



ORIGINAL INSTRUCTIONS

# Instruction Manual

## Air Cooled Thermo-con (Compact type)

### HEF Series



This product used a built-in pump to circulate a liquid (water or 20% EG) at a constant temperature, controlled by Thermo-Electric (Peltier) Modules. This circulating liquid cools parts of customer's machine that generate 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)<sup>(1)</sup>, and other safety regulations.

- <sup>(1)</sup> 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: 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.

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

Model No.	HEF002-A6*	
Operation temp. range	10 to 60°C (No dew condensation)	
Ambient Environment	Temperature	10 to 35°C
	Humidity	35 to 70%RH
	Altitude	up to 2000 m
	Environment	No corrosive gas, solvent such as thinner and flammable gas
Storage environment	Temperature	-40 to 70°C (No dew condensation and frost formation)
	Humidity	5 to 95%RH
	Environment	No corrosive gas, solvent such as thinner and flammable gas
Accuracy related to temp	Stability: +/- 0.1 °C (Circulating fluid OUT is directly connected with IN)	
Cooling capacity	Approx. 220W (Flow rate 1L/min, set temperature 25°C and ambient temperature 25°C)	
Circulating fluid	Water, Ethylene glycol solution up to 20%	
Tank capacity	Approx. 110mL	
Pump capacity	Refer to performance chart.	
Port size	IN/OUT: Rc1/4	
Wetted materials	Stainless steel, EPDM, NBR, Ceramic, PPE, PPS, Carbon, PP, POM	
Power supply	DC24V +/- 10%	
Current consumption	12.5A (Peak current 18A)	
Insulation resistance	50MΩ or more (DC500V)	
Over voltage category	Category I	
Pollution degree	Pollution degree II	
Limitation of hazardous substance	RoHS compliant products	
Acoustic noise	37 to 60dBA (variable fan speed mode) 45dBA (constant fan speed mode)	
Cooling method	Air cooled	
Main functions	Offset function, Setting value memory function, Communication, RUN/STOP input signal, Output shut off alarm, Fan speed control	
Input operation and indications	- Key switch / LCD display	
RUN/STOP input signal	- RUN/STOP input signal	
Output shut off alarm	- Circuit voltage: Approx. DC5V, Passing current: Approx. DV10mA - Relay contact specification for output shut off alarm - DC30V, 1A (Resistance load)	
Communications <sup>*1,2</sup>	RS-232C / RS-485	
Mass (Dry)	Approx. 3.5 kg	
Options	- NPT fitting IN/OUT fitting - High head pump - Thermo-con (1pc) - Operation Manual (1pc) - Power supply cable (1m, 16AWG, with Ferrite core)(1pc)	
Contents of package		

Notes:

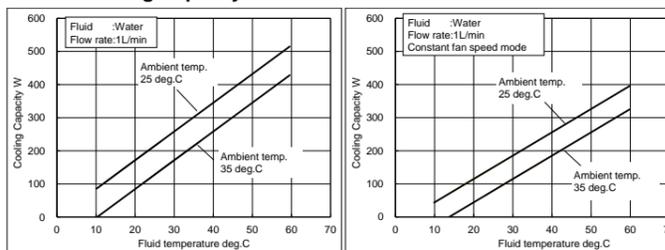
\*1 Communications: Reading of measured temperature, Setting and reading of target temperature, Setting and reading of offset value, Storage of set value, Setting and reading of control mode. Further details refer to 'Communication Manual'.

\*2 Use shielded cable for serial communications.

### 2.3 Performance Charts

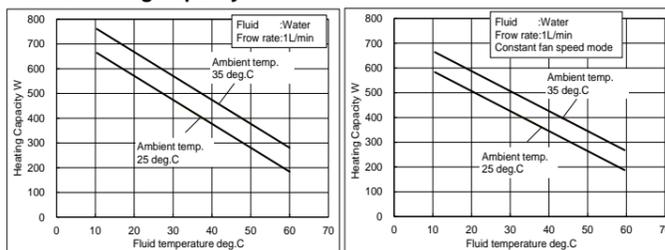
Values on the performance charts are not guaranteed values but representative values. Allow margins for safety when selecting the model.

#### 2.3.1 Cooling Capacity



Note: Cooling capacity decrease approx. 20W when high pressure pump option selected.

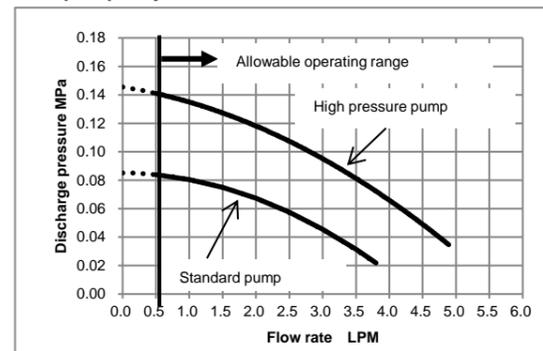
#### 2.3.2 Heating Capacity



Note: Heating capacity increase approx. 10W when high pressure pump option selected.

## 2 Specifications - continued

### 2.3.3 Pump Capacity



### 2.3.4 Connector Specifications

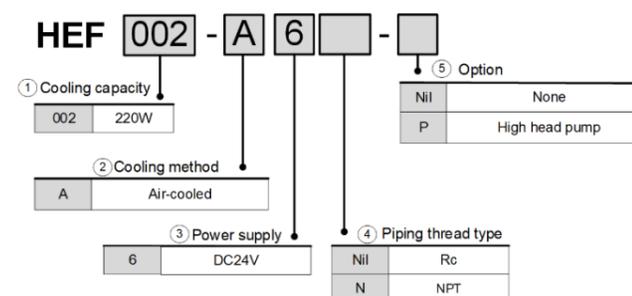
Description	No.	Signal	Style and Part No.
Power supply connector	1	DC24V+	J.S.T. Mfg. JFA connector J4000 series SC02B-J42SK-GHXR
	2	DC24V-	
Alarm, RUN/STOP, Communication connector	1	RS-485 BUS +	D-sub 9 pin (socket type) Fixed screw: M2.6
	2	RS-232C RD	
	3	RS-232C SD	
	4	RUN/STOP signal Input	
	5	SG	
	6	Output Cutoff Alarm (Open During Alarm)	
	7	Output Cutoff Alarm Common	
	8	RUN/STOP signal Input	
	9	RS-485 BUS -	

### 2.4 Product serial number code

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

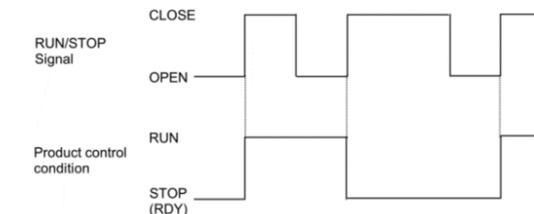
Year	2022	2023	2024	2025	2026	2027	...
Month	A	B	C	D	E	F	...
Jan	o	Ao	Bo	Co	Do	Eo	Fo
Feb	P	AP	BP	CP	DP	EP	FP
Mar	Q	AQ	BQ	CQ	DQ	EQ	FQ
Apr	R	AR	BR	CR	DR	ER	FR
May	S	AS	BS	CS	DS	ES	FS
Jun	T	AT	BT	CT	DT	ET	FT
Jul	U	AU	BU	CU	DU	EU	FU
Aug	V	AV	BV	CV	DV	EV	FV
Sep	W	AW	BW	CW	DW	EW	FW
Oct	X	AX	BX	CX	DX	EX	FX
Nov	y	Ay	By	Cy	Dy	Ey	Fy
Dec	Z	AZ	BZ	CZ	DZ	EZ	FZ

## 3 How to Order

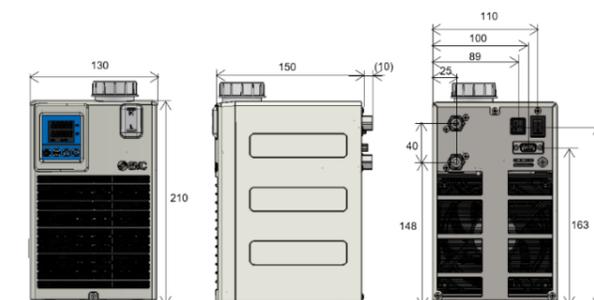


## 4 Special Features

- Offset function**  
This function controls the temperature slide by an offset value from set point temperature. When the circulating fluid travels to the target object, a certain deviation occurs between the temperature just before the object and the set temperature of the product due to the influence of ambient temperature on the piping. In this case, if the deviation is input as the offset value, the temperature of the circulating fluid just before the object can match with the setting value. For example, if 0.1 °C is set here, the actual reference temperature for control is lower than the indicated SV by 0.1 °C.
- Setting value memory function**  
Even if the power is turned off the set values are saved and will be restored at power on.
- Output shut off alarm function**  
The product has a self-check function that can detect faults with the product and interrupts the output to the thermo modules, pump and fan, stopping operation. This function gives an alarm if a critical error happens, the display shows ALARM. At the same time, the alarm output connector gives an output through a relay contact. This alarm cannot be removed unless the power is cycled. When the power is being cycled leave at least 3 seconds between turning the power off and turning the power back on.
- Fan speed control function**  
Fan speed is controlled automatically in accordance with the heat load.
- RUN/STOP signal function by remote**  
A contact input between pins 4 and 8 of the connector (Alarm, RUN/STOP, Communication connector) can be used to RUN/STOP (RDY) the product.

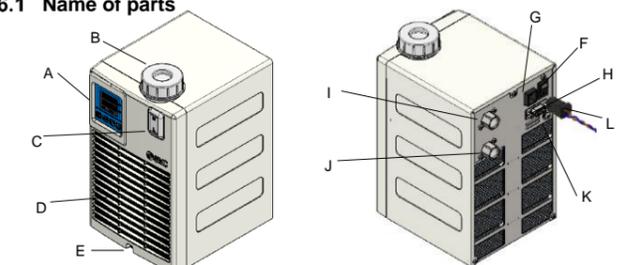


## 5 Outline Dimensions (mm)



## 6 Names of Parts

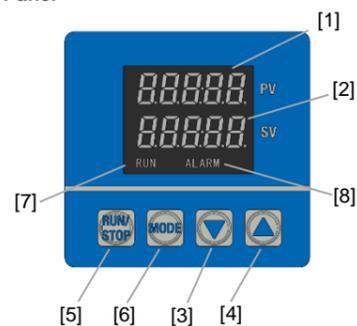
### 6.1 Name of parts



A	Display/Operation panel	G	Power supply connector
B	Reservoir Cap	H	Alarm, RUN/STOP, Communication connector
C	Level gauge	I	Circulating fluid OUT
D	Air filter (air inlet)	J	Circulating fluid IN/Drain
E	Screw for filter maintenance	K	PE connector (M4)
F	Main power switch	L	Power supply cable (Accessory, with Ferrite core)

## 6 Name of Parts - continued

### 6.2 Display Panel



No.	Description	Detail
[1]	Display 1	Displays the temperature control or setting content.
[2]	Display 2	Displays set temperature or each selected input value.
[3]	[▼] key (DOWN key)	Decreases the set value.
[4]	[▲] key (UP key)	Increases the set value.
[5]	[RUN/STOP] key	Used to change control mode (RUN/RDY).
[6]	[MODE] key	Used to change screens and modes.
[7]	RUN	Lights up when the product is started and in operation (RUN).
[8]	ALARM	Lights up alarm occurs.

## 7 Installation

### 7.1 Installation

#### Caution

- Do not install the product unless the safety instructions have been read and understood.
- Pay special attention to the safety of all personnel when installing and transporting the product.
- Leakage from the product may damage peripheral equipment. Install a drain pan under the product to capture leakage. Furthermore, mount devices like a leak sensor on the installed drain pan to detect leakage so that it can alert operators around the area.

### 7.2 Environment

#### Warning

- The product should be installed upright on a stable base.
- Do not use in an environment where corrosive gases, chemicals, salt water or steam are present.
- Do not use in an explosive atmosphere.
- Do not expose to direct sunlight. Use a suitable protective cover.
- Do not install in a location subject to vibration or impact in excess of the product's specifications.
- Do not mount in a location exposed to radiant heat that would result in temperatures in excess of the product's specifications.
- Do not install the product in a location where the air inlet and air outlet vents are blocked. Also do not use the product in a sealed enclosure.
- Do not mount the product in a location where it is subject to strong vibrations and/or shock. Check the product specifications.
- Do not use the product where it can be exposed to strong electrical or magnetic emissions.
- Do not mount the product in a location where it is exposed to noise sources (such as discharging equipment, large relay and thyristor).
- Do not mount the product in a location with an altitude of more than 2000 meters.
- Do not mount the product where it is exposed to materials such as silicone, which may generate harmful gas.
- Install the product in a location where the ambient temperature range is between 10 to 35°C and the relative humidity range is between 35 to 70%. No dew condensation is allowed on the unit.
- Do not mount the product in a location exposed to radiant heat.
- To prevent adverse effects of noise on personnel, install at least 1 meter away from users.

## 7 Installation - continued

### 7.3 Piping

#### Caution

- Ensure that the power source and the power supply of the product is turned off (or the power plug must come off)
- Before connecting piping make sure to clean up chips, cutting oil, dust etc.
- Ensure the flow rate of the circulating fluid is as high as possible to maintain the temperature stability. Therefore, the length of the external piping should be minimised, and internal diameter should be as large as possible. Piping must have sufficient strength for the maximum discharge pressure of the circulating circuit.
- Likewise, if a tube is bent or multiple elbow fittings are used, the piping resistance will increase, and the flow rate will decrease. If the flow rate falls, the temperature stability will decrease.
- If installing a tank externally, only a sealed tank should be used. Do not use an open tank.

#### Caution

- Ensure that the INLET and OUTLET for circulating fluid is connected correctly. If any valves are used ensure that they do not restrict the flow, otherwise low flow may cause an alarm.
- When installing piping or fittings, ensure sealant material does not enter inside the port. When using seal tape, leave 1.5 to 2 threads exposed on the end of the pipe/fitting.
- Be sure to correctly tighten the fittings to the required torque (Rc1/4:12 to 14 N·m).

### 7.4 Wiring

- This product may use maximum current of 18A, depending on the operating conditions. Select the power source with some margins.
- Ensure that the power source and the power supply of the product is turned off before connecting the various connectors and power supply cable.
- Supply disconnecting device according to IEC60947-3 for the product must be provided in the end system.
- Do not install the disconnecting device in the place where the operation is difficult. And the switch of the disconnecting device must comply with the direction of the switch specified by IEC60447.
- Ensure that a lock out facility is available on the power source. Ensure that an Earth Leakage Breaker with proper capacity is used. Install it above 0.6m from the floor.
- Use the dedicated power supply for this product with SELV.
- Preparation and wiring of power supply cable:
  - Attach the proper connector (e.g. crimped terminal) that matches the power source to one end of accessory power supply cable. (Accessory cable: 16AWG, UL1007)
  - Connect the connector to the power source, and the product.
- Ensure that there is enough space between the power supply cable and the communication cable of the product and power cables of other equipment.
- Ensure the power supply and ground (protective earth) connections are made correctly.
- Be sure to provide the grounding (16AWG). Do not connect the ground in common with the ones for equipment that generates strong electromagnetic noise or high frequency.
- Connect the host to this unit with a twisted pair shield cable when applying communication function. When using the Communication connector, connect the circuit separated from the mains circuit by reinforced insulation.
- Ensure that external instruments connecting to this product provide the enclosure complied with UL61010-1 and use the cable which provides flame resistance (VW-1 or over).

## 7 Installation - continued

### 7.5 Filling the product

- Ensure that the power source and the power supply of the product are turned off (or the power plug must come off).
- Remove the reservoir cap.
- If using Ethylene Glycol, refer to the suppliers Material Safety Data Sheet (MSDS) and wear Personal Protective Equipment (PPE) as appropriate.
- Fill the circulating fluid into the reservoir. Stop filling once the level of fluid reaches the "H" mark.
- Turn on the power switch to fill the piping with the fluid, then operate RUN to start the pump.
- When the piping is filled with the circulating fluid, the level of the reservoir decreases, and low fluid level alarm arises accordingly. Then, turn off the power supply once again.
- Repeat the step from 4 to 6 until alarm doesn't appear anymore.
- Then, replace the cap on the reservoir and tighten it securely.
- Keep the fluid level between H and L of the level indicator.

#### Danger

- Never touch the power switch with wet hands to avoid electrical shock.

#### Caution

- Do not touch the surface when the set temperature is high. Temperature of the tank and the chassis near the tank could be high.
- Fluid other than water or Ethylene Glycol (up to 20%) should not be used as circulating fluid. Using such fluid may lead to leakage or damage of the pump.
- Operation of the pump with a large amount of air left in the piping for prolonged period may damage the pump. Remove air from piping before starting operation.
- If the power switch is turned on without circulating fluid, the pump could be damaged.
- Take care not to spill water over the product when supplying water to the reservoir. When a spill is made, wipe it off immediately and only supply power after it has dried. If this procedure is neglected, it may cause damage to the product.
- If a fluid with low conductivity such as DI water is used as circulating fluid, it can cause static electricity due to friction and damage the product. Take measures to minimize the static electricity from circulating fluid.

- Do not use with flow rate of circulating fluid is zero. If the flow rate is zero, the temperature of circulating fluid cannot be detected and might be increased or decreased. The pump might be broken as well.

## 8 Operation

### 8.1 Power Up

When power is turned on, "HELLO" is indicated on display panel for approx. 4 seconds.

### 8.2 Operation

The product starts up in the RDY mode (control stop) after the power is turned on, and by pressing the RUN/STOP key to put it in the RUN mode (control run), the pump, fan, and heat exchanger start operating and temperature control begins. The display shows the following information. (If the operation start status setting in the control setting mode is set to "2", operation can be started immediately after power-on.)

### 8.3 Settings

Controller has two modes, Operation mode and Setting mode. Each mode has the following contents.

#### Operation Mode: Initial mode

Used in normal operation (e.g. setting of target temperature/offset.)

#### Setting Mode: Press and hold [MODE] key for 2 seconds.

Used at maintenance and initial setting for controller/PID/Communication.

- Setting of functions and data in each mode:

- Press [MODE] key in each mode to select the required function.
- Increase or decrease data with the [▲] or [▼] key
  - Each press of the [▲] key increases the data by one count.
  - Each press of the [▼] key decreases the data by one count.
  - Holding the [▲] or [▼] key accelerates the increase or decrease.

## 8 Operation - continued

Turn on the power

#### Operation mode

[MODE] key	Function
-	Target / Measured Temp. Indication and setting
PuS1	Offset setting
fu1	Heating output indicator
fu2	Cooling output indicator

Press and hold [MODE] key for 2 sec

#### Setting Mode

<SET1> Control setting mode [MODE] key	<SET2> Communication setting mode [MODE] key
nd	Control Mode
P1	Heating proportional band
I	Integral time
d	Derivative time
t1	Heating proportional cycle
ArH	ARW
P2	Cooling proportional band
t2	Cooling proportional cycle
FES	Fan Control Setting
HSE	High Temp. Cutoff
LSE	Low Temp. Cutoff
ASE	Operation start status
CCS	Communication standard RS-232C / RS-485
Con	Communication parameter
bPS	Communication speed
Adr	Communication address
RYL	Response delay time

### 8.3.1 Operation Mode

When the power supply switch is turned on, the product is in operation mode. The target temperature is shown as well as the current measured temperature. Each press of the [MODE] key changes the operation mode display as follows:

No.	Modes	Function	Setting range (Min. increment)	Default
1	Target Temp./ Measured Temp. Indication and setting	Sets target temperature Set with [▲] or [▼] key  Indicates current temperature on PV and target temperature on SV	10.0 to 60.0°C (0.1°C)	25.0
2	Offset Setting	Sets the offset value of the PV. Set with [▲] or [▼] key  Ex. If set to 0.5, the temperature is controlled to a value that is 0.5°C lower than displayed temperature (PV).	-9.9 to 9.9°C (0.1°C)	0
3	Heating output indicator	Indicate the heating output ratio	0.0 to 100.0%	-
4	Cooling output indicator	Indicate the cooling output ratio	0.0 to 100.0%	-

**8 Operation - continued**

**8.3.2 Setting Mode**

Setting mode can be shown by pressing and holding the [MODE] key for approx. 2 sec.

Pressing the [MODE] key for approx. 2 sec again will return the setting mode to the Operation mode.

Setting mode selection is indicated with "SEt" and the required setting mode can be selected by increasing or decreasing the indicated number with the [▲] or [▼] key

SEt 01 Cnt	Function	Selects mode for each setting. Select with [▲] or [▼] key.
	Selectable setting	1, 2 1: Control Setting Mode 2: Communication Setting Mode

**SET1: Control Setting Mode**

Selecting "01" in Setting mode "SEt" activates the control setting mode. Each press of the [MODE] key changes the operating mode as follows.

No.	Modes	Function	Selectable Setting	Default
1	Control Mode Setting rUn rDy	Sets control mode. Select with [▲] or [▼] keys	rUn (RUN): Temperature control and pump/fan operation enabled rDy (RDY): Temperature control and pump/fan operation disabled	rUn
2	Heating Proportional Band Setting P1 75	Sets the proportional band for heating. Set with [▲] or [▼] key  This range is a percentage of temperature setting range.	0.1 to 200.0 %	7.5%

No.	Modes	Function	Selectable Setting	Default
3	Integral Time setting I 20	Sets the integral time. Set with [▲] or [▼] key	0 to 3600 sec.  If "0" is set, integral control is disabled.	20sec
4	Derivative Time Setting d 0	Sets the derivative time used for PID control. Set with [▲] or [▼] key	0 to 3600 sec.  If "0" is set, derivative control is disabled.	0sec
5	Heating Proportional Cycle Setting t1 10	Sets heating proportional cycle. Set with [▲] or [▼] key	0.1 to 120.0 sec  If the proportional cycle is set at 1 sec. and Heating Output is 70%, the output will be 0.7 sec. ON and 0.3 sec. OFF.	1.0sec
6	ARW Setting ArW 1000	Sets anti-reset wind-up. Set with [▲] or [▼] key	0.0 to 110.0 %  Reduces overshoot in PID control due to integrating operation. The integration operation is not performed above the set value. The set value must be higher than the output at stable control.	100.0%

**8 Operation - continued**

No.	Modes	Function	Selectable Setting	Default
7	Cooling Proportional Band Setting P2 050	Sets cooling proportional band for cooling. Set with [▲] or [▼] key	0.10 to 10.00 times.	0.50 times of P1 set value
8	Cooling Proportional Cycle Setting t2 10	Sets cooling proportional cycle. Set with [▲] or [▼] key	0.1 to 120.0 sec  If the proportional cycle is set at 1 sec. and Cooling Output is 70%, the output will be 0.7 sec. ON and 0.3 sec. OFF.	1.0sec
9	Fan Control Setting FCS 0	Sets fan control. Select with [▲] or [▼] keys	0: Variable fan speed mode Fan speed controlled according to controller output volume  1: Constant fan speed mode Constant fan speed regardless of controller output volume	0
10	High Temp. Cutoff setting HSt 700	Sets high temperature cutoff Set with [▲] or [▼] keys  Sets upper limit of temp measured by the internal temp sensor and stops operation of the product.	11.0 to 70.0°C (0.1°C)	70.0

No.	Modes	Function	Selectable Setting	Default
11	Low Temp. Cutoff setting LSt 00	Sets low temperature cutoff Set with [▲] or [▼] keys  Sets lower limit of temp measured by the internal temp sensor and stops operation of the product.	0.0 to 59.0°C (0.1°C)	0.0
12	Operation start status setting ASt 1	Sets operation start status. Select with [▲] or [▼] keys	1: Start up in the RDY mode after the power is turned on. (Temperature control and pump/fan operation disabled)  2: Start up in the RUN mode after the power is turned on. (Temperature control and pump/fan operation enabled)	1

**SET2: Communication Setting Mode**

Selecting "02" in Setting mode "SEt" activates the control setting mode. Each press of the [MODE] key changes the operating mode as follows.

No.	Modes	Function	Selectable Setting	Default
1	Communication standard setting CCS 232C	Sets communication standard. Select with [▲] or [▼] keys	232C : RS-232C 485 : RS-485	232C
2	Communication parameter setting Con nBn2	Sets communication parameters. Select with [▲] or [▼] keys	1 <sup>st</sup> digit : Stop bit length 1: 1 bit, 2: 2 bit 2 <sup>nd</sup> digit : Parity check n: None, o: Odd, e: Even 3 <sup>rd</sup> digit : Data length 7: 7 bit, 8: 8 bit 4 <sup>th</sup> digit : BCC check n: Disable, b: Enable The number of digits is counted from the right side.	nBn2

**8 Operation - continued**

No.	Modes	Function	Selectable Setting	Default
3	Communication speed setting bPS 96	Sets the communication speed. Select with [▲] or [▼] keys (2.4 ↔ 4.8 ↔ 9.6 ↔ 19.2 ↔ 38.4)	2.4 - 38.4 (2400 bps - 38400 bps)	9.6 (9600 bps)
4	Communication address setting Adr 1	Sets the communication address of the product. Set with [▲] or [▼] key	1 to 99 addresses	1
5	Response delay time setting Rdt 0	Sets the response delay time. Set with [▲] or [▼] key	0 to 250 ms	0ms

**9 Maintenance**

**9.1 General Maintenance**

**Caution**

- Not following proper maintenance procedures could cause the product to malfunction and lead to equipment damage.
- 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.

**9.2 Circulating fluid maintenance**

Replace the circulating fluid regularly to avoid any problems due to algae or contamination.

**9.2.1 Drain circulating fluid**

- Drain circulating fluid from the circulating fluid IN port. Loosen the reservoir cap to help draining. (Do not remove the cap)
- To drain from the piping, blow air (0.05MPa, about 1 minute) from the circulating fluid OUT to IN port. Close the reservoir cap while blowing.

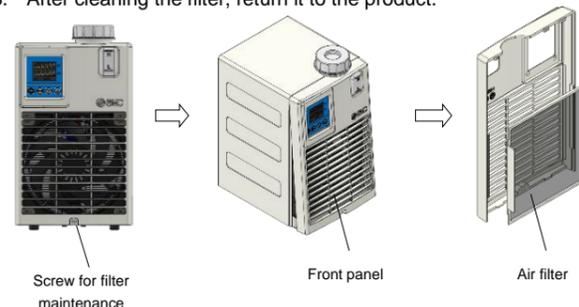
**Caution**

- When cleaning the panel, heat sink, filter use a vacuum cleaner to remove the dust. Do not use water or steam since it leads to rusting of the frame.

**9.3 Clean air filter periodically to avoid declining performance.**

**9.3.1 Clean air filter**

- Make sure that power is not supplied (or that the power plug is disconnected).
- Remove the filter maintenance screw (1 place), the front panel, then the air filter.
- After cleaning the filter, return it to the product.



**9 Maintenance - continued**

**9.4 Daily Check**

- Indication of display panel: Check temperature condition and confirm whether an alarm has occurred.
- Confirm that the panel, heat sink and filter are free from dust. A large amount of dust may impair the performance.
- Confirm there is no leakage of circulating fluid and check the condition of the piping (e.g. no tight bends or crushed pipes).
- Confirm there is no abnormal sound, smell or heating from the product.

**Caution**

- The repair and maintenance services of this unit are performed only at SMC factory. SMC does not provide on-site repair or maintenance service in a national or overseas situation.
- It is recommended to prepare spare units to minimize downtime due to those repair and maintenance services.
- Drain the fluid from the product when it is returned for the repair and maintenance service. If the fluid is left inside, an accident and damage can result during transportation.
- Do not make any modification to the product.
- Do not disassemble the product, unless required by installation instructions.
- If fluid other than water is used, wash the circulating fluid circuit with water or DI water before returning the product to SMC. Products that have not been washed may not be accepted at the factory.

**10 Troubleshooting**

The troubleshooting method depends on which alarm has been generated. Refer to the "Alarm list and Troubleshooting".

**Caution**

In the event of an unexpected problem or malfunction, switch off the product and investigate the cause. If the cause of the problem cannot be determined, do not use the product, but contact SMC for assistance.

**10.1 Alarm list**

Display	Content of alarm	Product Status	Reset
AL0	<b>Memory error</b> Occurs when the data stored inside of the EEPROM breaks.	Temp.control pump and fan stop	Turn ON Main power switch again
AL1	<b>Controller error</b> Occurs when A/D conversion is not performed properly.	Temp.control pump and fan stop	Turn ON Main power switch again
AL2	<b>Temp. sensor disconnection alarm</b> Occurs when the temperature sensor breaks.	Temp.control pump and fan stop	Turn ON Main power switch again
AL3	<b>Temp. sensor short circuit alarm</b> Occurs when the temperature sensor is short-circuited.	Temp.control pump and fan stop	Turn ON Main power switch again
AL4	<b>High temp. alarm</b> Internal temp. sensor value exceeds the high temp. cutoff temperature.	Temp.control pump and fan stop	Turn ON Main power switch again
AL5	<b>Low temp. alarm</b> Internal temp. sensor value is lower than the low temp. cutoff temperature.	Temp.control pump and fan stop	Turn ON Main power switch again
AL6	<b>Low level alarm</b> Occurs when liquid level is low	Temp.control pump and fan stop	Turn ON Main power switch again
AL7	<b>Thermostat alarm</b> Occurs when the thermostat that detects excessive heating begins operating.	Temp.control pump and fan stop	Turn ON Main power switch again

**10.2 Troubleshooting**

Code	Cause	Countermeasure
AL0	The EEPROM of Controller is broken due to high-level electric noise.	If the trouble cannot be solved even after restart, controller need to be replaced.
	The writing frequency to the EEPROM exceeds 0.1 million.	
AL1	The EEPROM of the controller is broken due to high-level electric noise.	If the trouble cannot be solved even after restart, controller need to be replaced.
AL2	Temperature sensor breaks.	If the trouble cannot be solved even after restart, temperature sensor need to be replaced.
AL3	Temperature sensor is short-circuited	If the trouble cannot be solved even after restart, temperature sensor need to be replaced.

**10 Troubleshooting - continue**

Code	Cause	Countermeasure	
AL4	Temp. sensor value exceeds the high temp. cutoff temperature.	Check the set value for high temp. cutoff temperature and confirm the temperature really reaches this value.	
	Flow rate is zero.	If flow rate of circulating fluid is zero, the temperature of the fluid cannot be measured and the temperature of the fluid may increase. Ensure the circulating fluid is allowed to flow.	
AL5	Temp. sensor value is lower than the low temp. cutoff temperature.	Check the set value for low temp. cutoff temperature and confirm the temperature really reaches this value.	
	Flow rate is zero.	If flow rate of circulating fluid is zero, the temperature of the fluid cannot be measured and the temperature of the fluid may decrease. Ensure the circulating fluid is allowed to flow.	
AL6	Level Switch	Fluid level of the tank is not enough Rifill tank with fluid	
	Fluid is leaking	Check all fluid connections connected with the product.	
AL7	Thermostat	Flow rate is zero.	If flow rate of circulating fluid is zero, the temperature of the fluid cannot be measured and the temperature of heat exchanger or heatsink may increase. Ensure the circulating fluid is allowed to flow.
		The pump breaks.	Check the pump operation. If the pump breaks, need to be replaced.
		Ambient temperature is too high. (out of 10-35°C)	Correct the ambient temperature within the specification range.
		Filter clogged	Clean the filter.
		The fan breaks	Check the fan operation. If the fan breaks, need to be replaced.

**13 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**

11.1 Below is a sample Declaration of Conformity (DoC) used for this product. An actual DoC will be supplied with each product.

Code	Requirements	Harmonised/applied standards
2006/42/EC (Machine Directive)	Annex I	EN/ISO 12100:2010 EN60204-1:2018
2014/53/EU (EMC Directive)	Annex I	EN61000-6-2:2005 EN61000-6-4:2007+A1:2011
2011/65/EU (RoHS Directive)	Annex II	EN IEC 63000:2018

SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 100-0021, JAPAN,  
declares under its sole responsibility, that the following equipment:  
Thermostatic(Compact type)  
HEF002 Series  
Serial No. AU-0001 onwards Marked H  
is in conformity with the relevant Union harmonisation legislation and has been demonstrated to fulfil the requirements with reference to the harmonised standard(s) or applied standard(s) as listed below:

Statutory Instrument	Requirements	Designated Standard/ Technical Specification
Supply of Machinery (Safety) Regulations 2008	Schedule 2	EN 60204-1:2018 EN ISO 12100:2010
Electromagnetic Compatibility Regulations 2016	Schedule 2	EN 61000-6-2:2005 EN 61000-6-4:2007+A1:2011
The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012	Schedule 2	EN IEC 63000:2018

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The person authorised to compile the technical file is the person named at the address below:

Tokyo, Date: \_\_\_\_\_  
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General Manager  
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**12 Limitations of Use**

12.1 Limited warranty and Disclaimer/Compliance Requirements  
Refer to Handling Precautions for SMC Products.

**Caution**

Refer to 'Section 2.1 Product Specification' for the product limitations of use.

**14 Contacts**

Refer to [www.smcworld.com](http://www.smcworld.com) or [www.smc.eu](http://www.smc.eu) for your local distributor/importer.

**SMC Corporation**

URL : <https://www.smcworld.com> (Global) <https://www.smc.eu> (Europe)  
SMC Corporation, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, Japan  
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