Circulating Fluid Temperature Controller

Thermo-chiller

Environmentally Resistant Type

New

CE RoHS

Protection of the electrical unit: IP54

Resistant to dusty or water splashing environment

Metal panel

- Entire exterior surface is metal.
- Stainless steel panel can be selected. (Option)

Large capacity tank (12 L)

- Increase in circulating fluid recovery volume (Option)

Compact (W377 x H615 x D500)

Temperature stability: ±0.1°C

Ambient temperature: 5 to 45°C

With heating function

Environmentally friendly R410A as refrigerant

Stainless steel panel specification (Option)

Model	Cooling capacity (60 Hz)	Temperature stability	Set temperature range
HRS018-R	1900 W	±0.1°C	5 to 40°C
HRS030-R	2900 W		

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

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

HRS-R Series

SMC

CAT.ES40-67A

Protection of the electrical unit: IP54

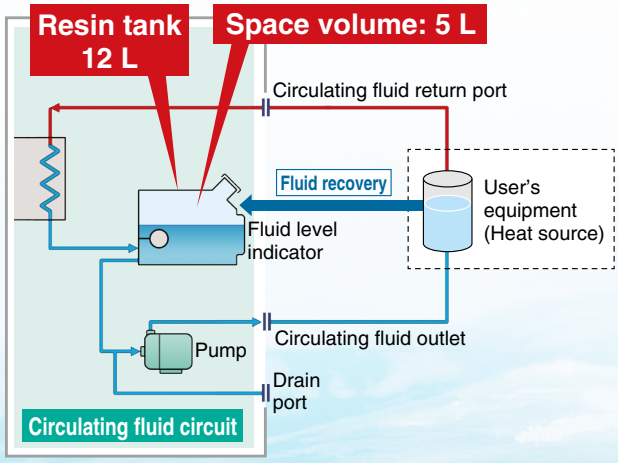
Board and electric parts are inside of the electrical box.
Protected from particles
and water splash

Entire panel is metal.

Standard Stainless steel (Option)

Large capacity tank is available. (Option)

For easier maintenance, the tank capacity for the return circulating fluid from the customer has been increased. From the High level line, an extra 5 litters of circulating fluid can be contained.

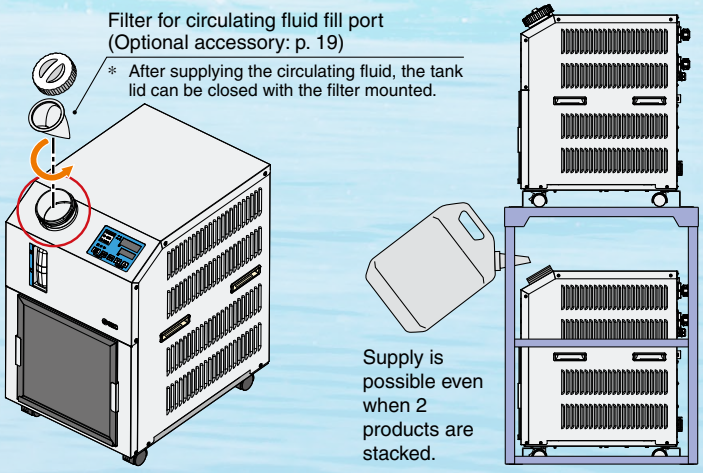


Easy cleaning of the tank

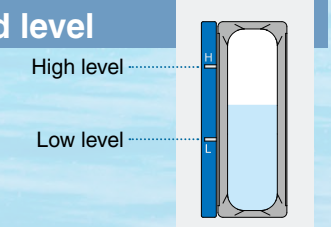
An opening (with a cap) for cleaning the tank is included separately from the circulating fluid fill port.
Opening diameter: ø110

Shaped for easy supply of circulating fluid

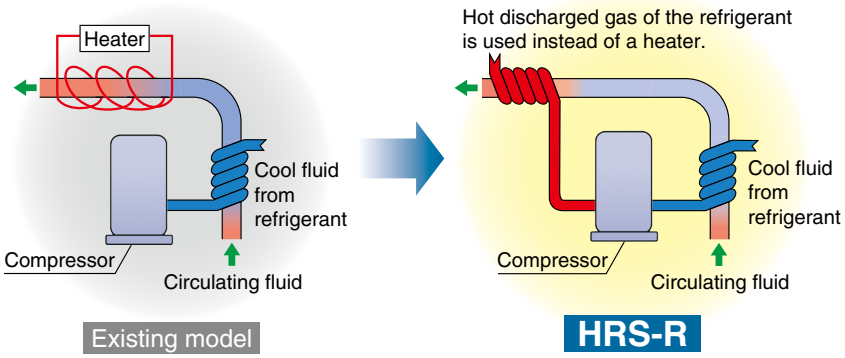
The angled supply port facilitates the easy supply of circulating fluid.



Easy to check the circulating fluid level

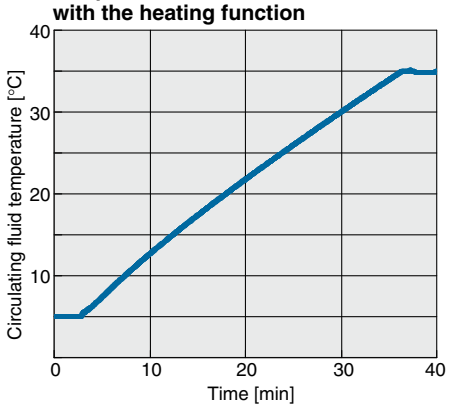


With heating function

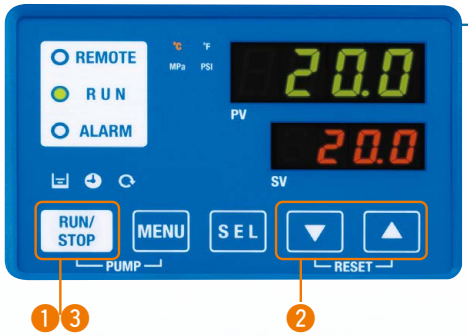


∗ This is just an example diagram.

Temperature increase with the heating function



Simple operation



Step 1 Press the RUN/STOP key.

Step 2 Adjust the temperature setting with the ▼/▲ keys.

Step 3 Press RUN/STOP key to stop operation.

Easy operation

Large digital display

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

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

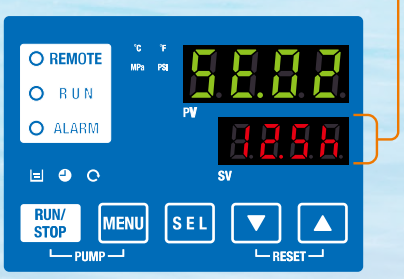
Timer operation function

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

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

Ex. SE.02 "ON timer"

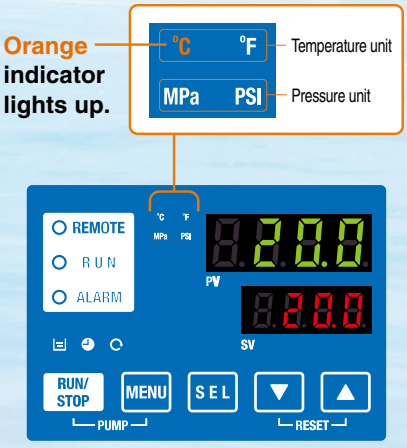
Timer The time remaining can be checked.



Unit conversion function

Temperature and pressure units can be changed.

Orange indicator lights up.



Power failure auto-restart function

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

Anti-freezing operation function

If the circulating fluid approaches its freezing point, for example, on a cold winter night, the pump operates automatically, and the heat generated by the pump warms the circulating fluid, preventing freezing.

Key-lock function

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

Function to output a signal for completion of preparation

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

Independent operation of the pump

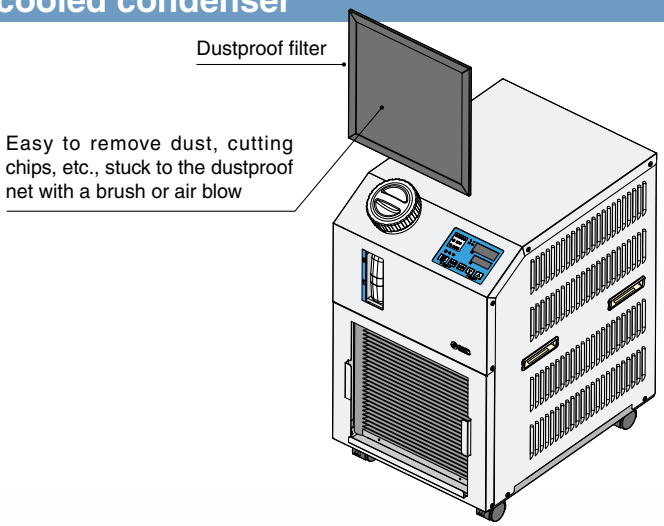
The pump can be operated independently while the chiller is powered off. This allows you to check for leakages in piping and to remove the air.

Reduced maintenance hours for the pump

Now with a magnet pump

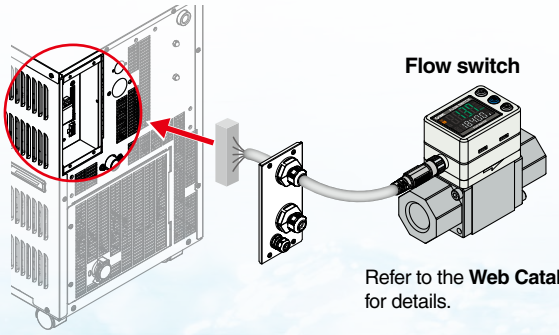
Due to the adoption of a sealless pump, no external leakage of the circulating fluid occurs. Also, periodic checking for pump leakage and replacement of the mechanical seal are not necessary.

Toolless inspection and cleaning of air-cooled condenser



Power supply (24 VDC) available

Power can be supplied from the connector on the rear side of the HRS-R to external switches, etc.



Refer to the **Web Catalog** for details.

Particle filter set

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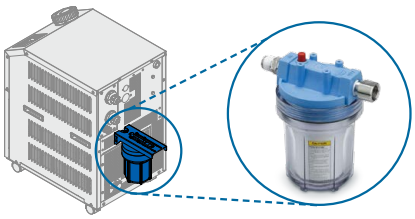


Removes foreign matter in the circulating fluid
Effective in preventing foreign matter from entering the user's equipment and chiller

· Prevents pump malfunction

Variations

Model		Cooling method	Cooling capacity [W] (50/60 Hz)	Single-phase 200 to 230 VAC (50/60 Hz)	Option p. 15	Optional accessories p. 16	International standards
	**HRS018-R**	Air-cooled refrigeration	1700/1900	●	· With automatic fluid fill function · Large capacity tank specification · Stainless steel panel specification · SI unit only	· Anti-quake bracket · Piping conversion fitting · Concentration meter · Bypass piping set · Particle filter set · Dustproof filter · Separately-installed power transformer · Filter for circulating fluid fill port	CE
	HRS030-R		2500/2900	●			

Self-diagnosis function and check display

Display of 31 types of alarm codes For details, refer to page 13.

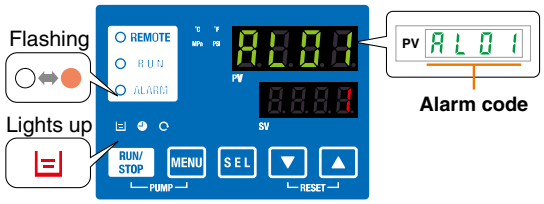
Operation is monitored at all times by the integrated sensor.
Should any error occur, the self-diagnosis result is displayed by the applicable alarm code (31 types).
This makes it easier to identify the cause of the alarm. Can be used before requesting service

Changeable alarm set values

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

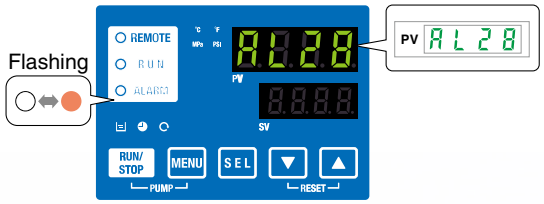
*1 Set values vary depending on the model.

Ex. AL01 "Low level in tank"



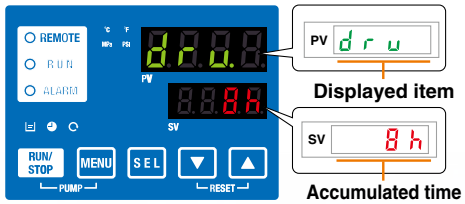
Alarm codes can be used for the notification of upcoming recommended maintenance.
The codes notify you when it's time to check the pump and fan motor. Helpful for facility maintenance

Ex. AL28 "Pump maintenance"



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

Ex. drv. "Accumulated operating time"



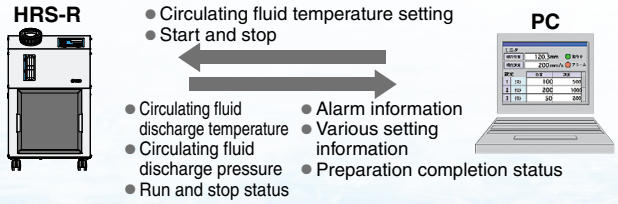
Displayed item
Circulating fluid outlet temperature
Circulating fluid return temperature
Compressor gas temperature
Circulating fluid outlet pressure
Compressor gas discharge pressure
Compressor gas return pressure
Accumulated operating time
Accumulated operating time of pump
Accumulated operating time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

Communication function

Serial communication (RS232C/RS485) and contact I/Os (2 inputs and 3 outputs) are equipped as standard. This allows for communication with the user's equipment and system construction, depending on the application. A 24 VDC output can be also provided and is available for use with flow switches (SMC's PF3W, etc.).

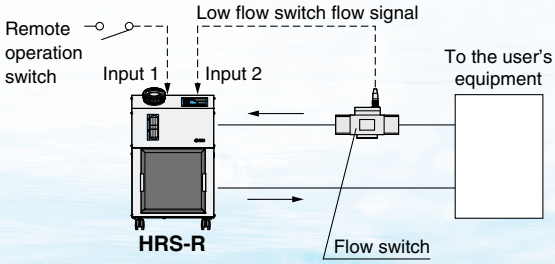
Ex. 1 Remote signal I/O through serial communication

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



Ex. 2 Remote operation signal input

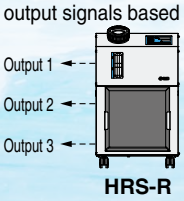
One of the contact inputs is used for remote operation and the other is used to monitor the flow of a flow switch. This is where their alarm outputs are taken in.



Power for flow switches (24 VDC) can be supplied by the thermo-chiller.

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

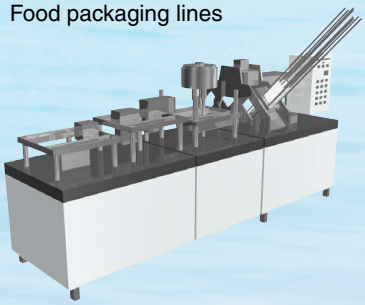
The alarm and status generated in the product are assigned to 3 output signals based on their contents, which can then be output.



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

Application Examples

Food packaging lines



Machining centers

Global Supply Network

SMC has a comprehensive network in the global market.

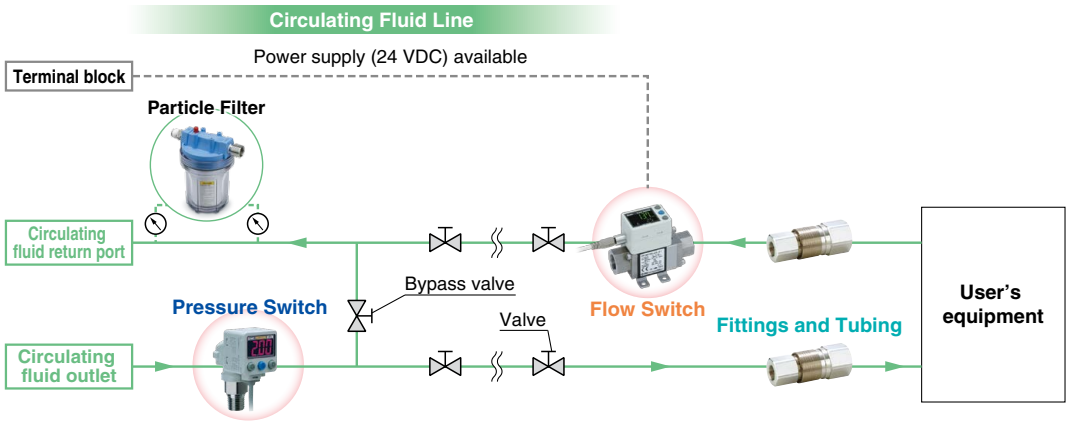
We now have a presence of more than 500 branch offices and distributors in 83 countries and regions worldwide, such as Asia, Oceania, North/Central/South America, and Europe. With this global network, we are able to provide a global supply of our substantial range of products and high-quality customer 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 according to the users' requirements.

Series	Temperature stability [°C]	Set temperature range [°C]	Cooling capacity [kW]													Environment	International standards
			1.2	1.8	2.4	3	4	5	6	9	10	15	20	25	28		
 **HRSE** **Basic type**	±2.0	10 to 30	●	●	●											Indoor use	CE (Only 230 VAC type)
 **HRS** **Standard type**	±0.1	5 to 40	●	●	●	●	●	●	●							Indoor use	CE (Only 60 Hz)
 **HRS-R** **Environmentally resistant type**	±0.1	5 to 40		●		●										Indoor use Electrical box IP54	CE
 **HRS090** **Standard type**	±0.5	5 to 35								●						Indoor use	CE (400 V as standard)
 **HRS100/150** **Standard type**	±1.0	5 to 35									●	●				Outdoor installation IPX4	CE (400 V as standard)
 **HRSH090** **Inverter type**	±0.1	5 to 40								●						Indoor use	CE (400 V as standard, 200 V as an option) (Only 200 V as an option)
 **HRSH** **Inverter type**	±0.1	5 to 35									●	●	●	●	●	Outdoor installation IPX4	CE (400 V as standard, 200 V as an option) (Only 200 V as an option)

Circulating Fluid/Facility Water Line Equipment

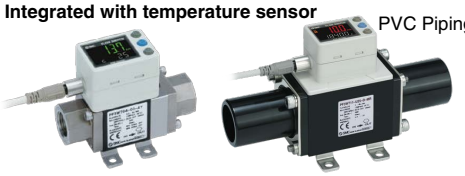


For the control of pressure and flow rate:
The digital display makes these aspects **visible**.

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

Refer to the **Web Catalog** for details.

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



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

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

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

Refer to the **Web Catalog** for details.

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

Pressure Sensor for General Fluids ***PSE56□, 57□***
Pressure Sensor Controller ***PSE200, 300, 300AC***

Particle Filter

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Fittings and Tubing

Refer to the **Web Catalog** 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

HRS-R Series Environmentally Resistant Type

Stainless steel panel specification (Option)

Thermo-chiller HRS-R Series

Options

Optional Accessories

Cooling Capacity Calculation

Thermo-chiller Environmentally Resistant Type
Single-phase 200 to 230 VAC CE
HRS-R Series

RoHS

Stainless steel panel specification (Option)

How to Order

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

Cooling capacity

018	Cooling capacity 1700/1900 W (50/60 Hz)
030	Cooling capacity 2500/2900 W (50/60 Hz)

Cooling method

A	Air-cooled refrigeration

Pipe thread type

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

Power supply

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

Option

Symbol	Description
Nil	None
J	With automatic fluid fill function
L	Large capacity tank specification
V	Stainless steel panel specification
W	SI unit only

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

Environmentally resistant type

R	Environmentally resistant type

Specifications

∗ There are different values from standard specifications. Refer to page 15 for details.

Model			HRS018-A□-20-□-R	HRS030-A□-20-□-R
Cooling method			Air-cooled refrigeration	
Refrigerant			R410A (HFC)	
Refrigerant charge		[kg]	0.39	
Control method			PID control	
Ambient temperature/Humidity/Altitude∗1		[°C]	Temperature: 5 to 45°C, Humidity: 30 to 70%, Altitude: less than 3000 m	
Circulating fluid system	**Circulating fluid**∗2		Tap water, 15% ethylene glycol aqueous solution∗4	
	Set temperature range∗1	[°C]	5 to 40	
	Cooling capacity∗3 **(50/60 Hz)**	[W]	1700/1900	2500/2900
	Heating capacity∗3 **(50/60 Hz)**	[W]	430/540	430/540
	Temperature stability∗5	[°C]	±0.1	
	Pump **Rated flow**∗6, 7 **(50/60 Hz)**	[L/min]	7 (0.13 MPa)/7 (0.18 MPa)	
	Pump **Maximum flow rate (50/60 Hz)**	[L/min]	27/29	
	Pump **Maximum pump head (50/60 Hz)**	[m]	14/19	
	Pump **Output**	[W]	200	
	Tank capacity	[L]	Approx. 5	
	Port size		Rc1/2	
	Fluid contact material		Stainless steel, Copper (Heat exchanger brazing), Bronze, Alumina ceramic, Carbon, PP, PE, POM, FKM, EPDM, PVC	
Electrical system	**Power supply**		Single-phase 200 to 230 VAC (50/60 Hz) Allowable voltage range ±10%	
	Applicable earth leakage breaker capacity∗8	[A]	10	
	Rated operating current	[A]	5.1/5.6	5.4/6.1
	Rated power consumption∗3 **(50/60 Hz)**	[kVA]	1.0/1.1	1.1/1.2
	Electrical box protection level		IP54 (Cable entry: IP67)	
Noise level∗9 **(50/60 Hz)**		[dB]	62/65	
Accessories			Fitting (for drain outlet) 1 pc., Input/output signal connector 1 pc., Operation Manual (for installation/operation) 1, Alarm code list sticker 1, Ferrite core (for communication) 1 pc. The power supply cable should be prepared by the user.	
Weight∗10		[kg]	45	

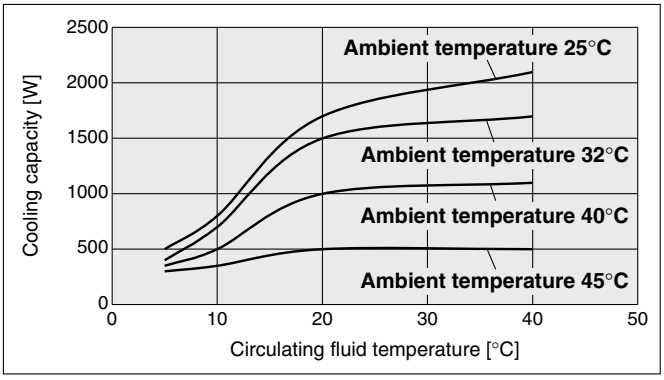
∗1 It should have no condensation.
∗2 If tap water is used, use water that conforms to Water Quality Standards of the Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994 cooling water system - circulating type - make-up water).
∗3 ① Ambient temperature: 25°C, ② Circulating fluid temperature: 20°C, ③ Circulating fluid rated flow, ④ Circulating fluid: Tap water
Refer to the cooling capacity graph on page 10 for details.
∗4 Use a 15% ethylene glycol aqueous solution if operating in a place where the circulating fluid temperature is 10°C or less.
∗5 Temperature at the thermo-chiller outlet when the circulating fluid flow is rated flow, and the circulating fluid outlet and return port are directly connected. Installation environment and the power supply are within specification range and stable.
∗6 The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.
∗7 Required minimum flow rate for maintaining the cooling capacity or temperature stability
The specification of the cooling capacity and the temperature stability may not be satisfied if the flow rate is lower than the rated flow. (In such a case, use a bypass piping set (sold separately).)
∗8 Purchase an earth leakage breaker with current sensitivity of 30 mA separately.
∗9 Front: 1 m, height: 1 m, stable with no load, Other conditions → See ∗3.
∗10 Weight in the dry state without circulating fluids

Cooling Capacity

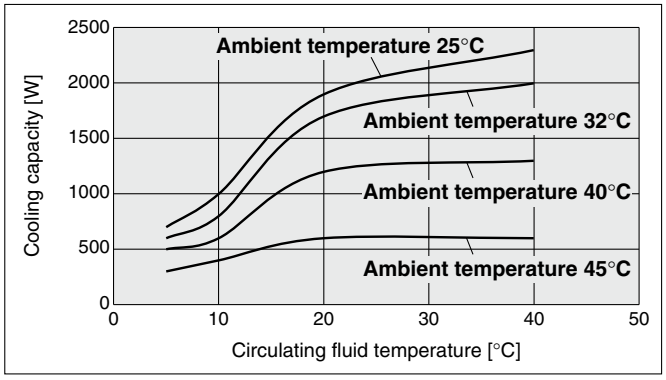
∗ If the product is used at altitude of 1000 m or higher, refer to “Operating Environment/Storage Environment” (page 23) Item 14 “∗ For altitude of 1000 m or higher.”

HRS018-A□-20-□-R

[50 Hz]

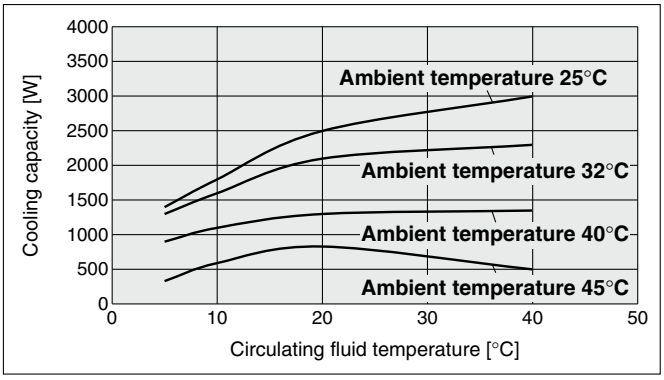


[60 Hz]

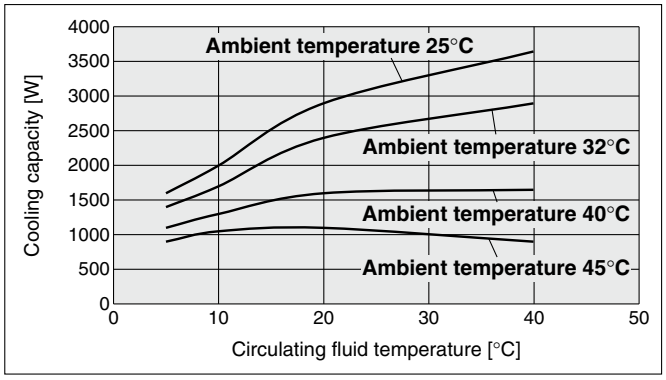


HRS030-A□-20-□-R

[50 Hz]



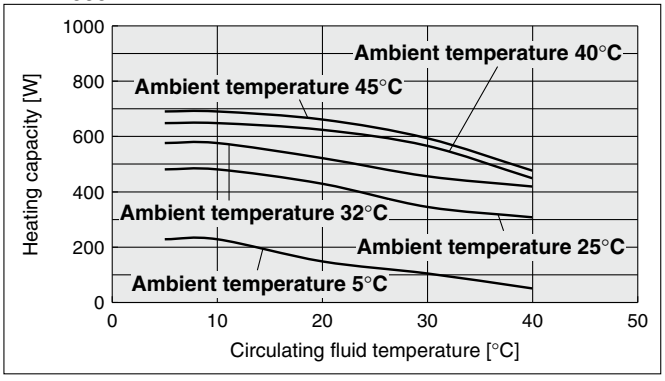
[60 Hz]



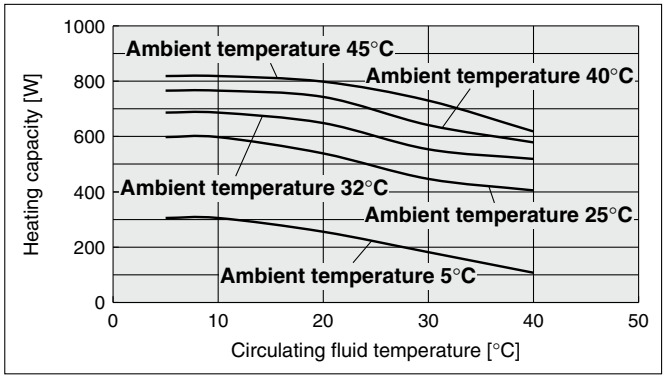
Heating Capacity

HRS$^{018}_{030}$-A-20-R

[50 Hz]

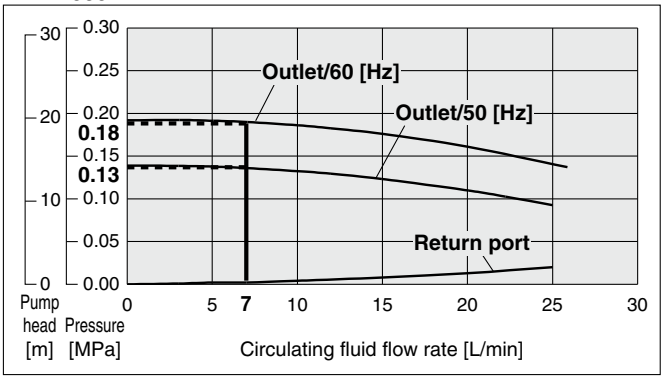


[60 Hz]



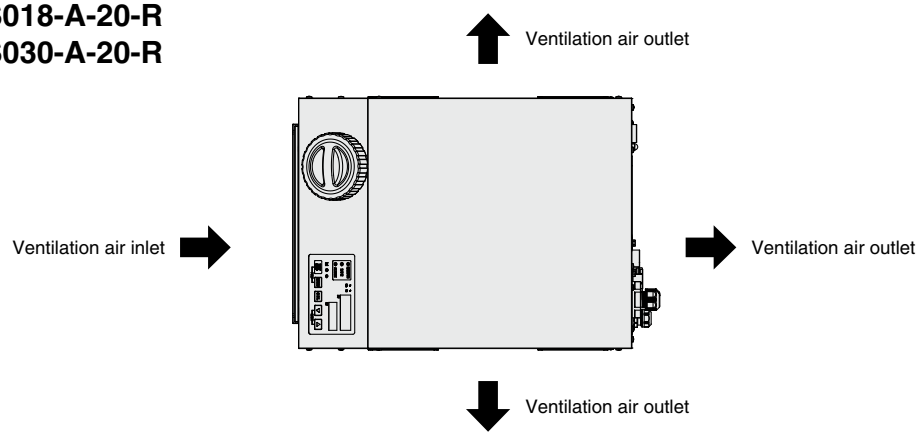
Pump Capacity

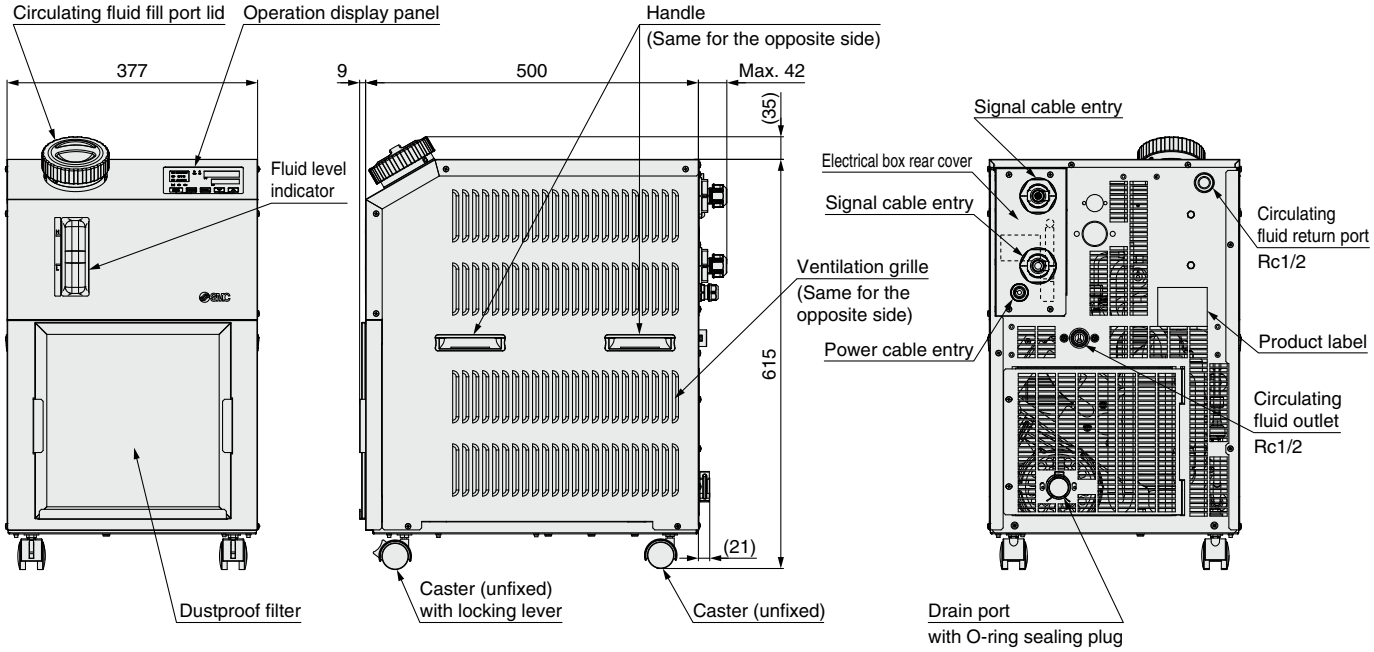
HRS$^{018}_{030}$-A-20-R (Single-phase 200 to 230 VAC)



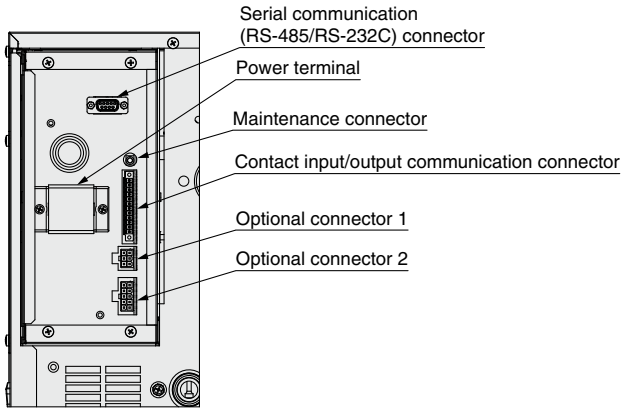
Dimensions

HRS018-A-20-R
HRS030-A-20-R



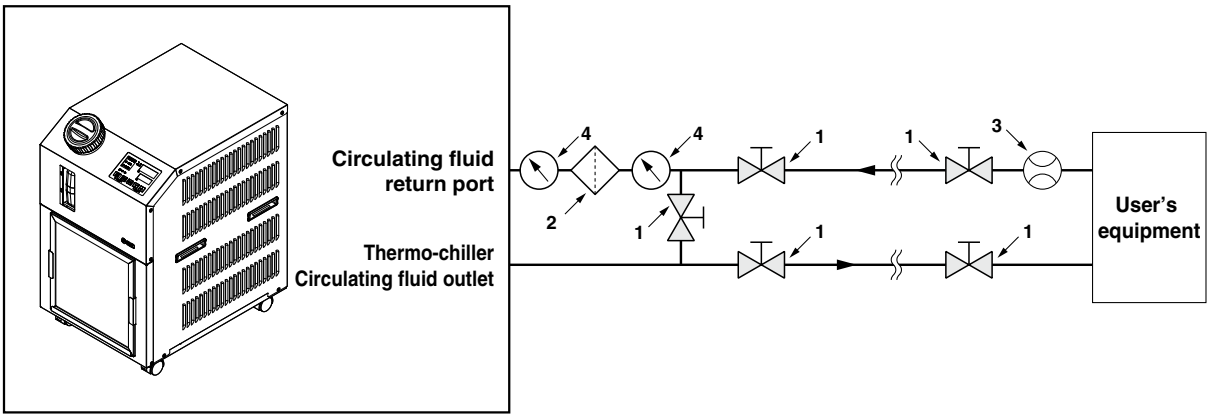


Connection for the power cable and signal cable
(The figure does not include the electrical box rear cover.)



Recommended External Piping Flow

External piping circuit is recommended as shown below.



No.	Description	Size	Recommended part no.	Note
1	Valve	Rc1/2	—	—
2	Filter	Rc1/2 20 μm	HRS-PF□□□	If foreign matter with a size of 20 μm or more are likely to enter, install the particle filter. For the recommended filter, refer to the optional accessory HRS-PF□□□ (page 18).
3	Flow meter	0 to 50 L/min	—	—
4	Pressure gauge	0 to 1.0 MPa	—	—
5	Others (pipe, hose, etc.)	ø15 or more	—	—

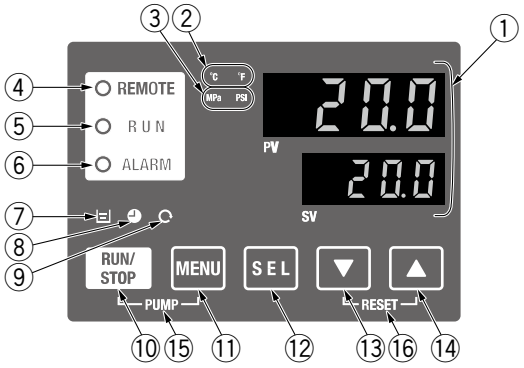
Cable Specifications

Power Cable Specifications

Applicable model	Rated value for thermo-chiller			Power cable example	
	Power supply	Applicable breaker rated current	Terminal block screw diameter	Cable size	Recommended crimped terminal
HRS018-A□-20-R **HRS030-A□-20-R**	Single-phase 200 to 230 VAC (50/60 Hz)	10 A	M3.5	3 cores x 2.0 mm^2 (3 cores x AWG 14) ∗ Including grounding cable Sheath O.D.: ø8.5 to ø11.5	R2-3.5

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, 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 display temperature (default setting: °C).	
③	**[MPa] [PSI] lamp**	Equipped with a unit conversion function. Displays the unit of display 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, is provided. Lights up when this function is operated.	
⑩	**[RUN/STOP] key**	Makes the product start or stop.	
⑪	**[MENU] key**	Shifts the main menu (display screen of circulating fluid discharge temperature and pressure) and other menus (for monitoring and entry of set values).	
⑫	**[SEL] key**	Changes the item in menu and enters the set value.	
⑬	**[▼] key**	Decreases the set value.	
⑭	**[▲] key**	Increases the set value.	
⑮	**[PUMP] key**	Press the [MENU] and [RUN/STOP] keys simultaneously. The pump starts running independently to make the product ready for start-up (release the air).	
⑯	**[RESET] key**	Press the [▼] and [▲] keys simultaneously. The alarm buzzer is stopped and the [ALARM] indicator is reset.	

Alarm

This unit has 31 types of alarms as standard, and displays each of them by its alarm code on the PV screen with the [ALARM] lamp ([LOW LEVEL] lamp) lit up on the operation display panel. The alarm can be read out through communication.

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

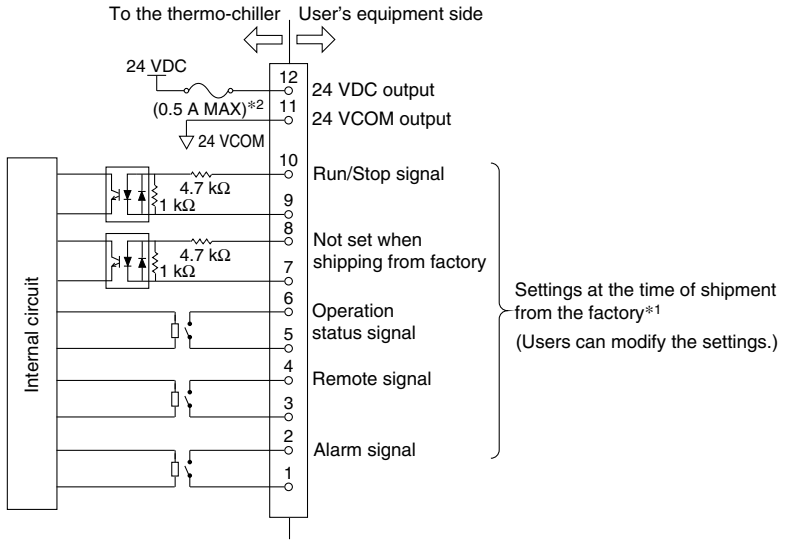
Alarm code	Alarm message	Operation status
AL18	Compressor overload	Stop
AL19*2	Communication error*2	Continue*1
AL20	Memory error	Stop
AL21	DC line fuse cut	Stop
AL22	Circulating fluid discharge temperature sensor failure	Stop
AL23	Circulating fluid return temperature sensor failure	Stop
AL24	Compressor intake temperature sensor failure	Stop
AL25	Circulating fluid discharge pressure sensor failure	Stop
AL26	Compressor discharge pressure sensor failure	Stop
AL27	Compressor intake pressure sensor failure	Stop
AL28	Pump maintenance	Continue
AL29	Fan motor maintenance	Continue
AL30	Compressor maintenance	Continue
AL31*2	Contact 1 input signal detection	Stop*1
AL32*2	Contact 2 inputs signal detection	Stop*1

*1 "Stop" or "Continue" are default settings. Users can change them to "Continue" and "Stop". For details, refer to the Operation Manual.
*2 "AL19, AL31, AL32" are disabled in the default setting. If this function is necessary, it should be set by the user, referring to the Operation Manual.

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

Communication Functions

Contact Input/Output

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

*1 The pin numbers and output signals can be set by the user. For details, refer to the Operation Manual.
*2 When using with optional accessories, depending on the accessory, the allowable current of 24 VDC devices will be reduced. Refer to the Operation Manual of the optional accessories for details.

Serial Communication

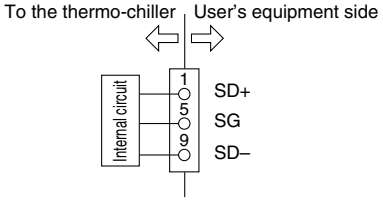
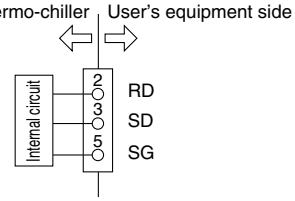
The serial communication (RS-485/RS-232C) enables the following items to be written and read out.
For details, refer to the Operation Manual for communication.

Writing

Run/Stop
Circulating fluid temperature setting (SV)

Readout

Circulating fluid present temperature
Circulating fluid discharge pressure
Status information
Alarm occurrence information

Item	Specifications	
Connector type	D-sub 9-pin, Female connector (Mounting screw: M2.6 x 0.45)	
Protocol	Modicon Modbus compliant/Simple communication protocol	
Standards	EIA standard RS-485	EIA standard RS-232C
Circuit diagram		

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

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

HRS-R Series
Options

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

Option symbol

J With Automatic Fluid Fill Function

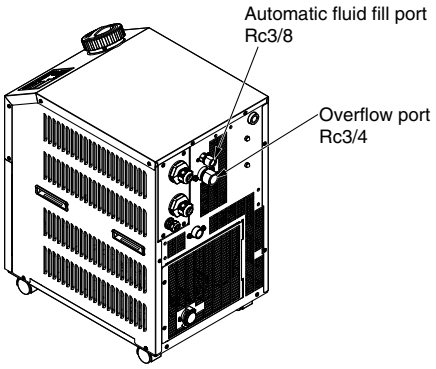
HRS□-A-20-J-R

With automatic fluid fill function

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

Applicable model	HRS018/030-A-20-J-R
Fluid fill method	Built-in solenoid valve for automatic fluid fill
Fluid fill pressure [MPa]	0.2 to 0.5

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



Option symbol

L Large Capacity Tank Specification

HRS□-A-20-L-R

Large capacity tank specification

Tank capacity: 12 L

* No change in external dimensions

Option symbol

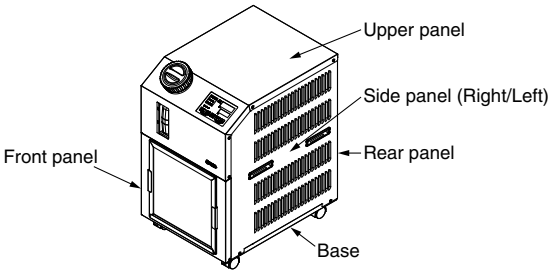
V Stainless Steel Panel Specification

HRS□-A-20-V-R

Stainless steel panel specification

Exterior panel material is stainless steel (hairline finish).

* No change in external dimensions



Option symbol

W SI Unit Only

HRS□-A-20-W-R

SI unit only

The circulating fluid temperature and pressure are displayed in SI units [MPa/°C] only.

If this option is not selected, a product with a unit selection function will be provided by default.

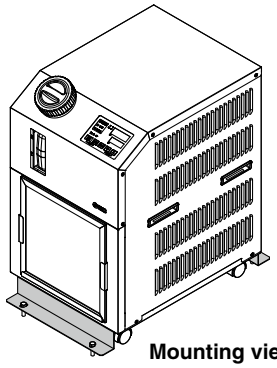
* No change in external dimensions

HRS-R Series
Optional Accessories

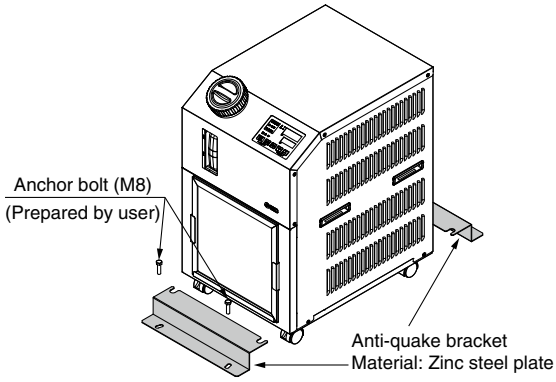
① Anti-Quake Bracket

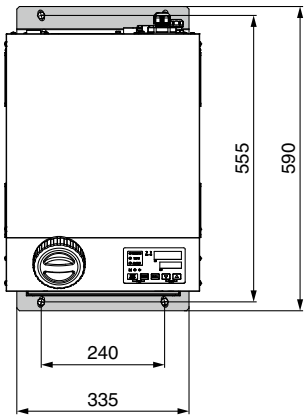
This bracket can be used to reduce product damage in the case of an earthquake. An anchor bolt (M8) suitable for the flooring material should be prepared separately by the user. (Anti-quake bracket thickness: 1.6 mm)

Part no. (per unit)	Applicable model
HRS-TK001	HRS018-A-20-□-R HRS030-A-20-□-R



Mounting view





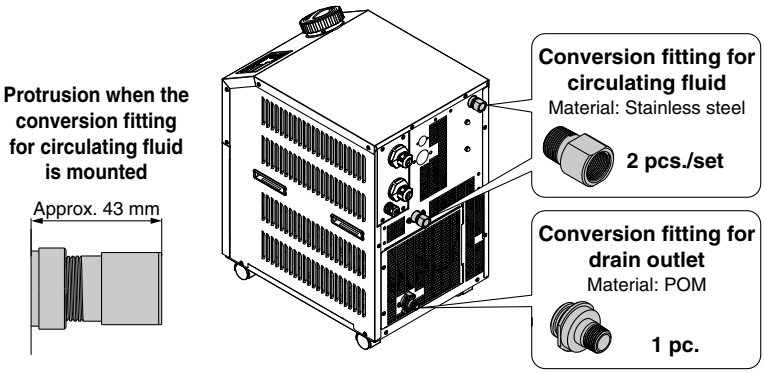
② Piping Conversion Fitting

■ Conversion fitting for circulating fluid + Conversion fitting for drain outlet
HRS018-A-20-□-R, HRS030-A-20-□-R

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

Part no.		Applicable model
HRS-EP001	G thread conversion fitting set	HRS018-A-20-□-R HRS030-A-20-□-R
HRS-EP002	NPT thread conversion fitting set	

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

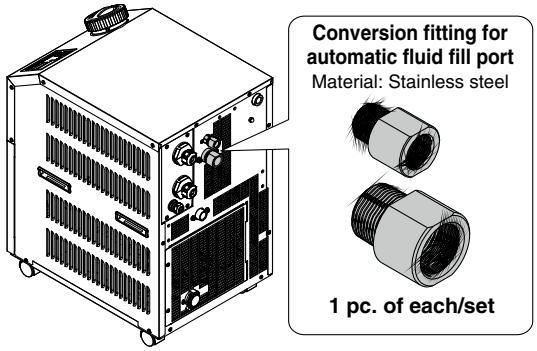


③ Piping Conversion Fitting (For Option)

■ Conversion fitting for automatic fluid fill port

This fitting changes the port size for the option, with automatic fluid fill function "-J" from Rc3/8, Rc3/4 to G3/8, G3/4 or NPT3/8, NPT3/4.
It is not necessary to purchase this when pipe thread type F or N is selected in "How to Order" since it is included in the product.

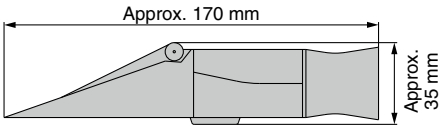
Part no.		Applicable model
HRS-EP005	G thread conversion fitting set	HRS018-A-20-J-R HRS030-A-20-J-R
HRS-EP006	NPT thread conversion fitting set	



④ Concentration Meter

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

Part no.	Applicable model
HRZ-BR002	HRS018-A-20-□-R HRS030-A-20-□-R



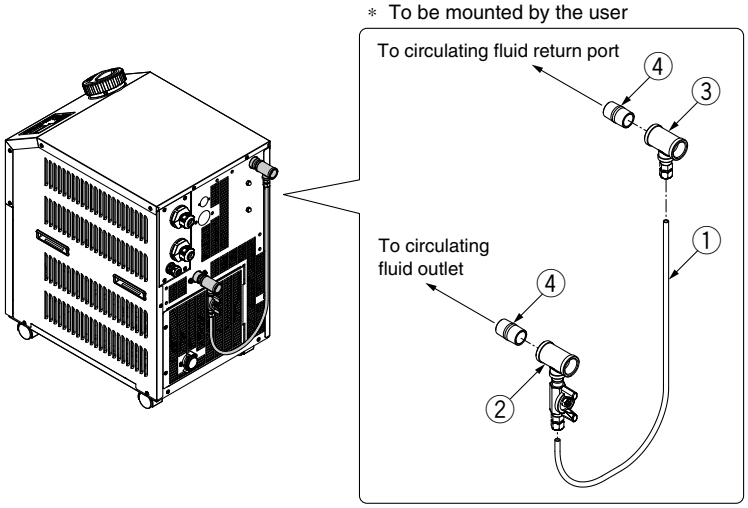
⑤ Bypass Piping Set

When the circulating fluid goes below the rated flow (7 L/min), cooling capacity will be reduced and the temperature stability will be badly affected. In such a case, use the bypass piping set.

Part no.	Applicable model
HRS-BP001	HRS018-A-20-□-R HRS030-A-20-□-R

Parts List

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



⑥ Particle Filter Set

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

HRS−PF001−W075−H
PF003

Filtration

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

Accessory

Symbol	Accessory
Nil	None
H	With handle

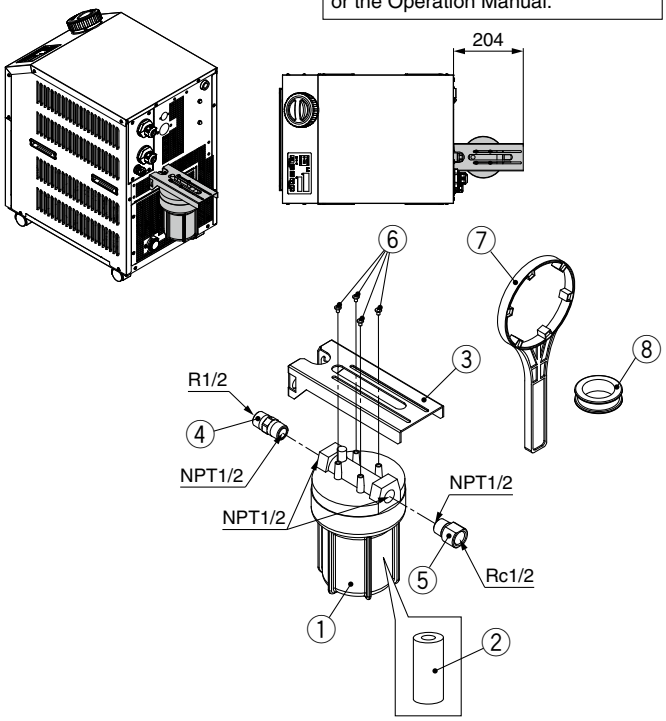
■ For circulating fluid outlet

[Used to protect user's equipment]

Part no.	Applicable model
HRS-PF001 (Element length L = 125 mm)	HRS018-A-20-□-R HRS030-A-20-□-R

Mounting view

The following reference drawing shows the HRS-PF001 mounted on the HRS018.
For details, refer to the dimensions or the Operation Manual.



■ For circulating fluid return port

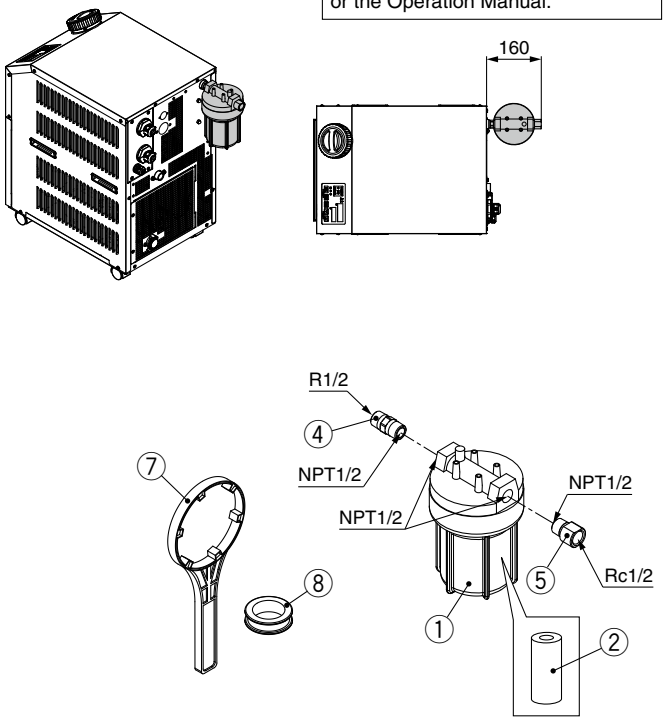
[Used to protect thermo-chiller]

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

Part no.	Applicable model
HRS-PF003 (Element length L = 125 mm)	HRS018-A-20-□-R HRS030-A-20-□-R

Mounting view

The following reference drawing shows the HRS-PF003 mounted on the HRS018.
For details, refer to the dimensions or the Operation Manual.



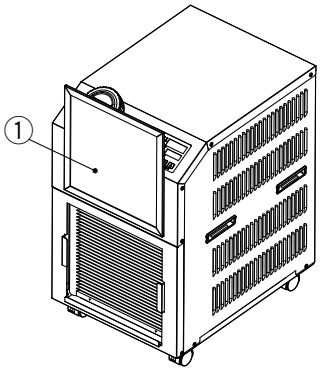
Parts List

No.	Model	Description	Fluid contact material	Qty.	Note
①	—	Body	PP	1	—
②	EJ202S-005X11	Element (Length L = 125 mm)	PP/PE	1	The product should be replaced when the pressure drop reaches 0.1 MPa.
	EJ202S-075X11			1	
③	—	Particle filter bracket	—	1	For HRS-PF001
④	—	Nipple	Stainless steel	1	Conversion from R to NPT
⑤	—	Extension piece	Stainless steel	1	Conversion from NPT to Rc
⑥	—	Tapping screw	—	4	—
⑦	—	Handle	—	1	When -H is selected
⑧	—	Sealant tape	PTFE	1	—

⑦ Dustproof Filter

A disposable dustproof filter is mounted on the front panel.

Part no.	Applicable model
HRS-FL003	HRS018-A-20-□-R HRS030-A-20-□-R



Parts List

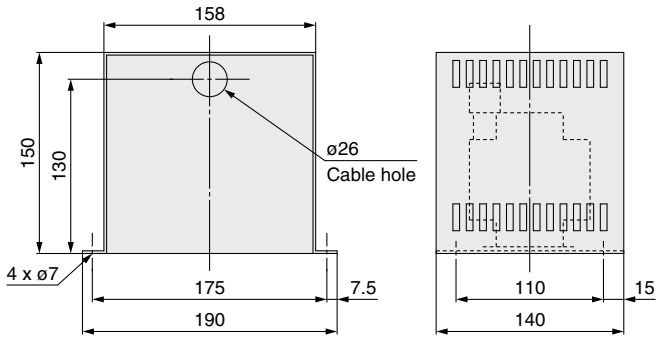
No.	Description	Part no.	Note
①	Dustproof filter	HRS-FL003	Size: 295 x 295 (5 filters per set)

⑧ Separately-Installed Power Transformer

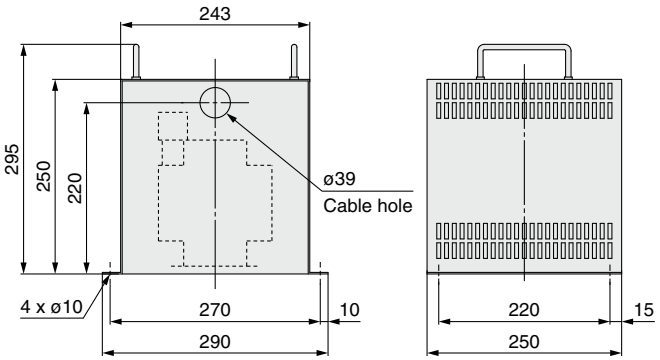
Specifications

Part no.	Applicable model	Volume	Type	Inlet voltage		Outlet voltage	
				50 Hz	60 Hz	50 Hz	60 Hz
IDF-TR2000-9	HRS018-A-20 HRS030-A-20	2 kVA	Single-phase	—	240 VAC	—	200, 220 VAC
IDF-TR2000-10				380, 400, 415 VAC	380 to 400, 400 to 415, 415 to 440 VAC	200 VAC	
IDF-TR2000-11				440, 460 VAC	440 to 460, 460 to 500 VAC		

IDF-TR2000-9



IDF-TR2000-10, 11

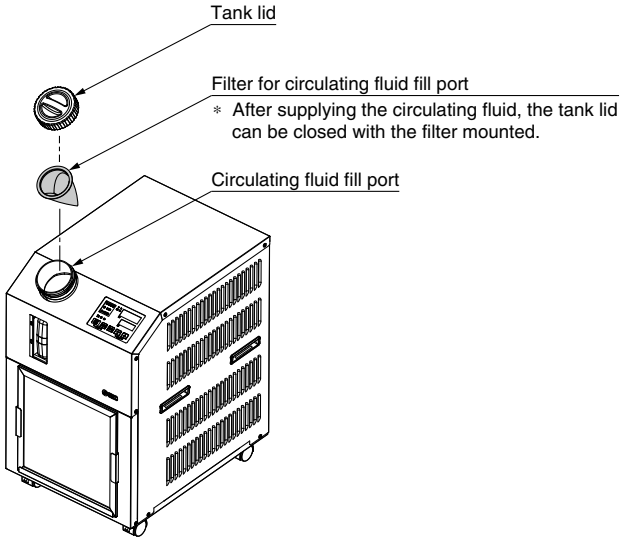


⑨ Filter for Circulating Fluid Fill Port

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

■ Filter for circulating fluid fill port
HRS-PF007

Material	Stainless steel 304, Stainless steel 316
Mesh size	200

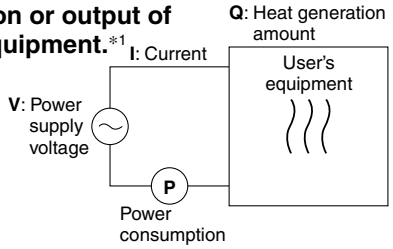


HRS-R Series
Cooling Capacity Calculation

Required Cooling Capacity Calculation

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

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



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

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

Q = P = 1000 [W]

Cooling capacity = Considering a safety factor of 20%,

1000 [W] x 1.2 = 1200 [W]

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

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

Q = P = V x I x Power factor

In this example, using a power factor of 0.85:

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

Cooling capacity = Considering a safety factor of 20%,

850 [W] x 1.2 = 1020 [W]

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

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

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

In this example, using an efficiency of 0.7:

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

Cooling capacity = Considering a safety factor of 20%,

1143 [W] x 1.2 = 1372 [W]

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

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

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

Heat generation amount by user's equipment **Q**	: Unknown [W] ([J/s])
Circulating fluid	: Tap water∗1
Circulating fluid mass flow rate q_m	: (= ρ x q_v ÷ 60) [kg/s]
Circulating fluid density ρ	: 1 [kg/dm^3]
Circulating fluid (volume) flow rate q_v	: 10 [dm^3/min]
Circulating fluid specific heat **C**	: 4.2 x 10^3 [J/(kg·K)]
Circulating fluid outlet temperature T_1	: 293 [K] (20 [°C])
Circulating fluid return temperature T_2	: 295 [K] (22 [°C])
Circulating fluid temperature difference ΔT	: 2.0 [K] (= $T_2 - T_1$)
Conversion factor: minutes to seconds (SI units)	: 60 [s/min]

∗1 Refer to page 21 for the typical physical property value of tap water or other circulating fluids.

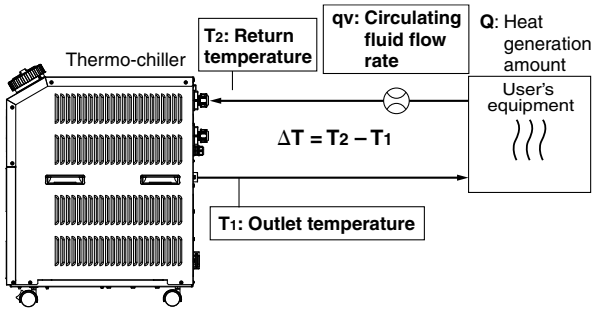
$$\mathbf{Q = q_m \times C \times (T_2 - T_1)}$$

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

$$\mathbf{= 1400\ [J/s] \approx 1400\ [W]}$$

Cooling capacity = Considering a safety factor of 20%,

1400 [W] x 1.2 = 1680 [W]



Example of conventional units (Reference)

Heat generation amount by user's equipment **Q**	: Unknown [cal/h] → [W]
Circulating fluid	: Tap water∗1
Circulating fluid weight flow rate q_m	: (= ρ x q_v x 60) [kgf/h]
Circulating fluid weight volume ratio γ	: 1 [kgf/L]
Circulating fluid (volume) flow rate q_v	: 10 [L/min]
Circulating fluid specific heat **C**	: 1.0 x 10^3 [cal/(kgf·°C)]
Circulating fluid outlet temperature T_1	: 20 [°C]
Circulating fluid return temperature T_2	: 22 [°C]
Circulating fluid temperature difference ΔT	: 2.0 [°C] (= $T_2 - T_1$)
Conversion factor: hours to minutes	: 60 [min/h]
Conversion factor: kcal/h to kW	: 860 [(cal/h)/W]

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

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

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

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

$$\mathbf{\approx 1400\ [W]}$$

Cooling capacity = Considering a safety factor of 20%,

1400 [W] x 1.2 = 1680 [W]

Required Cooling Capacity Calculation

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

Heat quantity by cooled substance (per unit time) **Q**: Unknown [W] ([J/s])
Cooled substance : Water
Cooled substance mass **m** : (= ρ x **V**) [kg]
Cooled substance density ρ : 1 [kg/L]
Cooled substance total volume **V** : 20 [dm^3]
Cooled substance specific heat **C** : 4.2 x 10^3 [J/(kg·K)]
Cooled substance temperature when cooling begins T_0 : 305 [K] (32 [°C])
Cooled substance temperature after t hour T_t : 293 [K] (20 [°C])
Cooling temperature difference ΔT : 12 [K] (= $T_0 - T_t$)
Cooling time Δt : 900 [s] (= 15 [min])

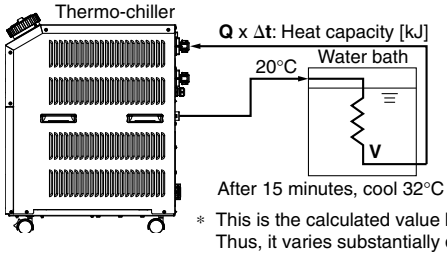
∗ Refer to the following for the typical physical property values by circulating fluid.

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

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

Cooling capacity = Considering a safety factor of 20%,

1120 [W] x 1.2 = 1344 [W]



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

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

Example of conventional units (Reference)

Heat quantity by cooled substance (per unit time) **Q**: Unknown [cal/h] → [W]
Cooled substance : Water
Cooled substance weight **m** : (= ρ x **V**) [kgf]
Cooled substance weight volume ratio γ : 1 [kgf/L]
Cooled substance total volume **V** : 20 [L]
Cooled substance specific heat **C** : 1.0 x 10^3 [cal/(kgf·°C)]
Cooled substance temperature when cooling begins T_0 : 32 [°C]
Cooled substance temperature after t hour T_t : 20 [°C]
Cooling temperature difference ΔT : 12 [°C] (= $T_0 - T_t$)
Cooling time Δt : 15 [min]
Conversion factor: hours to minutes : 60 [min/h]
Conversion factor: kcal/h to kW : 860 [(cal/h)/W]

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

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

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

Cooling capacity = Considering a safety factor of 20%,

1120 [W] x 1.2 = 1344 [W]

Precautions on Cooling Capacity Calculation

1. Heating capacity

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

2. Pump capacity

<Circulating fluid flow rate>

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

<Circulating fluid discharge pressure>

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

Circulating Fluid Typical Physical Property Values

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

Density ρ: 1 [kg/L] (or, using conventional units, weight volume ratio γ = 1 [kgf/L])
Specific heat **C**: 4.19 x 10^3 [J/(kg·K)] (or, using conventional units, 1 x 10^3 [cal/(kgf·°C)])

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

Water

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

15% Ethylene Glycol Aqueous Solution

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

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

HRS-R Series
Specific Product Precautions 1

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For temperature control equipment precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website: https://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 parts of circulating fluid.

The recommended circulating fluid is the tap water or 15% ethylene glycol aqueous solution. Using corrosive materials such as aluminum or iron for fluid contact parts such as piping may cause clogging or leakage in the circulating fluid circuit. Therefore, take sufficient care when selecting fluid contact part materials such as piping.

4. Design the piping so that no foreign matter enter the chiller.

If foreign matter such as scales in the piping enter the circulating fluid, this may cause the pump to malfunction.

Selection

⚠ Warning

1. Model selection

For selecting a model of thermo-chiller, it is required to know the heat generation amount of the user's equipment. Obtain the heat generation amount, referring to the "Cooling Capacity Calculation" on pages 20 and 21 before selecting a model.

Handling

⚠ Warning

1. Thoroughly read the Operation Manual.

Read the Operation Manual completely before operation, and keep the manual where it can be referred to as necessary.

Transportation/Carriage/Movement

⚠ Warning

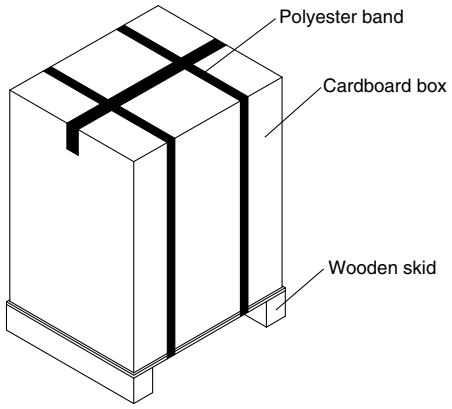
1. This product is heavy. Pay attention to safety and position of the product when it is transported, carried and moved.

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

⚠ Caution

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

The product will be delivered in the packaging shown below.



Model	Weight [kg]*1	Dimensions [mm]
HRS018-A-20-□-R **HRS030-A-20-□-R**	54	Height 790 x Width 470 x Depth 580

*1 For models with an option, the weights are increased as below.

Option symbol	Description	Additional weight
-J	With automatic fluid fill function	+1 kg
-L	Large capacity tank specification	+1 kg
-V	Stainless steel panel specification	No addition

HRS-R Series
Specific Product Precautions 2

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For temperature control equipment precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website: https://www.smcworld.com

Operating Environment/Storage Environment

⚠Warning

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

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

Altitude [m]	① Upper limit of ambient temperature [°C]	② Cooling capacity coefficient
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

15) In locations where strong impacts or vibrations occur
16) In locations where a massive force strong enough to deform the product is applied or the weight from a heavy object is applied
17) In locations where there is not sufficient space for maintenance
18) Environment in which the product is exposed to particles or water splash that is higher than IP54

Operating Environment/Storage Environment

⚠Warning

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

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

3. Conduct ventilation and cooling to discharge heat.

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

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

Mounting/Installation

⚠Warning

1. Do not use the product outdoors.

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

The external panel can be deformed and danger can result.

⚠Caution

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

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

This product cannot be directly installed on the floor as some screws come out from the bottom of the product.
• HRS018/030-R 10 mm

HRS-R Series
Specific Product Precautions 3

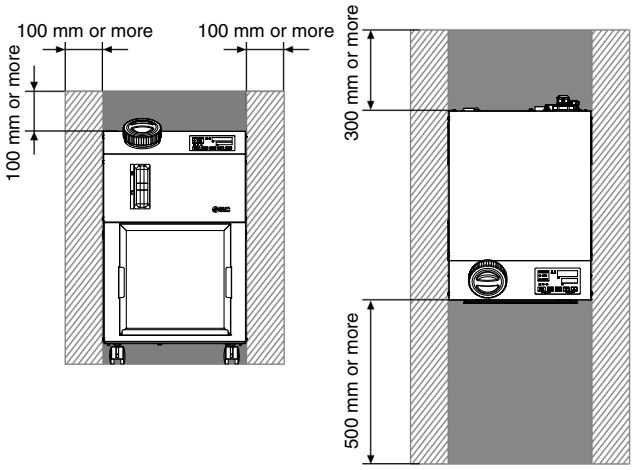
Be sure to read this before handling the products. Refer to the back cover for safety instructions. For temperature control equipment precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website: https://www.smcworld.com

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.

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.



<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
HRS018-R	Approx. 4	70	40
HRS030-R	Approx. 6	100	60

Piping

⚠ Caution

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

If the operating performance is not sufficient, the pipings may burst during operation. Also, the use of corrosive materials such as aluminum or iron for fluid contact parts, such as piping, may not only lead to clogging or leakage in the circulating fluid and facility water circuits but also refrigerant leakage and other unexpected problems. Provide protection against corrosion when you use the product.

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

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

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

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

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

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

Electrical Wiring

⚠ Warning

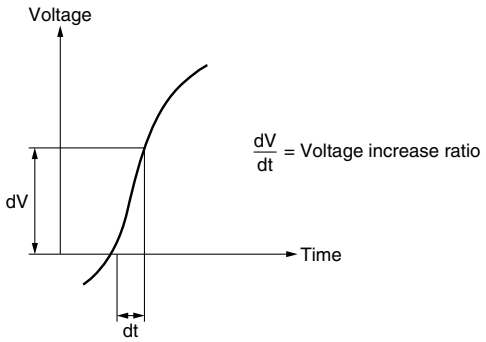
1. Grounding should never be connected to a water line, gas line or lightning rod.

⚠ Caution

1. Communication cable should be prepared by the 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.



HRS-R Series
Specific Product Precautions 4

Be sure to read this before handling the products. Refer to the back cover for safety instructions. For temperature control equipment precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website: https://www.smcworld.com

Circulating Fluid

⚠ Caution

1. Avoid oil or other foreign matter 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 a 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	Scale generation
Standard item	pH (at 25°C)	—	6.0 to 8.0	○	○
	Electric conductivity (25°C)	[μS/cm]	100*1 to 300*1	○	○
	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	○	

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

• ○: Factors that have an effect on corrosion or scale generation

• Even if the water quality standards are met, complete prevention of corrosion is not guaranteed.

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

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

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

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

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

Operation

⚠ Warning

1. Confirmation before operation

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

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

2. Confirmation during operation

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

3. Emergency stop method

• When an abnormality is confirmed, stop the machine immediately. After pushing the [OFF] switch, be sure to shut off the breaker of the user's power supply.

Operation Restart Time/Operation and Suspension Frequency

⚠ Caution

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

2. Operation and suspension frequency should not exceed 10 times per day. Frequently switching between operation and suspension may result in the malfunction of the refrigeration circuit.

Protection Circuit

⚠ Caution

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

• Power supply voltage is not within the rated voltage range of ±10%.
• In case the water level inside the tank is reduced abnormally.
• Circulating fluid temperature is too high.
• Compared to the cooling capacity, the heat generation amount of the user's equipment is too high.
• Ambient temperature is too high. (45°C or more)
• Refrigerant pressure is too high.
• Ventilation grille is clogged with dust or dirt.

Maintenance

⚠ Caution

<Periodical inspection every one month>

1. Clean the ventilation grille.

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

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

<Periodical inspection every three months>

1. Inspect the circulating fluid.

1) When using tap water

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

2) When using ethylene glycol aqueous solution

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

Dilute or add as needed to adjust the concentration.

<Periodical inspection during the winter season>

1. Make water-removal arrangements beforehand.

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

2. Consult a professional.

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

■ Refrigerant with GWP reference

Refrigerant	Global warming potential (GWP)	
	Regulation (EU) No 517/2014 (Based on the IPCC AR4)	Revised Fluorocarbons Recovery and Destruction Law (Japanese law)
R134a	1,430	1,430
R404A	3,922	3,920
R407C	1,774	1,770
R410A	2,088	2,090

* This product is hermetically sealed and contains fluorinated greenhouse gases (HFC). When this product is sold on the market in the EU after January 1, 2017, it needs to be compliant with the quota system of the F-Gas Regulation in the EU.
* See specification table for refrigerant used in the product.

⚠ Safety Instructions

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

⚠ Caution: **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

⚠ Warning: **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

⚠ Danger : **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

*1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines.
(Part 1: General requirements)
ISO 10218-1: Manipulating industrial robots – Safety.
etc.

⚠ Warning

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

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.

The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis.
4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

⚠ Caution

1. The product is provided for use in manufacturing industries.

The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

Limited warranty and Disclaimer/ Compliance Requirements

The product used is subject to the following "Limited warranty and Disclaimer" and "Compliance Requirements".
Read and accept them before using the product.

Limited warranty and Disclaimer

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

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

Compliance Requirements

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

⚠ Caution

SMC products are not intended for use as instruments for legal metrology.

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country. Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.