Peltier-Type Thermoelectric Bath

- Accurately controls the temperature of liquid in the bath.
- Temperature stability: ±0.01°C
- Temperature distribution: ±0.02°C in the bath
- Environmentally friendly and refrigerant-free
- Heaterless
- Function to detect abnormal heating and temperature sensor errors comes standard.
- Light and compact
- Greatly reduced vibration and operating noise when compared with the refrigerated type.

Applications
- Chemicals for MOCVD
- Diffusion gas
- Various samples, materials and parts
- Chemicals and liquids with high viscosity

Controller
Peltier element
Facility water outlet
Facility water inlet
Circulating pump

Series HEB

CAT.EUS40-50Aa-UK
**Series HEB**

**Features**

- Exclusively developed dual tank construction to provide consistent temperature at any position in the bath

![Diagram](image-url)

**Peltier element**
(Thermo-module, Thermoelectric device)

**Temperature sensor**
- Accurate display by measuring the circulating fluid with a temperature sensor directly

**Application Examples**

- **Semiconductor**
  - Evaporation of chemicals for MOCVD
  - Temperature control of diffusion gas

- **Various tests**
  - Thermal test with immersion

- **Physical and chemical analysis**
  - Temperature control of various samples, materials and parts

- **Various chemical processes**
  - Indirect temperature control of chemicals and liquids with high viscosity

**Principle of Peltier Device (Thermo-module, Thermoelectric device)**

A Peltier device (thermo-module, thermoelectric device) is a plate type element, inside which P-type semiconductors and N-type semiconductors are located alternately. If direct current is supplied to the Peltier device, heat is transferred inside the device, and one face generates heat and increases temperature while the other face sucked heat and decreases temperature. Therefore, changing the direction of the current supplied to the Peltier device can achieve heating and cooling operation. This method has a fast response and can shift quickly between heating and cooling, so temperature can be controlled very precisely.
Peltier-Type Thermoelectric Bath

Series HEB

How to Order

Combination (Controller + Liquid tank)

HEB C 002 – W A 10 –

- Shape of bath: C Round
- Cooling capacity: 002 140 W
- Radiating method: W Water-cooled
- Liquid tank size: 10 ø130 x H180
- Communication: A RS-485, B RS-232C

Option:
- N NPT1/4
- Rc1/4

- The option should be specified when ordering.

Liquid tank

HEB C 002 – H W 10 –

- Shape of bath: C Round
- Cooling capacity: 002 140 W
- Liquid tank
- Radiating method: W Water-cooled
- Liquid tank size: 10 ø130 x H180
- Option:
- N NPT1/4
- Rc1/4

- The option should be specified when ordering.

Controller

HEBC002 – C A

- Controller
- Communication: A RS-485, B RS-232C
## Specifications
(For details, please consult our “Product Specifications” information.)

<table>
<thead>
<tr>
<th>Specifications</th>
<th>HEBC002-WA10</th>
<th>HEBC002-WB10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
<td>HEBC002-WA10</td>
<td>HEBC002-WB10</td>
</tr>
<tr>
<td><strong>Cooling method</strong></td>
<td>Peltier device (Thermo-module, Thermoelectric device)</td>
<td></td>
</tr>
<tr>
<td><strong>Radiating method</strong></td>
<td>Liquid tank: Water-cooled, Controller: Forcible air-cooled</td>
<td></td>
</tr>
<tr>
<td><strong>Control method</strong></td>
<td>Cooling/Heating automatic shift PID control</td>
<td></td>
</tr>
<tr>
<td><strong>Ambient temperature/humidity</strong></td>
<td>10 to 35°C, 35 to 80% RH</td>
<td></td>
</tr>
<tr>
<td><strong>Circulating fluid system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Application fluid</strong></td>
<td>Clear water, Fluorinated liquid (Fluorinert™ FC-3283, GALDEN® HT135, HT200)</td>
<td></td>
</tr>
<tr>
<td><strong>Set temperature range</strong></td>
<td>Note 1) Note 2)</td>
<td>140 W (Water)</td>
</tr>
<tr>
<td><strong>Cooling capacity</strong></td>
<td>Note 2)</td>
<td>140 W (Water)</td>
</tr>
<tr>
<td><strong>Heating capacity</strong></td>
<td>Note 2)</td>
<td>300 W (Water)</td>
</tr>
<tr>
<td><strong>Temperature stability</strong></td>
<td>Note 3)</td>
<td>±0.01°C</td>
</tr>
<tr>
<td><strong>Temperature distribution</strong></td>
<td>Note 3)</td>
<td>±0.02°C</td>
</tr>
<tr>
<td><strong>Tank dimensions</strong></td>
<td>Internal diameter ø130 x Liquid level 188 mm</td>
<td></td>
</tr>
<tr>
<td><strong>Facility/water system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td>10 to 35°C (no condensation)</td>
<td></td>
</tr>
<tr>
<td><strong>Pressure range</strong></td>
<td>Within 0.5 MPa</td>
<td></td>
</tr>
<tr>
<td><strong>Flow rate</strong></td>
<td>Note 4)</td>
<td>3 to 5 L/min</td>
</tr>
<tr>
<td><strong>Port size</strong></td>
<td>IN/OUT: Rc1/4</td>
<td></td>
</tr>
<tr>
<td><strong>Wetted parts material</strong></td>
<td>Stainless steel 303, Stainless steel 304, FEP, A6063 (anodised)</td>
<td></td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>Single-phase 100 to 240 VAC, 50/60 Hz</td>
<td></td>
</tr>
<tr>
<td><strong>Overcurrent protector</strong></td>
<td>10 A</td>
<td></td>
</tr>
<tr>
<td><strong>Current consumption</strong></td>
<td>4 A (100 VAC) to 2 A (240 VAC)</td>
<td></td>
</tr>
<tr>
<td><strong>Alarm</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(With alarm output connector)</td>
<td>1) Overheating of liquid tank (which activates the thermostat)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2) Controller output voltage reduction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3) Controller fan rotation stopped</td>
<td></td>
</tr>
<tr>
<td><strong>Communications</strong></td>
<td>RS-485</td>
<td>RS-232C</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Liquid tank: Approx. 8.5 kg</td>
<td>Controller: Approx. 6.5 kg</td>
</tr>
<tr>
<td><strong>Accessories</strong></td>
<td>Power cable (2 m), DC cable, Signal cable (3 m each)</td>
<td></td>
</tr>
<tr>
<td><strong>Safety standards</strong></td>
<td>CE marking, UL (NRTL) standard</td>
<td></td>
</tr>
</tbody>
</table>

Note 1) GALDEN® is a trademark of Solvay Solexis and Fluorinert™ is a trademark of 3M. For other fluids, please contact SMC.

Note 2) Determined under the following conditions: water as the circulating fluid, set temperature 25°C, facility water temperature 25°C, flow rate 3 L/min, ambient temperature 25°C, and sealed from outside air with a lid.

Note 3) Differs depending on the operating conditions.

Note 4) An appropriate range is from 3 to 5 L/min. To prevent damage to the radiating system, do not supply a flow over the maximum flow rate of 8 L/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. Confirm that there is no problem by carrying out an operating test beforehand.
### Cooling Capacity

- Ambient temperature: 25°C
- Liquid level: 180 mm (Liquid temperature: 25°C)
- Facility water temperature: 25°C
- Facility water flow rate: 3 L/min
- Shut out from outside with a lid (polystyrene foam)

Time [minute] vs. Circulating fluid temperature [°C]

- **GALDEN® HT200**
- **Fluorinert™ FC-3283**
- **Water**

### Heating Capacity

- Ambient temperature: 25°C
- Liquid level: 180 mm (Liquid temperature: 25°C)
- Facility water temperature: 25°C
- Facility water flow rate: 3 L/min
- Shut out from outside with a lid (polystyrene foam)

Time [minute] vs. Circulating fluid temperature [°C]

- **GALDEN® HT200**
- **Fluorinert™ FC-3283**
- **Water**

### Pressure Loss in Facility Water Circuit

<table>
<thead>
<tr>
<th>Flow rate [L/min]</th>
<th>Pressure loss [kPa]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>7</td>
<td>70</td>
</tr>
<tr>
<td>8</td>
<td>80</td>
</tr>
</tbody>
</table>

The values shown on the performance chart are not guaranteed, but typical. Allow margins for safety when selecting the model.

### Parts Description

- **RUN LED**
- **TROUBLE LED**
- **Display/Operation panel**
- **Power switch**
- **Signal connector**
- **Alarm output connector**
- **DC connector**
- **Fan**
- **Communication connector**
- **Tank**
- **Facility water outlet**
- **Facility water inlet**
- **DC output connector**
**Dimensions**

**Liquid tank**

**Internal dimensions of liquid tank**

**Controller**
Connectors

Water Bath and Controller Connection

- **Connector for water baths**
  - **DC connector (male connector)**
    - Nanaboshi Electric Mfg. Co., Ltd.: NJC-245-RM UL CSA
  - **Signal connector (male connector)**
    - Hirose Electric Co., Ltd.: CDA-15P Holding screw M2.6

- **Connection cable**
  - **DC cable**
    - Nanaboshi Electric Mfg. Co., Ltd.: NJC-245-PF UL CSA
  - **Signal cable**
    - Hirose Electric Co., Ltd.: CDA-15S Holding screw M2.6

- **Power cable**
  - **Connector for controllers**
    - **Power connector**
      - IEC 60320 C-14 or equivalent
      - Male connector

- **Connector for External Equipment**
  - Connectors that fit with a communication connector and an alarm output connector should be prepared by the customer.

- **Alarm output connector**
  - Hirose Electric Co., Ltd.: CDE-9P
  - Holding screw M2.6
  - Fitting connector: CDE-9S or equivalent

- **Communication connector**
  - Hirose Electric Co., Ltd.: CDE-9S
  - Holding screw M2.6
  - Fitting connector: CDE-9S or equivalent

Maintenance

Maintenance of this unit is performed only in the form of return to and repair at SMC’s site. As a rule, SMC will not conduct on-site maintenance. Separately, the following parts have a limited life and need to be replaced before the life ends.

Parts Life Expectation

<table>
<thead>
<tr>
<th>Description</th>
<th>Expected life</th>
<th>Possible failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulating pump</td>
<td>3 to 5 years</td>
<td>The circulating fluid cannot be fed due to worn bearing and/or insufficient capacity of electrolytic capacitor, which results in temperature controlling failure.</td>
</tr>
<tr>
<td>Fan</td>
<td>5 to 10 years</td>
<td>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 output stops and the display goes off.</td>
</tr>
<tr>
<td>DC power supply</td>
<td>5 to 10 years</td>
<td>Abnormal voltage is generated and the display goes off due to insufficient capacity of electrolytic capacitor.</td>
</tr>
</tbody>
</table>
### System Design

**Warning**

1. The catalogue shows the specifications of the Thermoelectric Bath.
   1. Check detailed specifications in the separate “Product Specifications”, and evaluate the compatibility of the Thermoelectric Bath with customer’s system.
   2. The Thermoelectric Bath is equipped with a protective circuit independently, but the whole system should be designed by the customer to ensure safety.

### Handling

**Warning**

1. Thoroughly read the Operation Manual.
   Read the Operation Manual completely before operation, and keep this manual available whenever necessary.

### Operating Environment/Storage Environment

**Warning**

1. Avoid using the Thermoelectric Bath in an environment where it could be splashed by fluids (including mist) such as water, salt water, oil, chemicals, or solvents.
2. The Thermoelectric Bath is not designed for clean room usage.
   It generates dust from the pump inside the tank and the cooling fan in the controller.
3. Low molecular siloxane can damage the contact of the relay.
   Use the Thermoelectric Bath in a place free from low molecular siloxane.
4. Reserve a space of 50 mm or more at the ventilation hole of the controller.

### Radiation Air

**Caution**

1. The ventilation hole for radiation air must not be exposed to particles and dust as far as possible.
2. Do not let the inlet and outlet for radiation air get closed.
   If radiation is prevented, the internal power supply will overheat, causing the protective circuit to be activated and stopping the Thermoelectric Bath.
3. If more than one Thermoelectric Bath is used, consider their arrangement so that the downstream sides of the Thermoelectric Bath suck radiation air from the upstream sides.

### Circulating Fluid

**Caution**

1. Do not use fluids other than those described in the specification.
   Otherwise, the pump will be overloaded and may break. If such a fluid is used, please contact SMC beforehand.
2. The Thermoelectric Bath must not be operated without circulating fluid.
   The pump breaks by empty driving.
3. The circulating fluid may evaporate, lowering the level in the tank.
   Significant reduction of the fluid level can break the circulating pump as well as causing the performance to deteriorate. Use with appropriate liquid level at all times.

### Facility Water

**Caution**

1. The set value can be written to EEPROM, but only up to approx. 100,000 times.
   In particular, pay attention to how many of times the writing is performed using the communication function.
Maintenance

⚠️ Warning

1. Prevention of electric shock and fire
   Do not operate the switch with wet hands. Also, do not operate
   the Thermoelectric Bath with water or fluid left on it.

2. Action in the case of error
   If any error such as abnormal sounds, smoke, or bad smell
   occurs, cut off the power at once, and stop supplying facility
   water. Please contact SMC or a sales distributor to repair the
   Thermoelectric Bath.

3. Regular inspection
   Check the following items at least once a month. The inspec-
   tion must be done by an operator who has sufficient knowledge
   and experience.
   a) Check of displayed contents.
   b) Check of temperature, vibration and abnormal sounds in the
      body of the Thermoelectric Bath.
   c) Check of the voltage and current of the power supply system.
   d) Check for leakage and contamination of the circulating fluid
      and intrusion of foreign objects to it.
   e) Check radiation air flow condition and temperature.
   f) Check for leakage, quality change, flow rate and temperature
      of facility water.
Safety Instructions

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

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

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

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

### Warning

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

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

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

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

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

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

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

   1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

   2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalogue.

   3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

   4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

### Caution

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

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

**Safety Instructions**

Be sure to read “Handling Precautions for SMC Products” (M-E03-3) before using.

### Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

### Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\(^2\)

   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.

   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalogue for the particular products.

- **2) Vacuum pads are excluded from this 1 year warranty.**

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

### Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.

2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

### Safety Instructions

SMC Corporation (Europe)

**Caution**

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

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

**SMC CORPORATION**

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Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.