Circulating Fluid Temperature Controller

# Low GWP Refrigerant Chiller

# Thermo-chiller Standard Type

New

CE UKCA RoHS

**GWP:146**[*1]

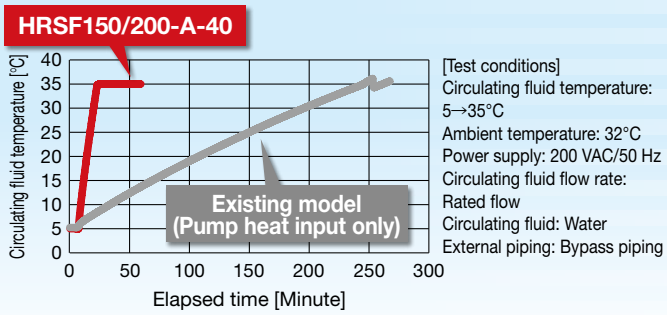
**EU refrigerant regulations: GWP150 or more**
**US refrigerant regulations: GWP700 or more**
**California, US refrigerant regulations: GWP750 or more**
*1 Regulation (EU) 2024/573, AIM Act 40 CFR Part 84

## Environmentally friendly R454C as refrigerant

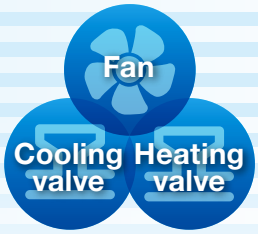
Not available for air transport

## No heater is required, as the circulating fluid is heated using only the heat exhausted by the refrigerating circuit.

### ■ Heating-up time: 1/10




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




**Cooling capacity** 15 kW/20 kW

**Temperature stability** (When a load is stable) ±0.1°C

**Set temperature range** 5°C to 35°C

**Low-noise design** 70 dB(A)

**Outdoor installation** IPX4


Compatible with power supplies in Europe, Asia, Oceania, and North, Central, and South America

●3-phase 400 VAC

# HRSF150/200 Series

SMC

CAT.ES40-79A

# CONTENTS

## *HRSF150/200 Series* Standard Type


**Circulating Fluid Temperature Controller**

**Low GWP Refrigerant Chiller** **Thermo-chiller HRSF150/200 Series**

Low GWP Refrigerant Chiller

# Thermo-chiller Standard Type
# Air-cooled 400 V Type
# *HRSF150/200 Series*

## How to Order

**HRSF 200 – A □ – 40 – □**

**Cooling capacity**

| | |
|---|---|
| **150** | 15.7 kW |
| **200** | 20.5 kW |

**Cooling method**

| | |
|---|---|
| **A** | Air-cooled refrigeration |

**Pipe thread type**

| | |
|---|---|
| **Nil** | Rc |
| **F** | G (with Rc-G conversion fitting set) |
| **N** | NPT (with Rc-NPT conversion fitting set) |

**Power supply**

| | |
|---|---|
| **40** | 3-phase 380 to 415 VAC (50 Hz)<br>3-phase 380 to 480 VAC (60 Hz) |

**Option**

| | |
|---|---|
| **Nil** | None |
| **A** | With caster adjuster-foot |
| **K**∗1 | With fluid fill port |
| **M** | Applicable to DI water piping |

∗1 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.)

## Specifications

| Model | | | | HRSF150-A□-40-□ | HRSF200-A□-40-□ |
|---|---|---|---|---|---|
| **Cooling method** | | | | Air-cooled refrigeration | |
| **Refrigerant** | | | | R454C (HFO/HFC, GWP: 146)∗10 | |
| **Refrigerant charge** | | | kg | 1.5 | 1.5 |
| **Control method** | | | | PID control | |
| **Ambient temperature**∗1, 8 | | | °C | –20 to 45 | |
| Circulating fluid system | **Circulating fluid**∗1, 2 | | | Tap water, 15 to 40% Ethylene glycol aqueous solution, Deionized water | |
| | **Set temperature range**∗1 | | °C | 5 to 35 | |
| | **Cooling capacity**∗3, 8 | | kW | 15.7 | 20.5 |
| | **Heating capacity**∗4 | | kW | 3 | 5.5 |
| | **Temperature stability**∗5 | | °C | ±0.1 | |
| | **Pump capacity** | **Rated flow (Outlet)** | L/min | 45 (0.45 MPa) | |
| | | **Maximum flow rate** | L/min | 130 | |
| | | **Maximum pump head** | m | 50 | |
| | **Settable pressure range**∗6 | | MPa | 0.1 to 0.5 | |
| | **Minimum operating flow rate**∗7 | | L/min | 25 | 35 |
| | **Tank capacity** | | L | 42 | |
| | **Circulating fluid outlet, circulating fluid return port** | | | Rc1 (Symbol F: G1, Symbol N: NPT1) | |
| | **Tank drain port** | | | Rc3/4 (Symbol F: G3/4, Symbol N: NPT3/4) | |
| | **Automatic fluid fill system (Standard)** | **Supply side pressure range** | MPa | 0.2 to 0.5 | |
| | | **Supply side fluid temperature** | °C | 5 to 35 | |
| | | **Automatic fluid fill port** | | Rc1/2 (Symbol F: G1/2, Symbol N: NPT1/2) | |
| | | **Overflow port** | | Rc1 (Symbol F: G1, Symbol N: NPT1) | |
| | **Fluid contact material** | | **Metal** | Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze | |
| | | | **Resin** | PTFE, PU, FKM, EPDM, PVC, NBR, POM, PE, NR | |
| Electrical system | **Power supply** | | | 3-phase 380 to 415 VAC (50 Hz) Allowable voltage range ±10% (No continuous voltage fluctuation)<br>3-phase 380 to 480 VAC (60 Hz) Allowable voltage range +4%, –10% (Max. voltage less than 500 V and no continuous voltage fluctuation) | |
| | **Earth leakage breaker (Standard)** | **Rated current** | A | 30 | |
| | | Sensitivity of leak current | mA | 30 | |
| | **Rated operating current**∗5 | | A | 13.1 | 16.9 |
| | **Rated power consumption**∗5 | | kW (kVA) | 8.0 (9.0) | 10.8 (11.7) |
| **Noise level (Front 1 m/Height 1 m)**∗5 | | | dB (A) | 68 | |
| **Waterproof specification** | | | | IPX4 | |
| **Accessories** | | | | Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.),<br>Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.),<br>Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 6 M8 bolts)∗9 | |
| **Weight (dry state)** | | | kg | 230 | |

∗1 When the ambient temperature or circulating fluid temperature is 10°C or below, use ethylene glycol aqueous solution.
∗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)
For the concentration of the ethylene glycol aqueous solution, refer to the operation manual.
Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)
∗3 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Circulating fluid flow rate: Rated flow, ⑤ Power supply: 400 VAC
∗4 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid flow rate: Rated flow, ④ Power supply: 400 VAC
∗5 ① Ambient temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Load: Same as the cooling capacity, ⑤ Circulating fluid flow rate: Rated flow, ⑥ Power supply: 400 VAC, ⑦ Piping length: Shortest
∗6 With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.
∗7 Fluid flow rate to maintain the cooling capacity. If the actual flow rate is lower than this, install a bypass piping.
∗8 If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.
∗9 The anchor bolt fixing brackets (including 6 M8 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.
∗10 R454C is a slightly flammable refrigerant. Avoid using this product in proximity to open flames.

Low GWP Refrigerant Chiller

# Thermo-chiller Standard Type
# Water-cooled 400 V Type
# *HRSF150/200 Series*

## How to Order

**HRSF 200 – W □ – 40 – □**

**Cooling capacity**

| | |
|---|---|
| 150 | 15.7 kW |
| 200 | 20.6 kW |

**Cooling method**

| | |
|---|---|
| W | Water-cooled refrigeration |

**Pipe thread type**

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

**Power supply**

| | |
|---|---|
| 40 | 3-phase 380 to 415 VAC (50 Hz)<br>3-phase 380 to 480 VAC (60 Hz) |

**Option**

| | | | |
|---|---|---|---|
| Nil | None | K*1 | With fluid fill port |
| A | With caster adjuster-foot | M | Applicable to DI water piping |

*1 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.)

## Specifications

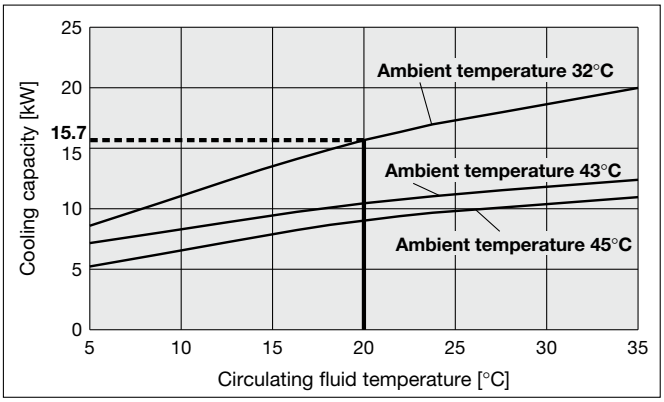
| Model | | | | HRSF150-W□-40-□ | HRSF200-W□-40-□ |
|---|---|---|---|---|---|
| Cooling method | | | | Water-cooled refrigeration | |
| Refrigerant | | | | R454C (HFO/HFC, GWP: 146)*11 | |
| Refrigerant charge | | | kg | 1.4 | 1.4 |
| Control method | | | | PID control | |
| Ambient temperature*1, 8 | | | °C | 2 to 45 | |
| Circulating fluid system | Circulating fluid*2 | | | Tap water, 15% Ethylene glycol aqueous solution, Deionized water | |
| | Set temperature range*1 | | °C | 5 to 35 | |
| | Cooling capacity*3, 8 | | kW | 15.7 | 20.6 |
| | Heating capacity*4 | | kW | 3.5 | 4.0 |
| | Temperature stability*5 | | °C | ±0.1 | |
| | Pump capacity | Rated flow (Outlet) | L/min | 45 (0.45 MPa) | |
| | | Maximum flow rate | L/min | 130 | |
| | | Maximum pump head | m | 50 | |
| | Settable pressure range*6 | | MPa | 0.1 to 0.5 | |
| | Minimum operating flow rate*7 | | L/min | 25 | 35 |
| | Tank capacity | | L | 42 | |
| | Circulating fluid outlet, circulating fluid return port | | | Rc1 (Symbol F: G1, Symbol N: NPT1) | |
| | Tank drain port | | | Rc3/4 (Symbol F: G3/4, Symbol N: NPT3/4) | |
| | Automatic fluid fill system (Standard) | Supply side pressure range | MPa | 0.2 to 0.5 | |
| | | Supply side fluid temperature | °C | 5 to 35 | |
| | | Automatic fluid fill port | | Rc1/2 (Symbol F: G1/2, Symbol N: NPT1/2) | |
| | | Overflow port | | Rc1 (Symbol F: G1, Symbol N: NPT1) | |
| | Fluid contact material | | Metal | Stainless steel, Copper (Heat exchanger brazing), Brass, Bronze | |
| | | | Resin | PTFE, PU, FKM, EPDM, PVC, NBR, POM, PE, NR | |
| Facility water system | Temperature range | | °C | 5 to 40 | |
| | Pressure range | | MPa | 0.3 to 0.5 | |
| | Required flow*10 | | L/min | 30 | 50 |
| | Facility water pressure differential | | MPa | 0.3 or more | |
| | Facility water inlet/outlet | | | Rc1 (Symbol F: G1, Symbol N: NPT1) | |
| | Fluid contact material | | Metal | Stainless steel, Copper (Heat exchanger brazing), Bronze, Brass | |
| | | | Resin | PTFE, NBR, EPDM | |
| Electrical system | Power supply | | | 3-phase 380 to 415 VAC (50 Hz) Allowable voltage range ±10% (No continuous voltage fluctuation)<br>3-phase 380 to 480 VAC (60 Hz) Allowable voltage range +4%, −10% (Max. voltage less than 500 V and no continuous voltage fluctuation) | |
| | Applicable earth leakage breaker (Standard) | Rated current | A | 30 | |
| | | Sensitivity of leak current | mA | 30 | |
| | Rated operating current*5 | | A | 12.7 | 15.6 |
| | Rated power consumption*5 | | kW (kVA) | 7.6 (8.8) | 9.7 (10.8) |
| Noise level (Front 1 m/Height 1 m)*5 | | | dB (A) | 60 | |
| Waterproof specification | | | | IPX4 | |
| Accessories | | | | Alarm code list stickers 2 pcs. (English 1 pc./Japanese 1 pc.),<br>Operation Manual (for installation/operation) 2 pcs. (English 1 pc./Japanese 1 pc.),<br>Y-strainer (40 meshes) 25A, Barrel nipple 25A, Anchor bolt fixing brackets 2 pcs. (including 6 M8 bolts)*9 | |
| Weight (dry state) | | | kg | Approx. 195 | |

*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.
*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.
Tap water: Standard of The Japan Refrigeration And Air Conditioning Industry Association (JRA GL-02-1994)
15% ethylene glycol aqueous solution: diluted by tap water in condition above without any additives such as antiseptics.
Deionized water: Electric conductivity 1 μS/cm or higher (Electric resistivity 1 MΩ·cm or lower)
*3 ① Facility water temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Circulating fluid flow rate: Rated flow, ⑤ Power supply: 400 VAC
*4 ① Facility water temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid flow rate: Rated flow, ④ Power supply: 400 VAC
*5 ① Facility water temperature: 32°C, ② Circulating fluid: Tap water, ③ Circulating fluid temperature: 20°C, ④ Load: Same as the cooling capacity, ⑤ Circulating fluid flow rate: Rated flow, ⑥ Power supply: 400 VAC, ⑦ Piping length: Shortest
*6 With the pressure control mode by inverter. When the pressure control mode is not used, the pump power frequency set mode can be used.
*7 Fluid flow rate to maintain the cooling capacity. If the actual flow rate is lower than this, install a bypass piping.
*8 If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.
*9 The anchor bolt fixing brackets (including 6 M8 bolts) are used for fixing to wooden skids when packaging the thermo-chiller. No anchor bolt is included.
*10 The actual flow rate of facility water will fluctuate according to your operating conditions.
*11 R454C is a slightly flammable refrigerant. Avoid using this product in proximity to open flames.

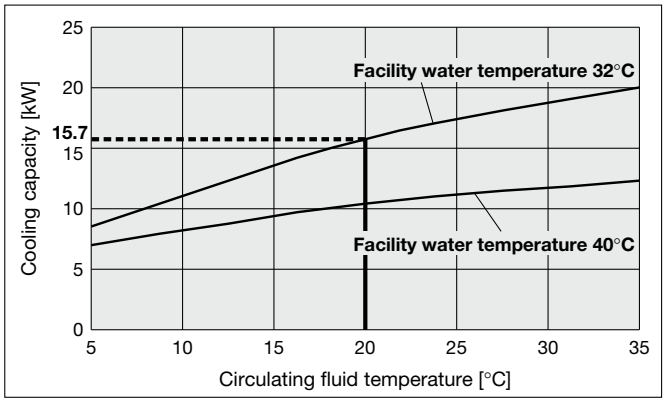
## Cooling Capacity

* If the product is used at an altitude of 1000 meters or higher, the maximum allowable ambient temperature and the cooling capacity decrease. For details, refer to the operation manual.

### HRSF150-A□-40-□




### HRSF150-W□-40-□

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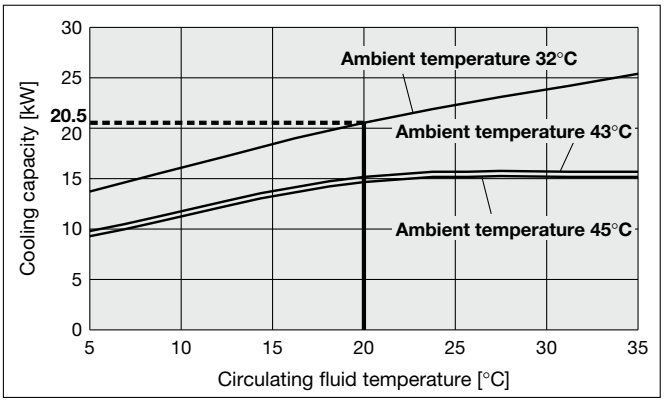
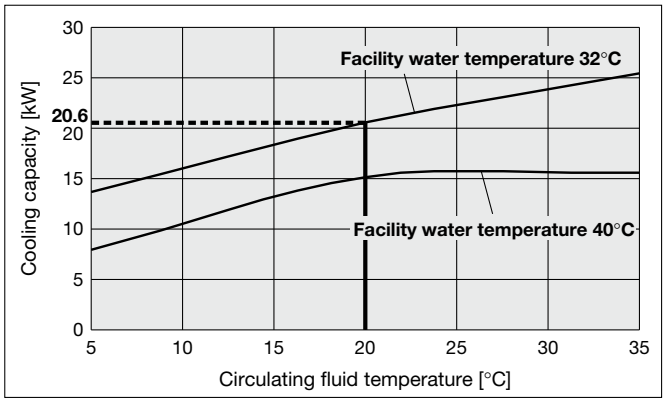
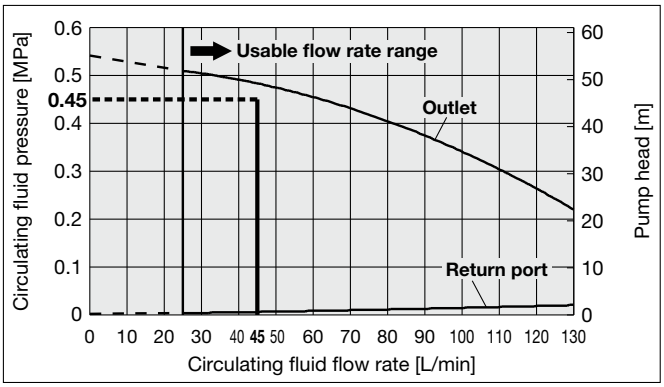



### HRSF200-W□-40-□



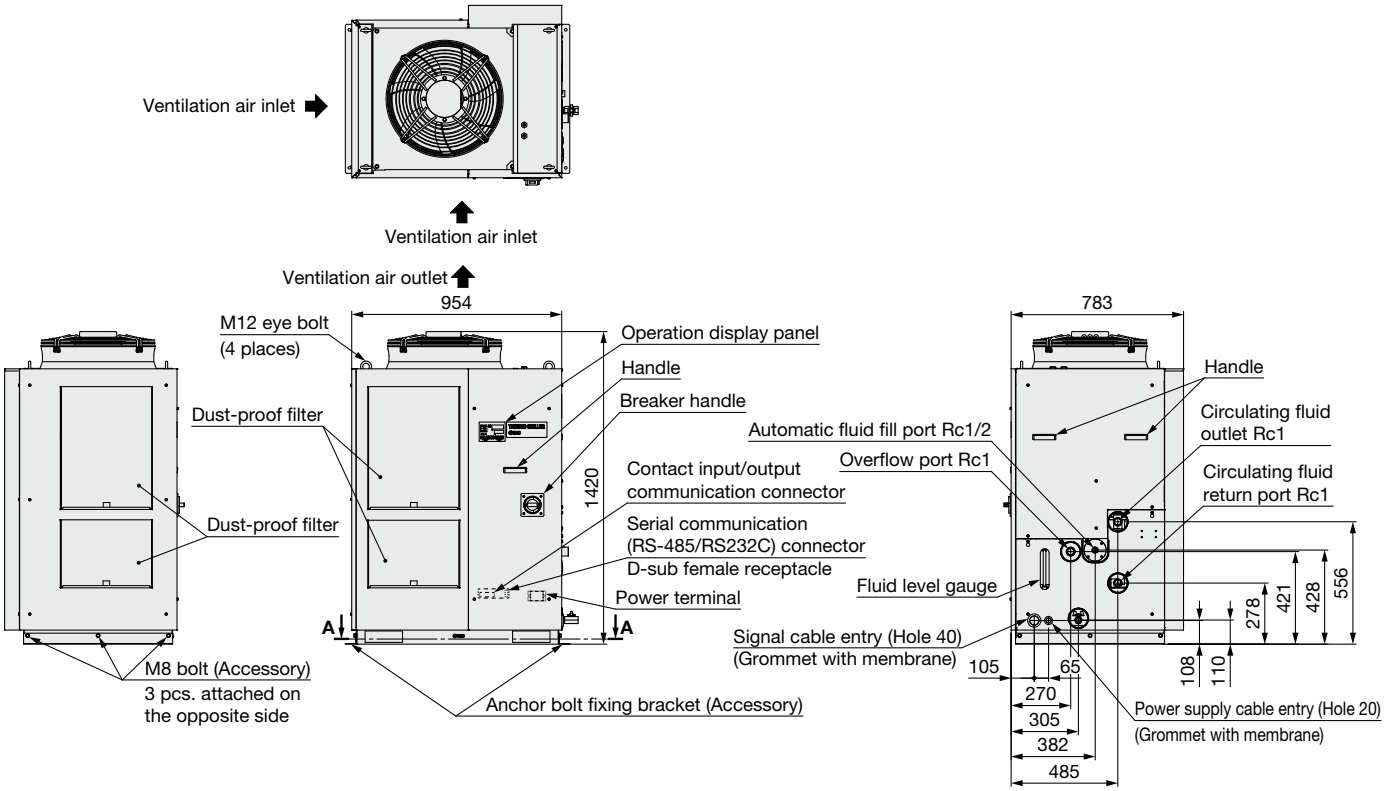

## Pump Capacity

### HRSF150/200-A□-40-□
### HRSF150/200-W□-40-□

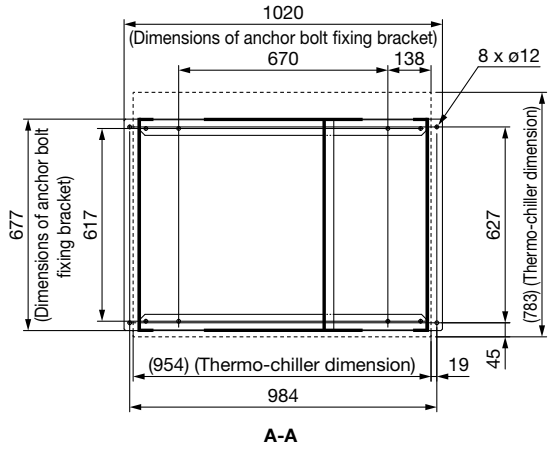


## Dimensions

### HRSF150/200-A-40 (Air-cooled 400 V type)

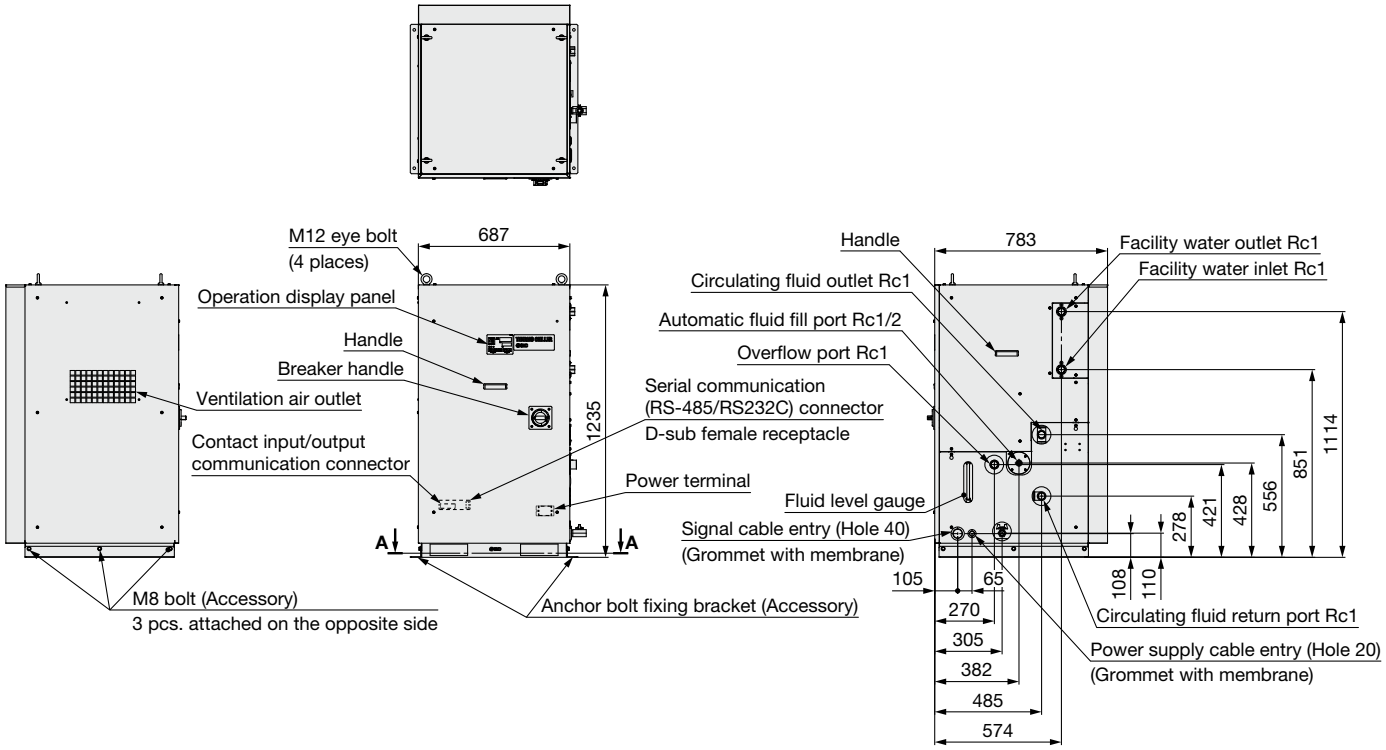



### Anchor bolt fixing position

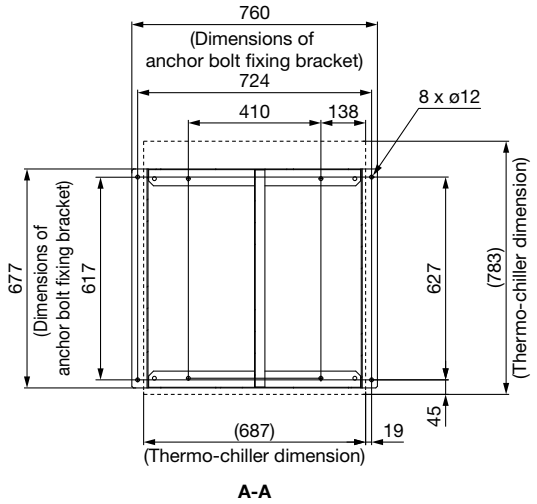


## Dimensions

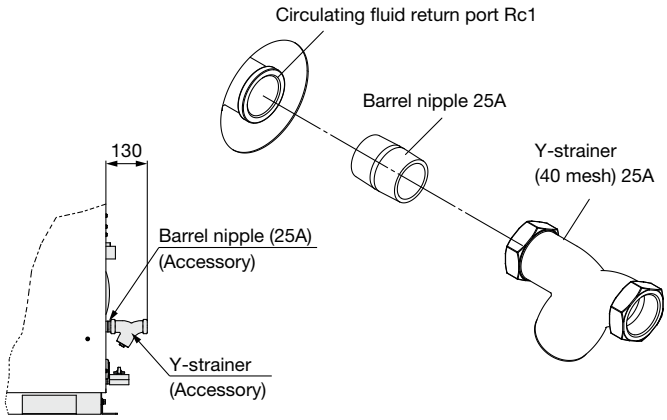
### HRSF150/200-W-40 (Water-cooled 400 V type)




### Anchor bolt fixing position




### Accessory: Y-strainer mounting view



# *HRSF150/200 Series*
# Options

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

**A** **Option symbol**

## With Caster Adjuster-foot

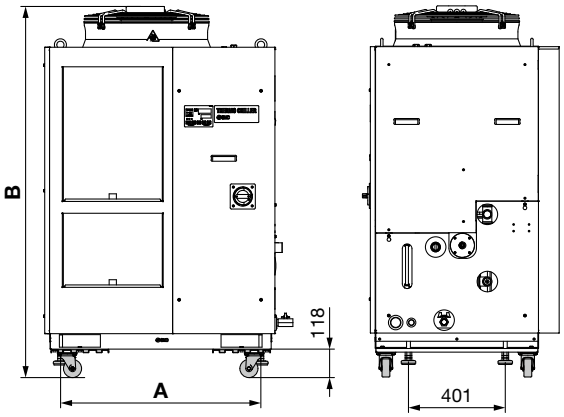
**HRSF150/200□−□□−□−A**

**With caster adjuster-foot**

Unfixed casters and adjuster feet stops are mounted.

| Applicable model | Dimension [mm] | | Additional weight∗1 [kg] |
|---|---|---|---|
| | A | B | |
| **HRSF150/200-A□-□□-A** | 830 | 1538 | Approx. 18 |
| **HRSF150/200-W□-□□-A** | 570 | 1353 | |

∗1 Refers to the amount of increase from the standard weight




**K** **Option symbol**

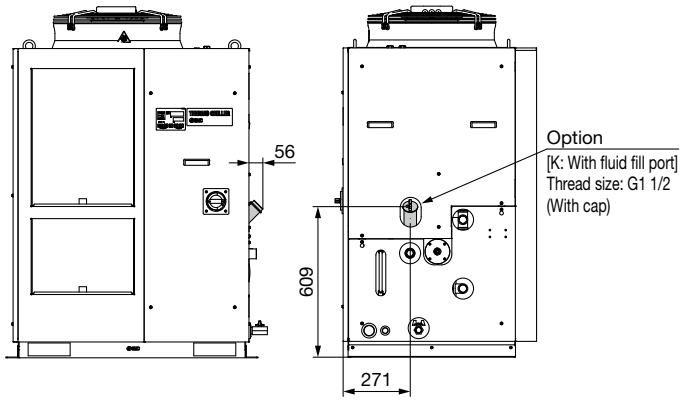
## With Fluid Fill Port

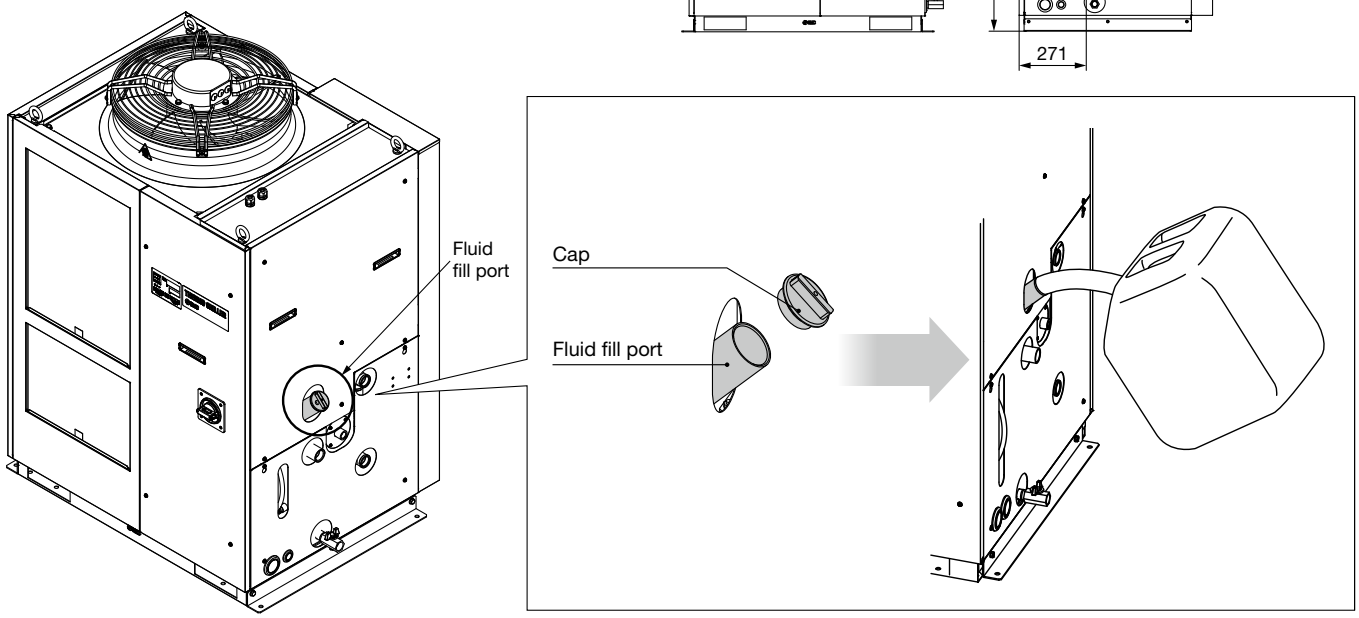
**HRSF□−□□−□−K**

**With fluid fill port**

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

| Applicable model | Dimension [mm] | |
|---|---|---|
| | A | B |
| **HRSF150-□□-□-K**<br>**HRSF200-□□-□-K** | 271 | 609 |




**(The figure shows the HRSF200-A-20-K.)**

**M** Option symbol

## Applicable to DI Water Piping

**HRSF □–□□–□–M**

**Applicable to DI water piping**

Contact material of the circulating fluid circuit is made from non-copper materials.

| Applicable model | **HRSF□-□□-□-M** |
|---|---|
| Contact material for circulating fluid | Stainless steel (including heat exchanger brazing), PTFE, PU, FKM, EPDM, PVC, NBR, POM |

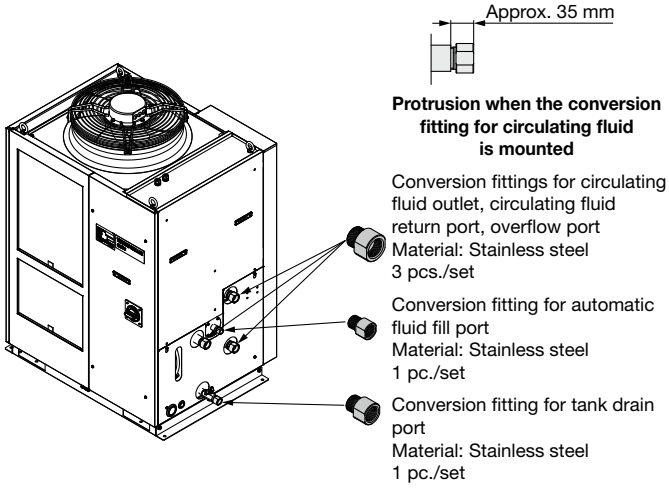
∗ No change in external dimensions

# *HRSF150/200 Series*
# Optional Accessories

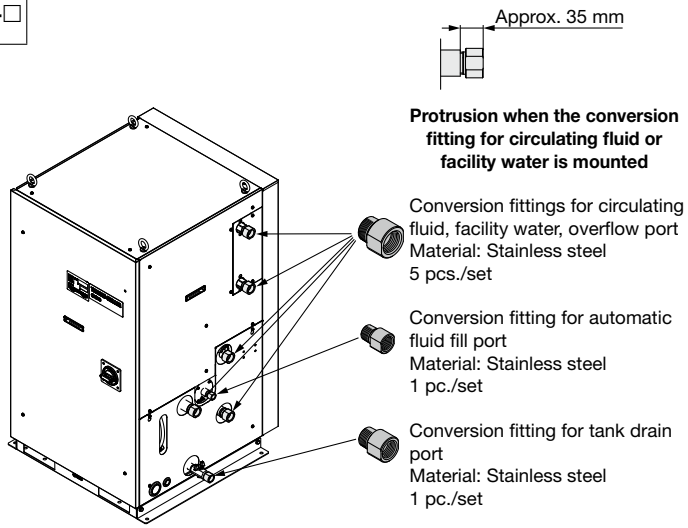
## ① Piping Conversion Fitting

This is a fitting to change the port from Rc to G or NPT.
· Circulating fluid outlet, Circulating fluid return port, Overflow port Rc1 → NPT1 or G1
· Drain port Rc3/4 → NPT3/4 or G3/4
· Automatic fluid fill port Rc1/2 → NPT1/2 or G1/2
· Facility water inlet, Facility water outlet Rc1 → NPT1 or G1 (for HRS-EP015 or HRS-EP016)
(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.)

| Part no. | Contents | Applicable model |
|---|---|---|
| **HRS-EP013** | NPT thread conversion fitting set | **HRSF150/200□-A-□** |
| **HRS-EP014** | G thread conversion fitting set | |
| **HRS-EP015** | NPT thread conversion fitting set | **HRSF150/200□-W-□** |
| **HRS-EP016** | G thread conversion fitting set | |




**HRS-EP013, HRS-EP014**




**HRS-EP015, HRS-EP016**

## ② Caster Adjuster-foot Kit

This is a set of unfixed casters and adjuster feet stop.
When installed by the customer, 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.

| Part no. | Applicable model | Dimension [mm] | Weight [kg] |
|---|---|---|---|
| | | **A** | |
| **HRS-KS002** | **HRSF150-A□-□**<br>**HRSF200-A□-□** | 830 | Approx. 18 |
| | **HRSF150-W□-□**<br>**HRSF200-W□-□** | 570 | |

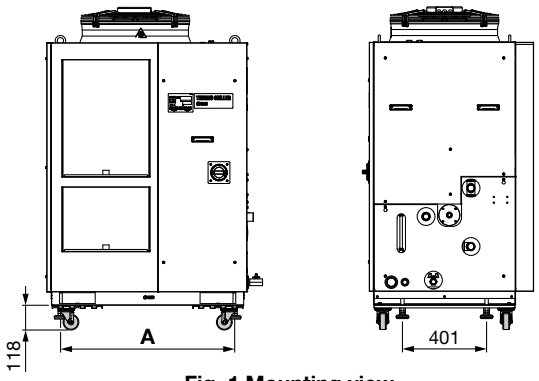



**Fig. 1 Mounting view**

**Parts List**

| Description |
|---|
| Procedure manual |
| Caster adjuster-foot bracket (2 pcs.) |
| Fixing bolt (M8) (8 pcs.) |

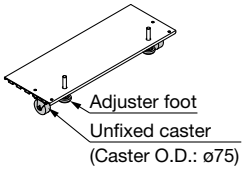



**Fig. 2 Caster adjuster-foot bracket (2 pcs.)**

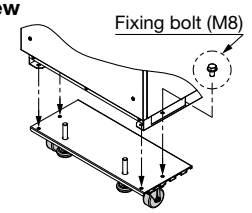


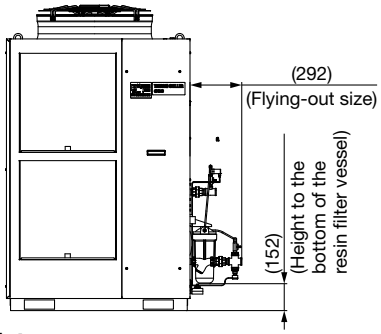

**Fig. 3 Fixing bolt (8 pcs.)**

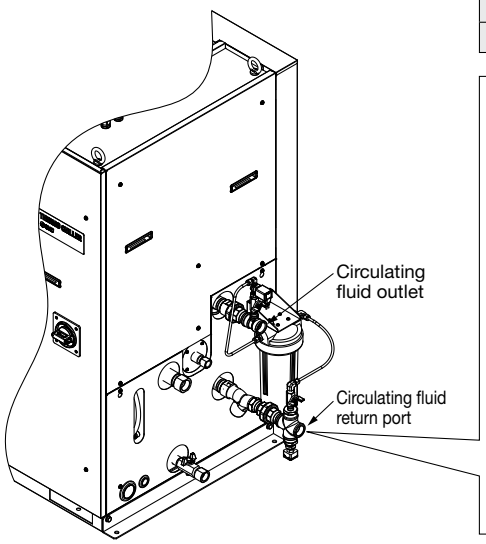
## ③ Electric Conductivity Control Set

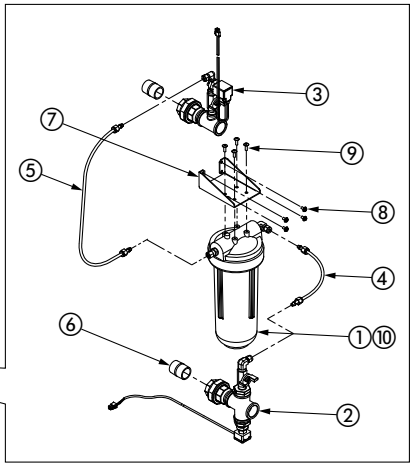
The set indicates and controls the electric conductivity of the circulating fluid. Refer to the Operation Manual for details.

| Part no. | Applicable model |
|---|---|
| **HRS-DI006** | **HRSF150-□□-□**<br>**HRSF200-□□-□** |

| | |
|---|---|
| Measurement range of electric conductivity | 2.0 to 48.0 μS/cm |
| Set range of electric conductivity target | 5.0 to 45.0 μS/cm |
| Set range of electric conductivity hysteresis | 2.0 to 10.0 μS/cm |
| Operating temperature range (Circulating fluid temperature) | 5 to 60°C |
| Power consumption | 400 mA or less |
| Installation environment | Indoor |




**Parts List**

| No. | Description | Fluid contact material | Qty. |
|---|---|---|---|
| ① | DI filter vessel | PC, PP | 1 |
| ② | DI sensor assembly | Stainless steel, PPS | 1 |
| ③ | DI control piping assembly | Stainless steel, EPDM | 1 |
| ④ | DI filter outlet tube | PFA, POM | 1 |
| ⑤ | DI filter inlet tube | PFA, POM | 1 |
| ⑥ | Nipple (Size: 1 inch) | Stainless steel | 2 |
| ⑦ | Mounting bracket | — | 1 |
| ⑧ | Mounting screw (M5 screw) | — | 4 |
| ⑨ | Tapping screw (M5 screw) | — | 4 |
| ⑩ | DI filter cartridge (Part no.: HRS-DF001)*1 | PP, PE | 1 |

*1 The product should be replaced when it can no longer preserve the electrical conductivity set value.

## ④ Bypass Piping Set

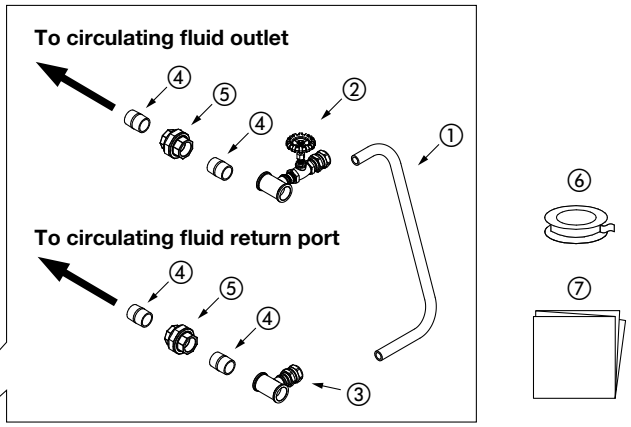
When the circulating fluid goes below the minimum operating flow rate (as shown below), cooling capacity will be reduced and the temperature stability will be badly affected. Use the bypass piping set to ensure a circulating fluid flow rate of the minimum operating flow rate or more.

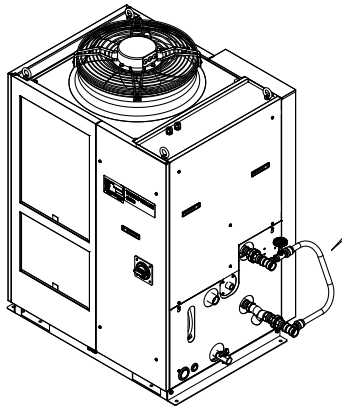
| Part no. | Applicable model | Minimum operating flow rate [L/min] |
|---|---|---|
| **HRS-BP005** | **HRSF150-□□-□**<br>**HRSF200-□□-□** | 25 |

**■Bypass Piping Set (Stainless steel)**

| Part no. | Applicable model | Minimum operating flow rate [L/min] |
|---|---|---|
| **HRS-BP011** | **HRSF150-□□-□**<br>**HRSF200-□□-□** | 25 |

*1 When option "M" is selected, we recommend using the HRS-BP011.



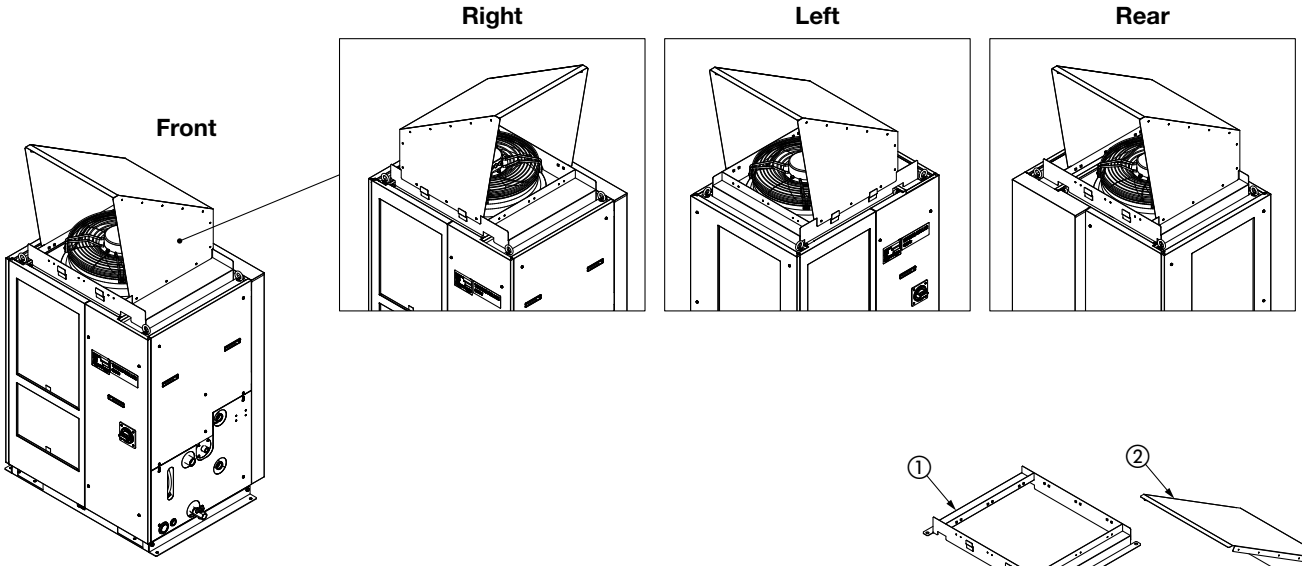
**(The figure shows the HRSF200-A-20.)**

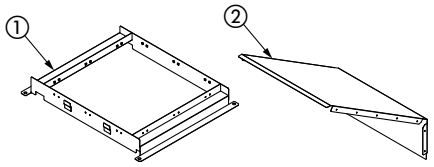
**Parts List**

| No. | Description | Fluid contact material | | Qty. |
|---|---|---|---|---|
| | | **HRS-BP005** | **HRS-BP011** | |
| ① | Hose (I.D.: 15 mm) | PVC | PVC | 1 (Approx. 700 mm) |
| ② | Outlet piping assembly (With globe valve) | Stainless steel, Brass, Bronze | SUS | 1 |
| ③ | Return piping assembly | Stainless steel, Brass | SUS | 1 |
| ④ | Nipple (Size: 1 inch) | Stainless steel | SUS | 4 |
| ⑤ | Union (Size: 1 inch) | Stainless steel | SUS | 2 |
| ⑥ | Sealant tape | PTFE | PTFE | 1 |
| ⑦ | Operation Manual | — | — | 1 |

## ⑤ Snow Protection Hood

Stainless steel 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.

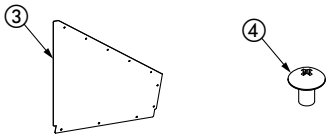


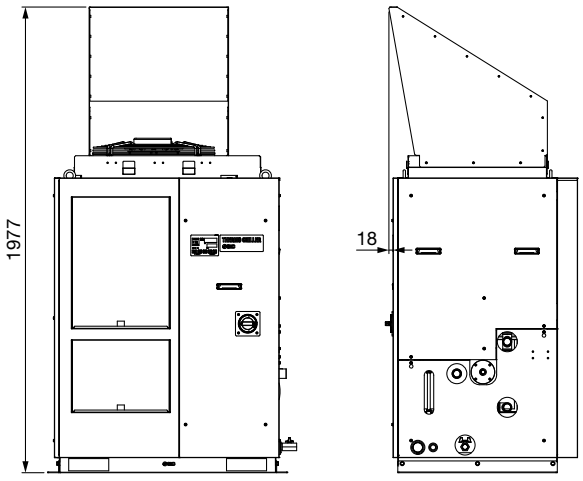




| Part no. | Applicable model | Weight [kg] |
|---|---|---|
| **HRS-BK004** | **HRSF150-A□-□**<br>**HRSF200-A□-□** | 18 |

**Parts List**

| No. | Description | Qty. |
|---|---|---|
| ① | Snow protection hood base | 1 |
| ② | Snow protection hood A | 1 |
| ③ | Snow protection hood B | 2 |
| ④ | Assembly/Mounting screw | 20 |




**Mounting condition for HRS-BK004**

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

## ⑥ Particle Filter Set

Removes foreign matter in the circulating fluid. This set cannot be directly connected to the thermo-chiller. Install it in the user's piping system. Refer to the Operation Manual for details.

### Particle Filter Set

**HRS−PF005−H**

**Accessory**

| Symbol | Accessory |
|---|---|
| **Nil** | None |
| **H** | With handle |

| Fluid | Tap water |
|---|---|
| Max. operating pressure | 0.65 MPa |
| Operating temperature range | 5 to 35°C |
| Nominal filtration accuracy | 5 μm |
| Installation environment | Indoors |

**Parts List**

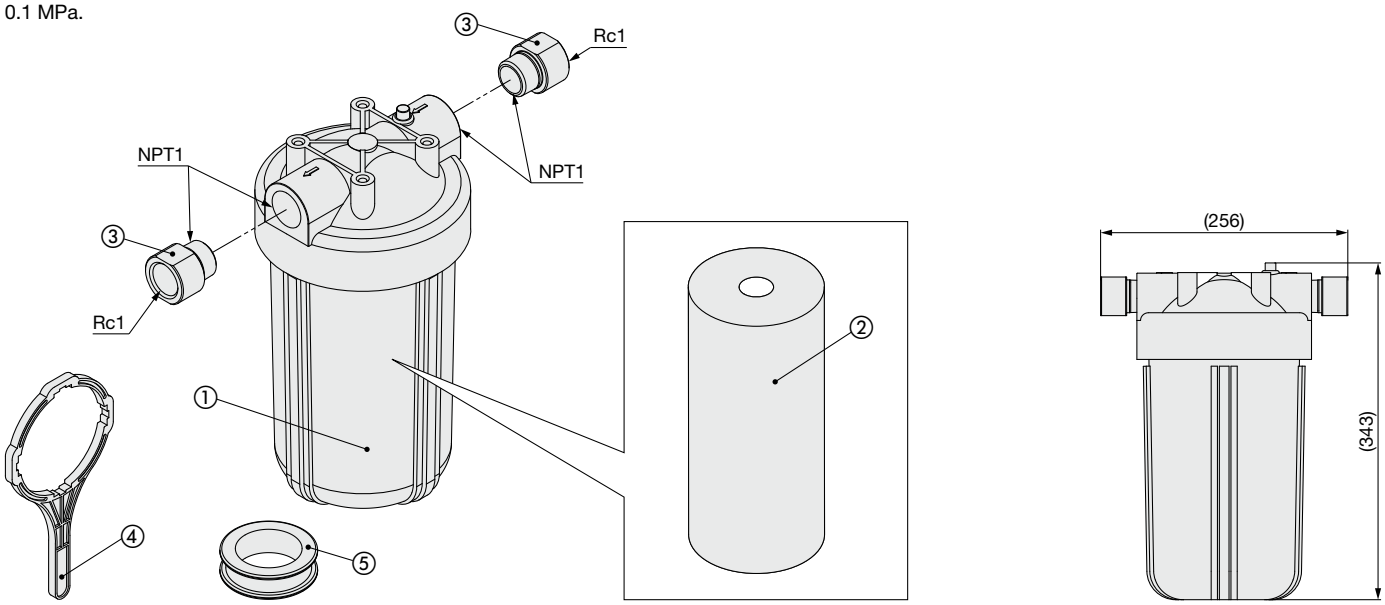
| No. | Description | Material | Qty. | Note |
|---|---|---|---|---|
| ① | Body | PC, PP | 1 | — |
| ② | Element*1 | PP | 1 | — |
| ③ | Extension piece | Stainless steel | 2 | Conversion from NPT to Rc |
| ④ | Handle | — | 1 | When -H is selected |
| ⑤ | Sealant tape | PTFE | 1 | — |

*1 The product should be replaced when the pressure drop reaches 0.1 MPa.

### Replacement Element

**HRS−PF006**

The product should be replaced when the pressure drop reaches 0.1 MPa.



## ⑦Wired Remote Controller

When the wired remote controller is connected to the thermo-chiller, the operation start/stop setting or the set temperature can be changed from a place apart from the thermo-chiller. For details, refer to the Operation Manual.

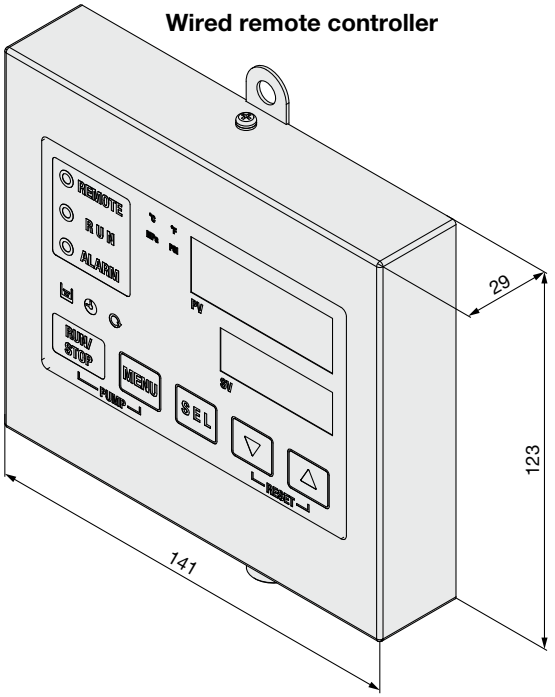
### Wired Remote Controller

**HRS–CV004–** **1**

**Accessories**

| Symbol | Accessories |
|---|---|
| **Nil** | None |
| **1** | With cable (Approx. 20 m) |
| **2** | With cable (Approx. 50 m) |
| **3** | With cable (Approx. 100 m) |

**Wired remote controller**



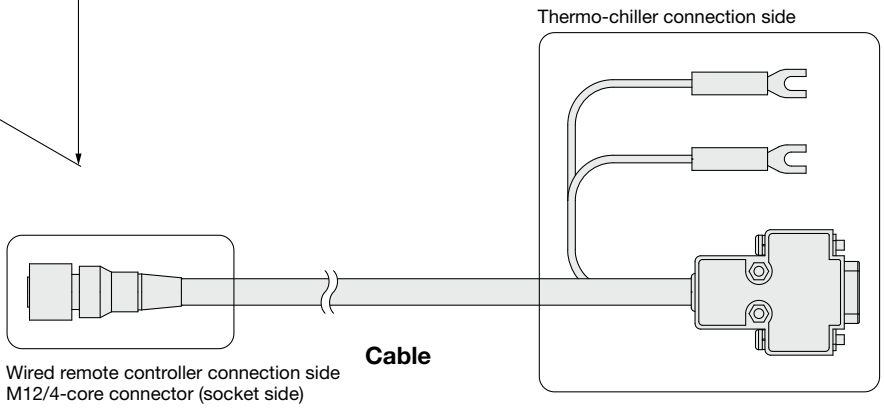

**Displayed items**

| |
|---|
| Circulating fluid discharge temperature |
| Circulating fluid discharge set temperature |
| Circulating fluid discharge pressure |
| Circulating fluid electric conductivity*1 |
| Circulating fluid flow rate |
| Alarm code*2 |

∗1 Only when the electric conductivity control set is used.
∗2 Only when an alarm occurs. The alarm cannot be reset with the remote controller. Be sure to reset the alarm with the thermo-chiller main unit.

**Operable items**

| |
|---|
| Operation start/stop |
| Circulating fluid temperature setting |
| Alarm sound stop |
| Key-lock |
| Key operation sound ON/OFF |
| Digital display brightness adjustment |
| Alarm sound ON/OFF |



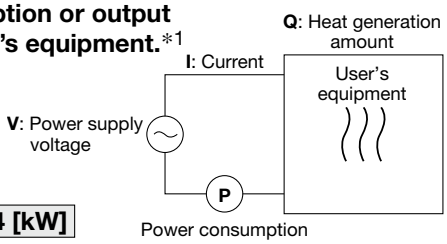

∗ To use the wired remote controller, the thermo-chiller main unit setting is needed.
∗ Use the wired remote controller indoors.
∗ Pass the cable through the duct, etc. so that it is not exposed to rain water or direct sunlight.

# *HRSF150/200 Series*
# Cooling Capacity Calculation

## 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




① **Derive the heat generation amount from the power consumption.**

Power consumption **P**: 20 [kW]

**Q = P = 20 [kW]**

Cooling capacity = Considering a safety factor of 20%, **20 [kW] x 1.2 =** **24 [kW]**

② **Derive the heat generation amount from the power supply output.**

Power supply output **VI**: 20 [kVA]

**Q = P = V x I x Power factor**

In this example, using a power factor of 0.85:

**= 20 [kVA] x 0.85 = 17 [kW]**

Cooling capacity = Considering a safety factor of 20%,

**17 [kW] x 1.2 =** **20.4 [kW]**

③ **Derive the heat generation amount from the output.**

Output (shaft power, etc.) **W**: 13 [kW]

$$\mathbf{Q = P = \frac{W}{Efficiency}}$$

In this example, using an efficiency of 0.7:

$$\mathbf{= \frac{13}{0.7} = 18.6\ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

**18.6 [kW] x 1.2 =** **22.3 [kW]**

∗1 The examples above 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∗1
Circulating fluid mass flow rate **qm** : (= ρ x **qv** ÷ 60) [kg/s]
Circulating fluid density ρ : 1 [kg/L]
Circulating fluid (volume) flow rate **qv** : 70 [L/min]
Circulating fluid specific heat **C** : 4.186 x $10^3$ [J/(kg·K)]
Circulating fluid outlet temperature $\mathbf{T_1}$ : 293 [K] (20 [°C])
Circulating fluid return temperature $\mathbf{T_2}$ : 297 [K] (24 [°C])
Circulating fluid temperature difference $\Delta\mathbf{T}$ : 4 [K] (= $\mathbf{T_2 - T_1}$)
Conversion factor: minutes to seconds (SI units): 60 [s/min]

∗1 Refer to page 15 for the typical physical property value of tap water or other circulating fluids.

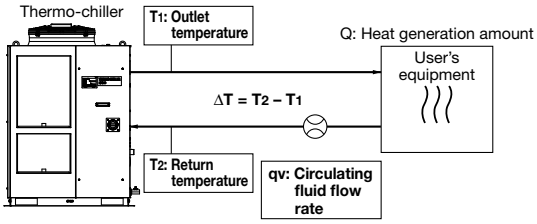
$$\mathbf{Q = qm \times C \times (T_2 - T_1)}$$

$$\mathbf{= \frac{\rho \times qv \times C \times \Delta T}{60} = \frac{1 \times 70 \times 4.186 \times 10^3 \times 4.0}{60}}$$

$$\mathbf{= 19535\ [J/s] \approx 19535\ [W] = 19.5\ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

**19.5 [kW] x 1.2 =** **23.4 [kW]**




#### Example of conventional units (Reference)

Heat generation amount by user's equipment **Q**: Unknown [cal/h] → [W]
Circulating fluid : Tap water∗1
Circulating fluid weight flow rate **qm** : (= ρ x **qv** x 60) [kgf/h]
Circulating fluid weight volume ratio γ : 1 [kgf/L]
Circulating fluid (volume) flow rate **qv** : 70 [L/min]
Circulating fluid specific heat **C** : 1.0 x $10^3$ [cal/(kgf·°C)]
Circulating fluid outlet temperature $\mathbf{T_1}$: 20 [°C]
Circulating fluid return temperature $\mathbf{T_2}$: 24 [°C]
Circulating fluid temperature difference $\Delta\mathbf{T}$: 4 [°C] (= $\mathbf{T_2 - T_1}$)
Conversion factor: hours to minutes : 60 [min/h]
Conversion factor: kcal/h to kW : 860 [(cal/h)/W]

$$\mathbf{Q = \frac{qm \times C \times (T_2 - T_1)}{860}}$$

$$\mathbf{= \frac{\gamma \times qv \times 60 \times C \times \Delta T}{860}}$$

$$\mathbf{= \frac{1 \times 70 \times 60 \times 1.0 \times 10^3 \times 4.0}{860}}$$

$$\mathbf{= \frac{16800000\ [cal/h]}{860}}$$

$$\mathbf{\approx 19534\ [W] = 19.5\ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

**19.5 [kW] x 1.2 =** **23.4 [kW]**

## 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** : (= ρ x **V**) [kg]
Cooled substance density ρ : 1 [kg/L]
Cooled substance total volume **V** : 300 [L]
Cooled substance specific heat **C** : 4.186 x $10^3$ [J/(kg·K)]
Cooled substance temperature when cooling begins $T_0$ : 305 [K] (32 [°C])
Cooled substance temperature after t hour $T_t$ : 293 [K] (20 [°C])
Cooling temperature difference $\Delta T$ : 12 [K] (= $T_0 - T_t$)
Cooling time $\Delta t$ : 900 [s] (= 15 [min])

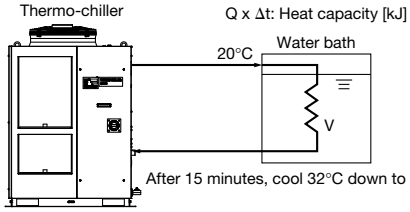
∗ Refer to the following for the typical physical property values by circulating fluid.

$$Q = \frac{m \times C \times (T_0 - T_t)}{\Delta t} = \frac{\rho \times V \times C \times \Delta T}{\Delta t}$$

$$= \frac{1 \times 300 \times 4.186 \times 10^3 \times 12}{900} = 16744 \text{ [J/s]} \approx 16.7 \text{ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

**16.7 [kW] x 1.2 = 20 [kW]**




### Example of conventional units (Reference)

Heat quantity by cooled substance (per unit time) **Q**: Unknown [cal/h] → [W]
Cooled substance : Water
Cooled substance weight **m** : (= ρ x **V**) [kgf]
Cooled substance weight volume ratio γ : 1 [kgf/L]
Cooled substance total volume **V** : 300 [L]
Cooled substance specific heat **C** : 1.0 x $10^3$ [cal/(kgf·°C)]
Cooled substance temperature when cooling begins $T_0$ : 32 [°C]
Cooled substance temperature after t hour $T_t$ : 20 [°C]
Cooling temperature difference $\Delta T$ : 12 [°C] (= $T_0 - T_t$)
Cooling time $\Delta t$ : 15 [min]
Conversion factor: hours to minutes : 60 [min/h]
Conversion factor: kcal/h to kW : 860 [(cal/h)/W]

$$Q = \frac{m \times C \times (T_0 - T_t)}{\Delta t \times 860} = \frac{\gamma \times V \times 60 \times C \times \Delta T}{\Delta t \times 860}$$

$$= \frac{1 \times 300 \times 60 \times 1.0 \times 10^3 \times 12}{15 \times 860}$$

$$\approx 16744 \text{ [W]} = 16.7 \text{ [kW]}$$

Cooling capacity = Considering a safety factor of 20%,

**16.7 [kW] x 1.2 = 20 [kW]**

∗ This is the calculated value by changing the fluid temperature only. Thus, it varies substantially depending on the water bath or piping shape.

## 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 catalog uses the following values for density and specific heat in calculating the required cooling capacity.**

Density ρ: 1 [kg/L] (or, using conventional units, weight volume ratio γ = 1 [kgf/L] )
Specific heat **C**: 4.19 x $10^3$ [J/(kg·K)] (or, using conventional units, 1 x $10^3$ [cal/(kgf·°C)])

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

**Water**

| Physical property value / Temperature | Density ρ [kg/L] | Specific heat C [J/(kg·K)] | Conventional units | |
|---|---|---|---|---|
| | | | Weight volume ratio γ [kgf/L] | Specific heat C [cal/(kgf·°C)] |
| **5°C** | 1.00 | 4.2 x $10^3$ | 1.00 | 1 x $10^3$ |
| **10°C** | 1.00 | 4.19 x $10^3$ | 1.00 | 1 x $10^3$ |
| **15°C** | 1.00 | 4.19 x $10^3$ | 1.00 | 1 x $10^3$ |
| **20°C** | 1.00 | 4.18 x $10^3$ | 1.00 | 1 x $10^3$ |
| **25°C** | 1.00 | 4.18 x $10^3$ | 1.00 | 1 x $10^3$ |
| **30°C** | 1.00 | 4.18 x $10^3$ | 1.00 | 1 x $10^3$ |
| **35°C** | 0.99 | 4.18 x $10^3$ | 0.99 | 1 x $10^3$ |
| **40°C** | 0.99 | 4.18 x $10^3$ | 0.99 | 1 x $10^3$ |

**15% Ethylene Glycol Aqueous Solution**

| Physical property value / Temperature | Density ρ [kg/L] | Specific heat C [J/(kg·K)] | Conventional units | |
|---|---|---|---|---|
| | | | Weight volume ratio γ [kgf/L] | Specific heat C [cal/(kgf·°C)] |
| **5°C** | 1.02 | 3.91 x $10^3$ | 1.02 | 0.93 x $10^3$ |
| **10°C** | 1.02 | 3.91 x $10^3$ | 1.02 | 0.93 x $10^3$ |
| **15°C** | 1.02 | 3.91 x $10^3$ | 1.02 | 0.93 x $10^3$ |
| **20°C** | 1.01 | 3.91 x $10^3$ | 1.01 | 0.93 x $10^3$ |
| **25°C** | 1.01 | 3.91 x $10^3$ | 1.01 | 0.93 x $10^3$ |
| **30°C** | 1.01 | 3.91 x $10^3$ | 1.01 | 0.94 x $10^3$ |
| **35°C** | 1.01 | 3.91 x $10^3$ | 1.01 | 0.94 x $10^3$ |
| **40°C** | 1.01 | 3.92 x $10^3$ | 1.01 | 0.94 x $10^3$ |

∗ Shown above are reference values.

# *HRSF150/200 Series*
# Specific Product Precautions 1

**Be sure to read this before handling the products. Refer to the back cover for safety instructions. For temperature control equipment precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website.**

## Design

## ⚠ Warning

**1. This catalog shows the specifications of a single unit.**

1) Check the specifications of the single unit (contents of this catalog) and thoroughly consider the adaptability between the user's system and this unit.
2) Although a 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 conditions. Also, the user is requested to carry out a 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 circulating fluid and facility water contact parts.**

Using corrosive materials such as aluminum 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 pipings, consider the suitability for temperature.

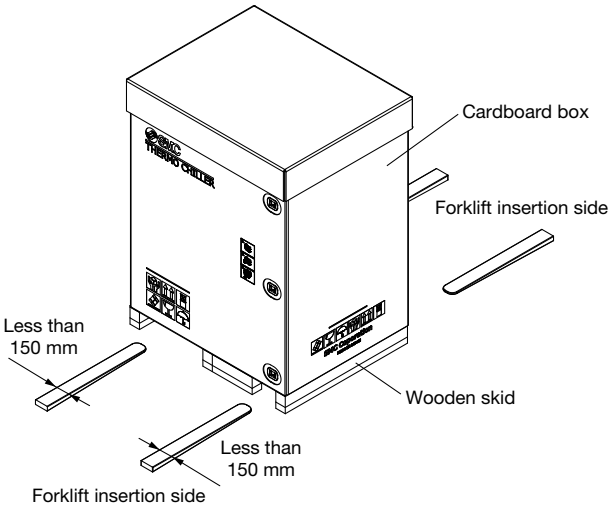
**5. This product uses a slightly flammable refrigerant (R454C). Avoid using this product in proximity to open flames.**
**Ensure compliance with local laws and regulations regarding the use and application of this product.**

## Transportation / Carriage / Movement

## ⚠ Warning

**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.




**<When Packaged>**

| Model | Weight [kg] | Dimensions [mm] |
|---|---|---|
| **HRSF150-A□-40** | 271 | Height 1585 x Width 1185 x Depth 955 |
| **HRSF200-A□-40** | | |
| **HRSF150-W□-40** | 230 | Height 1485 x Width 925 x Depth 955 |
| **HRSF200-W□-40** | | |
| **HRSF150-A□-40-A** | 289 | Height 1710 x Width 1185 x Depth 955 |
| **HRSF200-A□-40-A** | | |
| **HRSF150-W□-40-A** | 248 | Height 1610 x Width 925 x Depth 955 |
| **HRSF200-W□-40-A** | | |

**2. Transporting with 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.

# *HRSF150/200 Series*
# Specific Product Precautions 2

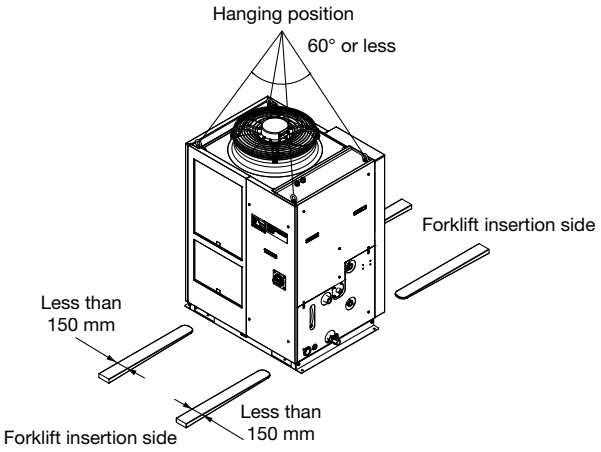
**Be sure to read this before handling the products. Refer to the back cover for safety instructions. For temperature control equipment precautions, refer to the "Handling Precautions for SMC Products" and the "Operation Manual" on the SMC website.**

**Transportation / Carriage / Movement**

## ⚠ Warning

**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 center of gravity and hold it within 60°.




**(When using option A/With caster adjuster-foot and optional accessories/Caster adjuster-foot kit HRS-KS002)**

**4. Transporting with casters**

1) This product is heavy and should be moved by at least two people.
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.

**5. This product cannot be transported by air as this product uses a slightly flammable refrigerant (R454C).**

## ⚠ Caution

**If this product is to be transported after delivery, please use the original packaging the product was delivered in. If other packaging is to be used, carefully package the product so as to prevent the product from incurring any damage during transport.**

### ■ Refrigerant with GWP reference

| Refrigerant | Global Warming Potential (GWP) | | |
|---|---|---|---|
| | Regulation (EU) 2024/573, AIM Act 40 CFR Part 84 | Fluorocarbon Emissions Control Act (Japan) | |
| | | GWP value labeled on products | GWP value to be used for reporting the calculated amount of leakage |
| R134a | 1,430 | 1,430 | 1,300 |
| R404A | 3,922 | 3,920 | 3,940 |
| R407C | 1,774 | 1,770 | 1,620 |
| R410A | 2,088 | 2,090 | 1,920 |
| R448A | 1,386 | 1,390 | 1,270 |
| R454C | 146 | 145 | 146 |

*1 This product is hermetically sealed and contains fluorinated greenhouse gases.
*2 For refrigerant type used in this product, refer to the product specifications.

## Temperature Control Equipment

# ⚠ 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), and other safety regulations.

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

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

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

## ⚠ Warning

**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 catalog 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. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not allowed.**

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, combustion equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

## ⚠ Caution

**SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries.**
**Use in non-manufacturing industries is not allowed.**

Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

## 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.

## 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. Period**
The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.

**2. Scope**
For any failure reported within the warranty period which is clearly our responsibility, replacement parts will be provided. In that case, removed parts shall become the property of SMC.
This guarantee applies only to our product independently, and not to any other damage incurred due to the failure of the product.

**3. Content**
The following situations are out of scope of this warranty.
1. The product was incorrectly installed or connected with other equipment.
2. The product was modified or altered in construction.
3. The failure was a secondary failure of the product caused by the failure of equipment connected to the product.
4. The failure was caused by a natural disaster such as an earthquake, typhoon, or flood, or by an accident or fire.
5. The failure was caused by operation different from that shown in the Operation Manual or outside of the specifications.
6. The checks and maintenance specified (daily checks and regular checks) were not performed.
7. The failure was caused by the use of circulating fluid or facility water other than those specified.
8. The failure occurred naturally over time (such as discoloration of a painted or plated face).
9. The failure does not affect the functioning of the product (such as new sounds, noises and vibrations).
10. The failure was due to the "Installation Environment" specified in the Operation Manual.

**4. Disclaimer**
1. Expenses for daily and regular checks
2. Expenses for repairs performed by other companies
3. Expenses for transfer, installation and removal of the product
4. Expenses for replacement of parts other than those in this product, or for the supply of liquids
5. Inconvenience and loss due to product failure (such as telephone bills, compensation for workplace closure, and commercial losses)

For warranted repair, please contact the supplier you purchased this product from.

| ⚠ Safety Instructions | Be sure to read the "Handling Precautions for SMC Products" (M-E03-3) and "Operation Manual" before use. |
|---|---|

**SMC Corporation**