Circulating Fluid Temperature Controller

Thermo-chiller Standard Type

New

(UL Standards)

RoHS

Lightweight/Compact
Temperature stability ±0.1°C

HRS050 New HRS060

HRS012/018/024 New HRS030

Same width for all models: 377 mm

Model	Size (mm)	Weight	Cooling capacity (60 Hz)	Set temperature range
HRS012	W 377 x H 615 x D 500	40 kg	1300 W	5 to 40°C
HRS018			1900 W	
HRS024			2400 W	
New HRS030	W 377 x H 660 x D 500	47 kg	3200 W	
HRS050	W 377 x H 976 x D 592	69 kg	5100 W	
New HRS060		73 kg	5900 W	

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

- Single-phase 100 VAC (50/60 Hz), 115 VAC (60 Hz)
- Single-phase 200 to 230 VAC (50/60 Hz)

With heating function Heating method using discharged heat makes a heater unnecessary.

Convenient functions Page 835
Timer operation function/Unit conversion function/Power failure auto-restart function/ Anti-freezing operation function

Self diagnosis function and check display Page 836
35 types of alarm codes

Easy maintenance Page 835
Tool-less maintenance of filter

Communication function Page 836
Equipped with serial communication (RS232C, RS485) and contact I/Os (2 inputs and 3 outputs) as standard.

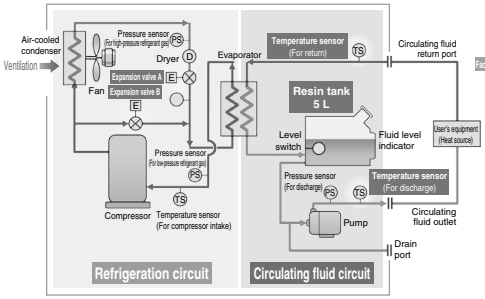
Environmental friendly R407C R410A as refrigerant

Series HRS

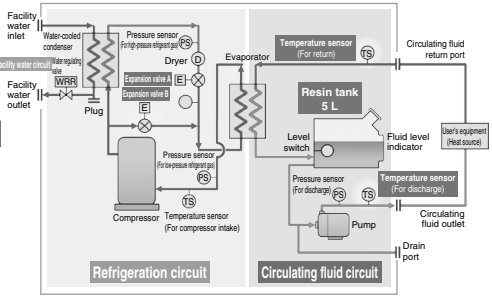
Temperature stability ±0.1°C/Compact

The precision temperature control method by expansion valve and temperature sensor, realized high temperature stability of ±0.1°C and a small-size tank.

■Air-cooled HRS□-A-□



■Water-cooled HRS□-W-□



Refrigeration circuit

- The compressor compresses the refrigerant gas, and discharges the high temperature and high pressure refrigerant gas.
- In the case of air-cooled refrigeration, the high temperature and high pressure refrigerant gas is cooled down by an air-cooled condenser with the ventilation of the fan, and becomes a liquid. In the case of water-cooled refrigeration, the refrigerant gas is cooled by a water-cooled condenser with the facility water in the facility water circuit, and becomes a liquid.
- The liquefied high pressure refrigerant gas expands and its temperature lowers when it passes through expansion valve A and vaporizes by taking heat from the circulating fluid in the evaporator.
- The vaporized refrigerant gas is sucked into the compressor and compressed again.
- When heating the circulating fluid, the high pressure and high temperature refrigerant gas is bypassed into the evaporator by expansion valve B, to heat the circulating fluid.

Point The combination of precise control of **expansion valve A** for cooling, and **expansion valve B** for heating realized high temperature stability.

Circulating fluid circuit

- The circulating fluid discharged from the pump, is heated or cooled by the user's equipment and returns to the thermo-chiller.
- The circulating fluid is controlled to a set temperature by the refrigeration circuit, to be discharged to the user's equipment side again by the thermo-chiller.

Point Since the refrigeration circuit is controlled by the signal from **2 temperature sensors (for return and discharge)**, precise temperature control of the circulating fluid can be performed. Therefore, there is no necessity of absorbing the temperature difference in the circulating fluid with a large tank capacity, and realizes high temperature stability even with a **small-size tank**. Also, contributes to space-saving.

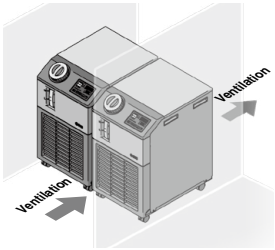
Facility water circuit

For water-cooled refrigeration HRS□-W-□

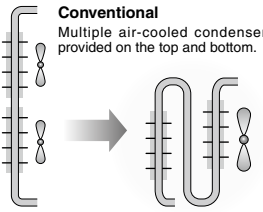
- The water control valve opens and closes to keep the refrigerant gas pressure consistent. The facility water flow rate is controlled by the water control valve.

Installation close to a wall is possible on both sides.

(HRS012/018/024 ∗ Except option G)

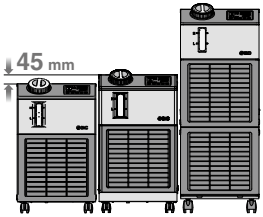


Reduced-height double condenser structure (HRS030/060)



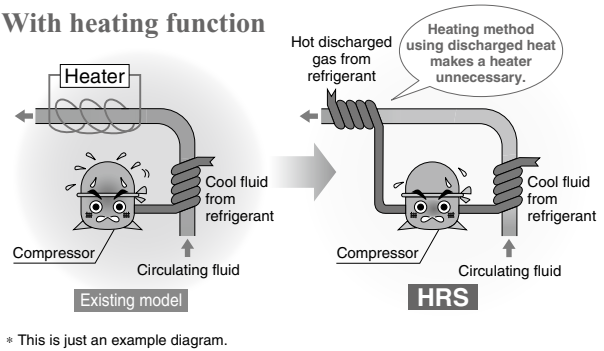
Conventional
Multiple air-cooled condensers are provided on the top and bottom.

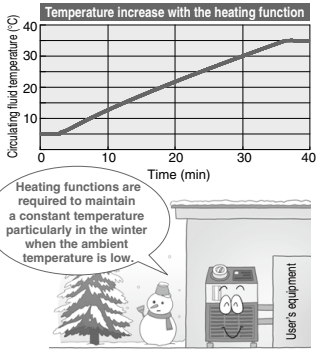
HRS030
Achieved a maximum reduction in the height of the product while expanding the cooling capacity, by providing overlapped air-cooled condensers.



HRS012 018 024 HRS030 **HRS050** HRS060

With heating function





∗ This is just an example diagram.

Simple operation

Step ❶ Press the RUN/STOP keys.

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

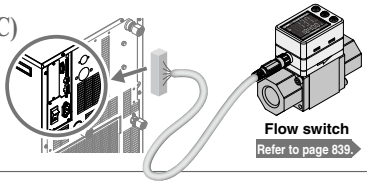
Step ❸ Press the RUN/STOP key to stop.
Easy operation by these steps

Large digital display

The "large digital display" (7-segment and 4 digits) and "2 row display" provide a clearer view of the current value (PV) and set value (SV).

Power supply (24 VDC) available

Power can be supplied from the connector at the rear side of the HRS to external switches etc.



Variations

Model		Cooling method	Cooling capacity W (50/60 Hz)	Single-phase 100 VAC (50/60 Hz) 115 VAC (50/60 Hz)	Single-phase 200 to 230 VAC (50/60 Hz)	Option **Page 855**	Optional accessories **Page 859**	International standards
	**HRS012**	Air-cooled refrigeration	1100/1300	●	●	· With earth leakage breaker · With automatic water fill function · Applicable to DI water (Deionized water) piping · High-pressure pump (∗ HRS050/060 cannot be selected) · High-temperature environment specifications (∗ HRS030/050/060 cannot be selected)	· Anti-quake bracket · Piping conversion fitting (For air-cooled, water-cooled and option) · Concentration meter · By-pass piping set · Power supply cable · DI filter set · Electrical resistance sensor set ● Particle filter set · Drain pan set (With water leakage sensor) ● Connector cover ● Analog gateway unit ● Replacement type dustproof filter set · Separately installed power transformer	CE cMETus∗ (UL Standards) **Refer to pages 841 to 844 for details on applicable models.**
	HRS018		1500/1700	●	—			
			1700/1900	—	●			
	**HRS024**		2100/2400	—	●			
	HRS030	Water-cooled refrigeration	2600/3200	—	●			
	**HRS050**		4700/5100	—	●			
	HRS060		4900/5900	—	●			

: Newly added models ● : Newly added optional accessories ∗ UL Standards: Applicable to 60 Hz only

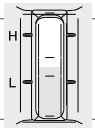
Reduces the maintenance hours for the pump.

Adoption of the magnet pump*

No external leakage of the circulating fluid because the sealless pump is used, and a periodic check of the pump leakage and replacement of the mechanical seal are not necessary.

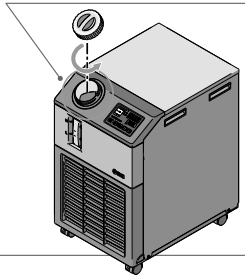
* When the option, high-pressure pump, is selected and for HRS050/060, the mechanical seal pump is chosen.

Easy check of the circulating fluid level

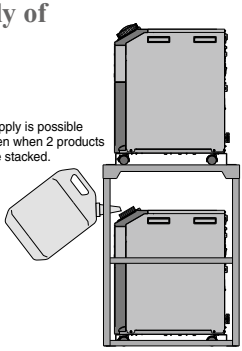


Shaped for easy supply of circulating fluid

The angled supply port facilitates the supply of circulating fluid.



Supply is possible even when 2 products are stacked.

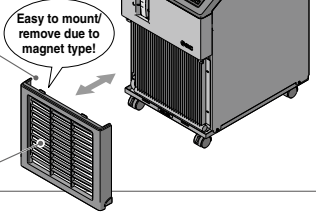


Tool-less inspection and cleaning of air-cooled condenser

Dustproof filter

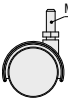
Integrated with the grill of the front panel. Mounting and removal can be done easily.

Easy to clean dust and cutting chips etc. stuck to the dustproof net by brush or air blow.



With casters (Removable)

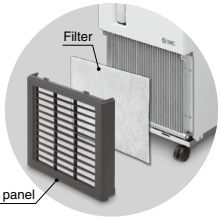
M8 thread



Optional Accessories

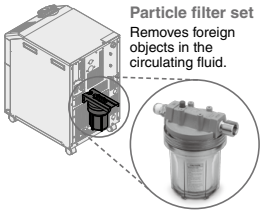
Replacement type dustproof filter set

Suitable for use in excessively dusty atmospheres. The disposable type filter saves time and effort of cleaning.



Particle filter set

Removes foreign objects in the circulating fluid.



Convenient Functions (Refer to the Operation Manual for details.)

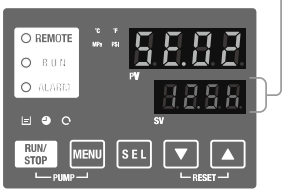
Timer operation function

Timer for ON and OFF can be set in units of 0.5 h up to 99.5 h.

Ex.) Can set to stop on Saturday and Sunday and restart on Monday morning.

Ex. SE.02 "ON timer"

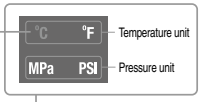
Timer The time remaining can be checked.

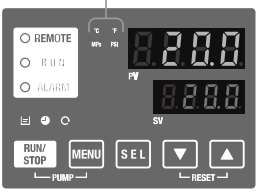


Unit conversion function

Temperature and pressure units can be changed.

Orange indicator lights up.





Power failure auto-restart function

Automatic restart from stoppage due to power failure etc. is possible without pressing the RUN/STOP key and remote operation.

Anti-freezing operation function

If the temperature approaches freezing point, e.g. in winter at night, the pump operates automatically and the heat generated by the pump warms the circulating fluid, preventing freezing.

Key-lock function

Can be set in advance to protect the set values from being changed by pressing keys by mistake.

Function to output a signal for completion of preparation

Notifies by communication when the temperature reaches the pre-set temperature range.

Independent operation of the pump

The pump can be operated independently while chiller is powered off. You can check piping leak and remove the air.

Self Diagnosis Function and Check Display

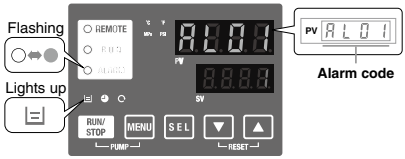
Display of 35 types of alarm codes For details, refer to page 853.
Operation is monitored all the time by the integrated sensor.
Should any error occur, the self diagnosis result is displayed by the applicable alarm code from 35 types.
This makes it easier to identify the cause of the alarm.
Can be used before requesting service.

Changeable alarm set values

Setting item	Set value
Circulating fluid discharge temperature rise	5 to 48°C
Circulating fluid discharge temperature drop	1 to 39°C
Circulating fluid discharge pressure rise	0.05 to 0.75 MPa*
Circulating fluid discharge pressure drop	0.05 to 0.18 MPa*

* Set values vary depending on the model.

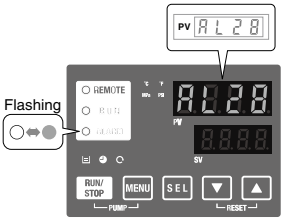
Ex. AL01 "Low level in tank"



Alarm codes notify of checking times.
Notifies when to check the pump and fan motor.
Helpful for facility maintenance.

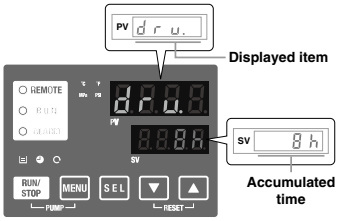
* The fan motor is not used in water-cooled refrigeration.

Ex. AL28 "Pump maintenance"



Check display
The internal temperature, pressure and operating time of the product are displayed.

Ex. drv. "Accumulated operating time"



Displayed item
Circulating fluid outlet temperature
Circulating fluid return temperature
Compressor gas temperature
Circulating fluid outlet pressure
Compressor gas discharge pressure
Compressor gas return pressure
Accumulated operating time
Accumulated operating time of pump
Accumulated operating time of fan motor*
Accumulated operating time of compressor

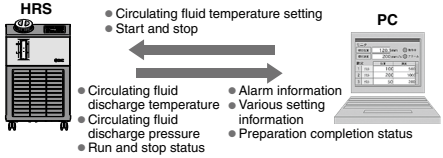
* These are displayed only for air-cooled refrigeration.

Communication Function

The serial communication (RS232C/RS485) and contact I/Os (2 inputs and 3 outputs) are equipped as standard.
Communication with the user's equipment and system construction are possible, depending on the application.
A 24 VDC output can be also provided, and is available for a flow switch (SMC's PF2W etc.).

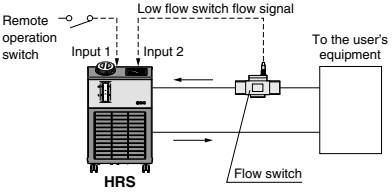
Ex. 1 Remote signal I/O through serial communication

The remote operation is enabled (to start and stop) through serial communication.



Ex. 2 Remote operation signal input

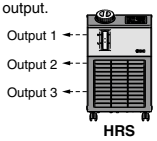
One of the contact inputs is used for remote operation and the other is used for a flow switch to monitor the flow, and their warning outputs are taken in.



Power for flow switch (24 VDC) can be supplied from thermo-chiller.

Ex. 3 Alarm and operation status (start, stop, etc.) signal output

The alarm and status generated in the product are assigned to 3 output signals based on their contents, and can be output.



• Output setting example
Output 1: Temperature rise
Output 2: Pressure rise
Output 3: Operation status (start, stop, etc.)

Application Examples

	Heat source	Automotive	Light electrical appliance	Food	Machinery	Medical	Semiconductor
Arc welding machine	Torch	●			●		
Resistance welding machine	Tip	●	●		●		
Laser welding machine	Oscillator	●	●		●		●
UV curing device	Lamp	●	●	●		●	
X-ray instrument			●			●	●
Electronic microscope	Lens		●			●	●
Laser marker	Oscillator	●	●	●		●	●
Ultra sonic wave inspection machine		●	●		●		
Atomizing device/ Crushing equipment	Blade			●			
Linear motor	Motor	●			●		
Packaging machines (food products)	Dies/ Welded portions			●			
Mold cooling	Mold	●	●	●		●	
Temperature control of adhesive and paint material	Paint material/ Welding materials	●	●	●			
Cooling of vacuum pump	Pump	●					●
Shrink fit machine	Workpiece	●			●		
Gas cylinder cabinet							●
Concentrating equipment	Test liquid			●		●	
Reagent cooling equipment	Reagent			●		●	●
Cleaning machine (hydrocarbon-based)	Cleaning tank	●	●		●		
Printing machine	Roller		●	●	●		
Chamber electrode	Electrode						●
High frequency induction heating equipment	Power supply/ Heating coil	●			●		

Global Supply Network

SMC has a comprehensive network in the global market.

We now have a presence of more than 400 branch offices and distributors in 78 countries world wide such as Asia, Oceania, North/Central/South America, and Europe. With this global network, we are able to provide a global supply of our substantial range of products with the best service. We also provide full support to local factories, foreign manufacturing companies and Japanese companies in each country.

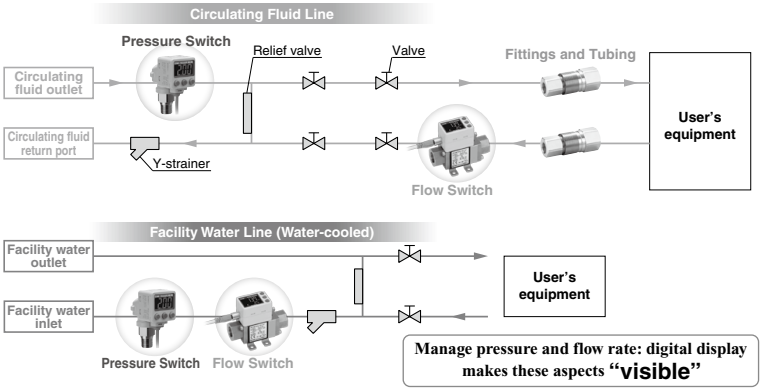
SMC Thermo-chiller Variations

Lots of variations are available in response to the users' requirements.

As of August 2014

Series	Temperature stability [°C]	Set temperature range [°C]	Cooling capacity [kW]											Environment	International standards
			1.2	1.8	2.4	3	5	6	9	10	15	20	25		
 **HRSE Basic type**	±2.0	10 to 30	●	●	●									Indoor use	—
 **HRS Standard type**	±0.1	5 to 40	●	●	●	●	●	●						Indoor use	CE (Only 60 Hz)
 **HRS100/150 Standard type**	±1.0	5 to 35								●	●			Outdoor installation IPX4	—
 **HRSH090 Inverter type**	±0.1	5 to 40							●					Indoor use	CE (400 V as standard) UL Standards (To be obtained)
 **HRSH Inverter type**	±0.1	5 to 35								●	●	●	●	Outdoor installation IPX4	CE (400 V as standard, 200 V as an option) (Only 200 V as an option)

Circulating Fluid/Facility Water Line Equipment

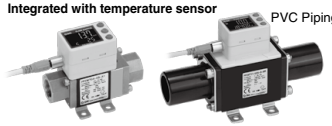


Manage pressure and flow rate: digital display makes these aspects "visible"

Flow Switch: Monitors the flow rate and temperature of the circulating fluid and facility water.

Refer to the Best Pneumatics No. 6 for details.

3-Color Display Digital Flow Switch for Water ***PF3W***
Integrated with temperature sensor



3-Color Display
Electromagnetic Type Digital Flow Switch ***LFE***

Digital Flow Switch for
Deionized Water and Chemical Liquids ***PF2D***
4-Channel Flow Monitor ***PF2□200***

Pressure Switch: Monitors pressure of the circulating fluid and facility water.

Refer to the Best Pneumatics No. 6 for details.

2-Color Display
High-Precision Digital Pressure Switch ***ISE80***

Pressure Sensor for General Fluids ***PSE56□***
Pressure Sensor Controller ***PSE200,300***

Fittings and Tubing

Refer to the Best Pneumatics No. 6 for details.

S Coupler ***KK***

S Coupler/Stainless Steel
(Stainless Steel 304) ***KKA***

Metal One-touch Fittings ***KQB2***

Stainless Steel 316
One-touch Fittings ***KQG2***

Stainless Steel 316 Insert Fittings ***KFG2***

Fluoropolymer Fittings ***LQ***

Tubing ***T□***

Series	Material
T	Nylon
TU	Polyurethane
TH	FEP (Fluoropolymer)
TD	Modified PTFE (Soft fluoropolymer)
TL	Super PFA
TLM	PFA

CONTENTS

Series HRS

Thermo-chiller Standard Type
Single-phase 100/115 VAC
Series HRS

(UL Standards)

RoHS

How to Order

Air-cooled refrigeration **HRS 018 – A □ – 10 – □**

Cooling capacity

012	Cooling capacity 1100/1300 W (50/60 Hz)
018	Cooling capacity 1500/1700 W (50/60 Hz)

Note) UL Standards: Applicable to 60 Hz only

Cooling method

A	Air-cooled refrigeration

Pipe thread type

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

Option

Symbol	Option
Nil	None
B	With earth leakage breaker
J	With automatic water fill function
M	Applicable to DI water (deionized water) piping
T	High-pressure pump mounted Note)

- When multiple options are combined, indicate symbols in alphabetical order.

Note) ● The cooling capacity will decrease by about 300 W from the value in the catalog.
● Pending for CE marking and UL Standards

Power supply Note)

Symbol	Power supply
10	Single-phase 100 VAC (50/60 Hz) 115 VAC (60 Hz)

Note) UL Standards: Applicable to 60 Hz only

Specifications

* There are different values from standard specifications. Refer to pages 855 to 857 for details.

Model				HRS012-A□-10	HRS018-A□-10
Cooling method				Air-cooled refrigeration	
Refrigerant				R407C (HFC)	
Control method				PID control	
Ambient temperature/humidity Note 1)				Temperature: 5 to 40°C, Humidity: 30 to 70%	
Circulating fluid system	**Circulating fluid** Note 2)			Tap water, 15% ethylene glycol aqueous solution Note 4)	
	Set temperature range Note 1)		°C	5 to 40	
	Cooling capacity Note 3) **(50/60 Hz)**		W	1100/1300	1500/1700
	Heating capacity Note 3) **(50/60 Hz)**		W	360/450	
	Temperature stability Note 5)		°C	±0.1	
	Pump	**Rated flow** Note 6) Note 7) **(50/60 Hz)**	L/min	7 (0.13 MPa)/7 (0.18 MPa)	
		Maximum flow rate (50/60 Hz)	L/min	27/29	
		Maximum pump head (50/60 Hz)	m	14/19	
		Output	W	200	
	Tank capacity		L	Approx. 5	
	Port size			Rc1/2	
	Fluid contact material			Stainless steel, Copper (Heat exchanger brazing), Bronze, Alumina ceramic, Carbon, PP, PE, POM, FKM, EPDM, PVC	
Electrical system	**Power supply**			Single-phase 100 VAC (50/60 Hz), 115 VAC (60 Hz) Allowable voltage range ±10%	
	Circuit protector		A	15	
	Applicable earth leakage breaker capacity Note 8)		A	15	
	Rated operating current		A	7.5/8.3	7.7/8.4
	Rated power consumption Note 3) **(50/60 Hz)**		kVA	0.7/0.8	0.8/0.8
Noise level Note 9) **(50/60 Hz)**			dB	58/55	
Accessories				Fitting (for drain outlet) 1 pc., Input/output signal connector 1 pc., Power supply connector 1 pc., Operation manual (for installation/operation) 1, Quick manual (with a clear case) 1, Alarm code list sticker 1, Ferritic core (for communication) 1 pc. Power supply cable should be ordered the option (sold separately) or prepared by the user.	
Weight Note 10)			kg	40	

Note 1) It should have no condensation.
Note 2) If tap water is used, use water that conforms to Water Quality Standards of the Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994 cooling water system - circulating type - make-up water).
Note 3) ① Ambient temperature: 25°C, ② Circulating fluid temperature: 20°C, ③ Circulating fluid rated flow, ④ Circulating fluid: Tap water
Refer to the cooling capacity graph on page 845 for details.
Note 4) Use a 15% ethylene glycol aqueous solution if operating in a place where the circulating fluid temperature is 10°C or less.
Note 5) Outlet temperature when the circulating fluid flow is rated flow, and the circulating fluid outlet and return port are directly connected. Installation environment and the power supply are within specification range and stable.
Note 6) The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.
Note 7) Required min. flow rate for cooling capacity or maintaining the 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 by-pass piping set (sold separately).)
Note 8) Purchase an earth leakage breaker with current sensitivity of 15 mA or 30 mA separately. (A product with an optional earth leakage breaker (option B) is also available. Refer to page 855.)
Note 9) Front: 1 m, height: 1 m, stable with no load, Other conditions → Note 3)
Note 10) Weight in the dry state without circulating fluids
Note 11) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 874) Item 14 "• For altitude of 1000 m or higher".

How to Order

Water-cooled refrigeration **HRS 018 – W □ – 10 – □**

Cooling capacity

012	Cooling capacity 1100/1300 W (50/60 Hz)
018	Cooling capacity 1500/1700 W (50/60 Hz)

Note) UL Standards: Applicable to 60 Hz only

Cooling method

W	Water-cooled refrigeration

Pipe thread type

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

Power supply Note)

Symbol	Power supply
10	Single-phase 100 VAC (50/60 Hz) 115 VAC (60 Hz)

Note) UL Standards: Applicable to 60 Hz only

Option

Symbol	Option
Nil	None
B	With earth leakage breaker
J	With automatic water fill function
M	Applicable to DI water (deionized water) piping
T	High-pressure pump mounted Note)

- When multiple options are combined, indicate symbols in alphabetical order.

Note) ● The cooling capacity will decrease by about 300 W from the value in the catalog.
● Pending for CE marking and UL Standards

Specifications

* There are different values from standard specifications. Refer to pages 855 to 857 for details.

Model				HRS012-W□-10	HRS018-W□-10
Cooling method				Water-cooled refrigeration	
Refrigerant				R407C (HFC)	
Control method				PID control	
Ambient temperature/humidity Note 1)				Temperature: 5 to 40°C, Humidity: 30 to 70%	
Circulating fluid system	**Circulating fluid** Note 2)			Tap water, 15% ethylene glycol aqueous solution Note 4)	
	Set temperature range Note 1)		°C	5 to 40	
	Cooling capacity Note 3) **(50/60 Hz)**		W	1100/1300	1500/1700
	Heating capacity Note 3) **(50/60 Hz)**		W	360/450	
	Temperature stability Note 5)		°C	±0.1	
	Pump	**Rated flow** Note 6) Note 7) **(50/60 Hz)**	L/min	7 (0.13 MPa)/7 (0.18 MPa)	
		Maximum flow rate (50/60 Hz)	L/min	27/29	
		Maximum pump head (50/60 Hz)	m	14/19	
		Output	W	200	
	Tank capacity		L	Approx. 5	
	Port size			Rc1/2	
	Fluid contact material			Stainless steel, Copper (Heat exchanger brazing), Bronze, Alumina ceramic, Carbon, PP, PE, POM, FKM, EPDM, PVC	
Facility water system	**Temperature range**		°C	5 to 40	
	Pressure range		MPa	0.3 to 0.5	
	Required flow rate Note 11) **(50/60 Hz)**		L/min	8	12
	Inlet-outlet pressure differential of facility water		MPa	0.3 or more	
	Port size			Rc3/8	
	Fluid contact material			Stainless steel, Copper (Heat exchanger brazing), Bronze, Synthetic rubber	
Electrical system	**Power supply**			Single-phase 100 VAC (50/60 Hz), 115 VAC (60 Hz) Allowable voltage range ±10%	
	Circuit protector		A	15	
	Applicable earth leakage breaker capacity Note 8)		A	15	
	Rated operating current		A	7.5/8.3	7.7/8.4
	Rated power consumption Note 3) **(50/60 Hz)**		kVA	0.7/0.8	0.8/0.8
Noise level Note 9) **(50/60 Hz)**			dB	58/55	
Accessories				Fitting (for drain outlet) 1 pc., Input/output signal connector 1 pc., Power supply connector 1 pc., Operation manual (for installation/operation) 1, Quick manual (with a clear case) 1, Alarm code list sticker 1, Ferritic core (for communication) 1 pc. Power supply cable should be ordered the option (sold separately) or prepared by the user.	
Weight Note 10)			kg	40	

Note 1) It should have no condensation.
Note 2) If tap water is used, use water that conforms to Water Quality Standards of the Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994 cooling water system - circulating type - make-up water).
Note 3) ① Ambient temperature: 25°C, ② Circulating fluid temperature: 20°C, ③ Circulating fluid rated flow, ④ Circulating fluid: Tap water, ⑤ Facility water temperature: 25°C
Refer to the cooling capacity graph on page 845 for details.
Note 4) Use a 15% ethylene glycol aqueous solution if operating in a place where the circulating fluid temperature is 10°C or less.
Note 5) Outlet temperature when the circulating fluid flow is rated flow, and the circulating fluid outlet and return port are directly connected. Installation environment and the power supply are within specification range and stable.
Note 6) The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.
Note 7) Required min. flow rate for cooling capacity or maintaining the 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 by-pass piping set (sold separately).)
Note 8) Purchase an earth leakage breaker with current sensitivity of 15 mA or 30 mA separately. (A product with an optional earth leakage breaker (option B) is also available. Refer to page 855.)
Note 9) Front: 1 m, height: 1 m, stable with no load, Other conditions → Note 3)
Note 10) Weight in the dry state without circulating fluids
Note 11) Required flow rate when a load for the cooling capacity is applied at a circulating fluid temperature of 20°C, and circulating fluid rated flow and facility water temperature of 25°C.
Note 12) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 874) Item 14 "* For altitude of 1000 m or higher".

Thermo-chiller Standard Type
Single-phase 200 to 230 VAC
Series HRS

(UL Standards)

RoHS

How to Order

Air-cooled refrigeration **HRS 018 – A □ – 20 – □**

Cooling capacity

012	Cooling capacity 1100/1300 W (50/60 Hz)
018	Cooling capacity 1700/1900 W (50/60 Hz)
024	Cooling capacity 2100/2400 W (50/60 Hz)
030	Cooling capacity 2600/3200 W (50/60 Hz)
050	Cooling capacity 4700/5100 W (50/60 Hz)
060	Cooling capacity 4900/5900 W (50/60 Hz)

Note) UL Standards: Applicable to 60 Hz only

Cooling method

A	Air-cooled refrigeration

Pipe thread type

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

Option

Symbol	Option	Applicable model
Nil	None	HRS012/018/024 030/050/060
B	With earth leakage breaker	
J	With automatic water fill function	
M	Applicable to DI water (deionized water) piping	
T	High-pressure pump mounted Note)	HRS012/018/024/030
G	High-temperature environment specifications	HRS012/018/024

- When multiple options are combined, indicate symbols in alphabetical order.

Note) The cooling capacity will decrease by about 300 W from the value in the catalog.

Power supply Note)

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

Note) UL Standards: Applicable to 60 Hz only

Specifications

∗ There are different values from standard specifications. Refer to pages 855 to 857 for details.

Model			HRS012-A□-20	HRS018-A□-20	HRS024-A□-20	HRS030-A□-20	HRS050-A□-20	HRS060-A□-20
Cooling method			Air-cooled refrigeration					
Refrigerant			R407C (HFC)				R410A (HFC)	
Control method			PID control					
Ambient temperature/humidity Note 1)			Temperature: 5 to 40°C, High-temperature environment specifications (option): 5 to 45°C, Humidity: 30 to 70%					
Circulating fluid system	**Circulating fluid** Note 2)		Tap water, 15% ethylene glycol aqueous solution Note 4)					
	Set temperature range Note 1)	°C	5 to 40					
	Cooling capacity Note 3) **(50/60 Hz)**	W	1100/1300	1700/1900	2100/2400	2600/3200	4700/5100	4900/5900
	Heating capacity Note 3) **(50/60 Hz)**	W	530/650			600/640	1100/1400	1000/1300
	Temperature stability Note 5)	°C	±0.1					
	Pump **Rated flow** Note 6) Note 7) **(50/60 Hz)**	L/min	7 (0.13 MPa)/7 (0.18 MPa)				23 (0.24 MPa)/26 (0.32 MPa)	23 (0.21 MPa)/28 (0.29 MPa)
	Pump **Maximum flow rate (50/60 Hz)**	L/min	27/29			34/40	31/42	29/38
	Pump **Maximum 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), Bronze, Alumina ceramic, Carbon, PP, PE, POM, FKM, EPDM, PVC					
Electrical system	**Power supply**		Single-phase 200 to 230 VAC (50/60 Hz) Allowable voltage range ±10%					
	Circuit protector	A	10				20	30
	Applicable earth leakage breaker capacity Note 8)	A	10				20	30
	Rated operating current	A	4.6/5.1	4.7/5.2	5.1/5.9	5.2/6.0	8/11	8.9/11.5
	Rated power consumption Note 3) **(50/60 Hz)**	kVA	0.9/1.0	0.9/1.0	1.0/1.2	1.0/1.2	1.7/2.2	1.8/2.3
Noise level Note 9) **(50/60 Hz)**		dB	60/61			62/65	65/68	66/68
Accessories			Fitting (for drain outlet) 1 pc. Note 11), Input/output signal connector 1 pc., Power supply connector 1 pc. Note 11), Operation manual (for installation/operation) 1, Quick manual (with a clear case) 1 Note 11), Alarm code list sticker 1, Ferritic core (for communication) 1 pc. Power supply cable should be ordered the option (sold separately) or prepared by the user.					
Weight Note 10)		kg	43			47	69	73

Note 1) It should have no condensation.

Note 2) If tap water is used, use water that conforms to Water Quality Standards of the Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994 cooling water system - circulating type - make-up water).

Note 3) ① Ambient temperature: 25°C, ② Circulating fluid temperature: 20°C, ③ Circulating fluid rated flow, ④ Circulating fluid: Tap water
Refer to the cooling capacity graph on pages 845 and 846 for details.

Note 4) Use a 15% ethylene glycol aqueous solution if operating in a place where the circulating fluid temperature is 10°C or less.

Note 5) Outlet temperature when the circulating fluid flow is rated flow, and the circulating fluid outlet and return port are directly connected. Installation environment and the power supply are within specification range and stable.

Note 6) The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.

Note 7) Required min. flow rate for cooling capacity or maintaining the 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 by-pass piping set (sold separately).)

Note 8) Purchase an earth leakage breaker with current sensitivity of 30 mA separately. (A product with an optional earth leakage breaker (option B) is also available.)

Note 9) Front: 1 m, height: 1 m, stable with no load, Other conditions → Note 3)

Note 10) Weight in the dry state without circulating fluids

Note 11) It is not provided for HRS050/060.

Note 12) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 874) Item 14 "∗ For altitude of 1000 m or higher".

SMC

How to Order

Water-cooled refrigeration **HRS 018 – W □ – 20 – □**

Cooling capacity

012	Cooling capacity 1100/1300 W (50/60 Hz)
018	Cooling capacity 1700/1900 W (50/60 Hz)
024	Cooling capacity 2100/2400 W (50/60 Hz)
030	Cooling capacity 2600/3200 W (50/60 Hz)
050	Cooling capacity 4700/5100 W (50/60 Hz)
060	Cooling capacity 4900/5900 W (50/60 Hz)

Note) UL Standards: Applicable to 60 Hz only

Cooling method

W	Water-cooled refrigeration

Pipe thread type

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

Power supply Note)

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

Note) UL Standards: Applicable to 60 Hz only

Option

Symbol	Option	Applicable model
Nil	None	HRS012/018/024 030/050/060
B	With earth leakage breaker	
J	With automatic water fill function	
M	Applicable to DI water (deionized water) piping	
T	High-pressure pump mounted Note)	HRS012/018/024/030

- When multiple options are combined, indicate symbols in alphabetical order.

Note) The cooling capacity will decrease by about 300 W from the value in the catalog.

Specifications

∗ There are different values from standard specifications. Refer to pages 855 to 857 for details.

Model			HRS012-W□-20	HRS018-W□-20	HRS024-W□-20	HRS030-W□-20	HRS050-W□-20	HRS060-W□-20
Cooling method			Water-cooled refrigeration					
Refrigerant			R407C (HFC)				R410A (HFC)	
Control method			PID control					
Ambient temperature/humidity Note 1)			Temperature: 5 to 40°C, High-temperature environment specifications (option): 5 to 45°C, Humidity: 30 to 70%					
Circulating fluid system	**Circulating fluid** Note 2)		Tap water, 15% ethylene glycol aqueous solution Note 4)					
	Set temperature range Note 1)		5 to 40					
	Cooling capacity Note 3) **(50/60 Hz)**	W	1100/1300	1700/1900	2100/2400	2600/3200	4700/5100	4900/5900
	Heating capacity Note 3) **(50/60 Hz)**	W	530/650			400/600	1000/1300	
	Temperature stability Note 5)	°C	±0.1					
	Pump **Rated flow** Note 6) Note 7) **(50/60 Hz)**	L/min	7 (0.13 MPa)/7 (0.18 MPa)				23 (0.24 MPa)/26 (0.32 MPa)	23 (0.21 MPa)/26 (0.29 MPa)
	Pump **Maximum flow rate (50/60 Hz)**	L/min	27/29			34/40	31/42	29/38
	Pump **Maximum 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), Bronze, Alumina ceramic, Carbon, PP, PE, POM, FKM, EPDM, PVC					
Facility water system	**Temperature range**	°C	5 to 40					
	Pressure range	MPa	0.3 to 0.5					
	Required flow rate Note 11) **(50/60 Hz)**	L/min	8	12	14	15	16	17
	Inlet-outlet pressure differential of facility water	MPa	0.3 or more					
	Port size		Rc3/8					
	Fluid contact material		Stainless steel, Copper (Heat exchanger brazing), Bronze, Synthetic rubber					
Electrical system	**Power supply**		Single-phase 200 to 230 VAC (50/60 Hz) Allowable voltage range ±10%					
	Circuit protector	A	10				20	
	Applicable earth leakage breaker capacity Note 8)	A	10				20	
	Rated operating current	A	4.6/5.1	4.7/5.2	5.1/5.9	5.2/6.0	7.6/10	7.6/10.4
	Rated power consumption Note 3) **(50/60 Hz)**	kVA	0.9/1.0	0.9/1.0	1.0/1.2	1.0/1.2	1.5/2.0	1.5/2.1
Noise level Note 9) **(50/60 Hz)**		dB	60/61			62/65	65/68	66/68
Accessories			Fitting (for drain outlet) 1 pc. Note 12), Input/output signal connector 1 pc., Power supply connector 1 pc. Note 12), Operation manual (for installation/operation) 1, Quick manual (with a clear case) 1 Note 12), Alarm code list sticker 1, Ferritic core (for communication) 1 pc. Power supply cable should be ordered the option (sold separately) or prepared by the user.					
Weight Note 10)		kg	43			46	67	

Note 1) It should have no condensation.

Note 2) If tap water is used, use water that conforms to Water Quality Standards of the Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994 cooling water system - circulating type - make-up water).

Note 3) ① Ambient temperature: 25°C, ② Circulating fluid temperature: 20°C, ③ Circulating fluid rated flow, ④ Circulating fluid: Tap water, ⑤ Facility water temperature: 25°C Refer to the cooling capacity graph on pages 845 and 846 for details.

Note 4) Use a 15% ethylene glycol aqueous solution if operating in a place where the circulating fluid temperature is 10°C or less.

Note 5) Outlet temperature when the circulating fluid flow is rated flow, and the circulating fluid outlet and return port are directly connected. Installation environment and the power supply are within specification range and stable.

Note 6) The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.

Note 7) Required min. flow rate for cooling capacity or maintaining the 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 by-pass piping set (sold separately).)

Note 8) Purchase an earth leakage breaker with current sensitivity of 30 mA separately. (A product with an optional earth leakage breaker (option B) is also available.)

Note 9) Front: 1 m, height: 1 m, stable with no load, Other conditions → Note 3)

Note 10) Weight in the dry state without circulating fluids

Note 11) Required flow rate when a load for the cooling capacity is applied at a circulating fluid temperature of 20°C, and circulating fluid rated flow and facility water temperature of 25°C.

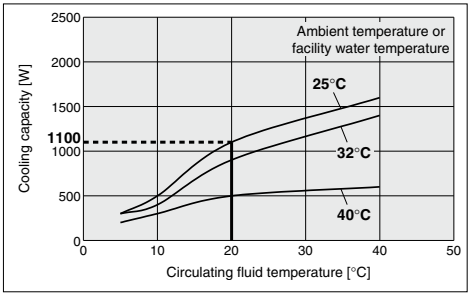
Note 12) It is not provided for HRS050/060.

Note 13) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/ Storage Environment" (page 874) Item 14 "∗ For altitude of 1000 m or higher".

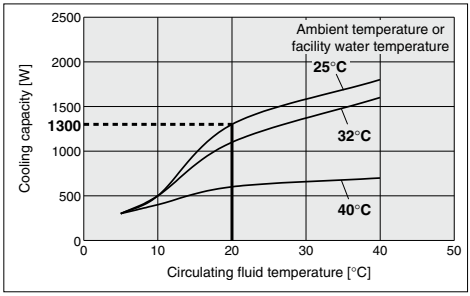
Cooling Capacity

Note 1) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 874) Item 14 "∗ For altitude of 1000 m or higher".
Note 2) For a product with high-pressure pump option (-T), the cooling capacity will decrease by about 300 W from each graph.

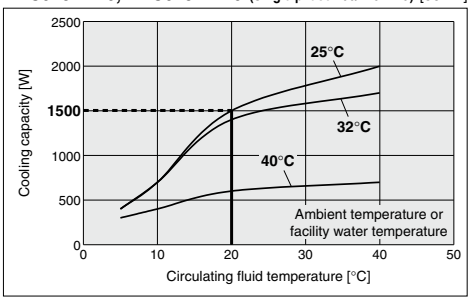
HRS012-A-10, HRS012-W-10 (Single-phase 100/115 VAC) [50 Hz]



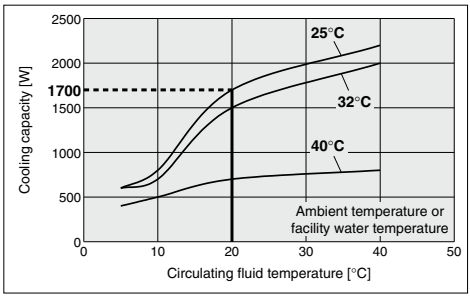
[60 Hz]



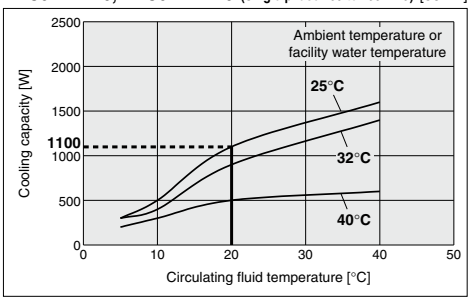
HRS018-A-10, HRS018-W-10 (Single-phase 100/115 VAC) [50 Hz]



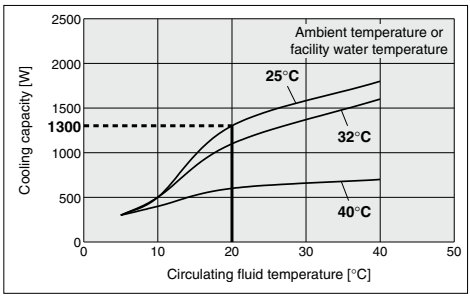
[60 Hz]



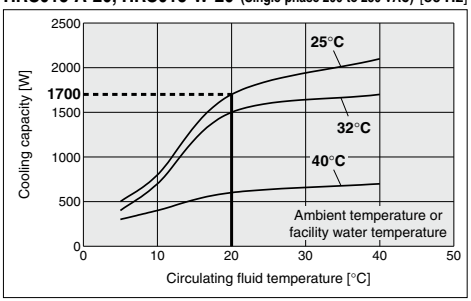
HRS012-A-20, HRS012-W-20 (Single-phase 200 to 230 VAC) [50 Hz]



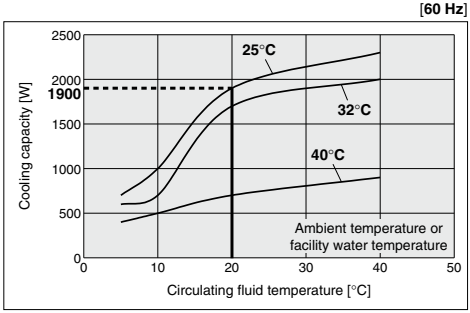
[60 Hz]



HRS018-A-20, HRS018-W-20 (Single-phase 200 to 230 VAC) [50 Hz]



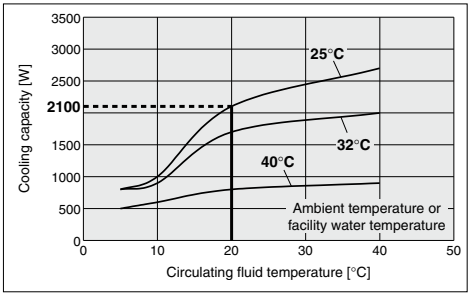
[60 Hz]



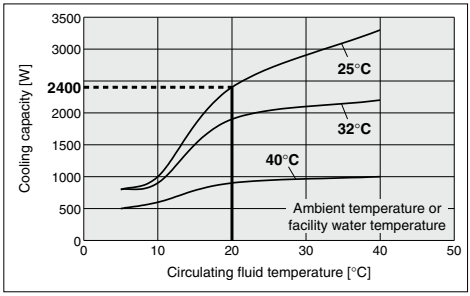
Cooling Capacity

Note 1) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 874) Item 14 "∗ For altitude of 1000 m or higher".
Note 2) For a product with high-pressure pump option (-T), the cooling capacity will decrease by about 300 W from each graph.

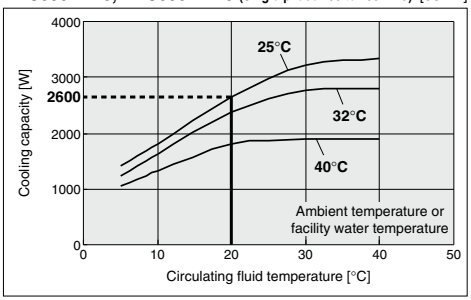
HRS024-A-20, HRS024-W-20 (Single-phase 200 to 230 VAC) [50 Hz]



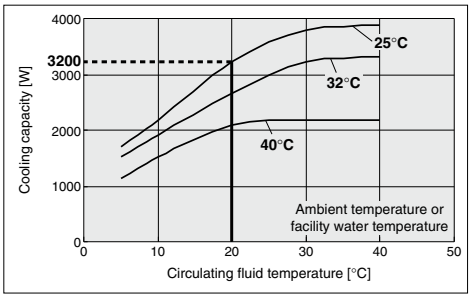
[60 Hz]



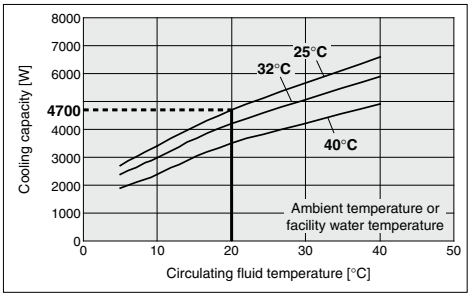
HRS030-A-20, HRS030-W-20 (Single-phase 200 to 230 VAC) [50 Hz]



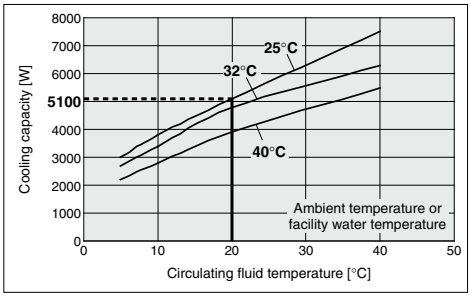
[60 Hz]



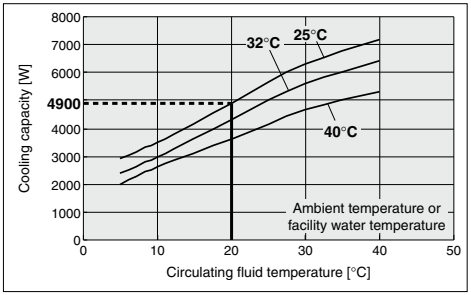
HRS050-A-20, HRS050-W-20 (Single-phase 200 to 230 VAC) [50 Hz]



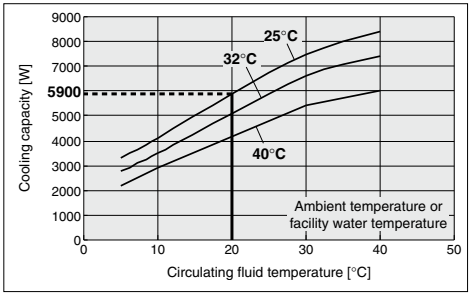
[60 Hz]



HRS060-A-20, HRS060-W-20 (Single-phase 200 to 230 VAC) [50 Hz]



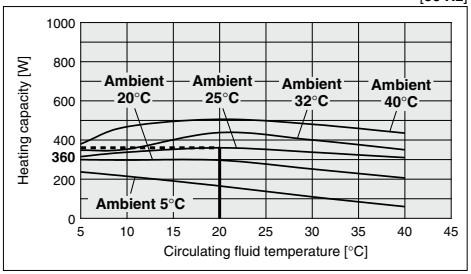
[60 Hz]



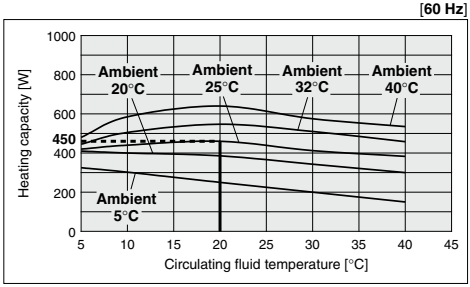
Heating Capacity

HRS$^{012}_{018}$-$^{A}_{W}$-10 (Single-phase 100/115 VAC)

[50 Hz]

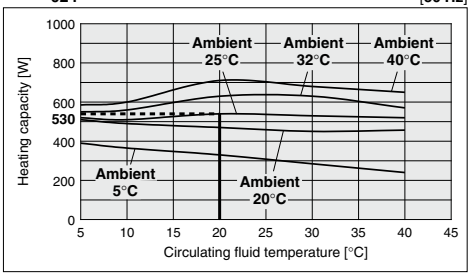


[60 Hz]

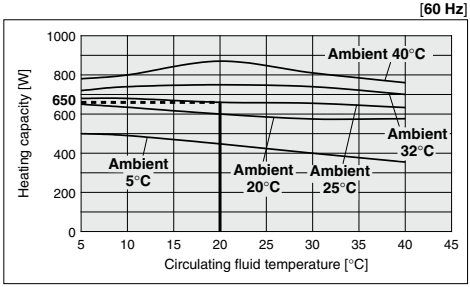


HRS$^{012}_{018}_{024}$-$^{A}_{W}$-20 (Single-phase 200 to 230 VAC)

[50 Hz]

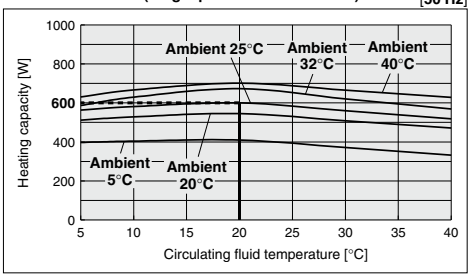


[60 Hz]

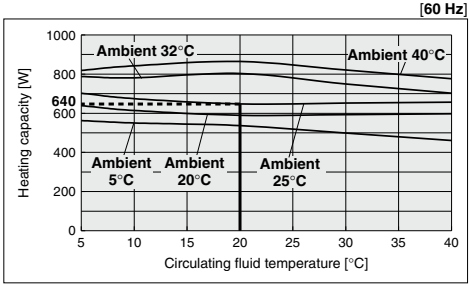


HRS030-A-20 (Single-phase 200 to 230 VAC)

[50 Hz]

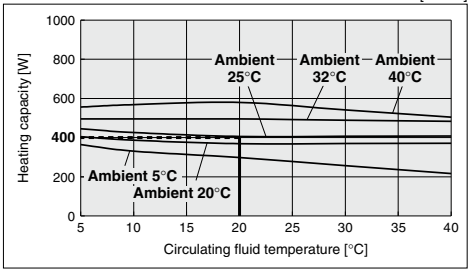


[60 Hz]

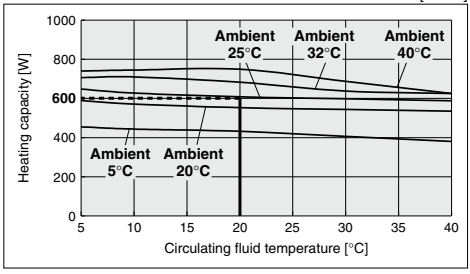


HRS030-W-20 (Single-phase 200 to 230 VAC)

[50 Hz]



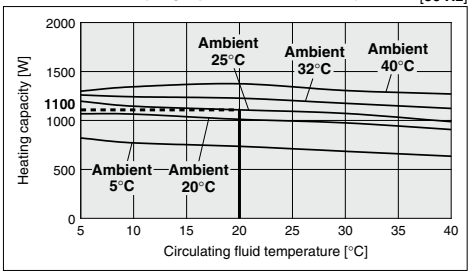
[60 Hz]



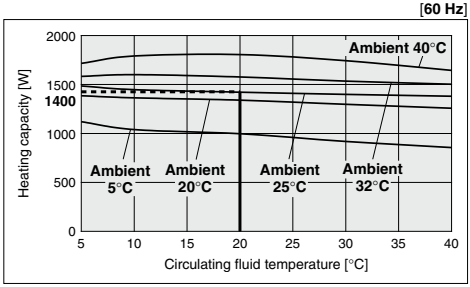
Heating Capacity

HRS050-A-20 (Single-phase 200 to 230 VAC)

[50 Hz]

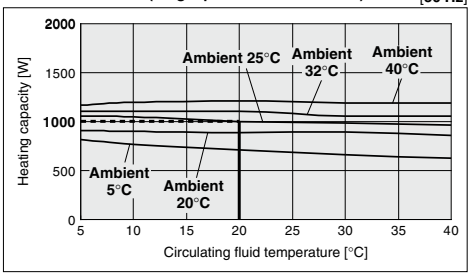


[60 Hz]

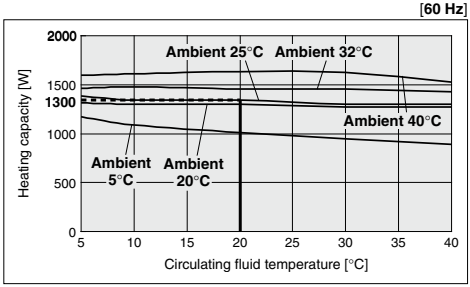


HRS050-W-20 (Single-phase 200 to 230 VAC)

[50 Hz]

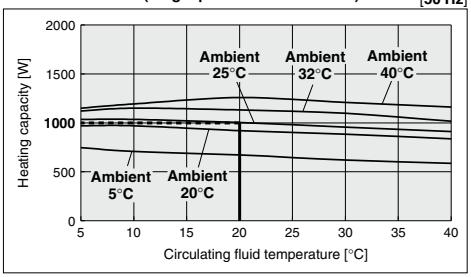


[60 Hz]

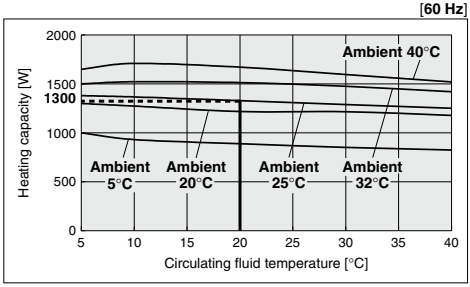


HRS060-A-20 (Single-phase 200 to 230 VAC)

[50 Hz]

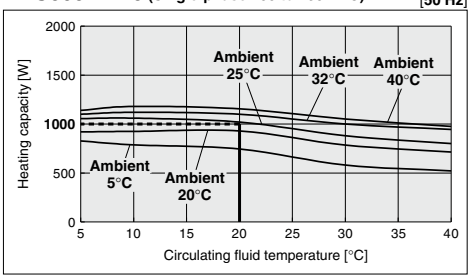


[60 Hz]

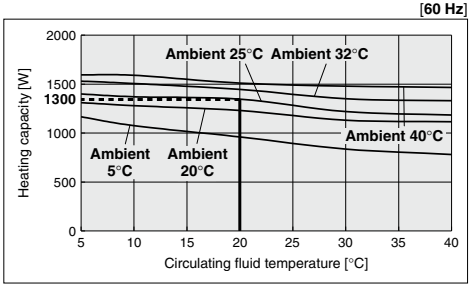


HRS060-W-20 (Single-phase 200 to 230 VAC)

[50 Hz]

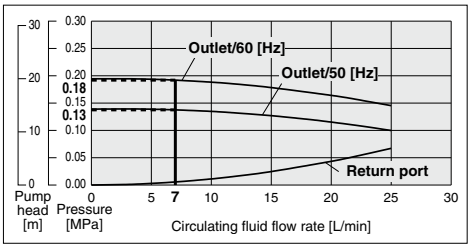


[60 Hz]

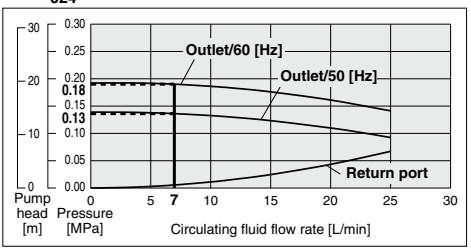


Pump Capacity

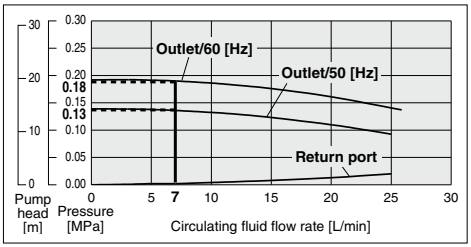
HRS$^{012}_{018}$-$^{A}_{W}$-10 (Single-phase 100/115 VAC)



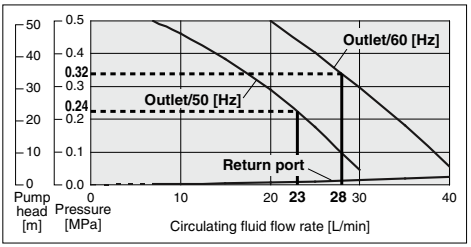
HRS$^{012}_{018}$-$^{A}_{W}$-20 (Single-phase 200 to 230 VAC)



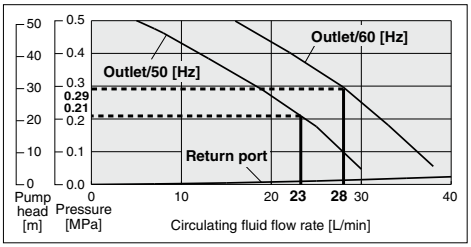
HRS030-$^{A}_{W}$-20 (Single-phase 200 to 230 VAC)



HRS050-$^{A}_{W}$-20 (Single-phase 200 to 230 VAC)

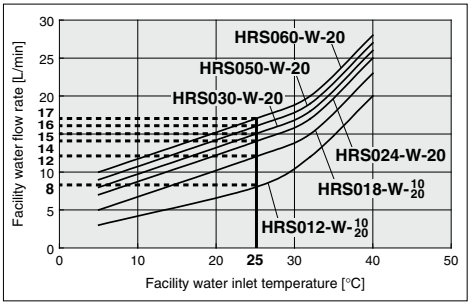


HRS060-$^{A}_{W}$-20 (Single-phase 200 to 230 VAC)



Required Facility Water Flow Rate

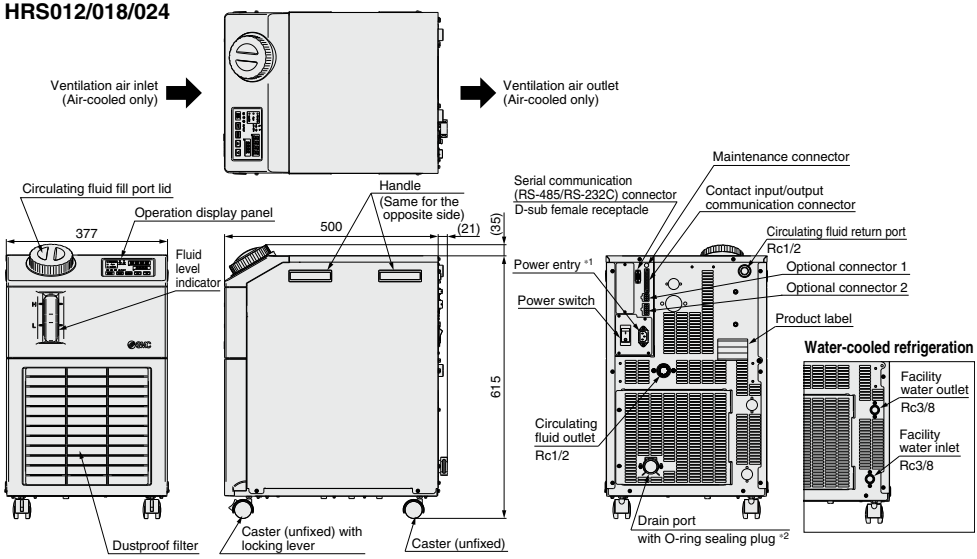
HRS012-W-$^{10}_{20}$, HRS018-W-$^{10}_{20}$, HRS024-W-20
HRS030-W-20, HRS050-W-20, HRS060-W-20



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

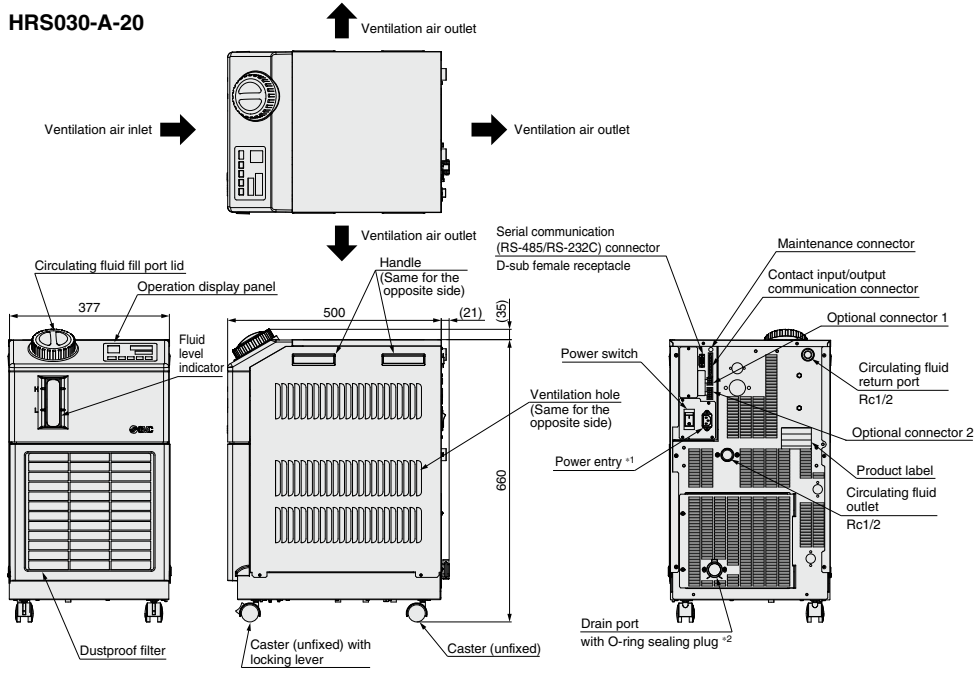
Dimensions

HRS012/018/024



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

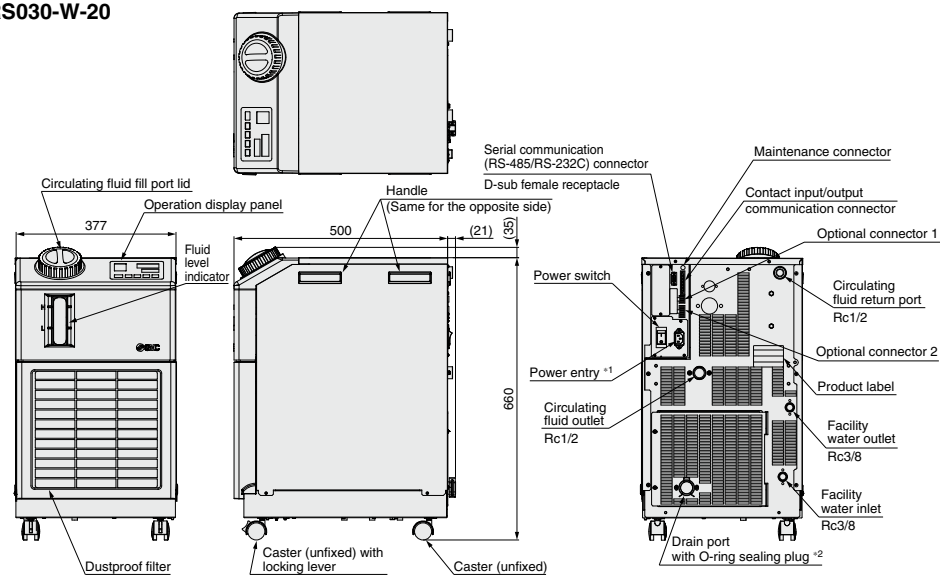
HRS030-A-20



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

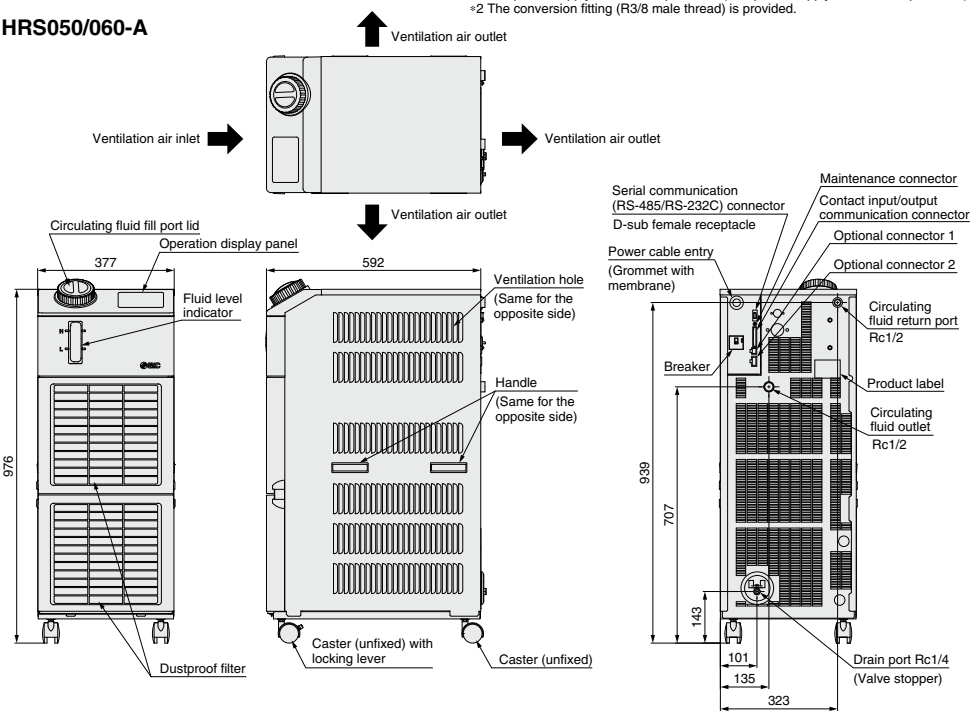
Dimensions

HRS030-W-20



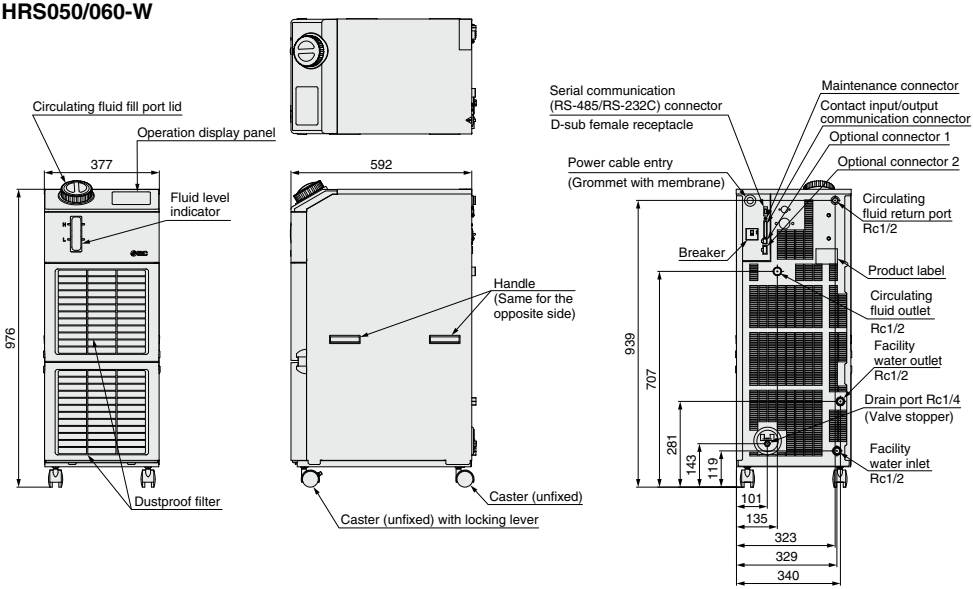
*1 The power supply cable is not provided. (The power supply connector is provided.)
*2 The conversion fitting (R3/8 male thread) is provided.

HRS050/060-A



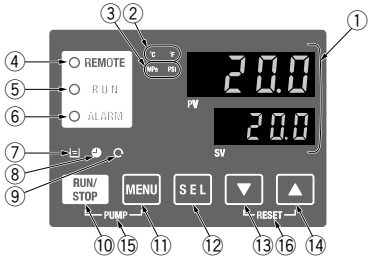
Dimensions

HRS050/060-W



Operation Display Panel

The basic operation of this unit is controlled through the operation display panel on the front of the product.



No.	Description	Function	
①	**Digital display (7-segment and 4 digits)**	**PV**	Displays the circulating fluid current discharge temperature and pressure and alarm codes and other menu items (codes).
		SV	Displays the circulating fluid discharge temperature and the set values of other menus.
②	**[°C] [°F] indicator**	Equipped with a unit conversion function. Displays the unit of display temperature (default setting: °C).	
③	**[MPa] [PSI] indicator**	Equipped with a unit conversion function. Displays the unit of display pressure (default setting: MPa).	
④	**[REMOTE] indicator**	Enables remote operation (start and stop) by communication. Lights up during remote operation.	
⑤	**[RUN] indicator**	Lights up when the product is started, and goes off when it is stopped. Flashes during stand-by for stop or anti-freezing function, or independent operation of the pump.	
⑥	**[ALARM] indicator**	Flashes with buzzer when alarm occurs.	
⑦	**[ ] indicator**	Lights up when the surface of the fluid level indicator falls below the L level.	
⑧	**[ ] indicator**	Equipped with a timer for start and stop. Lights up when this function is operated.	
⑨	**[ ] indicator**	Equipped with a power failure auto-restart function, which restarts the product automatically after stopped due to a power failure, is provided. Lights up when this function is operated.	
⑩	**[RUN/STOP] key**	Makes the product start or stop.	
⑪	**[MENU] key**	Shifts the main menu (display screen of circulating fluid discharge temperature and pressure) and other menus (for monitoring and entry of set values).	
⑫	**[SEL] key**	Changes the item in menu and enters the set value.	
⑬	**[▼] key**	Decreases the set value.	
⑭	**[▲] key**	Increases the set value.	
⑮	**[PUMP] key**	Press the [MENU] and [RUN/STOP] keys simultaneously. The pump starts running independently to make the product ready for start-up (release the air).	
⑯	**[RESET] key**	Press the [▼] and [▲] keys simultaneously. The alarm buzzer is stopped and the [ALARM] indicator is reset.	

Alarm

This unit has 35 types of alarms as standard, and displays each of them by its alarm code on the PV screen with the [ALARM] lamp ([LOW LEVEL] lamp) lit up on the operation display panel. The alarm can be read out through communication.

Alarm code	Alarm message	Operation status
AL01	Low level in tank	Stop *1
AL02	High circulating fluid discharge temperature	Stop
AL03	Circulating fluid discharge temperature rise	Continue *1
AL04	Circulating fluid discharge temperature drop	Continue *1
AL05	High circulating fluid return temperature (60°C)	Stop
AL06	High circulating fluid discharge pressure	Stop
AL07	Abnormal pump operation	Stop
AL08	Circulating fluid discharge pressure rise	Continue *1
AL09	Circulating fluid discharge pressure drop	Continue *1
AL10	High compressor intake temperature	Stop
AL11	Low compressor intake temperature	Stop
AL12	Low super heat temperature	Stop
AL13	High compressor discharge pressure	Stop
AL15	Refrigerating circuit pressure (high pressure side) drop	Stop
AL16	Refrigerating circuit pressure (low pressure side) rise	Stop
AL17	Refrigerating circuit pressure (low pressure side) drop	Stop
AL18	Compressor overload	Stop
AL19 *2	Communication error *2	Continue *1

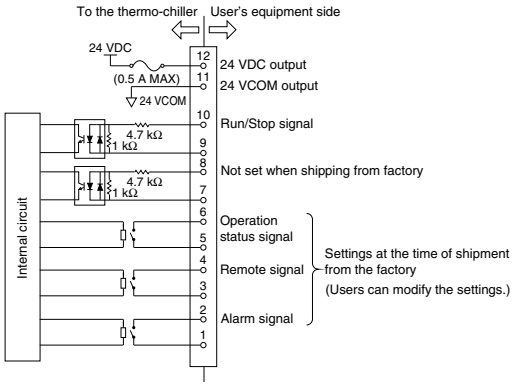
Alarm code	Alarm message	Operation status
AL20	Memory error	Stop
AL21	DC line fuse cut	Stop
AL22	Circulating fluid discharge temperature sensor failure	Stop
AL23	Circulating fluid return temperature sensor failure	Stop
AL24	Compressor intake temperature sensor failure	Stop
AL25	Circulating fluid discharge pressure sensor failure	Stop
AL26	Compressor discharge pressure sensor failure	Stop
AL27	Compressor intake pressure sensor failure	Stop
AL28	Pump maintenance	Continue
AL29	Fan motor maintenance *3	Continue
AL30	Compressor maintenance	Continue
AL31 *2	Contact 1 input signal detection	Stop *1
AL32 *2	Contact 2 inputs signal detection	Stop *1
AL33 *4	Water leakage	Stop *1
AL34 *4	Electrical resistance rise	Continue
AL35 *4	Electrical resistance drop	Continue
AL36 *4	Electrical resistance sensor failure	Continue

*1 "Stop" or "Continue" are default settings. Users can change them to "Continue" and "Stop". For details, refer to the Operation Manual.
*2 "AL19, AL31, AL32" are disabled in the default setting. If this function is necessary, it should be set by the user referring to the Operation Manual.
*3 For water-cooled models, the alarm is not activated.
*4 This alarm function can be used when the option (sold separately) is used.

Please download the Operation Manual via our website, http://www.smcworld.com

Communication Function

Contact Input/Output

Item		Specifications
Connector type (to the product)		MC 1,5/12-GF-3,5
Input signal	Insulation method	Photocoupler
	Rated input voltage	24 VDC
	Operating voltage range	21.6 VDC to 26.4 VDC
	Rated input current	5 mA TYP
	Input impedance	4.7 kΩ
Contact output signal	Rated load voltage	48 VAC or less/30 VDC or less
	Maximum load current	500 mA AC/DC (resistance load)
	Minimum load current	5 VDC 10 mA
Output voltage		24 VDC ±10% 0.5 A Max
Circuit diagram		

∗ The pin numbers and output signals can be set by user. For details, refer to the Operation Manual.

Serial Communication

The serial communication (RS-485/RS-232C) enables the following items to be written and read out.
For details, refer to the Operation Manual for communication.

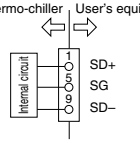
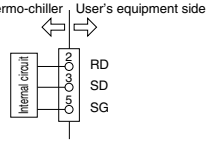
Writing

Run/Stop
Circulating fluid temperature setting (SV)

Readout

Circulating fluid present temperature (PV)
Circulating fluid discharge pressure (SV)
Electrical resistance ∗1
Status information
Alarm occurrence information

∗1 When optional electrical resistance sensor set is used

Item	Specifications	
Connector type	D-sub 9-pin, Female connector	
Protocol	Modicon Modbus compliant/Simple communication protocol	
Standards	EIA standard RS-485	EIA standard RS-232C
Circuit diagram		

∗ The terminal resistance of RS-485 (120 Ω) can be switched by the operation display panel. For details, refer to the Operation Manual.
Do not connect other than in the way shown above, as it can result in failure.

Please download the Operation Manual via our website, http://www.smcworld.com

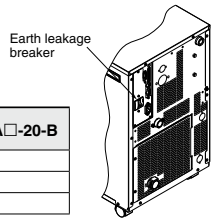
Series HRS
Options

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

B Option symbol: With Earth Leakage Breaker

HRS□□-□□-□-B

B: With earth leakage breaker



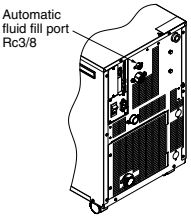
In the event of a short circuit, overcurrent or overheating, the earth leakage breaker will automatically shut off the power supply.

Applicable model	HRS012/018-□□-10-B	HRS012/018/024/030-□□-20-B	HRS050-□□-20-B HRS060-W□-20-B	HRS060-A□-20-B
Rated current sensitivity (mA)	30	30	30	30
Rated shutdown current (A)	15	10	20	30
Short circuit display method	Mechanical button			

J Option symbol: With Automatic Water Fill Function

HRS□□-□□-□-J

J: With automatic water fill function



By installing this at the automatic water 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	HRS012/018/024/030/050/060-□□-□-J
Fluid fill method	Built-in solenoid valve for automatic water fill
Fluid fill pressure (MPa)	0.2 to 0.5

∗ When the option, with automatic water fill function, is selected, the weight increases by 1 kg.

M Option symbol: Applicable to DI Water (Deionized Water) Piping

HRS□□-□□-□-M

M: Applicable to DI water (Deionized water) piping

Contact material of the circulating fluid circuit is made from non-copper materials.

Applicable model	HRS012/018/024/030/050/060-□□-□-M
Contact material for circulating fluid	Stainless steel (including heat exchanger brazing), Alumina ceramic, SiC, Carbon, PP, PE, POM, FKM, NBR, EPDM, PVC

∗ No change in external dimensions

T Option symbol: High-pressure Pump Mounted

HRS□□-□□-□□-T

T: High-pressure pump mounted

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

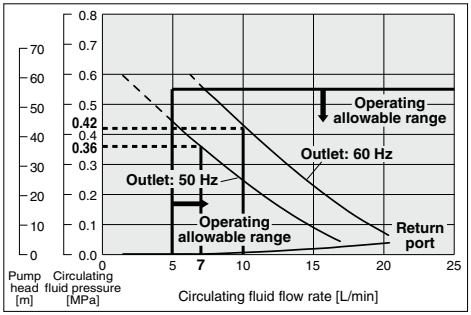
∗ **HRS050/060 cannot be selected.**

Applicable model			HRS012/018-□□-10-T/MT	HRS012/018/024/030-□□-20-T	HRS012/018/024/030-□□-20-MT Note 1)
Pump	Rated flow (50/60 Hz) Note 2) Note 3)	L/min	7 (0.36 MPa)/10 (0.42 MPa)	10 (0.44 MPa)/14 (0.40 MPa)	10 (0.32 MPa)/14 (0.32 MPa)
	Maximum flow rate (50/60 Hz)	L/min	18/22		
	Maximum pump head (50/60 Hz)	m	55	70	60
	Output	W	320	550	
Circuit protector		A	15	15 (10 A for standard)	
Recommended earth leakage breaker capacity		A	15		
Cooling capacity Note 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)		

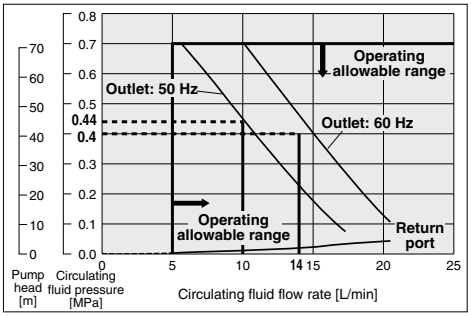
Note 1) -MT: Applicable to DI water (deionized water) piping + High-pressure pump
Note 2) The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.
Note 3) Required min. flow rate for cooling capacity or maintaining the temperature stability.
Note 4) Cooling capacity will decrease as pump power increases.
Note 5) When the option, high-pressure pump mounted, is selected, the weight increases by 4 kg for -10 type and 6 kg for -20 type.
∗ No change in external dimensions

Pump Capacity

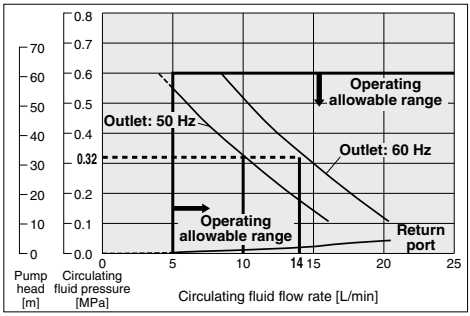
HRS012/018-□□-10-T/MT



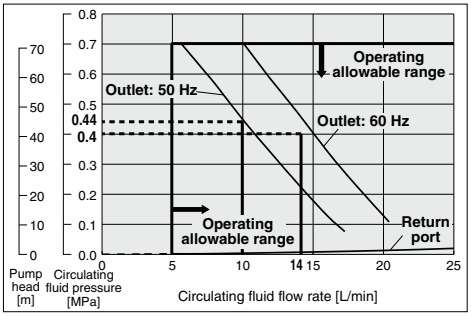
HRS012/018/024-□□-20-T



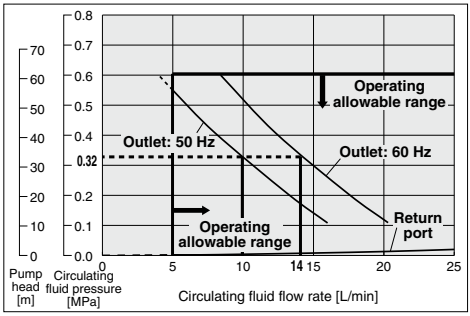
HRS012/018/024-□□-20-MT



HRS030-□□-20-T



HRS030-□□-20-MT



Note) 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 Specifications

HRS□□– A □–20– G

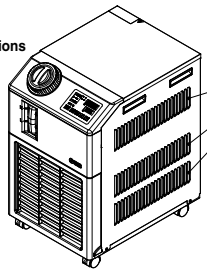
High-temperature environment specifications

Makes use at ambient temperatures 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.)

Applicable model	HRS012/018/024-A□-20-G
Cooling method	Air-cooled refrigeration
Power supply	Single-phase 200 to 230 VAC (50/60 Hz)

∗ No change in external dimensions

∗ HRS030/050/060 cannot be selected.



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

∗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).

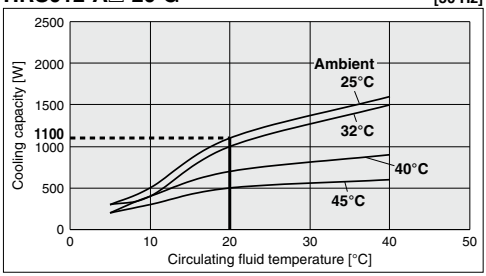
Note 1) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment"(page 874) Item 14 "∗ For altitude of 1000 m or higher".

Note 2) For a product with high-pressure pump option (-T), the cooling capacity will decrease by about 300 W from each graph.

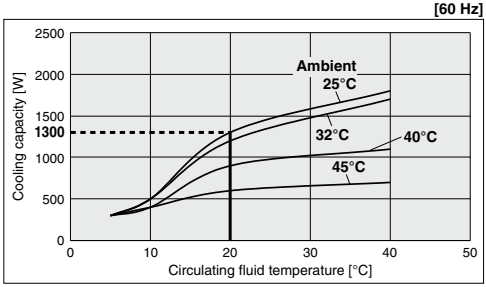
Cooling Capacity

HRS012-A□-20-G

[50 Hz]

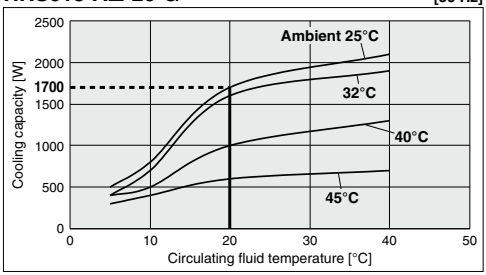


[60 Hz]

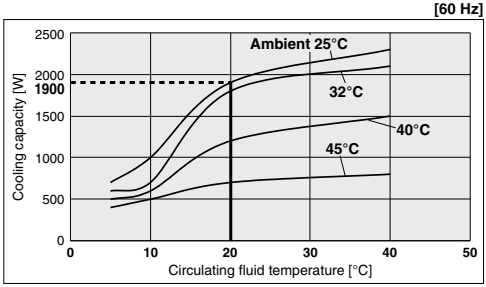


HRS018-A□-20-G

[50 Hz]

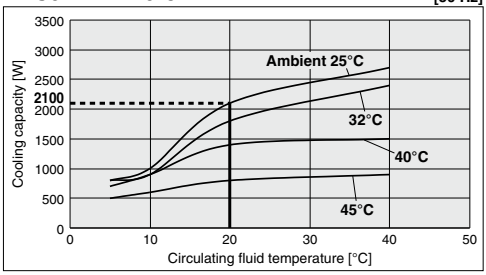


[60 Hz]

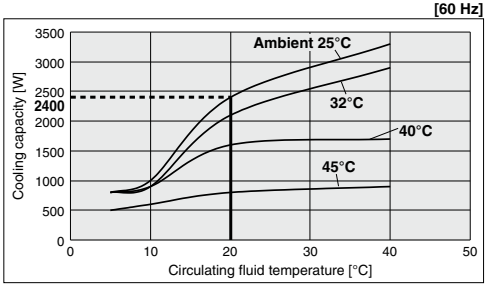


HRS024-A□-20-G

[50 Hz]



[60 Hz]



Series HRS
Optional Accessories

Applicable Model List/Air-Cooled Refrigeration

No.	Description		Part no.	HRS012-A HRS018-A		HRS024-A-20	HRS030-A-20	HRS050-A-20 HRS060-A-20	Option		Page
				-10	-20				(for -J)	(for -T)	
①	Anti-quake bracket		HRS-TK001	●	●	●	●	—	—	—	861
			HRS-TK002	—	—	—	—	●	—	—	
②	Piping conversion fitting (for air-cooled refrigeration)	G thread conversion fitting set	HRS-EP001	●	●	●	●	—	—	—	861
		NPT thread conversion fitting set	HRS-EP002	●	●	●	●	—	—	—	
		G thread conversion fitting set	HRS-EP009	—	—	—	—	●	—	—	
		NPT thread conversion fitting set	HRS-EP010	—	—	—	—	●	—	—	
③	Piping conversion fitting Note 1) (for automatic water fill port)	G thread conversion fitting set	HRS-EP005	—	—	—	—	—	●	—	862
		NPT thread conversion fitting set	HRS-EP006	—	—	—	—	—	●	—	
	Piping conversion fitting Note 2) (for drain outlet)	G thread conversion fitting set	HRS-EP007	—	—	—	—	—	—	●	
		NPT thread conversion fitting set	HRS-EP008	—	—	—	—	—	—	●	
④	Concentration meter		HRZ-BR002	●	●	●	●	●	●	●	863
⑤	Bypass piping set		HRS-BP001	●	●	●	●	—	—	—	863
			HRS-BP004	—	—	—	—	●	—	—	
⑥	Power supply cable	For single-phase 100/115 VAC type	HRS-CA001	●	—	—	—	—	—	—	864
		For single-phase 200 VAC type	HRS-CA002	—	●	●	●	— Note 3)	—	—	
		For single-phase 100/115 VAC type	HRS-CA003	●	—	—	—	—	—	—	
		For single-phase 200 VAC type	HRS-CA004	—	—	—	—	● Note 4)	—	—	
	Retaining clip		HRS-S0074	●	●	●	●	—	—	—	
⑦	DI filter set		HRS-DP001	●	●	●	●	●	—	—	865
			HRS-DP002	●	●	●	●	●	—	—	
⑧	Electrical resistance sensor set		HRS-DI001	●	●	●	●	●	—	—	866
		With control function/bypass	HRS-DI003	●	●	●	●	●	—	—	
		With bypass	HRS-DI004	●	●	●	●	●	—	—	
		With control function	HRS-DI005	●	●	●	●	●	—	—	
⑨	Particle filter set	(#5) OUT side	HRS-PF001	●	●	●	●	●	—	—	867
		(#10) OUT side	HRS-PF002	—	—	—	—	●	—	—	
		(#5) IN side	HRS-PF003	●	●	●	●	●	—	—	
		(#10) IN side	HRS-PF004	—	—	—	—	●	—	—	
⑩	Drain pan set	With water leakage sensor	HRS-WL001	●	●	●	●	—	—	—	868
			HRS-WL002	—	—	—	—	●	—	—	
⑪	Connector cover		HRS-BK001	●	●	●	●	—	—	—	869
			HRS-BK002	—	—	—	—	●	—	—	
⑫	Analog gateway unit		HRS-CV001	●	●	●	●	●	—	—	869
⑬	Replacement type dustproof filter set		HRS-FL001	●	●	●	—	—	—	—	869
	Replacement type dustproof filter		HRS-FL002	●	●	●	—	—	—	—	
⑭	Separately installed power transformer		IDF-TR1000-1	●	—	—	—	— Note 3)	—	—	870
			IDF-TR1000-2	●	—	—	—		—	—	
			IDF-TR1000-3	●	—	—	—		—	—	
			IDF-TR1000-4	●	—	—	—		—	—	
			IDF-TR2000-9	—	●	●	●		—	—	
			IDF-TR2000-10	—	●	●	●		—	—	
			IDF-TR2000-11	—	●	●	●		—	—	

Note 1) When option J is selected.
Note 2) When option T or the HRS050/060 is selected.
Note 3) For the HRS050/060 models: To be prepared by user.
Note 4) Not applicable for the HRS060-A□-20. To be prepared by user.

Applicable Model List/Water-Cooled Refrigeration

No.	Description		Part no.	HRS012-W HRS018-W -10	HRS012-W HRS018-W -20	HRS024-W-20	HRS030-W-20	HRS050-W-20 HRS060-W-20	Option (for -J)	Option (for -T)	Page
①	Anti-quake bracket		HRS-TK001	●	●	●	●	—	—	—	861
			HRS-TK002	—	—	—	—	●	—	—	
②	Piping conversion fitting (for water-cooled refrigeration)	G thread conversion fitting set	HRS-EP003	●	●	●	●	—	—	—	862
		NPT thread conversion fitting set	HRS-EP004	●	●	●	●	—	—	—	
		G thread conversion fitting set	HRS-EP011	—	—	—	—	●	—	—	
		NPT thread conversion fitting set	HRS-EP012	—	—	—	—	●	—	—	
③	Piping conversion fitting Note 1) (for automatic water fill port)	G thread conversion fitting set	HRS-EP005	—	—	—	—	●	●	—	862
		NPT thread conversion fitting set	HRS-EP006	—	—	—	—	●	●	—	
	Piping conversion fitting Note 2) (for drain outlet)	G thread conversion fitting set	HRS-EP007	—	—	—	—	—	—	●	
		NPT thread conversion fitting set	HRS-EP008	—	—	—	—	—	—	●	
④	Concentration meter		HRZ-BR002	●	●	●	●	●	●	●	863
⑤	Bypass piping set		HRS-BP001	●	●	●	●	—	—	—	863
			HRS-BP004	—	—	—	—	●	—	—	
⑥	Power supply cable	For single-phase 100/115 VAC type	HRS-CA001	●	—	—	—	—	—	—	864
		For single-phase 200 VAC type	HRS-CA002	—	●	●	●	— Note 3)	—	—	
		For single-phase 100/115 VAC type	HRS-CA003	●	—	—	—	—	—	—	
		For single-phase 200 VAC type	HRS-CA004	—	—	—	—	● Note 4)	—	—	
	Retaining clip		HRS-S0074	●	●	●	●	●	—	—	
⑦	DI filter set		HRS-DP001	●	●	●	●	●	—	—	865
			HRS-DP002	●	●	●	●	●	—	—	
⑧	Electrical resistance sensor set		HRS-DI001	●	●	●	●	●	—	—	866
		With control function/bypass	HRS-DI003	●	●	●	●	●	—	—	
		With bypass	HRS-DI004	●	●	●	●	●	—	—	
		With control function	HRS-DI005	●	●	●	●	●	—	—	
⑨	Particle filter set	(#5) OUT side	HRS-PF001	●	●	●	●	●	—	—	867
		(#10) OUT side	HRS-PF002	—	—	—	—	●	—	—	
		(#5) IN side	HRS-PF003	●	●	●	●	●	—	—	
		(#10) IN side	HRS-PF004	—	—	—	—	●	—	—	
⑩	Drain pan set	With water leakage sensor	HRS-WL001	●	●	●	●	—	—	—	868
			HRS-WL002	—	—	—	—	●	—	—	
⑪	Connector cover		HRS-BK001	●	●	●	●	—	—	—	869
			HRS-BK002	—	—	—	—	●	—	—	
⑫	Analog gateway unit		HRS-CV001	●	●	●	●	●	—	—	869
⑬	Replacement type dustproof filter set		—	—	—	—	—	—	—	—	—
	Replacement type dustproof filter		—	—	—	—	—	—	—	—	
⑭	Separately installed power transformer		IDF-TR1000-1	●	—	—	—	— Note 3)	—	—	870
			IDF-TR1000-2	●	—	—	—		—	—	
			IDF-TR1000-3	●	—	—	—		—	—	
			IDF-TR1000-4	●	—	—	—		—	—	
			IDF-TR2000-9	—	●	●	●		—	—	
			IDF-TR2000-10	—	●	●	●		—	—	
			IDF-TR2000-11	—	●	●	●		—	—	

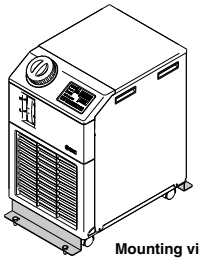
Note 1) When option J is selected.
Note 2) When option T or the HRS050/060 is selected.
Note 3) For the HRS050/060 models: To be prepared by user.
Note 4) Not applicable for the HRS060-A□-20. To be prepared by user.

① Anti-quake Bracket

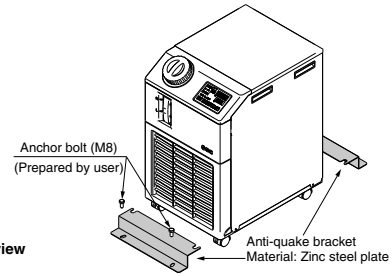
Bracket for earthquakes. Anchor bolt (M8) suitable for the flooring material should be prepared separately by user.
(Anti-quake bracket thickness: 1.6 mm)

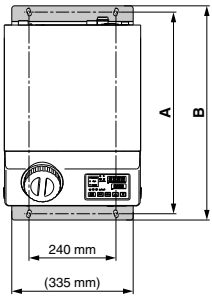
(mm)

Part no. (per unit)	Applicable model	A	B
HRS-TK001	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□	555	(590)
	HRS030-□□-□	546	(581)
HRS-TK002	HRS050-□□-□ HRS060-□□-□	664	(698)



Mounting view





② Piping Conversion Fitting (For Air-Cooled Refrigeration)

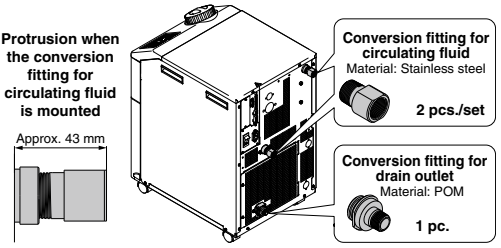
■Conversion fitting for circulating fluid + Conversion fitting for drain outlet

HRS012-A□-□, HRS018-A□-□, HRS024-A□-□, HRS030-A□-□

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	HRS012-A-□ HRS018-A-□ HRS024-A-□ HRS030-A-□
HRS-EP002	NPT thread conversion fitting set	

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

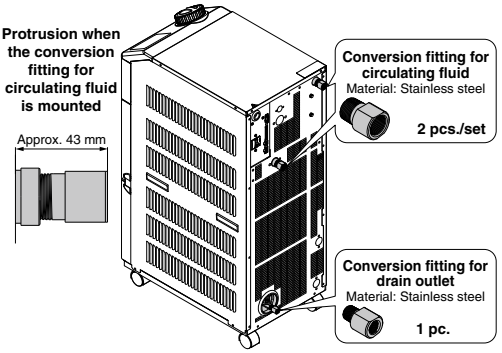


HRS050-A□-□, HRS060-A□-□

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	HRS050-A-□
HRS-EP010	NPT thread conversion fitting set	HRS060-A-□

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



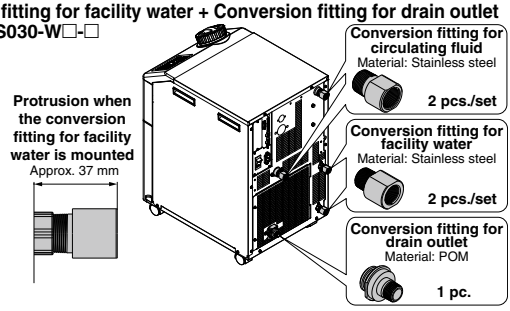
② Piping Conversion Fitting (For Water-Cooled Refrigeration)

■Conversion fitting for circulating fluid + Conversion fitting for facility water + Conversion fitting for drain outlet
HRS012-W□-□, HRS018-W□-□, HRS024-W□-□, HRS030-W□-□

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	HRS012-W-□ HRS018-W-□
HRS-EP004	NPT thread conversion fitting set	HRS024-W-□ HRS030-W-□

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

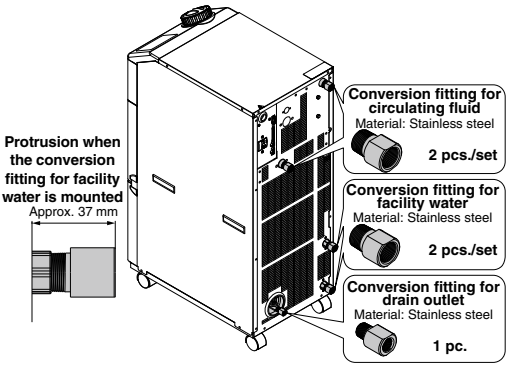


HRS050-W□-□, HRS060-W□-□

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 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	HRS050-W-□
HRS-EP012	NPT thread conversion fitting set	HRS060-W-□

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

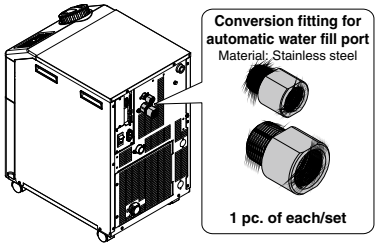


③ Piping Conversion Fitting (For Option)

■Conversion fitting for automatic water fill port

This fitting changes the port size for option-J "With Automatic Water Fill Function" 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.

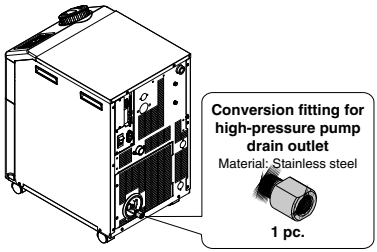
Part no.		Applicable model
HRS-EP005	G thread conversion fitting	HRS012-□-□-J HRS018-□-□-J HRS024-□-□-J
HRS-EP006	NPT thread conversion fitting	HRS030-□-□-J HRS050-□-□-J HRS060-□-□-J



■Conversion fitting for drain outlet

This fitting changes the port size for drain outlet for option-T "High-pressure Pump" 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	HRS012-□-□-T HRS018-□-□-T HRS024-□-20-T
HRS-EP008	NPT thread conversion fitting	HRS030-□-20-T HRS050-□-20 Note) HRS060-□-20 Note)

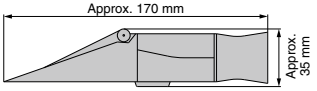


Note) It is not necessary to purchase this when you purchase HRS-EP009 to 012 since it is included in the product.

④ Concentration Meter

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

Part no.	Applicable model
HRZ-BR002	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□ HRS030-□□-□ HRS050-□□-□ HRS060-□□-□



⑤ By-pass Piping Set

When the circulating fluid goes below the rated flow (7 L/min for HRS012, 018, 024, 030 and 23/28 L/min for HRS050, 060), cooling capacity will be reduced and the temperature stability will be badly affected. In such a case, use the by-pass piping set.
A high-pressure pump is also available.

Part no.	Applicable model
HRS-BP001	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□ HRS030-□□-□

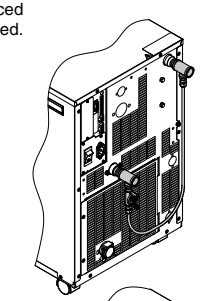
Parts List

No.	Description
①	By-pass tube (700 mm) (Part no.: TL0806)
②	Outlet piping (with ball valve)
③	Return port piping
④	Nipple (Size: 1/2) (2 pcs.)

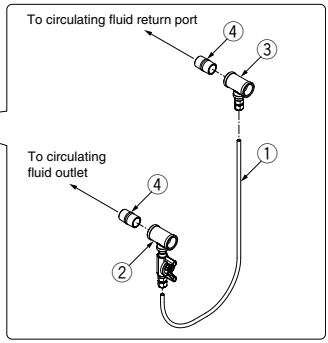
Part no.	Applicable model
HRS-BP004	HRS050-□□-□ HRS060-□□-□

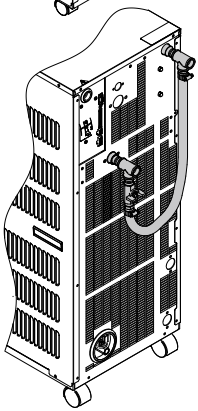
Parts List

No.	Description
①	Hose (Approx. 700 mm)
②	Outlet piping (with ball valve)
③	Return port piping
④	Nipple (Size: 1/2) (2 pcs.)
⑤	Hose band (2 pcs.)

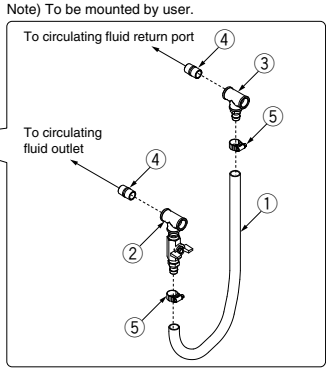


Note) To be mounted by user.





Note) To be mounted by user.



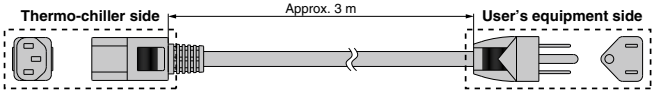
⑥ Power Supply Cable

■For single-phase 100/115 VAC type

∗ Not applicable for the 200 V type.

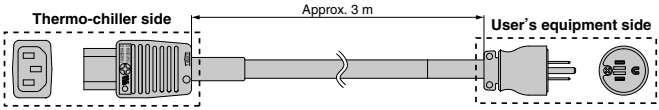
Part no.	Applicable model
HRS-CA001	HRS012-□□-10 HRS018-□□-10

∗ Not applicable to retaining clip



Part no.	Applicable model
HRS-CA003	HRS012-□□-10 HRS018-□□-10

∗ Applicable to retaining clip

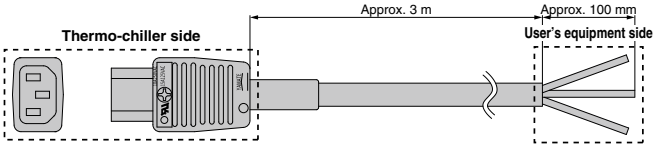


■For single-phase 200 VAC type

∗ Not applicable for the 100 V type.

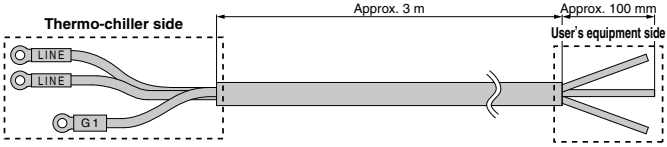
Part no.	Applicable model
HRS-CA002	HRS012-□□-20 HRS018-□□-20 HRS024-□□-20 HRS030-□□-20

∗ Applicable to retaining clip



Part No.	Applicable model
HRS-CA004	HRS050-□□-20 HRS060-W□-20

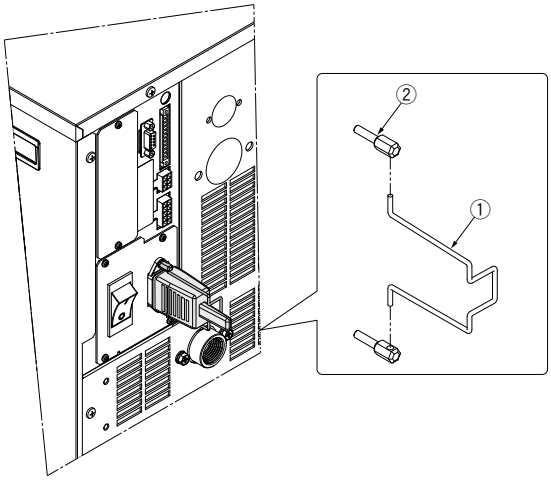
∗ Not available for HRS060-A□-20. It should be prepared by user.
∗ Not applicable to retaining clip



■Retaining clip

Holds the connector on the thermo-chiller side in position.

Part no.	Applicable power supply cable
HRS-S0074	HRS-CA002 HRS-CA003 Power supply connector for accessory



Parts List

No.	Description
①	Retaining clip
②	Holding screw

⑦ DI Filter Set

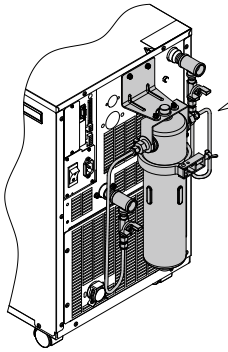
It is possible to keep electrical resistance by flowing the circulating fluid to the ion replacement resin (DI filter).
The set parts are in order to install DI filter to by-pass circuit and flow the fixed rate of the circulating fluid to DI filter.
It is not to control the value of electrical resistance.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

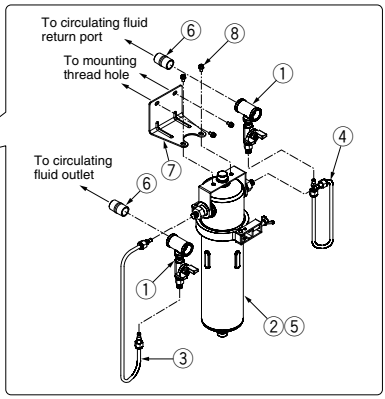
■Stainless steel type

Suitable for locations with dusty atmospheres.

Part no.	Applicable model
HRS-DP001	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□ HRS030-□□-□ HRS050-□□-□ HRS060-□□-□

∗ Can not be installed in combination with particle filter set (HRS-PF001 to PF004).





Parts List

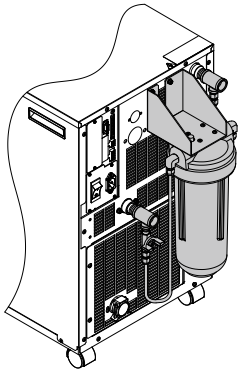
No.	Description
①	Branch line (2 pcs.)
②	DI filter case (Stainless steel)
③	DI filter inlet tube
④	DI filter outlet tube
⑤	DI filter cartridge (Part no.; HRS-DF001)
⑥	Nipple (Size: 1/2) (2 pcs.)
⑦	Mounting bracket
⑧	Mounting screw (M6 screw, 2 pcs.) (M5 screw, 2 pcs.)

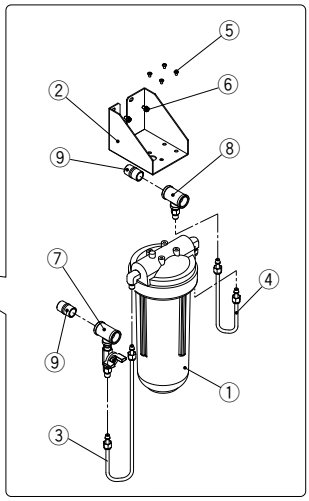
■Resin type

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

Part no.	Applicable model
HRS-DP002	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□ HRS030-□□-□ HRS050-□□-□ HRS060-□□-□

∗ Can not be installed in combination with particle filter set (HRS-PF003, PF004).





Parts List

No.	Description
①	DI filter case (Resin)
②	Mounting bracket
③	DI filter inlet tube
④	DI filter outlet tube
⑤	Tapping screw (4 pcs.)
⑥	Mounting screw (M5, 2 pcs.)
⑦	Branch line for inlet
⑧	Branch line for outlet
⑨	Nipple (Size: 1/2) (2 pcs.)

⑧ Electrical Resistance Sensor Set

Maintains, displays and controls electrical resistivity of the circulating fluid, DI water (Deionized water).
The function differs according to the model (Refer to Table 1). Refer to the Operation Manual for details.

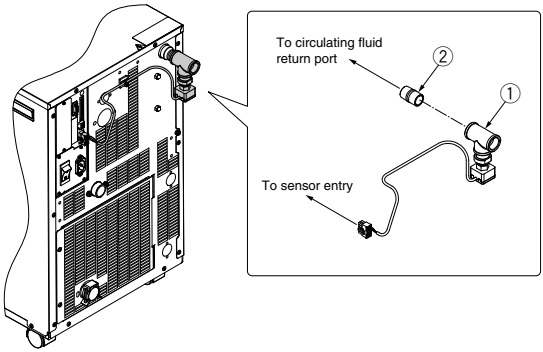
Part no.	Applicable model
HRS-DI001	HRS012-□□-□
HRS-DI003	HRS018-□□-□
HRS-DI004	HRS024-□□-□
HRS-DI005	HRS030-□□-□
	HRS050-□□-□
	HRS060-□□-□

Table 1: Combination of Option and Optional Accessories

	HRS Model	Option M	Optional accessories	Feed-water *1	Electrical resistivity maintenance	Electrical resistivity display *2, *3	Electrical resistivity control	By-pass
①	Standard	No	—	○	× *4	×	×	×
②	Standard	Yes	—	○	× *5	×	×	×
③	Standard	Yes	HRS-DI001	○	×	○	×	×
④	Standard	Yes	HRS-DP001	○	○	×	×	×
⑤	Standard	Yes	HRS-DP001 + HRS-DI001 (DI filter set)	○	○	○	×	×
⑥	Standard	Yes	HRS-DI003	○	○	○	○	○
⑦	Standard	Yes	HRS-DI004	○	○	○	×	○
⑧	Standard	Yes	HRS-DI005	○	○	○	○	×

*1: When only supplying or feeding DI water (Deionized water) (At the start of use etc.)
*2: Display range is 0 to 4.5 MΩ·cm.
*3: Readout using serial communications (RS-485/RS-232C) can be performed.
*4: The DI water (Deionized water) cannot flow continuously.
*5: The DI water (Deionized water) can flow continuously. (Electrical resistance 4.5 MΩ·cm or less) However, the electrical resistance cannot be kept, displayed or controlled.

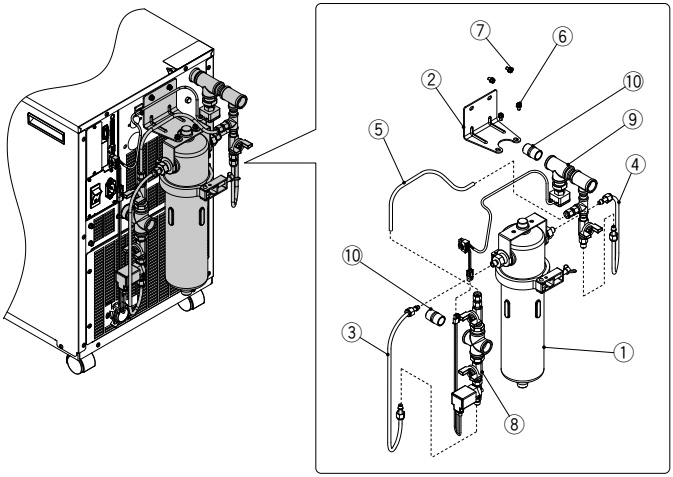
[③ Mounting example: HRS012-A-20 + HRS-DI001]



Parts List

No.	Description
①	Electrical resistance sensor
②	Nipple (Size: 1/2) (1 pc.)

[⑥ Mounting example: HRS012-A-20-M + HRS-DI003]



Parts List

No.	Description
①	DI filter case (Stainless steel)
②	Mounting bracket
③	DI filter inlet tube
④	DI filter outlet tube
⑤	By-pass tube
⑥	Mounting screw (M6, 2 pcs.)
⑦	Mounting screw (M5, 2 pcs.)
⑧	Electrical resistance sensor
⑨	Solenoid valve for control
⑩	Nipple (Size: 1/2) (2 pcs.)

⑨ Particle Filter Set

Removes foreign objects in the circulating fluid.

HRS−PF001−W075−H
PF002
PF003
PF004

Filtration

Symbol	Nominal filtration accuracy (μm)	Element part no. for PF001/ PF003 (single part)	Element part no. for PF002/ PF004 (single part)
Nil	Without element	—	—
W005	5	EJ202S-005X11	EJ302S-005X11
W075	75	EJ202S-075X11	EJ302S-075X11

Accessory

Symbol	Accessory
Nil	None
H	With handle

■For circulating fluid outlet

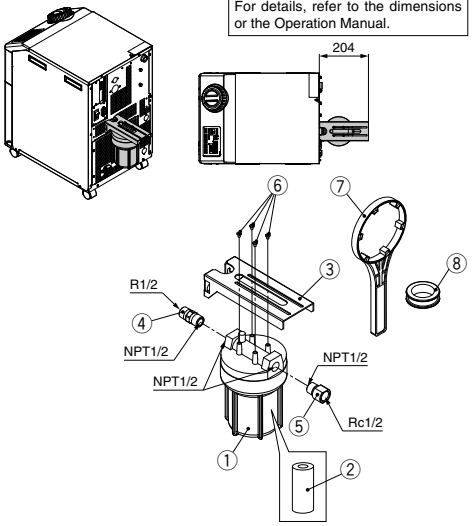
Part no.	Applicable model
HRS-PF001 (Element length L = 125 mm)	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□ HRS030-□□-□ HRS050-□□-□ HRS060-□□-□
HRS-PF002 (Element length L = 250 mm)	HRS050-□□-□ HRS060-□□-□

■For circulating fluid return port

Part no.	Applicable model
HRS-PF003 (Element length L = 125 mm)	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□ HRS030-□□-□ HRS050-□□-□ HRS060-□□-□
HRS-PF004 (Element length L = 250 mm)	HRS050-□□-□ HRS060-□□-□

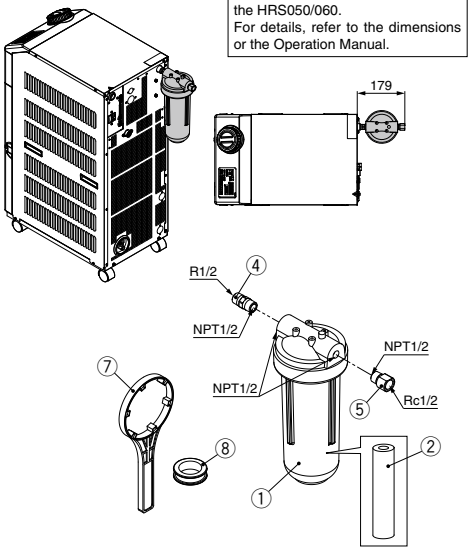
Mounting view

The following reference drawing shows the HRS-PF001 mounted on the HRS012 to 024.
For details, refer to the dimensions or the Operation Manual.



Mounting view

The following reference drawing shows the HRS-PF004 mounted on the HRS050/060.
For details, refer to the dimensions or the Operation Manual.



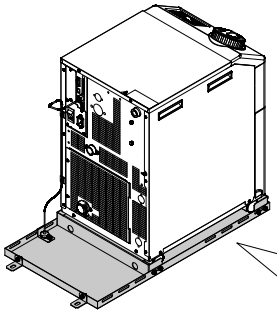
Parts List

No.	Model	Description	Material	Q'ty	Note
①	—	Body	PP	1	—
②	EJ202S-005X11	Element (Length L = 125 mm)	PP/PE	1	For HRS-PF001/003
	EJ202S-075X11			1	
	EJ302S-005X11	Element (Length L = 250 mm)		1	For HRS-PF002/004
	EJ302S-075X11			1	
③	—	Particle filter bracket	SGCC	1	For HRS-PF001/002
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	—	Pipe tape	PTFE	1	—

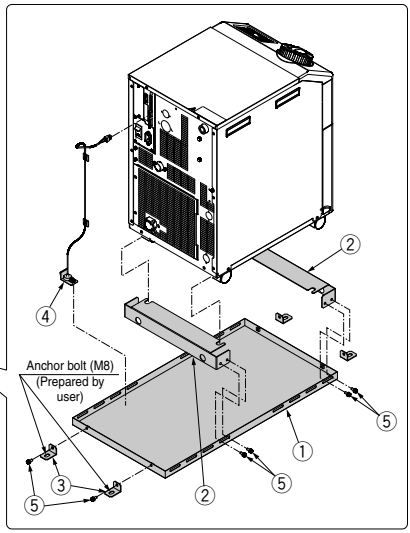
⑩ Drain Pan Set (With Water Leakage Sensor)

Drain pan for the thermo-chiller. Liquid leakage from the thermo-chiller can be detected by mounting the attached water leakage sensor. Anchor bolt (M8) suitable for the flooring material should be prepared separately by user.

Part no.	Applicable model
HRS-WL001	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□ HRS030-□□-□



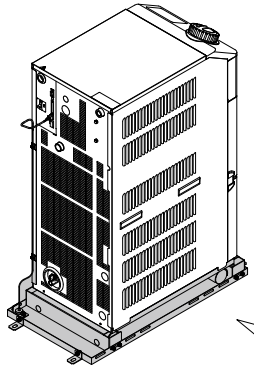
HRS012/018/024/030



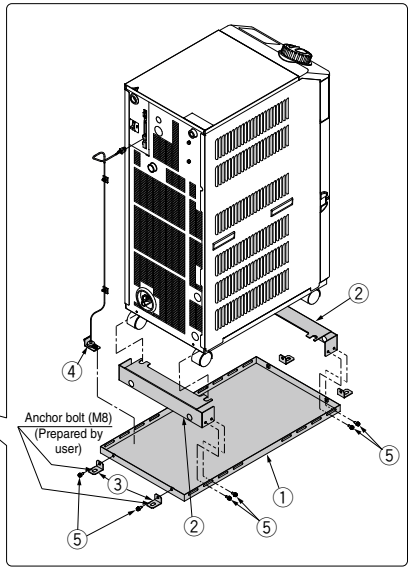
Parts List

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

Part no.	Applicable model
HRS-WL002	HRS050-□□-□ HRS060-□□-□



HRS050/060



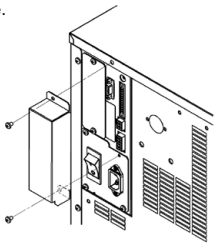
Parts List

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

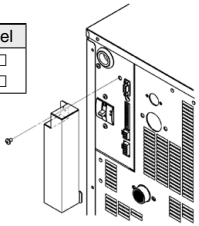
⑪ Connector Cover

Protects the connector at the rear side.

Part no.	Applicable model
HRS-BK001	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□ HRS030-□□-□



Part no.	Applicable model
HRS-BK002	HRS050-□□-□ HRS060-□□-□



⑫ Analog Gateway Unit

This is an expansion unit for adding analog communication functions.
"Analog communication, contact input/output" functions can be used.

●Analog communication

The set circulating fluid temperature can be changed by entering the analog voltage.
Converts the current circulating fluid temperature and current electrical resistance value (∗1) to an analog voltage for output.
∗1: Displayed when optional "Electrical resistance sensor set/HRS-DI001, DI003, DI004 and DI005" are used.

●Contact input/output

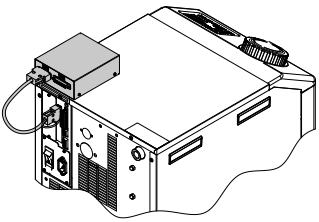
The Run/Stop of the thermo-chiller HRS series can be operated by a contact signal.
The contact signal of the operation status, alarm occurrence status and the TEMP READY status can also be output.

Part no.	Applicable model
HRS-CV001	HRS012-□□-□ HRS018-□□-□ HRS024-□□-□ HRS030-□□-□ HRS050-□□-□ HRS060-□□-□

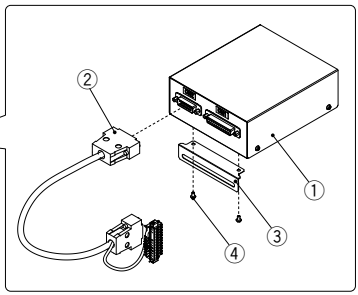
Parts List

No.	Description
①	Analog gateway box
②	Connection cable
③	Mounting bracket
④	Mounting screw (M3, 2 pcs.)

When this product is used, the "contact input/output" and "serial communication" functions standardly equipped in the thermo-chiller HRS series cannot be used.



Mounting example



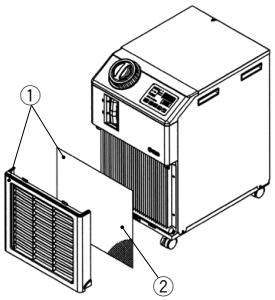
⑬ Replacement Type Dustproof Filter Set

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

Part no.	Applicable model
HRS-FL001	HRS012-A□-□ HRS018-A□-□ HRS024-A□-□

Parts List

No.	Description	Part no.	Note
①	Replacement type dustproof filter set	HRS-FL001	Front panel with hook-and-loop fastener for holding 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



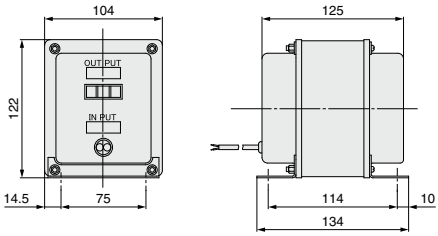
⑭ Separately Installed Power Transformer

Specifications

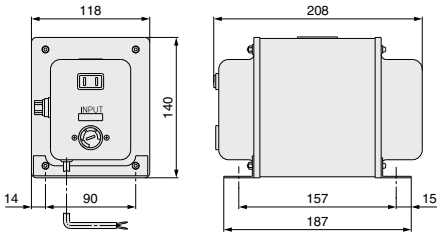
Part no.	Applicable model	Volume	Type	Inlet voltage		Outlet voltage	
				50 Hz	60 Hz	50 Hz	60 Hz
IDF-TR1000-1	HRS012-□-10 HRS018-□-10	1 kVA	Single-phase	110 VAC	120 VAC	100 VAC	100, 110 VAC
IDF-TR1000-2				240 VAC	240 to 260 VAC		
IDF-TR1000-3				380, 400, 415 VAC	380 to 420 VAC		
IDF-TR1000-4				420, 440, 480 VAC	420 to 520 VAC		
IDF-TR2000-9	HRS012-□-20 HRS018-□-20 HRS024-□-20 HRS030-□-20	2 kVA		—	240 VAC	200 VAC	200, 220 VAC
IDF-TR2000-10				380, 400, 415 VAC	380 to 400, 400 to 415, 415 to 440 VAC		
IDF-TR2000-11				440, 460 VAC	440 to 460, 460 to 500 VAC		

∗ For HRS050/060 should be prepared by user.

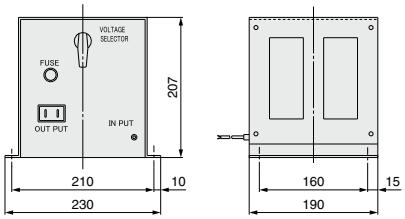
IDF-TR1000-1



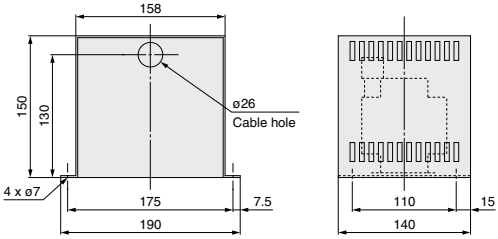
IDF-TR1000-2



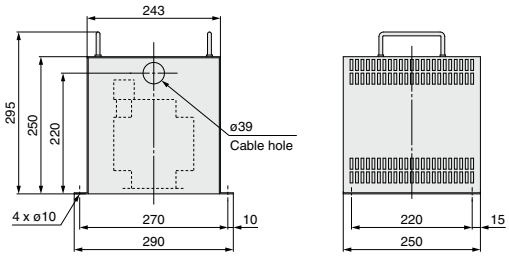
IDF-TR1000-3, 4



IDF-TR2000-9



IDF-TR2000-10, 11

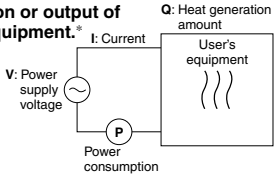


Series ***HRS***
Cooling Capacity Calculation

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

Power consumption **P**: 1000 [W]

Q = P = 1000 [W]

Cooling capacity = Considering a safety factor of 20%,

1000 [W] x 1.2 = **1200 [W]**

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

Power supply output **VI**: 1.0 [kVA]

Q = P = V x I x Power factor

In this example, using a power factor of 0.85:

= 1.0 [kVA] x 0.85 = 0.85 [kW] = 850 [W]

Cooling capacity = Considering a safety factor of 20%,

850 [W] x 1.2 = **1020 [W]**

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

Output (shaft power etc.) **W**: 800 [W]

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

In this example, using an efficiency of 0.7:

$$= \frac{800}{0.7} = 1143 \text{ [W]}$$

Cooling capacity = Considering a safety factor of 20%,

1143 [W] x 1.2 = **1372 [W]**

* The above examples 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*
Circulating fluid mass flow rate $\mathbf{q_m}$	: (= ρ x $\mathbf{q_v}$ ÷ 60) [kg/s]
Circulating fluid density ρ	: 1 [kg/dm^3]
Circulating fluid (volume) flow rate $\mathbf{q_v}$	: 10 [dm^3/min]
Circulating fluid specific heat **C**	: 4.2 x 10^3 [J/(kg·K)]
Circulating fluid outlet temperature $\mathbf{T_1}$	: 293 [K] (20 [°C])
Circulating fluid return temperature $\mathbf{T_2}$	: 295 [K] (22 [°C])
Circulating fluid temperature difference **ΔT**	: 2.0 [K] (= $\mathbf{T_2 - T_1}$)
Conversion factor: minutes to seconds (SI units)	: 60 [s/min]

* Refer to page 872 for the typical physical property value of tap water or other circulating fluids.

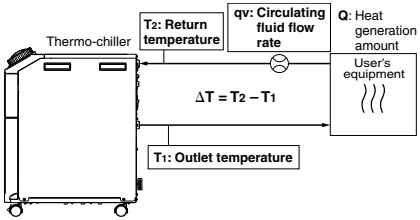
$$\mathbf{Q = q_m \times C \times (T_2 - T_1)}$$

$$= \frac{\rho \times q_v \times C \times \Delta T}{60} = \frac{1 \times 10 \times 4.2 \times 10^3 \times 2.0}{60}$$

= 1400 [J/s] ≈ 1400 [W]

Cooling capacity = Considering a safety factor of 20%,

1400 [W] x 1.2 = **1680 [W]**



Example of conventional measurement units (Reference)

Heat generation amount by user's equipment **Q**	: Unknown [cal/h] → [W]
Circulating fluid	: Tap water*
Circulating fluid weight flow rate $\mathbf{q_m}$	: (= ρ x $\mathbf{q_v}$ x 60) [kgf/h]
Circulating fluid weight volume ratio γ	: 1 [kgf/L]
Circulating fluid (volume) flow rate $\mathbf{q_v}$	: 10 [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 $\mathbf{T_2}$	: 22 [°C]
Circulating fluid temperature difference **ΔT**	: 2.0 [°C] (= $\mathbf{T_2 - T_1}$)
Conversion factor: hours to minutes	: 60 [min/h]
Conversion factor: kcal/h to kW	: 860 [(cal/h)/W]

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

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

$$= \frac{1 \times 10 \times 60 \times 1.0 \times 10^3 \times 2.0}{860}$$

$$= \frac{1200000 \text{ [cal/h]}}{860}$$

≈ 1400 [W]

Cooling capacity = Considering a safety factor of 20%,

1400 [W] x 1.2 = **1680 [W]**

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** : 20 [dm^3]
Cooled substance specific heat **C** : 4.2 x 10^3 [J/(kg·K)]
Cooled substance temperature when cooling begins T_0 : 305 [K] (32 [°C])
Cooled substance temperature after t hour T_t : 293 [K] (20 [°C])
Cooling temperature difference ΔT : 12 [K] (= $T_0 - T_t$)
Cooling time Δt : 900 [s] (= 15 [min])

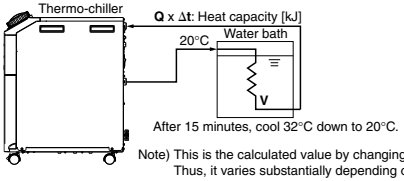
∗ Refer to the following for the typical physical property values by circulating fluid.

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

$$= \frac{1 \times 20 \times 4.2 \times 10^3 \times 12}{900} = 1120 \text{ [J/s]} \approx 1120 \text{ [W]}$$

Cooling capacity = Considering a safety factor of 20%,

1120 [W] x 1.2 = 1344 [W]



After 15 minutes, cool 32°C down to 20°C.

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

Example of conventional measurement 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** : 20 [L]
Cooled substance specific heat **C** : 1.0 x 10^3 [cal/(kgf·°C)]
Cooled substance temperature when cooling begins T_0 : 32 [°C]
Cooled substance temperature after t hour T_t : 20 [°C]
Cooling temperature difference ΔT : 12 [°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]

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

$$= \frac{1 \times 20 \times 60 \times 1.0 \times 10^3 \times 12}{15 \times 860}$$

$$\approx 1120 \text{ [W]}$$

Cooling capacity = Considering a safety factor of 20%,

1120 [W] x 1.2 = 1344 [W]

Precautions on Cooling Capacity Calculation

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

2. Pump capacity
<Circulating fluid flow rate>
Circulating fluid flow rate varies depending on the circulating fluid discharge pressure. Consider the installation height difference between the thermo-chiller and the user's equipment, and the piping resistance such as circulating fluid pipings, or piping size, or piping curves in the machine. Check beforehand if the required flow is achieved, using the pump capacity curves.
<Circulating fluid discharge pressure>
Circulating fluid discharge pressure has the possibility to increase up to the maximum pressure in the pump capacity curves. Check beforehand if the circulating fluid pipings or circulating fluid circuit of the user's equipment are fully durable against this pressure.

Circulating Fluid Typical Physical Property Values

1. This catalog uses the following values for density and specific heat in calculating the required cooling capacity.
Density ρ: 1 [kg/L] (or, using conventional unit system, weight volume ratio γ = 1 [kgf/L])
Specific heat **C**: 4.19 x 10^3 [J/(kg·K)] (or, using conventional unit system, 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 unit system	
			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 unit system	
			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

Note) The above shown are reference values. Contact circulating fluid supplier for details.

Series HRS
Specific Product Precautions 1

Be sure to read this before handling. Refer to page 1154 for Safety Instructions. For Temperature Control Equipment Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, http://www.smcworld.com

Design

⚠ Warning

1. This catalog shows the specifications of a single unit.

1) Confirm the specifications of the single unit (contents of this catalog) and thoroughly consider the adaptability between the user's system and this unit.
2) Although the protection circuit as a single unit is installed, prepare a drain pan, water leakage sensor, discharge air facility, and emergency stop equipment, depending on the user's operating condition. Also, the user is requested to carry out the safety design for the whole system.

2. When attempting to cool areas that are open to the atmosphere (tanks, pipes), plan your piping system accordingly.

When cooling open-air external tanks, arrange the piping so that there are coil pipes for cooling inside the tanks, and to carry back the entire flow volume of circulating fluid that is released.

3. Use non-corrosive material for fluid contact parts of circulating fluid.

Using corrosive materials such as aluminum or iron for fluid contact parts such as piping may cause clogging or leakage in the circulating fluid circuit. Provide protection against corrosion when you use the product.

Selection

⚠ Warning

1. Model selection

For selecting a model of thermo-chiller, it is required to know the heat generation amount of the user's equipment. Obtain the heat generation amount, referring to "Cooling Capacity Calculation" on pages 871 and 872 before selecting a model.

Handling

⚠ Warning

1. Thoroughly read the Operation Manual.

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

Transportation/Transfer/Movement

⚠ Warning

1. This product is heavy. Pay attention to safety and position of the product when it is shipped, carried and moved.

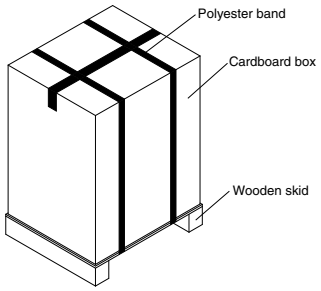
2. Read the Operation Manual carefully to move theproduct after unpacking.

Transportation/Transfer/Movement

⚠ Caution

1. Never put the product down sideway as this may cause failure.

The product will be delivered in the packaging shown below.



Model	Weight (kg) Note)	Dimensions (mm)
HRS012-□□-10 **HRS018-□□-10**	49	Height 790 x Width 470 x Depth 580
HRS012-□□-20 **HRS018-□□-20** **HRS024-□□-20**	52	Height 790 x Width 470 x Depth 580
HRS030-A□-20	56	Height 830 x Width 470 x Depth 580
HRS030-W□-20	55	
HRS050-A□-20	80	Height 1160 x Width 450 x Depth 670
HRS050-W□-20	78	
HRS060-A□-20	84	
HRS060-W□-20	78	

Note) For products with an option, the weights are increased as below.

Option symbol	Description	Additional weight
-B	With earth leakage breaker	No addition
-J	With automatic water fill function	+1 kg
-M	Applicable to deionized water piping	No addition
-T	High-pressure pump mounted (100 V type)	+4 kg
	High-pressure pump mounted (200 V type)	+6 kg
-G	High-temperature environment specifications	No addition

Series HRS
Specific Product Precautions 2

Be sure to read this before handling. Refer to page 1154 for Safety Instructions. For Temperature Control Equipment Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, http://www.smcworld.com

Operating Environment/Storage Environment

⚠ Warning

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

1) Outdoors
2) In locations where water, water steam, salt water, and oil may splash on the product.
3) In locations where there are dust and particles.
4) In locations where corrosive gases, organic solvents, chemical fluids, or flammable gases are present. (This product is not explosion proof.)
5) In locations where the ambient temperature exceeds the limits as mentioned below.
   During transportation/storage: 0 to 50°C (But as long as water or circulating fluid are not left inside the pipings)
   During operation: 5 to 40°C (When option G, high-temperature environment specifications, is selected: 5 to 45°C)
6) In locations where the ambient humidity is out of the following range or where condensation occurs.
   During transportation/storage: 15 to 85%
   During operation: 30 to 70%
7) In locations which receive direct sunlight or radiated heat.
8) In locations where there is a heat source nearby and the ventilation is poor.
9) In locations where temperature substantially changes.
10) In locations where strong magnetic noise occurs. (In locations where strong electric fields, strong magnetic fields and surge voltage occur.)
11) In locations where static electricity occurs, or conditions which make the product discharge static electricity.
12) In locations where high frequency occurs.
13) In locations where damage is likely to occur due to lightning.
14) In locations at altitude of 3000 m or higher (Except during storage and transportation)
   ∗ For altitude of 1000 m or higher
   Because of lower air density, the heat radiation efficiencies of the devices in the product will be lower in the location at altitude of 1000 m or higher. Therefore, the maximum ambient temperature to use and the cooling capacity will lower according to the descriptions in the table below. Select the thermo-chiller considering the descriptions.
   ① Upper limit of ambient temperature: Use the product in ambient temperature of the described value or lower at each altitude.
   ② Cooling capacity coefficient: The product's cooling capacity will lower to one that multiplied by the described value at each altitude.

Altitude [m]	① Upper limit of ambient temperature [°C]		② Cooling capacity coefficient
	40°C products	45°C products (For high-temperature environment specifications, Option G)	
Less than 1000 m	40	45	1.00
Less than 1500 m	38	42	0.85
Less than 2000 m	36	38	0.80
Less than 2500 m	34	35	0.75
Less than 3000 m	32	32	0.70

15) In locations where strong impacts or vibrations occur.
16) In locations where a massive force strong enough to deform the product is applied or a weight from a heavy object is applied.
17) In locations where there is not sufficient space for maintenance.

⚠ Warning

2. Install in an environment where the unit will not come into direct contact with rain or snow.

These models are for indoor use only.
Do not install outdoors where rain or snow may fall on them.

3. Conduct ventilation and cooling to discharge heat. (Air-cooled refrigeration)

The heat which is cooled down through air-cooled condenser is discharged.
When using in a room which is shut tightly, ambient temperature will exceed the specification range stipulated in this catalog, which will activate the safety detector and stop the operation.
In order to avoid this situation, discharge the heat outside of a room by ventilation or cooling facilities.

4. The product is not designed for clean room usage. It generates particles internally.

Series HRS
Specific Product Precautions 3

Be sure to read this before handling. Refer to page 1154 for Safety Instructions. For Temperature Control Equipment Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, http://www.smcworld.com

Mounting/Installation

⚠Warning

1. Do not use the product outdoors.

2. Do not place heavy objects on top of this product, or step on it.

The external panel can be deformed and danger can result.

⚠Caution

1. Install on a rigid floor which can withstand this product's weight.

2. When installing without the casters, use the adjuster feet etc. to raise the chiller to the following heights or more.

This product cannot be directly installed on the floor as some screws come out from the bottom of the product.

· HRS012 to 030 10 mm

· HRS050/060 15 mm

Piping

⚠Caution

1. Regarding the circulating fluid pipings, consider carefully the suitability for shutoff pressure, temperature and circulating fluid.

If the operating performance is not sufficient, the pipings may burst during operation. Also, using corrosive materials such as aluminum or iron for fluid contact parts such as piping may cause clogging or leakage in the circulating fluid and facility water circuits. Provide protection against corrosion when you use the product.

2. Select the piping port size which can exceed the rated flow.

For the rated flow, refer to the pump capacity table.

3. When tightening at the circulating fluid inlet and outlet, drain port or overflow port of this product, use a pipe wrench to clamp the connection ports.

4. For the circulating fluid piping connection, install a drain pan and wastewater collection pit just in case the circulating fluid may leak.

5. This product series are constant-temperature fluid circulating machines with built-in tanks.

Do not install equipment on your system side such as pumps that forcibly return the circulating fluid to the unit. Also, if you attach an external tank that is open to the air, it may become impossible to circulate the circulating fluid. Proceed with caution.

Electrical Wiring

⚠Warning

1. Grounding should never be connected to a water line, gas line or lightning rod.

⚠Caution

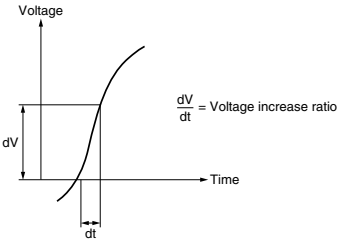
1. Communication cable should be prepared by user.

Electrical Wiring

⚠Caution

2. Provide a stable power supply which is not affected by surge or distortion.

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



Circulating Fluid

⚠Caution

1. Avoid oil or other foreign objects entering the circulating fluid.

2. When water is used as a circulating fluid, use tap water that conforms to the appropriate water quality standards.

Use tap water that conforms to the standards shown below (including water used for dilution of ethylene glycol aqueous solution).

Tap Water (as Circulating Fluid) Quality Standards

The Japan Refrigeration and Air Conditioning Industry Association
JRA GL-02-1994 "Cooling water system – Circulation type – Make-up water"

	Item	Unit	Standard value	Influence: Corrosion	Influence: Scale generation
Standard item	pH (at 25°C)	—	6.0 to 8.0	○	○
	Electric conductivity (25°C)	[μS/cm]	100* to 300*	○	○
	Chloride ion (Cl^-)	[mg/L]	50 or less	○	
	Sulfuric acid ion (SO_4^{2-})	[mg/L]	50 or less	○	
	Acid consumption amount (at pH4.8)	[mg/L]	50 or less		○
	Total hardness	[mg/L]	70 or less		○
	Calcium hardness ($CaCO_3$)	[mg/L]	50 or less		○
	Ionic state silica (SiO_2)	[mg/L]	30 or less		○
Reference item	Iron (Fe)	[mg/L]	0.3 or less	○	○
	Copper (Cu)	[mg/L]	0.1 or less	○	
	Sulfide ion (S_2^-)	[mg/L]	Should not be detected.	○	
	Ammonium ion (NH_4^+)	[mg/L]	0.1 or less	○	
	Residual chlorine (Cl)	[mg/L]	0.3 or less	○	
	Free carbon (CO_2)	[mg/L]	4.0 or less	○	

* In the case of [MΩ·cm], it will be 0.003 to 0.01.
• ○: Factors that have an effect on corrosion or scale generation.
• Even if the water quality standards are met, complete prevention of corrosion is not guaranteed.

3. Use an ethylene glycol aqueous solution that does not contain additives such as preservatives.

4. When using ethylene glycol aqueous solution, maintain a maximum concentration of 15%.

Overly high concentrations can cause a pump overload. Low concentrations, however, can lead to freezing when circulating fluid temperature is 10°C or lower and cause the thermo-chiller to break down.

5. A magnet pump is used as a circulating pump for circulating fluid.

It is particularly impossible to use liquid including metallic powder such as iron powder.

Series HRS
Specific Product Precautions 4

Be sure to read this before handling. Refer to page 1154 for Safety Instructions. For Temperature Control Equipment Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, http://www.smcworld.com

Facility Water Supply

⚠ Warning

<Water-cooled refrigeration>

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

■ Required facility water system
<Heat radiation amount/Facility water specifications>

Model	Heat radiation kW	Facility water specifications
HRS012-W□-□	Approx. 2	Refer to "Facility water system" in the specifications.
HRS018-W□-□	Approx. 4	
HRS024-W□-20	Approx. 5	
HRS030-W□-20	Approx. 6	
HRS050-W□-20	Approx. 10	
HRS060-W□-20	Approx. 12	

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

<Tap Water (as Facility Water) Quality Standards>
The Japan Refrigeration and Air Conditioning Industry Association
JRA GL-02-1994 "Cooling water system – Circulation type – Make-up water"

	Item	Unit	Standard value	Influence	
				Corrosion	Scale generation
Standard item	pH (at 25°C)	—	6.5 to 8.2	○	○
	Electric conductivity (25°C)	[μS/cm]	100* to 800*	○	○
	Chloride ion (Cl^-)	[mg/L]	200 or less	○	
	Sulfuric acid ion (SO_4^{2-})	[mg/L]	200 or less	○	
	Acid consumption amount (at pH4.8)	[mg/L]	100 or less		○
	Total hardness	[mg/L]	200 or less		○
	Calcium hardness ($CaCO_3$)	[mg/L]	150 or less		○
	Ionic state silica (SiO_2)	[mg/L]	50 or less		○
Reference item	Iron (Fe)	[mg/L]	1.0 or less	○	○
	Copper (Cu)	[mg/L]	0.3 or less	○	
	Sulfide ion (S_2^-)	[mg/L]	Should not be detected.	○	
	Ammonium ion (NH_4^+)	[mg/L]	1.0 or less	○	
	Residual chlorine (Cl)	[mg/L]	0.3 or less	○	
	Free carbon (CO_2)	[mg/L]	4.0 or less	○	

* In the case of [MΩ-cm], it will be 0.001 to 0.01.
· ○: Factors that have an effect on corrosion or scale generation.
· Even if the water quality standards are met, complete prevention of corrosion is not guaranteed.

3. Supply pressure of 0.5 MPa or less.
If the supply pressure is high, it will cause water leakage.

4. Be sure to prepare your utilities so that the pressure of the thermo-chiller facility water outlet is at 0 MPa (atmospheric pressure) or more.
If the facility water outlet pressure becomes negative, the internal facility water piping may collapse, and proper flow control of facility water will be impossible.

Using deionized water as facility water may cause problems such as clogging in the piping due to metal ion.

Operation

⚠ Warning

1. Confirmation before operation

1) The fluid level of a tank should be within the specified range of "HIGH" and "LOW".
When exceeding the specified level, the circulating fluid will overflow.

2) Remove the air.
Conduct a trial operation, looking at the fluid level.
Since the fluid level will go down when the air is removed from the user's piping system, supply water once again when the fluid level is reduced. When there is no reduction in the fluid level, the job of removing the air is completed.
Pump can be operated independently.

2. Confirmation during operation

• Check the circulating fluid temperature.
The operating temperature range of the circulating fluid is between 5 and 40°C.
When the amount of heat generated from the user's equipment is greater than the product's capability, the circulating fluid temperature may exceed this range. Use caution regarding this matter.

3. Emergency stop method

• When an abnormality is confirmed, stop the machine immediately. After pushing the [OFF] switch, be sure to turn off the power switch.

Operation Restart Time

⚠ Caution

1. Wait five minutes or more before restarting operation after it has been stopped. If the operation is restarted within five minutes, the protection circuit may activate and the operation may not start properly.

Protection Circuit

⚠ Caution

1. If operating in the below conditions, the protection circuit will activate and an operation may not be performed or will stop.

• Power supply voltage is not within the rated voltage range of ±10%.
• In case the water level inside the tank is reduced abnormally.
• Circulating fluid temperature is too high.
• Compared to the cooling capacity, the heat generation amount of the user's equipment is too high.
• Ambient temperature is too high. (40°C or more)
• Refrigerant pressure is too high.
• Ventilation hole is clogged with dust or dirt.

Specific Product Precautions 5

Be sure to read this before handling. Refer to page 1154 for Safety Instructions. For Temperature Control Equipment Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, http://www.smcworld.com

Maintenance

⚠ Caution

<Periodical inspection every one month>

1. Clean the ventilation hole.

If the dustproof filter becomes clogged with dust or debris, a decline in cooling performance can result.

In order to avoid deforming or damaging the dustproof filter, clean it with a long-haired brush or air gun.

<Periodical inspection every three months>

1. Inspect the circulating fluid.

1) When using tap water

- Replacement of tap water
  Failure to replace the tap water can lead to the development of bacteria or algae. Replace it regularly depending on your usage conditions.
- Tank cleaning
  Consider whether dirt, slime or foreign objects may be present in the circulating fluid inside the tank, and carry out regular cleanings of the tank.

2) When using ethylene glycol aqueous solution

Use a concentration meter to confirm that the concentration does not exceed 15%.

Dilute or add as needed to adjust the concentration.

<Periodical inspection during the winter season>

1. Make water-removal arrangements beforehand.

If there is a risk of the circulating fluid freezing when the product is stopped, release the circulating fluid in advance.

2. Consult a professional.

For additional methods to prevent freezing (such as commercially available tape heaters etc.), consult a professional for advice.