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Rev. date	

To:

Delivery Specification

Thermo Electric Bath

Product Description

HEBC002-WA10
HEBC002-WB10

Model no. / Series / Part no.

Return this Specification to SMC after stamping of signing in the column of Signature of reception. This Specification is recognized to be accepted if no reply for 20 days from the date of issue of SMC.

Signature of reception	S M C date stamp

Prepared by: PD Div. 6

Appr'd	Chk'd	Prep'd
Sakama PD Div. 6	Saika PD Div. 6	Ono PD Div. 6

SMC Corporation

Revision History

Rev. No.	Date	Reason for revision	Appr'd	Prep'd	Note

Contents

1. Scope

1) This Specifications explains an electronic cooling/heating contant temperature bath “Thermo Electric Bath”.

2) The manufactured range is as shown on the figure below. Preapare other items than listed on section 6-2 by customer itself separately.

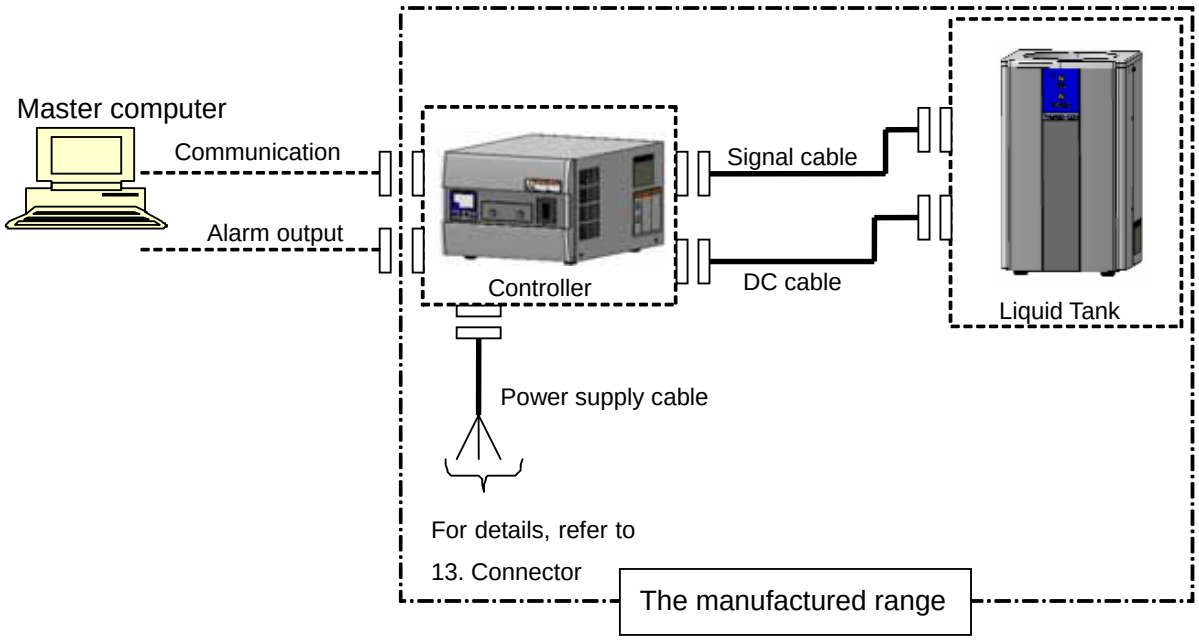


Fig. 1 Scope

Note) A power supply cable is not terminated and remains bared. Terminate it in accordance with the specifications of connected equipment.

2. Repair and Maintenance

(1) This product needs to be returned to the SMC factory for repair and maintenance.
Essentially, on-site repairs and maintenance cannot be offered. Be sure to drain the liquid from the liquid tank and clean and dry the product before returning.
Any injury or damge to equipment during tranport due to improper cleaning and drying of the product cannot be compensated.

(2) It is recommended that you prepare a back-up product to minimize machine downtime during repairs and maintenance.

(3) The packing box in which the product came has been made specifically for this product. Use this box to return the product to the SMC factory for repair or maintenance.

(4) Separately, the following parts need replacement at regular basis, and other parts should be also checked periodically. For replacement, return the part to us.

Replacement parts

Part name: Recirculating pump

Capable life: 3 to 5 years

Possible failure: The recirculating fluid cannot be fed due to worn bearing and/or insufficient capacity of electrolytic capacitor, which results in temperature controlling failure.

Part name: Fan

Capable life: 5 to 10 years

Possible failure: The capacity of the fan lowers due to the end of lubricating performance of the bearing, which results in increase of internal temperature of the Controller.
The overheat protective function at the inside of the power supply starts, the outputs stops and the display goes off.

Part name: DC power supply

Capable life: 5 to 10 years

Possible failure: Abnormal voltage is generated and the display goes off due to insufficient capacity of electrolytic capacitor.

3. Period and Scope of Warranty

(1) Content

If the purchased product fails, it will be repaired at no cost within the period and requirements mentioned below.

Replacement, adjustment, and inspection of failed parts are all within the range of this warranty, i.e., will be performed at no cost. The parts removed for repair will belong to SMC.

(2) Period

1 years after delivery to the place customer specified.

(3) Scope

If the product fails within the warranty period and the fault lies with SMC, it will be repaired at no cost.

(4) Out of scope

The following situations are out of the scope of this warranty.

①The failure was caused by operation different from that shown in the Operation Manual or operation over the SMC specified parameter limits.

②The failure was caused by retrofitting that SMC did not approve.

③The failure was caused by a recirculating fluid or cooling water with specifications other than those specified by SMC.

④The failure occurred naturally over time (such as discoloration of a painted or plated face).

⑤The failure does not affect the functioning of the product (such as new sounds, noises and vibrations)

⑥The failure was caused by a natural disaster such as an earthquake, typhoon, lightening or flood, or by an accident or fire.

⑦The failure was caused by installation of the product in an environment other than that specified in the Operation Manual.

(5) Disclaimer

① Expenses to compensate for secondary damages to other equipment and goods due to the failure of the product
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 the product and for the supply of liquids
⑤ Losses resulting from the inability to use the product (such as telephone charges, compensation for workplace closings, and commercial losses)
⑥ Expenses and compensation not covered in “(1) Content”.
⑦ Expenses for returning the product

(6) Request for repair

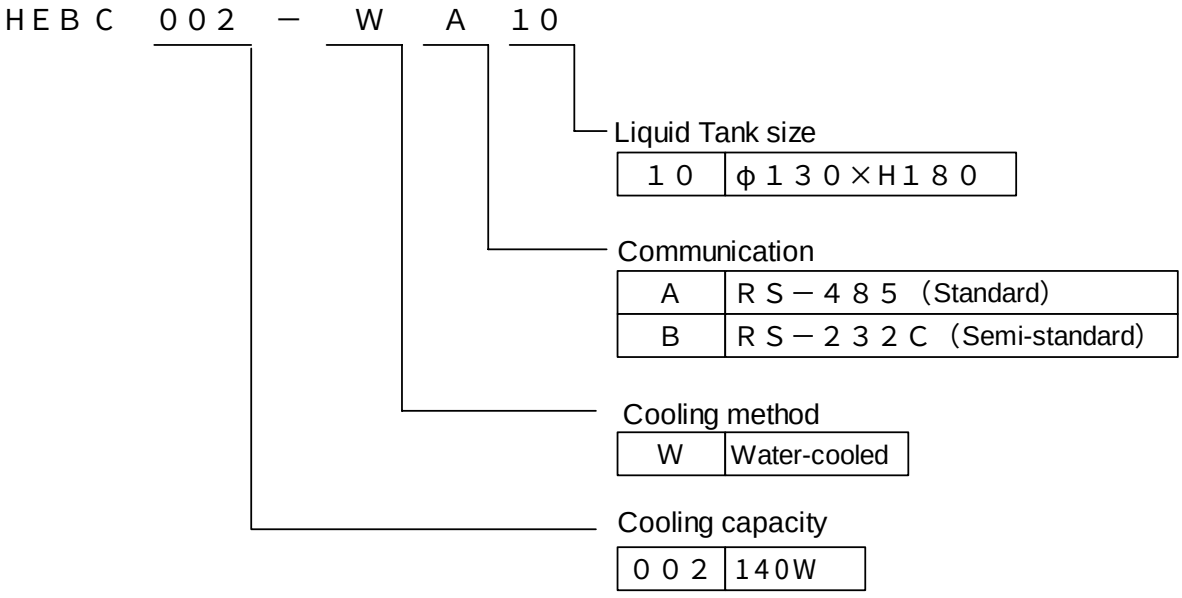
When repair of the product is needed, contact the shop where the product was purchased. When this is done, the repair will then be performed under warranty by SMC.

No-cost repair of the product is assured within the period and requirements mentioned above. Failures which occur after the warranty period has passed will, in principle, be charged.

4. How to Order and Manufacturing Code Indication

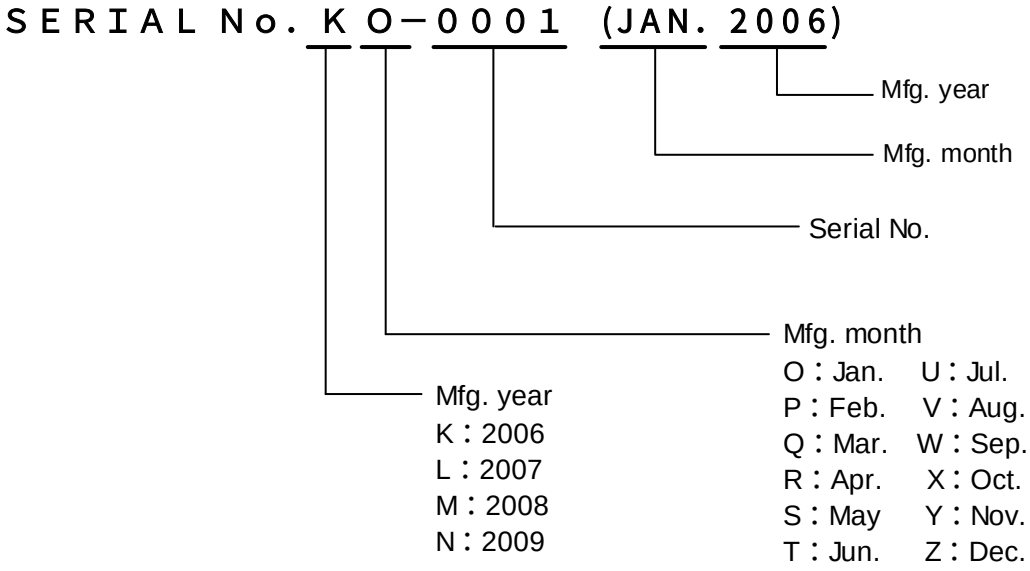
4-1. How to order

How to order the Thermo Electric Bath is as follows. It includes whole content of “6-2 Packaging content”. Also, it should be noted that there is no independent part number for a Liquid Tank and Controller.



4-2. Manufacturing code indication

The date of manufacturing can be found on the model number plate attached to this product.



5. Specifications

Table1 Thermo Electric Bath specifications

Part No.		HEBC002-WA10	HEBC002-WB10
Control method		Cooling/heating automatic shift PWM control	
Cooling / Heating method		Thermoelectric device (Thermo-module)	
Radiating method	Liquid Tank	Water-cooled	
	Controller	Forcible air-cooled	
Operating temp. range		-15.0 to 60.0°C (5°C or more for water) (Note 1) (Note 5)	
Temp. stability (including temp. distribution)		±0.1°C (set temp.10 to 35°C)(Note 1) ±0.15°C (-15.0 to 60.0℃ outside of the above range) (Note 1)	
Cooling capacity		140W (Water) (Note 2)	
Heating capacity		300W (Water) (Note 2)	
Recirculating fluid	Application fluid	Water, GALDEN® HT135, HT200, Fluorinert ™ FC-3283 (Note 3)	
	Tank dimensions	I.D.φ130 × Liquid level 180mm	
Cooling water	Temperature	10 to 35°C (no dew condensation)	
	Flow rate	3 to 5L/min (Note 4)	
	Max. operating pressure	0.5MPa	
Cooling water port size		Rc1/4	
Power supply		AC100 to 240V, Single phase, 50/60Hz, 4 to 2A	
Overcurrent protection		Circuit protector (acting as a power supply switch) with rated current 10A	
Main functions		Auto tuning, Set value memory, Temp. upper/lower deviation limit alarm, Output cutoff alarm	
Communication		RS-485	RS-232C
Input operation Indication		Membrane key sheet 7 segment LED	
Alarm output		Temp. upper/lower deviation limit alarm, Output cutoff alarm Relay contact output: opened when the alarm occurs 125VAC,0.4A/30VDC,2A (resistive load) 125VAC, 0.2A/30VDC,1A (inductive load)	
Temperature sensor		Resistance thermometer sensor, Pt100Ω,3-Connecting wire, Class A, JIS C 1604	
Ambient temp./humidity Ambient air quality		10 to 35°C, 35 to 80%RH(no dew condensation) Appropriate environment without corrosive gas, solvent such as thinner and combustible gas.	
Dimensions	Liquid Tank	W 200 × H 332 × D 207mm(excluding protrusion)	
	Controller	W 250 × H 180 × D 340mm(excluding protrusion)	
Weight	Liquid Tank	Approx. 8.5kg (Empty)	
	Controller	Approx. 6.5kg	
Connection cable		DC cable, Signal cable: 3m each	
Accessory cable		Power supply cable: 2m	

Note 1) Differs depending on operating conditions.

Note2) Determined under the following conditions: water as the recirculating fluid, set temperature 25℃, cooling water temperature 25℃, flow rate 3L/min, ambient temperature 25℃, and sealed from outside air with a lid.

Note 3) GALDEN® is a trade mark of Solvay Solexis and Fluorinert™ is a trade mark of 3M.

Note 4) An appropriate range is from 3 to 5L/min. To prevent damage to the radiating system, do not supply a flow over the maximum flow rate of 8L/min.

Note 5) When the temperature is set high, the liquid temperature inside of the liquid tank and the temperature inside of the thermostat could differ greatly depending on the heating mode at start-up, and the thermostat could then begin operating and stop the output.

6. Packaging and Deliverables

6-1. Packaging

- One Liquid Tank and Controller are packaged into one box for delivery.
- The product is packaged with a vinyl bag for delivery.
- Accessories such as a power supply cable and Operation Manual are packaged together.
- The pacakging box is made specific for the Thermo Electric Bath. When it is returned for maintenance or repair to our factory, use this box.
- The packaging has been evaluated in accordance with JIS Z0200 level Ⅲ (10 to 20kg).

6-2. Packaging content

①Thermo Electric Bath (Liquid Tank)	1 pcs
②Thermo Electric Bath (Controller)	1 pcs
③Signal cable	1 pcs
④DC cable	1 pcs
⑤Power supply cable	1 pcs
⑥Operation Manual	1 pcs

7. Shipment inspection

In assembly process of the Thermo Electric Bath, the following inspections are performed 100% and the inspection record is attached to the product for delivery.

Table 2 Shipment inspection items

Item	Content
1. Appearance form	・Defect on appearance and shape ・Name plate
2. Leakage test	・Cooling water circuit ・Tank
3. Standard temp. test	・Deviation of temp. from reference thermometer
4. Temp. stability test	・Stability of temp. at set value
5. Cooling capacity test	・Time to cool the recirculating fluid
6. Dielectric withstand test	・Dielectric withstand test between AC and PE

8. Functions

1) Auto tuning function

This function automatically adjusts the PID values (proportional band, integrating time, and derivative time) necessary for control.

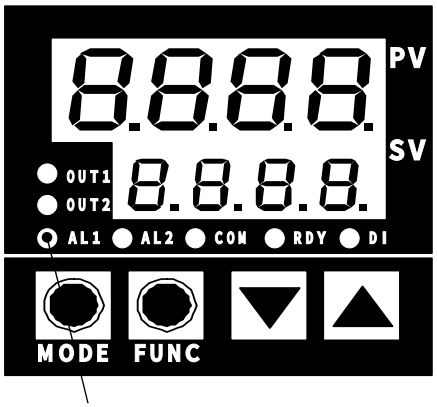
Appropriate PID values are input at the time of shipment from the factory. If the temperature deviation is found at these values on a regular basis, try to perform auto tuning. The Controller will calculate and set PID values automatically. Auto tuning may require a significant amount of time to complete, depending on the operating conditions.

2)Temperature Upper / Lower Deviation Limit Alarm Function (at shipment)

This function generates an alarm when the measured temperature deviates from the set temperature by an amount outside of that defined as the upper or lower limit deviation. In that case, the **AL1** LED of the Controller lights up and the alarm is generated via relay contact to a pin for the temperature upper/lower deviation alarm of the alarm output connector. After the measured temperature returns to within the upper or lower deviation, the alarm will be reset automatically. In its initial setting, the alarm comes on immediately after the power supply is turned on when the temperature at that time deviates from the set temperature by an amount outside of the upper or lower deviation limit. It is possible to change this setting so that the alarm will not come on during warm-up to a temperature within the upper and lower deviation limit after the power supply is turned on.

Table3 Relay contact for temperature deviation alarm

Item	Specification
Output type	Relay contact output: Opened when an alarm occurs.
Contact rating	125VAC,0.4A/30VDC,2A (resistive load) 125VAC, 0.2A/30VDC,1A (inductive load)
Minimum load	5VAC,10mA / 5VDC,10mA
Mechanical life	5 million cycles or more
Electrical life	0.2 million cycles or more



This LED lights up when the temperature deviation alarm occurs.

3) Offset Function

This function adjusts the measurement range of the temperature sensor from -1.0 to 1.0°C. The temperature sensor can be calibrated by inputting the difference (calibration value) between the temperatures of a standard thermometer and the temperature sensor.

The Controller has already been given the calibration value of 25 °C independently.

This input value is described in the Inspection Record.

4) Set Value Memory (EEPROM back-up)

This function memorizes all set values input via the operation and display panel to nonvolatile memory EEPROM as back-up. Even if the power supply is turned off, the settings remain and do not need to be reset when the power supply is restarted.

Any set value input via the communication function is not stored. If they need to be stored, use a storage request message. (Refer to Operating Manual.)

The writing limit is approx. 0.1 million times. If the setting is performed via the communication function, pay attention to how many times the writing has been done.

5) Output cutoff Alarm Function

This function cuts off output to the thermo-module (stops control) and generates an alarm when a serious abnormality occurs. When the alarm occurs, the TROUBLE LED lights up and the alarm is generated via relay contact to the pin for the output cutoff alarm of the alarm output connector. This alarm cannot be reset unless the power supply is turned off once and restarted. Problems that may cause this alarm include the following:

① Overheating of Liquid Tank (Thermostat starts operating.)

② Lowering of Controller output voltage

③Stopping of Controller fun rotation

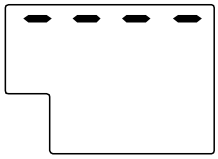
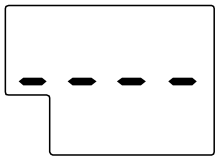
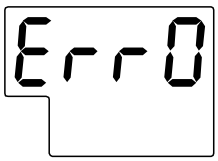
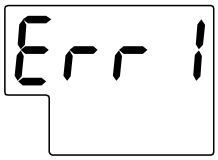
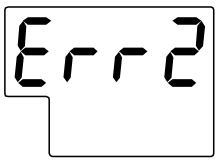
Table 4 Relay contact for output cutoff alarm

Item	Specification
Output type	Relay contact output: Opened when an alarm occurs.
Contact rating	125VAC,0.4A/30VDC,2A (resistive load) 125VAC, 0.2A/30VDC,1A (inductive load)
Minimum load	5VAC,10mA / 5VDC,10mA
Mechanical life	5 million cycles or more
Electrical life	0.2 million cycles or more

6) Alarm Indication on Operation and Display Panel

Alarms indicated on the operation and display panel are as follows. There is no output generated to the alarm output connector. If this type of alarm occurs, be sure to turn off and restart the power supply once after the trouble causing the alarm is eliminated.

Table5　Indication of alarms on operation and display panel

Indicator	Content
	Shown when a temperature sensor is opened (including disconnection of the signal cable).
	Shown when a temperature sensor is short circuited.
	Shown when the Controller has a memory error.
	Shown when the Controller has an A/D conversion error.
	The auto tuning has failed. This alarm also occurs when auto tuning is not finished after approx. 3 hours. The key-in operation can restart control with PID values before auto tuning.

7）Communication Function

• HEBC002-WA10

This product has a communication function conforming to communication protocol RS-485. The transmission cable length, i.e., transmittable distance, is 500m. RS-485 enables one master computer to set and monitor operation conditions of up to 31 Thermo Electric Baths.

• HEBC002-WB10

This product has a communication function conforming to communication protocol RS-232C. The transmittable distance is 15m. RS-232C enables one master computer to set and monitor the operating conditions of only one Thermo Electric Bath.

The content communicated by this product is as follows.

1) Setting and reading of target temperature
2) Reading of measured temperature
3) Setting and reading of offset value
4) Storage of set value (Any set value input via the communication function is not stored. If they need to be stored, use a storage request message.)

9. Outline Dimensions

The detail can be found on specifications.

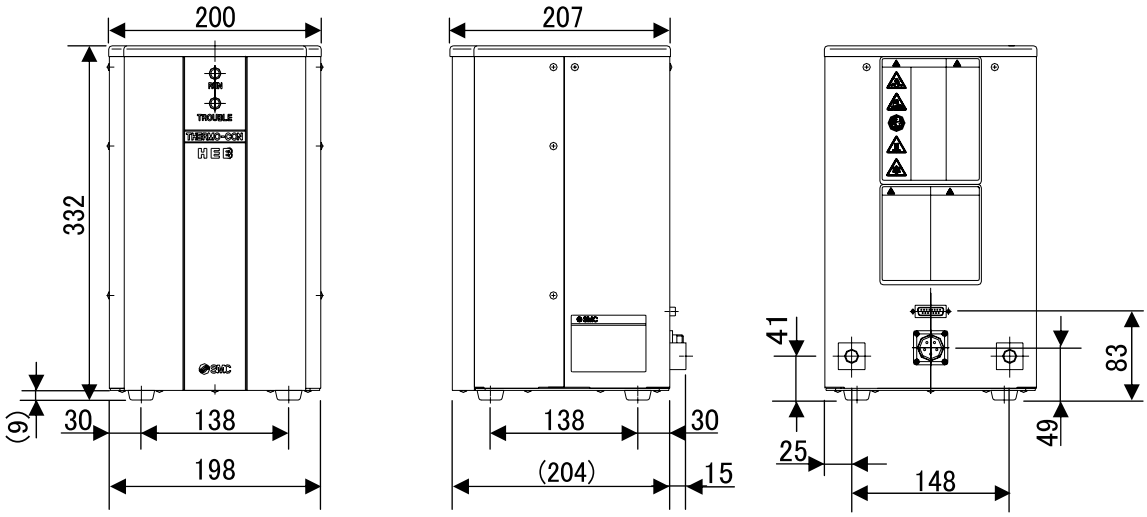


Fig. 2 Liquid Tank

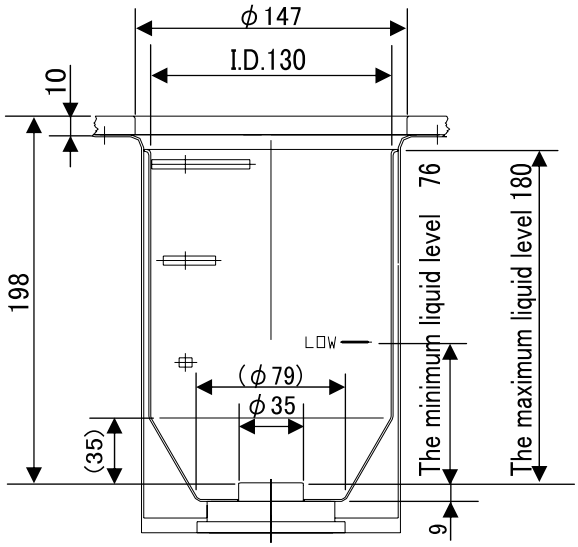


Fig. 3 Internal dimensions of Liquid Tank

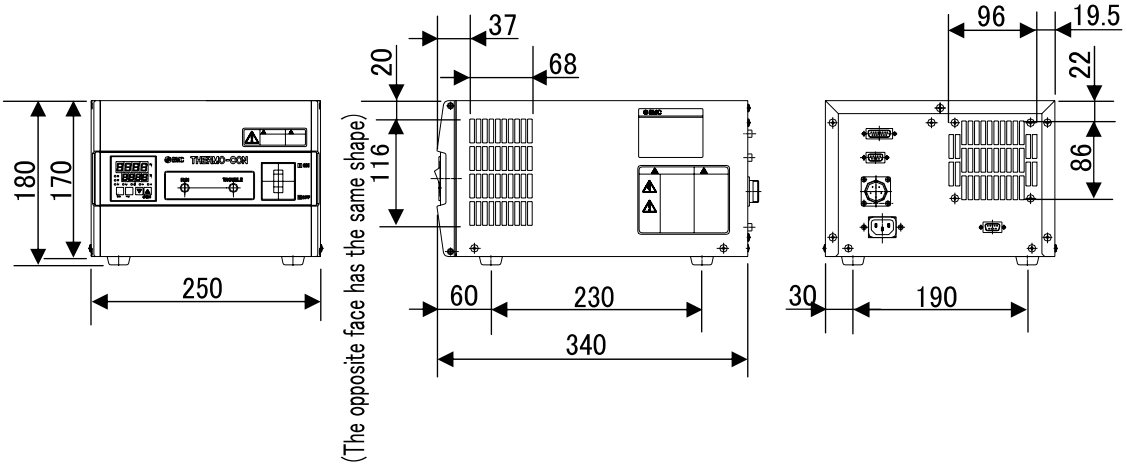


Fig. 4 Controller

10. Performance Chart

The values shown on the performance chart are representative and not guaranteed. Allow a margin for safety to decide use of the product.

1)Cooling capacity

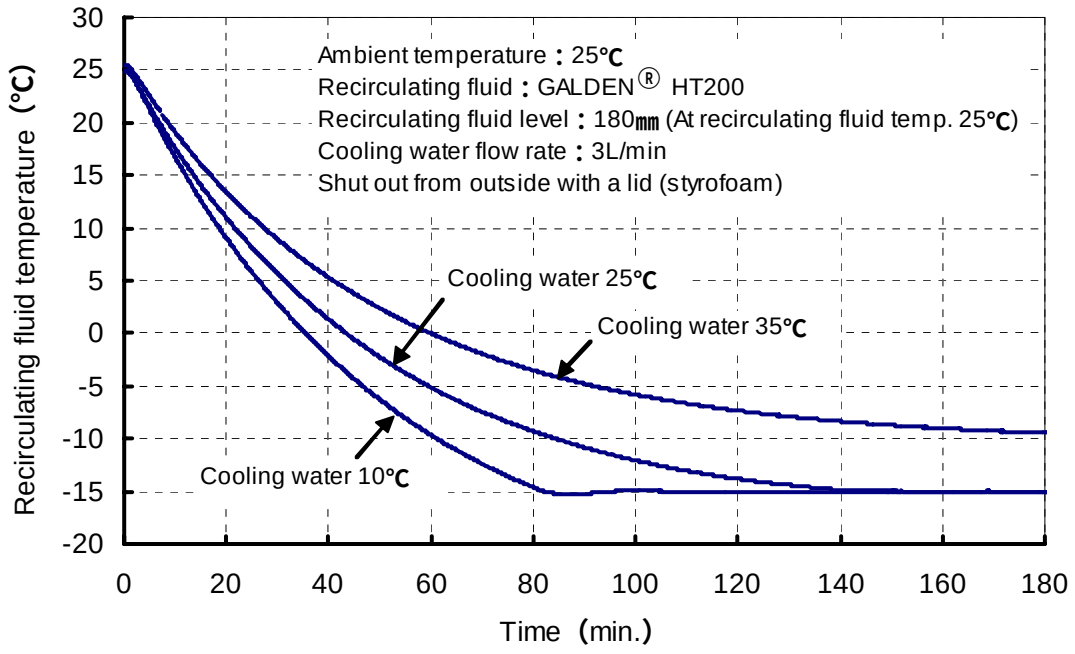


Fig.5 Cooling capacity

2) Heating capacity

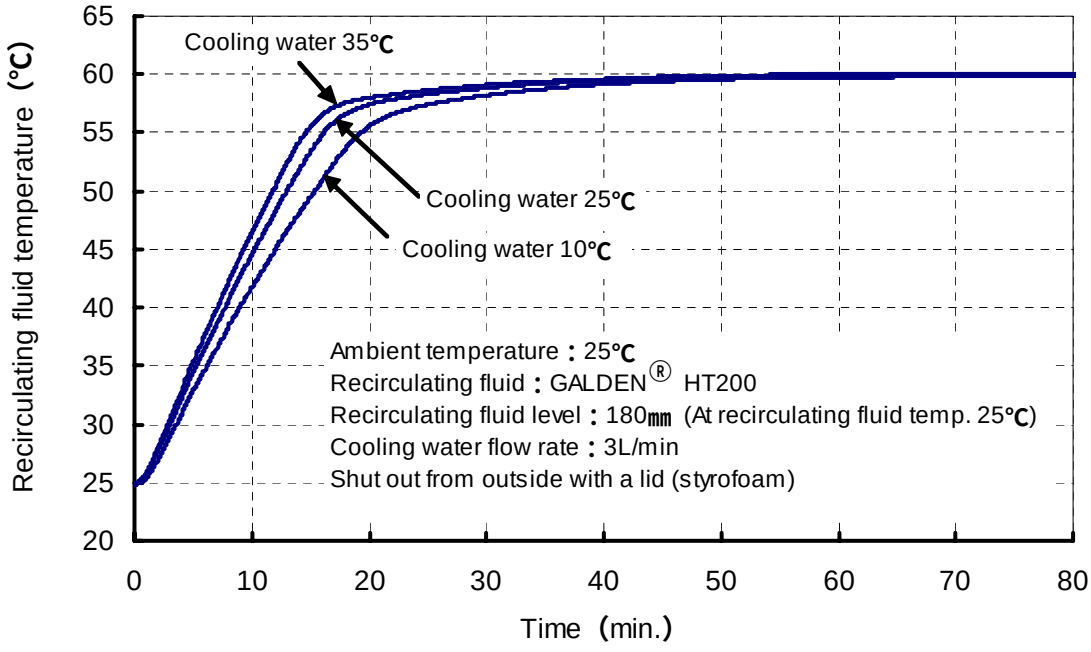


Fig. 6 Heating capacity

3) Pressure loss in cooling water circuit

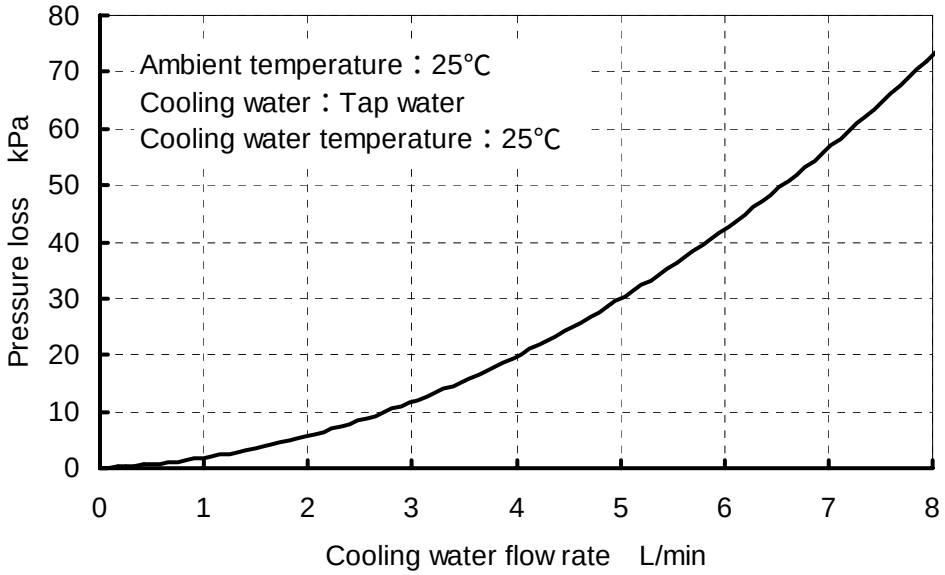


Fig. 7 Pressure loss

11. Communication

11-1. Cautions for Communication

The writing limit is approx. 0.1 million times.

If the setting is performed via the communication function, pay attention to how many times the writing has been done. Any set value input via the communication function is not stored.

If they need to be stored, use a storage request message.

11-2. Communication

Details of the communication format can be found on the Operation Manual.

Table6 Communication

	HEBC002-WA10	HEBC002-WB10
Protocol	RS-485	RS-232C
Circuit type	Half duplex	Half duplex
Communication type	Asynchronous	Asynchronous
Communication speed (BPS)	1200/2400/4800/9600/19200	1200/2400/4800/9600/19200
Character code	ASCII	ASCII
Interface	2-wire	3-wire
Parity	Without /Odd/Even	Without /Odd/Even
Start bit	1 bit	1bit
Data length	7/8 bit	7/8 bit
Stop bit	1/2 bit	1/2 bit
BCC check	Disable/Enable	Disable/Enable
Address	1 to 99	1 to 99

The settings are as underlined at the time of shipment from the factory.

12. Precautions on handling

⚠ Caution

Keep the precautions to prevent accidents accompanying injury and a failure of the product resulting in peripheral equipment damage.

1) Surrounding environment and Set-up Environment

(1) Do not use this product in the following environments.

①Environments containing splashing water, salt water, oil, or various chemicals (including chemical mists).

②Environments containing particles and dust.

③Environments containing corrosive gas, solvents and flammable gas.

④Envirnoments containing direct sunlight and radiant heat.

⑤Environments having ambient temperatures over the following range:

Operation 10 to 35°C

Storage 0 to 50°C

(with no recirculating fluid and with cooling water in the liquid tank and piping).

⑥Environments having ambient humidity over the following range:

Operation 35 to 80%

Storage 35 to 85%

⑦Environments with sharp temperature changes.

⑧Environments generating strong magnetic noise (having a strong electric or magnetic field that generates surges.)

⑨Environments generating electrical static discharge and conditions in which static electricity is applied to this product.

⑩Environments generating strong high frequency radiation (including radio frequency appliances such as mobile phones and tranceivers).

⑪ Environments generating strong vibrations and impacts.

⑫Environments that may be damaged by lightning.

⑬ Environments in which forces or gravity may deform the body of the product.

⑭Locating the cables of the product near the power lines of other machines.

⑮Conditions in which insufficient grounding for the power supply is provided

⑯Conditions that cause dew condensation (this may occur on the surface of the piping when the cooling water temperature is low).

⑰Environments containing harmful gases such as silicone.

⑱Places not allowing a space of 50mm or more at the air inlet of the Controller and thus causing the sucking of exhausted heat from the air inlet.

⑲Places preventing the horizontal set-up of the product.

(2) This product uses a fan and generates dust. When it is set up and operated in a clean room, take appropriate preliminary measures for dust.

2) Power Supply and Grounding

(1) Terminate the power supply cable in a manner suitable to the specifications of the connected equipment. This product must be supplied with power through a branch protective circuit and earth leakage breaker rated at 15A or less. Terminate the power supply cable in a manner suitable to the specifications of the connected equipment. Do not use crimping after soldering.

(2) The cables attached to this product are designed specifically for the Thermo Electric Bath. Do not use them for other purposes.

(3) Be sure to provide protective ground, which must be class D for Japan (ground resistance of 100ohm or less). Grounding can be provided via the PE line of the power supply cable. Do not use the same ground being used by equipment that generates strong electrical magnetic noise or high frequencies.

3) Controller's heat radiation air

(1) Do not close the inlet and outlet of the heat radiation air. If the heat radiation is interrupted, the internal power supply is overheated and a protective circuit will start which causes the Controller to stop automatically. Turn off the power supply, make the Controller well ventilated and confirm it is cooled sufficiently before restarting the power supply.

4) Recirculating Fluid

(1) Other fluids than described on the specification table in this manual are not applicable. If it is used to this product, the pump could be overloaded and damaged.

(2) Do not operate without recirculating fluid, or the product may idle and break. The recirculating fluid has effective range of levels. Check that it reaches that range under operating conditions.

(3) The recirculating fluid may evaporate. The product is unable to maintain performance at a significantly lower fluid level and this could cause breakage of the circulating pump. Maintain the appropriate level at all times.

(4) Check for the presence of foreign matter in the recirculating fluid. If foreign matter enters the circulating pump, the pump could break.

(5) If water is used for the recirculating fluid, keep the temperature at 5^{o}C or more.

5) Heat radiation water to the Liquid Tank

(1) Use fresh water such as tap water for the cooling water.
If cooling water is circulated, control the quality of the cooling water to prevent corrosion of the wetted material. (Wetted material：SUS303、SUS304、FEP、A6063(anodized))

(2) The maximum allowable working pressure of the cooling water system is 0.5 MPa. The pressure over this value could cause the internal piping of the water tank to have water leakage.

(3) The appropriate flow rate range is from 3 to 5L/min. If a higher flow rate is supplied, the cooling and heating capacity will be slightly affected, but a flow rate of lower than 3L/min will impair the cooling and heating capacity significantly. If that happens, the cooling water temperature could reach approx. 90^{o}C at the inside of the tank, and if a resin tube is used for piping, it could become softened and rupture. Therefore, cool the product naturally before supplying cooling water at the appropriate flow rate. The cooling water system may break if a flow rate over 8L/min is used.

6) Maintenance check

(1) Action for abnormality

If any abnormality such as noise, smoke and odor is found, turn off the power supply immediately and stop the cooling water supply to stop the product, and ask for repair.

(2) Prohibition of decomposing and remodeling

Do not disassemble and retrofit the product by removing the panel to prevent electric shock, burns and injuries.

(3) Stop of a long term

When the product is not used for a long time, remove the recirculating fluid and cooling water and turn off the main power supply to prepare for unexpected accidents.

(4) Disposing

When disposing of this product, be sure to use an industrial waste processing vendor that conforms to the “Law concerning disposal of waste and cleaning” and the “Ordinance defined by each municipal corporation”. Dispose of the recirculating fluid in the manner described in the MSDS.

7) Transport and Transfer

(1) Avoid strong vibrations and impacts

This product is precise equipment and must not be subject to strong vibration and impact during transport and transfer.

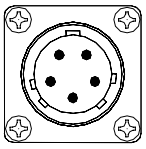
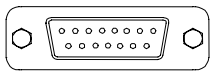
13. Connectors

⚠ Caution

The power supply cable and connection cable are specific for the Thermo Electric Bath. Do not use them to others. Prepare mating connectors for communication connector and alarm output connector by customer separately.

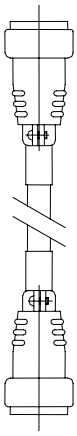
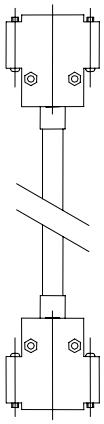
13-1. Connection of Liquid Tank and Controller

・Liquid Tank connector

DC connector (male)	Signal connector (male)
Nanaboshi Electric Mfg.co.,Ltd: NJC-245-RM UL CSA 	Hirose Electric co.,Ltd: CDA-15P Fixed screw M2.6 

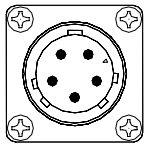
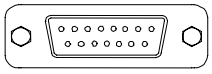
Connected ↕ Connected ↕

・Connection cable

DC cable	Signal cable
Nanaboshi Electric Mfg.co.,Ltd: NJC-245-PF UL CSA Female  Male Nanaboshi Electric Mfg.co.,Ltd: NJC-245-PM UL CSA	Hirose Electric co.,Ltd: CDA-15S Fixed screw M2.6 Female  Male Hirose Electric co.,Ltd: CDA-15P Fixed screw M2.6

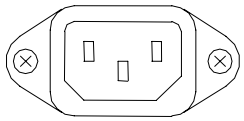
Connected ↕ Connected ↕

・Controller connector

DC output connector (female)	Signal connector (female)
Nanaboshi Electric Mfg.co.,Ltd: NJC-245-RF UL CSA 	Hirose Electric co.,Ltd: CDA-15S Fixed screw M2.6 

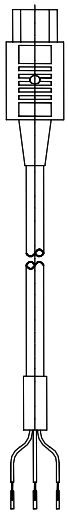
13-2. Connection of power supply cable

・Controller connector

Power supply connector
IEC60320 C-14 equivalent Male 

Connected

・Power supply cable

Controller side
IEC60320 C-13 equivalent Female  AWG14

	Content
Black 1	AC100-240V (L)
Black 2	AC100-240V (N)
Green/Yellow	PE

13-3. Connector for external equipment

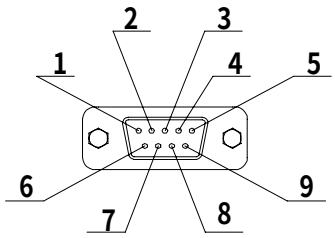
Prepare mating connectors for communication connector and alarm output connector by customer separately.

- **Alarm output connector**

  Hirose Electric co.,Ltd: CDE-9P Fixed screw M2.6

  Mating connector: CDE-9S equivalent

Pin no.	Content
1	Temp. upper/lower deviation limit alarm contact (opened for alarm)
2	Temp. upper/lower deviation limit alarm common
3-4	Unused
5	Output cutoff alarm contact (opened for alarm)
6	Output cutoff alarm common
7-9	Unused



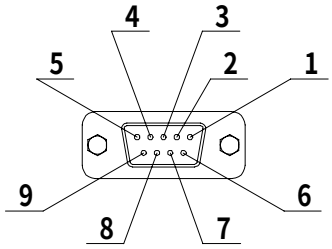
Alarm output connector
D-sub 9 pin (male)

- **Communication connector**

  Hirose Electric co.,Ltd: CDE-9S Fixed screw M2.6

  Mating connector: CDE-9P equivalent

Pin no.	Content	
	HEBC002-WA10	HEBC002-WB10
1	RS-485 T/R(A)	Unused
2	RS-485 T/R(B)	RS-232C RX
3	Unused	RS-232C TX
4	Unused	Unused
5	Unused	RS-232C SG
6-9	Unused	Unused



Communication connector
D-sub 9 pin (female)

14. Flow sheet

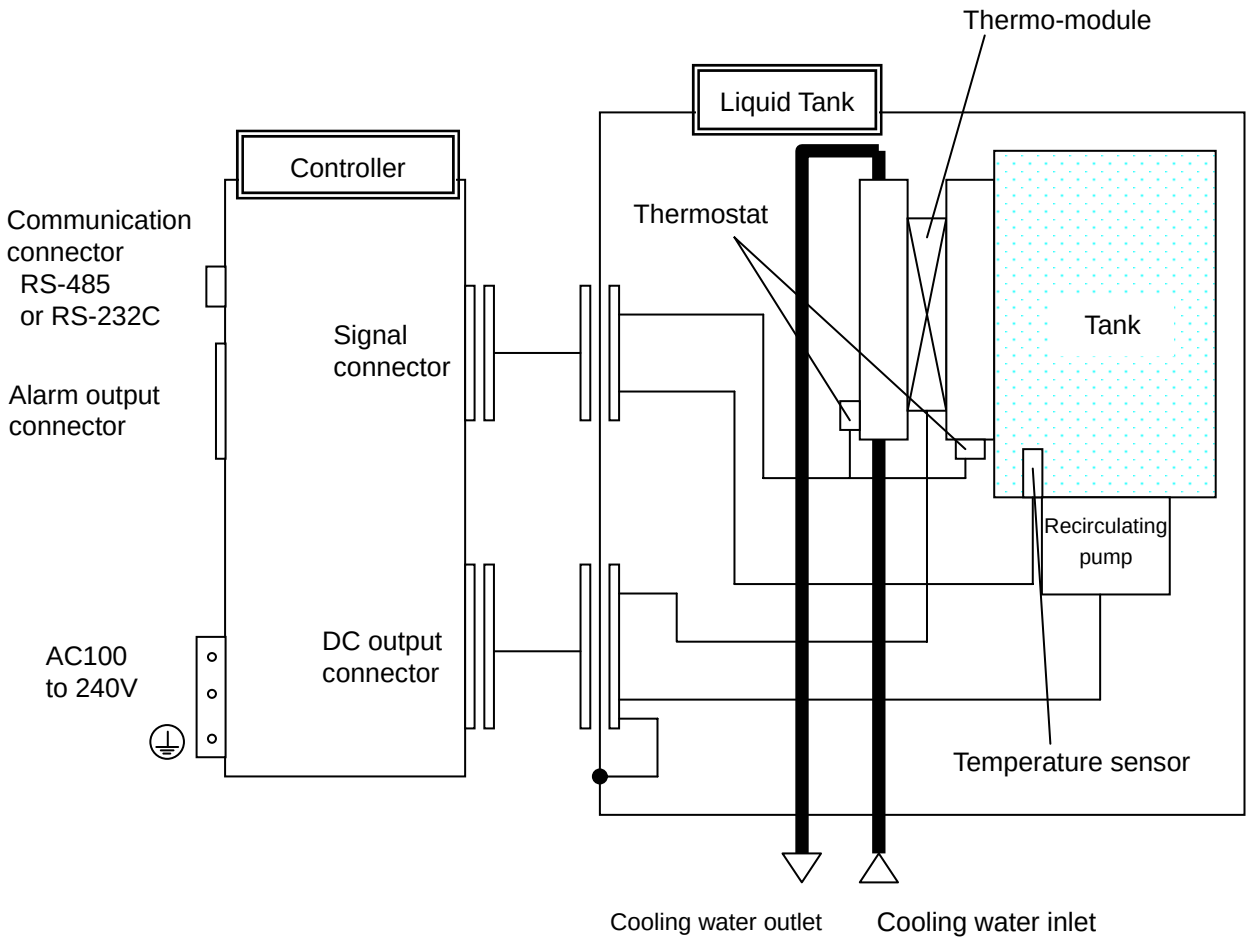


Fig. 7 Flow sheet