No heater required, circulating fluid is heated using heat exhausted by refrigerating circuit.

Heating-up time: 1/10

| HRS150-A-40 | Cooling valve control | Temperature stability ±1.0°C |
| HRS150-A-40 | Air-cooled condenser fan | Low-noise design 70 dB(A) |
| HRS150-A-40 | Heating valve control | Outdoor installation IPX4 |

| Cooling capacity | 10 kW/15 kW |
| Set temperature range | 5°C to 35°C |
| Max. ambient temperature | 45°C |

| Cooling valve control | Heating valve control |
| Air-cooled condenser fan |

| Option | Added Variations! |
| - With fluid fill port |

| Optional accessories |  |
| - Electric conductivity control set |  |
| - Relief valve set |  |
| - Snow protection hood (Air-cooled only) |

Compact, Space-saving

Series HRS100/150

Environmental friendly R410A as refrigerant

CAT.EUS40-62B-UK
### Refrigeration circuit

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

### Circulating fluid circuit

- The circulating fluid discharged from the pump, is heated or cooled by the user's equipment and returns to the thermo-chiller.
- The circulating fluid is controlled to a set temperature by the user's equipment circuit, to be discharged to the user's equipment side again by the thermo-chiller.

### Facility water circuit

- This circuit construction of the position of the parts may be different from actual product.
- For water-cooled refrigeration HRS-W:
  - The water regulating valve opens and closes to keep the refrigerant gas pressure consistent. The facility water flow rate is controlled by the water regulating valve.

### Point

- The combination of precise control of expansion valve A for cooling, and expansion valve B for heating realised high temperature stability.
- Since the refrigeration circuit is controlled by the signal from 2 temperature sensors for return and discharge the precise temperature control of the circulating fluid can be performed. Therefore, there is no necessity of absorbing the temperature difference in the circulating fluid with a large tank capacity, and realises high temperature stability even with a small-size tank. Also, contributes to space-saving.

### Variations

<table>
<thead>
<tr>
<th>Model</th>
<th>Cooling method</th>
<th>Cooling capacity [kW] (50/60 Hz)</th>
<th>Power supply</th>
<th>Option</th>
<th>Optional accessories (Pages 17 to 20)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS100</td>
<td>Air-cooled refrigeration</td>
<td>9.0/9.5</td>
<td></td>
<td></td>
<td>- Piping conversion fitting</td>
</tr>
<tr>
<td>HRS150</td>
<td>Air-cooled refrigeration</td>
<td>13.0/14.5</td>
<td></td>
<td></td>
<td>- Caster adjuster-foot kit</td>
</tr>
<tr>
<td>HRS100</td>
<td>Water-cooled refrigeration</td>
<td>10.0/11.0</td>
<td></td>
<td></td>
<td>- Electric conductivity control set</td>
</tr>
<tr>
<td>HRS150</td>
<td>Water-cooled refrigeration</td>
<td>14.5/16.5</td>
<td></td>
<td></td>
<td>- Bypass piping set</td>
</tr>
</tbody>
</table>

- With caster adjuster-foot
- With fluid fill port

- New variations
Circulating Fluid Temperature Controller
Thermo-chiller Standard Type Series HRS100/150

Circulating fluid can be heated without a heater.

Heating method using discharged heat makes a heater unnecessary.

- For HRS150-A-40
  - Circulating fluid temperature: 5~35°C
  - Ambient temperature: 32°C
  - Power supply: 380 to 410 V (50 / 60 Hz)
  - Circulating fluid flow rate: Rated flow
  - Circulating fluid: Water
  - External piping: Bypass piping

Heater is not necessary even when ambient temperature is low.

- This is just an example diagram.

Electric conductivity control set (Optional accessories) (With DI filter + Solenoid valve kit for control)

The electric conductivity of the circulating fluid can be set with the controller monitor arbitrarily.

Set control range: 5.0 to 45.0 μS/cm

The electric conductivity of the circulating fluid can be set with the controller monitor arbitrarily.

Set control range: 5.0 to 45.0 μS/cm

With caster adjuster-foot (Option)

Prevents increase in circulating fluid discharge pressure.
(Relief pressure: 0.32 MPa)

Improved maintenance performance

Circulating fluid fill port (Option)

Fluid fill port is equipped in the upper part of the tank in addition to the automatic fluid fill port for a tap water piping connection.

Front side access

All the electrical components can be checked from the front side for the easier maintenance work.

Alarm code list

Alarm code list stickers are included.
This can be put under the operation panel for reference.
(Alarm ➤ Page 14)

Operation display panel Easy maintenance with the check display

Alarm codes notify of checking times. 
Notifies when to check the pump and fan motor. Helpful for facility maintenance.

Ex. AL01 “Low level in tank”

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

Ex. DRV. “Accumulated operating time”

Displayed item

<table>
<thead>
<tr>
<th>Displayed item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>Circulating fluid outlet temperature</td>
</tr>
<tr>
<td>Temperature</td>
<td>Circulating fluid return temperature</td>
</tr>
<tr>
<td>Pressure</td>
<td>Compressor gas temperature</td>
</tr>
<tr>
<td>Pressure</td>
<td>Circulating fluid outlet pressure</td>
</tr>
<tr>
<td>Pressure</td>
<td>Compressor gas return pressure</td>
</tr>
<tr>
<td>Pressure</td>
<td>Accumulated operating time</td>
</tr>
<tr>
<td>Accumulated operating time</td>
<td>Accumulated operating time of pump</td>
</tr>
<tr>
<td>Accumulated operating time</td>
<td>Accumulated operating time of fan</td>
</tr>
<tr>
<td>Accumulated operating time</td>
<td>Accumulated operating time of compressor</td>
</tr>
<tr>
<td>Accumulated operating time</td>
<td>Accumulated operating time of output filter</td>
</tr>
</tbody>
</table>

*1 This is not measurement value. Use it for reference. *2 These are displayed only for air-cooled refrigeration.

Convenient functions Details ➤ Page 14

Timer function, Anti-freezing function, Power failure auto-restart function, Warming-up function, Key-lock function, etc.
Communication function

The serial communication (RS232C/RS485) and contact I/Os (2 inputs and 3 outputs) are equipped as standard. Communication with the user’s equipment and system construction are possible, depending on the application. A 24 V DC output can also be provided, and is available for a flow switch (SMC’s PF3W, etc.).

**Ex. 1 Remote signal I/O through serial communication**

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

- Circulating fluid temperature setting
- Start and stop
- Circulating fluid discharge temperature
- Run and stop status
- Alarm information
- Various setting information
- Preparation completion status

**Ex. 2 Remote operation signal input**

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

- Input 1
- Low flow switch
- Flow signal

**Ex. 3 Alarm and operation status (start, stop, etc.) signal output**

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

- Output 1
- Output 2
- Output 3

**IPX4**

IP (International Protection) is the industrial standard for “Degrees of protection provided by outer defensive enclosures of electric equipment (IP Code)” according to IEC 60529 and JIS C 0920.

IPX4: No harmful influence by water splash is acceptable from every direction.

**Can be installed outdoors.**

- Transformer unnecessary
- Applicable to 380 to 415 V AC
- Transformers are unnecessary even when used overseas.

**Power supply (24 V DC) available**

Power can be supplied from the terminal block of the thermo-chiller to external switches etc.

- Transformer unnecessary
- Applicable to 380 to 415 V AC
- Transformers are unnecessary even when used overseas.

Makes cooling water easily available, anytime, anywhere.

- There is no cooling tower. Tap water is being used.
  - Less tap water used!
  - Dripping stops
  - Cooling water at a consistent temperature can be supplied regardless of the season.
- There is a cooling tower, but high temperatures in summer or low (freezing) temperatures in winter make cooling water temperatures unstable.

Applications

- Laser beam machine/Laser welding machine
  - Cooling of the laser oscillation part and power source
- Printing machine
  - Temperature control of the roller
- Cleaning machine
  - Temperature control of cleaning solution
SMC has a comprehensive network in the global market.

We now have a presence of more than 400 branch offices and distributors in 78 countries world wide such as Asia, Oceania, North/Central/South America, and Europe. With this global network, we are able to provide a global supply of our substantial range of products with the best service. We also provide full support to local factories, foreign manufacturing companies and Japanese companies in each country.

### SMC Thermo-chiller Variations

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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HRSE Basic type</td>
<td>±2.0</td>
<td>10 to 30</td>
<td>1.2 1.8 2.4 3 5 6 9 10 15 20 25</td>
<td>Indoor use</td>
<td>Single-phase 230 V AC (50 / 60 Hz)</td>
</tr>
<tr>
<td>HRS Standard type</td>
<td>±0.1</td>
<td>5 to 40</td>
<td>1.2 1.8 2.4 3 5 6 9 10 15 20 25</td>
<td>Indoor use</td>
<td>Single-phase 100 to 115 V AC (50 / 60 Hz)* Single-phase 200 to 230 V AC (50 / 60 Hz)</td>
</tr>
<tr>
<td>HRS100/150 Standard type</td>
<td>±1.0</td>
<td>5 to 35</td>
<td>1.2 1.8 2.4 3 5 6 9 10 15 20 25</td>
<td>Outdoor installation IPX4</td>
<td>3-phase 380 to 415 V AC (50 / 60 Hz)</td>
</tr>
<tr>
<td>HRSH090 Inverter type</td>
<td>±0.1</td>
<td>5 to 40</td>
<td>1.2 1.8 2.4 3 5 6 9 10 15 20 25</td>
<td>Indoor use</td>
<td>3-phase 380 to 415 V AC (50 / 60 Hz)</td>
</tr>
<tr>
<td>HRSH Inverter type</td>
<td>±0.1</td>
<td>5 to 35</td>
<td>1.2 1.8 2.4 3 5 6 9 10 15 20 25</td>
<td>Outdoor installation IPX4</td>
<td>3-phase 200 V AC (50 / 60 Hz) 3-phase 200 to 230 V AC (50 / 60 Hz) 3-phase 380 to 415 V AC (50 / 60 Hz)</td>
</tr>
</tbody>
</table>

* Only available for lower cooling capacities.
Circulating Fluid/Facility Water Line Equipment

**Circulating Fluid Line**
- Power supply (24 V DC) available
- Terminal block
- Y-strainer
- Pressure Switch
- Bypass valve
- Flow Switch
- Valve
- Fittings and Tubing
- User’s equipment
- Circulating fluid outlet
- Circulating fluid return port
- Facility water outlet
- Facility water inlet

**Facility Water Line (Water-cooled)**
- Power supply (24 V DC) available
- Terminal block
- Facility water outlet
- Facility water inlet
- Pressure Switch
- Flow Switch

**Flow Switch**: Monitors the flow rate and temperature of the circulating fluid and facility water. Refer to the catalogues on [www.smc.eu](http://www.smc.eu).
- 3-Colour Display Digital Flow Switch for Water **PF3W**
- 3-Colour Display Electromagnetic Type Digital Flow Switch **LFE**
- Digital Flow Switch for Deionised Water and Chemical Liquids **PF2D**
- 4-Channel Flow Monitor **PF2/L50132 200**

**Pressure Switch**: Monitors pressure of the circulating fluid and facility water. Refer to the catalogues on [www.smc.eu](http://www.smc.eu).
- 2-Colour Display High-Precision Digital Pressure Switch **ISE80**
- Pressure Sensor for General Fluids **PSE56**
- Pressure Sensor Controller **PSE200,300**

**Fittings and Tubing**
- S Coupler **KK**
- S Coupler/Stainless Steel (Stainless Steel 304) **KKA**
- Metal One-touch Fittings **KQB2**
- Stainless Steel 316 One-touch Fittings **KQG2**
- Stainless Steel 316 Insert Fittings **KFG2**
- Fluoropolymer Fittings **LQ**

**Manage pressure and flow rate**: digital display makes these aspects “visible”
CONTENTS

Series HRS100/150 Standard Type

Thermo-chiller Series HRS100/150

- How to Order/Specifications Air-cooled 400 V: Page 7
- How to Order/Specifications Water-cooled 400 V: Page 8
- Cooling Capacity: Page 9
- Pump Capacity: Page 10
- Dimensions: Page 11
- Recommended External Piping Flow: Page 13
- Cable Specifications: Page 13
- Operation Display Panel: Page 14
- List of Function: Page 14
- Alarm: Page 14
- Communication Function: Page 15

Options

- With Caster Adjuster-Foot: Page 16
- With Fluid Fill Port: Page 16

Optional Accessories

1. Piping Conversion Fitting: Page 17
2. Caster Adjuster-foot Kit: Page 17
3. Electric Conductivity Control Set: Page 18
4. Bypass Piping Set: Page 18
5. Relief Valve Set: Page 19
6. Snow Protection Hood: Page 20

Cooling Capacity Calculation

- Required Cooling Capacity Calculation: Page 21
- Precautions on Cooling Capacity Calculation: Page 22
- Circulating Fluid Typical Physical Property Values: Page 22

Specific Product Precautions: Page 23
## Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>HRS100-A</th>
<th>HRS150-A</th>
<th>HRS100-A-40</th>
<th>HRS150-A-40</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Circuit fluid system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circulating fluid</td>
<td>Tap water, 15% ethylene glycol aqueous solution, Deionised water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set temperature range</td>
<td>5 to 35 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling capacity 50/60 Hz</td>
<td>kW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating capacity 50/60 Hz</td>
<td>kW</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature stability</td>
<td>°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pump capacity</td>
<td>Rated flow 50/60 Hz (Outlet)</td>
<td>l/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum flow rate 50/60 Hz</td>
<td>l/min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum pump head</td>
<td>m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum operating flow rate 50/60 Hz</td>
<td>l/min</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic fluid fill system (Standard)</td>
<td>Supply side pressure range</td>
<td>MPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply side fluid temperature</td>
<td>°C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic fluid fill port</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overflow port</td>
<td>Rc 1/2 (Symbol F: G 1/2, Symbol N: NPT 1/2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid contact material</td>
<td>Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze, PTFE, PU, EPDM, PVC, NBR, PE, NR, PBT, PP, POM, Carbon, Ceramic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>3-phase 380 to 415 V AC (50/60 Hz)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth leakage breaker (Standard/With handle)</td>
<td>Rated current A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity of leak current mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated operating current 50/60 Hz</td>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated power consumption 50/60 Hz</td>
<td>kW (kVA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise level (Front 1 m/Height 1 m)</td>
<td>dB (A)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waterproof specification</td>
<td>IPX4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (dry state)</td>
<td>kg</td>
<td></td>
<td></td>
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<tr>
<td>Compliant standards</td>
<td>CE marking</td>
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<tr>
<td>EMC Directive</td>
<td>Machinery Directive</td>
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<td>2004/108/EC</td>
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<tr>
<td>2006/42/EC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Note 1)
1. Use a 15% ethylene glycol aqueous solution if operating in a place where the ambient temperature and/or circulating fluid temperature is 10°C or less.
2. Use fluid in condition below as the circulating fluid.
   - Tap water: Standard of The Japan Refrigeration And Air Conditioning Industry Association (JRA GL-02-1994)
   - Deionised water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)

### Note 2)
1. 400 V type is provided with an earth leakage breaker (-B) as standard.
2. This is a manual fluid fill port that is different from the automatic fluid fill port. Fluid can be supplied manually into the tank without removing the side panel.
   - (Fluid can be supplied manually for models without option -K if the side panel is removed.)

### Note 3)
1. 15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.

### Note 4)

### Note 5)

### Note 6)

### Note 7)
1. Fluid flow rate to maintain the cooling capacity and to keep the circulating fluid discharge pressure to 0.5 MPa or less. If the actual flow rate is lower than this, install a bypass piping.
NOTE 2) Use fluid in condition below as the circulating fluid. Also, when there is a possibility of the facility water being frozen, make sure to discharge all the facility water from the facility water circuit.

NOTE 1) Use a 15% ethylene glycol aqueous solution if operating in a place where the ambient temperature and/or circulating fluid temperature is 10°C or less. Also, when there is a possibility of the facility water being frozen, make sure to discharge all the facility water from the facility water circuit.

NOTE 4) 

NOTE 3) 

NOTE 7) Fluid flow rate to maintain the cooling capacity and to keep the circulating fluid discharge pressure to 0.5 MPa or less. If the actual flow rate is lower than this, install a bypass piping.
### Cooling Capacity

*If the product is used at altitude of 1000 m or higher, refer to “Operating Environment/Storage Environment” (page 23) Item 13 "For altitude of 1000 m or higher".*

**Series HRS100/150 Standard Type**

#### HRS100-A□-40-□ (50 Hz)

![Graph](image)

#### HRS100-A□-40-□ (60 Hz)

![Graph](image)

#### HRS100-W□-40-□ (50 Hz)

![Graph](image)

#### HRS100-W□-40-□ (60 Hz)

![Graph](image)

#### HRS150-A□-40-□ (50 Hz)

![Graph](image)

#### HRS150-A□-40-□ (60 Hz)

![Graph](image)

#### HRS150-W□-40-□ (50 Hz)

![Graph](image)

#### HRS150-W□-40-□ (60 Hz)

![Graph](image)
Pump Capacity

**HRS100/150-A □-40-□**
**HRS100/150-W □-40-□**

![Diagram showing pump capacity with X and Y axes labeled. X-axis: Circulating fluid flow rate [l/min]. Y-axis: Pump head [m]. Usable range marked at 0.1, 0.2, 0.3, 0.4, 0.5 MPa for 50 Hz and 60 Hz. Circulating fluid return port and outlet highlighted.]
### Dimensions

**HRS100/150-A-40 (Air-cooled 400 V type)**

- **Overflow port Rc1**
- **Automatic fluid fill port Rc 1/2**
- **Circulating fluid outlet Rc 3/4**
- **Circulating fluid return port Rc 3/4**
- **Signal cable entry (Hole 40) (Grommet with membrane)**
- **Fluid level indicator**
- **Pump drain port Rc 1/4 (Valve stopper)**
- **Power cable entry (Hole 40) (Grommet with membrane)**
- **Eye bolt M12 (4 places)**
- **Dustproof filter**
- **Contact input/output communication connector**
- **Operation display panel**
- **Breaker handle (Note 1)**
- **Dustproof filter**
- **Serial communication (RS-485/RS-232C) connector**
- **D-sub female receptacle**
- **Power terminal**
- **Ventilation air outlet**
- **Handle**

**Note 1)** A breaker handle is equipped as standard for the 400 V type only.
**Note 2)** The HRS100 is not equipped with a lower dustproof filter.

---

**HRS100/150-W-40 (Water-cooled 400 V type)**

- **Overflow port Rc1**
- **Automatic fluid fill port Rc 1/2**
- **Circulating fluid outlet Rc 3/4**
- **Circulating fluid return port Rc 3/4**
- **Signal cable entry (Hole 40) (Grommet with membrane)**
- **Fluid level indicator**
- **Pump drain port Rc 1/4 (Valve stopper)**
- **Power cable entry (Hole 40) (Grommet with membrane)**
- **Eye bolt M12 (4 places)**
- **Dustproof filter**
- **Contact input/output communication connector**
- **Operation display panel**
- **Breaker handle (Note 1)**
- **Dustproof filter**
- **Serial communication (RS-485/RS-232C) connector**
- **D-sub female receptacle**
- **Power terminal**
- **Ventilation air outlet**
- **Ventilation air inlet**

**Note 1)** A breaker handle is equipped as standard for the 400 V type only.
Dimensions

HRS100/150-A-40 (Air-cooled 400 V type)
Anchor bolt fixing position A

HRS100/150-W-40 (Water-cooled 400 V type)
Anchor bolt fixing position B

Accessory: Y-strainer mounting view
* Mount it by yourself on the circulating fluid return port.

Circulating fluid return port Rc 3/4

144

Barrel nipple 20A

Y-strainer (40 mesh) 20A

(954) (Thermo-chiller dimension)

(687) (Thermo-chiller dimension)
Recommended External Piping Flow

External piping circuit is recommended as shown below.

- Ensure that the overflow port is connected to the wastewater collection pit in order to avoid damage to the tank of the thermo-chiller.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Valve</td>
<td>Rc 1/2</td>
</tr>
<tr>
<td>2</td>
<td>Valve</td>
<td>Rc 3/4</td>
</tr>
<tr>
<td>3</td>
<td>Y-strainer (#40) (Accessory)</td>
<td>Rc 3/4</td>
</tr>
<tr>
<td>4</td>
<td>Flow meter</td>
<td>Prepare a flow meter with an appropriate flow range.</td>
</tr>
<tr>
<td>5</td>
<td>Valve (Part of thermo-chiller)</td>
<td>Rc 1/4</td>
</tr>
<tr>
<td>6</td>
<td>Y-strainer (#40)</td>
<td>Rc 1/2</td>
</tr>
<tr>
<td>7</td>
<td>Pressure gauge</td>
<td>0 to 1 MPa</td>
</tr>
<tr>
<td>8</td>
<td>Y-strainer (#40) or filter</td>
<td>Rc 3/4</td>
</tr>
</tbody>
</table>

Cable Specifications

Power supply and signal cable should be prepared by user.

Power Cable Specifications

<table>
<thead>
<tr>
<th>Applicable model</th>
<th>Rated value for thermo-chiller</th>
<th>Power cable examples</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Power supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Applicable breaker current</td>
<td>Terminal block screw dia.</td>
</tr>
<tr>
<td></td>
<td>Terminal block screw dia.</td>
<td>Cable size</td>
</tr>
<tr>
<td></td>
<td>Terminal block screw dia.</td>
<td>Clipped terminal on the thermo-chiller side</td>
</tr>
<tr>
<td>HRS100-A-40-40</td>
<td>3-phase 380 to 415 V AC (50 / 60 Hz)</td>
<td>20 A</td>
</tr>
<tr>
<td>HRS100-W-40-40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRS150-A-40-40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HRS150-W-40-40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: An example of the cable specifications is when two kinds of vinyl insulated wires with a continuous allowable operating temperature of 70 °C at 600 V, are used at an ambient temperature of 30 °C. Select the proper size of cable according to an actual condition.

Signal Cable Specifications

<table>
<thead>
<tr>
<th>Terminal specifications</th>
<th>Cable specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal block screw diameter</td>
<td>Recommended crimped terminal</td>
</tr>
<tr>
<td>M3</td>
<td>Y-shape crimped terminal 1.25Y-3</td>
</tr>
<tr>
<td></td>
<td>0.75 mm² (AWG18) Shielded cable</td>
</tr>
</tbody>
</table>
**Operation Display Panel**

The basic operation of this unit is controlled through the operation display panel on the front of the product.

- **[ALARM] lamp**
  - Flashes with buzzer when alarm occurs.
- **[RUN] lamp**
  - Lights up when the product is started, and goes off when it is stopped. Flashes during stand-by for stop or anti-freezing function, or independent operation of the pump.
- **[REMOTE] lamp**
  - Enables remote operation (start and stop) by communication. Lights up during remote operation.
- **[SEL] key**
  - Changes the item in menu and enters the set value.
- **[PUMP] key**
  - Press this key to simultaneously display the menu and [RUN/STOP] keys. The pump starts running independently to make the product ready for start-up (release the air).
- **[RESET] key**
  - Press this key to simultaneously display the alarm buzzer is stopped and the [ALARM] lamp is reset.

**List of Function**

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Main display</td>
<td>Displays the current and set temperature of the circulating fluid, discharge pressure of the circulating fluid. Changes the circulating fluid set temperature.</td>
</tr>
<tr>
<td>2</td>
<td>Alarm display menu</td>
<td>Indicates alarm number when an alarm occurs.</td>
</tr>
<tr>
<td>3</td>
<td>Inspection monitor menu</td>
<td>Product temperature, pressure and accumulated operating time can be checked as daily inspection. Use these for daily inspection.</td>
</tr>
<tr>
<td>4</td>
<td>Key-lock</td>
<td>Keys can be locked so that set values cannot be changed by operator error.</td>
</tr>
<tr>
<td>5</td>
<td>Timer for operation start/stop</td>
<td>Timer is used to set the operation start/stop.</td>
</tr>
<tr>
<td>6</td>
<td>Signal for the completion of preparation</td>
<td>A signal is output when the circulating fluid temperature reaches the set temperature, when using contact input/output and serial communication.</td>
</tr>
<tr>
<td>7</td>
<td>Offset function</td>
<td>Use this function when there is a temperature offset between the discharge temperature of the thermo-chiller and user's equipment.</td>
</tr>
<tr>
<td>8</td>
<td>Reset after power failure</td>
<td>Start operation automatically after the power supply is turned on.</td>
</tr>
<tr>
<td>9</td>
<td>Key click sound setting</td>
<td>Operation panel key sound can be set on/off.</td>
</tr>
<tr>
<td>10</td>
<td>Changing temp. unit</td>
<td>Temperature unit can be changed. Centigrade (°C) ⇔ Fahrenheit (°F)</td>
</tr>
<tr>
<td>11</td>
<td>Changing pressure unit</td>
<td>Pressure unit can be changed. MPa ⇔ PSI</td>
</tr>
<tr>
<td>12</td>
<td>Data reset</td>
<td>Functions can be reset to the default settings (settings when shipped from the factory).</td>
</tr>
<tr>
<td>13</td>
<td>Accumulation time reset</td>
<td>Function when the pump, the fan or the compressor is replaced. Reset the accumulated time here.</td>
</tr>
<tr>
<td>14</td>
<td>Anti-freezing function</td>
<td>Circulating fluid is protected from freezing during winter or at night. Set beforehand if there is a risk of freezing.</td>
</tr>
<tr>
<td>15</td>
<td>Warming-up function</td>
<td>When circulating fluid temperature rising time at starting needs shortening during winter or at night, set beforehand.</td>
</tr>
<tr>
<td>16</td>
<td>Anti-snow coverage function</td>
<td>If there will be a possibility of the snow coverage due to the change of the installation environment (season, weather), set beforehand.</td>
</tr>
<tr>
<td>17</td>
<td>Alarm buzzer sound setting</td>
<td>Alarm sound can be set on/off.</td>
</tr>
<tr>
<td>18</td>
<td>Alarm customising</td>
<td>Operation during alarm condition and threshold values can be changed depending on the alarm type.</td>
</tr>
<tr>
<td>19</td>
<td>Communication</td>
<td>This function is used for contact input/output or serial communication.</td>
</tr>
</tbody>
</table>

**Alarm**

This unit has alarms as standard, and displays each of them by its alarm code on the PV screen with the [ALARM] lamp ([LOW LEVEL] lamp) lit up on the operation display panel. The alarm can be read out through communication.

- **Code**
  - AL01: Low level in tank
  - AL02: High circulating fluid discharge temp.
  - AL03: Circulating fluid discharge temp. rise
  - AL04: Circulating fluid discharge temp. drop
  - AL05: High circulating fluid return temp.
  - AL06: High circulating fluid discharge pressure
  - AL07: Abnormal pump operation
  - AL08: Circulating fluid discharge pressure rise
  - AL09: Circulating fluid discharge pressure drop
  - AL10: High compressor intake temp.
  - AL11: Low compressor intake temp.
  - AL12: Low super heat temp.
  - AL13: High compressor discharge pressure
  - AL14: Anti-freezing function (season, weather), set beforehand.
  - AL15: Refrigeration circuit pressure (high pressure side) drop
  - AL16: Refrigeration circuit pressure (low pressure side) rise
  - AL17: Refrigeration circuit pressure (low pressure side) rise
  - AL18: Compressor running failure
  - AL19: Communication error
  - AL20: Memory error
  - AL21: Dc line fuse cut
  - AL22: Circulating fluid discharge temp. sensor failure
  - AL23: Circulating fluid return temp. sensor failure
  - AL24: Compressor intake temp. sensor failure
  - AL25: Circulating fluid discharge pressure sensor failure
  - AL26: Compressor discharge pressure sensor failure
  - AL27: Compressor intake pressure sensor failure
  - AL28: Pump maintenance
  - AL29: Fan maintenance
  - AL30: Compressor maintenance
  - AL31: Contact input 1 signal detection
  - AL32: Contact input 2 signal detection
  - AL33: Compressor discharge temp. sensor failure
  - AL34: Compressor discharge temp. rise
  - AL35: Dustproof filter maintenance
  - AL36: Power stoppage
  - AL37: Compressor waiting
  - AL40: Fan failure
  - AL41: Pump over current
  - AL42: Compressor over current
  - AL43: Pump over current
  - AL44: Air exhaust fan stoppage
  - AL45: Incorrect phase error
  - AL46: Phase board over current

**Note**

1) Does not occur on the product of air-cooled refrigeration type.
2) Does not occur on the product of air-cooled refrigeration type.
3) For details, refer to the Operation Manual.

For details, refer to the Operation Manual. Please download it via our website, http://www.smc.eu
# Communication Function

## Contact Input/Output

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector type</td>
<td>M3 terminal block</td>
</tr>
<tr>
<td>Insulation method</td>
<td>Photocoupler</td>
</tr>
<tr>
<td>Rated input voltage</td>
<td>24 V DC</td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>21.6 to 26.4 V DC</td>
</tr>
<tr>
<td>Rated input current</td>
<td>5 mA TYP</td>
</tr>
<tr>
<td>Input impedance</td>
<td>4.7 kΩ</td>
</tr>
<tr>
<td>Rated load voltage</td>
<td>48 V AC or less/30 V DC or less</td>
</tr>
<tr>
<td>Maximum load current</td>
<td>500 mA AC/DC (resistance load)</td>
</tr>
<tr>
<td>Minimum load current</td>
<td>5 V DC 10 mA</td>
</tr>
<tr>
<td>Output voltage</td>
<td>24 V DC ±10 % 500 mA MAX (No inductive load)</td>
</tr>
</tbody>
</table>

### Circuit diagram

<table>
<thead>
<tr>
<th>Signal Description</th>
<th>Default Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact input signal 2</td>
<td>—</td>
</tr>
<tr>
<td>Contact input signal 1</td>
<td>Run/stop signal input</td>
</tr>
<tr>
<td>Contact output signal 3</td>
<td>Alarm status signal output</td>
</tr>
<tr>
<td>Contact output signal 2</td>
<td>Remote status signal output</td>
</tr>
<tr>
<td>Contact output signal 1</td>
<td>Operation status signal output</td>
</tr>
</tbody>
</table>

* The pin numbers and output signals can be set by user. For details, refer to the Operation Manual for communication.

### Serial Communication

The serial communication (RS-485/RS-232C) enables the following items to be written and read out. For details, refer to the Operation Manual for communication.

#### Writing
- Run/Stop
- Circulating fluid temperature setting (SV)

#### Readout
- Circulating fluid present temperature
- Circulating fluid discharge pressure
- Status information
- Alarm occurrence information

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector type</td>
<td>D-sub 9-pin, Female connector</td>
</tr>
<tr>
<td>Protocol</td>
<td>Modicon Modbus compliant/Simple communication protocol</td>
</tr>
<tr>
<td>Standards</td>
<td>EIA standard RS-485</td>
</tr>
<tr>
<td>Circuit diagram</td>
<td>To the thermo-chiller User’s equipment side</td>
</tr>
</tbody>
</table>

* The terminal resistance of RS-485 (120 Ω) can be switched by the operation display panel. For details, refer to the Operation Manual for communication. Do not connect other than in the way shown above, as it can result in failure.

Please download the Operation Manual via our website, http://www.smc.eu
Series *HRS100/150*

**Options**

*Note*) Options have to be selected when ordering the thermo-chiller. It is not possible to add them after purchasing the unit.

### Option symbol

**A**

*With Caster Adjuster-Foot*

**HRS-——-——- A**

Unfixed casters and adjuster feet stops are mounted.

<table>
<thead>
<tr>
<th>Applicable model</th>
<th>Dimension [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>HRS100/150-A-40-A</td>
<td>830</td>
</tr>
<tr>
<td>HRS100/150-W-40-A</td>
<td>570</td>
</tr>
</tbody>
</table>

### Option symbol

**K**

*With Fluid Fill Port*

**HRS-——-——- K**

When the automatic fluid fill port is not used, fluid can be supplied manually without removing the panel.

*Fluid fill port*

*Cap*

+ Dimensions are common to all models.
Series HRS100/150
Optional Accessories

1 Piping Conversion Fitting

This is a fitting to change the port from Rc to G or NPT.
- Circulating fluid outlet, Circulating fluid return port Rc 3/4 → NPT 3/4 or G 3/4
- Overflow port Rc 1 → NPT 1 or G 1
- Automatic fluid fill port Rc 1/2 → NPT 1/2 or G 1/2
(It is not necessary to purchase this when pipe thread type F or N is selected in "How to Order" since it is included in the product.)

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Contents</th>
<th>Applicable model</th>
<th>Dimension [mm]</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-EP028</td>
<td>G thread conversion fitting set</td>
<td>HRS100/150-W-L52408</td>
<td>A: 570, B: 401</td>
<td></td>
</tr>
<tr>
<td>HRS-EP029</td>
<td>NPT thread conversion fitting set</td>
<td>HRS100/150-W-L52408</td>
<td>A: 570, B: 401</td>
<td></td>
</tr>
<tr>
<td>HRS-EP030</td>
<td>G thread conversion fitting set</td>
<td></td>
<td>A: 570, B: 401</td>
<td></td>
</tr>
</tbody>
</table>

2 Caster Adjuster-foot Kit

This is a set of unfixed casters and adjuster feet stop.
When installed by user, it is necessary to lift the thermo-chiller by a forklift or sling work.
Carefully read the procedure manual included with this kit before performing the installation.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
<th>Dimension [mm]</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-KS002</td>
<td>HRS100/150-W-L52408</td>
<td>A: 570, B: 401</td>
<td>Caster adjuster-foot bracket (2 pcs.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fixing bolt (M8) (8 pcs.)</td>
</tr>
</tbody>
</table>

Fig. 1 Mounting view
Fig. 2 Caster adjuster-foot bracket (2 pcs.)
Fig. 3 Fixing bolt (8 pcs.)
3 Electric Conductivity Control Set

The set indicates and controls the electric conductivity of the circulating fluid. Refer to the Operation Manual for details.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
<th>Measurement range of electric conductivity</th>
<th>Set range of electric conductivity target</th>
<th>Set range of electric conductivity hysteresis</th>
<th>Operating temperature range (Circulating fluid temperature)</th>
<th>Power consumption</th>
<th>Installation environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-DI010</td>
<td>HRS100-□□□□□</td>
<td>2.0 to 48.0 μS/cm</td>
<td>5.0 to 45.0 μS/cm</td>
<td>2.0 to 10.0 μS/cm</td>
<td>5 to 60 °C</td>
<td>400 mA or less</td>
<td>Indoors</td>
</tr>
</tbody>
</table>

4 Bypass Piping Set

Ensure that the circulating fluid flow rate will be more than the minimum required flow rate using a bypass piping set so that the circulating fluid discharge pressure would be 0.5 MPa or less. Otherwise, an alarm due to circulating fluid discharge pressure or pump over current may occur.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
<th>Minimum operating flow rate [l/min] (50 / 60 Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-BP007</td>
<td>HRS100-□□□□□</td>
<td>28/42</td>
</tr>
</tbody>
</table>

Parts List

No. Description
1. Hose (I.D.: 15 mm, Length: 700 mm)
2. Outlet piping assembly (With globe valve)
3. Return piping assembly
4. Barrel nipple (Size: 3/4 inch) (2 pcs.)
5. Union (Size: 3/4 inch) (2 pcs.)
6. Sealant tape
7. Operation Manual
5 Relief Valve Set

If a solenoid valve is installed in the user’s system and the circulating fluid supply stops or decreases during thermo-chiller operation, the circulating fluid discharge pressure of the thermo-chiller increases and an alarm may occur. The relief valve set opens the valve when the pressure exceeds the set pressure level, which prevents pressure increase.

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Applicable model</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS-BP008</td>
<td>HRS100-□□□□□□□□</td>
</tr>
<tr>
<td></td>
<td>HRS150-□□□□□□□□</td>
</tr>
</tbody>
</table>

- Relief valve set pressure: 0.32 MPa (The relief valve starts to open when the circulating fluid discharge pressure reaches 0.32 MPa.)
- The setting is made so that the circulating fluid discharge pressure of the thermo-chiller does not exceed 0.5 MPa even when the thermo-chiller is operated at 60 Hz and the water is no longer supplied to the user’s system.
- The set pressure of the relief valve should not be adjusted (or changed) by the user. If the set pressure needs to be adjusted, it should be conducted by authorised engineers.

### Parts List

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hose (I.D.: 15 mm, Length: 700 mm)</td>
</tr>
<tr>
<td>2</td>
<td>Outlet piping assembly (With globe valve)</td>
</tr>
<tr>
<td>3</td>
<td>Return piping assembly</td>
</tr>
<tr>
<td>4</td>
<td>Barrel nipple (Size: 3/4 inch) (4 pcs.)</td>
</tr>
<tr>
<td>5</td>
<td>Union (Size: 3/4 inch) (4 pcs.)</td>
</tr>
<tr>
<td>6</td>
<td>Sealant tape</td>
</tr>
<tr>
<td>7</td>
<td>Operation Manual</td>
</tr>
</tbody>
</table>
**6 Snow Protection Hood**

Snow protection hood for air-cooled chiller. According to the mounting direction of the snow protection hood, the ventilation from the fan can be selected from four directions, front, rear, left and right.

*This hood does not completely prevent snow from entering the inside of the chiller.*

---

### Parts List

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Q'ty</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Snow protection hood base</td>
<td>1</td>
</tr>
<tr>
<td>②</td>
<td>Snow protection hood A</td>
<td>1</td>
</tr>
<tr>
<td>③</td>
<td>Snow protection hood B</td>
<td>2</td>
</tr>
<tr>
<td>④</td>
<td>Assembly/Mounting screw</td>
<td>18</td>
</tr>
</tbody>
</table>

---

**Part no.** HRS-BK005

- **Applicable model**
  - HRS100-A
  - HRS150-A

---

**Mounting condition for HRS-BK005**
Required Cooling Capacity Calculation

**Example 1: When the heat generation amount in the user's equipment is known.**

The heat generation amount can be determined based on the power consumption or output of the heat generating area — i.e. the area requiring cooling — within the user's equipment.

1. **Derive the heat generation amount from the power consumption.**
   - Power consumption $P$: 7 [kW]
   - $Q = P = 7$ [kW]
   - Cooling capacity = Considering a safety factor of 20 %, $7$ [kW] $\times 1.2 = 8.4$ [kW]

2. **Derive the heat generation amount from the power supply output.**
   - Power supply output $V$: 8.8 [kVA]
   - $Q = P = V \times I \times \text{Power factor}$
     - In this example, using a power factor of 0.85:
     - $8.8$ [kVA] $\times 0.85 = 7.5$ [kW]
   - Cooling capacity = Considering a safety factor of 20 %, $7.5$ [kW] $\times 1.2 = 9.0$ [kW]

3. **Derive the heat generation amount from the output.**
   - Output (shaft power etc.) $W$: 5.1 [kW]
   - $Q = P = \frac{W}{\text{Efficiency}}$
     - In this example, using an efficiency of 0.7:
     - $\frac{5.1}{0.7} = 7.3$ [kW]
   - Cooling capacity = Considering a safety factor of 20 %, $7.3$ [kW] $\times 1.2 = 8.8$ [kW]

* The above examples calculate the heat generation amount based on the power consumption. The actual heat generation amount may differ due to the structure of the user's equipment. Be sure to check it carefully.

**Example 2: When the heat generation amount in the user's equipment is not known.**

Obtain the temperature difference between inlet and outlet by circulating the circulating fluid inside the user's equipment.

- **Heat generation amount by user's equipment** $Q$: Unknown [W] (J/s)
- **Circulating fluid** : Tap water*
- **Circulating fluid mass flow rate** $q_m$: ($= \rho \times q_v + 60$) [kg/s]
- **Circulating fluid density** $\rho$: 1 [kg/l]
- **Circulating fluid flow rate** $q_v$: 35 [l/min]
- **Circulating fluid specific heat** $C$: $4.186 \times 10^3$ [J/(kg·K)]
- **Circulating fluid outlet temperature** $T_1$: 293 [K] (20 [°C])
- **Circulating fluid return temperature** $T_2$: 296 [K] (23 [°C])
- **Circulating fluid temperature difference** $T$: 3 [K] ($= T_2 - T_1$)

Conversion factor: minutes to seconds (SI units) : 60 [s/min]

Conversion factor: kcal/h to kW : 860 [(cal/h)/W]

$Q = \frac{q_m \times C \times (T_2 - T_1)}{60 \times 860}$

$Q = \frac{1 \times 35 \times 60 \times 1.0 \times 10^3 \times 3.0}{60 \times 860}$

$Q = 7325$ [W] = 7.3 [kW]

Cooling capacity = Considering a safety factor of 20 %, $7.3$ [kW] $\times 1.2 = 8.8$ [kW]

* Refer to page 22 for the typical physical property value of tap water or other circulating fluids.
Required Cooling Capacity Calculation

Example 3: When there is no heat generation, and when cooling the object below a certain temperature and period of time.

Heat quantity by cooled substance (per unit time) \( Q \) : Unknown [W] ([J/s])
Cooled substance : Water
Cooled substance mass \( m \) : \((= \rho \times V) \) [kg]
Cooled substance density \( \rho \) : 1 [kg/l]
Cooled substance total volume \( V \) : 150 [L]
Cooled substance specific heat \( C \) : \(4.186 \times 10^3 \) [J/(kg·K)]
Cooled substance temperature when cooling begins \( T_0 \) : 303 [K] (30 [°C])
Cooled substance temperature after \( t \) hour \( T_t \) : 293 [K] (20 [°C])
Cooling temperature difference \( \Delta T \) : 10 [K] (\(= T_0 - T_t \))
Cooling time \( \Delta t \) : 900 [s] (= 15 [min])

* Refer to the following for the typical physical property values by circulating fluid.

\[
Q = \frac{m \times C \times (T_0 - T_t)}{\Delta t} = \frac{1 \times 150 \times 4.186 \times 10^3 \times 10}{900} = 6977 \text{ [J/s]} = 7.0 \text{ [kW]}
\]

Cooling capacity = Considering a safety factor of 20 %, 7.0 [kW] \times 1.2 = 8.4 [kW]

---

Precautions on Cooling Capacity Calculation

1. Heating capacity
   When the circulating fluid temperature is set above room temperature, it needs to be heated by the thermo-chiller. The heating capacity depends on the circulating fluid temperature. Consider the radiation rate and heat capacity of the user's equipment and check beforehand if the required heating capacity is provided.

2. Pump capacity
   <Circulating fluid flow rate>
   Circulating fluid flow rate varies depending on the circulating fluid discharge pressure. Consider the installation height difference between the thermo-chiller and the user's equipment, and the piping resistance such as circulating fluid pipings, or piping size, or piping curves in the machine. Check beforehand if the required flow is achieved, using the pump capacity curves.

   <Circulating fluid discharge pressure>
   Circulating fluid discharge pressure has the possibility to increase up to the maximum pressure in the pump capacity curves. Check beforehand if the circulating fluid pipings or circulating fluid circuit of the user's equipment are fully durable against this pressure.

Circulating Fluid Typical Physical Property Values

1. This catalogue uses the following values for density and specific heat in calculating the required cooling capacity.
   Density \( \rho \) : 1 [kg/l] (or, using conventional unit system, weight volume ratio \( \gamma = 1 \) [kgf/l])
   Specific heat \( C \) : \(4.19 \times 10^3 \) [J/(kg·K)] (or, using conventional unit system, \(1 \times 10^3 \text{ [cal/(kgf·°C)]}\))

2. Values for density and specific heat change slightly according to temperature shown below. Use this as a reference.

### Water

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Density ( \rho ) [kg/l]</th>
<th>Specific heat ( C ) [J/(kg·K)]</th>
<th>Conventional unit system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5°C</td>
<td>1.00</td>
<td>(4.2 \times 10^3)</td>
<td>1.00</td>
</tr>
<tr>
<td>10°C</td>
<td>1.00</td>
<td>(4.19 \times 10^3)</td>
<td>1.00</td>
</tr>
<tr>
<td>15°C</td>
<td>1.00</td>
<td>(4.18 \times 10^3)</td>
<td>1.00</td>
</tr>
<tr>
<td>20°C</td>
<td>1.00</td>
<td>(4.18 \times 10^3)</td>
<td>1.00</td>
</tr>
<tr>
<td>25°C</td>
<td>1.00</td>
<td>(4.18 \times 10^3)</td>
<td>1.00</td>
</tr>
<tr>
<td>30°C</td>
<td>1.00</td>
<td>(4.18 \times 10^3)</td>
<td>1.00</td>
</tr>
<tr>
<td>35°C</td>
<td>0.99</td>
<td>(4.18 \times 10^3)</td>
<td>0.99</td>
</tr>
<tr>
<td>40°C</td>
<td>0.99</td>
<td>(4.18 \times 10^3)</td>
<td>0.99</td>
</tr>
</tbody>
</table>

### 15 % Ethylene Glycol Aqueous Solution

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Density ( \rho ) [kg/l]</th>
<th>Specific heat ( C ) [J/(kg·K)]</th>
<th>Conventional unit system</th>
</tr>
</thead>
<tbody>
<tr>
<td>5°C</td>
<td>1.02</td>
<td>(3.91 \times 10^3)</td>
<td>1.02</td>
</tr>
<tr>
<td>10°C</td>
<td>1.02</td>
<td>(3.91 \times 10^3)</td>
<td>1.02</td>
</tr>
<tr>
<td>15°C</td>
<td>1.02</td>
<td>(3.91 \times 10^3)</td>
<td>1.02</td>
</tr>
<tr>
<td>20°C</td>
<td>1.01</td>
<td>(3.91 \times 10^3)</td>
<td>1.01</td>
</tr>
<tr>
<td>25°C</td>
<td>1.01</td>
<td>(3.91 \times 10^3)</td>
<td>1.01</td>
</tr>
<tr>
<td>30°C</td>
<td>1.01</td>
<td>(3.91 \times 10^3)</td>
<td>1.01</td>
</tr>
<tr>
<td>35°C</td>
<td>1.01</td>
<td>(3.91 \times 10^3)</td>
<td>1.01</td>
</tr>
<tr>
<td>40°C</td>
<td>1.01</td>
<td>(3.92 \times 10^3)</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Note) The above shown are reference values. Contact circulating fluid supplier for details.
### Design

⚠️ Warning

1. This catalogue shows the specifications of a single unit.
   1) Check the specifications of the single unit (contents of this catalogue) and thoroughly consider the adaptability between the user's system and this unit.
   2) Although the protection circuit as a single unit is installed, prepare a drain pan, water leakage sensor, discharge air facility, and emergency stop equipment, depending on the user's operating condition. Also, the user is requested to carry out the safety design for the whole system.

2. When attempting to cool areas that are open to the atmosphere (tanks, pipes), plan your piping system accordingly.

   When cooling open-air external tanks, arrange the piping so that there are coil pipes for cooling inside the tanks, and to carry back the entire flow volume of circulating fluid that is released.

3. Use non-corrosive material for fluid contact of circulating fluid and facility water.

   Using corrosive materials such as aluminium or iron for fluid contact parts such as piping may cause clogging or leakage in the circulating fluid and facility water circuits. Provide protection against corrosion when you use the product.

4. The facility water outlet temperature (water-cooled type) may increase up to around 60 °C.

   When selecting the facility water pippings, consider the suitability for temperature.

### Selection

⚠️ Warning

Model selection

For selecting a model of thermo-chiller, it is required to know the heat generation amount of the user's equipment. Obtain the heat generation amount, referring to "Cooling Capacity Calculation" on pages 21 and 22 before selecting a model.

### Handling

⚠️ Warning

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. Do not use in the following environment as it will lead to a breakdown.

   1) In locations where water vapour, salt water, and oil may splash on the product.
   2) In locations where there are dust and particles.
   3) In locations where corrosive gases, organic solvents, chemical fluids, or flammable gases are present. (This product is not explosion proof.)
   4) In locations where the ambient temperature exceeds the limits as mentioned below.
   
   During transportation/storage: –15 °C to 50 °C (But as long as water or circulating fluid are not left inside the pipings)
   
   During operation: –5 °C to 45 °C (However, use a 15 % ethylene glycol aqueous solution if operating in a place where the ambient temperature or circulating fluid temperature is 10 °C or less.)

   5) In locations where condensation may occur.
   6) In locations which receive direct sunlight or radiated heat.
   7) In locations where there is a heat source nearby and the ventilation is poor.
   8) In locations where temperature substantially changes.
   9) In locations where strong magnetic noise occurs.
   (In locations where strong electric fields, strong magnetic fields and surge voltage occur.)
   10) In locations where static electricity occurs, or conditions which make the product discharge static electricity.
   11) In locations where high frequency occurs.
   12) In locations where damage is likely to occur due to lightning.
   13) In locations at altitude of 3000 m or higher (Except during storage and transportation)
   * For altitude of 1000 m or higher
   
   Because of lower air density, the heat radiation efficiencies of the devices in the product will be lower in the location at altitude of 1000 m or higher. Therefore, the maximum ambient temperature to use and the cooling capacity will lower according to the descriptions in the table below.

   Select the thermo-chiller considering the descriptions.

   ① Upper limit of ambient temperature: Use the product in ambient temperature of the described value or lower at each altitude.

   ② Cooling capacity coefficient: The product's cooling capacity will lower to one that multiplied by the described value at each altitude.

<table>
<thead>
<tr>
<th>Altitude [m]</th>
<th>Upper limit of ambient temperature [°C]</th>
<th>Cooling capacity coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1000 m</td>
<td>45</td>
<td>1.00</td>
</tr>
<tr>
<td>Less than 1500 m</td>
<td>42</td>
<td>0.85</td>
</tr>
<tr>
<td>Less than 2000 m</td>
<td>38</td>
<td>0.80</td>
</tr>
<tr>
<td>Less than 2500 m</td>
<td>35</td>
<td>0.75</td>
</tr>
<tr>
<td>Less than 3000 m</td>
<td>32</td>
<td>0.70</td>
</tr>
</tbody>
</table>

14) In locations where strong impacts or vibrations occur.
15) In locations where a massive force strong enough to deform the product is applied or a weight from a heavy object is applied.
16) In locations where there is not sufficient space for maintenance.
17) In locations where liquid that exceeds the conditions required for the degrees of protection IPX4 may splash on the product.
18) Insects or plants may enter the unit.

2. The product is not designed for clean room usage. It generates particles internally.
1. This product will require an acceptance with the product not unloaded from the truck, and the user will need to unload the product by himself. Prepare a forklift.

The product will be delivered in the packaging shown below.

2. Transportation by forklift
   1) A licensed driver should drive the forklift.
   2) The proper place to insert the tines of the forklift differs depending on the model of cooler. Check the insert position, and be sure to drive the fork in far enough for it to come out the other side.
   3) Be careful not to bump the fork to the cover panel or piping ports.

### When Packaged

<table>
<thead>
<tr>
<th>Model</th>
<th>Weight (kg)</th>
<th>Dimensions [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS100-A</td>
<td>212</td>
<td>Height 1585 x Width 1185 x Depth 955</td>
</tr>
<tr>
<td>HRS150-A</td>
<td>218</td>
<td>Height 1485 x Width 925 x Depth 955</td>
</tr>
<tr>
<td>HRS100-W</td>
<td>186</td>
<td>Height 1710 x Width 1185 x Depth 955</td>
</tr>
<tr>
<td>HRS150-W</td>
<td>189</td>
<td>Height 1610 x Width 925 x Depth 955</td>
</tr>
<tr>
<td>HRS100-A-A</td>
<td>231</td>
<td>Height 1585 x Width 1185 x Depth 955</td>
</tr>
<tr>
<td>HRS150-A-A</td>
<td>237</td>
<td>Height 1485 x Width 925 x Depth 955</td>
</tr>
<tr>
<td>HRS100-W-A</td>
<td>205</td>
<td>Height 1710 x Width 1185 x Depth 955</td>
</tr>
<tr>
<td>HRS150-W-A</td>
<td>208</td>
<td>Height 1610 x Width 925 x Depth 955</td>
</tr>
</tbody>
</table>

3. Hanging transportation
   1) Crane manipulation and slinging work should be done by an eligible person.
   2) Do not grip the piping on the right side or the handles of the panel.
   3) When hanging by the eye bolts, be sure to use a 4-point hanging method. For the hanging angle, use caution regarding the position of the centre of gravity and hold it within 60°.

### When using option A

4. Transporting using casters
   1) This product is heavy and should be moved by at least two persons.
   2) Do not grip the piping port on the right side or the handles of the panel.
   3) When transporting using a forklift, be sure not to let it hit the casters or adjusters, and drive the fork all the way through until it comes out the other side.
   4) Do not get across steps with casters.

### Mounting/Installation

**Warning**
Do not place heavy objects on top of this product, or step on it.
The external panel can be deformed and danger can result.

**Caution**
1. Install on a rigid floor which can withstand this product’s weight.
2. Secure with bolts, anchor bolts, etc.
Series HRS100/150
Specific Product Precautions 3

Be sure to read this before handling. Refer to the back cover for Safety Instructions. For Temperature Control Equipment Precautions, refer to “Handling Precautions for SMC Products” and the Operation Manual on SMC website, http://www.smc.eu

Mounting/Installation

Caution
3. Refer to the Operation Manual for this product, and secure an installation space that is necessary for the maintenance and ventilation.

Air-cooled refrigeration
1. The air-cooled type product exhausts heat using the fan that is mounted to the product. If the product is operated with insufficient ventilation, ambient temperature may exceed 45°C, and this will affect the performance and life of the product. To prevent this ensure that suitable ventilation is available (see below).
2. For installation indoors, ventilation ports and a ventilation fan should be equipped as needed.

Required installation space for ventilation and maintenance

Caution
1. Regarding the circulating fluid and facility water pipings, consider carefully the suitability for temperature, circulating fluid and facility water.
If the operating performance is not sufficient, the pipings may burst during operation. Using corrosive materials such as aluminium or iron for fluid contact parts such as piping may cause clogging or leakage in the circulating fluid and facility water circuits. Provide protection against corrosion when you use the product.
2. Select the piping port size which can exceed the rated flow.
For the rated flow, refer to the pump capacity table.
3. When tightening at the drain port of this product, use a pipe wrench to clamp the connection ports.
4. Supply water pressure to the automatic fluid fill port of this product should be 0.2 to 0.5 MPa.
This product has a built-in ball (float) tap. If you attach it to the faucet of a sink etc. it will automatically supply water to the rated fluid level of the tank (halfway between HIGH and LOW.)
If the water supply pressure is too high, the pipes may burst during use. Proceed with caution.
5. Ensure that piping is connected to the overflow port so that the circulating fluid can be exhausted to the drainage pit when the fluid level in the tank increases.
6. For the circulating fluid piping connection, install a drain pan and wastewater collection pit just in case the circulating fluid may leak.
7. 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.

Heat radiation amount/Required ventilation rate

<table>
<thead>
<tr>
<th>Model</th>
<th>Heat radiation amount [kW]</th>
<th>Required ventilation rate [m³/min]</th>
<th>Differential temp. of 3°C between inside and outside of installation area</th>
<th>Differential temp. of 6°C between inside and outside of installation area</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS100-A-</td>
<td>Approx. 18</td>
<td>305</td>
<td>155</td>
<td></td>
</tr>
<tr>
<td>HRS150-A-</td>
<td>Approx. 26</td>
<td>440</td>
<td>220</td>
<td></td>
</tr>
</tbody>
</table>
Warning
Grounding should never be connected to a water line, gas line or lightning rod.

Caution
1. Power supply and communication cables should be prepared by user.
2. Provide a stable power supply which is not affected by surge or distortion.
   If the voltage increase ratio ($dV/dt$) at the zero cross should exceed 40 V/200 μsec., it may result in malfunction.

<For option B [With earth leakage breaker]>
3. This product is installed with a breaker with the following operating characteristics.
   For the user's equipment (inlet side), use a breaker whose operating time is equal to or longer than the breaker of this product. If a breaker with shorter operating time is connected, the user's equipment could be cut off due to the inrush current of the motor of this product.

HRS100-A/W-40, HRS150-A/W-40
**Circulating Fluid**

**Caution**

1. Avoid oil or other foreign objects entering the circulating fluid.

2. When water is used as a circulating fluid, use tap water that conforms to the appropriate water quality standards.

   Use tap water that conforms to the standards shown below (including water used for dilution of ethylene glycol aqueous solution).

3. Use an ethylene glycol that does not contain additives such as preservatives.

4. When using an 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 °C or lower and cause the thermo-chiller to break down.

5. When deionised water is used, the electric conductivity should be 1 μS/cm or higher (Electric resistivity: 1 MΩ·cm or lower).

**Warning**

1. When using an ethylene glycol aqueous solution, set the supply pressure between 0.3 to 0.5 MPa. Ensure that the pressure difference at the facility water inlet/outlet is low, it will cause an insufficient flow rate of the facility water, and poor temperature control.

2. When using tap water as facility water, use water that conforms to the appropriate water quality standards.

   Use water that conforms to the standards shown below.

**Tap Water (as Circulating Fluid) Quality Standards**

The Japan Refrigeration and Air Conditioning Industry Association

JRA GL-02-1994 “Cooling water system – Circulation type – Make-up water”

### Facility Water Supply

**Warning**

1. The water-cooled refrigeration type thermo-chiller radiates heat to the facility water. Prepare the facility water system that satisfies the heat radiation and the facility water specifications below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Heat radiation [kW]</th>
<th>Facility water specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>HRS100-W</td>
<td>Approx. 19</td>
<td>Refer to “Facility water system” in the specifications on page 8.</td>
</tr>
<tr>
<td>HRS150-W</td>
<td>Approx. 28</td>
<td></td>
</tr>
</tbody>
</table>

2. When using tap water as facility water, use water that conforms to the appropriate water quality standards.

   Use water that conforms to the standards shown below.

**Tap Water (as Facility Water) Quality Standards**

The Japan Refrigeration and Air Conditioning Industry Association

JRA GL-02-1994 “Cooling water system – Circulation type – Make-up water”

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Standard value</th>
<th>Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH (at 25 °C)</td>
<td></td>
<td>6.0 to 8.0</td>
<td></td>
</tr>
<tr>
<td>Electric conductivity (25 °C)</td>
<td>μS/cm</td>
<td>100* to 300*</td>
<td></td>
</tr>
<tr>
<td>Chloride ion (Cl⁻)</td>
<td>mg/l</td>
<td>50 or less</td>
<td></td>
</tr>
<tr>
<td>Sulfuric acid ion (SO₄²⁻)</td>
<td>mg/l</td>
<td>50 or less</td>
<td></td>
</tr>
<tr>
<td>Acid consumption amount (at pH 8.4)</td>
<td>mg/l</td>
<td>50 or less</td>
<td></td>
</tr>
<tr>
<td>Total hardness</td>
<td>mg/l</td>
<td>70 or less</td>
<td></td>
</tr>
<tr>
<td>Calcium hardness (CaCO₃)</td>
<td>mg/l</td>
<td>50 or less</td>
<td></td>
</tr>
<tr>
<td>Ionic state silica (SiO₂)</td>
<td>mg/l</td>
<td>30 or less</td>
<td></td>
</tr>
<tr>
<td>Iron (Fe)</td>
<td>mg/l</td>
<td>0.3 or less</td>
<td></td>
</tr>
<tr>
<td>Copper (Cu)</td>
<td>mg/l</td>
<td>0.1 or less</td>
<td></td>
</tr>
<tr>
<td>Sulfide ion (S⁻₂)</td>
<td>mg/l</td>
<td>Should not be detected</td>
<td></td>
</tr>
<tr>
<td>Ammonium ion (NH₄⁺)</td>
<td>mg/l</td>
<td>0.1 or less</td>
<td></td>
</tr>
<tr>
<td>Residual chlorine (Cl⁻)</td>
<td>mg/l</td>
<td>0.3 or less</td>
<td></td>
</tr>
<tr>
<td>Free carbon (CO₂)</td>
<td>mg/l</td>
<td>4.0 or less</td>
<td></td>
</tr>
</tbody>
</table>

* In the case of [M2⁺,M⁻], it will be 0.003 to 0.01.
* : Factors that have an effect on corrosion or scale generation.

Even if the water quality standards are met, complete prevention of corrosion is not guaranteed.

3. Set the supply pressure between 0.3 to 0.5 MPa. Ensure a pressure difference at the facility water inlet/outlet of 0.3 MPa or more.

If the supply pressure is high, it will cause water leakage. If the supply pressure and pressure difference at the facility water inlet/outlet is low, it will cause an insufficient flow rate of the facility water, and poor temperature control.
**Operation**

**Warning**

1. Confirmation before operation
   - 1) The fluid level of a tank should be within the specified range of “HIGH” and “LOW”.
      - When exceeding the specified level, the circulating fluid will overflow.
   - 2) Remove the air.
      - Conduct a trial operation, looking at the fluid level.
      - Since the fluid level will go down when the air is removed from the user's piping system, supply water once again when the fluid level is reduced. When there is no reduction in the fluid level, the job of removing the air is completed.
      - Pump can be operated independently.

2. Confirmation during operation
   - Check the circulating fluid temperature.
     - The operating temperature range of the circulating fluid is between 5 and 35 °C.
     - When the amount of heat generated from the user's equipment is greater than the product's capability, the circulating fluid temperature may exceed this range. Use caution regarding this matter.

3. Emergency stop method
   - When an abnormality is confirmed, stop the machine immediately. After the machine has stopped, make sure to turn off the breaker of the user's equipment (on the upstream side).

**Operation Restart Time**

**Caution**

Wait five minutes or more before restarting operation after it has been stopped. If the operation is restarted within five minutes, the protection circuit may activate and the operation may not start properly.

**Maintenance**

**Caution**

- Periodical inspection every one month>
  - Clean the ventilation hole.
    - If the dustproof filter of water-cooled type product becomes clogged with dust or debris, a decline in cooling performance can result.
    - In order to avoid deforming or damaging the dustproof filter, clean it with a long-haired brush or air gun.

- Periodical inspection every three months>
  - Inspect the circulating fluid.
    - 1. When using tap water or deionised water
        - Replacement of circulating fluid
          - Failure to replace the circulating fluid can lead to the development of bacteria or algae. Replace it regularly depending on your usage conditions.
        - 2. When using ethylene glycol aqueous solution
          - Use a concentration meter to confirm that the concentration does not exceed 15%.
          - Dilute or add as needed to adjust the concentration.

- Periodical inspection during the winter season>
  - 1. Make water-removal arrangements beforehand.
    - If there is a risk of the circulating fluid and facility water freezing when the product is stopped, release the circulating fluid and facility water in advance.
  - 2. Consult a professional.
    - This product has an “anti-freezing function”, “warming-up function”, and “anti-snow coverage function”. Read the Operation Manual carefully, and if any additional anti-freezing function (e.g. tape heater) is needed, ask for it from the vendor.

- Periodical inspection during the winter season>
  - 2. Consult a professional.
    - This product has an “anti-freezing function”, “warming-up function”, and “anti-snow coverage function”. Read the Operation Manual carefully, and if any additional anti-freezing function (e.g. tape heater) is needed, ask for it from the vendor.

**Caution**

- If operating in the below conditions, the protection circuit will activate and an operation may not be performed or will stop.
  - Power supply voltage is not within the rated voltage range of ±10%.
  - In case the water level inside the tank is reduced abnormally.
  - Circulating fluid temperature is too high.
  - Compared to the cooling capacity, the heat generation amount of the user's equipment is too high.
  - Ambient temperature is over 45 °C.
  - Ventilation hole is clogged with dust or dirt.
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.

Safety Instructions

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 machines 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 and 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 equipment failure when configuring the equipment.

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.

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.

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.

Safety Instructions

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

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1 Limited warranty and disclaimer/Compliance Requirements

1) ISO 4414: Pneumatic fluid power – General rules relating to systems.
ISO 4413: Hydraulic fluid power – General rules relating to systems.
IEC 60204-1: Safety of machinery – Electrical equipment of machines.
(1 Part. 1. General requirements)
ISO 10218-1: Manipulating industrial robots - Safety.

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.

SMC Corporation

Alkabara UDX 15F, 4-14-1, Sotokanda, Chiyoda-ku, Tokyo 101-0021, JAPAN Phone: 03-5207-8349 FAX: 03-5298-5362 Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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