Circulating Fluid Temperature Controller

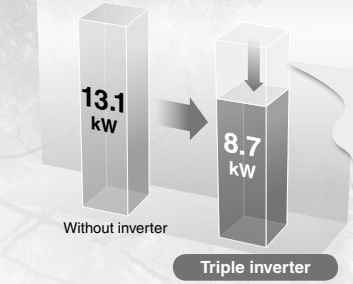
Thermo-chiller Inverter Type

New

(UL Standards)

RoHS

Outstanding energy saving effect with the triple inverter!



Power consumption
34%*1
Energy saving

Triple inverter

- DC inverter compressor
- DC inverter fan*2 (For air-cooled type)
- Inverter pump

- Cooling capacity 10 kW, 15 kW, 20 kW, 25 kW
- Temperature stability ±0.1°C (when a load is stable)
- Compact, Space-saving
- Outdoor installation, Splashproof type (IPX4)
- Low-noise design Operating noise Max. 68 dB
- Outdoor installation (IPX4)
- Max. ambient temperature 45°C
- Maintenance free pump
  Mechanical seal-less **immersion pump** is used.
  No need to replace the seal → Maintenance hours reduced

New
Added CE-/UL-compliant products to air-cooled/water-cooled 200 V type. (Option)

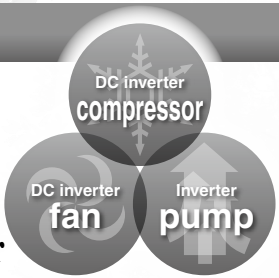
Compatible power supplies in Europe, Asia, Oceania, North, Central and South America

- 3-phase 200 VAC
- 3-phase 400 VAC

Series HRSH

*1 Under the conditions shown on page 935
*2 For water-cooled type, a water regulating valve is used for the facility water flow control instead of a fan.

Triple inverter



(The water-cooled type is not equipped with a fan.)

The inverter respectively controls the number of motor rotations of the compressor, fan and pump depending on the load from the user's equipment.

Power consumption reduced by 34%*

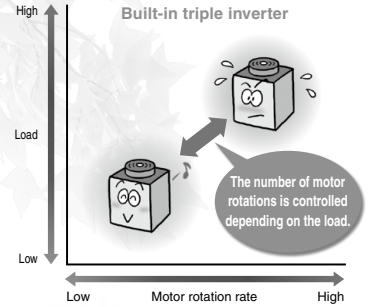
compared with a thermo-chiller without the inverter

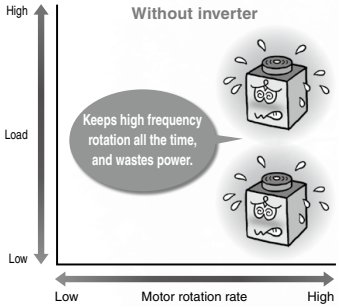
With the inverter, it is possible to operate with the same performance even with the power supply of 50 Hz.

* For HRSH250-A-20

Conditions

- Outdoor air temperature: 32°C ● Circulating fluid temperature setting: 20°C ● Heat load in the user's equipment: 25 kW ● Power supply: 200 V 60 Hz
- Circulating fluid flow rate: 60 L/min@0.5 MPa to the user's equipment ● External piping: The shortest distance assumed to the user's equipment
- Values shown in the graph for a thermo-chiller without inverter are found by calculation based on an assumption that a thermo-chiller is operated with a general refrigerant circuit that controls the compressor by turning the power ON/OFF, and with a bypass to the circulating fluid circuit.





Variations

Cooling capacities ranging from 10 kW to 25 kW

Air-cooled refrigeration

Model		HRSH100-A	HRSH150-A	HRSH200-A
Cooling capacity		10.5 kW	15.7 kW	20.5 kW
Power supply	-20	3-phase 200 VAC (50 Hz), 3-phase 200 to 230 VAC (60 Hz)		
	-40	3-phase 380 to 415 VAC (50/60 Hz)		
Set temp. range		5 to 35°C		
Temp. stability		±0.1°C		

Model		HRSH250-A
Cooling capacity		25 kW
Power supply	-20	3-phase 200 VAC (50 Hz), 3-phase 200 to 230 VAC (60 Hz)
	-40	3-phase 380 to 415 VAC (50/60 Hz)
Set temp. range		5 to 35°C
Temp. stability		±0.1°C

Water-cooled refrigeration

Model		HRSH100-W	HRSH150-W	HRSH200-W	HRSH250-W
Cooling capacity		11.5 kW	15.7 kW	20.6 kW	24 kW
Power supply	-20	3-phase 200 VAC (50 Hz), 3-phase 200 to 230 VAC (60 Hz)			
	-40	3-phase 380 to 415 VAC (50/60 Hz)			
Set temp. range		5 to 35°C			
Temp. stability		±0.1°C			

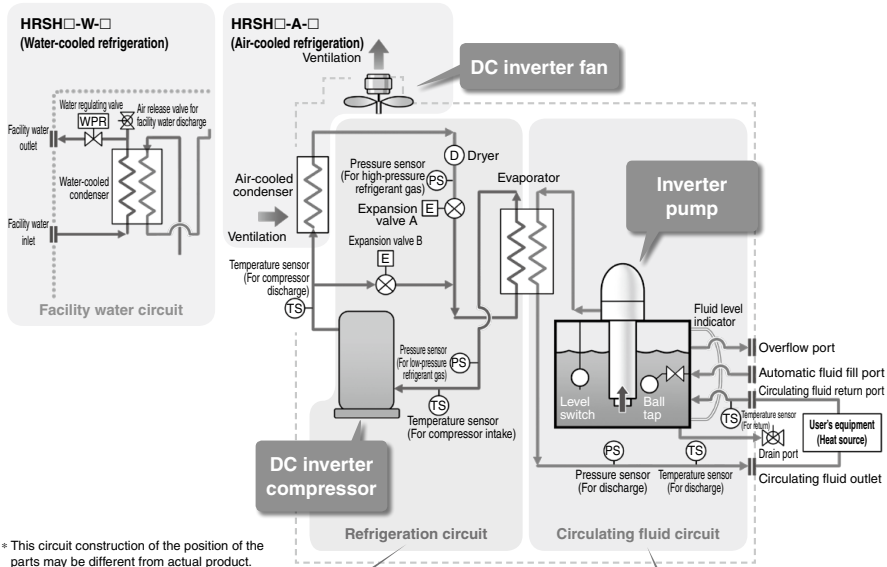
Options
▸Page 956

- With caster adjuster-foot
- With earth leakage breaker (400 V type is equipped as standard.)
- With earth leakage breaker with handle (400 V type is equipped as standard.)
- With fluid fill port

Optional accessories
▸Page 959

- Piping conversion fitting
- Caster adjuster-foot kit
- Electric conductivity control set
- Bypass piping set
- Snow protection hood (Air-cooled only)

Circuit diagram



∗ This circuit construction of the position of the parts may be different from actual product.

Refrigeration circuit

- The DC inverter 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 DC inverter 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 DC inverter 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 inverter control of the compressor and fan (facility water flow control by a water regulating valve is used in water-cooled refrigeration), and the precise control of expansion valves A and B realizes energy saving operation without waste and high temperature stability.

Circulating fluid circuit

- The circulating fluid discharged from the inverter pump, is heated or cooled by the user's equipment and returns to the tank.
- The circulating fluid is sent to the evaporator by the inverter pump, and 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

Adjusting the discharge pressure by pump inverter control eliminates wasteful discharge of the circulating fluid and realizes energy saving operation.

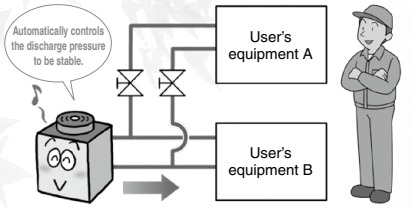
POINT

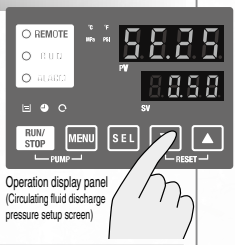
Since the refrigeration circuit is controlled by the signal from 2 temperature sensors (for return and discharge), precise temperature control of the circulating fluid can be performed. Therefore, there is no necessity of absorbing the temperature difference in the circulating fluid with a large tank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

Circulating fluid pressure adjustable

Inverter pump

Discharge pressure of the circulating fluid can be set with the operation panel. The inverter pump automatically controls the discharge pressure to the set pressure without adjusting the bypass piping under various piping conditions. Power consumption can be reduced by this control.
(Operation to the set pump operating frequency is also possible.)



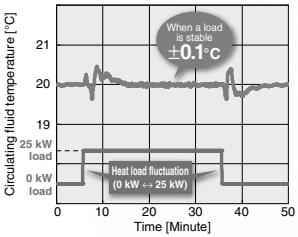


Operation display panel
(Circulating fluid discharge pressure setup screen)

When the product is used with the flow path switched for maintenance, the pressure adjusting function controls the discharge pressure to be stable. (Secure the specified minimum flow for each branch circuit.)

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

By controlling the DC inverter compressor, DC inverter fan, and electronic expansion valve simultaneously, it maintains the good temperature stability when the heat load fluctuates.

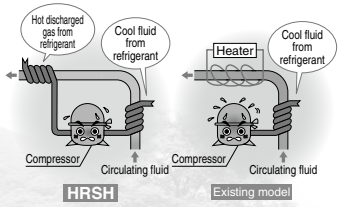


∗ For HRSH250-A-20

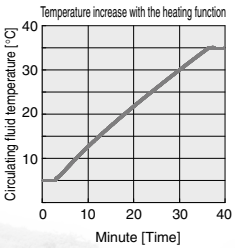
Conditions
- Outdoor air temperature: 32°C
- Circulating fluid temperature setting: 20°C
- Heat load in the user's equipment: 25 kW
- Power supply: 200 V 60 Hz
- Circulating fluid flow: 125 L/min@0.5 MPa
- External piping: Bypass piping + Heat load

Circulating fluid can be heated without a heater.

Heating method using discharged heat makes a heater unnecessary.

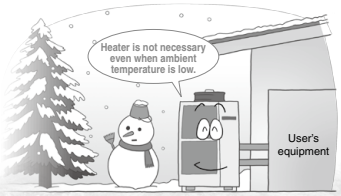


∗ This is just an example diagram.



∗ For HRSH250-A-20

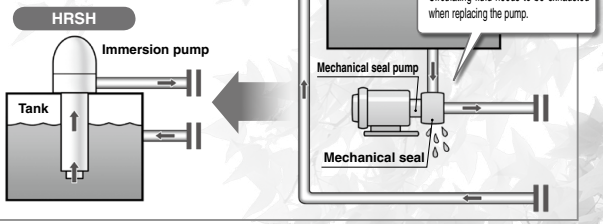
Conditions
- Ambient temperature: 5°C
- Power supply: 200 V 60 Hz
- Circulating fluid flow: 125 L/min@0.5 MPa
- External piping: Bypass piping



Reduces the maintenance hours for the pump.

Mechanical seal-less immersion pump is used.

As the pump has no external leakage of the circulating fluid, a periodic check of the pump leakage and replacement of the mechanical seal are not necessary. There is no need to exhaust the circulating fluid when removing the pump.



Compact and lightweight 280 kg (For HRSH250-A-20)

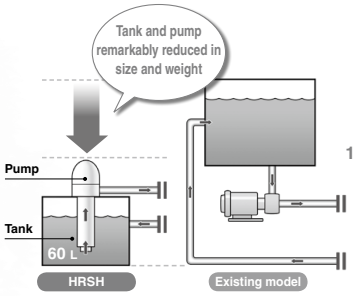
Compact tank 60 L (HRSH250-A)

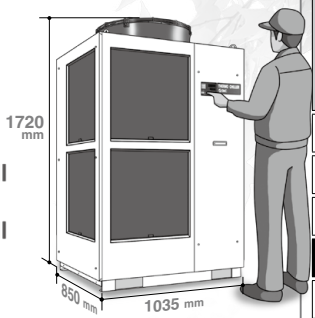
Temperature followability control reduced the tank capacity required as a buffer.

Aluminum air-cooled condenser

High heat transfer efficiency, lightweight

The integrated tank and pump saves space.

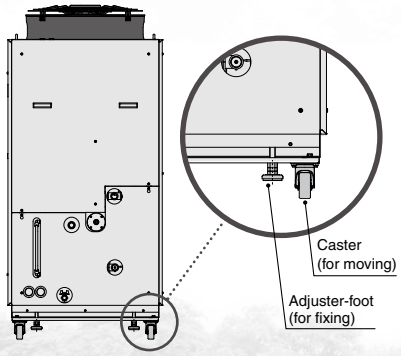




(HRSH250-A)

	Model	Height [mm]	Width [mm]	Depth [mm]	Weight [kg]
Air-cooled refrigeration	HRSH100-A	1420	954	715	180
	HRSH150/200-A	1420	954	715	215
	HRSH250-A	1720	1035	850	280
Water-cooled refrigeration	HRSH100-W	1235	687	715	150
	HRSH150/200/250-W	1235	687	715	180

With caster adjuster-foot (Option)

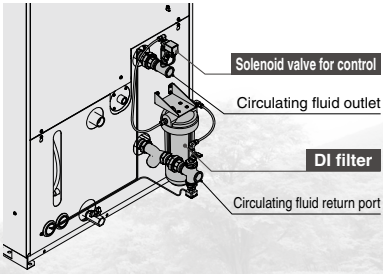


Electric conductivity control set

(With DI filter + Solenoid valve kit for control)

The electric conductivity of the circulating fluid can be set with the controller monitor arbitrarily.

Set control range: 5.0 to 45.0 μS/cm



IPX4

IP (International Protection) is the industrial standard for "Degrees of protection provided by outer defensive enclosures of electric equipment (IP Code)" according to IEC 60529 and JIS C 0920.

IPX4: No harmful influence by water splash is acceptable from every direction.

Can be installed outdoors.

Globally compatible power supplies

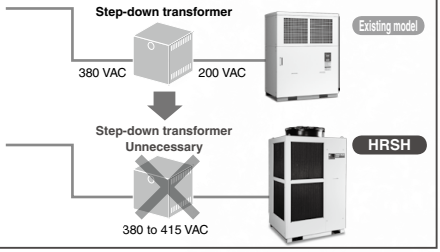
CE (400 V type only)

(Europe, Asia, Oceania, Central and South America)

Transformer unnecessary

Power supply **Applicable to 200 to 230 VAC, or 380 to 415 VAC**

Transformers are unnecessary even when used overseas.



Improved maintenance performance

Fluid fill port for the circulating fluid is available. (Option)

Fluid fill port is equipped in the upper part of the tank in addition to the automatic fluid fill port for a tap water piping connection.

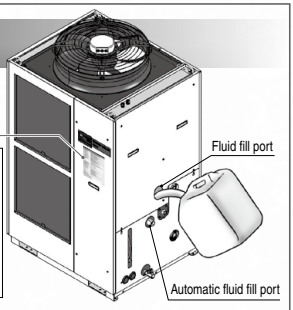
Front side access

All the electrical components can be checked from the front side for the easier maintenance work.

Alarm code list

Alarm code list stickers (English 1 pc./Japanese 1 pc.) are included. This can be put under the operation panel for reference.

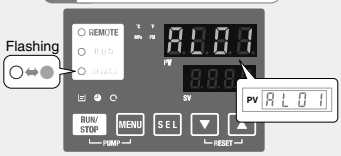
(Alarm ▶ Page 954)



Operation display panel Easy maintenance with the check display

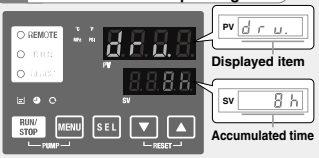
Alarm codes notify of checking times.
Notifies when to check the **pump** and **fan motor**. Helpful for facility maintenance.

Ex. **AL01 "Low level in tank"**



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

Ex. **drv. "Accumulated operating time"**



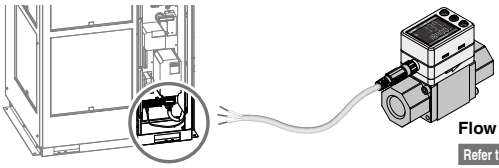
Displayed item	
Temperature	Circulating fluid outlet temperature
	Circulating fluid return temperature
	Compressor gas temperature
Flow rate	Circulating fluid flow rate*1
Pressure	Circulating fluid outlet pressure
	Compressor gas discharge pressure
	Compressor gas return pressure
Operating time	Accumulated operating time
	Accumulated operating time of pump
	Accumulated operating time of fan*2
	Accumulated operating time of compressor
	Accumulated operation time of dustproof filter*2

*1 This is not measurement value. Use it for reference. *2 These are displayed only for air-cooled refrigeration.

Convenient functions Details ▶ **Page 954** Timer function, Anti-freezing function, Power failure auto-restart function, Warming-up function, Key-lock function, etc.

Power supply (24 VDC) available

Power can be supplied from the terminal block on the rear side to external switches etc.



Flow switch

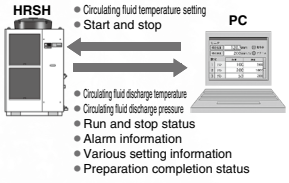
Refer to page 942.

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 PF3W, etc.).

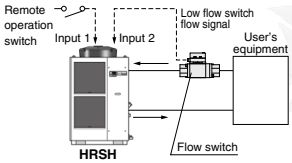
Ex.1 Remote signal I/O through serial communication

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



Ex.2 Remote operation signal input

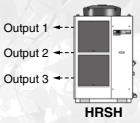
One of the contact inputs is used for remote operation and the other is used for a flow switch to monitor the flow, and their warning outputs are taken in.



Power for flow switch (24 VDC) can be supplied from the 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.

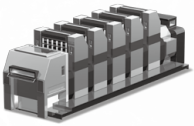


• Output setting example
Output 1: Temperature rise
Output 2: Pressure rise
Output 3: Operation status (start, stop, etc.)

Applications

Laser beam machine/ Laser welding machine

Cooling of the laser oscillation part and power source

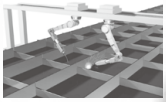


Printing machine

Temperature control of the roller

Cleaning machine

Temperature control of cleaning solution

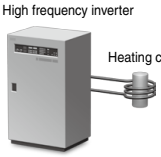


Arc welding machine

Cooling of the power source

Resistance welding machine (Spot welding)

Cooling of the welding head electrodes, transformers and transistors (thyristors)



High frequency induction heating equipment

Cooling of the heating coils, high frequency power source and around inverters

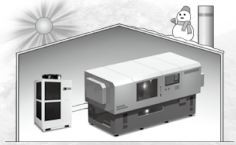
Makes cooling water easily available, anytime, anywhere.

When··· **There is no cooling tower. Tap water is being used.**

Even without a cooling tower, an air-cooled refrigerated chiller can be used to easily supply cooling water.

When··· There is a cooling tower, but high temperatures in summer or low (freezing) temperatures in winter make cooling water temperatures unstable.

Cooling water at a consistent temperature can be supplied regardless of the season.



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.

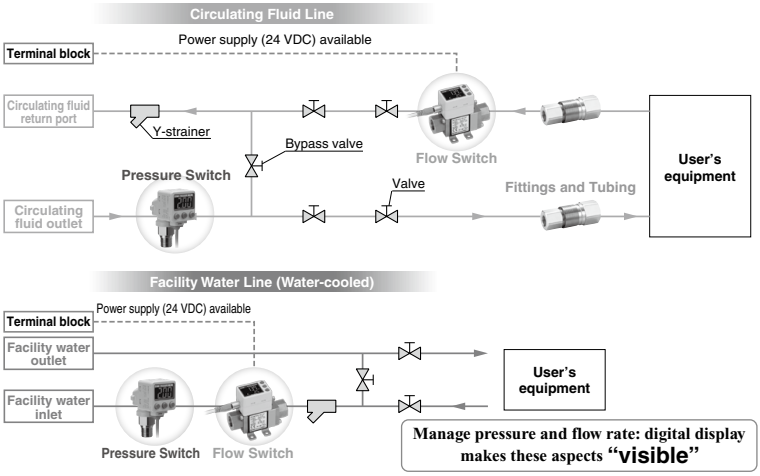
SMC Thermo-chiller Variations

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 (MET) (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) (MET) (Only 200 V as an option. See page 958.)

Circulating Fluid/Facility Water Line Equipment



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

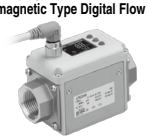
Refer to the **WEB catalog** or the Best Pneumatics No. 6 for details.

3-Color Display Digital Flow Switch for Water ***PF3W***

Integrated flow adjustment valve and temperature sensor

PVC Piping

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.

Refer to the **WEB catalog** or 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 **WEB catalog** or 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 HRSH Inverter Type

Thermo-chiller Inverter Type
Air-cooled 200 V Type
Series HRSH

(UL Standards)

RoHS

How to Order

HRSH 250 – A □ – 20 – □

Cooling capacity

100	10.5 kW
150	15.7 kW
200	20.5 kW
250	25 kW

Cooling method

A	Air-cooled refrigeration

Pipe thread type

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

Power supply

20	3-phase 200 VAC (50 Hz) 3-phase 200 to 230 VAC (60 Hz)

Option

Nil	None
A	With caster adjuster-foot
B	With earth leakage breaker
B1	With earth leakage breaker with handle
K Note 1)	With water fill port
S Note 2)	Conforming to CE/UL standards

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

Note 1) This is a manual water fill port that is different from the automatic water fill port. Water can be supplied manually into the tank without removing the side panel. (Water can be supplied manually for the model without the symbol K if the side panel is removed.)

Note 2) Combination with option B or option B1 is not necessary. The earth leakage breaker with a handle (Option B1) is provided as standard.

Models Compatible with Option S

Model	UL	CE
HRSH100	Pending	Pending
HRSH150	●	●
HRSH200	●	●
HRSH250	●	●

Specifications

Model				HRSH100-A□-20-□	HRSH150-A□-20-□	HRSH200-A□-20-□	HRSH250-A□-20-□
Cooling method				Air-cooled refrigeration			
Refrigerant				R410A (HFC)			
Control method				PID control			
Ambient temperature/Altitude Note 1), 9)			°C	Temperature: –5 to 45, Altitude: less than 3000 m			
Circulating fluid system	Circulating fluid Note 2)			Tap water, 15% Ethylene glycol aqueous solution, Deionized water			
	Set temperature range Note 1)		°C	5 to 35			
	Cooling capacity Note 3), 9)		kW	10.5	15.7	20.5	25
	Heating capacity Note 4)		kW	2.5	3	5.5	7.5
	Temperature stability Note 5)		°C	±0.1			
	Pump capacity	Rated flow (Outlet)	L/min	45 (0.43 MPa)	45 (0.45 MPa)		125 (0.5 MPa)
		Maximum flow rate	L/min	120	130		180
		Maximum pump head	m	50			80
	Settable pressure range Note 6)		MPa	0.1 to 0.5			0.1 to 0.8
	Minimum operating flow rate Note 7)		L/min	20	25		40
	Tank capacity		L	25	42		60
	Circulating fluid outlet, circulating fluid return port			Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Tank drain port			Rc3/4 (Symbol F: G3/4, Symbol N: NPT3/4)			
	Automatic water fill system (Standard)	Supply side pressure range	MPa	0.2 to 0.5			
		Supply side fluid temperature	°C	5 to 35			
		Automatic water fill port		Rc1/2 (Symbol F: G1/2, Symbol N: NPT1/2)			
		Overflow port		Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Fluid contact material		Metal	Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze			
			Resin	PTFE, PU, FKM, EPDM, PVC, NBR, POM, PE, NR			
Electrical system	Power supply			3-phase 200 VAC (50 Hz), 3-phase 200 to 230 VAC (60 Hz) Allowable voltage range ±10% (No continuous voltage fluctuation)			
	Applicable earth leakage breaker Note 8)	Rated current	A	30		40	50
		Sensitivity of leak current	mA	30			
	Rated operating current Note 5)		A	14	17	25	34
	Rated power consumption Note 5)		kW (kVA)	4.5 (4.9)	5.8 (6)	8.4 (8.7)	10.4 (11.6)
Noise level (Front 1 m/Height 1 m) Note 5)			dB (A)	68			
Waterproof specification				IPX4			
Accessories				Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.), Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.), Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 6 M8 bolts) Note 10)			
Weight (dry state)			kg	Approx. 180	Approx. 215		Approx. 280

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

Note 2) Use fluid in condition below as the circulating fluid.
Tap water: Standard of The Japan Refrigeration And Air Conditioning Industry Association (JRA GL-02-1994)
15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.
Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)

Note 3) ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Circulating fluid flow rate: Rated flow, ⑤ Power supply: 200 VAC

Note 4) ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid flow rate: Rated flow, ④ Power supply: 200 VAC

Note 5) ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Load: Same as the cooling capacity, ⑤ Circulating fluid flow rate: Rated flow, ⑥ Power supply: 200 VAC, ⑦ Piping length: Shortest

Note 6) With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.

Note 7) Fluid flow rate to maintain the cooling capacity and the temperature stability. If the actual flow rate is lower than this, install a bypass piping.

Note 8) To be prepared by user. A specified earth leakage breaker is installed for option B [With earth leakage breaker] and B1 [With earth leakage breaker with handle].

Note 9) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 964) Item 13 "∗ For altitude of 1000 m or higher".

Note 10) The anchor bolt fixing brackets (including 6 M8 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.

Thermo-chiller Inverter Type
Water-cooled 200 V Type
Series HRSH

(UL Standards)

RoHS

How to Order

HRSH 250 – W □ – 20 – □

Cooling capacity

100	11.5 kW	**200**	20.6 kW
150	15.7 kW	**250**	24 kW

Cooling method

W	Water-cooled refrigeration

Pipe thread type

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

Power supply

20	3-phase 200 VAC (50 Hz) 3-phase 200 to 230 VAC (60 Hz)

Option

Nil	None	**B1**	With earth leakage breaker with handle
A	With caster adjuster-foot	**K** Note 1)	With water fill port
B	With earth leakage breaker	**S** Note 2)	Conforming to CE/UL standards

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

Note 1) This is a manual water fill port that is different from the automatic water fill port. Water can be supplied manually into the tank without removing the side panel. (Water can be supplied manually for the model without the symbol K if the side panel is removed.)

Note 2) Combination with option B or option B1 is not necessary. The earth leakage breaker with a handle (Option B1) is provided as standard.

Models Compatible with Option S

Model	UL	CE
HRSH100	Pending	Pending
HRSH150	●	●
HRSH200	●	●
HRSH250	●	●

Specifications

Model				HRSH100-W□-20-□	HRSH150-W□-20-□	HRSH200-W□-20-□	HRSH250-W□-20-□
Cooling method				Water-cooled refrigeration			
Refrigerant				R410A (HFC)			
Control method				PID control			
Ambient temperature/Altitude Note 1), 9)			°C	Temperature: 2 to 45, Altitude: less than 3000 m			
Circulating fluid system	**Circulating fluid** Note 2)			Tap water, 15% Ethylene glycol aqueous solution, Deionized water			
	Set temperature range Note 1)		°C	5 to 35			
	Cooling capacity Note 3), 9)		kW	11.5	15.7	20.6	24
	Heating capacity Note 4)		kW	2.5	3.5	4.0	7.2
	Temperature stability Note 5)		°C	±0.1			
	Pump capacity	**Rated flow (Outlet)**	L/min	45 (0.43 MPa)	45 (0.45 MPa)		
		Maximum flow rate	L/min	120	130		
		Maximum pump head	m	50			
	Settable pressure range Note 6)		MPa	0.1 to 0.5			
	Minimum operating flow rate Note 7)		L/min	20	25		
	Tank capacity		L	25	42		
	Circulating fluid outlet, circulating fluid return port			Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Tank drain port			Rc3/4 (Symbol F: G3/4, Symbol N: NPT3/4)			
	Automatic water fill system (Standard)	**Supply side pressure range**	MPa	0.2 to 0.5			
		Supply side fluid temperature	°C	5 to 35			
		Automatic water fill port		Rc1/2 (Symbol F: G1/2, Symbol N: NPT1/2)			
		Overflow port		Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Fluid contact material		**Metal**	Stainless steel, Copper (Heat exchanger brazing), Bronze, Brass			
			Resin	PTFE, PU, FKM, EPDM, PVC, NBR, POM, PE, NR			
Facility water system	**Supply side pressure range**		MPa	0.3 to 0.5			
	Supply side temperature range		°C	5 to 40			
	Required flow		L/min	25	30	50	55
	Facility water pressure differential		MPa	0.3 or more			
	Facility water inlet/outlet			Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Fluid contact material		**Metal**	Stainless steel, Copper (Heat exchanger brazing), Bronze, Brass			
			Resin	PTFE, EPDM, NBR			
Electrical system	**Power supply**			3-phase 200 VAC (50 Hz), 3-phase 200 to 230 VAC (60 Hz), Allowable voltage range ±10% (No continuous voltage fluctuation)			
	Applicable earth leakage breaker Note 8)	**Rated current**	A	30		40	50
		Sensitivity of leak current	mA	30			
	Rated operating current Note 5)		A	14	17	21	25
	Rated power consumption Note 5)		kW (kVA)	4.2 (4.7)	5.3 (5.8)	6.6 (7.0)	8.0 (8.4)
Noise level (Front 1 m/Height 1 m) Note 5)			dB (A)	61	60		61
Waterproof specification				IPX4			
Accessories				Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.), Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.), Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 6 M8 bolts) Note 10)			
Weight (dry state)			kg	Approx. 150	Approx. 180		

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

Note 2) Use fluid in condition below as the circulating fluid.
Tap water: Standard of The Japan Refrigeration And Air Conditioning Industry Association (JRA GL-02-1994)
15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics. Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)

Note 3) ① Facility water temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Circulating fluid flow rate: Rated flow, ⑤ Power supply: 200 VAC

Note 4) ① Facility water temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid flow rate: Rated flow, ④ Power supply: 200 VAC

Note 5) ① Facility water temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Load: Same as the cooling capacity, ⑤ Circulating fluid flow rate: Rated flow, ⑥ Power supply: 200 VAC, ⑦ Piping length: Shortest

Note 6) With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.

Note 7) Fluid flow rate to maintain the cooling capacity and the temperature stability. If the actual flow rate is lower than this, install a bypass piping.

Note 8) To be prepared by user. A specified earth leakage breaker is installed for option B [With earth leakage breaker] and B1 [With earth leakage breaker with handle].

Note 9) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 964) Item 13 "* For altitude of 1000 m or higher".

Note 10) The anchor bolt fixing brackets (including 6 M8 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.

Thermo-chiller Inverter Type
Air-cooled 400 V Type
Series HRSH

How to Order

HRSH 250 – A □ – 40 – □

Cooling capacity

100	10.5 kW
150	15.7 kW
200	20.5 kW
250	25 kW

Cooling method

A	Air-cooled refrigeration

Pipe thread type

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

Power supply

40	3-phase 380 to 415 VAC (50/60 Hz)

Option

Nil Note 1)	None
A	With caster adjuster-foot
K Note 2)	With water fill port

Note 1) 400 V type is provided with an earth leakage breaker (-B) as standard.

Note 2) This is a manual water fill port that is different from the automatic water fill port. Water can be supplied manually into the tank without removing the side panel. (Water can be supplied manually for the model without the symbol K if the side panel is removed.)

Specifications

Model				HRSH100-A□-40-□	HRSH150-A□-40-□	HRSH200-A□-40-□	HRSH250-A□-40-□
Cooling method				Air-cooled refrigeration			
Refrigerant				R410A (HFC)			
Control method				PID control			
Ambient temperature/Altitude Note 1), 8)			°C	Temperature: –5 to 45, Altitude: less than 3000 m			
Circulating fluid system	**Circulating fluid** Note 2)			Tap water, 15% Ethylene glycol aqueous solution, Deionized water			
	Set temperature range Note 1)		°C	5 to 35			
	Cooling capacity Note 3), 8)		kW	10.5	15.7	20.5	25
	Heating capacity Note 4)		kW	2.5	3	5.5	7.5
	Temperature stability Note 5)		°C	±0.1			
	Pump capacity	**Rated flow (Outlet)**	L/min	45 (0.43 MPa)	45 (0.45 MPa)		125 (0.5 MPa)
		Maximum flow rate	L/min	120	130		180
		Maximum pump head	m	50			80
	Settable pressure range Note 6)		MPa	0.1 to 0.5			0.1 to 0.8
	Minimum operating flow rate Note 7)		L/min	20	25		40
	Tank capacity		L	25	42		60
	Circulating fluid outlet, circulating fluid return port			Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Tank drain port			Rc3/4 (Symbol F: G3/4, Symbol N: NPT3/4)			
	Automatic water fill system (Standard)	**Supply side pressure range**	MPa	0.2 to 0.5			
		Supply side fluid temperature	°C	5 to 35			
		Automatic water fill port		Rc1/2 (Symbol F: G1/2, Symbol N: NPT1/2)			
		Overflow port		Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Fluid contact material		**Metal**	Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze			
			Resin	PTFE, PU, FKM, EPDM, PVC, NBR, POM, PE, NR			
Electrical system	**Power supply**			3-phase 380 to 415 VAC (50/60 Hz) Allowable voltage range ±10% (No continuous voltage fluctuation)			
	Earth leakage breaker (Standard)	**Rated current**	A	20	30		
		Sensitivity of leak current	mA	30			
	Rated operating current Note 5)		A	7.4	9.3	12.8	16
	Rated power consumption Note 5)		kW (kVA)	4.6 (5.1)	5.8 (6.4)	8.2 (8.9)	10.1 (11.1)
Noise level (Front 1 m/Height 1 m) Note 5)			dB (A)	68			
Waterproof specification				IPX4			
Accessories				Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.), Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.), Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 6 M8 bolts) Note 9)			
Weight (dry state)			kg	Approx. 180	Approx. 215		Approx. 280
CE marking	**EMC Directive**			2004/108/EC			
	Machinery Directive			2006/42/EC			

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

Note 2) Use fluid in condition below as the circulating fluid.
Tap water: Standard of The Japan Refrigeration And Air Conditioning Industry Association (JRA GL-02-1994)
15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.
Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ-cm or lower)

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

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

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

Note 6) With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.

Note 7) Fluid flow rate to maintain the cooling capacity and the temperature stability. If the actual flow rate is lower than this, install a bypass piping.

Note 8) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 964) Item 13 "∗ For altitude of 1000 m or higher".

Note 9) The anchor bolt fixing brackets (including 6 M8 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.

Thermo-chiller Inverter Type
Water-cooled 400 V Type
Series HRSH

How to Order

HRSH 250 – W □ – 40 – □

Cooling capacity

100	11.5 kW
150	15.7 kW
200	20.6 kW
250	24 kW

Cooling method

W	Water-cooled refrigeration

Pipe thread type

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

Power supply

40	3-phase 380 to 415 VAC (50/60 Hz)

Option

Nil Note 1)	None
A	With caster adjuster-foot
K Note 2)	With water fill port

Note 1) 400 V type is provided with an earth leakage breaker (-B) as standard.

Note 2) This is a manual water fill port that is different from the automatic water fill port. Water can be supplied manually into the tank without removing the side panel. (Water can be supplied manually for the model without the symbol K if the side panel is removed.)

Specifications

Model				HRSH100-W□-40-□	HRSH150-W□-40-□	HRSH200-W□-40-□	HRSH250-W□-40-□
Cooling method				Water-cooled refrigeration			
Refrigerant				R410A (HFC)			
Control method				PID control			
Ambient temperature/Altitude Note 1), 8)			°C	Temperature: 2 to 45, Altitude: less than 3000 m			
Circulating fluid system	Circulating fluid Note 2)			Tap water, 15% Ethylene glycol aqueous solution, Deionized water			
	Set temperature range Note 1)		°C	5 to 35			
	Cooling capacity Note 3), 8)		kW	11.5	15.7	20.6	24
	Heating capacity Note 4)		kW	2.5	3.5	4.0	7.2
	Temperature stability Note 5)		°C	±0.1			
	Pump capacity	Rated flow (Outlet)	L/min	45 (0.43 MPa)	45 (0.45 MPa)		
		Maximum flow rate	L/min	120	130		
		Maximum pump head	m	50			
	Settable pressure range Note 6)		MPa	0.1 to 0.5			
	Minimum operating flow rate Note 7)		L/min	20	25		
	Tank capacity		L	25	42		
	Circulating fluid outlet, circulating fluid return port			Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Tank drain port			Rc3/4 (Symbol F: G3/4, Symbol N: NPT3/4)			
	Automatic water fill system (Standard)	Supply side pressure range	MPa	0.2 to 0.5			
		Supply side fluid temperature	°C	5 to 35			
		Automatic water fill port		Rc1/2 (Symbol F: G1/2, Symbol N: NPT1/2)			
		Overflow port		Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Fluid contact material		Metal	Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze			
			Resin	PTFE, PU, FKM, EPDM, PVC, NBR, POM, PE, NR			
Facility water system	Temperature range		°C	5 to 40			
	Pressure range		MPa	0.3 to 0.5			
	Required flow		L/min	25	30	50	55
	Facility water pressure differential		MPa	0.3 or more			
	Facility water inlet/outlet			Rc1 (Symbol F: G1, Symbol N: NPT1)			
	Fluid contact material		Metal	Stainless steel, Copper (Heat exchanger brazing), Bronze, Brass			
			Resin	PTFE, NBR, EPDM			
Electrical system	Power supply			3-phase 380 to 415 VAC (50/60 Hz), Allowable voltage range ±10% (No continuous voltage fluctuation)			
	Applicable earth leakage breaker (Standard)	Rated current	A	20	30		
		Sensitivity of leak current	mA	30			
	Rated operating current Note 5)		A	7.3	8.8	10.6	12.8
	Rated power consumption Note 5)		kW (kVA)	4.4 (5.0)	5.3 (6.1)	6.6 (7.4)	8.2 (8.9)
Noise level (Front 1 m/Height 1 m) Note 5)			dB (A)	61	60		61
Waterproof specification				IPX4			
Accessories				Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.), Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.), Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 6 M8 bolts) Note 9)			
Weight (dry state)			kg	Approx. 150	Approx. 180		
Compliant standards	CE marking	EMC Directive		2004/108/EC			
		Machinery Directive		2006/42/EC			

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

Note 2) Use fluid in condition below as the circulating fluid.
Tap water: Standard of The Japan Refrigeration And Air Conditioning Industry Association (JRA GL-02-1994)
15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.
Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ-cm or lower)

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

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

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

Note 6) With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.

Note 7) Fluid flow rate to maintain the cooling capacity and the temperature stability. If the actual flow rate is lower than this, install a bypass piping.

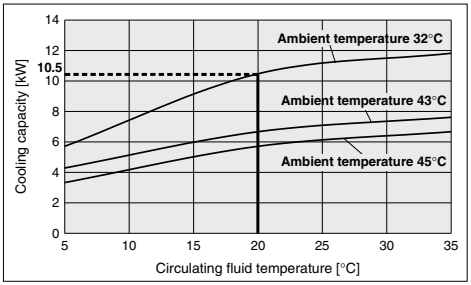
Note 8) If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (page 964) Item 13 "∗ For altitude of 1000 m or higher".

Note 9) The anchor bolt fixing brackets (including 6 M8 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.

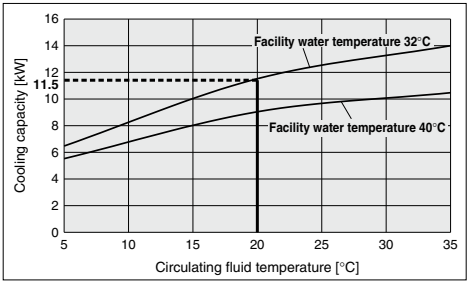
Cooling Capacity

∗ If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/ Storage Environment" (page 964) Item 13 "∗ For altitude of 1000 m or higher".

HRSH100-A□-20/40-□



HRSH100-W□-20/40-□



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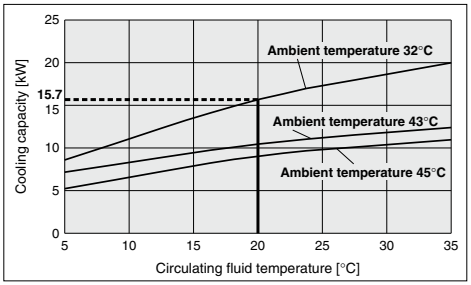

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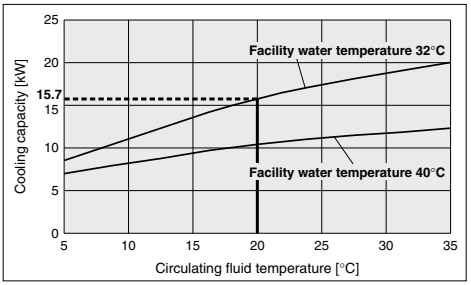
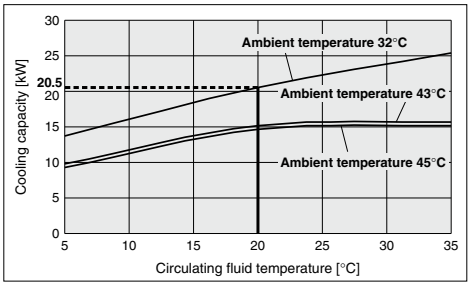
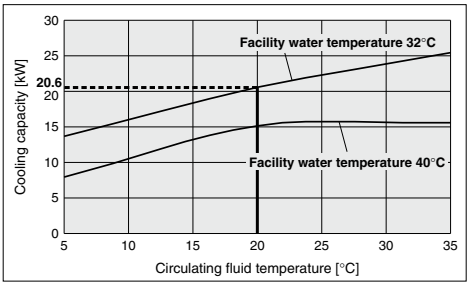


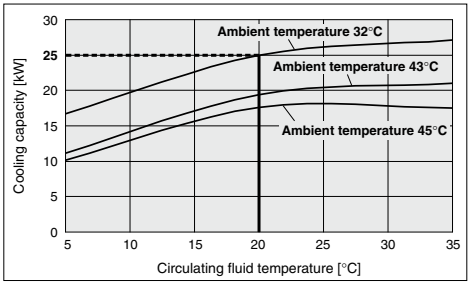
HRSH200-A□-20/40-□



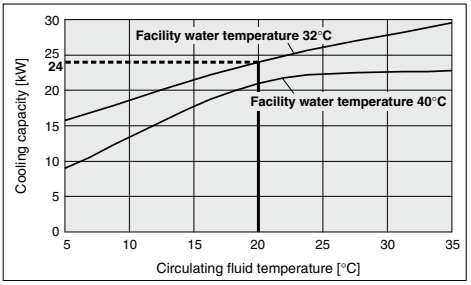
HRSH200-W□-20/40-□



HRSH250-A□-20/40-□

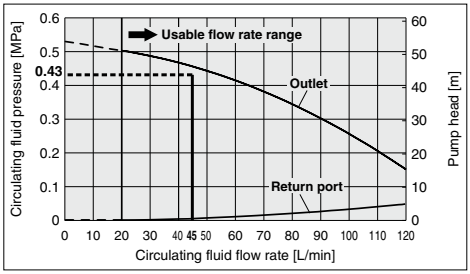


HRSH250-W□-20/40-□

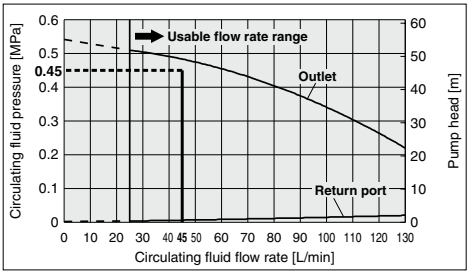


Pump Capacity

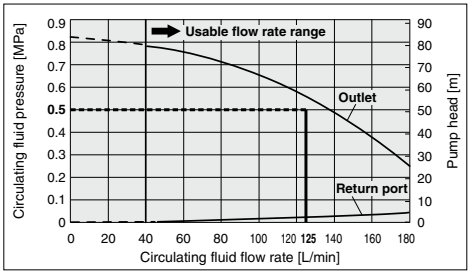
HRSH100-A□-20/40-□
HRSH100-W□-20/40-□



HRSH150/200-A□-20/40-□
HRSH150/200/250-W□-20/40-□

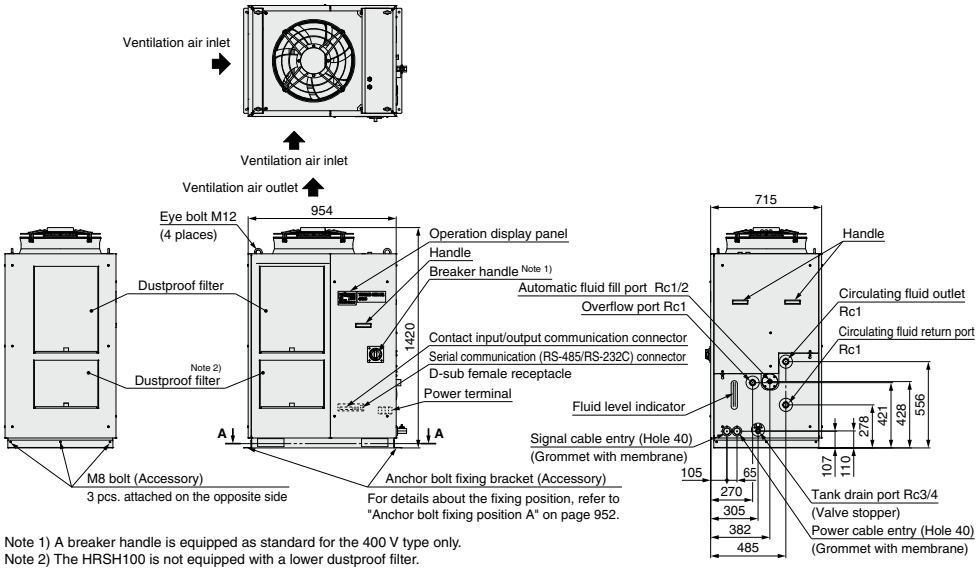


HRSH250-A□-20/40-□



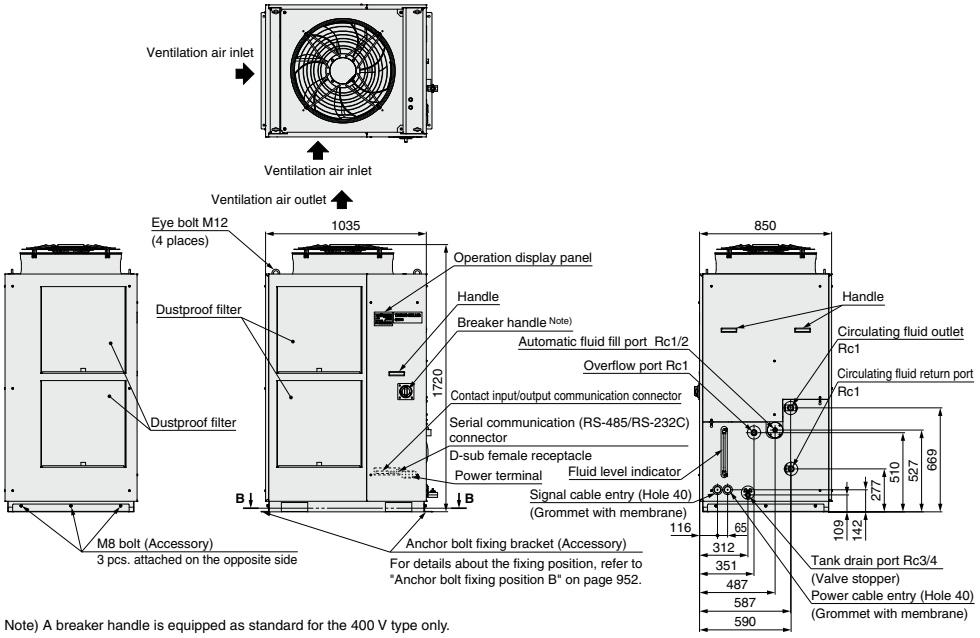
Dimensions

HRSH100/150/200-A-20 (Air-cooled 200 V type)
HRSH100/150/200-A-40 (Air-cooled 400 V type)



Note 1) A breaker handle is equipped as standard for the 400 V type only.
Note 2) The HRSH100 is not equipped with a lower dustproof filter.

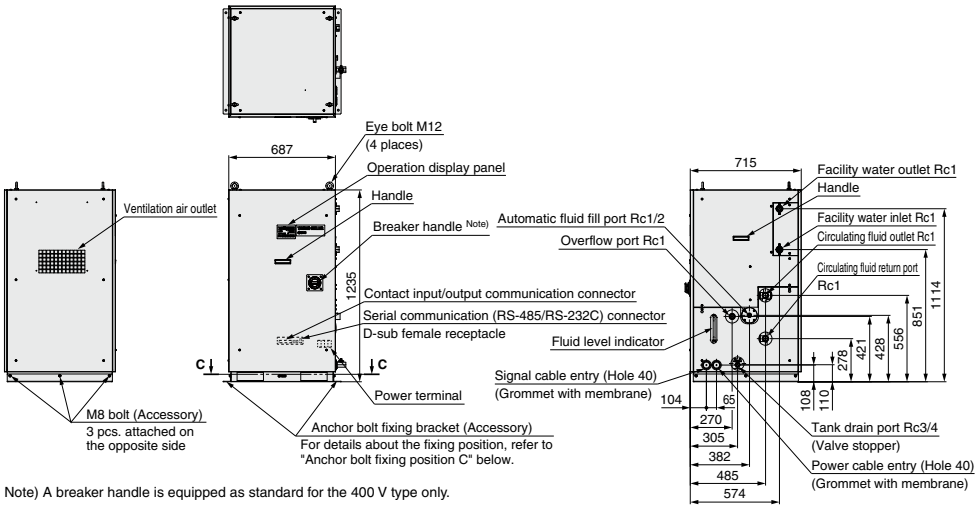
HRSH250-A-20 (Air-cooled 200 V type)
HRSH250-A-40 (Air-cooled 400 V type)



Note) A breaker handle is equipped as standard for the 400 V type only.

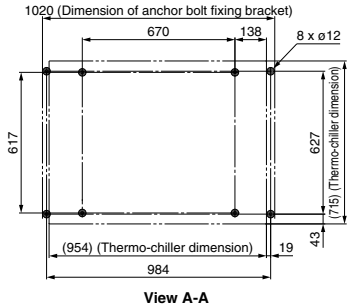
Dimensions

HRSH100/150/200/250-W-20 (Water-cooled 200 V type)
HRSH100/150/200/250-W-40 (Water-cooled 400 V type)



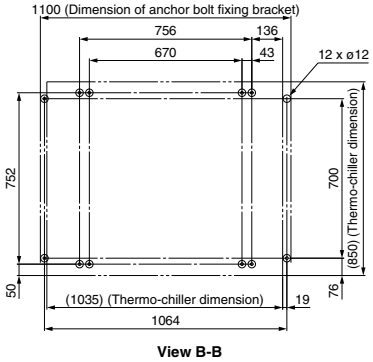
Note) A breaker handle is equipped as standard for the 400 V type only.

Anchor bolt fixing position A



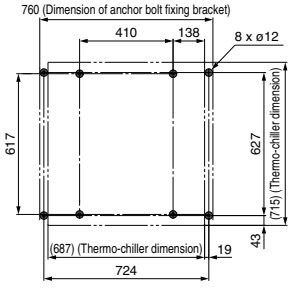
View A-A

Anchor bolt fixing position B



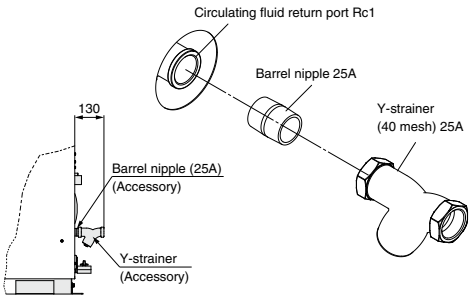
View B-B

Anchor bolt fixing position C



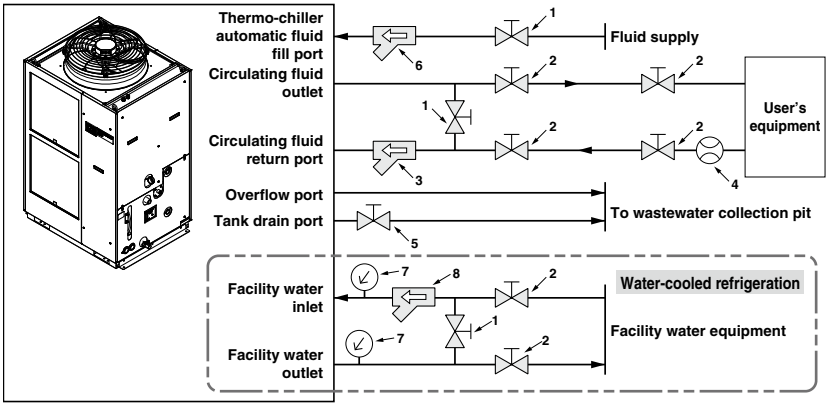
View C-C

Accessory: Y-strainer mounting view



Recommended External Piping Flow

External piping circuit is recommended as shown below.



∗ Ensure that the overflow port is connected to the wastewater collection pit in order to avoid damage to the tank of the thermo-chiller.

No.	Description	Size
1	Valve	Rc1/2
2	Valve	Rc1
3	Y-strainer (#40) (Accessory)	Rc1
4	Flow meter	Prepare a flow meter with an appropriate flow range.
5	Valve (Part of thermo-chiller)	Rc3/4
6	Y-strainer (#40)	Rc1/2
7	Pressure gauge	0 to 1.0 MPa
8	Y-strainer (#40)	Rc1

Cable Specifications

Power supply and signal cable should be prepared by user.

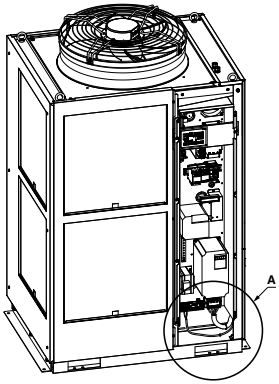
Power Cable Specifications

Applicable model	Rated value for thermo-chiller			Power cable examples	
	Power supply	Applicable breaker rated current	Terminal block thread size	Cable size	Crimped terminal on the thermo-chiller side
HRSH100-□□-20 **HRSH150-□□-20**	3-phase 200 VAC (50 Hz) 3-phase 200 to 230 VAC (60 Hz)	30 A	M5	4 cores x 5.5 mm² (4 cores x AWG10) (Including grounding cable)	R5.5-5
HRSH200-□□-20		40 A		4 cores x 8 mm² (4 cores x AWG8) (Including grounding cable)	R8-5
HRSH250-□□-20		50 A		4 cores x 8 mm² (4 cores x AWG8) (Including grounding cable)	R8-5
HRSH100-□□-40	3-phase 380 to 415 VAC (50/60 Hz)	20 A		3 x 5.5 mm² (3 x AWG10) (Power supply) 1 x 14 mm² (1 x AWG6) (Grounding cable)	R5.5-5 (Power supply) R14-5 (Grounding cable)
HRSH150-□□-40 **HRSH200-□□-40** **HRSH250-□□-40**		30 A			

Note) An example of the cable specifications is when two kinds of vinyl insulated wires with a continuous allowable operating temperature of 70°C at 600 V, are used at an ambient temperature of 30°C. Select the proper size of cable according to an actual condition.

Signal Cable Specifications

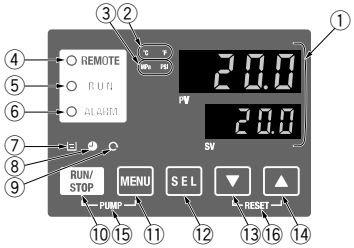
Terminal specifications		Cable specifications
Terminal block screw diameter	Recommended crimped terminal	0.75 mm² (AWG18) Shielded cable
M3	Y-shape crimped terminal 1.25Y-3	



Partially enlarged view A

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] lamp**	Equipped with a unit conversion function. Displays the unit of displayed temperature (default setting: °C).	
③	**[MPa] [PSI] lamp**	Equipped with a unit conversion function. Displays the unit of displayed pressure (default setting: MPa).	
④	**[REMOTE] lamp**	Enables remote operation (start and stop) by communication. Lights up during remote operation.	
⑤	**[RUN] lamp**	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] lamp**	Flashes with buzzer when alarm occurs.	
⑦	**[ ] lamp**	Lights up when the surface of the fluid level indicator falls below the L level.	
⑧	**[ ] lamp**	Equipped with a timer for start and stop. Lights up when this function is operated.	
⑨	**[ ] lamp**	Equipped with a power failure auto-restart function, which restarts the product automatically after stopped due to a power failure. 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] lamp is reset.	

List of Function

No.	Function	Outline
1	**Main display**	Displays the current and set temperature of the circulating fluid, discharge pressure of the circulating fluid. Changes the circulating fluid set temperature.
2	**Alarm display menu**	Indicates alarm number when an alarm occurs.
3	**Inspection monitor menu**	Product temperature, pressure and accumulated operating time can be checked as daily inspection. Use these for daily inspection.
4	**Key-lock**	Keys can be locked so that set values cannot be changed by operator error.
5	**Timer for operation start/stop**	Timer is used to set the operation start/stop.
6	**Signal for the completion of preparation**	A signal is output when the circulating fluid temperature reaches the set temperature, when using contact input/output and serial communication.
7	**Offset function**	Use this function when there is a temperature offset between the discharge temperature of the thermo-chiller and user's equipment.
8	**Reset after power failure**	Start operation automatically after the power supply is turned on.
9	**Key click sound setting**	Operation panel key sound can be set on/off.
10	**Changing temp. unit**	Temperature unit can be changed. Centigrade (°C) ⇔ Fahrenheit (°F)
11	**Changing pressure unit**	Pressure unit can be changed. MPa ⇔ PSI
12	**Data reset**	Functions can be reset to the default settings (settings when shipped from the factory).
13	**Accumulation time reset**	Reset function when the pump, the fan or the compressor is replaced. Reset the accumulated time here.
14	**Pump operation mode set**	The fluid supply mode of the pump can be changed Pressure control mode ⇔ Frequency set mode
15	**Anti-freezing function**	Circulating fluid is protected from freezing during winter or at night. Set beforehand if there is a risk of freezing.
16	**Warming-up function**	When circulating fluid temperature rising time at starting needs shortening during winter or at night, set beforehand.
17	**Anti-snow coverage function**	If there will be a possibility of the snow coverage due to the change of the installation environment (season, weather), set beforehand.
18	**Alarm buzzer sound setting**	Alarm sound can be set to on/off.
19	**Alarm customizing**	Operation during alarm condition and threshold values can be changed depending on the alarm type.
20	**Communication**	This function is used for contact input/output or serial communication.

Alarm

This unit has 42 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.

Code	Alarm message
AL01	Low level in tank
AL02	High circulating fluid discharge temp.
AL03	Circulating fluid discharge temp. rise
AL04	Circulating fluid discharge temp. drop
AL05	High circulating fluid return temp.
AL08	Circulating fluid discharge pressure rise
AL09	Circulating fluid discharge pressure drop
AL10	High compressor intake temp.
AL11	Low compressor intake temp.
AL12	Low super heat temp.
AL13	High compressor discharge pressure
AL15	Refrigeration circuit pressure (high pressure side) drop
AL16	Refrigeration circuit pressure (low pressure side) rise
AL17	Refrigeration circuit pressure (low pressure side) drop
AL18	Compressor running failure

Code	Alarm message
AL19	Communication error
AL20	Memory error
AL21	DC line fuse cut
AL22	Circulating fluid discharge temp. sensor failure
AL23	Circulating fluid return temp. sensor failure
AL24	Compressor intake temp. sensor failure
AL25	Circulating fluid discharge pressure sensor failure
AL26	Compressor discharge pressure sensor failure
AL27	Compressor intake pressure sensor failure
AL28	Pump maintenance
AL29	Fan maintenance Note 1)
AL30	Compressor maintenance
AL31	Contact input 1 signal detection
AL32	Contact input 2 signal detection
AL37	Compressor discharge temp. sensor failure

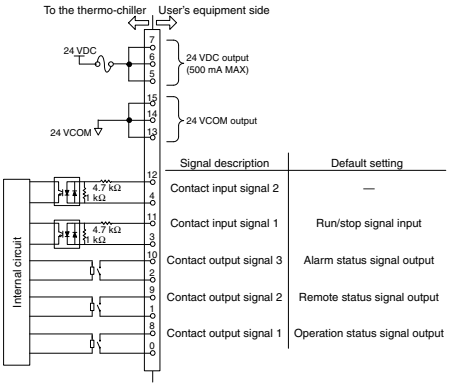
Code	Alarm message
AL38	Compressor discharge temp. rise
AL39	Internal unit fan stoppage
AL40	Dustproof filter maintenance Note 1)
AL41	Power stoppage
AL42	Compressor waiting
AL43	Fan breaker trip Note 1)
AL44	Fan inverter error Note 1)
AL45	Compressor breaker trip Note 2)
AL46	Compressor inverter error
AL47	Pump breaker trip Note 2)
AL48	Pump inverter error
AL49	Air exhaust fan stoppage Note 3)

Note 1) Does not occur on the product of water-cooled refrigeration type.
Note 2) Does not occur on the product of power supply specification '-20'.
Note 3) Does not occur on the product of air-cooled refrigeration type.
∗ For details, read the Operation Manual.

For details, refer to the Operation Manual. Please download it via our website, http://www.smcworld.com

Communication Function

Contact Input/Output

Item		Specifications
Connector type		M3 terminal block
Input signal	Insulation method	Photocoupler
	Rated input voltage	24 VDC
	Operating voltage range	21.6 to 26.4 VDC
	Rated input current	5 mA TYP
	Input impedance	4.7 kΩ
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% 500 mA MAX (No inductive load)
Circuit diagram		

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

Serial Communication

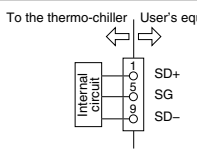
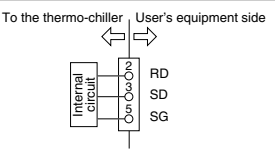
The serial communication (RS-485/RS-232C) enables the following items to be written and read out.
For details, refer to the Operation Manual for communication.

Writing

Run/Stop
Circulating fluid temperature setting (SV)

Readout

Circulating fluid present temperature (PV)
Circulating fluid discharge pressure (SV)
Status information
Alarm occurrence information

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 for communication. 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 ***HRSH***
Options

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

A Option symbol

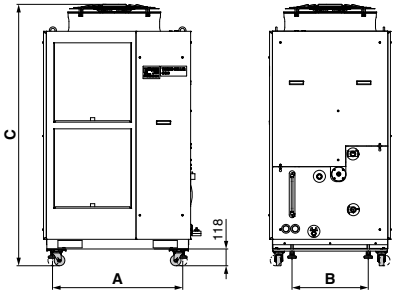
With Caster Adjuster-Foot

HRSH□-□□-□-A

With caster adjuster-foot

Unfixed casters and adjuster feet stops are mounted.

Applicable model	Dimension [mm]		
	A	B	C
HRSH250-A□-□□-A	916	536	1838
HRSH100/150/200-A□-□□-A	830	401	1538
HRSH100/150/200/250-W□-□□-A	570		1353



B Option symbol

With Earth Leakage Breaker

HRSH□-□□-20-B

With earth leakage breaker

A leakage breaker is built in to automatically stop the supply power when it has short-circuit, over current or electrical leakage. (It is not necessary to select this option since an earth leakage breaker is installed for the models with power supply specification '-40' as standard equipment.)

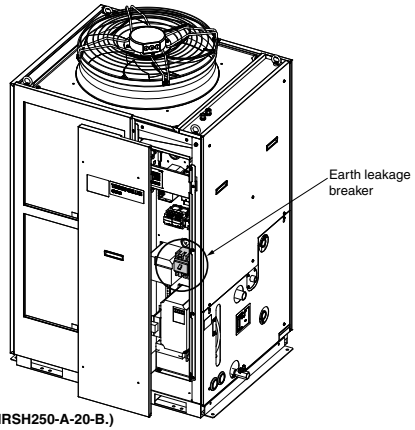
Applicable model	Rated current [A]	Sensitivity of leak current [mA]	Short circuit display method
HRSH100-□□-20-B	30	30	Mechanical button
HRSH150-□□-20-B			
HRSH200-□□-20-B	40		
HRSH250-□□-20-B	50		

∗ 400 V type is equipped as standard.

(Refer to the specifications on pages 947, 948 and the dimensions on pages 951, 952 for details.)

∗ Cannot be selected together with option B1.

∗ Cannot be selected together with option S.



(The figure shows the HRSH250-A-20-B.)

INDEX

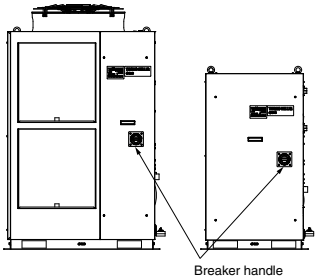
B1 Option symbol

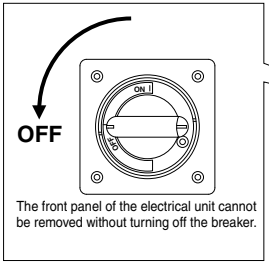
With Earth Leakage Breaker with Handle

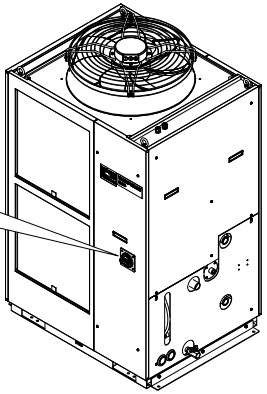
HRSH□-□□-20-B1

With earth leakage breaker with handle

A breaker operation handle that can be operated without removing the front panel for the electrical unit is mounted. Breaker capacity, sensitivity of leak current, and operating characteristics of the breaker are the same as option B. (It is not necessary to select this option since an earth leakage breaker with a handle is installed for the models with power supply specification '-40' as standard equipment.)







∗ 400 V type is equipped as standard.

∗ Cannot be selected together with option B.

∗ Cannot be selected together with option S.

K Option symbol

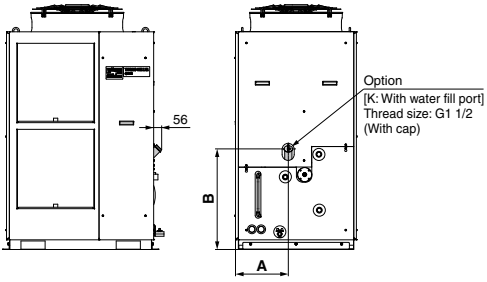
With Water Fill Port

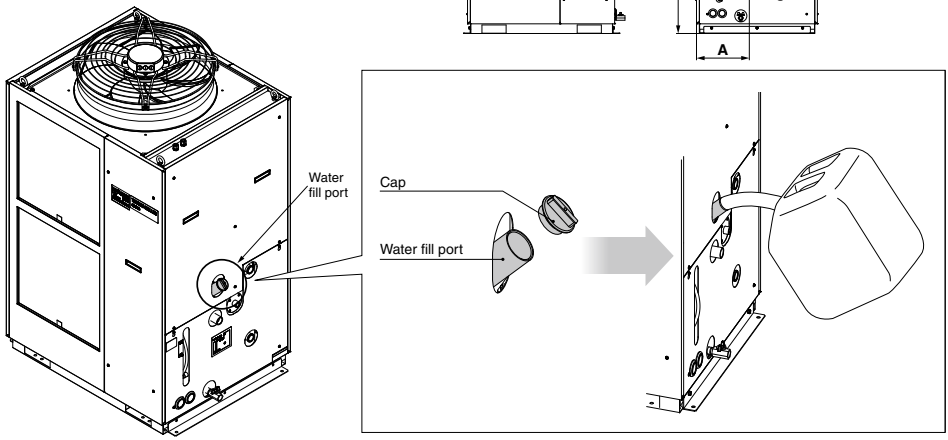
HRSH□-□□-□-K

With water fill port

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

Applicable model	Dimension [mm]	
	A	B
HRSH100-□□-□-K **HRSH150-□□-□-K** **HRSH200-□□-□-K** **HRSH250-W□-□-K**	271	609
HRSH250-A□-□-K	372	708





(The figure shows the HRSH250-A-20-K.)

S Option symbol

Conforming to CE/UL Standards

HRSH□-□□-20-S

Conforming to CE/UL standards

Products conforming to CE/UL standards.
The following standards are applicable.

Applicable standard		
CE marking	EMC directive	2004/108/EC
	Machinery directive	2006/42/EC
UL standard	E112803 (UL61010-1)	

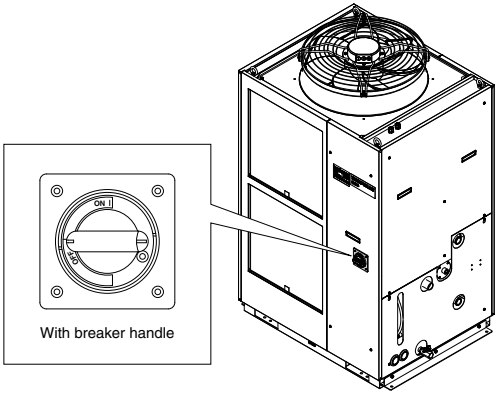
When selecting this option,
- An earth leakage breaker with a breaker handle is equipped. (The breaker are the same as those for option B1.)
- A caution label is added.
- The CE/UL certification mark is added to the model number label.

∗ Cannot be selected for 400 V type.

∗ Cannot be selected together with option B.

∗ Cannot be selected together with option B1.

∗ For the operation in accordance with the UL standard, the product should be used in an environment at a pollution degree of 2 or less. Prepare a power supply of overvoltage category Ⅱ or less.



With breaker handle

Models Compatible with Option S

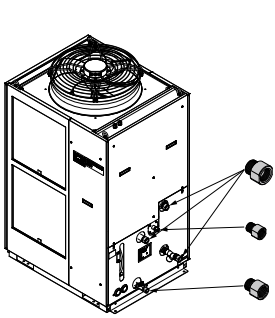
Applicable model	-A□	-W□
HRSH100-□□-20-S	Pending	Pending
HRSH150-□□-20-S	●	●
HRSH200-□□-20-S	●	●
HRSH250-□□-20-S	●	●

Series HRSH
Optional Accessories

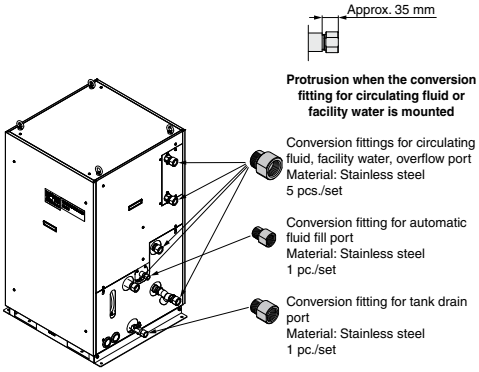
① Piping Conversion Fitting

This is a fitting to change the port from Rc to G or NPT.
· Circulating fluid outlet, Circulating fluid return port, Overflow port Rc1 → NPT1 or G1
· Drain port Rc3/4 → NPT3/4 or G3/4
· Automatic fluid fill port Rc1/2 → NPT1/2 or G1/2
· Facility water inlet, Facility water outlet Rc1 → NPT1 or G1 (for HRS-EP015 or HRS-EP016)
(It is not necessary to purchase this when pipe thread type F or N is selected in "How to Order" since it is included in the product.)

Part no.	Contents	Applicable model
HRS-EP013	NPT thread conversion fitting set	**HRSH□-A-□**
HRS-EP014	G thread conversion fitting set	
HRS-EP015	NPT thread conversion fitting set	**HRSH□-W-□**
HES-EP016	G thread conversion fitting set	



HRS-EP013, HRS-EP014



HRS-EP015, HRS-EP016

② Caster Adjuster-Foot Kit

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

Part no.	Applicable model	Dimension [mm]	
		A	**B**
HRS-KS001	**HRSH250-A□-□**	916	536
HRS-KS002	**HRSH100-A□-□** **HRSH150-A□-□** **HRSH200-A□-□**	830	401
	HRSH100-W□-□ **HRSH150-W□-□** **HRSH200-W□-□** **HRSH250-W□-□**	570	

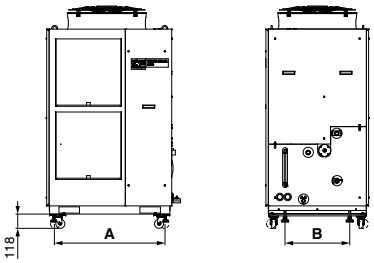


Fig. 1 Mounting view

Parts List

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

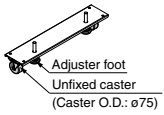


Fig. 2 Caster adjuster-foot bracket (2 pcs.)

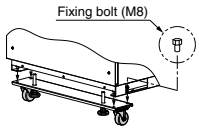


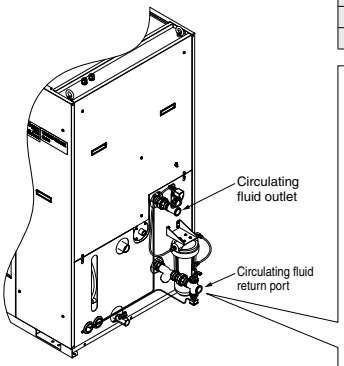
Fig. 3 Fixing bolt (8 pcs.)

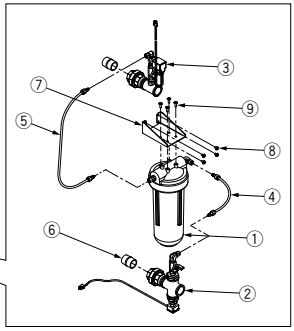
③ Electric Conductivity Control Set

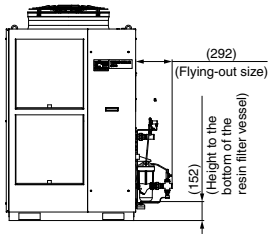
The set indicates and controls the electric conductivity of the circulating fluid. Refer to the Operation Manual for details.

Part no.	Applicable model
HRS-DI006	**HRSH100-□□-□** **HRSH150-□□-□** **HRSH200-□□-□** **HRSH250-□□-□**

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







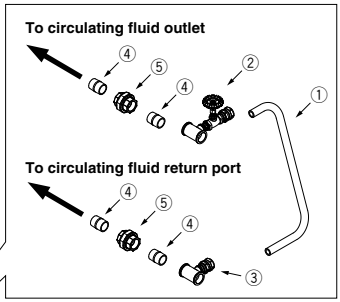
Parts List

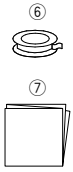
No.	Description
①	DI filter vessel (resin)
②	DI sensor assembly
③	DI control piping assembly
④	DI filter outlet tube
⑤	DI filter inlet tube
⑥	Nipple (2 pcs.)
⑦	Mounting bracket
⑧	Mounting screw (4 pcs.)
⑨	Tapping screw (4 pcs.)

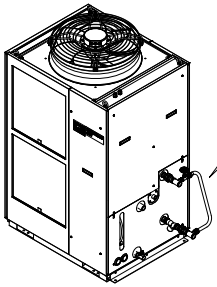
④ Bypass Piping Set

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

Part no.	Applicable model	Minimum operating flow rate [L/min]
HRS-BP005	**HRSH100-□□-□**	20
	HRSH150-□□-□ **HRSH200-□□-□** **HRSH250-W□-□**	25
	HRSH250-A□-□	40







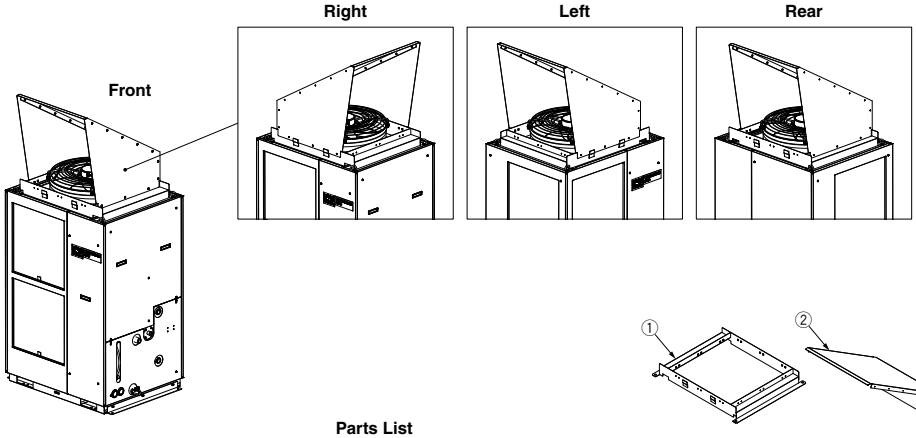
(The figure shows the HRSH250-A-20.)

Parts List

No.	Description
①	Hose (I.D.: 15 mm, Length: 700 mm)
②	Outlet piping assembly (With globe valve)
③	Return piping assembly
④	Barrel nipple (Size: 1 inch) (2 pcs.)
⑤	Union (Size: 1 inch) (2 pcs.)
⑥	Sealant tape
⑦	Operation Manual

⑤ Snow Protection Hood

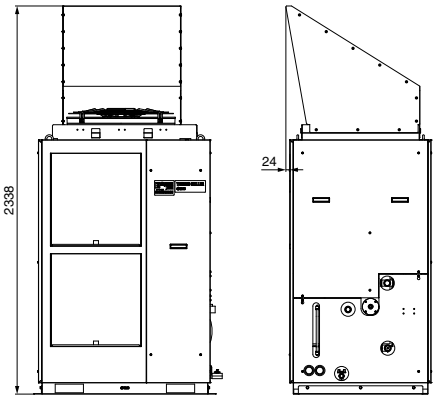
Stainless steel snow protection hood for air-cooled chiller.
According to the mounting direction of the snow protection hood, the ventilation from the fan can be selected from four directions, front, rear, left and right.



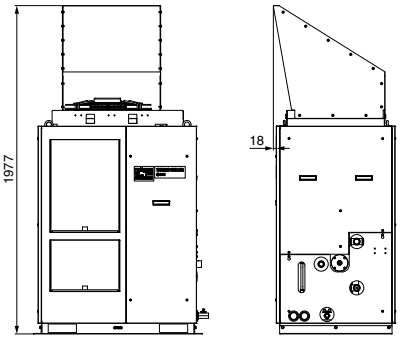
Part no.	Applicable model	Weight [kg]
HRS-BK003	**HRSH250-A□-□**	22
HRS-BK004	**HRSH100-A□-□** **HRSH150-A□-□** **HRSH200-A□-□**	18

Parts List

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



Mounting condition for HRS-BK003



Mounting condition for HRS-BK004

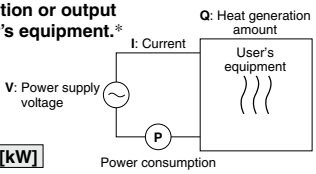
∗ This hood does not completely prevent snow from entering the inside of the chiller.

Series ***HRSH***
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**: 20 [kW]

Q = P = 20 [kW]

Cooling capacity = Considering a safety factor of 20%, **20 [kW] x 1.2 =** **24 [kW]**

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

Power supply output **VI**: 20 [kVA]

Q = P = V x I x Power factor

In this example, using a power factor of 0.85:

= 20 [kVA] x 0.85 = 17 [kW]

Cooling capacity = Considering a safety factor of 20%,

17 [kW] x 1.2 = **20.4 [kW]**

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

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

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

In this example, using an efficiency of 0.7:

$$\mathbf{= \frac{13}{0.7} = 18.6\ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

18.6 [kW] x 1.2 = **22.3 [kW]**

* 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 **qm**	: (= ρ x **qv** ÷ 60) [kg/s]
Circulating fluid density ρ	: 1 [kg/L]
Circulating fluid (volume) flow rate **qv**	: 70 [L/min]
Circulating fluid specific heat **C**	: 4.186 x 10^3 [J/(kg·K)]
Circulating fluid outlet temperature $\mathbf{T_1}$	: 293 [K] (20 [°C])
Circulating fluid return temperature $\mathbf{T_2}$	: 297 [K] (24 [°C])
Circulating fluid temperature difference **ΔT**	: 4 [K] (= $\mathbf{T_2 - T_1}$)
Conversion factor: minutes to seconds (SI units)	: 60 [s/min]

* Refer to page 963 for the typical physical property value of tap water or other circulating fluids.

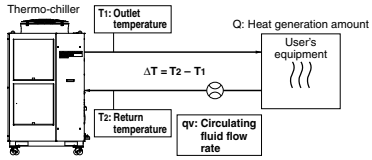
$$\mathbf{Q = qm \times C \times (T_2 - T_1)}$$

$$\mathbf{= \frac{\rho \times qv \times C \times \Delta T}{60} = \frac{1 \times 70 \times 4.186 \times 10^3 \times 4.0}{60}}$$

$$\mathbf{= 19535\ [J/s] \approx 19535\ [W] = 19.5\ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

19.5 [kW] x 1.2 = **23.4 [kW]**



HRSH250-A

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 **qm**	: (= ρ x **qv** x 60) [kgf/h]
Circulating fluid weight volume ratio γ	: 1 [kgf/L]
Circulating fluid (volume) flow rate **qv**	: 70 [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 $\mathbf{T_2}$	: 24 [°C]
Circulating fluid temperature difference **ΔT**	: 4 [°C] (= $\mathbf{T_2 - T_1}$)
Conversion factor: hours to minutes	: 60 [min/h]
Conversion factor: kcal/h to kW	: 860 [(cal/h)/W]

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

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

$$\mathbf{= \frac{1 \times 70 \times 60 \times 1.0 \times 10^3 \times 4.0}{860}}$$

$$\mathbf{= \frac{16800000\ [cal/h]}{860}}$$

$$\mathbf{\approx 19534\ [W] = 19.5\ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

19.5 [kW] x 1.2 = **23.4 [kW]**

Required Cooling Capacity Calculation

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

Heat quantity by cooled substance (per unit time) **Q** : Unknown [W] ([J/s])
Cooled substance : Water
Cooled substance mass **m** : (= ρ x **V**) [kg]
Cooled substance density ρ : 1 [kg/L]
Cooled substance total volume **V** : 300 [L]
Cooled substance specific heat **C** : 4.186 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])

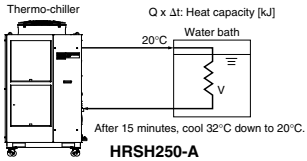
∗ Refer to the following for the typical physical property values by circulating fluid.

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

$$= \frac{1 \times 300 \times 4.186 \times 10^3 \times 12}{900} = 16744\ [J/s] \approx 16.7\ [kW]$$

Cooling capacity = Considering a safety factor of 20%,

16.7 [kW] x 1.2 = 20 [kW]



HRSH250-A

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** : 300 [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]

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

$$= \frac{1 \times 300 \times 60 \times 1.0 \times 10^3 \times 12}{15 \times 860}$$

$$\approx 16744\ [W] = 16.7\ [kW]$$

Cooling capacity = Considering a safety factor of 20%,

16.7 [kW] x 1.2 = 20 [kW]

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

Precautions on Cooling Capacity Calculation

1. Heating capacity

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

2. Pump capacity

<Circulating fluid flow rate>

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

<Circulating fluid discharge pressure>

Circulating fluid discharge pressure has the possibility to increase up to the maximum pressure in the pump capacity curves. Check beforehand if the circulating fluid pipings or circulating fluid circuit of the user's equipment are fully durable against this pressure.

Circulating Fluid Typical Physical Property Values

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

Density 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 HRSH
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) Check 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 of circulating fluid and facility water.

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.

4. The facility water outlet temperature (water-cooled type) may increase up to around 60°C.

When selecting the facility water pipings, consider the suitability for temperature.

Selection

⚠ Warning

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 962 and 963 before selecting a model.

Handling

⚠ Warning

Thoroughly read the Operation Manual.

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

Operating Environment/Storage Environment

⚠ Warning

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

1) In locations where water vapor, salt water, and oil may splash on the product.
2) In locations where there are dust and particles.
3) In locations where corrosive gases, organic solvents, chemical fluids, or flammable gases are present. (This product is not explosion proof.)
4) In locations where the ambient temperature exceeds the limits as mentioned below.
   During transportation/storage: –15°C to 50°C (But as long as water or circulating fluid are not left inside the pipings)
   During operation: –5°C to 45°C (However, use a 15% ethylene glycol aqueous solution if operating in a place where the ambient temperature or circulating fluid temperature is 10°C or less.)
5) In locations where condensation may occur.
6) In locations which receive direct sunlight or radiated heat.
7) In locations where there is a heat source nearby and the ventilation is poor.
8) In locations where temperature substantially changes.
9) In locations where strong magnetic noise occurs. (In locations where strong electric fields, strong magnetic fields and surge voltage occur.)
10) In locations where static electricity occurs, or conditions which make the product discharge static electricity.
11) In locations where high frequency occurs.
12) In locations where damage is likely to occur due to lightning.
13) 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
Less than 1000 m	45	1.00
Less than 1500 m	42	0.85
Less than 2000 m	38	0.80
Less than 2500 m	35	0.75
Less than 3000 m	32	0.70

14) In locations where strong impacts or vibrations occur.
15) In locations where a massive force strong enough to deform the product is applied or a weight from a heavy object is applied.
16) In locations where there is not sufficient space for maintenance.
17) In locations where liquid that exceeds the conditions required for the degrees of protection IPX4 may splash on the product.
18) Insects or plants may enter the unit.

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

Specific Product Precautions 2

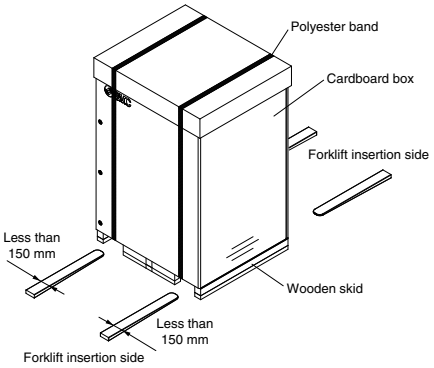
Be sure to read this before handling. Refer to page 1154 for Safety Instructions. For Temperature Control Equipment Precautions, refer to "Handling Precautions for SMC Products" and the Operation Manual on SMC website, http://www.smcworld.com

Transportation/Transfer/Movement

⚠ Warning

1. This product will require an acceptance with the product not unloaded from the truck, and the user will need to unload the product by himself. Prepare a forklift.

The product will be delivered in the packaging shown below.



<When packaged>

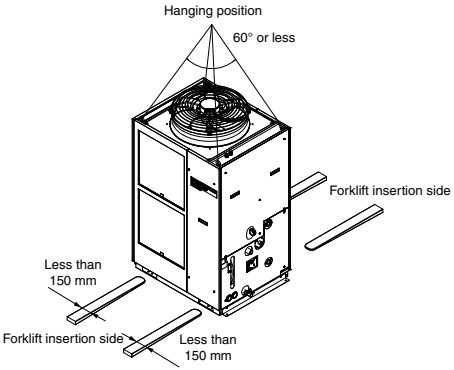
Model	Weight [kg]	Dimensions [mm]
HRSH100-A□-□	221	Height 1585 x Width 1185 x Depth 955
HRSH150-A□-□ **HRSH200-A□-□**	256	
HRSH250-A□-□	330	Height 1895 x Width 1230 x Depth 1040
HRSH100-W□-□	185	Height 1485 x Width 925 x Depth 955
HRSH150-W□-□ **HRSH200-W□-□** **HRSH250-W□-□**	215	
HRSH100-A□-A	233	Height 1710 x Width 1185 x Depth 955
HRSH150-A□-A **HRSH200-A□-A**	268	
HRSH250-A□-A	344	Height 2020 x Width 1230 x Depth 1040
HRSH100-W□-A	197	Height 1610 x Width 925 x Depth 955
HRSH150-W□-A **HRSH200-W□-A** **HRSH250-W□-A**	227	

2. Transportation by forklift

1) A licensed driver should drive the forklift.
2) The proper place to insert the tines of the forklift differs depending on the model of cooler. Check the insert position, and be sure to drive the fork in far enough for it to come out the other side.
3) Be careful not to bump the fork to the cover panel or piping ports.

3. Hanging transportation

1) Crane manipulation and slinging work should be done by an eligible person.
2) Do not grip the piping on the right side or the handles of the panel.
3) When hanging by the eye bolts, be sure to use a 4-point hanging method. For the hanging angle, use caution regarding the position of the center of gravity and hold it within 60°.



HRSH250-A-20

(When using option A/With caster adjuster-foot and optional accessories/Caster adjuster-foot kit HRS-KS001 or KS002)

4. Transporting using casters

1) This product is heavy and should be moved by at least two persons.
2) Do not grip the piping port on the right side or the handles of the panel.
3) When transporting using a forklift, be sure not to let it hit the casters or adjusters, and drive the fork all the way through until it comes out the other side.
4) Do not get across steps with casters.

Mounting/Installation

⚠ Warning

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. Secure with bolts, anchor bolts, etc.

Series HRSH
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

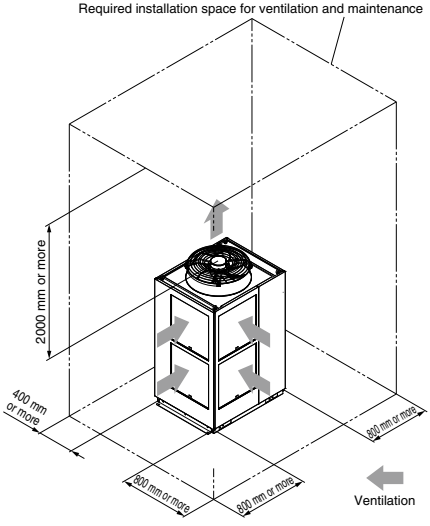
Mounting/Installation

⚠ Caution

3. Refer to the Operation Manual for this product, and secure an installation space that is necessary for the maintenance and ventilation.

<Air-cooled refrigeration>

1. The air-cooled type product exhausts heat using the fan that is mounted to the product. If the product is operated with insufficient ventilation, ambient temperature may exceed 45°C, and this will affect the performance and life of the product. To prevent this ensure that suitable ventilation is available (see below).
2. For installation indoors, ventilation ports and a ventilation fan should be equipped as needed.



HRSH250-A

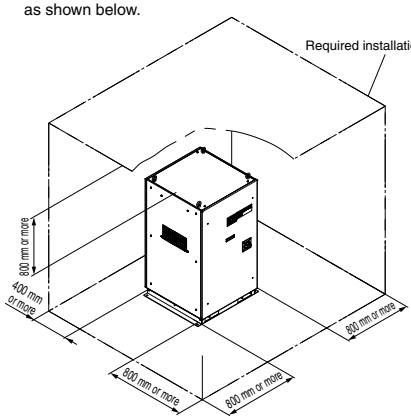
3. If it is impossible to exhaust heat from the installation area indoors, or when the installation area is conditioned, provide a duct for heat exhaustion to the air outlet port of this product for ventilation. Do not mount the inlet of the duct (flange) directly to the air vent of the product, and keep a space larger than the diameter of the duct. Additionally, consider the resistance of the duct when making the air vent port for the duct.

<Heat radiation amount/Required ventilation rate>

Model	Heat radiation amount [kW]	Required ventilation rate [m³/min]	
		Differential temp. of 3°C between inside and outside of installation area	Differential temp. of 6°C between inside and outside of installation area
HRSH100-A□-□	Approx. 18	305	155
HRSH150-A□-□	Approx. 29	490	245
HRSH200-A□-□	Approx. 35	590	295
HRSH250-A□-□	Approx. 44	730	365

<Water-cooled refrigeration>

When installing the product, keep the space for maintenance as shown below.



Piping

⚠ Caution

1. Regarding the circulating fluid and facility water pipings, consider carefully the suitability for temperature, circulating fluid and facility water.

If the operating performance is not sufficient, the pipings may burst during operation. 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 drain port of this product, use a pipe wrench to clamp the connection ports.

4. Supply water pressure to the automatic fluid fill port of this product should be 0.2 to 0.5 MPa.

This product has a built-in ball (float) tap. If you attach it to the faucet of a sink etc. it will automatically supply water to the rated fluid level of the tank (halfway between HIGH and LOW.) If the water supply pressure is too high, the pipes may burst during use. Proceed with caution.

5. Ensure that piping is connected to the overflow port so that the circulating fluid can be exhausted to the drainage pit when the fluid level in the tank increases.

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

7. 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.

Series HRSH
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

Electrical Wiring

⚠ Warning

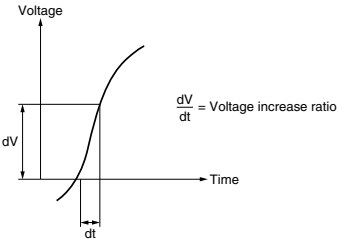
Grounding should never be connected to a water line, gas line or lightning rod.

⚠ Caution

1. Power supply and communication cables should be prepared by user.

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

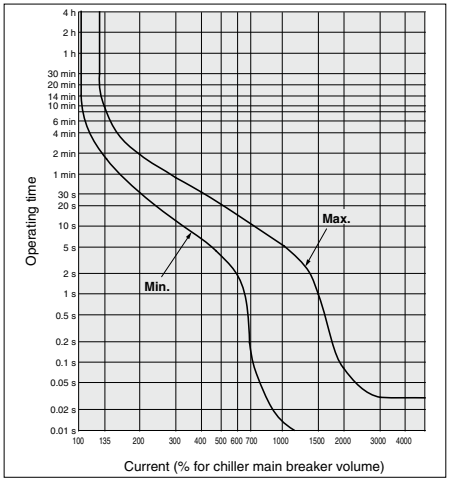
If the voltage increase ratio (dV/dt) at the zero cross should exceed 40 V/200 μsec., it may result in malfunction.



<For 400 V type and option B [With earth leakage breaker]>

3. This product is installed with a breaker with the following operating characteristics.

For the user's equipment (inlet side), use a breaker whose operating time is equal to or longer than the breaker of this product. If a breaker with shorter operating time is connected, the user's equipment could be cut off due to the inrush current of the motor of this product.



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. When deionized water is used, the electric conductivity should be 1 μS/cm or higher (Electric resistivity: 1 MΩ·cm or lower).

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
HRSH100-W□-□	Approx. 20	Refer to "Facility water system" in the specifications on pages 946 and 948.
HRSH150-W□-□	Approx. 27	
HRSH200-W□-□	Approx. 34	
HRSH250-W□-□	Approx. 40	

Series HRSH
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

Facility Water Supply

⚠ Warning

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. Set the supply pressure between 0.3 to 0.5 MPa. Ensure a pressure difference at the facility water inlet/outlet of 0.3 MPa or more.
If the supply pressure is high, it will cause water leakage. If the supply pressure and pressure difference at the facility water inlet/outlet is low, it will cause an insufficient flow rate of the facility water, and poor temperature control.

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 35°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 the machine has stopped, make sure to turn off the breaker of the user's equipment (on the upstream side).

Operation Restart Time

⚠ Caution

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

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 over 45°C.
• Ventilation hole is clogged with dust or dirt.

Maintenance

⚠ Caution

<Periodical inspection every one month>
Clean the ventilation hole.
If the dustproof filter of water-cooled type product 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>
Inspect the circulating fluid.
1. When using tap water or deionized water
• Replacement of circulating fluid
Failure to replace the circulating fluid can lead to the development of bacteria or algae. Replace it regularly depending on your usage conditions.
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 and facility water freezing when the product is stopped, release the circulating fluid and facility water in advance.

2. Consult a professional.
This product has an "anti-freezing function", "warming-up function", and "anti-snow coverage function". Read the Operation Manual carefully, and if any additional anti-freezing function (e.g. tape heater) is needed, ask for it from the vendor.