Thermo-chiller *HRS Series* Maintenance Handbook



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Technical Data/Glossary of Terms



Thermo-chiller HRS Series Maintenance Handbook

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Safety Instructions



Before starting maintenance on the product, be sure to carefully read and fully understand all the warnings and precautions described in this handbook.

Before Starting Maintenance on the Product

- This chapter describes safety related issues regarding the maintenance of the product.
- This product is a circulating fluid temperature controller. SMC shall not take any responsibility for any problems that may arise from using the product for other purposes.
- This product is for the indoor use and not available outdoor.
- This product is not designed for a clean room. It generates dust from the internal components such as pump and fan motor (for air-cooled type).
- This product operates at a high voltage and contains components which become very hot and rotate. If a component needs to be replaced or repaired, use extreme caution regarding electric shocks, burns, cuts, and entanglement.
- All personnel who work with or around the product and those involved in the maintenance, operation, or other work related to the product should carefully read and fully understand the safety related information in this handbook before starting any maintenance work.

Reading the Handbook

This handbook contains symbols to help identify important actions when performing maintenance.



This sign stands for actions that must be followed.



This sign stands for prohibited actions.

Hazards

Level of hazards

The instructions given in this handbook aim to assure safe and correct operation of the unit and to prevent injury of operators or damage to the unit. These instructions are grouped into three categories, Danger, Warning and Caution, which indicate the level of hazard, damage and also the degree of emergency. All texts that contain safety critical matter and should be carefully observed.

DANGER, WARNING and CAUTION signs are in order according to seriousness (DANGER > WARNING > CAUTION).

▲ DANGER

"DANGER": Hazard that will cause serious personal injury or death during operation.

▲ WARNING

"WARNING": Hazard that may cause serious personal injury or death during operation.

"CAUTION": Hazard that may cause minor personal injury.

"CAUTION without exclamation symbol": Hazard that may cause damage or failure of the unit, facility, etc.

Definition of "Serious injury" and "Light injury"

Serious injury: The injury that gives aftereffects including loss of eyesight, burnt, electrical shock, fracture, poisoning, etc. and requires long-term treatment or hospitalization.

Light injury: The injury that does not need long term treatment or hospitalization. (Others excluded from serious injury.)

Types of hazard labels

The unit has various potential hazards and they are marked with warning labels. Be sure the read this section before starting any work on the unit.

Warning related to electricity

MARNING

This symbol stands for a possible risk of electric shock.

The product is operated at high voltage and contains uncovered live terminals inside. • DO NOT operate the product without cover panels fitted.

• DO NOT work inside this product unless you have been trained to do so.

Warning related to high temperatures

This symbol stands for a possible risk of hot surface and burns.



The product has surfaces that can reach high temperatures during operation. Even after the power is turned off, there can still be residual heat in the product.

- DO NOT operate the product without cover panels fitted.
- DO NOT start working inside the product until the temperature has decreased sufficiently.

Warning related to rotating objects

\land WARNING

This symbol stands for a possible risk of cutting fingers or hand, or entanglement by rotating fan (For air-cooled type).

The product contains a cooling fan that rotates during operation of the product. The fan can start and stop intermittently and without warning. • DO NOT operate the product without cover panels fitted.

Warning related to other general dangers

K WARNING This symbol stands for general danger. Hazards Inside Hot Surfaces Inside — See Hot Surface symbol Rotating Fan Inside — See Rotating Fan symbol (For air-cooled type) Pressurized System Inside — The product contains pressurized fluid systems. • DO NOT operate the product without cover panels fitted.

Locations of hazard labels

There are various warning labels on the product to show the potential hazards.

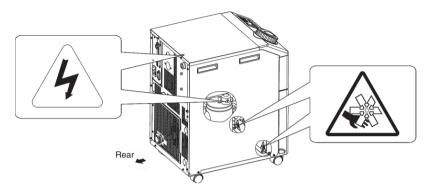


Fig. 1-1 Warning label position

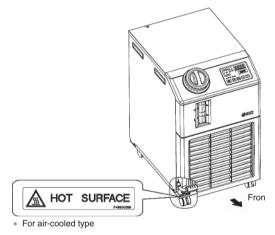


Fig. 1-2 Warning label position

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Other Labels

Product label

Information about the product, such as Serial No. and Model No. can be found on the model label. This information is needed when contacting an SMC sales distributor.

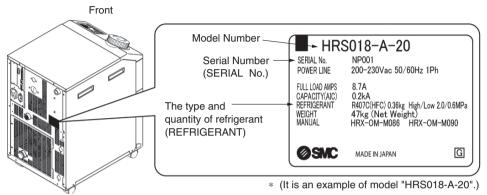


Fig. 1-3 Position of product label

How to see the manufacturing code R O 001 (January 2013)

		R			0	001
Year	Symbol	Remarks	Month	Symbol	Remarks	Serial no.
2013	R		1	0	Repeated from O to Z in	
2014	S	Repeated from A to Z in alphabetical	2	Р	alphabetical order, with O	
2015	Т	order	3	Q	for January and Z for	_
Q	Q	01001	Q	Q	December	

Safety Measures

Safety instructions for use

▲ WARNING



Follow the instructions below when using the product. Failure to follow the instructions may cause an accident and injury.

- Before starting maintenance of the product, be sure to lock out and tag out the breaker of the user's power supply.
- If operating the product during maintenance, be sure to inform all workers nearby.
- Use only the correct tools and procedure when installing or maintaining the product.
- Use the recommended personal protective equipment where specified to protect yourself from any hazards.

- Check all parts and screws are fitted correctly and securely after maintenance.
- Do not remove the panels except for the cases permitted in this handbook.
- Do not remove the panels during operation.

Waste Disposal

Disposal of refrigerant and compressor oil

The product uses hydrofluorocarbon type refrigerant (HFC) and compressor oil. Comply with the laws and regulations in each country for the disposal of refrigerant and compressor oil. The type and quantity of refrigerant is described on the product label.

If these fluids need to be recovered, read and understand the instructions below carefully. If there is any unclear point, contact an SMC's sales distributor.

- Only maintenance personnel or qualified people are allowed to open the cover panels of the product.
- Do not mix the compressor oil with domestic waste for disposal. Also, the disposal of the waste must only be conducted by specific facilities that are permitted for that purpose.

▲ WARNING

- Comply with the laws and regulations in each country for the disposal of refrigerant and compressor oil.
- The release of refrigerant in to the atmosphere is banned by law. Recover it with specific equipment and dispose of it correctly.
- Only people who have sufficient knowledge and experience about the product and its accessories are allowed to recover the refrigerant and compressor oil.

Disposal of product

The disposal of the product must be handled by a specialized industrial waste disposal agency in accordance with local laws and regulations.

Material Safety Data Sheet (SDS)

Maintenance personnel should check with the customer whether any chemical substances, such as antiseptic, have been added to the circulating fluid or facility water remaining in the product.

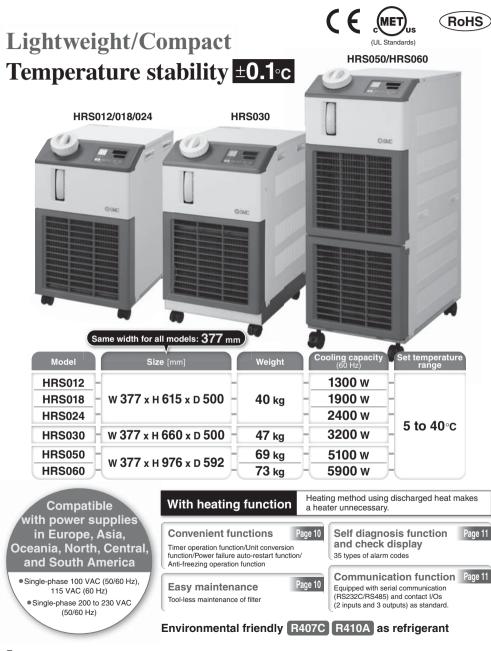
If any such substance has been added, ask the customer to submit the SDS of that substance, and start maintenance in accordance with the hazard and toxicity information described therein.

However, depending on the case, you may wish to ask the customer to wash the product beforehand. Please note that safety should always take priority.

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Thermo-chiller HRS Series



Temperature stability $\pm 0.1^{\circ}$ C / Compact

The precision temperature control method by expansion valve and temperature sensor, realized high temperature stability of $\pm 0.1^{\circ}$ C and a small-size tank.

Air-cooled HRS

Ar coccess Coccession Vertidion Provident station Provident statio

Refrigeration circuit

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



Circulating fluid circuit

Water-cooled HBS -W-

- The circulating fluid discharged from the pump, is heated or cooled by the user's equipment and returns to the thermo-chiller.
- The circulating fluid is controlled to a set temperature by the refrigeration circuit, to be discharged to the user's equipment side again by the thermo-chiller.
- Point Since the refrigeration circuit is controlled by the signal from 2 temperature sensors (for return and discharge), precise temperature control of the circulating fluid can be performed. Therefore, there is no necessity of absorbing the temperature difference in the circulating fluid with a large tank capacity, and realizes high temperature stability even with a small-size tank. Also, contributes to space-saving.

Facility water circuit

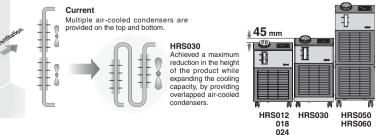
 The water-regulating valve opens and closes to keep the refrigerant gas pressure consistent. The facility water flow rate is controlled by the water-regulating valve.

Installation close to a wall is possible on both sides.

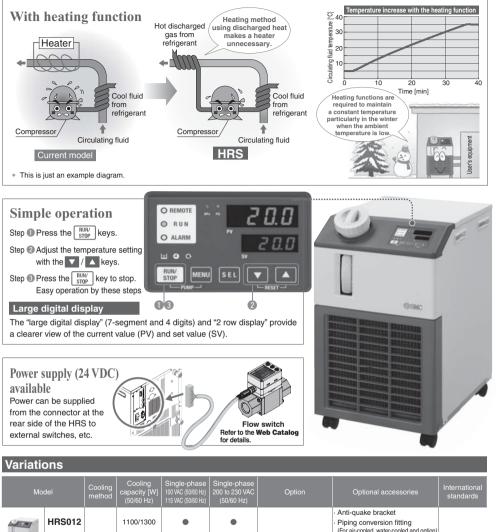
(HRS012/018/024 * Except option G)



Reduced-height double condenser structure (HRS030/060)



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L.	HRS012		1100/1300	•	٠		Piping conversion fitting (For air-cooled, water-cooled and option)	
			1500/1700	•	_	· With earth leakage	 Concentration meter 	
	HRS018		1700/1900			breaker	 Bypass piping set 	"
			1700/1900	_		With automatic fluid	 Power supply cable 	CE
						fill function	· DI filter set	
1 I I I I I I I I I I I I I I I I I I I	HRS024	Air-cooled refrigeration	2100/2400	_	•	 Applicable to deionized water piping 	Electric resistance sensor set/ Electric resistance control set	
		Water-cooled				High pressure pump	· Electric conductivity sensor set/	(UL Standards)
	HRS030	refrigeration	2600/3200	_	•	mounted (* The HRS050/ 060 cannot be selected.)		Refer to pages 15
						,	 Particle filter set 	to 18 for details
harring .						 High temperature environment specification 	· Drain pan set (With water leakage sensor)	on applicable models.
L _	HRS050		4700/5100	_	•	(* The HRS030/050/060	 Connector cover 	mouels.
						cannot be selected.)	 Analog gateway unit 	
							Replacement type dustproof filter set	
	HRS060		4900/5900	_	•		· Separately installed power transformer	
							· Filter for circulating fluid fill port	
			-		-	-		

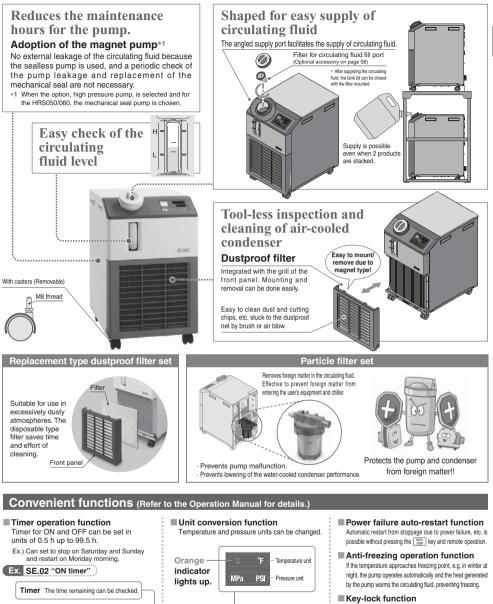
* UL Standards: Applicable to only 60 Hz



Circulating Fluid Temperature Controller Thermo-chiller Standard Type HRS Series

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Thermo-chiller HRS Series



O REMOTE

O RUN

O ALARM

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STOP

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O REMOTE

O RUN

O ALARM

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STOP

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

- Function to output a signal for completion of preparation Notifies by communication when the temperature reaches the pre-set temperature range.
- Independent operation of the pump The pump can be operated independently while chiller is powered off. You can check piping leak and remove the air.

Self diagnosis function and check display

Display of 35 types of alarm codes For details, refer to page 120.

Operation is monitored all the time by the integrated sensor.

Should any error occur, the self diagnosis result is displayed by the applicable alarm code from 35 types. This makes it easier to identify the cause of the alarm.

Can be used before requesting service.

Changeable alarm set values

Setting item	Set value
Circulating fluid discharge temperature rise	5 to 48°C
Circulating fluid discharge temperature drop	1 to 39°C
Circulating fluid discharge pressure rise	0.05 to 0.75 MPa*1
Circulating fluid discharge pressure drop	0.05 to 0.18 MPa*1
d. Osturaluse uses descending as the second	

*1 Set values vary depending on the model.



Alarm codes notify of checking times.

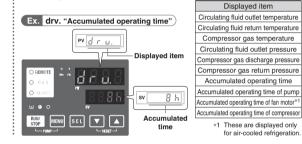
Notifies when to check the pump and fan motor. Helpful for facility maintenance.

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



Check display

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

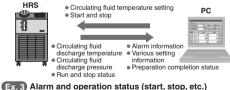


Communication function

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

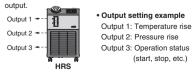
Ex. 1 Remote signal I/O through serial communication

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



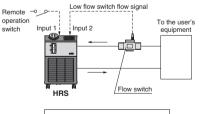
signal output

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



Ex. 2 Remote operation signal input

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



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

Application Examples

1 4	Heat source	Automotive	Light electrical appliance	Food	Machinery	Medical	Semiconductor
Arc welding machine	Torch	•			•		
Resistance welding machine	Tip	•	•		•		
Laser welding machine	Oscillator	•	•		•		•
JV curing device	Lamp	•	•	•		•	
X-ray instrument			•			•	•
Electronic microscope	Lens		•			•	•
Laser marker	Oscillator	•	•	•		•	•
Ultra sonic wave nspection machine		•	•		•		
Atomizing device/ Crushing equipment	Blade			•			
Linear motor	Motor	•			•		
Packaging machines (food products)	Dies/ Welded portions			•			
Mold cooling	Mold	•	•	•		•	
Temperature control of adhesive and paint material	Paint material/ Welding materials	•	•	•			
Cooling of vacuum pump	Pump	•					•
Shrink fit machine	Workpiece	•			•		
Gas cylinder cabinet							•
Concentrating equipment	Test liquid			٠		•	
Reagent cooling equipment	Reagent			•		•	•
Cleaning machine (hydrocarbon-based)	Cleaning tank	•	•		•		
Printing machine	Roller		•	•	•		
Chamber electrode	Electrode						•
High frequency induction heating equipment	Power supply/ Heating coil	•			•		

Global Supply Network-

SMC has a comprehensive network in the global market.

We now have a presence of more than 500 branch offices and distributors in 83 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.





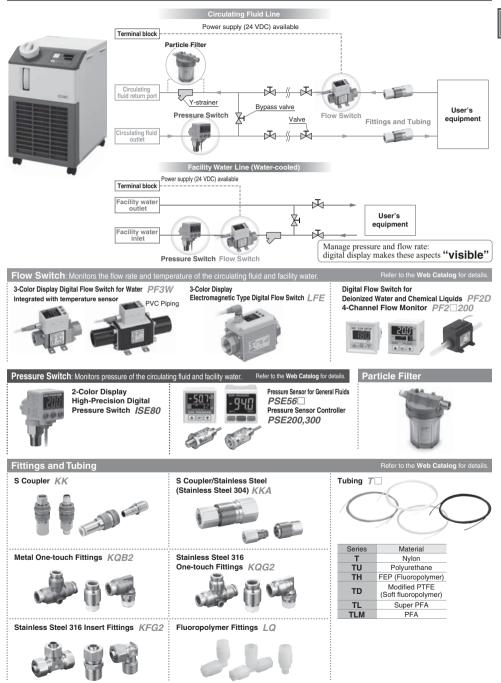
SMC Thermo-chiller Variations

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

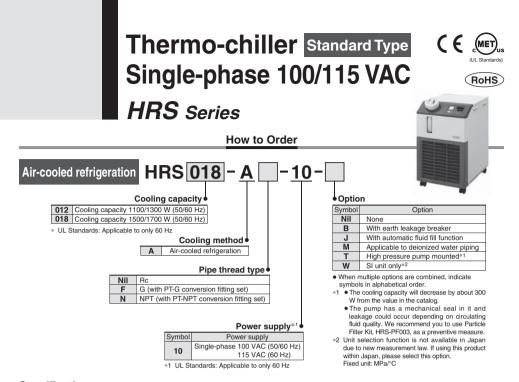
Temperature Set temperature Cooling capacity [y [kV	V]				Environment	International						
Se	ries	stability [°C]	range [°C]	1.2	1.8	2.4	3	5	6	9	10	15	20	25	28	Environment	standards
	HRSE Basic type	±2.0	10 to 30	•	•	•										Indoor use	Ç € (Only 230 VAC type)
	HRS Standard type	±0.1	5 to 40	•	•	•	•	•	•							Indoor use	C € ,, (Only 60 Hz)
	HRS090 Standard type	±0.5	5 to 35							•						Indoor use	C € (400 V as standard)
	HRS100/150 Standard type	±1.0	5 to 35								•	•				Outdoor installation IPX4	C € (400 V as standard)
	HRSH090 Inverter type	±0.1	5 to 40							•						Indoor use	C E (400 V as standard, 200 V as an option) (Only 200 V as an option)
ĊĒ	HRSH Inverter type	±0.1	5 to 35								•	•	۲	•	•	Outdoor installation IPX4	(400 V as standard, 200 V as an option) ,, (Only 200 V as an option)



Circulating Fluid/Facility Water Line Equipment



@SMC

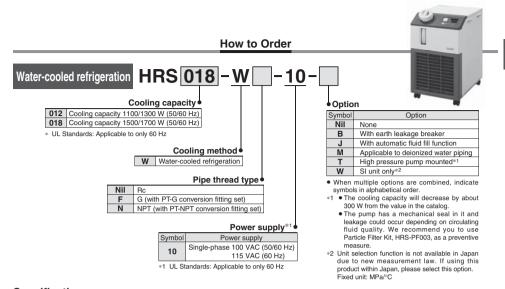


Specifications * There are different values from standard specifications. Refer to the Web Catalog for details.

Model				HRS012-A□-10	HRS018-A□-10		
Cooling method				Air-cooled refrigeration			
Refrigerant R407C (HFC)				(HFC)			
Refrigerant c	harge		kg	0.32 0.33			
Control meth	od			PID control			
Ambient tem	perature/	Humidity/Altitude*1, 11	Temperature: 5 to 40°C, Humidity: 30 to 70%, Altitude: less than 3000 m				
Circulating fluid*2		Tap water, 15% ethylene glycol aqueous solution*4					
	Set temperature range*1 °C			5 to 40			
	Cooling capacity (50/60 Hz)*3		W	1100/1300	1500/1700		
	Heating capacity (50/60 Hz)*3 W		W	360/450			
	Temperature stability ^{*5} °C		°C	±0.1			
Circulating fluid		Rated flow (50/60 Hz)*6, 7	L/min	7 (0.13 MPa)/7 (0.18 MPa)			
	Pump	Maximum flow rate (50/60 Hz)	L/min	27/29			
system	Pump	Maximum pump head (50/60 H	z) m	14	/19		
		Output	W	200			
	Tank ca	pacity	L	Approx. 5			
	Port size			Rc1/2			
	Fluid contact material		Stainless steel, Copper (Heat exchanger brazing), Bronze, Alumina ceramic,				
	Fiuld Co	Fluid contact material		Carbon, PP, PE, POM, FKM, EPDM, PVC			
	Power e	Single-phase 100 V			C (50/60 Hz), 115 VAC (60 Hz)		
	Power supply		Allowable voltage range ±10%				
Electrical	Circuit protector A		15				
system	Applicable earth leakage breaker capacity ^{*8} A		Α	15			
		perating current	Α	7.5/8.3	7.7/8.4		
	Rated po	ower consumption (50/60 Hz)*3	kVA	0.7/0.8	0.8/0.8		
Noise level (5	50/60 Hz)*	9	dB	1B 58/55			
Accessories				Fitting (for drain outlet) 1 pc., Input/output signal connector 1 pc., Power supply connector 1 pc.			
				Operation Manual (for installation/operation) 1, Quick Manual (with a clear case) 1,			
AUCESSUILES			Alarm code list sticker 1, Ferrite core (for communication) 1 pc.,				
				Power supply cable: Option (sold separa	ately) to be ordered or prepared by user.		
Weight*10			kg	4	0		
1 It should have	no condonor	ation		#6 The capacity at the thermo-chill	er outlet when the circulating fluid temperature is 20°C.		

- *2 If tap water is used, use water that conforms to Water Quality Standards of the Japan Re-frigeration and Air Conditioning Industry Association (JRA GL-02-1994 cooling water sys-Ambient temperature: 25°C, 2 Circulating fluid temperature: 20°C, 3 Circulating fluid
- *3 rated flow, @ Circulating fluid: Tap water Refer to the cooling capacity graph on page 19 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 Outlet temperature when the circulating fluid flow is rated flow, and the circulating fluid outlet and return port are directly connected. Installation environment and the power supply are within specification range and stable
- *7 Required minimum flow rate for cooling capacity or maintaining the temperature stability. The specification of the cooling capacity and the temperature stability may not be satis (sold separately).)
- 88 Purchase an earth leakage breaker with current sensitivity of 15 mA or 30 mA separately. (A product with an optional earth leakage breaker (option B) is also available. Refer to
- page 42.) *9 Front: 1 m, height: 1 m, stable with no load, Other conditions → See *3
- 10 Weight in the dry state without circulating fluids 11 Weight inte dry state without circulating fluids 11 If the product is used at altitude of 1000 m or higher, refer to "Operating Environment" (Web Catalog) Item 14 * For altitude of 1000 m or higher."

Thermo-chiller Standard Type HRS Series



Specifications * There are different values from standard specifications. Refer to the Web Catalog for details

Model				HRS012-W□-10	HRS018-W□-10		
Cooling method				Water-cooled refrigeration			
Refrigerant				R407C (HFC)			
Refrigerant charge kg			kg	0.25	0.26		
Control meth				PID control			
Ambient temp		lumidity/Altitude ^{*1}		Temperature: 5 to 40°C, Humidity: 30 to 70%, Altitude: less than 3000 m			
	Circulating fluid*2			Tap water, 15% ethylene glycol aqueous solution*4			
	Set temperature range*1 °C						
			W				
		capacity (50/60 Hz)*3	W	360/450			
	Temperature stability ^{*5} °C			±0.1			
Circulating	Rated flow (50/60 Hz)*6, 7 L/min			7 (0.13 MPa)/7 (0.18 MPa)			
fluid		Maximum flow rate (50/60 Hz)					
system		Maximum pump head (50/60 H					
	Output W						
	Tank capacity L			Approx. 5			
	Port size						
	Fluid contact material		Stainless steel, Copper (Heat exchanger brazing), Bronze, Alumina ceramic,				
	Temperature range °C						
Facility	Pressure range MPa						
water	Required flow rate (50/60 Hz)*11 L/min			÷			
system	Inlet-outlet pressure differential of facility water MPa						
-,	Port size				ure: 5 to 40°C, Humidity: 30 to 70%, Altitude: less than 3000 m Tap water, 15% ethylene glycol aqueous solution*4 100/1300 1 1500/1700 360/450 ±0.1 7 (0.13 MPa)/7 (0.18 MPa) 27/29 14/19 200 Approx. 5 Rc1/2		
	Fluid co	ntact material					
	Power s	vlagu					
Electrical	Circuit protector A						
system	Applicable earth leakage breaker capacity*8 A						
		perating current	A				
Notes Issuel (wer consumption (50/60 Hz)*3	kVA dB				
Weight ^{*10} kg			ka				
*1 It should have r			ĸg	10			

*2 If tap water is used, use water that conforms to Water Quality Standards of the Japan Re-frigeration and Air Conditioning Industry Association (JRA GL-02-1994 cooling water sys-

Ingradion and an exponential industry resolution for GEV21594 Couling water sys-tem - circulating type - make-up water). ① Ambient temperature: 25°C, ② Circulating fluid temperature: 20°C, ③ Circulating fluid rated flow, ④ Circulating fluid: Tap water, ⑤ Facility water temperature: 25°C Refer to the cooling capacity graph on page 19 for details. *3

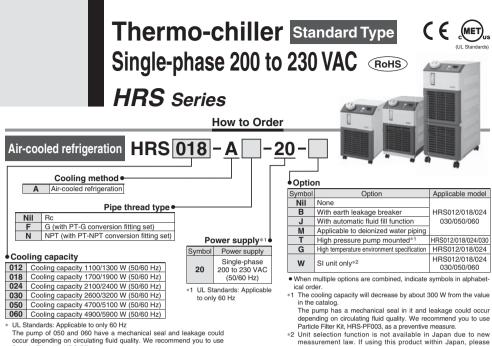
*4 Use a 15% ethylene glycol aqueous solution if operating in a place where the circulating fluid temperature is 10°C or less.

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

*7 Required minimum flow rate for cooling capacity or maintaining the temperature stability. The specification of the cooling capacity and the temperature stability may not be satis (sold separately).)

88 Purchase an earth leakage breaker with current sensitivity of 15 mA or 30 mA separately. (A product with an optional earth leakage breaker (option B) is also available. Refer to the Web Catalog for details.) *9 Front: 1 m, height: 1 m, stable with no load, Other conditions \rightarrow See *3

10 Weight in the dry state without circulating fluids 11 Required flow rate when a load for the cooling capacity is applied at a circulating fluid tem-perature of 20°C, and circulating fluid rated flow and facility water temperature of 25°C.



Particle Filter Kit, HRS-PF004, as a preventive measure.

select this option Fixed unit: MPa/°C

Specifications * There are different values from standard specifications. Refer to the Web Catalog for details

Model	HRS012-A -20	HRS018-A□-20	HRS024-A -20	HRS030-A -20	HRS050-A -20	HRS060-A -20
Cooling method	Air-cooled refrigeration					
Refrigerant	R407C (HFC)			R410A (HFC)		
Refrigerant charge kg	0.35	0.36	0.36	0.57	0.65	0.85
Control method	PID control					
Ambient temperature/Humidity/Altitude*1, 12	Temperature: 5 to 40°C, High temperature environment specification (option): 5 to 45°C, Humidity: 30 to 70%, Altitude: less than 3000 m					
Circulating fluid*2	Tap water, 15% ethylene glycol aqueous solution*4					
Set temperature range*1 °C	5 to 40					
Cooling capacity (50/60 Hz)*3 W	1100/1300	1700/1900	2100/2400	2600/3200	4700/5100	4900/5900
Cooling capacity (50/60 Hz)*3 W Heating capacity (50/60 Hz)*3 W Temperature stability*5 °C		530/650		600/640	1100/1400	1000/1300
	±0.1					
B Rated flow (50/60 Hz)*6, 7 L/min	7 (0.13 MPa)/7 (0.18 MPa)			23 (0.24 MPa)/28 (0.32 MPa)	23 (0.21 MPa)/28 (0.29 MPa)	
Bated flow (50/60 Hz)*6.7 L/min Maximum flow rate (50/60 Hz) L/min Maximum pump head (50/60 Hz) L/min Maximum pump head (50/60 Hz) W Tank capacity L Port size L		27/29		34/40	31/42	29/38
🚊 🔤 Maximum pump head (50/60 Hz) m	14/19			50		
Telefond State Sta	200				550	
ਤੋਂ Tank capacity L	Approx. 5					
Dort size	Rc1/2					
Fluid contact material	Stainless steel, Copper (Heat exchanger brazing), Bronze, Alumina ceramic, Carbon, PP, PE, POM, FKM, EPDM, PVC					
Power supply Circuit protector Applicable earth leakage breaker capacity*8 Rated operating current Brated operating current Brated operating current	Single-phase 200 to 230 VAC (50/60 Hz) Allowable voltage range ±10%					
Circuit protector A	10			20	30	
. Applicable earth leakage breaker capacity*8 A	10			20	30	
Rated operating current A	4.6/5.1	4.7/5.2	5.1/5.9	5.2/6.0	8/11	8.9/11.5
Rated power consumption (50/60 Hz)*3 kVA	0.9/1.0	0.9/1.0	1.0/1.2	1.0/1.2	1.7/2.2	1.8/2.3
Noise level (50/60 Hz)*9 dB		60/61		62/65	65/68	66/68
Accessories	Fitting (for drain outlet) 1 pc.*11, Input/output signal connector 1 pc., Power supply connector 1 pc.*11, Operation Manual (for installation/operation) 1, Quick Manual (with a clear case) 1*11, Alarm code list sticker 1, Ferrite core (for communication) 1 pc., Power supply cable: Option (sold separately) to be ordered or prepared by user.					
Weight*10 kg		43		47	69	73
1 It should have no condensation.	I.		he canacity at the ther	 mo-chiller outlet when	the circulating fluid te	

- *2 If tap water is used, use water that conforms to Water Quality Standards of the Japan Befrigeration and Air Conditioning Industry Association (JRA GL-02-1994 cooling water sys-
- tem 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 pages 19 and 20 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 Outlet temperature when the circulating fluid flow is rated flow, and the circulating fluid ply are within specification range and stable.
- (sold separately).) *8 Purchase an earth leakage breaker with current sensitivity of 30 mA separately

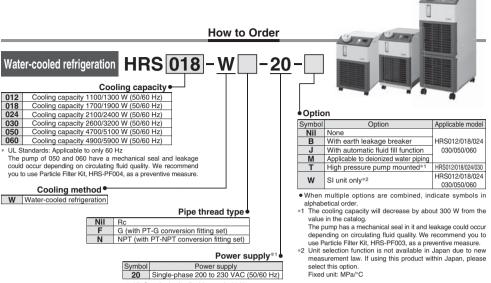
*7 Required minimum flow rate for cooling capacity or maintaining the temperature stability. The specification of the cooling capacity and the temperature stability may not be satis-

fied if the flow rate is lower than the rated flow. (In such a case, use a bypass piping set

- (A product with an optional earth leakage breaker (option B) is also available.)
- *9 Front: 1 m, height: 1 m, stable with no load, Other conditions → See *3. *10 Weight in the dry state without circu lating fluids

*11 It is not provided for the HRS050/060. *12 If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/ Storage Environment" (Web Catalog) Item 14 ** For altitude of 1000 m or higher."

Thermo-chiller Standard Type HRS Series



*1 UL Standards: Applicable to only 60 Hz

Specifications * There are different values from standard specifications. Refer to the Web Catalog for details.

Model						
Cooling method	HR5012-WU-20	HRS018-W□-20			RE2020-W□-20	RS000-₩□-20
Refrigerant		Water-cooled refrigeration R407C (HFC)			R410A (HFC)	
Refrigerant charge kg	0.3	0.31	0.31	0.5	0.65	0.75
Control method	0.5	0.01	PID c		0.05	0.75
Ambient temperature/Humidity/Altitude*1	Temperature: 5 to 40°C, Humidity: 30 to 70%, Altitude: less than 3000 m					
Circulating fluid*2	Tap water, 15% ethylene glycol aqueous solution*4					
Cat temperature represt	5 to 40					
E Cooling capacity (50/60 Hz)*3 W Heating capacity (50/60 Hz)*3 W Temperature cability*5 °C	1100/1300	1700/1900	2100/2400	2600/3200	4700/5100	4900/5900
Heating capacity (50/60 Hz)*3 W	1100/1000	530/650	2100/2400	400/600		/1300
Temperature stability*5 °C	±0.1					
Deted flow (50/60 Hz)*6.7				23 (0.24 MPa)/28 (0.32 MPa) 23 (0.21 MPa)/28 (0.29 MP		
₩ Maximum flow rate (50/60 Hz) L/min		27/29	. (34/40	31/42	29/38
A rate in own (30/00 Hz) - L/min Maximum flow rate (50/60 Hz) L/min Maximum pump head (50/60 Hz) m Output W Tank capacity L Port size	14/19			50		
		200			550	
Tank capacity	Approx. 5					
Port size						
Fluid contact material	Stainless steel, Copper (Heat exchanger brazing), Bronze, Alumina ceramic, Carbon, PP, PE, POM, FKM, EPDM, PVC					
E Temperature range °C	5 to 40					
Temperature range°CPressure rangeMPa	0.3 to 0.5					
Required flow rate (50/60 Hz)*11 L/min	8	12	14	15	16	17
Inlet-outlet pressure differential of facility water MPa	0.3 or more					
Port size	Rc3/8			Rc	1/2	
Fluid contact material	Stainless steel, Copper (Heat exchanger brazing), Bronze, Synthetic rubber					
Power supply	Single-phase 200 to 230 VAC (50/60 Hz) Allowable voltage range ±10%					
<u> <u> </u> Circuit protector </u>	10			20		
Applicable earth leakage breaker capacity*8 A	10			20		
Applicable earth leakage breaker capacity*8 A B Applicable earth leakage breaker capacity*8 A B Rated operating current A B Rated operating current A	4.6/5.1	4.7/5.2	5.1/5.9	5.2/6.0	7.6/10	7.6/10.4
	0.9/1.0	0.9/1.0	1.0/1.2	1.0/1.2	1.5/2.0	1.5/2.1
Noise level (50/60 Hz)*9 dB		60/61		62/65	65/68	66/68
Accessories	Fitting (for drain outlet) 1 pc.*12, Input/output signal connector 1 pc., Power supply connector 1 pc.*12, Operation Manual (for installation/operation) 1, Quick Manual (with a clear case) 1*12, Alarm code list sticker 1, Ferrite core (for communication) 1 pc., Power supply cable: Option (sold separately) to be ordered or prepared by user.					
Weight*10 kg		43		46	6	7
*1 It should have no condensation.		*6 T	e capacity at the the	mo-chiller outlet when	the circulating fluid te	mperature is 20°C.

- *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, ⑤ Facility water temperature: 25°C
- Refer to the cooling capacity graph on pages 19 and 20 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 Outlet temperature when the circulating fluid flow is rated flow, and the circulating fluid
- outlet and return port are directly connected. Installation environment and the power sup-ply are within specification range and stable.
- *7 Required minimum flow rate for cooling capacity or maintaining the temperature stability. The specification of the cooling capacity and the temperature stability may not be satis-fied 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.
- (A product with an optional earth leakage breaker (option B) is also available.)
 *9 Front: 1 m, height: 1 m, stable with no load, Other conditions → See *3.

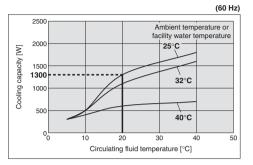
- *10 Weight in the dry state without circulating fluids *11 Required flow rate when a load for the cooling capacity is applied at a circulating fluid temperature of 20°C, and circulating fluid rated flow and facility water temperature of 25°C. *12 It is not provided for the HRS050/060.

HRS Series Standard Type

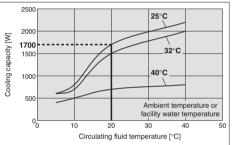
Cooling Capacity

- If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (Web Catalog) Item 14 "* For altitude of 1000 m or higher."
- For models with high pressure pump mounted (-T), the cooling capacity will decrease by about 300 W from each graph.

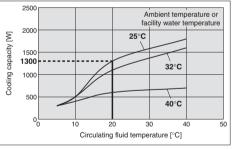
HRS012-A-10, HRS012-W-10 (Single-phase 100/115 VAC) (50 Hz)



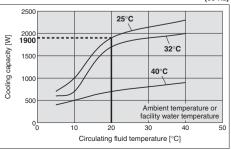


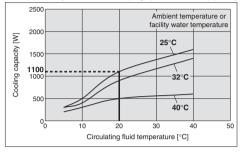


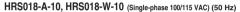


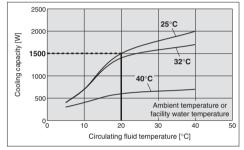


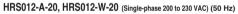


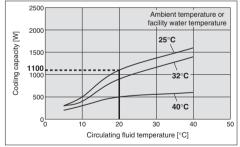


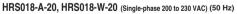


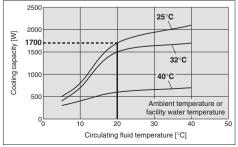










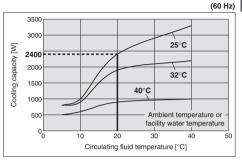


Thermo-chiller Standard Type HRS Series

- If the product is used at altitude of 1000 m or higher, refer to "Operating Environment/Storage Environment" (Web Catalog) Item 14 "* For altitude of 1000 m or higher."
- For models with high pressure pump mounted (-T), the cooling capacity will decrease by about 300 W from each graph.

HRS024-A-20. HRS024-W-20 (Single-phase 200 to 230 VAC) (50 Hz)

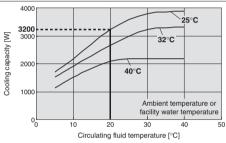
Cooling Capacity



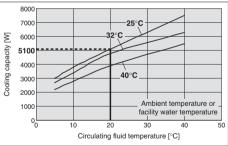


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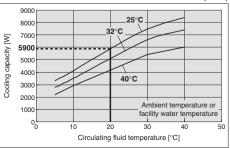
Thermo-chiller HRS Series

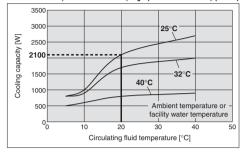


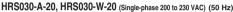


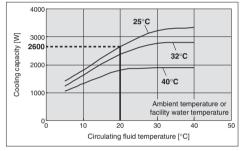




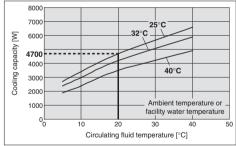




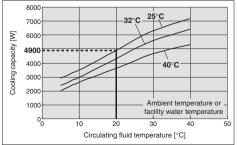








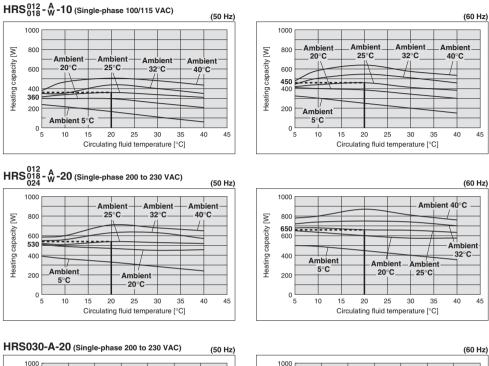




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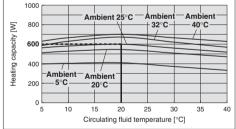
HRS Series Standard Type

Heating Capacity

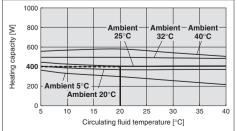


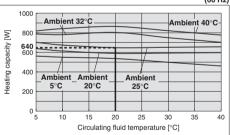
(50 Hz)

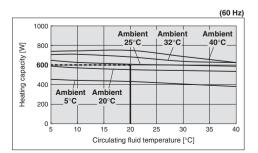
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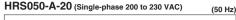
HRS030-W-20 (Single-phase 200 to 230 VAC)

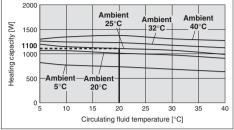


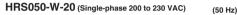


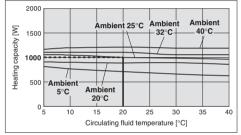


Heating Capacity

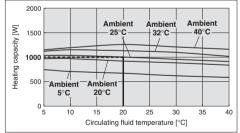


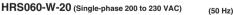


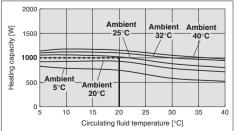


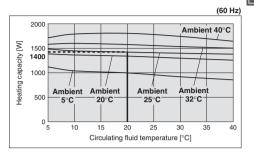


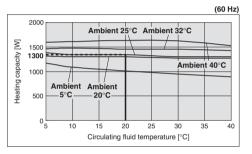


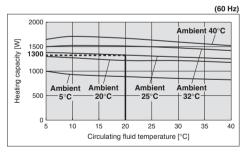


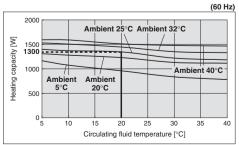






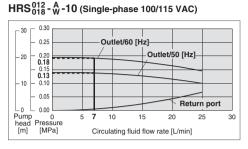




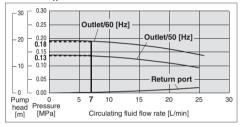


HRS Series Standard Type

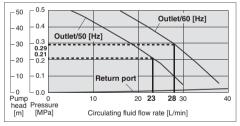
Pump Capacity



HRS030- ^A_W-20 (Single-phase 200 to 230 VAC)

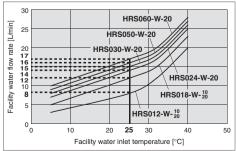


HRS060- ^A/_W-20 (Single-phase 200 to 230 VAC)

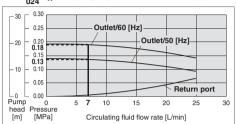


Required Facility Water Flow Rate

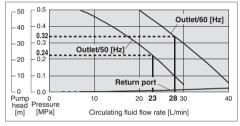
HRS012-W-¹⁰₂₀, HRS018-W-¹⁰₂₀, HRS024-W-20 HRS030-W-20, HRS050-W-20, HRS060-W-20



$HRS_{018}^{012} - \frac{A}{W} - 20$ (Single-phase 200 to 230 VAC)



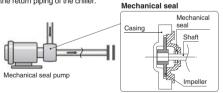
HRS050- ^A_W-20 (Single-phase 200 to 230 VAC)



▲Caution

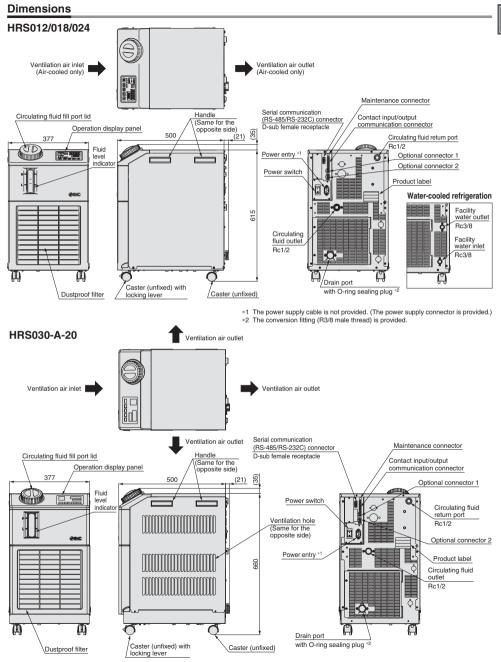
Mechanical Seal Pump

The pump used for the thermo-chiller HRS050/060 series uses a mechanical seal with the fixed ring and rotary ring used for the shaft seal part. If foreign matter enter the gap between the seals, this may cause a trouble such as leakage from the seal part or pump lock. Therefore, it is strongly recommended to install the particle filter in the return piping of the chiller.



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

@SMC



@SMC

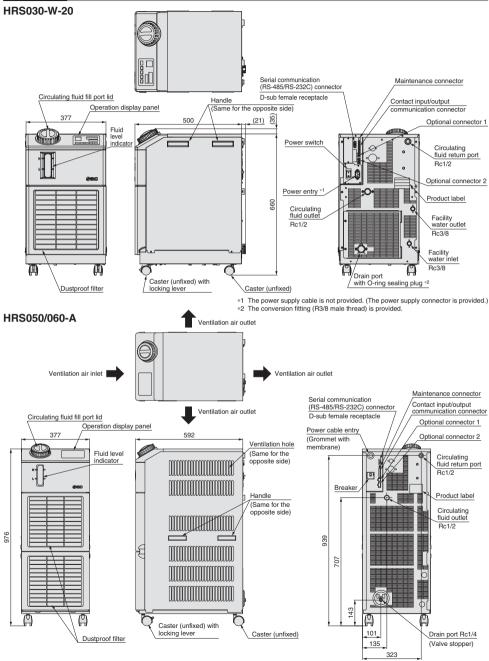
*1 The power supply cable is not provided. (The power supply connector is provided.)
*2 The conversion fitting (R3/8 male thread) is provided.

2

Thermo-chiller HRS Series

HRS Series Standard Type

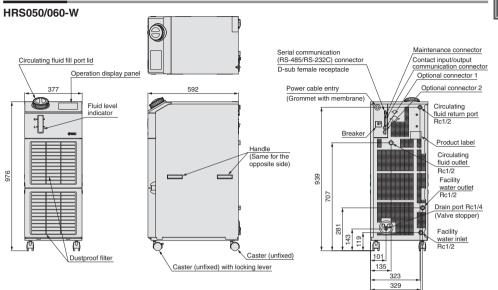
Dimensions



∕ SMC

340

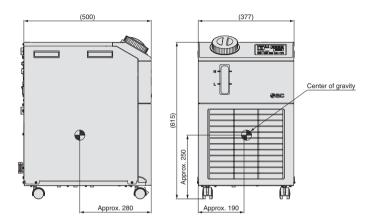
Dimensions



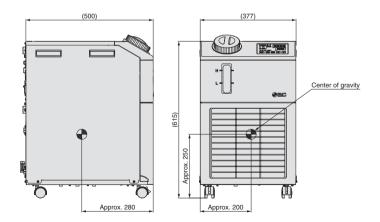
HRS Series Standard Type

Center of Gravity

HRS012/018-A-10



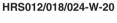
HRS012/018-W-10

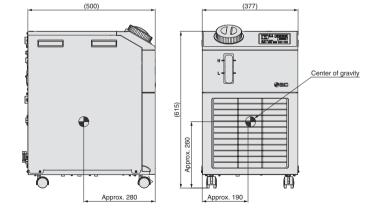


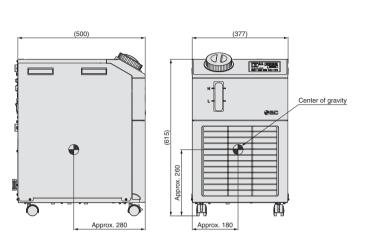
Thermo-chiller Standard Type HRS Series

Center of Gravity

HRS012/018/024-A-20



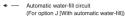


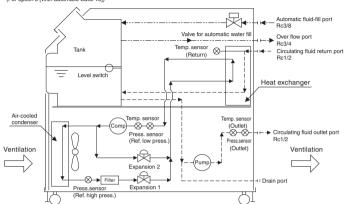


Flow Chart

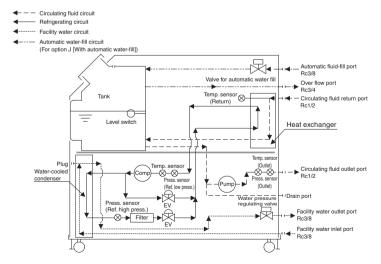
HRS012/018/024/030-A-10/20

- Circulating fluid circuit
 - Refrigerating circuit



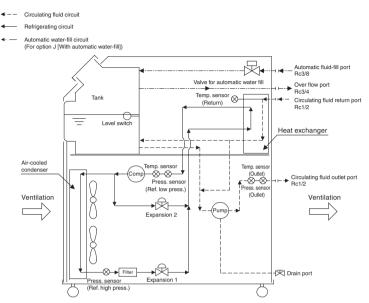


HRS012/018/024/030-W-10/20



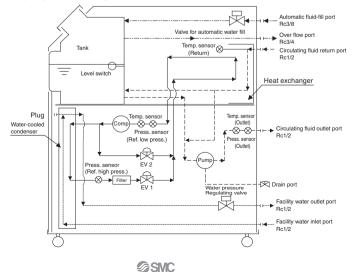
Flow Chart

HRS050/060-A-20



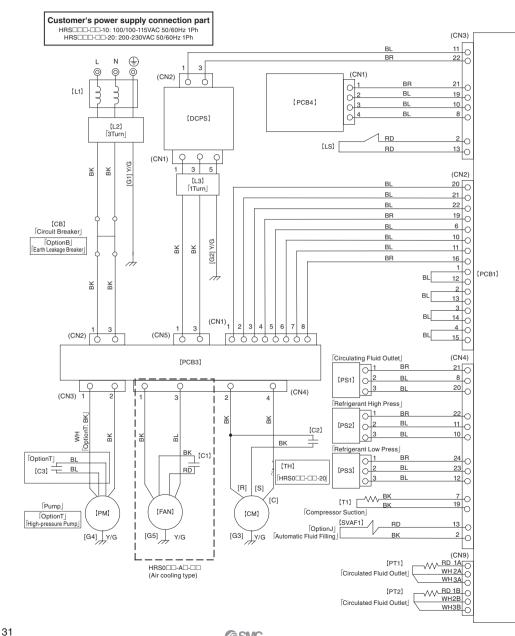
HRS050/060-W-20

- Refrigerating circuit
- ----- Facility water circuit
- Automatic water-fill circuit
- (For option J [With automatic water-fill])

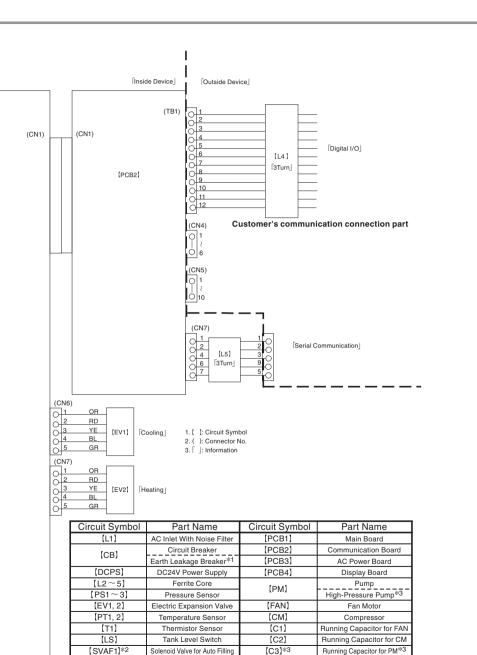


Electric Circuit Diagram

HRS000-00-00







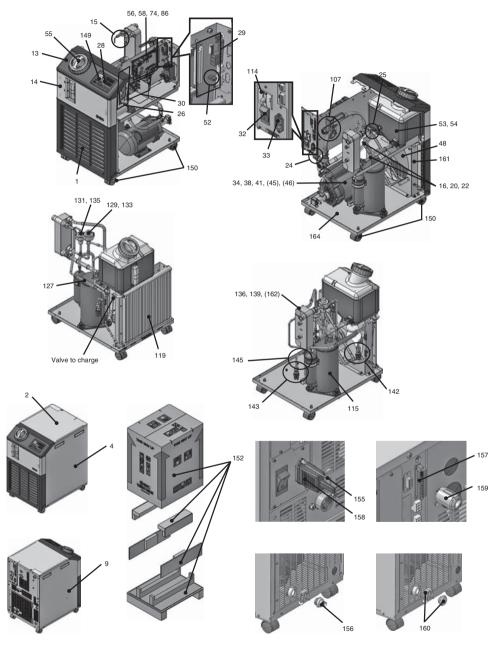
[SVAF1]*2

*1 Option B *2 Option J

*3 Option T

Construction

Applicable models, Ser. No.: HRS012-A-10-, TP (FEB. 2015) or earlier



Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
1 [Dustproof filter	HRS-S0001	•
2 l	Jpper Panel	HRS-S0002	•
4 F	Right Side Panel	HRS-S0003	•
9 L	eft Side Panel	HRS-S0004	•
13 F	Front panel B	HRS-S0005	•
14 F	Front panel A	HRS-S0006	•
15 1	Temperature sensor	HRS-S0007	•
16 H	Hose (For standard pump)	HRS-S0008	•
	Hose (For option T)	HRS-S0077	O (For option T)
	Hose (For option MT)	HRS-S0069	O (For option MT)
	Pressure sensor (For circulating fluid)	HRS-S0011	•
	_evel switch	HRS-S0014	•
	DC power supply	HRS-S0016	•
	Display board	HRS-S0017	•
	Communication board	HRS-S0018	•
	Pawer board	HRS-S0019	
	Pawer switch (For 15A)	HRS-S0079	•
	nlet socket	HRS-S0070	
	Pump (for 100V)	HRS-S0021 HRS-S0022	•
	High head pump (For 100V type option T)		○ (For option T)
38 1	High head pump (For 100V type option 1) High head pump (For 100V type option MT)	HRS-S0265	○ (For option T) ○ (For option MT)
		HRS-S0266	
	Mechanical seal Kit (For 100V type option T)	HRS-S0390	○ (For option T)
	Mechanical seal Kit (For 100V type option MT)	HRS-S0412	 (For option MT)
	Fan (for 100V)With bracket	HRS-S0023	•
	Fuse (5Pcs.)	HRS-S0024	•
	Fank	HRS-S0025	•
	Fank (For automatic water-fill)	HRS-S0072	 (For option J)
	Fank lid	HRS-S0026	•
	Main Board (for HRS012/018/024)	HRS-S0134	●/○ Note 2.
	Main Board (for HRS012-A-10)	HRS-S0033	•
	Main Board (for HRS012-A-10-T)	HRS-S0282	 (For option T)
	Main Board (for HRS012-A-10-MT)	HRS-S0283	 (For option MT)
107 5	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
114 E	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
115 (Compressor (for 100V type)	HRS-S0409	•
119 (Condenser (For air-cooled type)	HRS-S0381	•
127 F	Filter drier	HRS-S0387	•
129 E	Electronic Expansion Valve (For heating)	HRS-S0028	•
	Electronic Expansion Valve (For cooling)	HRS-S0029	•
	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
	Heat exchanger	HRS-S0030	
	Heat exchanger (For option M)	HRS-S0413	○ (For option M)
	Pressure sensor (For high pressure)	HRS-S0012	
	Pressure sensor (For high or low pressure)	HRS-S0012	•
	Thermistor sensor	HRS-S0057	•
	Label (For Operation display)	HRS-S0057	•
	Caster (4Pcs.)	HRS-S0058	
	Caster (4PCS.) Packaging Materials set	HRS-S0059 HRS-S0060	
	Packaging Materials set Power supply connector omission prevention fittings		
		HRS-S0074	
	Drain Fitting	HRS-S0102	•
	Sequence I/O command signal connector	HRS-S0103	•
	Power supply connector	HRS-S0104	•
	Ferrite core	HRS-S0105	•
	Drain Plug set	HRS-S0132	•
	Condenser bracket	HRS-S0015	•
	Thermal insulator for heat exchanger	HRS-S0031	•
164 E	Base	HRS-S0061	•

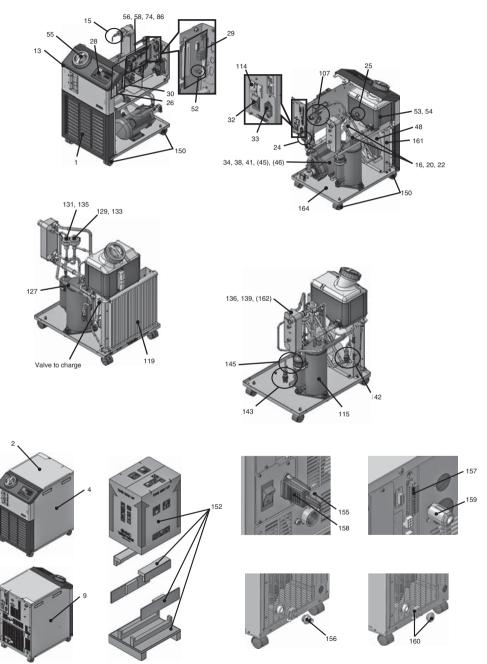
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS012-A-10-, After TQ (MAR. 2015)



Construction

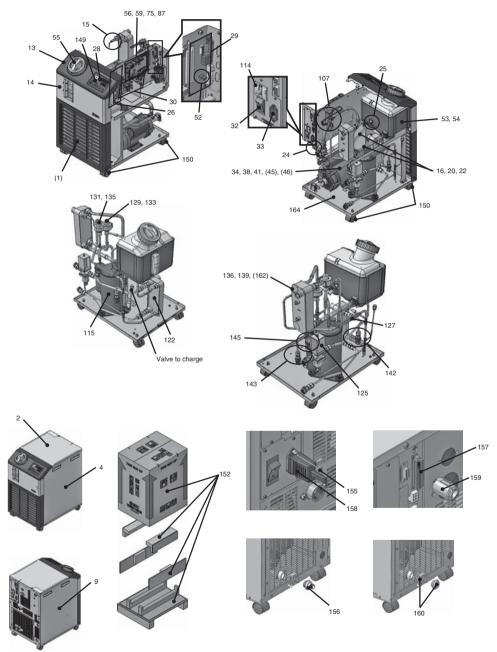
No. Note 1.	Names of parts	Parts number	●: For standard type ◯: For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	O (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
32	Pawer switch (For 15A)	HRS-S0070	•
33	Inlet socket	HRS-S0021	•
34	Pump (for 100V)	HRS-S0022	•
38	High head pump (For 100V type option T)	HRS-S0225	O (For option T)
41	High head pump (For 100V type option MT)	HRS-S0266	○ (For option MT)
45	Mechanical seal Kit (For 100V type option T)	HRS-S0200	○ (For option T)
46	Mechanical seal Kit (For 100V type option MT)	HRS-S0412	○ (For option MT)
48	Fan (for 100V)With bracket	HRS-S0023	
52	Fuse (5Pcs.)	HRS-S0025	•
53	Tank	HRS-S0024 HRS-S0025	
53	Tank (For automatic water-fill)	HRS-S0025 HRS-S0072	○ (For option J)
55	Tank (For automatic water-fill)	HRS-S0072 HRS-S0026	(For option J)
55			
	Main Board (for HRS012/018/024)	HRS-S0134	•/〇 Note 2.
58	Main Board (for HRS012-A-10)	HRS-S0033	
74	Main Board (for HRS012-A-10-T)	HRS-S0282	O (For option T)
86	Main Board (for HRS012-A-10-MT)	HRS-S0283	O (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	○ (For option J)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
115	Compressor (for 100V type)	HRS-S0409	•
119	Condenser (For air-cooled type)	HRS-S0381	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
161	Condenser bracket	HRS-S0015	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
164	Base	HRS-S0061	

Note 1. Excerpt number from the total list of P.91 to 98

It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS012-W-10-, TP (FEB. 2015) or earlier



Construction

No. Note 1.	Names of parts	Parts number	 ●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	
20	Hose (For option T)	HRS-S0000	O (For option T)
20	Hose (For option MT)	HRS-S0077	(For option MT)
24		HRS-S0069	
	Pressure sensor (For circulating fluid)		•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	
32	Pawer switch (For 15A)	HRS-S0070	•
33	Inlet socket	HRS-S0021	•
34	Pump (for 100V)	HRS-S0022	•
38	High head pump (For 100V type option T)	HRS-S0265	 (For option T)
41	High head pump (For 100V type option MT)	HRS-S0266	O (For option MT)
45	Mechanical seal Kit (For 100V type option T)	HRS-S0390	(For option T)
46	Mechanical seal Kit (For 100V type option MT)	HRS-S0412	○ (For option MT)
52	Fuse (5Pcs.)	HRS-S0024	
53	Tank	HRS-S0024	
	Tank (For automatic water-fill)		-
54		HRS-S0072	O (For option J)
55	Tank lid	HRS-S0026	
56	Main Board (for HRS012/018/024)	HRS-S0134	●/○ Note 2.
59	Main Board (for HRS012-W-10)	HRS-S0034	•
75	Main Board (for HRS012-W-10-T)	HRS-S0284	 (For option T)
87	Main Board (for HRS012-W-10-MT)	HRS-S0285	 (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
115	Compressor (for 100V type)	HRS-S0409	•
122	Heat exchanger (Condenser)	HRS-S0133	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve (101 cooling)	HRS-S0029	•
			-
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	○ (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
149	Label (For Operation display)	HRS-S0058	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0102	
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0104	
	Drain Plug set	HRS-S0105	
160			

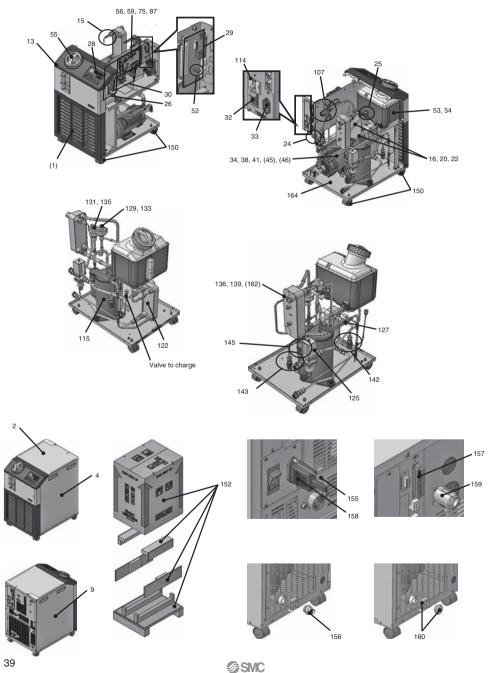
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS012-W-10, After TQ (MAR. 2015)



Construction

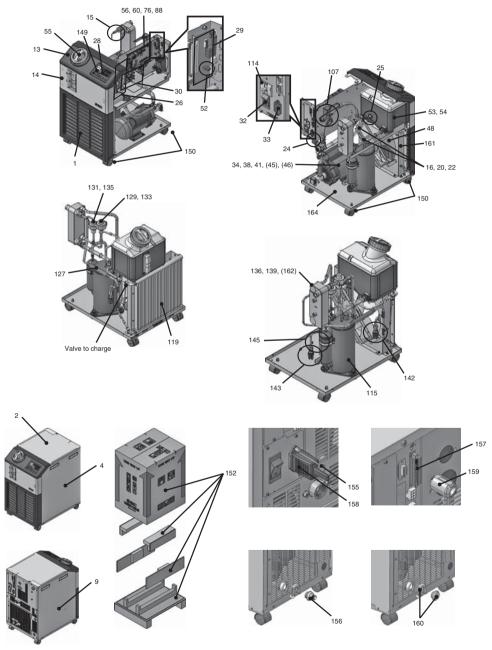
No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	○ (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	ě
32	Pawer switch (For 15A)	HRS-S0070	•
33	Inlet socket	HRS-S0021	•
34	Pump (for 100V)	HRS-S0022	
38	High head pump (For 100V type option T)	HRS-S0265	O (For option T)
41	High head pump (For 100V type option MT)	HRS-S0266	○ (For option MT)
45	Mechanical seal Kit (For 100V type option T)	HRS-S0390	○ (For option T)
46	Mechanical seal Kit (For 100V type option MT)	HRS-S0412	○ (For option MT)
52	Fuse (5Pcs.)	HRS-S0024	
53	Tank	HRS-S0024	
54	Tank (For automatic water-fill)	HRS-S0025	O (For option J)
55	Tank lid	HRS-S0072	
56		HRS-S0020	•/O Note 2.
	Main Board (for HRS012/018/024)		0/0 Note 2.
59	Main Board (for HRS012-W-10)	HRS-S0034	
75	Main Board (for HRS012-W-10-T)	HRS-S0284	O (For option T)
87	Main Board (for HRS012-W-10-MT)	HRS-S0285	O (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	O (For option J)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	○ (For option B or BT)
115	Compressor (for 100V type)	HRS-S0409	•
122	Heat exchanger (Condenser)	HRS-S0133	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Seguence I/O command signal connector	HRS-S0102	•
158	Power supply connector	HRS-S0104	
159	Ferrite core	HRS-S0105	
			-
	Drain Plug set	HBS-S0132	
160 160 162	Drain Plug set Thermal insulator for heat exchanger	HRS-S0132 HRS-S0031	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/·O". It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS018-A-10-, TP (FEB. 2015) or earlier



Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	O (For option T)
22	Hose (For option MT)	HRS-S0069	O (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	
30	Pawer board	HRS-S0019	•
32	Pawer switch (For 15A)	HRS-S0070	•
33	Inlet socket	HRS-S0070	
34	Pump (for 100V)	HRS-S0021	
38	High head pump (For 100V type option T)	HRS-S0222	○ (For option T)
<u>38</u> 41	High head pump (For 100V type option 1) High head pump (For 100V type option MT)	HRS-S0265 HRS-S0266	○ (For option 1) ○ (For option MT)
41	Mechanical seal Kit (For 100V type option MT)	HRS-S0266 HRS-S0390	(For option IVI)
	Mechanical seal Kit (For 100V type option 1) Mechanical seal Kit (For 100V type option MT)		(For option T)
46		HRS-S0412	
48	Fan (for 100V)With bracket	HRS-S0023	•
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	O (For option J)
55	Tank lid	HRS-S0026	•
56	Main Board (for HRS012/018/024)	HRS-S0134	●/○ Note 2.
60	Main Board (for HRS018-A-10)	HRS-S0035	•
76	Main Board (for HRS018-A-10-T)	HRS-S0286	 (For option T)
88	Main Board (for HRS018-A-10-MT)	HRS-S0287	 (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
115	Compressor (for 100V type)	HRS-S0409	•
119	Condenser (For air-cooled type)	HRS-S0381	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	
139	Heat exchanger (For option M)	HRS-S0413	○ (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	
143	Pressure sensor (For high or low pressure)	HRS-S0012	
145	Thermistor sensor	HRS-S0013	
145	Label (For Operation display)	HRS-S0057	•
149	Caster (4Pcs.)	HRS-S0058	
150		HRS-S0059 HRS-S0060	-
	Packaging Materials set		•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
161	Condenser bracket	HRS-S0015	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
164	Base	HRS-S0061	

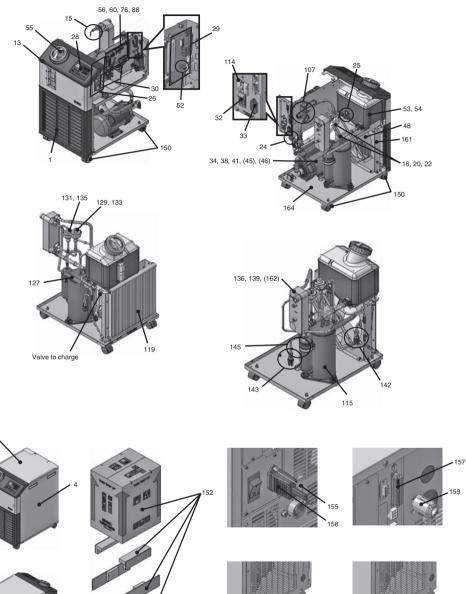
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS018-A-10 , After TQ (MAR. 2015)





156

160

2

Construction

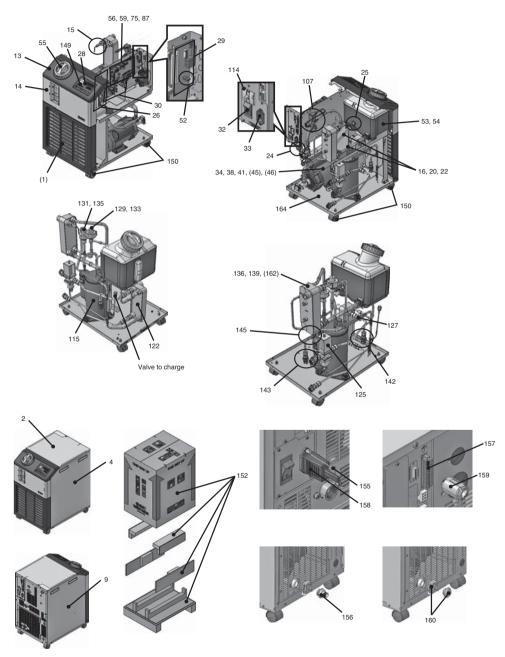
No. Note 1.	Names of parts	Parts number	●: For standard type ◯: For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	O (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
32	Pawer switch (For 15A)	HRS-S0070	•
33	Inlet socket	HRS-S0021	•
34	Pump (for 100V)	HRS-S0022	•
38	High head pump (For 100V type option T)	HRS-S0265	O (For option T)
41	High head pump (For 100V type option MT)	HRS-S0266	○ (For option MT)
45	Mechanical seal Kit (For 100V type option T)	HRS-S0390	O (For option T)
46	Mechanical seal Kit (For 100V type option MT)	HRS-S0412	○ (For option MT)
48	Fan (for 100V)With bracket	HRS-S0023	
52	Fuse (5Pcs.)	HRS-S0024	
53	Tank	HRS-S0024	
54	Tank (For automatic water-fill)	HRS-S0025	○ (For option J)
55	Tank lid	HRS-S0072	
55	Main Board (for HRS012/018/024)	HRS-S0026	•/○ Note 2.
60		HRS-S0134 HRS-S0035	0/0 Note 2.
	Main Board (for HRS018-A-10)		O (Fee entire T)
76	Main Board (for HRS018-A-10-T)	HRS-S0286	O (For option T)
88 107	Main Board (for HRS018-A-10-MT) Solenoid Valve (For automatic water-fill)	HRS-S0287 HRS-S0071	○ (For option MT)
107	Earth leakage breaker (For option B or BT)	HRS-S0071 HRS-S0394	 (For option J) (For option B or BT)
			(For option B or B1)
115	Compressor (for 100V type)	HRS-S0409	•
119	Condenser (For air-cooled type)	HRS-S0381	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
161	Condenser bracket	HRS-S0015	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
164	Base	HRS-S0061	•

Note 1. Excerpt number from the total list of P.91 to 98

It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS018-W-10-, TP (FEB. 2015) or earlier



Construction

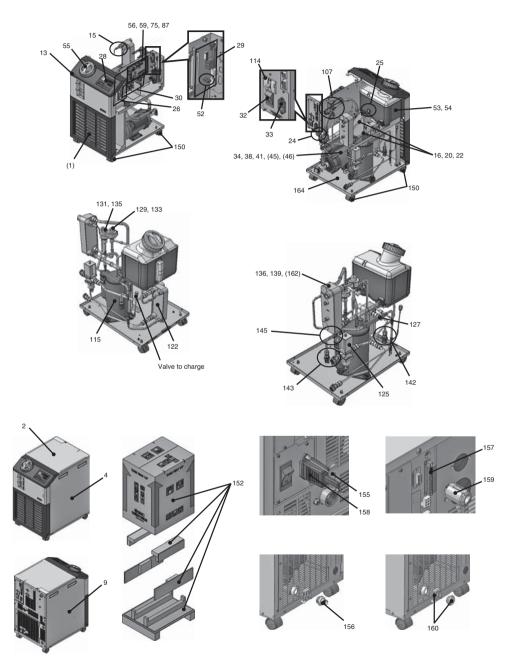
No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	 (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
32	Pawer switch (For 15A)	HRS-S0070	•
33	Inlet socket	HRS-S0021	•
34	Pump (for 100V)	HRS-S0022	•
38	High head pump (For 100V type option T)	HRS-S0265	O (For option T)
41	High head pump (For 100V type option MT)	HRS-S0266	 (For option MT)
45	Mechanical seal Kit (For 100V type option T)	HRS-S0390	 (For option T)
46	Mechanical seal Kit (For 100V type option MT)	HRS-S0412	 (For option MT)
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	O (For option J)
55	Tank lid	HRS-S0026	•
56	Main Board (for HRS012/018/024)	HRS-S0134	●/○ Note 2.
61	Main Board (for HRS018-W-10)	HRS-S0036	•
77	Main Board (for HRS018-W-10-T)	HRS-S0288	O (For option T)
89	Main Board (for HRS018-W-10-MT)	HRS-S0289	O (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	○ (For option J)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	○ (For option B or BT)
115	Compressor (for 100V type)	HRS-S0409	•
122	Heat exchanger (Condenser)	HRS-S0133	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	(For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	
143	Pressure sensor (For high or low pressure)	HRS-S0013	
145	Thermistor sensor	HRS-S0057	•
149	Label (For Operation display)	HRS-S0058	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0102	
158	Power supply connector	HRS-S0103	
159	Ferrite core	HRS-S0105	
160	Drain Plug set	HRS-S0105	•
162	Thermal insulator for heat exchanger	HRS-S0032	
		1110-00031	-

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS018-W-10-, After TQ (MAR. 2015)



Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	○ (For option T)
22	Hose (For option MT)	HRS-S0069	O (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	
28	Display board	HRS-S0520	
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	
32	Pawer switch (For 15A)	HRS-S0079	
33	Inlet socket	HRS-S0070	
34	Pump (for 100V)	HRS-S0021	
38	High head pump (For 100V type option T)	HRS-S0022 HRS-S0265	O (For option T)
41			(For option MT)
41	High head pump (For 100V type option MT) Mechanical seal Kit (For 100V type option T)	HRS-S0266 HRS-S0390	
			○ (For option T)
46	Mechanical seal Kit (For 100V type option MT)	HRS-S0412	 (For option MT)
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	O (For option J)
55	Tank lid	HRS-S0026	•
56	Main Board (for HRS012/018/024)	HRS-S0134	●/○ Note 2.
61	Main Board (for HRS018-W-10)	HRS-S0036	•
77	Main Board (for HRS018-W-10-T)	HRS-S0288	 (For option T)
89	Main Board (for HRS018-W-10-MT)	HRS-S0289	 (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
115	Compressor (for 100V type)	HRS-S0409	•
122	Heat exchanger (Condenser)	HRS-S0133	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	
157	Sequence I/O command signal connector	HRS-S0102	
157	Power supply connector	HRS-S0103	
158	Forrite core	HRS-S0104 HRS-S0105	
160	Drain Plug set	HRS-S0105 HRS-S0132	
160			•
	Thermal insulator for heat exchanger	HRS-S0031	•
164	Base	HRS-S0061	

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

Construction

56, 62, 78, 90, 98, 101, 104 15 140 13 111, 114 107 14 52 53, 54 31, 32 49 33 161 24 150 35, 39, 42, (47) 16, 20, 22 131, 135 129, 133 150 164 136, 139, (162) 127 145, (163) 119 Valve to charge 142 116 152 For options other than G For options G 157 55 156 160 158

Applicable models, Ser. No.: HRS012-A - 20-, TP (FEB. 2015) or earlier

Construction

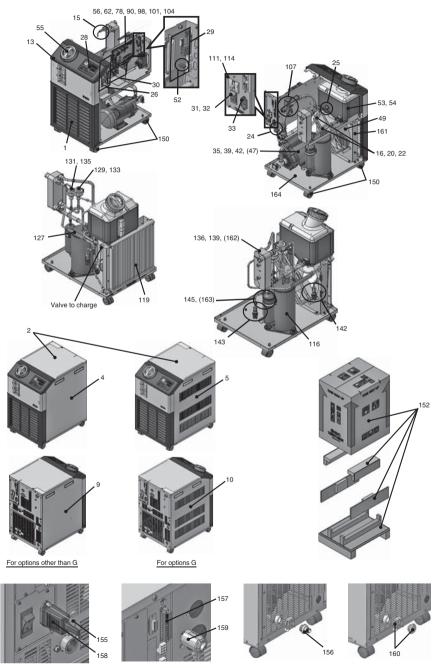
No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
5	Right Side Panel (For option G)	HRS-S0075	 (For option G)
9	Left Side Panel	HRS-S0004	•
10	Left Side Panel (For option G)	HRS-S0076	○ (For option G)
13 14	Front panel B	HRS-S0005	
14	Front panel A Temperature sensor	HRS-S0006 HRS-S0007	•
16	Hose (For standard pump)	HRS-S0007	•
20	Hose (For option T)	HRS-S0077	O (For option T)
22	Hose (For option MT)	HRS-S0069	○ (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	○ (For option T)
33	Inlet socket	HRS-S0021	•
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	○ (For option T)
42	High head pump (For option MT)	HRS-S0063	⊖ (For option MT)
47	Mechanical seal Kit	HRG-S0211	O (For option T)
49 52	Fan (for 200V type) Fuse (5Pcs.)	HRS-S0067 HRS-S0024	•
53	Tank	HRS-S0024 HRS-S0025	
54	Tank (For automatic water-fill)	HRS-S0025	O (For option J)
55	Tank lid	HRS-S0072	
56	Main Board (for HRS012/018/024)	HRS-S0134	•/○ Note 2.
62	Main Board (for HRS012-A-20)	HRS-S0037	
78	Main Board (for HRS012-A-20-T)	HRS-S0038	○ (For option T)
90	Main Board (for HRS012-A-20-MT)	HRS-S0039	O (For option MT)
98	Main Board (for HRS012-A-20-G)	HRS-S0078	O (For option G)
101	Main Board (for HRS012-A-20-GT)	HRS-S0079	 (For option GT)
104	Main Board (for HRS012-A-20-GMT)	HRS-S0080	 (For option GMT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	 (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	•
119	Condenser (For air-cooled type)	HRS-S0381	•
127 129	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating) Electronic Expansion Valve (For cooling)	HRS-S0028 HRS-S0029	•
133	Electronic Expansion Valve (For cooling)	HRS-S0029 HRS-S0009	
135	Electronic Expansion Valve Coll (For realing)	HRS-S0009 HRS-S0010	
135	Heat exchanger	HRS-S0010	•
139	Heat exchanger (For option M)	HRS-S0413	O (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	
149	Label (For Operation display)	HRS-S0058	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set Condenser bracket	HRS-S0132	•
161 162	Thermal insulator for heat exchanger	HRS-S0015 HRS-S0031	
162	Thermal insulator for copper pipe	HRS-S0031	
164	Base	HRS-S0032	•
104	10400	110-30001	—

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS012-A -20-, After TQ (MAR. 2015)



Construction

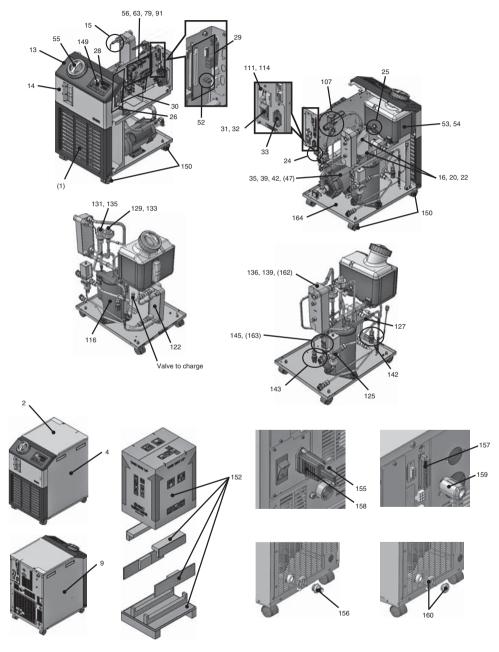
No. Note1.	Names of parts	Parts number	 For standard type For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
5	Right Side Panel (For option G)	HRS-S0075	 (For option G)
9	Left Side Panel	HRS-S0004	•
10	Left Side Panel (For option G)	HRS-S0076	 (For option G)
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	 (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	 (For option T)
33	Inlet socket	HRS-S0021	•
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	○ (For option T)
42	High head pump (For option MT)	HRS-S0063	O (For option MT)
47	Mechanical seal Kit	HRG-S0211	O (For option T)
49	Fan (for 200V type)	HRS-S0067	•
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	O (For option J)
55	Tank lid	HRS-S0026	•
56	Main Board (for HRS012/018/024)	HRS-S0134	●/◯ Note 2.
62	Main Board (for HRS012-A-20)	HRS-S0037	•
78	Main Board (for HRS012-A-20-T)	HRS-S0038	○ (For option T)
90	Main Board (for HRS012-A-20-MT)	HRS-S0039	O (For option MT)
98	Main Board (for HRS012-A-20-G)	HRS-S0078	○ (For option G)
101	Main Board (for HRS012-A-20-GT)	HRS-S0079	○ (For option GT)
104	Main Board (for HRS012-A-20-GMT)	HRS-S0080	○ (For option GMT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	(For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	○ (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0393	○ (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	
119	Condenser (For air-cooled type)	HRS-S0000	•
127			
127	Filter drier Electronic Expansion Valve (For heating)	HRS-S0387 HRS-S0028	
			•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	
139	Heat exchanger (For option M)	HRS-S0413	O (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
161	Condenser bracket	HRS-S0015	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
163	Thermal insulator for copper pipe	HRS-S0032	•
164	Base	HRS-S0061	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS012-W -20-, TP (FEB. 2015) or earlier



Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	O (For option T)
22	Hose (For option MT)	HRS-S0069	O (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	• (Far artice T)
32	Pawer switch (For 15A)	HRS-S0070	O (For option T)
33	Inlet socket	HRS-S0021	•
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	O (For option T)
42	High head pump (For option MT)	HRS-S0063	○ (For option MT)
47	Mechanical seal Kit	HRG-S0211	○ (For option T)
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	○ (For option J)
55	Tank lid	HRS-S0026	
56	Main Board (for HRS012/018/024)	HRS-S0134	•/O Note 2.
63	Main Board (for HRS012-W-20)	HRS-S0040	
79	Main Board (for HRS012-W-20-T)	HRS-S0041	O (For option T)
91	Main Board (for HRS012-W-20-MT)	HRS-S0042	O (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	○ (For option J)
111	Earth leakage breaker (For option B) Earth leakage breaker (For option B or BT)	HRS-S0393 HRS-S0394	○ (For option B)
114 116	Compressor (for 200V type)	HRS-S0394 HRS-S0068	 (For option B or BT)
			•
122	Heat exchanger (Condenser)	HRS-S0133	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129 131	Electronic Expansion Valve (For heating) Electronic Expansion Valve (For cooling)	HRS-S0028	•
	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133 135	Electronic Expansion Valve Coll (For neating)	HRS-S0009 HRS-S0010	•
	Heat exchanger		•
136 139	Heat exchanger (For option M)	HRS-S0030 HRS-S0413	(For option M)
139	Pressure sensor (For high pressure)	HRS-S0413 HRS-S0012	
142	Pressure sensor (For high or low pressure) Pressure sensor (For high or low pressure)	HRS-S0012 HRS-S0013	•
143	Thermistor sensor	HRS-S0013 HRS-S0057	•
145	Label (For Operation display)	HRS-S0057 HRS-S0058	
149	Caster (4Pcs.)	HRS-S0058	
150	Packaging Materials set	HRS-S0059	
152	Packaging Materials set Power supply connector omission prevention fittings	HRS-S0060	•
155	Drain Fitting	HRS-S0102	
150	Sequence I/O command signal connector	HRS-S0102	•
157	Power supply connector	HRS-S0103	
158	Ferrite core	HRS-S0104 HRS-S0105	
160	Drain Plug set	HRS-S0105	
160	Thermal insulator for heat exchanger	HRS-S0132 HRS-S0031	•
		nno-00031	
162	Thermal insulator for copper pipe	HRS-S0032	•

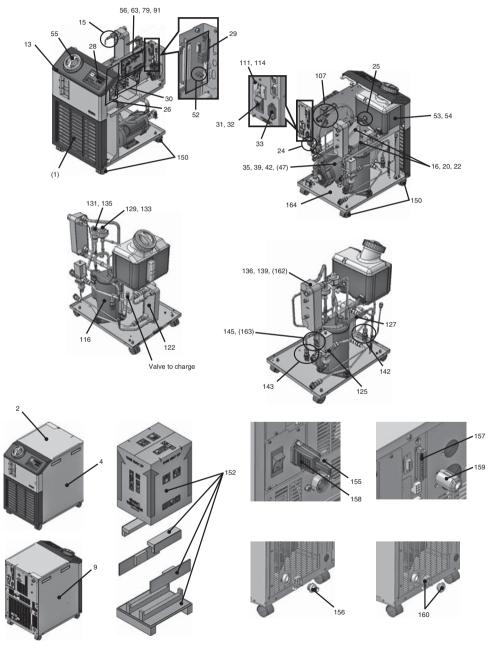
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS012-W -20-, After TQ (MAR. 2015)



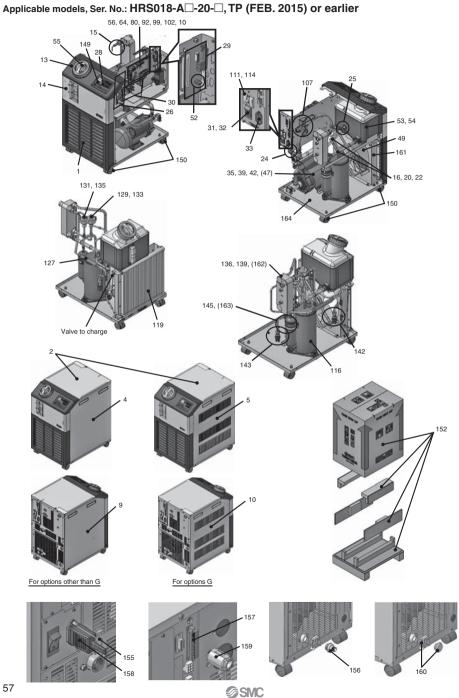
Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	 (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	 (For option T)
33	Inlet socket	HRS-S0021	•
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	 (For option T)
42	High head pump (For option MT)	HRS-S0063	 (For option MT)
47	Mechanical seal Kit	HRG-S0211	O (For option T)
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	○ (For option J)
55	Tank lid	HRS-S0026	\bullet
56	Main Board (for HRS012/018/024)	HRS-S0134	●/◯ Note 2.
63	Main Board (for HRS012-W-20)	HRS-S0040	•
79	Main Board (for HRS012-W-20-T)	HRS-S0041	O (For option T)
91	Main Board (for HRS012-W-20-MT)	HRS-S0042	O (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	O (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	○ (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	○ (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	
122	Heat exchanger (Condenser)	HRS-S0133	ě
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0029	•
135	Electronic Expansion Valve Coll (For cooling)	HRS-S0003	•
136	Heat exchanger	HRS-S0010	
139	Heat exchanger (For option M)	HRS-S0413	○ (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	
143	Pressure sensor (For high pressure)	HRS-S0012	
145	Thermistor sensor	HRS-S0073	
150	Caster (4Pcs.)	HRS-S0057	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0000	•
156	Drain Fitting	HRS-S0174	
150	Sequence I/O command signal connector	HRS-S0102	•
157	Power supply connector	HRS-S0103	•
150	Ferrite core	HRS-S0104 HRS-S0105	•
160	Drain Plug set	HRS-S0105	•
160	Thermal insulator for heat exchanger	HRS-S0132 HRS-S0031	•
162	Thermal insulator for neat exchanger	HRS-S0031 HRS-S0032	•
			-
164	Base	HRS-S0061	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/·O". It is used by setting the program.

Construction



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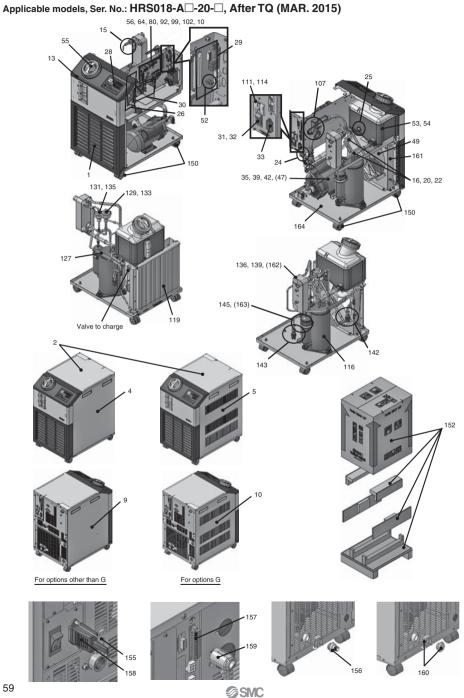
Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
5	Right Side Panel (For option G)	HRS-S0075	 (For option G)
9	Left Side Panel	HRS-S0004	•
10	Left Side Panel (For option G)	HRS-S0076	 (For option G)
13 14	Front panel B	HRS-S0005	
14	Front panel A Temperature sensor	HRS-S0006 HRS-S0007	•
16	Hose (For standard pump)	HRS-S0007	•
20	Hose (For option T)	HRS-S0077	O (For option T)
22	Hose (For option MT)	HRS-S0069	○ (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	 (For option T)
33	Inlet socket	HRS-S0021	•
35	Pump (for 200V type)	HRS-S0066	•
39 42	High head pump (For option T)	HRS-S0062	○ (For option T)
42	High head pump (For option MT)	HRS-S0063	 (For option MT) (For option T)
47	Mechanical seal Kit Fan (for 200V type)	HRG-S0211 HRS-S0067	
52	Fuse (5Pcs.)	HRS-S0067 HRS-S0024	•
53	Tank	HRS-S0024	
54	Tank (For automatic water-fill)	HRS-S0023	O (For option J)
55	Tank lid	HRS-S0026	
56	Main Board (for HRS012/018/024)	HRS-S0134	•/〇 Note 2.
64	Main Board (for HRS018-A-20)	HRS-S0043	•
80	Main Board (for HRS018-A-20-T)	HRS-S0044	 (For option T)
92	Main Board (for HRS018-A-20-MT)	HRS-S0045	 (For option MT)
99	Main Board (for HRS018-A-20-G)	HRS-S0081	 (For option G)
102	Main Board (for HRS018-A-20-GT)	HRS-S0082	 (For option GT)
105	Main Board (for HRS018-A-20-GMT)	HRS-S0083	 (For option GMT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	○ (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	O (For option B)
114 116	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
119	Compressor (for 200V type) Condenser (For air-cooled type)	HRS-S0068 HRS-S0381	
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0023	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	○ (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	\bullet
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
149	Label (For Operation display)	HRS-S0058	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155 156	Power supply connector omission prevention fittings	HRS-S0074 HRS-S0102	•
156	Drain Fitting Sequence I/O command signal connector	HRS-S0102 HRS-S0103	•
157		HRS-S0103 HRS-S0104	
158	Power supply connector Ferrite core	HRS-S0104 HRS-S0105	
160	Drain Plug set	HRS-S0103	•
161	Condenser bracket	HRS-S0015	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
163	Thermal insulator for copper pipe	HRS-S0032	•
164	Base	HRS-S0061	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

Construction



Construction

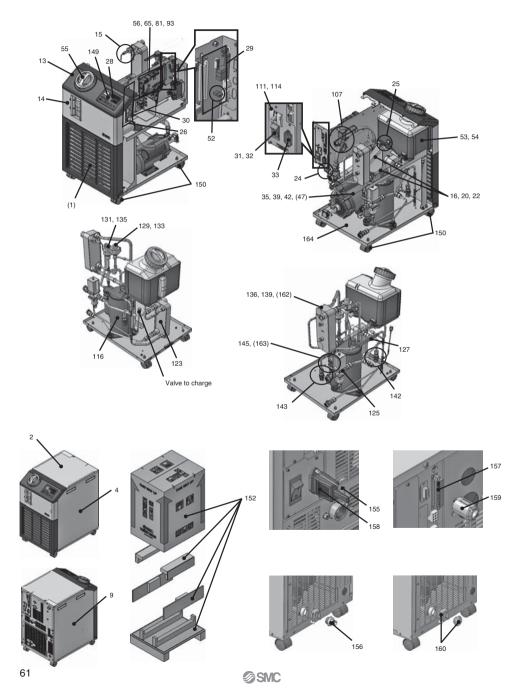
No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
5	Right Side Panel (For option G)	HRS-S0075	 (For option G)
9	Left Side Panel	HRS-S0004	•
10	Left Side Panel (For option G)	HRS-S0076	 (For option G)
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	O (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	
32	Pawer switch (For 15A)	HRS-S0070	○ (For option T)
33	Inlet socket	HRS-S0021	• (: :: option 1)
35	Pump (for 200V type)	HRS-S0021	•
39	High head pump (For option T)	HRS-S0062	○ (For option T)
42	High head pump (For option MT)	HRS-S0063	○ (For option MT)
47	Mechanical seal Kit	HRG-S0211	O (For option T)
49	Fan (for 200V type)	HRS-S0067	
52	Fuse (5Pcs.)	HRS-S0024	
53	Tank	HRS-S0024	
54	Tank (For automatic water-fill)	HRS-S0025	○ (For option J)
55	Tank lid	HRS-S0072	
56	Main Board (for HRS012/018/024)	HRS-S0120	•/〇 Note 2.
64	Main Board (for HRS012/018/024)	HRS-S0043	
80	Main Board (for HRS018-A-20) Main Board (for HRS018-A-20-T)	HRS-S0043	○ (For option T)
92		HRS-S0044 HRS-S0045	
92	Main Board (for HRS018-A-20-MT)	HRS-S0045 HRS-S0081	O (For option MT)
	Main Board (for HRS018-A-20-G)		○ (For option G)
102	Main Board (for HRS018-A-20-GT)	HRS-S0082	O (For option GT)
105	Main Board (for HRS018-A-20-GMT)	HRS-S0083	○ (For option GMT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	O (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	O (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	•
119	Condenser (For air-cooled type)	HRS-S0381	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
161	Condenser bracket	HRS-S0015	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
163	Thermal insulator for copper pipe	HRS-S0032	•
	Base	HRS-S0061	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS018-W-20-, TP (FEB. 2015) or earlier



Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	O (For option T)
22	Hose (For option MT)	HRS-S0069	O (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	• (Far artice T)
32	Pawer switch (For 15A)	HRS-S0070	O (For option T)
33	Inlet socket	HRS-S0021	•
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	O (For option T)
42	High head pump (For option MT)	HRS-S0063	○ (For option MT)
47	Mechanical seal Kit	HRG-S0211	○ (For option T)
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	○ (For option J)
55	Tank lid	HRS-S0026	
56	Main Board (for HRS012/018/024)	HRS-S0134	•/O Note 2.
65	Main Board (for HRS018-W-20)	HRS-S0046	
81	Main Board (for HRS018-W-20-T)	HRS-S0047	O (For option T)
93	Main Board (for HRS018-W-20-MT)	HRS-S0048	O (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	○ (For option J)
111	Earth leakage breaker (For option B) Earth leakage breaker (For option B or BT)	HRS-S0393 HRS-S0394	○ (For option B)
114 116	Compressor (for 200V type)	HRS-S0394 HRS-S0068	 (For option B or BT)
123	Heat exchanger (Condenser)	HRS-S0068	•
			-
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129 131	Electronic Expansion Valve (For heating) Electronic Expansion Valve (For cooling)	HRS-S0028	•
133	Electronic Expansion Valve (For cooling)	HRS-S0029 HRS-S0009	•
133	Electronic Expansion Valve Coll (For neating)	HRS-S0009 HRS-S0010	
135	Heat exchanger	HRS-S0010	-
136	Heat exchanger (For option M)	HRS-S0030 HRS-S0413	(For option M)
139	Pressure sensor (For high pressure)	HRS-S0413 HRS-S0012	
142	Pressure sensor (For high or low pressure)	HRS-S0012	
143	Thermistor sensor	HRS-S0013 HRS-S0057	•
145	Label (For Operation display)	HRS-S0057 HRS-S0058	
149	Caster (4Pcs.)	HRS-S0058	
150	Packaging Materials set	HRS-S0059	
152	Power supply connector omission prevention fittings	HRS-S0060	
155	Drain Fitting	HRS-S0074 HRS-S0102	
157	Sequence I/O command signal connector	HRS-S0102	•
157	Power supply connector	HRS-S0103	
150	Ferrite core	HRS-S0104 HRS-S0105	
160	Drain Plug set	HRS-S0105	
160	Thermal insulator for heat exchanger	HRS-S0031	•
163	Thermal insulator for copper pipe	HRS-S0031	•
	Internationation for copper pipe	HRS-S0032	-

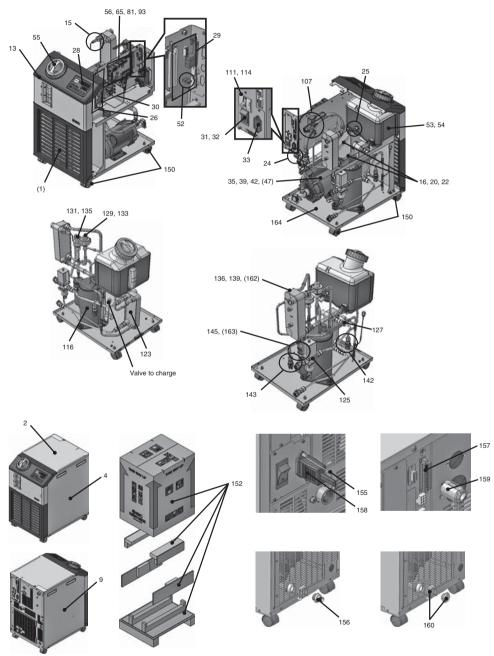
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS018-W -20-, After TQ (MAR. 2015)



Construction

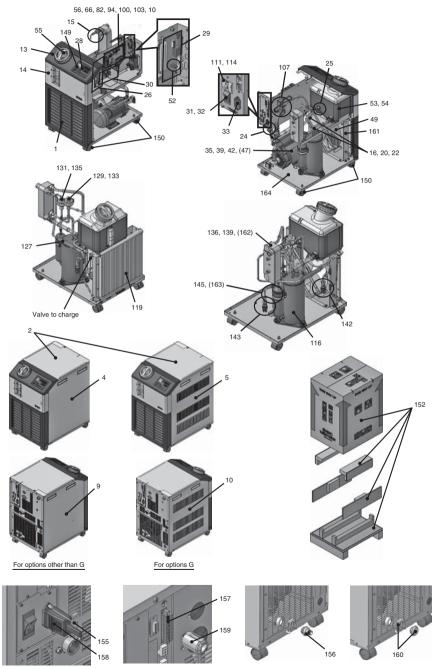
No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	 (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	 (For option T)
33	Inlet socket	HRS-S0021	• /
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	O (For option T)
42	High head pump (For option MT)	HRS-S0063	O (For option MT)
47	Mechanical seal Kit	HRG-S0211	O (For option T)
52	Fuse (5Pcs.)	HRS-S0024	• •
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	○ (For option J)
55	Tank lid	HRS-S0026	•
56	Main Board (for HRS012/018/024)	HRS-S0134	●/◯ Note 2.
65	Main Board (for HRS018-W-20)	HRS-S0046	
81	Main Board (for HRS018-W-20-T)	HRS-S0047	○ (For option T)
93	Main Board (for HRS018-W-20-MT)	HRS-S0048	○ (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	○ (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	○ (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	○ (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	
123	Heat exchanger (Condenser)	HRS-S0384	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For rooling)	HRS-S0028	•
133	Electronic Expansion Valve (For Cooling)	HRS-S0029	•
135	Electronic Expansion Valve Coll (For cooling)	HRS-S0009	•
135	Heat exchanger	HRS-S0010 HRS-S0030	
136	Heat exchanger Heat exchanger (For option M)	HRS-S0030 HRS-S0413	⊖ (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	
142	Pressure sensor (For high pressure) Pressure sensor (For high or low pressure)	HRS-S0012 HRS-S0013	
143	Thermistor sensor	HRS-S0013 HRS-S0057	
145	Caster (4Pcs.)	HRS-S0057 HRS-S0059	•
150		HRS-S0059 HRS-S0060	
	Packaging Materials set		
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
163	Thermal insulator for copper pipe	HRS-S0032	•
164	Base	HRS-S0061	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/·O". It is used by setting the program.

Construction





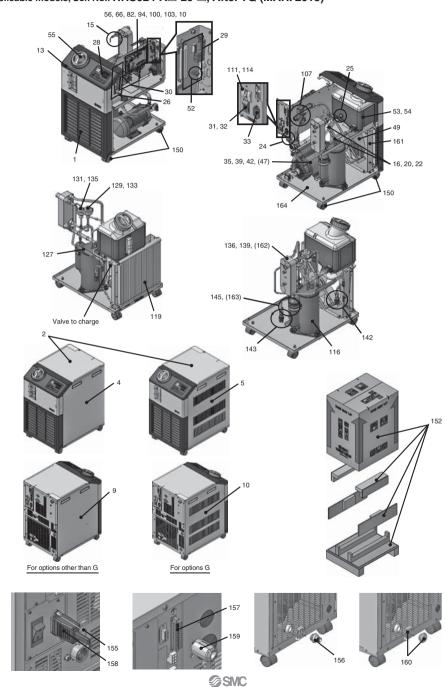
Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
5	Right Side Panel (For option G)	HRS-S0075	 (For option G)
9	Left Side Panel	HRS-S0004	•
10	Left Side Panel (For option G)	HRS-S0076	 (For option G)
13 14	Front panel B	HRS-S0005	
14	Front panel A Temperature sensor	HRS-S0006 HRS-S0007	•
16	Hose (For standard pump)	HRS-S0007	•
20	Hose (For option T)	HRS-S0077	O (For option T)
20	Hose (For option MT)	HRS-S0069	○ (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	 (For option T)
33	Inlet socket	HRS-S0021	•
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	O (For option T)
42	High head pump (For option MT)	HRS-S0063	○ (For option MT)
47	Mechanical seal Kit	HRG-S0211	O (For option T)
49	Fan (for 200V type)	HRS-S0067	•
52	Fuse (5Pcs.)	HRS-S0024	•
53 54	Tank Tank (For automatic water-fill)	HRS-S0025 HRS-S0072	○ (For option J)
54	Tank (For automatic water-till)	HRS-S0072 HRS-S0026	
56	Main Board (for HRS012/018/024)	HRS-S0020	•/○ Note 2.
66	Main Board (for HRS024-A-20)	HRS-S0049	
82	Main Board (for HRS024-A-20-T)	HRS-S0050	○ (For option T)
94	Main Board (for HRS024-A-20-MT)	HRS-S0051	○ (For option MT)
100	Main Board (for HRS024-A-20-G)	HRS-S0084	○ (For option G)
103	Main Board (for HRS024-A-20-GT)	HRS-S0085	 (For option GT)
106	Main Board (for HRS024-A-20-GMT)	HRS-S0086	 (For option GMT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	 (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	•
119	Condenser (For air-cooled type)	HRS-S0381	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating) Electronic Expansion Valve Coil (For cooling)	HRS-S0009 HRS-S0010	
135 136	Heat exchanger	HRS-S0010 HRS-S0030	
130	Heat exchanger (For option M)	HRS-S0030	O (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	
143	Pressure sensor (For high or low pressure)	HRS-S0012	•
145	Thermistor sensor	HRS-S0057	•
149	Label (For Operation display)	HRS-S0058	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
161	Condenser bracket	HRS-S0015	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
163	Thermal insulator for copper pipe	HRS-S0032	•
164	Base	HRS-S0061	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

Construction



Applicable models, Ser. No.: HRS024-A -20-, After TQ (MAR. 2015)

Construction

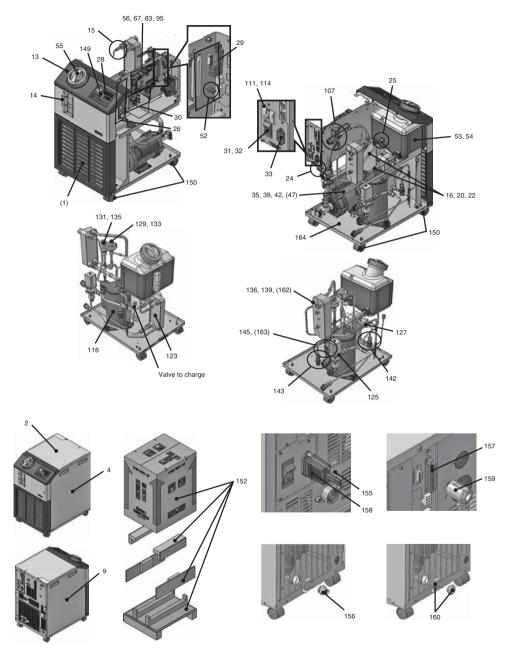
No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	l l
4	Right Side Panel	HRS-S0003	•
5	Right Side Panel (For option G)	HRS-S0075	 (For option G)
9	Left Side Panel	HRS-S0004	•
10	Left Side Panel (For option G)	HRS-S0076	 (For option G)
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	O (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	
32	Pawer switch (For 15A)	HRS-S0070	○ (For option T)
33	Inlet socket	HRS-S0021	• (: :: option 1)
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	○ (For option T)
42	High head pump (For option MT)	HRS-S0063	○ (For option MT)
47	Mechanical seal Kit	HRG-S0211	O (For option T)
49	Fan (for 200V type)	HRS-S0067	
52	Fuse (5Pcs.)	HRS-S0024	
53	Tank	HRS-S0024	
54	Tank (For automatic water-fill)	HRS-S0025	○ (For option J)
55	Tank lid	HRS-S0072 HRS-S0026	
56	Main Board (for HRS012/018/024)	HRS-S0120	•/〇 Note 2.
66	Main Board (for HRS012/016/024)	HRS-S0049	
82	Main Board (for HRS024-A-20) Main Board (for HRS024-A-20-T)	HRS-S0049 HRS-S0050	○ (For option T)
 94		HRS-S0050	
100	Main Board (for HRS024-A-20-MT)	HRS-S0051 HRS-S0084	O (For option MT)
	Main Board (for HRS024-A-20-G)		○ (For option G)
103	Main Board (for HRS024-A-20-GT)	HRS-S0085	O (For option GT)
106	Main Board (for HRS024-A-20-GMT)	HRS-S0086	○ (For option GMT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	O (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	O (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	•
119	Condenser (For air-cooled type)	HRS-S0381	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	
145	Thermistor sensor	HRS-S0057	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
161	Condenser bracket	HRS-S0015	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
163	Thermal insulator for copper pipe	HRS-S0032	•
	Base	HRS-S0061	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS024-W□-20-□, TP (FEB. 2015) or earlier



Construction

No. Note1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	 (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	O (For option T)
33	Inlet socket	HRS-S0021	•
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	 (For option T)
42	High head pump (For option MT)	HRS-S0063	 (For option MT)
47	Mechanical seal Kit	HRG-S0211	 (For option T)
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	 (For option J)
55	Tank lid	HRS-S0026	•
56	Main Board (for HRS012/018/024)	HRS-S0134	•/O Note 2.
67	Main Board (for HRS024-W-20)	HRS-S0052	•
83	Main Board (for HRS024-W-20-T)	HRS-S0053	 (For option T)
95	Main Board (for HRS024-W-20-MT)	HRS-S0054	 (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	 (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	•
123	Heat exchanger (Condenser)	HRS-S0384	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
149	Label (For Operation display)	HRS-S0058	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
163	Thermal insulator for copper pipe	HRS-S0032	•
164	Base	HRS-S0061	•

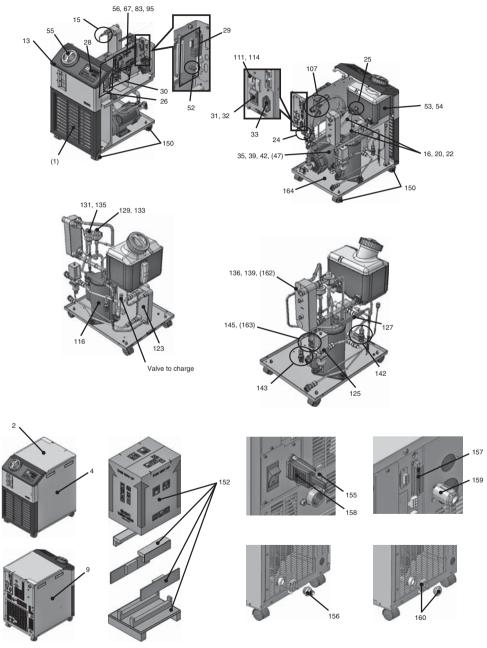
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS024-W -20-, After TQ (MAR. 2015)



Construction

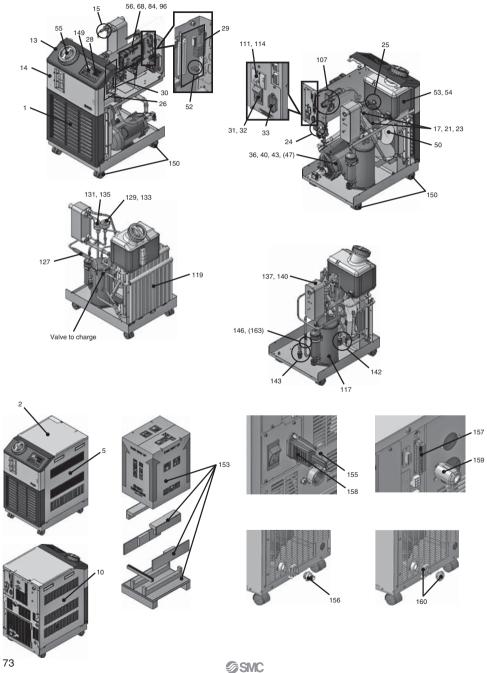
No. Note 1.	Names of parts	Parts number	●: For standard type ◯: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
4	Right Side Panel	HRS-S0003	•
9	Left Side Panel	HRS-S0004	•
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
16	Hose (For standard pump)	HRS-S0008	•
20	Hose (For option T)	HRS-S0077	 (For option T)
22	Hose (For option MT)	HRS-S0069	 (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	O (For option T)
33	Inlet socket	HRS-S0021	•
35	Pump (for 200V type)	HRS-S0066	•
39	High head pump (For option T)	HRS-S0062	O (For option T)
42	High head pump (For option MT)	HRS-S0063	 (For option MT)
47	Mechanical seal Kit	HRG-S0211	 (For option T)
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	 (For option J)
55	Tank lid	HRS-S0026	•
56	Main Board (for HRS012/018/024)	HRS-S0134	O Note 2.
67	Main Board (for HRS024-W-20)	HRS-S0052	•
83	Main Board (for HRS024-W-20-T)	HRS-S0053	 (For option T)
95	Main Board (for HRS024-W-20-MT)	HRS-S0054	 (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	O (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	 (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	•
123	Heat exchanger (Condenser)	HRS-S0384	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
136	Heat exchanger	HRS-S0030	•
139	Heat exchanger (For option M)	HRS-S0413	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
145	Thermistor sensor	HRS-S0057	•
150	Caster (4Pcs.)	HRS-S0059	•
152	Packaging Materials set	HRS-S0060	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0102	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
162	Thermal insulator for heat exchanger	HRS-S0031	•
			-
163	Thermal insulator for copper pipe	HRS-S0032	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/·O". It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS030-A -20-, TP (FEB. 2015) or earlier



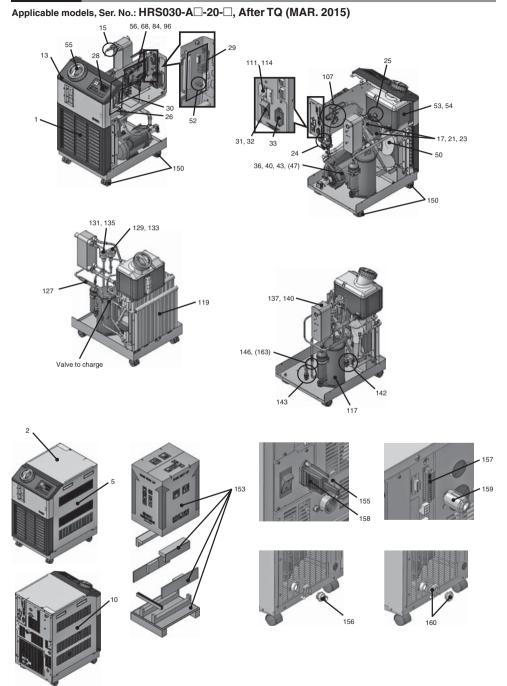
Construction

No. Note1.	Names of parts	Parts number	 For standard type For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
5	Right Side Panel (For option G)	HRS-S0075	•
10	Left Side Panel (For option G)	HRS-S0076	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
17	Hose (For standard pump)	HRS-S0302	•
21	Hose (For option T)	HRS-S0303	O (For option T)
23	Hose (For option MT)	HRS-S0304	○ (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0014	•
28	Display board	HRS-S0017	
20	Communication board	HRS-S0017 HRS-S0018	
30			•
	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	
32	Pawer switch (For 15A)	HRS-S0070	O (For option T)
33	Inlet socket	HRS-S0021	•
36	Pump (for 200V)	HRS-S0361	•
40	High head pump (For option T)	HRS-S0299	 (For option T)
43	High head pump (For option MT)	HRS-S0300	 (For option MT)
47	Mechanical seal Kit	HRG-S0211	 (For option T)
50	Fan	HRS-S0301	•
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	 (For option J)
55	Tank lid	HRS-S0026	•
56	Main Board (for HRS012/018/024)	HRS-S0134	●/○ Note 2.
68	Main Board	HRS-S0290	•
84	Main Board (for HRS030-A-20-T)	HRS-S0291	O (For option T)
96	Main Board (for HRS030-A-20-MT)	HRS-S0292	○ (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	(For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	(For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	○ (For option B or BT)
117	Compressor (for 200V type)	HRS-S0423	
119	Condenser (For air-cooled type)		•
		HRS-S0381	
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
137	Heat exchanger Assy	HRS-S0380	•
140	Heat exchanger Assy (For option M)	HRS-S0414	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
146	Thermistor sensor	HRS-S0338	•
149	Label (For Operation display)	HRS-S0058	•
150	Caster (4Pcs.)	HRS-S0059	•
153	Packaging Materials set	HRS-S0391	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	
157	Sequence I/O command signal connector	HRS-S0102	•
158	Power supply connector	HRS-S0103	
150	Ferrite core	HRS-S0104	•
	Drain Plug set	HRS-S0105	•
160			

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/·O". It is used by setting the program.

Construction



Construction

No. Note1.	Names of parts	Parts number	 For standard type For option type
1	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
5	Right Side Panel (For option G)	HRS-S0075	•
10	Left Side Panel (For option G)	HRS-S0076	•
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	
17	Hose (For standard pump)	HRS-S0302	•
21	Hose (For option T)	HRS-S0303	 (For option T)
23	Hose (For option MT)	HRS-S0304	 (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	O (For option T)
33	Inlet socket	HRS-S0021	•
36	Pump (for 200V)	HRS-S0361	•
40	High head pump (For option T)	HRS-S0299	O (For option T)
43	High head pump (For option MT)	HRS-S0300	O (For option MT)
47	Mechanical seal Kit	HRG-S0211	○ (For option T)
50	Fan	HRS-S0301	•
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	
54	Tank (For automatic water-fill)	HRS-S0072	OO (For option J)
55	Tank lid	HRS-S0026	
56	Main Board (for HRS012/018/024)	HRS-S0134	•/○ Note 2.
68	Main Board	HRS-S0290	Note 2.
84	Main Board (for HRS030-A-20-T)	HRS-S0291	O For option T)
96	Main Board (for HRS030-A-20-T)	HRS-S0291	○ (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0292	○ (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	○ (For option B)
114	Earth leakage breaker (For option B)	HRS-S0393	○ (For option B or BT)
117	Compressor (for 200V type)	HRS-S0423	
119	Condenser (For air-cooled type)	HRS-S0423	
127	Filter drier		•
		HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
137	Heat exchanger Assy	HRS-S0380	
140	Heat exchanger Assy (For option M)	HRS-S0414	○ (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
146	Thermistor sensor	HRS-S0338	•
150	Caster (4Pcs.)	HRS-S0059	•
153	Packaging Materials set	HRS-S0391	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
163	Thermal insulator for copper pipe	HRS-S0032	•

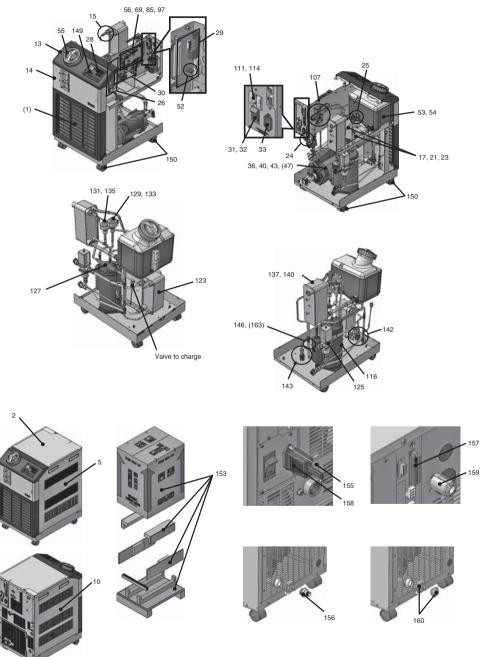
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS030-W -20-, TP (FEB. 2015) or earlier



Construction

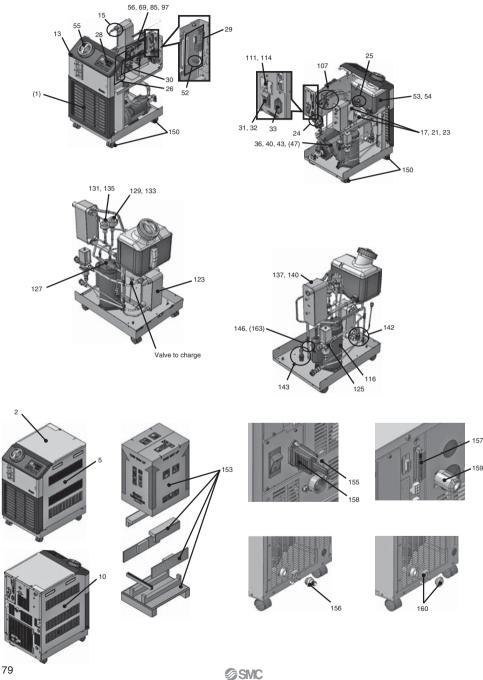
No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	
5	Right Side Panel (For option G)	HRS-S0075	•
10	Left Side Panel (For option G)	HRS-S0076	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
17	Hose (For standard pump)	HRS-S0302	•
21	Hose (For option T)	HRS-S0303	O (For option T)
23	Hose (For option MT)	HRS-S0304	○ (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	
25	Level switch	HRS-S0014	
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0017	
20	Communication board		-
		HRS-S0018	•
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	•
32	Pawer switch (For 15A)	HRS-S0070	○ (For option T)
33	Inlet socket	HRS-S0021	•
36	Pump (for 200V)	HRS-S0361	•
40	High head pump (For option T)	HRS-S0299	 (For option T)
43	High head pump (For option MT)	HRS-S0300	 (For option MT)
47	Mechanical seal Kit	HRG-S0211	 (For option T)
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	O (For option J)
55	Tank lid	HRS-S0026	
56	Main Board (for HRS012/018/024)	HRS-S0134	•/○ Note 2.
69	Main Board	HRS-S0293	Note 2.
85	Main Board (for HRS030-W-20-T)	HRS-S0293	O (For option T)
	Main Board (for HRS030-W-20-IT)		
97		HRS-S0295	○ (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	○ (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	○ (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	○ (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	•
123	Heat exchanger (Condenser)	HRS-S0384	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
137	Heat exchanger Assy	HRS-S0380	
140	Heat exchanger Assy (For option M)	HRS-S0414	○ (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	
143	Pressure sensor (For high pressure)	HRS-S0012	
145	Thermistor sensor	HRS-S0338	
140	Label (For Operation display)	HRS-S0058	
149	Caster (4Pcs.)		
		HRS-S0059	•
153	Packaging Materials set	HRS-S0391	•
155	Power supply connector omission prevention fittings	HRS-S0074	•
156	Drain Fitting	HRS-S0102	•
157	Sequence I/O command signal connector	HRS-S0103	•
158	Power supply connector	HRS-S0104	•
159	Ferrite core	HRS-S0105	
160	Drain Plug set	HRS-S0132	•
163	Thermal insulator for copper pipe	HRS-S0032	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/·O". It is used by setting the program.

Construction

Applicable models, Ser. No.: HRS030-W -20-, After TQ (MAR. 2015)



Construction

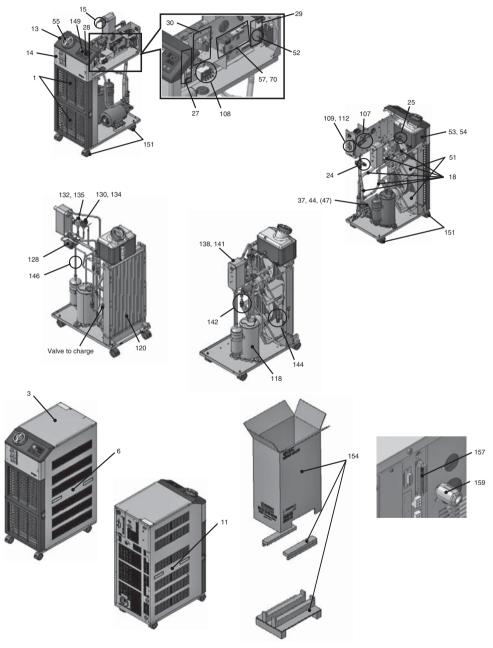
No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
2	Upper Panel	HRS-S0002	•
5	Right Side Panel (For option G)	HRS-S0075	•
10	Left Side Panel (For option G)	HRS-S0076	•
13	Front panel	HRS-S0519	•
15	Temperature sensor	HRS-S0007	•
17	Hose (For standard pump)	HRS-S0302	•
21	Hose (For option T)	HRS-S0303	○ (For option T)
23	Hose (For option MT)	HRS-S0304	O (For option MT)
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
26	DC power supply	HRS-S0016	•
28	Display board	HRS-S0520	•
29	Communication board	HRS-S0018	
30	Pawer board	HRS-S0019	•
31	Pawer switch	HRS-S0020	
32	Pawer switch (For 15A)	HRS-S0020	O (For option T)
33	Inlet socket	HRS-S0070	
36	Pump (for 200V)	HRS-S0021	•
40	High head pump (For option T)	HRS-S0361 HRS-S0299	○ (For option T)
-			
43	High head pump (For option MT)	HRS-S0300	○ (For option MT)
47	Mechanical seal Kit	HRG-S0211	○ (For option T)
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	O (For option J)
55	Tank lid	HRS-S0026	•
56	Main Board (for HRS012/018/024)	HRS-S0134	●/○ Note 2.
69	Main Board	HRS-S0293	•
85	Main Board (for HRS030-W-20-T)	HRS-S0294	 (For option T)
97	Main Board (for HRS030-W-20-MT)	HRS-S0295	 (For option MT)
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
111	Earth leakage breaker (For option B)	HRS-S0393	 (For option B)
114	Earth leakage breaker (For option B or BT)	HRS-S0394	 (For option B or BT)
116	Compressor (for 200V type)	HRS-S0068	•
123	Heat exchanger (Condenser)	HRS-S0384	•
125	Water regulating valve	HRS-S0385	•
127	Filter drier	HRS-S0387	•
129	Electronic Expansion Valve (For heating)	HRS-S0028	•
131	Electronic Expansion Valve (For cooling)	HRS-S0029	•
133	Electronic Expansion Valve Coil (For heating)	HRS-S0009	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
137	Heat exchanger Assy	HRS-S0380	•
140	Heat exchanger Assy (For option M)	HRS-S0414	○ (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	
143	Pressure sensor (For high or low pressure)	HRS-S0013	•
146	Thermistor sensor	HRS-S0338	•
150	Caster (4Pcs.)	HRS-S0059	•
153	Packaging Materials set	HRS-S0039	•
155	Power supply connector omission prevention fittings	HRS-S0074	
155	Drain Fitting	HRS-S0074 HRS-S0102	
156	Drain Fitting Sequence I/O command signal connector	HRS-S0102 HRS-S0103	
157	Power supply connector		
		HRS-S0104	•
159	Ferrite core	HRS-S0105	•
160	Drain Plug set	HRS-S0132	•
163	Thermal insulator for copper pipe	HRS-S0032	•

Note 1 Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

Construction

Applicable models: HRS050-A□-20-□



Construction

No. Note 1.	Names of parts	Parts number	 For standard type For option type
1	Dustproof filter	HRS-S0001	•
3	Upper Panel	HRS-S0092	•
6	Right Side Panel (For air cooling)	HRS-S0093	•
11	Left Side Panel (For air cooling)	HRS-S0095	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
18	Hose (For standard pump)	HRS-S0097	•
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
27	DC power supply	HRS-S0087	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
37	Pump	HRS-S0088	•
44	Pump (For option M)	HRS-S0089	 (For option M)
47	Mechanical seal Kit	HRG-S0211	•
51	Fan	HRS-S0099	•
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	 (For option J)
55	Tank lid	HRS-S0026	•
57	Main Board (HRS050)	HRS-S0135	●/○ Note 2.
70	Main Board	HRS-S0090	•
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
108	Relay (For Compressor)	HRS-S0392	•
109	Circuit breaker	HRS-S0395	•
112	Earth leakage breaker (For option B)	HRS-S0348	 (For option B)
118	Compressor	HRS-S0337	•
120	Condenser (For air-cooled type)	HRS-S0382	•
128	Filter drier	HRZ-S0227	•
130	Electronic Expansion Valve (For heating)	HRS-S0340	•
132	Electronic Expansion Valve (For cooling)	HRS-S0341	•
134	Electronic Expansion Valve Coil (For heating)	HRS-S0386	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
138	Heat exchanger	HRS-S0184	•
141	Heat exchanger (For option M)	HRS-S0415	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
144	Pressure sensor (For high pressure)	HRS-S0183	•
146	Thermistor sensor	HRS-S0338	•
149	Label (For Operation display)	HRS-S0058	•
151	Caster (4Pcs.)(for HRS050)	HRS-S0098	•
154	Packaging Materials set	HRS-S0151	•
157	Sequence I/O command signal connector	HRS-S0103	•
159	Ferrite core	HRS-S0105	

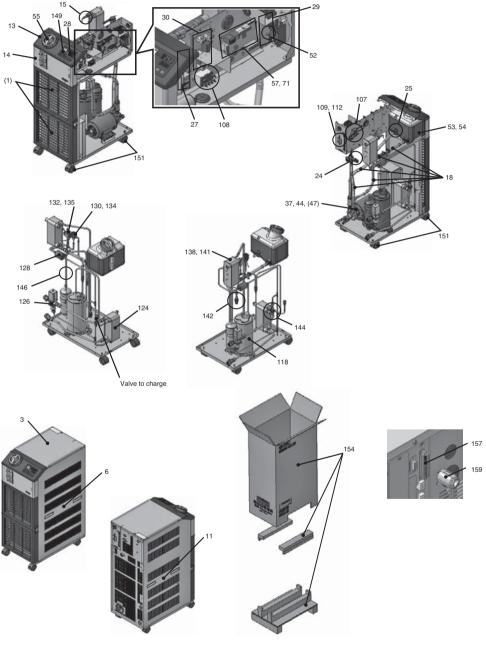
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models: HRS050-W□-20-□



Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
3	Upper Panel	HRS-S0092	•
8	Right Side Panel (For water-cooled)	HRS-S0094	•
12	Left Side Panel (For water-cooled)	HRS-S0096	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
18	Hose (For standard pump)	HRS-S0097	•
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
27	DC power supply	HRS-S0087	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
37	Pump	HRS-S0088	•
44	Pump (For option M)	HRS-S0089	 (For option M)
47	Mechanical seal Kit	HRG-S0211	•
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	 (For option J)
55	Tank lid	HRS-S0026	•
57	Main Board (HRS050)	HRS-S0135	/ Note 2.
71	Main Board	HRS-S0091	•
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option T)
108	Relay (For Compressor)	HRS-S0392	•
109	Circuit breaker	HRS-S0395	•
112	Earth leakage breaker (For option B)	HRS-S0348	 (For option B)
118	Compressor	HRS-S0337	•
124	Heat exchanger (Condenser)	HRS-S0152	•
126	Water regulating valve	HRS-S0388	•
128	Filter drier	HRZ-S0227	•
130	Electronic Expansion Valve (For heating)	HRS-S0340	•
132	Electronic Expansion Valve (For cooling)	HRS-S0341	•
134	Electronic Expansion Valve Coil (For heating)	HRS-S0386	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
138	Heat exchanger	HRS-S0184	•
141	Heat exchanger (For option M)	HRS-S0415	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
144	Pressure sensor (For high pressure)	HRS-S0183	•
146	Thermistor sensor	HRS-S0338	•
149	Label (For Operation display)	HRS-S0058	•
151	Caster (4Pcs.)(for HRS050)	HRS-S0098	•
154	Packaging Materials set	HRS-S0151	•
157	Sequence I/O command signal connector	HRS-S0103	•
159	Ferrite core	HRS-S0105	•

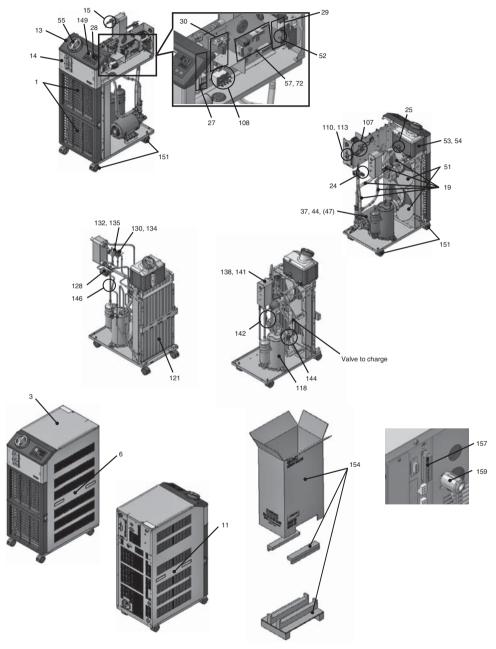
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models: HRS060-A□-20-□



Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
1	Dustproof filter	HRS-S0001	•
3	Upper Panel	HRS-S0092	•
7	Right Side Panel (For air cooling)	HRS-S0298	•
11	Left Side Panel (For air cooling)	HRS-S0095	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
19	Hose (For standard pump)	HRS-S0362	•
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
27	DC power supply	HRS-S0087	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	
37	Pump	HRS-S0088	•
44	Pump (For option M)	HRS-S0089	 (For option M)
47	Mechanical seal Kit	HRG-S0211	•
51	Fan	HRS-S0099	•
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	 (For option J)
55	Tank lid	HRS-S0026	•
57	Main Board (HRS050)	HRS-S0135	●/◯ Note 2.
72	Main Board	HRS-S0296	•
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
108	Relay (For Compressor)	HRS-S0392	•
110	Circuit breaker	HRS-S0396	•
113	Earth leakage breaker (For option B)	HRS-S0397	 (For option B)
118	Compressor	HRS-S0337	•
121	Condenser (For air-cooled type)	HRS-S0383	•
128	Filter drier	HRZ-S0227	•
130	Electronic Expansion Valve (For heating)	HRS-S0340	•
132	Electronic Expansion Valve (For cooling)	HRS-S0341	•
134	Electronic Expansion Valve Coil (For heating)	HRS-S0386	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
138	Heat exchanger	HRS-S0184	•
141	Heat exchanger (For option M)	HRS-S0415	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
144	Pressure sensor (For high pressure)	HRS-S0183	•
146	Thermistor sensor	HRS-S0338	•
149	Label (For Operation display)	HRS-S0058	•
151	Caster (4Pcs.)(for HRS050)	HRS-S0098	•
154	Packaging Materials set	HRS-S0151	•
157	Sequence I/O command signal connector	HRS-S0103	•
159	Ferrite core	HRS-S0105	•

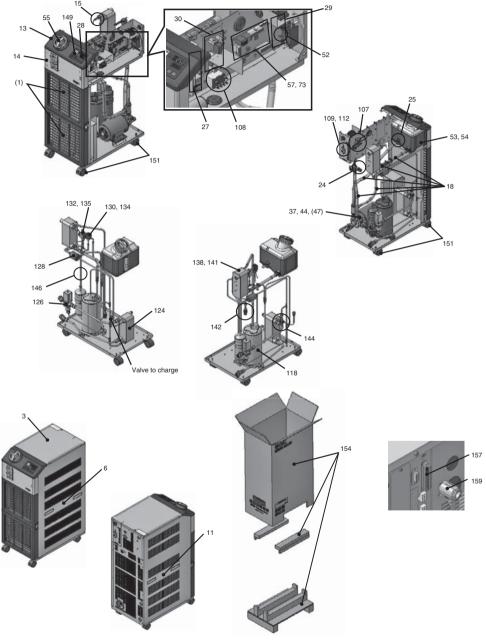
Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O".

It is used by setting the program.

Construction

Applicable models: HRS060-W \Box -20- \Box



Construction

No. Note 1.	Names of parts	Parts number	●: For standard type ○: For option type
(1)	Dustproof filter	HRS-S0001	•
3	Upper Panel	HRS-S0092	•
8	Right Side Panel (For water-cooled)	HRS-S0094	•
12	Left Side Panel (For water-cooled)	HRS-S0096	•
13	Front panel B	HRS-S0005	•
14	Front panel A	HRS-S0006	•
15	Temperature sensor	HRS-S0007	•
18	Hose (For standard pump)	HRS-S0097	•
24	Pressure sensor (For circulating fluid)	HRS-S0011	•
25	Level switch	HRS-S0014	•
27	DC power supply	HRS-S0087	•
28	Display board	HRS-S0017	•
29	Communication board	HRS-S0018	•
30	Pawer board	HRS-S0019	•
37	Pump	HRS-S0088	•
44	Pump (For option M)	HRS-S0089	 (For option M)
47	Mechanical seal Kit	HRG-S0211	•
52	Fuse (5Pcs.)	HRS-S0024	•
53	Tank	HRS-S0025	•
54	Tank (For automatic water-fill)	HRS-S0072	 (For option J)
55	Tank lid	HRS-S0026	•
57	Main Board (HRS050)	HRS-S0135	/O Note 1.
73	Main Board	HRS-S0297	•
107	Solenoid Valve (For automatic water-fill)	HRS-S0071	 (For option J)
108	Relay (For Compressor)	HRS-S0392	•
109	Circuit breaker	HRS-S0395	•
112	Earth leakage breaker (For option B)	HRS-S0348	 (For option B)
118	Compressor	HRS-S0337	•
124	Heat exchanger (Condenser)	HRS-S0152	•
126	Water regulating valve	HRS-S0388	•
128	Filter drier	HRZ-S0227	•
130	Electronic Expansion Valve (For heating)	HRS-S0340	•
132	Electronic Expansion Valve (For cooling)	HRS-S0341	•
134	Electronic Expansion Valve Coil (For heating)	HRS-S0386	•
135	Electronic Expansion Valve Coil (For cooling)	HRS-S0010	•
138	Heat exchanger	HRS-S0184	•
141	Heat exchanger (For option M)	HRS-S0415	 (For option M)
142	Pressure sensor (For high pressure)	HRS-S0012	•
144	Pressure sensor (For high pressure)	HRS-S0183	•
146	Thermistor sensor	HRS-S0338	•
149	Label (For Operation display)	HRS-S0058	•
151	Caster (4Pcs.)(for HRS050)	HRS-S0098	•
154	Packaging Materials set	HRS-S0151	•
157	Sequence I/O command signal connector	HRS-S0103	•
159	Ferrite core	HRS-S0105	•

Note 1. Excerpt number from the total list of P.91 to 98

Note 2. These are replacement parts of the standard specification or option specification used in HRS that are marked " O.O.".

It is used by setting the program.

Replacement Parts for Optional Accessories

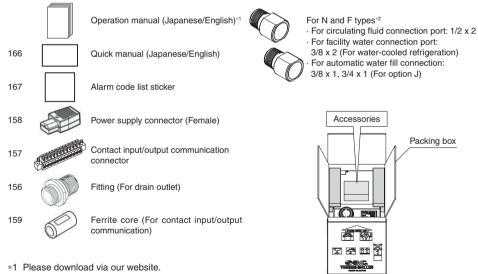
Divergen	ce piping	Particle filter bracket	t, P.P.Depth Element
HRS-DP001	HRS-DP002	HRS-PF001	HRS-PF002
170		172, 174 171	173, 175

Water leakage detect	or (For drain pan set)	DI Se	ensor
HRS-WL001	HRS-WL002	HRS-DI001	HRS-DI004
176			We have a second

DI Sensor for control Electrical conductivity Sensor Electrical conductivity Sensor for control HRS-D1003 HRS-D1005 HRS-D1008 HRS-D1009

Replacement Parts for Optional Accessories

Construction (Accessories included in the package)



*2 Refer to the Web Catalog for details on the optional accessories HRS-EP

@SMC

Replacement Parts List

Replacement parts for circulating fluid circuit and electrical circuit

No.			Parts number		Pac	kaged	
NO.	Recommended	Names of some	HRS-S	Weight		qty	
	stock parts	Names of parts	HRZ-S	[kg]		9·J	
			HRG-S			Unit	
1	*1	Dustproof filter	HRS-S0001	0.5	1	pcs.	
2	-	Upper Panel	HRS-S0002	1.0	1	pcs.	
3		Upper Panel	HRS-S0002	1.0	1	pcs.	
4		Right Side Panel	HRS-S0032	1.6	1	pcs.	
5		Right Side Panel (For option G)	HRS-S0005	1.6	1	pcs.	
6		Right Side Panel (For air cooling)	HRS-S0093	3.0	1	pcs.	
7		Right Side Panel (For air cooling)	HRS-S0298	3.0	1	pcs.	
8		Right Side Panel (For water-cooled)	HRS-S0094	3.0	1	pcs.	
9		Left Side Panel	HRS-S0004	1.6	1	pcs.	
10		Left Side Panel (For option G)	HRS-S0076	1.6	1	pcs.	
11		Left Side Panel (For air cooling)	HRS-S0070	3.0	1	pcs.	
12		Left Side Panel (For water-cooled)	HRS-S0095	3.0	1	pcs.	
12		Front panel B (~S/N TP)	HRS-S0096	0.2	1		
13		Front panel (S/N TQ~)	HRS-S0005 HRS-S0519	0.2	1	pcs.	
		Front panel (S/N TQ~)	HRS-S0019 HRS-S0006	0.2	1	pcs.	
14		(Integration to No.13)(S/N TQ~)	1113-30006	0.2	-	pes.	
15		Temperature sensor	HRS-S0007	0.1	1	ass'y	
16	-	Hose (For standard pump)	HRS-S0007	0.1	1	kit	
10		Hose (For standard pump) Hose (For standard pump)	HRS-S0008	0.6	1	kit	
18		Hose (For standard pump) Hose (For standard pump)	HRS-S0302 HRS-S0097	1.0	1	kit	
18		Hose (For standard pump) Hose (For standard pump)	HRS-S0097 HRS-S0362	1.0	1	kit	
20		Hose (For option T)	HRS-S0362	0.6	1	kit	
20		Hose (For option T)	HRS-S0303	0.6	1	kit	
22		Hose (For option MT)	HRS-S0069	0.6	1	kit	
		Hose (For option MT)	HRS-S0009	0.6	1	kit	
23 24		Pressure sensor (For circulating fluid)	HRS-S0304 HRS-S0011	0.6	1		
25		Level switch	HRS-S0014	0.1	1	pcs.	
25			HRS-S0014 HRS-S0016	0.1	1	pcs.	
26	-	DC power supply DC power supply	HRS-S0016 HRS-S0087	0.2	1	pcs.	
21	-	Display board (~S/N TP)	HRS-S0087	0.23	1	pcs.	
28			HRS-S0017 HRS-S0520	0.2	1	ass'y	
29		Display board (S/N TQ~) Communication board	HRS-S0520 HRS-S0018	0.1	1	ass'y	
		Pawer board		0.1	1	pcs.	
30	-		HRS-S0019			pcs.	
31		Pawer switch	HRS-S0020	0.037	1	pcs.	
32		Pawer switch (For 15A)	HRS-S0070 HRS-S0021	0.037	· ·	pcs.	
33 34		Inlet socket			1	kit	
		Pump (for 100V)	HRS-S0022	7.0	1	ass'y	
35		Pump (for 200V type) Pump (for 200V)	HRS-S0066	7.0		ass'y	
36			HRS-S0361	10.0	1	ass'y	
37	*4	Pump	HRS-S0088	12.0	1	ass'y	
38		High head pump (For 100V type option T)	HRS-S0265	12.0	1	ass'y	
39		High head pump (For option T)	HRS-S0062	12.0	1	ass'y	
40		High head pump (For option T)	HRS-S0299	12.0	1	ass'y	
41		High head pump (For 100V type option MT)	HRS-S0266	12.0	1	ass'y	
42		High head pump (For option MT)	HRS-S0063	12.0	1	ass'y	
43		High head pump (For option MT)	HRS-S0300	12.0	1	ass'y	
44		Pump (For option M)	HRS-S0089	12.0	1	ass'y	
45		Mechanical seal Kit (For 100V type option T)	HRS-S0390		1	kit	
46		Mechanical seal Kit (For 100V type option MT)	HRS-S0412	0.010	1	kit	
47		Mechanical seal Kit	HRG-S0211	0.018	1	kit	
48		Fan (for 100V) With bracket	HRS-S0023	1.7	1	ass'y	
		Fan (for 200V type)	HRS-S0067	1.7	1	ass'y	
49		Fan	HRS-S0301	3.1	1	ass'y	
50		Fan	HRS-S0099	3.1	1	ass'y	
50 51							
50 51 52		Fuse (5Pcs.)	HRS-S0024	0.0005	5	pcs.	
50 51 52 53		Tank	HRS-S0025	0.8	1	pcs. ass'y	
50 51 52						pcs.	

*1 These are recommended stock for replacement parts that are marked "".

*2 These are replacement parts of the standard specification used in HRS that are marked ".

*3 These are replacement parts of the option specification used in HRS that are marked "O".

*4 These are recommended stock for replacement parts of 100 VAC specifications that are marked "[]".

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*5 These are replacement parts of the standard specification or option specification used in HRS that are marked "•/O". It is used by setting the program.

*6 These are the parts that are not included with HRS that are marked "()". But there is no problem to use.

*7 These are replacement parts used to optional accessories that are marked "▲".

Replacement Parts List

Replacement parts for circulating fluid circuit and electrical circuit (Continues)

			Parts number		Packaged		
No.	Recommended	Newsee of works	HRS-S	Weight	qty		
INO.	stock parts	Names of parts	HRZ-S	[kg]			
			HRG-S			Unit	
56		Main Board (for HRS012/018/024)	HRS-S0134	0.13	1	pcs.	
57		Main Board (HRS050)	HRS-S0135	0.13	1	pcs.	
58		Main Board (for HRS012-A-10)	HRS-S0033	0.13	1	pcs.	
59		Main Board (for HRS012-W-10)	HRS-S0034	0.13	1	pcs.	
60		Main Board (for HRS018-A-10)	HRS-S0035	0.13	1	pcs.	
61		Main Board (for HRS018-W-10)	HRS-S0036	0.13	1	pcs.	
62		Main Board (for HRS012-A-20)	HRS-S0037	0.13	1	pcs.	
63		Main Board (for HRS012-W-20)	HRS-S0040	0.13	1	pcs.	-
64		Main Board (for HRS018-A-20)	HRS-S0043	0.13	1	pcs.	
65		Main Board (for HRS018-W-20)	HRS-S0046	0.13	1	pcs.	
66		Main Board (for HRS024-A-20)	HRS-S0040	0.13	1	pcs.	
67		Main Board (for HRS024-W-20)	HRS-S0052	0.13	1	pcs.	
68		Main Board	HRS-S0290	0.13	1		_
69		Main Board	HRS-S0290	0.13	1	pcs.	
70		Main Board	HRS-S0293	0.13	1	pcs.	
70		Main Board	HRS-S0090	0.13	1	pcs.	
72		Main Board	HRS-S0091 HRS-S0296	0.13	1	pcs.	
73		Main Board	HRS-S0296	0.13	1	<u> </u>	
73		Main Board (for HRS012-A-10-T)	HRS-S0297 HRS-S0282	0.13	1	pcs.	_
75		Main Board (for HRS012-A-10-T)	HRS-S0282	0.13	1	pcs.	
75		Main Board (for HRS012-W-10-1) Main Board (for HRS018-A-10-T)			1	pcs.	
			HRS-S0286	0.13		pcs.	
77		Main Board (for HRS018-W-10-T)	HRS-S0288	0.13	1	pcs.	
78		Main Board (for HRS012-A-20-T)	HRS-S0038	0.13	1	pcs.	
79		Main Board (for HRS012-W-20-T)	HRS-S0041	0.13	1	pcs.	
80		Main Board (for HRS018-A-20-T)	HRS-S0044	0.13	1	pcs.	
81		Main Board (for HRS018-W-20-T)	HRS-S0047	0.13	1	pcs.	
82		Main Board (for HRS024-A-20-T)	HRS-S0050	0.13	1	pcs.	
83		Main Board (for HRS024-W-20-T)	HRS-S0053	0.13	1	pcs.	
84		Main Board (for HRS030-A-20-T)	HRS-S0291	0.13	1	pcs.	
85		Main Board (for HRS030-W-20-T)	HRS-S0294	0.13	1	pcs.	
86		Main Board (for HRS012-A-10-MT)	HRS-S0283	0.13	1	pcs.	
87		Main Board (for HRS012-W-10-MT)	HRS-S0285	0.13	1	pcs.	
88		Main Board (for HRS018-A-10-MT)	HRS-S0287	0.13	1	pcs.	
89		Main Board (for HRS018-W-10-MT)	HRS-S0289	0.13	1	pcs.	
90		Main Board (for HRS012-A-20-MT)	HRS-S0039	0.13	1	pcs.	
91		Main Board (for HRS012-W-20-MT)	HRS-S0042	0.13	1	pcs.	
92		Main Board (for HRS018-A-20-MT)	HRS-S0045	0.13	1	pcs.	
93		Main Board (for HRS018-W-20-MT)	HRS-S0048	0.13	1	pcs.	
94		Main Board (for HRS024-A-20-MT)	HRS-S0051	0.13	1	pcs.	
95		Main Board (for HRS024-W-20-MT)	HRS-S0054	0.13	1	pcs.	
96		Main Board (for HRS030-A-20-MT)	HRS-S0292	0.13	1	pcs.	
97		Main Board (for HRS030-W-20-MT)	HRS-S0295	0.13	1	pcs.	
98		Main Board (for HRS012-A-20-G)	HRS-S0078	0.13	1	pcs.	
99		Main Board (for HRS018-A-20-G)	HRS-S0081	0.13	1	pcs.	
100		Main Board (for HRS024-A-20-G)	HRS-S0084	0.13	1	pcs.	
101		Main Board (for HRS012-A-20-GT)	HRS-S0079	0.13	1	pcs.	
102		Main Board (for HRS018-A-20-GT)	HRS-S0082	0.13	1	pcs.	
103		Main Board (for HRS024-A-20-GT)	HRS-S0085	0.13	1	pcs.	
104		Main Board (for HRS012-A-20-GMT)	HRS-S0080	0.13	1	pcs.	
105		Main Board (for HRS018-A-20-GMT)	HRS-S0083	0.13	1	pcs.	
106		Main Board (for HRS024-A-20-GMT)	HRS-S0086	0.13	1	pcs.	
107		Solenoid Valve (For automatic water-fill)	HRS-S0071	0.3	1	ass'y	
108		Relay (For Compressor)	HRS-S0392	0.09	1	pcs.	
109		Circuit breaker	HRS-S0395	0.2	1	pcs.	
110		Circuit breaker	HRS-S0396	0.2	1	pcs.	

*1 These are recommended stock for replacement parts that are marked "".

*2 These are replacement parts of the standard specification used in HRS that are marked ".

*3 These are replacement parts of the option specification used in HRS that are marked "O".

*4 These are recommended stock for replacement parts of 100 VAC specifications that are marked "[]".

	Applicable models of HRS															
		HRS	□-□-10							HRS□□	□-□-20					
	012-A	012-W	018-A	018-W	012-A	012-W	018-A	018-W	024-A	024-W	030-A	030-W	050-A	050-W	060-A	060-\
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∗5 These are replacement parts of the standard specification or option specification used in HRS that are marked "●/○". It is used by setting the program.

*6 These are the parts that are not included with HRS that are marked "()". But there is no problem to use.

*7 These are replacement parts used to optional accessories that are marked "▲".

Replacement Parts List

Replacement parts for circulating fluid circuit and electrical circuit (Continues)

			Parts number		Pac	kaged	
No.	Recommended stock parts	Names of parts	HRS-S	Weight [kg]		qty Unit	
111		Earth leakage breaker (For option B)	HRS-S0393	0.2	1	pcs.	
112		Earth leakage breaker (For option B)	HRS-S0348	0.2	1	pcs.	
113		Earth leakage breaker (For option B)	HRS-S0397	0.2	1	pcs.	
114		Earth leakage breaker (For option B or BT)	HRS-S0394	0.2	1	pcs.	

Replacement parts for refrigeration circuit and facility water circuit

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No.	Recommended stock parts	Names of parts	Parts number HRS-S HRZ-S	Weight [kg]		kaged qty	
			HRG-S□□□			Unit	
115		Compressor (for 100V type)	HRS-S0409		1	kit	
116		Compressor (for 200V type)	HRS-S0068	12.0	1	kit	
117		Compressor (for 200V type)	HRS-S0423	12.0	1	kit	
118		Compressor	HRS-S0337	17.0	1	kit	
119		Condenser (For air-cooled type)	HRS-S0381		1	ass'y	
120		Condenser (For air-cooled type)	HRS-S0382		1	ass'y	
121		Condenser (For air-cooled type)	HRS-S0383		1	kit	
122		Heat exchanger (Condenser)	HRS-S0133	1.0	1	ass'y	
123		Heat exchanger (Condenser)	HRS-S0384	1.0	1	ass'y	
124		Heat exchanger (Condenser)	HRS-S0152	1.0	1	ass'y	
125		Water regulating valve	HRS-S0385	0.8	1	ass'y	
126		Water regulating valve	HRS-S0388	0.9	1	ass'y	
127		Filter drier	HRS-S0387		1	pcs.	
128		Filter drier	HRZ-S0227		1	pcs.	
129		Electronic Expansion Valve (For heating)	HRS-S0028	0.30	1	kit	
130		Electronic Expansion Valve (For heating)	HRS-S0340	0.21	1	kit	
131		Electronic Expansion Valve (For cooling)	HRS-S0029	0.30	1	kit	
132		Electronic Expansion Valve (For cooling)	HRS-S0341	0.23	1	kit	
133	-	Electronic Expansion Valve Coil (For heating)	HRS-S0009	0.20	1	ass'y	
134		Electronic Expansion Valve Coil (For heating)	HRS-S0386	0.20	1	ass'y	
135		Electronic Expansion Valve Coil (For cooling)	HRS-S0010	0.20	1	ass'y	
136		Heat exchanger	HRS-S0030	1.0	1	ass'y	
137		Heat exchanger Assy	HRS-S0380	1.0	1	ass'y	
138		Heat exchanger	HRS-S0184	1.0	1	ass'v	
139		Heat exchanger (For option M)	HRS-S0413	4.0	1	ass'y	
140		Heat exchanger Assy (For option M)	HRS-S0414	5.0	1	ass'y	
141		Heat exchanger (For option M)	HRS-S0415	5.0	1	ass'v	
142		Pressure sensor (For high pressure)	HRS-S0012	0.08	1	DCS.	
143		Pressure sensor (For high or low pressure)	HRS-S0013	0.08	1	pcs.	
144		Pressure sensor (For high pressure)	HRS-S0183	0.08	1	pcs.	
145		Thermistor sensor	HRS-S0057	0.05	1	kit	
146		Thermistor sensor	HRS-S0338	0.05	1	kit	
_	•	(Charging weight of refrigerant)	R407C	0.00			
-		(Charging weight of refrigerant)	R410A	$\sum_{i=1}^{n}$			

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*3 These are replacement parts of the option specification used in HRS that are marked "O".

*4 These are recommended stock for replacement parts of 100 VAC specifications that are marked "[]".

						App	licable m	odels of H	IRS						
	HRS□□	□-□-10			HRS□□										
012-A	A 012-W 018-A 018-W 012-A 012-W 018-A 018-W 024-A 024-W 030-A 030-W 050-A 050-W 060-A 060-W														
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	e models of HRS															
		HRS□□	⊡-⊡-10							HRS□□	□-□-20					
	012-A	012-W	018-A	018-W	012-A	012-W	018-A	018-W	024-A	024-W	030-A	030-W	050-A	050-W	060-A	060-W
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	to	to	to	to	to	to	to	to	to	to	to	to				
				0.260 kg												
	\backslash	\land	\backslash	\land	\backslash	\land	0.640	0.640	0.830	0.720						
													to 0.670 kg	to 0.670 kg	to 0.860 kg	to 0.750 kg

*5 These are replacement parts of the standard specification or option specification used in HRS that are marked "O(O". It is used by setting the program.

*6 These are the parts that are not included with HRS that are marked "(●)". But there is no problem to use.

*7 These are replacement parts used to optional accessories that are marked "▲".

Replacement Parts List

Other replacement parts

No.	Recommended stock parts	Names of parts	Parts number HRS-S HRZ-S HRG-S	Weight [kg]		kaged qty Unit	
147		Extraction tool (J.S.T.)	HRS-S0055	0.010	1	pcs.	
148		Extraction tool (molex)	HRS-S0056	0.005	1	pcs.	
149		Label (For Operation display)	HRS-S0058	0.010	1	pcs.	
149		(Integration to No.13)(S/N TQ~)				/	
150		Caster (4Pcs.)	HRS-S0059	0.24	4	pcs.	
151		Caster (4Pcs.)(for HRS050)	HRS-S0098	0.24	4	pcs.	
152		Packaging Materials set	HRS-S0060	20.0	1-5	kit	
153		Packaging Materials set	HRS-S0391	20.0	1-5	kit	
154		Packaging Materials set	HRS-S0151	27.0	1	kit	
155		Power supply connector omission prevention fittings	HRS-S0074	0.005	1	kit	
156		Drain Fitting	HRS-S0102	0.1	1	pcs.	
157		Sequence I/O command signal connector	HRS-S0103	0.01	1	pcs.	
158		Power supply connector	HRS-S0104	0.04	1	kit	
159		Ferrite core	HRS-S0105	0.03	1	pcs.	
160		Drain Plug set	HRS-S0132	0.03	1	kit	
161		Condenser bracket	HRS-S0015	1.0	1	kit	
162		Thermal insulator for heat exchanger	HRS-S0031	0.0	1	kit	
163		Thermal insulator for copper pipe	HRS-S0032	0.1	1	kit	
164		Base	HRS-S0061	2.6	1	pcs.	
165		PT Thread Adaptor Set	HRS-S0073	0.3	1	pcs.	
166		Quick manual	HRS-S0106	0.03	1	vol.	
167		Alarm cord list label	HRS-S0107	0.01	1	pcs.	
168		Accessory set	HRS-S0108	0.90	1	kit	
169		Accessory set	HRS-S0109	0.80	1	kit	

Replacement parts for optional accessories

			Parts number		Par	ckaged	
No.	Recommended stock parts	Names of parts	HRS-S□ HRZ-S□ HRG-S□	Weight [kg]		qty Unit	
170		Divergence piping	HRS-S0100	0.3	1	ass'y	
171		Particle filter bracket	HRS-S0244	0.35	1	kit	
172		P.P.Depth Element (5 µmm)	EJ202S-005X11	0.083	1	pcs.	
173		P.P.Depth Element (5 µmm)	EJ302S-005X11	0.083	1	pcs.	
174		P.P.Depth Element (75 µmm)	EJ202S-075X11	0.165	1	pcs.	
175		P.P.Depth Element (75 µmm)	EJ302S-075X11	0.165	1	pcs.	
176		Water leakage detector (For drain pan set)	HRS-S0215	0.06	1	ass'y	
177		DI Sensor	HRS-S0419		1	ass'y	
178		DI Sensor for control	HRS-S0420		1	ass'y	
179		Electrical conductivity Sensor	HRS-S0424		1	ass'y	
180		Electrical conductivity Sensor for control	HRS-S0425		1	ass'y	

*1 These are recommended stock for replacement parts that are marked "".

*2 These are replacement parts of the standard specification used in HRS that are marked ".

*3 These are replacement parts of the option specification used in HRS that are marked "O".

*4 These are recommended stock for replacement parts of 100 VAC specifications that are marked "[]".

	Applicable models of HRS														
HRS□□□-□-10					HRS□□										
012-A	012-W	018-A	018-W	012-A	012-W	018-A	018-W	024-A	024-W	030-A	030-W	050-A	050-W	060-A	060-W
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	Applicable models of optional accessories												
HRS-DDDD													
DP001	PF002	PF001	PF002	WL001	WL002	DI001	DI003	DI004	DI005	D1008	D1009		
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∗5 These are replacement parts of the standard specification or option specification used in HRS that are marked "●/○". It is used by setting the program.

*6 These are the parts that are not included with HRS that are marked "()". But there is no problem to use.

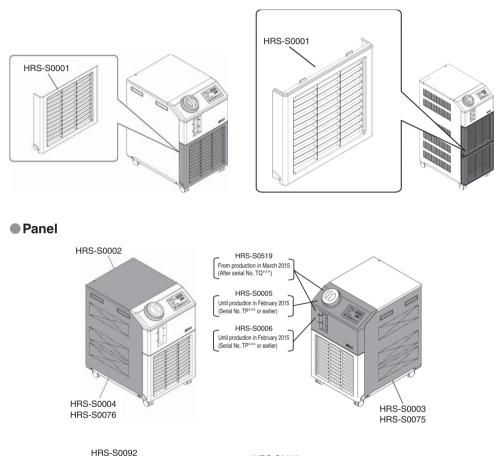
*7 These are replacement parts used to optional accessories that are marked "A".

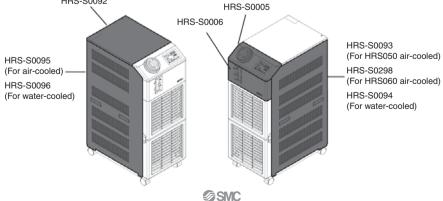
*8 These parts that are marked "x" are not used in HRS.

But can be used as tools or piping material at the time of replacement work.

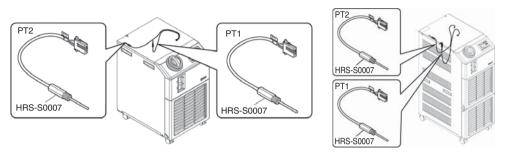
Illustration of Replacement Parts

Dustproof filter

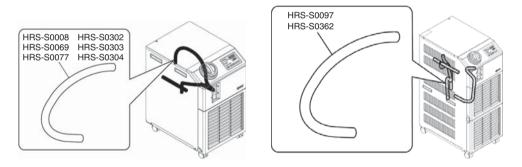




Temperature sensor



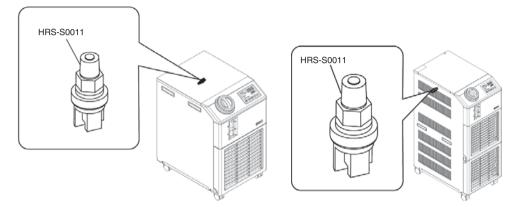
Hose



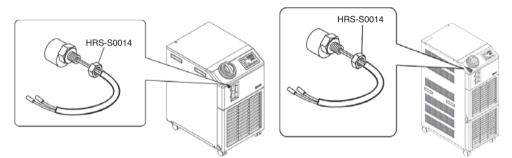
HRS Series Standard Type

Illustration of Replacement Parts

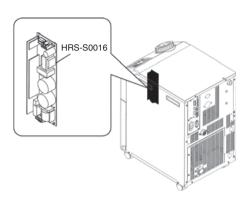
Pressure sensor (For circulating fluid)

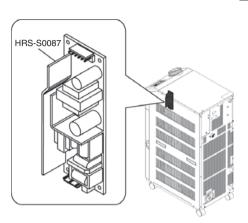


Level switch



DC power supply





HRS Series Standard Type

Illustration of Replacement Parts

Main board / Communication board / Power board / Display board / Fuse

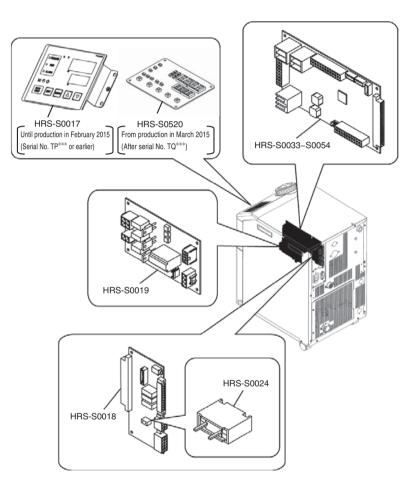
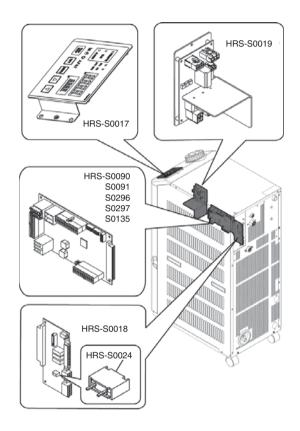


Illustration of Replacement Parts

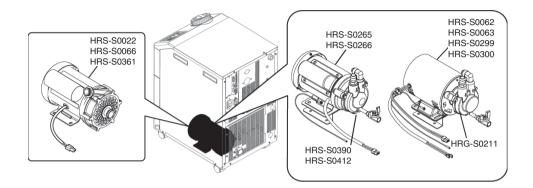
Main board / Communication board / Power board / Display board / Fuse



HRS Series Standard Type

Illustration of Replacement Parts

Pump



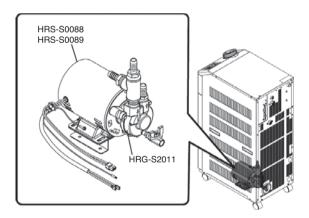
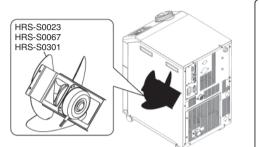
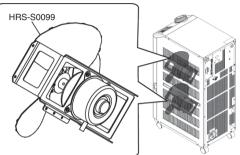


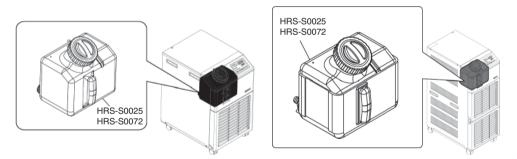
Illustration of Replacement Parts

Fan





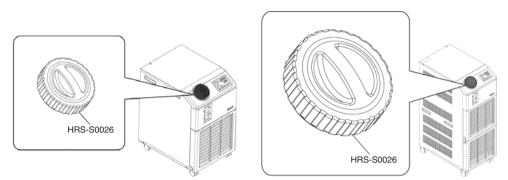
Tank



HRS Series Standard Type

Illustration of Replacement Parts

Tank lid



Valve for automatic water fill

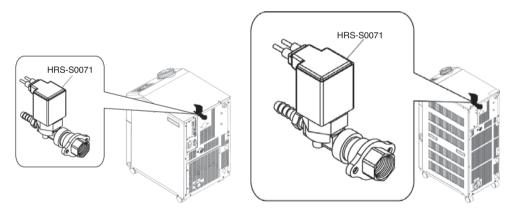
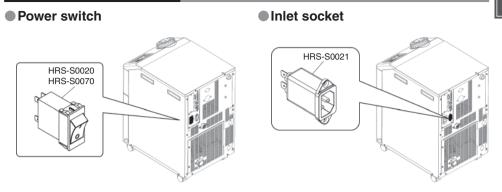
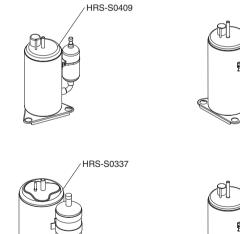


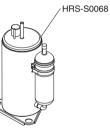
Illustration of Replacement Parts



Compressor

C



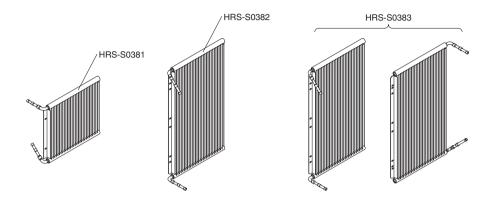




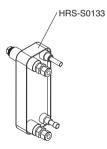
HRS Series Standard Type

Illustration of Replacement Parts

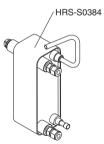
Condenser (For air-cooled type)

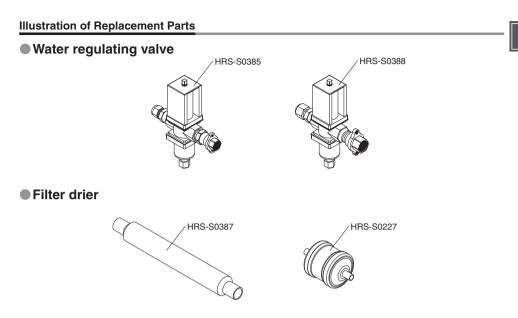


Heat exchanger (For water-cooled type)

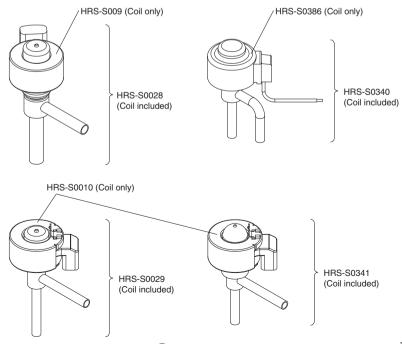








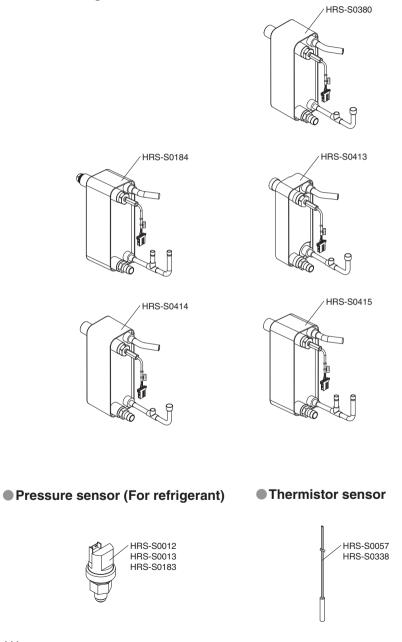
Electronic expansion valve, Electronic expansion valve coil



HRS Series Standard Type

Illustration of Replacement Parts

Heat exchanger



Parts Replacement Cycle

We recommend that you replace the parts according to the cycle specified in the table below so that you can extend the service life of your thermo-chiller.

	Description		No. ^{note)}	Reason for recommendation	Replacement cycle	
(For option J: With automatic water fill function) 107 the opening and closing performance of the valve. 24 months Circulating pump 34 to 44 Wear of the bearing will lead to a decrease in the circulating fluid flow rate. Cooling fan (For air-cooled type) 48 to 51 Wear of the bearing will lead to a decrease in heat radiation efficiency. Seal, O-ring Deterioration will lead to a decrease in the performance. 36 months Seal, O-ring — Deterioration will lead to a decrease in air vent performance. 36 months Dustproof filter 1 Clogging will lead to a decrease in air vent performance. 36 months Compressor 115 to 118 War of the bearing or compressed secton (sliding secton) will lead to a decrease in cooling capacity. 36 months Parts for refrigerant circuit Heat exchanger assembly 136 to 141 Deterioration of the device will lead to a decrease in cooling capacity. Deterioration of the device will lead to a decrease in cooling capacity. Parts for refrigerant circuit Filter drier 127, 128 Deterioration of the device will lead to a decrease in function. Deterioration of the device will lead to a decrease in cooling capacity. Electrical boards Display board 28 Failure to replace the parts will lead to a decrease in function. Deterioration of the board or mounted components will lead to a dec			45 to 47	(The mechanical seal may need to be replaced when the leakage rate	6000 to 8000 hours (Normally 1 year)	
Cooling fan (For air-cooled type) 48 to 51 Wear of the bearing will lead to a decrease in hear radiation efficiency. Electronic expansion valve 129 to 132 Deterioration of the device will lead to a decrease in temperature control performance. 36 months Seal, O-ring — Deterioration will lead to a decrease in temperature control performance. 36 months Dustproof filter 1 Clogging will lead to a decrease in air vent performance. 36 months Compressor 115 to 118 Wear of the bearing or compressed section (sliding section) will lead to a decrease in cooling capacity. 36 months Parts for refrigerant circuit Heat exchanger assembly 136 to 141 122 to 124 Condenser (Air-cooled) 119 to 121 Deterioration of the device will lead to a decrease in cooling capacity. Parts for refrigerant circuit Eiter drier 127, 128 Deterioration of the device will lead to a decrease in temperature control performance. Electrical boards Display board 28 Failure to replace the parts will lead to a decrease in display function and/or operability. Deterioration of the board or mounted components will lead to a decrease in display function. Power board 30 Ideation of the sliding section will lead to a decrease in operating function. Dc power supply 26, 27 <td></td> <td></td> <td>107</td> <td></td> <td>24 months</td>			107		24 months	
Electronic expansion valve 129 to 132 Deterioration of the device will lead to a decrease in temperature control performance. 36 months Seal, O-ring — Deterioration will lead to a decrease in seal performance. 36 months Dustproof filter 1 Clogging will lead to a decrease in air vent performance. 9 Compressor 115 to 118 Wear of the bearing or compressed section (siding section) will lead to a decrease in cooling capacity. 9 Parts for refrigerant circuit Heat exchanger assembly 136 to 141 122 to 124 Condenser (Mater-cooled) 119 to 121 Deterioration of the device will lead to a decrease in cooling capacity. Parts for refrigerant circuit Eilter drier 127, 128 Deterioration of the device will lead to a decrease in temperature control performance. Water regulating valve 125, 126 Display board 28 Main board 29 Failure to replace the parts will lead to a decrease in display function and/or operability. Deterioration of the board or mounted components will lead to a decrease in function. Dc power supply 26, 27 Electrical Earth leakage breaker (For option B or BT) 109 to 114 Wear or fixation of the siding section will lead to a decrease in control power supply function.	Circulating pump		34 to 44	Wear of the bearing will lead to a decrease in the circulating fluid flow rate.		
Seal, O-ring — Deterioration will lead to a decrease in seal performance. Dustproof filter 1 Clogging will lead to a decrease in air vent performance. Compressor 115 to 118 Wear of the bearing or compressed section (sliding section) will lead to a decrease in cooling capacity. Parts for refrigerant circuit Heat exchanger assembly 136 to 141 Condenser (Air-cooled) 119 to 121 Condenser (Water-cooled) 122 to 124 Filter drier 127, 128 Water regulating valve 125, 126 Display board 28 Main board 56 to 106 Communication board 29 Power board 30 Deterioration of the board or mounted components will lead to a decrease in operability. Deterioration of the board or mounted components will lead to a decrease in operability. Deterioration of the board or mounted components will lead to a decrease in performance.	Cooling fan (For air-co	ooled type)	48 to 51	Wear of the bearing will lead to a decrease in heat radiation efficiency.	1	
Dustproof filter 1 Clogging will lead to a decrease in air vent performance. Compressor 115 to 118 Wear of the tearing or compressed section (sliding section) will lead to a decrease in cooling capacity. Parts for refrigerant circuit Heat exchanger assembly 136 to 141 Condenser (Air-cooled) 119 to 121 Condenser (Water-cooled) 122 to 124 Filter drier 127, 128 Water regulating valve 125, 126 Display board 28 Main board 56 to 106 Communication board 29 Power board 30 Deterioration of the board or mounted components will lead to a decrease in function. DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114	Electronic expansion	valve	129 to 132	Deterioration of the device will lead to a decrease in temperature control performance.	36 months	
Compressor 115 to 118 War of the bearing or compressed section (sliding section) will lead to a decrease in cooling capacity. Parts for refrigerant circuit Heat exchanger assembly 136 to 141 Condenser (Air-cooled) 119 to 121 Condenser (Water-cooled) 122 to 124 Filter drier 127, 128 Water regulating valve 125, 126 Display board 28 Main board 56 to 106 Communication board 29 Power board 30 Deterioration of the board or mounted components will lead to a decrease in function. DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114	Seal, O-ring		—	Deterioration will lead to a decrease in seal performance.		
Heat exchanger assembly 136 to 141 Condenser (Air-cooled) 119 to 121 Condenser (Water-cooled) 122 to 124 Filter drier 127, 128 Water regulating valve 125, 126 Display board 28 Main board 56 to 106 Communication board 29 Power board 30 Deterioration of the board or mounted components will Power board 30 DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114 Wear or fixation of the sliding section will lead to a decrease in control power supply function.	Dustproof filter		1	Clogging will lead to a decrease in air vent performance.		
Parts for refrigerant circuit Condenser (Åir-cooled) 119 to 121 Deterioration of the device will lead to a decrease in temperature control performance. Parts for refrigerant circuit Filter drier 122, 124 Deterioration of the device will lead to a decrease in temperature control performance. Filter drier 127, 128 Temperature control performance. Water regulating valve 125, 126 Display board 28 Main board 56 to 106 Communication board 29 Deterioration of the board or mounted components will beterioration of the board or mounted components will Power board 30 DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114	Compressor		115 to 118	Wear of the bearing or compressed section (sliding section) will lead to a decrease in cooling capacity.		
Parts for refrigerant circuit Condenser (Water-cooled) 122 to 124 Filter drier Deterioration of the device will lead to a decrease in temperature control performance. Filter drier 127, 128 Water regulating valve 125, 126 Display board 28 Main board 56 to 106 Communication board 29 Power board 30 Deterioration of the board or mounted components will Power board 30 Do power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114		Heat exchanger assembly	136 to 141			
Circuit Condenser (Water-cooled) 122 to 124 Filter drier 127, 128 Water regulating valve 125, 126 Display board 28 Main board 56 to 106 Main board 29 Power board 30 Power board 30 DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT)	Dente (en mérice met	Condenser (Air-cooled)	119 to 121	Deterioretica of the device will be due a device in		
Filter drier 127, 128 Water regulating valve 125, 126 Display board 28 Main board 56 to 106 Main board 56 to 106 Power board 29 Deterioration of the board or mounted components will Power board 30 DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114 Wear or fixation of the sliding section will lead to a decrease in control power supply function. Deterioration of the condenser will lead to a decrease in control power supply function.		Condenser (Water-cooled)	122 to 124			
Display board 28 Main board 56 to 106 Communication board 29 Power board 30 Dc power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114		Filter drier	127, 128			
Main board 56 to 106 Failure to replace the parts will lead to a decrease in display function and/or operability. Electrical boards Communication board 29 Deterioration of the board or mounted components will lead to a decrease in function. Power board 30 Idea to a decrease in function. DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114		Water regulating valve	125, 126			
Electrical boards Communication board 29 Deterioration of the board or mounted components will lead to a decrease in function. Power board 30 lead to a decrease in function. DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114		Display board	28		1	
Electrical boards Communication board 29 Deterioration of the board or mounted components will lead to a decrease in function. Power board 30 Lead to a decrease in function. DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114		Main board	56 to 106			
Power board 30 lead to a decrease in function. DC power supply 26, 27 Electrical components Earth leakage breaker (For option B or BT) 109 to 114 Wear or fixation of the sliding section will lead to a decrease in control power supply function. Deterioration of the condenser will lead to a decrease in control power supply function.	Electrical boards	Communication board	29			
Electrical components Earth leakage breaker (For option B or BT) 109 to 114 Wear or fixation of the sliding section will lead to a decrease in operating function. Deterioration of the condenser will lead to a decrease in control power supply function.		Power board	30			
components option B or BT) 109 to 114 Deterioration of the condenser will lead to a decrease in control power supply function.		DC power supply	26, 27			
Temperature sensor 15			109 to 114			
		Temperature sensor	15		70	
Pressure sensor (For circulating fluid) 24		Pressure sensor (For circulating fluid)	24			
Pressure sensor (For high pressure) 142, 144	_	Pressure sensor (For high pressure)	142, 144			
Sensors Pressure sensor (For low pressure) 143 Deterioration will lead to a decrease in function.	Sensors	Pressure sensor (For low pressure)	143	Deterioration will lead to a decrease in function.		
Level switch 25		Level switch	25			
Thermistor sensor 145, 146 72 months		Thermistor sensor	145, 146		72 months	
Parts for circulating fluid circuits Hose 16 to 23 Deterioration will lead to a decrease in function.	Parts for circulating fluid circuits	Hose	16 to 23	Deterioration will lead to a decrease in function.		
Fuse 52		Fuse	52			
Upper panel 2, 3		Upper panel	2, 3			
Right side panel 4 to 8		Right side panel	4 to 8			
Left side panel 9 to 12		Left side panel	9 to 12			
Front panel 13, 14		Front panel	13, 14			
Tank 53, 54		Tank	53, 54			
Tank lid 55	Other	Tank lid	55			
Electronic expansion valve coil 133 to 135 When replacement is required based on the inspection		Electronic expansion valve coil	133 to 135	When replacement is required based on the inspection		
Other Caster (4 pcs.) 150, 151 results		Caster (4 pcs.)	150, 151			
Drain fitting 156		Drain fitting	156			
Drain plug set 160	C F	Drain plug set	160			
Power supply connector 158		Power supply connector	158			
Sequence I/O command signal connector 157		Sequence I/O command signal connector	157	1		
Quick manual 166		Quick manual	166			
Alarm cord list label 167	A	Alarm cord list label	167			
Accessory set 168, 169		Accessory set	168, 169	1		

Note) Numbers correspond to those in the replacement parts list on pages 91 to 98

Product Warranty

I. Product Warranty

1. Period

The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.

The warranty period of service parts (replacement parts) is 0.5 years after replacement.

2. Scope

For any failure reported within the warranty period which is clearly our responsibility, replacement parts will be provided. In that case, removed parts shall become the property of SMC. Any damage incurred by the failure is not our responsibility.

3. Content

- 1. We guarantee that the product will operate normally if it is installed under maintenance and control in accordance with the Operation Manual, and operated under the conditions specified in the catalog or contracted separately.
- 2. We guarantee that the product does not have any defects in components, materials or assembly.
- 3. We guarantee that the product complies with the outline dimensions provided.
- 4. The following situations are out of scope of this warranty.
 - (1) The product was incorrectly installed or connected with other equipment.
 - (2) The product was under insufficient maintenance and control or incorrectly handled.
 - (3) The product was operated outside of the specifications.
 - (4) The product was modified or altered in construction.
 - (5) The failure was a secondary failure of the product caused by the failure of equipment connected to the product.
 - (6) The failure was caused by a natural disaster such as an earthquake, typhoon, or flood, or by an accident or fire.
 - (7) The failure was caused by operation different from that shown in the Operation Manual or outside of the specifications.
 - (8) The checks and maintenance specified (daily checks and periodic inspection) were not performed.
 - (9) The failure was caused by the use of circulating fluid or facility water other than those specified.
 - (10) The failure occurred naturally over time (such as discoloration of a painted or plated face).
 - (11) Sensory phenomena that are considered no effect on the functions (such as noise, vibration).
 - (12) The failure was due to the "Installation Environment" specified in the Operation Manual.
 - (13) The failure was caused by the customer disregarding "6. Request to customers".

4. Disclaimer

The following are not covered by this warranty.

- (1) Expenses for daily checks and periodic inspection
- (2) Expenses for repairs performed by other companies
- (3) Expenses for transfer, installation and removal of the product
- (4) Expenses for replacement of parts other than those in this product, or for the supply of liquids
- (5) Inconvenience and loss due to product failure (such as telephone bills, compensation for workplace closure, and commercial losses).
- (6) Expenses and compensation not covered in "2. Scope".

Product Warranty

5. Agreement

If there is any doubt about anything specified in "2. Scope" and "3. Content", it shall be resolved by agreement between the customer and SMC.

6. Request to customers

Proper use and maintenance are essential to assure safe use of this product. Be sure to satisfy the following preconditions. Please note that we may refuse to carry out warranted repair if these preconditions have been disregarded.

- (1) Use the product following the instructions for handling described in the Operation Manual.
- (2) Perform checks and maintenance (daily checks and periodic inspection) specified in the Operation Manual and Maintenance Manual.
- (3) Record the check and maintenance results on the daily check sheet attached to the Operation Manual and Maintenance Manual.

7. Request for Warranted Repair

For warranted repair, please contact the supplier you purchased this product from. Warranted repair shall be on a request basis.

Repair shall be provided free of charge in accordance with the warranty period, preconditions and terms defined above. Therefore, a fee will be charged for any repairs if a failure is detected after the end of the warranty period.

II. Special Instructions

Instructions before the use of this unit

- (1) This unit is designed to be installed and operated in an industrial environment and used with a production facility.
- (2) This manual is intended to show the independent specifications of this unit. In order to prevent unexpected failure, read and understand the contents of this manual and Operation Manual carefully and perform sufficient evaluation under the various possible operating conditions with your system connected before operating this unit.
- (3) This product is for indoor use. It cannot be used outdoors.
- (4) Clean room specifications are not applied to this unit. The pump and ventilating fan installed in this unit generate dust particles.
- (5) If this unit is used in a system where there is a high risk of damage to human life and equipment, or in an application which needs particular consideration of safety, operate this unit with safety margins added to rated values, performance etc., and take appropriate safety measures such as fail-safe measures.
- (6) The construction of this unit is not suitable for suspension. When loading off the packaged unit or lifting this unit, it is necessary to use a forklift. Additionally, it is not acceptable to mount heavy objects onto this unit or stack two or more units.
- (7) This unit is used to supply circulating fluid to the customer's system using an installed pump. Do not install any pump or other devices on your system to forcibly return the circulating fluid to this unit.

Product Warranty

<text><text><text><text><text><text><text><text><text><text><text><text><text><text><text></text></text></text></text></text></text></text></text></text></text></text></text></text></text></text>	equipment damage the labels of "Cauti	 *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.
 1. The compatibility of the product is the responsibility of this specifications. Since the product specified here is used under various operating conditions, its compatibility with specifications based on necessary analysis and test results. The expected performance and safety assumation is and test results. The expected performance and safety assumation with a view to giving due consideration to any possibility of the person who has determined in the safety assumation of the equipment will be the responsibility of the person who has determined in the product. The product referring to its latest catalog information, with a view to giving due consideration to any possibility or product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed. 2. Only personnel with appropriate training should operate machines or equipment including our products must be performed. 3. Do not service or attempt to remove product and machineror equipment including the squarement. 4. The inspection and maintenance of machines or equipment including the equipment. 3. Do not service or attempt to remove product and machineror equipment including the performed. 4. The inspection and maintenance of machiner explanation and performed above are implemented. 5. Contact SMC beforehand and take special consideration on any appropriate training control to be performed. 5. Port and read and understand the specifications, or using SMC products with product is the industriate of the vacanty application of a determined. 6. Porticat SMC beforehand and take special consideration on any appropriate the safety measures in the product is to be used in any appropriate solution, space, shipping, vehicles any especifications, or using SMC products with productis called of the avainable anot devendent in contact with food a		
 person who designs the equipment or decides its specifications. Since the product specified here is used under various operating conditions, its compatibility with specifications according the decides its periodications of according the product in other industries. Consult SMC beforehand and the responsibility of the person who has determined information, with a view to giving due consideration to any possibility equipment failure when configuring the equipment of the equipment of the perioduct. This person should also continued the person should also continued to product seed in the product. This person should also continued to personnel with appropriate training should operate machinery and equipment. Orly 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 and experienced. Do not service or attempt to remove product and machinery/ equipment until safety is confirmed. The inspection and maintenance of machines or equipment should only performed by an operator who is appropriately trainal and experienced and maintenance of machinery/equipment should only be formed by an operator who is appropriately trainal and experienced and understand the specific provide provide preduct. Ob not service or attempt to remove product and machinery/ equipment until safety is confirmed. When the product is to be removed, confirm that the safety measures is on event affing or runawy of the divendent to product. When the product is to be used in any of the viscing of the product is to be used in any of the divendent to environment to control with appropriate training. Before machinery/equipment is consideration on equipment is consideration on equipment is considerations, or anendent expecified of the specific provide previded tor the ad	▲Warning	∆ Caution
 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 ravigation, 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 scalety equipment or other applications unsuitable for the standard specifications could be released in the product catalog. 3. An application which could have megative effects on people, property, or animals requiring special safety analysis. 	 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 tis compatibility with 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. 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. Do not service or attempt to remove product and machinery/ equipment until asfety is confirmed. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent failing or unaway of the driven objects have been confirmed. 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 are they reading. Before machinery/equipment is restarted, take measures to prevent 	The product herein described is basically provided for peaceful use in manufacturing industries. It 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 diversed, which were specified durability, running distance or resplacement parts. Please consult your nearest sales branch. S. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement poduct or necessary parts will be provided. This limited warranty applies only to our product. S. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified for the varanty. Avacuum pad is a consumable part, so it is warranted for a year after it is delivered. Also, the warranty period with the warranty for the warranty consult your measurest. A secure the product may have specified relations for the product. S. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified relation for a year after is delivered. Also, even within the warranty for he warranty for the warranty for the warranty for a year after is delivered.
 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 ravigation, 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 application which could have negative effects on people, property, or animals requiring special asfety analysis. Contact SMC beforehand and take special consideration of the countries involve in the transaction. Prior to the simplement of a SMC product to another count assure that all local rules governing that export are known and followed. Che and the could have negative effects on people, property, or animals requiring special asfety analysis. 		
 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 avoigtion, 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 stafety equipment or other applications unsultable for the standard specifications could be negative effects on people, property, or animals requiring special safety analysis. 		Compliance Requirements
 Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight. 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 direct services of the product catalog. An application which could have negative effects on people, property, or animals requiring special asfety analysis. 2. The exports of SMC products or technology from one country to another a governamed by the relevant security laws and regulations of the countries involves in the transaction. Prior to the shorment of a SMC product to another count assure that all local rules governing that export are known and followed. 2. Installation on equipment or other applications which could have negative effects on people, property, or animals requiring special asfety analysis. 3. An application which could have negative effects on people, property, or animals requiring special asfety analysis.		 The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
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. Magnetic content of the product catalog. SMC products are not intended for use as instruments for leg metrology. Measurement instruments that SMC manufactures or sells have not bee	 Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight. 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 	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.
3. An application which could have negative effects on people, property, or animals requiring special safety analysis. Measurement instruments that SMC manufactures or sells have not bee	applications, safety equipment or other applications unsuitable for the	△Caution
	 An application which could have negative effects on people, property, or animals requiring special safety analysis. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and 	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

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

3

Quick Manual and Check Sheets

Quick Manual
Read before using ·····p. 117
Safety Instructionsp. 117
1. Name of Parts and Accessoriesp. 117
2. Transportation, Transfer and Movingp. 117
3. Mounting and Installationp. 118
4. Pipingp. 118
5. Filling of Circulating Fluidp. 118
6. Wiring of Power Supplyp. 119
7. Start, Stop and Temperature Settingp. 119
8. How to Reset Alarmsp. 120
9. Alarm Code Listp. 120
Before Requesting Servicep. 120
Piping Check Sheet
Inspection Monitor Screen Check Sheet

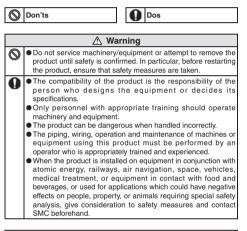
Quick Manual

Read before using

Thank you for purchasing SMC's thermo-chiller (hereinafter referred to as the "product"). This "Quick Manual" (hereinafter referred to as this "manual") briefly explains the procedures to start and stop the product and reset its alarms. Read this manual as well as the Operation Manual attached before using.

Safety Instructions

- Read and understand Safety Instructions carefully for proper use.
- In these instructions, warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury. Make sure to follow every instruction since they are important for safety.
- The symbols used in this manual have the following meanings.



▲ Caution

- Do not use the product outdoors. If the product is subjected to rain or water splash it may cause electrical shock, fire or failure.
 - Do not use the product in an area of high temperature and humidity which cannot be exhausted, or where it is exposed to corrosive substances. Cooling failure can result.
 - Do not handle the power supply connector and switch with wet hands. Electrical shock can result.
- Read the catalog and Operation Manual carefully. Keep to the specified procedures and within specified ranges.
 - This product is heavy (over 4 0 kg). When transferring the product with casters or handles, pay attention to slopes on the route and the risk of dropping the product.
 - Select piping applicable to the operating pressure range. Otherwise, it can cause fluid leakage or rupture.
 - Use fresh water or ethylene glycol aqueous solution (concentration of 15% or less) as the circulating fluid.
 - For the precautions for handling the circulating fluid, get the Material Safety Data Sheet from the manufacturer and read it.

1. Name of Parts and Accessories

Check the enclosed accessories with the delivered thermo-chiller.

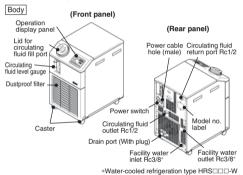
Accessories

1	Quick manual (this manual)		1 (with a clear cover)
2	Alarm code list label		1
3	Operation Manual		1
4	Power supply connector		1
5	Sequence I/O command signal connector*	Carlando I.	1
6	Fitting (for drain port)*		1
7	Ferrite core*	62	1

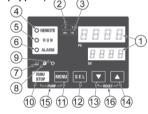
*These accessories are not explained in this manual.

For details, read the Operation Manual attached.

The names of parts used in this manual are as follows.

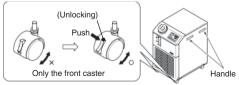


(Operation display panel)



2. Transportation, Transfer and Moving

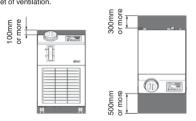
- 1) Be sure to unlock the caster (only at the front wheel). There is no lock function with the rear casters.
- 2) Push the left and right panels with the handle and move.
- Use corners when pushing the front or rear panel. Pushing at the center can deform the panel.



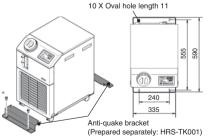
No	Description	Function			
1	Digital display		Displays the temperature and pressure of the circulating fluid and alarm codes.		
1	1 (7-segment,4 digits)	sv	Displays the discharge temperature of the circulating fluid and the set values of other menus.		
2	[°C] [°F] lamp	Disp	Equipped with a unit conversion function. Displays the unit of display temperature (default setting °C).		
3	[MPa] [PSI] lamp	Disp	Equipped with a unit conversion function. Displays the unit of display pressure (default setting MPa).		
4	[REMOTE] lamp*	Enables the remote operation (start and stop) by communication. Lights up during remote operation.			
5	[RUN] lamp	Lights up when the product is started and in operation. Goes off when the product 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 level indicator falls below the LOW level.			

3. Mounting and Installation

 Select a flat place applicable to the weight of the product for moving.
 Install the product so that there are no obstacles in the work space for setting up and servicing, or blocking the radiation at the inlet and outlet of ventilation.



- 3) After moving, lock the caster at the front wheel again.
- Fix the product to the floor or base using the anti-quake bracket (prepared separately).



*The Anchor bolts are not attached. To be prepared by the user.

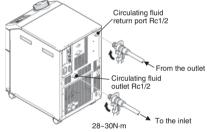
No	Description	Function
8	[] lamp°	Lights up while the run timer or stop timer function is working.
9	[@] lamp*	Lights up when the product is in automatic operation.
10	[RUN/STOP] key	Makes the product start or stop.
11	[MENU] key*	Shifts the main menu (display screen of temperature) and secret menu (entry of set values and monitor screen).
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	Keep the [MENU] and [RUN/STOP] keys pressed down simultaneously. The pump starts running independently to make the product ready for start-up (release the air).
16	[RESET] key	Keep the [▼] and [▲] keys pressed down simultaneously. This will stop the alarm buzzer and reset the [ALARM] lamp.

*These lamps and keys are not used in this manual.

For details, read the Operation Manual attached.

4. Piping

- 1) Connect the circulating fluid return port with the user's machine outlet.
- 2) Connect the circulating fluid discharge port with the user's machine inlet.



<Water-cooled refrigeration type HRSDD-W>

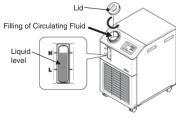
Connect the facility water inlet with the user's water source outlet.
 Connect the facility water outlet with the user's water source inlet.



N·m From the user's water source outlet To the user's water source inlet

5. Filling of Circulating Fluid

- 1) Check the drain port is plugged or closed by the valve to prevent the supplied circulating fluid from draining out.
- 2) Turn the lid for the circulating fluid fill port counterclockwise to open, and fill the circulating fluid up to "H" of the level indicator scale.
- 3) After filling to the specified level, turn the lid clockwise to close.



6. Wiring of Power Supply

A

Warning The electrical facilities should be installed and wired in accordance with local laws and regulations of each country and by the person who has knowledge and experience. Check the power supply. Operation with voltages, capacities, frequencies and cable sizes other than those specified can cause heat, fire and electrical shock.

Wire with an applicable cable size and terminal.

▲ Caution

 Use an individual socket or earth leakage breaker.
 Be sure to provide grounding. Incomplete grounding can cause failure and electrical shock.

Preliminary preparation for wiring.

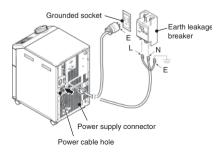
- 1) Prepare the cable and individual socket or earth leakage breaker shown in the table below.
- 2) Strip the sheath from both ends of the cable.
- 3) Disassemble the power supply connector (supplied as an accessory) and mount one end of the cable to the L, N and E terminals and reassemble the power supply connector.
- Connect the other end of the cable to a plug or crimped terminal that is connectable to the secondary side of the earth leakage breaker.

HRS model	Power supply voltage	Rated voltage [V]	Rated current [A]	Sensitivity of leak current [mA]	Cable qty. x size
	1-phase		comme leakage	ended e breaker	
HRS012-□□-10 HRS018-□□-10	(**,***)	100 200 Sharing	15	15 or 30	
	(60 Hz)	Recommended plug			3 cores x 14AWG
	(00112)	125	15		(3 cores x
HRS012-□□-20 HRS018-□□-20			comme eakage	ended e breaker	2.0 mm ²) *including
HRS024-□□-20 HRS030-□□-20	1-phase 200-230V AC		10	30	ground
HRS0 	(50/60 Hz)	200, 230	15	30	

Wiring of power supply

- 1) Insert the power supply connector to the power cable hole.
- Connect the plug or crimped terminal to the individual grounded socket or the secondary side of the earth leakage breaker and grounding.
- Turn on the breaker, etc. of the facility power supply and energize the product.

1-phase AC100 V, 115 V or AC200-230 V

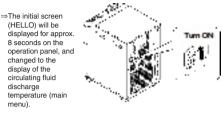


7. Start, Stop and Temperature Setting

Preliminary preparation for start-up.

Supply of power

1) Turn on the power switch.



Air release

- Press the [PUMP] key ([RUN/STOP] key and [MENU] key simultaneously). The [RUN] lamp flashes and only the pump continues to operation. This operation allows the discharge of the circulating fluid, and enables checking leakage from the piping and air release.
- At this time, the fluid level can lower and cause the alarm "AL01; Low tank level", which will lead to the stop of the product.
- 3) In that case, check that there is no leakage from the user's piping, fill the circulating fluid as specified in "5. Filling of Circulating Fluid" and take necessary actions in "8. How to Reset Alarms".
- Repeat steps 1) to 3) until the alarm ("AL01; Low tank level") is no longer generated.

Temperature setting

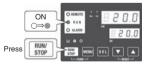
1) Press the [▼] and [▲] keys to change the SV to the required value.



(e.g.) "Set value of circulating fluid discharge temperature" 20.0°C (Default value)

Start of the product

- 1) Keep the [RUN/STOP] key pressed for approx. 2 seconds.
 - $\Rightarrow \mbox{The [RUN]}$ lamp lights up (in green) and the product starts running.
 - The circulating discharge temperature (PV) is controlled to the set temperature (SV).

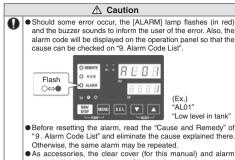


Stop of the product

- 1) Keep the [RUN/STOP] key pressed for approx. 2 seconds.
 - ⇒The [RUN] lamp flashes (in green) and continues the operation until the product is ready to stop. After approx. 1 0 seconds, the [RUN] lamp goes off and the product stops.



8. How to Reset Alarms



 As accessories, the clear cover (for this manual) and alarm code list label are enclosed. Stick the label to the panel to check the content of alarm codes.

Reset of alarm

Press the [RESET] key ([▼] and [▲] keys simultaneously).
 →The buzzer and then [ALARM] lamp (red) go off.



Before requesting service

Should some error occur, the user will be informed by the alarm (for warning). Check the cause and restart the product after eliminating it. If the same alarm is repeated frequently, or multiple alarms occur at the same time, which is obviously abnormal compared to the past performance of the product, contact the retailer or SMC sales representative where you purchased the product.

SMC Corporation

Address: 4-14-1 Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan TEL: +81 3 5207 8249 FAX : +81 3 5298 5362 URL: http://www.smcworld.com

This manual is subject to change without prior notice.

9. Alarm Code List

Alarm code	Description	Operation	Cause/Remedy (Press the reset key after eliminating the cause.)	
AL01	Low level in tank	Stop ^{*1}	The fluid level has fallen below the level indicator. Fill the circulating fluid.	
AL02	High circulating fluid discharge temp.	Stop	· Reduce the ambient temperature or heat load.	
AL03	Circulating fluid discharge temp. rise	Continued ^{*1}	· Wait until the temperature decreases.	
AL04	Circulating fluid discharge temp. drop	Continued ^{•1}	Check the ambient temperature condition and the temperature of supplied circulating fluid.	
AL05	High circulating fluid return temp.	Stop	Check the circulating fluid flows. Check the heat load are within the specified range.	
AL06	High circulating fluid discharge pressure	Stop	Check the user's piping for bends, squash and foreign matters.	
AL07	Abnormal pump operation	Stop	Restart and check the pump is operating.	
AL08	Circulating fluid discharge pressure rise	Continued ^{*1}	Check the user's piping for bends, squash and foreign matters.	
AL09	Circulating fluid discharge pressure drop	Continued ^{*1}	Restart and check the pump is operating.	
AL10	High compressor intake temp.	Stop	Check the temperature of the circulating fluid returning to the product.	
AL11	Low compressor intake temp.	Stop	Check the circulating fluid flows.	
AL12	Low super heat temperature	Stop	· Check the circulating fluid in the evaporator has not frozen.	
AL13	High compressor discharge pressure	Stop	Reduce the ambient temperature or heat load.	
AL15	Refrigerant circuit pressure (high pressure side) drop	Stop	Check the ambient temperature is within the specified range.	
AL16	Refrigerant circuit pressure (low pressure side) rise	Stop	Reduce the ambient temperature or heat load.	
AL17	Refrigerant circuit pressure (low pressure side) drop	Stop	Check the circulating fluid flows.	
AL18	Compressor overload	Stop	Leave for 10 minutes and restart, and check the compressor is operating.	
AL19 ⁺²	Communication error*2	Continued ^{•1}	The request message from the host computer has not arrived. See again.	
AL20	Memory error	Stop	Written data is different from read data. Ask for the service of RAM.	
AL21	DC line fuse cut	Stop*1	Ask for the service of the fuse of the DC circuit.	
AL22	Circulating fluid discharge temp. sensor failure	Stop		
AL23	Circulating fluid return temp. sensor failure	Stop	The temperature sensor is short-circuited or opened. Ask for the service of the temperature sensor.	
AL24	Compressor intake temp. sensor failure	Stop	Ask for the service of the temperature sensor.	
AL25	Circulating fluid discharge pressure sensor failure	Stop		
AL26	Compressor discharge pressure sensor failure	Stop	The pressure sensor is short-circuited or opened.	
AL27	Compressor intake pressure sensor failure	Stop	Ask for the service of the pressure sensor.	
AL28	Maintenance of pump	Continued	The timing of a periodical check is informed.	
AL29*3	Maintenance of fan motor*3	Continued	Recommended to ask for the check and service of the pump, fan motor and	
AL30	Maintenance of compressor	Continued	compressor.	
AL31*2	Contact input1 Signal detection	Stop*1		
AL32*2	Contact input2 Signal detection	Stop ^{*1}	Contact input is detected.	

*1 "Stop" or "Continued" are default setting. The user can changed to "Continued" and "Stop". For details, read the Operation Manual attached.

*2 "AL19, AL31, AL32" is disabled in the default setting. When this function needs to be enabled, refer to the Operation Manual attached.

*3 HRSDD-A-DD (Air-cooled refrigeration type).

*4 Refer to the "Operation Manual" (separate sheet) for other alarms.

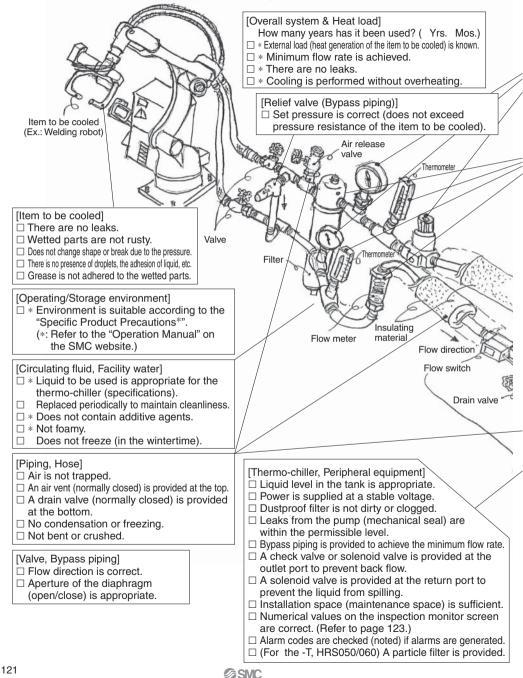


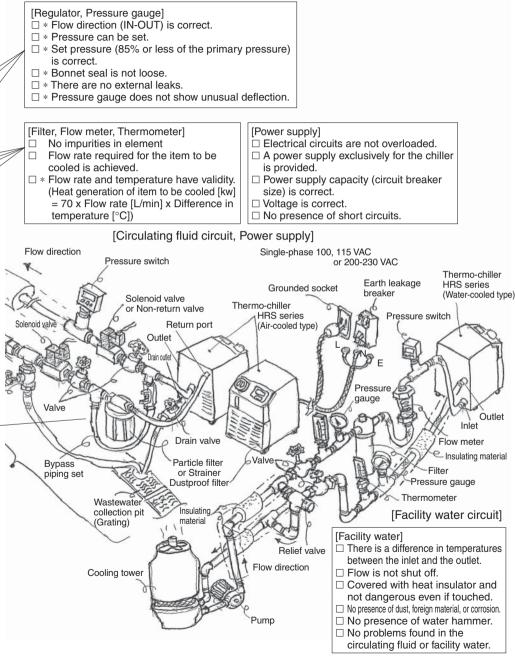
3

Piping Check Sheet

Please enter an " \bigcirc " for Yes and " \times " for No.

Be sure to check the items with a " * " for trouble during a trial run.





• The "Inspection Monitor Screen Check Sheet" and the "Piping Check Sheet" provide the items to be checked on the spot in the event of an alarm.

When you make a request for servicing, please submit the check sheets with all alarm codes that have been generated.

Inspection Monitor Screen Check Sheet

Please enter an " \bigcirc " for Yes and " \times " for No.

Be sure to check the items with a " * " for trouble during a trial run.

Display	Item	Contents	Value
<u>E I.</u>	Circulating fluid outlet temperature	Displays the temperature of the circulating fluid outlet. This temperature does not take offset into consideration.	
E 2.	Circulating fluid return port temperature	Displays the temperature of the circulating fluid return.	
E 3.	Compressor inlet temperature	Displays the temperature of the inlet of the compressor.	
P 1.	Circulating fluid outlet pressure	Displays the circulating fluid outlet pressure at the outlet.	
P.h.	Pressure of the higher pressure side of the refrigerant circuit	Displays the pressure of higher pressure side of the refrigerant circuit.	
PL.	Pressure of the lower pressure side of the refrigerant circuit	Displays the pressure of lower pressure side of the refrigerant circuit.	
d I .	Electric resistivity/ conductivity	Displays the electric resistivity/conductivity.	
PURP	Accumulated operation time of the pump	Displays the accumulated operation time of the pump.	
F. R. n. ñ	Accumulated operation time of the fun motor	Displays the accumulated operation time of the fan motor. (For air-cooled type)	
r E F.	Accumulated operation time of the compressor	Displays the accumulated operation time of the compressor.	
dru.	Accumulated operation time	Displays the accumulated operation time.	

List of inspection m	onitor menu check items
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Check of the circulating fluid outlet temperature

 Press and hold the [MENU] key for approx. 2 sec. The temperature of the circulating fluid outlet "<u>k-t</u>" is displayed on the digital display.



Displays the temperature of the circulating fluid at the outlet from which the fluid is fed to the customer's device. This temperature does not take temperature offset into consideration



Check of the circulating fluid inlet temperature

2. Press the [SEL] key once.

The temperature of the circulating fluid return is displayed on the digital display.



Displays the temperature of the circulating fluid returning from the customer's device.

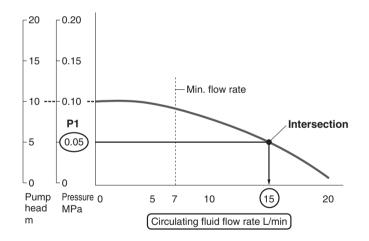


□ * Circulating fluid inlet temperature t2. is equal to or higher than t1. [°C], AL05 [High circulating fluid return temperature (60°C)] is not generated, and there is an allowance for cooling capacity relative to the heat generation of the item to be cooled.

[Refer to "Heat generation of the item to be cooled" below.]

Heat generation of the item to be cooled

1. Plot the circulating fluid outlet pressure P 1 . on the pump capacity diagram, and read off the circulating fluid flow rate.



2. Calculate the heat generation of the item to be cooled.

Heat generation of item to be cooled [kW] = 70 x Circulating fluid flow rate [L/min] x (t2. [°C] - Circulating fluid outlet temperature t1. [°C]) / 1000 [W/kW]

At this point,

70: Multiplier $[J \cdot min/(L \cdot K \cdot s)]$ (= Density of water $[kg/L] \times Specific heat [J/(kg \cdot K)] / 60 [s/min])$ 66 for the case of 15% ethylene glycol aqueous solution

Check of the compressor inlet temperature

3. Press the [SEL] key once.

The compressor inlet temperature is displayed on the digital display.



Displays the compressor inlet temperature.



□ The compressor inlet temperature t3. is -15 to 60 [°C], and AL12 [Low superheat temperature] is not generated.

Check of the circulating fluid outlet pressure

4. Press the [SEL] key once.

The circulating fluid outlet pressure is displayed on the digital display.

P	1.		
PV	Π.	1	3
SV			

The pressure of the circulating fluid outlet from which the fluid is sent to the customer's device is displayed.



□ Circulating fluid outlet pressure P1. is 0.05 [MPa] or higher, and AL06 [High circulating fluid discharge pressure] is not generated.

Check of the pressure of the higher pressure side of the refrigerant circuit

5. Press the [SEL] key once.

The pressure of the higher pressure side of the refrigerant circuit is displayed on the digital display.



Displays the pressure of the higher pressure side of the refrigerant circuit.



Pressure of the higher pressure side of the refrigerant circuit Ph. during operation is 0.1 [MPa] or more, and AL13 [High compressor discharge pressure] is not generated.
 In addition, the calculated temperature ^{Note 2} of the pressure of the higher pressure side of the refrigerant circuit Ph. during stoppage ^{Note 1} exceeds the ambient temperature.

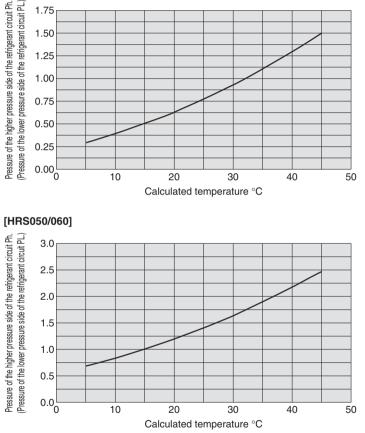
Note 1) Leave the compressor off for 24 hours to sufficiently cool it down to the ambient temperature. Note 2) Refer to "Calculated temperature of the pressure of the higher pressure side of the refrigerant circuit Ph. (the pressure of the lower pressure side of the refrigerant circuit PL.)" on page 126 for details.

3

Quick Manual and Check Sheets

Refrigerant leakage

1. If the calculated temperature of the pressure of the higher pressure side of the refrigerant circuit Ph. during stoppage is equal to or lower than the ambient temperature, the refrigerant may be leaking. Have a specialist (an engineer possessing a Class 1 or Class 2 Refrigerant Freon Handling License) check the details.



Calculated temperature of the pressure of the higher pressure side of the refrigerant circuit Ph. (the pressure of the lower pressure side of the refrigerant circuit PL.)

@SMC

[HRS012/018/024/030]

Check of the pressure of the lower pressure side of the refrigerant circuit

6. Press the [SEL] key once.

The pressure of the lower pressure side of the refrigerant circuit is displayed on the digital display.



Displays the pressure of the lower pressure side of the refrigerant circuit.



- Pressure of the lower pressure side of the refrigerant circuit PL. during operation is at least 0.2 Note 3) or 0.4 Note 4) [MPa], and AL16 [Refrigerant circuit pressure (lower pressure side) rise)] is not generated.
- Note 3) Refer to "Calculated temperature of the pressure of the higher pressure side of the refrigerant circuit Ph. (the pressure of the lower pressure side of the refrigerant circuit PL.)" for the HRS012/018/024/030 on page 126 for details.
- Note 4) Refer to "Calculated temperature of the pressure of the higher pressure side of the refrigerant circuit Ph. (the pressure of the lower pressure side of the refrigerant circuit PL.)" for the HRS050/060 on page 126 for details.

Check of the electric resistivity/conductivity

7. Press the [SEL] key once.

The electric resistivity/conductivity is displayed on the digital display.



* This function is available for customers who have purchased the electric resistivity/conductivity sensor set which is a separately sold accessory. Refer to the Operation Manual attached to these optional accessories for details.



Electric resistivity dl. is within the control range of 0.2 to 4.5 [MΩ] or 5 to 45 [μS], and neither AL34 [Electric resistivity/conductivity rise] nor AL35 [Electric resistivity/conductivity drop] are generated.

Check of the accumulated operation time of the pump

8. Press the [SEL] key once.

The accumulated operation time of the pump is displayed on the digital display.



Displays the accumulated operation time of the pump. Refer to the table below for the display.

Cumulative time	Indicated value
0h to 999h	Dh to 999h
1,000h to 99,999h	Lhh to 33hh
100,000h	Return to 🛛 🗘 h

List of time display

[For products other than the HRS012/018/024/030-T options (magnetic pump mounted)]

AL 2 8 Pump maintenance alarm is generated when the accumulated operation time of the pump reaches 20,000 hours ($\boxed{2 \ D \ h}$) or more.

[For the HRS012/018/024/030-T options (high-pressure pump) and the HRS050/060 standard products]

AL 2 8 Pump maintenance alarm is generated when the accumulated operation time of the pump reaches 8,000 hours ($\boxed{B \ h \ h}$) or more.



□ Accumulated operating time of the pump PunP has not reached 20,000 [h] Note 5) or 8,000 [h] Note 6), and AL28 [Maintenance of pump] is not generated.

Note 5) For products other than the HRS012/018/024/030-T options (magnetic pump mounted) Note 6) For the HRS012/018/024/030-T options (high-pressure pump) and the HRS050/060 standard products

Check of the accumulated operation time of the fan motor

9. Press the [SEL] key once.

The accumulated operation time of the fun motor is displayed on the digital display.



Displays the accumulated operation time of the fan motor. "List of time display" above for the display.

AL29 Fan motor maintenance alarm is generated when the accumulated operation time of the fan motor reaches 20,000 hours ($\boxed{2 \ h \ h}$) or more. For details, refer to Chapter 7 Alarm indication and trouble shooting.

Water-cooled refrigerated type does not have the fan motor. The accumulated time of the digital display shows "----".

Also, AL29 fan motor maintenance alarm is not generated.



□ Accumulated operation time of the fan motor FRn.n has not reached 20,000 [h] ^{Note 7}, and AL29 [Maintenance of fan motor] is not generated.

Check of the accumulated operation time of the compressor

10. Press the [SEL] key once.

The accumulated operation time of the compressor is displayed on the digital display.



Displays the accumulated operation time of the compressor. For the display, refer to "List of time display" on page 128.

AL 3.0 Compressor maintenance alarm is generated when the accumulated operation time of the compressor reaches 50,000 hours (52hh) or more. For details, refer to page 137.



□ Accumulated operation time of the fan compressor rEF. has not reached 50,000 [h], and AL30 [Maintenance of compressor] is not generated.

Check of the accumulated operation time

11. Press the [SEL] key once.

The accumulated operation time is displayed on the digital display.



Displays the accumulated operation time. For the display, refer to "List of time display" on page 128.



The accumulated operation time has not reached 6,000 to 8,000 [h] Note 8) (Inspection time of mechanical seal), 20,000 [h] (Inspection time of pump and fan motor) Note 9), or 50,000 [h] (Inspection time of compressor).

Note 8) For the HRS012/018/024/030-T options and the HRS050/060 standard products (high-pressure pump) Note 9) For air-cooled type only

Completing the Inspection Monitor Screen Check Sheet (Question sheet)

12. Put a "○"or "×" in the check boxes of items 1 to 11 of the "Inspection Monitor Screen Check Sheet" on page 130. When inquiring about a problem occurring at a customer's premises, please complete this check sheet to report the problem accurately, and contact your local sales representative or a service company.

▲ Caution

If the "Inspection Monitor Screen Check Sheet" (question sheet) is not available, the service company will conduct their own checks instead.

∕asmc

In such cases, a certain period of time will be required before we can start repairing.

Inspection Monitor Screen Check Sheet (Question Sheet)

Please enter an " \bigcirc " for Yes and " \times " for No. Be sure to check the items with a " * " for trouble during a trial run.

- □ * Circulating fluid outlet temperature t1. is 1 [°C] or higher, AL02 [High circulating fluid discharge temperature] is not generated, and the temperature is controlled to the preset temperature (= SV + Offset).
- □ * Circulating fluid inlet temperature t2. is equal to or higher than t1. [°C], AL05 [High circulating fluid return temperature (60°C)] is not generated, and there is an allowance for cooling capacity relative to the heat generation of the item to be cooled.
- □ The compressor inlet temperature t3. is –15 to 60 [°C], and AL12 [Low superheat temperature] is not generated.
- □ Circulating fluid outlet pressure P1. is 0.05 [MPa] or higher, and AL06 [High circulating fluid discharge pressure] is not generated.
- Pressure of the higher pressure side of the refrigerant circuit Ph. during operation is 0.1 [MPa] or more, and AL13 [High compressor discharge pressure] is not generated. In addition, the calculated temperature ^{Note 2} of the pressure of the higher pressure side of the refrigerant circuit Ph. during stoppage ^{Note 1}) exceeds the ambient temperature.
- □ Pressure of the lower pressure side of the refrigerant circuit PL. during operation is at least 0.2 ^{Note 3} or 0.4 ^{Note 4} [MPa], and AL16 [Refrigerant circuit pressure (lower pressure side) rise)] is not generated.
- \Box Electric resistivity dl. is within the control range of 0.2 to 4.5 [M Ω] or 5 to 45 [μ S], and neither AL34 [Electric resistivity/conductivity rise] nor AL35 [Electric resistivity/conductivity drop] are generated.
- □ Accumulated operating time of the pump PunP has not reached 20,000 [h] Note 5) or 8,000 [h] Note 6), and AL28 [Maintenance of pump] is not generated.
- □ Accumulated operation time of the fan motor FRn.n has not reached 20,000 [h] ^{Note 7)}, and AL29 [Maintenance of fan motor] is not generated.
- □ Accumulated operation time of the fan compressor rEF. has not reached 50,000 [h], and AL30 [Maintenance of compressor] is not generated.
- □ The accumulated operation time has not reached 6,000 to 8,000 [h] ^{Note 8} (Inspection time of mechanical seal), 20,000 [h] (Inspection time of pump and fan motor) ^{Note 9}, or 50,000 [h] (Inspection time of compressor).

Other (Must be filled in)

Specifically describe the details of the problem and emergency measures taken.

Maintenance

4

Alarms: Causes and Remedies (HRS012/018/024/030/050/060)p. 133
Troubleshooting of Alarms
Troubleshooting of Errors without Alarm Generationp. 242
Replacement Parts Chart
Parts Replacement Procedure
Check After Workp. 259
Replacement Procedure

Alarms: Causes and Remedies (HRS012/018/024/030/050/060)

When you've received requests from customers for product servicing due to the frequent generation of the same alarm or multiple alarms, refer to 1. Alarm Troubleshooting below and Troubleshooting on pages 138 to 248 in order to remedy the problem.

1. Alarm Troubleshooting

After taking note of all the alarm codes that are being generated, refer to Table 4 - 1 and follow the instructions to remedy each specific problem.

Table 4-1

Conditions	Remedy for specific problem
①No screen display or alarm, but chiller won't start up	p. 133
② Chiller starts up, but won't cool (Overload)	p. 133, 134
3 Won't warm up (Low load, Cooling load)	p. 135
(4) Circulating fluid, facility water, automatic water fill, etc., won't flow	p. 136
5 Circulating fluid/Refrigerant leakage	p. 136
6 Recommended replacement period of main functioning parts	p. 137
⑦ Sensor disconnection and other part errors	p. 137
⑧ Purity levels when using deionized water as the circulating fluid	p. 137

1 No screen display or alarm, but chiller won't start up

Phenomenon		Cause	Remedy
Alarm code	Description	Cause	Remedy
	The operation panel	Power source not supplying power	Supply the correct power.
Note)	displays nothing even	Poor display board connection	Securely insert the connector [CN1].
	the power supply	Power board error	Replace the power board.
	switch is turned ON.	Display board error	Replace the display board.
_	Impossible to operate with the "RUN/STOP" key	Communication settings are set. ([REMOTE] light is ON.)	Set to local mode.
	on the operation panel	Display board error	Replace the display board.
-	Lights on the operation panel or display(s) on the digital display does not show anything.	Display board error	Replace the display board.
	The alarm buzzer	Is "AS.01" in the alarm setting menu "OFF"?	Turn "AS.01" ON.
_	does not sound.	Display board error	Replace the display board.

Note) Problem with alarm symbol not being displayed

② Chiller starts up, but won't cool (Overload)

Phenomenon		Cause	Remedy
Alarm code	Description	Cause	nemeuy
		Temperature sensor error (with simultaneous AL22 generation)	Replace the temperature sensor.
		Ambient temperature exceeds the specification range (High ambient temperature)	Reduce the ambient temperature by ventilation, air conditioning, etc.
		External load exceeds the specification range (Object to be	
		cooled is generating too much heat for the chiller to handle)	cooled, or install a larger chiller.
		Insufficient ventilation space	Secure sufficient ventilation space.
		[For air-cooled type] Dirty dustproof filter	Clean or replace the dustproof filter.
			Replace facility water.
		[For water-cooled type] Dirty facility water	Clean the facility water circuit.
		[For water-cooled type] Dirty lacinty water	Replace the water-cooled condenser.
			Replace the water regulating valve.
		Power not being supplied to the pressure sensor (for high	
		pressure, for low pressure)	Replace the main board.
		Main board error	
AL02	High circulating fluid		Install bypass piping and open the valve.
ALUZ	discharge temp.		Replace the pump.
		Dirty circulating fluid	Replace circulating fluid.
			Clean the circulating fluid circuit.
			Replace the heat exchanger (evaporator).
			Please contact your nearest agency.
		Refrigerant leakage	Repair or replace the part of the refrigerant circuit where
			leakage is present. Please contact your nearest agency.
		Electronic expansion valve error	Replace the electronic expansion valve.
			Please contact your nearest agency.
		Pressure sensor (for high pressure) error	Replace the pressure sensor (for high pressure).
			Please contact your nearest agency.
		Pressure sensor (for low pressure) error	Replace the pressure sensor (for low pressure).
			Please contact your nearest agency.
		Other	Please contact an SMC's sales distributor.



② Chiller starts up, but won't cool (No refrigeration) (Continued)

P larm code	henomenon Description	Cause	Remedy
AL03	Circulating fluid	Problems occur immediately after operation start or stop	Refer to "Setting of temperature alarm monitoring method and alarm generation timing" in the operation manual and review.
	discharge temp. rise	Heat load fluctuation	Same as above
		Problem with the external piping (system)	Remedy the problem with the external piping (system).
		Other (Same as AL02) Temperature sensor error (with simultaneous AL23 generation)	Remedy AL02.
		External load exceeds the specification range (Object to be	Replace the temperature sensor. Reduce the amount of heat generated by the object to be
		cooled is generating too much heat for the chiller to handle)	cooled, or install a larger chiller.
		Problems occur immediately after operation start or stop	Use bypass piping, etc., to reduce the circulating fluid return
	High circulating fluid	Heat load fluctuation	temperature to 60°C or below.
AL05	return temp.	Problem with the external piping (system)	Remedy the problem with the external piping (system).
		Main board error	Replace the main board.
		Other alarms are being generated.	Check the troubleshooting section for the remedy for the alarm being general
		The circulating fluid discharge temperature is above 45°C.	Remedy AL02.
		Other	Please contact an SMC's sales distributor.
		Compressor intake temp. sensor (T1) failure (with simultaneous AL24 generation)	Replace the thermistor (T1).
		Temperature sensor error (with simultaneous AL05 generation)	Replace the temperature sensor.
		The circulating fluid discharge temperature is above 45°C.	Remedy AL02.
		External load exceeds the specification range (Object to be cooled is generating too much heat for the chiller to handle)	Reduce the amount of heat generated by the object to be cooled, or install a larger chiller.
AL10	High compressor	Problem with the external piping (system)	Remedy the problem with the external piping (system).
ALIO	intake temp.		Replace the pump.
		Flow rate of the circulating fluid is less than 5 L/min.	Install a bypass piping.
		Main board error	Replace the main board.
			Replace the electronic expansion valve.
		Electronic expansion valve error	Please contact your nearest agency.
		Ambient temperature exceeds the specification range (High ambient temperature)	Reduce the ambient temperature by ventilation, air conditioning,
		External load exceeds the specification range (Object to be	Reduce the amount of heat generated by the object to be
		cooled is generating too much heat for the chiller to handle)	cooled, or install a larger chiller.
		Insufficient ventilation space	Secure sufficient ventilation space.
		[For air-cooled type] Dirty dustproof filter	Clean or replace the dustproof filter.
			Replace facility water.
	High compressor	[For water-cooled type] Dirty facility water	Clean the facility water circuit.
			Replace the water-cooled condenser.
		Other alarms are being generated.	Replace the water regulating valve. Check the troubleshooting section for the remedy for the alarm being general
		Fan motor error	Replace the fan motor.
AL13		Power not being supplied to the pressure sensor (for high	
ALIS	discharge pressure	pressure, for low pressure)	Replace the main board.
		Main board error	
		Power board error	Replace the power board.
			Replace the pump.
		Flow rate of the circulating fluid is less than 5 L/min.	Install a bypass piping.
		Bracoura concer (for high proceure) error	Replace the pressure sensor (for high pressure).
		Pressure sensor (for high pressure) error	Please contact your nearest agency.
		Pressure sensor (for low pressure) error	Replace the pressure sensor (for low pressure).
			Please contact your nearest agency.
			Replace the electronic expansion valve.
		Electronic expansion valve error	
		Electronic expansion valve error	Please contact your nearest agency.
		Other alarms are being generated.	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being genera
		Other alarms are being generated. Problem in external environment	Please contact your nearest agency.
		Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being general Improve the external environment (operating environment).
	Refrigerant circuit	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure)	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being genera
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being genere Improve the external environment (operating environment). Replace the main board.
AL16		Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure)	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being general Improve the external environment (operating environment).
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure).
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency.
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being genere. Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Replace the electronic expansion valve.
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Please contact your nearest agency. Please contact your nearest agency. Please contact our nearest agency. Please contact our nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply.
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alms are being generated.	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alam being genere. Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Replace the electronic expansion valve. Please contact our nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply. Check the troubleshooting section for the emedy for the alam being genere.
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Ambient temperature exceeds the specification range (Hgh ambient temperature)	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being geners. Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Replace the electronic expansion valve. Please contact your nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply. Check the troubleshooting section for the remedy for the alarm being geners.
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Anbient temperature exceeds the specification range (High ambient temperature) External load exceeds the specification range (Object to be	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Please contact your nearest agency. Please contact your nearest agency. Please contact our nearest agency. Please contact our nearest agency. Please contact our nearest agency. Check the troubleshooting section for the remedy for the alarm being genera. Reduce the amount of heat generated by the object to be
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alms are being generated. Ambient temperature exceeds the specification range (High ambient temperature) External load exceeds the specification range (Object to be cooled is generating too much heat for the chiller to handle)	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Replace the electronic expansion valve. Please contact your nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply. Check the troubleshooting section for the remedy for the alarm being general Reduce the ambient temperature by ventilation, air conditioning. Reduce the amount of heat generated by the object to be cooled, or instal a larger chiller.
AL16	pressure (low	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Ambient temperature exceeds the specification range (Object to be cooled is generating too much heat for the chiller to handle) Insufficient ventilation space	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being geners Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Replace the electronic expansion valve. Please contact your nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply. Check the troubleshooting section for the remedy for the alarm being geners Reduce the ambient temperature by ventilation, air conditioning. Reduce the ambient temperature by ventilation, air conditioning. Reduce the ambient temperature by ventilation.
	pressure (low pressure side) rise	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Ambiert temperature exceeds the specification range (Object to be cooled is generating too much heat for the chiller to handle) Insufficient ventilation space [For air-cooled type] Dirty dustproof filter	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Please contact your nearest agency. Please contact your nearest agency. Please contact your nearest agency. Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being genera Reduce the amount of heat generated by the object to be cooled, or install a larger chiller. Secure sufficient ventilation space. Clean or replace the dustproof filter.
AL16	pressure (low pressure side) rise	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Ambient temperature exceeds the specification range (High ambient temperature) External load exceeds the specification range (High ambient temperature) Insufficient ventilation space [For air-cooled type] Dirty facility water	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alam being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Please contact your nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply. Check the troubleshooting section for the remedy for the alam being general Reduce the ambient temperature by ventilation, air conditioning. Reduce the ambient temperature by ventilation, air conditioning. Reduce the ambient temperature by ventilation, air conditioning. Cooled, or install a larger chiller. Secure sufficient ventilation space. Clean or replace the dustproof filter.
	pressure (low pressure side) rise	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Ambient temperature exceeds the specification range (High ambient temperature) External load exceeds the specification range (High ambient temperature) Insufficient ventilation space [For air-cooled type] Dirty dustproof filter [For water-cooled type] Facility water does not flow.	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alarm being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Please contact your nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply. Check the troubleshooting section for the remedy for the alarm being genera Reduce the ambient temperature by ventilation, air conditioning. Reduce the ambient temperature by ventilation, air conditioning. Reduce the ambient temperature by ventilation, air conditioning. Reduce the adbient temperature by ventilation, air conditioning. Reduce the adbient temperature by ventilation, air conditioning. Reduce the adbient temperature by ventilation, air conditioning. Please contact an SMC's sales distributor.
	pressure (low pressure side) rise	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Ambient temperature exceeds the specification range (High ambient temperature) External load exceeds the specification range (High ambient temperature) Insufficient ventilation space [For air-cooled type] Dirty facility water	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alam being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Replace the electronic expansion valve. Please contact your nearest agency. Please contact your nearest agency. Please contact your nearest agency. Please contact your nearest agency. Replace the ambient temperature by ventilation, air conditioning. Reduce the ambient temperature by ventilation, air conditioning. Reduce the ambient temperature by ventilation, air conditioning. Secure sufficient ventilation space. Clean or replace the dusproof filter. Supply clean facility water. Please contact an SMC's sales distributor. Replace the water-cooled condenser.
	pressure (low pressure side) rise	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Ambient temperature exceeds the specification range (High ambient temperature) External load exceeds the specification range (High ambient temperature) Insufficient ventilation space [For air-cooled type] Dirty dustproof filter [For water-cooled type] Dirty water does not flow. [For water-cooled type] Dirty water-cooled condenser	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alam being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Replace the electronic expansion valve. Please contact your nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply. Check the troubleshooting section for the remedy for the alam being genera Reduce the ambient temperature by ventilation, air conditioning, . Reduce the Mather to the dustproof filter. Supply clean facility water. Please contact an SMC's sales distributor. Replace the water-cooled condenser. Replace the water regulating valve.
	pressure (low pressure side) rise	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure sensor (for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Ambient temperature exceeds the specification range (High ambient temperature) External load exceeds the specification range (Object to be cooled is generating too much heat for the chiller to handle) Insufficient ventilation space [For water-cooled type] Dirty dustproof filter [For water-cooled type] Dirty water-cooled condenser Main board error	Please contact your nearest agency. Check the troubleshooling section for the remedy for the alam being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Please contact your nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply. Check the troubleshooling section for the remedy for the alam being genera Reduce the ambient temperature by ventilation, air conditioning, r Reduce the dustproof filter. Supply clean facility water. Please contact an SMC's sales distributor. Replace the water regulating valve. Replace the main board.
	pressure (low pressure side) rise	Other alarms are being generated. Problem in external environment Power not being supplied to the pressure sensor (for high pressure, for low pressure) Main board error Pressure for low pressure) error Electronic expansion valve error Other Power supply failure Other alarms are being generated. Ambient temperature exceeds the specification range (High ambient temperature) External load exceeds the specification range (High ambient temperature) Insufficient ventilation space [For air-cooled type] Dirty dustproof filter [For water-cooled type] Dirty water does not flow. [For water-cooled type] Dirty water-cooled condenser	Please contact your nearest agency. Check the troubleshooting section for the remedy for the alam being general Improve the external environment (operating environment). Replace the main board. Replace the pressure sensor (for low pressure). Please contact your nearest agency. Please contact your nearest agency. Please contact an SMC's sales distributor. Use an appropriate power supply. Check the troubleshooting section for the remedy for the alam being genera Reduce the ambient temperature by ventilation, air conditioning , Reduce the mather to the spece. Clean or replace the dustproof filter. Supply clean facility water. Please contact an SMC's sales distributor. Replace the water-cooled condenser. Replace the water regulating valve.



③Won't warm up (Low load, Cooling load)

Ph	nenomenon		
Alarm code	Description	Cause	Remedy
		Temperature sensor error (with simultaneous AL22 generation)	Replace the temperature sensor.
		Problems occur immediately after operation start or	Refer to "Setting of temperature alarm monitoring method and
		stop	alarm generation timing" in the operation manual and review.
		Heat load fluctuation	Same as above
		Cooling load exceeds the heating capacity	Use within the heating capacity or refrain from using
	Circulating fluid	(Heat generated by the object to be cooled is a negative cooling load)	exclusively for heating.
AL04	discharge temp.	Other alarms are being generated.	Check the troubleshooting section for the remedy for the alarm being generated
	drop	Main board error	Replace the main board.
		Flow rate of the size deting fluid is less than 5 L /min	Replace the pump.
		Flow rate of the circulating fluid is less than 5 L/min.	Install a bypass piping.
		Electronic expansion valve error	Replace the electronic expansion valve.
		Electronic expansion valve entor	Please contact your nearest agency.
		Other	Please contact an SMC's sales distributor.
		Compressor intake temp. sensor (T1) failure (with simultaneous AL24 generation)	Replace the thermistor (T1).
		Temperature sensor error (with simultaneous AL04 generation)	Replace the temperature sensor.
		Cooling load exceeds the heating capacity	Use within the heating capacity or refrain from using
		(Heat generated by the object to be cooled is a negative cooling load)	exclusively for heating.
		Flow rate of the circulating fluid is less than 5 L/min.	Replace the pump.
			Install a bypass piping.
AL11	Low compressor	Main board error	Replace the main board.
ALII	intake temp.		Replace circulating fluid.
		Dirty circulating fluid	Clean the circulating fluid circuit.
			Replace the heat exchanger (evaporator).
			Please contact your nearest agency.
		Electronic expansion valve error	Replace the electronic expansion valve.
		Electionic expansion valve entor	Please contact your nearest agency.
		Other	Please contact an SMC's sales distributor.
		Other alarms are being generated.	Check the troubleshooting section for the remedy for the alarm being generated
		Flow rate of the circulating fluid is less than 5 L/min.	Replace the pump.
			Install a bypass piping.
			Replace circulating fluid.
		Dirty circulating fluid	Clean the circulating fluid circuit.
			Replace the heat exchanger (evaporator).
			Please contact your nearest agency.
	Low super heat	Compressor intake temp. sensor (T1) failure (with simultaneous AL24 generation)	Replace the thermistor (T1).
AL12	temperature	Pressure sensor (for high pressure) error	Replace the pressure sensor (for high pressure).
	temperature		Please contact your nearest agency.
		Pressure sensor (for low pressure) error	Replace the pressure sensor (for low pressure).
			Please contact your nearest agency.
		Power not being supplied to the pressure sensor (for	
		high pressure, for low pressure)	Replace the main board.
		Main board error	
		Electronic expansion valve error	Replace the electronic expansion valve.
			Please contact your nearest agency.
	Refrigerant circuit pressure (low pressure side) drop	Other alarms are being generated.	Check the troubleshooting section for the remedy for the alarm being generated
		Problem in external environment	Improve the external environment (operating environment).
		Flow rate of the circulating fluid is less than 5 L/min.	Replace the pump.
			Install a bypass piping.
		Power not being supplied to the pressure sensor (for	Replace the main board.
AL17		high pressure, for low pressure)	
		Main board error	
AL17	pressure side, drop		Replace the pressure sensor (for low pressure).
ALIT	pressure side) drop	Pressure sensor (for low pressure) error	
ALIT		Pressure sensor (for low pressure) error	Please contact your nearest agency.
ALI7		Pressure sensor (for low pressure) error Electronic expansion valve error	

(4) Circulating fluid, facility water, automatic water fill, etc., won't flow

Phenomenon			
Alarm code	Description	Cause	Remedy
AL06		Pressure sensor (for circulating fluid) error (with simultaneous AL25 generation)	Replace the pressure sensor (for circulating fluid).
		Problem with the external piping (system)	Remedy the problem with the external piping (system).
	High circulating	······································	Install a bypass piping.
	fluid discharge	Clogging in the heat exchanger	Replace the heat exchanger (evaporator).
	pressure		Please contact your nearest agency.
		Other alarms are being generated.	Check the troubleshooting section for the remedy for the alarm being generated.
		Main board error	Replace the main board.
		Pressure sensor (for circulating fluid) error (with simultaneous AL25 generation)	Replace the pressure sensor (for circulating fluid).
		Ethylene glycol is too highly concentrated.	Replace with a 15% ethylene glycol aqueous solution.
AL07	Abnormal pump	Power voltage error	Use an appropriate power supply.
	operation	Pump error	Replace the pump.
		Main board error Power board error	Replace the main board.
			Replace the power board.
		AL06 is simultaneously being generated.	Check the troubleshooting section for the remedy for the alarm being generated (AL06).
		Pressure sensor (for circulating fluid) error (with simultaneous AL25 generation)	Replace the pressure sensor (for circulating fluid).
		Problem with the external piping (system)	Remedy the problem with the external piping (system).
AL08	Circulating fluid	This shows not value is show to the output of sides and the	Install a bypass piping. Review the alarm set value.
ALUO	discharge pressure	This alarm set value is close to the external piping resistance.	
	Circulating fluid discharge pressure drop	Clogging in the heat exchanger	Replace the heat exchanger (evaporator). Please contact your nearest agency.
		Other alarms are being generated.	Check the troubleshooting section for the remedy for the alarm being generated.
		Main board error	Replace the main board.
		Pressure sensor (for circulating fluid) error (with simultaneous AL25 generation)	Replace the pressure sensor (for circulating fluid).
AL09			Replace the pump.
ALUS		Problem with the external piping (system)	Remedy the problem with the external piping (system).
	alop	Other alarms are being generated.	Check the troubleshooting section for the remedy for the alarm being generated.
		Problem in external environment	Improve the external environment (operating environment).
			Replace the pump.
		Flow rate of the circulating fluid is less than 5 L/min.	Install a bypass piping.
	(Refrigerant circuit	Power not being supplied to the pressure sensor (for	initian a bypass piping.
	pressure (low	high pressure, for low pressure)	Replace the main board.
(AL17)	pressure side) drop)	Main board error	
			Replace the pressure sensor (for low pressure).
		Pressure sensor (for low pressure) error	Please contact your nearest agency.
		Electronic expansion valve error	Replace the electronic expansion valve.
			Please contact your nearest agency.
		Other	Please contact an SMC's sales distributor.
	[For water-cooled type]	Doesn't flow when the thermo-chiller is stopped	Start the thermo-chiller or install bypass piping for the
	Facility water does not flow.	Doesn't now when the thermo-chiller is stopped	facility water circuit.
	[For option J] Automatic water fill does not operate.	Power is not being supplied.	Supply power.
		The tank fluid level is above "L."	Running normally, even if water is not being supplied. Start supply of water at "L" or below.
-		Main board error	Replace the main board.
		Clogged automatic water fill opening	Replace the solenoid valve for automatic water-fill.
		Solenoid valve (used for automatic water fill) error	

5 Circulating fluid/Refrigerant leakage

Phenomenon		0	Demoty
Alarm code	Description	Cause	Remedy
AL01	Low level in tank	Declining liquid level of the level gauge	Supplement circulating fluid.
		Chiller internal circulating fluid leakage	Repair leakage points.
		External piping leakage	Repair external piping.
		Mechanical seal leakage	Replace the mechanical seal or pump.
		Poor level switch connection	Securely insert the main board connector [CN3].
		Level switch error	Replace the level switch.
		Main board error	Replace the main board.
AL15	Refrigerant circuit pressure (high pressure side) drop	Pressure sensor (for high pressure) error (with	Replace the pressure sensor (for high pressure).
		simultaneous AL26 generation)	Please contact your nearest agency.
		Refrigerant leakage	Repair or replace the part of the refrigerant circuit where
			leakage is present. Please contact your nearest agency.
		Main board error	Replace the main board.
AL33	Water leakage	[When used with the HRS-WL001 accessory (Sold separately)]	Securely insert the water leakage sensor connector.
		Poor water leakage sensor connection	
		Liquid is adhered to the bottom of the water leakage sensor.	Repair water leakage points.
		Water leakage sensor error	Replace the water leakage sensor.



Phenomenon		Cause	Remedy
Alarm code	Description	Cause	Reffiedy
AL28	Maintenance of pump	Recommended circulating fluid pump replacement period	Replace the circulating fluid pump.
AL29	Maintenance of fan motor	[For air-cooled type] Recommended fan motor replacement period	Replace the fan motor.
AL30	Maintenance of compressor	Recommended compressor replacement period	Replace the compressor.
Note)	[For -T (High pressure pump), HRS050/060] The accumulated operating time (dru.) has reached between 6,000 and 8,000 hours.	Recommended mechanical seal replacement period	Replace the mechanical seal.

Note) Problem with alarm symbol not being displayed

O Sensor disconnection and other part errors

Phenomenon		_	
Alarm code	Description	Cause	Remedy
AL19		Change the value set at the time of shipment from the factory.	Check Chapter 6 Communication alarm function in the operation manual's communication function volume.
	Communication	Main board error	Replace the main board.
	error	Communication board error	Replace the communication board.
AL20	Memory error	Main board error	Replace the main board.
		Other	Please contact an SMC's sales distributor.
AL21	DC line fuse cut	Fuse meltdown due to short-circuit protection function	Replace the fuse.
	Circulating fluid	Poor circulating fluid discharge temp. sensor (P1) connection	Securely insert the main board connector [PT1].
AL22	discharge temp.	Main board error	Replace the main board.
	sensor failure	Temperature sensor (PT1) error	Replace the temperature sensor (PT1).
	Circulating fluid	Poor circulating fluid return temp. sensor (PT2) connection	Securely insert the main board connector [PT2].
AL23	return temp. sensor	Main board error	Replace the main board.
	failure	Temperature sensor (PT2) error	Replace the temperature sensor (PT2).
AL24	Compressor intake temp. sensor failure	Poor compressor intake temp. sensor (T1) connection	Securely insert pins 7 and 19 of the main board connector [CN4].
AL24		Main board error	Replace the main board.
		Thermistor (T1) error	Replace the thermistor (T1).
	Circulating fluid discharge pressure sensor failure	Poor circulating fluid discharge pressure sensor (P1) connection	Securely insert pins 8, 20, and 21 of the main board connector [CN4].
AL25		Power is not being supplied to the pressure sensor (P1).	Replace the main board.
		Main board error	
		Pressure sensor P1 (for circulating fluid) error	Replace the pressure sensor P1 (for circulating fluid).
AL26	Compressor discharge pressure sensor failure	Poor pressure sensor (for high pressure) connection	Securely insert pins 10, 11, and 22 of the main board connector [CN4].
		Power is not being supplied to the pressure sensor (for high pressure).	Replace the main board.
		Main board error	
		Pressure sensor (for high pressure) error	Replace the pressure sensor (for high pressure).
AL27	Compressor intake pressure sensor failure	Poor pressure sensor (for low pressure) connection	Securely insert pins 12, 23, and 24 of the main board connector [CN4].
		Power is not being supplied to the pressure sensor	Replace the main board.
		(for low pressure).	
		Main board error	
		Pressure sensor (for low pressure) error	Replace the pressure sensor (for low pressure).
AL31	Contact input 1 signal detection	Contact input 1 signal was input.	Check the sensor connected to contact input 1 signal.
AL32	Contact input 2 signal detection	Contact input 2 signal was input.	Check the sensor connected to contact input 2 signal.

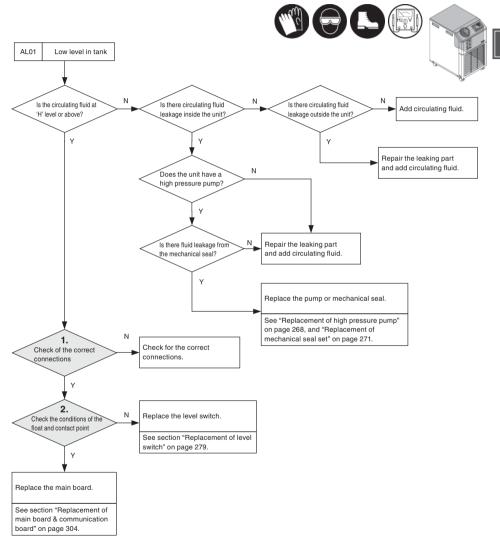
[®]Purity levels when using deionized water as the circulating fluid

Phenomenon		Cause	Remedy
Alarm code	Description	Cause	Remedy
	Electric resistivity/ conductivity rise	[When used with the HRS-DI accessory (Sold separately)] The purity level of the circulating fluid is above the set value.	Replace the DI filter set (HRS-DP).
		Electric resistivity sensor or electric conductivity sensor error	Replace the electric resistivity sensor or electric conductivity sensor
AL35 AL36	Electric resistivity/ conductivity drop	[When used with the HRS-DI accessory (Sold separately)] The purity level of the circulating fluid is below the set value.	Replace the DI filter set (HRS-DP).
		Electric resistivity sensor or electric conductivity sensor error	Replace the electric resistivity sensor or electric conductivity sensor
	Electric resistivity/ conductivity	[When used with the HRS-DI accessory (Sold separately)] The purity level of the circulating fluid is below the set value.	Replace the DI filter set (HRS-DP).
	sensor error	Electric resistivity sensor or electric conductivity sensor error	Replace the electric resistivity sensor or electric conductivity sensor

Troubleshooting of alarms

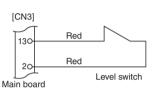
AL01: Low level in tank

<Detection method> The level switch in the tank operates to detect the alarm.



1. Check the connection

Securely connect the connectors to [CN3] of the main board. Pins of [LS1] must be securely inserted to the connectors. There must not be any incorrect insertion of the pins and defective crimping.



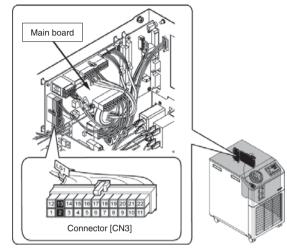


Fig. 4-1 Level switch connection check

2. Check conditions of the float and contact point

Remove the connectors [CN3]. Move the float of the level switch inside the tank.

Check that it is electrically conducted between the pin numbers 2 and 13 in the state shown below:

- \cdot When the float is in the lower position: Not electrically conducted between the contact points 2 and 13.
- \cdot When the float is in the upper position: Electrically conducted between the contact points 2 and 13.

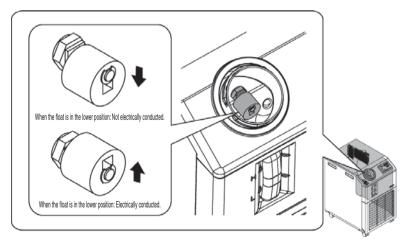
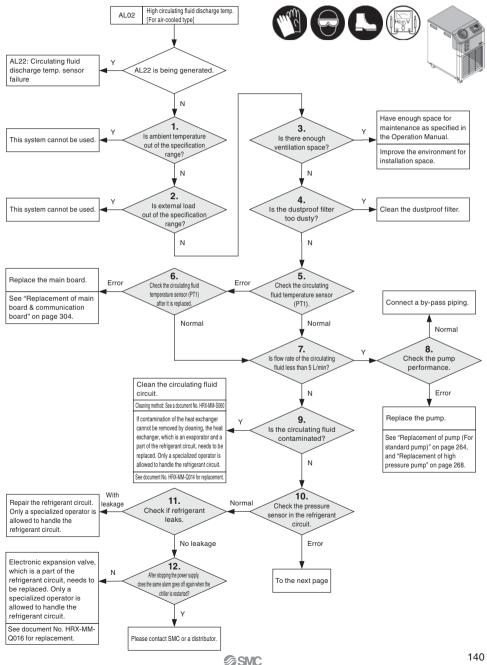
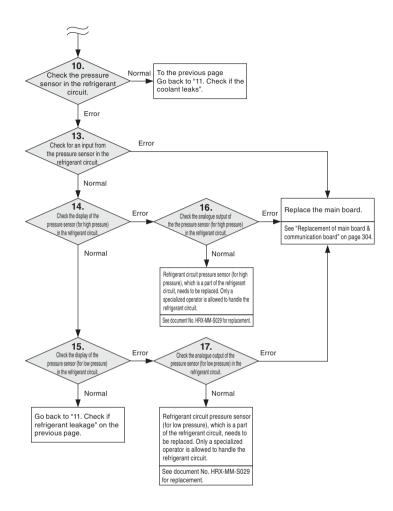


Fig. 4-2 Operation of the level switch

AL02: High circulating fluid discharge temp. [For air-cooled type]

<Detection method> This alarm goes off when the temperature sensor for the circulating fluid (for discharge) detects 60°C or more.





1. Ambient temperature is out of the specification range.

Ambient temperature is higher than 40°C (45°C for Option G "High ambient temperature specification").

2. External load is out of the specification range.

Cooling capacity varies depending on the ambient temperature, set circulating fluid temperature, and power supply frequency. Please refer to the "Cooling capacity" graph shown on pages 19 and 20.

3. Enough ventilation space has not been secured.

- \cdot The Thermo-Chiller is installed too close to a wall.
- \cdot There are other equipment close to the Thermo-Chiller.
- \cdot Hot ventilated air from other equipment enters the Thermo-Chiller.
- \cdot The Thermo-Chiller is operating in an enclosed space.
- (e.g. In a room without ventilation or air conditioner)

4. The dustproof filter is too dusty.

Dustproof filter on the front side of the Thermo-Chiller or the fin of the air-cooled condenser inside is contaminated.

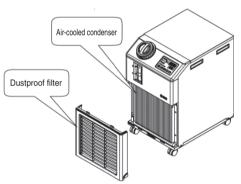


Fig. 4-3 An air-cooled condenser and a dustproof filter

5. Check the circulating fluid temperature sensor (PT1).

Two circulating fluid temperature sensors are used; one is for the outlet port (PT 1) and one for the return port (PT2). Compare the temperatures sensed by the temperature sensors under the conditions shown below to judge if the values provided by the temperature sensors are correct or not:

- (1) Connect a shorter pipe directly from the circulating fluid outlet port to the return port of the Thermo-Chiller with a valve mounted to the outlet port. (Mount a valve to the outlet port to make it possible to adjust the flow rate roughly.)
- (2) Operate the Thermo-Chiller and stabilize the temperature.
- (3) Check the temperature shown for "t 1 : Circulating fluid outlet temperature" and "t 2 : Circulating fluid return temperature" in the "Check Monitor Menu".

If the temperature is within the range of t 1 = t 2 +/- 2 °C, operation of the circulating fluid temperature sensor (PT1) is normal.

6. Check the circulating fluid temperature sensor (PT1) after it is replaced.

Replace the circulating fluid temperature sensor (PT 1). (See "Replacement of temperature sensor (PT 1)" on page 2 6 0.) After replacing, check that all the check items shown in "5. Check the circulating fluid temperature sensor (PT1))" are correctly followed.

7. Flow rate of the circulating fluid is less than 5 L/min.

Install a flow meter, and check the flow rate of the circulating fluid.

8. Install a flow meter, and check the flow rate of the circulating fluid.

Install a flow meter. Refer to the "Pump capacity" graph" on page 2 3 and check that the pump capacity is suitable for the circulating fluid outlet pressure and the circulating fluid flow rate.

9. Circulating fluid is contaminated.

Contamination contained in the circulating fluid adheres to the heat exchanger (evaporator), and it decreases the heat exchanger performance.

Open the cap of the tank, and check visually the contamination (e.g. deformation, foreign matter, abnormal smell) of the circulating fluid inside the tank.

When the visual check finds contamination in the circulating fluid, check the influence of the contamination to the heat exchanger by following the instructions shown below.

(1) Connect the circulating fluid outlet directly to the fluid return port with a valve mounted to the outlet port with a shorter piping to make it possible to operate the system at flow rate of circulating fluid at 7 L/min.

(For Option T, adjust the flow rate so that the circulating fluid discharge pressure will be approximately 0.4 MPa.)

- (2) Set the circulating fluid temperature to 20°C, and operate the Thermo-Chiller.
- (3) Check the temperature shown for "t2: Circulating fluid return temperature" and "t3: Compressor inlet temperature" in the "Check Monitor Menu".
- (4) Displayed temperature will be as shown below in accordance with level of contamination of the heat exchanger.
 - <With no contamination with the heat exchanger>
 - "t3: Suction temperature of the compressor" \geq "t2: Circulating fluid return temperature" -5° C <With contamination with the heat exchanger>

"t3: Suction temperature of the compressor" < "t2: Circulating fluid return temperature" –5°C e.g. (Normal) t2: 21.5, t3: 23.8, (Abnormal) t2: 21.5, t3: 15.5

10. Check the pressure sensor in the refrigerant circuit.

Two pressure sensors, one for high pressure and one for low pressure, are used for the refrigerant circuit. Take the following instructions to check for any abnormality with the pressure sensors:

- (1) Stop the Thermo-Chiller operation.
- (2) Check the temperature shown for "Ph: Refrigerant circuit pressure on the high pressure side" and "PL: Refrigerant circuit pressure on the low pressure side" in the "Check Monitor Menu".
- (3) If the pressure value shown by each sensor is +/- 0.1 MPa (Ph = PL +/- 0.1), it means that the pressure sensors are operating correctly.

11. Check for refrigerant leakage.

Refrigerant leakage reduces the cooling capacity. To check for refrigerant leakage, it is necessary to make the refrigerant circuit temperature same as the ambient temperature. Stop the Thermo-Chiller operation, and leave it not operating for 24 hours.

Take the following instructions to check for refrigerant leakage after leaving not operating.

- (1) Measure the ambient temperature (room temperature).
- (2) Check the pressure shown for "Ph: Refrigerant circuit pressure on the high pressure side" in the "Check Monitor Menu" of the Thermo-Chiller.
- (3) If the measured point is lower than the values shown in the graph in "Fig. 4 4 : Ambient temperature and refrigerant circuit pressure", it means there is refrigerant leakage caused.

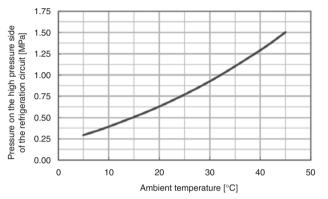


Fig. 4-4 Ambient temperature and refrigerant circuit pressure

12. After stopping power supply, check for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch on the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

13. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor.

Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

<Refrigerant circuit pressure sensor (for high pressure)>

Contact the positive probe to the pin number 22 and contact the negative probe to the pin number 10 of the "CN4" connector.

<Normal> Pin number 22 - Pin number 10: Voltage should be 5 VDC +/- 1 V

<Refrigerant circuit pressure sensor (for low pressure)>

Contact the positive probe to the pin number 24 and contact the negative probe to the pin number 12 of the "CN4" connector.

<Normal> Pin number 24 - Pin number 12: Voltage should be 5 VDC +/- 1 V

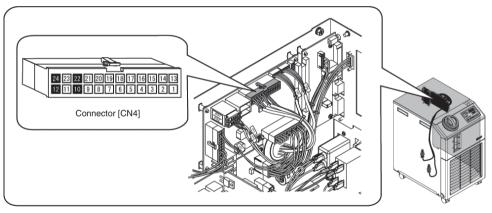


Fig. 4-5 Check of input to the refrigerant circuit pressure sensor

14. Check the display of the refrigerant circuit pressure sensor (for high pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor.

Follow the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 2.4 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "Ph: Refrigerant circuit pressure on the high pressure side" value is within the range (the shaded part) in Fig. 4-6. If the cross point is within the range, it means that the pressure sensor is operating correctly.

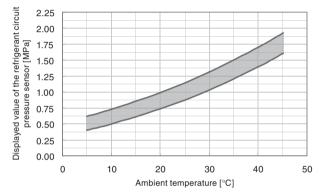


Fig. 4-6 Ambient temperature and refrigerant circuit pressure

15. Check the display of the refrigerant circuit pressure sensor (for low pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor.

Follow the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 2.4 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "PL: Refrigerant circuit pressure on the low pressure side" value is within the range (the shaded part) in Fig. 4-6. If the cross point is within the range, it means that the pressure sensor is operating correctly.

16. Check the analogue output of the refrigerant circuit pressure sensor (for high pressure).

Find out if the main board is operating correctly.

Follow the instructions shown below:

- (1) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 1 1 and contact the negative probe to the pin number 10 of the "CN4" connector.
- (4) Check that the voltage between the pin number 1 1 and the pin number 1 0 is in the same relationship shown in Fig. 4-8. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

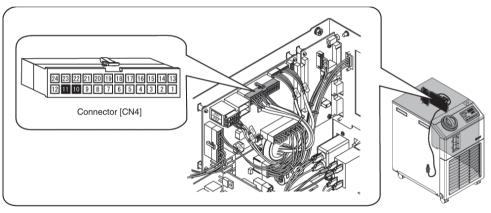


Fig. 4-7 Check of the refrigerant circuit pressure sensor (for high pressure) output

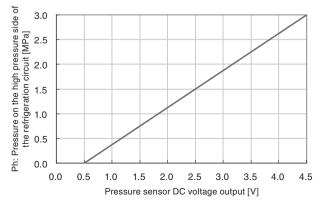


Fig. 4-8 Refrigerant circuit pressure sensor (for high pressure) analogue output SMC

17. Check the analogue output of the refrigerant circuit pressure sensor (for low pressure).

Find out if the main board is operating correctly.

Follow the instructions shown below:

- (1) Check the "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 2 3 and contact the negative probe to the pin number 12 of the "CN4" connector.
- (4) Check that the voltage between the pin number 2 3 and the pin number 1 2 is in the same relationship shown in Fig. 4-10. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

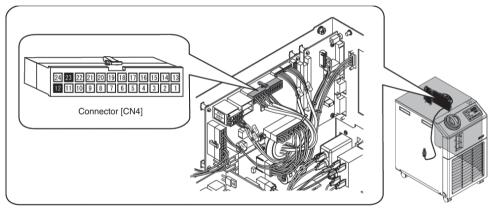


Fig. 4-9 Check of the refrigerant circuit pressure sensor (for low pressure) output

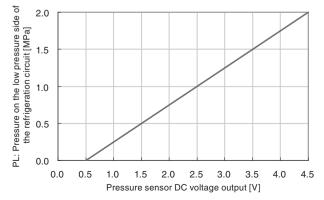
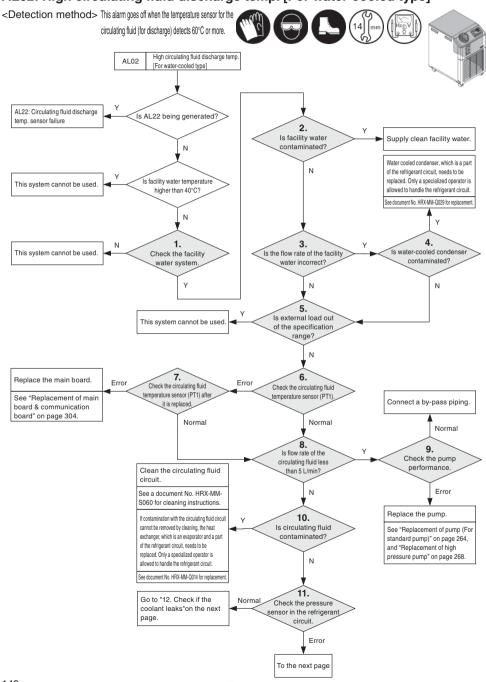


Fig. 4-10 Refrigerant circuit pressure sensor (for low pressure) analogue output

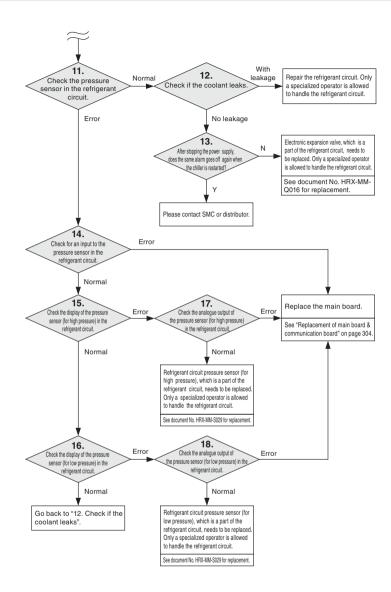
4





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AL02: High circulating fluid discharge temp. [For water-cooled type]



1. Check the facility water system.

Check that the facility water system capability satisfies the required facility water flow rate that is specified on page 23.

2. Facility water is contaminated.

Check that the facility water is clean (without any foreign matter or discolouration).

3. Incorrect flow rate of the facility water.

Install a flow meter and check that the facility water system satisfies the required facility water flow rate that is specified on page 23.

* Facility water does not flow when the Thermo-Chiller is not operating. Check the facility water flow rate while the external load is being applied to the Thermo-Chiller or the circulating fluid temperature is being decreased.

4. Water-cooled condenser is contaminated.

Contamination given to the water-cooled condenser reduces cooling capacity. Check the watercooled condenser for contamination by following the instructions shown below:

- (1) Remove the pipings connected to the inlet and outlet of the facility water.
- (2) Remove the upper panel and the right panel.
- (3) Remove the plug of the water-cooled condenser, and check inside the water-cooled condenser for contamination.

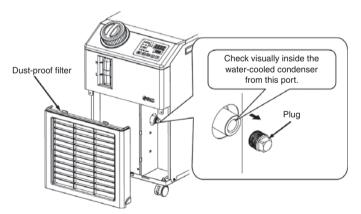


Fig. 4-11 The port for visual check for contamination inside the water-cooled condenser

5. External load is out of the specification range.

Cooling capacity varies depending on the facility water temperature, set circulating fluid temperature, and power supply frequency.

Please refer to the "Cooling capacity" graph on pages 19 and 20.

6. Check the circulating fluid temperature sensor (PT1).

Two circulating fluid temperature sensors are used; one is for the outlet port (PT 1) and one for the return port (PT 2). Compare the temperatures sensed by the temperature sensors under the conditions shown below to judge if the values provided by the temperature sensors are correct or not:

- (1) Connect a shorter pipe directly from the circulating fluid outlet port to the return port of the Thermo-Chiller with a valve mounted to the outlet port. (Mount a valve to the outlet port to make it possible to adjust the flow rate roughly.)
- (2) Operate the Thermo-Chiller and stabilize the temperature.
- (3) Check the temperature shown for "t 1 : Circulating fluid outlet temperature" and "t 2 : Circulating fluid return temperature" in the "Check Monitor Menu".

If the temperature is within the range of t1 = t2 +/- 2°C, operation of the circulating fluid temperature sensor (PT1) is normal.

7. Check the circulating fluid temperature sensor (PT1) after it is replaced.

Replace the circulating fluid temperature sensor (PT 1). (See "Replacement of the temperature sensor (PT1)" on page 260.) After replacing, check that all the check items shown in "6. Check the circulating fluid temperature sensor (PT1)" are correctly followed.

8. Flow rate of the circulating fluid is less than 5 L/min.

Install a flow meter, and check the flow rate of the circulating fluid.

9. Check the pump performance.

Install a flow meter. Refer to the "Pump capacity" graph" on page 2 3 and check that the pump capacity is suitable for the circulating fluid outlet pressure and the circulating fluid flow rate.

10. Circulating fluid is contaminated.

Contamination contained in the circulating fluid adheres to the heat exchanger (evaporator), and it decreases the heat exchanger performance.

Open the cap of the tank, and check visually the contamination (e.g. deformation, foreign matter, abnormal smell) of the circulating fluid inside the tank.

When the visual checks find contamination in the circulating fluid, check the influence of the contamination to the heat exchanger following the instructions shown below.

- (1) Connect the circulating fluid outlet directly to the fluid return port with a valve mounted to the outlet port with a shorter piping to make it possible to operate the system at flow rate of circulating fluid at 7 L/min. (For Option T, adjust the flow rate so that the circulating fluid discharge pressure will be approximately 0.4 MPa.)
- (2) Set the circulating fluid temperature to 20° C, and operate the Thermo-Chiller.
- (3) Check the temperature shown for "t2: Circulating fluid return temperature" and "t3: Compressor inlet temperature" in the "Check Monitor Menu".
- (4) Displayed temperature will be as shown below in accordance with level of contamination of the heat exchanger.
 <With no contamination with the heat exchanger>

"t3: Suction temperature of the compressor" \geq "t2: Circulating fluid return temperature" -5° C <With contamination with the heat exchanger>

"t3: Suction temperature of the compressor" < "t2: Circulating fluid return temperature" –5°C e.g. (Normal) t2: 21.5, t3: 23.8, (Abnormal) t2: 21.5, t3: 15.5

@SMC

11. Check the pressure sensor in the refrigerant circuit.

Two pressure sensors, one for high pressure and the other for low pressure, are used for the refrigerant circuit. Take the following instructions to check for any abnormality with the pressure sensors:

- (1) Stop the Thermo-Chiller operation.
- (2) Check the temperature shown for "Ph: Refrigerant circuit pressure on the high pressure side" and "PL: Refrigerant circuit pressure on the low pressure side" in the "Check Monitor Menu".
- (3) If the pressure value shown by each sensor is +/- 0.1 MPa (Ph = PL +/- 0.1), it means that the pressure sensors are operating correctly.

12. Check for refrigerant leakage.

Refrigerant leakage reduces the cooling capacity. To check for refrigerant leakage, it is necessary to make the refrigerant circuit temperature same as the ambient temperature. Remove the facility water piping, stop the Thermo-Chiller operation, and leave it not operating for 24 hours.

Take the following instructions to check for refrigerant leakage after leaving not operating.

- (1) Measure the ambient temperature (room temperature).
- (2) Check the pressure shown for "Ph: Refrigerant circuit pressure on the high pressure side" in the "Check Monitor Menu" of the Thermo-Chiller.
- (3) If the measured point is lower than the values shown in the graph in "Fig. 4 1 2 : Ambient temperature and refrigerant circuit pressure", it means there is refrigerant leakage caused.

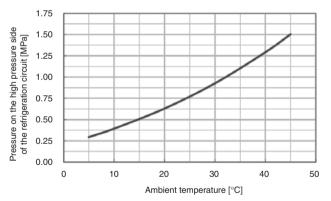


Fig. 4-12 Ambient temperature and refrigerant circuit pressure

13. After stopping power supply, check for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch of the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

14. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor.

Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

<Refrigerant circuit pressure sensor (for high pressure)>

Contact the positive probe to the pin number 22 and contact the negative probe to the pin number 10 of the "CN4" connector.

<Normal> Pin number 22 - Pin number 10: Voltage should be 5 VDC +/- 1 V

<Refrigerant circuit pressure sensor (for low pressure)>

Contact the positive probe to the pin number 24 and contact the negative probe to the pin number 12 of the "CN4" connector.

<Normal> Pin number 24 - Pin number 12: Voltage should be 5 VDC +/- 1 V

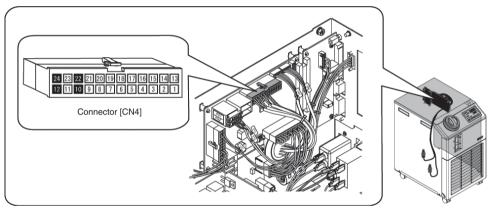


Fig. 4-13 Check of input to the refrigerant circuit pressure sensor

15. Check the display of the refrigerant circuit pressure sensor (for high pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor.

Follow the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 24 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "Ph: Refrigerant circuit pressure on the high pressure side" value is within the range (the shaded part) in Fig. 4-14. If the cross point is within the range, it means that the pressure sensor is operating correctly.

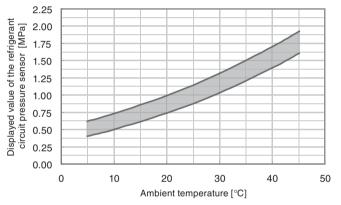


Fig. 4-14 Ambient temperature and refrigerant circuit pressure

16. Check the display of the refrigerant circuit pressure sensor (for low pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor. Follow the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 24 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "PL: Refrigerant circuit pressure on the low pressure side" value is within the range (the shaded part) in Fig. 4-14. If the cross point is within the range, it means that the pressure sensor is operating correctly.

17. Check the analogue output of the refrigerant circuit pressure sensor (for high pressure).

Find out if the main board is operating correctly.

Follow the instructions shown below:

- (1) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 1 1 and contact the negative probe to the pin number 10 of the "CN4" connector.
- (4) Check that the voltage between the pin number 1 1 and the pin number 1 0 is in the same relationship shown in Fig. 4-16. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

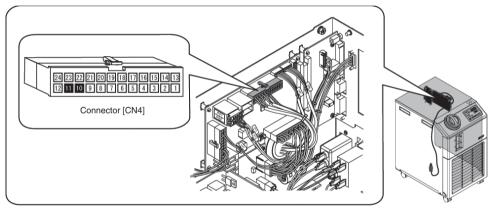


Fig. 4-15 Check of the refrigerant circuit pressure sensor (for high pressure) output

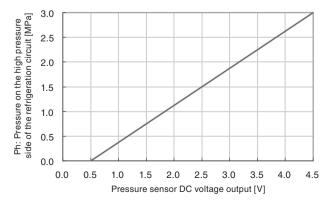


Fig. 4-16 Refrigerant circuit pressure sensor (for high pressure) analogue output

4

18. Check the analogue output of the refrigerant circuit pressure sensor (for low pressure).

Find out if the main board is operating correctly.

Follow the instructions shown below:

- (1) Check the "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 2 3 and contact the negative probe to the pin number 12 of the "CN4" connector.
- (4) Check that the voltage between the pin number 2 3 and the pin number 1 2 is in the same relationship shown in Fig. 4-18. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

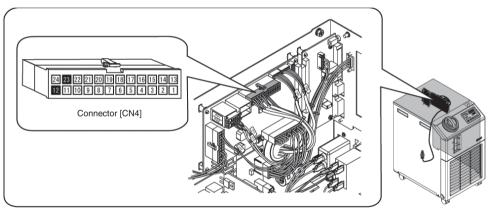


Fig. 4-17 Check of the refrigerant circuit pressure sensor (for low pressure) output

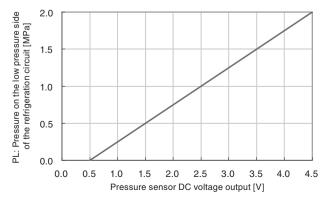
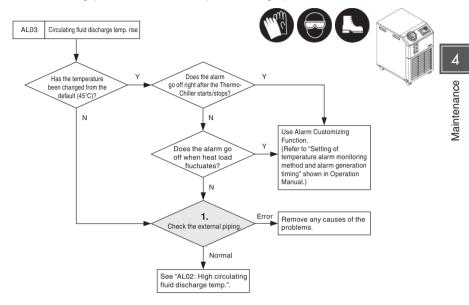


Fig. 4-18: Refrigerant circuit pressure sensor (for low pressure) analogue output

AL03: Circulating fluid discharge temp. rise

<Detection method> This alarm goes off when the temperature sensor for the circulating fluid (for discharge) detects 45°C or more (can be changed).



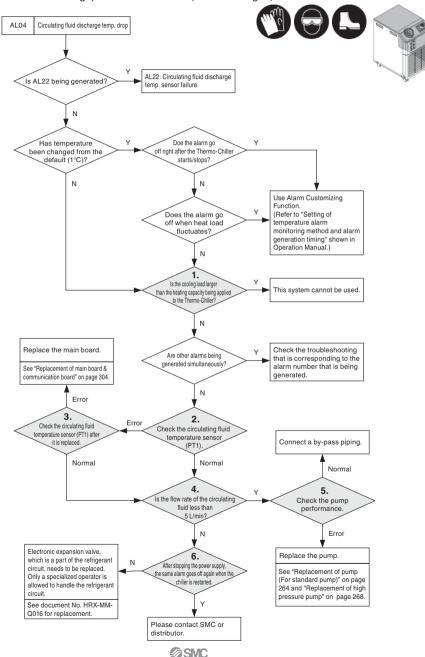
1. Check the external piping.

Check if the external piping is in the conditions shown below:

- (1) The system has a circuit that high temperature circulating fluid returns to the Thermo-Chiller at once due to an operation of the valve or the switching valve in the external piping.
- (2) The system has a circuit that the circulating fluid that has been heated by a waste heat of the workpiece that is cooled returns to the Thermo-Chiller at once when the Thermo-Chiller starts operation.

AL04: Circulating fluid discharge temp. drop

<Detection method> This alarm goes off when the temperature sensor for the circulating fluid (for discharge) detects 1°C or less (can be changed).



1. Cooling load that is larger than the heating capacity is being applied to the Thermo-Chiller.

Please refer to the "Heating capacity" graph on pages 21 and 22.

2. Check the circulating fluid temperature sensor (PT1).

Two circulating fluid temperature sensors are used; one is for the outlet port (PT1) and the other is for the return port (PT2). Compare the temperatures sensed by the temperature sensors under the conditions shown below to judge if the values provided by the temperature sensors are correct or not:

- (1) Connect a shorter pipe directly from the circulating fluid outlet port to the return port of the Thermo-Chiller with a valve mounted to the outlet port. (Mount a valve to the outlet port to make it possible to adjust the flow rate roughly.)
- (2) Operate the Thermo-Chiller and stabilize the temperature.
- (3) Check the temperature shown for "t 1 : Circulating fluid outlet temperature" and "t 2 : Circulating fluid return temperature" in the "Check Monitor Menu".
 If the temperature is within the range of t 1 = t 2 +/- 2 °C, operation of the circulating fluid temperature sensor (PT1) is normal.

3. Check the circulating fluid temperature sensor (PT1) after it is replaced.

Replace the circulating fluid temperature sensor (PT 1). (See "Replacement of the temperature sensor (PT1)" on page 260.) After replacing, check that all the check items shown in "2. Check the circulating fluid temperature sensor (PT1)" are correctly followed.

4. Check flow rate of the circulating fluid is not less than 5 L/min.

Install a flow meter, and check the flow rate of the circulating fluid.

5. Check the pump performance.

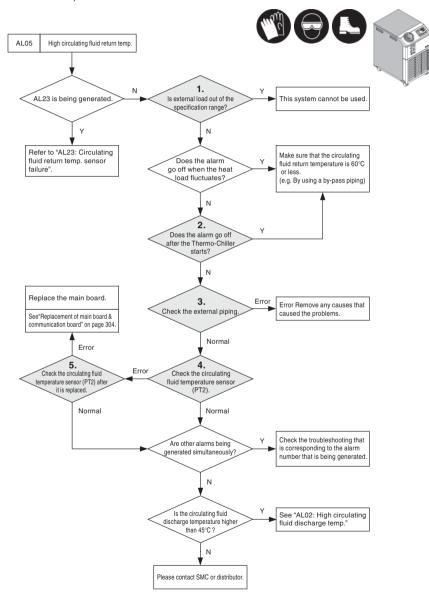
Install a flow meter. Refer to the "Pump capacity" graph" on page 2 3 and check that the pump capacity is suitable for the circulating fluid outlet pressure and the circulating fluid flow rate.

6. Check after stopping power supply for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch on the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

AL05: High circulating fluid return temp.

<Detection method> This alarm goes off when the temperature sensor for the circulating fluid (for fluid return) detects 60°C or more.



1. External load is out of the specification range.

Cooling capacity varies depending on the ambient temperature, facility water temperature, set circulating fluid temperature, and power supply frequency. Please refer to the "Cooling capacity" graph on pages 19 and 20.

2. The alarm goes off right after the Thermo-Chiller starts.

Check if the the Thermo-Chiller has a circuit that the circulating fluid that has been heated to 60°C or more by a waste heat of the workpiece that is cooled returns to the Thermo-Chiller at once when the Thermo-Chiller starts operation.

3. Check the external piping.

Check if the Thermo-Chiller has a circuit that high temperature circulating fluid returns to the Thermo-Chiller at once due to an operation of the valve or the switching valve in the external piping.

4. Check the circulating fluid temperature sensor (PT2).

Two circulating fluid temperature sensors are used; one is for the outlet port (PT1) and the other is for the return port (PT2). Compare the temperatures sensed by the temperature sensors under the conditions shown below to judge if the values provided by the temperature sensors are correct or not:

- (1) Connect a shorter pipe directly from the circulating fluid outlet port to the return port of the Thermo-Chiller with a valve mounted to the outlet port. (Mount a valve to the outlet port to make it possible to adjust the flow rate roughly.)
- (2) Operate the Thermo-Chiller and stabilize the temperature.
- (3) Check the temperature shown for "t 1 : Circulating fluid outlet temperature" and "t 2 : Circulating fluid return temperature" in the "Check Monitor Menu".

If the temperature is within the range of t 2 = t 1 +/- 2 °C, operation of the circulating fluid temperature sensor (PT2) is normal.

5. Check the circulating fluid temperature sensor (PT2) after it is replaced.

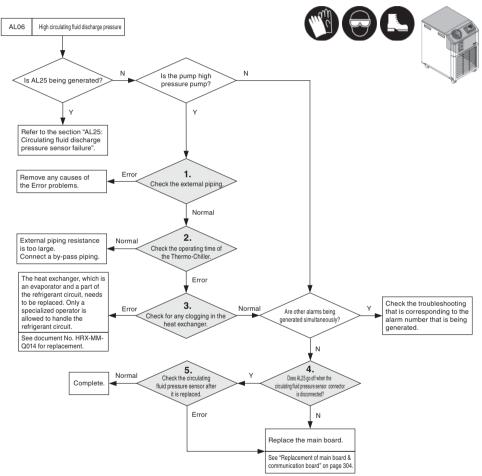
Replace the circulating fluid temperature sensor (PT 2). (See "Replacement of the temperature sensor (PT2)" on page 262 for the replacement procedure.) After replacing, check that all the check items shown in "4. Check the circulating fluid temperature sensor (PT2)" are correctly followed.

AL06: High circulating fluid discharge pressure

<Detection method> This alarm goes off when the pressures detected by the circulating fluid pressure

sensor (for discharge) reach the following values.

- \cdot Standard pump: The alarm will not be generated.
- · Option T (High pressure pump): 0.70 MPa
- · Option MT (High pressure pump for pure water): 0.60 MPa



1. Check the external piping.

Check if the external piping is in the conditions shown below:

- (1) The external piping has close bending, curves at a sharp angle or clogging.
- (2) A valve or a switching valve is mounted in the middle of the external piping, and it closes the piping temporarily.
- (3) A filter (strainer) for circulating fluid is used, and the filter is clogged.

2. Check the operating time of the Thermo-Chiller.

Operate the Thermo-Chiller as a single unit.

Connect an external piping of an I.D. of approximately 15 mm and a length of 2 meters or less) and a valve that is capable of roughly regulating pressure to the Thermo-Chiller.

Start operating the Thermo-Chiller with the valve fully open.

- (1) Check that "AL06: High circulating fluid discharge pressure" will not be generated with the valve fully open.
- (2) Display the circulating fluid discharge pressure "P1" on the operation panel, and gradually close the valve while the Thermo-Chiller is operating.

Check that "AL 0.6: High circulating fluid discharge pressure" is generated when the circulating fluid discharge pressure "P1" reaches the pressures shown below:

- · Option T: 0.7 MPa
- · Option MT: 0.6 MPa

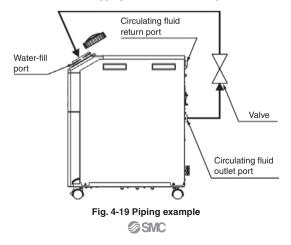
3. Check for any clogging in the heat exchanger.

Check for clogging in the heat exchanger (evaporator) due to contamination contained in the circulating fluid adheres to the heat exchanger.

Operate the Thermo-Chiller as a single unit.

- (1) Connect an external piping of an I.D. of approximately 15 mm and a length of 2 meters or less) and a valve that is capable of roughly regulating pressure to the Thermo-Chiller.
- (2) Do not connect the piping to the circulating fluid return port that is usually connected to it. Open the cap of the water fill port and inset the piping to the water fill port (to stop the circulating fluid entering the heat exchanger).

Operate the Thermo-Chiller to confirm that the "AL 0 6 : High circulating fluid discharge pressure" goes off. If it does not, it will cause clogging in the heat exchanger.



4. AL25 goes off when the circulating fluid pressure sensor connector is disconnected.

Confirm that "AL 2 5 : Circulating fluid discharge pressure sensor failure" goes off when the connector "PS 1 " of the circulating fluid pressure sensor (for discharge) is pulled out.

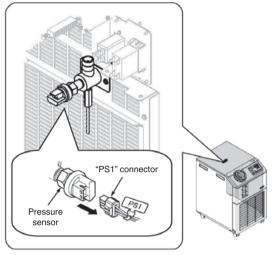


Fig. 4-20 Circulating fluid pressure sensor

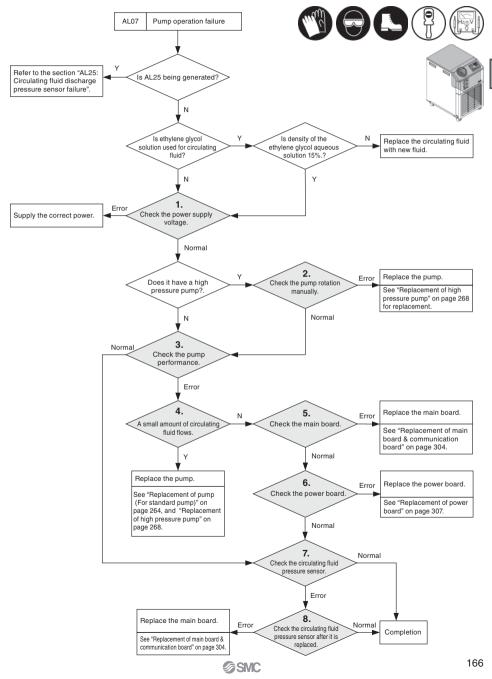
5. Check the circulating fluid pressure sensor after it is replaced.

Replace the circulating fluid pressure sensor (for discharge). (See "Replacement of pressure sensor" on page 282.)

After replacing the sensor, operate the Thermo-Chiller and confirm that the alarm does not go off again.

AL07: Abnormal pump operation

< Detection method> This alarm goes off when the pressures detected by the circulating fluid pressure sensor (for discharge) is 0.05 MPa or less.



4

1. Check the power supply voltage.

Check that the power supply voltage is within the specified range. Check the power supply voltage that is supplied to the connector of the power supply cable to be connected to Thermo-Chiller with a tester.

- Power supply specification

· -10 (100 V spec.): Single phase 100 VAC (50/60 Hz), 115 VAC (60 Hz)

· -20 (200 V spec.): Single phase 200 VAC to 230 VAC (50/60 Hz)

2. Check the pump rotation manually.

Check if the impeller of the high pressure pump has been locked by making a manual rotation. Remove the seal on the back of the motor. Insert a flat blade driver to rotate the motor shaft and check if the impeller rotates smoothly. If it does not rotate smoothly, there are some problems such as lodging of foreign matter at the pump part.

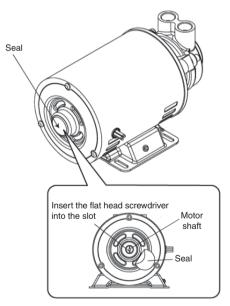


Fig. 4-21 Rotate the pump manually

3. Check the pump performance.

Operate the Thermo-Chiller as a single unit.

Install a pressure gauge (measurable range: approx. 0 to 1 MPa), a valve (with approximate flow adjustability), and a flow meter (measurable range: approx. 0 to 30 L/min) to the Thermo-Chiller. Make an isolated operation of the pump (by pressing the "RUN/STOP" key and "MENU" key simultaneously) to check the pump performance.

Based on the measurement results of the flow meter and the pressure gauge installed, check if the pump performance satisfies the values shown in the "Pump performance" graph on page 23.

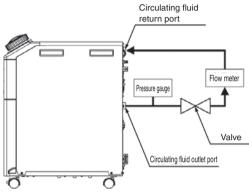


Fig. 4-22 Piping example

4. A small amount of circulating fluid flows.

Check that circulating fluid, even for a small amount, flows through the pump (that the pump can be rotated) when the pump makes an isolated operation (by pressing "RUN/STOP" key and "MENU" key simultaneously) with the piping conditions provided in section "3. Check the pump performance".

5. Check the main board.

Check that the main board outputs signals.

Disconnect the connector "CN1" on the power board.

Perform settings of the tester to make it possible to measure 24 VDC.

Contact the negative side probe to the connector pin number 6 on the cable side of the "CN1" that has been removed, and contact the positive side probe to the pin number 8.

Check the voltage between the cable side connectors number 6 and number 8 while making an isolated operation of the pump (by pressing the "RUN/STOP" key and "MENU" key simultaneously). <Normal> Between pin numbers 6 and 8: 24 VDC

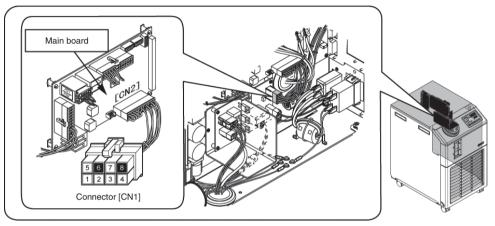


Fig. 4-23 Check the pump signal output

6. Check the power board.

Check that the power is being supplied to the pump.

Disconnect the connector "CN3" of the power board to which the pump cable is connected.

Check if power supply voltage is being supplied to the "CN3" connector (Pin No. 1 and No.2) of the power board with a tester while the pump makes an isolated operation (by pressing "RUN/STOP" key and "MENU" key simultaneously).

[Power supply voltage to be supplied]

- \cdot –10 (100 V spec.): Single phase 100 VAC (50/60 Hz), or 115 VAC (60 Hz)
- · -20 (200 V spec.): Single phase 200 VAC to 230 VAC (50/60 Hz)

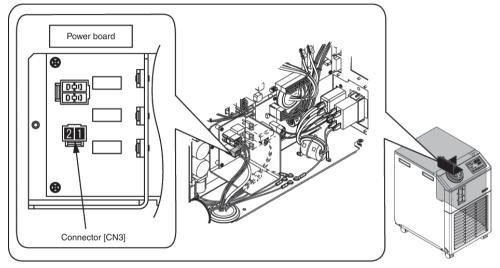


Fig. 4-24 Check the pump input

7. Check the circulating fluid pressure sensor.

Install a pressure gauge, valve, and flow meter to the Thermo-Chiller in the same way as in step "3. Check the pump performance". Compare the circulating fluid discharge pressure of the Thermo-Chiller with the value measured by the pressure gauge in the following procedure.

- (1) Display the circulating fluid discharge pressure "P1" on the Operation Panel of the Thermo-Chiller.
- (2) Perform an isolated operation of the pump (by pressing "RUN/STOP" key and "MENU" key simultaneously) to check if the value measured by the pressure gauge and the value displayed by the Thermo-Chiller are within the range provided below. If they are, the circulating fluid pressure sensor is operating correctly.

Pressure "P1" displayed by the Thermo-Chiller = Pressure measured by the pressure gauge +/- 0.07 MPa

8. Check the circulating fluid pressure sensor after it is replaced.

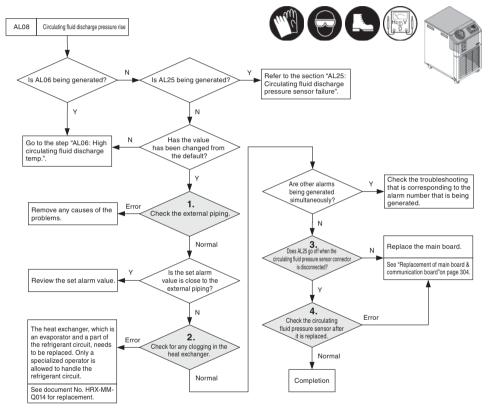
Replace the circulating fluid pressure sensor (for discharge). (See "Replacement of pressure sensor" on page 282.) After replacing the sensor, operate the Thermo-Chiller and confirm that the alarm does not go off again.

AL08: Circulating fluid discharge pressure rise

<Detection method> This alarm goes off when the pressures detected by the circulating fluid pressure

sensor (for discharge) reach the following values (change in the values acceptable).

- · Standard pump: 0.30 MPa
- · Option T (High pressure pump): 0.70 MPa
- · Option MT (High pressure pump for pure water): 0.60 MPa



1. Check the external piping.

Check if the external piping is in the conditions shown below:

- (1) The external piping has close bending, curves at a sharp angle or clogging.
- (2) A valve or a switching valve is mounted in the middle of the external piping, and it closes the piping temporarily.
- (3) A filter (strainer) for circulating fluid is used, and the filter is clogged. Filtration rating has been changed.

2. Check for any clogging in the heat exchanger.

Check for clogging in the heat exchanger (evaporator) due to contamination contained in the circulating fluid adheres to the heat exchanger.

Operate the Thermo-Chiller as a single unit.

Install a pressure gauge (measurable range: approx. 0 to 1 MPa), a valve (with approximate flow adjustability), and a flow meter (measurable range: approx. 0 to 30 L/min) to the Thermo-Chiller. Make an isolated operation of the pump (by pressing the "RUN/STOP" key and "MENU" key simultaneously) to measure the circulating fluid flow rate and the circulating fluid return pressure. From the measurement results, if the circulating fluid return pressure is higher than the pressure at the return port in the "Pump capacity" graph shown in the Operation Manual, it means that there is a clogging i the heat exchanger.

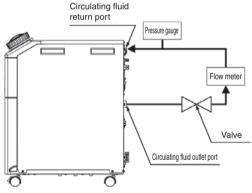


Fig. 4-25 Piping example

3. AL25 goes off when the circulating fluid pressure sensor connector is disconnected.

Confirm that "AL 2 5 : Circulating fluid discharge pressure sensor failure" goes off when the connector "PS 1 " of the circulating fluid pressure sensor (for discharge) is pulled out.

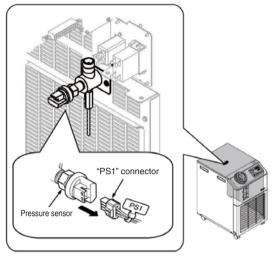


Fig. 4-26 Circulating fluid pressure sensor

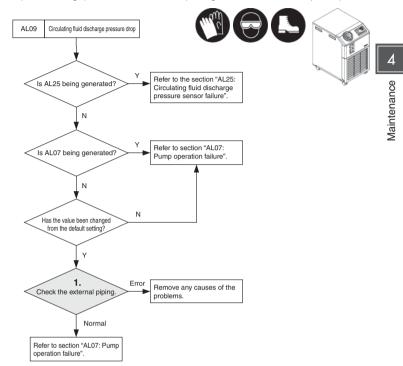
4. Check the circulating fluid pressure sensor after it is replaced.

Replace the circulating fluid pressure sensor (for discharge). (See "Replacement of pressure sensor" on page 282.)

After replacing the sensor, operate the Thermo-Chiller and confirm that the alarm does not go off again.

AL09: Circulating fluid discharge pressure drop

<Detection method> This alarm goes off when the pressures detected by the circulating fluid pressure sensor (for discharge) is 0.05 MPa or less (change in the values acceptable).



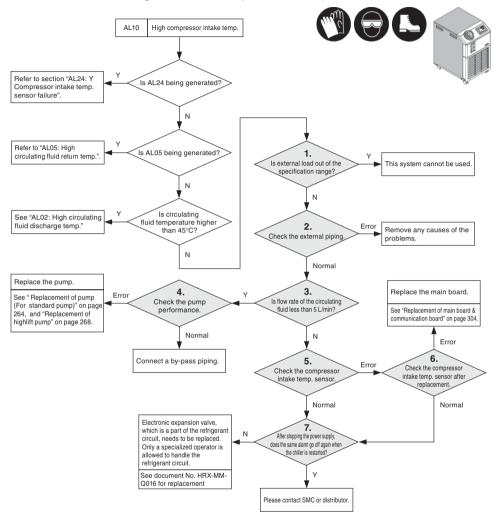
1. Check the external piping.

Check if the external piping is in the conditions shown below:

- (1) Valve opening has been changed.
- (2) A valve or a switching valve is mounted to the external piping, and they reduce the piping resistance temporarily.
- (3) A filter (strainer) for circulating fluid is used, and the filter element has been replaced with new one. A filter element has been forgotten to be mounted. Filtration rating has been changed.

AL10: High compressor intake temp.

<Detection method> This alarm goes off when the compressor intake temperature sensor detects 60°C or more.



1. External load is out of the specification range.

Cooling capacity varies depending on the ambient temperature, facility water temperature, set circulating fluid temperature, and power supply frequency.

Please refer to the "Cooling capacity" graph on pages 19 and 20.

2. Check the external piping.

Check if the external piping is in the conditions shown below:

- (1) The system has a circuit that high temperature circulating fluid returns to the Thermo-Chiller at once due to an operation of the valve or the switching valve in the external piping.
- (2) The system has a circuit that the circulating fluid (6 0 °C or more) that has been heated by a waste heat of the workpiece that is cooled returns to the Thermo-Chiller at once when the Thermo-Chiller starts operation.

3. Flow rate of the circulating fluid is less than 5 L/min.

Install a flow meter, and check the flow rate of the circulating fluid.

4. Check the pump performance.

Install a flow meter. Refer to the "Pump capacity" graph" on page 2 3 and check that the pump capacity is suitable for the circulating fluid outlet pressure and the circulating fluid flow rate.

5. Check the compressor intake temp. sensor.

Check for any difference between the actual compressor intake temperature and the temperature detected by the compressor intake temperature sensor by following the instructions shown below:

- (1) Stop the Thermo-Chiller and leave it not operating for 24 hours to make the temperature of the temperature sensor itself be the same as the ambient temperature.
- (2) Check the temperature shown for "t 1 : Circulating fluid discharge temperature" and "t 3 : Compressor inlet temperature" in the "Check Monitor Menu" of the Thermo-Chiller.
- (3) If t3 = t1 + -3 oC, it means that the compressor intake temperature sensor is operating correctly.

6. Check the compressor intake temp. sensor after replacement.

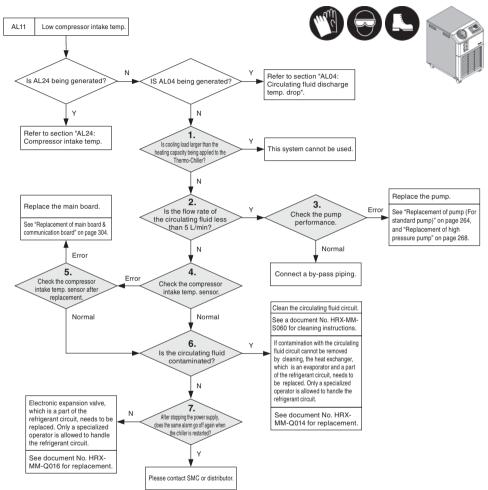
Replace the compressor intake temperature sensor with a new one. (See document No. HRX-MM-Q016 for replacement instructions) After replacing, check that all the check items shown in "5. Check the compressor intake temperature sensor." are correctly followed.

7. After stopping power supply, check for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch of the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

AL11: Low compressor intake temp.

<Detection method> This alarm goes off when the compressor intake temperature sensor detects -15°C or less.



1. Cooling load that is larger than the heating capacity is being applied to the Thermo-Chiller. Please refer to the "Heating capacity" graph on pages 21 and 22.

2. Flow rate of the circulating fluid is less than 5 L/min.

Install a flow meter, and check the flow rate of the circulating fluid.

3. Check the pump performance.

Install a flow meter. Refer to the "Pump capacity" graph" on page 2 3 and check that the pump capacity is suitable for the circulating fluid outlet pressure and the circulating fluid flow rate.

4. Check the compressor intake temp. sensor.

Check for any difference between the actual compressor intake temperature and the temperature detected by the compressor intake temperature sensor by following the instructions shown below:

- (1) Stop the Thermo-Chiller and leave it not operating for 24 hours to make the temperature of the temperature sensor itself be the same as the ambient temperature.
- (2) Check the temperature shown for "t 1 : Circulating fluid discharge temperature" and "t 3 : Compressor inlet temperature" in the "Check Monitor Menu" of the Thermo-Chiller.
- (3) If $t3 = t1 + -3^{\circ}C$, it means that the compressor intake temperature sensor is operating correctly.

5. Check the compressor intake temp. sensor after replacement.

Replace the compressor intake temperature sensor with a new one. (See document No. HRX-MM-Q016 for replacement instructions) After replacing, check that all the check items shown in "4. Check the compressor intake temperature sensor." are correctly followed.

6. Circulating fluid is contaminated.

Contamination contained in the circulating fluid adheres to the heat exchanger (evaporator), and it decreases the heat exchanger performance.

Open the cap of the tank, and check visually the contamination (e.g. deformation, foreign matter, abnormal smell) of the circulating fluid inside the tank.

When the visual check finds contamination in the circulating fluid, check the influence of the contamination to the heat exchanger by following the instructions shown below.

- (1) Connect the circulating fluid outlet directly to the fluid return port with a valve mounted to the outlet port with a shorter piping to make it possible to operate the system at flow rate of circulating fluid at 7 L/min. (For Option T, adjust the flow rate so that the circulating fluid discharge pressure will be approximately 0.4 MPa.)
- (2) Set the circulating fluid temperature to 20°C, and operate the Thermo-Chiller.
- (3) Check the temperature shown for "t2: Circulating fluid return temperature" and "t3: Compressor inlet temperature" in the "Check Monitor Menu".
- (4) Displayed temperature will be as shown below in accordance with level of contamination of the heat exchanger.
 - <With no contamination with the heat exchanger>

"t3: Suction temperature of the compressor" \geq "t2: Circulating fluid return temperature" $-5^\circ C$ <With contamination with the heat exchanger>

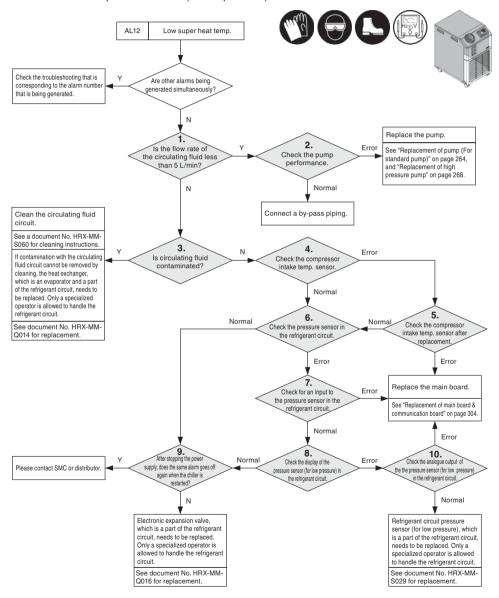
"t3: Suction temperature of the compressor" < "t2: Circulating fluid return temperature" -5° C e.g. (Normal) t2: 21.5, t3: 23.8, (Abnormal) t2: 21.5, t3: 15.5

7. After stopping power supply, check for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch of the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

AL12: Low super heat temperature

<Detection method> This alarm goes off when the compressor intake temperature sensor detects the value that is lower than the converted temperature by the refrigerant circuit pressure sensor (for low pressure).



1. Flow rate of the circulating fluid is less than 5 L/min.

Install a flow meter, and check the flow rate of the circulating fluid.

2. Check the pump performance.

Install a flow meter. Refer to the "Pump capacity" graph" on page 2 3 and check that the pump capacity is suitable for the circulating fluid outlet pressure and the circulating fluid flow rate.

3. Circulating fluid is contaminated.

Contamination contained in the circulating fluid adheres to the heat exchanger (evaporator), and it decreases the heat exchanger performance.

Open the cap of the tank, and check visually the contamination (e.g. deformation, foreign matter, abnormal smell) of the circulating fluid inside the tank.

When the visual check finds contamination in the circulating fluid, check the influence of the contamination to the heat exchanger by following the instructions shown below.

- (1) Connect the circulating fluid outlet directly to the fluid return port with a valve mounted to the outlet port with a shorter piping to make it possible to operate the system at flow rate of circulating fluid at 7 L/min. (For Option T, adjust the flow rate so that the circulating fluid discharge pressure will be approximately 0.4 MPa.)
- (2) Set the circulating fluid temperature to 20°C, and operate the Thermo-Chiller.
- (3) Check the temperature shown for "t2: Circulating fluid return temperature" and "t3: Compressor inlet temperature" in the "Check Monitor Menu".
- (4) Displayed temperature will be as shown below in accordance with level of contamination of the heat exchanger.
 - "t3: Suction temperature of the compressor" \geq "t2: Circulating fluid return temperature" $-5^{\circ}C$ <With contamination with the heat exchanger>
 - "t3: Suction temperature of the compressor" < "t2: Circulating fluid return temperature" –5°C e.g. (Normal) t2: 21.5, t3: 23.8, (Abnormal) t2: 21.5, t3: 15.5

4. Check the compressor intake temp. sensor.

Check for any difference between the actual compressor intake temperature and the temperature detected by the compressor intake temperature sensor by following the instructions shown below:

- (1) Stop the Thermo-Chiller and leave it not operating for 24 hours to make the temperature of the temperature sensor itself be the same as the ambient temperature.
- (2) Check the temperature shown for "t 1 : Circulating fluid discharge temperature" and "t 3 : Compressor inlet temperature" in the "Check Monitor Menu" of the Thermo-Chiller.
- (3) If $t3 = t1 + -3^{\circ}C$, it means that the compressor intake temperature sensor is operating correctly.

5. Check the compressor intake temp. sensor after replacement.

Replace the compressor intake temperature sensor with a new one. (See document No. HRX-MM-Q016 for replacement instructions) After replacing, check that all the check items shown in "4. Check the compressor intake temperature sensor." are correctly followed.

6. Check the pressure sensor in the refrigerant circuit.

Two pressure sensors, one for high pressure and the other for low pressure, are used for the refrigerant circuit. Take the following instructions to check for any abnormality with the pressure sensors:

- (1) Stop the Thermo-Chiller operation.
- (2) Check the temperature shown for "Ph: Refrigerant circuit pressure on the high pressure side" and "PL: Refrigerant circuit pressure on the low pressure side" in the "Check Monitor Menu".
- (3) If the pressure value shown by each sensor is +/- 0.1 MPa (Ph = PL +/- 0.1), it means that the pressure sensors are operating correctly.

7. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor.

Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

<Refrigerant circuit pressure sensor (for low pressure)>

Contact the positive probe to the pin number 24 and contact the negative probe to the pin number 12 of the "CN4" connector.

<Normal> Pin number 24 - Pin number 12: Voltage should be 5 VDC +/- 1 V

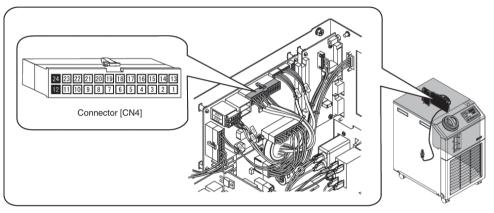


Fig. 4-27 Check of the refrigerant circuit pressure sensor (for low pressure) input

8. Check the display of the refrigerant circuit pressure sensor (for low pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor.

Follow the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 2.4 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "PL: Refrigerant circuit pressure on the low pressure side" value is within the range (the shaded part) in Fig. 4-28. If the cross point is within the range, it means that the pressure sensor is operating correctly.

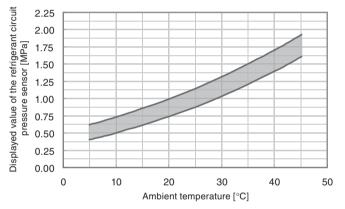


Fig. 4-28 Ambient temperature and refrigerant circuit pressure

9. After stopping power supply, check for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch on the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

10. Check the analogue output of the refrigerant circuit pressure sensor (for low pressure).

Find out if the main board is operating correctly.

- (1) Check the "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 2 3 and contact the negative probe to the pin number 12 of the "CN4" connector.
- (4) Check that the voltage between the pin number 2 3 and the pin number 1 2 is in the same relationship shown in Fig. 4-30. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

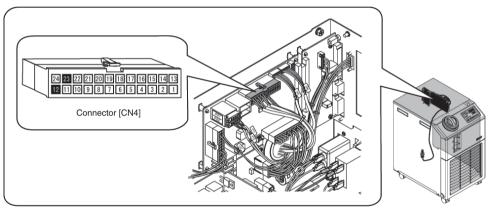


Fig. 4-29 Check of the refrigerant circuit pressure sensor (for low pressure) output

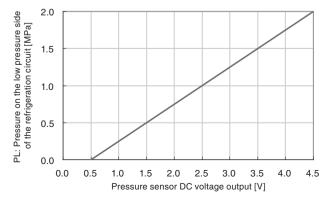
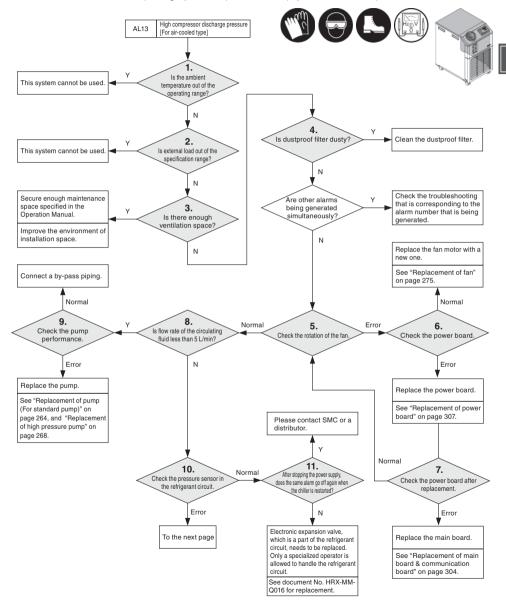


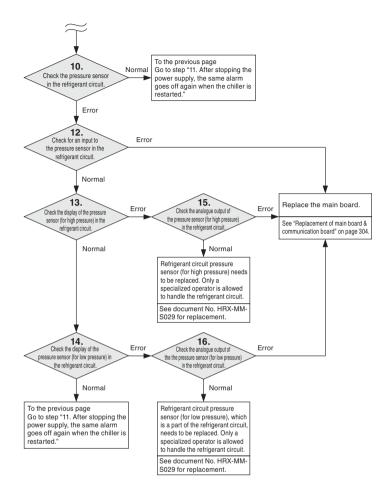
Fig. 4-30 Refrigerant circuit pressure sensor (for low pressure) analogue output



AL13: High compressor discharge pressure [For air-cooled type]

<Detection method> This alarm goes off when the pressure detected by the refrigerant circuit pressure sensor (for high pressure) is 2.6 MPa (Option G: 2.8 MPa) or more.





1. Ambient temperature is out of the specification range.

Ambient temperature is higher than 40°C (45°C for Option G "High ambient temperature specification").

2. External load is out of the specification range.

Cooling capacity varies depending on the ambient temperature, set circulating fluid temperature, and power supply frequency.

Please refer to the "Cooling capacity" graph on pages 19 and 20.

3. Enough ventilation space has not been secured.

- \cdot The Thermo-Chiller is installed too close to a wall.
- \cdot There is other equipment close to the Thermo-Chiller.
- \cdot Hot ventilated air from other equipment enters the Thermo-Chiller.
- The Thermo-Chiller is operating in an enclosed space. (e.g. In a room without ventilation or air conditioner)

4. The dustproof filter is too dusty.

Dustproof filter on the front side of the Thermo-Chiller or the fin of the air-cooled condenser inside is contaminated.

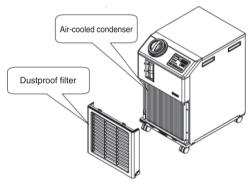


Fig. 4-31 An air-cooled condenser and a dustproof filter

5. Check the rotation of the fan.

Check visually that the fan rotates right after starting the Thermo-Chiller operation from the stopped state.

(Depending on the installation environment, the fan may stop rotating for few seconds after starting the product operation, which is normal. If the fan does not rotate after starting the operation, this is not normal.)

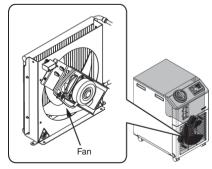


Fig. 4-32 Fan position

6. Check the power board.

Check that the power is being supplied to the fan motor.

Disconnect the connector "CN 4 " of the power board to which the fan/compressor cable is connected.

Operate the Thermo-Chiller (by pressing "RUN/STOP" key), and check if power supply voltage is supplied to the pins number 1 to number 3 of the "CN4" connector on the power board with a tester. In this test, if voltage supply is confirmed only for a couple of seconds after the Thermo-Chiller is started, it is normal.

Depending on the installation environment, power supply voltage may stop (or the voltage may drop to approximately 1 0 VAC) in some seconds after starting the product operation, which is normal. If the power supply voltage is not confirmed at the start operation, it is judged not to be normal.

[Power supply voltage to be supplied]

- · -10 (100 V spec.): Single phase 100 VAC (50/60 Hz), or 115 VAC (60 Hz)
- \cdot –20 (200 V spec.): Single phase 200 VAC to 230 VAC (50/60 Hz)

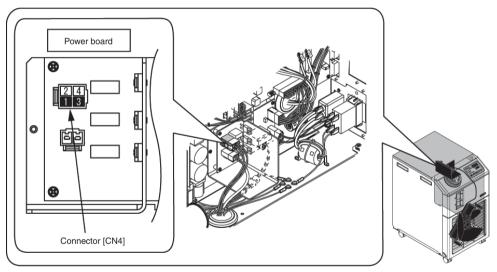


Fig. 4-33 Confirm the fan input

7. Check the power board after replacement.

Replace the power board. (See "Replacement of power board" on page 307.) After replacing the power board, confirm that all the items specified in step 6 have been checked.

8. Flow rate of the circulating fluid is less than 5 L/min.

Install a flow meter, and check the flow rate of the circulating fluid.

9. Check the pump performance.

Install a flow meter. Refer to the "Pump capacity" graph" on page 2 3 and check that the pump capacity is suitable for the circulating fluid outlet pressure and the circulating fluid flow rate.

10. Check the pressure sensor in the refrigerant circuit.

Two pressure sensors, one for the high pressure and one for the low pressure, are used for the refrigerant circuit.

The following instructions are to check for any abnormality with the pressure sensors:

- (1) Stop the Thermo-Chiller operation.
- (2) Check the temperature shown for "Ph: Refrigerant circuit pressure on the high pressure side" and "PL: Refrigerant circuit pressure on the low pressure side" in the "Check Monitor Menu".
- (3) If the pressure value shown by each sensor is +/- 0.1 MPa (Ph = PL +/- 0.1), it means that the pressure sensors are operating correctly.

11. After stopping power supply, check for the same alarm goes off when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch on the Thermo-Chiller), check if the same alarm goes off when the Thermo-Chiller is restarted.

12. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor.

Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

<Refrigerant circuit pressure sensor (for high pressure)>

Contact the positive probe to the pin number 22 and contact the negative probe to the pin number 10 of the "CN4" connector.

<Normal> Pin number 22 - Pin number 10: Voltage should be 5 VDC +/- 1 V

<Refrigerant circuit pressure sensor (for low pressure)>

Contact the positive probe to the pin number 24 and contact the negative probe to the pin number 12 of the "CN4" connector.

<Normal> Pin number 24 - Pin number 12: Voltage should be 5 VDC +/- 1 V

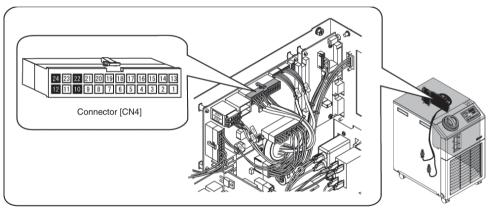


Fig. 4-34 Check of the refrigerant circuit pressure sensor input

13. Check the display of the refrigerant circuit pressure sensor (for high pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor.

Follow the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 2.4 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "Ph: Refrigerant circuit pressure on the high pressure side" value is within the range (the shaded part) in Fig. 4-35. If the cross point is within the range, it means that the pressure sensor is operating correctly.

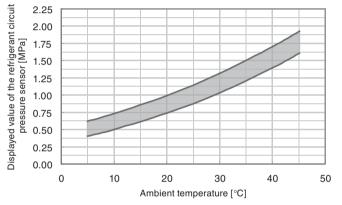


Fig. 4-35 Ambient temperature and refrigerant circuit pressure

14. Check the display of the refrigerant circuit pressure sensor (for low pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor. Follow the instructions shown below:

- Leave the Thermo-Chiller not operating for 24 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "PL: Refrigerant circuit pressure on the low pressure side" value is within the range (the shaded part) in Fig. 4-35 If the cross point is within the range, it means that the pressure sensor is operating correctly.

15. Check the analogue output of the refrigerant circuit pressure sensor (for high pressure).

Find out if the main board is operating correctly.

- (1) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 1 1 and contact the negative probe to the pin number 10 of the "CN4" connector.
- (4) Check that the voltage between the pin number 1 1 and the pin number 1 0 is in the same relationship shown in Fig. 4-37. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

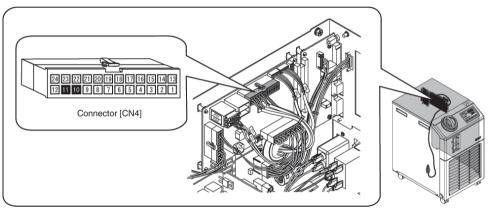


Fig. 4-36 Check of the refrigerant circuit pressure sensor (for high pressure) output

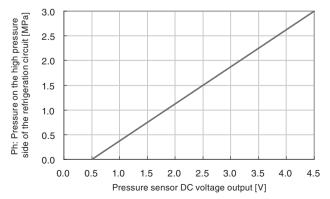


Fig. 4-37 Refrigerant circuit pressure sensor (for high pressure) analogue output

16. Check the analogue output of the refrigerant circuit pressure sensor (for low pressure).

Find out if the main board is operating correctly.

Follow the instructions shown below:

- (1) Check the "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 2 3 and contact the negative probe to the pin number 12 of the "CN4" connector.
- (4) Check that the voltage between the pin number 2 3 and the pin number 1 2 is in the same relationship shown in Fig. 4-39. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

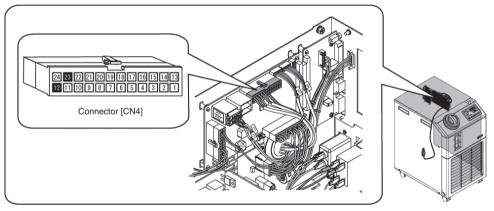


Fig. 4-38 Check of the refrigerant circuit pressure sensor (for low pressure) output

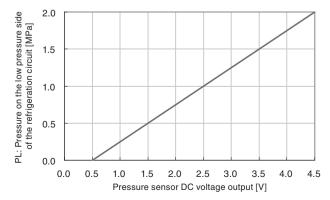
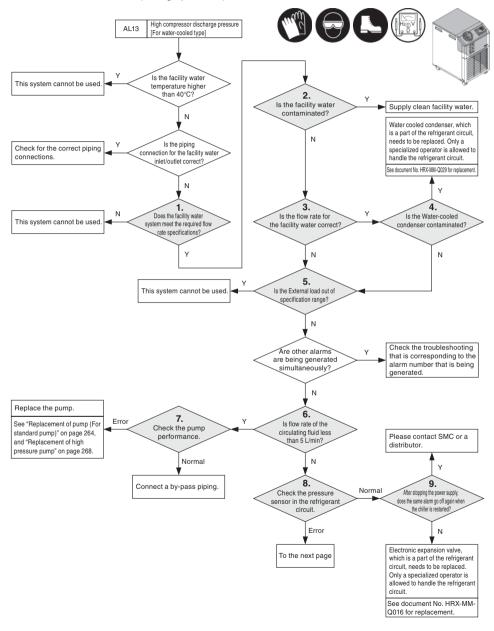


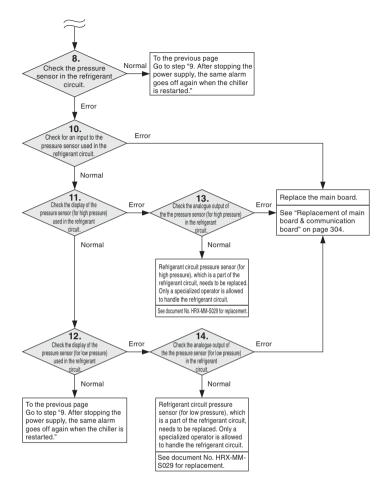
Fig. 4-39 Refrigerant circuit pressure sensor (for low pressure) analogue output

4

AL13: High compressor discharge pressure [For water-cooled type]

<Detection method> This alarm goes off when the pressure detected by the refrigerant circuit pressure sensor (for high pressure) is 2.6 MPa or more.





Maintenance

1. Check the facility water system.

Check that the facility water system satisfies the required facility water flow rate that is specified on page 23.

2. Facility water is contaminated.

Check that the facility water is clean (without any foreign matter or discolouration).

3. Incorrect flow rate of the facility water.

Install a flow meter and check that the facility water system satisfies the required facility water flow rate that is specified on page 23.

* Facility water does not flow when the Thermo-Chiller is not operating. Check the facility water flow rate while the external load is being applied to the Thermo-Chiller or the circulating fluid temperature is being decreased.

4. Water-cooled condenser is contaminated.

Contamination given to the water-cooled condenser reduces cooling capacity. Check the watercooled condenser for contamination by following the instructions shown below:

- (1) Remove the pipings connected to the inlet and outlet of the facility water.
- (2) Remove the upper panel and the right panel.
- (3) Remove the plug of the water-cooled condenser, and check inside the water-cooled condenser for contamination.

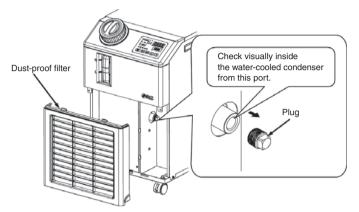


Fig. 4-40 The port for visual check for contamination inside the water-cooled condenser

5. External load is out of the specification range.

Cooling capacity varies depending on the facility water temperature, set circulating fluid temperature, and power supply frequency.

Please refer to the "Cooling capacity" graph on pages 19 and 20.

6. Flow rate of the circulating fluid is less than 5 L/min.

Install a flow meter, and check the flow rate of the circulating fluid.

7. Check the pump performance.

Install a flow meter. Refer to the "Pump capacity" graph" on page 2 3 and check that the pump capacity is suitable for the circulating fluid outlet pressure and the circulating fluid flow rate.

8. Check the pressure sensor in the refrigerant circuit.

Two pressure sensors, one for high pressure and the other for low pressure, are used for the refrigerant circuit. Take the following instructions to check for any abnormality with the pressure sensors:

- (1) Stop the Thermo-Chiller operation.
- (2) Check the temperature shown for "Ph: Refrigerant circuit pressure on the high pressure side" and "PL: Refrigerant circuit pressure on the low pressure side" in the "Check Monitor Menu".
- (3) If the pressure value shown by each sensor is +/- 0.1 MPa (Ph = PL +/- 0.1), it means that the pressure sensors are operating correctly.

9. After stopping power supply, check for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch on the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

10. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor.

Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

<Refrigerant circuit pressure sensor (for high pressure)>

Contact the positive probe to the pin number 22 and contact the negative probe to the pin number 10 of the "CN4" connector.

<Normal> Pin number 22 - Pin number 10: Voltage should be 5 VDC +/- 1 V

<Refrigerant circuit pressure sensor (for low pressure)>

Contact the positive probe to the pin number 24 and contact the negative probe to the pin number 12 of the "CN4" connector.

<Normal> Pin number 24 - Pin number 12: Voltage should be 5 VDC +/- 1 V

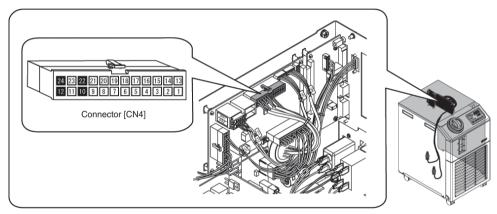


Fig. 4-41 Check of the refrigerant circuit pressure sensor input

11. Check the display of the refrigerant circuit pressure sensor (for high pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor.

Follow the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 2.4 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "Ph: Refrigerant circuit pressure on the high pressure side" value is within the range (the shaded part) in Fig. 4-42. If the cross point is within the range, it means that the pressure sensor is operating correctly.

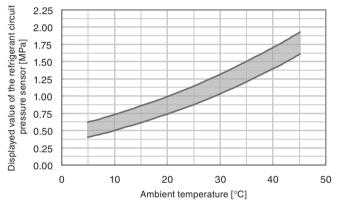


Fig. 4-42 Ambient temperature and refrigerant circuit pressure

12. Check the display of the refrigerant circuit pressure sensor (for low pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor. Follow the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 24 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "PL: Refrigerant circuit pressure on the low pressure side" value is within the range (the shaded part) in Fig. 4-42. If the cross point is within the range, it means that the pressure sensor is operating correctly.

13. Check the analogue output of the refrigerant circuit pressure sensor (for high pressure).

Find out if the main board is operating correctly.

Follow the instructions shown below:

- (1) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 1 1 and contact the negative probe to the pin number 10 of the "CN4" connector.
- (4) Check that the voltage between the pin number 1 1 and the pin number 1 0 is in the same relationship shown in Fig. 4-44. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

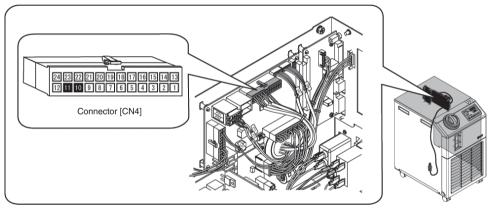


Fig. 4-43 Check of the refrigerant circuit pressure sensor (for high pressure) output

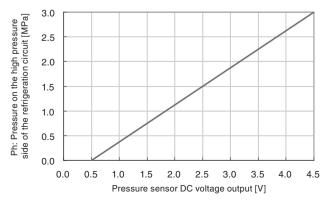


Fig. 4-44 Refrigerant circuit pressure sensor (for high pressure) analogue output

4

14. Check the analogue output of the refrigerant circuit pressure sensor (for low pressure).

Find out if the main board is operating correctly.

- (1) Check the "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 2 3 and contact the negative probe to the pin number 12 of the "CN4" connector.
- (4) Check that the voltage between the pin number 2 3 and the pin number 1 2 is in the same relationship shown in Fig. 4-46. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

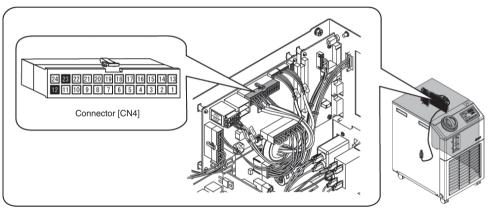


Fig. 4-45 Check of the refrigerant circuit pressure sensor (for low pressure) output

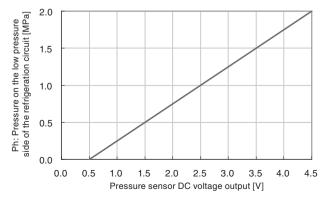
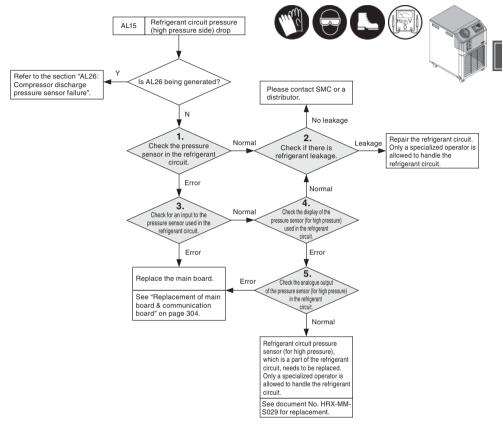


Fig. 4-46 Refrigerant circuit pressure sensor (for low pressure) analogue output

AL15: Refrigerant circuit pressure (high pressure side) drop

<Detection method> This alarm goes off when the pressure detected by the refrigerant circuit pressure sensor (for high pressure) is 0.1 MPa or less.



1. Check the pressure sensor in the refrigerant circuit.

Two pressure sensors, one for high pressure and the other for low pressure, are used for the refrigerant circuit. Take the following instructions to check for any abnormality with the pressure sensors:

- (1) Stop the Thermo-Chiller operation.
- (2) Check the temperature shown for "Ph: Refrigerant circuit pressure on the high pressure side" and "PL: Refrigerant circuit pressure on the low pressure side" in the "Check Monitor Menu".
- (3) If the pressure value shown by each sensor is +/- 0.1 MPa (Ph = PL +/- 0.1), it means that the pressure sensors are operating correctly.

2. Check for refrigerant leakage.

Refrigerant leakage reduces the cooling capacity. To check for refrigerant leakage, it is necessary to make the refrigerant circuit temperature same as the ambient temperature. Stop the Thermo-Chiller operation, and leave it not operating for 24 hours.

Take the following instructions to check for refrigerant leakage after leaving not operating.

- (1) Measure the ambient temperature (room temperature).
- (2) Check the pressure shown for "Ph: Refrigerant circuit pressure on the high pressure side" in the "Check Monitor Menu" of the Thermo-Chiller.
- (3) If the measured point is lower than the values shown in the graph in "Fig. 4 4 7 : Ambient temperature and refrigerant circuit pressure", it means there is refrigerant leakage caused.

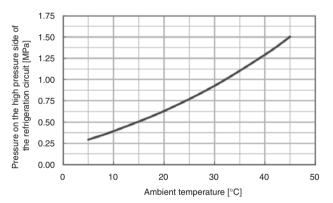


Fig. 4-47 Ambient temperature and refrigerant circuit pressure

3. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor.

Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

<Refrigerant circuit pressure sensor (for high pressure)>

Contact the positive probe to the pin number 22 and contact the negative probe to the pin number 10 of the "CN4" connector.

<Normal> Pin number 22 - Pin number 10: Voltage should be 5 VDC +/- 1 V

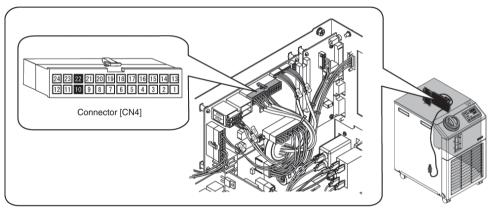


Fig. 4-48 Check of the refrigerant circuit pressure sensor (for high pressure) input

4. Check the display of the refrigerant circuit pressure sensor (for high pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor.

- (1) Leave the Thermo-Chiller not operating for 2.4 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "Ph: Refrigerant circuit pressure on the high pressure side" value is within the range (the shaded part) in Fig. 4-49. If the cross point is within the range, it means that the pressure sensor is operating correctly.

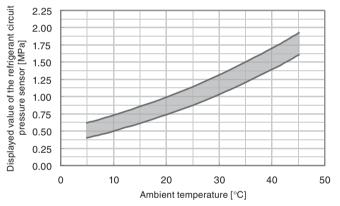


Fig. 4-49 Ambient temperature and refrigerant circuit pressure

5. Check the analogue output of the refrigerant circuit pressure sensor (for high pressure).

Find out if the main board is operating correctly.

Follow the instructions shown below:

- (1) Check the "Ph: Refrigerant circuit pressure on the high pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 1 1 and contact the negative probe to the pin number 10 of the "CN4" connector.
- (4) Check that the voltage between the pin number 1 1 and the pin number 1 0 is in the same relationship shown in Fig. 4-51. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

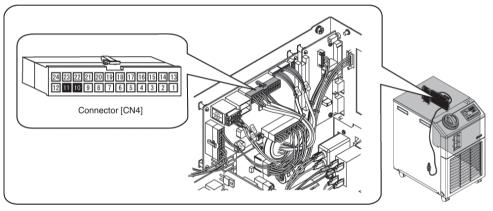


Fig. 4-50 Check of the refrigerant circuit pressure sensor (for high pressure) output

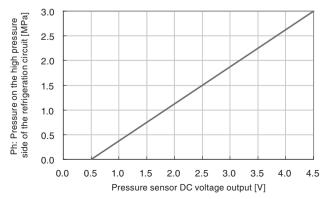


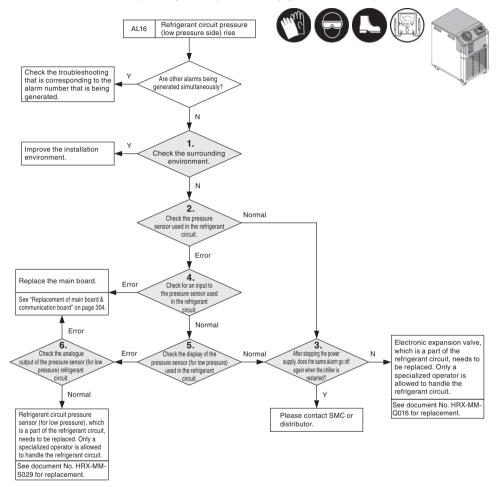
Fig. 4-51 Refrigerant circuit pressure sensor (for high pressure) analogue output

SMC

4

AL16: Refrigerant circuit pressure (low pressure side) rise

<Detection method> This alarm goes off when the pressure detected by the refrigerant circuit pressure sensor (for low pressure) is 0.8 MPa (Option G: 0.85 MPa) or more.



1. Check the surrounding environment.

- Check if the surrounding environment is in the conditions shown below:
- (1) Flow rate fluctuates due to a valve and a switching valve in the external piping. (Heat load is fluctuating.)
- (2) Heat that is larger than the cooling capacity is transiently being applied to the Thermo-Chiller.

2. Check the pressure sensor in the refrigerant circuit.

Two pressure sensors, one for high pressure and the other for low pressure, are used for the refrigerant circuit. Take the following instructions to check for any abnormality with the pressure sensors:

- (1) Stop the Thermo-Chiller operation.
- (2) Check the temperature shown for "Ph: Refrigerant circuit pressure on the high pressure side" and "PL: Refrigerant circuit pressure on the low pressure side" in the "Check Monitor Menu".
- (3) If the pressure value shown by each sensor is +/- 0.1 MPa (Ph = PL +/- 0.1), it means that the pressure sensors are operating correctly.

3. After stopping power supply, check for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch on the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

4. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor. Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

<Refrigerant circuit pressure sensor (for low pressure)>

Contact the positive probe to the pin number 24 and contact the negative probe to the pin number 12 of the "CN4" connector. <Normal> Pin number 24 - Pin number 12: Voltage should be 5 VDC +/- 1 V

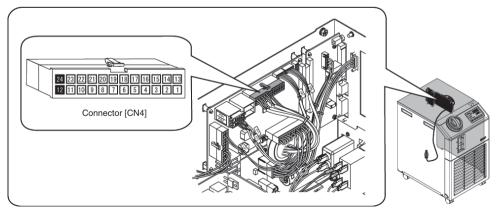


Fig. 4-52 Check of the refrigerant circuit pressure sensor (for low pressure) input

4

5. Check the display of the refrigerant circuit pressure sensor (for low pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor.

- (1) Leave the Thermo-Chiller not operating for 2.4 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "PL: Refrigerant circuit pressure on the low pressure side" value is within the range (the shaded part) in Fig. 4-53. If the cross point is within the range, it means that the pressure sensor is operating correctly.

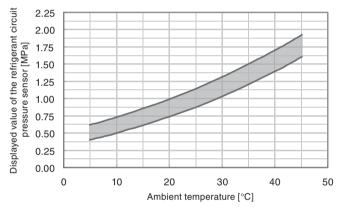


Fig. 4-53 Ambient temperature and refrigerant circuit pressure

6. Check the analogue output of the refrigerant circuit pressure sensor (for low pressure).

Find out if the main board is operating correctly.

Follow the instructions shown below:

- (1) Check the "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 2 3 and contact the negative probe to the pin number 12 of the "CN4" connector.
- (4) Check that the voltage between the pin number 2 3 and the pin number 1 2 is in the same relationship shown in Fig. 4-55. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

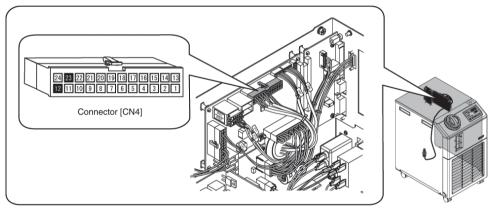


Fig. 4-54 Check of the refrigerant circuit pressure sensor (for low pressure) output

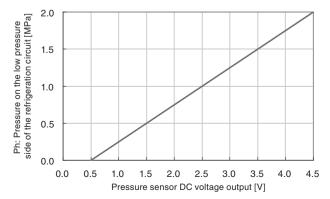


Fig. 4-55 Refrigerant circuit pressure sensor (for low pressure) analogue output

4

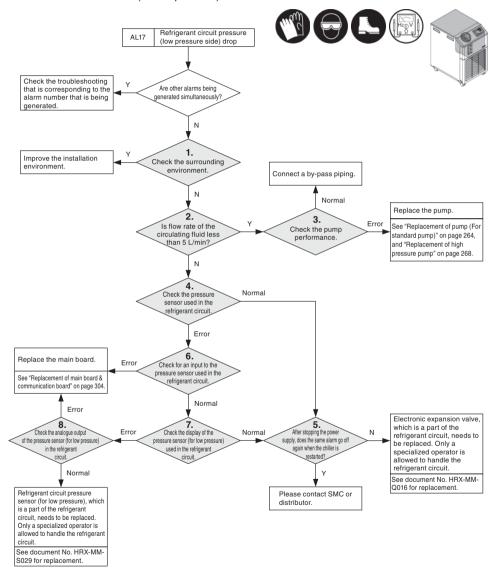
208



AL17: Refrigerant circuit pressure (low pressure side) drop

<Detection method> This alarm goes off when the pressure detected by the refrigerant circuit pressure

sensor (for low pressure) is 0.2 MPa or less.



1. Check the surrounding environment.

Check if the surrounding environment is in the conditions shown below:

- (1) Flow rate fluctuates due to a valve and a switching valve in the external piping. (Heat load is fluctuating.)
- (2) The system has a circuit that low temperature circulating fluid returns to the Thermo-Chiller at once.

2. Flow rate of the circulating fluid is less than 5 L/min.

Install a flow meter, and check the flow rate of the circulating fluid.

3. Check the pump performance.

Install a flow meter. Refer to the "Pump capacity" graph" on page 2 3 and check that the pump capacity is suitable for the circulating fluid outlet pressure and the circulating fluid flow rate.

4. Check the pressure sensor in the refrigerant circuit.

Two pressure sensors, one for high pressure and the other for low pressure, are used for the refrigerant circuit. Take the following instructions to check for any abnormality with the pressure sensors:

(1) Stop the Thermo-Chiller operation.

- (2) Check the temperature shown for "Ph: Refrigerant circuit pressure on the high pressure side" and "PL: Refrigerant circuit pressure on the low pressure side" in the "Check Monitor Menu".
- (3) If the pressure value shown by each sensor is +/- 0.1 MPa (Ph = PL +/- 0.1), it means that the pressure sensors are operating correctly.

5. After stopping power supply, check for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch on the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

6. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor.

Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

<Refrigerant circuit pressure sensor (for low pressure)>

Contact the positive probe to the pin number 24 and contact the negative probe to the pin number 12 of the "CN4" connector.

<Normal> Pin number 24 - Pin number 12: Voltage should be 5 VDC +/- 1 V

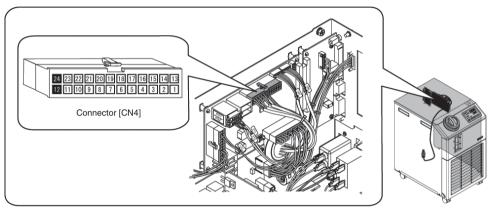


Fig. 4-56 Check of the refrigerant circuit pressure sensor (for low pressure) input

7. Check the display of the refrigerant circuit pressure sensor (for low pressure).

Compare the refrigerant circuit pressure and the ambient temperature with those shown in the graph to check the displayed value of the refrigerant circuit pressure sensor.

Follow the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 2.4 hours to make the ambient temperature and the temperature inside the Thermo-Chiller the same.
- (2) Check the ambient temperature.
- (3) Check "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (4) Check if the value at the cross point of the ambient temperature and the "PL: Refrigerant circuit pressure on the low pressure side" value is within the range (the shaded part) in Fig. 4-57. If the cross point is within the range, it means that the pressure sensor is operating correctly.

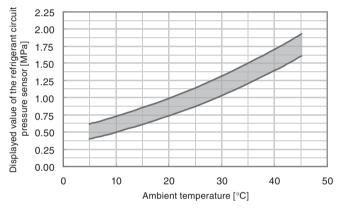


Fig. 4-57 Ambient temperature and refrigerant circuit pressure

8. Check the analogue output of the refrigerant circuit pressure sensor (for low pressure).

Find out if the main board is operating correctly.

Follow the instructions shown below:

- (1) Check the "PL: Refrigerant circuit pressure on the low pressure side" value in the "Check Monitor Menu".
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 2 3 and contact the negative probe to the pin number 12 of the "CN4" connector.
- (4) Check that the voltage between the pin number 2 3 and the pin number 1 2 is in the same relationship shown in Fig. 4-59. (Accuracy: +/- 5%)
- (5) If the voltage is in the same relationship as the graph shows, it means that the main board is operating correctly.

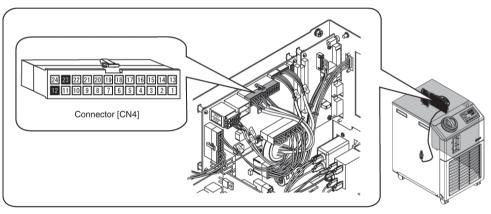


Fig. 4-58 Check of the refrigerant circuit pressure sensor (for low pressure) output

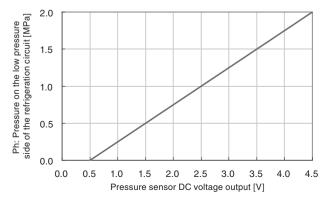


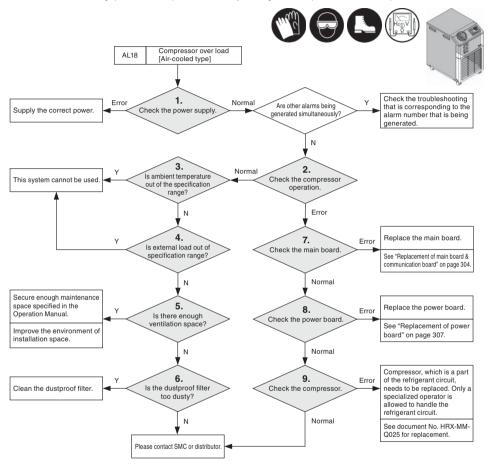
Fig. 4-59 Refrigerant circuit pressure sensor (for low pressure) analogue output

4

Maintenance

AL18: Compressor overload [For air-cooled type]

<Detection method> This alarm goes off when the difference between the pressure detected by the refrigerant circuit pressure sensor for high pressure and the pressure detected by the refrigerant circuit pressure sensor for low pressure is 0.1 MPa or less.



1. Check of power supply

Check if the power supply is correct.

(1) Check if the power supply is within the specified range. Measure the power supply voltage that is connected to the connector of the power supply cable to be connected to the Thermo-Chiller with a tester, and check if the power supply voltage is within the specification range.

Thermo-Chiller model: HRSD-D-10/20-D

-Power supply specification

- · -10 (100 V spec.): Single phase 100 VAC (50/60 Hz), 115 VAC (60 Hz)
- · -20 (200 V spec.): Single phase 200 VAC to 230 VAC (50/60 Hz)
- (2) Check that there is no temporary voltage drop or instantaneous power supply stop caused with the power supply.

2. Check the compressor operation.

Leave the Thermo-Chiller in an operation stop state for 2 hours or more (to decrease the temperature of the compressor body).

After starting Thermo-Chiller operation, judge if the compressor is operating with the compressor operating noise and the vibration of the compressor.

(When checking vibration, use a screwdriver to touch the compressor body. Do not touch the compressor body directly with hand as it becomes hot while it is operating.)

3. Ambient temperature is out of the specification range.

Ambient temperature is higher than 4 0 $^{\circ}$ C (4 5 $^{\circ}$ C for Option G "High ambient temperature specification").

4. External load is out of the specification range.

Cooling capacity varies depending on the ambient temperature, set circulating fluid temperature, and power supply frequency.

Please refer to the "Cooling capacity" graph on pages 19 and 20.

5. Enough ventilation space has not been secured.

· The Thermo-Chiller is installed too close to a wall.

- · There is other equipment close to the Thermo-Chiller.
- \cdot Hot ventilated air from other equipment enters the Thermo-Chiller.
- · The Thermo-Chiller is operating in a enclosed space.

(e.g. In a room without ventilation or air conditioner)

6. The dustproof filter is too dusty.

Dustproof filter on the front side of the Thermo-Chiller or the fin of the air-cooled condenser inside is contaminated.

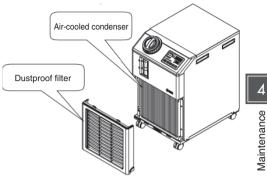


Fig. 4-60 An air-cooled condenser and a dustproof filter

7. Check the main board.

Check that the main board outputs signals.

Disconnect the connector "CN1" on the power board.

Perform settings of the tester to make it possible to measure 24 VDC.

Contact the negative side probe to the connector pin number 7 on the cable side of the "CN1" that has been removed, and contact the positive side probe to the pin number 8.

Operate the Thermo-Chiller (by pressing "RUN/STOP" key), and heck the voltage between the cable connectors number 7 and number 8.

<Normal> Between pin numbers 7 and 8: 24 VDC

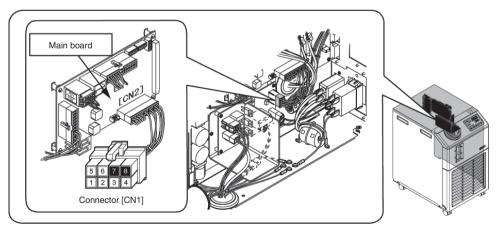


Fig. 4-61 Check the compressor signal output

8. Check the power board.

Check that the power is being supplied to the compressor.

Disconnect the connector "CN 4 " of the power board to which the fan/compressor cable is connected.

Operate the Thermo-Chiller (by pressing "RUN/STOP" key), and check if power supply voltage is supplied to the pins number 2 to number 4 of the "CN4" connector on the power board with a tester.

[Power supply voltage to be supplied]

- · -10 (100 V spec.): Single phase 100 VAC (50/60 Hz), or 115 VAC (60 Hz)
- · -20 (200 V spec.): Single phase 200 VAC to 230 VAC (50/60 Hz)

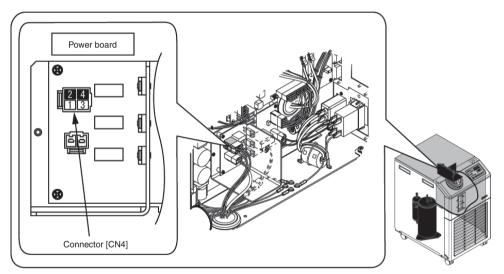


Fig. 4-62 Check the compressor input

9. Check the compressor.

Perform the checks after leaving the Thermo-Chiller not operating for 2 hours or more (after the compressor body temperature has decreased enough).

Disconnect the connector "CN 4 " of the power board to which the fan/compressor cable is connected.

Check the electricity continuity between the cable connector pin number 2 and the pin number 4 with a tester.

<Normal> Electric continuity between the cable connector pin number 2 and the pin number 4: Yes

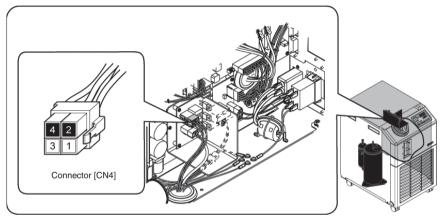
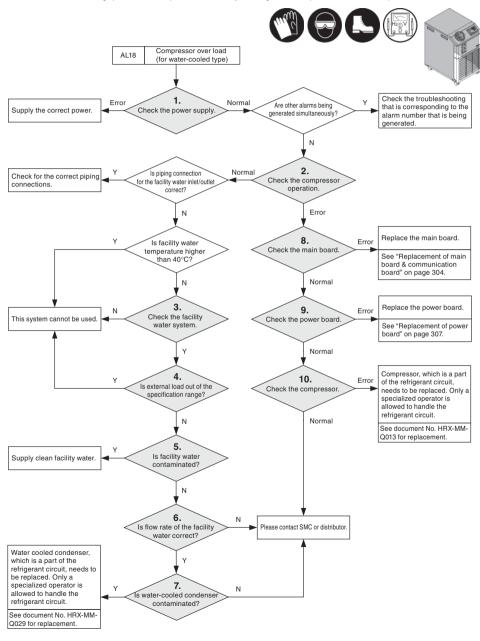


Fig. 4-63 Check the compressor

AL18: Compressor overload [For water-cooled type]

< Detection method> This alarm goes off when the difference between the pressure detected by the refrigerant circuit pressure sensor for high pressure and the pressure detected by the refrigerant circuit pressure sensor for low pressure is 0.1 MPa or less.



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1. Check of power supply

Check if the power supply is correct.

(1) Check if the power supply is within the specified range. Measure the power supply voltage that is connected to the connector of the power supply cable to be connected to the Thermo-Chiller with a tester, and check if the power supply voltage is within the specification range.

- Power supply specification

· -10 (100 V spec.): Single phase 100 VAC (50/60 Hz), 115 VAC (60 Hz)

· -20 (200 V spec.): Single phase 200 VAC to 230 VAC (50/60 Hz)

(2) Check that there is no temporary voltage drop or instantaneous power supply stop caused with the power supply.

2. Check the compressor operation.

Leave the Thermo-Chiller in an operation stop state for 2 hours or more (to decrease the temperature of the compressor body).

After starting Thermo-Chiller operation, judge if the compressor is operating with the compressor operating noise and the vibration of the compressor.

(When checking vibration, use a screwdriver to touch the compressor body. Do not touch the compressor body directly with hand as it becomes hot while it is operating.)

3. Check the facility water system.

Check that the facility water system capability satisfies the required facility water flow rate that is specified on page 23.

4. External load is out of the specification range.

Cooling capacity varies depending on the facility water temperature, set circulating fluid temperature, and power supply frequency.

Please refer to the "Cooling capacity" graph on pages 19 and 20.

5. Facility water is contaminated.

Check that the facility water is clean (without any foreign matter or discolouration).

6. Incorrect flow rate of the facility water.

Install a flow meter and check that the facility water system satisfies the required facility water flow rate that is specified on page 23.

* Facility water does not flow when the Thermo-Chiller is not operating. Check the facility water flow rate while the external load is being applied to the Thermo-Chiller or the circulating fluid temperature is being decreased.

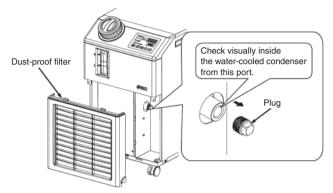
SMC

7. Water-cooled condenser is contaminated.

Contamination given to the water-cooled condenser reduces cooling capacity. Check the watercooled condenser for contamination by following the instructions shown below:

(1) Remove the pipings connected to the inlet and outlet of the facility water.

- (2) Remove the upper panel and the right panel.
- (3) Remove the plug of the water-cooled condenser, and check inside the water-cooled condenser for contamination.





8. Check the main board.

Check that the main board outputs signals.

Disconnect the connector "CN1" on the power board.

Perform settings of the tester to make it possible to measure 24 VDC.

Contact the negative side probe to the connector pin number 7 on the cable side of the "CN1" that has been removed, and contact the positive side probe to the pin number 8.

Operate the Thermo-Chiller (by pressing "RUN/STOP" key), and heck the voltage between the cable connectors number 7 and number 8.

<Normal> Between pin numbers 7 and 8: 24 VDC

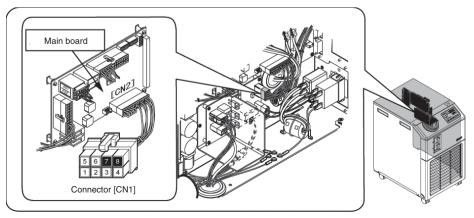


Fig. 4-65 Check the compressor signal output

9. Check the power board.

Check that the power is being supplied to the compressor.

Disconnect the connector "CN 4 " of the power board to which the fan/compressor cable is connected.

Operate the Thermo-Chiller (by pressing "RUN/STOP" key), and check if power supply voltage is supplied to the pins number 2 to number 4 of the "CN4" connector on the power board with a tester.

[Power supply voltage to be supplied]

- · -10 (100 V spec.): Single phase 100 VAC (50/60 Hz), or 115 VAC (60 Hz)
- · -20 (200 V spec.): Single phase 200 VAC to 230 VAC (50/60 Hz)

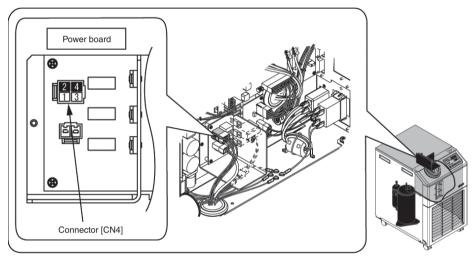


Fig. 4-66 Check the compressor input

4

10. Check the compressor.

Perform the checks after leaving the Thermo-Chiller not operating for 2 hours or more (after the compressor body temperature has decreased enough).

Disconnect the connector "CN 4 " of the power board to which the fan/compressor cable is connected.

Check the electricity continuity between the cable connector pin number 2 and the pin number 4 with a tester.

<Normal> Electric continuity between the cable connector pin number 2 and the pin number 4: Yes

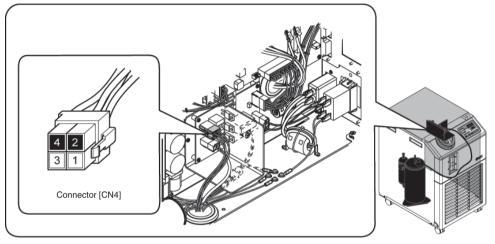
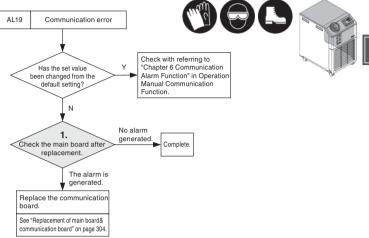


Fig. 4-67 Check the compressor

AL19: Communication error

<Detection method> This alarm goes off when no request messages have been received from the host computer for a specific period of time.



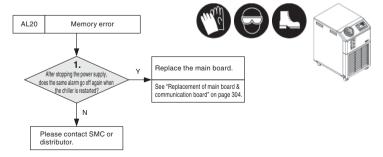
1. Check the main board after replacement.

Replace the main board with a new one. (See "Replacement of main board & communication board" on page 304.)

After replacement, check if the alarm goes off again.

AL20: Memory error

<Detection method> This alarm goes off when the written data to the CPU and the read data do not match.

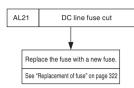


1. After stopping power supply, check for the same alarm goes off again when the chiller is re-started.

After stopping power supply (by tuning off the power supply switch on the Thermo-Chiller), check if the same alarm goes off again when the Thermo-Chiller is restarted.

AL21: DC line fuse cut

<Detection method> This alarm goes off when the fuse in the DC circuit of the contact I/O communication connector blows.



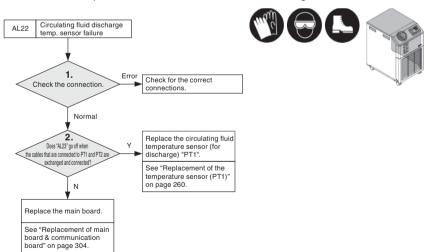


[Remarks]

- · It is necessary to replace the fuse to reset the alarm.
- When AL21 is generated the Thermo-Chiller is stop as default setting. Although DC circuit cannot be used (the alarm cannot be reset), it is possible to continue the Thermo-Chiller operation even when the AL21 is being generated by changing setting of the "AS.15" in the Alarm Setting Menu. (Refer to the section "Alarm Customizing Function" in Operation Manual for details.)

AL22: Circulating fluid discharge temp. sensor failure

<Detection method> This alarm goes off when the circulating fluid temperature sensor (for discharge) detects temperature that is outside of – 80 to 120°C range.



1. Check the connection

Check the circulating fluid temperature sensor (for discharge) "PT 1" that is connected to the main board for the items shown below:

- (1) The connector is securely connected.
- (2) The pins are securely inserted and there is no defective crimping. Check for the correct connection by lightly pulling the cable.

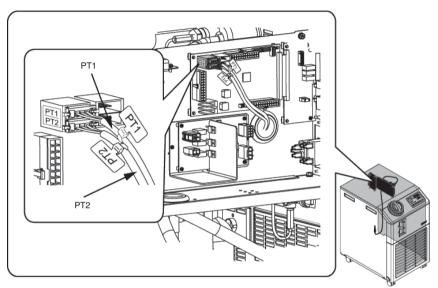


Fig. 4-68 Check for the correct connection of PT1

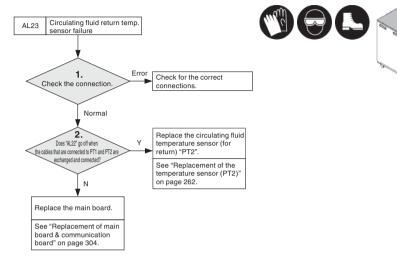
2. "AL 2 3 " goes off when the cables that are connected to PT 1 and PT 2 are exchanged and connected.

Perform checking with the Thermo-Chiller not operating. Check if "AL 2 2" is reset and "AL 2 3" is generated by taking the following instructions:

- (1) Exchange the inserting position of the connector "PT 1" for circulating fluid temperature sensor (for discharge) and the connector "PT2" for circulating fluid temperature sensor (for return).
- (2) Reset the alarm.
- (3) Check if the cables inserting position exchange resets "AL22" and generates "AL23".

AL23: Circulating fluid return temp. sensor failure

<Detection method> This alarm goes off when the circulating fluid temperature sensor (for return) detects temperature that is outside of -80 to 120°C range.



1. Check the connection

Check the circulating fluid temperature sensor (for return) "PT 2" that is connected to the main board for the items shown below:

- (1) The connector is securely connected.
- (2) The pins are securely inserted and there is no defective crimping. Check for the correct connection by lightly pulling the cable.

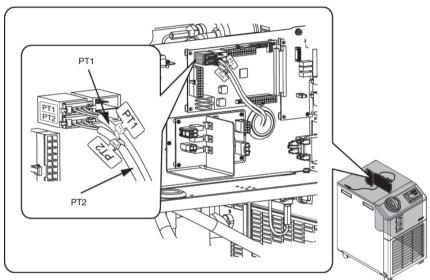


Fig. 4-69 Check for the correct connection of PT2

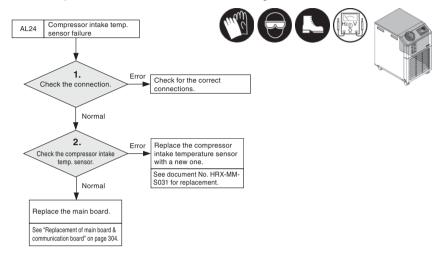
2. "AL 2 2" goes off when the cables that are connected to PT 1 and PT 2 are exchanged and connected.

Perform checking with the Thermo-Chiller not operating. Check if "AL 2 3" is reset and "AL 2 2" is generated by taking the following instructions:

- (1) Exchange the inserting position of the connector "PT 1" for circulating fluid temperature sensor (for discharge) and the connector "PT2" for circulating fluid temperature sensor (for return).
- (2) Reset the alarm.
- (3) Check if the cables inserting position exchange resets "AL23" and generates "AL22".

AL24: Compressor intake temp. sensor failure

<Detection method> This alarm goes off when the compressor intake temperature sensor detects temperature that is outside of -40 to 70°C range.



1. Check the connection

Check the compressor intake temperature sensor "T1" (thermistor sensor) that is connected to the connector "CN4", pin numbers from 7 to 19, of the main board for the check points shown below:

- (1) The connector "CN4" is securely connected.
- (2) The pins of the compressor intake temperature sensor "T 1" (with black lead wire) are securely inserted and there is no defective crimping. Check for the correct connection by lightly pulling the cable.

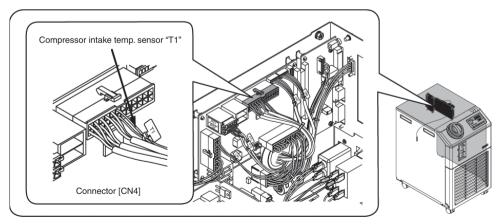


Fig. 4-70 Check the connection of the compressor intake temperature sensor

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2. Check the compressor intake temperature sensor.

Disconnect the connector "CN 4" of the main board. Check the resistance of the pins number 7 to 1 9 (compressor intake temperature sensor) of the remove cable side connector by following the instructions shown below:

- (1) Leave the Thermo-Chiller not operating for 2.4 hours. (Make the temperature of the refrigerant circuit the same as the ambient temperature.)
- (2) Measure the ambient temperature.
- (3) Disconnect the connector "CN 4" of the main board, and measure the resistance between the pin number 7 and the pin number 1 9 to which the compressor intake temperature sensor is connected with a tester.
- (4) Check that the resistance and the ambient temperature detected by the tester almost match the resistances and ambient temperatures shown in Table 4 - 2 Resistances detected by thermistor sensor (Reference) on page 231. If there is a difference of +/- 5°C or more in the temperatures, it is judged to be abnormal.

(AL24 is generated when the temperature reaches -40° C or less (resistance: 43.34 k Ω or more) or 70°C or more (0.4895 k Ω or less). When the resistance is 43.34 k Ω or more or 0.4895 k Ω or less, the sensor is judged to have failure.)

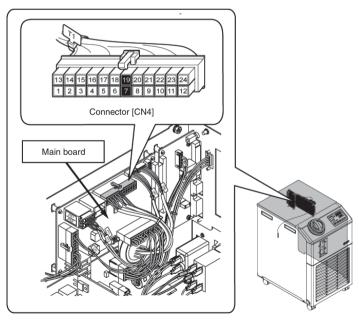


Fig. 4-71 Check the resistance of the compressor intake temperature sensor

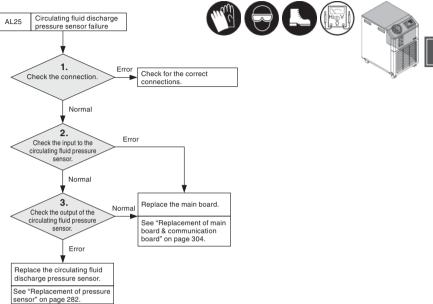
Δ

Temperature °C	Criterion kΩ	Temperature °C	Criterion kΩ	Temperature °C	Criterion kΩ
		-		-	
-40.0	43.34	0.0	6.000	40.0	1.274
-39.0	40.98	1.0	5.746	41.0	1.231
-38.0	38.76	2.0	5.503	42.0	1.190
-37.0	36.68	3.0	5.273	43.0	1.150
-36.0	34.72	4.0	5.053	44.0	1.111
-35.0	32.87	5.0	4.844	45.0	1.075
-34.0	31.14	6.0	4.645	46.0	1.039
-33.0	29.51	7.0	4.455	47.0	1.005
-32.0	27.97	8.0	4.273	48.0	0.9724
-31.0	26.53	9.0	4.100	49.0	0.9409
-30.0	25.17	10.0	3.935	50.0	0.9106
-29.0	23.88	11.0	3.778	51.0	0.8814
-28.0	22.67	12.0	3.628	52.0	0.8532
-27.0	21.53	13.0	3.485	53.0	0.8261
-26.0	20.45	14.0	3.348	54.0	0.8000
-25.0	19.43	15.0	3.217	55.0	0.7749
-24.0	18.47	16.0	3.092	56.0	0.7507
-23.0	17.57	17.0	2.972	57.0	0.7273
-22.0	16.71	18.0	2.858	58.0	0.7048
-21.0	15.90	19.0	2.749	59.0	0.6832
-20.0	15.13	20.0	2.644	60.0	0.6622
-19.0	14.41	21.0	2.545	61.0	0.6421
-18.0	13.72	22.0	2.449	62.0	0.6226
-17.0	13.07	23.0	2.358	63.0	0.6038
-16.0	12.46	24.0	2.270	64.0	0.5857
-15.0	11.88	25.0	2.186	65.0	0.5683
-14.0	11.33	26.0	2.106	66.0	0.5514
-13.0	10.80	27.0	2.029	67.0	0.5351
-12.0	10.31	28.0	1.955	68.0	0.5194
-11.0	9.838	29.0	1.885	69.0	0.5042
-10.0	9.392	30.0	1.817	70.0	0.4895
-9.0	8.969	31.0	1.752		
-8.0	8.568	32.0	1.690		
-7.0	8.187	33.0	1.630		
-6.0	7.825	34.0	1.573		
-5.0	7.481	35.0	1.518		
-4.0	7.154	36.0	1.465		
-3.0	6.844	37.0	1.414		
-2.0	6.548	38.0	1.366		
-1.0	6.267	39.0	1.319		
0.0	6.000	40.0	1.274		

Table 4-2 Thermistor sensor resistance (Reference)

AL25: Circulating fluid discharge pressure sensor failure

<Detection method> This alarm goes off when the pressure detected by the circulating fluid pressure sensor (for discharge) is out of -0.33 to 1.5 MPa range.



1. Check the connection

Check the circulating fluid pressure sensor (for discharge) that is connected to the connector "CN4", pin numbers 8, 20, and 21 of the main board for the check points shown below:

- (1) The connector "CN4" is securely connected.
- (2) Pin numbers 8, 20, and 21 of the circulating fluid pressure sensor (for discharge) "PS 1 are securely inserted and there is no defective crimping. Check for the correct connection by lightly pulling the cable.

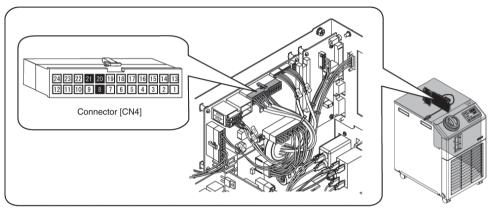


Fig. 4-72 Check the connection of the circulating fluid pressure sensor

2. Check the input to the circulating fluid pressure sensor.

Check that the power is supplied to the circulating fluid pressure sensor (for discharge). Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

Contact the positive probe to the pin number 21 and contact the negative probe to the pin number 20 of the "CN4" connector.

<Normal> Pin number 21 - Pin number 20: Voltage should be 24 VDC.

3. Check the output of the circulating fluid pressure sensor.

Find which has a problem, the circulating fluid pressure sensor (for discharge) or the main board. Follow the instructions shown below:

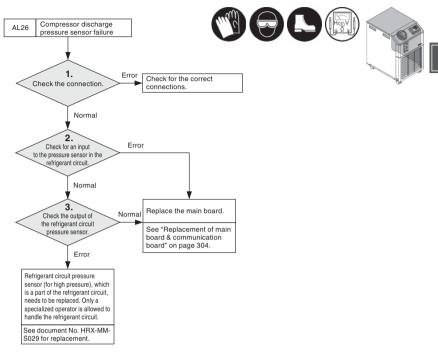
- (1) Perform checking with the Thermo-Chiller not operating.
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 8 and contact the negative probe to the pin number 20 of the "CN4" connector.
- (4) Check that the voltage between the pin number 8 and the pin number 20 is in the range shown below:

<Normal> Between pin numbers 8 and 20: 1 VDC +/- 0.2 V

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AL26: Compressor discharge pressure sensor failure

<Detection method> This alarm goes off when the pressure detected by the refrigerant circuit pressure sensor (for high pressure) is out of the –0.33 to 3.0 MPa range.



1. Check the connection

Check the refrigerant circuit pressure sensor (for high pressure) that is connected to the connector "CN4", pin numbers 10, 11, and 22 of the main board for the check points shown below:

- (1) The connector "CN4" is securely connected.
- (2) Pin numbers 10, 11, and 22 of the refrigerant circuit pressure sensor (for high pressure) "PS2" are securely inserted and there is no defective crimping. Check for the correct connection by lightly pulling the cable.

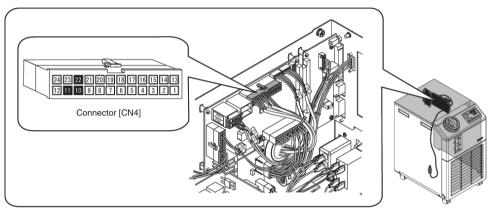


Fig. 4-73 Check connection of the refrigerant circuit pressure sensor (for high pressure)

2. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor (high pressure). Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

Contact the positive probe to the pin number 22 and contact the negative probe to the pin number 10 of the "CN4" connector.

<Normal> Pin number 22 - Pin number 10: Voltage should be 5 VDC +/- 1 V

3. Check the output of the refrigerant circuit pressure sensor.

Find which has a problem, the refrigerant circuit pressure sensor (for high pressure) or the main board. Follow the instructions shown below:

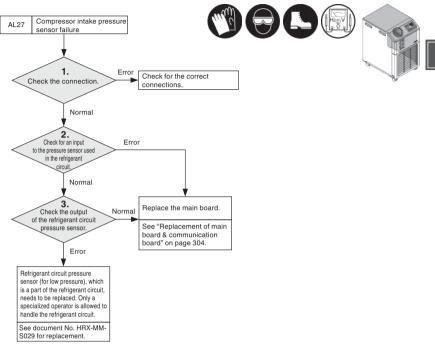
- (1) Perform checking with the Thermo-Chiller not operating.
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 1 1 and contact the negative probe to the pin number 10 of the "CN4" connector.
- (4) Check that the voltage between the pin number 10 and the pin number 11 is in the range shown below:

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<Normal> Between pin numbers 10 and 11: 0.5 to 4.5 VDC +/- 0.2 V

AL27: Compressor intake pressure sensor failure

<Detection method> This alarm goes off when the pressure detected by the refrigerant circuit pressure sensor (for low pressure) is out of the -0.20 to 3.0 MPa range.



1. Check the connection.

Check the refrigerant circuit pressure sensor (for low pressure) that is connected to the connector "CN4", pin numbers 12, 23, and 24 of the main board for the check points shown below:

- (1) The connector "CN4" is securely connected.
- (2) Pin numbers 12, 23, and 24 of the refrigerant circuit pressure sensor (for low pressure) "PS3" are securely inserted and there is no defective crimping. Check for the correct connection by lightly pulling the cable.

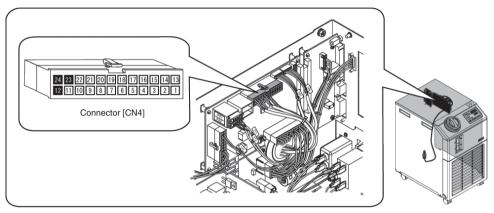


Fig. 4-74 Check connection of the refrigerant circuit pressure sensor (for low pressure)

2. Check for an input to the pressure sensor in the refrigerant circuit.

Check that the power is supplied to the refrigerant circuit pressure sensor (low pressure). Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.

Contact the positive probe to the pin number 24 and contact the negative probe to the pin number 12 of the "CN4" connector.

<Normal> Pin number 24 - Pin number 12: Voltage should be 5 VDC +/- 1 V

3. Check the output of the refrigerant circuit pressure sensor.

Find which has a problem, the refrigerant circuit pressure sensor (for low pressure) or the main board. Follow the instructions shown below:

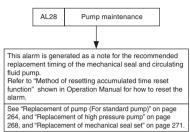
- (1) Perform checking with the Thermo-Chiller not operating.
- (2) Check voltage by contacting the probe of the tester directly to the connector external surface with the "CN4" connector of the main board being inserted.
- (3) Contact the positive probe to the pin number 2 3 and contact the negative probe to the pin number 12 of the "CN4" connector.
- (4) Check that the voltage between the pin number 23 and the pin number 12 is in the range shown below:

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<Normal> Between pin numbers 23 and 12: 0.5 to 4.5 VDC +/- 0.2 V

AL28: Maintenance of pump

<Detection method> This alarm goes off when the accumulated operating time of the pump reaches 8,000 hours or 20,000 hours.



1. For HRS012/018/024/030-A/W-D-T, HRS050/060-A/W-D

This alarm is generated every 8,000 hours of accumulated operating time. Be sure to check for leakage around the pump (mechanical seal). However, even in the absence of leakage, the mechanical seal should be replaced as a preventive measure.

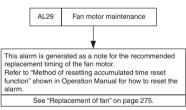
The mechanical seal can be replaced up to 2 times. After the accumulated operating time has reached 20,000 hours, the pump itself will need to be replaced.

2. For HRS012/018/024/030-A/W-DD-D (Other than high pressure pump specification)

This alarm is generated every 20,000 hours of accumulated operating time. Be sure to check for pump errors. However, even in the absence of errors, the pump should be replaced as a preventive measure.

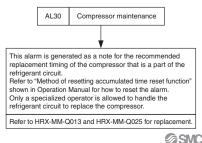
AL29: Maintenance of fan motor [For air-cooled type]

<Detection method> This alarm goes off when the accumulated operating time of the fan motor reaches 20,000 hours.



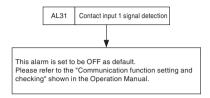
AL30: Maintenance of compressor

<Detection method> This alarm goes off when the accumulated operating time of the compressor reaches 50,000 hours.



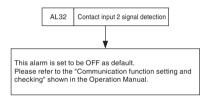
AL31: Contact input 1 signal detection

<Detection method> This alarm goes off when a contact input is detected.



AL32: Contact input 2 signal detection

<Detection method> This alarm goes off when a contact input is detected.

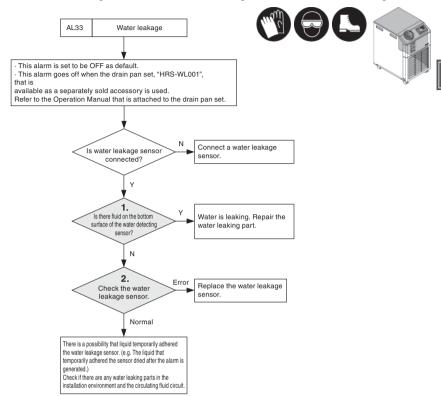


4

Maintenance

AL33: Water leakage

<Detection method> This alarm goes off when the water leakage sensor detects water leakage.



1. Liquid remains on the bottom surface of the water detecting sensor.

There is a leakage sensing part on the bottom surface of the water leakage sensor, and if liquid contacts there, the water leakage sensor operates. Check if there is any liquid sticking to it.

2. Check the water leakage sensor.

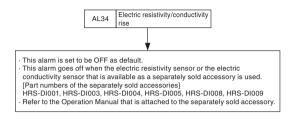
Check the operation of the water leakage sensor following the instructions shown below:

- If any liquid adheres on the bottom surface (the sensing part) of the water leakage sensor, wipe it off with waste cloth, etc.
- (2) Check that the indicator of the water leakage sensor turns green.
- (3) Reset the alarm of the Thermo-Chiller and confirm that AL33 is reset.
- (4) Put some water onto the bottom surface of the water leakage sensor to check if AL33 is generated.
- (5) If AL33 is generated when the procedures 1 to 4 are taken, the water leakage sensor is judged to be operating normally.

If the indicator does not turn ON or the indicator light does not change from red, the water leakage sensor operation is judged to abnormal.

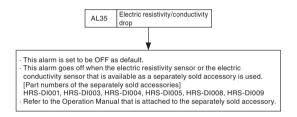
AL34: Electric resistivity/conductivity rise

<Detection method> This alarm goes off when the value detected by the electric resistivity sensor or the electric conductivity sensor exceeds the set value.



AL35: Electric resistivity/conductivity drop

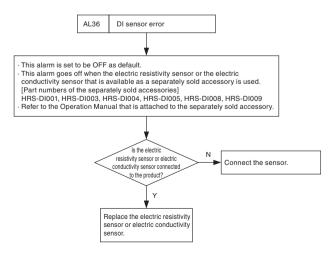
<Detection method> This alarm goes off when the value detected by the electric resistivity sensor or the electric conductivity sensor is lower than the set value.



AL36: Electric resistivity/conductivity sensor error

<Detection method> This alarm goes off when the value detected by the electric resistivity sensor is out of -0.6 to 5.6 M Ω range.

The value detected by the electric resistivity sensor is out of –6.2 to 56.2 $\mbox{M}\Omega$ range.



∕ SMC

Troubleshooting of errors without alarm generation

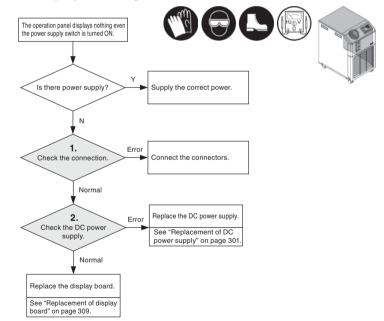
• The circulating fluid temperature does not go down

The circulating fluid temperature does not go down.

• The circulating fluid temperature does not go up



The operation panel displays nothing



4

1. Check the connection.

Check that the connector "CN1" of the display board is connected.

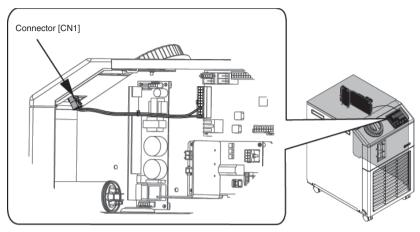


Fig. 4-75 Check connection of the display board

2. Check the DC power supply.

Follow the instructions shown below to check that 24 VDC is being output from the DC power supply.

- (1) With the DC power supply connector "CN 2" connected, directly contact the probe of the tester with the pins from outside of the connectors.
- (2) Contact the negative probe to the pin number 1 and contact the positive probe to the pin number 3 of the "CN2" connector, and measure the DC voltage output.
 <Normal> 24 VDC is being output.

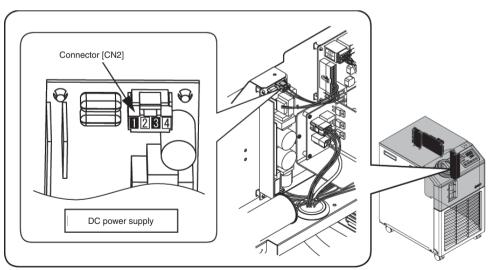
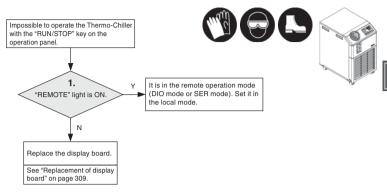


Fig. 4-76 Check the DC power supply output

4

Maintenance

Impossible to operate the Thermo-Chiller with the "RUN/STOP" key on the operation panel



1. "REMOTE" light is ON.

Check if the "REMOTE" light on the operation panel is ON. If it is ON, the Thermo-Chiller is in the remote operation mode.

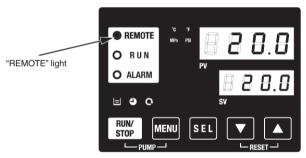
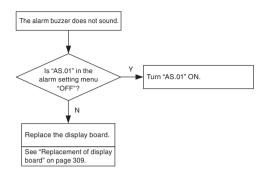


Fig. 4-77 Check the "REMOTE" light

Lights on the operation panel or display(s) on the digital display does not operate



The alarm buzzer does not sound



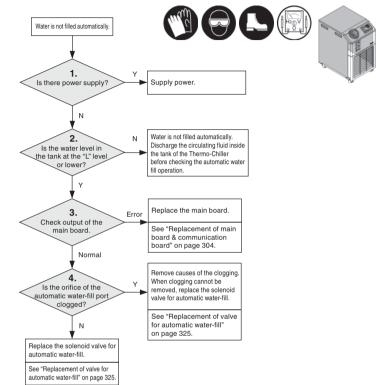
• Facility water does not flow (for water-cooled type)



4

Maintenance





1. No power supply.

The solenoid valve for automatic water-fill opens when the power supply switch of the Thermo-Chiller is ON. Check that the power is being supplied to the Thermo-Chiller.

2. The water level in the tank is at the "L" level or lower.

Water is filled automatically when the water level in the tank is at "L" level or lower.

3. Check output of the main board.

Check if the power is supplied from the main board to the solenoid valve for automatic water-fill.

- (1) Check it with the water level in the tank at "L" level or lower (the water level that generates "AL01: Low level in tank").
- (2) With the connector "CN4" of the main board connected, directly contact the probe of the tester with the pins from outside of the connectors.
- (3) Contact the negative probe to the pin number 1 and contact the positive probe to the pin number 13 of the "CN4" connector, and measure the DC voltage output.
 <Normal> 24 VDC is being output.

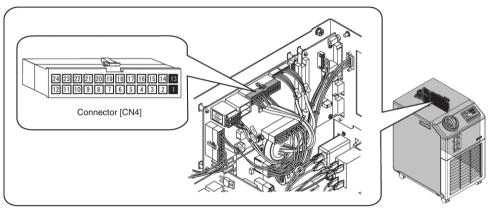


Fig. 4-78 Check the input of the solenoid valve for automatic water-fill

4. Orifice of the automatic water-fill port is clogged.

There is an orifice at the automatic water-fill port. Check that there is no clogging with foreign matter, etc.

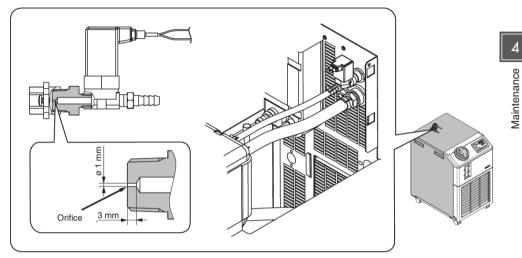


Fig. 4-79 Check the orifice for automatic water-fill port

Replacement Parts Chart

An error occurring in one of the corresponding parts is the cause of the generation of the alarm. After checking the piping check sheet on pages 121 and 122, if there doesn't appear to be any problems with the operating environment, conditions, applications, etc., proceed to inspecting the corresponding parts and consider replacement if needed.

					Circ	culatir	ng flui	id circ	uit/El	ectric	al cir	cuit p	arts						Ref	rigera	ant cir	cuit p	arts		
	ote1) No.	1	25	34 to 44	45 to 47	48 to 51	Note2)	15	15	24	176	177 to 180	56 to 106	30	29	52	115 to 118	119 to 121	122 to 124	125 126	136 to 141	143	142 144	129 to 132	145 146
Alarm code	Cooling method	Dustproof filter	Level switch	Pump/High pressure pump	Mechanical seal	Fan motor	Bypass piping	Circulating fluid temperature sensor (PT1)	Circulating fluid temperature sensor (PT2)	Circulating fluid discharge pressure sensor	Water leakage sensor	Electric resistivity/conductivity sensor	Main board	Power board	Communication board	Fuse	Compressor	Air-cooled condenser	Water-cooled condenser	Water regulating valve	Heat exchanger	Refrigerant circuit pressure sensor (for low pressure)	Refrigerant circuit pressure sensor (for high pressure)	Electronic expansion valve	Compressor intake temperature sensor (T1)
AL01	Common		•	•	•								•											\square	
AL02	Air-cooled	Note3)		•			•	•					•					•			•	•	٠	•	
AL03	Water-cooled Common	•		•			•	•					•					•	•	•	•	•	•	•	
AL03 AL04	Common	-		•			•	•					-	_				•	•	•	•	•	•	•	
AL04	Common			•			•	-	•				•												
AL06	Common						•			•			•								•				
AL07	Common			•						•			•	•											
AL08	Common						٠			٠															
AL09	Common																								
AL10	Common																	٠					٠		
AL11	Common			•			•	•					•								٠		_	•	•
AL12	Common			•			•						•								•	•	•	•	•
AL13	Air-cooled Water-cooled	•		•		•	•						•	•				•	•	•		•	•	•	
AL15	Common																						٠		
AL16	Common												٠									٠			
AL17	Common			•			•						•	-			_	-				•		•	
AL18	Air-cooled Water-cooled	•											•	•			•	•						\vdash	
AL19	Common												•	•	•		•		•	•				\vdash	
AL13	Common												•		•										
AL21	Common												-			•									
AL22	Common																								
AL23	Common								٠				٠												
AL24	Common																								
AL25	Common									•			•												
AL26	Common												•								<u> </u>		•	\vdash	
AL27	Common				Note4)								•								-	•		\vdash	
AL28	Common			•	Note4)																				
AL29	Air-cooled					•																		\vdash	
AL30	Common																•							\vdash	
AL31 AL32	Common Common							-							•									\vdash	
AL32 AL33	Common							-			•				•									\vdash	
AL33 AL34	Common										-	•													
AL35	Common											•													
AL36	Common											•													

Note 1) Each number corresponds to a number on the replacement parts list on pages 91 to 98.

Note 2) The bypass piping part number is HRS-BP001.

Note 3) The
mark indicates the part error which is the cause of the generation of the alarm.

Note 4) For HRS012/018/024/030-T (High pressure pump) and HRS050/060



Parts Replacement Procedure

Precautions for Whole Work



The panel must not be removed or mounted during the operation of the product. While the product is in operation, some parts will get hot or cold and a high voltage power supply will be applied, so there is a risk of burns (or frostbite) and electric shock to the operator.

▲ WARNING

WARNING



After the product is stopped, there is still a danger of getting burnt (or frostbitten) due to residual heat. Do not start work until the product reaches normal temperature.

▲ WARNING

Unless otherwise specified, be sure to shut off the breaker of the facility power supply (the user's machine power supply).



When the panel is removed or mounted, be sure to wear protective shoes and gloves to prevent injury with the edge of the panel.

Preparation for work

Remove the panel which covers the part to be replaced and drain the circulating fluid if necessary.

Check after work

After the work is completed, check the product can operate normally.

Tools to be used

Prepare all tools before starting work.

Description	lcon	Content
	() () () () () () () () () () () () () (Flat size: 9 mm
	8 mm	Flat size: 8 mm
Spanner/Wrench	10 mm	Flat size: 10 mm
Spannel/Wiench	17 mm	Flat size: 17 mm
	21 mm	Flat size: 21 mm
	24 mm	Flat size: 24 mm
Drain pan	\bigcirc	Height: Max. 100 mm
Nippers		_
Pliers		_
Cross recessed screwdriver	Max. 200 mm	Total length: Max. 200 mm
(*1)		_
flat blade screwdriver (*1)		_
Long-nose plier		_
Hexagon wrench	2mm	Flat size: 2 mm
I IERAYUT WIETICI	5mm	Flat size: 5 mm

Tools for repairing circulating fluid circuit/electrical circuit

(*1) Screwdriver with magnetic tip.

Silicone sealant

Recommended: HRG-S0214

Drying time: 2 hours

• The following tools are required to perform repair work on the refrigerant circuit.

Tools for repairing refrigerant	circuit
---------------------------------	---------

No.	Description	Photo	Remarks
1	Charge valve		
2	Refrigerant gauge manifold Charge hose	00	
3	Vacuum pump		
4	Leak detector Refrigerant gas (R407C)		
5	Scale		
6	Set of brazing tools Refrigerant recovery cylinder		
7	Refrigerant gas collector Charge hose		

Removal and the mounting of the panel

Removal

CAUTION A



Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

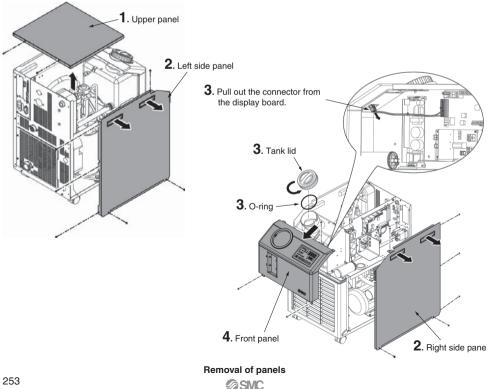




- 1. Remove the upper panel. (Screw x 2)
- 2. Remove the side panel. (Screw x each right and left 6)
- 3. Remove the tank lid.
- 4. Remove the front panel. (Screw x 3)

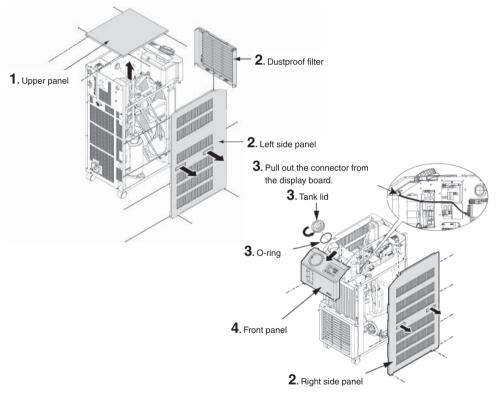
* Pull out the connector from the display board to remove the front panel.

After removing the tank lid, remove the O-ring at the side of the fluid inlet with a pair of tweezers.



HRS050/060-A/W-

- 1. Remove the upper panel. (Screw x 6)
- 2. Remove the side panels after removing the dustproof filter on the top. (Screw x 8 on each side) * Refer to page 285 for the procedure of removal of the dustproof filter.
- 3. Remove the tank lid.
- 4. Remove the front panel. (Screw x 3)
 - * Pull out the connector from the display board to remove the front panel. After removing the tank lid, remove the O-ring at the side of the fluid inlet with a pair of tweezers.



Removal of panels

Mounting

Panel attachment is performed in inverse order of its removal.



Maintenance A

Discharge of the circulating fluid and facility water

HRS

The following parts requires to discharge the circulating fluid. Follow the procedure below. Discharge the circulating fluid before the replacement.

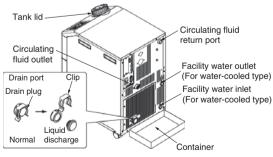
Description	Part number
Temperature sensor	HRS-S0007
Hose (For standard pump) (For HRS012/018/024)	HRS-S0008
Hose (For standard pump) (For HRS030)	HRS-S0302
Hose (For high pressure pump MT) (For HRS012/018/024)	HRS-S0069
Hose (For high pressure pump MT) (For HRS030)	HRS-S0304
Hose (For high pressure pump T) (For HRS012/018/024)	HRS-S0077
Hose (For high pressure pump T) (For HRS030)	HRS-S0303
Level switch	HRS-S0014
Pump (For 100 V type)	HRS-S0022
Pump (For 200 V type)	HRS-S0066
Pump (For HRS030)	HRS-S0361
High pressure pump (For 100 V type option T)	HRS-S0265
High pressure pump (For 100 V type option MT)	HRS-S0266
High pressure pump (For 200 V type option T) (For HRS012/018/024)	HRS-S0062
High pressure pump (For 200 V type option T) (For HRS030)	HRS-S0299
High pressure pump (For 200 V type option MT) (For HRS012/018/024)	HRS-S0063
High pressure pump (For 200 V type option MT) (For HRS030)	HRS-S0300
Mechanical seal set (For 100 V type option T) (For HRS012/018)	HRS-S0390
Mechanical seal set (For 100 V type option MT) (For HRS012/018)	HRS-S0412
Mechanical seal set (For 200 V type option T, MT)	HRG-S0211
Tank	HRS-S0025
Tank (For automatic water fill)	HRS-S0072
Valve for automatic water fill	HRS-S0071

Service parts which requires the discharge of the circulating fluid

⚠ WARNING

Stop the customer device and release the residual pressure before discharging the circulating fluid.
Before discharging the facility water, in case of water-cooled refrigerated type, stop the equipment for the facility water, or stop the facility water circuit to release the residual pressure.

1. Place a container underneath the drain outlet. (The capacity of the container should be approx. 10 L)



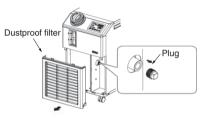
Drain the circulating fluid and facility water

- 2. Remove the tank lid.
- 3. Remove the drain plug on the drain port on the piping to discharge the fluid. An O-ring is used for the drain plug. Take care not to damage the O-ring.

- 4. Confirm that a sufficient amount of the circulating fluid has been drained from the user's machine and piping, and apply air purge from the circulating fluid return port.
- 5. After discharging the circulating fluid in the tank, refit the drain plug, clip and close the tank lid.

<For the water-cooled refrigeration chiller, drain the facility water according to the procedures from 6 to 8.>

- 6. Remove the piping of the outlet of the facility water.
- 7. Remove the dustproof filter to remove the plug. Refer to page 284 for the procedure of removal.



Removal of plug

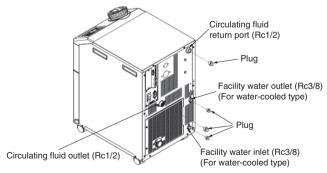
A

CAUTION



Just removing the facility water piping does not discharge the facility water completely. Remove the plug to discharge the facility water.

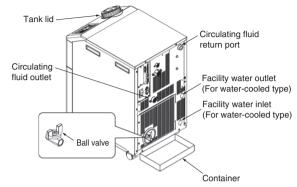
- After ensuring that the facility water is completely discharged, apply the sealant tape to the plugs which are removed during step 7 for mounting. Mount the dustproof filter after mounting them. Refer to page 284 for how to mount.
- 9. Refer to the figure below. Plug to the piping of the product to mount the plug to the piping of the product.



Plug to the piping of the product

Option T [High pressure pump]

The ball valve is the drain port. Open the ball valve to discharge the circulating fluid in the same way as procedure 1 to 9. Close the ball valve after discharging the circulating fluid.



Drain the circulating fluid and facility water from the product for option T [High pressure pump]

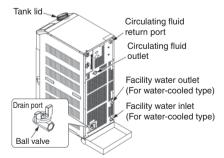
HRS050/060-A/W-

The following parts requires to discharge the circulating fluid. Follow the procedure below. Discharge the circulating fluid before the replacement.

Service parts which	requires the	discharge of the	circulating fluid
---------------------	--------------	------------------	-------------------

Description	Part number			
Temperature sensor	HRS-S0007			
Hose	HRS-S0097			
Hose (For HRS060 air-cooled type)	HRS-S0362			
Level switch	HRS-S0014			
Pump	HRS-S0088			
Pump (For option M)	HRS-S0089			
Tank	HRS-S0025			
Tank (For automatic water fill)	HRS-S0072			
Valve for automatic water fill	HRS-S0071			
Mechanical seal set	HRG-S0211			

1. Place a container underneath the drain outlet. (The capacity of the container should be approx. 10 L)



Drain the circulating fluid and facility water

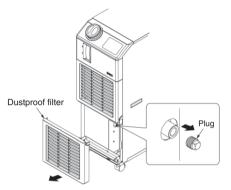
- 2. Remove the tank lid.
- 3. Open the ball valves at the drain port and drain the fluid.

∕ SMC

- 4. Confirm that a sufficient amount of the circulating fluid has been drained from the user's machine and piping, and apply air purge from the circulating fluid return port.
- 5. After the circulating fluid finishes has drained from the tank, close the ball valve at the drain port and put the tank lid back.

<For the water-cooled refrigeration chiller, drain the facility water according to the procedures from 6 to 8.>

- 6. Remove the piping of the outlet of the facility water.
- 7. Remove the dustproof filter to remove the plug. Refer to page 285 for the procedure of removal.

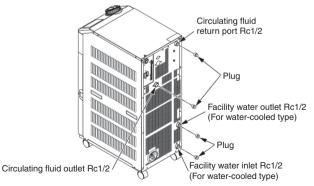


Removal of the plug



Just removing the facility water piping does not discharge the facility water completely. Remove the plug to discharge the facility water.

- After ensuring that the facility water is completely discharged, apply the sealant tape to the plugs which are removed during step 7 for mounting. Mount the dustproof filter after mounting them. Refer to page 285 for how to mount.
- 9. Refer to the figure below. Plug to the piping of the product to mount the plug to the piping of the product.



Plug to the piping of the product



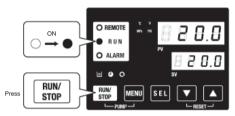
Check After Work

After the work is completed, check the product can operate normally.

Starting the product

Press the [RUN/STOP] key on the operation panel.

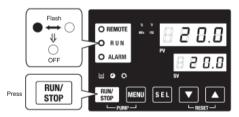
- The [RUN] lamp lights up (in green) and the product starts running.
- The circulating discharge temperature (PV) is controlled to the set temperature (SV).



Starting the product

Stopping the product

- 1. Press the [RUN/STOP] key on the operation panel.
 - The [RUN] lamp on the operation panel flashes green at 1 second intervals, and continues operation to prepare to stop.
 - After approx. 15 seconds, the [RUN] lamp goes off and the product stops.



Stopping the product

Check items after starting

Check the following items after starting the product.

A WARNING



When an Alarm is seen, press the [STOP] key and then turn off the power supply switch to stop the product, and turn off the breaker of the user's power supply to isolate the product.

- There is no leakage from piping.
- There is no drain of circulating fluid from the drain port.
- The circulating fluid pressure is within the specified range.
- The tank level is within the specified range.

Replacement Procedure

Replacement of temperature sensor (PT1)





Part number of service parts (Temperature sensor)

Description	Part number
Temperature sensor	HRS-S0007

\land WARNING

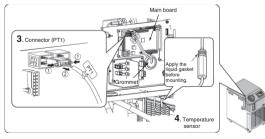


Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

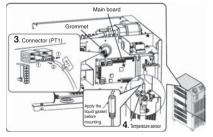
- When the temperature sensor is removed or mounted, it is turned using a spanner/wrench. At that time, be careful not to twist its cable. Otherwise, it can break.
- The product must not be operated until the liquid gasket is completely hardened. Otherwise, it can cause fluid leakage.

Removal

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 3. Remove the connector (PT1) from the main board.
- 4. Remove the temperature sensor (PT1).



Removal of temperature sensor (PT1)



Removal of temperature sensor (PT1)

Mounting

1. Apply the liquid gasket to the threads of the temperature sensor and mount the temperature sensor using a spanner/wrench.

Tips

Do not apply the liquid gasket to the first thread. Otherwise, the liquid gasket will spread to the circulating circuit and cause the product to fail. To prevent dust from getting caught in the threads, check there is no dust stuck to the threads before the screw is mounted.

- 2. Put through the electric wire from the grommet to the inside of the electric equipment.
- 3. Mount the connector (PT1) of the temperature sensor.
- 4. Mount the upper panel and the right panel in reversed order of removal. (Fixing screw x 8)



Replacement of temperature sensor (PT2)

HRS



Part number of service parts (Temperature sensor)

Description	Part number
Temperature sensor	HRS-S0007

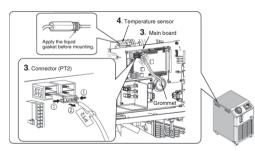
▲ WARNING

Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

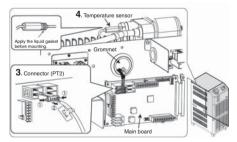
- When the temperature sensor is removed or mounted, it is turned using a spanner/wrench. At that time, be careful not to twist its cable. Otherwise, it can break.
- The product must not be operated until the liquid gasket is completely hardened. Otherwise, it can cause fluid leakage.

Removal

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the left referring the removal and the mounting of the panel.
- 3. Remove the connector (PT2) from the main board.
- 4. Remove the temperature sensor (PT2).



Removal of temperature sensor (PT2)



Removal of temperature sensor (PT2)

4

Mounting

1. Apply the liquid gasket to the threads of the temperature sensor and mount the temperature sensor using a spanner/wrench.

Tips

Do not apply the liquid gasket to the first thread. Otherwise, the liquid gasket will spread to the circulating circuit and cause the product to fail. To prevent dust from getting caught in the threads, check there is no dust stuck to the threads before the screw is mounted.

- 2. Put through the electric wire from the grommet to the inside of the electric equipment.
- 3. Mount the connector (PT2) of the temperature sensor.
- 4. Mount the upper panel and the left panel in reversed order of removal. (Fixing screw x 8)



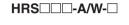
Replacement of pump (For standard pump)

Removal

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

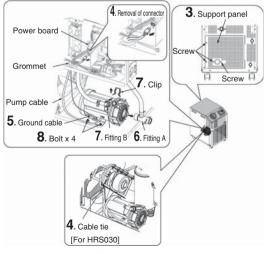




Part number of service parts (Pump (For standard type))

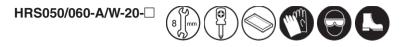
Description	Part number
Pump (For 100 V type)	HRS-S0022
Pump (For 200 V type)	HRS-S0066
Pump (For HRS030)	HRS-S0361

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 3. Remove the support panel. (Screw x 4)
- 4. Remove the connector of the pump cable from the power board. * For the HRS030, cut the cable tie of the pump cable fixed to the fan motor bracket.
- 5. Place the drain pan beneath fitting A. Remove fitting A to discharge water in the pump.
- 6. Remove the clip mounted to fitting B to remove fitting B.
- 7. Remove bolts to remove the pump. (Bolt x 4)
- 8. Remove the ground cable (G4) attached to the pump. (Screw x 1)



Removal of pump

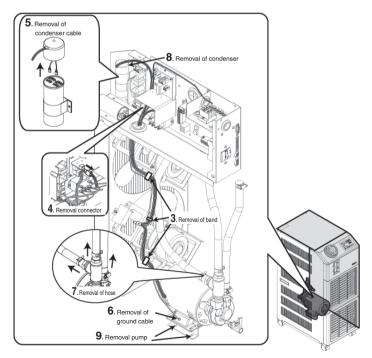
4



Part number of service parts (Pump)

Description	Part number
Pump	HRS-S0088
Pump (For option M)	HRS-S0089

- 1. Discharge the circulating fluid referring to the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the right referring to the removal and the mounting of the panel.
- 3. Remove the band. (3 locations)
- 4. Remove the connector of the pump cable from the power board.
- 5. Remove the cable from the condenser.
- 6. Remove the ground cable (G3) attached to the pump. (Screw x 1)
- 7. Remove the hose attached to the pump. (3 pcs.)
- 8. Remove the condenser. (Screw x 1)
- 9. Remove the pump. (Screw x 4)



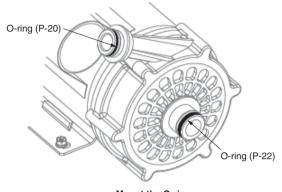
Removal of pump



Mounting



1. Mount O-ring to the pump. (2 O-rings) * Size is different. (Refer to the figure below.)



Mount the O-ring

Connect the ground cable (G4).
 * There are two washers inside. Hold the ground cable between them to fix it to the pump.



3. Insert the pump to the notch of the base. Hand tighten the screw to the end. When the position is fixed, tighten with a screwdriver. (Bolt x 2)



- 4. Mount fitting to two locations. * Apply grease.
- 5. Put the pump connector through the grommet from the bottom in order to connect to the power board.
 - * For the HRS030, fix the pump cable on the fan motor bracket with a cable tie to prevent the pump cable from touching the fan.
- 6. Mount the support panel. (Screw x 4)

(2 pcs. of the left side)





(2 pcs. of the drain port)

7. Mount the upper panel and the right panel in reversed order of removal.

Δ

HRS050/060-A/W-20-

1. Mount the pump. (Screw x 4)



2. Mount the hose. (2 pcs.)

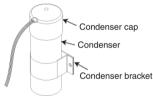
Tightening torque of hose between pump and circulating fluid outlet: 29N

- 3. Connect the ground cable (G3). (Screw x 1)
- 4. Mount cable to the condenser.



Mount the condenser

5. Mount the cap and bracket to the condenser, and it mount the electrical equipment panel. (Screw x 1)



Mount the condenser

- 6. Mount pump cable to the power board.
- 7. Mount the band. (3 locations)
- 8. Mount the upper panel and the right panel in reversed order of removal.

Replacement of high pressure pump

Removal

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

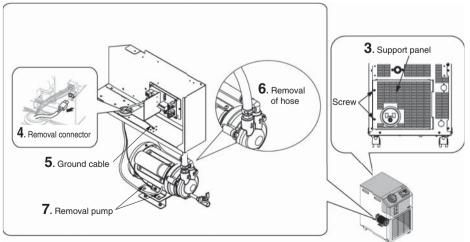




Part number of service parts (High pressure pump)

Description	Part number
High pressure pump (For 100 V type option T)	HRS-S0265
High pressure pump (For 100 V type option MT)	HRS-S0266

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 3. Remove the support panel. (Screw x 2)
- 4. Remove the connector of the pump cable from the power board.
- 5. Remove the ground cable (G4) attached to the pump. (Screw x 1)
- 6. Remove the hose attached to the pump. (2 pcs.)
- 7. Remove the pump. (Screw x 4)



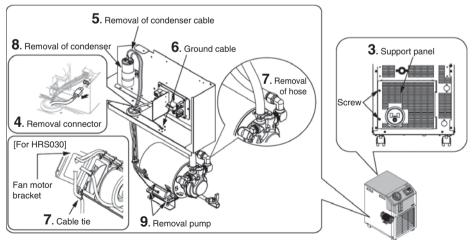
Removal of high pressure pump



Part number of service parts (High pressure pump)

Description	Part number
High pressure pump (For 200 V type option T) (HRS012/018/024)	HRS-S0062
High pressure pump (For 200 V type option T) (HRS030)	HRS-S0299
High pressure pump (For 200 V type option MT) (HRS012/018/024)	HRS-S0063
High pressure pump (For 200 V type option MT) (HRS030)	HRS-S0300

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 3. Remove the support panel. (Screw x 2)
- 4. Remove the connector of the pump cable from the power board.
- 5. Remove the cable from the condenser.
- 6. Remove the ground cable (G4) attached to the pump. (Screw x 1) * For the HRS030, cut the cable tie of the pump cable fixed to the fan motor bracket.
- 7. Remove the hose attached to the pump. (2 pcs.)
- 8. Remove the condenser. (Screw x 1)
- 9. Remove the pump. (Screw x 4)



Removal of high pressure pump

Mounting

HRSDD-A/W-10-T

- 1. Mount the pump. (Screw x 4)
- 2. Mount the hose. (2 pcs.)

Tightening torque of hose between high pressure pump and circulating fluid outlet:

- 3. Connect the ground cable (G4). (Screw x 1)
- 4. Mount pump cable to the power board.
- 5. Mount the support panel. (Screw x 2)

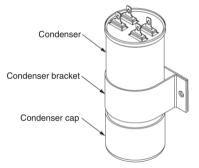


6. Mount the upper panel and the right panel in reversed order of removal.

3.04

HRSDD-A/W-20-T

1. Mount the cap and bracket to the condenser, and it mount the electrical equipment panel. (Screw x 1)



Mount the condenser

- 2. Mount the pump. (Screw x 4)
- 3.0N · m
- 3. Mount the hose. (2 pcs.)

Tightening torque of hose between high pressure pump and circulating fluid outlet:



- 4. Connect the ground cable (G4). (Screw x 1)
- 5. Mount cable to the condenser.
- 6. Mount pump cable to the power board.
 - * For the HRS030, fix the pump cable on the fan motor bracket with a cable tie to prevent the pump cable from touching the fan.
- 7. Mount the support panel. (Screw x 2)



8. Mount the upper panel and the right panel in reversed order of removal.

Replacement of mechanical seal set

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.



HRS0¹-A/W-10- (M) T (For high pressure pump 100 V type)

Part number of service parts (Mechanical seal set)

Description	Part number
Mechanical seal set [For 100 V type option T]	HRS-S0390
Mechanical seal set [For 100 V type option MT]	HRS-S0412

HRS□□-A/W-20- (M) T (For high pressure pump 200 V type) HRS050/060-A/W-20- (M)

Part number of service parts (Mechanical seal set)

Description	Part number
Mechanical seal set [For 200 V type option T, MT]	HRG-S0211

O-ring size

These service parts include three of O-rings.

Please use A for HRS012/018/024/030 series (Only the high pressure pump).

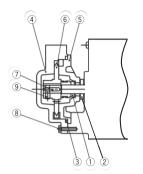
O-ring size

Chiller model	O-ring type	Remarks
HRS012/018/024/030 series	А	Only the high pressure pump (Option T)
HRS050/060 series	В	-
HRG010 series	С	-

* For details, refer to page 409.

Internal construction of pump

The internal construction of the pump is as follows.

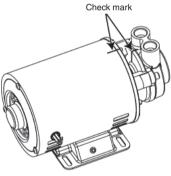


No.	Description	
1	Mechanical seal	
2	Deflector rubber	
3	O-ring	
(4)	(Body)	
(5)	(Cover)	
6	(Impeller)	
7	(Key)	
8	(Set screw)	
9	(Hexagon socket head bolts)	

Internal construction of pump

Removal

- 1. Remove the high pressure pump referring the replacement of high pressure pump
- 2. Before disassembling the pump, place a "check mark" on the body, cover, and the motor.



Check mark

- **3.** Remove the body. (Hexagon socket head bolt x 3) Place the drain pan under the body and drain water from the pump.
- 4. Remove the impeller and spring.

Tips

There is a danger of parts popping out. If the impeller gets stuck and cannot be removed, screw two screws of M6 x 50 mm or larger into the two thread holes of the impeller to pull out the impeller.

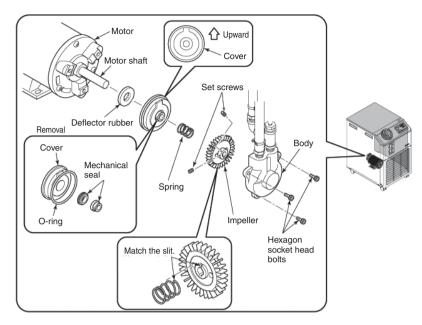
5. Remove the mechanical seal, O-ring and cover all in one.

Tips

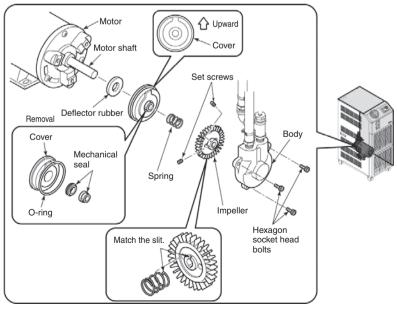
If the cover cannot be removed, insert the blade of the spanner/wrench between the cover and motor and bring it up.

6. Remove the deflector rubber.

HRS012/018/024



HRS050/060



Removal of mechanical seal set

Mounting

4.

- 1. Mount the deflector rubber to the motor shaft.
- 2. Mount the O-ring and mechanical seals (2 pcs.) onto the cover and onto the motor shaft.

Tips

Push the mechanical seal to the end. The mounting direction of the cover is specified. Pay attention to the direction. Align "check marks." (See How to Removal 2.)

3. Mount the spring and impeller onto the motor shaft. (Set screw x 2)

Tips

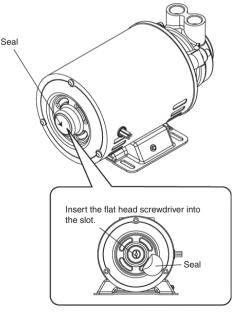
The direction of the spring is determined by the key of the impeller.

- Mount the body onto the motor. (Hexagon socket head bolt x 3)
- Remove the tape on the back of the motor. Insert the flat blade driver to rotate the motor shaft and check if the impeller rotates smoothly. Re-tape after checking. (Refer to the rotation verification of impeller below.)

Tips

The motor shaft does not rotate smoothly when the impeller comes into contact with the body or cover. Remove the body, and adjust the impeller.

6. Mount the high pressure pump referring the replacement of high pressure pump.



Rotation verification of impeller

Replacement of fan

Removal

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.



Part number of service parts (Fan)

Description	Part number
Fan (For 100 V type)	HRS-S0023
Fan (For 200 V type) (HRS012/018/024)	HRS-S0067
Fan (For 200 V type) (HRS030)	HRS-S0301

- 1. Remove the upper panel and the panels on both sides referring the removal and the mounting of the panel.
- 2. Remove the fan motor pin from the connector of the compressor cable. (2 pcs.)

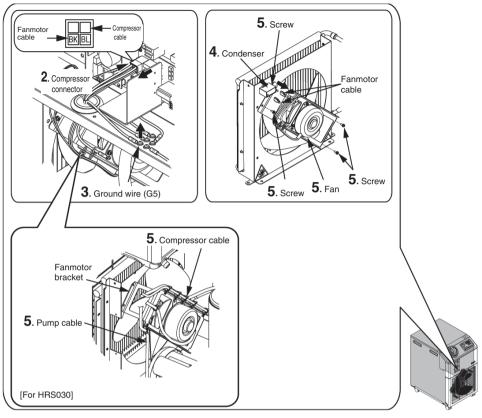
Tips

Use VLJ-20 of J.S.T. Mfg. Co., Ltd for removing pins. Our part no. : HRS-S0055

- 3. Remove the ground wire (G5). (Screw x 1)
- 4. Remove the condenser. (Screw x 1)
- 5. Remove the fan. (Screw x 4)
 - * For the HRS030, cut the cable ties of the pump cable (1 place) and the compressor cable (5 places) fixed to the fan motor bracket.

Δ

Maintenance



Removal of fan



Part number of service parts (Fan)

Description	Part number
Fan	HRS-S0099

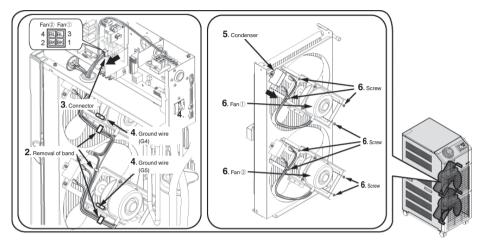
- 1. Remove the upper panel and the panels on both sides referring to the removal and the mounting of the panel.
- 2. Remove the band. (3 locations)
- Remove the fan motor pin from the connector of the compressor cable. (2 pcs.) Insert the fan motor cable into the compressor cable connector. (Fan①: No. 1 and No. 3; Fan②: No. 2 and No. 4)

Tips

Use VLJ-20 of J.S.T. Mfg. Co., Ltd for removing pins. Our part no.: HRS-S0055

SMC

- 4. Remove the ground wire (Fan 1): G4, Fan 2): G5) mounted on the fan to be replaced. (Screw x 1)
- 5. Remove the condenser. (Screw x 1)
- 6. Remove the fan. (Screw x 4)



Removal of fan

Mounting

HRS012/018/024-A

1. Mount the fan. (Screw x 4)



2. Mount the condenser. Then, mount the fan motor cable. (Screw x 1) Connect the pink cable to the left, black cable to the right.



3. Insert the fan motor cable to the compressor cable connector.



Black: No. 1 Blue: No. 3 * BK is black, BL is blue.

4. Mount the ground wire (G5). (Screw x 1)



- * For the HRS030, fix the pump cable (1 place) and the compressor cable (5 places) to the fan motor bracket with cable ties.
- 5. Mount the upper panel and the panels on both sides in reversed order of removal.

HRS050/060-A-20-

1. Mount the fan. (Screw x 4)

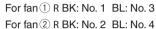


 Mount the condenser. Then, mount the fan motor cable. (Screw x 1) Connect the pink cable to the left, black cable to the right.



3. Insert the fan motor cable to the compressor cable connector.





- * BK is black, BL is blue.
- 4. Mount the ground wire (Fan 1): G4, Fan 2): G5). (Screw x 1)



5. Mount the upper panel and the panels on both sides in reversed order of removal.

Replacement of level switch

Removal

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

HRS012/018/024-A/W-D



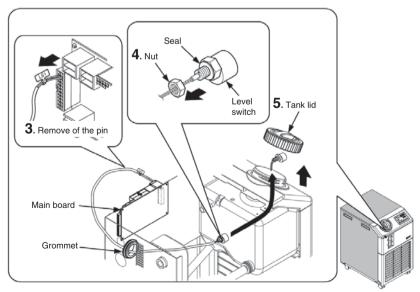
Part number of service parts (Level switch)

Description	Part number
Level switch	HRS-S0014

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the left referring the removal and the mounting of the panel.
- 3. Remove the level switch pin [LS1] (two red lines) from the main board.

Tips Use "57031-6000" of MOLEX for removing. Our part no.: HRS-S0056

- 4. Remove the nut with a spanner/wrench.
- 5. Remove the lid of the tank and take out the level switch from the tank.



Removal of level switch



Part number of service parts (Level switch)

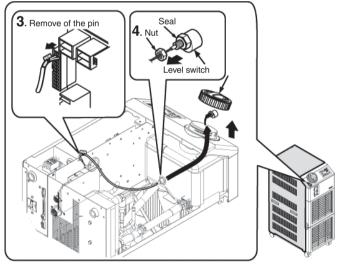
Description	Part number
Level switch	HRS-S0014

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the left referring the removal and the mounting of the panel.
- 3. Remove the level switch pin [LS1] (two red lines) from the main board.

Tips

Use "57031-6000" of MOLEX for removing. Our part no.: HRS-S0056

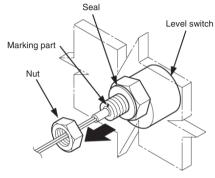
- 4. Remove the nut with a spanner/wrench.
- 5. Remove the lid of the tank and take out the level switch from the tank.



Removal of level switch

HRS012/018/024-00-00 HRS050/060-00-00

- 1. Mount the marking tie at approx. 40 \pm 5 mm away from the cable end.
- 2. Remove the nut of the level switch.
- 3. Mount the nut after mounting the level switch to the tank. (Nut x 1)

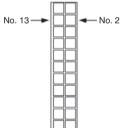


Mount of level switch

Tips

The marking part of the level switch faces upward.

4. Put the level switch cable [LS1] (2 pcs.) through the grommet. Insert the pin to the connector. (No. 2 & No. 13)



Location to mount the connector

Tips

It does not matter which connector [LS1] is mounted to which socket.

- 5. Mount the upper panel and the side panel on the left in reversed order of removal.
- 6. Mount the lid of the tank.

Replacement of pressure sensor

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

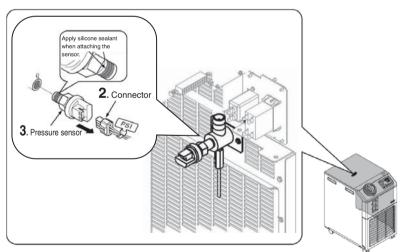
HRS012/018/024-00-00 HRS050/060-00-00



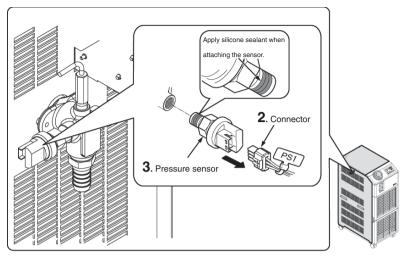
Part number of service parts (Pressure sensor)

Description	Part number
Pressure sensor (For circulating fluid)	HRS-S0011

- 1. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 2. Remove the connector of the pressure sensor cable (PS1) from the pressure sensor.
- 3. Remove the pressure sensor.



Removal of pressure sensor



Removal of pressure sensor

HRS012/018/024/030-00-00

HRS050/060-00-00

1. Apply a liquid gasket to the threads of the pressure sensor and mount it.

2. Mount the connector of the pressure sensor cable (PS1) to the pressure sensor.

3. Mount the upper panel and the side panel on the right in reversed order of removal.

Replacement of dustproof filter

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

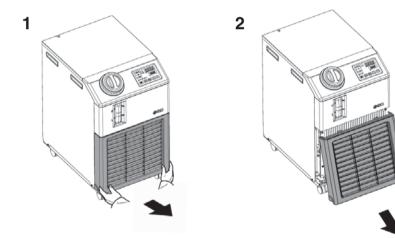
HRS012/018/024/030-□□-□□ HRS050/060-□□-□□



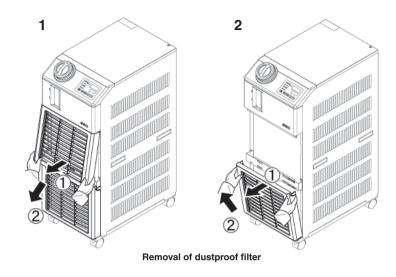
Part number of service parts (Dustproof filter)

Description	Part number
Dustproof filter	HRS-S0001

- 1. Pull out the lower part of the side surface of the dustproof filter.
- 2. When the magnet comes off, pull the dustproof filter downwards to remove. Care should be taken not to deform or scratch the air-cooled condenser.



Removal of dustproof filter



HRS012/018/024/030-00-00 HRS050/060-00-00

1. Mount the dustproof filter in reversed order of removal.

Replacement of front panel

🛆 WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

HRS012/018/024/030-A/W-



Part number of service parts (Front panel)

From production in March 2015 (After serial No. TQ***)

Description	Part number
Front panel	HRS-S0519

Until production in February 2015 (Serial No. TP*** or earlier)

Description	Part number
Front panel A	HRS-S0006
Front panel B	HRS-S0005

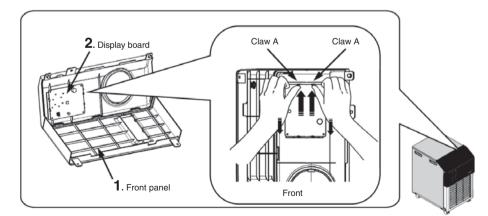
* For serial No., refer to Product label in the Operation Manual.

From production in March 2015 (After serial No. TQ***)

- 1. Remove the upper panel, the panels on both sides and the front panel referring the removal and the mounting of the panel.
- 2. Remove the display board.

Tips

Push the claws A at the back of the front panel with both thumbs to open the front panel. Pull the display board with fingers to remove the display board.

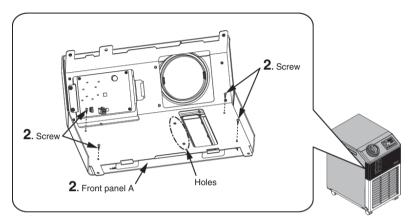


Removal of front panel

4

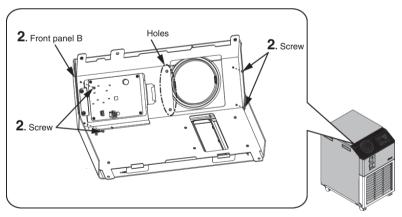
Until production in February 2015 (Serial No. TP*** or earlier)

- 1. Remove the upper panel, the panels on both sides and the front panel referring the removal and the mounting of the panel.
- 2. Remove the front panel A. (Screw x 4)



Removal of front panel A

3. Remove the front panel B. (Screw x 4)



Removal of front panel B

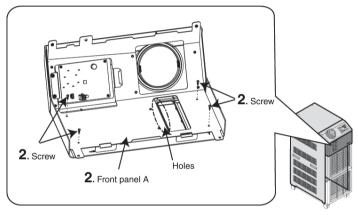
HRS050/060-A/W-20-



Part number of service parts (Front panel A)

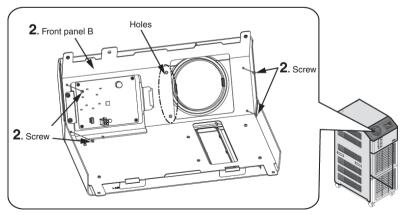
Description	Part number	
Front panel A	HRS-S0006	
Part number of service parts (Front panel B)		
Part number of servic	e parts (Front panel B)	
Part number of servic Description	e parts (Front panel B) Part number	

- 1. Remove the upper panel, the panels on both sides and the front panel referring the removal and the mounting of the panel.
- **2.** Remove the front panel A. (Screw x 4)



Removal of front panel A

3. Remove the front panel B. (Screw x 4)



Removal of front panel B

4

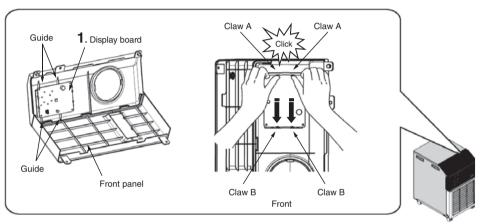
HRS012/018/024/030-A/W-D

From production in March 2015 (After serial No. TQ***)

1. Mount the display board.

Tips

Align with the 4 guides at the back of the front panel, set the end of the display board to the 2 claws B. Pull the display board forward while pushing the 2 claws A out with both thumbs until the claws click.



Mounting of front panel

2. Mount the upper panel, the panels on both sides and the front panel in reversed order of removal.

Until production in February 2015 (Serial No. TP*** or earlier)

1. Mount the front panel B. (Screw x 4)

Tips

Mount front panel B aligning with holes at the center.

2. Mount the front panel A. (Screw x 4)

Tips

Mount front panel A aligning with holes at the center.

3. Mount the upper panel, the panels on both sides and the front panel in reversed order of removal.

HRS050/060-A/W-20-

1. Mount the front panel B. (Screw x 4)

Tips

Mount front panel B aligning with holes at the center.

2. Mount the front panel A. (Screw x 4)

Tips

Mount front panel A aligning with holes at the center.

3. Mount the upper panel, the panels on both sides and the front panel in reversed order of removal.

Replacement of tank

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

HRS012/018/024/030-A/W-□ HRS050/060-A/W-20-□



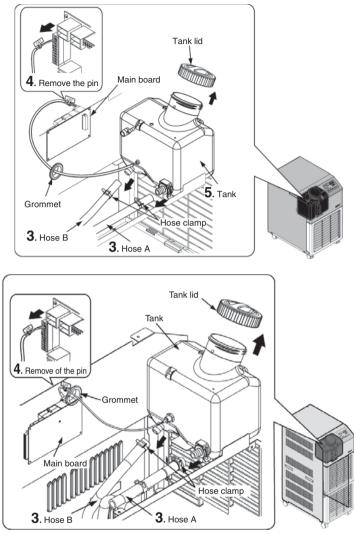
Part number of service parts (Tank)

Description	Part number
Tank	HRS-S0025

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel, the panels on both sides and the front panel referring the removal and the mounting of the panel.
- 3. Remove the hose clamp and remove hose A and hose B.
- 4. Remove the level switch pin [LS1] (two red lines) from the main board.

Tips Use "57031-6000" of MOLEX for removing. Our part no.: HRS-S0056

5. Remove the tank.



Removal of tank

HRS012/018/024/030-A/W-J (With automatic water fill function) HRS050/060-A/W-20-J



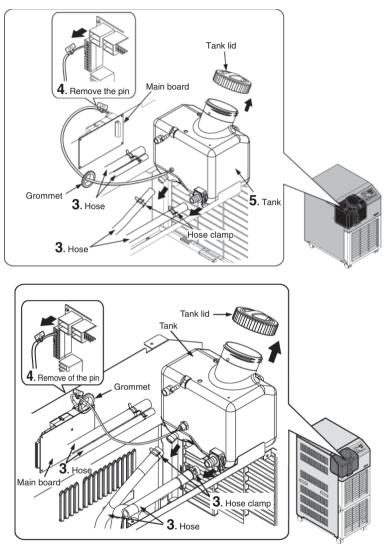
Part number of service parts (Tank (For automatic water fill))

Description	Part number
Tank (For automatic water fill)	HRS-S0072

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel, the panels on both sides and the front panel referring the removal and the mounting of the panel.
- 3. Remove the hose clamp and remove hoses. (4 pcs.)
- 4. Remove the level switch pin [LS1] (two red lines) from the main board.

Tips Use "57031-6000" of MOLEX for removing. Our part no.: HRS-S0056

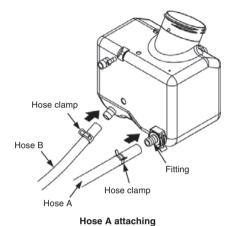
5. Remove the tank.



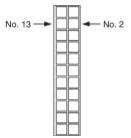
Removal of tank (With automatic water fill function)

■ Mounting HRS012/018/024/030-A/W-□ HRS050/060-A/W-20-□

- 1. Install the tank.
- 2. Assemble the fitting mounted to the tank and hose A.



- 3. Mount the hose B.
- 4. Put the level switch cable [LS1] (2 pcs.) through the grommet. Insert the pin to the connector. (No. 2 & No. 13)





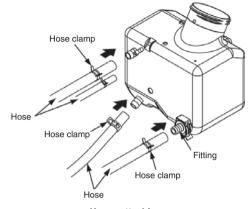
Tips

It does not matter which connector [LS1] is mounted to which socket.

- 5. Mount the upper panel, the panels on both sides and the front panel in reversed order of removal.
- 6. Mount the tank lid.

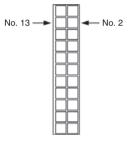
HRS012/018/024/030-A/W- $\Box\Box$ -J (With automatic water fill function) HRS050/060-A/W-20-J

- 1. Install the tank.
- 2. Mount the hoses and fitting to the tank. (4 pcs.)



Hoses attaching

 Put the level switch cable [LS1] (2 pcs.) through the grommet. Insert the pin to the connector. (No. 2 & No. 13)



Location to mount the connector

Tips

It does not matter which connector [LS1] is mounted to which socket.

- 4. Mount the upper panel, the panels on both sides and the front panel in reversed order of removal.
- 5. Mount the tank lid.

Maintenance

Replacement of inlet socket



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

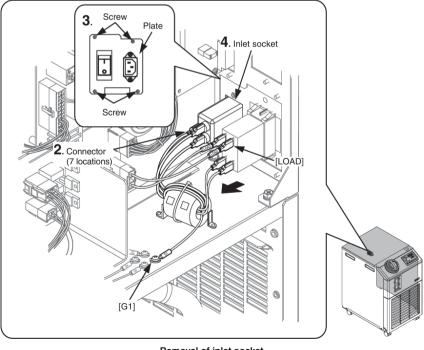
HRS012/018/024/030-A/W-D



Part number of service parts (Inlet socket)

Description	Part number
Inlet socket	HRS-S0021

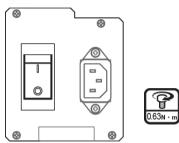
- 1. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- **2.** Remove the connector. (7 locations)
- 3. Remove the plate. (Screw x 4)
- 4. Remove the inlet socket. (Screw x 2)



Removal of inlet socket

HRS012/018/024/030-A/W-

1. Mount the inlet socket. (Screw x 2) * Be careful of the mounting direction.

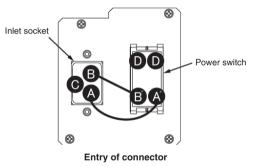


Mounting direction in inlet socket

2. Mount the plate. (Screw x 4)



3. Insert wiring to terminal A-A', B-B', [G1] to terminal C, [LOAD] to terminal D.



4. Mount the upper panel and the side panel on the right in reversed order of removal.

4

Replacement of power switch

⚠ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

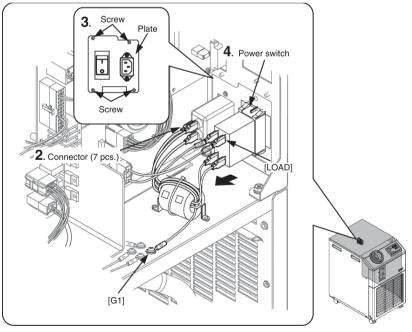
HRS012/018/024/030-A/W-D



Part number of service parts (Power switch)

Description	Part number	Applicable models
Power switch (For 10 A type)	HRS-S0020	 For 200 V type (Except high pressure pump)
Power switch (For 15 A type)	HRS-S0070	For 100 V type For high pressure pump 200 V type

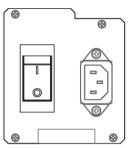
- 1. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 2. Remove the connector. (7 locations)
- 3. Remove the plate. (Screw x 4)
- 4. Remove the power switch.



Removal of power switch

HRS012/018/024/030-A/W-D

- 1. Mount the power switch.
 - * Be careful of the mounting direction.

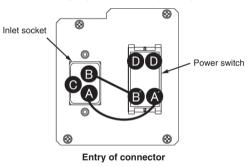


Mounting direction in power switch

2. Mount the plate. (Screw x 4)



3. Insert wiring to terminal A-A', B-B', [G1] to terminal C, [LOAD] to terminal D.



4. Mount the upper panel and the side panel on the right in reversed order of removal.

4

Replacement of DC power supply

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

HRS - - - A/W-



Part number of service parts (DC power supply)

Description	Part number
DC power supply	HRS-S0016

HRS050/060-A/W-20-



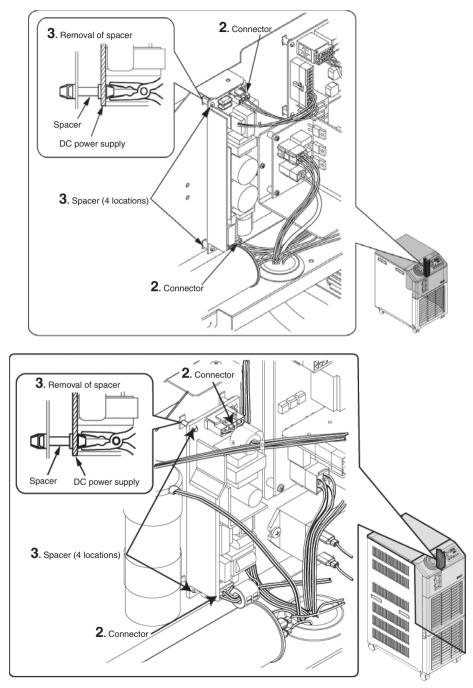
Part number of service parts (DC power supply)

Description	Part number
DC power supply	HRS-S0087

- 1. Remove the upper panel, the side panel on the right and the front panel referring the removal and the mounting of the panel.
- 2. Remove the connector of DC power supply. (2 locations)
- 3. Hold the spacer (4 locations) to remove DC power supply.

4

Maintenance



Mounting HRS012/018/024/030-A/W-HRS050/060-A/W-

- **1.** Mount the DC power supply. (Spacer x 4)
- 2. Mount the connector (2 locations).
- 3. Mount the upper panel, the side panel on the right and the front panel in reversed order of removal.

Replacement of main board & communication board

MARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

HRS012/018/024/030-A/W-D



Part number of service parts (Main board and communication board)

Description	Part number	Applicable models	Remarks
-	HRS-S0033	HRS012-A-10	
	HRS-S0282	HRS012-A-10-T	_
	HRS-S0283	HRS012-A-10-MT	
	HRS-S0034	HRS012-W-10	_
	HRS-S0284	HRS012-W-10-T	_
Γ	HRS-S0285	HRS012-W-10-MT	
Γ	HRS-S0035	HRS018-A-10	_
	HRS-S0286	HRS018-A-10-T	_
	HRS-S0287	HRS018-A-10-MT	_
	HRS-S0036	HRS018-W-10	_
Γ	HRS-S0288	HRS018-W-10-T	_
	HRS-S0289	HRS018-W-10-MT	
Γ	HRS-S0037	HRS012-A-20	
	HRS-S0078	HRS012-A-20-G	_
	HRS-S0038	HRS012-A-20-T	_
-	HRS-S0079	HRS012-A-20-GT	_
	HRS-S0039	HRS012-A-20-MT	_
	HRS-S0080	HRS012-A-20-GMT	_
	HRS-S0040	HRS012-W-20	_
	HRS-S0041	HRS012-W-20-T	_
	HRS-S0042	HRS012-W-20-MT	_
	HRS-S0043	HRS018-A-20	_
	HRS-S0081	HRS018-A-20-G	_
Main board*	HRS-S0044	HRS018-A-20-T	
	HRS-S0082	HRS018-A-20-GT	
	HRS-S0045	HRS018-A-20-MT	
	HRS-S0083	HRS018-A-20-GMT	
	HRS-S0046	HRS018-W-20	
	HRS-S0047	HRS018-W-20-T	
-	HRS-S0048	HRS018-W-20-MT	
	HRS-S0049	HRS024-A-20	
-	HRS-S0084	HRS024-A-20-G	
-	HRS-S0050	HRS024-A-20-T	
-	HRS-S0085	HRS024-A-20-GT	
-	HRS-S0051	HRS024-A-20-MT	
-	HRS-S0086	HRS024-A-20-GMT	
-	HRS-S0052	HRS024-W-20	
_	HRS-S0053	HRS024-W-20-T	
	HRS-S0054	HRS024-W-20-1	
-	HRS-S0290	HRS030-A-20	
-	HRS-S0291	HRS030-A-20-T	
	HRS-S0292	HRS030-A-20-MT	
	HRS-S0292	HRS030-A-20-M1	
-	HRS-S0293	HRS030-W-20 HRS030-W-20-T	
-	HRS-S0294 HRS-S0295	HRS030-W-20-1 HRS030-W-20-MT	
-	NN9-90299	ппо000-W-20-IVI I	
	HRS-S0134	HRS012,018,024/030 series	Be sure to perform an initial setting of the main board.
Communication board	HRS-S0018	-	

The main board has to be selected either one of options listed. HRS-S0033 to HRS-S0054 and HRS-S0078 to HRS-S0086 and HRS-S0282 to HRS-S0295 are preset their initial setting. HRS-S0134 is universal part so it needs initial setting after replace the board.



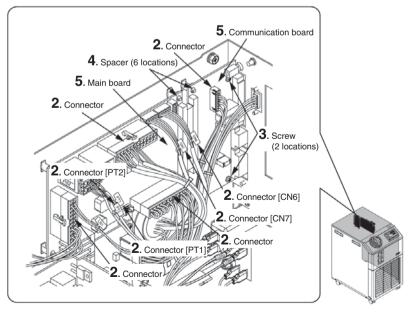
Part number of service parts (Main board and communication board)

Description	Part number	Applicable models	Remarks
Main board*	HRS-S0090	HRS050-A-20	—
	HRS-S0091	HRS050-W-20	—
	HRS-S0296	HRS060-A-20	
	HRS-S0297	HRS060-W-20	
	HRS-S0135	HRS050/060 series	Be sure to perform an initial setting of the main board.
Communication board	HRS-S0018		—

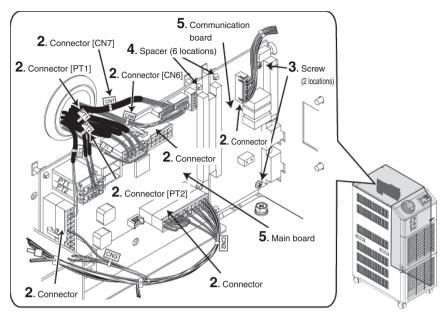
* The main board has to be selected either one of options listed. HRS-S0090 and HRS-S0091, S0296, S0297 are preset their initial setting. HRS-S0135 is universal part so it needs initial setting after replace the board.

1. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.

- 2. Remove the connector of main board and communication board. (7 locations)
- 3. Remove the screw (2 locations) of communication board.
- 4. Hold the spacer (6 locations) to remove main board and communication board. (Refer to the figure on page 302.)
- 5. Remove the communication board from main board.



Removal of main board & communication board



Removal of main board & communication board

HRS012/018/024/030-A/W-D HRS050/060-A/W-20-D

- 1. Insert the main board to the communication board.
- 2. Mount the main board and communication board. (Spacer x 6)
- 3. Mount the screw of communication board. (2 locations)



- 4. Mount the connector of the main board and the communication board. (7 locations)
- Mount the upper panel and the side panel on the right in reversed order of removal.
 * When replacing the main control board, HRS-S0134, be sure to perform an initial setting of the main board. Please refer to the initial setting procedure attached to the service parts.

Replacement of power board

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

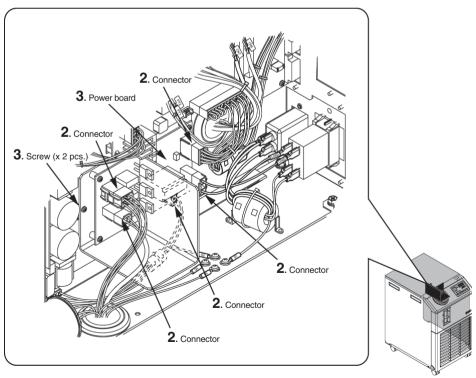
HRS012/018/024/030-A/W-□ HRS050/060-A/W-20-□

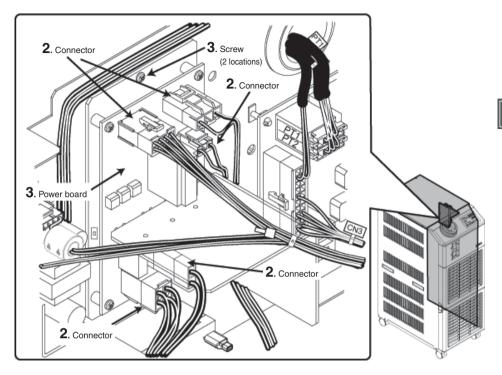


Part number of service parts (Power board)

Description	Part number	
Power board	HRS-S0019	

- 1. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 2. Remove the connector of power board. (5 locations)
- 3. Remove the power board. (Screw x 2)





HRS012/018/024/030-A/W-D HRS050/060-A/W-20-D

1. Mount the power board. (Screw x 2)



- 2. Mount the connector of power board. (5 locations)
- 3. Mount the upper panel and the side panel on the right in reversed order of removal.

4

Replacement of display board

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal





Part number of service parts (Display board)

From production in March 2015 (After serial No. TQ***)

· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	
Description	Part number	Description	Part number
Display board	HRS-S0520	Display board	HRS-S0017

* For serial No., refer to Product label in the Operation Manual.

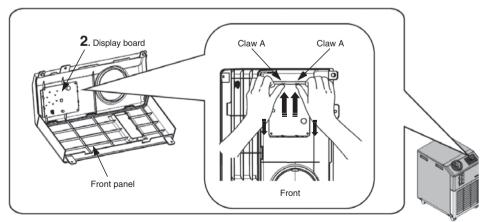
Until production in February 2015 (Serial No. TP*** or earlier)

From production in March 2015 (After serial No. TQ***)

- 1. Remove the upper panel, the panels on both sides and the front panel referring the removal and the mounting of the panel.
- 2. Remove the display board.

Tips

Push the claws A at the back of the front panel with both thumbs to open the front panel. Pull the display board with fingers to remove the display board.

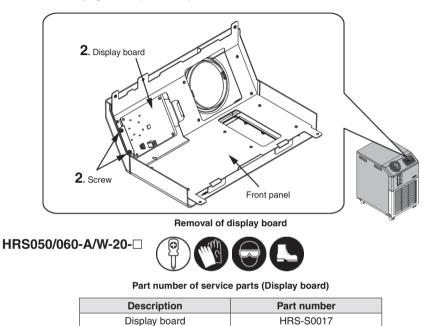


Removal of display board

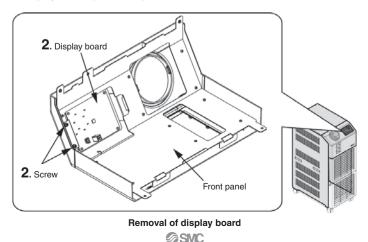


Until production in February 2015 (Serial No. TP*** or earlier)

- 1. Remove the upper panel, the panels on both sides and the front panel referring the removal and the mounting of the panel.
- 2. Remove the display board. (Screw x 2)



- 1. Remove the upper panel, the panels on both sides and the front panel referring the removal and the mounting of the panel.
- 2. Remove the display board. (Screw x 2)



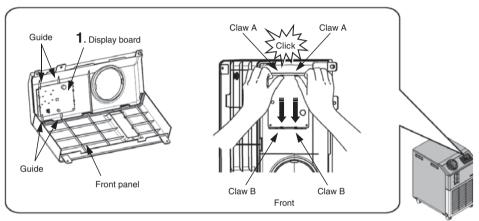
HRS012/018/024/030-A/W-

From production in March 2015 (After serial No. TQ***)

1. Mount the display board.

Tips

Align with the 4 guides at the back of the front panel, set the end of the display board to the 2 claws B. Pull the display board forward while pushing the 2 claws A out with both thumbs until the claws click.



Mount the display board

2. Mount the upper panel, the panels on both sides and the front panel in reversed order of removal.

Until production in February 2015 (Serial No. TP*** or earlier)

1. Mount the display board. (Screw x 4)



Tips Mount the display board using the notch.

2. Mount the upper panel, the panels on both sides and the front panel in reversed order of removal.

HRS050/060-A/W-20-

1. Mount the display board. (Screw x 4)



Tips Mount the display board using the notch.

2. Mount the upper panel, the panels on both sides and the front panel in reversed order of removal.

Replacement of hose

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

HRS012/018/024/030-A/W-D

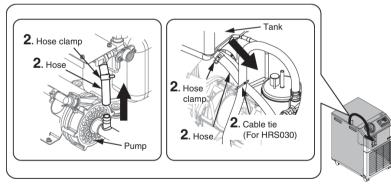


Part number of service parts (Hose)

Description	Part number
Hose	HRS-S0008
Hose (For HRS030)	HRS-S0302
Hose (For high pressure pump MT)	HRS-S0069
Hose (For high pressure pump MT) (For HRS030)	HRS-S0304
Hose (For high pressure pump T)	HRS-S0077
Hose (For high pressure pump T) (For HRS030)	HRS-S0303

Between tank-pump

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the panels on both sides referring the removal and the mounting of the panel.
- 3. Remove the hose clamp and remove the hose.
 - * For the HRS030, cut the cable tie which fixes the hose between the pump and circulating fluid outlet port.



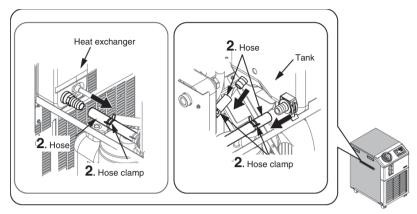
Removal of hose (Between tank-pump)

Between tank-heat exchanger

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the left referring the removal and the mounting of the panel.
- 3. Remove the hose clamp on the tank side. (2 locations)
- 4. Remove the tank.

∕ SMC

^{5.} Remove the hose clamp on the heat exchanger side and remove the hose.



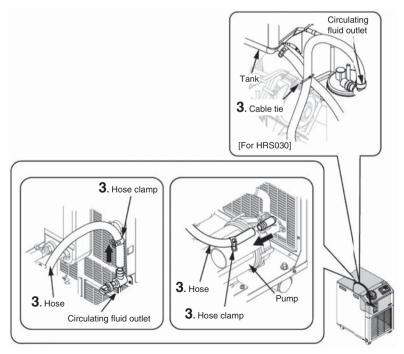
Removal of plastic hose (Between tank-heat exchanger)

Between pump-circulating fluid outlet

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.

3. Remove the hose clamp and remove hose.

* For the HRS030, cut the cable tie which fixes the hose between the pump and tank.

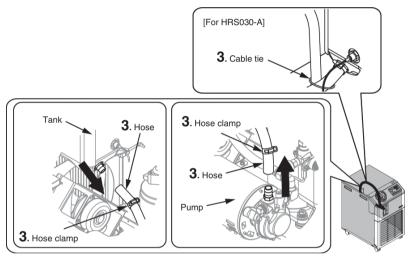


Removal of plastic hose (Between pump-circulating fluid outlet)

High pressure pump

Between tank-pump

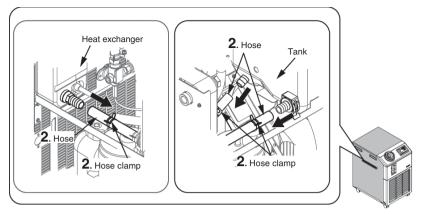
- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the panels on both sides referring the removal and the mounting of the panel.
- 3. Remove the hose clamp and remove hose.
 - * For the HRS030-A, cut the cable tie which fixes the hose between the pump and circulating fluid outlet port.



Removal of plastic hose (Between tank-pump)

Between tank-heat exchanger

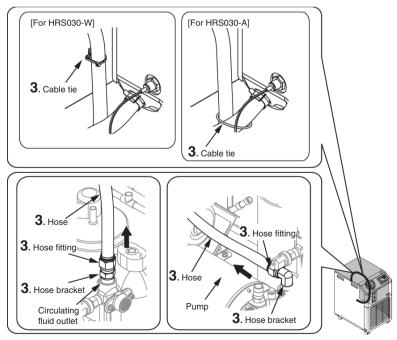
- 4. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 5. Remove the upper panel and the side panel on the left referring the removal and the mounting of the panel.
- 6. Remove the hose clamp on the tank side. (2 locations)
- 7. Remove the tank.
- 8. Remove the hose clamp on the heat exchanger side and remove the hose.



Removal of plastic hose (Between tank-heat exchanger)

Between pump-circulating fluid outlet

- 1. Discharge the circulating fluid referring the discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 3. The hose fitting is loosened and remove the hose.
 - * For the HRS030-A, cut the cable tie which fixes the hose between the tank and pump.
 - * For the HRS030-W, cut the cable tie fixed on the electrical panel.



Removal of plastic hose (Between pump-circulating fluid outlet)

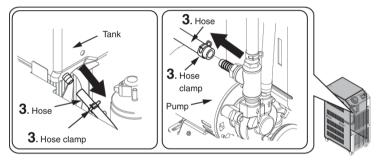


Part number of service parts (Hose)

Description	Part number
Hose	HRS-S0097
Hose (For HRS060)	HRS-S0362

Between tank-pump

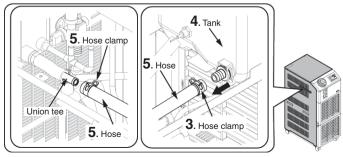
- 1. Discharge the circulating fluid referring to discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the panels on both sides referring to removal and the mounting of the panel.
- 3. Remove the hose clamp and remove the hose.



Removal of hose (Between tank-pump)

Between tank-union tee

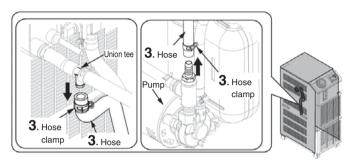
- 1. Discharge the circulating fluid referring to discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the left referring to removal and the mounting of the panel.
- 3. Remove the hose clamp on the tank side. (2 locations)
- 4. Remove the tank.
- 5. Remove the hose clamp on the union tee side and remove the hose.



Removal of hose (Between tank-union tee)

Between heat exchanger-union tee

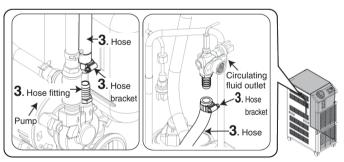
- 1. Discharge the circulating fluid referring to discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the left referring to removal and the mounting of the panel.
- 3. Remove the hose clamp and remove hose.



Removal of plastic hose (Between heat exchanger-union tee)

Between pump-circulating fluid outlet

- 1. Discharge the circulating fluid referring to discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the side panel on the right referring to removal and the mounting of the panel.
- 3. The hose fitting is loosened and remove the hose.

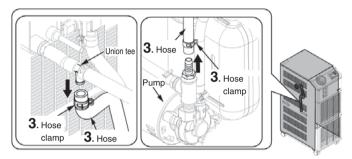


Removal of hose (Between pump-circulating fluid outlet)

4

Between pump-union tee

- 1. Discharge the circulating fluid referring to discharge of the circulating fluid and facility water.
- 2. Remove the upper panel and the panels on both sides referring to removal and the mounting of the panel.
- 3. Remove the hose clamp and remove hose.



Removal of plastic hose (Between pump-union tee)

Mounting

HRS012/018/024/030-A/W-D

Check the hose is not twisted after connecting.

Mounting (Between tank-pump)

- 1. Mount the hose using the hose clamp.
- Hold the hose with the hose clamp.
 * For the HRS030, fix the hose between the pump and circulating fluid outlet port with a cable tie to prevent the hose between the tank and pump from touching the fan motor bracket.
- 3. Mount the upper panel and the panels on both sides in reversed order of removal.

Mounting (Between tank-heat exchanger)

- 1. Mount the hose on the tank using the hose clamp.
- 2. Install the tank.
- 3. Mount the hose on the heat exchanger.
- 4. Hold the hose with the hose clamp. (3 locations)
- 5. Mount the upper panel and the side panel on the left in reversed order of removal.

Mounting (Between pump-circulating fluid outlet)

- 1. Mount the hose using the hose clamp.
- 2. Hold the hose with the hose clamp.
 - * For the HRS030, fix the hose between the tank and pump with a cable tie to prevent the hose between the pump and circulating fluid outlet port from touching the fan motor bracket.
- 3. Mount the upper panel and the side panel on the right in reversed order of removal.

High pressure pump

Check the hose is not twisted after connecting.

Mounting (Between tank-pump)

- 1. Mount the hose using the hose clamp.
- 2. Hold the hose with the hose clamp.
- Mount the upper panel and the panels on both sides in reversed order of removal.
 * For the HRS030-A, fix the hose between the pump and circulating fluid outlet port with a cable tie to prevent the hose between the tank and pump from touching the fan motor bracket.

Mounting (Between tank-heat exchanger)

- 1. Mount the hose on the tank using the hose clamp.
- 2. Install the tank.
- 3. Mount the hose on the heat exchanger.
- 4. Hold the hose with the hose clamp. (3 locations)
- 5. Mount the upper panel and the side panel on the left in reversed order of removal.

Mounting (Between pump-circulating fluid outlet)

1. Mount the hose fitting to the hose bracket.



- 2. Mount the upper panel and the side panel on the right in reversed order of removal.
 - * For the HRS030-A, fix the hose between the tank and pump with a cable tie to prevent the hose between the pump and circulating fluid outlet port from touching the fan motor bracket.
 - * For the HRS030-W, fix the cable tie on the electrical panel.

4

HRS050/060-A/W-20-

Check the hose is not twisted after connecting.

Mounting (Between tank-pump)

- 1. Mount the hose using the hose clamp.
- 2. Hold the hose with the hose clamp.
 - * For the HRS060, bind heat insulation tube around the hose and fix it with a cable tie to prevent it from touching the upper fan motor.
- 3. Mount the upper panel and the side panel on the left in reversed order of removal.

Mounting (Between tank-union tee)

- 1. Mount the hose on the tank using the hose clamp.
- 2. Install the tank.
- 3. Mount the hose on the union tee.
- 4. Hold the hose with the hose clamp. (3 locations)
- 5. Mount the upper panel and the side panel on the left in reversed order of removal.

Mounting (Between pump-circulating fluid outlet)

1. Mount the hose fitting to the hose bracket.



2. Mount the upper panel and the side panel on the right in reversed order of removal.

Mounting (Between heat exchanger-union tee)

- 1. Mount the hose using the hose clamp.
- 2. Hold the hose with the hose clamp.
- 3. Mount the upper panel and the side panel on the left in reversed order of removal.

Mounting (Between pump-union tee)

- 1. Mount the hose using the hose clamp.
- 2. Hold the hose with the hose clamp.
- 3. Mount the upper panel and the panels on both sides in reversed order of removal.

Replacement of fuse

▲ WARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

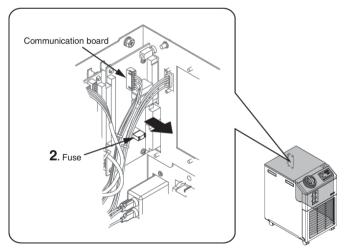
HRS012/018/024/030-A/W-D



Part number of service parts (Fuse)

Description	Part number		
Fuse	HRS-S0024		

- 1. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 2. Remove the fuse.



Removal of fuse

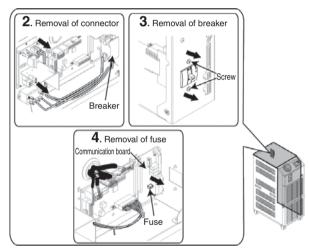
HRS050/060-A/W-20-



Part number of service parts (Fuse)

Description	Part number		
Fuse	HRS-S0024		

- 1. Remove the upper panel and the side panel on the right referring to removal and the mounting of the panel.
- 2. Remove the connector of breaker.
- 3. Remove the breaker. (Screw x 2)
- 4. Remove the fuse.



Removal of fuse

Mounting

HRS012/018/024/030-A/W-D

- 1. Mount the fuse.
- 2. Mount the upper panel and the side panel on the right in reversed order of removal.

HRS050/060-A/W-20-

- 1. Mount the fuse.
- 2. Mount the breaker. (Screw x 2)
- 3. Mount the upper panel and the side panel on the right in reversed order of removal.

Replacement of valve for automatic water fill

MARNING



Be sure to shut off the breaker of the facility power supply (the user's machine power supply) before replacement work.

Removal

HRS012/018/024/030-A/W-J HRS050/060-A/W-20-J



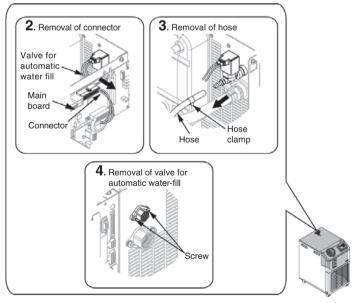
Part number of service parts (Valve for automatic water fill)

Description	Part number	
Valve for automatic water fill	HRS-S0071	

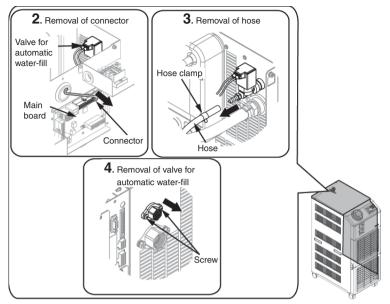
- 1. Remove the upper panel and the side panel on the right referring the removal and the mounting of the panel.
- 2. Remove the cable connector of valve from the main board.

Tips Use "57031-6000" of MOLEX for removing. Our part no.: HRS-S0056

- 3. The hose mounted on valve for automatic water fill is removed.
- 4. Remove the valve for automatic water fill.



Removal of valve for automatic water fill



Removal of valve for automatic water fill

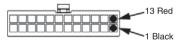
Mounting

HRS012/018/024/030-A/W-J HRS050/060-A/W-20-J

1. Mount the valve for automatic water fill.



2. Mount the cable connector of valve to the main board.



Mount the connector of valve for automatic water fill

3. Mount the hose.

Spare parts for replacement of the compressor HRS012/018/024/030-A/W-10/20

Model	Part No	Part name	Qty.	Photo
HRS012-A/W-10 HRS018-A/W-10 HRS024-A/W-10 HRS030-A/W-10	HRS-S0409	Compressor (Include accessories)	1	
HRS012-A/W-20 HRS018-A/W-20 HRS024-A/W-20 HRS030-A/W-20	HRS-S0068	Compressor (Include accessories)	1	

Table 4-3. Tools list for repairing refrigerant circuit

▲ WARNING



There is danger of an electric shock. Make sure to turn OFF the power supply before performing replacement work.

There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.



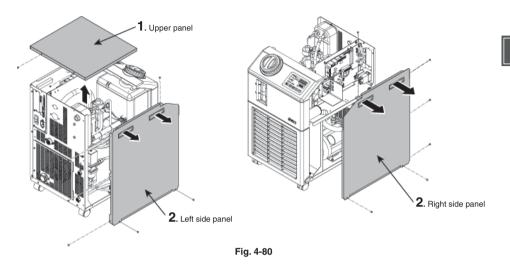
Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

4

Maintenance

Disassembly

- 1. Remove the upper panels.
- 2. Remove the left side panel and right side panel.



3. Remove the cap of the high pressure service port on the refrigerant circuit, and then mount a charge valve.

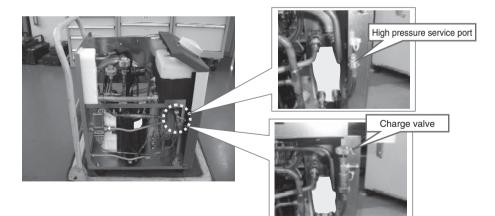
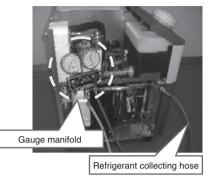


Fig. 4-81

4. Connect the hose of the gauge manifold to the charge valve, and then collect the refrigerant gas, with the refrigerant collector.



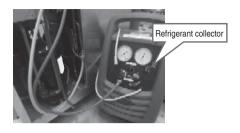


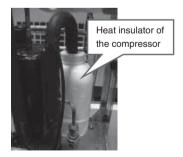
Fig. 4-82

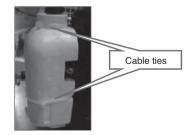
5. Open the terminal cover of the compressor, and disconnect the wirings (R,S,T).



Fig. 4-83

6. Cut the cable ties with a pair of nippers, and remove the heat insulator of the accumulator.





wirings



7. Remove the heat insulator and remove the fixture from the thermistor sensor.

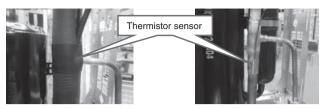


Fig. 4-85

8. Remove the earth wiring.

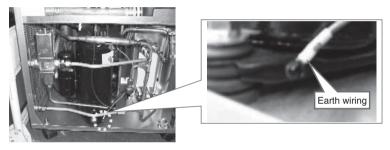


Fig. 4-86

- **9.** Warm the brazing filler material of the suction piping A and outlet piping B, using the welding equipment. After melting the brazing filler material, hold and pull out the suction piping A and outlet piping B with pliers.
 - * The suction piping A and outlet piping B of the compressor are to be reused. Use caution not to deform or melt the copper tubings when disconnecting them.

▲ DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.

The collection and the disposal of refrigerant (HFC) and compressor oil must be in compliance with the bylaws of the local municipality.

Δ

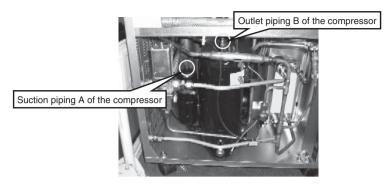


Fig. 4-87

10. Loosen the fitting with a spanner, and remove the facility water pipings A and B, and refrigerant piping flare.



Fig. 4-88

- 11. Loosen and remove the hexagon head nut of the feet of the compressor.
 - * Since it is difficult to remove the hexagon head bolt 3, remove the support panel first

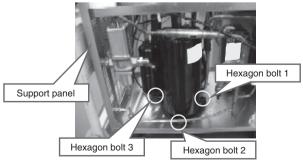


Fig. 4-89

Remount

- 1. Mount the compressor on the base while aligning it to the holes, and hold it with flat washers and hexagon head bolts by using a spanner.
 - * Do not remove the two rubber caps of the compressor until immediately before brazing in order to prevent oxidization inside the compressor.

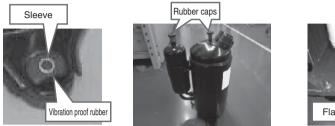




Fig. 4-90

2. Remove the rubber caps. Insert copper piping into the suction piping A and outlet piping, and braze them.Mount the refrigerant piping flare to the water control valve.

▲ DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.
 - * When brazing, make sure to wear protective glasses for brazing, and do not directly look at the flame.
 - * Before starting to braze, nitrogen gas must be applied inside the copper pipe to avoid oxidization of the internal surface of the copper pipe.
 - * After brazing is complete, confirm that the brazing filler material is applied to the entire brazed part by visual observation.



Fig. 4-91

- 3. Check for any leakage from the brazed parts by filling the refrigerant circuit with refrigerant gas and nitrogen gas.
 - Fill the refrigerant gas (R407C) into the refrigerant circuit until the gas pressure reaches 0.29 MPa, and fill the nitrogen gas into the refrigerant circuit until the gas pressure reaches 1.37 MPa.
- 4. Check for leakage at the brazed parts using a leak detector. Set value of the leakage detector: 1.5×10^{-5} std. cc/sec





- 5. Collect the refrigerant gas and nitrogen gas used for the leakage check.
 ① Entrust a special industrial waste disposal trader with the mixture of refrigerant gas and nitrogen gas which you have collected.
- 6. After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.

The charging hose (Red) shall be 0.92 m length.

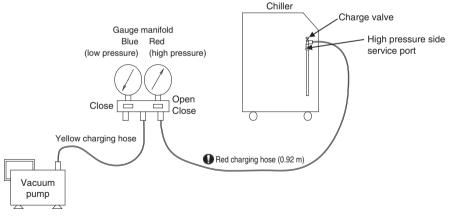


Fig. 4-93

Unit g

7. Charge the specified amount of the refrigerant gas (Refer to Table 4-4.).

Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.

- * Use a regularly calibrated scale to measure the gas to be filled in.
- * If air is left inside the hose between the refrigerant cylinder and the service port, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.
- The service port is located at high pressure side.

So you cannot add refrigerant during the system in operation.

Refrigerant	Chiller Model				
	HRS012-W-10 HRS018-W-10	HRS012-W-20 HRS018-W-20 HRS024-W-20	HRS030-W-20		
R407C	255 ±5 g	300 ±5 g	495 ±15 g		

Table 4-4. The amount of refrigerant

Refer the refrigerant charge procedure HRX-MM-Q018

They contain useful tips to keep the charge amount controlled.

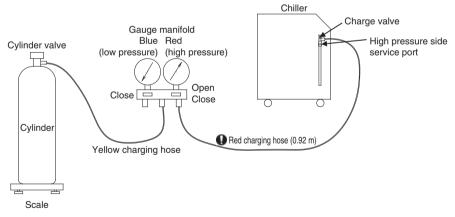


Fig. 4-94

4

 Confirm that no refrigerant gas leaks from the service port Loosen the charge valve if there is no leakage of the refrigerant gas. (This closes the spring loaded check valve.)

Disconnect the hose of the charge valve, and remove the charge valve. Mount the cap nut to the service port, and tighten it with a spanner.

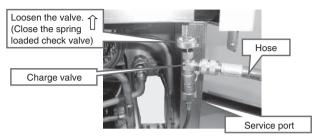


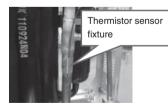
Fig. 4-95

9. Connect the facility water piping A and B. Mount the heat insulator of the accumulator with cable ties (At 2 parts)



Fig. 4-96

10. Install the thermistor sensor with a fixture, and affix a heat insulator.



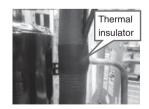
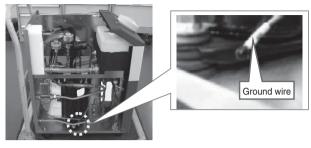


Fig. 4-97

11. Connect the grounding wire of the compressor.





12. Insert wiring (R, S, T) into the terminals of the compressor, and close the cover by tightening the nut.

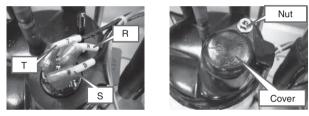


Fig. 4-99

13. Mount the panels in order, from left panel, right panel and upper panel. Test the operation to confirm that the temperature control is correctly performed. The replacement work is now completed, if temperature is controlled within the range of +/- 0.3°C of the set temperature.



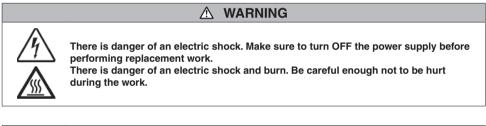
Fig. 4-100

4

Replacement procedure of compressor HRS050/060-A/W-20

Model	Part No.	Description	Qty.	Image
HRS050-A/W-20 HRS060-A/W-20	HRS-S0337	Compressor, (Include accessories)	1	

Table 4-5 Replacement parts





Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

Disassembly

1. Remove the upper panel, dust-proof filter, side panel.

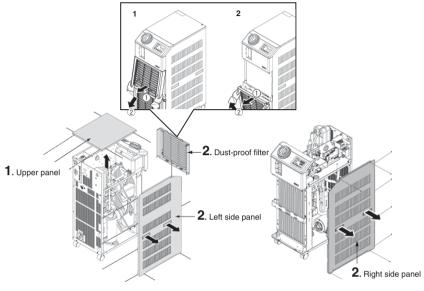


Fig. 4-101

Remove the cap of the service port on the refrigerant circuit, and then mount a charge valve.
 [Air-Cooled type]

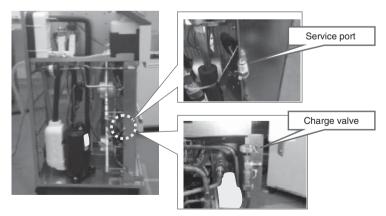


Fig. 4-102



[Water-Cooled type]

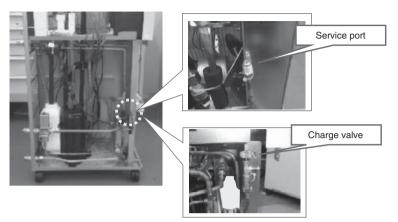


Fig. 4-103

3. Connect the hose of the gauge manifold to the high pressure service port, and then collect the refrigerant gas, with the refrigerant collector.

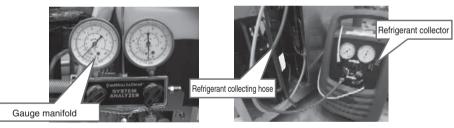


Fig. 4-104

4. Open the terminal cover of the compressor, and disconnect the wirings (R,S,C).



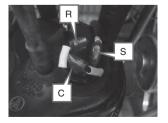


Fig. 4-105

5. Remove the earth wiring.



Fig. 4-106

6. Cut the cable ties with a pair of nippers, and remove the heat insulator of the accumulator.

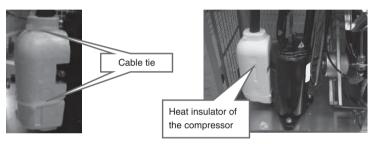


Fig. 4-107

- 7. Warm the brazing filler material of the suction piping A and outlet piping B, using the welding equipment. After melting the brazing filler material, hold and pull out the suction piping A and outlet piping B with pliers.
 - * The suction piping A and outlet piping B of the compressor are to be reused. Use caution not to deform or melt the copper tubings when disconnecting them.



Fig. 4-108

8. Loosen and remove the hexagon head nuts (M8) of the feet of the compressor.



Fig. 4-109

Remount

- 1. Mount the vibration proof rubber and sleeve (Table 1, No.6) on the feet of the compressor while aligning the position of the holes, and mount the compressor on the base.
- 2. Install the flat washer and the hexagon head bolt, and tighten them with a spanner.
 - * Do not remove the two rubber caps of the compressor until immediately before brazing in order to prevent oxidization inside the compressor.

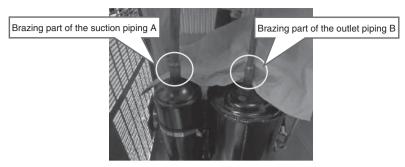




3. Remove the rubber cap. Insert a copper piping to the suction piping A and outlet piping B, and braze them.

▲ DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.
 - * When brazing, make sure to wear protective glasses for brazing, and do not directly look at the flame.
 - * Before starting brazing, nitrogen gas must be applied inside the copper tubing to avoid oxidization of the internal surface of the copper tubing.
 - * After finishing brazing, confirm that the brazing filler material is applied to the entire brazed part by visual observation.





4. Check for any refrigerant leakage from the brazed parts by filling coolant gas and nitrogen gas inside of the refrigerant circuit.

Fill the refrigerant gas (R407C) into the refrigerant circuit until the gas pressure reaches 0.29
 MPa, and fill the nitrogen gas into the refrigerant circuit until the gas pressure reaches 1.37 MPa.

Check for leakage at the brazed parts using a leak detector.
 Set value of the leakage detector: 1.5 x 10⁻⁵ std.cc/sec



Fig. 4-112

- 6. Collect the refrigerant gas and nitrogen gas used for the refrigerant leakage check.
 ① Entrust a special industrial waste disposal trader with the mixture of refrigerant gas and nitrogen gas which you have collected.
- 7. After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.

Use the red hose with specified length (0.92 m).

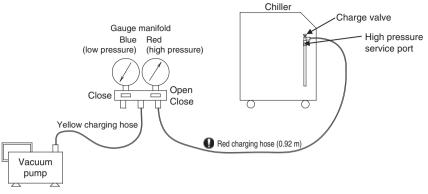


Fig. 4-113

8. Fill the specified amount of refrigerant gas. (See Table 4-6.)

Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.

- * Use a regularly calibrated scale to measure the gas to be filled in.
- * If air is left inside the hose between the refrigerant cylinder and the service port, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.

The service port is located at high pressure side.

The refrigerant cannot be enclosed during operation.

Refrigerant	Model No.			
	HRS050-A□-20 HRS050-W□-20	HRS060-A□-20	HRS060-W□-20	
R410A	655 ±15 g	845 ±15 g	735 ±15 g	

Table 4-6. The amount of refrigerant for each model

Refer the refrigerant charge procedure HRX-MM-Q018

They contain useful tips to keep the charge amount controlled.

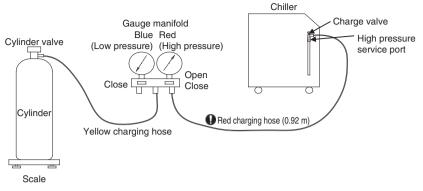


Fig. 4-114

- 9. Confirm that no refrigerant gas leaks from the service port.
- 10. Loosen the charge valve if there is no leakage of the refrigerant gas. (Close the spring loaded check valve.)
- 11. Disconnect the hose of the charge valve, and remove the charge valve.
- 12. Mount the cap nut to the service port, and tighten it with a spanner.

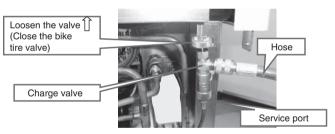


Fig. 4-115

13. Mount the heat insulator of the accumulator with cable ties (at two parts).

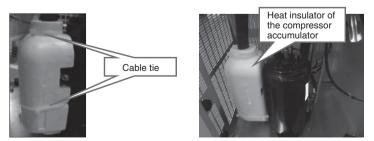


Fig. 4-116

Δ

14. Connect the earth wire to the compressor.

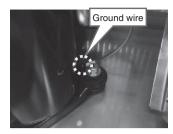
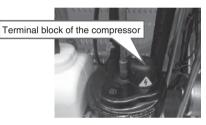


Fig. 4-117

15. Insert the wirings (R, S and C) into the terminals of the compressor. Put the cover onto the terminals, and fix the cover by tightening the nuts.



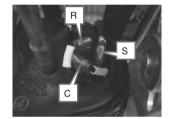


Fig. 4-118

16. Mount the panels in order, from left panel, right panel, dust-proof filter, and upper panel. Test the operation to confirm that the temperature control is correctly performed. The replacement work is now completed, if temperature is controlled within the range of +/- 3.0°C of the set temperature.



Fig. 4-119



Replacement of heat exchanger HRS012/018/024/030/050/060-A/W-10/20

Model	Part No.	Description	Qty.	Image
HRS012-A/W-10/20 HRS018-A/W-10/20 HRS024-A/W-20	HRS-S0030			
HRS012-A/W-10/20-M HRS018-A-W-10/20-M HRS024-A/W-20-M	HRS-S0413	Heat exchanger	1	R
HRS030-A/W-20	HRS-S0380			
HRS030-A/W-20-M	HRS-S0414			81
HRS050-A/W-20 HRS060-A/W-20	HRS-S0184		-	t
HRS050-A/W-20-M HRS060-A/W-20-M	HRS-S0415	Heat exchanger	I	

Table 4-7. Replacement parts

▲ WARNING



There is danger of an electric shock. Make sure to turn OFF the power supply before performing replacement work.

There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.

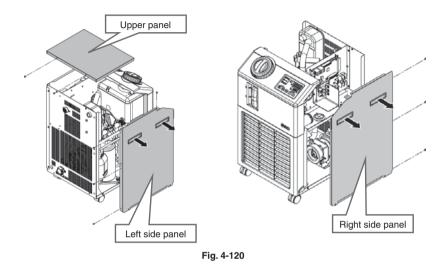


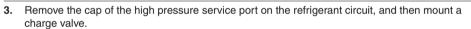
▲ CAUTION

Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

Disassembly

- **1.** Remove the upper panel.
- 2. Remove the left side panel and right side panel.





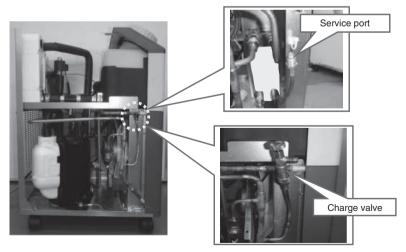
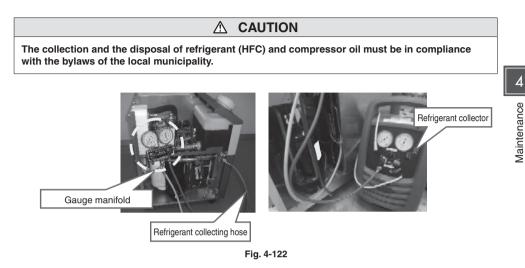
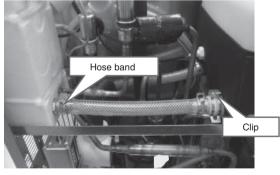


Fig. 4-121

4. Connect the hose of the gauge manifold to the charge valve, and then collect the refrigerant gas, with the refrigerant collector.



5. Remove the hose which is connected to the heat exchanger from the tank and the clip mounted on the tank side. Move the hose band at heat exchanger side (barb fitting side), then pull the hose from the fitting.

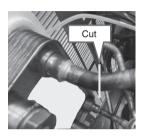




6. Cut the cable ties to remove the thermal insulator of the heat exchanger. Remove the temperature sensor connector. 7. Cut the copper tubes of the heat exchanger.

DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.



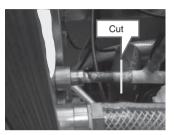


Fig. 4-124

8. Heat the brazed parts where the copper pipes were connected, and pull out the copper pipes (2 pieces) after cutting them. Loosen the domed cap nuts (M6 x 2) and remove the sleeves, thermal insulator and heat exchanger from the panel.

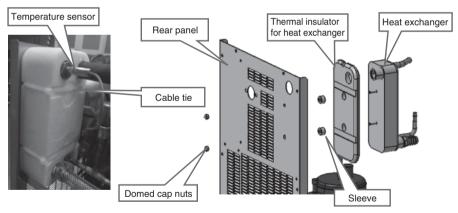


Fig. 4-125

Δ

Maintenance

Remount

1. Loosen the domed cap nuts (M6 x 2) and remove the sleeve, thermal insulator and heat exchanger from the panel.

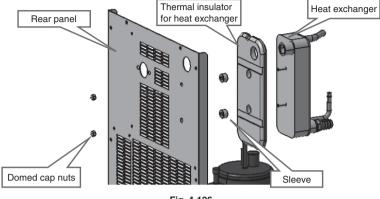


Fig. 4-126

2. Protect the electrical wires and heat insulator with wet waste cloth to prevent them from burning out.

Insert a copper pipe while warming the connection part with a burner, then braze it.

- $\ast\,$ When brazing, make sure to wear protective glasses for brazing, and do not directly look at the flame.
- * Before starting brazing, nitrogen gas must be applied inside the copper tubing to avoid oxidization of the internal surface of the copper tubing.
- * After finishing brazing, confirm that the brazing filler material is applied to the entire brazed part by visual observation.

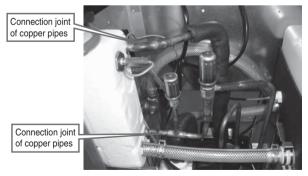


Fig. 4-127

- 3. Check for any refrigerant leakage from the brazed parts by filling coolant gas and nitrogen gas inside of the refrigerant circuit.
 - Fill the refrigerant gas (R407C) into the refrigerant circuit until the gas pressure reaches 0.29
 MPa, and fill the nitrogen gas into the refrigerant circuit until the gas pressure reaches 1.37 MPa.
 - Set value of the leakage detector: (2 x 10⁻⁵ std.cc/sec)



Fig. 4-128

- 4. Collect the refrigerant gas (R407C) and nitrogen gas used for the refrigerant leakage check.
- 5. After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.

The charging hose (Red) shall be 0.92 m length.

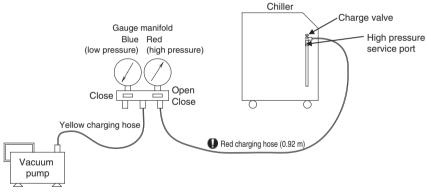


Fig. 4-129

6. Fill the specified amount of refrigerant gas. (See Table 4-8, 9.)

DANGER

- Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.
 - * Use a regularly calibrated scale to measure the gas to be filled.
 - * If air is left inside the hose between the refrigerant cylinder and the charge valve, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.

The refrigerant cannot be enclosed during operation.

Re	efrigerant	HRS012-A-10 HRS018-A-10	HRS012-A-20 HRS018-A-20 HRS024-A-20	HRS012-W-10 HRS018-W-10 255 +5 g	HRS012-W-20 HRS018-W-20 HRS024-W-20	HRS030-A-20	HRS030-W-20
F	R407C	320 ±5 g	350 ±5 g	255 ±5 g	300 ±5 g	565 ±15 g	495 ±15 g

Table 4-8. The amount of refrigerant (HRS012/018/024/030)

Table 4-9. The amount of refrigerant (HRS050/060)

Refrigerant	HRS050-A20	HRS050-W-20	HRS060-A-20	HRS060-W-20
R410A	655 ±15 g	655 ±15 g	845 ±15 g	735 ±15 g

Make sure to refer to Procedure for filling refrigerant gas (HRX-MM-Q018) to fill the refrigerant correctly.

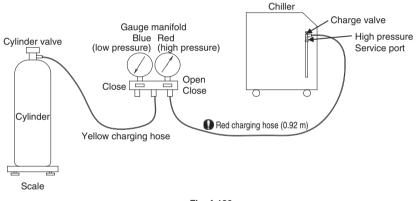
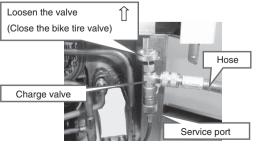


Fig. 4-130

- 7. Confirm that no refrigerant gas leaks from the service port. Loosen the charge valve if there is no leakage of the refrigerant gas. (Close the spring loaded check valve.)
- 8. Disconnect the hose of the charge valve, and remove the charge valve. Mount the cap nut to the service port, and tighten it with a spanner.



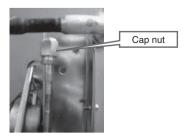


Fig. 4-131

Δ

- 9. Mount the thermal insulators for tube, heat exchanger and electric expansion valve, and hold them in position.
- 10. Connect the circulating water hose for heat exchanger, and hold it with a hose band.
- Remount the panels in order, from left panel, right panel and upper panel. Test the operation to confirm that the temperature control is correctly performed. If the temperature is stabilized to within +/- 3.0°C of the set temperature, the replacement work is completed.

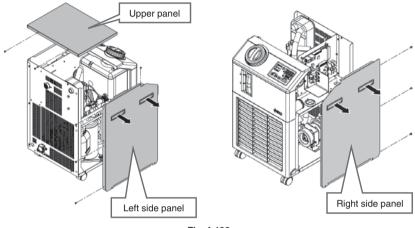


Fig. 4-132

Replacement of air-cooled condenser HRS012 to 060-A-10/20

Model	Part No.	Description	Qty.	Image
HRS012-A-10/20 HRS018-A-10/20 HRS024-A-20	HRS-S0381	Condenser (For Air-cooled)	1	
HRS030-A-20			2	d'international
HRS050-A-20	HRS-S0382	Condenser (For Air-cooled)	1	
HRS060-A-20	HRS-S0383	Condenser (For Air-cooled)	1 set	

Table 4-10. Replacement parts

HRS012/018/024-A-10/20

Disassembly

1. Remove the upper panel, left panel, right panel, dust-proof filter and front panel.

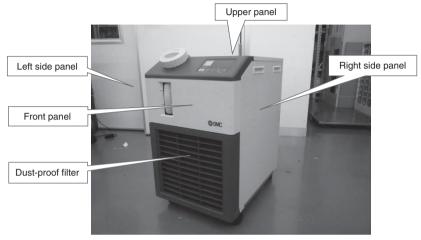
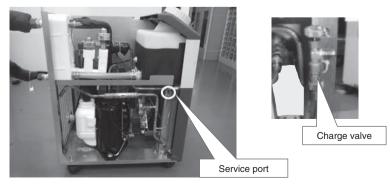


Fig. 4-133

The collection and the disposal of refrigerant (HFC) and compressor oil must be in compliance with the bylaws of the local municipality.

- 2. Hold the lower part of the service port with a spanner, and remove the cap nut. (Spanner size: 14 mm, 17 mm)
- 3. After mounting a charge valve onto the service port, collect the refrigerant gas with a refrigerant gas collector.





@SMC



- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.
- 4. Protect the electrical wires and heat insulator with wet waste cloth to prevent them from burning out.
- 5. Pull the copper pipes out while warming the connection joints of the copper pipes of the air-cooled condenser with a burner.



Fig. 4-135

- 6. Remove the screw of air-cooled condenser. (4 pcs.)
- 7. After removing the display connector inside of the front panel, remove the front panel. (3 parts.)

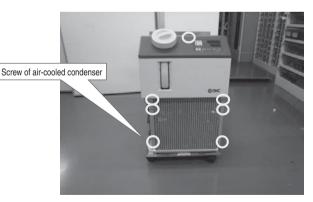






Fig. 4-136

4

- 8. Remove the screws of the tank bracket. (2 pcs.)
- 9. Lift the tank bracket up and remove the Air-Cooled condenser.

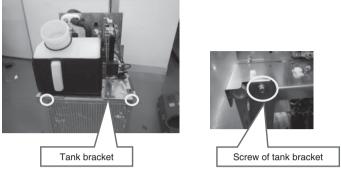


Fig. 4-137

HRS030-A-20

Disassembly

1. Remove the upper panel, left panel, right panel, dust-proof filter and front panel.

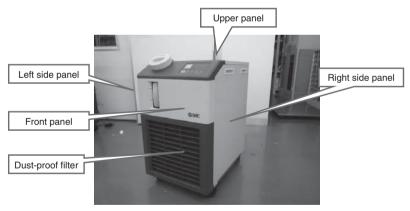


Fig. 4-138

- 2. Hold the lower part of the service port with a spanner, and remove the cap nut. (Spanner size:14 mm,17 mm)
- 3. After mounting a charge valve onto the service port, collect the refrigerant gas with a refrigerant gas collector.

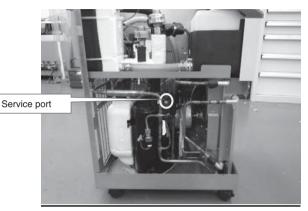




Fig. 4-139

▲ DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.
- 4. Protect the electrical wires and heat insulator with wet waste cloth to prevent them from burning out.
- 5. Pull the copper pipes out while warming the connection joints of the copper pipes of the air-cooled condensers No.1 and No.2 with a burner.

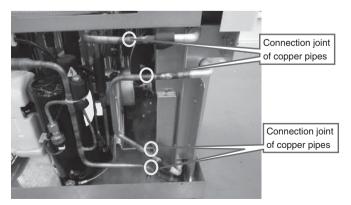


Fig. 4-140

- 6. After removing the display connector backside of the front panel, remove the front panel.
- 7. Remove the screw of Air-Cooled condenser 1.

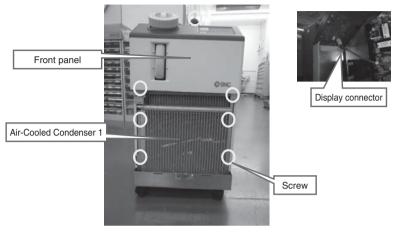


Fig. 4-141

- 8. Remove the screw of Air-Cooled condenser bracket. (Left / 2pcs., right / 3pcs.)
- 9. Lift the tank bracket up and remove the air-cooled condenser 2.

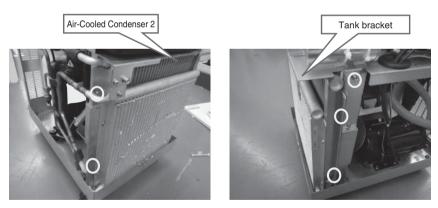


Fig. 4-142

HRS050-A-20

Disassembly

1. Remove the upper panel, left panel, right panel, dust-proof filter.

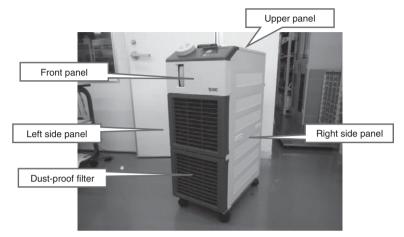
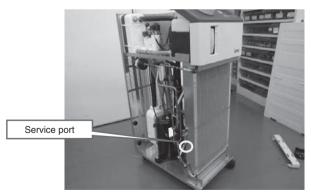


Fig. 4-143

- 2. Hold the lower part of the service port with a spanner, and remove the cap nut. (Spanner size:14 mm,17 mm)
- 3. After mounting a charge valve onto the service port, collect the refrigerant gas with a refrigerant gas collector.





4

Fig. 4-144

▲ DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.
- 4. Protect the electrical wires and heat insulator with wet waste cloth to prevent them from burning out.
- 5. Pull the copper pipes out while warming the connection joints of the copper pipes of the air-cooled condenser with a burner.

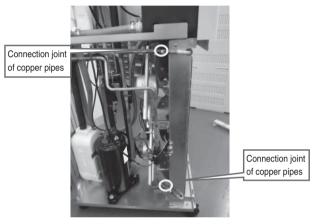


Fig. 4-145

- 6. Remove the bracket of the dust-proof filter.
- 7. Remove the condenser bracket.

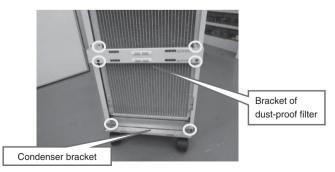


Fig. 4-146

8. Remove the screw of Air-Cooled condenser.

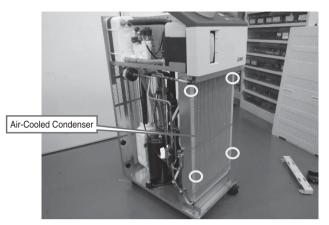


Fig. 4-147

HRS060-A-20

Disassembly

1. Remove the upper panel, left panel, right panel, dust-proof filter.

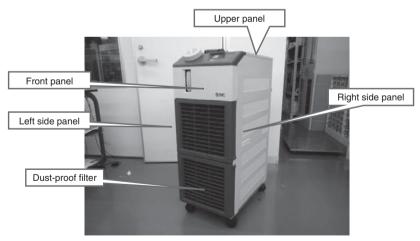


Fig. 4-148

- 2. Hold the lower part of the service port with a spanner, and remove the cap nut. (Spanner size: 14 mm, 17 mm)
- 3. After mounting a charge valve onto the service port, collect the refrigerant gas with a refrigerant gas collector.
- 4. Protect the electrical wires and heat insulator with wet waste cloth to prevent them from burning out.
- 5. Pull the copper pipes out while warming the connection joints of the copper pipes of the air-cooled condenser with a burner.

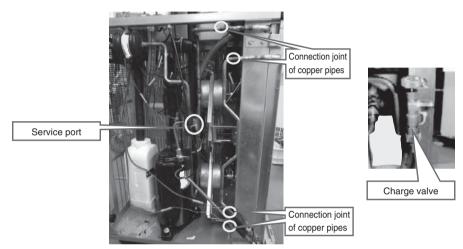


Fig. 4-149

- 6. After removing the display connector inside of the front panel, remove the front panel.
- 7. Remove the screws of the condenser bracket and the air-cooled condenser No.1.

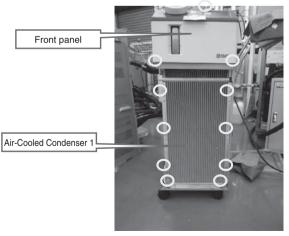






Fig. 4-150

- 8. Remove the condenser bracket, tank bracket.
- 9. Lift the tank bracket up and remove the air-cooled condenser 2.

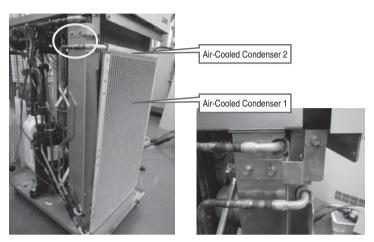


Fig. 4-151

Remount

- 1. Remount the new air-cooled condenser.
- 2. Insert copper pipes while warming the connection joints of the air-cooled condensers and copper pipes with a burner, then braze them.

A DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.
 - * When brazing, make sure to wear protective glasses for brazing, and do not directly look at the flame.
 - * Before starting brazing, nitrogen gas must be applied inside the copper tubing to avoid oxidization of the internal surface of the copper tubing.
 - * After finishing brazing, confirm that the brazing filler material is applied to the entire brazed part by visual observation.
- 3. Check for any refrigerant leakage from the brazed parts by filling coolant gas and nitrogen gas inside of the refrigerant circuit.
 - Fill the refrigerant gas (R407C) into the refrigerant circuit until the gas pressure reaches 0.29 MPa, and fill the nitrogen gas into the refrigerant circuit until the gas pressure reaches 1.37 MPa.
 - \cdot Check for leakage at the brazed parts using a leak detector.
 - \cdot Set value of the leakage detector: (2 x 10^{-5} std.cc/sec)
- Collect the refrigerant gas (R410A,R407C) and nitrogen gas used for the refrigerant leakage check.

- 5. Connect the vacuum pump and draw vacuum for more than 30 minutes.
 - After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.
- 6. Fill the specified amount of refrigerant gas.

Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.

The service port is located at high pressure side.

The refrigerant cannot be enclosed during operation.

Refrigerant	HRS012-A-10 HRS018-A-10	HRS012-A-20 HRS018-A-20 HRS024-A-20	HRS030-A-20
R407C	320 ±5 g	350 ±5 g	565 ±15 g

Table 4-12. The amount of refrigerant (HRS050/060)

Refrigerant	HRS050-A-20	HRS060-A-20
R410A	655 ±15 g	845 ±15 g

Make sure to refer to Procedure for filling refrigerant gas (HRX-MM-Q018) to fill the refrigerant correctly.

- * Use a regularly calibrated scale to measure the gas to be filled.
- * If air is left inside the hose between the refrigerant cylinder and the charge valve, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.
- Remove the charge valve to confirm that no refrigerant leakage occurs from the service port, then, hold the lower part of the service port with a spanner and tighten the cap nut. (Spanner size: 14 mm, 17 mm)
- 8. Test the operation to confirm that the temperature control is correctly performed.





Fig. 4-152

Replacement of water-cooled condenser HRS012 to 060-W-10/20

Model	Part No.	Part name	Appearance
HRS012-W-10 HRS018-W-10 HRS012-W-20 HRS018-W-20 HRS024-W-20	HRS-S0133	Heat exchanger	
HRS030-W-20	HRS-S0384	Heat exchanger	
HRS050-W-20 HRS060-W-20	HRS-S0152	Heat exchanger	

Table 4-13. Replacement parts

▲ WARNING



There is danger of an electric shock. Make sure to turn OFF the power supply before performing replacement work.

There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.



Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

Disassembly

1. Remove the upper panel and side panel.

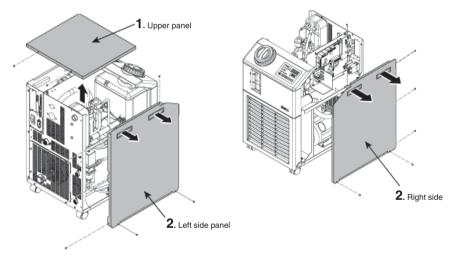


Fig. 4-153

4

Maintenance

2. Mount the charge valve to the service port.

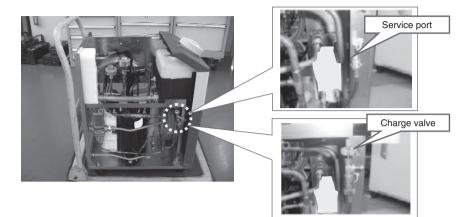


Fig. 4-154

3. Connect the hose of the gauge manifold to the high-pressure service port, and collect the refrigerant gas with the refrigerant collector.

The collection and the disposal of refrigerant (HFC) and compressor oil must be in compliance with the bylaws of the local municipality.

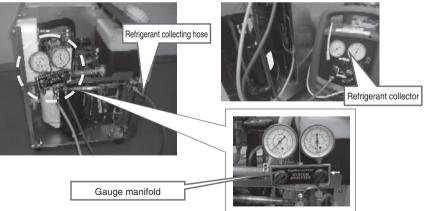
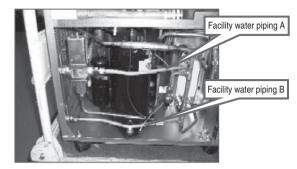


Fig. 4-155



4. Loosen the fittings with a spanner, and remove the facility water piping A and B.

Fig. 4-156

- 5. Melt the brazing filler material at the joint of the copper pipes using the brazing equipment. After melting the brazing filler material, hold and pull out the copper pipes with pliers.
 - * The copper pipe is to be reused. Use caution not to deform or melt the copper pipe when disconnecting it.

▲ DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.

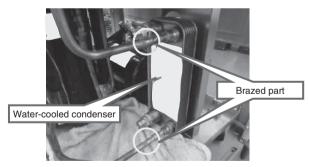


Fig. 4-157

6. Loosen the cap nuts (2pcs.) that are held to the condenser port, and remove the water-cooled condenser.



Fig. 4-158

7. Install a spacer to the holding bolt at the back of the water-cooled condenser. (The spacer is to be reused.)

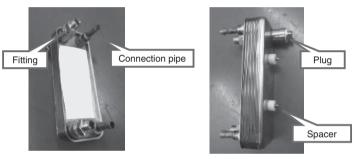


Fig. 4-159

8. Mount the water-cooled condenser assembly to the condenser port (Hexagon cap nut /2pcs.), and braze the joint of the condenser connection pipe.

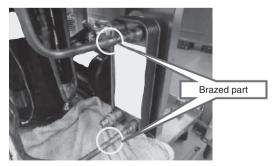


Fig. 4-160

Δ

- 9. Check for any refrigerant leakage from the brazed parts by filling coolant gas and nitrogen gas inside of the refrigerant circuit.
 - Fill the refrigerant gas (R407C) into the refrigerant circuit until the gas pressure reaches 0.29 MPa , and fill the nitrogen gas into the refrigerant circuit until the gas pressure reaches 1.37 MPa.
- 10. Check for leakage at the brazed parts using a leak detector.



Fig. 4-161

- Collect the refrigerant gas and nitrogen used for the refrigerant leakage check.
 Entrust a special industrial waste disposal trader with the mixture of refrigerant gas and nitrogen gas which you have collected.
- **12.** After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.

Use the red hose with specified length (0.92 m).

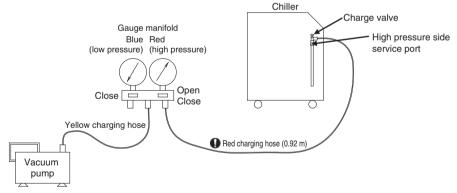


Fig. 4-162

13. Fill the specified amount of refrigerant gas. (See Table 4-14.)

Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.

- * Use a regularly calibrated scale to measure the gas to be filled.
- * If air is left inside the hose between the refrigerant cylinder and the service port, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.

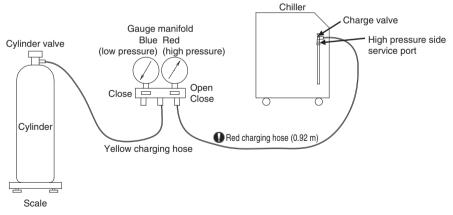
The service port is located at high pressure side.

The refrigerant cannot be enclosed during operation.

Refrigerant					
	HRS012-W-10 HRS018-W-10	HRS012-W-20 HRS018-W-20 HRS024-W-20	HRS030-W-20	HRS050-W-20	HRS060-W-20
R407C	255 ±5 g	300 ±5 g	495 ±15 g	—	—
R410A			_	655 ±15 g	735 ±15 g

Table 4-14. The amount of refrigerant for each model

Make sure to refer to Procedure for filling refrigerant gas (HRX-MM-Q018) to fill the refrigerant correctly.





4

- 14. Confirm that no refrigerant gas leaks from the service port.
- **15.** Loosen the charge valve if there is no leakage of the refrigerant gas. (Close the spring loaded check valve.)
- 16. Disconnect the hose of the charge valve, and remove the charge valve.
- 17. Mount the cap nut to the service port, and tighten it with a spanner.

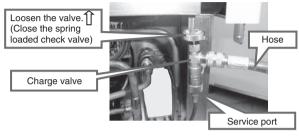


Fig. 4-164

- **18.** Remount the panels in order, from left panel, right panel and upper panel.
- 19. Test the operation to confirm that the temperature control is correctly performed. The replacement work is now completed, if temperature is controlled within the range of +/- 0.3°C of the set temperature.



Fig. 4-165

Replacement of water pressure regulating valve HRS012 to 060-W-10/20

Model	Part No.	Description	Qty.	Image
HRS012-W-10/20 HRS018-W-10/20 HRS024-W-20 HRS030-W-20	HRS-S0385	Water pressure regulating valve	1	
HRS050-W-20 HRS060-W-20	HRS-S0388	Water pressure regulating valve	1	Ţ





▲ WARNING

There is danger of an electric shock. Make sure to turn OFF the power supply before performing replacement work.

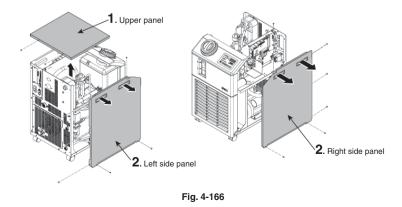
There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.



Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

Disassembly

1. Remove the upper panel and side panel.



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2. Mount the charge valve to the service port.

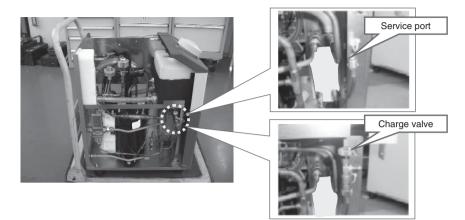


Fig. 4-167

3. Connect the hose of the gauge manifold to the high-pressure service port, and collect the refrigerant gas with the refrigerant collector.

▲ CAUTION

The collection and the disposal of refrigerant (HFC) and compressor oil must be in compliance with the bylaws of the local municipality.

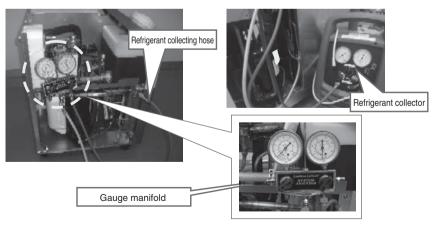
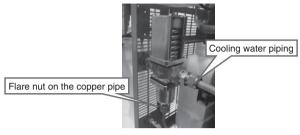


Fig. 4-168

- 4. Remove the cooling water piping.
- 5. Remove the flare nut on the copper pipe





- 6. Remove the facility water piping on the user side.
- 7. Remove the fitting of the water pressure regulating valve on the side of the facility water outlet on the rear panel.

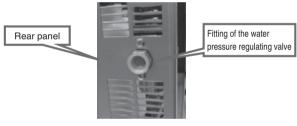


Fig. 4-170

Remount

- 1. Remount the water pressure regulating valve on the rear panel.
- 2. Tighten the flare nut on the copper pipe of the water pressure regulating valve with a spanner. (Spanner size: 17 mm)

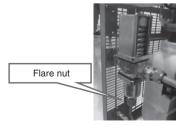


Fig. 4-171

4

- 3. Fill in refrigerant gas and nitrogen gas inside of the refrigerant circuit.
 - Fill the refrigerant gas (R407C) into the refrigerant circuit until the gas pressure reaches 0.29
 MPa, and fill the nitrogen gas into the refrigerant circuit until the gas pressure reaches 1.37 MPa.
- 4. Check for any leakage from the copper pipe flare with a leak detector.



Fig. 4-172

- 5. Collect the refrigerant gas and nitrogen used for the refrigerant leakage check.
 ① Entrust a special industrial waste disposal trader with the mixture of refrigerant gas and nitrogen gas which you have collected.
- 6. After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.

Use the red hose with specified length (0.92 m).

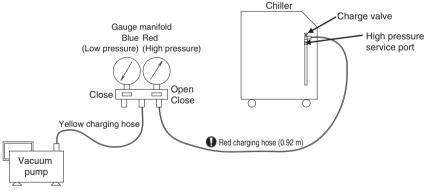


Fig. 4-173

7. Fill the specified amount of refrigerant gas. (See Table 4-16.)

Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.

- * Use a regularly calibrated scale to measure the gas to be filled.
- * If air is left inside the hose between the refrigerant cylinder and the charge valve, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.

The service port is located at high pressure side.

The refrigerant cannot be enclosed during operation.

Refrigerant			Model No.		
	HRS012-W-10 HRS018-W-10	HRS012-W-20 HRS018-W-20 HRS024-W-20	HRS030-W-20	HRS050-W-20	HRS060-W-20
R407C	255 ±5 g	300 ±5 g	495 ±15 g	—	—
R410A		—	—	655 ±15 g	735 ±15 g

Table 4-16. The amount of refrigerant for each model

Make sure to refer to Procedure for filling refrigerant gas (HRX-MM-Q018) to fill the refrigerant correctly.

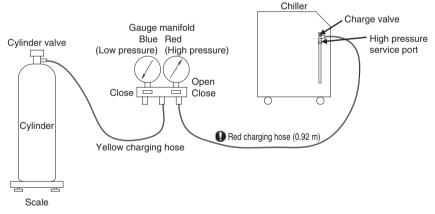


Fig. 4-174

Maintenance

- 8. Confirm that no refrigerant gas leaks from the service port.
- 9. Loosen the charge valve if there is no leakage of the refrigerant gas. (Close the spring loaded check valve.)
- 10. Disconnect the hose of the charge valve, and remove the charge valve.
- 11. Mount the cap nut to the service port, and tighten it with a spanner.

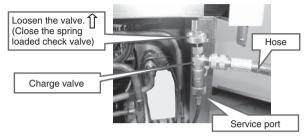


Fig. 4-175

- **12.** Remount the panels in order, from left panel, right panel and upper panel.
- 13. Test the operation to confirm that the temperature control is correctly performed. The replacement work is now completed, if temperature is controlled within the range of +/- 0.3°C of the set temperature.



Fig. 4-176

Δ

Maintenance

Replacement of filter dryer HRS012/018/024/030-A/W10/20

Table 4-17 Replacement parts

Model	Part No.	Description	Qty.	Image
HRS012-A/W-10/20 HRS018-A/W-10/20 HRS024-A/W-20 HRS030-A/W-20	HRZ-S0387	Filter dryer	1	

▲ WARNING



There is danger of an electric shock. Make sure to turn OFF the power supply before performing replacement work.

There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.

Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

Disassembly

1. Remove the upper panel and side panel.

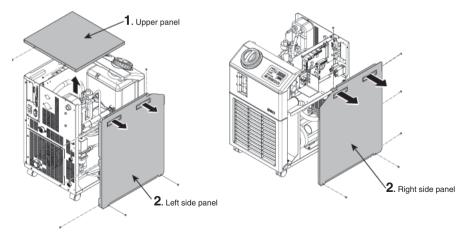


Fig. 4-177

⊘SMC

2. Mount the charge valve to the service port of the refrigerant circuit.

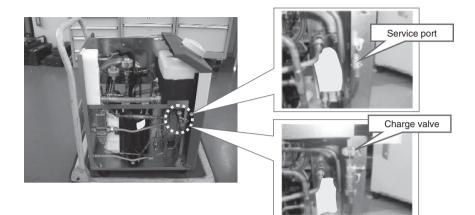


Fig. 4-178

3. Connect the hose of the gauge manifold to the service port, and collect the refrigerant gas with the refrigerant collector.

▲ CAUTION

The collection and the disposal of refrigerant (HFC) and compressor oil must be in compliance with the bylaws of the local municipality.

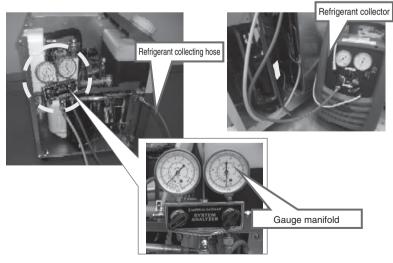


Fig. 4-179

SMC

- 4. Melt the brazing filler material at the joint of the copper pipes using the brazing equipment. After melting the brazing filler material, hold and pull out the copper pipes with pliers.
 - * The copper pipe is to be reused. Use caution not to deform or melt the copper pipe when disconnecting it.

▲ DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.

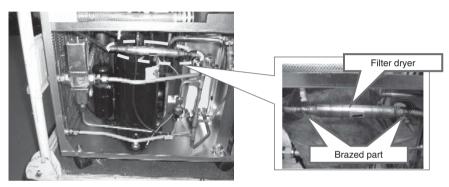


Fig. 4-180

Remount

- 1. Cover the flow direction label on the filter dryer with a wet cloth.Confirm the flow direction of the refrigerant. Insert the copper pipe to the filter dryer, and braze the joint.
 - * Use a regularly calibrated scale to measure the gas to be filled.
 - * If air is left inside the hose between the refrigerant cylinder and the charge valve, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.

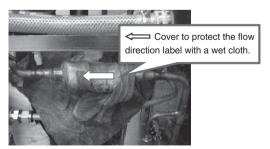


Fig. 4-181

- 2. Check for any leakage from the brazed parts by filling refrigerant gas and nitrogen gas inside of the refrigerant circuit.
- **3.** Check for leakage at the brazed parts using a leak detector. Set value of the leakage detector: 1.5 x 10⁻⁵ std.cc/sec



Fig. 4-182

- Collect the refrigerant gas and nitrogen used for the refrigerant leakage check.
 Entrust a special industrial waste disposal trader with the mixture of refrigerant gas and nitrogen gas which you have collected.
- 5. After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.

The charging hose (Red) shall be 0.92 m length.

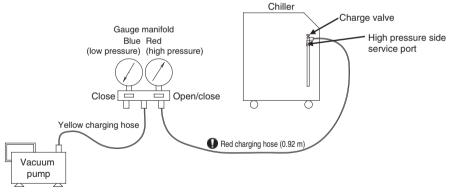


Fig. 4-183

6. Fill the specified amount of refrigerant gas. (See Table 4-18.)

Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.

- * Use a regularly calibrated scale to measure the gas to be filled in.
- * If air is left inside the hose between the refrigerant cylinder and the service port, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.

The service port is located at high pressure side.

So you cannot add refrigerant during the system in operation.

Table 4-18 The amount of refrigerant for each model

Refrigerant	HRS012-A-10 HRS018-A-10	HRS012-W-10	HRS018-A-20	HRS012-W-20 HRS018-W-20 HRS024-W-20	HRS030-A-20	HRS030-W-20
R407C	320 ±5 g	255 ±5 g	350 ±5 g	300 ±5 g	565 ±15 g	495 ±15 g

Refer the refrigerant charge procedure HRX-MM-Q018

They contain useful tips to keep the charge amount controlled.

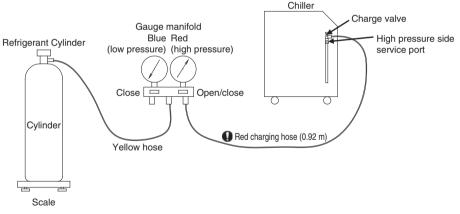


Fig. 4-184

- 7. Confirm that no refrigerant gas leaks from the service port.
- 8. Loosen the charge valve if there is no leakage of the refrigerant gas. (This closes the spring loaded check valve.)
- 9. Disconnect the hose of the charge valve, and remove the charge valve.
- 10. Mount the cap nut to the service port, and tighten it with a spanner.

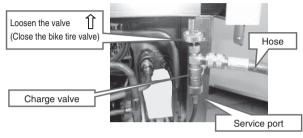


Fig. 4-185

- **11.** Mount the panels in order, from left panel, right panel and upper panel.
- 12.. Test the operation to confirm that the temperature control is correctly performed. The replacement work is now completed, if temperature is controlled within the range of +/- 3.0°C of the set temperature.



Fig. 4-186

Replacement of filter dryer HRS050/060-A/W-20

Table 4-19	Replacement par	rts
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Model	Part No.	Description	Qty.	Image
HRS050-A/W-20 HRS060-A/W-20	HRZ-S0227	Filter dryer	1	



▲ WARNING

∧ CAUTION

There is danger of an electric shock. Make sure to turn OFF the power supply before performing replacement work.

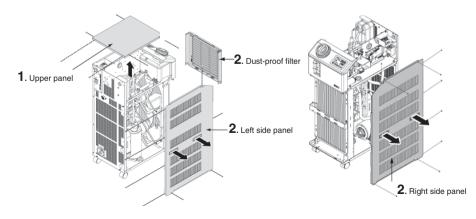
There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.



Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

Disassembly

1. Remove the left panel, right panel and upper panel.



4

2. Remove the cap nut of the high pressure service port on the refrigerant circuit, and then mount a charge valve.

[Air-cooled type]

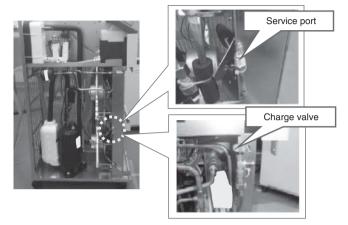


Fig. 4-188

[Water-cooled type]

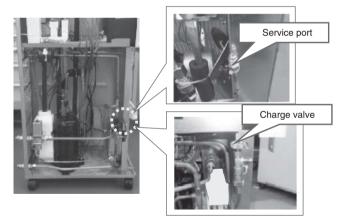


Fig. 4-189

3. Connect the hose of the gauge manifold to the high-pressure service port, and collect the refrigerant gas with the refrigerant collector.

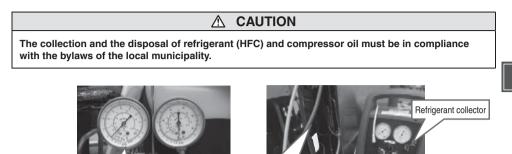


Fig. 4-190

Refrigerant collecting hose

- 4. Melt the brazing filler material at the joint of the copper pipes of the filter dryer using the brazing equipment. After melting the brazing filler material, hold and pull out the copper pipes with pliers.
 - * The copper pipe is to be reused. Use caution not to deform or melt the copper pipe when disconnecting it.

A DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.

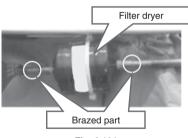


Fig. 4-191

5. Cover the flow direction label on the filter dryer with a wet cloth.

Gauge manifold

- 6. Confirm the flow direction of the refrigerant. Insert the filter dryer to the copper pipes, and braze the joint.
 - * When brazing, make sure to wear protective glasses for brazing, and do not directly look at the flame.
 - * Before starting brazing, nitrogen gas must be applied inside the copper tubing to avoid oxidization of the internal surface of the copper tubing.
 - * After finishing brazing, confirm that the brazing filler material is applied to the entire brazed part by visual observation.



- 7. Check for any leakage from the brazed parts by filling the refrigerant circuit with refrigerant gas and nitrogen gas.
 - Fill the refrigerant gas (R407C) into the refrigerant circuit until the gas pressure reaches 0.29 MPa, and fill the nitrogen gas into the refrigerant circuit until the gas pressure reaches 1.37 MPa.
 - MPa, and fill the hitrogen gas into the refrigerant circuit until the gas pressure reaches 1.37
- 8. Check for leakage at the brazed parts using a leak detector. Set value of the leakage detector: 1.5×10^{-5} std. cc/sec



Fig. 4-192

- 9. Collect the refrigerant gas and nitrogen used for the leakage check.
 ① Entrust a special industrial waste disposal trader with the mixture of refrigerant gas and nitrogen gas which you have collected.
- **10.** After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.

Use the red hose with specified length (0.92 m).

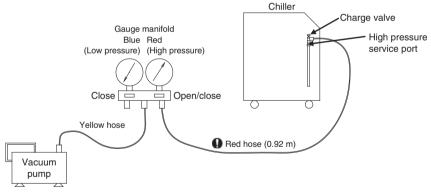


Fig. 4-193

11. Fill the specified amount of refrigerant gas. (See Table 4-20.)

Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.

- * Use a regularly calibrated scale to measure the gas to be filled in.
- * If air is left inside the hose between the refrigerant cylinder and the service port, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.
- The service port is located at high pressure side.

So you cannot add refrigerant during the system in operation.

Refrigerant	Model No.				
	HRS050-A-20 HRS050-W-20	HRS060-A-20	HRS060-W-20		
R410A	655 ±15 g	845 ±15 g	735 ±15 g		

Table 4-20. The amount of refrigerant for each model

Refer the refrigerant charge procedure HRX-MM-Q018

They contain useful tips to keep the charge amount controlled.

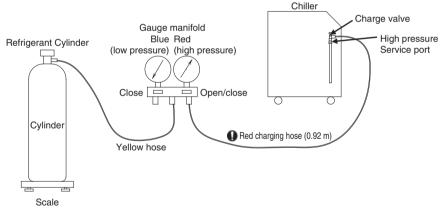


Fig. 4-194

- 12. Confirm that no refrigerant gas leaks from the service port.
- **13.** Loosen the charge valve if there is no leakage of the refrigerant gas. (This closes the spring loaded check valve.)
- 14. Disconnect the hose of the charge valve, and remove the charge valve.
- 15. Mount the cap nut to the service port, and tighten it with a spanner.



Fig. 4-195

- **16.** Mount the panels in order, from left panel, right panel and upper panel.
- 17. Test the operation to confirm that the temperature control is correctly performed. The replacement work is now completed, if temperature is controlled within the range of +/- 3.0°C of the set temperature.



Fig. 4-196

Replacement of Electric expansion valve HRS012 to 060-A/W-10/20

Model	Part No.	Description	Qty.	Image
HRS012-A/W-10/20 HRS018-A/W-10/20	HRS-S0029	Electric expansion valve (EV1)	1	
HRS024-A/W-20 HRS030-A/W-20	HRS-S0028	Electric expansion valve (EV2)	I	I
HRS050-A/W-20	HRS-S0341	Electric expansion valve (EV1)	1	
HRS060-A/W-20	HRS-S0340	Electric expansion valve (EV2)		I

Table 4-21	Replacement	parts
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There is danger of an electric shock. Make sure to turn OFF the power supply before performing replacement work.

There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.

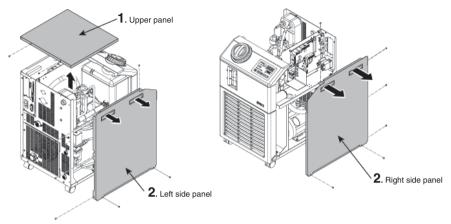


Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

Disassembly

1. Remove the upper panel and side panel.

HRS012 to 030-A/W-10/20





HRS050/060-A/W-20

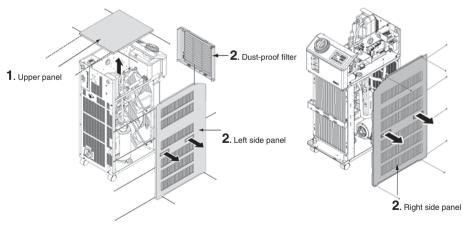


Fig. 4-198

2. Mount the charge valve to the service port.

HRS012 to 030-A/W-10/20

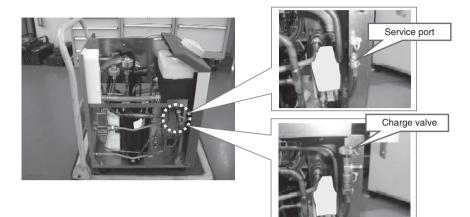


Fig. 4-199

 Mount the charge valve to the service port. HRS050/060-A/W-20

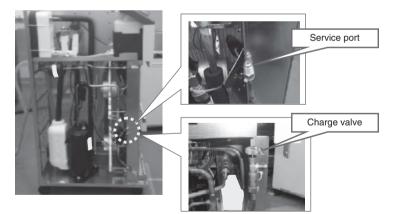


Fig. 4-200

4

4. Connect the hose of the gauge manifold to the high-pressure service port, and collect the refrigerant gas with the refrigerant collector.

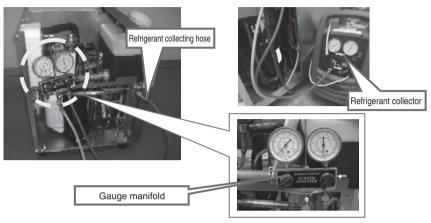


Fig. 4-201

- 5. Remove the coil which is mounted to the electronic expansion valve.
- 6. Remove all the thermal insulators around the electronic expansion valve. Handle the insulators with care. They will be reused.

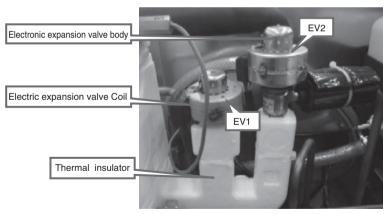
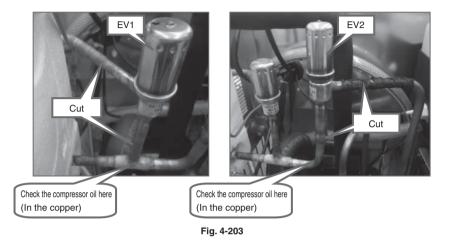


Fig. 4-202

7. Cut the copper pipes (2 places on the side of the electronic expansion valve from the brazed part) for removal.

After the removal, make sure that no compressor oil is left in the copper pipe. If some oil remains, remove it with a waste cloth.



- 8. Protect the electronic expansion valve, thermal insulator and cables with a wet cloth so that they are not burnt during mounting of the electronic expansion valve.
- **9.** Heat the brazed parts where the electronic expansion valve and the copper pipe were connected, and pull out the copper pipes of the expansion valve (2 places).

A DANGER

- Only trained and qualified personnel who are knowledgeable and skilled in brazing can perform the work of this document.
- Brazing has to be performed in a well ventilated area and where no flammable objects are present.

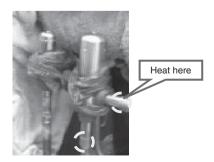


Fig. 4-204

Remount

1. Protect the new electronic expansion valve from heat by a wet cloth.

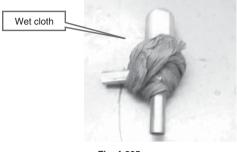


Fig. 4-205

- The electronic expansion valve may not be inserted into the copper pipe smoothly. Insert the copper pipe of the electronic expansion valve while heating the copper pipe, and braze it.
 - * When brazing, make sure to wear protective glasses for brazing, and do not directly look at the flame.
 - * Before starting brazing, nitrogen gas must be applied inside the copper tubing to avoid oxidization of the internal surface of the copper tubing.
 - * After finishing brazing, confirm that the brazing filler material is applied to the entire brazed part by visual observation.

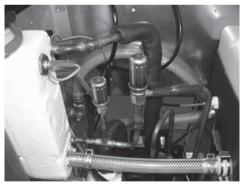


Fig. 4-206

3. Check for any leakage from the brazed parts by filling the refrigerant circuit with refrigerant gas and nitrogen gas.

Fill the refrigerant gas (R407C) into the refrigerant circuit until the gas pressure reaches 0.29
 MPa, and fill the nitrogen gas into the refrigerant circuit until the gas pressure reaches 1.37 MPa.

4. Check for leakage at the brazed parts using a leak detector. Set value of the leakage detector: 1.5×10^{-5} std. cc/sec



Fig. 4-207

- 5. Collect the refrigerant gas and nitrogen gas used for the leakage check.
 ① Entrust a special industrial waste disposal trader with the mixture of refrigerant gas and nitrogen gas which you have collected.
- 6. After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.

The charging hose (Red) shall be 0.92 m length.

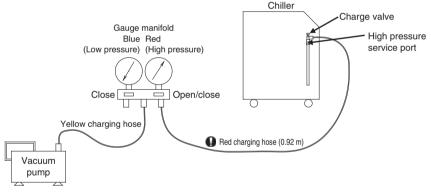


Fig. 4-208

7. Fill the specified amount of refrigerant gas. (See Table 4-22, 23.)

Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.

- * Use a regularly calibrated scale to measure the gas to be filled in.
- * If air is left inside the hose between the refrigerant cylinder and the service port, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.

The service port is located at high pressure side.

The refrigerant cannot be enclosed during operation.

Table 4-22. The amount of refrigerant (HRS012/018/024/030)

Refrigerant	HRS012-A-10 HRS018-A-10	HRS012-A-20 HRS018-A-20 HRS024-A-20	HRS012-W-10 HRS018-W-10	HRS012-W-20 HRS018-W-20 HRS024-W-20	HRS030-A-20	HRS030-W-20
R407C	320 ±5 g	350 ±5 g	255 ±5 g	300 ±5 g	565 ±15 g	495 ±15 g

Table 4-23. The amount of refrigeran	t (HRS050/060)
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Refrigerant	HRS050-A-20	HRS050-W-20	HRS060-A-20	HRS060-W-20
R410A	655 ±15 g	655 ±15 g	845 ±15 g	735 ±15 g

Refer the refrigerant charge procedure HRX-MM-Q018

They contain useful tips to keep the charge amount controlled.

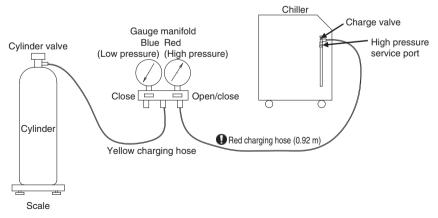
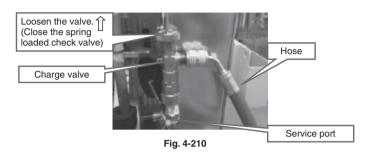


Fig. 4-209

- 8. Confirm that no refrigerant gas leaks from the service port.
- 9. Loosen the charge valve if there is no leakage of the refrigerant gas. (This closes the spring loaded check valve.)
- 10. Disconnect the hose of the charge valve, and remove the charge valve.
- 11. Mount the cap nut to the service port, and tighten it with a spanner.



- 12. Mount the panels in order, from left panel, right panel and upper panel.
 Initial setting is required after replacing EV1 (electronic expansion valve for cooling). Be sure to refer to How to set the minimum opening of the electronic expansion valve for cooling (HRX-MM-S002) in the attachment.
- 13. Test the operation to confirm that the temperature control is correctly performed. The replacement work is now completed, if temperature is controlled within the range of +/- 3.0°C of the set temperature.



Fig. 4-211

Replacement of Refrigerant Pressure Sensor HRS012 to 060-A/W-10/20

Model	Part No.	Description	Qty.	Image
HRS012-A/W-10/20 HRS018-A/W-10/20	HRS-S0012	Refrigerant Pressure Sensor (For high pressure)	1	dian.
HRS024-A/W-20 HRS030-A/W-20	HRS-S0013	Refrigerant Pressure Sensor (For low pressure)	1	20
HRS050-A-20	HRS-S0183	Refrigerant Pressure Sensor (For high pressure)	1	anno a s
HRS060-A-20	HRS-S0012	Refrigerant Pressure Sensor (For low pressure)	1	

Table 4-24. Replacement parts

▲ WARNING



There is danger of an electric shock. Make sure to turn OFF the power supply before performing replacement work.

There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.



Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

4

Maintenance

HRS012 to 030-A/W-10/20

Disassembly [High pressure side]

1. Remove the upper panel and left side panel.

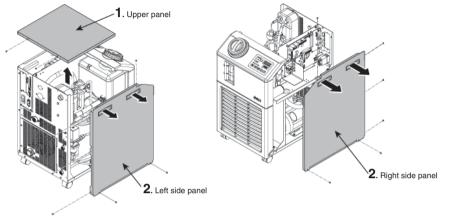


Fig. 4-212

2. Hold the lower part of the service port with a spanner, and remove the cap nut (Spanner size: 14 mm, 17 mm)

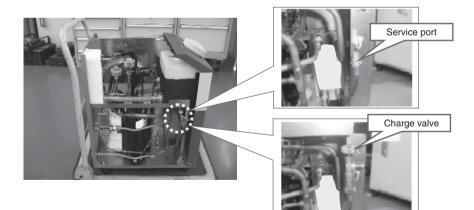


Fig. 4-213

3. After mounting a charge valve to the service port,collect the refrigerant gas. (Refrigerant gas collector)

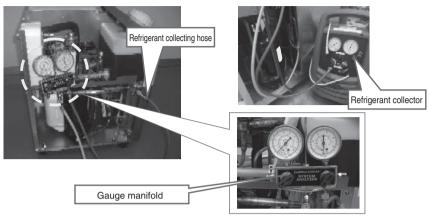


Fig. 4-214

- 4. Remove the wiring connector of the refrigerant pressure sensor.
- 5. Hold the refrigerant pressure sensor body with a spanner and remove the pressure sensor. (Spanner size: 12 mm, 17 mm)





Refrigerant Pressure Sensor (for high pressure)

Fig. 4-215

Disassembly [Low pressure side]

- 1. Put a container under the drain port, and remove the drain clip and drain plug to discharge the circulating fluid.
- 2. Remove the support panel.

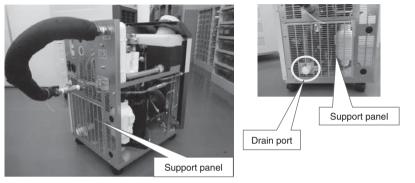


Fig. 4-216

- 3. Remove the wiring connector of the refrigerant pressure sensor.
- 4. Hold the refrigerant pressure sensor body with a spanner and remove the pressure sensor. (Spanner size: 12 mm, 17 mm)

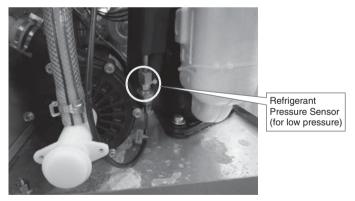


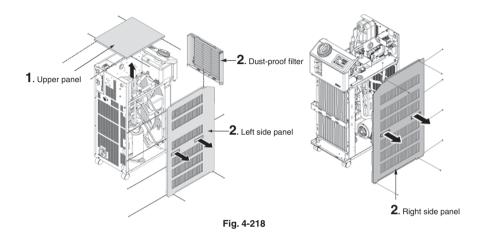
Fig. 4-217

4

Replacement of Refrigerant Pressure Sensor HRS050/060-A/W-20

Disassembly [High pressure side]

1. Remove the upper panel and left side panel.



- 2. Hold the lower part of the service port with a spanner, and remove the cap nut. (Spanner size: 14 mm, 17 mm)
- 3. Mount the charge valve to the service port.

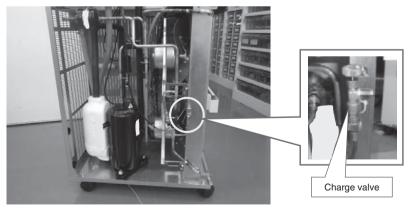


Fig. 4-219

4. After mounting a charge valve to the service port, collect the refrigerant gas. (Refrigerant collector)

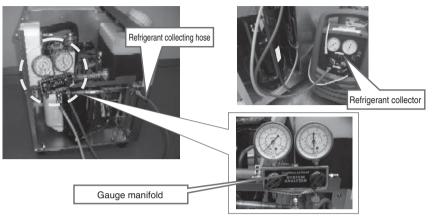


Fig. 4-220

- 5. Remove the wiring connector of the refrigerant pressure sensor.
- 6. Hold the refrigerant pressure sensor body with a spanner and remove the pressure sensor. (Spanner size: 12 mm, 17 mm)

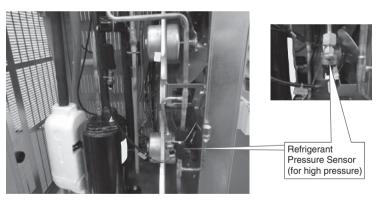
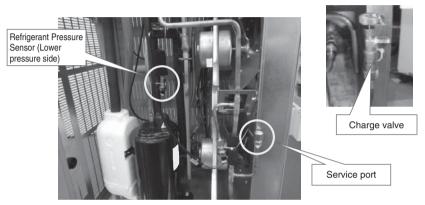


Fig. 4-221

Disassembly [Lower pressure side]

- 1. Hold the lower part of the service port with a spanner, and remove the cap nut. (Spanner size: 14 mm, 17 mm)
- 2. After mounting a charge valve to the service port, collect the refrigerant gas. (Refrigerant gas collector)
- 3. Remove the wiring connector of the refrigerant pressure sensor.
- 4. Hold the refrigerant pressure sensor body with a spanner and remove the pressure sensor. (Spanner size: 12 mm, 17 mm)





Remount [High pressure side,Low pressure side]

- 1. Hold the new refrigerant pressure sensor body side with a spanner and mount the pressure sensor. (Spanner size: 12 mm, 17 mm)
- 2. Mount the wiring connector.
- Connect the vacuum pump and draw vacuum. (For more than 30 minutes.) After confirming that the refrigerant pressure gage measures zero, start drawing vacuum for more than 30 minutes.
- 4. Fill the specified amount of refrigerant gas.(Refer to Table 4-25, 26.)
 - * Use a regularly calibrated scale to measure the gas to be filled.
 - * If air is left inside the hose between the refrigerant cylinder and the charge valve, the air enters the refrigerant piping. If air enters the compressor, it may cause the product failure. Make sure to fill the hose with refrigerant before enclosing the refrigerant.

Apply the correct amount of the refrigerant. The performance of the product may not be realized if the amount is too large or too small.

The service port is located at high pressure side.

The refrigerant cannot be enclosed during operation.

Table 4-25. The amount of refrigerant	(HRS012/018/024/030)
---------------------------------------	----------------------

Refrigerant	HRS012-A-10 HRS018-A-10	HRS012-A-20 HRS018-A-20 HRS024-A-20	HRS012-W-10 HRS018-W-10	HRS012-W-20 HRS018-W-20 HRS024-W-20	HRS030-A-20	HRS030-W-20
R407C	320 ±5 g	350 ±5 g	255 ±5 g	300 ±5 g	565 ±15 g	495 ±15 g

Table 4-26.	The	amount of	refrigerant	(HRS050/060)
10010 4 20.	1110	annount of	reingerunt	(1110000/000)

Refrigerant	HRS050-A-20	HRS050-W-20	HRS060-A-20	HRS060-W-20	
R410A	655 ±15 g	655 ±15 g	845 ±15 g	735 ±15 g	

Refer the refrigerant charge procedure HRX-MM-Q018

They contain useful tips to keep the charge amount controlled.

- 5. Remove the charge valve to confirm that no refrigerant gas leakage occurs from the service port.
- 6. Mount the cap nut to the service port, and tighten it with a spanner. (Spanner size: 14 mm, 17 mm)
- Test the operation to confirm that the temperature control is correctly performed. (Temperature stability: +/- 0.1°C)

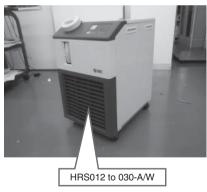




Fig. 4-223

4

5

Replacement Procedure for Mechanical Seal

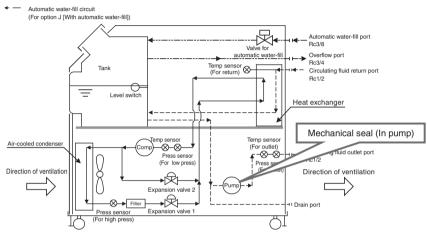
* For the 200 V only

Models with Mechanical Seal

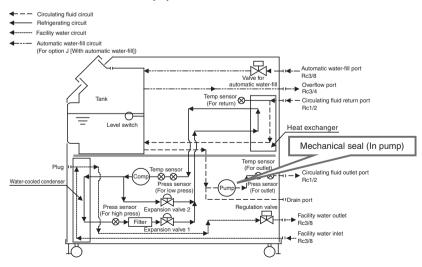
HRS012/018/024/030-A□-20-(M)T

Circulating fluid circuit

Refrigerating circuit

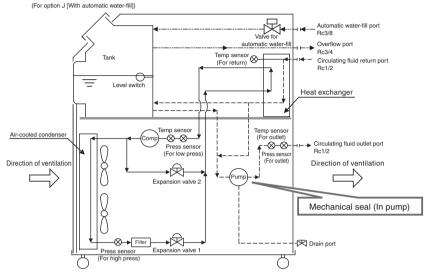


HRS012/018/024/030-W -20-(M)T



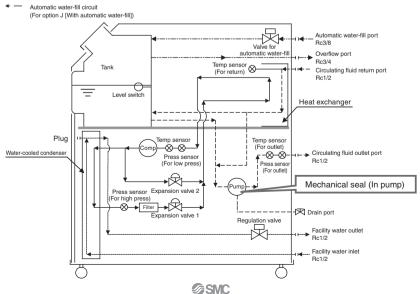
HRS050/060-A - 20- (M)

- Circulating fluid circuit
- Refrigerating circuit
 - Automatic water-fill circuit



HRS050/060-W□-20-□(M)

- Circulating fluid circuit
- Refrigerating circuit
- Facility water circuit



Service parts to be used

 \cdot The mechanical seal set contains the following service parts.

Please confirm that all of them are present before replacement.

Table 5-1 Mechanical seal set

Model	Part No.	Part name	Qty.	Photo
	_	Mechanical seal (Stationary)	1	0
	_	Mechanical seal (Dynamic)	1	0
	_	Mechanical seal (Spring)	1	
HRG-S0211	_	Rubber washer	1	0
HRG-S0211	_	O-ring A	1	A
	_	O-ring B	1	(P)
	_	O-ring C	1	
	HRX-OM-Q007	Operation manual	1	

These service parts include three types of O-rings.

Select the appropriate O-ring referring to the comparison table below.

Table 5-2 Appropriate models	for	each	O-ring
------------------------------	-----	------	--------

O-ring	Applicable models	Remarks
A	HRS012/018/024/030 series	For high pressure pump option (-T)
В	HRS050/060 series	For standard and all options
С	HRG010 series	For standard and all options

Tools to be used and recommended protective equipment

• Tools to be used in the replacement work and useful equipment are shown in the table below. Please prepare the tools shown in the table.

No.	Description	Photo	Remarks
1	Permanent marker		
2	Allen wrench (Flat size: 5 mm)		
3	Allen wrench (Flat size: 2 mm)		
4	Pliers (which can hold 4-mm key width)		
5	Flat blade screwdriver (which can be inserted into 4-mm key way)		

Table 5-3 Tools list (1)

No.	Description	Photo	Remarks
6	Flat head screwdriver (which can be inserted into a flat blade groove of the shaft on the rear face of the motor)	-	
7	Pulley remover (Nominal size 3")	A.	
8	Alcohol		
9	Cloth (such as paper towels)		
10	File (flat or triangle)		
11	Sandpaper or sponge abrasive material (#180 to #200)		
12	Pushing tool (for rotating ring and for fixing ring)	0	
13	Pliers (medium size)	ex_	

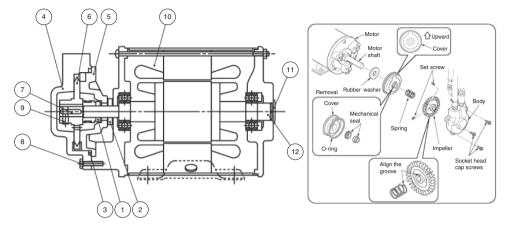
Table 5-3 Tools list (2)

No.	Description	Photo	Remarks
14	Thickness gauge (0.03 mm)	0 10	
15	Thickness gauge (0.05 mm)	• 18	
16	Plastic hammer (medium size)	<u><u><u></u></u></u>	
17	Drain pan (Less than 100 mm in height)		
18	Dustcloth		

Table 5-3 Tools list (3)

Table 5-4 Recommended protective tools

No.	Description	Photo	Remarks
1	Gloves	MA NO	
2	Goggles	The	
3	Safety shoes		



Internal construction of the pump

Table 5-5 Internal construction of the pump

No.	Name	No.	Name
1	Mechanical seal	7	(Key)
2	Rubber washer	8	(Hexagon socket head cap screw)
3	O-ring	9	(Set screw x 2)
4	(Body)	10	(Motor)
5	(Cover)	11	(Seal)
6	(Impeller)	12	(Motor shaft)

Replacement procedure

▲ WARNING



The pump may operate suddenly due to automatic operation, which is dangerous. Make sure to turn OFF the power supply before performing replacement work. There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.



Be sure to wear protective footwear and gloves when attaching or removing panels. Sharp edges of the panels may lead to personal injury if not handled properly.

Removal procedure

1. Remove the upper and side panels of the thermo-chiller to remove the pump.

Note

Please read and understand the separate service manual (HRX-MM-M056, P013).

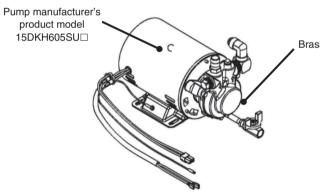


Fig. 5-1 Pump for HRS012/018/024--20-T, HRS030--20-T

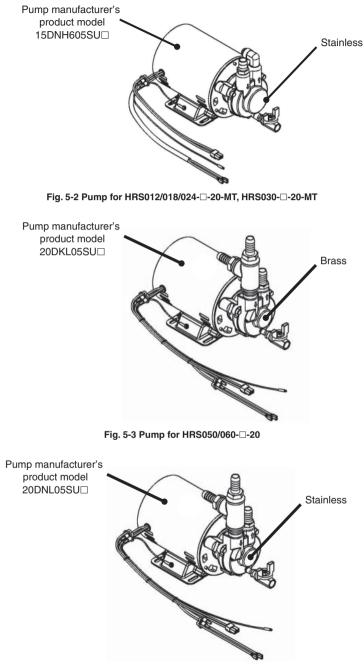
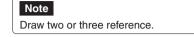


Fig. 5-4 Pump for HRS050/060---20-M

(The following procedure is common for all pump models. The procedure is shown using a HRS050/060-□-20 pump as an example.)

2. Draw alignment reference on the body (front casing), cover (back casing) and motor.





3. Loosen the hexagon socket head cap screws that have fixed the body.



4. Remove the body.

Note

Remove the body slowly with a flat head screwdriver as a lever.



5

5. Loosen the two set screws that fix the impeller to the shaft.

Note

Do not completely remove the two set screws from the impeller, so that they will not be lost.



6. Move the impeller forward together with the cover (back casing).

Note

Move the impeller slightly with a pulley remover or an alternative tool. If it is moved completely, the spring and rotating ring will run into the key.



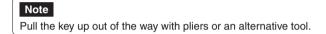
7. Remove the impeller by hand.



8. Then remove the spring.



9. Remove the key.







Note

Insert a flat head (watchmaker's) screwdriver into a gap between the key and key way, and remove the key using the screwdriver as a lever.



10. Move the dynamic seal from pump, together with the cover (back casing).



Move them with a pulley remover or an alternative tool.



11. Remove the dynamic seal from the motor shaft.



@SMC

12. Then, remove the cover.



13. Remove the O-ring from the cover.



14. Then, remove the stationary seal which has been fitted into the cover.

Note

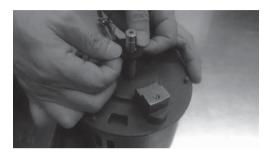
Turn the cover over and push the visible stationary seal lightly with a screwdriver end to remove it. Be careful not to damage it.



15. Pull the rubber washer off of the motor shaft.

Note

The rubber washer covers the gap of motor shaft bearing. It can be removed by pulling up with fingers.



16. Removal is complete.



Cleaning procedure

Note

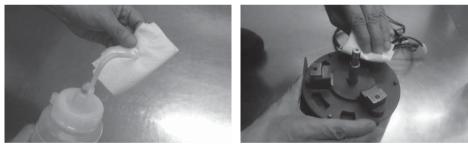
Remove the adhered contamination with file, sandpaper and sponge abrasive material.

Note

When wiping off the contamination with alcohol, there should not be a large amount of inflammables or fire, and the area should be sufficiently ventilated. Never use alcohol in a sealed place.

1. Clean the motor flange (cover mounting face).





2. Clean the key way of the motor shaft.



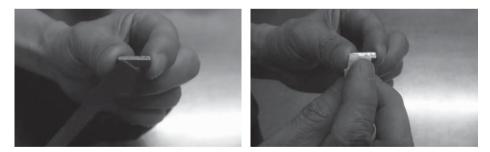
3. Clean the outer surface and step part of the motor shaft.



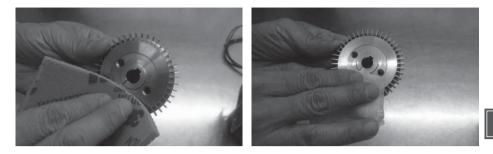
4. Clean the end surface of the cover.



5. Clean the key.



6. Clean the end surface of the impeller.



7. Clean the key way and inner surface of the impeller.



Remounting procedure

1. Install a new rubber washer onto the motor shaft, and press it against the outer surface of the motor.

Note Cover the gap of the motor shaft bearing by pushing it lightly.



2. Install a new stationary seal into the cover.



Note

Push it firmly with a pushing tool or an alternative tool.



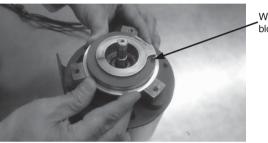
3. Install the cover with the stationary seal onto the motor shaft, and push it into the motor bracket.

Note

Confirm that the cover put onto the motor bracket can be rotated by hand.

Note

Align the parts using the "Alignment marks" drawn on before disassembling the product. If the marks have been been rubbed off, the water passage block should be mounted pointing at the top of the motor.



Water passage block

4. Install dynamic seal a new rotating ring onto the motor shaft.

Note

Wet the inner part (rubber lip) of the dynamic seal slightly with water and insert the rotating ring by sliding it.

Note

Never apply oil, It can damage the rubber.



Note

Push the dynamic seal until it comes into contact with the fixed ring. Confirm that the end of the rubber lip of the dynamic seal is almost the same surface level as the step part of the motor shaft.

Note

If the dynamic seal does not come into contact with the stationary seal, it may lead to liquid leakage.

Make contact it firmly with a pushing tool or an alternative tool.



5. Install the key into the key way of the motor shaft.

Note

If it is difficult to fit the key, remove the burrs caused by the file.

Note

The direction (right or left; front or rear; front or back) of the key is not specified.

Note

Put the key with pliers and a plastic hammer. Be careful not to crush the R part of the key way with the edge of the key.







6. Install a new spring onto the motor shaft.



Install it with the spring tang pointing to the top of the pump, as shown.



7. Install the impeller onto the motor shaft.

Note

Install it by aligning the key and the key way of the impeller.

Note

If it is difficult to insert the impeller, remove the burrs using a file.

Note

Hang the spring tang on the groove of the impeller.





Groove

8. Slide the impeller to the specified motor shaft position, and fix it with grub screws.

Note

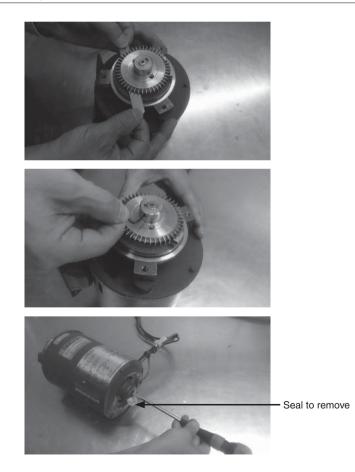
Insert the thickness gauge (Pump manufacturer's model DKH, DNH: 0.03 mm, DKL, DNL: 0.05 mm) into a gap between the impeller and the cover, and tighten it temporarily.

Note

Pull out the thickness gauge after the temporary tightening, and tighten the hollow set screws to the specified tightening torque $(1.5 \text{ N} \cdot \text{m})$ to fix the impeller.

Note

After tightening the hollow set screws, remove the seal (silver) on the rear face of the motor. And then, insert the flat head screwdriver to the motor shaft to check if it rotates smoothly.



9. Install a new O-ring (Thickness: 2 mm) onto the cover.



10. Put the body over the cover of Step 9.

Note

The O-ring should not be caught on the body.

Note

Align the parts using the "Alignment marks" draw on before disassembling the product. If the marks have been gone, align the water passage blocks.

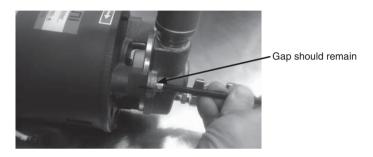




11. Fix the body of Step 10 to the motor bracket by tightening the hexagon socket head cap screws.

Note

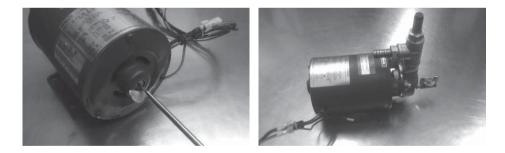
The tightening torque of the hexagon socket head cap screw is 5.2 N·m. Tighten them so that a gap remains between the body and motor bracket. No liquid leakage will occur even if there is a gap as an O-ring seal is used. Be careful not to tighten the screws excessively, otherwise the body may deform.



12. Remove the seal (silver) on the rear face of the motor of Step 11. And then, use the flat head screwdriver to check if the motor shaft rotates smoothly.

Note

If it does not rotate smoothly, the body or cover may come into contact with the impeller. If so, disassemble and reassemble the product again until the motor shaft rotates smoothly.



■Inspection and precautions before use

1. Install the pump to a thermo-chiller and confirm that no liquid leaks from the mechanical seal.

Note

Refer to the separate service manual (HRX-MM-M056, P013) for installation of the pump to thermo-chiller.

Note

If liquid leaks, perform the removal, cleaning and remounting procedure again until the liquid leakage is stopped.

2. Confirm that there is no abnormality (vibration or noise) when running the pump.

Note

If some errors were found, reinspect the parts and assembly condition.

3. Lastly, wipe off the "Alignment marks" with alcohol. The replacement procedure is complete.

6

Fluorocarbon Recovery Procedure

This section describes the basic structure of the recovery equipment and the recovery method.

Please refer to the catalogs and instruction manuals provided by the recovery equipment manufacturer for details.

The previous "Law Concerning the Recovery and Destruction of Fluorocarbons" was revised, and the new "Act on Rational Use and Proper Management of Fluorocarbons" (abbreviated as the "Fluorocarbons Emission Control Law", and commonly known as the "Revised Fluorocarbons Law") was put into force in April 2015.

The new law mandates that the recovery and filling of fluorocarbons during the maintenance of a Class I Specified Product Note 1) such as a thermo-chiller only be performed by qualified Class I Fluorocarbon Filling and Recovery Operators Note 2) registered in the prefecture in which the place of maintenance is located and having sufficient knowledge about the special inspections and periodic inspections of fluorocarbons (Class I Refrigerant Fluorocarbons Handling Engineer Note 2) or Class II Refrigerant Fluorocarbons Handling Engineer Note 3).

We ask the owners (or managers) of our thermo-chillers to check the qualifications of the maintenance personnel when they arrive on the premises.

- Note 1) Commercial air conditioners, freezing equipment, and refrigeration equipment filled with fluorocarbon as a refrigerant (excluding Class II Specified Products and car air conditioners) including thermochillers.
- Note 2) Previously known as Class I Fluorocarbon Recovery Operators
- Note 3) Qualification certified by the Japan Association of Refrigeration and Air Conditioning Contractors in line with the enforcement of the Fluorocarbons Emission Control Law
- Note 4) Qualification certified by the Japan Refrigerants and Environment Conservation Organization

Structure of Recovery Equipment

The fluorocarbon in the thermo-chiller is sucked into the system side port on the recovery equipment (built-in compressor). The fluorocarbon is then liquefied by the built-in air-cooled condenser and discharged from the cylinder side port. The fluorocarbon is then filled into the recovery cylinder.

[Recovery equipment]

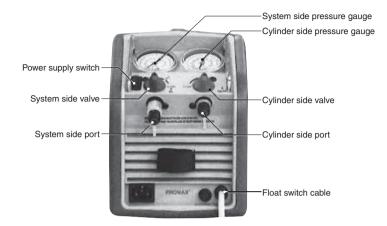


Fan (Air-cooled condenser)

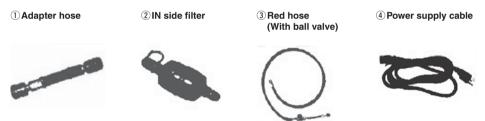
Specifications (Example)

Name/Application	Fluorocarbon recovery equipment
Recovery method	Compressor system (with high-pressure cutoff function)
Types of fluorocarbons that can be recovered	R134a, R404A, R407C, R410A, etc.
Recovery cylinder	With float switch exclusively for recovery equipment 21 L
Safety device	Overfilling prevention (High-pressure cutoff, Float switch)
(Power supply)	(100 VAC (50 Hz, 60 Hz))
(Weight)	(Approx. 10 kg)





[Accessories]



Other Tools to be Prepared

1. Prepare a recovery cylinder (designated by the recovery equipment manufacturer) for each type of fluorocarbon.

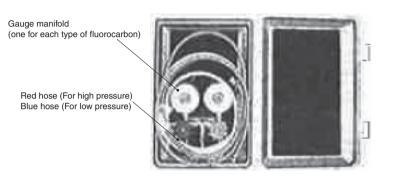
Be sure to use the cylinder designated by the recovery equipment manufacturer.

CAUTION When using an empty cylinder for the first time, be sure to vacuum it to -0.1 [MPa] before use. If any uncondensed gas (e.g. nitrogen, air) remains in the cylinder, the inner pressure will rise during the recovery of the fluorocarbon, causing the safety device to be activated. Use extreme caution. Image: transform of the fluorocarbon of the fluorocarbon of the fluorocarbon of the safety device to be activated. Use extreme caution. Image: transform of the fluorocarbon of the fluorocarbon of the fluorocarbon of the safety device to be activated. Use extreme caution. Image: transform of the fluorocarbon of the fluorocarbon of the fluorocarbon of the safety device to be activated. Use extreme caution. Image: transform of the fluorocarbon of the fluorocarbon of the fluorocarbon of the safety device to be activated. Use extreme caution. Image: transform of the fluorocarbon of the fluorocarbon of the fluorocarbon of the fluorocarbon of the safety device to be activated. Use extreme caution. Image: transform of the fluorocarbon of the fluorocarbon



Recovery cylinder (one for each type of fluorocarbon) 2. Prepare a gauge manifold and hose for each type of fluorocarbon.

Use the gauge manifold and hoses exclusively for each type of fluorocarbon.

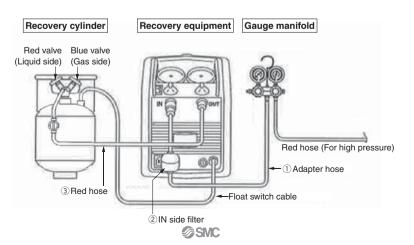


Connection with Recovery Cylinder and Gauge Manifold

1. Connect one end of the provided red hose to the OUT port on the recovery equipment and the other end to the red valve on the cylinder (liquid side).

There are cases in which the valve colors are reversed (depending on the recovery equipment manufacturer). Use extreme caution.

Connect one end of the yellow hose to the IN port on the recovery equipment and the other end to the provided IN side filter. Then, connect one end of the provided adapter hose to the IN side filter and the other end to the center port of the gauge manifold.



Connection of the Power Supply Cable and Float Switch (Safety Device) Cable

- 1. Connect one end of the provided power supply cable ④ to the recovery equipment and the other end to the 100 VAC power supply.
- 2. Connect the float switch cable on the recovery equipment to the float switch on the recovery cylinder.

Be extremely careful regarding the position of the cable terminal pin. Connecting the cable forcibly may damage the pin.

Connection with Thermo-chiller

Weight scale

1. Connect one end of the red hose to the gauge manifold and the other end to the charge port (high-pressure side) of the thermo-chiller.

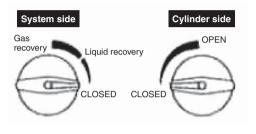
CAUTION All connections must be appropriate and sufficiently tightened. Recovery cylinder Recovery equipment Gauge manifold Thermo-chiller Red valve (Liquid side) Red valve (Liquid side) Red valve (High-pressure side) Red hose (High-pres

diam.

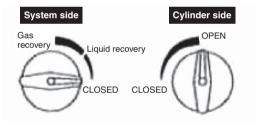
Charge port (High pressure)

Preparation for Recovery

- 1. Turn both the system side valve and the cylinder side valve on the recovery equipment to the CLOSED position.
- 2. Read off the weight of the recovery cylinder before starting the recovery process.
- 3. Open (turn counterclockwise) the red valve (liquid side) on the cylinder.
- 4. Open the red valve (high-pressure side) on the gauge manifold.
- 5. Check that the needle of the pressure gauge (high-pressure side) on the gauge manifold goes up.
- 6. Check again that both the system side (thermo-chiller side) valve and the cylinder side valve on the recovery equipment are set to the CLOSED position.

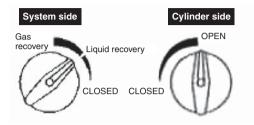


7. Turn the cylinder side (right side) valve on the recovery equipment to the OPEN position.



Starting the Recovery Process

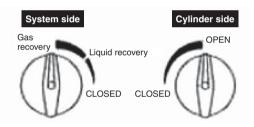
- 1. Turn the power supply switch to ON. (Activate the recovery equipment.)
- 2. Turn the system side (thermo-chiller side) valve on the recovery equipment to the liquid recovery position.



3. Then, turn the system side (thermo-chiller side) valve slowly to the gas recovery position.

Tips

If the recovery equipment generates violent knocking, slowly turn the system side (thermo-chiller side) valve in the CLOSED direction until the knocking weakens. After the knocking weakens, turn the valve to the gas recovery position, and resume the fluorocarbon recovery.



 After the pressure on the system side (thermo-chiller side) has remained at -0.08 [MPa] for approximately 20 seconds or longer, turn the power supply switch to OFF to stop the recovery equipment.

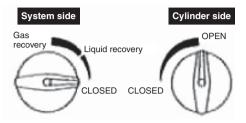
Tips

When the fluorocarbon remaining in the thermo-chiller has vaporized, the gauge pressure of the gauge manifold will increase again.

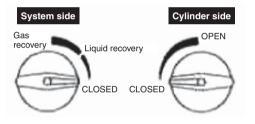
Continue to repeat the recovery process until the gauge pressure stops increasing.

Finishing the Recovery Process

- 1. Close the red valve (high-pressure side) on the gauge manifold.
- 2. Close the system side (thermo-chiller side) valve on the recovery equipment. Leave the cylinder side valve open at this point.



- 3. When the pressure remains stable at -0.08 [MPa], turn the power supply switch to OFF to stop the recovery equipment.
- 4. Close the red valve on the recovery cylinder.
- 5. Close the cylinder side valve on the recovery cylinder.



- 6. Read off the weight of the recovery cylinder after the recovery process.
- 7. Lastly, disconnect all hoses.

Check the IN side filter for dirt. If the filter is dirty, replace it with a new one.

Submission of Certificate for Fluorocarbon Recovered

- 1. After the recovery process, calculate the difference in the weight of the cylinder before and after the recovery process to obtain the amount recovered.
- 2. Enter the amount recovered in the "Certificate for Fluorocarbon Recovered," and submit it to the manager (customer).

Form (Sample)

Certif	icate for F	luoro	carbon	Recovere Cert	d ificate no.
Date of issue	Мо	nth	Date	Year	
Date of recovery	Мо	nth	Date	Year	
Type and amount of fluorocarbon recovered	Type (R no.)	R–		Amount (kg)	
Manager who ordered the maintenance	Address				
(E.g. owner of equipment)	Name				
	Address				
Person in charge of control	Name			Department	
	TEL			email	
Location of equipment	Address				
from which fluorocarbon was recovered	Name of facility (E.g. name of building)				
Specific equipment	Control no.				
information	Model no.			Product no.	
	Address				
Fluorocarbon Filling and Recovery Operator	Name				
	TEL			Registration no.	
Recovered by or witnessed by (E.g. Refrigerant Fluorocarbons Handling Engineer)	Name			Qualified person no.	

To managers of equipment

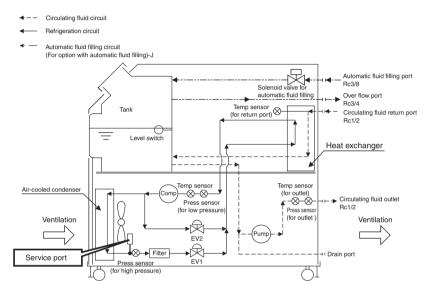
Note: Store this "Certificate for Fluorocarbon Recovered" as it will be necessary to calculate the leakage amount.

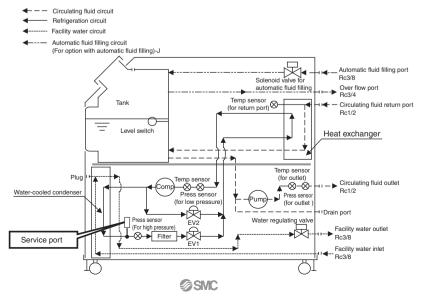
[Reference documents]

· Bosch Automotive Service Solutions Corp., Operation Manual for the RG3000J made by RoBINAIR

- · Industrial Network for Fluorocarbon Recovery Promotion (INFREP), Fluorocarbon Recovery Guideline, March 25, 2009
- Ministry of the Environment, Ministry of Economy, Trade, and Industry, "Act on Rational Use and Proper Management of Fluorocarbons (Fluorocarbons Emission Control Law) Guidelines for Operation Concerning Filling and Receiver (Operations) (14t citize issued in March 2015)

Flow Chart





Required tools

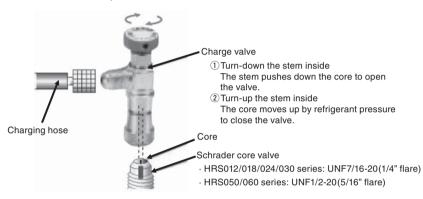
Some special tools are required in the procedure

Charge valve (Example)

HRS chiller equips Schrader core valve at the service port.

When remove the charging hose from the Schrader core valve, you experienced to have not a little amount of refrigerant was evacuated from the system.

By using the charge valve, you can disconnect the charging hose with minimum refrigerant loss from the system. The size of the parts are varied depending on the model. Please use the charge valve with the service port to fit.



Gauge Manifold for R407c/R410a and charging hose

High pressure gauge \cdots -1 to 35 x 100 kPa (-1 to 35bar) Low pressure gauge \cdots -1 to 15 x 100 kPa (-1 to 15bar) Charging hose (Red, Yellow) 0.92 m UNF7/16 (1/4 flare)

You cannot use a gauge manifold for R22





Gauge manifold

Charging hose

• We cannot use another length charging hose.

Weight scale



Weight scale



Refrigerant gas cylinder

R407C/R410A



Refrigerant gas cylinder

Vacuum pump



Vacuum pump

Tools

No.1	Description	Q'ty	Note
1	Screwdriver	1	Phillips head screwdriver
2	Wrench	2	100 mm
3	Protective glove	1	Rubber glove

Procedure

▲ WARNING



There is danger of an electric shock. Be sure to turn the power off before installation work.

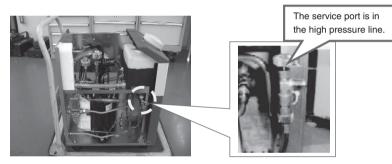
There is danger of an electric shock and burn. Be careful enough not to be hurt during the work.



When mounting or removing the panel, be sure to wear protective gloves or shoes to prevent injuries from its sharp edges.

1. Remove panel and install the charge valve

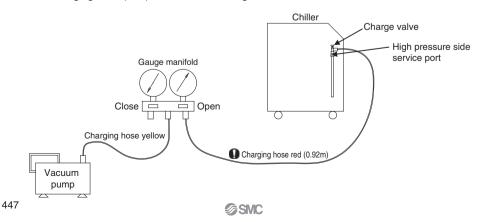
View after removal of the upper panel and the side paneler.





2. Vacuum

The vacuum pumping has to be more than 30 minutes. The charging hose (Red) shall be 0.92 M length



3. Charging

Setup the equipment as Fig. 7-2 for the refrigerant charging Purge out the air from the charging hose



Wear gloves to protect your hands from frostbite from the refrigerant gas.

Charge the refrigerant carefully adjusting the valve opening on the gauge manifold so that you can control precise charge amount



Hint: Close the valve on the gauge manifold when getting 1 g before getting the desired charging amount.



After the charging operation, around 1 2 g of the refrigerant will be existing in the 0.92m charging hose (Red hose in the Fig.7-2).

Unit a

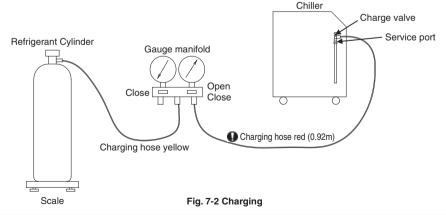
Table 7-1. The amount of refrigerant (HRS012/018/024/030)

			-			0
	HRS012-A-10	HRS012-A-20	HRS012-W-10	HRS012-W-20	HRS030-A-20	HRS030-W-20
Refrigerant gas	HRS018-A-10	HRS018-A-20	HRS018-W-10	HRS018-W-20		
		HRS024-A-20		HRS024-W-20		
R407C	320 ±5	350 ±5	255 ±5	300 ±5	565 ±15	495 ±15

Table 7-2. The amount of refrigerant (HRS050/060)

		•		5
Refrigerant gas	HRS050-A-20	HRS050-W-20	HRS060-A-20	HRS060-W-20
R410A	655 ±15	655 ±15	845 ±15	735 ±15

You have to count 12 g of refrigerant that will remain in the 0.92 m charging hose You have to add 12 g extra on above charging amount when you check the scale indication measuring the weight decrease of the refrigerant cylinder.





Hint: The service port is located in high pressure side of refrigeration system, so you cannot add refrigerant into the system during the chiller in operation,

Unit q

Submission of Certificate for Fluorocarbon Filled

- 1. After the filling process, calculate the difference in the weight of the cylinder before and after the filling process to obtain the amount filled.
- 2. Enter the amount filled in the "Certificate for Fluorocarbon Filled," and submit it to the manager (customer).

Form (Sample)

Се	rtificate fo	r Fluc	orocarb		ificate no.
Date of issue	Мо	nth	Date	Year	
Date of filling	Мо	nth	Date	Year	
Type of fluorocarbon filled	Type (R no.)	R–		GWP value	
Amount of fluorocarbon filled	Amount filled (kg)			Amount filled with fluorocarbon recovered (kg)	
The timing at which the fluorocarbon was filled (Circle either item.)	Filled when n equipment				e when the new It was installed
Manager who ordered the	Address				
maintenance (E.g. owner of equipment)	Name				
	Address				
Person in charge of control	Name			Department	
	TEL			email	
Location of equipment into which fluorocarbon was	Address				
filled	Name of facility (E.g. name of building)				
Specific equipment	Control no.				
information	Model no.			Product no.	
	Address				
Fluorocarbon Filling and Recovery Operator	Name				
	TEL			Registration no.	
Filled by or witnessed by (E.g. Refrigerant Fluorocarbons Handling Engineer)	Name			Qualified person no.	

To managers of equipment

Note: Store this "Certificate for Fluorocarbon Filled" as it will be necessary to calculate the leakage amount.

[Reference document]

 Ministry of the Environment, Ministry of Economy, Trade, and Industry, "Act on Rational Use and Proper Management of Fluorocarbons (Fluorocarbons Emission Control Law) – Guidelines for Operation Concerning Filling and Recovery Operators" (1st edition issued in March 2015)

Types of Fluorocarbons and Regulations

Name	Characteristics	Application
CFC / Chlorofluorocarbons	Ozone layer depleting substances including chlorine Complete abolition ^{Note 1)} was required by the Montreal Protocol. Specified CFCs including R11, 12, 113, 114, and 115	Refrigerant: Refrigerators, car air conditioners Foaming agent Cleaning agent Aerosol (spray)
HCFC / Hydrochlorofluorocarbons	Alternative CFCs of specified CFCs These are still ozone layer depleting substances including chlorine. Complete abolition Nete avas required by the Montreal Protocol. R22, 123, 141b, 142b, 225, etc.	Refrigerant: Refrigerators, room air conditioners, packaged air conditioners, air dryers, chillers, etc. Foaming agent · Cleaning agent
HFC / Hydrofluorocarbons	Alternative CFCs of specified CFCs Although these do not include chlorine, and thus do not deplete ozone layers, these are called greenhouse gases because their global warming potential (GWP) is approximately hundreds to four thousand times that of carbon dioxide. These are listed in the substances targeted for reduction specified by the Kyoto Protocol ^{Nute 30} . R32, R134a, 404A, 407C, 410A, etc.	Refrigerant: Refrigerators, room air conditioners, packaged air conditioners, air dryers, thermo-chillers, etc. Foaming agent Cleaning agent Aerosol (spray)
HFO / Hydrofluoroolefins	Substances having low GWP and less impact on global warming However, there are few examples of these substances being used in refrigeration equipment because of their combustion characteristics. R1234yf, 1234ze, etc.	 Refrigerant: Car air conditioners Foaming agent Cleaning agent
Natural refrigerant / Refrigerants other than fluorocarbons	Substances used as refrigerant during the initial stages of refrigeration equipment development Ammonia (NH3, GWP0), which is hazardous if it leaks during handling, carbon dioxide (CO ₂ , GWP1), water (H ₂ O), hydrocarbons (HC) such as propane, air, etc.	Refrigerant: Refrigerators of some manufacturers and commercial refrigerators Foarming agent Aerosol (spray) Dry-cleaning (solvent)

Note 1) They have already been abolished completely in advanced nations. They were abolished at the end of 2009 in developing nations.

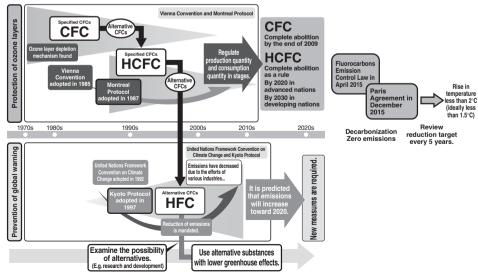
Note 2) They will be abolished completely by 2020 in advanced nations, and by 2030 in developing nations.

Note 3) Concerning Japan's CO₂ reduction target, Japan was able to successfully reduce emissions by 8.4%, achieving their target (reduction by 6% compared to 1990) of the first commitment period (2008 to 2012).

For the target (reduction by 25% compared to 1990) of the second commitment period (2013 to 2020), Japan declared non-participation due to the Great East Japan Earthquake.

For more information, refer to the website of the Ministry of Economy, Trade, and Industry and the Ministry of the Environment.

Reduction Plan in Accordance with the Montreal Protocol, Kyoto Protocol, and Paris Agreement



Excerpt: Ministry of the Environment and Ministry of Economy, Trade, and Industry, "Overview of the Fluorocarbons Emission Control Law - Required Efforts based on the Revised Law" (January 2015)

450

The "Act on Rational Use and Proper Management of Fluorocarbons" (the "Fluorocarbons Emission Control Law") was put into force in April 2015.

To protect the ozone layer and prevent global warming, owners (or managers) of chillers are obliged to control the emission of fluorocarbons (CFC, HCFC, HFC).

In response to this, measures that must be implemented by customers are described below.

We ask customers to implement these measures appropriately.

Check

nspect!

Repair

Record!

Calculate

Report.

Recover

Obligation concerning the installation of equipment

■ Install equipment in an appropriate location.

To prevent damage to the equipment, install the equipment in an appropriate location and maintain the installation environment.

* Do not install a source of vibration near the equipment. Provide sufficient space for inspection and repair. Clean around the equipment.

Obligations concerning the use of equipment

Implement equipment inspection.

Implement the simple inspection of all pieces of equipment. For equipment larger than the specified size, implement periodic inspection by an expert.

To fulfill the obligation, consider making a list of equipment owned or to be managed, establishing an inspection system and creating a schedule.

Implement leak prevention measures and prohibit the filling of unrepaired equipment with refrigerant*.

Repair the equipment when a leak of fluorocarbon is found.

Filling unrepaired equipment with fluorocarbon is prohibited as a rule.

The filling of fluorocarbons must be entrusted to a Class I Fluorocarbon Filling and Recovery Operator registered in the relevant prefecture.

Store inspection history.

Concerning the equipment inspection and maintenance history, keep records for each piece of equipment, and store these records until the equipment is disposed of.

Calculate and report the fluorocarbon leakage amount.

Calculate the leakage amount upon receipt of the "Certificate for Fluorocarbon Filled/Recovered" issued by the Class I Fluorocarbon Filling and Recovery Operator. If the leakage amount is more than the specified level, this must be reported to the nation every fiscal year.

* The leakage amount reported is officially announced with the name of the company.

To fulfill the obligation, consider establishing a system of tallying the amount filled and amount recovered and creating a schedule.



Obligation concerning the disposal of equipment

■ Thoroughly recover fluorocarbons^{*} when disposing of equipment. Entrust the recovery of unnecessary fluorocarbons, issue the "Request for Recovery" or the "Confirmation of Entrustment," and bear the cost of the recovery, recycling, and destruction of the fluorocarbons.

The recovery of fluorocarbons must be entrusted to a Class I Fluorocarbon Filling and Recovery Operator registered in the relevant prefecture.





Implement equipment inspection.

The two types of equipment inspection based on the "Fluorocarbons Emission Control Law" are as follows:

- Simple inspection intended for all commercial air conditioners, freezing equipment, and refrigeration equipment (Visual checks of product appearance, etc.)
- Periodic inspection intended for commercial air conditioners, freezing equipment, and refrigeration equipment larger than the specified size (Inspection conducted by an expert)

The table below summarizes the products subject to periodic inspection and the inspection frequency based on the laws.

	Inspection frequency	Compressor output	Refrigerated air dryer	Refrigerated thermo-chiller (Production of the underlined series has been terminated.)
Simple inspection	At least once every 3 months	Less than 7.5 [kW]	All IDF⊟ series IDU series IDH series INOD series	All HRZ series INR-242-12 HRS series HRG series INR-496 series INR-242 series INR-497 series INR-338 series INR-499 series INR-341 series INR-57 series
Periodical inspection	At least once every year	7.5 [kW] or more	IDF370B IDF370D only	HRZ008-L HRZ008-L1 only



Store inspection history.

Carefully read the instructions below, and be sure to store the "Refrigerant Leakage Inspection and Maintenance Record" (refer to page 453).

[Instructions for filling out the Refrigerant Leakage Inspection and Maintenance Record]

- ① Visit the website of the Japan Association of Refrigeration and Air Conditioning Contractors (http://www.jarac.or.jp/kirokubo/), and download the "Refrigerant Leakage Inspection and Maintenance Record" (normal version of Excel macro execution type) in compliance with the "Fluorocarbons Emission Control Law". Prepare a record for each thermo-chiller and store it in an appropriate location. Ensure that the name of the manager has been entered.
- ②Use one of the specialized companies (a Class I Fluorocarbon Filling and Recovery Operator) tied up with SMC, wherever possible.

Only an expert qualified as a Class I or Class II Fluorocarbons Handling Engineer may implement inspection.

- ③ For the refrigerant to be used, total initial amount filled, and initial amount filled at production, copy the refrigerant type and the amount filled provided on the nameplate on the rear of the thermo-chiller or in the catalog. Enter "Less than 7.5 kW" for the compressor output and "0.00 kg" for the additional amount filled at installation.
- (4) Conduct a simple inspection of all thermo-chillers at least once every three months, and record the results. Conduct a comprehensive inspection along with the "Daily Check Sheet" (indirect method) provided in the Operation Manual.
- ⑤ Inspection can be undertaken by one of the specialized companies tied up with SMC in place of the customer.

(6) If any repairs are made, record the amount recovered, amount filled, and repair details.

 $\ensuremath{\overline{\mathcal{O}}}$ Continue to conduct inspections and record the results according to the specified frequency.

8

Refrigera	ant Leak	age Insp	ection	and Mai	ntenance	e Record	April 1	1, 2009	to June	30, 201	7				Control no.				Supplen
Manager of	Na	me	Fluo	rocarbo	n Co., L	.td.						Equipment m	anufacturer	XYZ R	efrigerate	or Co., Lt	d.	-	_
equipment	Add	lress	3-4-5	00,00	City, OOF	Prefecture	JAPAN 1	123-4567 System A-1 Date of installation April 11, 2009											
Location of	Name	of facility	ххх	Supern	narket,	XX Shop	C		TEL	01-23	34-5678	r	Туре	Ther	mo-chille	er Mo	del HRS01	8-A-20	_
equipment	Add	lress	9-87	00,000	City, OOP	refecture,	JAPAN 3	321-9876	TEL	01-22	22-3333	Equipment	Mfg. code	١	VP001	Applic	tion For co	oling	
Person r operation			Taro	Kankyo)				TEL	01-22	22-3333	used			itput of or motor	Les	s than 7.	5 kW	
ress of ted etc.	SD M Co., L	aintena .td.	ince)), () xxx-xx	City, ⊖ ∝	⊖Prefec	cture,	TEL		-000- 200	Refrigera		ital nt filled	Total amou recovered			2-t	
Name and address of company inspected etc.	XYZ	Co., Ltd			0, 00 xxx-xx	City, OC	Prefec	illie,	TEL	000)-000-)00	amount		72	0.36	0.00	0.0	000	
Nam oomp					/				TEL			Refrigerant us		07C	Total initial	amount filled	(kg) 0.3	36	
GWP	value	of F	311	P12	R32	R134a	R22	R123	R245fa	R502	R404A	1407A R40	7C R410	A R410	DB R152	a R142b	R507A		
main r	efrigera	ant 4	750	10900	675	1430	1910	11	1030	4660	3920	2110 177	0 2090	223	0 124	2310	3990		
			pection		Amount	filled (kg) Use of FC recovered (kg)	Amount recovered (kg)		ection thod	Inspection result	Cause of leakage failure	Location of leakage/ failure	Repai content (includir planned re	is ng re	ame of com (inspectio epair, recov filling)	n, Nam	e of Enginer eer no.	er Reason for difficultien of repair	es P
02/2009(N		Initial a at prod			0.36				_	_									
04/11/2	2009	Additional am	ount filled	at installation	0.00									\neg	-	-	-		
MM/DD	/2015	Simple	inspe	ection	0.00	0.00	0.00	Ind	irect	None	—	—	_		-	_	—	-	Τ
MM/DD	/2015	Simple	inspe	ection	0.00	0.00	0.00	Ind	irect	None	_	_	-		-	_	-		
MM/DD	/2015	Simple	inspe	ection	0.00	0.00	0.00	Indi	irect	None	_	-			-	_	_	_	
MM/DD	/2015	Simple	inspe	ection	0.00	0.00	0.00		rect, rect	None	_	-	-		YZ o., Ltd.	0000	No. 2-xx-xx	, –	
MM/DD	/2016	Simple	inspe	ection	0.00	0.00	0.00	Ind	irect		—	—	-		-	-	-	-	Τ
MM/DD	/2016	Inspect mainter (repair)	nance		0.36	0.00	0.36		rect, rect	None	_	-	Replacer of heat exchange	X	YZ o., Ltd.	0000	No. 2-xx-xx	. –	-
MM/DD	/2016	Simple	inspe	ection	0.00	0.00	0.00	Indi	irect	None	-	-	-		-	_		-	
MM/DD		Simple	inspe	ection	0.00	0.00	0.00		irect	None	-	—	-		-	—	-	-	
MM/DD		Simple	inspe	ection	0.00	0.00	0.00		irect	None	_	_	_		-	_			
MM/DD		Simple	- ·		0.00	0.00	0.00		irect	None	_	_	-		-	-	-		
MM/DD	/2016	Simple	inspe	ection	0.00	0.00	0.00	Ind	irect	None	_	-	_		_			+-	┿
																		+	Ŧ
Tota					0.72	0.00	0.36											+	t

SNC, Thermo-chiller Daily Check Sheet

For information about how to perform daily checks of the thermo-chiller, refer to section "8.21 Daily Check" in the "Operation Manual".

Model no. Mfg. code

Check and record the condition at startup right after setting up.

		Setting up	conditions	Fluid leakage		Operatio	on panel	Circulating fluid temperature	Operation conditions	Facility wa	ter (Water-	cooled only)	
Date	Performed by	Temperature	Humidity	Present/	Inside/Outside of liquid level indicator range	Display Operation	Disalau Osaratian	°C	Presence of error	Temperature	Flow rate	Supply pressure	Result
	-,	°C	%	Not present	Inside/Outside	υιοριαγ	Operation		Present/Not present	°C	L/min	MPa	
Initial value (Default setting)													



Calculate and report the fluorocarbon leakage amount.

It is necessary to calculate the leakage amount (each business operator, each business place) using the formula below based on the "Certificate for Fluorocarbon Filled/Recovered" issued by the Class I Fluorocarbon Filling and Recovery Operator.

Fluorocarbon leakage amount calculated (CO₂-t) = (Amount filled (kg) – Amount recovered at maintenance of equipment (kg)) x Global warming potential/1,000

If the leakage amount calculated every fiscal year exceeds 1,000 CO2-t, it must be reported to the nation (government agency in charge of business) by the end of July of the next fiscal year.

A penalty is imposed on companies that violate the obligation required by the "Fluorocarbons Emission Control Law" as below.

O Discharge of fluorocarbons without good reason Imprisonment for up to 1 year or fine of up to 500,000 ven

- Oviolation of the municipal or prefecturalFine of up to 500.000 ven
 - governor's orders concerning the obligations related to the use or disposal of equipment

ONon-report or false report of leakage amount calculated...Administrative penalty of up to 100.000 ven

If you need further information regarding the management of equipment, the recovery of fluorocarbons. etc., contact the manufacturer of the air conditioner, freezing equipment, or refrigeration equipment, or the maintenance agency, prefectural government, Ministry of the Environment, Ministry of Economy, Trade, and Industry, or visit the website shown below.

Ministry of the Environment,

Global Environment Bureau, Climate Change Policy Division, Office of Fluorocarbons Control Policy 1-4-2, Kasumigaseki, Chiyoda-ku, Tokyo 100-0013

Ministry of Economy, Trade, and Industry, Manufacturing Industries Bureau, Chemical Management Policy [TEL] 03-3501-1511 (Main number) Division, Fluoride Gases Management Office 1-3-1 Kasumigaseki, Chiyoda-ku, Tokyo 100-8901

[TEL] 03-3581-3351 (Main number) [URL] http://www.env.go.jp/seisaku/list/ ozone html

[URL] http://www.meti.go.jp/policy/chemical_ management/ozone/index.html

* The list of contacts of prefectural bureaus in charge of the Fluorocarbons Emission Control Law is provided on the website of the Ministry of the Environment.

[Excerpt]

*3

Ministry of the Environment, the "Act on Rational Use and Proper Management of Fluorocarbons" (the "Fluorocarbons Emission Control Law") was put into effect in April 2015.

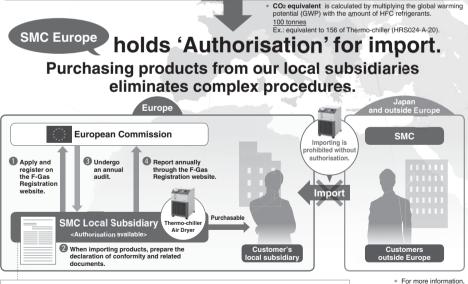


Refrigeration equipment using HFC refrigerant imported into the EU from January 2017, such as refrigerated Thermo-chillers and Air dryers, is subject to this regulation.



HFCs imported into the EU must be from the EU Quota system.

- It shall apply to producers or importers of 100 tonnes and more CO₂ equivalent* of hydrofluorocarbons per year.
- · European Commission annually allocates 'Quotas' to manufacturers and importers of HFC refrigerants.
- Quota holders can give 'authorisation' to refrigeration equipment importers to use a specified amount of guota held by the guota holder.



@SMC

refer to page 456.

List of local subsidiaries of SMC Europe (with import quota licenses available)										
Ireland	SMC Pneumatics (Ireland) Ltd.	Spain/Portugal	SMC España SA							
U.K.	SMC Pneumatics (U.K.) Ltd.	Denmark	SMC DANMARK A/S							
Italy/Greece	SMC Italia S.p.A.	Germany	SMC Deutschland GmbH							

MC Pneumatics (U.K.) Ltd.	Denmark	SMC DANMARK A/S
MC Italia S.p.A.	Germany	SMC Deutschland Gm
MC Pneumatik GmbH (Austria)	Finland	SMC Automation Oy
MC Nederland BV	France	SMC France
MC Automation AB	Belgium	SMC Belgium NV/SA

Austria

Sweden

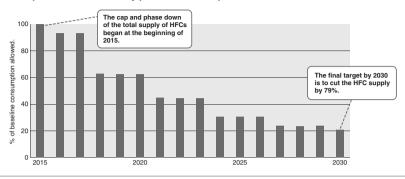
Netherlands

S S

SI

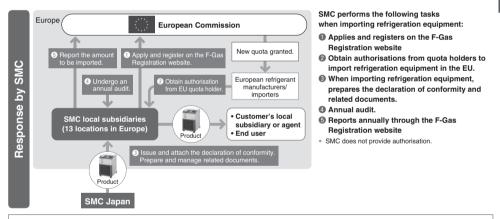
EU F-Gas Regulation (517/2014)

The European Union aims to reduce the environmental impact of HFCs via regulation. The EU commission released the new F-gas regulation. One of the key changes is implementing a phase down of the quantity of HFC that can be placed in the market by producers and importers between 2015 and 2030.



Effect of the EU F-Gas Regulation

From January 2017, importers who intend to import refrigeration equipment into the EU must first register on the European Commission 'HFC register' and obtain authorisation from an EU quota holder. This is mandatory.



Customer management of the F-Gas regulation*:

Each importer (customers local subsidiary / agent or end user) who receives the refrigeration equipment directly, must perform the above five tasks in Europe.

This information is based on SMC's own investigation. It is recommended that customers conduct their own investigation into the European F-Gas Regulation 517/2014 and take appropriate actions at their discretion.

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

Handling of Thermo-chillers That Have Become Unnecessary

As SMC is not registered as a specialized handling operator based on the "Fluorocarbons Emission Control Law" and the "Industrial Waste Disposal Law," we are not permitted to collect and dispose of thermo-chillers that users no longer require. If you are requested by users to collect such thermo-chillers, take action as described below.

<Response to users>

Explain to users that SMC is not permitted to collect unnecessary thermo-chillers (industrial waste) as we are not a Class I Fluorocarbon Filling and Recovery Operator, and then take either action described below.

 Response 1: Introduce a maintenance agency qualified to conduct disposal.

 Response 2: Ask users to directly request an operator registered with the local government.

 (A list of registered operators can be found on the website of the relevant prefectural government or municipality.)

Filling and recovery of fluorocarbons and collection and transfer of industrial waste

1. Recovery of fluorocarbons

Equipment containing fluorocarbons must be disposed of by a Class I Fluorocarbon Filling and Recovery Operator based on the "Fluorocarbons Emission Control Law."

<Reference>

Fluorocarbon Filling and Recovery Operators can implement the recovery process only in the prefecture where they are registered.

E.g.) An operator registered in Hiroshima Prefecture can only recover fluorocarbons in Hiroshima Prefecture and bring them to a Fluorocarbon Destruction Operator in Hiroshima Prefecture. In the case where the fluorocarbons are recovered in Hiroshima Prefecture and then brought to a Fluorocarbon Destruction Operator in Yamaguchi Prefecture, this Fluorocarbon Filling and Recovery Operator must be registered in both Hiroshima and Yamaguchi Prefectures.

2. Disposal of industrial waste

After fluorocarbons are recovered from thermo-chillers, these chillers are handled as industrial waste. Based on the "Industrial Waste Disposal Law," disposal of industrial waste must be entrusted to an Industrial Waste Collection and Transfer Operator registered with the local government. <Beference>

Industrial Waste Collection and Transfer Operators must be registered in the location where they perform loading and unloading.

E.g.) If an operator loads the industrial waste in Kanagawa Prefecture and unloads it in Fukushima Prefecture, they must be registered in both of these prefectures.

Precautions when SMC collects and inspects a product

When a product is collected from the user to inspect alarm causes and it is determined that repair is not possible, you may be asked by the user to dispose of the product instead of returning it to them. However, SMC is not permitted to perform disposal due to the abovementioned "Fluorocarbons Emission Control Law" and the "Industrial Waste Disposal Law."

When you are requested to collect and inspect a product, be sure to explain before collection that the product will be returned to the user even if it turns out to be irreparable.



Earthquake Resistance Strength Calculation: Selection of Anchor Bolts

This chapter describes how to select the anchor bolts that need to be prepared to prevent the product from falling in the case of an earthquake.

For customers, please provide the calculated values in this chapter when you make a request for the installation of a product to a company specializing in construction, foundation concrete placement, or installation work.

For companies specializing in construction, foundation concrete placement, or installation work, please check the calculated values in this chapter when you have received a request for product installation from a customer.

This chapter provides earthquake-proof calculations to cope with earthquakes of an anticipated side. These calculations do not guarantee resistance for earthquakes beyond anticipation. We ask for your understanding.

Calculation results vary greatly depending on the installation location (penthouse, roof floor, higher floors, middle floors, ground floor, or basement), horizontal seismic intensity for design, equipment weight, center of gravity position, or the interval, quantity, size or embedded length of the anchor bolts. Refer to "Seismic Design and Construction Guideline for Building Equipment" (2014 Edition) issued by The Building Center of Japan.

Installation Location and Anticipated Seismic Force

1) HRS012/018-A/W-10

Item				Model	HRS012/018 -A-10	HRS012/018 -W-10
	Dry mass			[kg]	4	5
	Tank capacity			[L]	5	
Other capacity (Piping, etc.)			[L]	2		
Fluid				Tap water		
	Fluid density			[kg/L]	1	
Thermo- chiller	Oper	ating mass	m	[kg]	52	
crimer	_ <u>≥</u> Height		h	[cm]	25	
	Center of gravity	From the left		[cm]	19	20
		From the front		[cm]	28	
		From the closest anchor bolt	Lg	[cm]	11.85	10.85
	Seisi	nic zoning factor	Z	[-]	1.	.0
Installation	Standard seismic intensity for design Ks		[-]	2.0		
location	Horizont	al seismic intensity for design	Z·Ks	[-]	2.0	
	Vertical seismic intensity for design		Z·Ks/2	[-]	1.0	
Anticipated	Horizontal direction FH = m·Z·K		F⊢ = m·Z·Ks	[N]	1020	
seismic force	Vertical direction		$Fv = m \cdot Z \cdot Ks/2$	[N]	510	
			-			459

2) HRS012/018/024-A/W-20

Item				Model	HRS012/018/024 -A-20	HRS012/018/024 -W-20
Dry mass			[kg]	48		
	Tank capacity			[L]	5	
	Other	capacity (Piping, etc.)		[L]	2	
Fluid				Tap water		
T h	Fluid density			[kg/L]	1	
Thermo- chiller	Operating mass		m	[kg]	55	
crimer	ity	Height	h	[cm]	26	
	Center of gravity	From the left		[cm]	18	19
		From the front		[cm]	28	
		From the closest anchor bolt	Lg	[cm]	11.15	11.85
	Seismic zoning factor Z [-]		[-]	1.0		
Installation	allation Standard seismic intensity for design Ks [-]		2.	.0		
location			[-]	2.0		
	Vertical	seismic intensity for design	Z·Ks/2	[-]	1.0	
Anticipated	Horiz	zontal direction	Fн = m·Z·Ks	[N]	10	79
seismic force	force Vertical direction		$Fv = m \cdot Z \cdot Ks/2$	[N]	539	

3) HRS050/060-A/W-20

ltem				Model	HRS050/060 -A-20	HRS050/060 -W-20
	Dry mass			[kg]	69	67
	Tank capacity			[L]	5	
	Other capacity (Piping, etc.)			[L]	3	
	Fluid			Tap water		
	Fluid density [kg/		[kg/L]	1		
Thermo- chiller	Oper	rating mass	m	[kg]	77 75	
Cimer	Center of gravity	Height	h	[cm]	48.8	
		From the left		[cm]	18.85	
		From the front		[cm]	296	
		From the closest anchor bolt	Lg	[cm]	12	
	Seismic zoning factor		Z	[-]	1.0	
Installation	Standard seismic intensity for design Ks		Ks	[-]	2.0	
location	Horizontal seismic intensity for design Z-Ks		[-]	2.0		
	Vertical seismic intensity for design Z-Ks/2		Z·Ks/2	[-]	1.0	
Anticipated	Horizontal direction Fr		Fн = m·Z·Ks	[N]	1510	1471
seismic force	Vertical direction Fv = m·Z·K		$Fv = m \cdot Z \cdot Ks/2$	[N]	755	735

Anchor Bolt (M8), Anti-quake Bracket (HRS-TK001/002) Specifications

Item			Specifications	
	Nominal			M8
	Total quantity	n	[pcs.]	4
	Quantity per side	nt	[pcs.]	2
Anchor bolt	Effective area (For coarse bolts)	An	[mm²]	36.6
Anchor Doll	Material		-	SS400
	Tensile strength		[MPa] (N/mm²)	400 to 510
	Yield point or proof stress		[MPa] (N/mm²)	235 or more
Anti-guake	Part no.			HRS-TK001/002
bracket (Optional	Anchor bolt	Short side L	[cm]	24
accessory)	sory) through-hole pitch		[cm]	Refer to the Web Catalog.
O	Embedded length		[mm]	40
Construction method	Foundation strength (Concrete)		[MPa] (N/mm²)	18 or more

Force Acting on Anchor Bolts

1) HRS012/018-A/W-10

Model			HRS012/018 -A-10	HRS012/018 -W-10	
Overturning moment (Seismic force in horizontal direction)		Mн = Fн⋅h	[N·m]	255	
Vertical mome force in vertica	•	Mv = Fv⋅Lg	[N·m]	60.4	55.3
Resisting moment (Dead weight of thermo-chiller) Mm = 9.8·m·Lg [N·m		[N·m]	60.4	55.3	
	Pull-out	Rb = (Мн + Mv – Mm)/(L·nt)	[N/pc.]	531	531
force		Short-term allowance (Refer to page 462.)	[N/pc.]	3,000	
Force acting	Tensile	σ = Rb/A n	[MPa/pc.]	14.51	14.51
bolts stress		Short-term allowance [= Yield point or proof stress]	[MPa/pc.]	235	
Shearing stress		τ = Fн/(n·An)	[MPa/pc.]	6.97	
		Short-term allowance [= Yield point or proof stress/\/3]	[MPa/pc.]	136	

2) HRS012/018/024-A/W-20

Model			HRS012/018/024 -A-20	HRS012/018/024 -W-20	
Overturning moment (Seismic force in horizontal direction)		Mн = Fн∙h	[N·m]	280	
Vertical moments force in vertical		Mv = Fv∙Lg	[N·m]	60.1	63.9
Resisting moment (Dead weight of thermo-chiller)		Mm = 9.8⋅m⋅Lg	[N·m]	60.1	63.9
	Pull-out	Rb = (Мн + Мv – Мm)/ (L·nt)	[N/pc.]	584	584
force		Short-term allowance (Refer to page 462.)	[N/pc.]	3,000	
Force acting	g σ = Rb/An		[MPa/pc.]	15.96	15.96
bolts		Short-term allowance [= Yield point or proof stress]	[MPa/pc.]	235	
Shearing stress		τ = Fн/(n·An)	[MPa/pc.]	7.37	
		Short-term allowance [= Yield point or proof stress/√3]	[MPa/pc.]	136	

3) HRS050/060-A/W-20

Item			Model	HRS050/060 -A-20	HRS050/060 -W-20
Overturning moment (Seismic force in horizontal direction)		Mн = Fн⋅h	[N·m]	737	718
Vertical mome force in vertica	•	Mv = Fv⋅Lg	[N·m]	90.6	88.3
Resisting moment (Dead weight of thermo-chiller) Mm = 9.8·m·Lg [N		[N·m]	90.6	88.3	
	Pull-out	Rb = (Мн + Мv – Мm)/ (L·nt)	[N/pc.]	1,535	1,496
force		Short-term allowance (Refer to page 462.)	[N/pc.]	3,000	
Force acting			[MPa/pc.]	42.0	40.9
bolts		Short-term allowance [= Yield point or proof stress]	[MPa/pc.]	235	
	Shearing	τ = Fн/(n·An)	[MPa/pc.]	10.3	10.0
stress		Short-term allowance [= Yield point or proof stress/√3]	[MPa/pc.]	136	

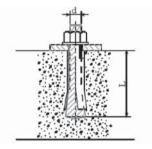
Result of Anchor Bolt Selection (Result of Earthquake Resistance Strength Calculation)

If an anchor bolt with a sufficient pull-out load, compared to the pull-out force acting on the anchor bolt shown in the above calculation sheets, is selected, the size of the anchor bolt will be larger than the extension type shown below. Check with the bolt manufacturer for details.

Anchor bolts will differ depending on the installation location at the customers' premises and the strength of the floor or foundation concrete.

Regarding these points, consult with the company specializing in construction, foundation concrete placement, or installation work with which you request installation.

Post-installed male thread type mechanical anchor bolt



Extension type

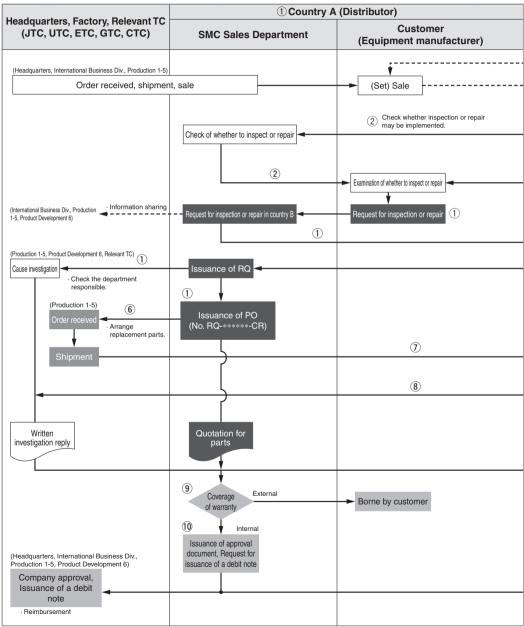
	0				Embedded
Bolt size d	Con	length L			
(Nominal)	120	150	180	200	(mm)
M8	300	300	300	300	40
M10	380	380	380	380	45
M12	670	670	670	670	60
M16	920	920	920	920	70
M20	1,200	1,200	1,200	1,200	90
M24	1,200	1,200	1,200	1,200	100
Limit of embedded length of bolt (L)	100 or less	120 or less	160 or less	180 or less	

Short-term allowable pull-out load (kgf)

[Excerpt] "Earthquake-proof Calculation Software for Equipment" explanatory material prepared by the Japan Federation of Mechanical & Electrical Consulting Firms Association

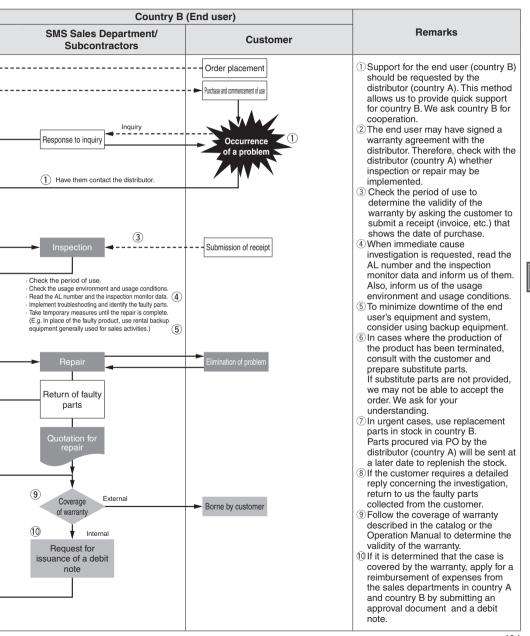
10 Customer Support Flow Chart for Use in the Event of a Problem

Customer support flow chart for when there is a problem with a product an end user in country B has purchased from a distributer in country A



@SMC

This flow chart has been created based on the information provided in the "S-ComPa 2 PAGE" and "Chiller Maintenance" materials. Refer to these materials for details.



@SMC

10

Frequently Asked Questions (FAQ)

Question		Answer	Refer to
	How can I find the part number of the replacement parts?	Refer to "Construction" and "Replacement Parts List" in this handbook as well as the Service Manual.	This handbook: Construction, Replacement Parts List (pages 33 to 111)
Replacement parts	What is the replacement cycle of the mechanical seal?	The approximate cycle is every 6,000 to 8,000 hours of operation. When 8,000 hours have passed, you will be notified by AL28 (Pump maintenance). When this alarm is generated, consider conducting a leak inspection and replacing the mechanical seal.	This handbook: Parts Replacement Cycle (page 112), Maintenance Standards, Operation Manual, etc.
	How do I replace the mechanical seal?	Refer to this handbook as well as the Service Manual. This work can be carried out by any of the service companies tied up with SMC. Please consider outsourcing the replacement work. When replacement is performed by the customer, be sure to conduct pre-training.	This handbook: Replacement Procedure for Mechanical Seal (pages 409 to 434)
	What do I do when AL01 (Low level in tank) is generated?	The level in the tank is low. Check that there is no leakage from the piping, including that of the customer's equipment. If no leakage is found, fill the tank with circulating fluid in accordance with the Operation Manual.	This handbook: Maintenance (pages 138 and 139)
Alarm handling	What do I do when AL06 (High circulating fluid discharge pressure) is generated?	Resistance (pressure loss) of the piping, including that of the customer's equipment, has exceeded the pump capacity of the thermo-chiller. Check whether there are throttles in the piping, including that of the customer's equipment. If throttles are present, increase the piping size or relieve the circulating liquid flow rate by providing bypass piping (set).	This handbook: Maintenance (pages 163 to 165)
	What do I do when AL28 (Pump maintenance) is generated?	This alarm notifies you that the pump or mechanical seal needs to be inspected or replaced. This work can be carried out by any of the service companies tied up with SMC. Please consider outsourcing the replacement work. When replacement is performed by the customer, be sure to conduct pre-training.	This handbook: Maintenance (page 238)

	Question	Answer	Refer to	
Circulating	Can I use circulating fluids or additive agents not listed in the catalog?	SMC can check this for you. Inform us of the chemical compositions of the circulating fluids and additive agents you wish to use and the names of the manufacturers or distributors of them. All wetted parts materials are listed in the SMC Thermo-chiller catalog. Confirm these materials, and also contact the distributor or manufacturer if needed.	Catalog, Operation Manual (Specific Product	
fluid	Will you verify circulating fluids and additive agents not included in the catalog?	SMC can check this for you. When a circulating fluid and additive agent blended by the manufacturer (distributor) for long-term use is used, it is very difficult to find problems in a short-term life test. Therefore, all wetted parts materials are listed in the SMC Thermo-chiller catalog. Confirm these materials, and also contact the distributor or manufacturer if needed.	Precautions, Water Quality Standards)	
Storage	What should I do when the product will not be in use for long periods?	Leaving a product that contains circulating fluid inactive may cause the pump to get stuck. When you do not plan to use the product for long periods (one month or longer), conduct a non-load operation periodically or remove the circulating fluid from the product before storing it.	Operation Manual (For long-term stoppage)	
Support	How is the maintenance system in Japan?	In Japan, our 54 branch offices and 94 distributors with 500 sales offices provide support for customers. A number of service companies tied up with SMC provide support for the thermo- chiller. As SMC's sales offices are also capable of providing support, we will be able to help you even in emergencies.		
system	How is the maintenance system overseas?	In countries overseas, our 500 sales offices in 83 countries/regions provide support for customers. Support for the thermo-chiller is accepted by 3 offices in North, Central, and South America, by 9 offices in Europe, and by 10 offices in Asia (22 offices in total). As SMC's sales offices in Japan also serve as mediators, we will be able to help you even in emergencies.	SMC Website, Support Guide	

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Refrigeration Circuits, Peltier Devices, Cooling Sources

Compressor

A compressor draws in low-pressure chlorofluorocarbon (CFC) refrigerant gas, compresses the gas and then discharges it as a high-pressure, high-temperature gas. Compressors are classified into various types (reciprocating, rotary, screw, etc.) according to the mechanical compression method used.

Refrigerator

A compressor that compresses a refrigerant gas. These are called refrigerators to distinguish them from machines such as air compressors.

CFC refrigerant

CFC (chlorofluorocarbon) refrigerants are organic compounds made up of elements including carbon, hydrogen, chlorine and fluorine. They are referred to generically using the DuPont brand name of Freon[®].

When CFCs are used as heat-transfer mediums and circulated inside refrigeration circuits, causing heating and cooling during their condensation and evaporation phase changes, the CFCs are referred to as CFC refrigerants.

Specified CFC

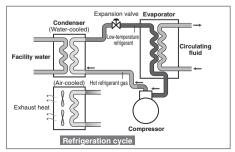
Due to their stability as a chemical substance and their safety with respect to humans, CFCs came to be widely used as industrial materials, particularly refrigerants. However, it was later recognized that when CFCs (and HCFCs (hydrochlorofluorocarbons)) containing chlorine are released into the atmosphere, they rise up into the ozone layer and deplete it.

This resulted in the establishment of the Montreal Protocol in 1987, which classified CFCs such as Freon R12 and HCFCs such as Freon R22 as "specified CFCs" and prohibited their manufacture. As a result, their use has now almost completely died out.

Instead of specified CFCs and HCFCs, SMC products now use HFC refrigerants such as R134a and R404A that have an ozone depletion potential (ODP) of zero.

Fundamentals of refrigeration circuits

In a refrigeration circuit, refrigerant gas injected into the circuit repeatedly travels through a cycle of compression, condensation, expansion and evaporation, creating hightemperature and low-temperature sections in the circuit. The compressor compresses low-pressure refrigerant gas and discharges the gas at a high temperature and pressure level. The hot, pressurized refrigerant gas enters the condenser where it is cooled by the external air or cooling water and condenses to form a high-pressure liquid refrigerant. As the high-pressure liquid refrigerant passes through a constricting mechanism, such as an expansion valve, it rapidly depressurizes and some of the refrigerant tevaporates. The release of evaporation heat causes the refrigerant tiself to cool



so that it becomes a combination of gas and liquid at a lowtemperature and pressure level. In its combined gas-liquid state, the refrigerant enters the evaporator where it continually evaporates while absorbing the heat within the evaporator, thereby cooling the interior of the evaporator. When the refrigerant emerges from the evaporator, it evaporates entirely and becomes a low-pressure refrigerant gas. The low-pressure refrigerant gas is then drawn into the compressor and again becomes a high-temperature, high-pressure gas as the cycle is repeated.

Condenser

A heat exchanger used to condense high-temperature, highpressure refrigerant gas. A condenser has the function of releasing heat drawn up by the refrigeration circuit to the outside. Condensers can be air-cooled or water-cooled, depending on the cooling method used.

Air-cooled condenser

Air-cooled condensers are generally made up of copper tubes through which the refrigerant flows, with numerous thin aluminum fins attached around the outside of the tubes. Outside air is forced over the fins by a device, such as a fan motor, to cool the pipes to the ambient temperature and condense the refrigerant gas.

If an air-cooled condenser is installed inside a building, it can be used to heat the interior of the building since the heat generated by the refrigeration circuit is released as waste heat from the outside of the condenser. The room in which an aircooled condenser is installed must have adequate ventilation or air-conditioning equipment.

Water-cooled condenser

A heat exchanger that uses cooling water to cool and condense the coolant. Water-cooled condensers can be used in environments, such as large factories where cooling tower water or the cooling water for an air-conditioning system can be circulated and used.

Depending on their construction, heat exchangers can be double-pipe type, shell-and-tube type or plate type units.

Refrigerant dryer

In a refrigeration circuit, a refrigerant dryer consists of filters that absorb and remove moisture inside the refrigeration circuit. Refrigerant dryers are normally installed in pipes carrying liquid refrigerant after it emerges from the condenser.

Expansion valve

A component that creates an expansion in the refrigeration circuit. As the refrigerant passes through this valve, a large pressure loss results, thereby making it possible to create high-pressure and low-pressure segments within the refrigeration circuit.

There are several types of expansion valve, including constant-pressure expansion valves and thermal expansion valves. Such types allow the size of the valve aperture to be adjusted using refrigerant pressure or temperature feedback from an outlet passage.

Capillary tube

The capillary tubes used in refrigeration circuits are simply small-caliber copper tubes, normally used in the expansion step, that act as a fixed restrictor in the refrigerant passage.

Evaporator

A heat exchanger used to cool the target substance (e.g., water or air) using the evaporative heat from a lowtemperature, low-pressure combined gaseous and liquid refrigerant in the refrigeration circuit.

Cooler

 \rightarrow Evaporator



Accumulator

A tank installed in a refrigeration circuit on the inlet side of the compressor. A compressor is a component designed to compress gas, so a malfunction will occur if any liquid coolant enters the compressor. Installing an accumulator has the function of separating out the coolant gas that is sucked into the compressor and any remaining refrigerant, and of preventing the liquid refrigerant from being sucked into the compressor. The inclusion of an accumulator creates a system that is highly resistant to variability in factors such as the cooling load.

Hot gas bypass

A refrigeration circuit sometimes includes a circuit that allows high-temperature, high-pressure refrigerant gas (hot gas) discharged from the compressor to bypass the condenser so that it reaches the evaporator (on the low-pressure side) without being condensed. This prevents the evaporator temperature (on the low-pressure side) from dropping too far and reduces the risk of liquid refrigerant being drawn into the compressor when the cooling load is low (if there is nothing to refrigerate), thereby ensuring more stable functions of the refrigeration circuit.

This also allows a flow of hot gas to be intentionally directed to the evaporator with the aim of heating the evaporator rather than cooling it.

Water-regulating valve

A control valve, installed on the cooling water pipe for a water-cooled condenser, used to adjust the amount of cooling water flowing to the condenser. Water-regulating valves can be either pressure-regulated or temperature-regulated, with the amount of flow regulated using feedback from the condensing pressure or condensing temperature, respectively.

When the cooling water temperature is low, a large flow of cooling water to a water-cooled condenser reduces the condensing pressure and lowers the cooling capacity. In this sort of situation, a water-regulating valve restricts the cooling water flow and maintains the condensing pressure at the desired value. Water-regulating valves also have the function of reducing water consumption by preventing unnecessarily large flows of cooling water.

Inverter control

In compressors that use an ordinary AC motor, the motor rotation rate is fixed according to the frequency of the AC power supply, with the result that the refrigerant discharge rate is also fixed. Inverter control in a refrigeration circuit is the use of an inverter to vary the compressor rotation rate and thereby control the rate of refrigerant circulation.

This provides means of saving energy by, for example, running the compressor at a slower rate when the cooling load is low.

Protective devices in refrigeration circuits

In refrigeration circuits, protection must be provided for electrical components such as compressors, and against abnormal refrigerant pressures. Protective measures for compressors (motors) include protective devices such as overload relays (built into the compressor to detect overcurrent and overheating), thermal relays (fitted externally to detect motor overcurrent) and temperature switches.

The devices used to protect against pressure faults include pressure switches, safety valves and rupture disks. However, in refrigeration circuits built into compact devices, the protective devices are often confined to just overload relays, or just thermal relays and pressure switches depending on the anticipated level of risk.

Facility water

The cooling water flowing through a water-cooled condenser used to expel waste heat generated in the refrigeration circuit

to the outside.

In ordinary factories or buildings, fluids such as cooling tower water or chiller water are used as facility water.

Cooling tower

A cooling tower is a facility that uses cooling water to expel the waste heat circulated and collected inside a factory or other building into the outside air. Cooling towers are installed in outdoor locations such as on the rooftops of buildings. The cooling water is sprayed down like a shower from the top of the cooling tower and forcibly brought into contact with the outside air. Ya fan motor. As well as being directly cooled by the temperature of the outside air, the partial evaporation of the cooling water itself draws off evaporation heat, cooling the water further.

Because cooling towers are directly cooled by the outside air, the resulting cooling water temperature varies seasonally depending on the climatic conditions. In addition, the cooling water cannot theoretically be cooled to a temperature any lower than 5°C above the wet-bulb temperature of the outside air.

Peltier device

An element with a structure made up of alternating layers of flat P-type and N-type semiconductors arrayed in series. When a direct current flows through the element, heat moves from one plate surface to the next, so that one surface is cooled as the opposing surface is heated. This is referred to as the Peltier effect.

By changing the direction of current flow, the direction of heat movement can also be changed, providing a simple means of cooling and heating.

Thermo-module

- → Peltier device
- Thermoelectric device

→ Peltier device

Thermoelectric system

A temperature control system that uses a Peltier element to directly cool and heat a liquid, gas or solid.

Heat exchangers suitable for fluids are installed on both sides of the Peltier element, with the fluid to be temperaturecontrolled on one side of the element while the heat exchanger on the other side is used to dissipate heat.

Fluid Control and Heat-related

Pump capacity/Water-supply capacity

A pump's water-supply capacity is indicated by the amount of water it can cause to flow at a given pressure (lifting height). The characteristic curve (pump curve) that indicates the correlation between pressure and flow rate varies depending on the pump type, and thus, the user must check that the type of pump selected is suitable for the intended application.

Lifting height/Pressure

Lifting height (in meters) is often used instead of pressure to indicate the pump capacity. Lifting height is a numerical value that indicates the capacity of a pump in terms of the height (in meters) to which it can lift a fluid.

The value for pressure is obtained by multiplying the lifting height by the density of the fluid; for example, if a pump capable of generating a lifting height of 10 meters is used to pump water, which has a density of 1 kg/L, the unit pressure generated by the pump is 1 kg/cm² (0.1 MPa).

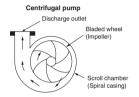
If a more dense fluid is used, the pressure is higher even though the lifting height remains the same.

Pipe resistance

When water or another fluid is caused to flow through a passage composed of pipes, valves, etc., the pressure differential generated by friction between the various devices and the fluid is known as "pipe resistance." A synonymous term is "pressure loss."

Centrifugal pump

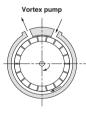
This is one type of pump in which a bladed wheel (impeller) spins inside the pump chamber (casing), applying centrifugal force to the fluid. This force is converted to pressure that discharges the fluid. A large volume of fluid can be pumped, but it is difficult to attain high pressure. When high-pressure is desired, a type fitted with multistage impellers can be used. This is a low-lifting height, high-flow volume pump.



Vortex pump

In this type of pump, a bladed wheel (impeller) spins inside the pump chamber (casing), applying centrifugal force to the fluid. This force is converted to pressure that discharges the fluid. As in a centrifugal pump, the fluid is discharged using centrifugal force, but the impeller has more blades than in a centrifugal pump, and in the pump chamber (casing), the aperture (clearance) is set more narrowly, allowing for a higher discharge pressure.

The pressure and flow rate characteristics attained are somewhere between that of a centrifugal pump and a vane pump. This is a mid-lifting height, mid-flow volume pump.

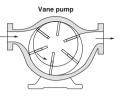


- Turbine pump
 - \rightarrow Vortex pump
- Cascade pump → Turbine pump
- Vane pump

In this type of pump, vanes set in a rotor inside the pump chamber brush against the inside walls of the chamber as they rotate, pushing out and discharging the fluid that is surrounded by the vanes, rotor and pump chamber walls. This is a type of PD (positive displacement) pump.

This is a high-lifting height, low-flow volume pump.

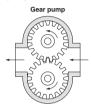
The vanes slide against the interior walls of the pump chamber, generating abrasion powder. In addition, this type of pump is susceptible to entry of foreign matter such as outside debris, etc.



Gear pump

Like the vane pump, this is a type of PD (positive displacement) pump, in which a pair of gears meshes with one another and rotates, pushing the fluid through the gap between them and discharging it.

This is a high-lifting height, low-flow volume pump.



Sealing mechanism

The bladed wheel (impeller) in the pump chamber through which the fluid passes is linked to the shaft of the external electric motor, and the rotation of the impeller discharges the fluid. As water or other fluids seeping through the motor shaft and reaching the electric motor can cause short circuits and other damage, it is necessary to have a mechanism sealing the pump chamber off from the shaft. This is known as a "sealing mechanism."

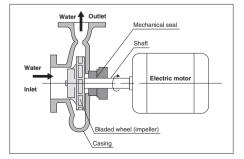
There are mechanical seal types, magnet coupling types and others.

Mechanical seal pump

This is a general terms for pumps that use mechanical seals for the sealing mechanism.

The rotating seal mounted on the motor shaft side and the fixed seal mounted on the pump chamber side rotate, and their surfaces touch one another, sealing off the fluid. As a result, there is a slight, external leakage of fluid. The volume of leakage increases over time, so it is necessary to replace the seal portions regularly.

This type can be used for applications where the motor shaft and impeller are directly linked and there is high-shaft power.

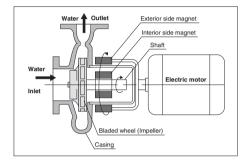


Magnet pump

This is a general term for pumps that use magnetic coupling for the sealing mechanism.

Using magnetism to couple the rotor on the inside of the pump chamber to the permanent magnet mounted on the motor shaft side, with the pump chamber wall between them, the rotation is conveyed to the rotor inside the pump chamber. Since the pump chamber can be completely separated, pump chamber can be completely sealed off, so there is absolutely no external leakage.

Since a large magnet coupling is needed, this type of pump is more difficult to make in small sizes than the mechanical seal type, and the cost is also higher.



DC canned pump

A pump with a sealless construction combining the motor and the pump in one. It can be made in compact sizes with absolutely no external leakage of fluid. A DC brushless motor is used.

Pump heat input

The volume of heat applied to the circulation loop, generated by the operation of the pump. When calculating the overall volume of heat applied to the circulation loop, it is necessary to consider the volume of heat generated by the pump, along with that of the object being cooled.

The pump converts the electrical power entering the motor into the kinetic energy of the fluid, which causes the fluid to circulate. This kinetic energy is reduced as a result of undergoing pressure loss inside the piping, and eventually the entirety of the kinetic energy is released into the circulating fluid as heat.

While there are differences depending on the type of pump, for rough calculations, the nominal heat emitted from the pump can be treated as the pump heat input.

Solenoid valve

A component that switches the flow of fluid from ON to OFF, or changes the direction by moving the plunger (iron core) using the force of electromagnetism.

Relief valve

When the inlet pressure exceeds a set level, this valve opens to release the outlet pressure.

Flow sensor/Flow switch

These components monitor the flow rate of the fluid. The flow sensor measures the flow rate linearly. The flow switch only has the function of commencing operation when the flow rate reaches a certain level, and does not perform measurement of the flow volume.

Particle filter

A filter that removes debris and other particles.

Check valve

A check valve is a device that prevents reverse flow of the fluid, keeping it flowing in one direction only.

Non-return valve

→ Check valve

Level switch

A switch that detects the fluid level inside the liquid tank. There are many different types, but the most common type employs a floating buoy, which causes a lead switch (magnetic switch) to turn ON and OFF.

DI filter

A filter that is filled with ion exchange resin used to remove leftover ions from the water. DI stands for "deionized," while "DI water" is deionized water, or water with its ions removed.

Fluid Properties, Materials, Physical Values

Density, specific gravity

The weight per unit of volume, measured in units of [kg/m³]. Specific gravity is the ratio of the density of a given substance to the density of water (1.0 [g/cm³]), and is a dimensionless quantity. When expressing this quantity within the CGS system of units, density and specific gravity have the same value.

Degree of viscosity

Thickness of a fluid. The units used to express absolute degree of viscosity are $[Pa \cdot s]$ units, but it is often expressed within the CGS system of units with [P] (Poise). 1 [Pa \cdot s] = 10 [P]

The value obtained by dividing absolute degree of viscosity by density is called the kinetic viscosity. This can be measured in $[m^2/s]$ units, but in general, [St] (Stokes) are used. 1 [St] = 0.0001 [m²/s]

Specific heat, specific heat capacity

The heat energy required to increase the temperature of an object by a certain temperature interval, under specific pressure and volume conditions.

. The specific heat of water: 1 [cal/g·K] = 4.184 x 10³ [J/kg·K]

Cooling capacity

The volume of heat (heat energy) that temperature control equipment can absorb (cool) per unit of time, at an arbitrary temperature.

Heat load

→ Cooling capacity

Heat

Terms such as heat, heat load, cooling capacity, etc., that are used in this catalog, indicate quantities of heat that can be absorbed or radiated per unit of time. As a result, the units employed are [W] = [J/s] (work rate) or [kcal/hr]. 1 kW = 860 kcal/hr

Specific resistance

A value indicating the electrical insulating properties of a liquid, and the unit used is $[\Omega \text{ cm}]$. When expressing the specific resistance of deionized water, it is sometimes called "DI level." At 25°C, the specific resistance of theoretically 100% deionized water is 18.3 [M\Omega cm].

Electric conductivity

A value indicating the ease with which electricity passes through a liquid, and is inversely proportional to the specific resistance. The unit used is [S/m], incorporating [S] (Siemens), the opposite of [Ω] (resistance).

At 25° C, the electric conductivity of theoretically 100% deionized water is 0.055 [µS/cm].

Tap water

Water that has been filtered and distilled and any impurities eliminated. It is also known as purified water.

Deionized water

Water that has had any impurities or ion elements removed. It is obtained by removing ion elements with ion exchange resin, after filtering out impurities with a particle filter. Its theoretical specific resistance has a limit of 18.3 [MΩ-cm], but it is impossible to actually attain this value. As a general rule, water with a specific resistance of 1 to 10 MΩ-cm is referred to as deionized water.

Ethylene glycol aqueous solution

Ethylene glycol is a type of alcohol, and adding it to water causes the freezing point of the water to drop. It is a major ingredient in antifreeze for automobiles. At a concentration of 60%, the freezing point drops to -40° C or lower, but the viscosity increases as the temperature drops, so taking fluidity into account, it is practical to consider about -20° C as the minimum temperature.

By adding ethylene glycol to deionized water, it is possible to raise the fluid's specific resistance, so it can be used for applications where circulating fluid with high insulating properties is desired.

Propylene glycol aqueous solution

Propylene glycol is a type of alcohol, and adding it to water causes the freezing point of water to drop. Like ethylene glycol, it is a major ingredient in antifreeze for automobiles.

It has lubricating properties, and is characteristically non-volatile.

Fluorinated fluids

Inert fluids in the fluorine series. There are many types, including perfluoropolyether (PFPE), perfluorocarbon (PFC), hydrofluoropolyether (HFPE), and hydrofluoroether (HFE), but they share the characteristic of high electrical insulation properties, and grades can be selected with appropriate fluidity even at low temperatures, such as -100° C, and high temperatures, such as 200°C and above.

They are chemically inert and non-poisonous.

Products are sold on the market, such as Fluorinert, made by 3M, and GALDEN, made by Solvay Solexis.

GALDEN[®]

The product name of a fluorinated fluid manufactured by Solvay Solexis. It is a perfluoropolyether with a high polymer compound, and various grades can be selected with differing temperature ranges and viscosity ranges depending on the degree of polymerization.

■ Fluorinert[™]

The product name of a fluorinated fluid manufactured by 3M. Its basic structure is a perfluorocarbon, but it has a wide variety of chemical structures, and various grades can be selected with differing temperature and viscosity ranges.

Circulating fluid, constant temperature circulating fluid

Fluid that circulates among the user's equipment, with temperature controlled by a chiller.

Taking freezing temperature, boiling point, electrical insulation properties and so on into consideration, tap water, deionized water, ethylene glycol aqueous solution, fluorinated fluids, etc., can be selected depending on the application.

Temperature Measurement and Control

• PT sensor, platinum resistance temperature detector

A type of temperature sensor taking advantage of the properties of platinum (Pt), which has an electric resistance that increases in proportion to the temperature. A sensor with the specification Pt 100 Ω has a resistance of 100 Ω at 0°C. As the resistance value is relatively small, and the sensor is easily influenced by the resistance value of the conductive wires, an input circuit is generally used which cancels out the resistance value of the conductive wires. A "wire wiring configurations and long conductive wires."

RTD (Resistance Temperature Detector) → PT sensor

Thermo couple

This is created by forming a loop, connecting the ends of two wires made of two different metals, and by keeping the two wires at separate temperatures at the connecting point. Thermoelectric power is generated according to this temperature differential (the Seebeck effect).

As a sensor, by keeping the end of one wire at a standard temperature and measuring the thermoelectric power generated, it can determine the temperature of the other wire terminal. A thermo couple is a sensor employing this principle.

Thermistor

A temperature sensor employing a semiconductor with electric resistance that changes in accordance with the temperature. There are two types,

PTC: positive temperature coefficient (a type for which the resistance increases as the temperature rises)

NTC: negative temperature coefficient (a type for which the resistance decreases as the temperature rises.)

The resistance value is generally large, amounting to several $M\Omega$, and there is little influence from the resistance of the conductive wires, so a 2-wire configuration is generally used.

Thermostat

A switch that turns ON or OFF when it reaches a certain set temperature. Most thermostats are bimetallic.

They are sometimes used for direct temperature control, such as switching a heater ON or OFF, but are also used often for safety circuits which switch OFF when the temperature becomes abnormally high.

The switch can be returned to its original position either automatically or manually.

Temperature fuse

A fuse in which an internal metal wire melts, breaking the circuit when exposed to a temperature exceeding the set temperature. When this kind of fuse blows, it cannot be restard and must be replaced.

• PV

PV: Process Value. In temperature control equipment, this indicates the current temperature measured by the temperature sensor.

sv

SV: Set Value. In temperature control equipment, this indicates the target value (set value) for performing temperature control.

ON/OFF temperature control

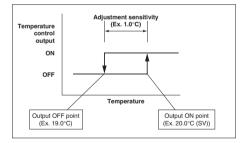
A control method for adjusting temperature by turning temperature control output ON or OFF relative to the set temperature.

When the temperature is above (below) the set temperature, output of the refrigerator (heater) is turned ON, and when the temperature is below (above) the set temperature, output is turned OFF.

Since there are only two operating rates relative to the set temperature, 0% or 100%, this is also called 2-position control.

Adjustment sensitivity (Hysteresis)

When the PV is extremely close to the SV in ON/OFF control, there may be "chattering" where the temperature control output repeatedly turns ON/OFF with small temperature variations, and this may have an adverse impact on output relays and connected equipment. To prevent this, spacing is provided between ON and OFF operation to stabilize control. This operation spacing is called adjustment sensitivity (hysteresis). For example, if the cooling output ON point (SV) is set to 20.0°C and hysteresis is set to 1.0°C, then cooling output will go OFF when temperature drops to 19.0°C, and go ON when temperature rises to 20.0°C.



PID control

A control method for producing temperature control output by comparing the temperature difference between the input value from the temperature sensor (PV) and the set temperature (SV), and using a combination of P (Proportional) operation, I (Integral) operation and D (Derivative) operation.

Output is linearly variable from 0 to 100%, and this enables smooth temperature control with no temperature wavering.

P (Proportional) operation: Operation where the amount of output is varied from 0 to 100% in proportion to the deviation between PV and SV (temperature difference). The range of temperatures for performing proportional operation (proportional band) must be input as a parameter.

I (Integral) operation: Operation where the temperature discrepancy is corrected by adjusting the amount of output relative to the time that deviation between PV and SV has continued. Since the amount of output is determined in response to the time that deviation continues, the integral time must be input as a parameter.

D (Derivative) operation: Operation where output is produced in accordance with the derivative (speed of change) of the temperature deviation. This is used to quickly correct sudden temperature variations when there is a sudden change in the ambient environment or load. The derivative time is input as a parameter, and the longer the derivative time, the stronger the correction output that is produced.

ARW width (Anti-Reset Windup width)

Range of integral operation used for PID control. This value is used to designate the range for calculating the integral term, to suppress buildup of the integral component.

Auto-tuning

In PID control, P, I, D and each parameter must be optimally set for the balance of the heat capacity of all parts where the circulation loop is connected. Auto-tuning refers to a function for automatically determining the setting of those parameters. SMC's temperature control equipment is shipped with PID parameters set at factory shipment to the greatest common factor for the various use conditions. However, if those parameter settings are likely to be unsuitable for the actual operating environment, some models provide a function which can automatically set parameters by using auto-tuning.

Time division proportional output

When controlling output of a heater or other device via a relay or SSR, this method of operation makes the ratio of ON time to OFF time proportional to the control output over a fixed time (0.2 to 1.0 sec) in accordance with a previously set time cycle. For example, if the control cycle is 1.0 sec, and the control output is 70%, then the ON time will be 0.7 sec and the OFF time 0.3 sec.

• PWM control

 \rightarrow Time division control

Offset function

Function for shifting the target temperature for actual temperature control from SV by adding or subtracting a separately set offset value (+ or – a certain number of °C) to or from the set temperature (SV).

For example, if the temperature upon arrival at the object of temperature control is shifted higher (or lower) relative to the temperature discharged from the chiller because a certain amount of heat input is received from piping due to the effects of ambient temperature, this offset value is set to correct that effect.

Learning control

A function for automatically calculating and setting the offset value (correction value for the set temperature).

A temperature sensor (external sensor) is provided near the object to be temperature controlled, and those signals are input to the chiller. The offset value is automatically calculated from the deviation between the discharged temperature and the external sensor.

External sensor

Temperature sensor mounted to the outside of temperature control equipment and used for learning control, etc.

Band width, Temperature upper/lower limit width

Temperature range for outputting alarms, etc., when PV deviates by more than a fixed temperature from the set temperature (SV).

Power Supply, Electrical Equipment

Power supply frequency

There are two frequencies for commercial AC power: 50 Hz and 60 Hz. The AC motors installed in temperature control equipment turn at a rotation speed corresponding to the power supply frequency. When operating with a 60 Hz power supply, the rotation speed is generally 10% faster than with 50 Hz. In the case of a pump, the flow rate and pressure increase, and in the case of a compressor in a refrigeration circuit, the cooling capacity increases. Current consumption also increases in the same way.

In the case of a resistance load, such as a DC pump or heater, performance does not depend on the frequency.

Three-phase power supply

With three-line AC current or AC voltage, the phases of the lines are shifted by 120°. $_$

The current values of each line are $1/\sqrt{3}$ smaller than single phase with the same level of transmitted power, so thinner wires can be used. There is also the advantage that a rotating magnetic field can be easily produced. (It is possible to use a 3-phase motor with a simple structure.)

A 3-phase power supply is used for equipment with high output.

Breaker

A device which protects load circuits and wires by breaking the circuit when an abnormal current flows in an outlet circuit due to problems such as overload or shorting. Depending on the application, a breaker may be called a motor breaker, circuit protector or other names. Earth leakage breakers monitor both current in the main circuit and leakage current, and break the circuit if leakage current is too high.

Relay

A switch which turns a mechanical contact ON/OFF with the power of an electromagnet (solenoid). This makes it possible to turn ON/OFF the high power of the contact with the low power needed to drive the electromagnet only, and thus relays are used for amplification. They are also frequently used as logic elements in sequence circuits.

Electromagnetic contactor

An electric device for turning power circuits ON/OFF to start and stop power equipment (e.g. motors, heaters). Just like a relay, these devices open or close a mechanical contact with the power of a solenoid. The principle of operation is the same as a relay, but a contactor is designed for high-voltage and large current.

Thermal relay

A circuit protection device incorporated into the power input circuit of a motor to provide output when motor overcurrent is detected. It is comprised of a heater which heats up in response to current, and a bimetal which opens and closes a contact in response to that heat. Since the thermal relay itself cannot open and close a high capacity power circuit, the main circuit for a motor or other device is broken by incorporating a control circuit with an electromagnetic contactor or relay.

Electromagnetic switch

A device integrating an electromagnetic contactor with a thermal relay.

Overload relay

This has the same structure as a thermal relay, and is used for the same purpose. Overload relays built into the compressors of small refrigeration circuits are installed on the wall of the compressor, and are actuated not by heat due to overcurrent but by the temperature of the compressor itself. In many small compressors, the main circuit is directly broken by the overload relay.

Impedance protection

A type of motor protection generally used for small AC fan motors and other small motors.

The motor is constructed so that it will not rise above a certain temperature, even when locked for some reason, due to the inherent impedance (AC resistance) of the motor coil itself. Therefore, the motor itself is protected against burnout, even though no thermal relay or other protective device is installed.

Solid state relay (SSR)

A relay which enables switching of high power using low power by using a thyristor or other semiconductor element. In comparison with an electromagnetic relay, this type has no mechanical moving parts, and thus is capable of high-speed switching. SSRs are compact, and have a long service life.

However, this does not mean that contacts are physically isolated. The fact that there is some leakage current even when the device is OFF must be taken into account.

Phase reversal relay (Plugging relay)

A switch which monitors the phase sequence of a 3-phase main power supply, and issues a warning if anything is abnormal.

When driving a 3-phase motor with a 3-phase power supply, the motor will turn backwards if the phase sequence of wiring is wrong. This relay is installed to prevent such reverse rotation. These relays are also called plugging relays.

DC power supply

A device which produces DC power from commercial AC power. DC power is for CPUs inside equipment and other control circuits. Peltier elements for Peltier circulators, thermoelectric baths and other equipment are driven with DC power, so they have a high-capacity DC power supply built-in.

EMO circuit

An EMO (EMergency Off) circuit is an electrical circuit provided to shut off all power and ensure safe conditions when an emergency stop button (EMO button) is pressed in an emergency.

Hardware interlock

This is an equipment control circuit for shutting off power in case of trouble. The circuit is logically configured using only relays and other hardware, and does not use software running on the CPU.

RS232C

A standard for serial communication. This is the communication standard when connecting a PC with an acoustic coupler or modem, and is used for one-to-one communication between PCs. Since RS232C itself only roughly stipulates the use of wiring systems and other hardware, detailed hardware specifications and software protocols are determined independently by each equipment manufacturer.

RS485

A standard for serial communication. Only one-to-one communication between devices can be done with RS232C, but with RS485 it is possible to communicate simultaneously with multiple devices by wiring them in a chained, multidrop fashion, and providing addresses via software.

Since RS485 itself only roughly stipulates the use of wiring systems and other hardware, detailed hardware specifications and software protocols are determined independently by each equipment manufacturer. Actual detailed protocols are determined independently by each equipment manufacturer.

DeviceNet

A standard for serial communication.

An open network owned by ODVA (Open DeviceNet Vendor Association Inc.), a non-profit organization headquartered in the US. This is a field network standard covering a wide scope, from the sensor level to the device level.

Analog communication

A method of communicating with external devices using voltage output such as 0 to 10 V. This enables output of PV (measured temperature, etc.) and reception of values like SV (set temperature).

Signal input/output, I/O

Input/Output signals such as alarm signal, or operation signals. Since there are various communication methods depending on the equipment model, such as relay output and open collector output, communication specifications must be checked before wiring.

Insulation withstand voltage

Electric potential difference where an insulator material will not be destroyed. In withstand voltage testing at product shipment from the factory, a high AC voltage of 1.5 kV (varies depending on the model) is applied between the electric circuit conductor and the chassis (grounded). Then it is checked that there is no flow of leakage current above the reference value.

Insulation resistance

Electric resistance between the conductor inside the device and the chassis (grounded). In insulation resistance testing at product shipment from the factory, it is checked that the resistance value with a measured DC voltage of 500 V (or 250 V) is at or above the reference value (a value such as 1 M Ω ; varies depending on the model).

Safety Standards

CE marking

For machinery and other equipment distributed in the EU (European Union), it is mandatory to display the CE mark. To display the CE mark, a product must declare itself to be in compliance with EU Directives. The main EU Directives relating to the products in this catalog are the Machinery Directive, EMC Directive and Low Voltage Directive. Each directive requires product compliance with the corresponding EN Standard (European Standard).

UL standards

Standards of a non-profit testing organization founded by the US National Fire Protection Association.

In the US, some states and municipalities require UL certification for the sale of electrical products.

CSA standards

Safety standards by the Canadian Standard Association, a nongovernmental Canadian standardization organization. Electrical products distributed in Canada must be CSA certified.

NRTL (National Recognized Test Laboratories)

Testing organizations capable of certification (of UL or CSA standards, etc.) which have been recognized according to Occupational Safety and Health Law set forth by OSHA (the US Occupational Safety and Health Administration). At present, 18 organizations have been recognized as NRTLs. UL and CSA are examples of certified organizations.

eti mark

eti (Electro-Test Inc.) is the mark that demonstrates compliance with UL standards.

ETL mark

Intertek ETL SEMKO is an NRTL, and issues the ETL mark. This mark demonstrates compliance with UL standards.

SEMI S2

SEMI is an international industry association of companies producing equipment and materials for the manufacture of semiconductors and flat panel displays. It has established its own standards as safety guidelines for the design of semiconductor manufacturing equipment.

SEMI S2 requirements relate to the work environment, health and safety for products used in semiconductor manufacturing, and cover chemical, radiation, electrical, physical, mechanical, environmental, fire, earthquake, emissions and ergonomics, as well as quality, documentation, manuals, etc. Many semiconductor manufacturers require that equipment operating in their plants comply with SEMI S2.

SEMI S8

SEMI S8 is a guideline on ergonomics which is more detailed than the ergonomic requirements in Section 14 of SEMI S2.

SEMI F47

SEMI F47 is a SEMI standard which stipulates guidelines regarding voltage sag immunity.

Semiconductor manufacturers require this standard for temperature control equipment, just like SEMI S2.

⊘SMC

To users of this handbook

This handbook is for use only by qualified refrigeration service technicians who hold valid local authorization. The procedures in this handbook require special skills and the use of special equipment and tools. The work required will be either extremely difficult or impossible for an un-authorized technician to perform.

Read the accompanying service manual in addition to this handbook, and be sure to fully understand the contents before performing any repair work. Also, prepare the product operation manual in advance.

Only a fully-qualified technician who understands the content of the operation manual and the procedures for this model, and who has sufficient knowledge of general machinery and equipment can perform the maintenance and repair of this product.

All work must be performed according to the procedures. However, SMC will not be held responsible for any problems incurred during the work.

It is strictly prohibited to copy, transfer or lend this handbook entirely or partially without prior permission from SMC.

Other caution

Follow any special safety instructions if there is any given for the working site.

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

SMC Corporation

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