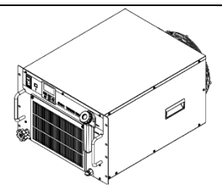
ORIGINAL INSTRUCTIONS

Instruction Manual
Thermo-chiller
HRRF012/018



The intended use of a built-in pump to circulate a liquid such as water, adjusted to a constant temperature by the refrigeration circuit. This circulating liquid cools parts of a customer's machine that generates heat.

1 Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of "Caution," "Warning" or "Danger."
They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC) *1), and other safety regulations.
*1) ISO 4414: Pneumatic fluid power — General rules and safety requirements for systems and their components.
ISO 4413: Hydraulic fluid power — General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines. Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots

- Refer to product catalogue, Operation Manual and Handling Precautions for SMC Products for additional information.
- Keep this manual in a safe place for future reference.

⚠ **Danger**	Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠ **Warning**	Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠ **Caution**	Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

⚠ Warning

- **Always ensure compliance with relevant safety laws and standards.**
- All work must be carried out in a safe manner by a qualified person in compliance with applicable national regulations.

2 Specifications

2.1 Product Specifications

HRRF012/018-A-20-*

Model			HRRF012-A-20-*	HRRF018-A-20-*
Cooling method			Air-Cooled refrigerant type	
Refrigerant			R454C (HFO/HFC, GWP 146)	
Refrigerant charge		kg (lb)	0.30 (0.66)	0.30 (0.66)
Cooling method			PID control	
Ambient temperature/Humidity/Altitude *1 *13			Temperature: 5 to 40°C, Humidity: 30 to 70%, Altitude: Less than 3000m	
Circulating fluid system	Circulating fluid *2		Tap water, Ethylene glycol aqueous solution 15%	
	Set temperature range *1	°C	5 to 35	
	Cooling capacity (50/60Hz) *3	W	1000/1200	1600/1800
	Heating capacity (50/60Hz) *4	W	450/500	
	Temperature stability *5	°C	±0.1	
	Pump capacity (50/60 Hz) *6	MPa	0.13 (at 7L/min) / 0.18 (at 7L/min) For option -T: 0.42 (at 10L/min) / 0.4 (at 14L/min) For option -MT: 0.32 (at 10L/min) / 0.32 (at 14L/min) For option -T1: 0.28 (at 10L/min) / 0.28 (at 10L/min)	
	Rated flow (50/60Hz) *7	L/min	7 / 7 For option -T, -MT: 10 / 14 For option -T1: 10 / 10	
	Flow display range *20	L/min	2 to 16	
	Electric conductivity display range	µS/cm	0.1 to 48 (for option -DM)	
	Electric conductivity setting range	µS/cm	0.5 to 45 (for option -DM) *21	
	Particle filter nominal filtration rating *19	µm	5	
	Bypass valve *19		Installed	
	Tank capacity	L	Approx. 4	
	Outlet, Return port size		Rc 1/2	
	Drain port size		Rc 1/4 with cap	
	Leakage protection		Drain pan (With water leakage detector *19)	
	Fluid contact material		Stainless steel, Copper brazing (Heat exchanger)*11, Brass*16, SiC, Aluminium oxide ceramic, Carbon, PP, PE, POM, PA, FKM, EPDM, PVC, PPS, AS, fluoropolymer*12, Ion exchange resin*12	
Electrical system	Power supply		1-phase AC200 to 230V 50/60Hz Allowable voltage fluctuation ±10%*14	
	Circuit protector	A	10 (for option -T, -MT, -T1: 15)	
	Applicable earth leakage breaker capacity *8		Rated current: 10A (for option -T, -MT, -T1: 15A) Sensitivity current: 30mA	
	Cable quantity x Size (including grounding cable) *15		3 core x 14AWG (3 core x 2.0mm²)	
	Rated operating current (50/60Hz) *3	A	4.9/5.9 For option -T, -MT: 6.1/7.8 For option -T1: 5.9/6.7	5.1/6.2 For option -T, -MT: 6.6/8.4 For option -T1: 6.2/7.1
	Rated power consumption (50/60Hz) *17	kW (kVA)	0.8/1.1 (1.0/1.2) For option -T,-MT: 1.2/1.6 (1.2/1.6) For option -T1: 1.0/1.2(1.2/1.4)	0.9/1.2 (1.0/1.3) For option -T,-MT: 1.3/1.7 (1.3/1.7) For option -T1: 1.1/1.3 (1.3/1.4)
Noise level (50/60Hz) *9		dB(A)	59/60	59/60
Accessories *18			Power supply connector, Maintenance handle for particle filter*19, Operation manual, Particle filter element*19	
Weight *10		kg	45	

Accessories *18		Power supply connector, Maintenance handle for particle filter*19, Operation manual, Particle filter element*19	
Weight *10	kg	45	

2 Specification - continued

HRRF012/018-W-20-*

Model			HRRF012-W-20-*	HRRF018-W-20-*
Cooling method			Water-Cooled refrigerant type	
Refrigerant			R454C (HFO/HFC, GWP 146)	
Refrigerant charge		kg (lb)	0.22 (0.48)	0.22 (0.48)
Cooling method			PID control	
Ambient temperature/Humidity/Altitude *1 *13			Temperature: 5 to 40°C, Humidity: 30 to 70%, Altitude: Less than 3000m	
Circulating fluid system	Circulating fluid *2		Tap water, Ethylene glycol aqueous solution 15%	
	Set temperature range *1	°C	5 to 35	
	Cooling capacity (50/60Hz) *3	W	1000/1200	1600/1800
	Heating capacity (50/60Hz) *4	W	450/500	
	Temperature stability *5	°C	±0.1	
	Pump capacity (50/60 Hz) *6	MPa	0.13 (at 7L/min) / 0.18 (at 7L/min) For option -T: 0.42 (at 10L/min) / 0.4 (at 14L/min) For option -MT: 0.32 (at 10L/min) / 0.32 (at 14L/min) For option -T1: 0.28 (at 10L/min) / 0.28 (at 10L/min)	
	Rated flow (50/60Hz) *7	L/min	7 / 7 For option -T, -MT: 10 / 14 For option -T1: 10 / 10	
	Flow display range *20	L/min	2 to 16	
	Electric conductivity display range	µS/cm	0.1 to 48 (for option -DM)	
	Electric conductivity setting range	µS/cm	0.5 to 45 (for option -DM) *21	
	Particle filter nominal filtration rating *19	µm	5	
	Bypass valve *19		Installed	
	Tank capacity	L	Approx. 4	
	Outlet, Return port size		Rc 1/2	
	Drain port size		Rc 1/4 with cap	
	Leakage protection		Drain pan (With water leakage detector *19)	
	Fluid contact material		Stainless steel, Copper brazing, Bronze, Synthetic rubber	
Facility water outlet system	Temperature range	°C	5 to 40	
	Pressure range	MPa	0.3 to 0.5	
	Required flow rate *21	L/min	8	12
	Inlet-outlet pressure differential of facility water	MPa	0.3 or more	
	Port size		Rc 3/8	
	Fluid contact material		Stainless steel, Copper brazing, Bronze, Synthetic rubber	
Electrical system	Power supply		1-phase AC200 to 230V 50/60Hz Allowable voltage fluctuation ±10%*14	
	Circuit protector	A	10 (for option -T, -MT, -T1: 15)	
	Applicable earth leakage breaker capacity *8		Rated current: 10A (for option -T, -MT, -T1: 15A) Sensitivity current: 30mA	
	Cable quantity x Size (including grounding cable) *15		3 core x 14AWG (3 core x 2.0mm²)	
	Rated operating current (50/60Hz) *3	A	4.5/5.1 For option -T, -MT: 5.4/6.8 For option -T1: 5.6/6.2	4.7/5.3 For option -T, -MT: 5.7/7.2 For option -T1: 5.8/6.4
	Rated power consumption (50/60Hz) *17	kW (kVA)	0.8/1.0 (0.9/1.0) For option -T,-MT: 1.1/1.4 (1.1/1.4) For option -T1: 1.0/1.1(1.2/1.4)	0.8/1.0 (0.9/1.0) For option -T,-MT: 1.1/1.5 (1.2/1.5) For option -T1: 1.0/1.2 (1.2/1.5)
Noise level (50/60Hz) *9		dB(A)	59/60	59/60
Accessories *18			Power supply connector, Maintenance handle for particle filter*19, Operation manual, Particle filter element*19	
Weight *10		kg	45	

*1: No condensation should be present. Use 15% ethylene glycol aqueous solution when operating at a temperature of 10℃ or less.
*2: If tap water is used, use water which satisfies the standard of The Japan Refrigeration and Air Conditioning Industry Association (JRA GL-02-1994/Cooling water system - circulation type - make-up water)
*3: (1) Ambient temperature: 25℃, (2) Circulating fluid temperature: 20°C, (3) Circulating fluid rated flow, (4) Circulating fluid: Tap water, (5) Power supply: 200 VAC, (6) Piping length: Shortest
For models with a high-pressure pump mounted (Options T, MT,T1), the cooling capacity will decrease by 300 W.
*4: (1) Ambient temperature: 25°C, (2) Circulating fluid temperature: 20°C, (3) Circulating fluid at the rated flow, (4) Circulating fluid: Tap water, (5) Power supply: 200 VAC, (6) Piping length: Shortest
*5: Temperature at the thermo-chiller outlet when the circulating fluid flow is at the rated flow and the circulating fluid outlet and return port are directly connected. The installation environment and power supply are within the specification range and stable.
*6: The capacity at the thermo-chiller outlet when the circulating fluid temperature is 20°C.
*7: The required flow rate for maintaining the cooling capacity or temperature stability. The specification of the cooling capacity and the temperature stability may not be satisfied if the flow rate is lower than the rated flow rate.
*8: Purchase an earth leakage breaker with a sensitivity current of 30mA and a power supply of 200 VAC separately.
*9: Front 1m/Height 1m/Static with no load. See note 4 for other conditions.
*10: Weight in the dry state without circulating fluids. The weight will increase by 1 kg when Option DM (With electric conductivity control function, Applicable to DI water piping) is selected. The weight will increase by 5 kg when Options T (High-pressure pump mounted) or MT (Applicable to DI water piping + High-pressure pump mounted) are selected. The weight will decrease by 1kg when option T1, option Z1.
*11: Options M (Applicable to DI water piping) and MT (Applicable to DI water piping + High-pressure pump mounted) do not contain copper or brass.
*12: For Option DM (With electric conductivity control function, Applicable to DI water piping)

2 Specification - continued

*13: If the altitude is 1000 m or more, please refer to "P.3-3 When Thermo-chiller installation in high altitude of 1000 meters or more" in the operation manual.
*14: No continuous voltage fluctuation.
*15: To be prepared by the customer.
*16: Option T (High-pressure pump mounted) contains this material.
*17: (1) Ambient temperature: 25°C, (2) Circulating fluid temperature: 20°C, (3) Circulating fluid rated flow, (4) Circulating fluid: Tap water, (5) Power supply: 200 VAC, (6) Piping length: Shortest, (7) With the rated cooling load applied.
*18: For Option DM (With electric conductivity control function, Applicable to DI water piping), a DI filter is included.
For pipe thread type F, a G thread conversion fitting set is included.
For pipe thread type N, an NPT thread conversion fitting set is
*19: Not included for Option Z (Removed parts)
*20: Not included for Options Z and Z1 (Removed parts)
*21: The required flow rate when the cooling capacity load is applied under the conditions in note 3

2.2 Product Serial Number Code

The production serial number code is printed on the label indicates the year of production as per the following table:

Year / Month		2024	2025	2026	….	2029	2030	2031	….
		C	D	E	….	H	i	J	….
Jan	o	Co	Do	Eo	….	Ho	io	Jo	….
Feb	P	CP	DP	EP	….	HP	iP	JP	….
Mar	Q	CQ	DQ	EQ	….	HQ	iQ	JQ	….
Apr	R	CR	DR	ER	….	HR	iR	JR	….
May	S	CS	DS	ES	….	HS	iS	JS	….
Jun	T	CT	DT	ET	….	HT	iT	JT	….
Jul	U	CU	DU	EU	….	HU	iU	JU	….
Aug	V	CV	DV	EV	….	HV	iV	JV	….
Sep	W	CW	DW	EW	….	HW	iW	JW	….
Oct	X	CX	DX	EX	….	HX	iX	JX	….
Nov	y	Cy	Dy	Ey	….	Hy	iy	Jy	….
Dec	Z	CZ	DZ	EZ	….	HZ	iZ	JZ	….

3 How to order

HRRF □ – A – □ – □

①Cooling capacity

012	1000W/1200W(50/60Hz)
018	1600W/1800W(50/60Hz)

②Cooling method

A	Air-cooled refrigeration

③Pipe thread type

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

④Power supply

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

⑤Option *1

Nil	None
DM	With electric conductivity control function, Applicable to DI water piping
M	Applicable to DI water piping
*2 T	High-pressure pump mounted
T1	Inverter pump mounted
Y	With feet / Without rack mounting brackets
*3 Z	Without either a flow sensor, Water leakage sensor, Particle filter, Bypass valve or retaining clip
*3 Z1	Without either a flow sensor, or retaining clip

*1 When multiple options are combined, indicate symbols in alphabetical order.
*2 If Option T is selected, Option T1 cannot be selected.
*3 Only Option Z or Z1 can be selected.

HRRF □ – W – □ – □

①Cooling capacity

012	1000W/1200W(50/60Hz)
018	1600W/1800W(50/60Hz)

②Cooling method

W	Water-cooled refrigeration

③Pipe thread type

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

④Power supply

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

⑤Option *1

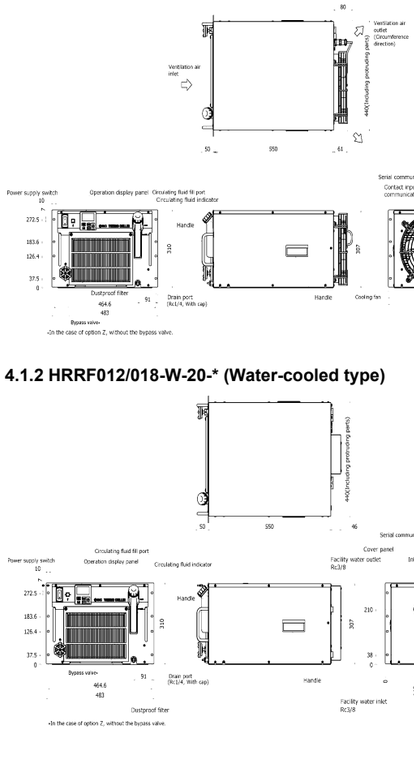
Nil	None
DM	With electric conductivity control function, Applicable to DI water piping
M	Applicable to DI water piping
*2 T	High-pressure pump mounted
T1	Inverter pump mounted
Y	With feet / Without rack mounting brackets
*3 Z	Without either a flow sensor, Water leakage sensor, Particle filter, Bypass valve or retaining clip
*3 Z1	Without either a flow sensor, or retaining clip

*1 When multiple options are combined, indicate symbols in alphabetical order.
*2 If Option T is selected, Option T1 cannot be selected.
*3 Only Option Z or Z1 can be selected.

4 Name of Parts and Accessories

4.1 Outline Dimensions

4.1.1 HRRF012/018-A-20-* (Air-cooled type)

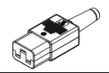
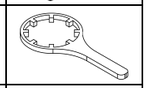
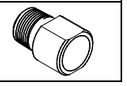


*In the case of option Z, without the bypass valve.

4.1.2 HRRF012/018-W-20-* (Water-cooled type)

*In the case of option Z, without the bypass valve.

4.2 Accessories

1	Operation manual	2 copies (English 1 copy/ Japanese 1 copy)	
2	Power supply connector	1 pc.	
3	Maintenance handle for particle filter *1	1 pc.	
4	Particle filter element *1	1 pc.	
5	For option DM DI filter	1 pc.	
6	For HRRF0**-*F-20-* G thread adapter set	1 pc.	
	For HRRF0**-*N-20-* NPT thread adapter set	1 pc.	

*1 In the case of option Z, not included.

4 Names of Parts and Accessories - continued

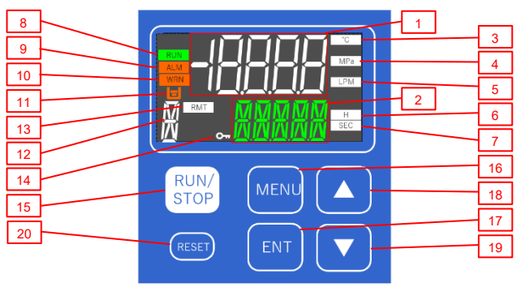
4.3 Function of Parts

The names of the parts used in the manual are as follows:

Name	Name
Operation display panel	Runs and stops the product and performs settings such as the circulating fluid temperature.
Fluid level gauge	Indicates the circulating fluid level of the tank.
Power supply switch	Shuts off the power supply to the internal equipment of product.
Model label	Shows the part number of the product.
Circulating fluid outlet port	The circulating fluid flows out from the outlet port.
Circulating fluid return port	The circulating fluid returns to the return port.
Drain port	Port to drain the circulating fluid out of the tank.
Power supply connector	Connect the power cable to the Power supply connector accessory, and then plug it in.
Communication connector CN1, CN2	Use for contact input / output, serial communication.
Facility water inlet (For water-cooled type)	A facility water inlet to which the facility water is fed through piping. The pressure of facility water should be in a range of 0.3 to 0.5MPa.
Facility water outlet (For water-cooled type)	A facility water outlet from which the facility water returns to the user's machine through piping.

4.3.1 Operation Display Panel

The operation panel on the front of the product controls the basic operation of the product.



No	Name	Function
1	Digital display (7 segment, 5 digit)	Displays the temperature, pressure and flow rate of the circulating fluid and the set values of other menus.
2	Digital display (11 segment, 7 digit)	Displays the discharge temperature of the circulating fluid and the set values of other menus.
3	[°C] lamp	Lights up when temperature is displayed on the digital display.
4	[MPa] lamp	Lights up when pressure is displayed on the digital display part.
5	[LPM] lamp	Lights up when flow rate is displayed on the digital display part.
6	[H] lamp	Lights up when time is displayed on the digital display section.
7	[SEC] lamp	Lights up when seconds are displayed on the digital display section.
8	[RUN] lamp	Lights up when the product is started and in operation.
9	[ALM] lamp	Lights up when a fault occurs. (This product will stop.)
10	[WRN] lamp	Lights up when a warning occurs. (This product will continue operation.)
11	[⊟] lamp	Lights up when [AL.01 Tank level drop failure] or [AL.02 Tank level drop] alarm is generated.
12	Digital display (11 segment, 1 digit)	[X] is displayed when notice for maintenance is generated.
13	[RMT] lamp	Lights up during remote operation by communication function.
14	[KEYLOCK] lamp	Lights up when key lock setting is active.
15	[RUN/STOP] key	Press and hold for 1 second to start or stop.
16	[MENU] key	Switching of each menu and cancellation of setting values.
17	[ENT] key	Switch to setting mode and set values.
18	[▲] key	Move item upward or increase the set value.
19	[▼] key	Move item downward or decrease the set value.
20	[RESET] key	Reset the alarm.

5 Installation

5.1 Installation

⚠ Warning

- Do not set up the product in places possibly exposed to leakage of flammable gas. Should any flammable gas stay around the product, the product may cause a fire.
- This product uses a slightly flammable refrigerant, and even if the refrigerant leaks, it may be difficult to notice due to the odour, so please always install it in a well-ventilated area.
- Do not block any ventilation openings on this product or in the facility in which it is installed. In the event of a refrigerant leak, slightly flammable refrigerant may remain.
- Do not use the product outdoors. If the product subjected to rain or water splash it may cause electrical shock, fire, or failure.

5.2 Hazard Labels

⚠ Warning

- The product has various potential hazards, and they are marked with warning labels.

Electric Shock Warning

	This symbol stands for a possible risk of electric shock.

Fire Hazards

	This symbol stands for possible fire hazards. This product uses a mildly flammable refrigerant (R454C).

5.3 Environment

⚠ Warning

The product must not be operated, installed, stored, or transported in the following conditions. Potential malfunction or damage to the product may occur if these instructions are disregarded.

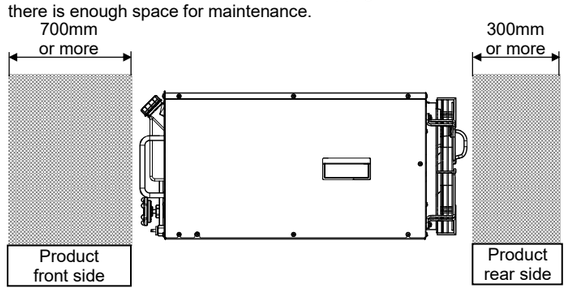
- Location that is outside.
- Location that is exposed to steam, salt water or oil.
- Location that is exposed to dust or powder material.
- Location that is exposed to corrosive gas, organic solvent, chemical solution, or flammable gas. (The product is not explosion-proof.)
- Location where the ambient temperature is out of the following range:
  In transportation and in storage 0 to 50°C
  (with no water or circulating fluid in piping)
  During operation 5 to 40°C
- Location where the ambient humidity is out of the following range or where condensation occurs:
  In transportation and storage 15 to 85%
  In operation 30 to 70%
- Location that is exposed to direct sunlight or heat radiation.
- Location that is near heat sources and poor in ventilation.
- Location that is subjected to abrupt changes in temperature.
- Location that is subjected to strong electromagnetic noise (intense electric field, intense magnetic field, or surges).
- Location that is subjected to static electricity, or conditions where static electricity can discharge to the product.
- Location that is subjected to strong high frequencies radiation (microwaves).
- Location that is subjected to potential lightning strike.
- Location at altitude of 3000m or higher (except during product storage and transport).
- Location where the product is affected by strong vibrations or impacts.
- Condition that applies external force or weight causing the product to be damaged.
- Do not stack the product on top of each other.
- Location without adequate space for maintenance as required.

5 Installation - continued

5.4 Installation and Maintenance Space

⚠ Caution

Have enough space for the ventilation for the product. Otherwise, it may cause a lack in cooling capacity or/and stoppage of the product. Ensure there is enough space for maintenance.



Required ventilation for Air-cooled type

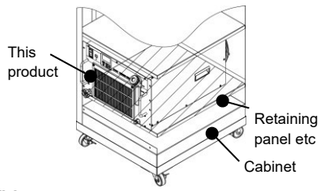
Model	Heat radiation (kW)	Required ventilation amount (m³/min)	
		Differential temp. of 3°C between inside and outside of installation area	Differential temp. of 6°C between inside and outside of installation area
HRRF012-A-20-*	Approx. 2	40	20
HRRF018-A-20-*	Approx. 4	70	40

Required ventilation for Water-cooled type

Model	Heat radiation (kW)	Facility water temp. range (°C)	Required facility water flow rate (L/min)		
			Facility water temperature		
			25°C	32°C	40°C
HRRF012-W-20-*	Approx. 2	5 to 40 (Rated 25)	8	12	20
HRRF018-W-20-*	Approx. 4		12	15	23

5.5 Mounting

1. When mounting the product to a cabinet, use a design which shall hold the weight at the bottom. Ensure safety with transportation test if the product is to be installed on a transportation device such as a trailer. Mount the product using the fixing holes in the front of the product. Use M5, M6 screws (bolts) or equivalent to the fix the product. It is recommended to leave a space of 1U between the product and the equipment. Do not drag this product after mounting, as the feet may be damaged. (option -Y)
2. In the case of air-cooling type, this product sucks air from the front and discharges it to the back. Please do not block the suction and the discharge air. Please do not install in a sealed place. (Refer to 3.2.3 "Installation and maintenance space".)



5.6 Electrical Wiring

⚠ Warning

- Do not modify the internal electrical wiring of the product. Incorrect wiring may cause electric shock or fire. Also, modifying the internal wiring will void the product's warranty.
- NEVER connect the ground to water line, gas pipe or lightning conductor.
- The installation of electrical equipment and wiring work should be performed only by personnel with sufficient knowledge and experience.
- Be sure to shut off the user's power supply. Wiring with the product energized is strictly prohibited.
- The wiring must be conducted using cables that are firmly secured to the product to prevent the external force of cables being applied to the terminals. Incomplete wiring, or improper securing of wiring, may cause electrical shock or excessive heat and fire.
- Ensure a stable power supply with no voltage surges.
- Ensure that an earth leakage breaker is used in the power supply of the product.
- Use a power supply suitable for the specifications of the product. Use a power supply of over voltage category 3 (IEC60664-1).

5 Installation - continued

- Be sure to connect the ground connection.
- Ensure that a lock out facility is available on the power supply.
- Each product must have its own separate earth leakage breaker. Otherwise, there can be a risk of electric shock or fire.
- Ensure that no harmonics are superimposed at power supply. (Do not use inverter, etc.)
- Supply a steady power supply which is not affected by surges or distortion.

Model	Power supply voltage	Cable qty. x size	Recommended earth leakage breaker	
			Rated current (A)	Sensitivity of leak current (mA)
HRRF012-A/W-20-*	1-phase 200-230V AC (50/60Hz)	3 core x 14AWG (3 cores x 2.0mm²) (including ground)	10	30
HRRF018-A/W-20-*				
HRRF012-A/W-20-*T*			15	
HRRF018-A/W-20-*T*				
HRRF012-A/W-20-*T1*				
HRRF018-A/W-20-*T1*				

5.7 Preparation and Wiring of Power Supply Cable

⚠ Warning

- The electrical facilities should be installed and wired in accordance with local laws and regulations of each country and by a person who has knowledge and experience.
- Check the power supply. Operation with voltages, capacities and frequencies other than the specified values can cause fire and electric shock.
- Wire with an applicable cable size and terminal. Forcibly mounting with an unsuitably size cable may result in heat generation or fire.
- After tightening the terminal screws, please visually check that the screws are not loosened, and pull the cables to ensure that the screws are tightened completely.
- Otherwise, there can be a risk of heat generation or fire.
- Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.
- Be sure to lock out and tag out the breaker of the facility power supply (customer power supply facility) before wiring.
- Be sure to connect the power supply cable from the product side first, and then connect the breaker of the facility power supply (the user's machine power supply).

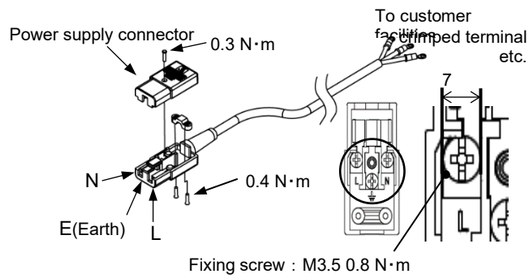
⚠ Caution

- Please wear protective gloves.
- Use a separate outlet or earth leakage breaker.
- Be sure to perform grounding (earth).
- Failure to do so may cause malfunction or electric shock.

1. Prepare the cable and individual socket or earth leakage breaker shown in the table below.

Cable Qty. x size
3 cores x 14 AWG (3 cores x 2.0mm²) *including ground

2. Connect the cable to the accessory power supply connector. 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. When using crimp terminals, select connectable terminals and crimp them with an appropriate tool.



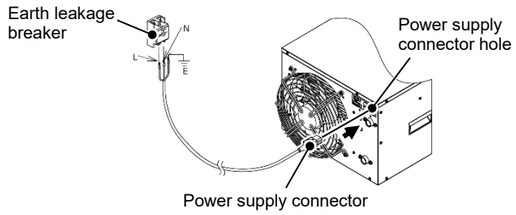
5 Installation - continued

Regarding connections, if you are using a stripped wire or bar terminal, connect it to the left side of the fixing screw. Do not connect to the right side.

Connect the other end of the cable to crimped terminals that are connectable to the power supply facility.

Please periodically check the torque of each fixing screw.

3. Insert the power supply connector to the power supply connector socket.
4. Connect the crimped terminals to the secondary side of the earth leakage breaker and grounding on the power supply facility.



5.8 Piping

Caution

- Connect piping firmly. Incorrect piping might cause leakage of supplied or drained fluid and wet surrounding area and facility.
- Use caution not to allow dust and foreign matter to enter the water circuit, etc. during connection of piping.
- Securely connect the piping at the piping port with specific wrench when tightening.
- Select the piping which can exceed the rated flow.
- Regarding the piping, carefully consider the suitability for shutoff pressure, temperature and circulating fluid. Incorrect piping can burst in service.
- Use non-corrosive material for fluid contact parts of circulating fluid and/or facility water. Using the materials that tend to rust or corrode may cause clogging or/and leakages of the circulating fluid and facility water circuits. In case of using these kinds of materials, consider and carry out some prevention against the rusting or corrosion by the customer side.
- Do not generate a rapid change of pressure by water hammer, etc. Internal parts of the product and/or the piping may be damaged.
- The temperature of the facility water outlet (For water-cooled type) may rise to about 60 °C. Select piping with careful consideration of its suitability for the temperature. If necessary, take safety measures such as installing a bypass circuit in the facility water circuit to lower the temperature at the facility water outlet.
- It is recommended to use heat insulation to reduce the heat radiation and absorption to/from customer's piping.
- This product series are constant-temperature fluid circulating machines with built-in tanks.
- Do not install equipment on your system side such as pumps that forcibly return the circulating fluid to the unit. Also, if you attach an external tank that is open to the air, it may become impossible to circulate the circulating fluid. Proceed with caution.
- Circulating fluid circuits and facility water circuits connected to the product should be equipped with a mechanism (e.g. relief valve) to safely release abnormal pressure.

5.8.1 Port size

Description	Port size	Recommended tightening torque	Recommended piping specifications
Circulating fluid outlet port	Rc	28 to 30 N·m	0.4MPa or more*2
Circulating fluid return port	1/2*1		
Facility water inlet port*3	Rc	22 to 24 N·m	1.0MPa or more (Supply pressure: 0.3 to 0.5MPa)
Facility water outlet port*3	3/8		

*1 For NPT and G thread, use a conversion connector available as an accessory separately
*2 In the case of option T and T1, 1.0 MPa or more
*3 For water-cooled type

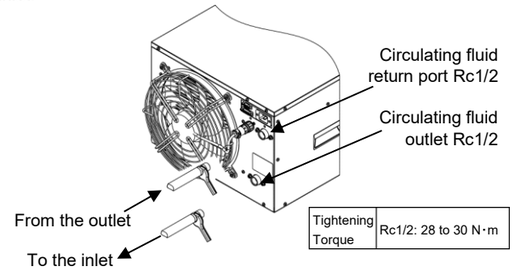
5 Installation - continued

5.8.2 How to Connect Piping

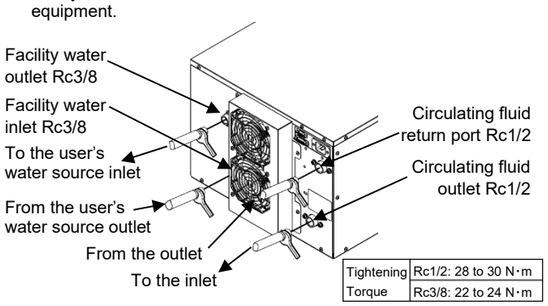
Caution

Make piping so that the circulating fluid always flows.
The product will break down if it is operated with no circulating fluid flowing.

1. Ensure that the power source and the power supply of the product is turned off (or the power plug is disconnected).
2. This product generates an alarm*1 and stops running when the circulating fluid flow rate becomes 2 L/min or less. Please make piping that flows more than 2 L/min.
   In addition, this product generates an alarm and stops when the circulating fluid discharge pressure becomes 0.5 MPa*2 or more.
   *1 For options Z and Z1 no alarm is generated. For models with options T1 and Z or T1 and Z1, the alarm will occur at less than 7L/min.
   *2 For option T1, 0.4MPa or more.
3. Connect the circulating fluid return port with the user's machine outlet.
4. Connect the circulating fluid discharge port with the user's machine inlet.

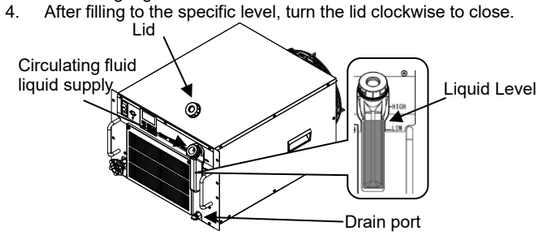


5. In case of water-cooled type, please also connect the piping of the facility water inlet and outlet of the customer's water source equipment.



5.9 Fill of circulating fluid

1. Ensure that the power source and the power supply of the product is turned off.
2. Check the drain port is plugged to prevent the supplied circulating fluid from draining out.
3. Open the circulating fluid inlet cap by turning it counterclockwise and fill the circulating fluid within the range from LOW to HIGH shown on the level gauge.
4. After filling to the specific level, turn the lid clockwise to close.

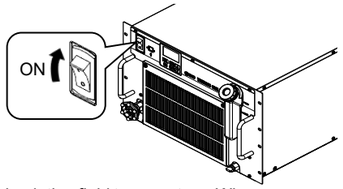


6 Start, Stop and Temperature Settings

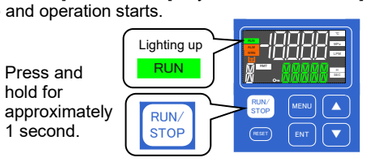
6.1 Starting the Product

1. Please supply power to this product. Turn on the power switch. The operation display panel lights up. At this point, this product is in the "Stopped" state (Please note that operation is started after the power is turned on when the operation signal is sent in the remote setting state.)

6 Start, Stop and Temperature Settings - continued



2. Set the circulating fluid temperature. When you press the "ENT" key, the set temperature (lower part of numerical value display: green) flashes. Press the [▲] [▼] key to set the target temperature, then press the "ENT" key to set. (Flashing ends when set.) Please refer to various setting / display.
3. Press and hold [RUN / STOP] key for 1 second. The [RUN] lamp lights up and operation starts.



- When you operate for the first time after piping, the circulating fluid in the tank decreases until the circulating fluid is filled in the piping. (An alarm occurs when the liquid level falls below "LOW".) When the circulating fluid in the tank decreases, repeat "Circulating liquid supply" procedure so that the liquid level is within the range from LOW to HIGH.
- 30 seconds after start of operation, if the circulating fluid flow rate is less than 2L/min, an alarm occurs and the product stops. Ensure that the circulating fluid flow rate will be 2L/min or more.
- In the case of option Z, Z1, the alarm of the flow rate decrease does not generate. Make piping so that the circulating fluid always flows. The product will break down if it is operated with no circulating fluid flowing.
- For options Z and Z1 no alarm is generated. For models with options T1 and Z or T1 and Z1, the alarm will occur at less than 7L/min.
- When using option T (high head pump specification), if the circulating fluid discharge pressure becomes 0.5 MPa or more, an alarm occurs and this product stops.
- For option T1, an alarm will occur and the product will stop when the circulating fluid discharge pressure exceeds 0.4 MPa. The factory default pump output setting is 90%.

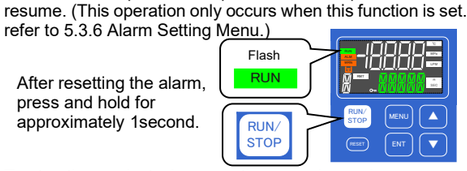
6.1.1 Operation Restart when an Alarm is Generated

This product has two types of operation depending on the alarm being generated. The restart is different depending on the operation mode.
[1] When the following alarms occur, this product stops.

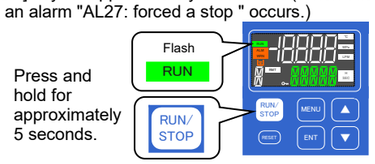
AL01: Low level in tank	AL24: Memory abnormal
AL09: Circulating fluid discharge pressure rise (Select from WRN/FLT)	AL25: Contact input 1 signal detection (Select from OFF/WRN/FLT)
AL17: Flow rate failure (Not generated for option Z and Z1)	AL26: Contact input 1 signal detection (Select from OFF/WRN/FLT)
AL18: High circulating fluid discharge temp	AL27: Forced a stop
AL19: High circulating fluid return temp	AL30: Refrigerant circuit abnormal
AL21: High circulating fluid discharge pressure	AL31: Sensor abnormal
AL22: Low circulating fluid discharge pressure	AL32: Controller abnormal

After resetting the alarm, when resuming operations press and hold the [RUN/STOP] key for approximately 1 second. (Refer to Chapter 7 Alarm Notification and Troubleshooting)

[2] When alarms except those shown above are generated the compressor stops, and the circulating fluid pump continues running for a fixed time (∗). At this time, the "RUN" lamp flashes. In case of resetting the alarm (Refer to 7.3 "What to do when an alarm occurs") while the pump is operating, pressing the "RUN / STOP" key once (1 second) causes the compressor to operate and the operation of the product will resume. (This operation only occurs when this function is set. For details, refer to 5.3.6 Alarm Setting Menu.)



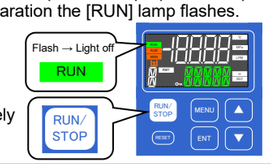
To stop the product when only the pump is running, press and hold the [RUN／STOP] key for approximately 5 seconds. (When this operation is performed, an alarm "AL27: forced a stop " occurs.)



6 Start, Stop and Temperature Settings - continued

6.2 Stopping the product

Press and hold the [RUN／STOP] key for 1 second.
[RUN] lamp goes out and operation stops.
*It takes about 10 seconds of operation to prepare to stop.
During the stopping preparation the [RUN] lamp flashes.



Caution

- Except in case of an emergency, do not turn OFF the breaker before the thermo-chiller stops operation completely.
- Wait 5 minutes or more before restating operation after it has been stopped. If the operation is restarted within 5 minutes, the protection circuit may activate and the operation may not start properly.
- Operation and suspension frequency should not exceed 10 times per day. Frequency switching between operation and suspension may result in the malfunction of the refrigeration circuit.

7 Maintenance

7.1 General Maintenance

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- If handled improperly, compressed air can be dangerous.
- Maintenance of pneumatic systems should be performed only by qualified personnel.
- Before performing maintenance, turn off the power supply and be sure to cut off the supply pressure. Confirm that the air is released to atmosphere.
- After installation and maintenance, apply operating pressure and power to the equipment and perform appropriate functional and leakage tests to make sure the equipment is installed correctly.
- If any electrical connections are disturbed during maintenance, ensure they are reconnected correctly and safety checks are carried out as required to ensure continued compliance with applicable national regulations.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation or maintenance instructions.

7.2 Water Quality Management

Warning

Use specified circulating fluids only. If other fluids are used, they may damage the product or result in dangerous hazards. When using tap water, SMC recommends the water quality shown in the standard of The Japan Refrigeration and Air Conditioning Industry Association “JRA GL-02-1994/Cooling water system - circulation type - make-up water” as reference. In most areas, tap water can be used. However, if the tap water in the area is hard, there is a possibility of failure or performance decline due to limescale build-up. To soften the water and avoid problems, consider using water hardness filters.

Caution

- Replace the circulating fluid and/or the facility water if any problems are found in the regular check. Even if no problems are found, some of the water in the tank evaporates and impurity concentration in the circulating fluid increases. Replace the circulating fluid on the tank once in every 3 months.
- Use an ethylene glycol aqueous solution that does not contain additives such as preservatives.
- When using ethylene glycol aqueous solution, maintain a maximum concentration of 15 %.
- Overly high concentrations can cause a pump overload.
- Low concentrations, however, can lead to freezing when circulating fluid temperature is 10 ℃ or lower and cause the thermo-chiller to break down.
- A magnet pump or mechanical seal pump is used as the circulating pump for the circulating fluid. It is particularly impossible to use liquid including metallic powder such as iron powder.

7.3 Inspection, Exchange, and Cleaning

Warning

- Do not perform key operation or setting of this equipment with wet hands. Do not touch the electrical parts such as the power supply plug. It may cause an electric shock.

7 Maintenance - continued

- Do not splash water directly on the product or do not wash with water. It might cause electric shock, fire, or etc.
- Shut off the power supply to this product before performing cleaning, maintenance, or inspection, or it may cause electric shock, injury, burn, or etc.
- When the panel has been removed for the purpose of inspection or exchange or cleaning, mount the panel after the work is completed. If the product is operated with the panel removed or open, it may cause injury or electric shock.

7.3.1 Daily Check

Item	Contents of check	
Installation condition	Check the installation conditions of the product.	・Check that there is no heavy object on the product or excessive force applying to the piping. ・Temperature should be within the specification range of the product. ・Make sure the ventilation grille is not obstructed. (For air-cooled type)
Fluid leakage	Check the installation conditions of the product.	Check that there is no fluid leakage from the connected parts of the piping.
Amount of circulating fluid	Check the liquid level indicator.	Fluid level should be between "HIGH" and "LOW" levels of the fluid level meter.
Operation panel	Check the indications on the display.	The numbers shown on the display should be clear and legible.
	Check the functionality.	Check that the keys, [RUN/STOP], [MENU], [ENT], [▼], and [▲], operate correctly.
Circulating fluid temperature	Check on the operation panel.	There should be no problem for operation.
Circulating fluid discharge pressure	Check on the operation panel.	There should be no problem for operation.
Circulating fluid flow rate	Check the operating condition of the product (except option Z, Z1)	There should be no problem for operation. If the flow rate is decreasing, check the particle filter for contamination, and if it is dirty, replace the element.
Operating condition	Check the operation condition.	・There should be no abnormality with noise, vibration, smell, or generation of smoke. ・There should be no active alarm signal.
Facility water (for water-cooled type)	Check the facility water condition.	Temperature, flow rate and pressure are within the specified range. If the flow rate is decreasing, the Y type strainer. Check clogging and clean the strainer.
Ventilating condition (for Air-cooled type)	Check the condition of the ventilation grille.	・Make sure the ventilation grille is not obstructed.

7.3.2 Monthly Check

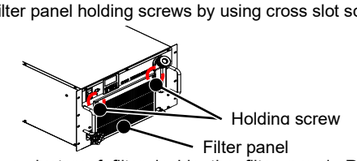
Item	Contents of check	
Ventilating condition (air cooled type)	Clean the ventilating grilles.	Make sure the ventilating grilles are not clogged with dust, etc.
Facility water (water cooled type)	Check the facility water.	Make sure the facility water is clean and contains no foreign matter.

7.3.2.1 Cleaning of Air Ventilation Port

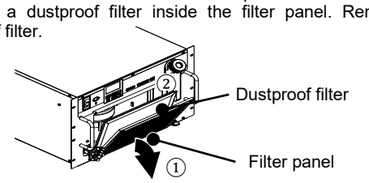
Caution

The dustproof filter at the ventilation inlet clogged with dust or debris, heat radiation performance declines. This will result in the reduction of cooling performance and may stop the operation because the safety device is triggered.

1. The dust proof filter is installed inside of filter panel in front of this product.
2. Loosen filter panel holding screws by using cross slot screwdriver.



3. There is a dustproof filter inside the filter panel. Remove the dustproof filter.



7 Maintenance - continued

7.3.3 Inspection Every 3 Months

Item	Contents of check	
Power supply	Check the power supply voltage.	- Make sure the supply voltage is within the specification range.
Circulating fluid	Replace the circulating water (clean water) periodically.	- Ensure that the water has not been contaminated and that there is no algae growth. - Circulating water inside the tank must be clean and there must not be foreign matter inside. - Check the water quality. (When using tap water) * About the water quality SMC recommends, please refer to "8.1 Water Quality Management". * It is recommended to replace the circulating fluid every 3 months when periodic maintenance is performed.
	Density control (When using 15% concentration ethylene glycol aqueous solution)	- Density must be within the range of 15 % +5/-0.
Facility water (For water-cooled type)	Check the water quality.	- Ensure that the water is clean and contains no foreign matter. Also check that the water has not been contaminated and there is no algae growth. - Check the water quality. * About the water quality SMC recommends, please refer to "8.1 Water Quality Management".

7.3.3.1 Replacement of Circulating Fluid

- Replace the circulating fluid with new clean fluid periodically, or it may get algae or decompose.
- About the water quality SMC recommends for the circulating fluid, please refer to "8.1 Water Quality Management" in the operation manual.
- Make sure that the concentration of ethylene glycol aqueous solution is 15%+5/0 when 15% ethylene glycol solution is used.
- If the particle filter element is dirty, replace the element. (See “8.4.1 Replacing Particle Filter” in the operation manual.)

7.3.3.2 Cleaning the Fluid Water System (Water Cooled Type)

- Clean the customer's facility water system and replace facility water.
- About the water quality SMC recommends for the facility water, please refer to "8.1 Water Quality Management" in the operation manual.
- Check the strainer and clean it if it is dirty. (Refer to "Cleaning of Y - strainer")

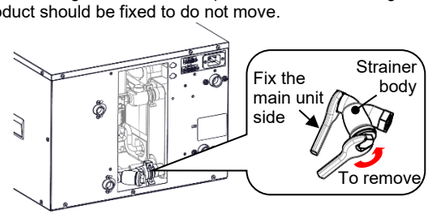
7.3.3.3 Cleaning of Y-strainer

When cleaning Y-strainer, facility water must be discharged.
Please refer to “8.3.2 Discharge of the Facility Water” in the operation manual.

Warning

- Before discharging the facility water, stop operation of the user’s equipment and release the residual pressure.
- Wear protective equipment like gloves to avoid getting injure like a cutting hand by sharp edge of panel.

1. Discharge the facility water. Please refer to "8.3.2 Discharge of the Facility Water" in the operation manual.
2. The strainer is installed on the back of the product. Remove the strainer using a tool such as a spanner. When removing the strainer, product should be fixed to do not move.



3. Clean the strainer.

4. After cleaning, please install the strainer by the reverse procedure.
5. Install the cover panel.

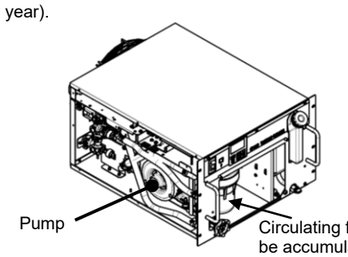
7 Maintenance - continued

7.3.4 Inspection Every 6 Months

Check for water leakage from pump (For option T [High head pump]). Remove the filter panel and check the pump for excessive leakage. If the leakage is found, replace the mechanical seal.

Caution

Leakage from the mechanical seal. It is impossible to prevent the leakage from the mechanical seal completely because of its structure. Although the leakage is described as 3cc/hr or less. The recommend lifetime of the mechanical seal before needing replacement is 6000 to 8000 hours (usually 1 year).



8 Troubleshooting

8.1 Troubleshooting

The troubleshooting method depends which alarm has been generated. Refer to “Table 7-1 Alarm code list and Troubleshooting” in the operation manual.

- Ensure that the alarm display screen is displayed. Alarm can only be reset on this screen.
- Press [RESET] key.
- The alarm is reset, and the [ALARM] (“ALM”, “WRN”) light turns OFF.
- The circulating fluid temperature display screen (main menu TOP screen) is displayed.
- Contact signal output for contact input/output communication stops. (Refer to the Operation Manual for communication for details.)

Alarm No.	Description	Initial value	Display unit: Upper stage (White)	Display unit: Lower stage (Green)	Cause / Remedy (Press the reset key after eliminating the cause.)
AL01	Low level in tank	FLT	AL01	LOW⇒LEVEL ⇒FLT	Fluid level shown by the fluid level meter has fallen. Add circulating fluid.
AL02	Low level in tank	WRN	AL02	LOW⇒LEVEL ⇒WRN	
AL04	Water leakage*1	WRN*2	AL04	WATER⇒ LEAK	Circulating fluid leakage inside the unit is suspected.
AL05	Pump Inverter error*3	WRN	AL05	PUMP⇒INV	Check the installation environment. Clean the dust filter of the ventilation.
AL06	Internal fan stop*4	WRN	AL06	FAN⇒ERROR	Check for fan rotation.
AL09	Circulating fluid discharge pressure rise	FLT*5	AL09	HIGH⇒ PRESS	Piping resistance increased. Check the opening of the valve, pinching or blockage of the piping or clogging of the filter.
AL10	Flow rate decreased*6	WRN*2	AL10	LOW⇒FLOW ⇒WRN	
AL11	Ambient temperature is out of the range*7	OFF*2	AL11	AMB⇒TEMP ⇒OUT	Check the installation environment. Clean the dust filter of the ventilation.
AL12	Electric conductivity increase*8	WRN*9	AL12	DI⇒ERROR	Replace DI filter.
AL13	NOT TEMP READY	OFF*2	AL13	TEMP⇒READY ⇒ERROR	Overloaded, cooling failure, insufficient circulating fluid flow rate, large fluctuation of the heat load, etc. Increase the flow rate through the chiller. (Adjust the by-pass valve)
AL14	Circulating fluid temperature increase	OFF*2	AL14	TEMP⇒ OUT.HI	
AL15	Circulating fluid temperature decrease	OFF*2	AL15	TEMP⇒ OUT.LO	
AL17	Low flow rate*10	FLT*2	AL17	LOW⇒FLOW ⇒FLT	Displayed flow rate: 2LPM or less, piping is thin, external valve is closed, pinching or blockage of the piping or clogging of the filter.
AL18	High circulating fluid discharge temp.	FLT	AL18	TEMP⇒FLT	Discharge temp.: 45oC or higher. Overload, cooling failure, insufficient flow rate, etc. Increase the flow rate through the chiller. (Adjust the by-pass valve)

8 Troubleshooting - continued

Alarm No.	Description	Initial value	Display unit: Upper stage (White)	Display unit: Lower stage (Green)	Cause / Remedy (Press the reset key after eliminating the cause.)
AL19	High circulating fluid return temp.	FLT	AL19	RET⇒TEMP ⇒FLT	Return temp.: 45oC or higher. Insufficient chiller flow rate, overload, etc. Increase the flow rate through the chiller. (Adjust the by-pass valve)
AL21	High circulating fluid discharge pressure*11	FLT	AL21	HIGH⇒ PRESS ⇒FLT	Displayed pressure: 0.6MPa (For option T1,0.45MPa) or higher. Connect piping so that the pressure is 0.5MPa (For option T1, 0.4MPa) or less. Adjust the bypass valve.
AL22	Low circulating fluid discharge pressure	FLT	AL22	LOW⇒PRESS ⇒FLT	Displayed pressure:0.03MPa or less. Check that the pump has not stopped.
AL24	Memory error	FLT	AL24	MEM⇒ ERROR	Turn off the power supply switch and restart. If the error occurs again, ask for service.
AL25	Contact input 1 signal detection	FLT*2	AL25	INP1⇒ERROR	Contact input has been detected.
AL26	Contact input 2 signal detection	FLT*2	AL26	INP2⇒ERROR	
AL27	Forced stop	FLT	AL27	FORCE⇒ STOP	Time for pump to continue operation is stopped (press “RUN/STOP” key for 5 seconds).
AL28	Notice for maintenance	OFF*2	AL28	MANT⇒ ALARM	Notice for maintenance, perform maintenance for part for which alarm is generated.
AL29	Communication error	WRN*2	AL29	COMM⇒ ERROR	No request message from the host computer. Try to send the request message again.
AL30	Compressor circuit error	FLT	AL30	REF⇒ERROR ⇒0000	Error occurred in the refrigerated circuit. Ask for service.
AL31	Sensor error	FLT	AL31	SENS⇒ ERROR⇒0000	An error occurred in a sensor. Ask for service.
AL32	Controller error	FLT	AL32	CTRL⇒ ERROR⇒0000	An error occurred in the controller. Ask for service.

*1 Not generated for option Z.
*2 Select from OFF / WRN / FLT.
*3 Only option T1.
*4 Only water-cooled type.
*5 Select from WRN / FLT.
*6 Not generated for option Z and Z1.
*7 Only air-cooled type.
*8 Only option DM. Alarm is automatically released when the electric conductivity returns within the range.
*9 Select from OFF / WRN.
*10 Not generated for option Z and Z1. However, for models that include both T1 and Z or Z1, it occurs at 7L/min or less.
*11 This does not occur with standard pump.

9 Limitations of Use

9.1 Limited warranty and disclaimer/compliance requirements

Refer to Handling Precautions for SMC Products.

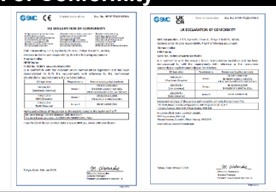
Caution

Refer to “Section 2.1 Product Specification” for the product limitation of use.

10 Product Disposal

This product shall not be disposed of as municipal waste. Check your local regulations and guidelines to dispose this product correctly, in order to reduce the impact on human health and the environment.

11 Declaration of Conformity



12 Contacts

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Spain	SMC España S.A.U.(HQ)	Zuazobidea 14, 01015 Vitoria-Gasteiz

Refer to www.smcworld.com or www.smc.eu for your local distributor/importer.

SMC Corporation

URL : https:// www.smcworld.com (Global) https:// www.smc.eu (Europe)
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Template DKP50047-F-085O