Non F-Gas
(CO_2 Refrigerant)

Circulating Fluid Temperature Controller

Refrigerated Thermo-chiller New

GWP = 1

Non F-Gas
CO_2 Refrigerant



CE UKCA ETL LISTED c US Intertek (UL Standards) RoHS

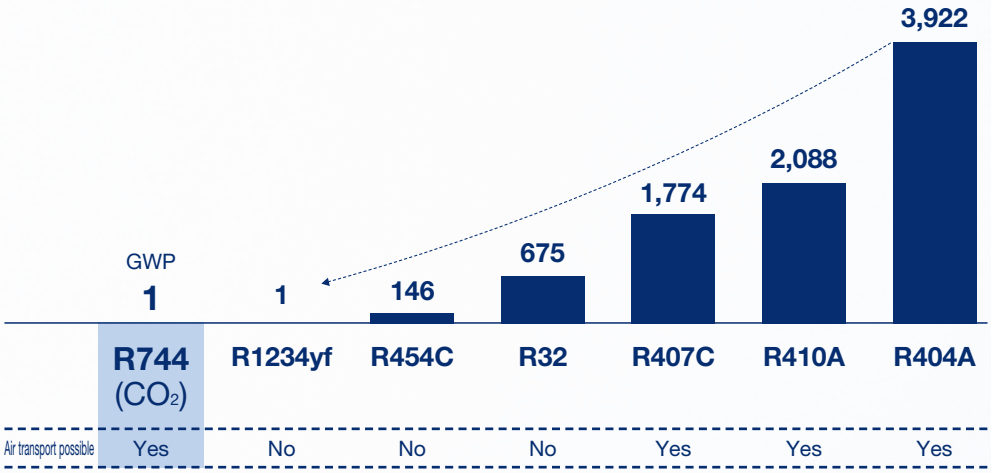
HRSC Series

SMC

CAT.EUS40-83A-UK

Air transport possible

Uses a CO_2 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 simple inspections and periodic inspections based on the Fluorocarbon Emissions Control Act (Japan)

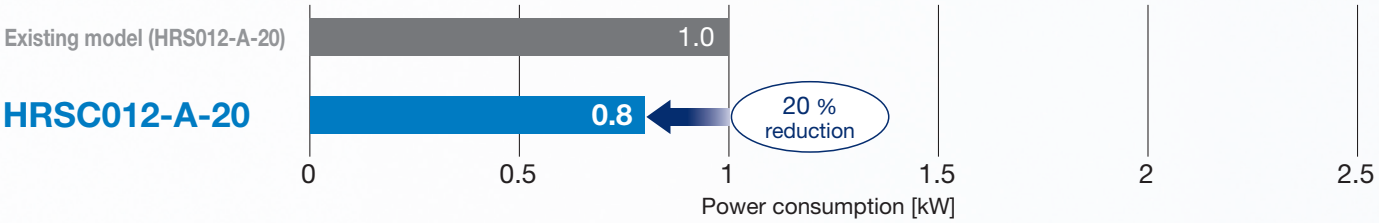
* Perform inspection and cleaning as outlined in the operation manual.


THERMO CHILLER
SMC
CO2
R744
SMC
SMC
SMC
SMC

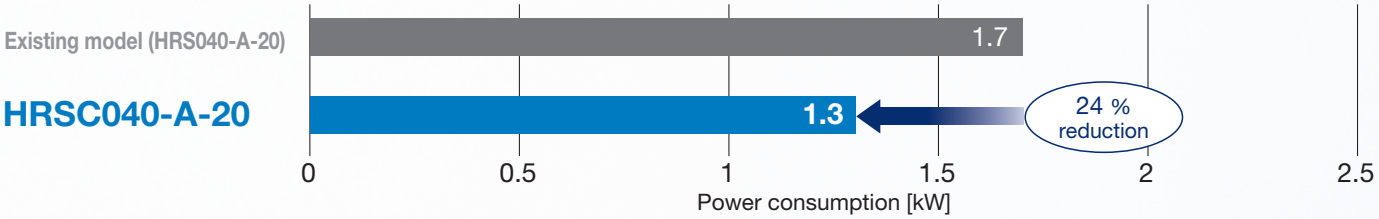
Energy Saving

Inverter compressor

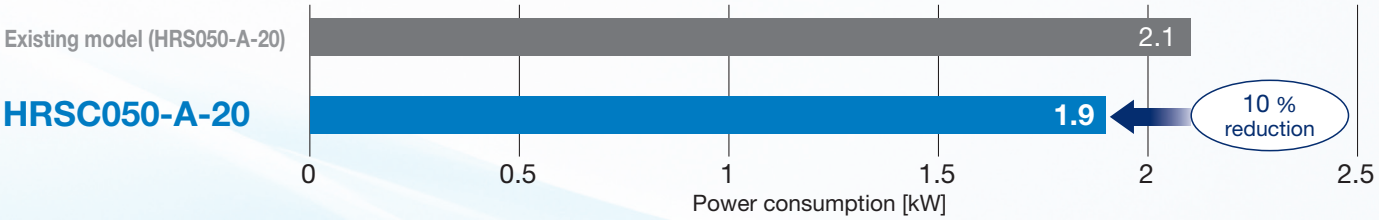
■ Reduced power consumption due to the optimal control of compressor rotations according to the load (compared with non-inverter chillers)



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)

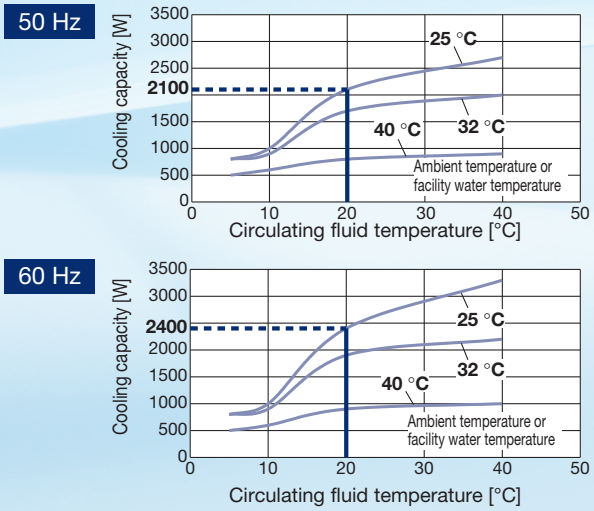


Conditions Ambient temperature: 25 °C, Circulating fluid temperature: 20 °C, Circulating fluid flow rate: 28 l/min, Heat load: 5.1 kW, Operating ratio: 50 % (Ratio of 5.1 kW heat load to 0 kW heat load)

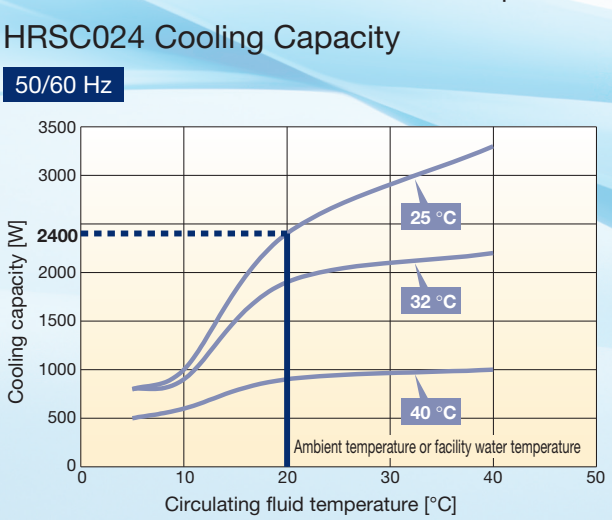
＊ Varies according to conditions

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

HRS024 Cooling Capacity



HRSC024 Cooling Capacity

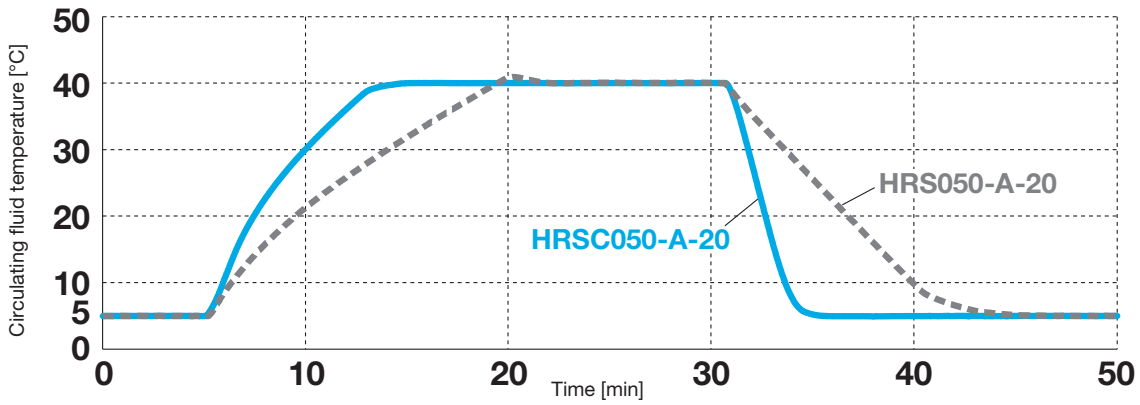


Same or better performance than the existing model

Same cooling/heating/pumping capacity and temperature stability

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

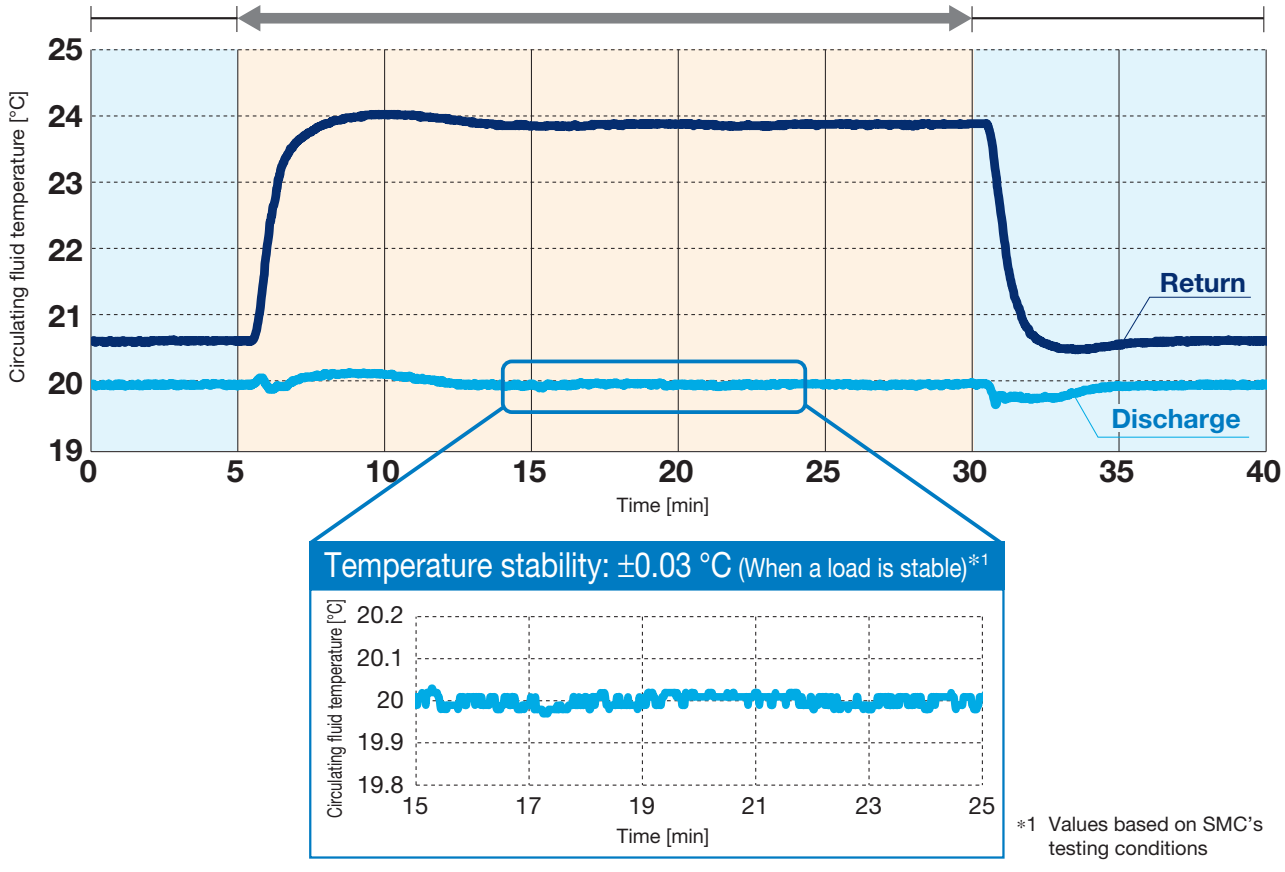
For the HRSC050-A-20



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



*1 Values based on SMC's testing conditions

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_2 refrigerant

Uses a non F-gas (CO_2 refrigerant)

Refrigerant type	GWP	Flammability	Air transport	Fluorocarbon Emissions Control Act (Japan)	Installation floor area restrictions
R744 (CO_2 refrigerant)	**1**	**Non-flammable**	**Possible**	**Not applicable**	**Not applicable**
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_2 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

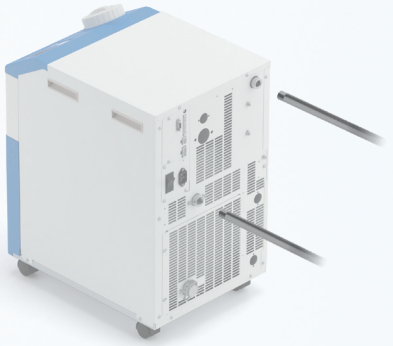
New Applicable to Deionised water piping (Option)

Model	Cooling method	Cooling capacity	Power supply	Option	Optional accessories	Environment	International standards
 **HRSC012**	Air-cooled type Water-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) With automatic fluid fill function High-pressure pump mounted (Cannot be selected for the HRSC050/060) Applicable to Deionised water piping	· Anti-quake bracket · Piping conversion fitting (For air-cooled, water-cooled, and options) · Concentration meter · Bypass piping set · Power supply cable · DI filter set · Electric resistance sensor set/ Electric resistance control set · Electric conductivity sensor set/ Electric conductivity control set · Particle filter set · Drain pan set (With water leakage sensor) · Replacement type dustproof filter set · Filter for circulating fluid fill port	Indoor use	CE UK CA ETL Intertek (UL Standards)
HRSC018		1.9 kW					
HRSC024		2.4 kW					
 **HRSC030**		3.2 kW					
HRSC040		4.2 kW					
 **HRSC050**		5.1 kW					
 **HRSC060**		5.9 kW					
HRSC090		9.5 kW (Air-cooled type) 11 kW (Water-cooled type)	3-phase 380Y/220 to 415Y/240 VAC (50 Hz) 380Y/220 to 480Y/277 VAC (60 Hz)	With automatic fluid fill function	· Piping conversion fitting · Concentration meter · Bypass piping set · Electric conductivity control set · Particle filter set · Filter for circulating fluid fill port (Cannot be selected for the HRSC100) · Drain pan set (With water leakage sensor) (Cannot be selected for the HRSC100) · Snow protection hood (HRSC100 Air-cooled type)		
 **HRSC100**		10.5 kW (Air-cooled type) 11.5 kW (Water-cooled type)		With casters and adjuster feet With fluid fill port		Outdoor installation (IPX4)	

Ensured interchangeability with existing models

Same external dimensions, port size, and layout

Existing model **HRS**



Non F-Gas (CO_2 Refrigerant) **HRSC**

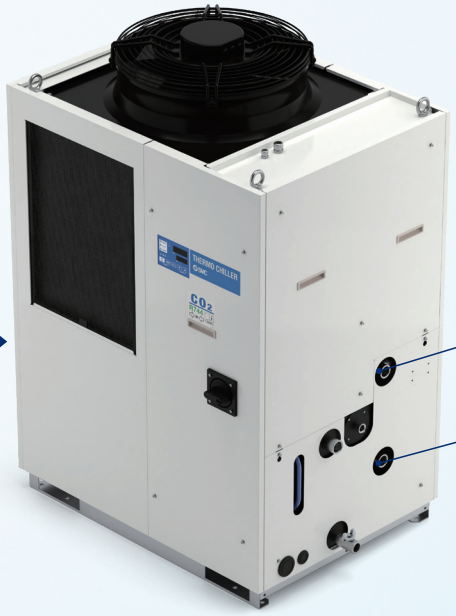


Reduced design labour

Existing model **HRSH**



Non F-Gas (CO_2 Refrigerant) **HRSC**



＊ Except for some models

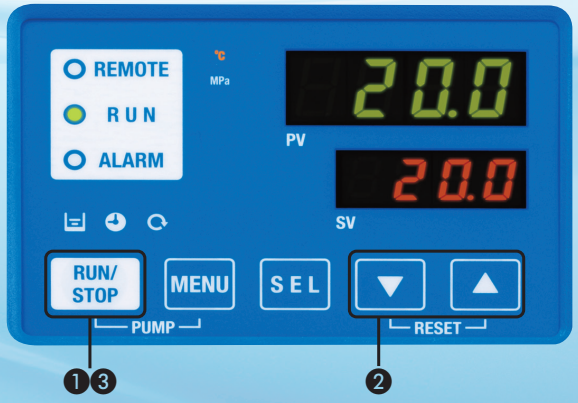
Operability the same as existing models

Step ❶ Press the RUN/STOP key.

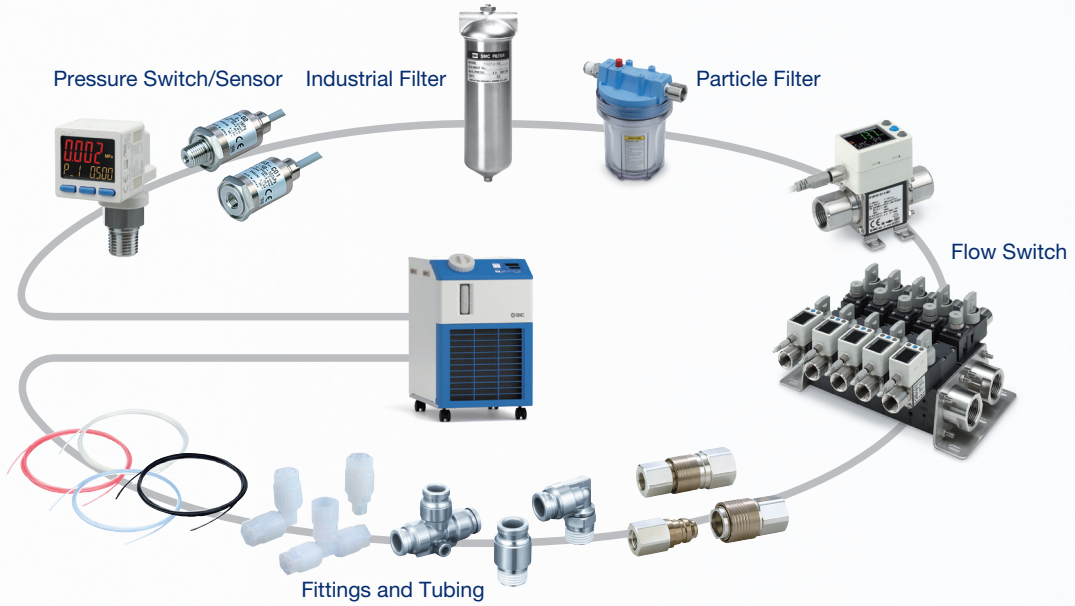
Step ❷ Adjust the temperature setting with the ▼ / ▲ keys.

Step ❸ Press the RUN/STOP key to stop operation.

Easy operation



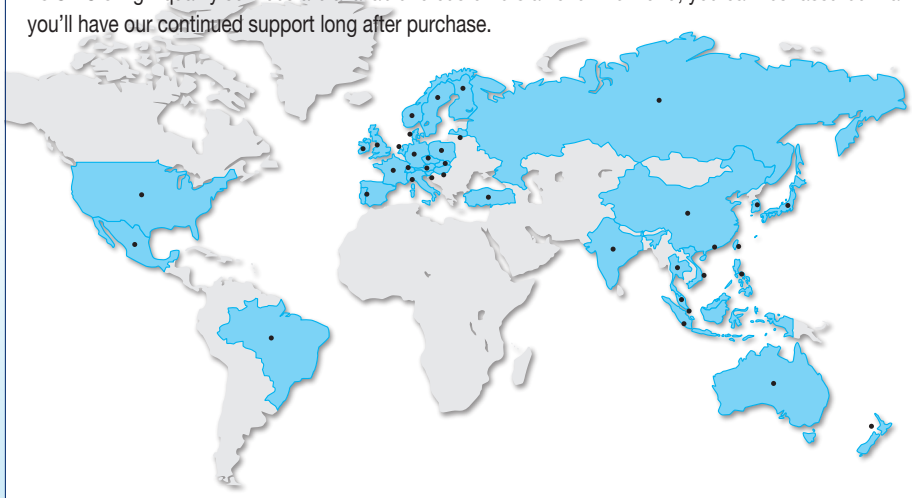
Circulating Fluid/Facility Water Line Related Equipment



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"

BCP Formulated

Non F-Gas
(CO_2 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: ±0.1 °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 (HRS040-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

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HRSC Series



Non F-Gas (CO_2 Refrigerant) **Thermo-chiller HRSC Series**

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Non F-Gas (CO_2 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

Pipe thread type

—	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
—	None	●	●	●	●	●	●	●
G	High-temperature environment specification	●	●	●	–	–	–	–
J	With automatic fluid fill function	●	●	●	●	●	●	●
M	Applicable to deionised water piping∗1	●	●	●	●	●	●	●
T	High-pressure pump mounted∗2	●	●	●	●	●	–	–

● When multiple options are combined, indicate symbols in alphabetical order.
∗1 ● If using deionised water that is 1 MΩ·cm or more (1 μS/cm or less), please select this option.
∗2 ● The cooling capacity will decrease by about 300 W from the value in the catalogue.
● 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_2, 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 system	**Circulating fluid**∗2		Tap water, 15 % ethylene glycol aqueous solution∗4, Deionised water						
	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	640	1100	1400	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)	
	Pump Max. flow rate (50/60 Hz)	[l/min]	27/29			34/40		31/42	
	Pump Max. pump head (50/60 Hz)	[m]	14/19					50	
	Pump 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						
Electrical system	**Power supply**		Single-phase 200 to 230 VAC (50/60 Hz), Allowable voltage range ±10 % (No continuous voltage fluctuation)						
	Earth leakage breaker (Standard) **Rated current**	[A]	10	10	15	15	20	30	30
	Earth leakage breaker (Standard) **Sensitivity current**	[mA]	30	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		[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]	51			53		73	

∗1 No condensation should be present.
∗2 Use fluid in condition below as the circulating fluid.
Tap water: Refer to "Water Quality Management" in the operation manual.
15 % ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.
Deionised water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)
∗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_2 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

W	Water-cooled refrigeration

Pipe thread type

–	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
–	None	●	●	●	●	●	●	●
J	With automatic fluid fill function	●	●	●	●	●	●	●
M	Applicable to deionised water piping∗1	●	●	●	●	●	●	●
T	High-pressure pump mounted∗2	●	●	●	●	●	–	–

● When multiple options are combined, indicate symbols in alphabetical order.
∗1 ● If using deionised water that is 1 MΩ·cm or more (1 μS/cm or less), please select this option.
∗2 ● 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.

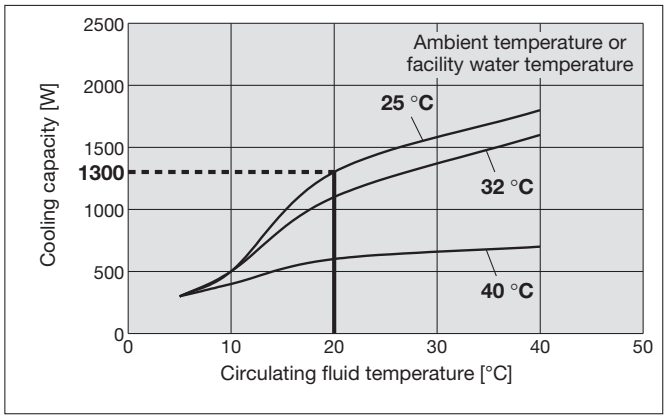
Model			HRSC012-W-20	HRSC018-W-20	HRSC024-W-20	HRSC030-W-20	HRSC040-W-20	HRSC050-W-20	HRSC060-W-20
Cooling method			Water-cooled refrigeration						
Refrigerant			R744 (CO_2, GWP: 1)						
Refrigerant charge		[kg]	0.4	0.4	0.4	0.41	0.41	0.44	0.44
Control method			PID control						
Ambient temperature/Humidity/Altitude/Installation environment∗1			Temperature: 5 to 40 °C, Humidity: 30 to 70 %, Altitude: less than 3000 m, Environment: Indoors						
Circulating fluid system	**Circulating fluid**∗2		Tap water, 15% ethylene glycol aqueous solution∗4, Deionised water						
	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)	
	Pump Max. flow rate (50/60 Hz)	[l/min]	27/29			34/40		31/42	
	Pump Max. pump head (50/60 Hz)	[m]	14/19					50	
	Pump 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						
Facility water system	**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						
Electrical system	**Power supply**		Single-phase 200 to 230 VAC (50/60 Hz), Allowable voltage range ±10 % (No continuous voltage fluctuation)						
	Earth leakage breaker (Standard) **Rated current**	[A]	10	10	10	15	20	20	20
	Earth leakage breaker (Standard) **Sensitivity current**	[mA]	30	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 (1.9/2.2.2)	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 Use fluid in condition below as the circulating fluid.
Tap water: Refer to "Water Quality Management" in the operation manual.
15 % ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.
Deionised water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)
∗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

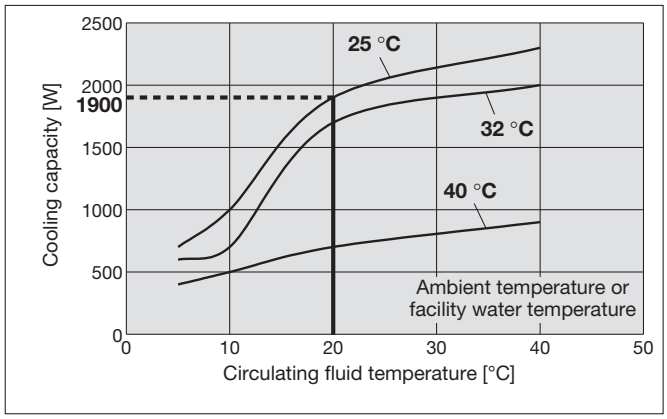
Cooling Capacity

* 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.

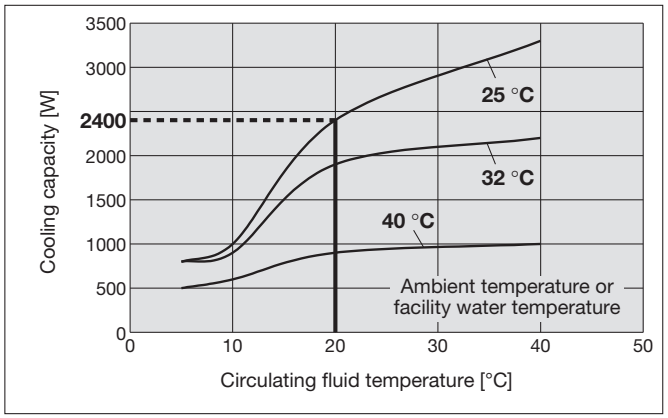
HRSC012-A-20, HRSC012-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



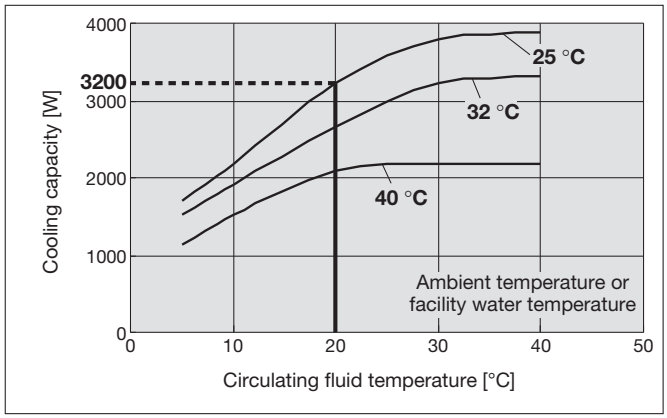
HRSC018-A-20, HRSC018-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



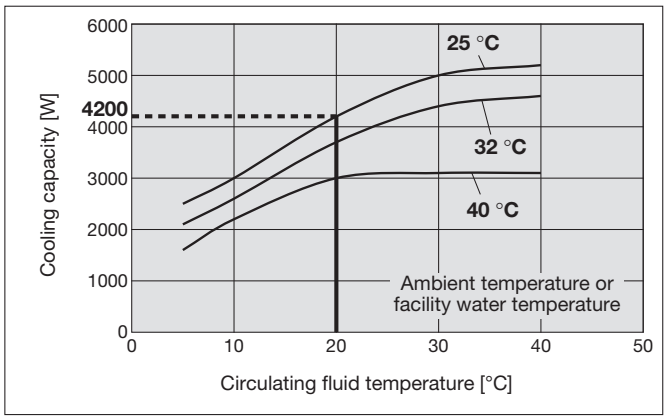
HRSC024-A-20, HRSC024-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



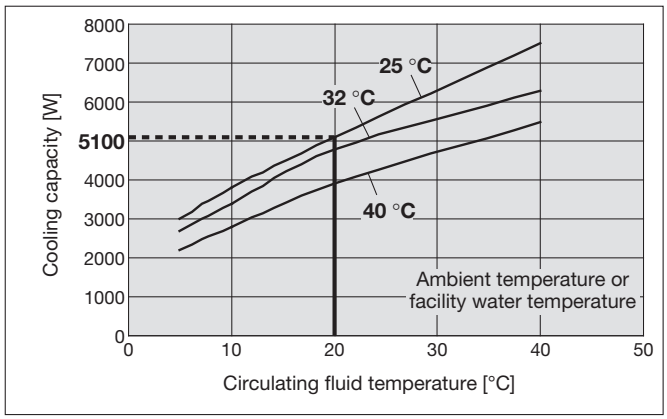
HRSC030-A-20, HRSC030-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



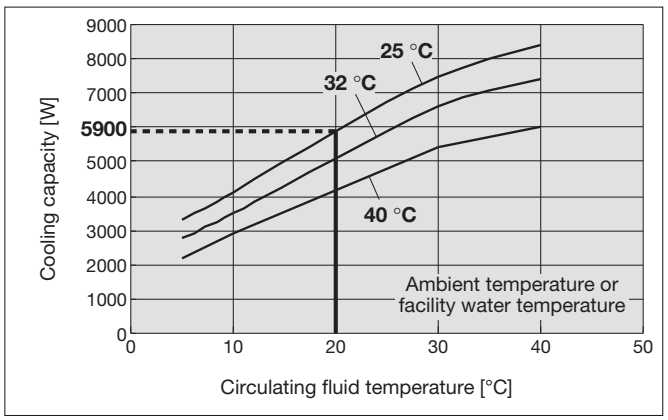
HRSC040-A-20, HRSC040-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



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

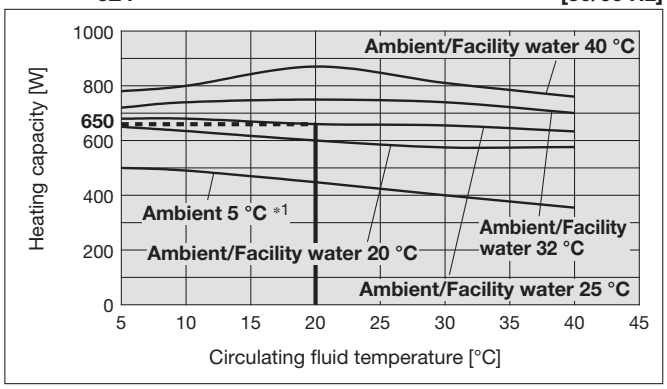


HRSC060-A-20, HRSC060-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



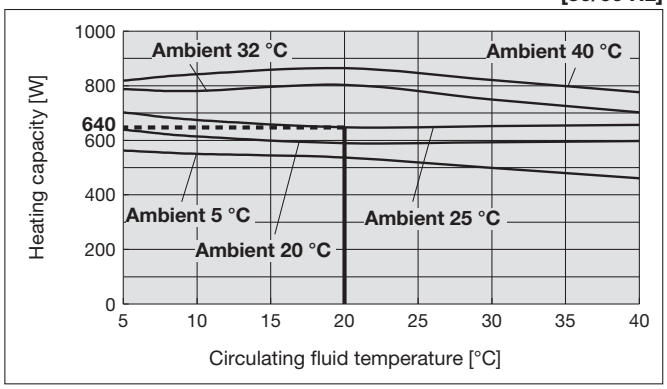
Heating Capacity

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

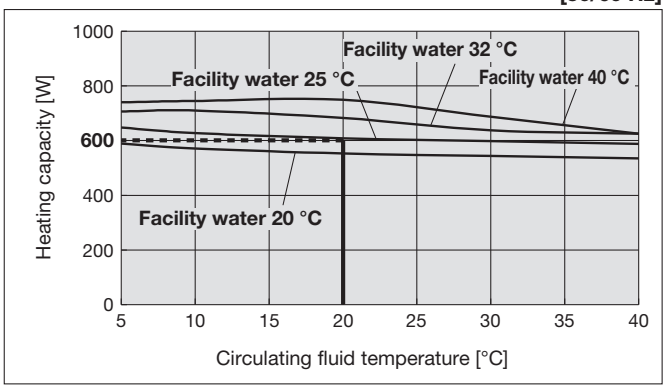


*1 Only for the air-cooled refrigeration type

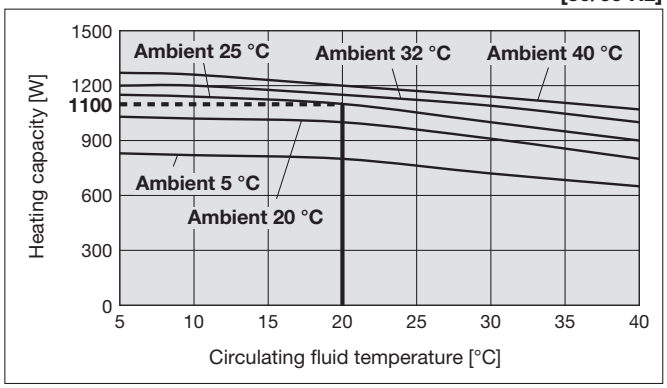
HRSC030-A-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



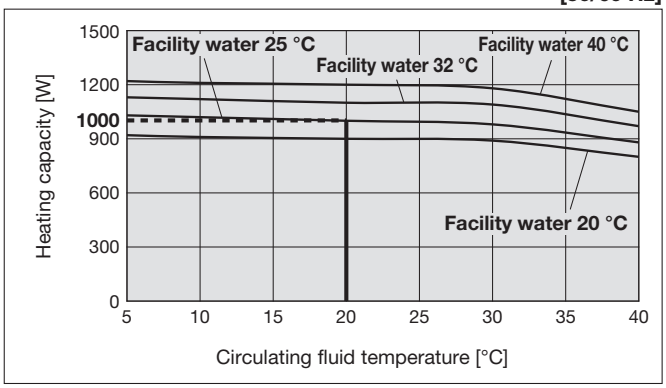
HRSC030-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



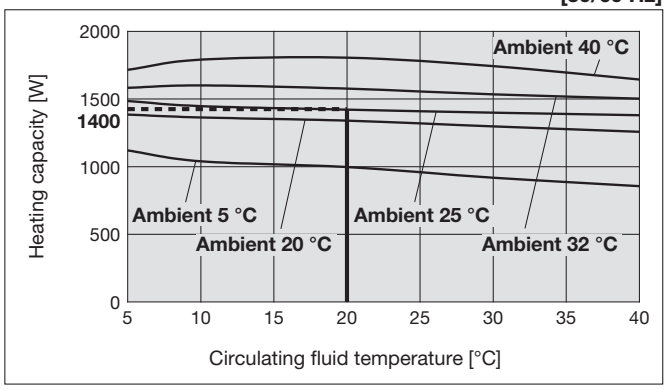
HRSC040-A-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



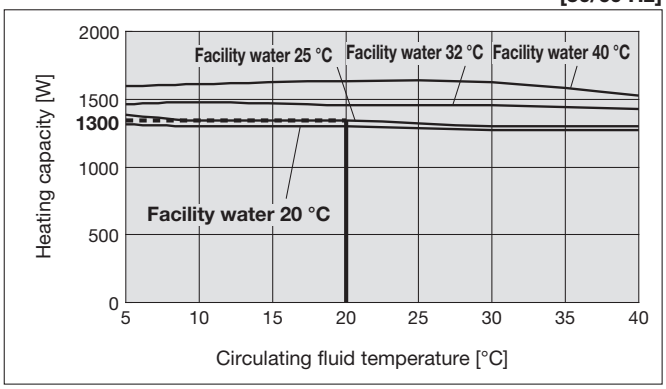
HRSC040-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]



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

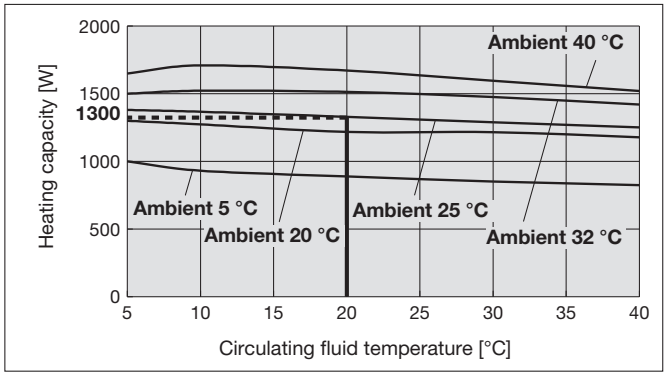


HRSC050-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]

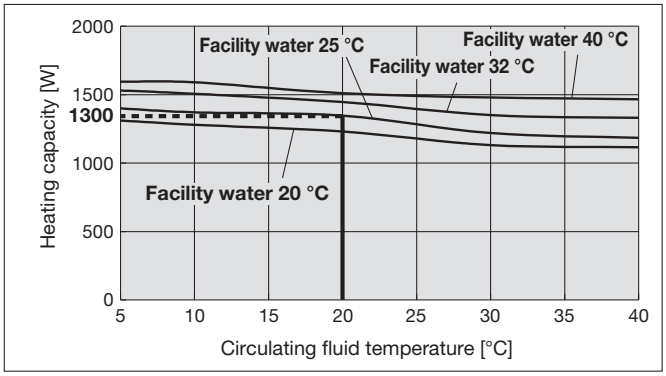


Heating Capacity

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

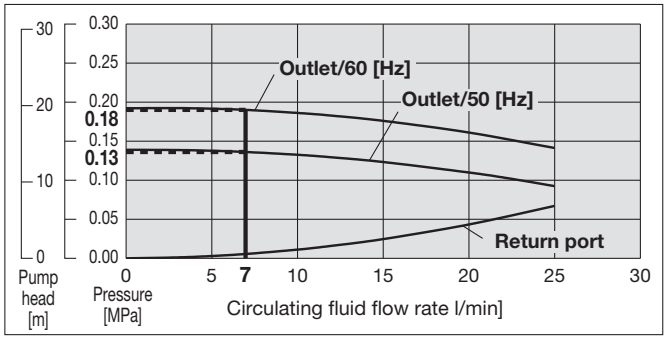


HRSC060-W-20 (Single-phase 200 to 230 VAC) [50/60 Hz]

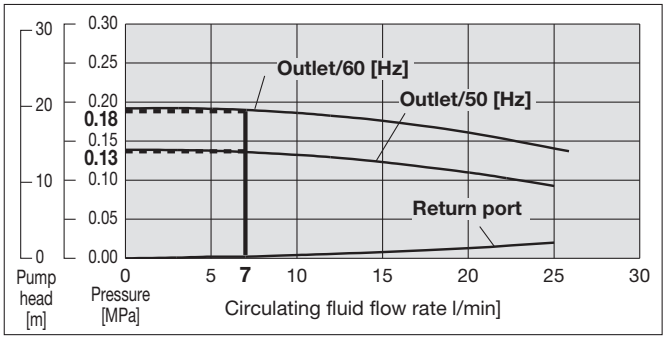


Pump Capacity

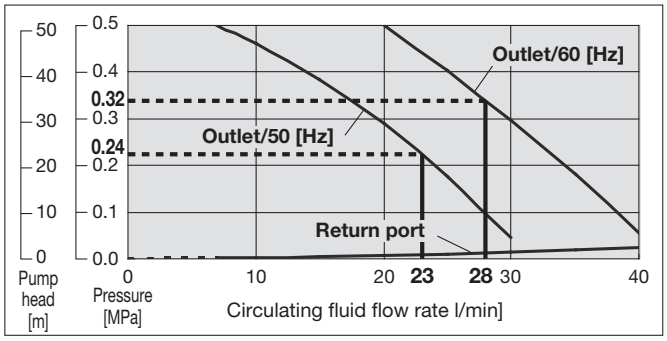
HRSC 012/018/024 - A/W -20 (Single-phase 200 to 230 VAC)



HRSC 030/040 - A/W -20 (Single-phase 200 to 230 VAC)

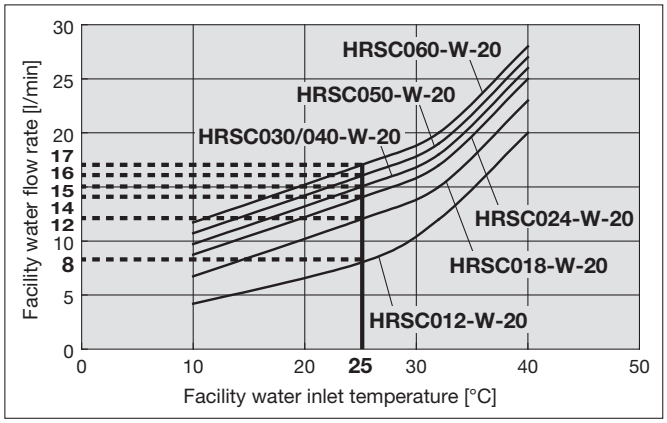


HRSC 050/060 - A/W -20 (Single-phase 200 to 230 VAC)



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

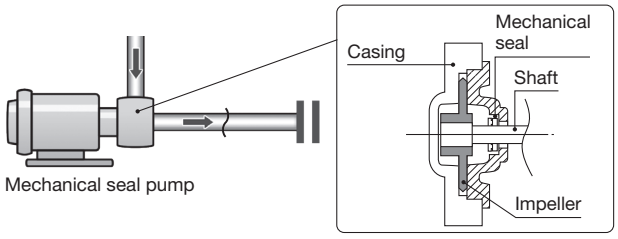


⚠ Caution

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.

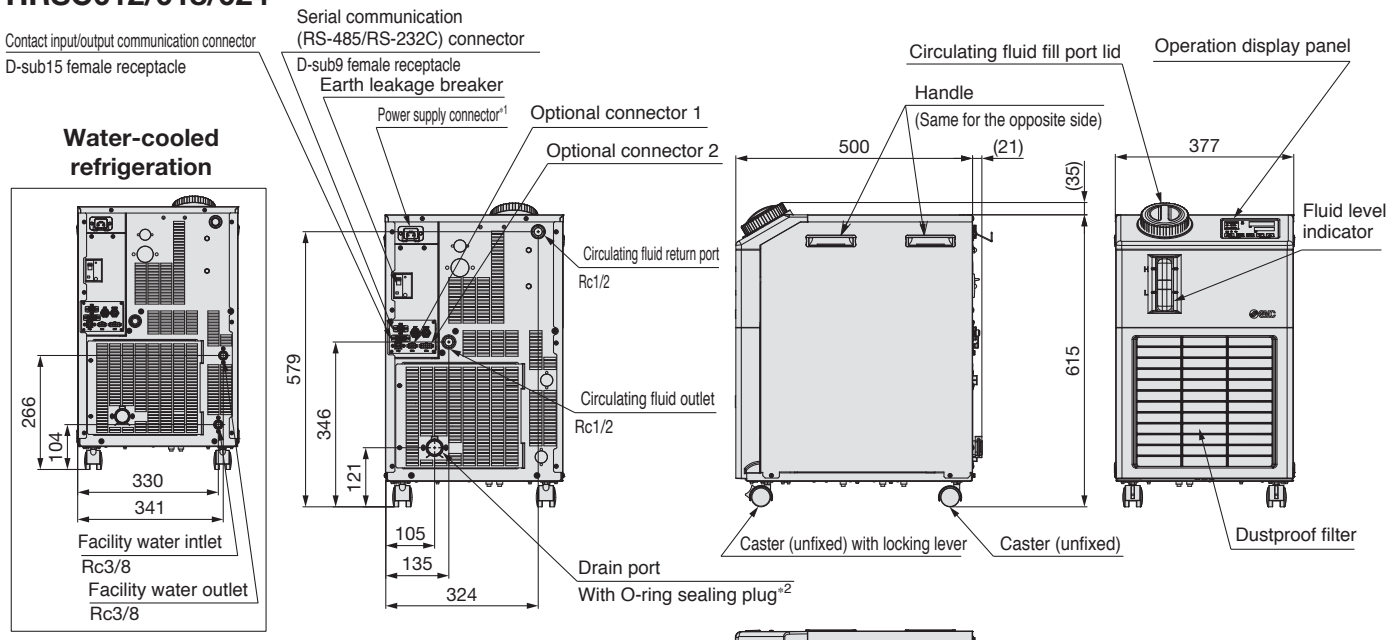
Mechanical seal

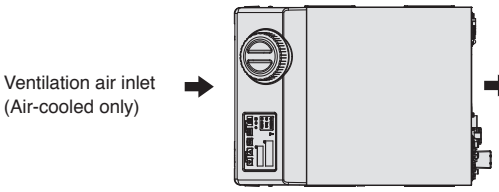


∗ This is the facility water flow rate at the circulating fluid rated flow and the cooling capacity listed in the "Cooling Capacity" specifications.

Dimensions

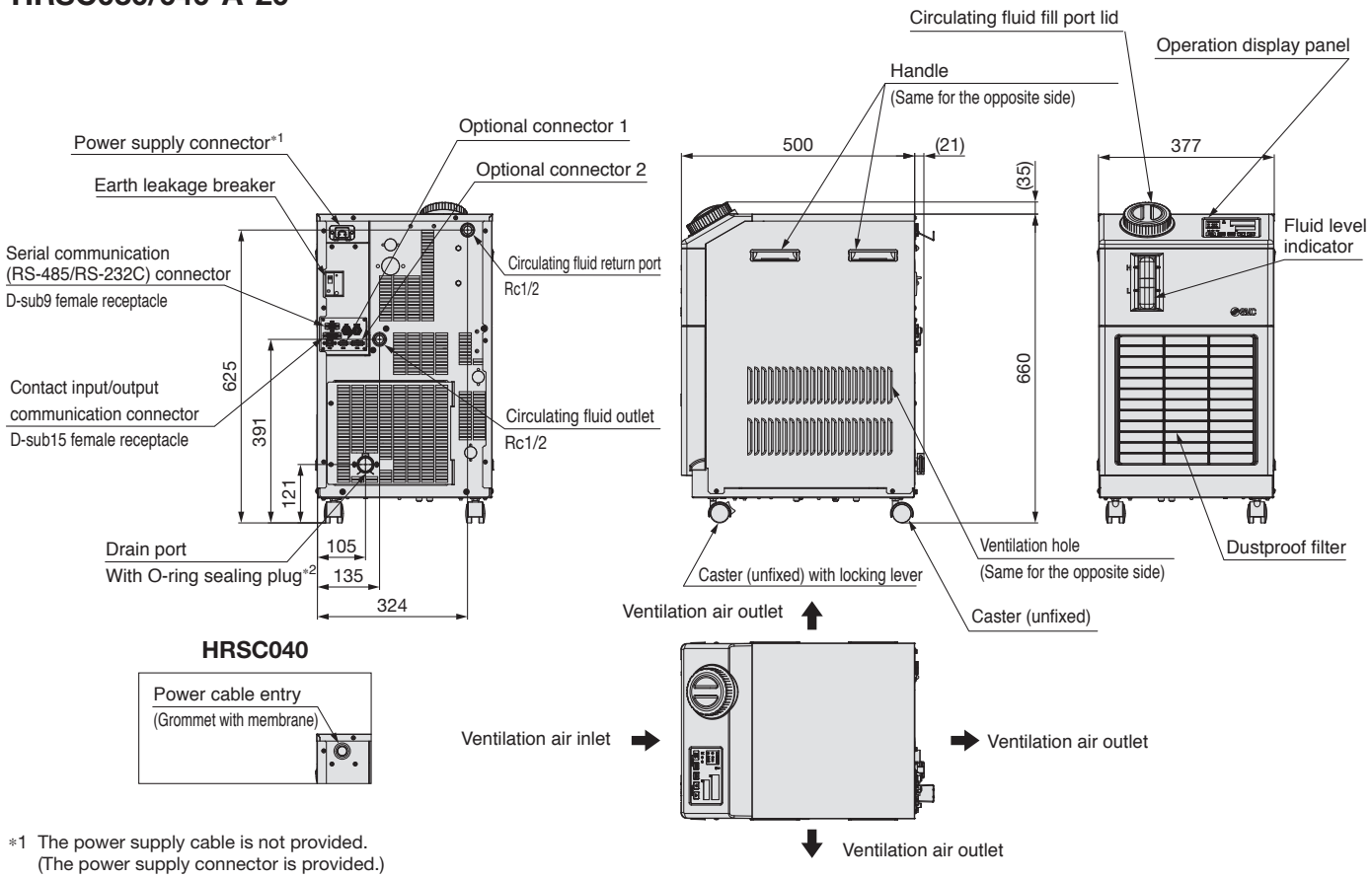
HRSC012/018/024





*1 The power supply cable is not provided.
(The power supply connector is provided.)
*2 The conversion fitting (R3/8 male thread) is provided.

HRSC030/040-A-20

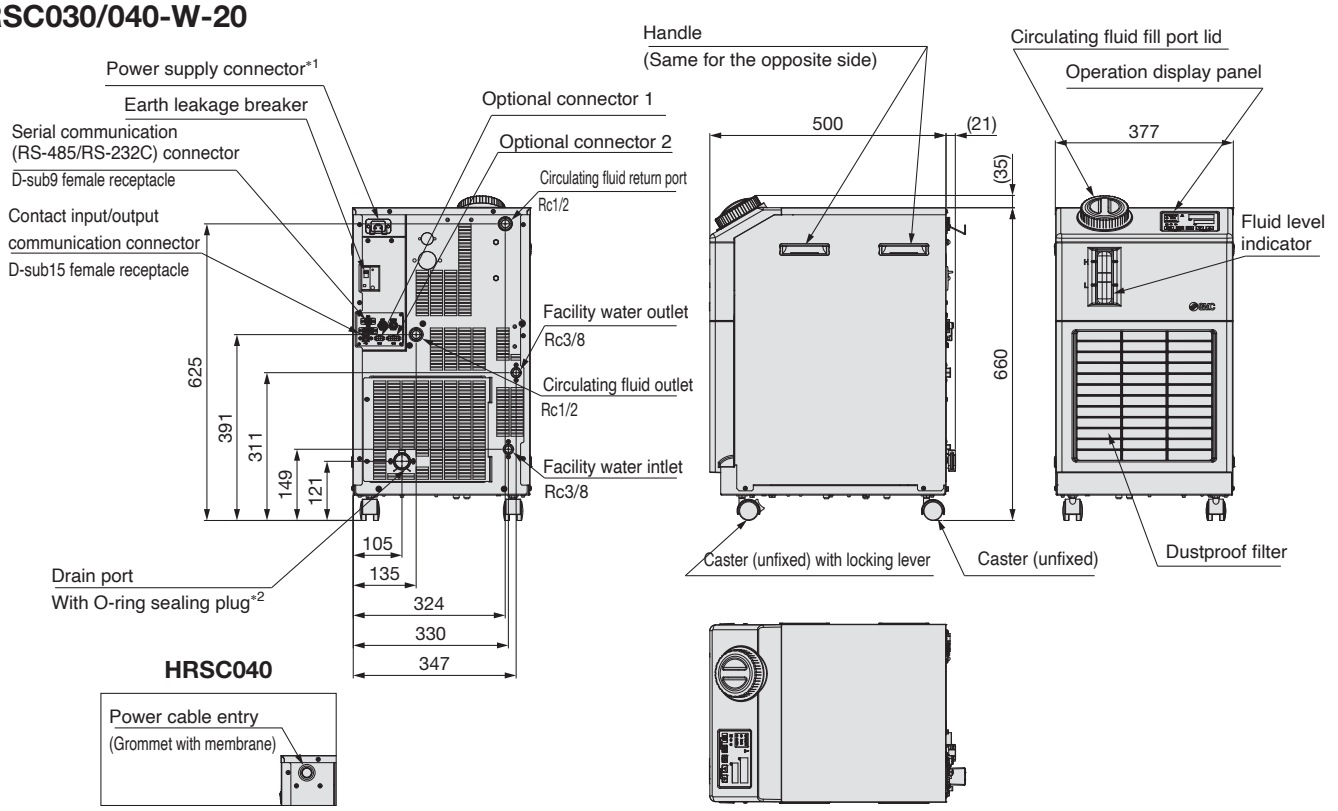


HRSC040

*1 The power supply cable is not provided.
(The power supply connector is provided.)
*2 The conversion fitting (R3/8 male thread) is provided.

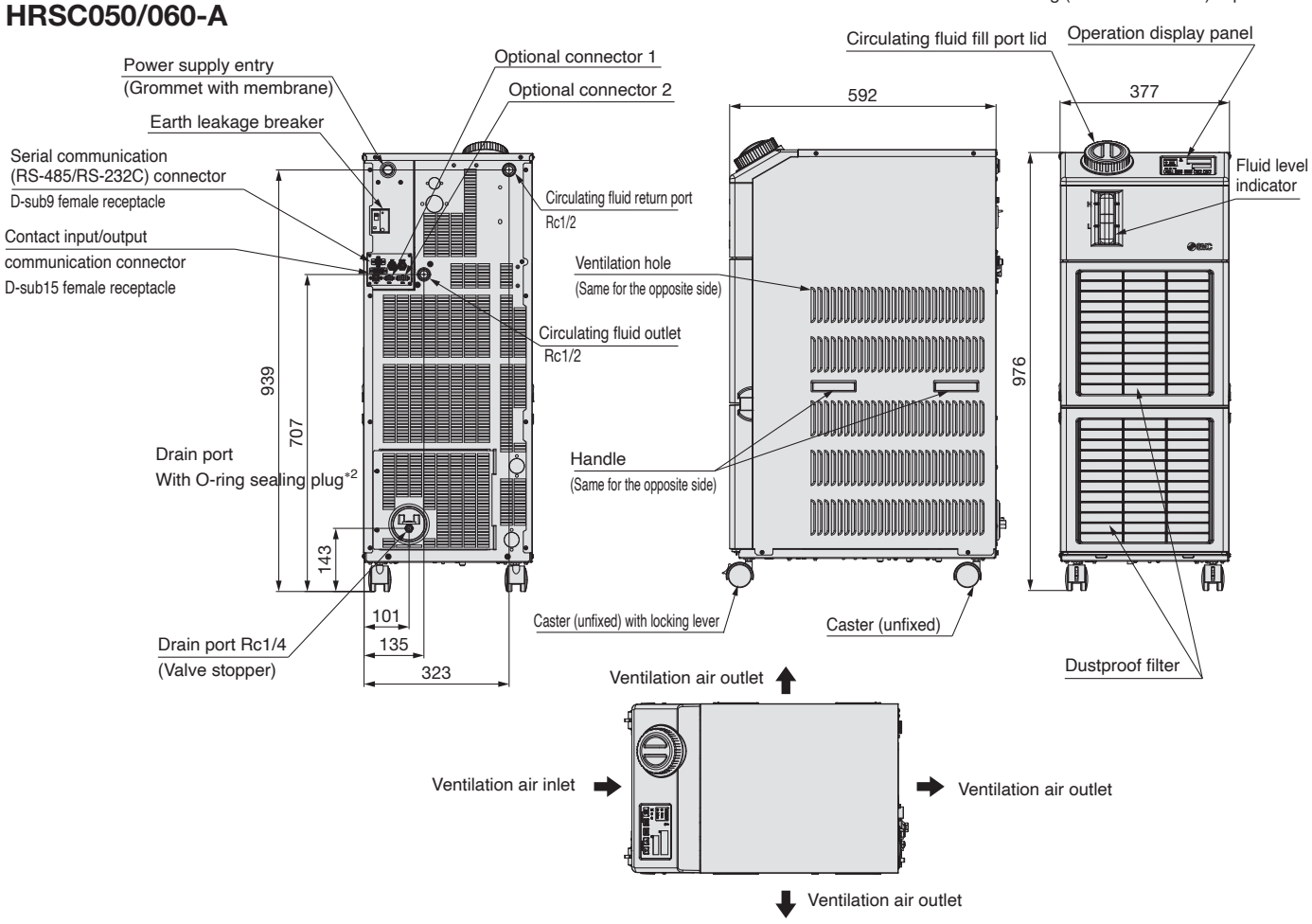
Dimensions

HRSC030/040-W-20



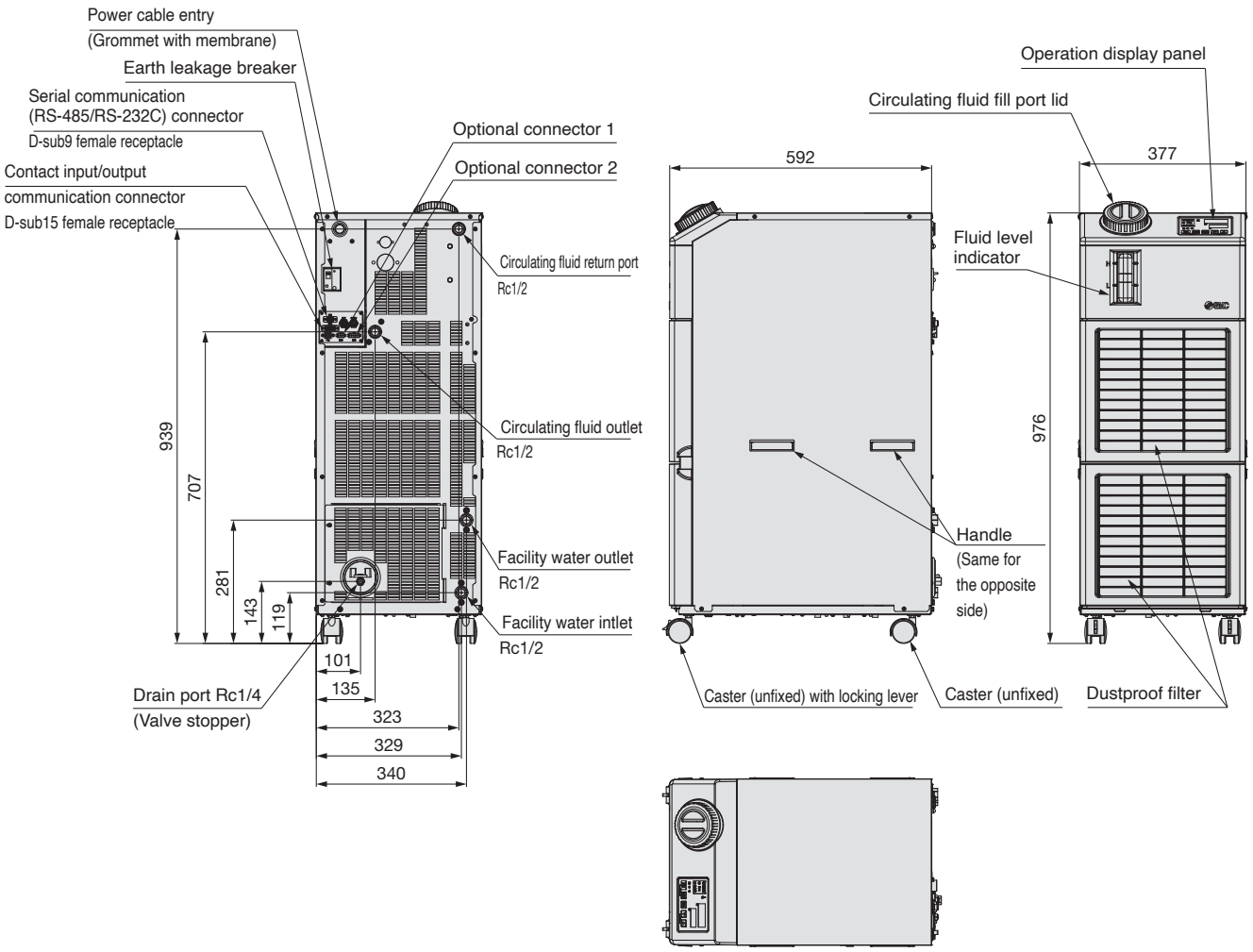
*1 The power supply cable is not provided.
(The power supply connector is provided.)
*2 The conversion fitting (R3/8 male thread) is provided.

HRSC050/060-A



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.**

G Option symbol

High-Temperature Environment Specification

HRSC□– A□–20– G

High-temperature environment specification

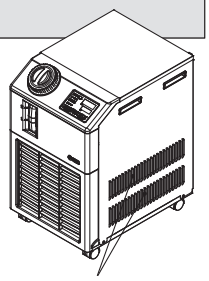
Applicable model	HRSC012/018/024-A□-20-G
Cooling method	Air-cooled refrigeration
Power supply	Single-phase 200 to 230 VAC (50/60 Hz)

* 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).

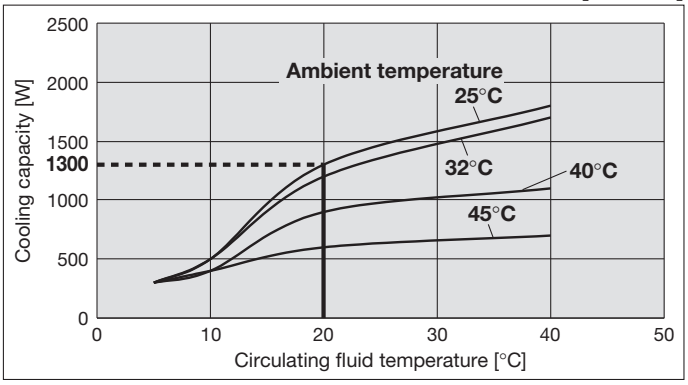


Ventilation slots are added to side panels (on both sides).

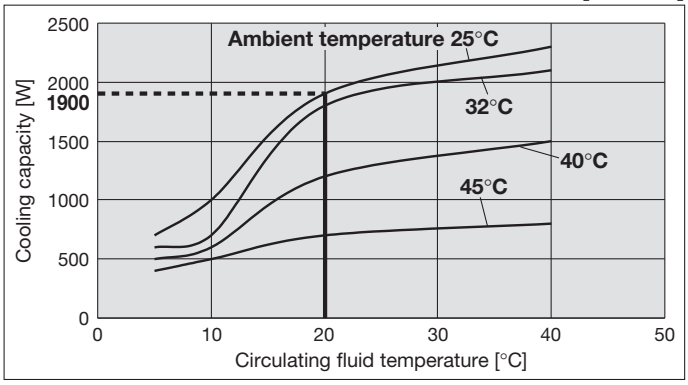
Cooling Capacity

* 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.

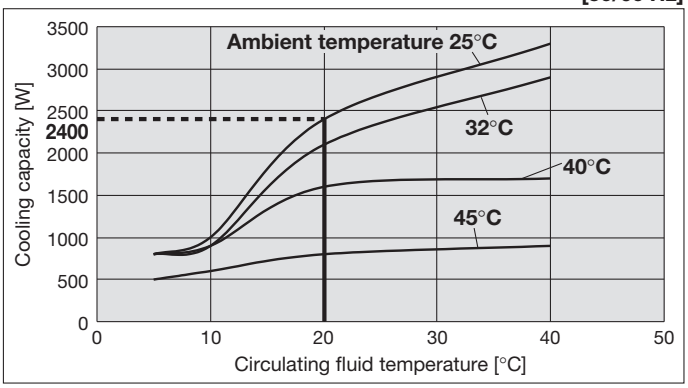
HRSC012-A□-20-G [50/60 Hz]



HRSC018-A□-20-G [50/60 Hz]



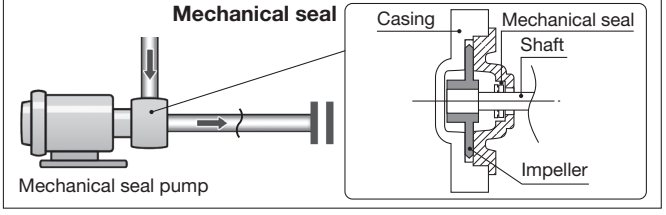
HRSC024-A□-20-G [50/60 Hz]



⚠ Caution

Mechanical Seal Pump

The pump used for the option T/MT 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.



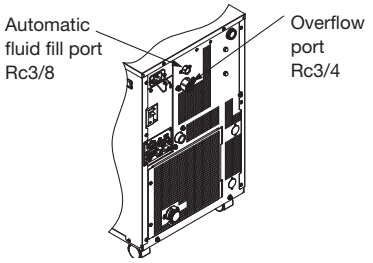
∗ **Options have to be selected when ordering the thermo-chiller. It is not possible to add them after purchasing the unit.**

J **Option symbol**

With Automatic Fluid Fill Function

HRSC□□□□-□□-2-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-□□-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.

M **Option symbol**

Applicable to Deionised Water Piping

HRSC□□□□-□□-20-M

Applicable to Deionised water piping

Contact material of the circulating fluid circuit is made from non-copper materials.
Select this when using Deionised water with a conductivity of 1 MΩ·cm or more (1 μs/cm or less).

Applicable model	**HRSC012/018/024/030/040/050/060-□□-20-M**
Contact material for circulating fluid	Stainless steel (including heat exchanger brazing), Alumina ceramic, SiC, Carbon, PP, PE, POM, FKM, EPDM, PVC

∗ No change in external dimensions

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

T Option symbol

High-Pressure Pump Mounted

HRSC□□–□□–20–T /MT

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.

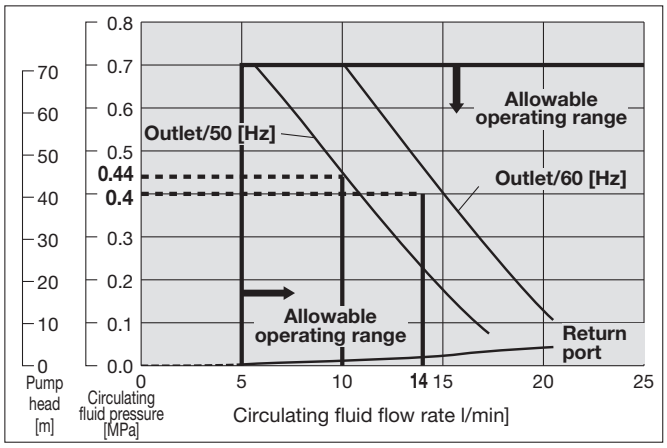
* **Cannot be selected for the HRSC050/060**

Applicable model			HRSC012/018/024/030-□□-20-T	HRSC012/018/024/030-□□-20-MT*1	HRSC040-□□-20-T/MT*1
Pump	Rated flow (50/60 Hz)*2, *3	L/min	10 (0.44 MPa) /14 (0.40 MPa)	10 (0.32 MPa) /14 (0.32 MPa)	23 (0.18 MPa) /28 (0.23 MPa)
	Max. flow rate (50/60 Hz)	L/min	18/22	18/22	30/35
	Max. pump head (50/60 Hz)	m	70	60	50
	Output	W	550		
Earth leakage breaker capacity		A	15		20
Cooling capacity*4		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)		

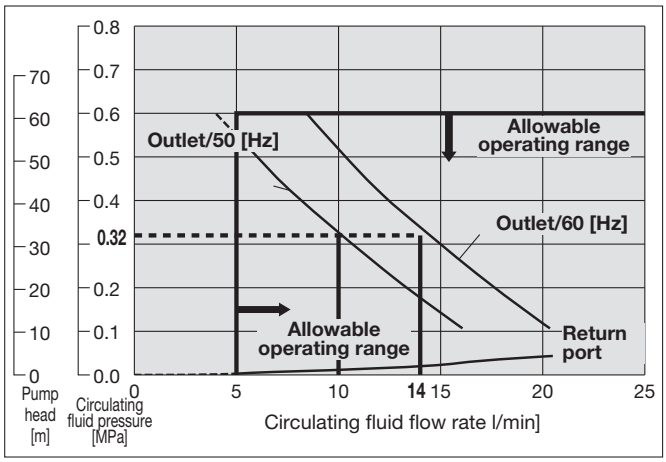
*1 -MT: Applicable to Deionised water piping + High-pressure pump
*2 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C
*3 The required minimum flow rate for maintaining the cooling capacity or temperature stability
*4 Cooling capacity will decrease as pump power increases.
* When the high-pressure pump mounted option is selected, the weight increases by 6 kg for -T and 7 kg for -MT.
* No change in external dimensions

Pump Capacity

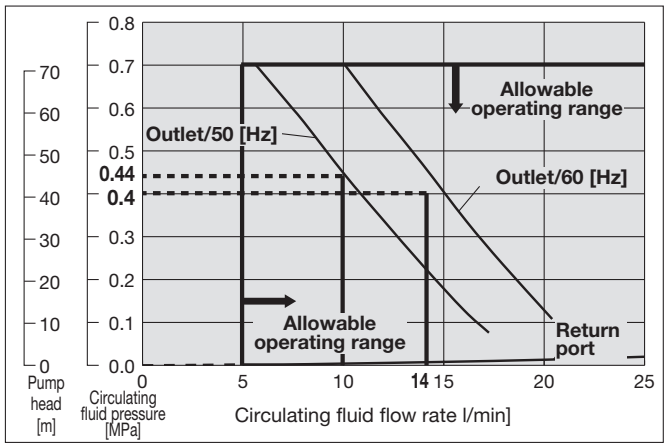
HRSC012/018/024-□□-20-T



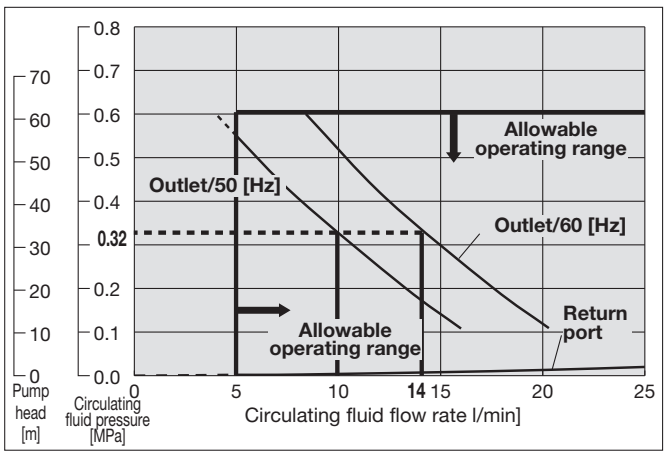
HRSC012/018/024-□□-20-MT



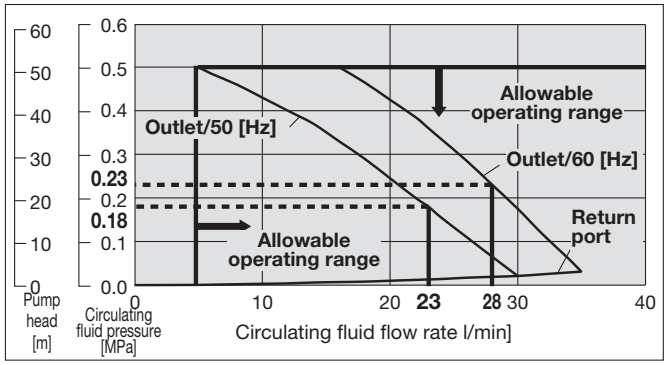
HRSC030-□□-20-T



HRSC030-□□-20-MT



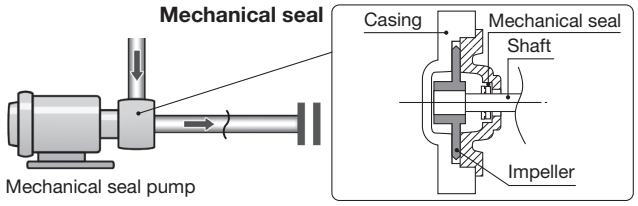
HRSC040-□□-20-T/MT



⚠ Caution

Mechanical Seal Pump

The pump used for the option T/MT 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.



HRSC Series
Optional Accessories

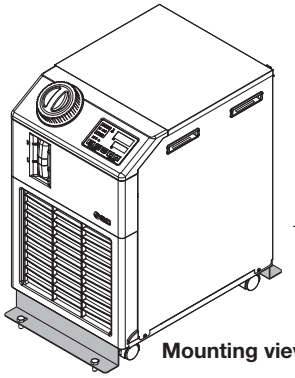
① Anti-Quake Bracket

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.

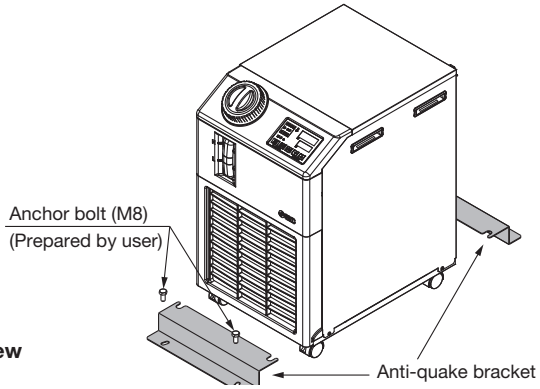
[mm]

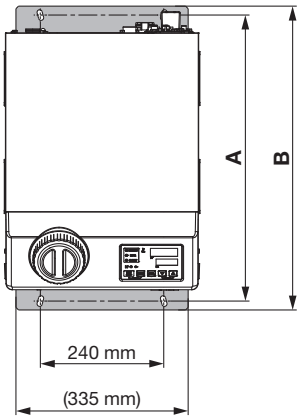
Part no. (per unit)	Applicable model	A	B	Plate thickness	Material
HRS-TK001	HRSC012-□□-20 HRSC018-□□-20 HRSC024-□□-20	555	(590)	1.6	Zinc steel plate
	HRSC030-□□-20 HRSC040-□□-20	546	(581)		
HRS-TK002	HRSC050-□□-20 HRSC060-□□-20	664	(698)	2.0	Stainless steel

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



Mounting view





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

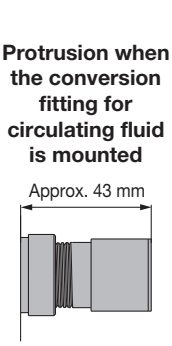
This fitting changes the port size for circulating fluid from Rc1/2 to G1/2 or NPT1/2, and for drain from Rc3/8 to G3/8 or NPT3/8. It is not necessary to purchase this when pipe thread type F or N is selected in "How to Order" since it is included in the product.

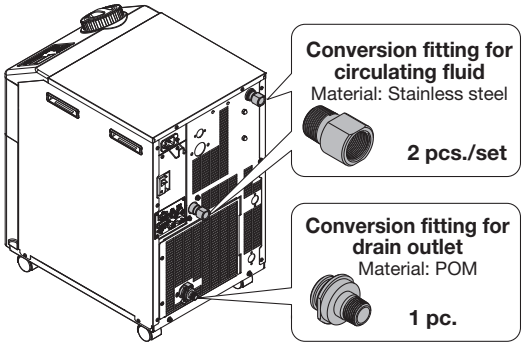
Part no.		Applicable model
HRS-EP001	G thread conversion fitting set	HRSC012-A-20 HRSC018-A-20 HRSC024-A-20
HRS-EP002	NPT thread conversion fitting set	HRSC030-A-20 HRSC040-A-20

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.

Protrusion when the conversion fitting for circulating fluid is mounted

Approx. 43 mm





HRSC050-A-20, HRSC060-A-20

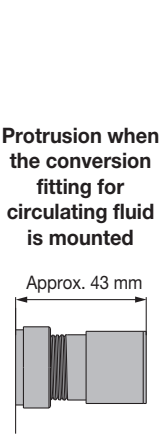
This fitting changes the port size for circulating fluid from Rc1/2 to G1/2 or NPT1/2, and for drain from Rc1/4 to G1/4 or NPT1/4. It is not necessary to purchase this when pipe thread type F or N is selected in "How to Order" since it is included in the product.

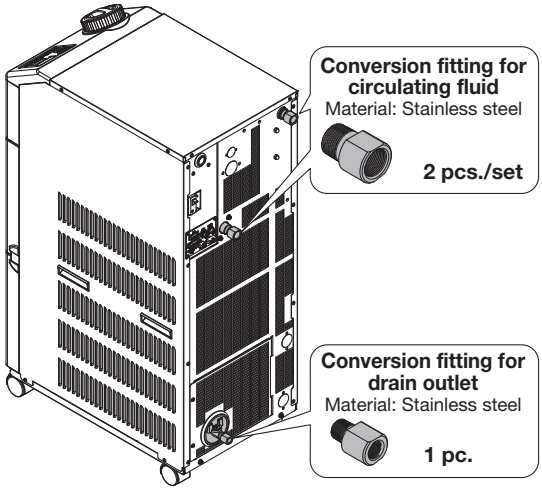
Part no.		Applicable model
HRS-EP009	G thread conversion fitting set	HRSC050-A-20
HRS-EP010	NPT thread conversion fitting set	HRSC060-A-20

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

Protrusion when the conversion fitting for circulating fluid is mounted

Approx. 43 mm





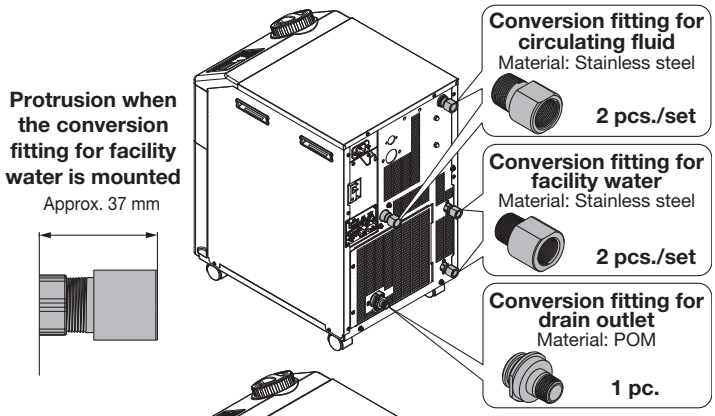
② Piping Conversion Fitting (For Water-Cooled Refrigeration)

■ 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
HRS-EP003	G thread conversion fitting set	HRSC012-W-20 HRSC018-W-20 HRSC024-W-20 HRSC030-W-20 HRSC040-W-20
HRS-EP004	NPT thread conversion fitting set	

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.

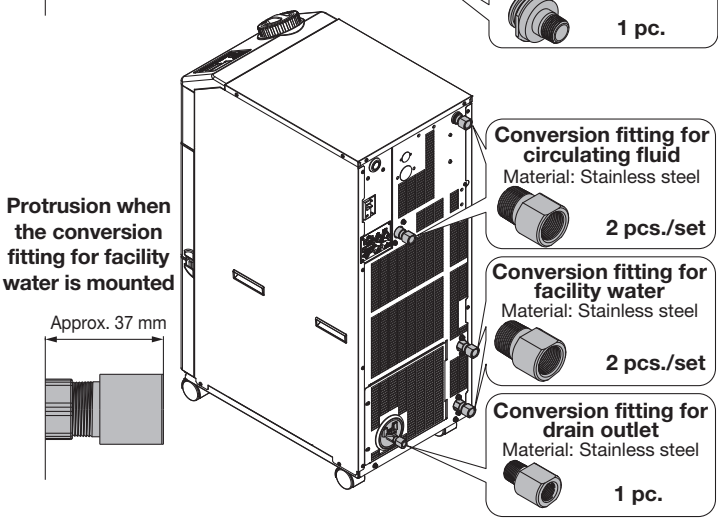


HRSC050-W-20, HRSC060-W-20

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
HRS-EP011	G thread conversion fitting set	HRSC050-W-20 HRSC060-W-20
HRS-EP012	NPT thread conversion fitting set	

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

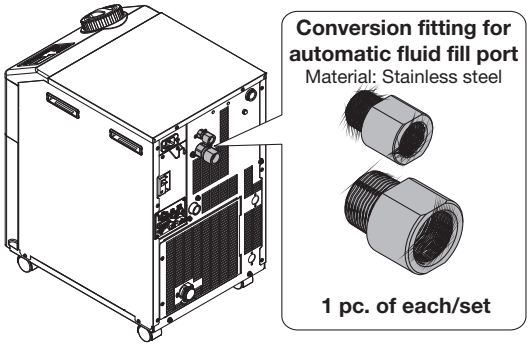


③ Piping Conversion Fitting (For Option)

■ 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.

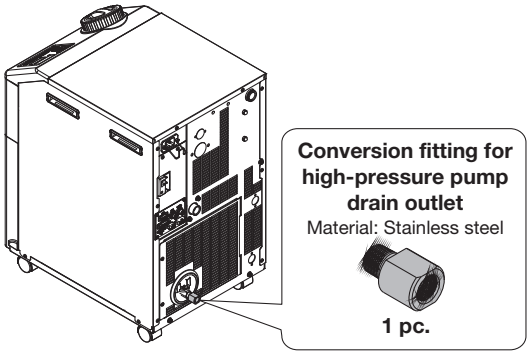
Part no.		Applicable model
HRS-EP005	G thread conversion fitting set	HRSC012-□-20-J HRSC018-□-20-J HRSC024-□-20-J HRSC030-□-20-J HRSC040-□-20-J HRSC050-□-20-J HRSC060-□-20-J
HRS-EP006	NPT thread conversion fitting set	



■ 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
HRS-EP007	G thread conversion fitting	HRSC012-□-20-T HRSC018-□-20-T HRSC024-□-20-T HRSC030-□-20-T HRSC040-□-20-T HRSC050-□-20*1 HRSC060-□-20*1
HRS-EP008	NPT thread conversion fitting	

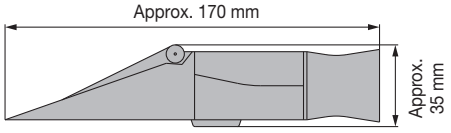


*1 It is not necessary to purchase this when you purchase the HRS-EP009 to 012 since it is included in the product.

④ Concentration Meter

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

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



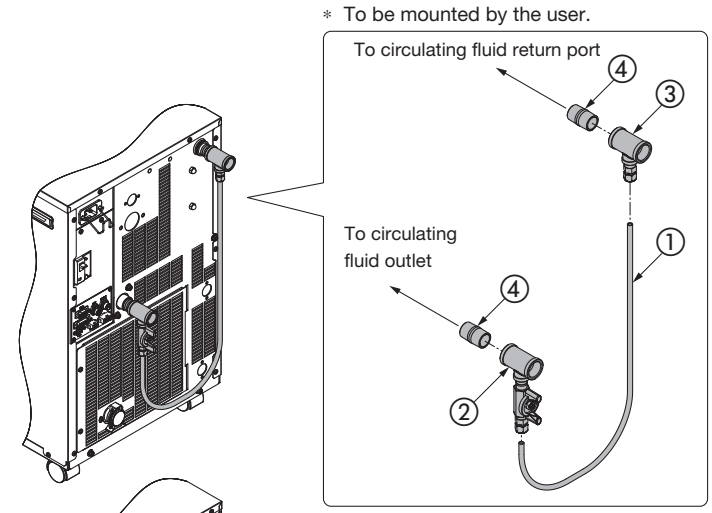
⑤ Bypass Piping Set

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 HRSC 0 5 0 , 0 6 0), 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
HRS-BP001	HRSC012-□□-20 HRSC018-□□-20 HRSC024-□□-20 HRSC030-□□-20

Parts List

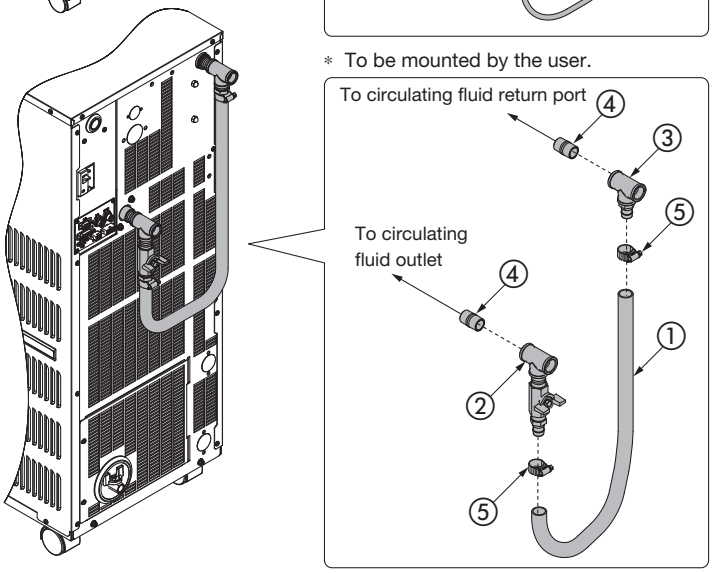
No.	Description	Fluid contact material	Qty.
①	Bypass tube (Part no.: TL0806)	PFA	1 (Approx. 700 mm)
②	Outlet piping (With ball valve)	Stainless steel	1
③	Return port piping	Stainless steel	1
④	Nipple (Size: 1/2)	Stainless steel	2



Part no.	Applicable model
HRS-BP004	HRSC040-□□-20 HRSC050-□□-20 HRSC060-□□-20

Parts List

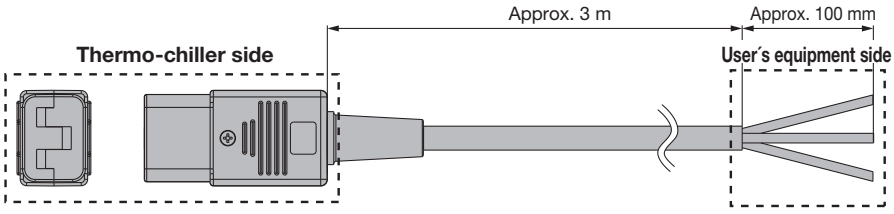
No.	Description	Fluid contact material	Qty.
①	Hose	PVC	1 (Approx. 700 mm)
②	Outlet piping (With ball valve)	Stainless steel	1
③	Return port piping	Stainless steel	1
④	Nipple (Size: 1/2)	Stainless steel	2
⑤	Hose band	—	2



⑥ Power Supply Cable

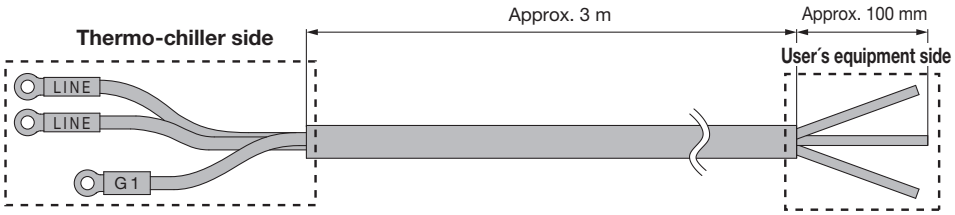
■ For single-phase 200 VAC type

Part no.	Applicable model
HRR-CA001	HRSC012-□□-20 HRSC018-□□-20 HRSC024-□□-20 HRSC030-□□-20



Part no.	Applicable model
HRS-CA004	HRSC040-□□-20 HRSC050-W□-20 HRSC060-W□-20

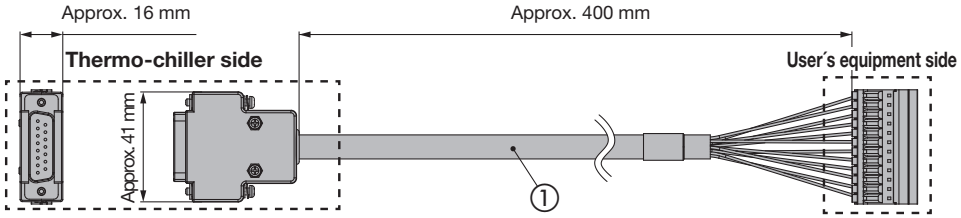
∗ Not available for the HRSC050/060-A□-20. To be prepared by the user.



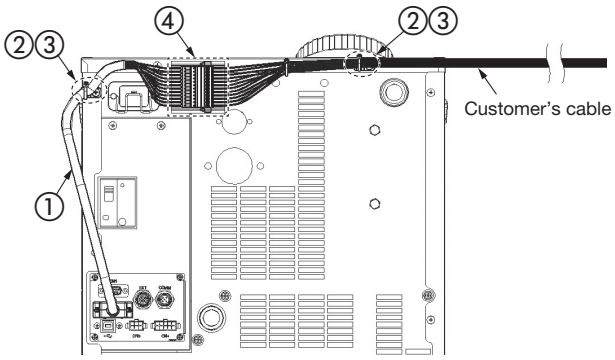
⑦ DIO Conversion Cable

The contact input/output communication connector used in the HRS012 to 060, HRSE, and HRSF012 to 060 series differs from that of the HRSC series.
For customers using this type of connector, a conversion cable is now available that allows existing communication cables to be used with the HRSC.
By using this cable, existing communication cables can continue to be used with the HRSC.

Part no.	Applicable model
HRS-CA008	HRSC012-□□-20 HRSC018-□□-20 HRSC024-□□-20 HRSC030-□□-20 HRSC040-□□-20 HRSC050-□□-20 HRSC060-□□-20



Cable mounting example (When mounting to a thermo-chiller)



Parts List

No.	Description	Qty.
①	DIO Conversion Cable	1
②	Cable mount	2
③	Binding band	2
④	Heat-shrinkable tube (50 mm)	1

⑧ DI Filter Set

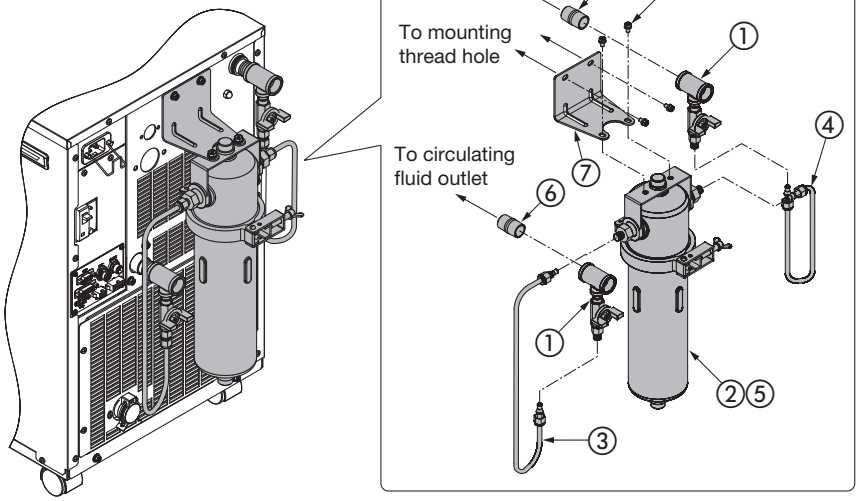
It is possible to retain the level of electric resistance and electric conductivity by flowing the circulating through the ion replacement resin (DI filter).
The set parts are in order to install DI filter to bypass circuit and flow the fixed rate of the circulating fluid to DI filter.
It is not to control 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
HRS-DP001	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

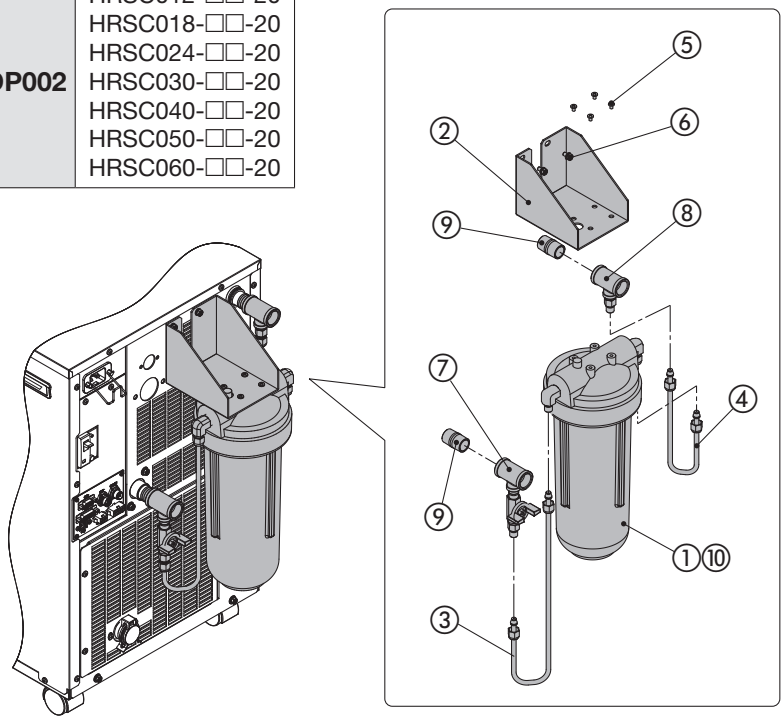
∗1 The product should be replaced when it can no longer preserve the electrical resistivity/ electrical conductivity set values.

■ Resin type

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

Part no.	Applicable model
HRS-DP002	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.

Option M needs to be selected at the time of purchase.
(When the electrical resistivity of the circulating fluid is 1 MΩ·cm or higher)

⑨ Electric Resistance Sensor Set/Electric Resistance Control Set

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

Part no.	Applicable model
HRS-DI001 HRS-DI005	HRSC012-□□-□ HRSC018-□□-□ HRSC024-□□-□ HRSC030-□□-□ HRSC040-□□-□ HRSC050-□□-□ HRSC060-□□-□
HRS-DI003 HRS-DI004	HRSC012-□□-□ HRSC018-□□-□ HRSC024-□□-□ HRSC030-□□-□

List of Function

Optional accessories	Description	Electric resistivity display*1, *2	Electric resistivity maintenance	Electric resistivity control	Bypass*3
HRS-DI001	Electric resistance sensor set	○	×	×	×
HRS-DI003	Electric resistance control set	○	○	○	○
HRS-DI004	Electric resistance sensor set	○	○	×	○
HRS-DI005	Electric resistance control set	○	○	○	×

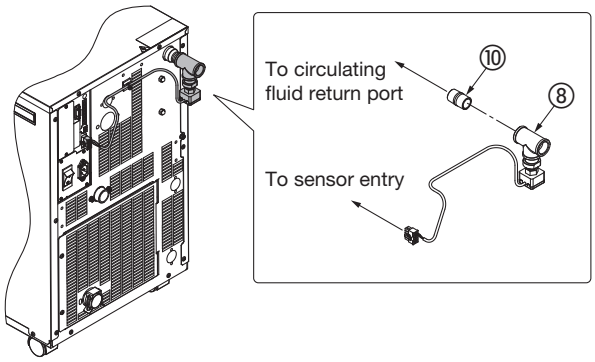
*1 Display range is 0 to 4.5 MΩ·cm.
*2 Readout using serial communications (RS-485/RS-232C) can be performed.
*3 This function is dedicated for the HRSC-BP001 and cannot be used for the HRS040/050/060.

Specifications

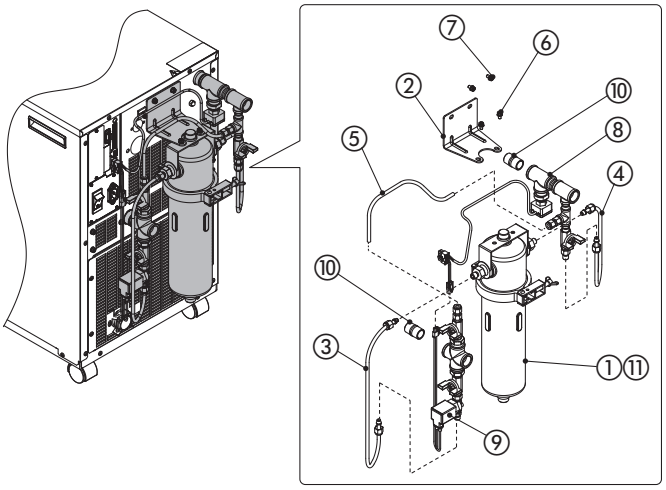
	Electric resistance sensor set	Electric resistance control set
Measurement range of electric resistivity	0 to 4.5 MΩ·cm	
Set range of electric resistivity target	—	0.2 to 4.0 MΩ·cm
Set range of electric resistivity hysteresis	—	0.1 to 0.9 MΩ·cm
Operating temperature range (Circulating fluid temperature)	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-M + HRS-DI001]



[Mounting example: HRSC012-A-20-M + HRS-DI003]



Parts List

No.	Description	Fluid contact material	Qty.			
			DI001	**DI003**	**DI004**	**DI005**
①	DI filter vessel	Stainless steel	—	1	1	—
		PC, PP	—	—	—	1
②	Mounting bracket	—	—	1	1	1
③	DI filter inlet tube	PFA, POM	—	1	1	1
④	DI filter outlet tube	PFA, POM	—	1	1	1
⑤	Bypass tube	PFA	—	1	1	—
⑥	Mounting screw (M6 screw)	—	—	2	2	—
⑦	Mounting screw (M5 screw)	—	—	2	2	6
⑧	Electric resistance sensor	Stainless steel, PPS	1	1	1	1
⑨	Solenoid valve for control	Stainless steel, EPDM	—	1	—	1
⑩	Nipple (Size: 1/2)	Stainless steel	1	2	2	2
⑪	DI filter cartridge (Part no.: HRS-DF001)*1	PP, PE	—	1	1	1

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

⑩ 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 (Deionised water). The function differs according to the model (Refer to the table below). Refer to the Operation Manual for details.

Part no.	Applicable model
HRS-DI008 HRS-DI011	HRSC012-□□-20 HRSC018-□□-20 HRSC024-□□-20 HRSC030-□□-20 HRSC040-□□-20 HRSC050-□□-20 HRSC060-□□-20
HRS-DI009	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	○	○	○	×

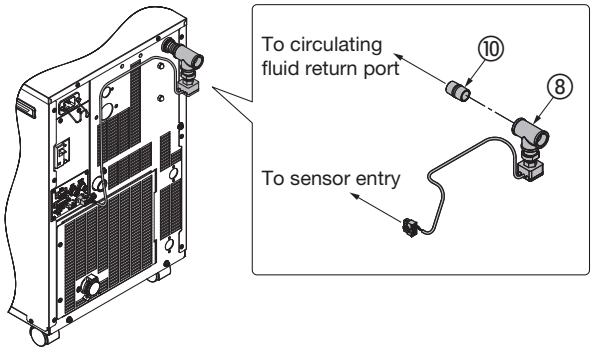
*1 Display range is 2 to 48 μS/cm.
*2 Readout using serial communications (RS-485/RS-232C) can be performed.
*3 This function is dedicated for the HRS-BP001 and cannot be used for the HRSC040/050/060.

Specifications

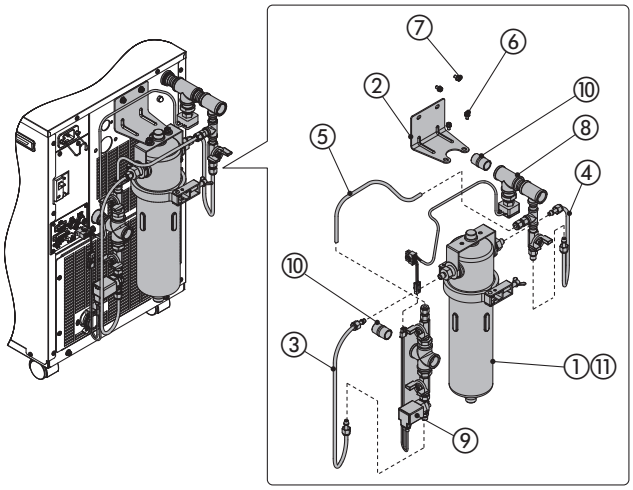
	Electric conductivity sensor set	Electric conductivity control set
Measurement range of electric conductivity	2.0 to 48.0 μS/cm	
Set range of electric conductivity target	—	5.0 to 45.0 μS/cm
Set range of electric conductivity hysteresis	—	2.0 to 10.0 μS/cm
Operating temperature range (Circulating fluid temperature)	5 to 60°C	
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.

⑪ 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)
—	Without element	—	—
W005	5	EJ202S-005X11	EJ302S-005X11
W075	75	EJ202S-075X11	EJ302S-075X11

Accessory

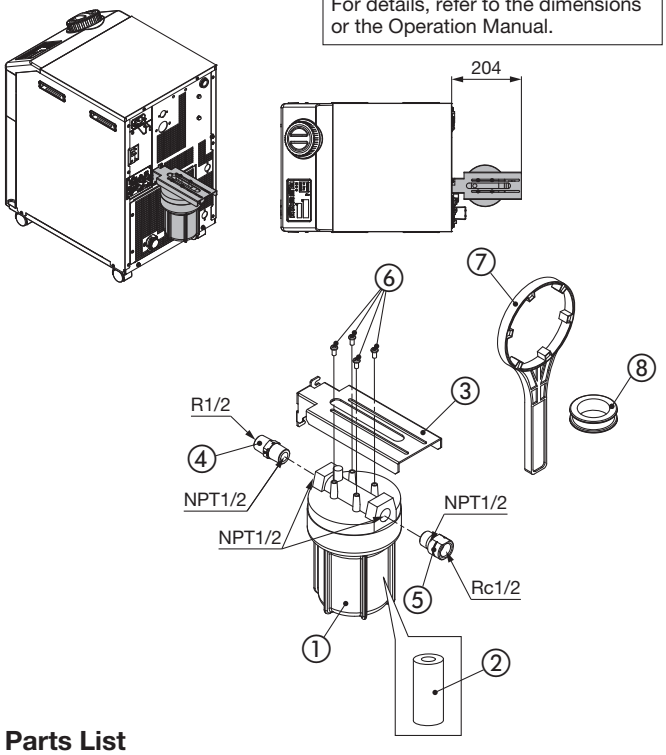
Symbol	Accessory
—	None
H	With handle

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

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



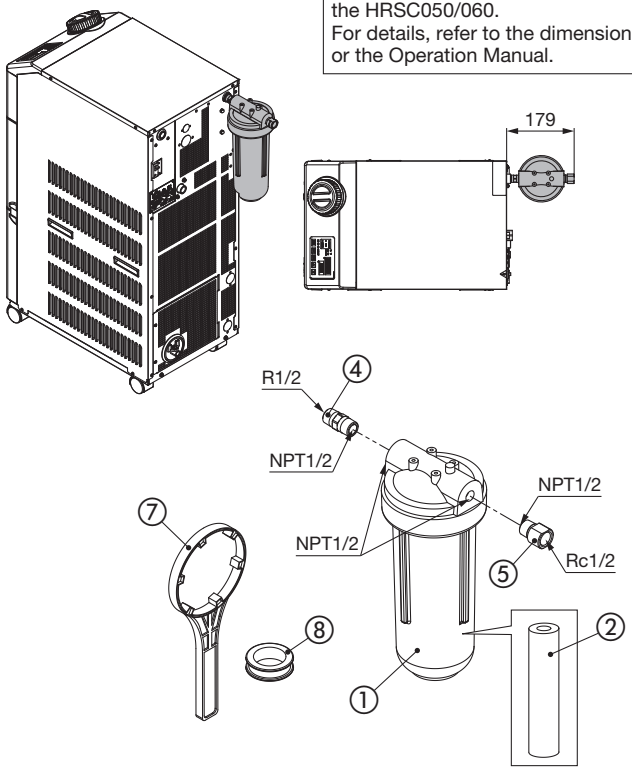
■ For circulating fluid return port [Used to protect thermo-chiller]

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
HRS-PF003 (Element length L = 125 mm)	HRSC012-□□-20 HRSC040-□□-20 HRSC018-□□-20 HRSC050-□□-20 HRSC024-□□-20 HRSC060-□□-20 HRSC030-□□-20
HRS-PF004 (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.



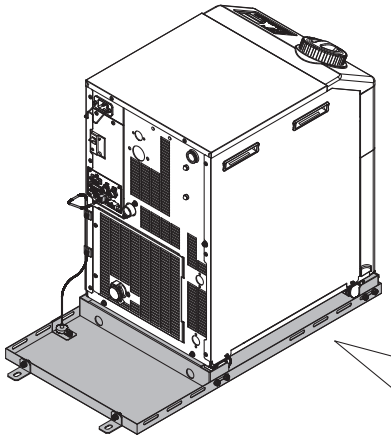
Parts List

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	For HRS-PF009/004	
	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	—	

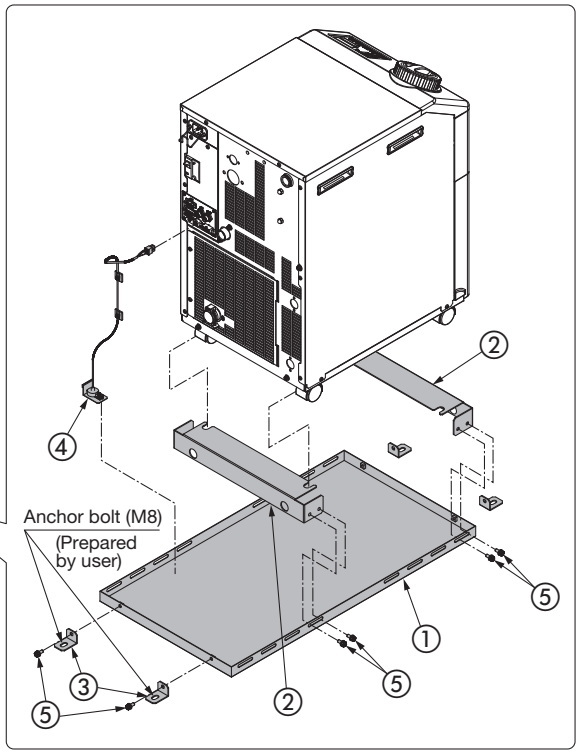
⑫ Drain Pan Set (With Water Leakage Sensor)

Drain pan for the thermo-chiller. Liquid leakage from the thermo-chiller can be detected by mounting the attached water leakage sensor. Anchor bolt (M 8) 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
HRS-WL001	HRSC012-□□-20 HRSC018-□□-20 HRSC024-□□-20 HRSC030-□□-20 HRSC040-□□-20



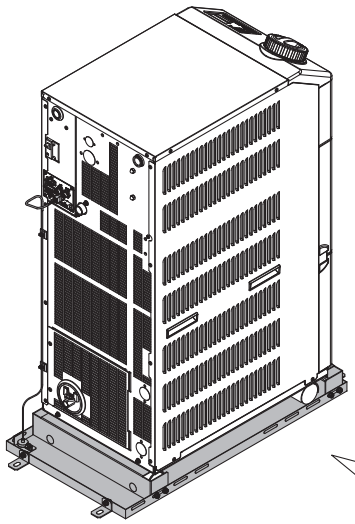
HRSC012/018/024/030/040



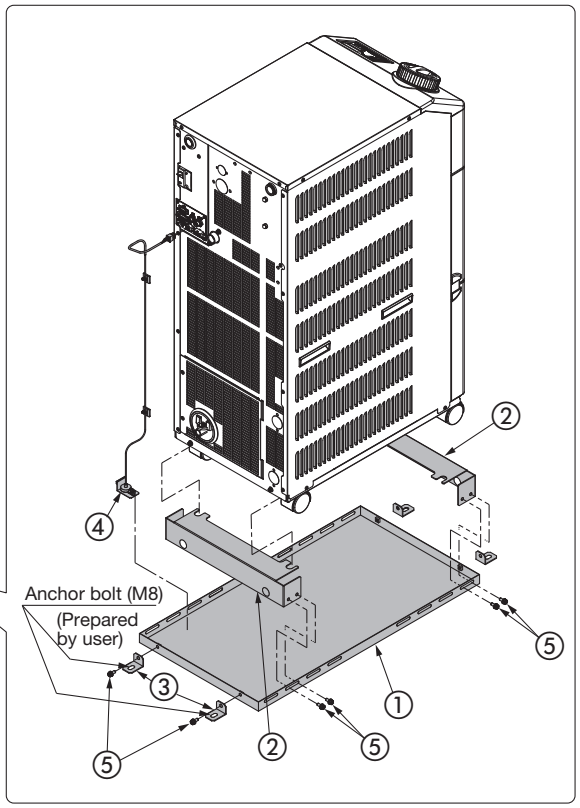
Parts List

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
HRS-WL002	HRSC050-□□-20 HRSC060-□□-20



HRSC050/060



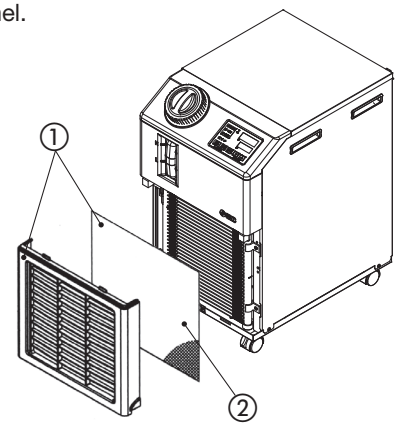
Parts List

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.)

⑬ Replacement Type Dustproof Filter Set

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

Part no.	Applicable model
HRS-FL001	HRSC012-A□-20 HRSC018-A□-20 HRSC024-A□-20



Parts List

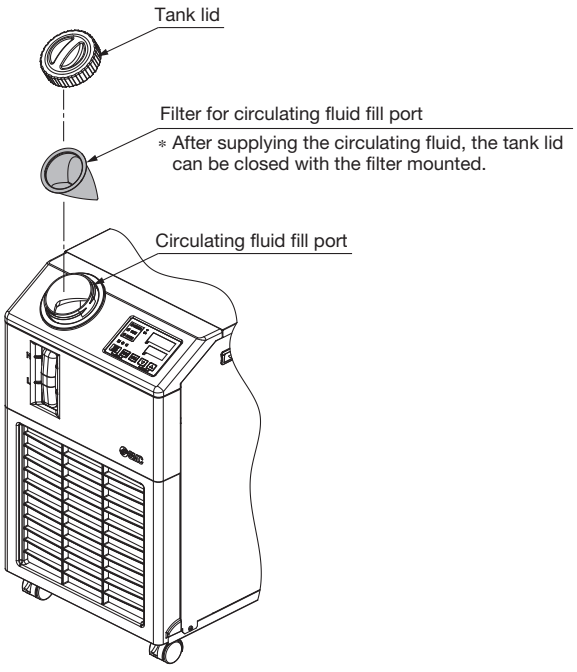
No.	Description	Part no.	Note
①	Replacement type dustproof filter set	HRS-FL001	A front panel with hook-and-loop fastener for holding the filter, 5 filters are included. (No dustproof net is included.)
②	Replacement type dustproof filter	HRS-FL002	5 filters per set Size: 300 x 370

⑭ 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



Non F-Gas
(CO_2 Refrigerant)

Circulating Fluid Temperature Controller
Refrigerated Thermo-chiller

HRSC090 Series

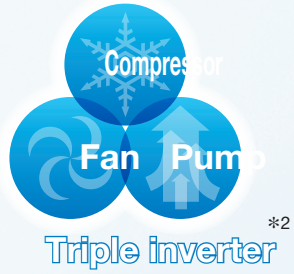
Power consumption reduced by 49 %*1
Outstanding energy saving due to the triple inverter!

GWP = 1 Compliant with each country's refrigerant regulations

Air transport possible

Intertek
(UL Standards)

RoHS





Cooling capacity **9.5 kW**

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

Set temperature range **5** °C to **40** °C

Compact, Space saving

Earth leakage breaker (Standard)

Low-noise design Operating noise 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)

*1 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 %

*2 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



Non F-Gas (CO_2 Refrigerant) **Thermo-chiller HRSC090 Series**

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Non F-Gas (CO_2 Refrigerant) Thermo-chiller

Air-cooled 400 V Type

HRSC090 Series

Intertek (UL Standards)

RoHS

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

—	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

—	None
J	With automatic fluid fill function



Specifications

Model				HRSC090-A-40
Cooling method				Air-cooled refrigeration
Refrigerant				R744 (CO_2, GWP: 1)
Refrigerant charge			[kg]	0.83
Control method				PID control
Ambient temperature/Humidity/Altitude/Installation environment*1, 10				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, Deionised water
	Set temperature range*1		[°C]	5 to 40
	Cooling capacity*3, 10		[kW]	9.5
	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
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*8 leakage breaker (Standard)	Rated current	[A]	20
		Sensitivity of leak current	[mA]	30
	Rated operating current*5		[A]	9.5
	Rated power consumption*5		[kW (kVA)]	6.4 (6.8)
Noise level (Front 1 m/Height 1 m)*5			[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)*11
Weight*9			[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.
Deionised 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_2 Refrigerant) Thermo-chiller
Water-cooled 400 V Type
HRSC090 Series

Intertek (UL Standards)

RoHS

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

—	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

—	None
J	With automatic fluid fill function



Specifications

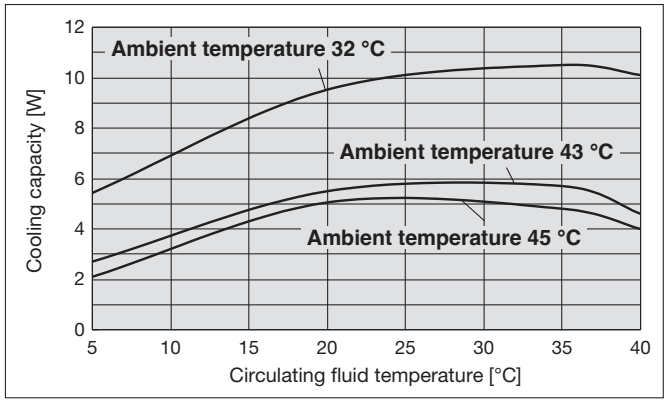
Model				HRSC090-W-40
Cooling method				Water-cooled refrigeration
Refrigerant				R744 (CO_2, GWP: 1)
Refrigerant charge			[kg]	1.07
Control method				PID control
Ambient temperature/Humidity/Altitude/Installation environment*1				Temperature: 5 to 45 °C, Humidity: 30 to 70 %, Altitude: less than 3000 m, Environment: Indoors
Circulating fluid system	Circulating fluid*2			Tap water, 15% Ethylene glycol aqueous solution, Deionised 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: Refer to "Water Quality Management" in the operation manual.
15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.
Deionised 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.

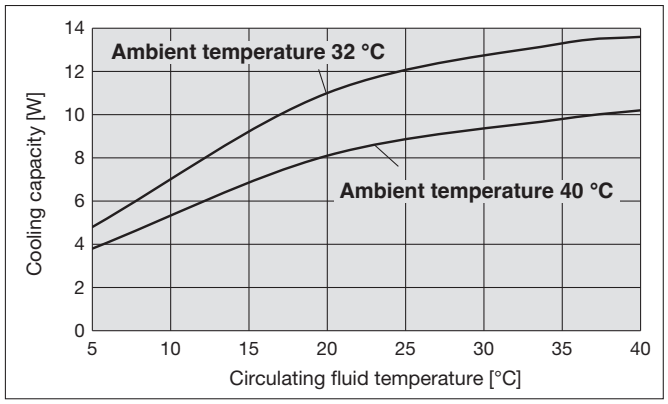
Cooling Capacity

* 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-□

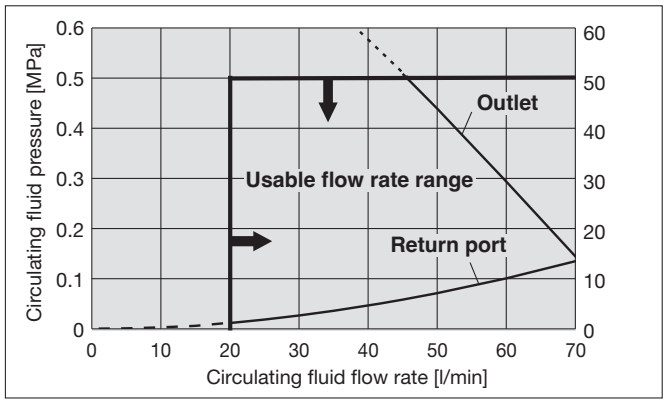


HRSC090-W□-40-□



Pump Capacity

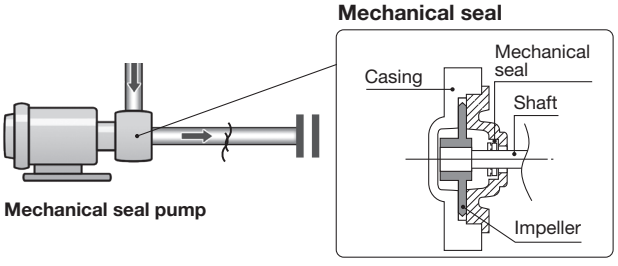
HRSC090-□□-40-□



⚠ Caution

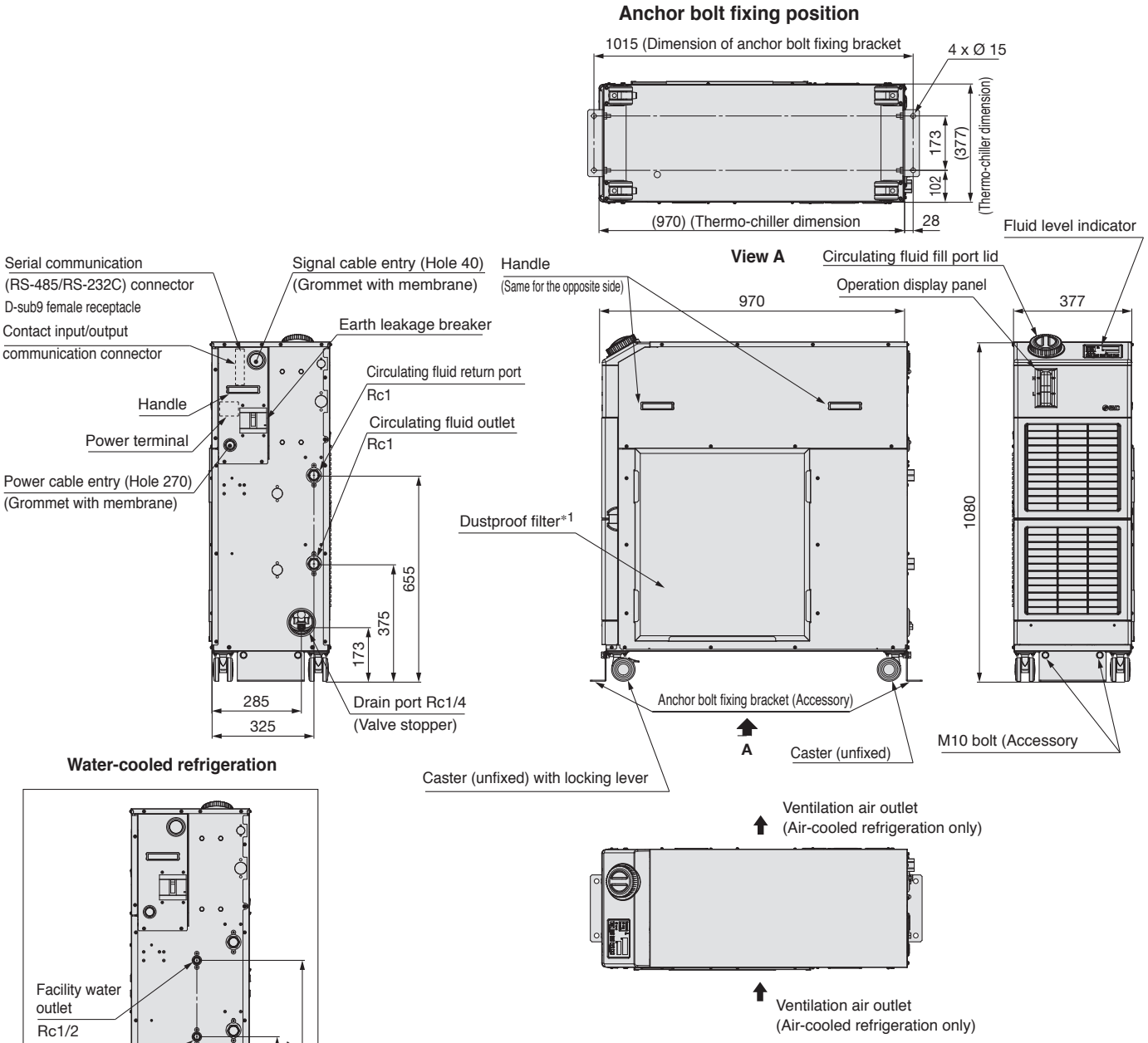
Mechanical Seal Pump

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

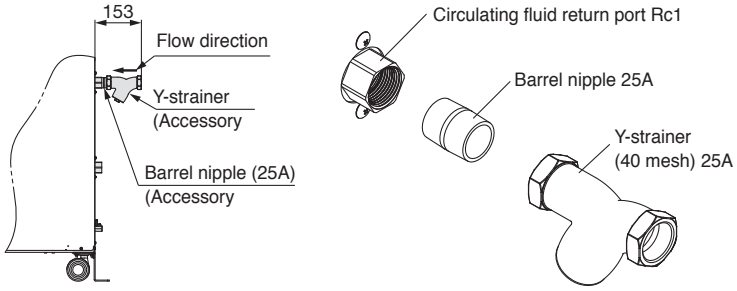
HRSC090-□-40



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

Accessory: Y-strainer mounting view

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



SMC

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

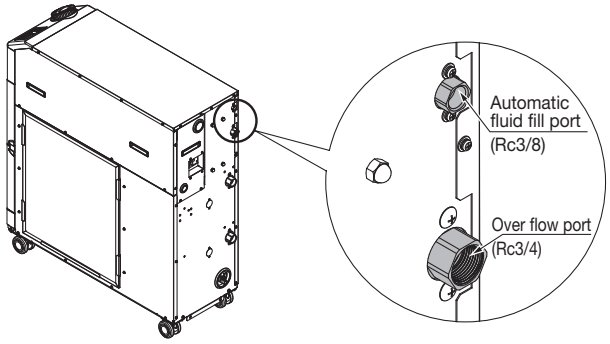
With Automatic Fluid Fill Function

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

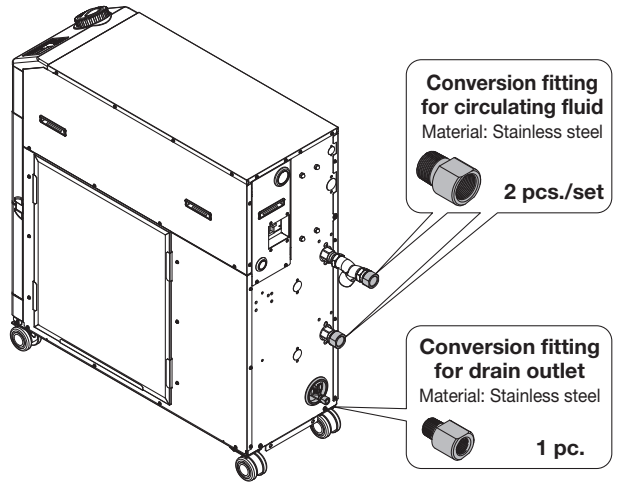


HRSC090 Series
Optional Accessories

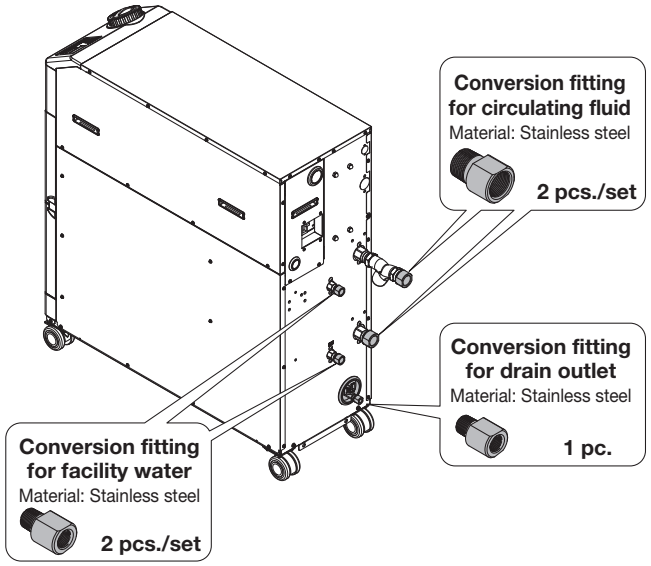
① Piping Conversion Fitting

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
HRS-EP018	NPT thread conversion fitting set	**HRSC090-A-40**
HRS-EP019	G thread conversion fitting set	



Part no.	Contents	Applicable model
HRS-EP022	NPT thread conversion fitting set	**HRSC090-W-40**
HRS-EP023	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
HRS-EP020	NPT thread conversion fitting set	**HRSC090-A-40-J**
HRS-EP021	G thread conversion fitting set	

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

② Bypass Piping Set

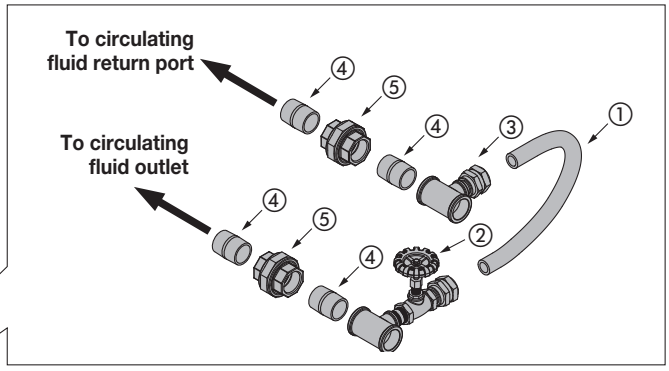
When the circulating fluid goes below the minimum operating flow rate (as shown below), cooling capacity will be reduced and the temperature stability will be badly affected. Use the bypass piping set to ensure a circulating fluid flow rate of the minimum operating flow rate or more.

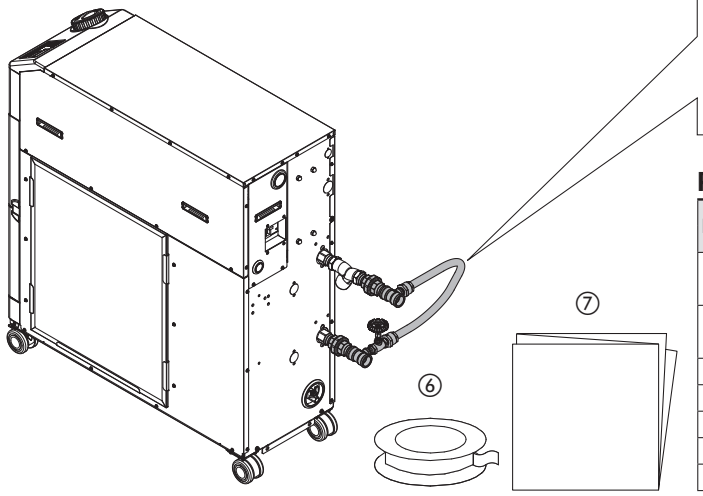
Bypass Piping Set

Part no.	Applicable model	Minimum operating flow rate [l/min]
HRS-BP005	**HRSC090-□□-40**	20

Bypass Piping Set (Stainless Steel)

Part no.	Applicable model	Minimum operating flow rate [l/min]
HRS-BP011	**HRSC090-□□-40**	20





Parts List

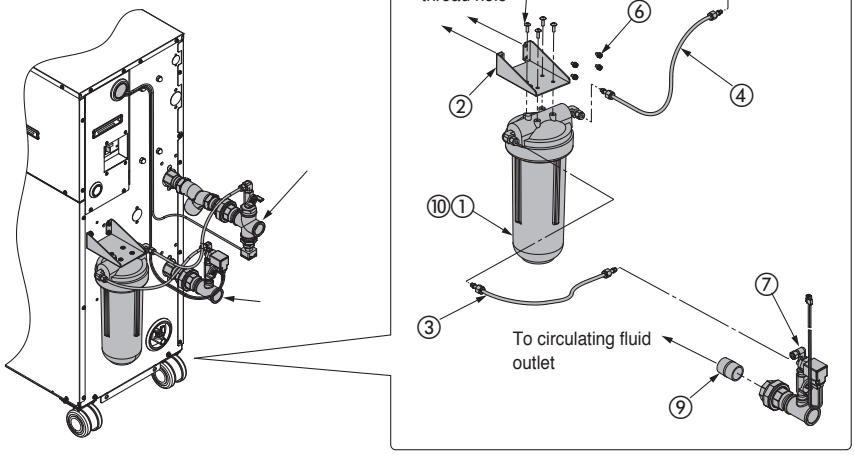
No.	Description	Fluid contact material		Qty.
		HRS-BP005	**HRS-BP011**	
①	Hose (I.D.: 15 mm)	PVC	PVC	1 (Approx. 700 mm)
②	Outlet piping assembly (With globe valve)	Stainless steel, Brass, Bronze	Stainless steel	1
③	Return piping assembly	Stainless steel, Brass	Stainless steel	1
④	Nipple (Size: 1 inch)	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

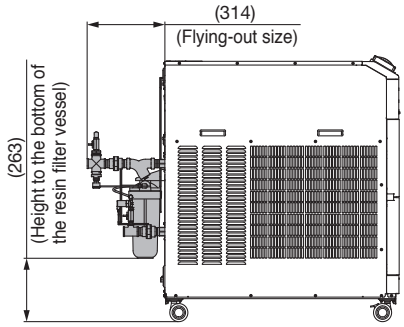
③ Electric Conductivity Control Set

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-□□-40**

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





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
—	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

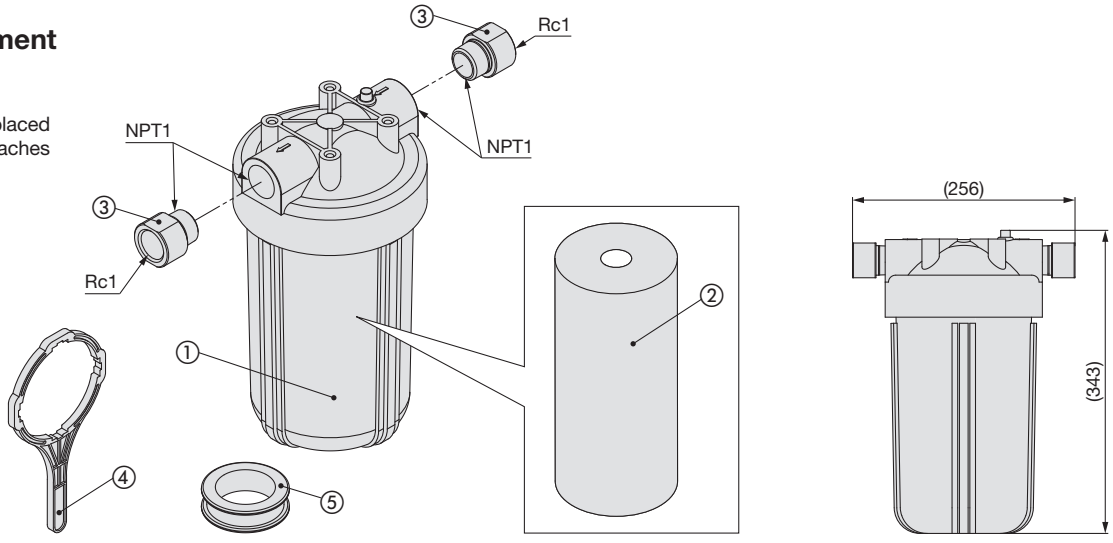
No.	Description	Material	Qty.	Note
①	Body	PC, PP	1	—
②	Element*1	PP	1	—
③	Extension piece	Stainless steel	2	Conversion from NPT to Rc
④	Handle	—	1	When -H is selected
⑤	Sealant tape	PTFE	1	—

*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.

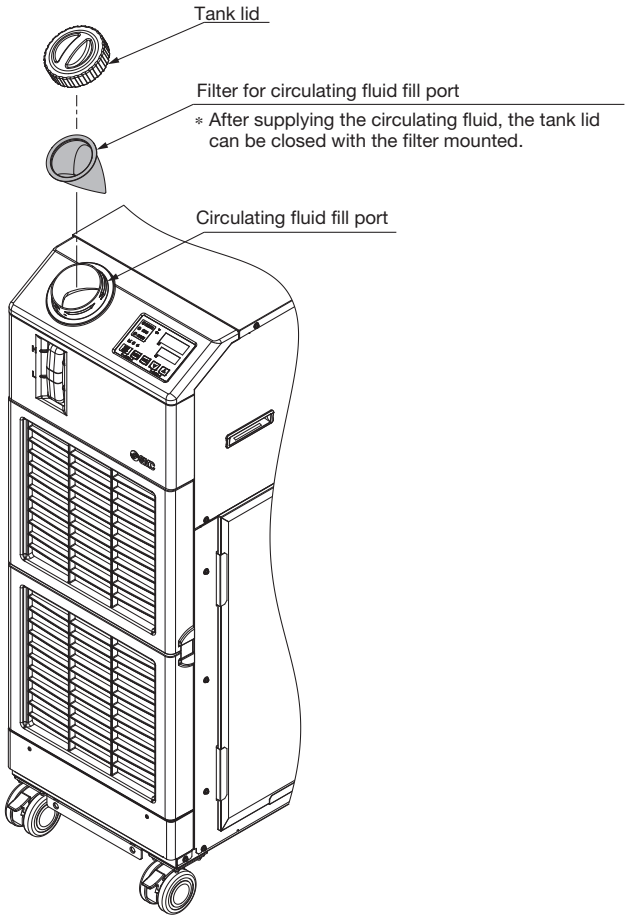


⑤ Filter for Circulating Fluid Fill Port

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

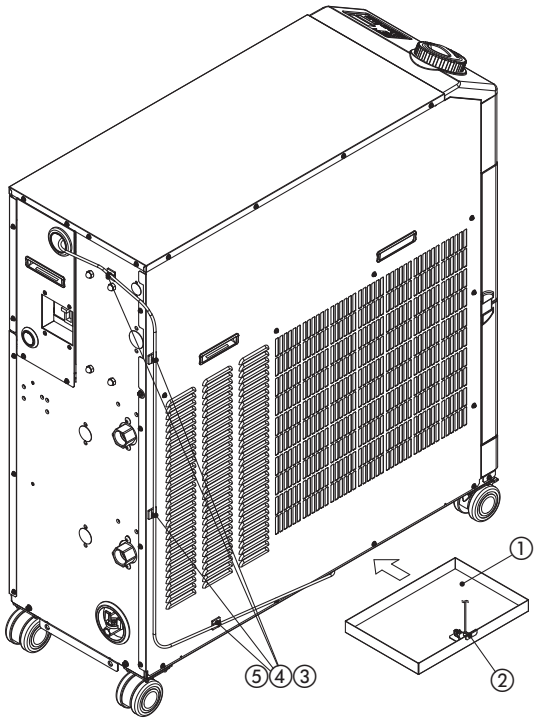
Material	Stainless steel 304, Stainless steel 316
Mesh size	200



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_2 Refrigerant)

Circulating Fluid Temperature Controller

Refrigerated Thermo-chiller

HRSC100 Series

Power consumption reduced by 45 %*1

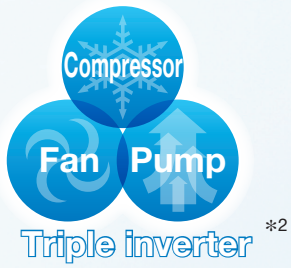
Outstanding energy saving due to with the triple inverter!

GWP = 1 Compliant with each country's refrigerant regulations

Air transport possible

Intertek
(UL Standards)

RoHS



*2



Cooling capacity **10** kW

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

Compact, Space saving

Outdoor installation, Splashproof type (IPX4)*3

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)

Earth leakage breaker (Standard)

Low-noise design Operating noise 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)

*1 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 %

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

*3 For unexpected natural phenomena, such as stormy weather exceeding the IPX4 level, make sure to take additional protective measures.

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HRSC100 Series



Non F-Gas (CO_2 Refrigerant) **Thermo-chiller HRSC100 Series**

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Non F-Gas (CO_2 Refrigerant) **Thermo-chiller**

Air-cooled 400 V Type

HRSC100 Series



How to Order

Air-cooled refrigeration **HRSC 100 – A □ – 40 – □**

Cooling capacity

100	10.5 kW

Cooling method

A	Air-cooled refrigeration

Pipe thread type

—	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

—	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
Cooling method				Air-cooled refrigeration
Refrigerant				R744 (CO_2, GWP: 1)
Refrigerant charge			[kg]	0.73
Control method				PID control
Ambient temperature/Altitude/Installation environment∗1, 10				Temperature: 5 to 45 °C, Altitude: less than 3000 m, Environment: Indoors/Outdoors
Circulating fluid system	**Circulating fluid**∗2			Tap water, 15 % Ethylene glycol aqueous solution, Deionised water
	Set temperature range∗1		[°C]	5 to 35
	Cooling capacity∗3		[kW]	10.5
	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
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]	8.5
	Rated power consumption∗5		[kW (kVA)]	5.6 (5.9)
Noise level (Front 1 m/Height 1 m)∗5			[dB (A)]	69
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. 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: Refer to "Water Quality Management" in the operation manual.
15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.
Deionised 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_2 Refrigerant) **Thermo-chiller**

Water-cooled 400 V Type

HRSC100 Series



How to Order

Water-cooled refrigeration **HRSC 100 – W □ – 40 – □**

Cooling capacity

100	11.5 kW

Cooling method

W	Water-cooled refrigeration

Pipe thread type

—	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

—	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

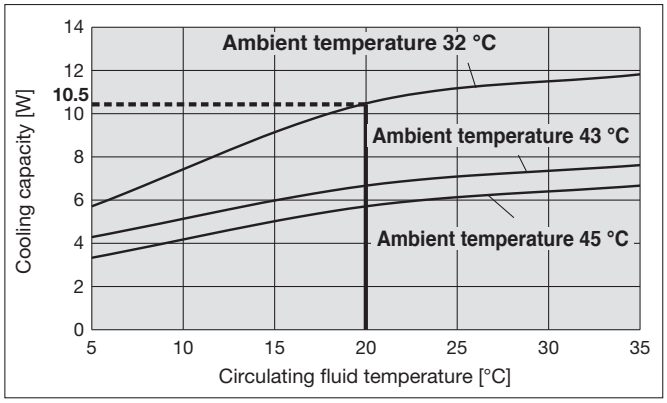
Model				HRSC100-W-40
Cooling method				Water-cooled refrigeration
Refrigerant				R744 (CO_2, GWP: 1)
Refrigerant charge			[kg]	1.04
Control method				PID control
Ambient temperature/Altitude/Installation environment*1				Temperature: 2 to 45 °C, Altitude: less than 3000 m, Environment: Indoors/Outdoors
Circulating fluid system	Circulating fluid*2			Tap water, 15 % Ethylene glycol aqueous solution, Deionised 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)*10
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: Refer to "Water Quality Management" in the operation manual.
15 % ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.
Deionised 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 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.

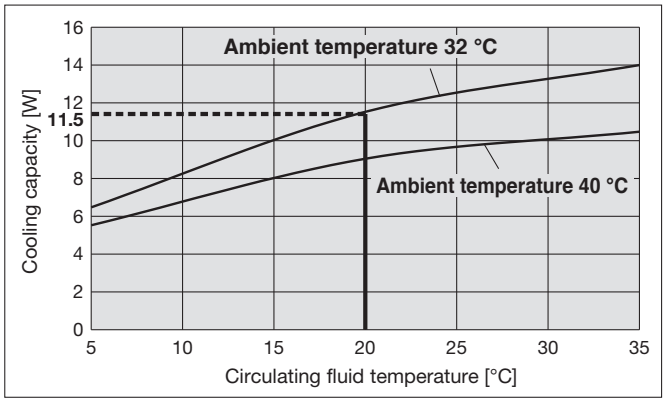
Cooling Capacity

* 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-□

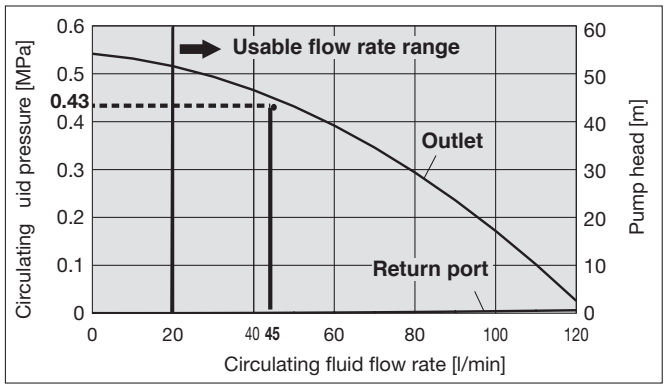


HRSC100-W□-40-□



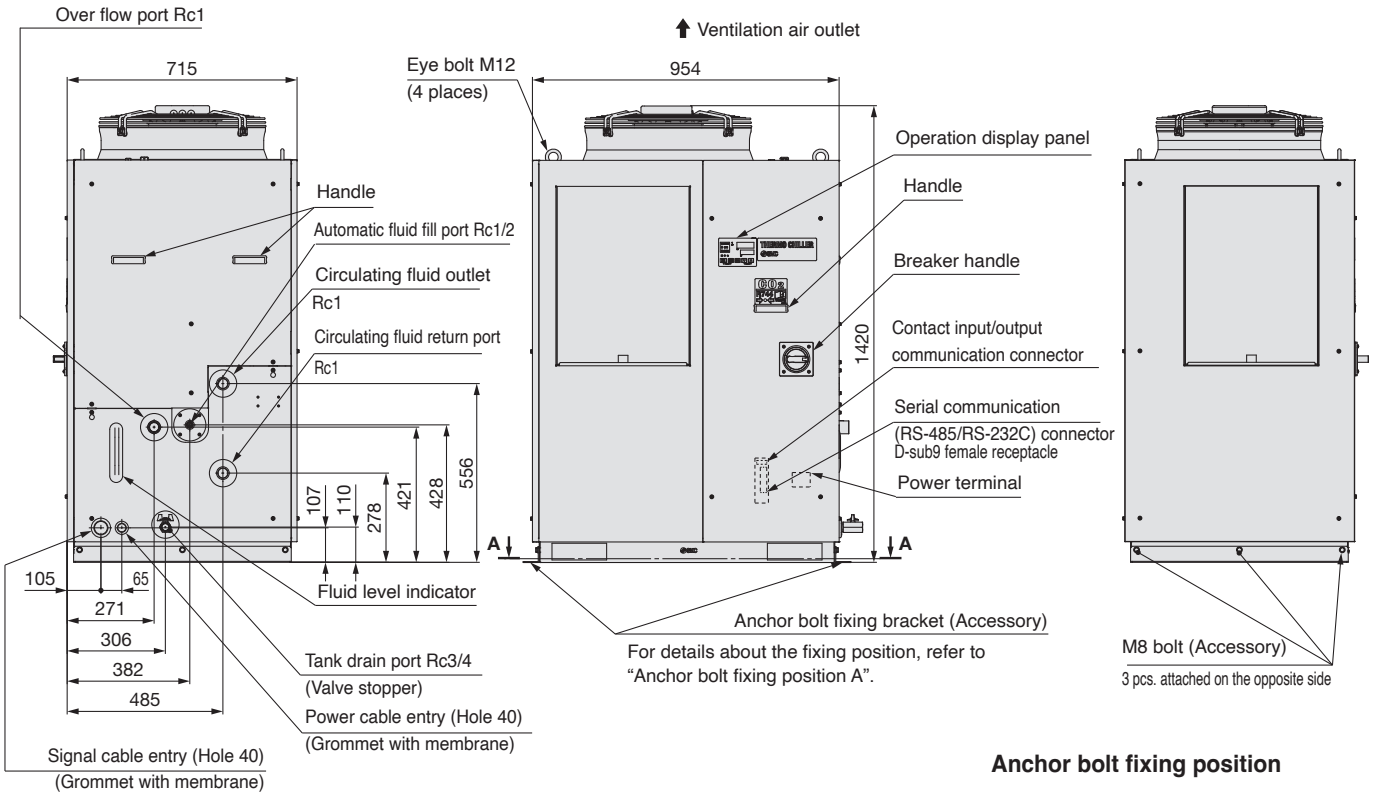
Pump Capacity

HRSC100-A□-40-□
HRSC100-W□-40-□

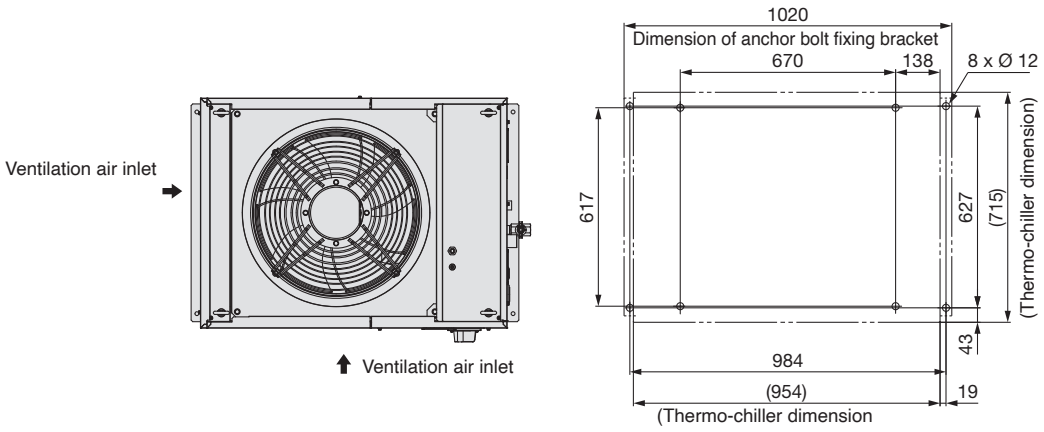


Dimensions

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



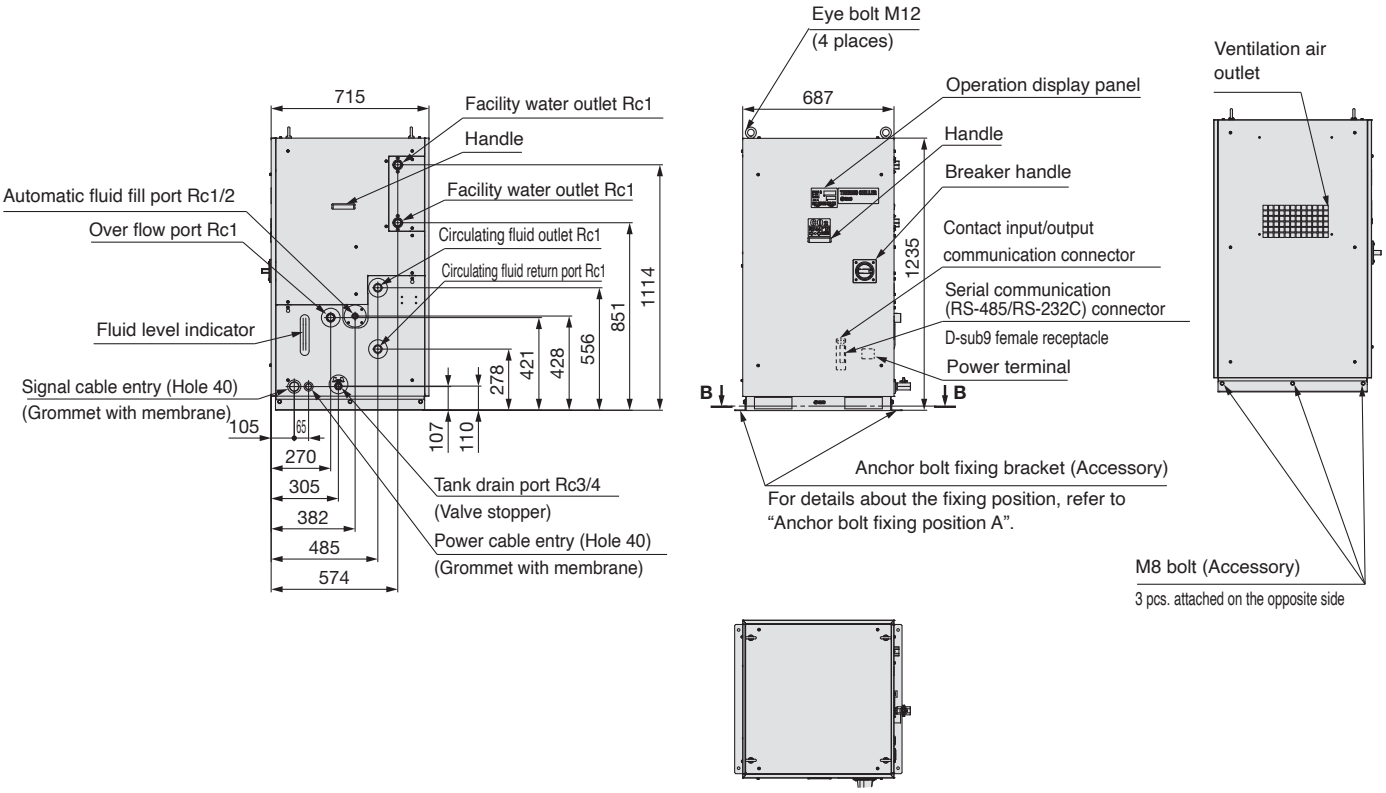
Anchor bolt fixing position



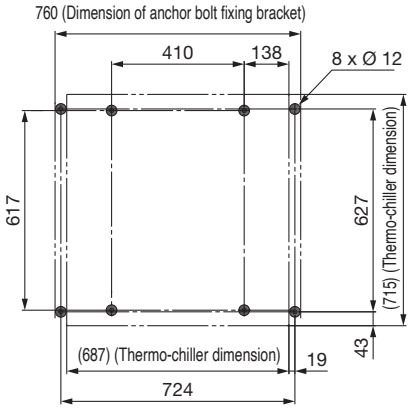
View A

Dimensions

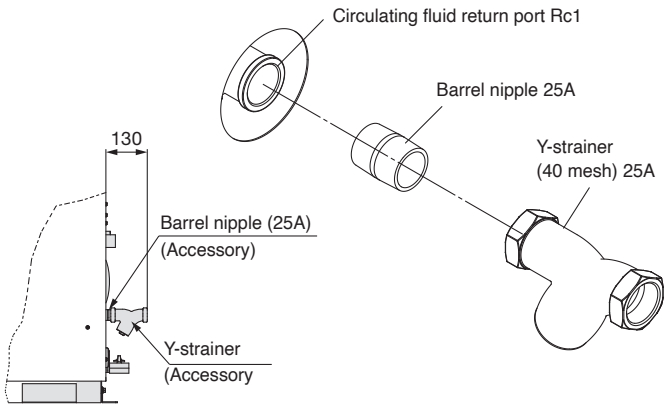
HRSC100-W-40 (Water-cooled 400 V type)



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

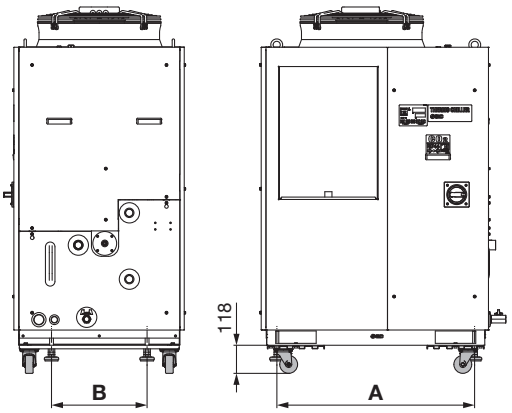
HRSC100−□□−40−A

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□-40-A	830	401	1538	Approx. 18
HRSC100-W□-40-A	570		1353	

∗1 Refers to the amount of increase from the standard weight



K Option symbol

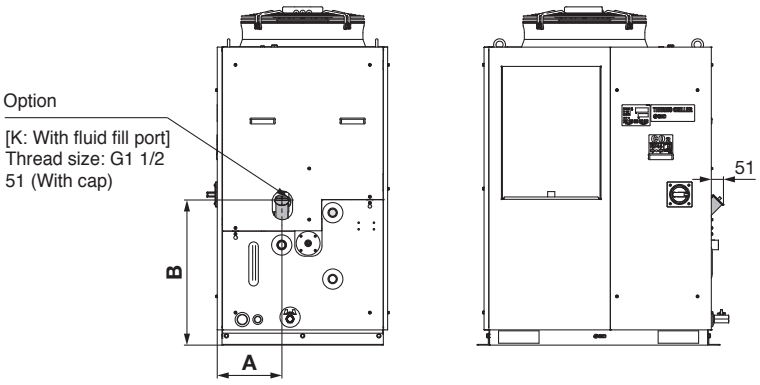
With Fluid Fill Port

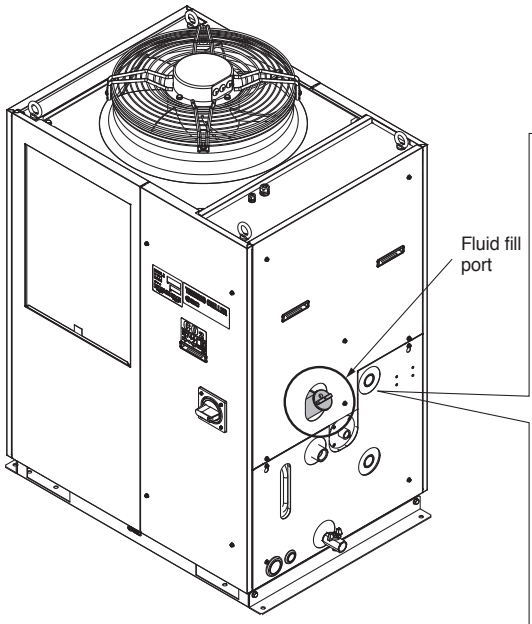
HRSC100−□□−40−K

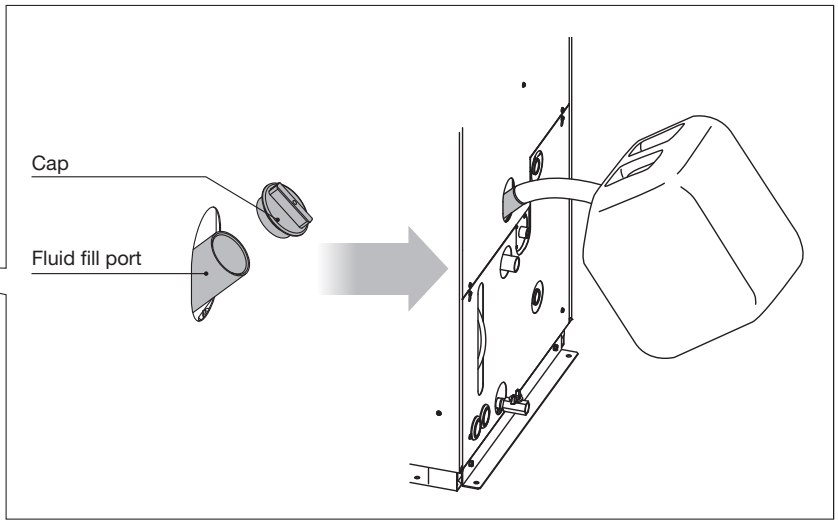
With fluid fill port

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







SMC

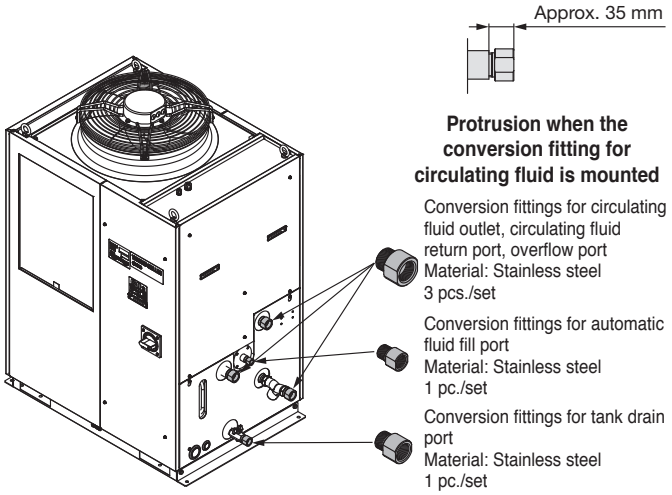
46

HRSC100 Series
Optional Accessories

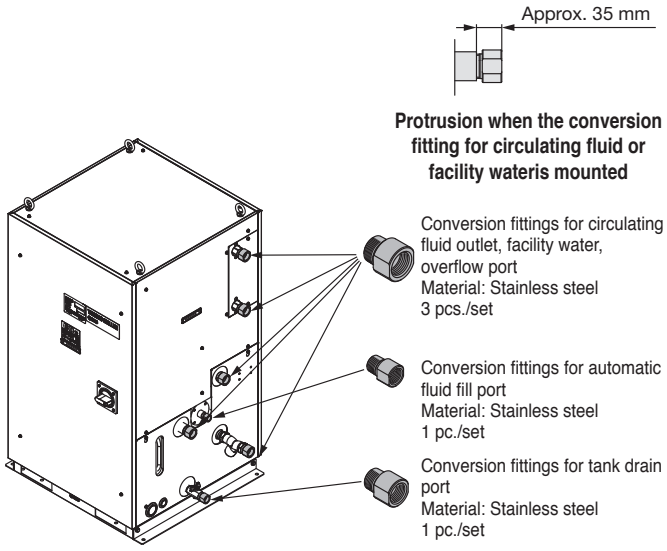
① Piping Conversion Fitting

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
HRS-EP013	NPT thread conversion fitting set	**HRSC100-A-40**
HRS-EP014	G thread conversion fitting set	
HRS-EP015	NPT thread conversion fitting set	**HRSC100-W-40**
HRS-EP016	G thread conversion fitting set	



HRS-EP013, HRS-EP014

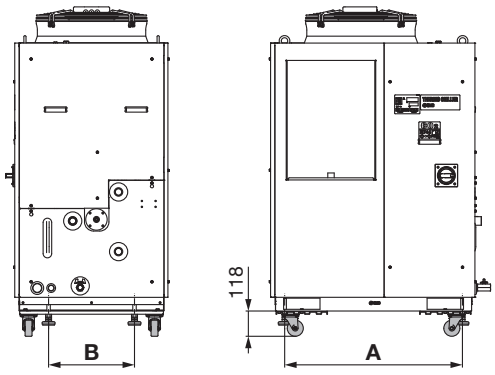


HRS-EP015, HRS-EP016

② Caster Adjuster-foot Kit

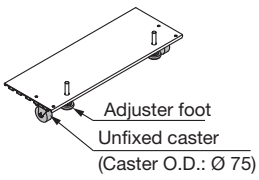
This is a set of unfixed casters and adjuster feet stop.
When installed by user, it is necessary to lift the thermo-chiller by a forklift or sling work.
Carefully read the procedure manual included with this kit before performing the installation.

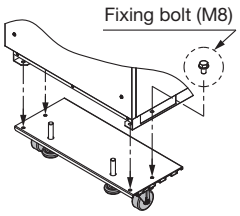
Part no.	Applicable model	Dimension [mm]			Weight [kg]
		A	**B**	**C**	
HRS-KS002	**HRSC100-A□-40**	830	401	1538	Approx. 18
	HRSC100-W□-40	570		1353	



Parts List

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



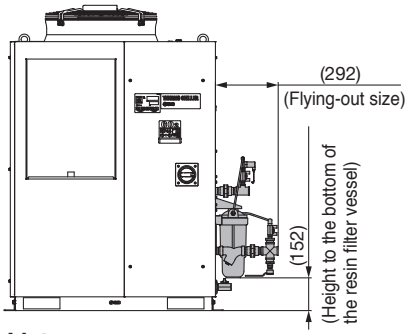


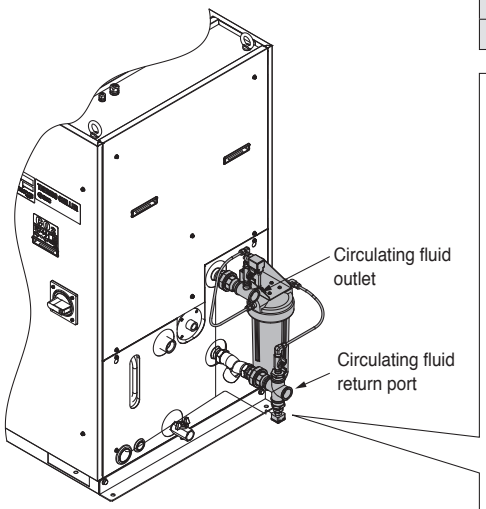
③ Electric Conductivity Control Set

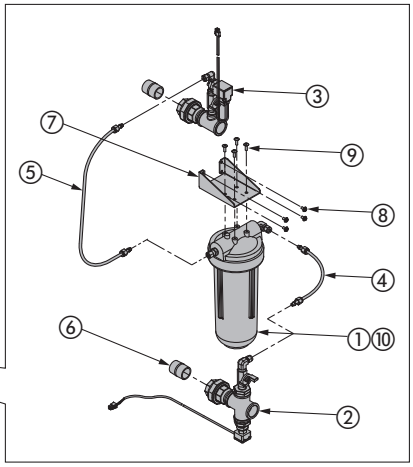
The set indicates and controls the electric conductivity of the circulating fluid. Refer to the Operation Manual for details.

Part no.	Applicable model
HRS-DI006	**HRSC100-□□-40**

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

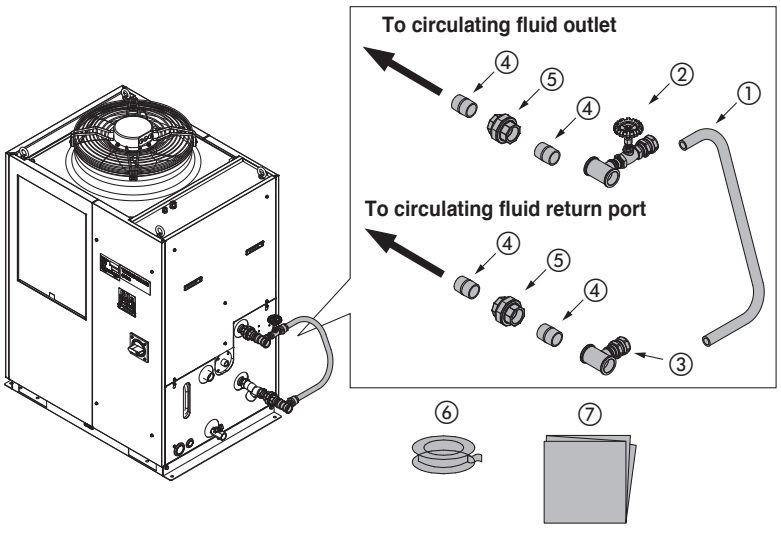
When the circulating fluid goes below the minimum operating flow rate (as shown below), cooling capacity will be reduced and the temperature stability will be badly affected. Use the bypass piping set to ensure a circulating fluid flow rate of the minimum operating flow rate or more.

Bypass Piping Set

Part no.	Applicable model	Minimum operating flow rate [l/min]
HRS-BP005	**HRSC100-□□-40**	20

Bypass Piping Set (Stainless Steel)

Part no.	Applicable model	Minimum operating flow rate [l/min]
HRS-BP011	**HRSC100-□□-40**	20

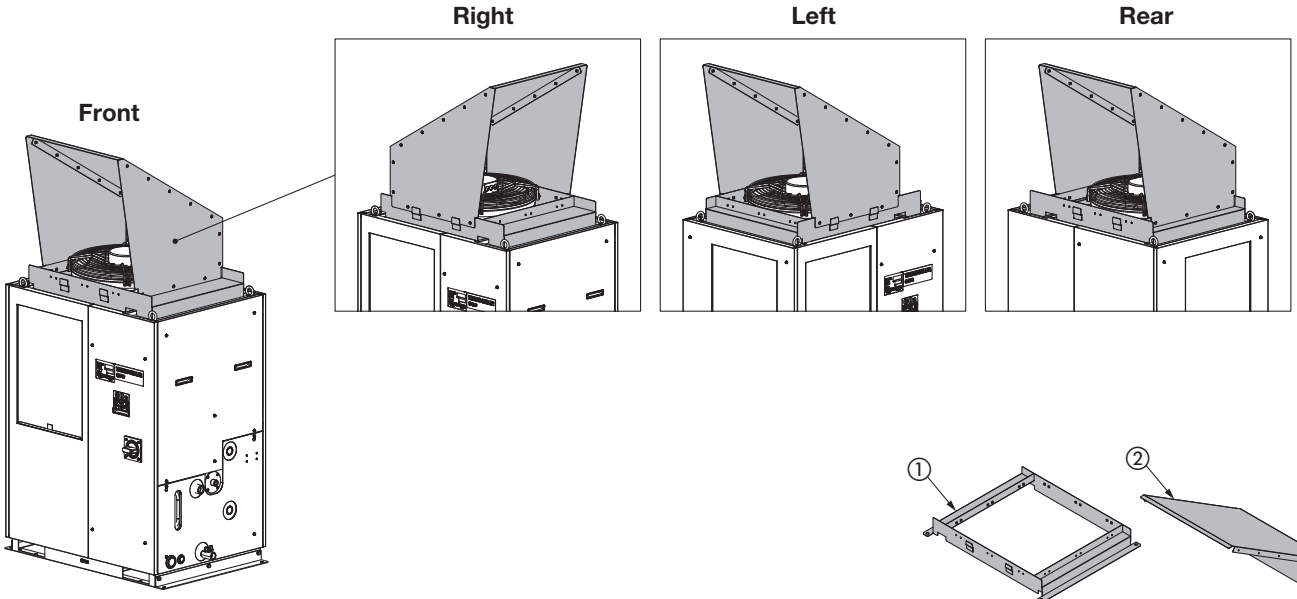


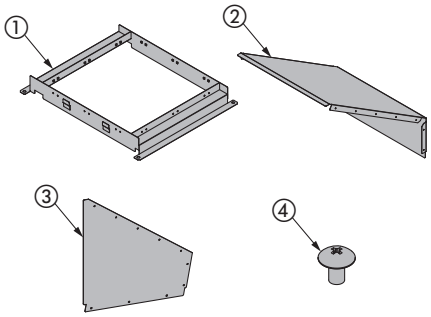
Parts List

No.	Description	Fluid contact material		Qty.
		HRS-BP005	HRS-BP011	
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

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.

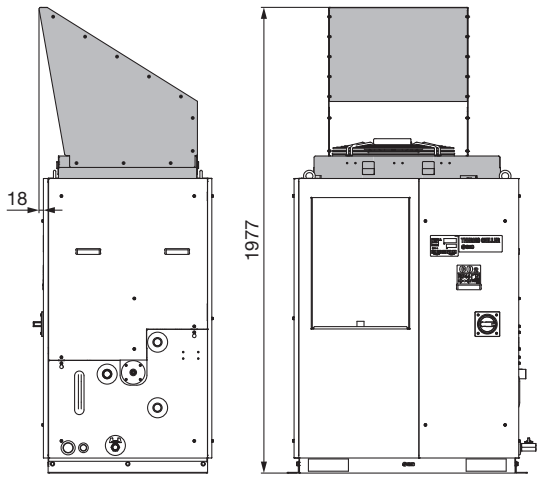




Part no.	Applicable model	Weight [kg]
HRS-BK004	**HRSC100-A□-40**	18

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
—	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

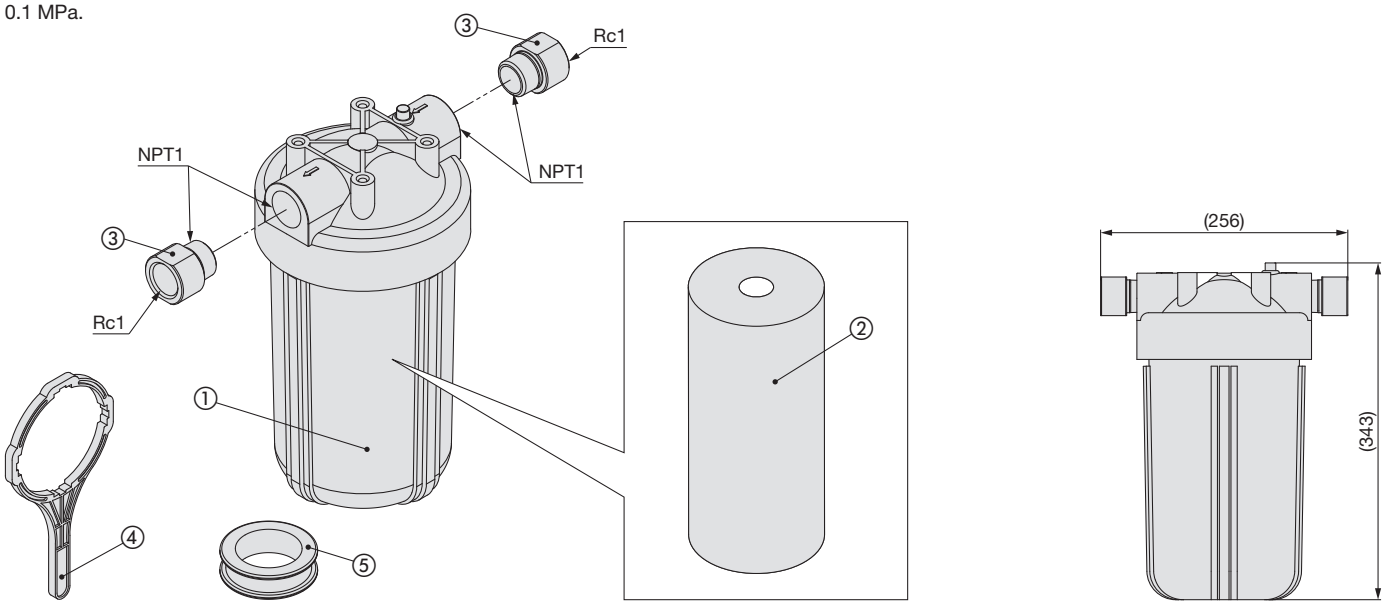
No.	Description	Material	Qty.	Note
①	Body	PC, PP	1	—
②	Element*1	PP	1	—
③	Extension piece	Stainless steel	2	Conversion from NPT to Rc
④	Handle	—	1	When -H is selected
⑤	Sealant tape	PTFE	1	—

*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.

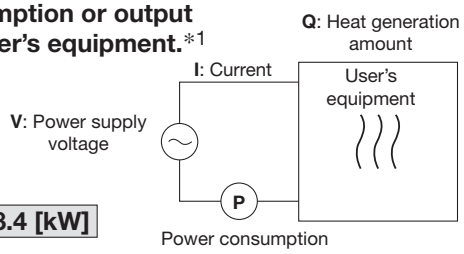


HRSC Series
Cooling Capacity Calculation

Required Cooling Capacity Calculation

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

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



① **Derive the heat generation amount from the power consumption.**

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

Q = P = 7 [kW]

Cooling capacity = Considering a safety factor of 20 %, **7 [kW] x 1.2 = 8.4 [kW]**

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

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

Q = P = V x I x Power factor

In this example, using a power factor of 0.85:

= 8.8 [kVA] x 0.85 = 7.5 [kW]

Cooling capacity = Considering a safety factor of 20 %,

7.5 [kW] x 1.2 = 9.0 [kW]

③ **Derive the heat generation amount from the output.**

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

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

In this example, using an efficiency of 0.7:

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

Cooling capacity = Considering a safety factor of 20 %,

7.3 [kW] x 1.2 = 8.8 [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** : (= ρ x **qv** ÷ 60) [kg/s]
Circulating fluid density ρ : 1 [kg/L]
Circulating fluid (volume) flow rate **qv** : 35 [l/min]
Circulating fluid specific heat **C** : 4.186 x 10^3 [J/(kg·K)]
Circulating fluid outlet temperature $\mathbf{T_1}$: 293 [K] (20 [°C])
Circulating fluid return temperature $\mathbf{T_2}$: 296 [K] (23 [°C])
Circulating fluid temperature difference $\Delta\mathbf{T}$: 3 [K] (= $\mathbf{T_2 - T_1}$)
Conversion factor: minutes to seconds (SI units): 60 [s/min]

∗1 Refer to page 52 for the typical physical property value of tap water or other circulating fluids.

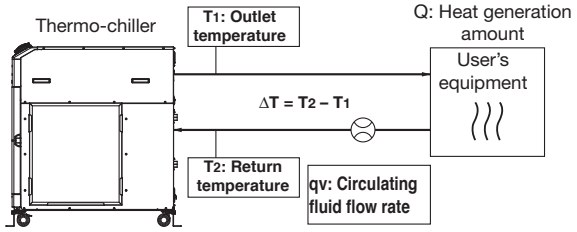
$$\mathbf{Q = qm \times C \times (T_2 - T_1)}$$

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

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

Cooling capacity = Considering a safety factor of 20 %,

7.3 [kW] x 1.2 = 8.8 [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** : (= ρ x **qv** x 60) [kgf/h]
Circulating fluid weight volume ratio γ : 1 [kgf/L]
Circulating fluid (volume) flow rate **qv** : 35 [l/min]
Circulating fluid specific heat **C** : 1.0 x 10^3 [cal/(kgf·°C)]
Circulating fluid outlet temperature $\mathbf{T_1}$: 20 [°C]
Circulating fluid return temperature $\mathbf{T_2}$: 23 [°C]
Circulating fluid temperature difference $\Delta\mathbf{T}$: 3 [°C] (= $\mathbf{T_2 - T_1}$)
Conversion factor: hours to minutes : 60 [min/h]
Conversion factor: kcal/h to kW : 860 [(cal/h)/W]

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

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

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

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

Cooling capacity = Considering a safety factor of 20 %,

7.3 [kW] x 1.2 = 8.8 [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** : (= ρ x **V**) [kg]
Cooled substance density ρ : 1 [kg/L]
Cooled substance total volume **V** : 150 [L]
Cooled substance specific heat **C** : 4.186 x 10^3 [J/(kg·K)]
Cooled substance temperature when cooling begins T_0 : 303 [K] (30 [°C])
Cooled substance temperature after t hour T_t : 293 [K] (20 [°C])
Cooling temperature difference ΔT : 10 [K] (= $T_0 - T_t$)
Cooling time Δt : 900 [s] (= 15 [min])

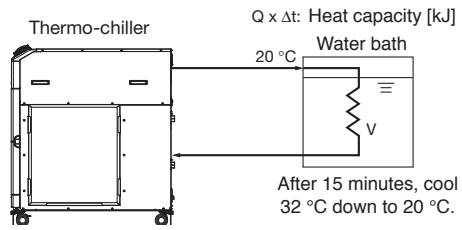
∗ Refer to the following for the typical physical property values by circulating fluid.

$$Q = \frac{m \times C \times (T_0 - T_t)}{\Delta t} = \frac{\rho \times V \times C \times \Delta T}{\Delta t}$$

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

Cooling capacity = Considering a safety factor of 20 %,

7.0 [kW] x 1.2 = 8.4 [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** : (= ρ x **V**) [kgf]
Cooled substance weight volume ratio γ : 1 [kgf/L]
Cooled substance total volume **V** : 150 [L]
Cooled substance specific heat **C** : 1.0 x 10^3 [cal/(kgf·°C)]
Cooled substance temperature when cooling begins T_0 : 30 [°C]
Cooled substance temperature after t hour T_t : 20 [°C]
Cooling temperature difference ΔT : 10 [°C] (= $T_0 - T_t$)
Cooling time Δt : 15 [min]
Conversion factor: hours to minutes : 60 [min/h]
Conversion factor: kcal/h to kW : 860 [(cal/h)/W]

$$Q = \frac{m \times C \times (T_0 - T_t)}{\Delta t \times 860} = \frac{\gamma \times V \times 60 \times C \times \Delta T}{\Delta t \times 860}$$

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

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

Cooling capacity = Considering a safety factor of 20 %,

7.0 [kW] x 1.2 = 8.4 [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 catalogue uses the following values for density and specific heat in calculating the required cooling capacity.

Density ρ: 1 [kg/L] (or, using conventional units, weight volume ratio γ = 1 [kgf/L])
Specific heat **C**: 4.19 x 10^3 [J/(kg·K)] (or, using conventional units, 1 x 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 ρ [kg/L]	Specific heat C [J/(kg·K)]	Conventional units	
			Weight volume ratio γ [kgf/L]	Specific heat C [cal/(kgf·°C)]
5 °C	1.00	4.2 x 10^3	1.00	1 x 10^3
10 °C	1.00	4.19 x 10^3	1.00	1 x 10^3
15 °C	1.00	4.19 x 10^3	1.00	1 x 10^3
20 °C	1.00	4.18 x 10^3	1.00	1 x 10^3
25 °C	1.00	4.18 x 10^3	1.00	1 x 10^3
30 °C	1.00	4.18 x 10^3	1.00	1 x 10^3
35 °C	0.99	4.18 x 10^3	0.99	1 x 10^3
40 °C	0.99	4.18 x 10^3	0.99	1 x 10^3

15% Ethylene Glycol Aqueous Solution

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

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

⚠ Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of **"Caution**," **"Warning"** or **"Danger**." They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) [1], and other safety regulations.

⚠ **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.

1) ISO 4414: Pneumatic fluid power – General rules and safety requirements for systems and their components.
ISO 4413: Hydraulic fluid power – General rules and safety requirements for systems and their components.
IEC 60204-1: Safety of machinery – Electrical equipment of machines. (Part 1: General requirements)
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots.
etc.

⚠ 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 catalogueue 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. Do not service or attempt to remove product and machinery/ equipment until safety is confirmed.
1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Our products cannot be used beyond their specifications.
Our products are not developed, designed, and manufactured to be used under the following conditions or environments.
Use under such conditions or environments is not covered.
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, fuel 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 catalogueues 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

We develop, design, and manufacture our products to be used for automatic control equipment, and provide them for peaceful use in manufacturing industries.
Use in non-manufacturing industries is not covered.
Products we manufacture and sell cannot be used for the purpose of transactions or certification specified in the Measurement Act.
The new Measurement Act prohibits use of any unit other than SI units in Japan.

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. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first. [2] Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided. This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogueue for the particular products.

2) Vacuum pads are excluded from this 1 year warranty.
A vacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

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Specifications are subject to change without prior notice and any obligation on the part of the manufacturer