HITACHI
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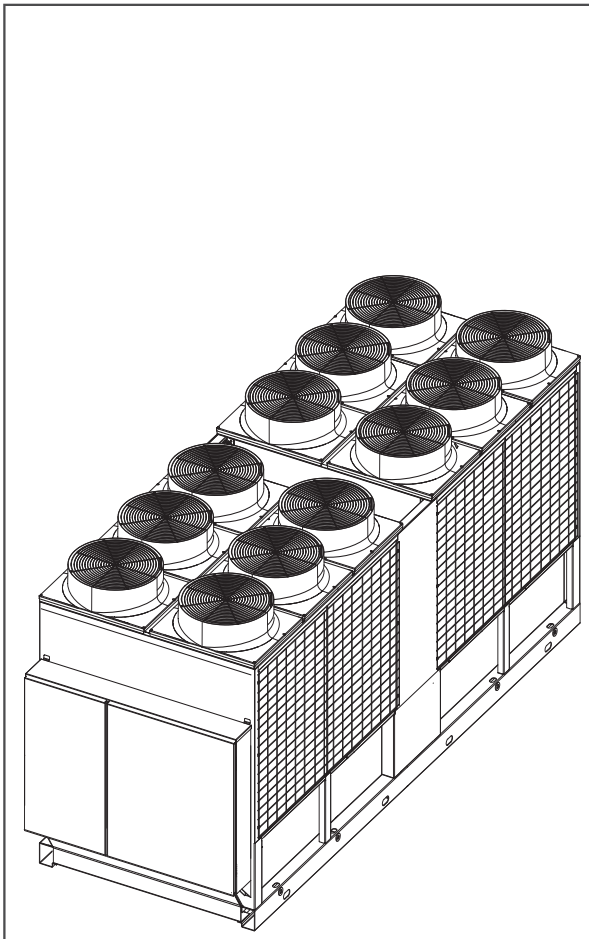
# SAMURAI SERIES
# AIR COOLED AND AIR TO WATER HEAT PUMP WATER CHILLERS
# -SCREW TYPE-



## Technical Catalogue

RCU2E(40-400)AG2
RHU2E(40-240)AG2

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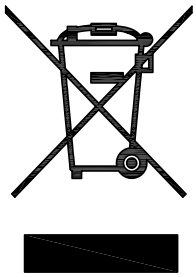
Specifications in this manual are subject to change without notice in order that HITACHI may bring the latest innovations to their customers.

Whilst every effort is made to ensure that all specifications are correct, printing errors are beyond Hitachi's control; Hitachi cannot be held responsible for these errors.



***ATTENTION:***

*This product and the batteries contained on it shall not be mixed with general house waste at the end of its life. They shall be retired according to the appropriated local or national regulations in a environmentally correct way in order to be treated at a specialized treatment facility for re-use, recycling and recovery. If a chemical symbol is printed beneath the symbol, it means that the battery contains heavy metal above a certain concentration.*

*If a chemical symbol is printed beneath the symbol, it means that the battery contains heavy metal above a certain concentration. Possible chemical symbols: - Pb: Lead (>0,004%).*

*Following Regulation EC Nº 842/2006 on Certain Fluorinated Greenhouse gases, the total amount of refrigerant charged in the unit is indicated on the specification label.*

*Do not vent R410A/R407C into the atmosphere: R410A & R407C are fluorinated greenhouse gases covered by the Kyoto protocol global warming potential (GWP) R410A/R407C: = 1975/1652.5.*

THIS EQUIPMENT CONTAINS FLUORINATED GREENHOUSE GASES COVERED BY THE KYOTO PROTOCOL

DO NOT VENT R407C INTO THE ATMOSPHERE

GWP: 1652.5

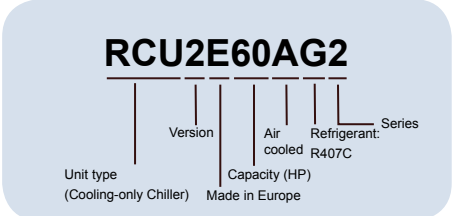
Contents

## ◆ Unit code list

NOTE:

| | |
|---|---|
| MODEL CODIFICATION | Please check by model name your air cooled type, its abbreviation and reference number in this technical catalogue. |

| RCU2E-AG2 SERIES | | | |
|---|---|---|---|
| ❄ 3~ | | | |
| Unit | Code | Unit | Code |
| RCU2E40AG2 | 8E041075 | RCU2E160AG2 | 8E161075 |
| RCU2E50AG2 | 8E051075 | RCU2E180AG2 | 8E181075 |
| RCU2E60AG2 | 8E061075 | RCU2E210AG2 | 8E211075 |
| RCU2E70AG2 | 8E071075 | RCU2E240AG2 | 8E241075 |
| RCU2E80AG2 | 8E081075 | RCU2E280AG2 | 8E281075 |
| RCU2E100AG2 | 8E101075 | RCU2E320AG2 | 8E321075 |
| RCU2E120AG2 | 8E121075 | RCU2E350AG2 | 8E351075 |
| RCU2E140AG2 | 8E141075 | RCU2E400AG2 | 8E401075 |

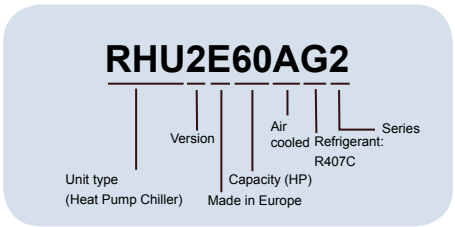
## MODEL CODIFICATION

Please check by model name your air-to-water heat pump model type, its abbreviation and reference number in this technical catalogue.

### RHU2E-AG2 SERIES

3~

| Unit | Code | Unit | Code |
|---|---|---|---|
| RHU2E40AG2 | 9E041075 | RHU2E120AG2 | 9E121075 |
| RHU2E50AG2 | 9E051075 | RHU2E140AG2 | 9E141075 |
| RHU2E60AG2 | 9E061075 | RHU2E160AG2 | 9E161075 |
| RHU2E70AG2 | 9E071075 | RHU2E180AG2 | 9E181075 |
| RHU2E80AG2 | 9E081075 | RHU2E210AG2 | 9E211075 |
| RHU2E100AG2 | 9E101075 | RHU2E240AG2 | 9E241075 |

# 1. Important Notice



- HITACHI pursues a policy of continuing improvement in design and performance of Products. The right is therefore reserved to vary specifications without notice.
- HITACHI cannot anticipate every possible circumstance that might involve a potential hazard.
- No part of this manual may be reproduced without written permission.
- Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Definitions for identifying hazard levels are provided below with their respective signal words.

***DANGER:***
*Immediate hazards which WILL result in severe personal injury or death.*

***WARNING:***
*Hazards or unsafe practices which COULD result in severe personal injury or death.*

***CAUTION:***
*Hazards or unsafe practices which COULD result in minor personal injury or product or property damage.*

***NOTE:***
*Useful information for operation and/or maintenance.*

- If you have any questions, contact your contractor or dealer of HITACHI.
- This instruction gives a common description and information for this water Chiller which you operate as well as for other models.
- This water Chiller has been designed for the following temperatures. Operate the unit within this range:

| Working Range for RCU2E-AG2 ºC | | |
|---|---|---|
| | Maximum | Minimum |
| Ambient temperature | 46 | -15 |
| Chilled Water Outlet Temperature | 15 | 5 (-10)* |

(*) In case of low water outlet temperature option

| Working Range for RHU2E-AG2 (Cooling Operation) ºC | | |
|---|---|---|
| | Maximum | Minimum |
| Ambient Temperature | 46 | -15 |
| Chilled Water Outlet Temperature | 15 | 5 (-10)* |

(*) In case of low water outlet temperature option

| Working Range for RHU2E-AG2 (Heating Operation) ºC | | |
|---|---|---|
| | Maximum | Minimum |
| Ambient Temperature | 21 (DB) (35)*<br>15.5 (WB) | -9.5 (DB)<br>-10 (WB) |
| Hot Water Outlet Temperature | 55 | 35 |

(*) In case of Heating Operation in high ambient temperature

- These instructions should be considered as a permanent part of the water Chiller equipment and should remain with the unit.

# 2. Features and Benefits

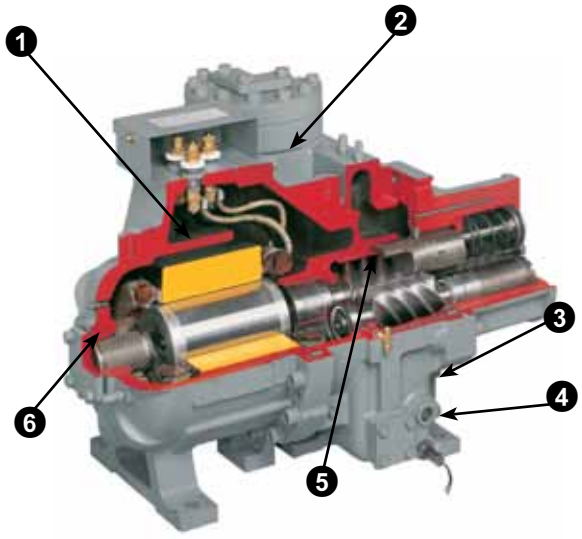


## Contents

## 2.1. Unit picture


**HITACHI** is a world leader in technology and with continual research and product development, which offers screw type **Air Cooled Water Chillers** from 112 KW to 1030KW and **Air-to-Water Heat Pump Water Chillers** from 106 kW to 585 kW (in Cooling mode) and from 110 kW to 555 kW (in Heating mode).

## 2.2. Compressor

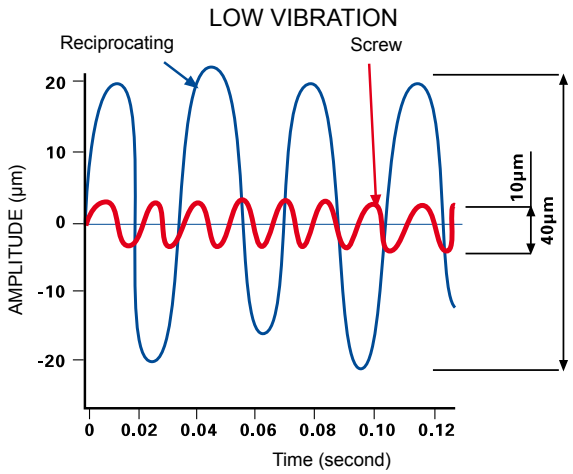



◆ **THE SAMURAI RANGE INCORPORATES THE LATEST DEVELOPMENT OF HITACHI´S SCREW COMPRESSOR TECHNOLOGY FOR THE NEW MILLENNIUM.**

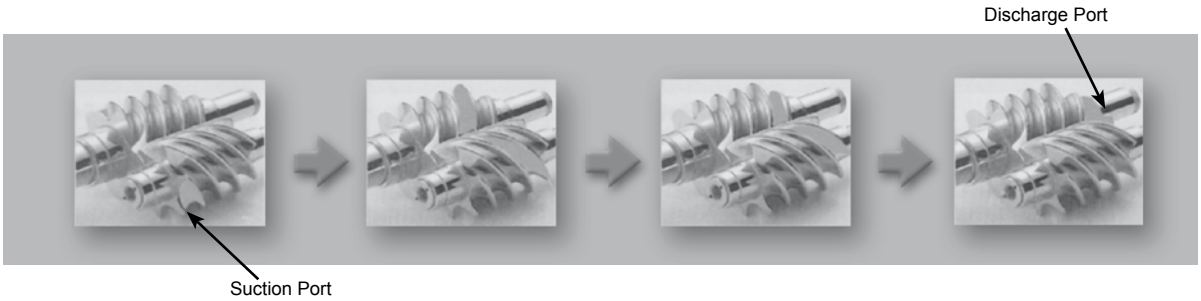
1. Highly Reliable HITACHI Two-Pole Motor
2. Built-in Oil Separator (Cyclone oil separator)
3. Oil Sight Glass
4. Oil Heater
5. High precision Twin Screw Rotors
6. Suction Filter

◆ **Twin screw compressor**

By having so few moving parts, it has become highly reliable with very low noise level and low vibration



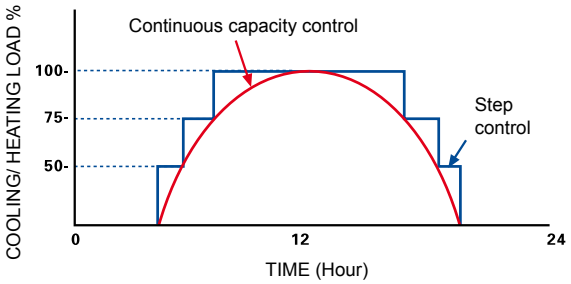

◆ **Principle of compression**




◆ **Continuous capacity control**

HITACHI´s Continuous Capacity Control system uses advanced electronic controls to position the infinitely variable slide valve within each compressor.

This modulation allows exact load control and accurate chilled water temperature without the need for expensive inverters.

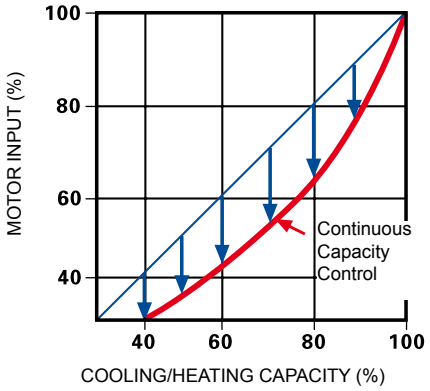


◆ **Energy Saving**

Thanks to Continuous Capacity Control, 15~20% energy saving is possible compared with current step control systems due to the following:

- The cooling/heating load can be more closely matched
- Continuous Capacity Control takes advantage of high efficiency part load performance.
- Frequent compressor starts and stops are eliminated.

PART LOAD PERFORMANCE




## 2.3. Control

◆ **Many Functions**

Newly developed Control Board has many functions shown below as standard.

- Current limiter
- Forced compressor load control
- 2 different temperatures setting
- Various fan control mode
- Memory data in alarm
- Automatic restart after power failure
- Output signal for free cooling application etc...

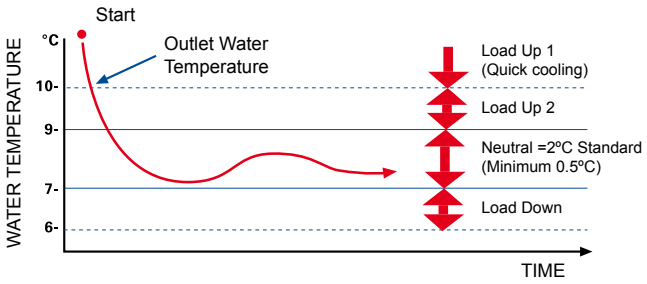
◆ **Precise Temperature Control**

Combination of “Continuous Capacity Control Compressor” and “HITACHI´s unique electronic controls” enable the Chiller to control outlet water temperature precisely, independent of cooling/heating load.

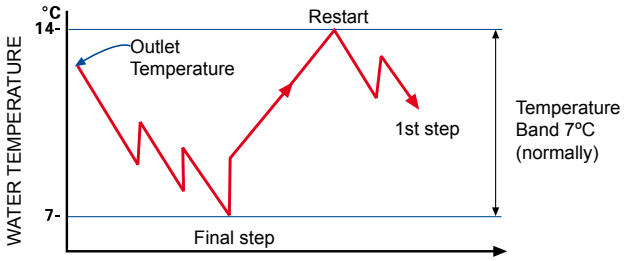
This control benefits not only air-conditioning but also industrial process use.

◆ **Example in cooling mode**

CONTINUOUS CAPACITY CONTROL



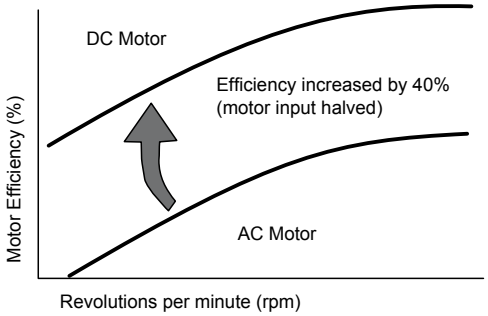

CONVENTIONAL STEP CONTROL




## 2.4. Fan motor

◆ **DC Fan Motor with Outstanding Efficiency**

The DC fan motor greatly improves efficiency compared to conventional products using an AC motor. Furthermore, air blasts are reduced by controlling the rotation speed of the fan.




**PWM (pulse width modulation) concept of speed control**

The switching element (a power MOSFET) switches back and forth at a frequency of several tens of kHz. This controls the ON//OFF duty rate per cycle and thus changes the voltage applied to the fan motor to control the rotation speed.

◆ **Low Sound**

Hitachi uses high technology to achieve the lowest sound. The new two bladed propeller, rather than four bladed, achieves a reduction of noise level, increases air flow volume, and at the same time provides an important reduction of motor power input

## 2.5. Electronic expansion valve

These units are equipped with an electronic expansion valve to provide sophisticated control under any temperature condition.

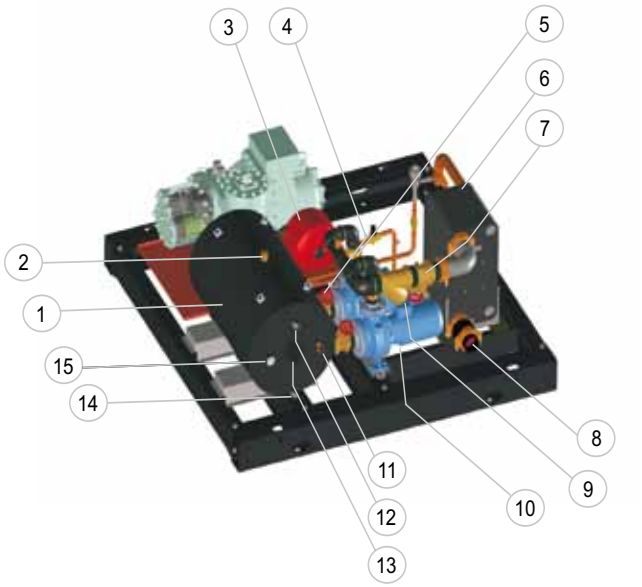
The electronic expansion valve provides reduced electrical power consumption compared to the classical system.

## 2.6. Hydrokit (option)

The Hydrokit option for RCU2E-AG2 and RHU2E-AG2 Chillers reduces the total installation time of the customer.

The chiller is equipped from the factory with the water pump, expansion vessel, safety valve, water flow regulation valve, and others. All the equipment is integrated inside the chiller without increasing chillers dimensions and saving total space installation.

The Hydrokit option is supplied with a heater to protect piping against freezing. Hitachi recommends the use of the option Water Cooler Heater when Hydrokit option is requested.




| Nr. | Name |
|---|---|
| 1 | Buffer Tank |
| 2 | Air Vent |
| 3 | Pressure Vessel |
| 4 | Stop Valve |
| 5 | Check Valve |
| 6 | Evaporator |
| 7 | Stop Valve |
| 8 | WATER OUTLET |
| 9 | Strainer |
| 10 | Pump |
| 11 | Safety Valve |
| 12 | Service Valve (Charge) |
| 13 | WATER INLET |
| 14 | Service Valve (Drain) |
| 15 | Pressure Gauge |

# 3. Operation Instructions

## Contents

## 3.1. Hitachi water chillers

- **To start the Unit.**
  1. Open the water inlet and outlet valves.
  2. After assuring that all control switches have been cut OFF, and the "LOCAL/REMOTE" switch on the printed circuit board is in the "LOCAL" position, turn ON the power switch.
  3. Confirm that phases R, S and T are correctly connected. The correct phase connection can be checked by a phase sequence indicator. If not correctly connected, the compressor does not start due to activation of a reversal phase protection device. Cut the main switch and interchange two of three terminals, R, S and T at the main power source terminals.
  4. Set the changeover switch the "Cool" or "Heat"
  5. Fully open the liquid line stop valves.
  6. Operate the chilled/hot water pump.
  7. Depress the "ON"(*) push button switch.
     (*)(Field-Supplied )
  8. Set the thermostat at the desired temperature

- **To stop the Unit**
  1. Depress the "OFF"(*) push button switch.
     (*)(Field–Supplied)
  2. Switch OFF the main power source when the unit is shut down for a long time period.

- **Pilot lamp**

  The red LED indicates the normal operation.
  When the orange LED is activated, any one of the safety devices may be functioning.
  Please contact your service assistant, if this condition is detected.

- **Daily checking**
  1. Check the power supply to ensure that it is proper.
  2. Check for abnormal sounds and vibrations.
  3. Check the unit amperage.
  4. Check the operating pressure.

- **Troubleshooting**
  - Unit Does Not Start
    1. Is the main switch ON?
    2. Is the main fuse OK?
    3. Is the chilled/hot water running?
    4. Are the thermostats calling for the cooling/heating operation?
  - Poor Cooling/Heating Operation
    1. Is there sufficient Air supplied to the air side heat exchanger?
    2. Is the setting temperature correct?
    3. Are the operating pressures normal?
    4. Is there sufficient water running through the water side heat exchanger?
  - Maintenance
    1. Remove any obstacles to the air side heat exchanger airflow, and clean the air side heat exchanger.
    2. Clean the unit with a cleaner.
    3. Clean the water side heat exchanger. (It is recommended that a specialist will be contacted for this kind of work.)

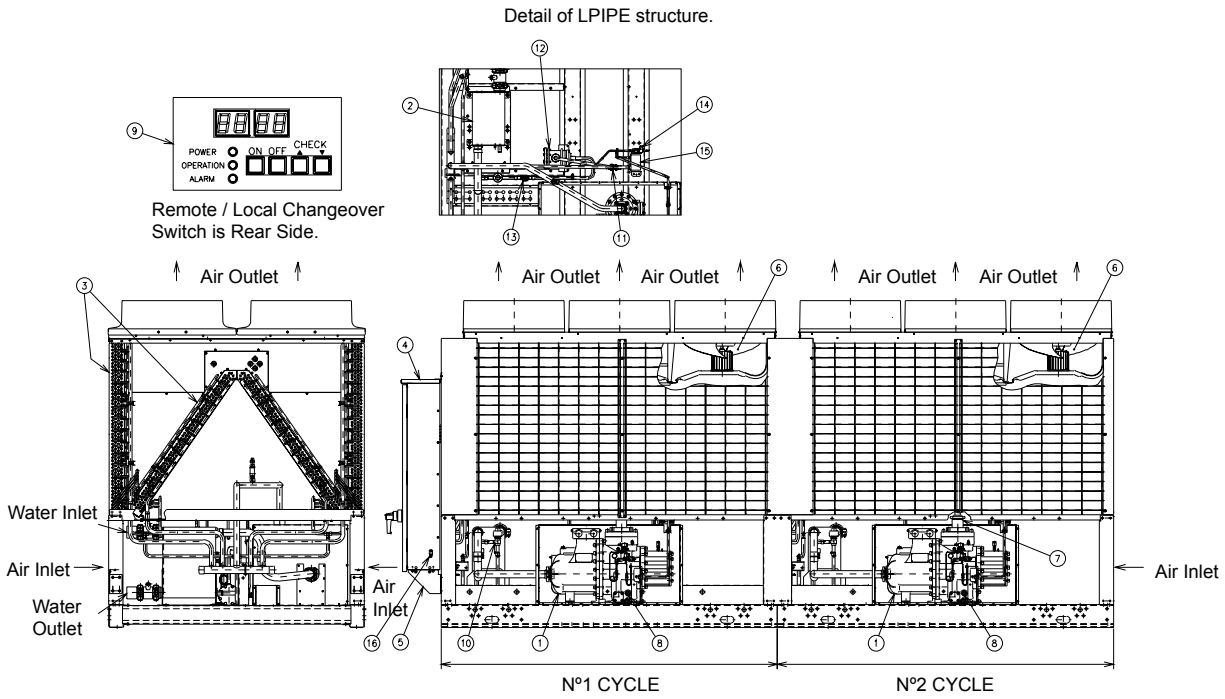
*DANGER*:
*Switch OFF main interruptor (M.I) for any work inside electrical box.*
*Keep electrical box cover closed 2 min. after switching power off (to discharge the capacitors).*

# 4. Components of Chiller

## Contents

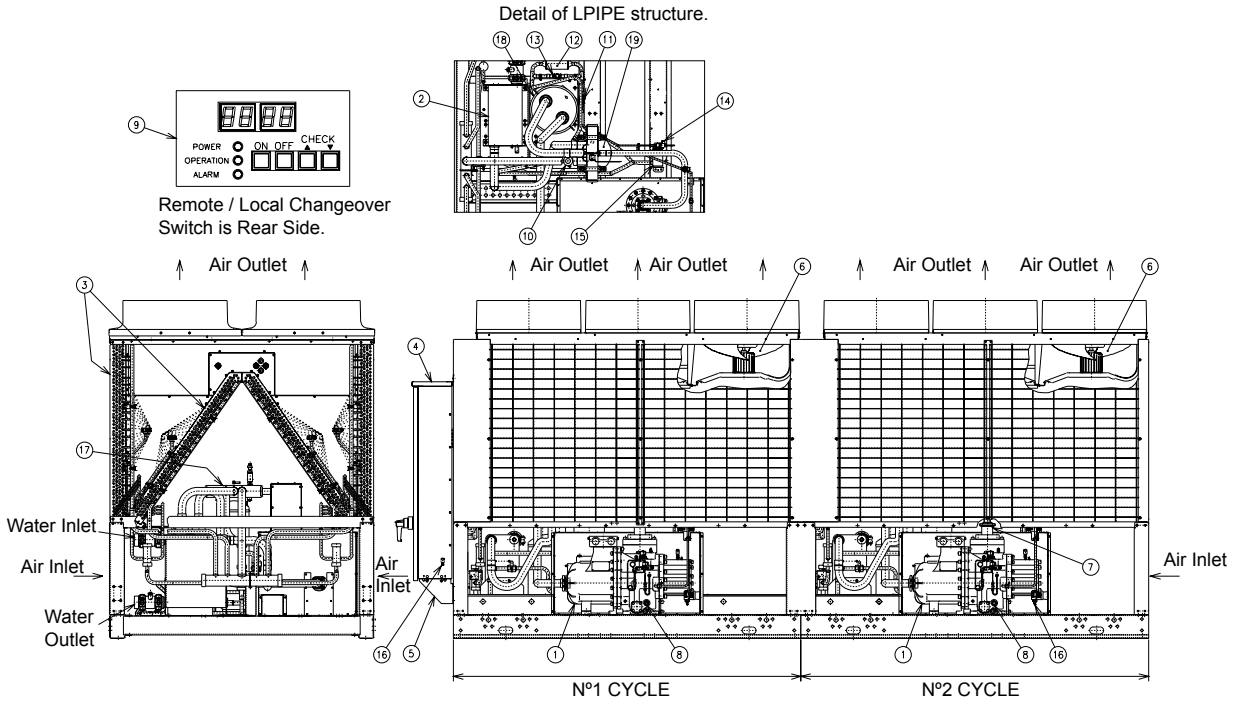
# 4.1. Structure drawing

◆ **HITACHI Air-Cooled Water Chiller (Example of 2 Compressors Chiller)**




| Nr. | Name | Nr. | Name |
|---|---|---|---|
| 1 | Compressor | 9 | Operation Switch |
| 2 | Water Cooler | 10 | Electronic Expansion Valve |
| 3 | Condenser | 11 | Liquid Line Stop Valve |
| 4 | Electrical Box | 12 | Filter Drier |
| 5 | Power Wiring Supply | 13 | Liquid Sight Glass |
| 6 | Fan | 14 | Solenoid Valve (only for 80, 160, 240, 320, 400 HP) |
| 7 | Check Valve | 15 | Economiser (only for 80, 160, 240, 320, 400 HP) |
| 8 | Oil Sight Glass | 16 | High Pressure Switch (inside electrical box) |

## ◆ HITACHI Air-to-Water heat pump Water Chiller (Example of 2 Compressors Chiller)




| Nr. | Name | Nr. | Name |
|---|---|---|---|
| 1 | Compressor | 11 | Liquid Line Stop Valve |
| 2 | Water Side Heat Exchanger | 12 | Biflow Drier |
| 3 | Air Side Heat Exchanger | 13 | Liquid Sight Glass |
| 4 | Electrical Box | 14 | Solenoid Valve (only for 80, 160, 240 HP) |
| 5 | Power Wiring Supply | 15 | Economiser (only for 80, 160, 240 HP) |
| 6 | Fan | 16 | High Pressure Switch (inside electrical box) |
| 7 | Check Valve | 17 | 4-Way Valve |
| 8 | Oil Sight Glass | 18 | Accumulator |
| 9 | Operation Switch | 19 | Liquid Tank |
| 10 | Electronic Expansion Valve | | |

# 5. Preparation Initial Check

## Contents

## 5.1. Initial check

- **Required Materials**

  Measure and Architectural Information Regarding Installation Location

- **Installation Location**

  Confirm that the final installation location is provided with convenient piping and wiring work. Strong water runoff should be avoided.

  This unit must be installed in a restricted area not accessible to the general public. Install the unit on a roof or in an area where people, except service engineer, can not touch the unit.

- **Installation Space**

  Check for obstacles which restrict condenser Air flow or hamper maintenance work in the space specified in Fig. 1.

- **Foundation**

  Check to ensure that the foundation is flat, level and sufficiently strong, taking into account the maximum foundation gradient (Fig. 2) and the unit weight balance. Confirm elevation provision for the unit on a solid base with an iron frame or concrete curbs shown in chapter 5.4.

  In order to obtain proper clearance beneath the unit for either rooftop or on the ground installation, where foundation bolts should be sunk into concrete. Additionally, for on the ground installation, provide a gravel or concrete space around the condenser Air intake in order to avoid airflow obstruction due to grass or other vegetation.

- **Unit**

  Check to ensure that the unit has been transported without damage. File a damage claim with the transportation companies if mishandling due to transportation company negligence is suspected.

- **Transportation**

  Secure the route to the final installation location by confirming the dimensions (Refer to the “General Data” in Chapter 13.1).

***DANGER***:
*If leakage is detected, stop the unit and contact the installer or service shop. Do not use a naked fire near the refrigerant gas. If a naked fire is utilised near the refrigerant gas, refrigerant is turned into a harmful phosgene compound.*

***WARNING:***
*This unit is operated with refrigerant R407C, which is non-flammable and non-poisonous. However, refrigerant itself is heavier than the atmosphere so that a floor is covered with refrigerant gas if refrigerant is leaked. Therefore, keep good ventilation to avoid choke during servicing.*

***CAUTION:***
*Check to ensure that valves are correctly opened. If not opened, serious damage will occur to the compressor due to an abnormal high pressure.*
*This unit controls air flow for condenser during low ambient temperature.*
*Due to this control, avoid the strong wind hits the unit directly. In such a case, put buffer plate around the unit.*

## 5.2. Placing the unit



◆ **Tools and Instruments**

Pincers, Wrenches, Facilities to Transport and Place The Unit.

◆ **Transportation**

Transport the unit as close to the final installation location as practical before unpacking is accomplished. Provide adequate facilities to place the unit on the foundation, with sufficient consideration given to those individuals performing the installation.

◆ **Unpacking**

Follow the instructions marked on the packing.

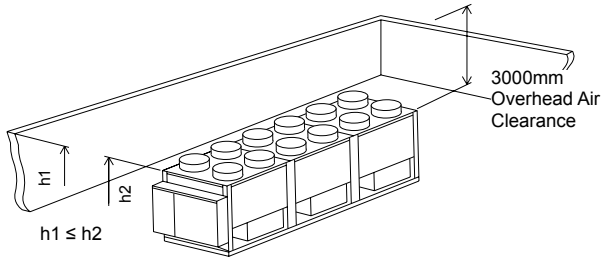
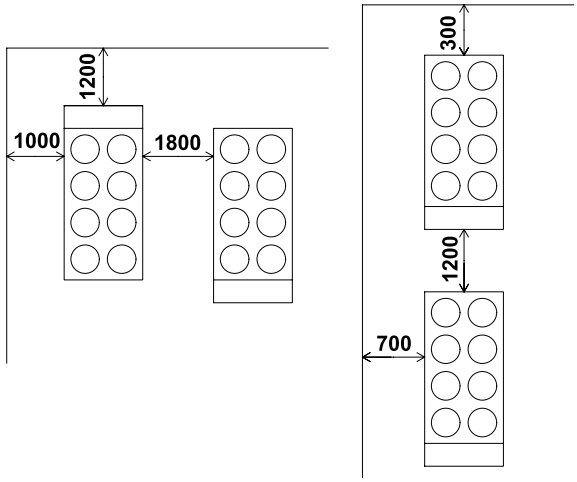



Fig.1. Operation Space

Minimum distances in order to ensure a correct air circulation




*NOTE:*

*The height of the wall shall be smaller than that of the unit cabinet.*
*When the unit is installed at a location where the unit is encircled with walls and obstruction of free Air circulation is suspected, construction with HITACHI regarding the operation space is recommended.*

◆ **Maximum Foundation Gradient**

The unit should be installed in an upright position within the gradient shown in Fig.2.

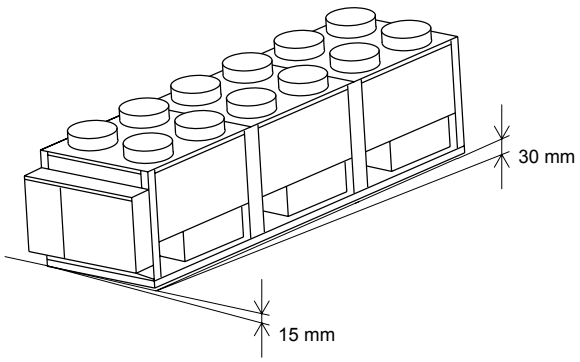



Fig.2. Maximum Foundation Gradient

## 5.3. Gravity centre

### ◆ Air-Cooled Water Chiller (Standard version)

Centre of Gravity

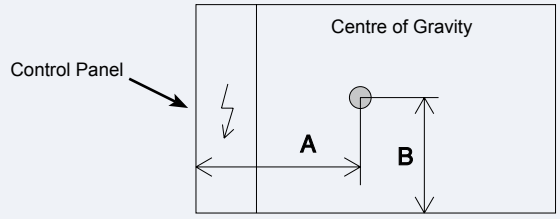
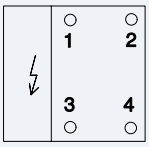
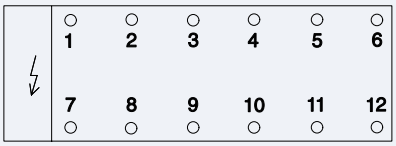



Fig.3. Centre of Gravity

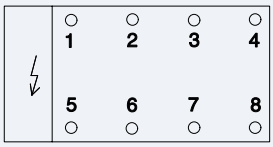
RCU2E 40, 50, 60, 70, 80AG2



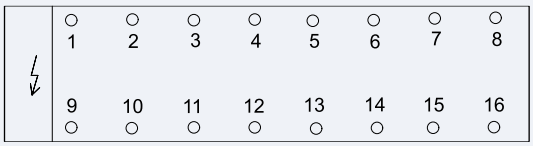

RCU2E 180, 210, 240AG2



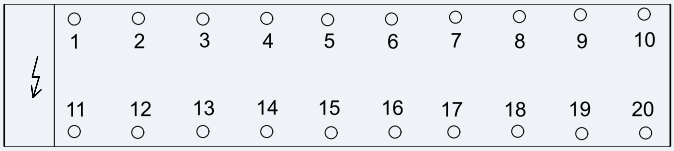

RCU2E 100, 120, 140, 160AG2




RCU2E 280, 320AG2




RCU2E 350, 400AG2




| Model | RCU2E–AG2 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 160 | 180 | 210 | 240 | 280 | 320 | 350 | 400 |
| Location | Weight Distribution (kg) | | | | | | | | | | | | | | | |
| 1 | 297 | 311 | 327 | 367 | 381 | 297 | 319 | 361 | 367 | 315 | 354 | 372 | 354 | 372 | 354 | 369 |
| 2 | 297 | 311 | 327 | 367 | 381 | 297 | 319 | 361 | 367 | 315 | 354 | 372 | 354 | 372 | 354 | 369 |
| 3 | 423 | 432 | 460 | 521 | 536 | 297 | 319 | 361 | 367 | 315 | 354 | 372 | 354 | 372 | 354 | 369 |
| 4 | 423 | 432 | 460 | 521 | 536 | 297 | 319 | 361 | 367 | 315 | 354 | 372 | 354 | 372 | 354 | 369 |
| 5 | | | | | | 418 | 439 | 502 | 528 | 315 | 354 | 372 | 354 | 372 | 354 | 369 |
| 6 | | | | | | 418 | 439 | 502 | 528 | 315 | 354 | 372 | 354 | 372 | 354 | 369 |
| 7 | | | | | | 418 | 439 | 502 | 528 | 434 | 498 | 511 | 354 | 372 | 354 | 369 |
| 8 | | | | | | 418 | 439 | 502 | 528 | 434 | 498 | 511 | 354 | 372 | 354 | 369 |
| 9 | | | | | | | | | | 434 | 498 | 511 | 497 | 372 | 354 | 369 |
| 10 | | | | | | | | | | 434 | 498 | 511 | 497 | 511 | 354 | 369 |
| 11 | | | | | | | | | | 434 | 498 | 511 | 497 | 511 | 498 | 513 |
| 12 | | | | | | | | | | 434 | 498 | 511 | 497 | 511 | 498 | 513 |
| 13 | | | | | | | | | | | | | 497 | 511 | 498 | 513 |
| 14 | | | | | | | | | | | | | 497 | 511 | 498 | 513 |
| 15 | | | | | | | | | | | | | 497 | 511 | 498 | 513 |
| 16 | | | | | | | | | | | | | 497 | 511 | 498 | 513 |
| 17 | | | | | | | | | | | | | | 511 | 498 | 513 |
| 18 | | | | | | | | | | | | | | | 498 | 513 |
| 19 | | | | | | | | | | | | | | | 498 | 513 |
| 20 | | | | | | | | | | | | | | | 498 | 513 |
| Operating Weight | | | | | | | | | | | | | | | | |
| (Kg) | 1440 | 1485 | 1575 | 1775 | 1835 | 2860 | 3030 | 3450 | 3580 | 4495 | 5115 | 5295 | 6810 | 7060 | 8525 | 8825 |
| Location of Centre of Gravity (mm) | | | | | | | | | | | | | | | | |
| Dimension A | 1180 | 1175 | 1180 | 1360 | 1370 | 2100 | 2005 | 2480 | 2490 | 2930 | 3700 | 3710 | 4890 | 4905 | 6110 | 6125 |
| Dimension B | 785 | 795 | 790 | 785 | 790 | 790 | 800 | 795 | 780 | 800 | 790 | 800 | 790 | 800 | 790 | 795 |

## ◆ Air-to-Water heat pump Water Chiller (Standard version)

Centre of Gravity

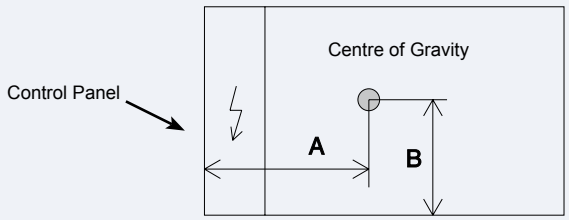
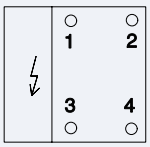
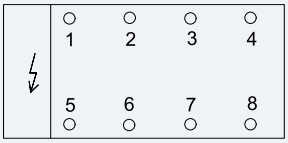



Fig.4. Centre of Gravity

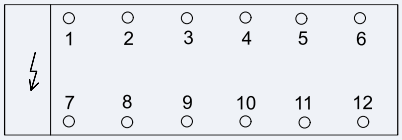
RHU2E 40, 50, 60, 70, 80AG2




RHU2E 100,120,140, 160AG2



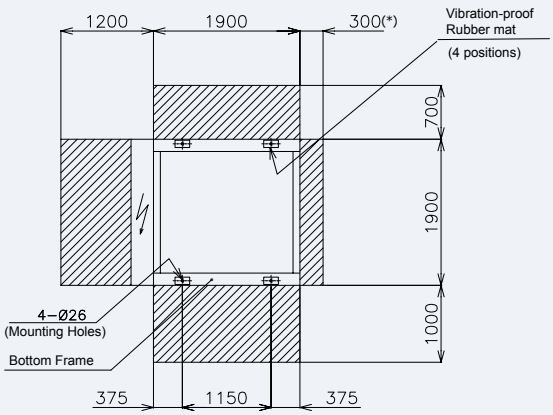

RHU2E 180, 210, 240AG2



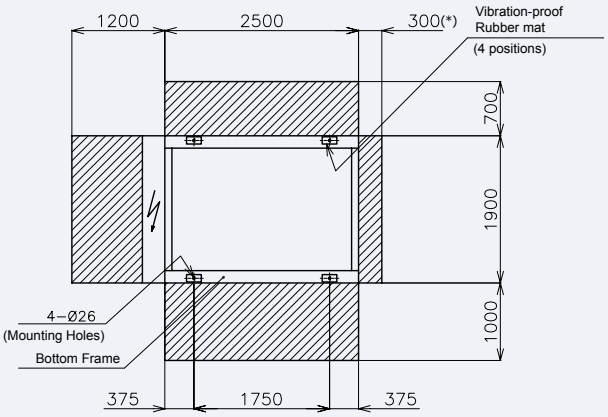

| Model | RHU2E–AG2 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 160 | 180 | 210 | 240 |
| Location | Weight Distribution (kg) | | | | | | | | | | | |
| 1 | 336 | 350 | 364 | 406 | 424 | 331 | 356 | 399 | 413 | 349 | 394 | 412 |
| 2 | 336 | 350 | 364 | 406 | 424 | 331 | 356 | 399 | 413 | 349 | 394 | 412 |
| 3 | 447 | 460 | 484 | 546 | 564 | 331 | 356 | 399 | 413 | 349 | 394 | 412 |
| 4 | 447 | 460 | 484 | 546 | 564 | 331 | 356 | 399 | 413 | 349 | 394 | 412 |
| 5 | | | | | | 440 | 468 | 531 | 544 | 349 | 394 | 412 |
| 6 | | | | | | 440 | 468 | 531 | 544 | 349 | 394 | 412 |
| 7 | | | | | | 440 | 468 | 531 | 544 | 459 | 525 | 542 |
| 8 | | | | | | 440 | 468 | 531 | 544 | 459 | 525 | 542 |
| 9 | | | | | | | | | | 459 | 525 | 542 |
| 10 | | | | | | | | | | 459 | 525 | 542 |
| 11 | | | | | | | | | | 459 | 525 | 542 |
| 12 | | | | | | | | | | 459 | 525 | 542 |
| Operating Weight | | | | | | | | | | | | |
| (Kg) | 1565 | 1620 | 1695 | 1905 | 1975 | 3085 | 3295 | 3720 | 3830 | 4850 | 5515 | 5725 |
| Location of Centre of Gravity (mm) | | | | | | | | | | | | |
| Dimension A | 1170 | 1165 | 1170 | 1340 | 1350 | 2095 | 2005 | 2470 | 2480 | 2930 | 3690 | 3700 |
| Dimension B | 815 | 820 | 815 | 810 | 815 | 815 | 820 | 815 | 820 | 820 | 815 | 820 |

## 5.4. Service space and foundation

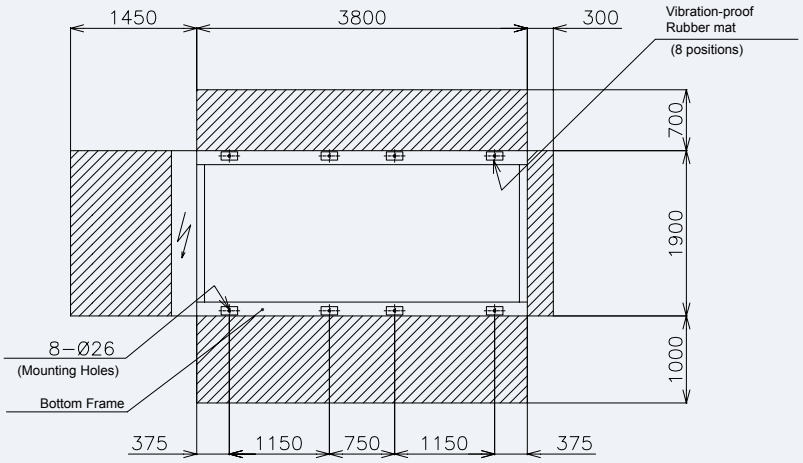
R(C/H)U2E 40, 50, 60 AG2



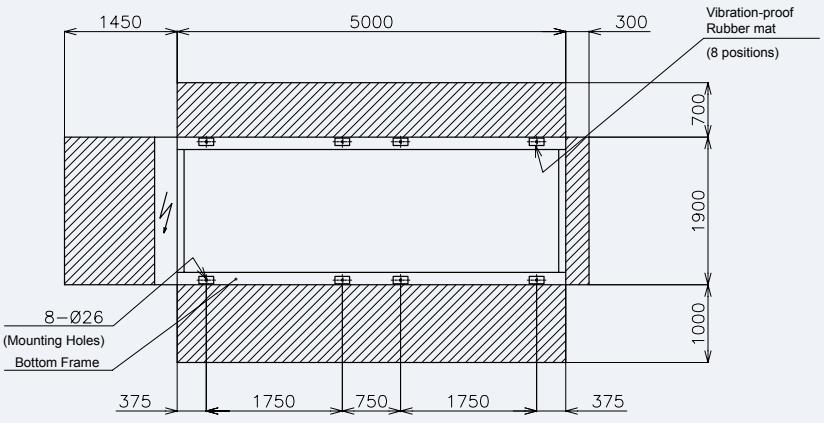

R(C/H)U2E 70, 80 AG2




R(C/H)U2E 100, 120 AG2

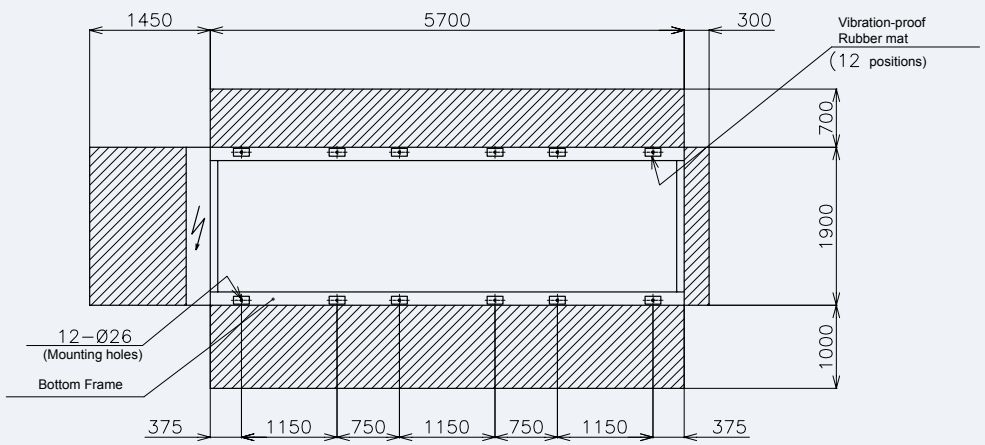



R(C/H)U2E 140, 160 AG2

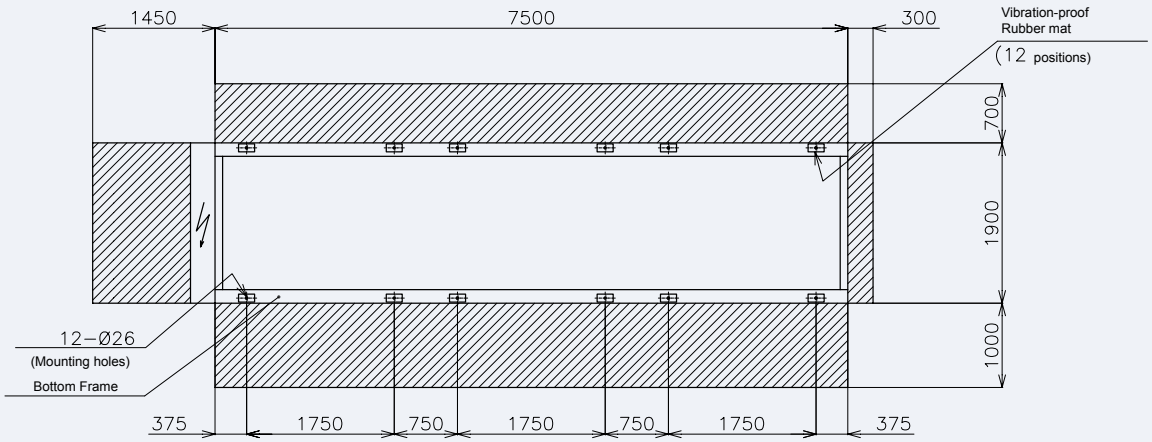



*(*) Installing Hydrokit option with Buffer Tank this measure should be changed from 300 to 800.*

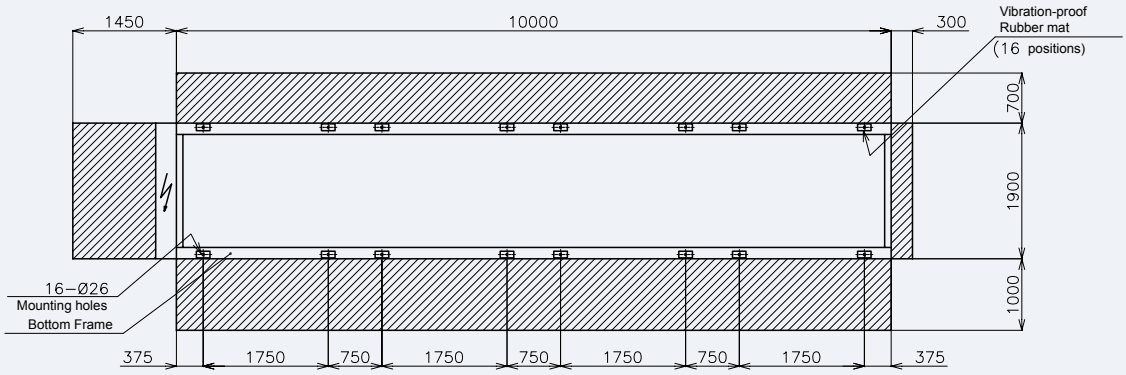
## R(C/H)U2E 180 AG2




## R(C/H)U2E 210, 240 AG2

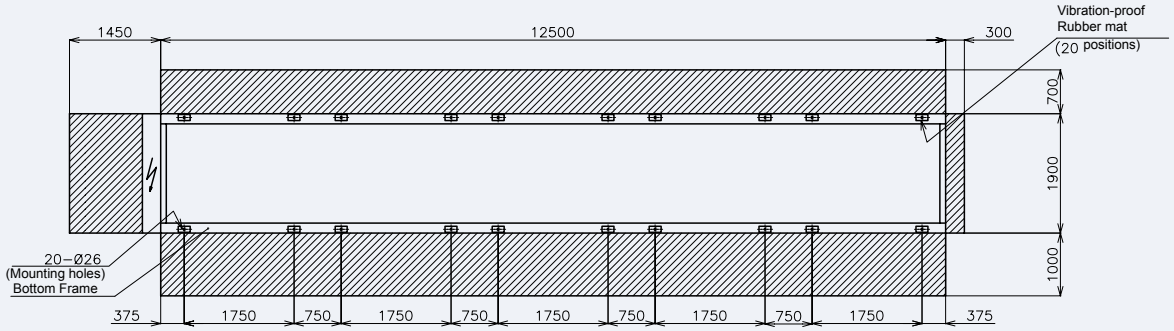



## RCU2E 280,320 AG2

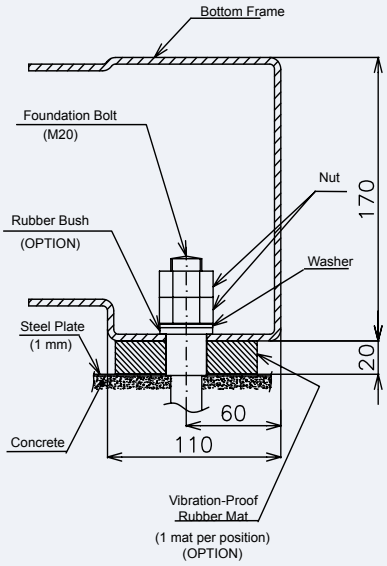



5

## RCU2E 350, 400 AG2




## DETAIL OF FOUNDATION



## 5.5. Transportation

### 5.5.1. Transportation by Rigging

Hook wire cables and apply field-supplied spreader bars on the top of the unit (see figure below) to prevent the unit panels from damage due to cable scratches. The unit should remain in an upright position even during rigging. The wire cable to rig the unit shall be three times stronger than the unit weight. Check to ensure that the rigging bolts are tightly fixed to the unit. The rigging angle shall be less than 60° as shown. The weight of the unit is indicated on the unit label.

Rigging shall be performed by the instruction drawing attached to the unit.

(Here the example of RCU2E180AG2 is shown).

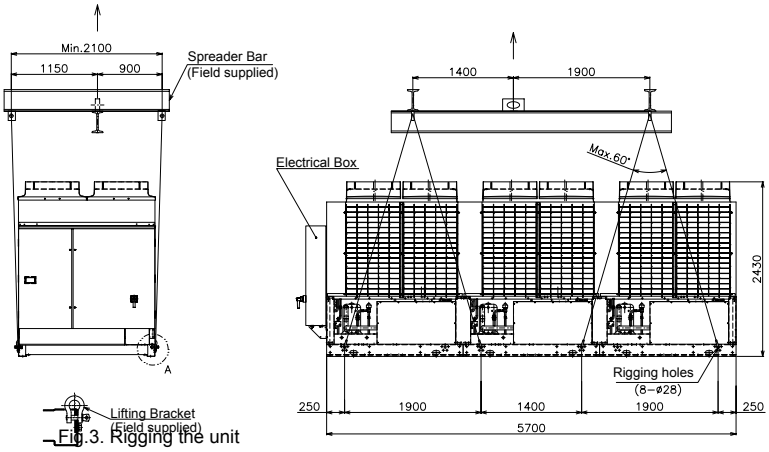



Fig.3. Rigging the unit

***DANGER***:
*Do not stand below the unit when rigging.*

***CAUTION:***
*Put clothes between wires and the unit to avoid damages.*

### 5.5.2. Declining the unit during transportation.

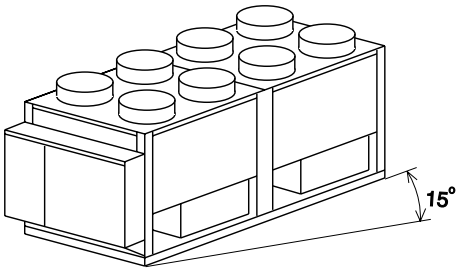


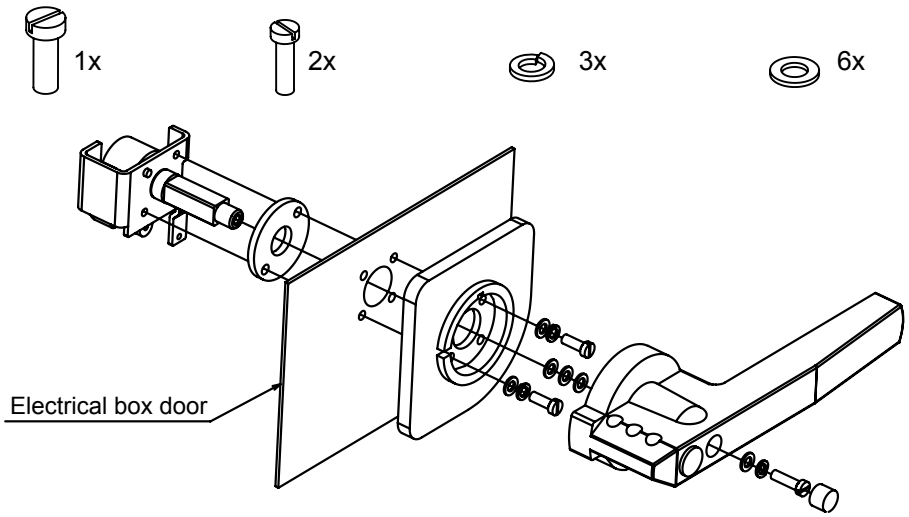

Fig.4. Declining the unit.

***WARNING:***
*Do not decline the unit more than an angle of 15º as shown in the figure during transportation. If declined more than an angle of 15º, the unit may fall down.*

# 6. Installation

## Contents

## 6.1. Handle installation




## 6.2. Electrical Wiring

◆ **Tools and Instruments**

One Set of Wiring tools and Electrical Tester (Clamp Meter)

◆ **Schedule Check**

***DANGER***:

- *This unit must be installed in a restricted area not accessible to the general public.*
- *Before obtaining access to terminals, all supply circuits must be disconnected. Switch OFF main switch (M.I) for any work inside electrical box.*
- *Keep electrical box cover closed 2 min. after switching power off (to discharge the capacitors). Do not switch power ON before connecting the earth protection conductor to "PE" terminal (residual leakage current).*
- *It is recommended that the main switch be locked in the "OFF" position, to prevent against accidental supply of power during equipment servicing.*

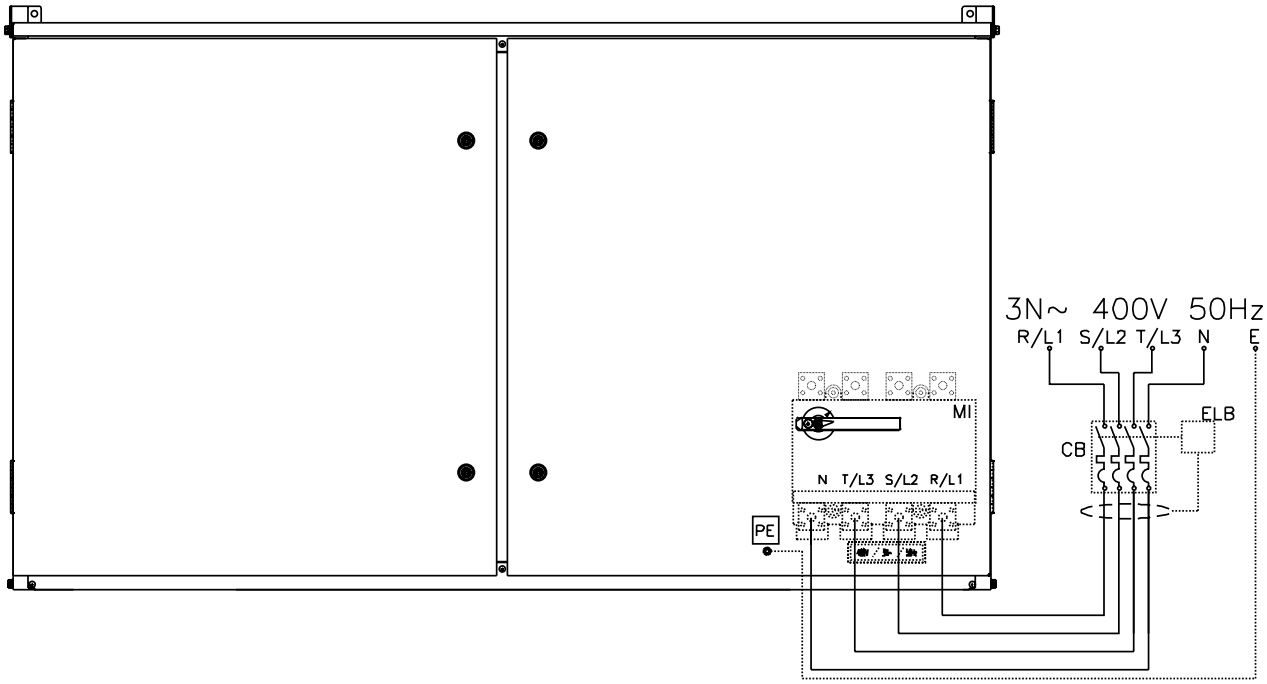
***NOTE:***

- *Electrical connection must be done by professional installers.*
- *Electrical wiring must comply with national and local codes. Contact your local authority in regards to standards, rules, regulations, etc.*

◆ **General check**

- Check that the earth wire is securely connected, tagged and locked in accordance with national and local codes.
- The following diagram shows the Hitachi recommendation for the power supply circuit. Ensure that the field-supplied electrical components (main power switches, circuit breakers, wires, connectors and wire terminals) have been properly selected according to the electrical data. Make sure that they comply with national and regional electrical codes.
- Check periodically the electrical connection tightening.
- Make sure that the power supply voltage is within ±10% of the rated voltage.
- Make sure that power supply has an impedance low enough to warranty not reduce the starting voltage more than 85% of the rated voltage.
- Check that power terminals L1, L2, L3 and N (R, S, T and N) are correctly connected to the MI terminals. Check terminals tightening and correct phase connection.

### ◆ Main Power Wiring Procedures




CB – Thermal and Magnetic Circuit Breaker according to EN 60947-4. C Type for Motor protection trip curve. Fixed Breaking Capacity according the table in next page.

EF – Alternatively, Electric Fuses according to EN 60269-2 could be used instead of CB. Use recommended CB values on the table in next page.

ELB – Earth Leakage Breaker according to EN 61008 and based on TN-S earth protection system.

***NOTE:***

*For other earth protection systems check regulations for the most proper ELB value.*

### ◆ Control Wiring

Connect the interlock wiring and control wiring between the unit terminals and the magnetic switches for the water pumps, according to Fig. 7 or the wiring label. The main connection to terminal N is required.

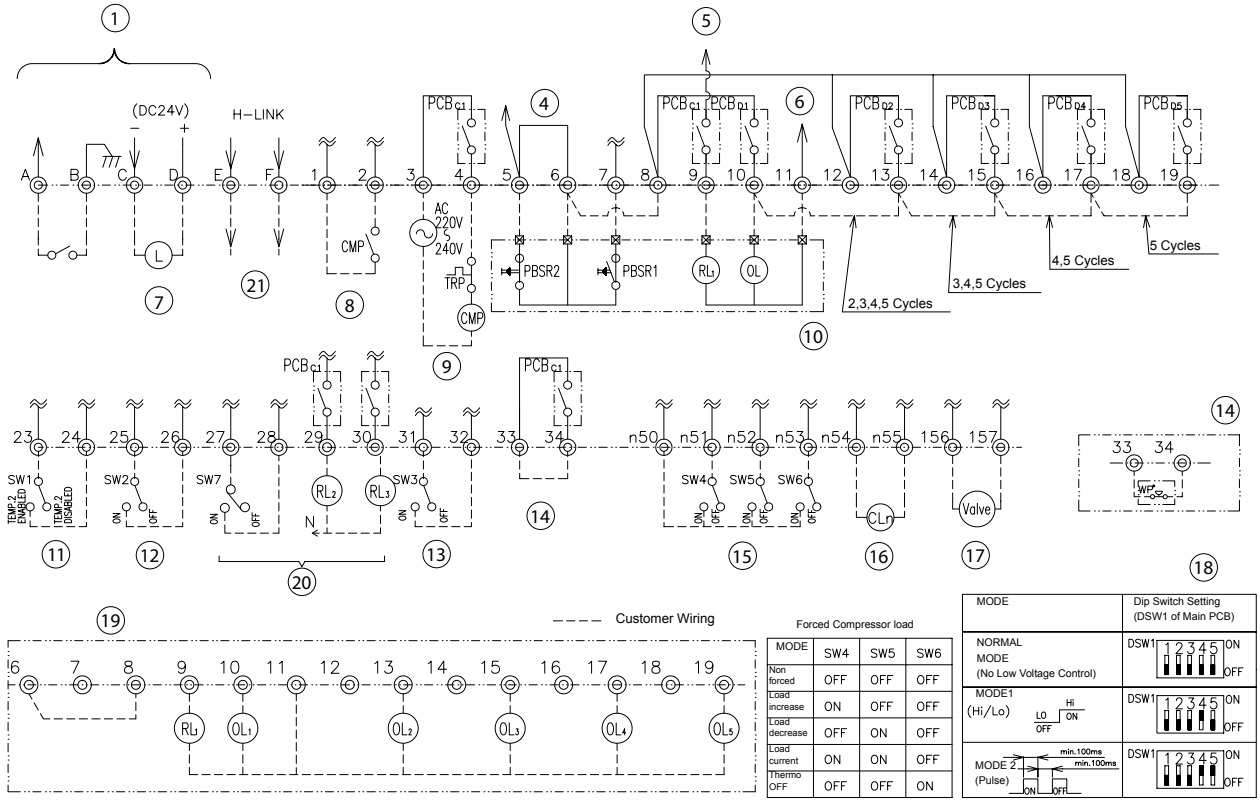



Fig.7. Control Circuit Wiring.

| Nr. | Name |
|---|---|
| 1 | Low voltage / Remote Control |
| 2 | Run / Stop Signal |
| 3 | Alarm signal (DC24V) |
| 4 | In case of Remote Control operation this wire shall be removed |
| 5 | 1~ 230V |
| 6 | Neutral |
| 7 | Alarm Lamp |
| 8 | Pump Interlock |
| 9 | Pump Operation |
| 10 | Remote Control Switch |
| 11 | 2nd Setting Temperature |
| 12 | External Thermostat Operation |
| 13 | External Fan Operation |
| 14 | Only used for different water pressure switch or flow switch options |
| 15 | Force Compressor load operation |
| 16 | Caution lamp for fan operation |
| 17 | Free cooling output signal |
| 18 | Setting of low voltage control |
| 19 | In case of individual indication without Remote Control Switch. |
| 20 | Operation mode switch/lamp (only for heat pumps models) |
| 21 | Connection for control Devices (CSC-5S,...) |

***NOTE:***

1. *All the settings shall be performed before Power ON.*
2. *Remote/Local Change over Switch on Operation Switch shall be set to "Remote".*
3. *Terminals 15~n57 are for AC220-240V,*
   *Terminals A~D are for DC24V*
   *Terminals E~F are H-LINK (Low signal)*

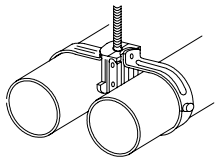
## 6.3. Water Piping

◆ **When Piping Connections are performed:**

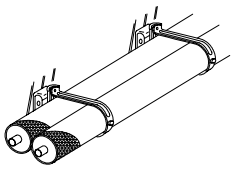
1. Connect all pipes as close as possible to the unit, so that disconnection can be easily performed when required.
2. Connect the Water Coolers in the same unit to the same common Water Piping.
3. It is recommended for the piping of the chilled water inlet and outlet that flexible joints be utilised, so that vibration will not transmit.
4. Whenever permissible, sluice valves should be utilised for water piping, in order to minimise flow resistance and to maintain sufficient water flow.
5. Proper inspection should be performed to check for leaking parts inside and outside the system, by completely opening the chilled water inlet and outlet valves to the water cooler.
   Additionally, equip valves to the inlet and outlet piping.
   Equip an air purge cock on the inlet piping and a drain cock on the outlet piping. The cock handle should be removed so that the cock can not be opened under normal circumstances. If this cock is opened during operation, trouble will occur due to water blow-off.
6. Sufficiently perform insulation to keep the chilled water piping cool and to prevent sweating of the piping.
7. Under the condition where the ambient temperature is low in winter, there is a case where equipment and piping will become damaged during the shutdown periods at night, because the water in the pump or piping will be frozen. To prevent freezing of the water, it is effective to operate the pumps.
   HITACHI Chiller has the pump ON/OFF operation control (see wiring diagram) water from piping.
   Additionally, in a case where measures such as water draining are difficult, utilise antifreeze mixture of ethylene glycol type or propylene glycol type.
8. Suspend the refrigerant and water piping at certain points and prevent the refrigerant and water piping from being in direct contact with the building: walls, ceilings, etc...
   If there is direct contact between pipes, abnormal sound may occur due to the vibration of the piping. Pay special attention in cases of short piping lengths.

   Do not fix the refrigerant and water pipes directly with the metal fittings (refrigerant piping may expand and contract).
   Some examples for suspension method are shown below.

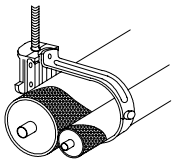
For suspending heavies



For piping along the wall



For instant installation work



9. The common water pipes (Inlet/Outlet) for RCU2E100~400AG2 are field supplied. Typical pipe working examples are indicated on chapter 6.3.
   It is not necessary to install any sensor in these common pipes for standard models.

   Number of connections for models:

| Models | Water Inlet | Water Outlet |
|---|---|---|
| RCU2E40, 50, 60, 70, 80AG2 | 1 | 1 |
| RCU2E100, 120, 140, 160AG2 | 2 | 2 |
| RCU2E180, 210, 240AG2 | 3 | 3 |
| RCU2E280, 320AG2 | 4 | 4 |
| RCU2E380, 400AG2 | 5 | 5 |

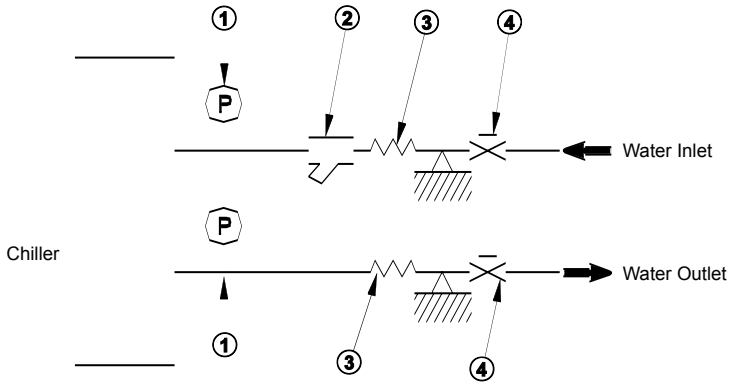
***NOTE:***

*Common Water Piping connecting each cooler can be prepared as Option.*

***CAUTION:***

*This product is equipped with plate type heat exchanger. In the plate heat exchanger, water flows through a narrow space between the plates. Therefore, there is a possibility that freezing may occur if foreign particles or dust are clogged. In order to avoid this clogging, 20 mesh water strainer shall be attached at the inlet of chilled water piping near the product. In case of punching metal type strainer, mesh hole size shall be ∅ 1.6mm or less.*

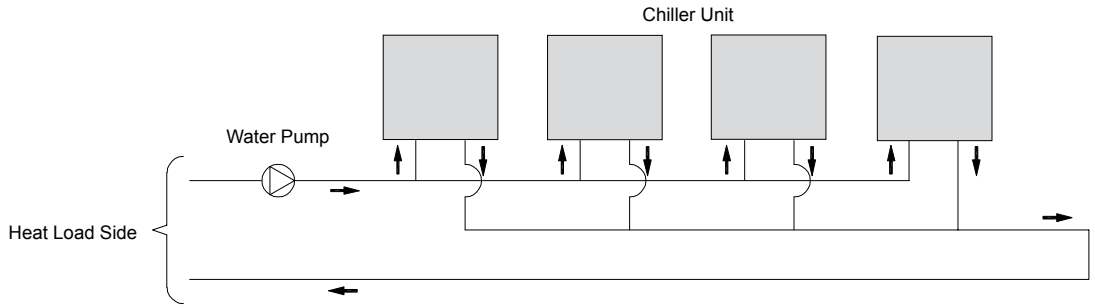
*Never use the salt type antifreeze mixture, because it possesses strong corrosion characteristics, and water equipment will be damaged.*




① Pressure Gauge
② Strainer
③ Flexible Joint
④ Valve

***NOTE:***
*Water strainer is prepared as option.*

***CAUTION:***
*In case of connecting some units to the same water piping, design the water piping so that the water distribution to each unit is equal (refer to figure below) Imbalance of water distribution may cause a serious damage like a water freezing in the heat-exchanger.*



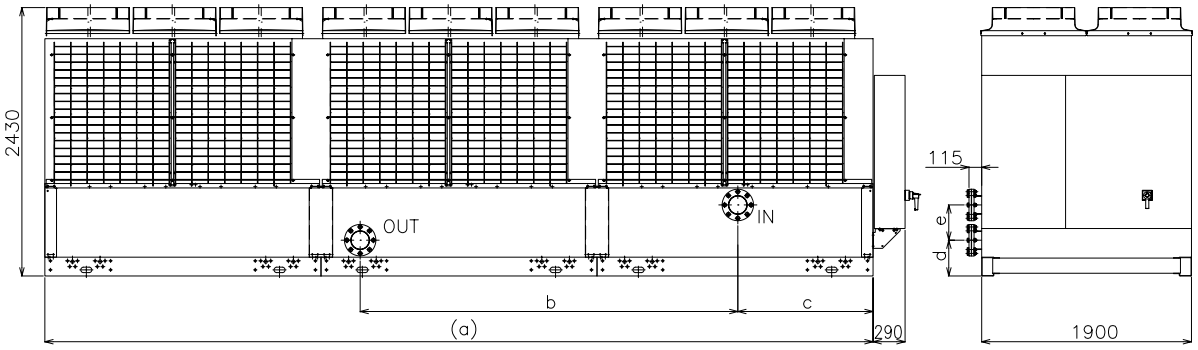

## 6.4. Typical Common Water Piping

The Common Water Pipe Distributor collects water from each inlet and outlet, providing a single water inlet and outlet connections, as shown in below drawing.

It is available as an option for use on Chillers with multiple plate heat exchangers.

The Common Water Pipe Distributor is pre assembled and integrated into the Chiller unit as a factory fitted option (see "Options line up" chapter).

◆ **RCU2E 100, 120, 140, 160, 180, 210, 240, 280, 320, 350, 400AG2**



◆ **DIMENSIONS TABLE**

| Model / Dim | a | b | c | d | e | Flange size | Connecting pipe diameter (mm) |
|---|---|---|---|---|---|---|---|
| RCU2E100AG2<br>RCU2E120AG2 | 3800 | 0 | 1385 | 335 | 300 | 4” | 114.3 |
| RCU2E140AG2<br>RCU2E160AG2 | 5000 | | 1685 | | | | |
| RCU2E180AG2 | 5700 | 2220 | 1225 | 325 | 320 | 6” | 168.3 |
| RCU2E210AG2<br>RCU2E240AG2 | 7500 | 3420 | | | | | |
| RCU2E280AG2<br>RCU2E320AG2 | 10000 | 5920 | | | | | |
| RCU2E350AG2<br>RCU2E400AG2 | 12500 | 8420 | | | | 8” | 219.1 |

## 6.5. Minimum internal system water volume



To ensure the cooling operation at least 5 minutes without interruption, the internal chilled water volume in the piping system should be greater than the minimum volume shown below.

| MODEL RCU2E-AG2 | | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 160 | 180 | 210 | 240 | 280 | 320 | 350 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Minimum Internal System Water Volume | m³ | 0.40 | 0.47 | 0.56 | 0.64 | 0.74 | 0.93 | 1.12 | 1.28 | 1.48 | 1.68 | 1.91 | 2.21 | 2.55 | 2.95 | 3.19 | 3.69 |

| MODEL RHU2E-AG2 | | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 160 | 180 | 210 | 240 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Minimum Internal System Water Volume | m³ | 0.39 | 0.46 | 0.54 | 0.66 | 0.70 | 0.91 | 1.09 | 1.33 | 1.40 | 1.63 | 1.99 | 2.10 |

***NOTE:***

*Minimum internal system water volume written above is for standard ON/OFF differential.*

*In case of changing ON/OFF differential, minimum internal water volume changes as following percentage.*

| Inlet ON/OFF Differential (set by Dip-switch 5, 3&4pins) | 4°C | 3°C | 2°C | 1°C |
|---|---|---|---|---|
| Minimum Internal Water Volume | 50% | 67% | 100% | 200% |

*To prevent frequent ON/OFF for no load or extremely low load operation, system internal water volume shall be more than above table.*

*ON/OFF cycles shall be maximum 6 times per hour.*
*(minimum 5 minutes operation and minimum 5 minutes thermostat OFF)*

## 6.6. Water Control

***CAUTION:***

*When industrial water is applied for chilled water and condenser water, industrial water rarely causes deposits of scales or other foreign substances on equipment. However, well water or river water may in most cases contain suspended solid matter, organic matter, and scales in great quantities. Therefore, such water should be subjected to filtration or softening treatment with chemicals before application as chilled water.*

*It is also necessary to analyse the quality of water by checking pH, electrical conductivity, ammonia ion content, sulphur content, and others, and to utilise industrial water only if problem is encountered through these checks.*

The following is the recommended standard water quality.

| Item | Chilled Water System | | Tendency (1) | |
|---|---|---|---|---|
| | Circulating Water (20 °C Less than) | Supply Water | Corrosion | Deposits of Scales |
| Standard Quality pH (25 °C) | 6.8 ~ 8.0 | 6.8 ~ 8.0 | ❍ | ❍ |
| Electrical Conductivity (mS/m) (25°C) {μS/cm} (25 °C) (2) | Less than 40 Less than 400 | Less than 30 Less than 300 | ❍ | ❍ |
| Chlorine Ion (mg $Cl^-$/l) | Less than 50 | Less than 50 | ❍ | |
| Sulphur Acid Ion (mg $SO_4^{2-}$/l) | Less than 50 | Less than 50 | ❍ | |
| The Amount of Acid Consumption (pH 4.8) (mg $CaCO_3$/l) | Less than 50 | Less than 50 | | ❍ |
| Total Hardness (mg $CaCO_3$/l) | Less than 70 | Less than 70 | | ❍ |
| Calcium Hardness (mg $CaCO_3$/l) | Less than 50 | Less than 50 | | ❍ |
| Silica L (mg $SIO_2$/l) | Less than 30 | Less than 30 | | ❍ |
| Reference Quality Total Iron (mg Fe/l) | Less than 1.0 | Less than 0.3 | ❍ | ❍ |
| Total Copper (mg Cu/l) | Less than 1.0 | Less than 0.1 | ❍ | |
| Sulphur Ion (mg $S^{2-}$/l) | It shall not be detected. | | ❍ | |
| Ammonium Ion (mg $NH_4^+$/l) | Less than 1.0 | Less than 0.1 | ❍ | |
| Remaining Chlorine (mg Cl/l) | Less than 0.3 | Less than 0.3 | ❍ | |
| Floating Carbonic Acid (mg $CO_2$/l) | Less than 4.0 | Less than 4.0 | ❍ | |
| Index of Stability | 6.8 ~ 8.0 | - | ❍ | ❍ |

***NOTE:***

*(1). The mark "❍" in the table means the factor concerned with the tendency of corrosion or deposits of scales.*

*(2). The value showed in "{ }" are for reference only according to the former unit.*

# 6.7. BMS gateways

### 6.7.1. HARDC70-CE1 (OP) - LonWorks® interface.

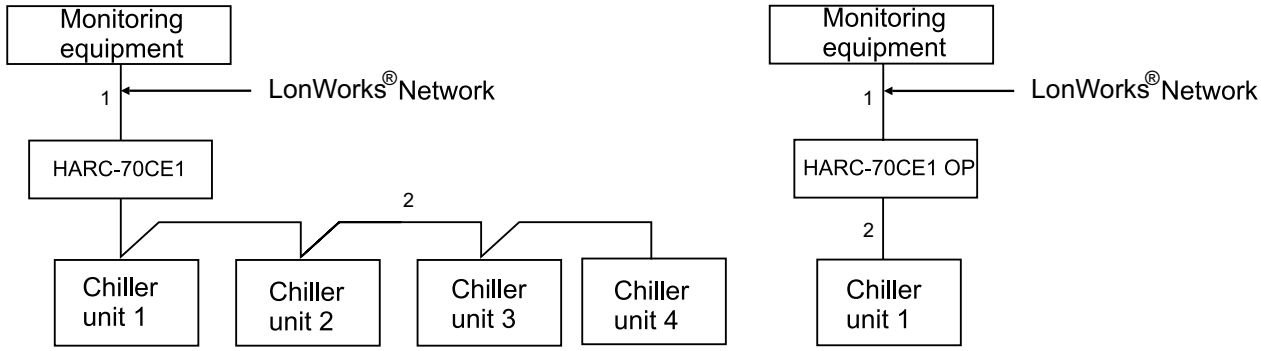
#### ◆ General Features

- There are two options for water chillers:
  - HARC-70CE1
  - HARC-70CE1 OP
- Gateway interface with BMS LonWorks systems (installations with intelligent BMS control).
- With the HARC-70CE1 connection to a H-LINK network, it is possible to control 4 setting points and 7 monitoring points of up to 4 chillers.
- With the HARC-70CE1 OP connection to a H-LINK network, it is possible to control 4 setting points and up to 44 monitoring points of one chiller unit.
- The HARC-70CE1 (OP) remote controls offer the option of self-checking their own status.



#### ◆ System

The following figure shows the internal configuration of the BMS connection used by the HARC-70CE1(OP).




| Nr. | Description | Wire size |
|---|---|---|
| 1 | Connection wire with upper system (field supplied) | |
| 2 | Connection with chiller, H- Link (field supplied) | 0.75 mm² twisted-pair cable with a maximum length of 1000 m |

***CAUTION:***
*Make sure that the shielded cable is earthed.*

## ◆ HARC-70CE1 (OP) Specifications

– Hardware specifications

| Element | Specification |
|---|---|
| Power supply | 1~ 230V ±10% 50Hz |
| Energy consumption | 10W (maximum) |
| External dimensions | Width: 170 mm, height: 75 mm, depth: 80 mm (Installed inside the box) |
| Weight | 0.6 kg |
| Installation conditions | Indoor |
| Temperature conditions | 0~45 °C |
| Humidity conditions | 10~80% (Without condensation) |
| Power supply wiring sizes (field supplied) | 2 $mm^2$ shielded |

– Telecommunications specifications for water chillers

| Element | Specification |
|---|---|
| Communication unit | Water chillers |
| Communications cable | Non polar, twisted and shielded 2 cable system |
| Telecommunications system | Half-duplex telecommunications |
| Synchronous system | Asynchronous communication system |
| Telecommunications speed | 9,600 bps |
| Wire size (field supply) | 0.75 $mm^2$ twisted-pair cable with a maximum length of 1000 m |
| Cable length (field supply) | 1,000 m (total length) |
| Connection quantity | HARC-70CE1 type: Maximum of 4 chiller addresses<br>HARC-70CE1 OP type: Maximum of 1 chiller address |

– Telecommunication specifications for the upper system

| Element | Specification |
|---|---|
| Communication unit | Upper monitoring equipment |
| Transmission protocol | LonTalk (*) protocol |
| Access method | Persistent CSMA/CD system planned |
| Coding system | Differential Manchester Code |
| Telecommunications speed | 78,000 bps |
| Maximum cable length | 500 m (total bus length) |

*(*) "LonTalk" is an "Echelon Corporation" trademark in the USA and other countries.*

### ◆ Control Signal

| | | |
|---|---|---|
| Control Operation | ON/OFF Chiller | All HARC'S |
| | Outlet Water Setting | All HARC'S |
| State Monitoring | ON/OFF | All HARC'S |
| | Chilled Water Outlet Setting | All HARC'S |
| | Chilled Water Outlet Temperature | All HARC'S |
| | Chilled Water Inlet Temperature. | All HARC'S |
| | Alarm Codes | All HARC'S |
| | Operation Status | All HARC'S |
| | Discharge Pressure 1,2 | Only HARC OP |
| | Suction Pressure 1,2 | Only HARC OP |
| | Discharge Temperature 1,2 | Only HARC OP |
| | Suction Temperature 1,2 | Only HARC OP |
| | Compressor Status (ON/OFF) 1,2 | Only HARC OP |
| | Outlet Water Temp. 1 | Only HARC OP |
| | Water Temp. In Evap. Backside 1 | Only HARC OP |



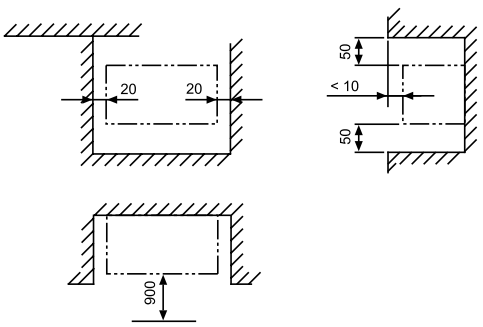
### ◆ Installation

a. Space requirements

***NOTE:***

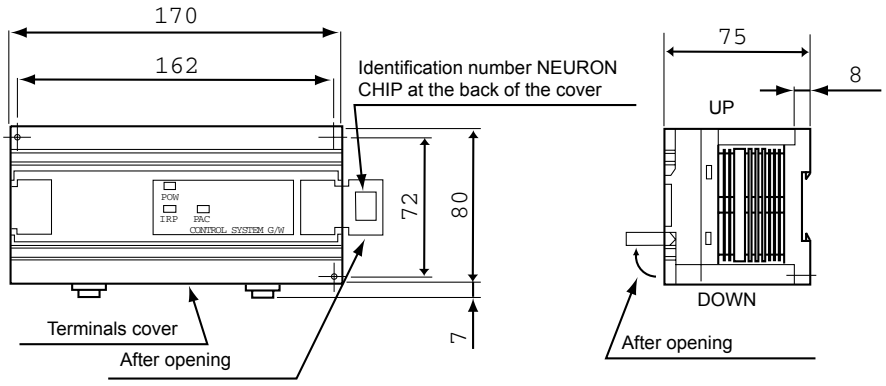
- *Bear in mind the safety summary warnings when selecting the installation site.*
- *The installation site should be located in a place with an earthing connection.*

Space required for the installation



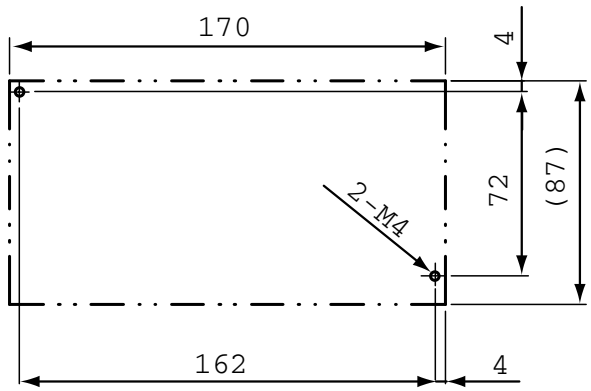

b. Installation procedure

1. Install the HARC-70CE1 in an earthed metal box, bearing in mind the following HARC-70CE1 dimensions for the box that it will be installed in.

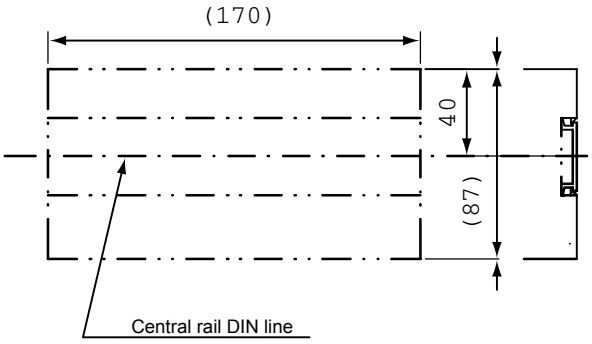


2. Secure the HARC-70CE1 in accordance with the following instructions, depending on if it is mounted with screws or DIN rails.

Screw mounting




DIN rail mounting




***CAUTION:***

*- All wiring work must be done in accordance with local regulations and the instructions of the electricity company.*

*- A qualified electrician should carry out the electrical wiring.*

*- Adjust the electrical leakage detector switch in accordance with local regulations.*

3 The HARC-70CE1 should be installed between the power supply, the monitoring equipment, the water chiller and the earth connection.

Please use it correctly according to the Controllers Technical Catalogue (TCGB0061).

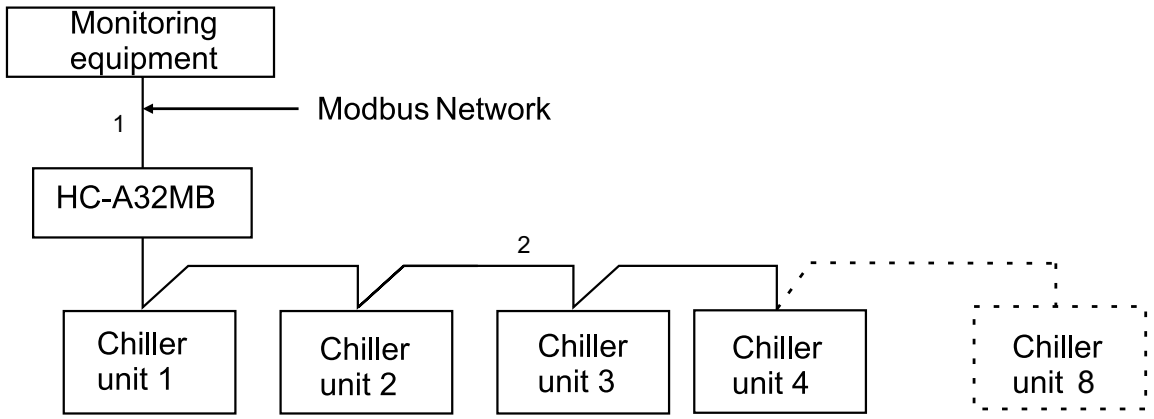
### 6.7.2. HC-A32MB - ModBus interface

◆ **General features**

- Gateway interface with BMS Modbus systems (installations with intelligent control or BMS).
- With the HC-A32MB connection to a H-LINK network, it is possible to control 4 setting points and 16 monitoring points.
- With the HC-A32MB it can be controlled up to 8 AG2 chillers

◆ **System**

The following figure shows the internal configuration of the BMS connection used by the HC-A32MB




| Nr. | Description | Wire size |
|---|---|---|
| 1 | Connection wire with upper system (field supplied) | |
| 2 | Connection with chiller, H- Link (field supplied) | Communication cables for the connection of HC-A32MB to an Hitachi installation. Twisted-pair shielded cable 0.75mm² |

***CAUTION:***

*Make sure that the shielded cable is earthed*

## ◆ HC- A32MB Specifications

### Hardware Specifications

| Item | Specifications |
|---|---|
| Power supply | 1~ 230 V ±10% 50Hz |
| Consumption | 25 W (maximum) |
| Outer dimensions | Width: 143 mm, Depth: 302 mm, Height: 76 mm |
| Weight | 1.75 kg |
| Assembling conditions | Indoors (in a control panel or desktop) |
| Ambient temperature | 0~40 °C |
| Humidity | 20~85% (Without condensation) |
| Power supply wiring sizes (field supplied) | 2 $mm^2$ shielded |

### MODBUS

| Item | Specifications |
|---|---|
| K5 | Serial Port RS485 (3 Pins connector) - MODBUS Protocol |
| Communication line | Twisted pair cable. Polarity |
| Communication system | Half-duplex, multipoint serial connection |
| Communication method | Non parity or odd/even parity selection. Data length: 8 bits - 1 stop bit |
| Baud rate transmission | 19,200/9,600 Baud |
| Length | max. 1,200 m according EIA-485 |

### H-LINK

| Item | Specifications |
|---|---|
| Communication with | HITACHI CHILLER |
| Communication line | Twisted pair shielded cable, non polarity |
| Communications system | Half-duplex |
| Communication method | Asynchronous |
| Speed of transmission | 9,600 Bauds |
| Length of wiring | 1,000 m maximum (total length of HLINK I/O bus) |
| Maximum number of HC-A32MB | 1 HC-A32MB/H-LINK SYSTEM (CHILLER) |

### ◆ Control signal

| | |
|---|---|
| Control Operation | ON/OFF Setting order |
| | Mode setting order |
| | Cool/Heat setting temperature |
| | Central setting |
| State Monitoring | Exist |
| | Chiller Address |
| | ON/OFF Status |
| | Mode Status |
| | COOL setting temperature status |
| | HEAT setting temperature status |
| | Inlet temperature |
| | Outlet temperature |
| | Ambient temperature |
| | Unit operation condition |
| | Alarm code for general Chiller Alarm |
| | Alarm code for cycle alarm |



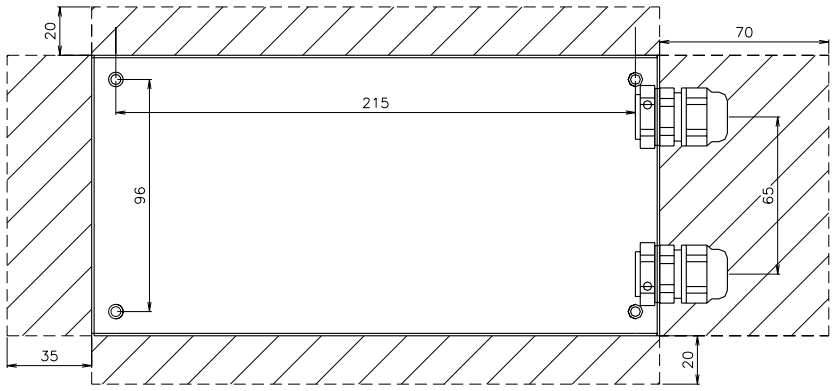
### ◆ Installation

a. Space requirements

***NOTE:***

*Bear in mind the safety summary warnings when the installation site.*
*The installation site should be located in place with an earthing connection.*

Keep free grated area for ventilation and cable connection




b. Installation procedure

Perform the following procedure:

1 Remove the rubber supports

2 Unscrew the 4 screws from the top cover and remove it

3 Attach the box to the rear vertical board from the inside with M4 screws (not provided) and place 3 mm washers on the outside to separate the box from the wall.

4 Reinstall the top cover. Be careful to position it correctly.

Please use it correctly according to the Controllers Technical Catalogue (TCGB0061).

# 6.8. Remote controllers

## 6.8.1. CSC-5S – Central Station

◆ **General features:**

- 8 chiller and 8 CSC-5S central remote control addresses can be connected on each H-LINK
- Up to 8 central remote controls (CSC-5S) can be connected to a H-LINK.
- Basic functions, heat/cold mode and temperature setting.
- When a problem occurs, an alarm code will immediately be displayed with detailed information about the error.
- A standard external input terminal is included for possible connection to a timer.
- The external signals control the following functions

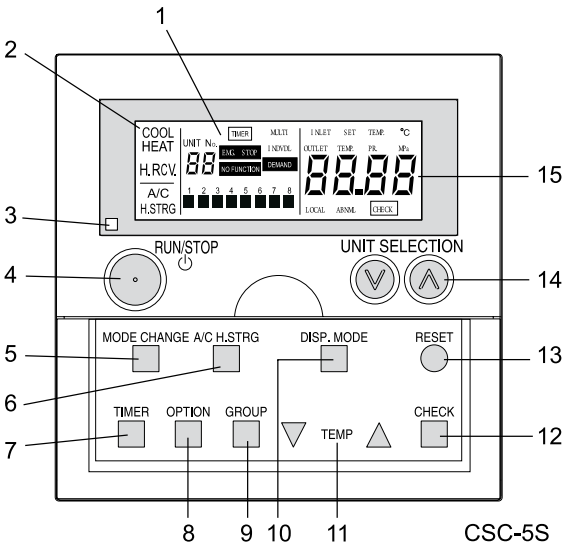
  Start/Stop.

  Operation mode (Cooling/Heating).

  Temperature setting (Cold/Heat).

◆ **CSC-5S Specifications**

| | |
|---|---|
| 1 | Unit operating indicator<br>Individual control indicator<br>Multiple unit control indicator<br>Timer indicator<br>Emergency stop indicator<br>Operation indicator for each unit<br>Demand indicator<br>“No Function” indicator, in the event of a malfunction |
| 2 | Operation mode indication<br>Indicates the operation mode selected for the indicated group: “Cool” (cooling), “Heat” (heating) and “H.RCV” (heat recovery) (not available). |
| 3 | Run indicator (red pilot). |
| 4 | “RUN/STOP” button . |
| 5 | “MODE” button (operation mode selection). |
| 6 | “A/C H.STRG” button (air-conditioning/heat storage). |
| 7 | “TIMER” button (timer selection). |
| 8 | “OPTION” button<br>Used for selecting the different options. |
| 9 | "GROUP" button (for setting groups). |
| 10 | “MODE” button (button for changing display). |
| 11 | “TEMP” button (for setting groups). |
| 12 | “CHECK” button<br>Used for service tasks. |
| 13 | “RESET” button (reset). |
| 14 | “UNIT SELECTION” button. |
| 15 | Temperature setting indicator<br>Inlet/outlet temperature indicator<br>“ABNML” alarm indicator<br>“LOCAL” local indicator |



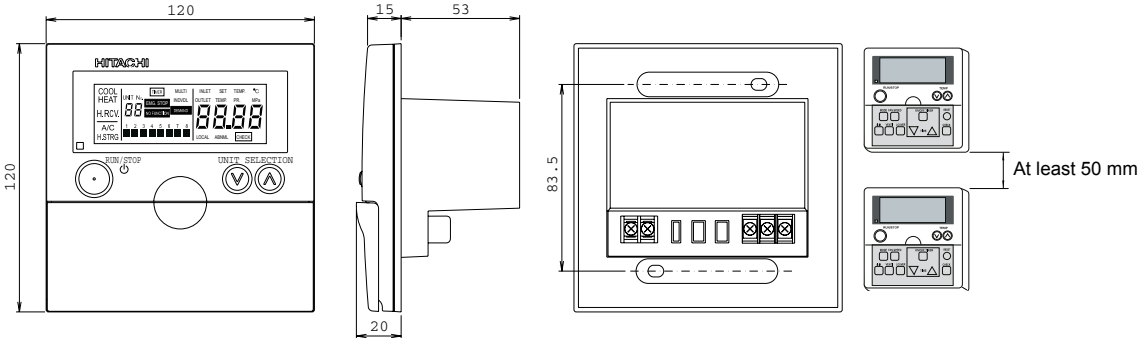
## ◆ Installation

a. Space requirements

Take note of the maximum admissible cable length between units and the control as well as between the units themselves, as shown in the following table:

| | | |
|---|---|---|
| Cable section | 0.3mm² | ≥0.75mm² |
| Cable length | 30m | 2 mm² shielded |

If several control units are to be installed in a vertical position, leave a distance of at least 50 mm between them to allow the front cover to be opened and to insert the tool for removing the control from its housing.

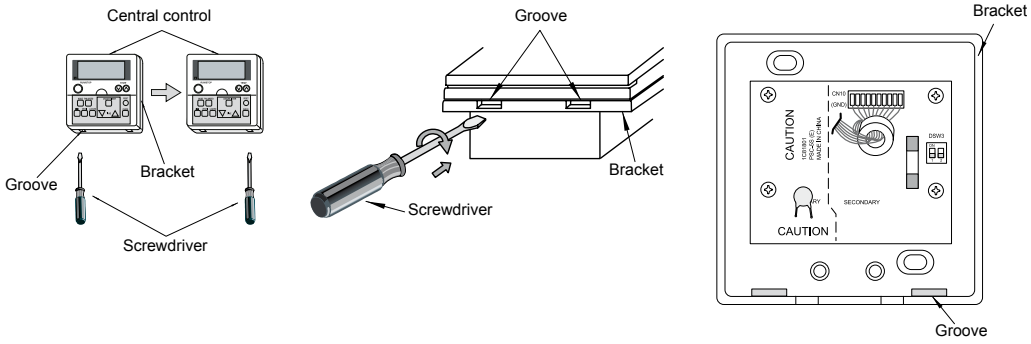





b. Installation procedure

1. Insert the flat headed screwdriver's tip into the grooves on the bottom of the bracket. Push and turn the screwdriver.

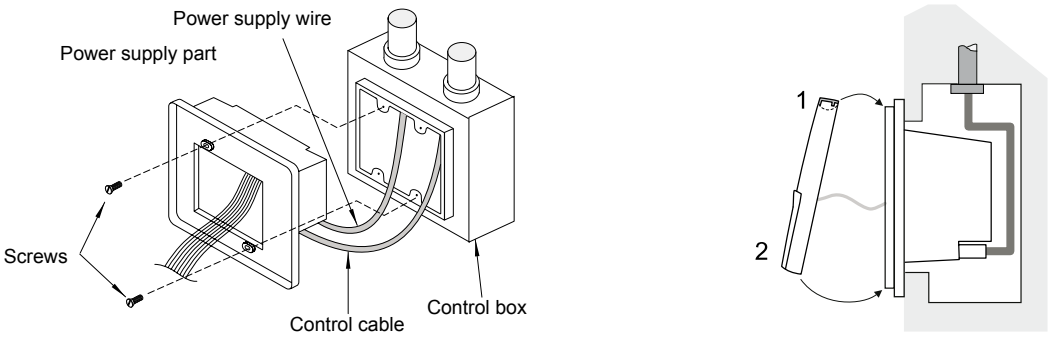
   Remove the part of the remote control linked to the power supply part, as shown in the following figure:




2. Connect the power supply part to the control box, as shown below.

***NOTE:***

*Do not lay the power supply cable and the remote control cable in the same conduit*




3. Connect the control unit part to the power supply part. Position the top first and then the bottom.

***CAUTION:***

*- Do not position all the signal cables together with the power supply cable and other signal cables. The noise caused by these cables could lead to the malfunction of the remote control and chiller unit. If the signal cables are next to the power cables and any other signal cables, maintain a distance of at least 15 cm between the signal cables and other cables, or pass the signal cables through a metal conduit which is earthed at one end.*

*- If the power supply cable is accidentally connected to the terminal board for the transmission signal and voltage is applied, the fuse will blow to protect the printed circuit board. In this case, this remote control can operate without the fuse, if pin no. 2 of DSW3 is set to the ON position.*

*- If the PSC-A1T remote control's timer is used, set the same address no. for the remote control and the timer.*

*- Make sure that the wiring is correct (do place the signal cables together with the electricity cables). Incorrect wiring could cause the remote control to malfunction*

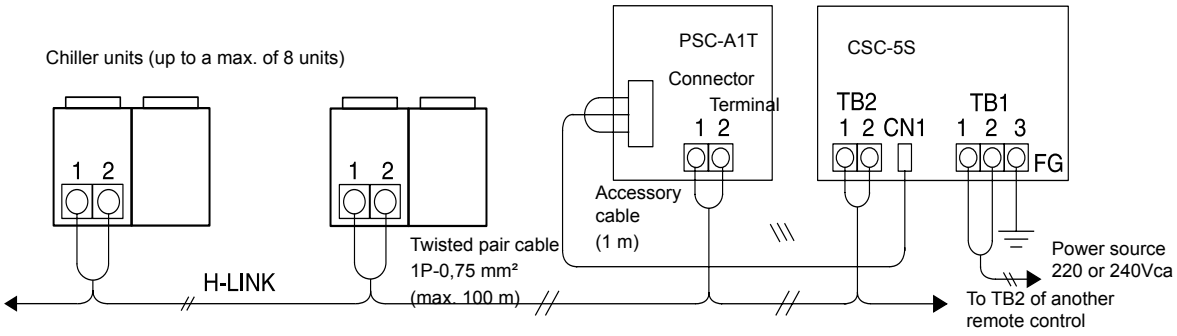
*- Before installing the wiring, switch off the power supply to the air conditioning system and central control unit.*

*- Installing the wiring while the central control power supply is switched on may cause the central control unit to malfunction.*

Electrical connection of the CSC-5S central remote control with the PSC-A1T timer

***NOTE:***

*- Up to 8* CSC-5S *central control units and one* PSC-A1T *timer can be connected to one H-Link.*




***NOTE:***

*Always use 0.75 mm2 twisted pair cable.*

*- Use the field supply cable for connection if the CSC-5S central remote control is used together with the PSC-A1T.*

*- The maximum total length of the wiring for all units is 1000 meters.*

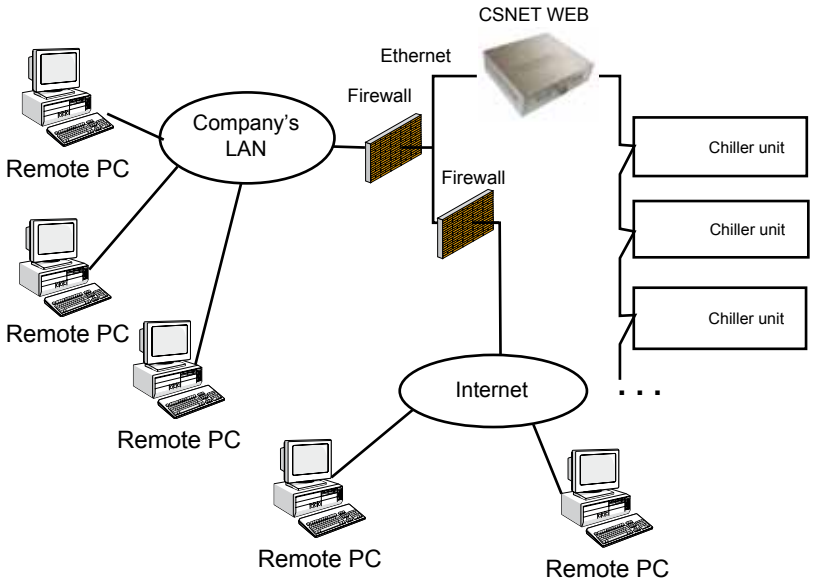
### 6.8.2. CSNET Web – Computer central control

◆ **General features**

- CSNET WEB is an independent centralised control system which can control an H-LINK communication line. When it is connected to a system with package units, it can control up to 160 indoor units or up to 8 water chillers.
- CSNET WEB uses JAVA technology to control and monitor remotely operation of the installation.
- Can be connected to a Local Area Network through its Ethernet port. After configuring the network, the system will be accessible from any site in the company's network.
- TIMER which is easier to program the calendar. It can memorize up to 4 years of programming and lets you choose an annual timer independently for each unit and day.
- Building layout view.

### ◆ System

The following figure shows the different connection of CSNET WEB






### ◆ CSNET Web Specifications

**Hardware specifications**

| Elements | Specifications |
|---|---|
| Power supply | AC 230 V 1~ ±10% (50Hz) |
| Consumption | 20W (maximum) |
| External dimensions | Width: 240 mm, Length: 204 mm, Alt: 74,5 mm |
| Weight | 1,94 kg |
| Installation conditions | Indoors (in a control panel, table-top) |
| Ambient temperature | 0~40 °C |
| Humidity | 20~85% (without condensation) |

**Specifications for communication with the units**

| Elements | Specifications |
|---|---|
| Communication with | H-LINK |
| Communication cable | Twin wire, without polarity |
| Communication system | Half-duplex |
| Communication method | Asynchronous |
| Transmission speed | 9600 Bauds |
| Cable length | Maximum 1000 m (total length) |
| Number of units | Up to 8 water chillers (1) |

Communication specifications with a local area network

| Elements | Specifications |
|---|---|
| Remote computer | Processor at 100 MHz, 256 MB RAM, 200 Mb free hard disc space. Windows 2000 or higher, with Java Runtime Environment (2) version 6 Update 3 or higher Installed (included in the CD-ROM) |

*(1) Water chillers only can be connected in an H_LINK communication line. Mixed connection of package units and water chillers is not permitted*

*(2) Java(R) is a registered trade mark of Sun Microsystems*

## ◆ Installation

a. Space requirements

Make sure that there is sufficient space around the CSNET WEB (a minimum of 50 mm) for heat to dissipate properly (see “Installation procedure”). If the equipment is installed vertically, situate the power feed below and the control outputs above.

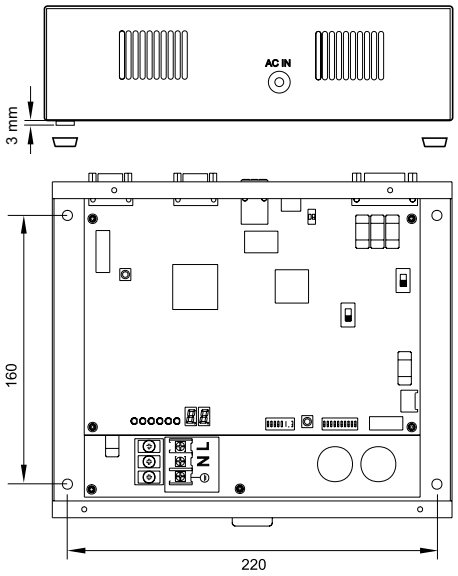
b. Installation procedure

1 Remove the rubber base pads

2 Remove the 4 screws from the cover and take it off

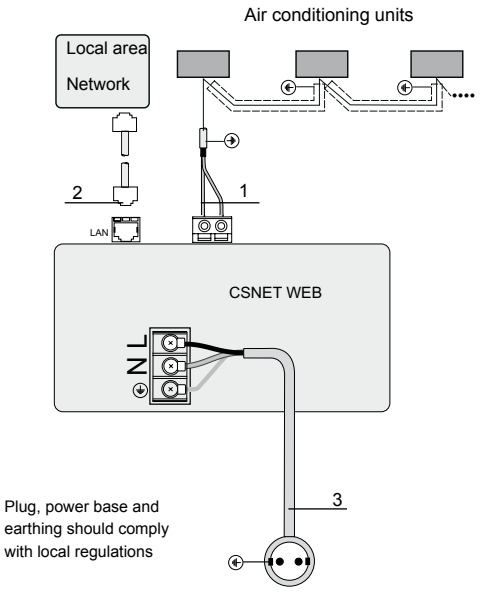
3 Secure the box to the vertical back plate from inside with M5 screws (not supplied), using 3 mm washers outside to separate the box from the wall.

4 Replace the cover. Be careful to position the top correctly.




c. Electrical wiring

| Nr. | Connection | Cable Specifications |
|---|---|---|
| ① | Transmission cable for the units (H-Link) | Twisted pair cable<br>1P-0.75 mm². Without polarity.<br>Insulated and earthed at one end.<br>To select the type of cable, see the Outdoor Unit Installation and Operation Manual. |
| ② | LAN line | Category 5 or above LAN cable<br>– A cross-over cable is needed for direct connection to a PC.<br>– A direct cable is needed for connection to a commercial distributor (Hub) |
| ③ | Network cable 2 phases + earth | AC 230V 1~50Hz<br>Make sure that the cable used complies with local regulations and that both the plug and socket are correctly earthed |




After making the connections, replace the cover

## 6.9. Installation final check

Inspect the installation work according to all documents and drawings. Sub-chapter 6.8.1 shows the minimum check points.

### 6.9.1. Installation Work Check List

1. Is the unit solidly mounted and levelled?

2. Is the installation location adequate?

- ☐ Space for Condenser Air Flow
- ☐ Space for Maintenance Work
- ☐ Noise and Vibration
- ☐ Sunshine and Rainfall
- ☐ Appearance

3. Is the water piping system adequate?

- ☐ Tube Size
- ☐ Length
- ☐ Flexible Joint
- ☐ Insulation
- ☐ Strainer
- ☐ Common Pipes (for 2~5 cycles)
- ☐ Water Drain
- ☐ Water Control
- ☐ Air Purge
- ☐ Pressure Control

4. Is the electrical wiring system adequate?

- ☐ Wire Size
- ☐ Switch Size
- ☐ Fuse Size
- ☐ Voltage and Hz
- ☐ Tightened Connections
- ☐ Operation Control Devices
- ☐ Safety Devices
- ☐ Interlock

5. Have the R, S and T phases of the water Chiller correctly been connected to the R, S and T phases of the main power source?

6. Are the stop valves for the condenser liquid line open?

7. Have the packing glands and the cap nuts for the stop valves been tightened?

8. Is BMS connected correctly and operate as decided?

# 7. Test Running

## Contents

## 7.1. Preparation

◆ **Tools and instruments**

- High Pressure Compound Gauge. Low Pressure Compound Gauge. Electrical Tester and General Tools.
- Remove the foreign particles and substances from the water piping, without going through the water coolers and clearing the water strainer filter before running. Check to ensure that no foreign particle and substance exists in the water piping.

***CAUTION:***

*Switch On the main power switch, and energise the oil heater for 12 hours before start-up, to sufficiently warm the oil.*

*Check to ensure that valves are correctly opened. If not opened, serious damage will occur to the compressor due to an abnormally high pressure.*

## 7.2. Test running

Test running should be performed as follows, when the unit is wired according to the HITACHI standard wiring label.

1. Switch ON the field-supplied pump and it will be started immediately and check the condition and operation state of that.
2. Fully open the liquid outlet stop valve.
3. Set the operation switch to “ON”, and the compressor will be started in a few minutes after this operation.

Test running should be accomplished as follows.

Each rotation direction of two rotors in the compressor is fixed so that a reversal phase protection device is equipped.

However, the rotation direction should be checked with a following method.

Confirm that phases R, S and T for the compressor are correctly connected. The correct phase connection can be checked by a phase sequence indicator. If not, the compressor does not start due to the activation of the reversal phase protection device.

Cut the main switch and interchange two of three terminals, R, S and T on the main terminals at the field connection side in the unit.

- Operate the pump for chilled water and other auxiliary equipment such as fan coil units and Air handling units.
- Check to ensure that the chilled water flows sufficiently and that other auxiliary equipment operates properly.
- Set the switch at the desired temperature.
- Depress the “ON“ push button, the condenser fans will start to operate and the compressor will be started.
- Check the rotation direction of the condenser fans.
- After system operation becomes stabilised, check the discharge and suction pressures by 7-segment on control panel.
- Check to ensure that the thermostat works properly.
- Check to ensure that the control and protective devices work properly.
- Starting timer and unload-starting timer are set at five (5), thirty (30) seconds and three (3) minutes, respectively, in accordance with operation characteristics. Therefore, local adjustment should be avoided.

***DANGER:***

*Switch OFF main interruptor (M.I) for any work inside Electrical Box.*

***CAUTION:***

*When the unit is wired according to the HITACHI standard wiring shown on the wiring label. Switch ON the main power switch, and energise the oil heater for 12 hours before start-up to sufficiently warm the oil.*

***NOTE:***

*A loud sound occurs when this compressor is stopped after the normal operation. However, this sound indicates no abnormalities and stops within a few seconds by the activation of the check valve. This sound is due to the reverse rotation of the screw rotors, resulting from the pressure difference between the discharge and the suction pressure.*

*Each compressor may show the different valves of running current due to individual capacity control for each compressor. This is not abnormal.*

## 7.3. Instructions after test running

When the test running is completed, please instruct customers about operation and periodic maintenance methods before leaving the unit, by using this manual. A special attention is required to the following caution:

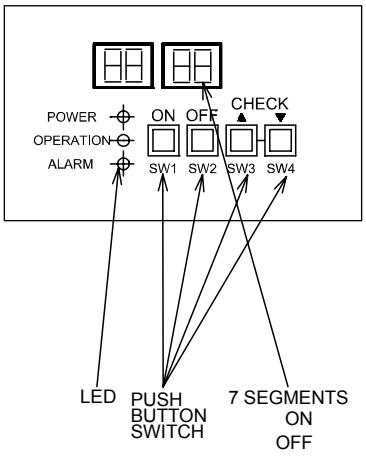
***CAUTION:***

*Do not cut off the power source switch during the operating season. When the power source switch is cut off, the oil heater for screw compressor is not energised, and the compressor might be damaged due to oil foaming at starting.*

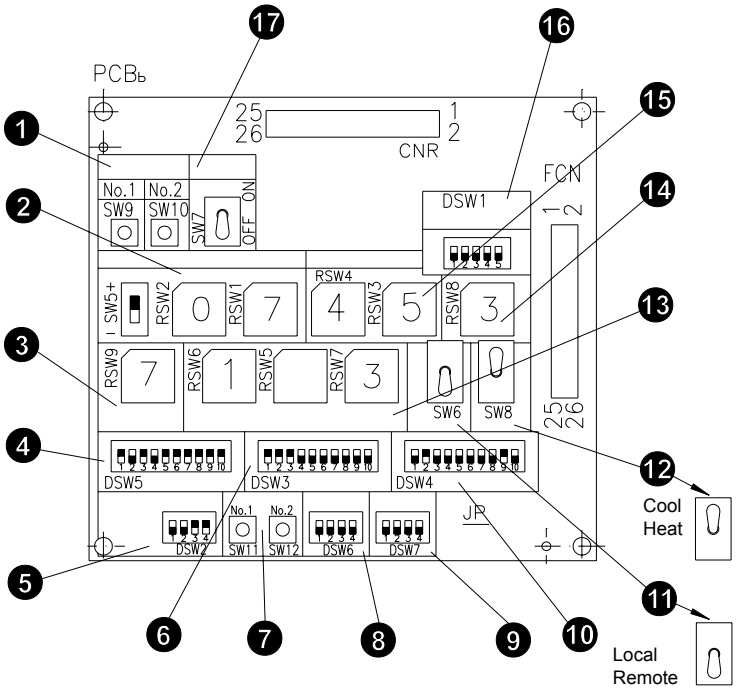
*When the operation season starts after long disconnection of the power source switch, please turn on the power source switch 12 hours before starting operation.*

# 8. Controller Adjustment

## Contents




| SWITCH POSITION | |
|---|---|
| ON / OFF | ON |
| ON / OFF | OFF |




❶ High Cut Check (Fan Stop for Checking)

❷ Chilled Water Temperature Setting
(STANDARD: “+07”)

❸ Defrosting Set by Ambient Temperature (Heat Pump)
(NOT AVAILABLE)

❹ Continuous Capacity Control Setting
(STANDARD)

❺ Compressor starting Delay Time
(STANDARD: 3 min)

❻ Mode Set Switch A/ H-LINK address
(DEPEND ON MODEL)

❼ Manual Defrost (Heat Pump)
(NOT AVAILABLE)

❽ Optional Function B
(STANDARD: ALL OFF)

❾ Optional Function C
(STANDARD: ALL OFF)

❿ Mode Set Switch B

⓫ Local/Remote Changeover Switch
(STANDARD: “Remote”)

⓬ Cool/Heat Changeover Switch
(STANDARD: “Cool”)

⓭ Current Limiter Setting
(DEPEND ON MODEL)

⓮ Neutral Zone Setting
(STANDARD: “3”)

⓯ Hot Water Temperature Setting for Heat Pump
(NOT AVAILABLE)

⓰ Optional Function A (Outernals signals, Self-Checking mode)
(STANDARD: ALL OFF)

⓱ Pump Operation
(STANDARD: OFF)

***NOTE:***
*In case of RCU2E280~400AG2 (4,5 cycles models), there are 2 PCBb. The first PCBb has the same functions. The second PCBb (subsidiary) has only available functions ❶, ❻ and ❼.*

## 8.1. Control System

Electrical Operation Controls advanced HITACHI Water Chillers are as follows.

- **Capacity Control**

  All models are equipped with an unloading system for each compressor, in order to adjust the cooling capacity and to provide precise temperature control for the chilled water, coupled with electronic thermostats.

- **Control Panel**

  ON switch, OFF switch, Power Supply Lamp, Operation Lamp, Alarm Lamp, Operation/Alarm Indicator for each refrigerant cycle and check switch are mounted in the Control Panel. The Control Panel is located at a position where easy access is available. Operation/Alarm indicator can display individual alarm codes such as High-Cut, Low-Cut etc. This function is very useful for detecting what alarm has occurred. Check switches are for checking chilled water temperature and alarm occurrence data. Chilled water temperature setting switches, ON/OFF Differential Setting Switches, Remote-Local Switch and so on are located at the rear side of Control Panel, in order not to access during operation.

- **Operation Hour-Meter**

  This hour-meter indicates the sum of the compressor operation.

- **Printed Circuit Board**

  A micro-processor, relays and electronic components are mounted on the Printed Circuit Board. Increased reliability is assured due to the elimination of mechanical parts and wires. This board contains various functions by applying micro-processor as follows:

  Screw Compressor Cycling Protection Circuit.
  The electronic timer of the screw compressor cycling protection (ccp) connected in the compressor control circuit delays the screw compressor restarting period for approximately three (3) minutes for No.1 compressor, four (4) minutes for No.2 compressor, five (5) minutes for No.3 compressor, six (6) minutes for No.4 compressor and seven (7) minutes for No. 5 compressor.

  Electronic Thermostat Circuit.
  The electronic thermostat senses chilled water outlet temperature, and operate capacity control solenoid valves of HITACHI screw compressor.

  Screw Compressor Reversing Protection Circuit.
  This circuit is composed of a reverse-phase protection device, preventing reverse operation of the screw compressor, because the screw compressor definitely cannot be operated in the wrong direction due to the misconnection of the main power phases.

  Restart after Power-Failure.
  In case that a power failure shorter than 2 seconds occurs, compressors can be restarted automatically within 3 minutes after power supply.

  If power failure longer than 2 seconds occurs, compressor also can be restarted by selection Switch Setting.

## 8.2. Controller Adjustment

Setting functions are next:

- **Chilled Water Outlet Temperature Setting Switch = RSW1 and RSW2 (07 ºC standard)**

  7°C for chilled water outlet temperature is recommended. The RSW1 and RSW2 dials are already set at 7 and 0. Setting at the figures from 3 to 9 of the RSW2 dial should not be permitted.

- **Heated Water Outlet Temperature Setting Switch = RSW3 and RSW4 (45 ºC standard)**

  45°C for heated water outlet temperature is recommended. The RSW3 and RSW4 dials are already set at 4 and 5. Setting at the figures from 0 to 1 and from 6 to 9 of the RSW4 dial should not be permitted.

  Only for RHU2E(40-240)AG2.

- **Current Limiter Set Switch = RSW5, 6, 7**

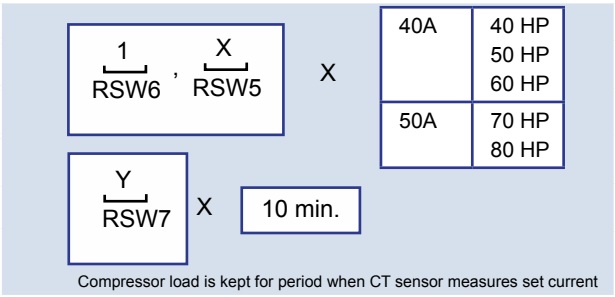
  RSW5 and RSW6 are used for setting the limiter current value. RSW7 is used for setting activating time of current limiter.

  – **$PCB_{B1}$ RSW5,6,7: CT Sensor function (Supplied as standard)**

  **($PCB_{B2}$ RSW5,6,7: No function)**

| Num. “X” | Model (HP) |
|---|---|
| 2 | 40 |
| 3 | 50/100 |
| 5 | 60/120/180 |
| 6 | 70/140/210/280/350 |
| 7 | 80/160/240/320/400 |




  e.g.:

  RCU2E40AG2: Compressor load is “down” and “hold” for 30min (Y=3; 3*10min) when compressor current is higher than 48 A (X=2; 1.2*40A).

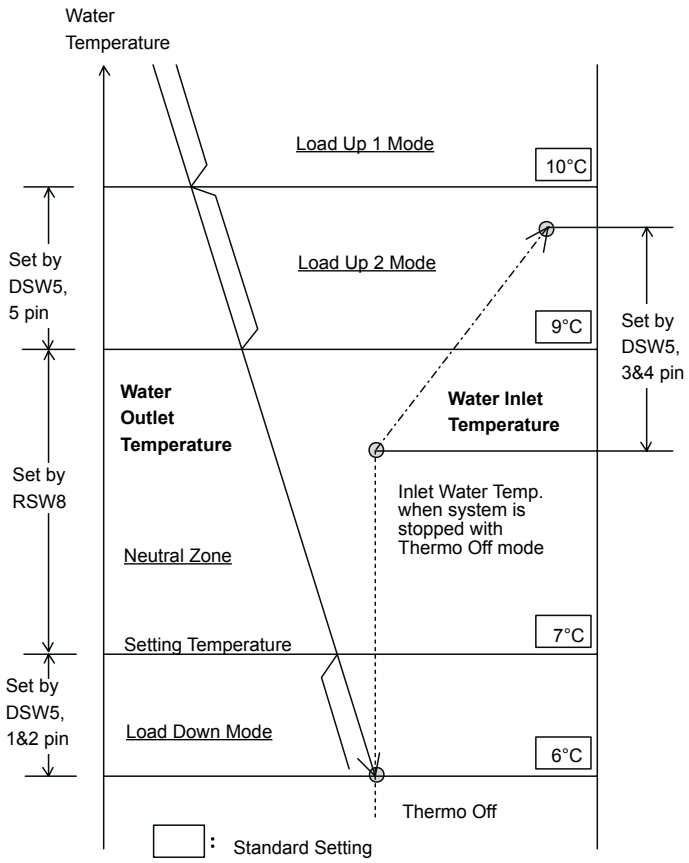
◆ **Neutral Zone Setting Switch = RSW8**

= 2 degrees is standard. The RSW8 dial is already set at 3 (= 2 degrees).
The figures at the RSW8 dial mean as follows:

| Figure | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Band (degree) | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 |

◆ **Continuous Capacity Control Setting Switch = DSW5**

Definition of Special Terms.

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◆ **Continuous Capacity Control Setting Switch=DSW5**

Temperature Band for Stop Setting Switch (1.0 ºC standard)

The figure 1 and 2 of the DSW5 switch are already set at figure 1 = ON side, 2 = OFF side.
The locations at the figure 1 and 2 of the DSW5 mean as follows.

| Figure | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
|---|---|---|---|---|---|---|---|---|
| Location | ON | ON | ON | OFF | OFF | ON | OFF | OFF |
| Band(degree) | 0.5 | | 1.0 | | 1.5 | | 2.0 | |

Temperature Band for Restart Setting Switch (2.0 ºC standard)
The figure 3 and 4 of the DSW5 switch are already set at figure 3 = ON side, 4 = OFF side.
The locations at the figure 3 and 4 of the DSW5 mean as follows.

| Figure | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|
| Location | ON | ON | ON | OFF | OFF | ON | OFF | OFF |
| Band(degree) | 1.0 | | 2.0 | | 3.0 | | 4.0 | |

Differential Temperature of Load-up 2 Mode Setting Switch (1.0 ºC standard)
The figure 5 of the DSW5 switch is already set at ON side.
The locations at the figure 5 of the DSW5 mean as follows.

| Figure | 5 | 5 |
|---|---|---|
| Location | ON | OFF |
| Band(degree) | 1.0 | 3.0 |

Output Signal Time for Load-up 1 Mode Setting Switch (12 seconds standard)
The figure 6 of the DSW5 switch is already set at ON side.
The locations at the figure 6 of the DSW5 mean as follows.

| Figure | 6 | 6 |
|---|---|---|
| Location | ON | OFF |
| Time(second) | 12 | 24 |

Output Signal Time for Load-up 2 and Load-down Mode Setting Switch (2 seconds standard)
The figure 7 and 8 of the DSW5 switch are already set at figure 7 = ON side,
8 = ON side.
The locations at the figure 7 and 8 of the DSW5 mean as follows.

| Figure | 7 | 8 | 7 | 8 | 7 | 8 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Location | ON | ON | ON | OFF | OFF | ON | OFF | OFF |
| Time(second) | 2 | | 4 | | 6 | | 8 | |

Interval of Output Signal Time for Load-up 2 and Load-down Mode Setting Switch. (60 seconds standard)

The figure 9 and 10 of the DSW5 switch, are already set at figure 9 = ON side, 10 = ON side. The locations at the figure 9 and 10 of the DSW5 mean as follows.

| Figure | 9 | 10 | 9 | 10 | 9 | 10 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|
| Location | ON | ON | ON | OFF | OFF | ON | OFF | OFF |
| Time(second) | 60 | | 90 | | 120 | | 30 | |

◆ **Setting of Compressor Cycling Protection Start = DSW2**

* Time Delay Starting for Compressor Setting Switch *

The compressor will be started after this setting time. (3 minutes standard)

The figure 1 and 2 of the DSW2 switch are already set at figure 1 = OFF side, 2 = OFF side.

The locations at the figure 1 and 2 of the DSW2 mean as follows.

| Figure | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
|---|---|---|---|---|---|---|---|---|
| Location | ON | ON | ON | OFF | OFF | ON | OFF | OFF |
| Time(minute) | 0.5 | | 6 | | 10 | | 3 | |

◆ **Manual Set Switch A = DSW3**

* Compressor Forcedly Stop Mode Setting Switch *

Master Printed Circuit Board: Switch “DSW3-1” is for No.1 compressor, “DSW3-2” for No.2, and “DSW3-3” for No.3,

Subsidiary Printed Circuit Board: Switch “DSW3-1” is for No. 4 compressor, and “DSW3-2” for No.5.

If necessary to stop any compressor, turn these switches (DSW3-1, DSW3-2 or DSW3-3) to the OFF side, the compressors corresponding to these switches which are turned to the OFF side will be stopped.

The figures of the DSW3 switch are initially set as follows depending on the compressor quantity.

This switch is for servicing, therefore, all the compressors shall be ON for normal operation:

| | Master PCB | | | Subsidiary PCB | | |
|---|---|---|---|---|---|---|
| Figure | 1 | 2 | 3 | 1 | 2 | 3 |
| Location | ON | OFF | OFF | OFF | OFF | OFF |
| Model | 1 Comp. System | | | | | |

| | Master PCB | | | Subsidiary PCB | | |
|---|---|---|---|---|---|---|
| Figure | 1 | 2 | 3 | 1 | 2 | 3 |
| Location | ON | ON | OFF | OFF | OFF | OFF |
| Model | 2 Comp. System | | | | | |

| | Master PCB | | | Subsidiary PCB | | |
|---|---|---|---|---|---|---|
| Figure | 1 | 2 | 3 | 1 | 2 | 3 |
| Location | ON | ON | ON | OFF | OFF | OFF |
| Model | 3 Comp. System | | | | | |

| | Master PCB | | | Subsidiary PCB | | |
|---|---|---|---|---|---|---|
| Figure | 1 | 2 | 3 | 4 | 5 | 6 |
| Location | ON | ON | ON | ON | OFF | OFF |
| Model | 4 Comp. System | | | | | |

| | Master PCB | | | Subsidiary PCB | | |
|---|---|---|---|---|---|---|
| Figure | 1 | 2 | 3 | 4 | 5 | 6 |
| Location | ON | ON | ON | ON | ON | OFF |
| Model | 5 Comp. System | | | | | |

DSW3-4,5,6,7: Enable of DC Fan Motor No. 11, 12, 13, 14 – Cycle Nº1 ($PCB_{B1}$)
DSW3-4,5,6,7: Enable of DC Fan Motor No. 41, 42, 43, 44 – Cycle Nº4 ($PCB_{B2}$)
DSW3-8,9,10: H-LINK ADDRESS [000 by default on $PCB_{B1}$];
Use same address in $PCB_{G1,G2}$ (DSW4-1,2,3)
DSW3-8,9,10: H-LINK ADDRESS [001 by default on $PCB_{B2}$];
Use same address in $PCB_{G3}$ (DSW4-1,2,3)

***NOTE:***
*The figures of DSW3 which are Not corresponding to the equipped compressor number are always turned to the OFF side.*

◆ **Manual Set Switch B = DSW4**

The figure 1 of the DSW4 switch must be turned to the ON side for Heat Pump models and to the OFF side for Cooling Only models

The figure 2 and 7 of the DSW4 switch must be turned to the ON side.

Setting at the figures 3,4, 5, 6 and 8 of the DSW4 switch should not be permitted (always at OFF side).

The figures 9 and 10 of DSW4 switch are for compressor and unit size setting as follows.

| Figure | 9 | 10 | 9 | 10 | 9 | 10 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|
| Location | OFF | ON | ON | OFF | ON | ON | OFF | OFF |
| Compressor | 40 HP | | 40 HP | | 50 HP | | 60 HP | |
| Unit | 40 HP | | 50 HP | | 60 HP | | 70,80 HP | |

◆ **Selection Switch for Cooling/ Heating Operation = SW8**

= All model in this series are for cooling only. So that Heating function is Not available.

The SW8 Selection Switch must be turned to the ***upper side***.

◆ **Selection Switch for Local/ Remote Operation = SW6**

= Remote operation is standard. So that the SW6 selection switch is turned to the ***lower side***.

If local operation is required, the SW6 selection switch is turned to the upper side.

■ **Selection Switch for Local/ Remote Pump Operation = SW7**

= The SW7 selection switch is turned to the ***lower ("OFF") side*** as remote setting.

If local operation is required, the SW7 selection switch is turned to the upper side.

◆ **Other Switches = SW5, DSW6 and RSW9**

This control panel is equipped with other switches:

The SW5 selection switch for chilled water/brine water, so that this switch must be turned to the ***upper side ("water")***. DSW6 and RSW9 for operation mode and setting change of these switches are not available.

It is recommended that the setting is not changed at site.

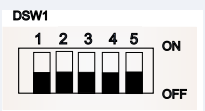
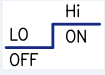
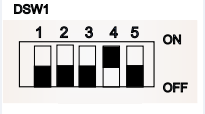
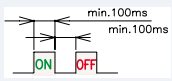
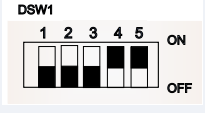
◆ **Setting of Low Voltage for Remote Control = DSW1**

This switch is used also for checking, resulting in easy troubleshooting.

– **Setting of Low Voltage for Remote Control = DSW1**

($PCB_{B2}$ DSW1: No function)

This switch is used also for checking (troubleshooting)

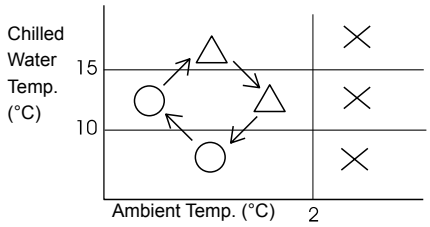
| MODE | Dip Switch Setting (DSW1 of Main PCB) |
|---|---|
| NORMAL MODE (Now low voltage control) |   |
| MODE 1 (Hi/Lo)   |   |
| MODE 2 (Pulse)   |   |

◆ **Anti-freeze Control by Pump Operation = DSW6-2pin**

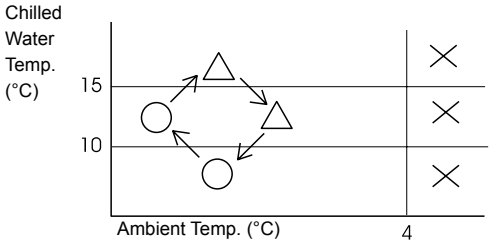
If the ambient temperature get lower than 2°C, water pump is operated forcedly and it protects water line against freezing. OFF side setting of DSW6-2pin makes this control available.
This control is available only when the pump is controlled by Chiller (See wiring diagram).

If water outlet temperature gets higher than 15°C, water pump is intermittently run with 5 minutes running and 55 minutes stopping.
The segment indicates 'PU' for 5 minutes in running and '88' for 55 minutes in stopping.
If ambient temperature gets higher than 4°C, this control will be cancelled.

Case 1. In case of ambient temperature decreasing




Case 2. In case of ambient temperature increasing




| Symbols Show | | |
|---|---|---|
| | ○ | Continuous Run |
| | △ | Intermittent Run |
| | × | Stopped |

For example, in case that this protection works under ambient temperature 2°C and chilling water is 10 ~15°C, then the water pump is running continuously.

When DSW6-2 is positioned at ON, makes this control be invalid. In case Chiller receives the running operation during this control, this protective control will be cancelled and go back to the normal water pump control.

This freeze protective control is not available under alarming due to water outlet or ambient thermistor abnormality (open or short circuit: alarm code... '12' or '22').

◆ **Low water outlet temperature option Setting = DSW4 and DSW7**

When this option is requested, the figure 4 of the DSW4 must be turned to the ON (UPPER) side.
Depend on Temperature Range, the figure 1 and 2 of the DSW7 is necessary to set as below.

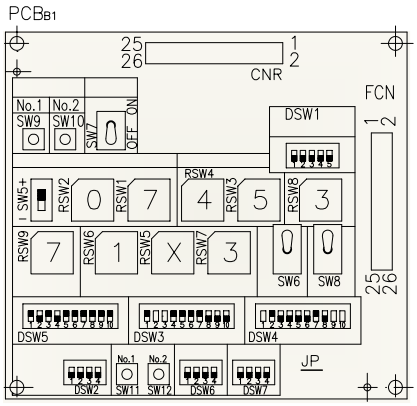
| Figure | 1 | 2 | 1 | 2 | 1 | 2 |
|---|---|---|---|---|---|---|
| Location | OFF | OFF | ON | OFF | OFF | ON |
| Temp. Range | Standard | | -5~5 °C | | -10~6 °C | |

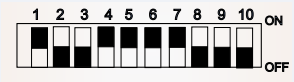
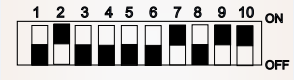
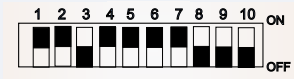
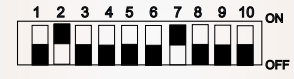
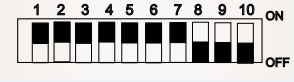
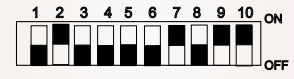
***NOTE:***
*Other information on Low water outlet temperature option is on chapter 16.3*

## 8.3. Factory Set'up

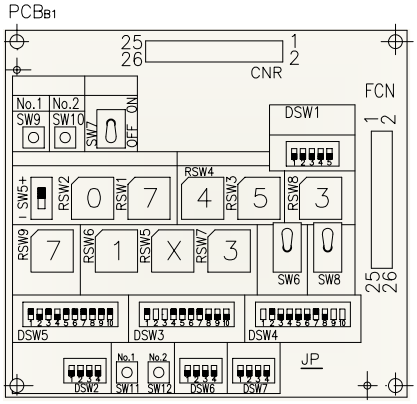
Configuration for standard version. Standard values are the ones shown on PCB drawing and table below.

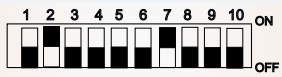
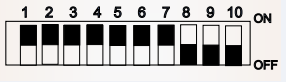
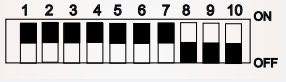
- **$PCB_{B1}$ (RHU2E(40-240)AG2)**




| MODEL | DSW3 | DSW4 | RSW5 |
|---|---|---|---|
| RHU2E40AG2 |  |  | RSW5 2 |
| RHU2E50AG2 | |  | RSW5 3 |
| RHU2E60AG2 | |  | RSW5 5 |
| RHU2E70AG2 | |  | RSW5 6 |
| RHU2E80AG2 | | | RSW5 7 |
| RHU2E100AG2 |  |  | RSW5 3 |
| RHU2E120AG2 | | | |
| RHU2E140AG2 | |  | RSW5 5 |
| RHU2E160AG2 | |  | RSW5 6 |
| | | | RSW5 7 |
| RHU2E180AG2 |  |  | RSW5 5 |
| RHU2E210AG2 | |  | RSW5 6 |
| RHU2E240AG2 | | | RSW5 7 |

◆ **PCB$_{B1}$ (RCU2E(40-400)AG2)**




| MODEL | DSW3 | DSW4 | RSW5 |
|---|---|---|---|
| RCU2E40AG2 |  |  |  |
| RCU2E50AG2 | |  |  |
| RCU2E60AG2 | |  |  |
| RCU2E70AG2 | | |  |
| RCU2E80AG2 | |  |  |
| RCU2E100AG2 |  |  |  |
| RCU2E120AG2 | | | |
| RCU2E140AG2 | |  |  |
| RCU2E160AG2 | |  |  |
| RCU2E180AG2 |  |  |  |
| RCU2E210AG2 | | | |
| RCU2E240AG2 | |  |  |
| RCU2E280AG2 |  |  |  |
| RCU2E320AG2 | | |  |
| RCU2E350AG2 |  |  |  |
| RCU2E400AG2 | | |  |

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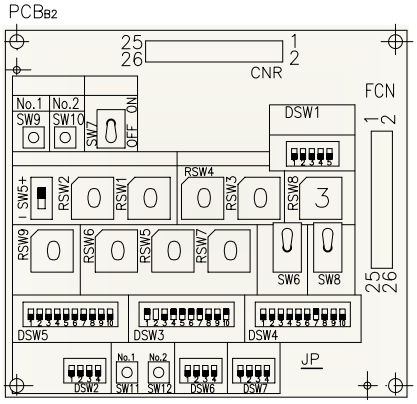
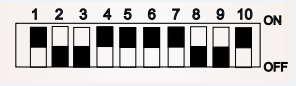
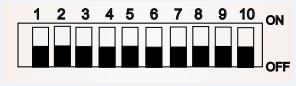
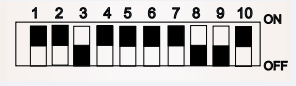
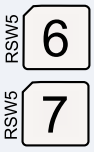
◆ **$PCB_{B2}$ (RCU2E(280-400)AG2)**

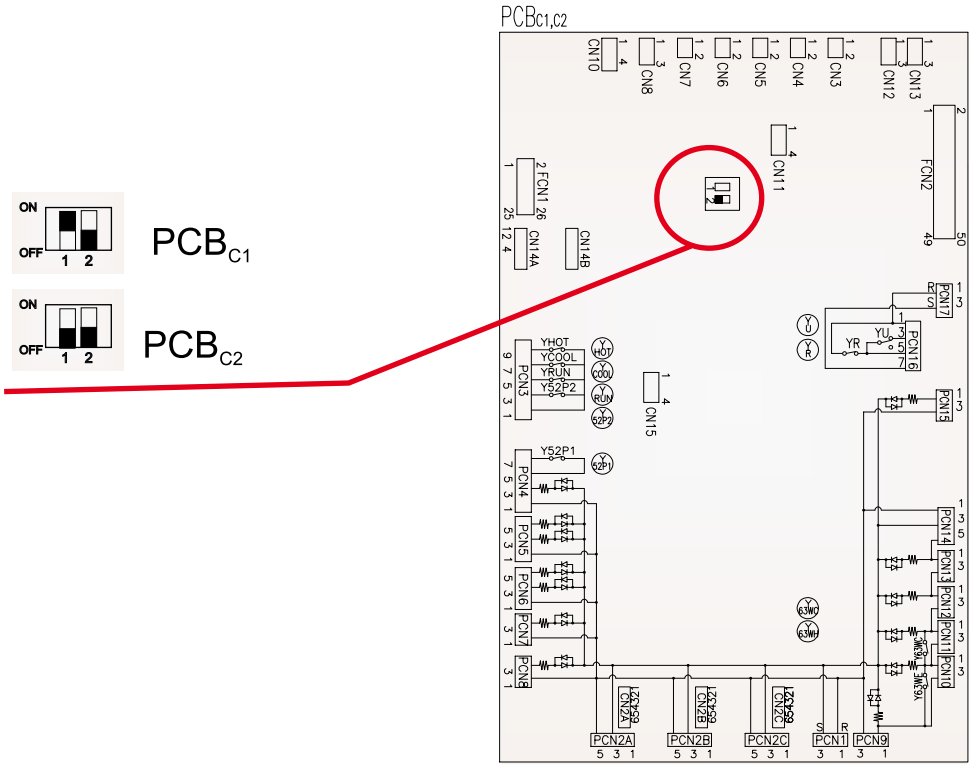



| MODEL | DSW3 | DSW4 | RSW5 |
|---|---|---|---|
| RCU2E280AG2<br>RCU2E320AG2 |  |  |  |
| RCU2E350AG2<br>RCU2E400AG2 |  |  |  |

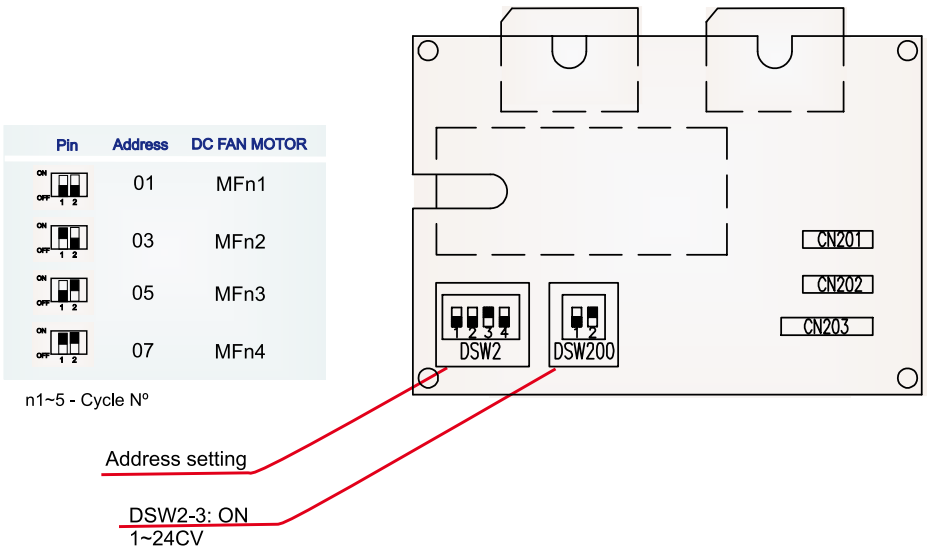
◆ **DIP SWITCH SETTING PCBC1,C2 (MAIN CONTROL PCB; Master & Subsidiary)**

DSW-1: H-LINK end resistance (ON only PCB C1)

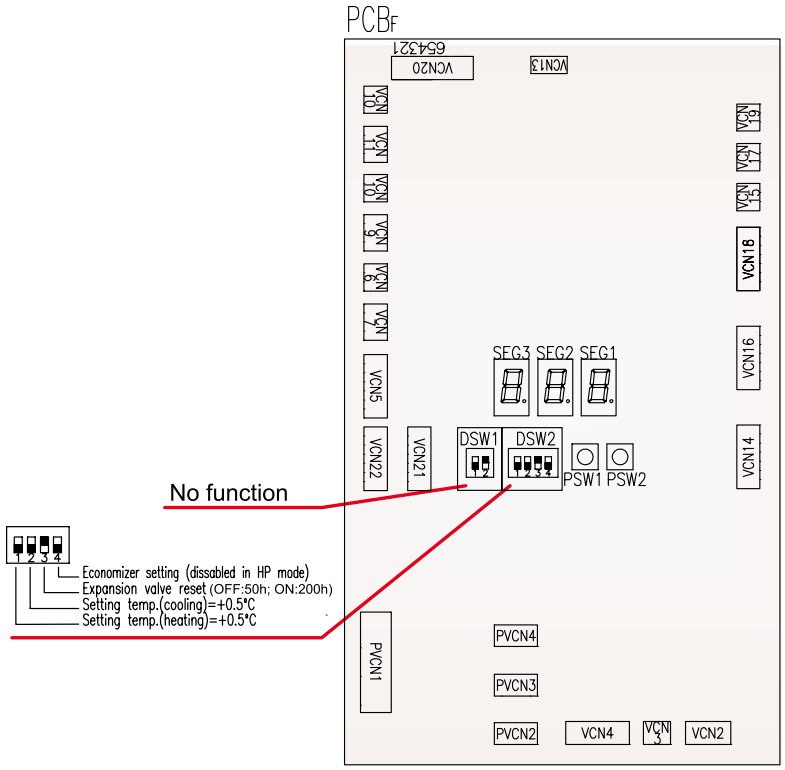
DSW-2: Fuse protection



## ◆ DIP SWITCH SETTING PCB$_{e1\sim e5}$ (FAN MODULE FOR DC FAN MOTORS)



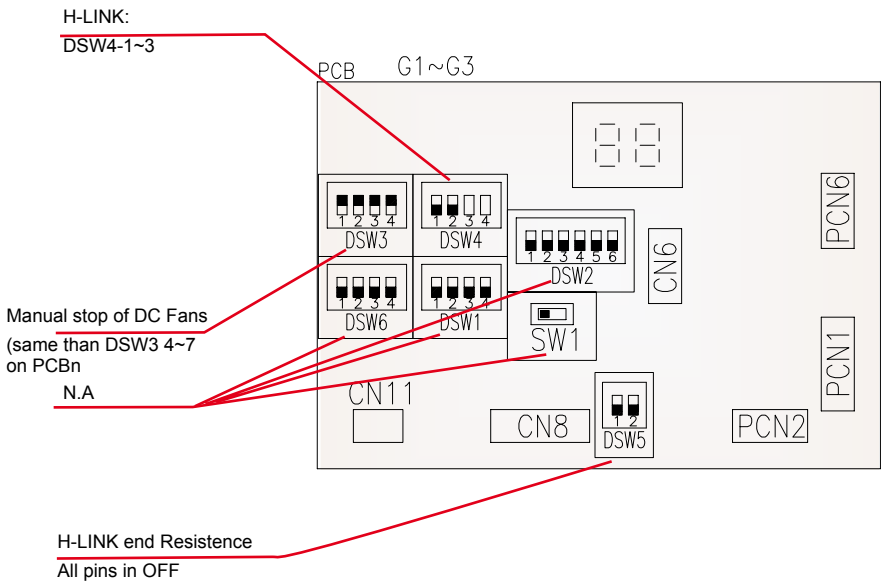

## ◆ DIP SWITCH SETTING PCB$_{F1\sim F2}$. (EXP. VALVE CONTROL PCB)



## ◆ DIP SWITCH SETTING PCB$_{G1,G2,G3}$ (FAN CONTROL PCB)

Standard Setting

| Setting PCB DSW4 | | H LINK DSW4 1 2 3 | PCB Nº DSW4 4 |
|---|---|---|---|
|  | PCB $_{G1}$ | 000 | 0 |
|  | PCB $_{G2}$ | 000 | 1 |
|  | PCB $_{G3}$ | 001 | 0 |

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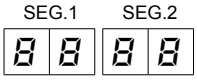
# 9. Self-Inspection Functions

## Contents

## 9.1. Alarm Indication

If the unit is operated under abnormal conditions, an alarm code (refer to the table below) is indicated and the “Alarm” LED lamp is lighted.
Function of 7-Segment Light Emitted Diode on Control Panel is as shown in the table below.



7 Segments on Control Panel

| Code | | | | | Content |
|---|---|---|---|---|---|
| No.1 Cycle | No.2 Cycle | No.3 Cycle | No.4 Cycle | No.5 Cycle | |
| C1H1 | C2H2 | C3H3 | C4H4 | C5H5 | Activation of High Pressure Switch |
| C1L1 | C2L2 | C3L3 | C4L4 | C5L5 | Excessively Low Pressure |
| C1L1 | C2L2 | C3L3 | C4L3 | C5L5 | Activation of Low Pressure Protection Control |
| C1H1 | C2H2 | C3H3 | C4H4 | C5H5 | Activation of AC Fan Internal Thermostat |
| C1S1 | C2S2 | C3S3 | C4S4 | C5S5 | Activation of Thermal Relay for Compressor or Malfunction of Auxiliary Relay ARn |
| C1b1 | C2b2 | C3b3 | C4b4 | C5b5 | Activation of Discharge Gas Thermistor |
| C1n1 | C2n2 | C3n3 | C4n4 | C5n5 | Activation of Compressor Internal Thermostat |
| C1d1 | C2d2 | C3d3 | C4d4 | C5d5 | Excess Low Temperature of Cooler Inlet Refrigerant |
| C1E1 | C2E2 | C3E3 | C4E4 | C5E5 | Activation of Suction Gas Thermistor |
| C1051 | C2051 | C3051 | C4051 | C5051 | Phase Abnormally |
| C1121 | C2121 | C3121 | C4121 | C5121 | Failure of Water Outlet Thermistor (Only for 2 - 5 cycle unit) |
| C1131 | C2131 | C3131 | C4131 | C5131 | Activation of Freeze Protection Control (More Than 2 Cycle Unit) |
| C1211 | C2211 | C3211 | C4211 | C5211 | Failure of Cooler inlet Refrigerant Thermistor (Open / Short) |
| C1231 | C2231 | C3231 | C4231 | C5231 | Failure of Discharge Gas Thermistor (Open / Short) |
| C1241 | C2241 | C3241 | C4241 | C5241 | Failure of Thermistor set before Expansion Valve |
| C1251 | C2251 | C3251 | C4251 | C5251 | Failure of Water Outlet Thermistor (Rear side of Water Cooler) |
| C1261 | C2261 | C3261 | C4261 | C5261 | Failure of Suction Gas Thermistor (Open / Short) |
| C1271 | C2271 | C3271 | C4271 | C5271 | Failure of Discharge Gas Pressure Sensor (Open / Short) |
| C1281 | C2281 | C3281 | C4281 | C5281 | Failure of Suction Gas Pressure Sensor (Open / Short) |
| C1F0 | C2F0 | C3F0 | C4F0 | C5F0 | Incorrect Setting of Fan Number |
| F1111 | F2111 | F3111 | F4111 | F5111 | Fan Inverter Rotation Abnormally *1 |
| F1211 | F2211 | F3211 | F4211 | F5211 | Activation of Fan Inverter Over Current Protection Control *1 |
| F1311 | F2311 | F3311 | F4311 | F5311 | Fan Inverter Phase Abnormally *1 |
| F1411 | F2411 | F3411 | F4411 | F5411 | Error Communication between Inverter PCB and Control or Fan Control PCB *1 |
| F1511 | F2511 | F3511 | F4511 | F5511 | Inverter Power Supply Abnormally *1 |

| Code | | | | | Content |
|---|---|---|---|---|---|
| No.1 Cycle | No.2 Cycle | No.3 Cycle | No.4 Cycle | No.5 Cycle | |
| | | 05 05 | | | Phase Abnormally |
| | | 11 11 | | | Failure of Water Inlet Temperature Thermistor |
| | | 12 12 | | | Failure of Water Outlet Thermistor. (Only for Single Cycle Unit) |
| | | 13 13 | | | Activation of Freeze Protection Control (Only for Single Cycle Unit) |
| | | 22 22 | | | Failure of Ambient Temperature Thermistor (Open / Short) |
| | | SP SP | | | No Feedback Signal from Water Pump |
| | | 40 40 | | | Incorrect Operation |
| | | EU EU | | | Error Communication between Expansion Valve PCB and Control PCB |
| | | Fc Fc | | | Error Communication between Fan Control PCB and Control PCB |
| | | CP CP | | | Error Communication between Control PCB ($PCB_{C1}$, $PCB_{C2}$) |
| | | “PU” “PU” | | | Alarm of Excessively High Water Temperature |
| | | 6E 6E | | | Alarm of Water Failure (Differential Pressure Switch or Flow Switch Option) |
| | | AP AP | | | Activation of Additional Protection Device |
| | | 03 03 | | | Error Communication between Chiller and Remote Controller (If CSC-5S is connected.) |
| F1P7 | F2P7 | F3P7 | F4P7 | F5P7 | Retry Operation (More Than 3 Fans Retry at The Same Time) |
| F1P8 | F2P8 | F3P8 | F4P8 | F5P8 | Retry Operation (by Alarm Fx-41 or Fx-51, x: Cycle No.) |
| C1P5 | C2P5 | C3P5 | C4P5 | C5P5 | Retry Operation (by Alarm Cx-6x or Cx-7x, x: Cycle No.) |
| C1P6 | C2P6 | C3P6 | C4P6 | C5P6 | Retry Operation (by Alarm Cx-9x or Cx-Lx, x: Cycle No.) |

“”-”” : Flickering , *1 : 21 Right side segment shows Fan No.

## 9.2. Normal Indication

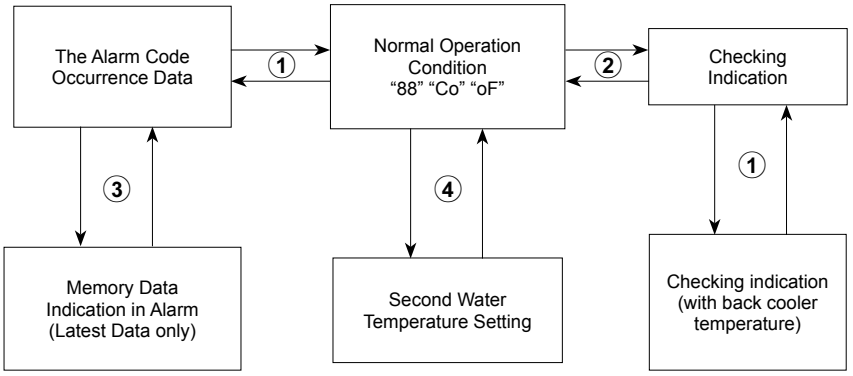
If the unit is operated under a normal operation condition, the operation code (refer to the table below) is indicated on 7-Segment LED’s of the control panel.

| Code | | | | | Content |
|---|---|---|---|---|---|
| No.1 Cycle | No.2 Cycle | No.3 Cycle | No.4 Cycle | No.5 Cycle | |
| C1 88 | C2 88 | C3 88 | C4 88 | C5 88 | Power Supply, After Stoppage |
| C1 Co | C2 Co | C3 Co | C4 Co | C5 Co | Cooling Operation |
| C1 oF | C2 oF | C3 oF | C4 oF | C5 oF | Stoppage by Thermo-OFF |
| | | PU PU | | | Pump Operation, Warning of Pump Feedback |
| C1 Et | C2 Et | C3 Et | C4 Et | C5 Et | Activation of Current Limiter |
| C1 EO | C2 EO | C3 EO | C4 EO | C5 EO | Initializing Electronic Expansion Valve |

## 9.3. Function for indication of operation condition

### ◆ Function for indication of operation condition

The setting temperature, chilled water temperature sensed at the thermistor, the setting differential temperature and the last alarm code are digitally indicated on the control panel.




① Press the check "Δ" and "∇" switches simultaneously for more than 3 sec.
It is changed to the normal mode by pressing the "Δ" and "∇" switches simultaneously for more than 3 sec. again.

② Press the check "Δ" switch for more than 3 sec.
It is changed to the normal mode by pressing the "Δ" switch for more than 3 sec. again.

③ Press the check "∇" switch for more than 3 seconds at the time to display latest Alarm code. It is changed to the normal mode by pressing the "∇" switch for more than 3 sec. again.

④ Press the check "∇" switch for more than 3 seconds.
It is changed to the normal mode by pressing the "∇" switch for more than 3 sec. again.

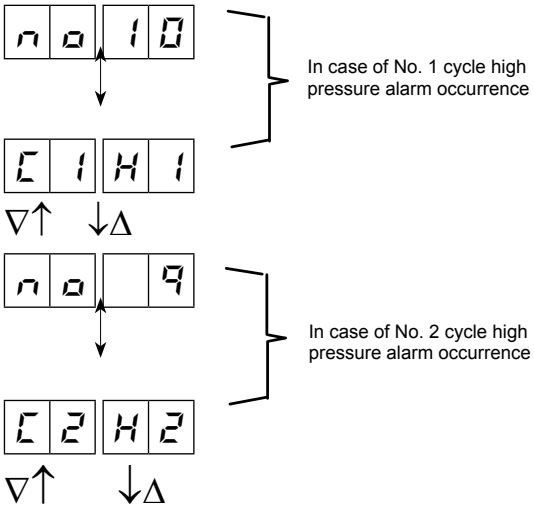
***NOTE:***
*Each indication mode shall be changed from the normal mode.*

### ◆ Indication mode of alarm occurrence data ①

The content of abnormal stoppage including activation of safety devices is memorised and indicated on the control panel

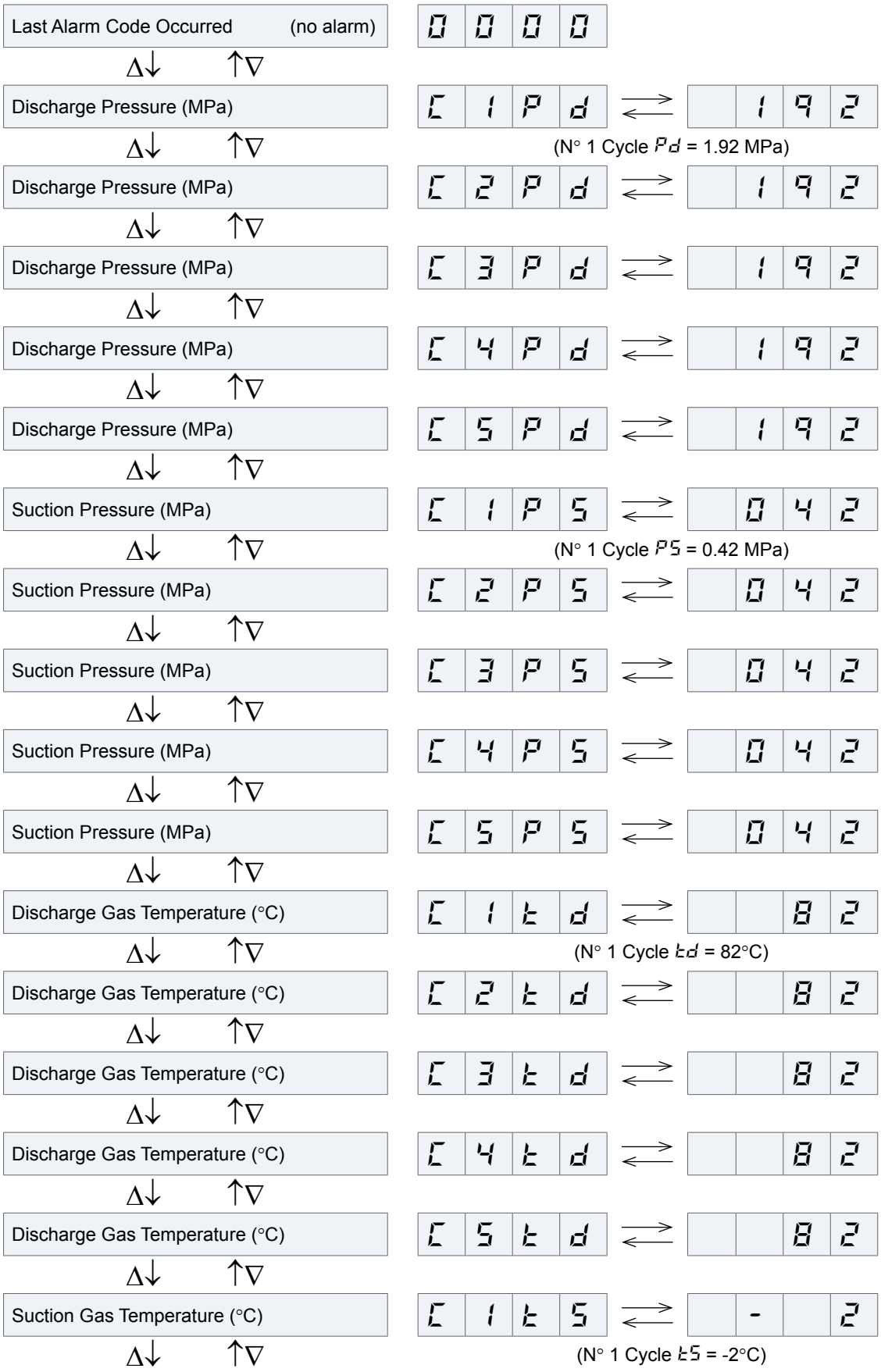
Alarm Occurrence Data (Max.10 data)

Example:




***NOTE:***
*If an abnormal operation is occurred under this indication mode, this indication mode is changed to the alarm indication mode.*

◆ **Checking Indication ②**

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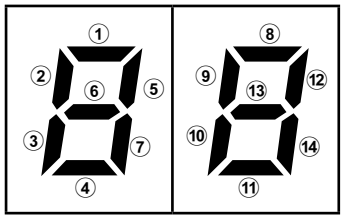
| | | |
|---|---|---|
| Suction Gas Temperature (°C) | C 2 t S | - 2 |
| Suction Gas Temperature (°C) | C 3 t S | - 2 |
| Suction Gas Temperature (°C) | C 4 t S | - 2 |
| Suction Gas Temperature (°C) | C 5 t S | - 2 |
| Evaporating Temperature (°C) | C 1 t r | - 5 |
| Evaporating Temperature (°C) | C 2 t r | - 5 |
| Evaporating Temperature (°C) | C 3 t r | - 5 |
| Evaporating Temperature (°C) | C 4 t r | - 5 |
| Evaporating Temperature (°C) | C 5 t r | - 5 |
| Liquid Temperature (°C) | C 1 t E | 3 5 |
| Liquid Temperature (°C) | C 2 t E | 3 5 |
| Liquid Temperature (°C) | C 3 t E | 3 5 |
| Liquid Temperature (°C) | C 4 t E | 3 5 |
| Liquid Temperature (°C) | C 5 t E | 3 5 |
| Water Inlet Temperature (°C) | C E L | 1 2 |
| Average Water Outlet Temperature (°C) | C o L | 7 |
| Water Outlet 1 Temperature (°C) | C o L 1 | 7 |
| Water Outlet 2 Temperature (°C) | C o L 2 | 6 |

(N° 1 Cycle $tr_1$ = 36°C)

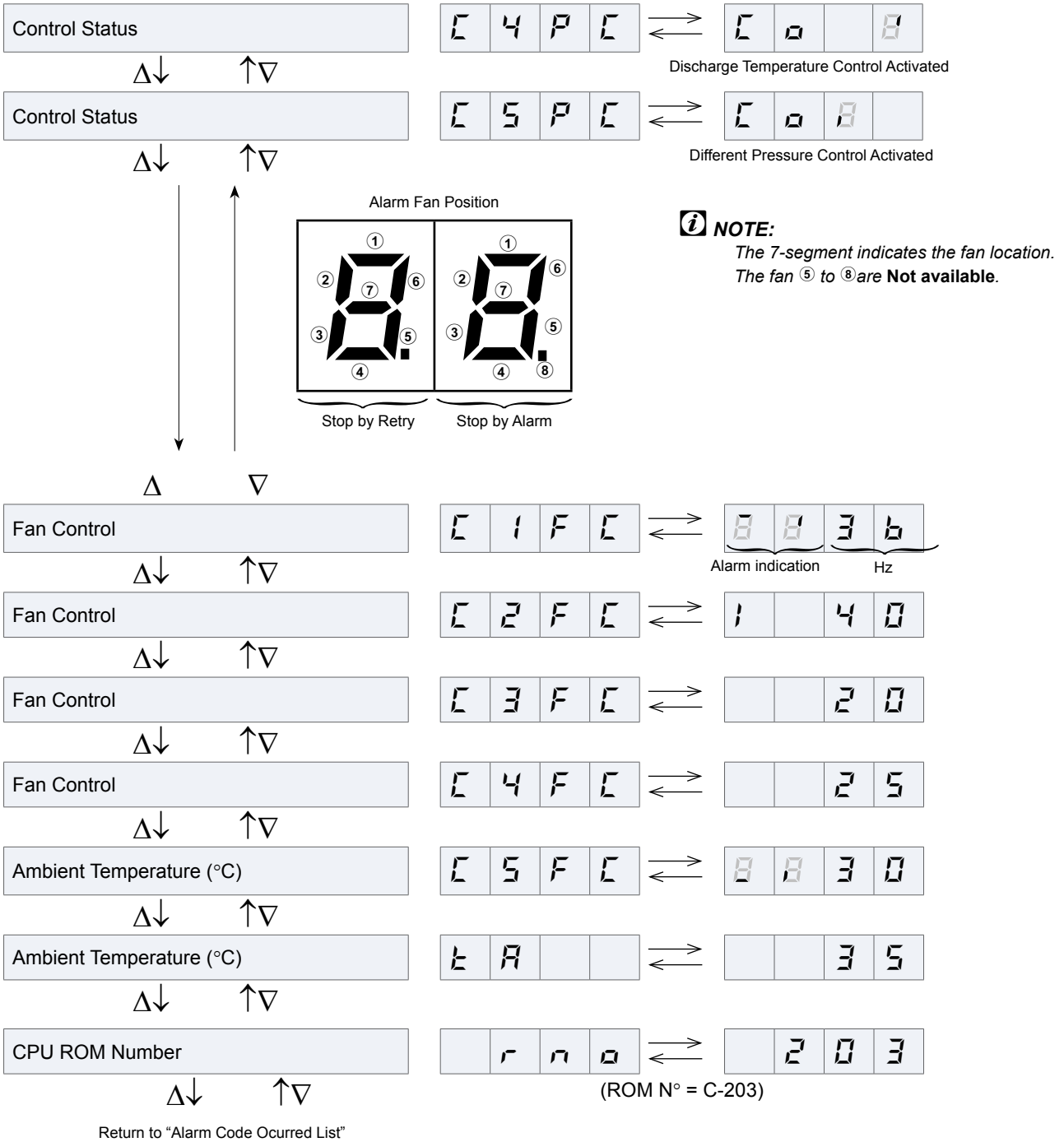
| | | |
|---|---|---|
| Water Outlet 3 Temperature (°C) | CoL3 | 7 |
| Water Outlet 4 Temperature (°C) | CoL4 | 7 |
| Water Outlet 5 Temperature (°C) | CoL5 | 7 |
| Setting Water Outlet Temperature (°C) | tSC | 7 |
| Second Setting Water Outlet Temperature (°C) | tSCd | 5 |
| Setting Neutral Zone Temperature Difference (°C) | dF | 2 |
| Ambient Temperature (°C) | tA | 35 |
| Compressor Capacity Control (°C) | C1Ld | UP (Load up) |
| Compressor Capacity Control (°C) | C2Ld | nU (Hold) |
| Compressor Capacity Control (°C) | C3Ld | dO (Load down) |
| Compressor Capacity Control (°C) | C4Ld | -- (Thermo-off) |
| Compressor Capacity Control (°C) | C5Ld | UP |

Alarm Control Status




| | | | |
|---|---|---|---|
| ① | Discharge Pressure Control | ⑧ | High Efficiency Mode |
| ② | Suction Pressure Control | ⑨ | Low Noise Mode |
| ③ | Different Pressure Control | ⑩ | Load Down Control (Water Outlet Temp.) |
| ④ | Freeze Protection Control | ⑪ | Not Available |
| ⑤ | Compressor Start Control | ⑫ | Discharge Temperature Control |
| ⑥ | Discharge Temperature Retry | ⑬ | Liquid Bypass (Not Available) |
| ⑦ | Current Limiter | ⑭ | Not Available |

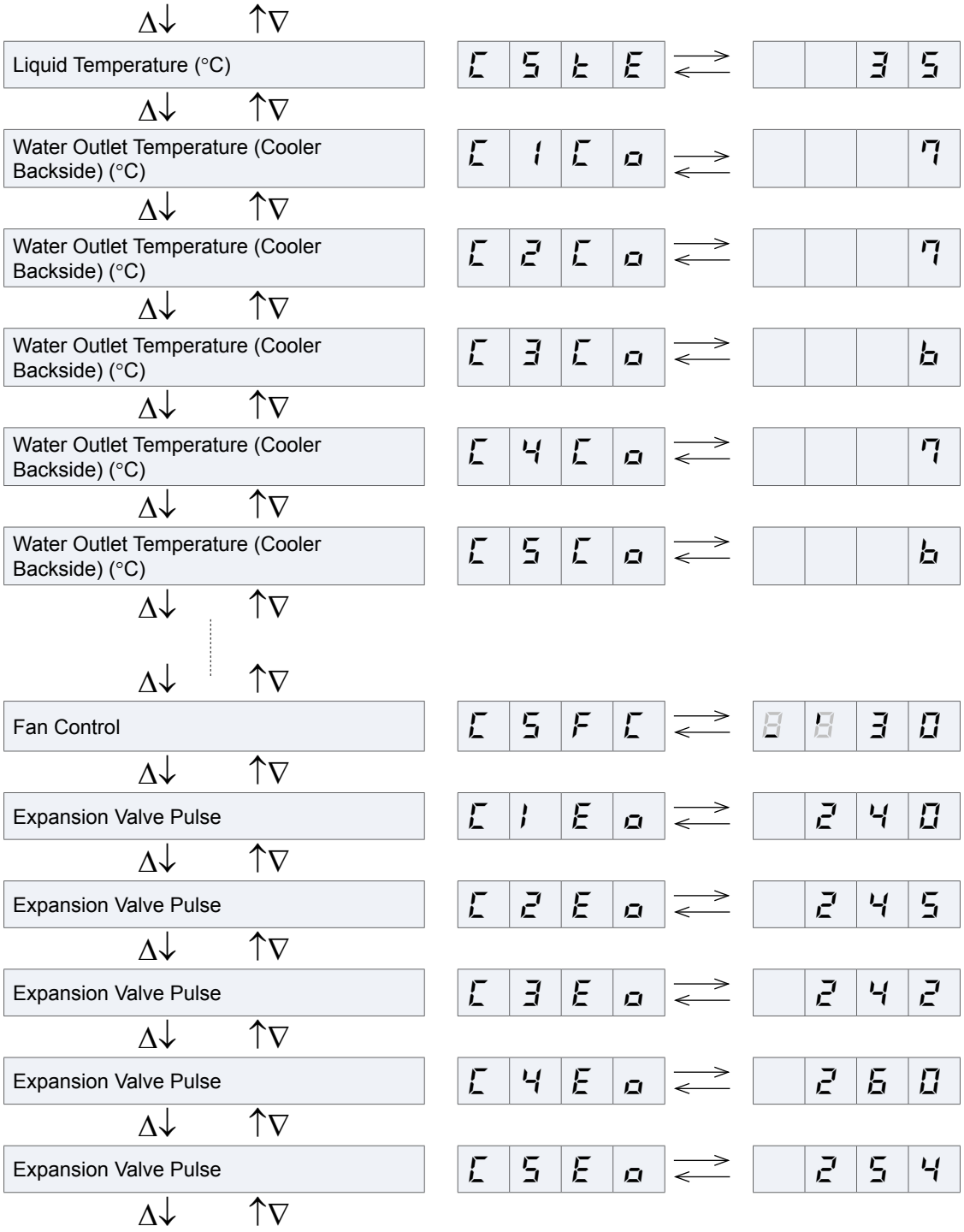
| | | |
|---|---|---|
| Control Status | C1PC | Co1 (Compressor Start Control) |
| Control Status | C2PC | Co2 (Suction Pressure Control Activated) |
| Control Status | C3PC | Co3 (Discharge Temperature Control Activated) |


Control Status
C4PC
Co 0
Discharge Temperature Control Activated
Control Status
C5PC
Co 0
Different Pressure Control Activated
Alarm Fan Position
Stop by Retry
Stop by Alarm
NOTE:
The 7-segment indicates the fan location.
The fan ⑤ to ⑧ are Not available.
Fan Control
C1FC
00 3b
Alarm indication
Hz
Fan Control
C2FC
140
Fan Control
C3FC
20
Fan Control
C4FC
25
Ambient Temperature (°C)
C5FC
00 30
Ambient Temperature (°C)
tA
35
CPU ROM Number
rno
203
(ROM N° = C-203)
Return to “Alarm Code Ocurred List”

◆ **Memory Data Indication in Alarm** ③

Data is indicated same as Checking Indication.

In addition the checking data, below data is added.

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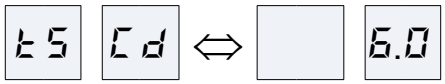
◆ **Second Water Temperature Setting** ④

This temperature setting can provide another setting value for water temperature.

It can be changed by external signal

Second Water Temperature Setting Procedure

1) Press the check "∇" switch for more than 3 seconds.
Then, display shows the current setting value.

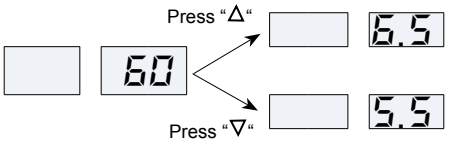



* This shows the setting value is 6ºC.

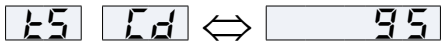
2) Press the check "Δ" and "∇" switches simultaneously for more than 3 seconds.The mode is changed to setting mode.

Then, the setting value can be changed by pressing the check "Δ" and "∇" switches.

However, the setting value shown on display, is not available in this moment.

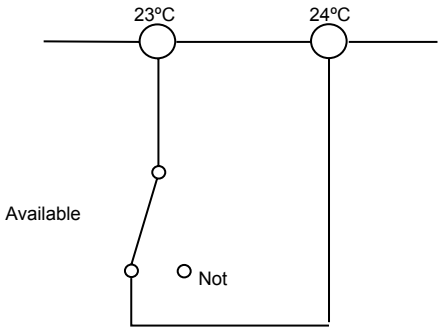



3) Press the check "Δ" and "∇" switches simultaneously for more than 3 seconds. At the same time, the setting value shown on display is memorized and available.




* The setting is changed to 9.5ºC.

When the wiring connection shown below, this second temperature setting is available.



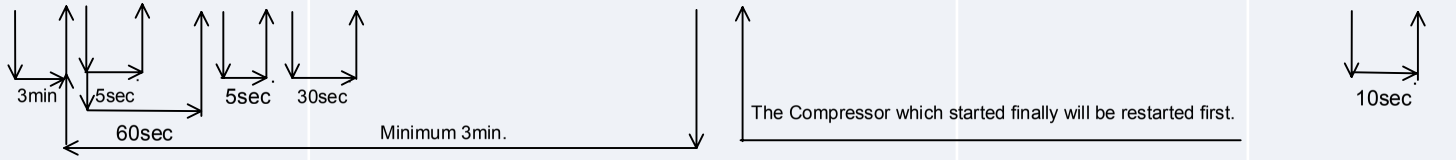
# 10. Control System

## Contents

| Control Devices \ Control Stage | | | Starting Control | | | | | Capacity Control | | | | | | | | | Safety Devices | | | Shut Down | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Main Power Switch | | MI | OFF | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ON | ON | ON | OFF |
| Operation Switch | | PBS | - | - | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | OFF | ON | OFF | - | - |
| Controller | Load Up | | - | - | - | - | - | ☆ | ☆ | - | - | - | - | ☆ | - | - | - | - | - | - | - | - | - |
| | Neutral | | - | - | - | - | - | - | - | ★ | - | - | - | - | - | ★ | ★ | ★ | - | ★ | - | - | - |
| | Load Down | | - | - | - | - | - | - | - | - | ☆ | ☆ | - | - | - | - | - | - | - | - | - | - | - |
| Safety Devices | | No.1 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | OPN | CLS | CLS | CLS | CLS | CLS |
| Chilled Water Pump | | CPUE | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF |
| Power Supply Indicator | | | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF |
| Operation Indicator | | | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | ON | OFF | OFF | OFF |
| Alarm Indicator | | | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF |
| Oil Heater | | CH1 | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | ON | ON | OFF | ON | ON | OFF |
| Compressor Motor | | MC1 | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| Fan Motor | | MF11~14 | OFF | OFF | | | | | | | ON | | | | | | | OFF | OFF | ON | OFF | OFF | OFF |
| Solenoid Valve | | SV11 | OFF | OFF | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV12 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV13 | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| Time Schedule | | | | | | | | | | | | | | | | | | | | | | | |

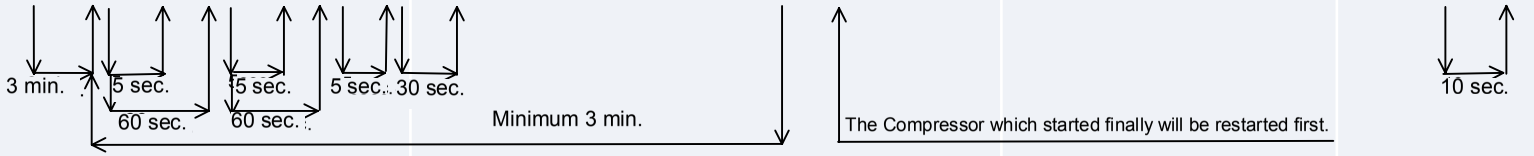

CLS: Close
OPN: Open
STA: Star
DLT: Delta
ULD: Unload
FLD: Full Load
☆: Changing Compressor Load
★: Keeping Compressor Load

| Control Devices \ Control Stage | | | Starting Control | | | | | | | Capacity Control | | | | | | | | | Safety Devices | | | | Shut Down | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Main Power Switch | | MI | OFF | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ON | ON | ON | OFF |
| Operation Switch | | PBS | - | - | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | OFF | ON | OFF | - | - |
| Controller | Load Up | | - | - | - | - | - | - | - | ☆ | ☆ | - | - | - | - | - | ☆ | - | - | - | ☆ | - | - | - | - | - |
| | Neutral | | - | - | - | - | - | - | - | - | - | ★ | - | - | - | - | - | ★ | ★ | ★ | - | - | ★ | - | - | - |
| | Load Down | | - | - | - | - | - | - | - | - | - | - | ☆ | ☆ | - | - | - | - | - | - | - | - | - | - | - | - |
| Safety Devices | | No.1 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.2 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | OPN | CLS | CLS | CLS | CLS | CLS |
| Chilled Water Pump | | CPUE | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF |
| Power Supply Indicator | | | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF |
| Operation Indicator | | | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | ON | OFF | OFF | OFF |
| Alarm Indicator | | | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF |
| Oil Heater | | CH1 | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH2 | OFF | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | ON | ON | OFF |
| Compressor Motor | | MC1 | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC2 | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| Fan Motor | | MF11~16 | OFF | OFF | | | | | | | | | ON | | | | | | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF21~26 | OFF | OFF | | | | | | | | | ON | | | | | | | | OFF | OFF | ON | OFF | OFF | OFF |
| Solenoid Valve | | SV11 | OFF | OFF | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV12 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV13 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV21 | OFF | OFF | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV22 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV23 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| Time Schedule | | | | | | | | | | | | | | | | | | | | | | | | | | |




CLS: Close
OPN: Open
STA: Star
DLT: Delta
ULD: Unload
FLD: Full Load
☆: Changing Compressor Load
★: Keeping Compressor Load

| Control Devices \ Control Stage | | | Starting Control | | | | | | | | | Capacity Control | | | | | | | | | Safety Devices | | | | | Shut Down | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Main Power Switch | | MI | OFF | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ON | ON | ON | OFF |
| Operation Switch | | PBS | - | - | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | OFF | ON | OFF | - | - |
| Controller | Load Up | | - | - | - | - | - | - | - | - | - | ☆ | ☆ | - | - | - | - | - | ☆ | - | - | - | ☆ | ☆ | - | - | - | - | - |
| | Neutral | | - | - | - | - | - | - | - | - | - | - | - | ★ | - | - | - | - | - | ★ | ★ | ★ | - | - | - | ★ | - | - | - |
| | Load Down | | - | - | - | - | - | - | - | - | - | - | - | - | ☆ | ☆ | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Safety Devices | | No.1 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | OPN | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.2 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.3 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | OPN | CLS | CLS | CLS | CLS | CLS |
| Chilled Water Pump | | CPUE | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF |
| Power Supply Indicator | | | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF |
| Operation Indicator | | | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | ON | OFF | OFF | OFF |
| Alarm Indicator | | | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | ON | OFF | OFF | OFF | OFF | OFF |
| Oil Heater | | CH1 | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | ON | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH2 | OFF | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH3 | OFF | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | ON | ON | OFF |
| Compressor Motor | | MC1 | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC2 | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC3 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| Fan Motor | | MF11~16 | OFF | OFF | ON | | | | | | | | | | | | | | | | | | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF21~26 | OFF | OFF | ON | | | | | | | | | | | | | | | | | | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF31~36 | OFF | OFF | ON | | | | | | | | | | | | | | | | | | | | OFF | OFF | ON | OFF | OFF | OFF |
| Solenoid Valve | | SV11 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV12 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV13 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV21 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV22 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV23 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV31 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV32 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV33 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF |
| Time Schedule | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |




CLS Close ULD: Unload
OPN: Open FLD: Full Load
STA: Star ☆: Changing Compressor Load
DLT Delta ★: Keeping Compressor Load

## 10.4. Standard Operation Sequence RCU2E280AG2, 320AG2

| Control Devices \ Control Stage | | Starting Control | | | | | | | | | | | Capacity Control | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Main Power Switch | MI | OFF | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Operation Switch | PBS | - | - | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Controller Load Up | | - | - | - | - | - | - | - | - | - | - | - | ☆ | ☆ | - | - | - | - | - | ☆ | - |
| Controller Neutral | | - | - | - | - | - | - | - | - | - | - | - | - | - | ★ | - | - | - | - | - | ★ |
| Controller Load Down | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ☆ | ☆ | - | - | - | - |
| Safety Devices | No.1 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS |
| | No.2 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS |
| | No.3 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS |
| | No.4 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS |
| Chilled Water Pump | CPUE | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON |
| Power Supply Indicator | | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON |
| Operation Indicator | | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON |
| Alarm Indicator | | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| Oil Heater | CH1 | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| | CH2 | OFF | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| | CH3 | OFF | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| | CH4 | OFF | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| Compressor Motor | MC1 | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% |
| | MC2 | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% |
| | MC3 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% |
| | MC4 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% |
| Fan Motor | MF11~16 | OFF | OFF | | | | | | | | | | ON | | | | | | | | |
| | MF21~26 | OFF | OFF | | | | | | | | | | ON | | | | | | | | |
| | MF31~36 | OFF | OFF | | | | | | | | | | ON | | | | | | | | |
| | MF41~46 | OFF | OFF | | | | | | | | | | ON | | | | | | | | |
| Solenoid Valve | SV11 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF |
| | SV12 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF |
| | SV13 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |
| | SV21 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF |
| | SV22 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF |
| | SV23 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |
| | SV31 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF |
| | SV32 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF |
| | SV33 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |
| | SV41 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF |
| | SV42 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF |
| | SV43 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |
| Time Schedule | | 3min. | 5sec. | 5sec. | 5sec. | 5sec. | 5sec. | 5sec | 30sec. | | | | | | | | | | | | |
| | | 60sec. | | 60sec. | | 60sec. | | | | | | | Minimum | | | | | | | | |
| | | | | | | | | | | | | | | | | | | The Compressor which started finally will be restarted first. | | | |

CLS: Close
OPN: Open
STA: Star
DLT: Delta
ULD: Unload
FLD: Full Load
☆: Changing Compressor Load
★: Keeping Compressor Load

to be continued in next page ⟶

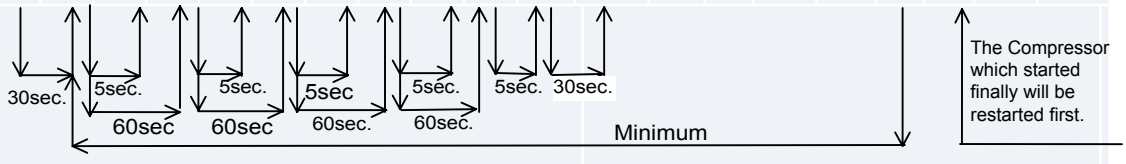
## Standard Operation Sequence RCU2E280AG2, 320AG2 (cont.)

| Control Devices \ Control Stage | | | Safety Devices | | | | | | Shut Down | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Main Power Switch | | MI | - | - | - | - | - | - | ON | ON | ON | OFF |
| Operation Switch | | PBS | - | - | - | - | - | OFF | ON | OFF | - | - |
| Controller | Load Up | | - | - | ☆ | ☆ | ☆ | - | - | - | - | - |
| | Neutral | | ★ | ★ | - | - | - | - | ★ | - | - | - |
| | Load Down | | - | - | - | - | - | - | - | - | - | - |
| Safety Devices | | No.1 | CLS | OPN | OPN | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.2 | CLS | CLS | OPN | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.3 | CLS | CLS | CLS | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.4 | CLS | CLS | CLS | CLS | OPN | CLS | CLS | CLS | CLS | CLS |
| Chilled Water Pump | | CPUE | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF |
| Power Supply Indicator | | | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF |
| Operation Indicator | | | ON | ON | ON | ON | OFF | OFF | ON | OFF | OFF | OFF |
| Alarm Indicator | | | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF |
| Oil Heater | | CH1 | OFF | ON | ON | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH2 | OFF | OFF | ON | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH3 | OFF | OFF | OFF | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH4 | OFF | OFF | OFF | OFF | ON | ON | OFF | ON | ON | OFF |
| Compressor Motor | | MC1 | DLT (ULD) 15~99% | OFF | OFF | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC2 | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC3 | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC4 | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| Fan Motor | | MF11~16 | ON | | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF21~26 | ON | | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF31~36 | ON | | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF41~46 | ON | | | | OFF | OFF | ON | OFF | OFF | OFF |
| Solenoid Valve | | SV11 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV12 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV13 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV21 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV22 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV23 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV31 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV32 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV33 | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV41 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV42 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV43 | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF |
| Time Schedule | | | The Compressor which started finally will be restarted first. | | | | | | | 10sec. | | |

CLS: Close
OPN: Open
STA: Star
DLT: Delta
ULD: Unload
FLD: Full Load
☆: Changing Compressor Load
★: Keeping Compressor Load

## 10.5. Standard Operation Sequence RCU2E350AG2, 400AG2

| Control Devices \ Control Stage | | | Starting Control | | | | | | | | | | | | | Capacity Control | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Main Power Switch | | MI | OFF | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Operation Switch | | PBS | - | - | ON | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Controller | Load Up | | - | - | - | - | - | - | - | - | - | - | - | - | - | ☆ | ☆ | - | - | - | - | - | ☆ | - |
| | Neutral | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ★ | - | - | - | - | - | ★ |
| | Load Down | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | ☆ | ☆ | - | - | - | - |
| Safety Devices | | No.1 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS |
| | | No.2 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS |
| | | No.3 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS |
| | | No.4 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS |
| | | No.5 | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS | CLS |
| Chilled Water Pump | | CPUE | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON |
| Power Supply Indicator | | | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON |
| Operation Indicator | | | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON |
| Alarm Indicator | | | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | Oil Heater | CH1 | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| | | CH2 | OFF | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| | | CH3 | OFF | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| | | CH4 | OFF | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| | | CH5 | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | OFF | OFF | OFF |
| Compressor Motor | | MC1 | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% |
| | | MC2 | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% |
| | | MC3 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% |
| | | MC4 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% |
| | | MC5 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | STA (ULD) 15% | DLT (ULD) 15% | DLT (ULD) 15~99% | DLT (FLD) 100% | DLT (FLD) 100% | DLT (ULD) 15~99% | DLT (ULD) 15% | OFF | STA (ULD) 15% | DLT (ULD) 15~99% | DLT (ULD) 15~99% |
| | Fan Motor | MF11~16 | OFF | OFF | | | | | | | | | | | ON | | | | | | | | | |
| | | MF21~26 | OFF | OFF | | | | | | | | | | | ON | | | | | | | | | |
| | | MF31~36 | OFF | OFF | | | | | | | | | | | ON | | | | | | | | | |
| | | MF41~46 | OFF | OFF | | | | | | | | | | | ON | | | | | | | | | |
| | | MF51~56 | OFF | OFF | | | | | | | | | | | ON | | | | | | | | | |
| Solenoid Valve | | SV11 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF |
| | | SV12 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF |
| | | SV13 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |
| | | SV21 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF |
| | | SV22 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF |
| | | SV23 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |
| | | SV31 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF |
| | | SV32 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF |
| | | SV33 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |
| | | SV41 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF |
| | | SV42 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF |
| | | SV43 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |
| | | SV51 | OFF | OFF | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF |
| | | SV52 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF |
| | | SV53 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | OFF | OFF | OFF | OFF | ON | OFF |
| Time Schedule | | | | | | | | | | | | | | | | | | | | | | | | |




CLS Close ULD: Unload
OPN: Open FLD: Full Load
STA: Star ☆: Changing Compressor Load
DLT Delta ★: Keeping Compressor Load

to be continued in next page ⟶

## Standard Operation Sequence RCU2E350AG2, 400AG2 (cont.)

| Control Devices \ Control Stage | | | Safety Devices | | | | | | | Shut Down | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Main Power Switch | | MI | - | - | - | - | - | - | - | ON | ON | ON | OFF |
| Operation Switch | | PBS | - | - | - | - | - | - | OFF | ON | OFF | - | - |
| Controller | Load Up | | - | - | ☆ | ☆ | ☆ | ☆ | - | - | - | - | - |
| | Neutral | | ★ | ★ | - | - | - | - | - | ★ | - | - | - |
| | Load Down | | - | - | - | - | - | - | - | - | - | - | - |
| Safety Devices | | No.1 | CLS | OPN | OPN | OPN | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.2 | CLS | CLS | OPN | OPN | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.3 | CLS | CLS | CLS | OPN | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.4 | CLS | CLS | CLS | CLS | OPN | OPN | CLS | CLS | CLS | CLS | CLS |
| | | No.5 | CLS | CLS | CLS | CLS | CLS | OPN | CLS | CLS | CLS | CLS | CLS |
| Chilled Water Pump | | CPUE | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF |
| Power Supply Indicator | | | ON | ON | ON | ON | ON | ON | ON | ON | ON | ON | OFF |
| Operation Indicator | | | ON | ON | ON | ON | ON | OFF | OFF | ON | OFF | OFF | OFF |
| Alarm Indicator | | | OFF | OFF | OFF | ON | ON | ON | OFF | OFF | OFF | OFF | OFF |
| Oil Heater | | CH1 | OFF | ON | ON | ON | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH2 | OFF | OFF | ON | ON | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH3 | OFF | OFF | OFF | ON | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH4 | OFF | OFF | OFF | ON | ON | ON | ON | OFF | ON | ON | OFF |
| | | CH5 | OFF | OFF | OFF | OFF | OFF | ON | ON | OFF | ON | ON | OFF |
| Compressor Motor | | MC1 | DLT (ULD) 15~99% | OFF | OFF | OFF | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC2 | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC3 | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC4 | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| | | MC5 | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | DLT (ULD) 15~99% | OFF | OFF | DLT (ULD) 15~99% | OFF | OFF | OFF |
| Fan Motor | | MF11~16 | | | ON | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF21~26 | | | ON | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF31~36 | | | ON | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF41~46 | | | ON | | | OFF | OFF | ON | OFF | OFF | OFF |
| | | MF51~56 | | | ON | | | OFF | OFF | ON | OFF | OFF | OFF |
| Solenoid Valve | | SV11 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV12 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV13 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV21 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV22 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV23 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV31 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV32 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV33 | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV41 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV42 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV43 | OFF | OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV51 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV52 | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF |
| | | SV53 | OFF | OFF | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF |
| Time Schedule | | | The Compressor which started finally will be restarted first. | | | | | | | 10sec | | | |

CLS Close ULD: Unload
OPN: Open FLD: Full Load
STA: Star ☆: Changing Compressor Load
DLT Delta ★: Keeping Compressor Load

# 11. Maintenance

## Contents

The unit should be periodically inspected according to the same items as those described in the paragraph titled “Test Running”. In order to ensure dependable performance and long life operation, the following additional items should be given for particular attention.

***WARNING:***

*If a fire accidentally occurs, turn OFF the main switch and use an extinguisher for an oil fire and an electric fire.*

*Do not operate the unit near flammable gases such aslacquer, paint oil, etc. to avoid a fire or an explosion.*

*Turn OFF the main switch when electrical box covers are removed for setting the temperature. Do not operate the unit without fixing panels.*

***DANGER***:

*Switch OFF main interruptor (MI) for any work inside electrical box.*

*Keep electrical box cover closed 2 min. after switching power off (to discharge the capacitors)*

***CAUTION:***

*Perform periodical maintenance according to the “INSTRUCTIONS” to maintain the unit in a good condition.*

*Do not touch the parts at the discharge gas side by hand, since the pipes at the discharge side are heated by refrigerant and the temperature becomes higher than 100 °C.*

*Do not utilise this unit for cooling or heating of drinking water or food. Comply with local codes and regulations.*

*Turn OFF all the main switches if refrigerant leakage or chilled water leakage occurs. Also, if the unit can not be stopped by the control switch, turn OFF all the switches for power source.*

## 11.1. Components

- **Compressor**

  The semi-hermetic screw compressor requires periodic maintenance, including replacement of parts. See the HITACHI Service Handbook for Screw Compressors, for details.

- **Air-cooled Condenser**

  Inspect the condenser and remove any accumulated dirt from the coil, at regular intervals. Other obstacles such as growing grass and pieces of paper, which might restrict Air flow, should also be removed.

- **Electrical Equipment**

  Always pay careful attention to working voltage, amperage and phase balance. Check for faulty contact caused by loosened terminal connections, oxidised contacts, foreign matter, and others.

- **Control and Protective Devices**

  Do not readjust the settings in the field unless the setting is maintained at the point other than the point listed in the table on chapter 8.

## 11.2. Lubrication

- **Compressor**

  The compressors are charged at the factory with the correct oil listed on the compressor nameplate. It is not necessary to add oil, if the refrigerant cycle remains sealed.

- **Fan Motor**

  Bearing of all fan motors are pre-lubricated. Lubrication is not required.

## 11.3. Deposit

Lime and other minerals in the chilled water tend to deposit on surfaces of plates over a long period of operation. As deposits of these minerals increase, excessive lower operation pressure is detected, indicating evidence of deposits on the water cooler.

***CAUTION:***

*Cleaning of Plate type Heat Exchangers shall be performed by specialists.*
*Please contact your contractor o dealer of HITACHI.*

*Clean the Water Strainer periodically according to its clogging degree.*

*It is strongly recommended to clean the Plate Heat Exchanger at the same time the Water Strainer is cleaned.*

***WARNING:***

*This product is equipped with Plate type Heat Exchangers, which are very sensitive of clogging and therefore they could get frozen unless special care is taken.*

*For that reason it is recommended to follow accurately the next caution about normal cleaning method. For further details, please contact your HITACHI installer.*

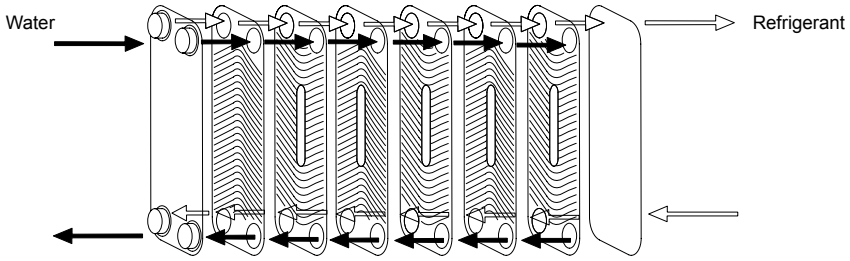
***CAUTION:***

*Correctly select cleaning agent depending on scales in the plate type heat exchangers. The cleaning chemicals are different depending on fouling degree.*

*This plate type heat exchanger is made of stainless steel. Do not use a cleaning agent containing hydrochloric acid or fluorine compound. If used, the heat exchanger will be damaged, resulting in refrigerant leakage.*

*After cleaning with cleaning agent, clean inside of water piping including the heat exchangers by using clean water. Perform water treatment (preventive treatment) in order to prevent the water circuit from corrosion or re-adhering of scales after cleaning.*

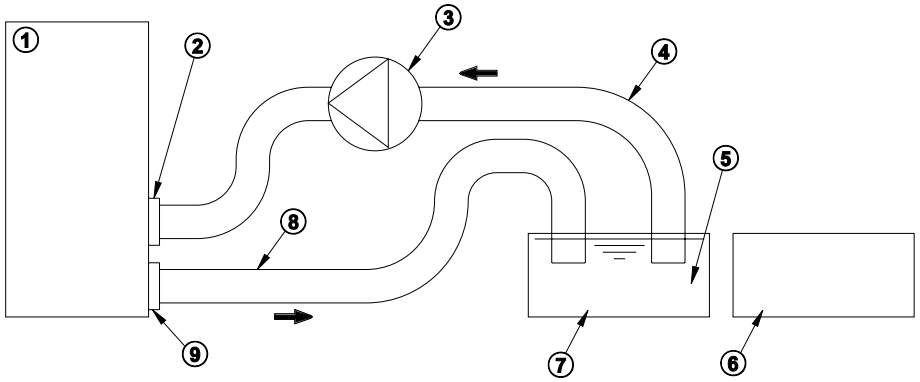
*In the case that a cleaning agent is used, adjust concentration of the cleaning agent, cleaning period and temperature according to the scale degree.*




*In the case that acid cleaning is performed, neutralisation treatment is required after cleaning. Treatment for neutralisation fluid should be performed by a waste fluid contractors.*

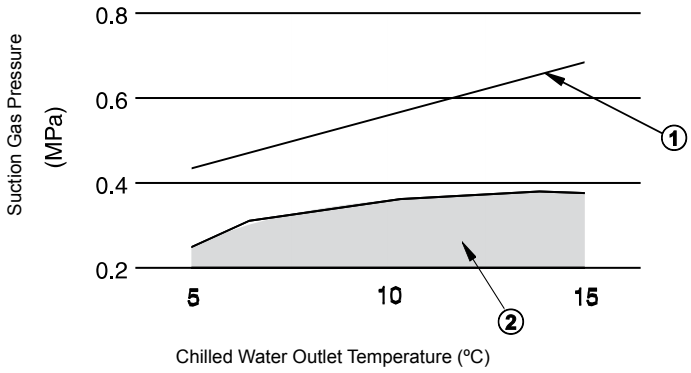
*The cleaning agent and neutralising agent have erosiveness and stimulativeness against eyes, skin, mucous membrane etc. Therefore use protection tools (protection glasses, protection gloves, protection shoes, protection cloth, protection mask, etc.) in order not to absorb or touch these agents during this cleaning work.*

## 11.4. Cleaning Method




| Nr. | Name | Nr. | Name |
|---|---|---|---|
| 1 | Chiller Unit | 6 | Waste Fluid Tank |
| 2 | Chilled Water / Inlet Piping | 7 | Cleaning Water Tank |
| 3 | Acid-resistant Type Water Pump | 8 | Hose |
| 4 | Hose | 9 | Chilled Water / Outlet Piping |
| 5 | Diluted Cleaning Fluid | | |

1. Installation of Cleaning Circuit
   - Stop the water Chiller unit.
   - Stop the circulating water pump.
   - Disconnect the connections at the chilled water inlet and install a circulating water circuit by using an acid-resistant type water pump.
2. Check of Circulating Circuit
   - Pour water in the cleaning tank and operate the acid-resistant type water pump.
   - Check to ensure that no water leakage exists.
   - Check to ensure that the water hose is firmly fixed.
   - Check to ensure that the cleaning agent will not damage equipment near the water Chiller even if bubbles occur and touch them.
   - Check to ensure that good ventilation is available.
   - Check to ensure that no abnormal sound occurs.
3. Cleaning Work
   - Discharge water in the water circuit of the air conditioning system.
   - Supply diluted cleaning fluid from the cleaning water tank by operating the acid-resistant pump.
   - Circulate the cleaning fluid for an appropriate period of time (the operating time should be determined according to the type of cleaning agent, concentration and fouling degree).
4. Waste Fluid
   - Stop the acid-resistant pump.
   - Put the waste fluid into the waste fluid tank.
   - Supply water into the cleaning tank and operate the pump for water cleaning.
   - Put the cleaning water into the waste fluid tank as same as the waste fluid.
   - Measure pH degree by using a pH test sheet and neutralise the waste fluid by gradually adding neutralising agent.
   - After neutralisation ask a waste fluid treatment contractors to handle it.
5. Neutralisation Treatment in the Water Piping
   - Put water into the cleaning tank.
   - Operate the acid-resistant pump after Air-purging.
   - Measure the pH degree and gradually add neutralising agent until the pH reaches pH = 7.
   - Operate the pump for a specified period of time for neutralisation.
   - Discharge the used water.
   - Operate the circulating pump and clean the circuit with water until no fouling fluid is observed.
6. Re-starting
   - Reconnect the water piping as they were so that the water Chiller can operate.
   - After cleaning, perform water treatment (preventive treatment) in order to prevent the water circuit from corrosion.




| Nr. | Name |
|---|---|
| 1 | Saturation Line of R407C |
| 2 | Area Requiring Cleaning |

## 11.5. Winter Shutdown

When shutting down the unit for winter, clean the inside and outside of the cabinet, and dry the unit. Pump down the refrigerant to the condenser and close the liquid outlet stop valves. This unit should be covered during shutdown, in order to protect it from dust and environmental conditions. Be sure to tighten the packing glands and the cap nuts of the valves.

Remove the drain plug and drain all residual water from the water cooler piping systems, as such water may freeze during the cold season. It is very helpful to supply brine (anti-freezer) to the piping systems.

## 11.6. Spring Start-Up

After any extended shutdown period, prepare the unit for operation as follows.

1. Thoroughly inspect and clean the unit.
2. Clean the water piping lines and the strainer.

Inspect the pump and other auxiliary equipment in the piping line.

3. Tighten all wiring connections and access panel.

***CAUTION:***
*When the main switch for this unit has been at the OFF position for an extended period of time, it should be switched ON at least 12 hours before start-up, so that oil in the compressor discharge casing may be warmed enough, to prevent oil foaming by the oil heater during start-up.*

## 11.7. Part Replacement

Replacement of parts should be undertaken by ordering from the HITACHI Spare Parts List.

***CAUTION:***
*Do not replace with spare parts which are not the equivalent.*

## 11.8. Refrigeration Cycle

- **Strainer**

  Check for clogging each time when the refrigeration cycle is opened.

- **Refrigerant Charge**

  Inspect the refrigerant charge of the system by checking the discharge and suction pressures. Perform a leakage test, if any leakage is suspected, and always perform such a test after a refrigeration cycle component is replaced. When refrigerant charge is required, follow the following instructions given for two cases:

  1. When Refrigerant Gas Completely Leaked.
     Before charging the entire cycle must be completely evacuated and dehydrated. A gauge manifold or equivalent piping preparation shown in the next page is recommended as a convenient procedure regarding both charging and evacuation.

     Fully open all the stop valves.

     Connect the evacuation line to the check joints of the high and the low pressure sides.

     Completely evacuate the entire cycle with a vacuum pump.

     Charge refrigerant to the refrigeration cycle by weighing the charging cylinder. The proper refrigerant charge is listed on the nameplate.

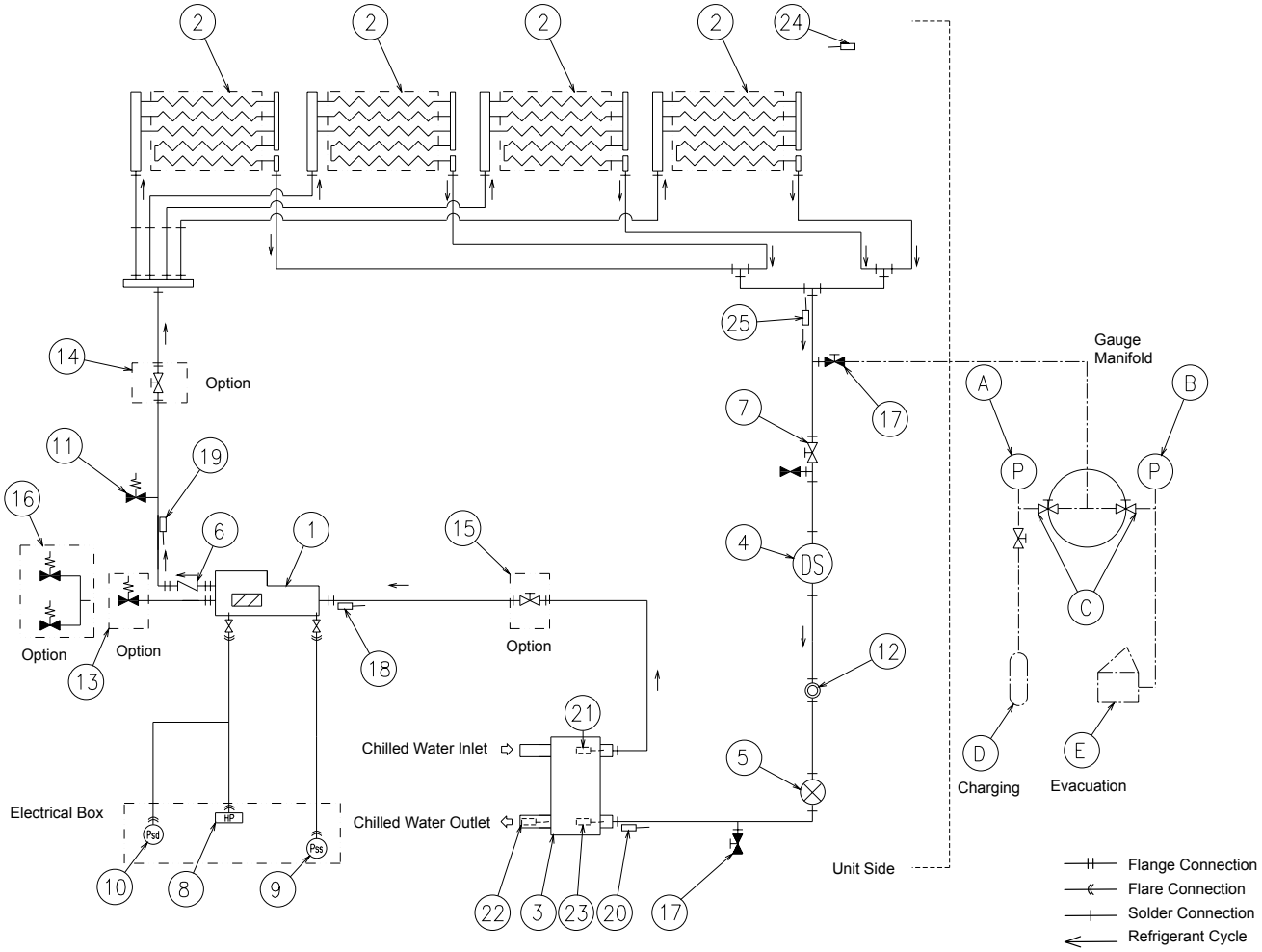
     When charging by weight is stopped due to high ambient temperature, close the valve and operate the unit after circulating the chilled water through the water cooler and installing a jumper on the low pressure switch, if required.

  2. When Only Additional Refrigerant is Required.
     Connect a gauge manifold to check joint of low pressure side, and connect a charge cylinder to gauge manifold.
     Operate the unit after circulating the chilled water and install a jumper on the low pressure switch, if required. Repeat the following procedure until pressure becomes proper (refer to page 58).

     Charge the gas refrigerant a little slowly into refrigeration cycle from check joint for low pressure.

     Check the pressure after refrigeration cycle becomes stable.

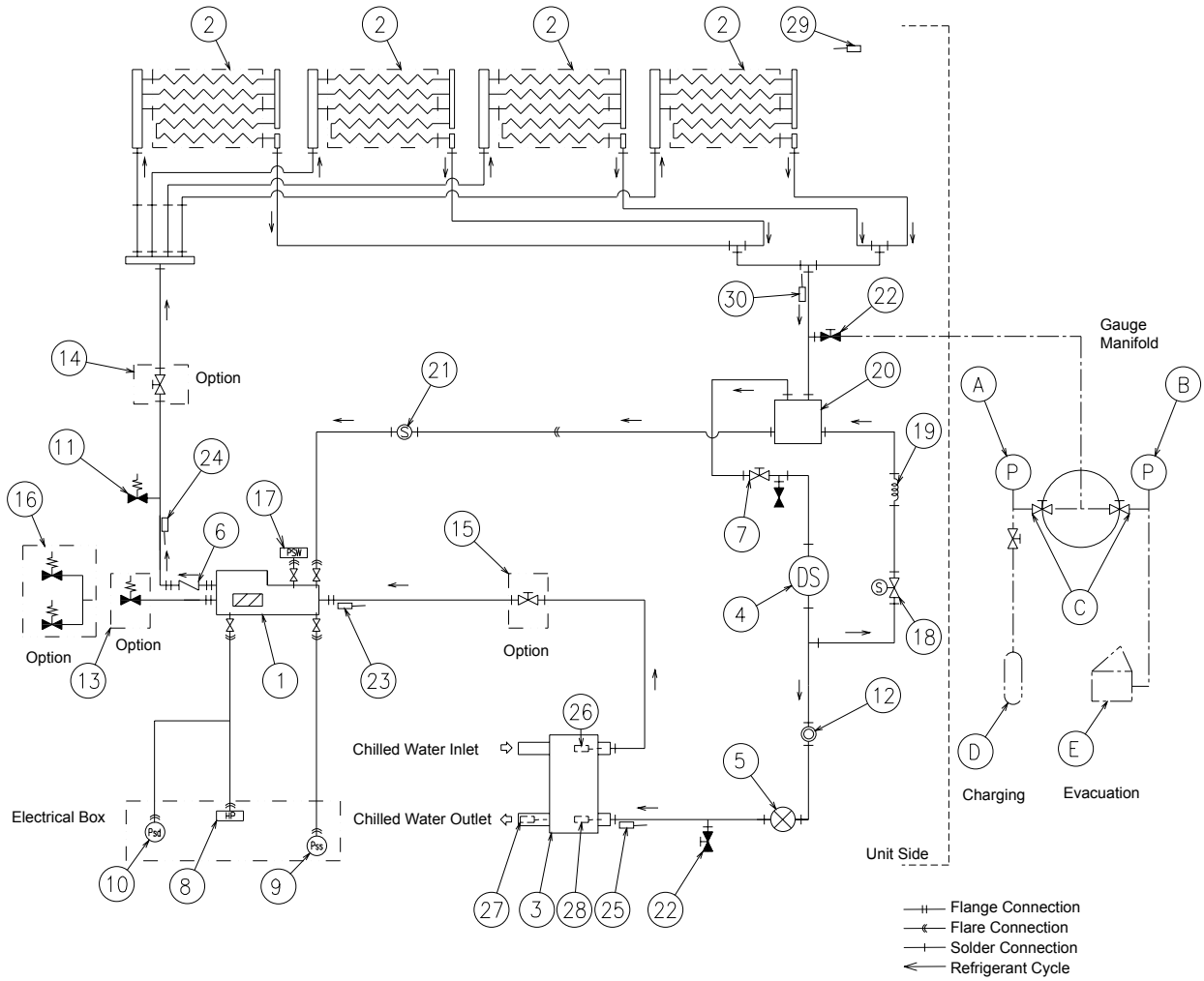
## 11.9. Refrigerant cycle diagram of Hitachi Air-Cooled Water Chiller (RCU2E40, 50, 60, 70, 100, 120, 140, 180, 210, 280, 350AG2)




| Nr. | Name | Nr. | Name |
|---|---|---|---|
| 1 | Compressor | 16 | Compressor Dual Safety Valve (Option) |
| 2 | Air-Cooled Condenser | 17 | Stop Valve |
| 3 | Water Cooler | 18 | Thermistor (Suction, THMsn) |
| 4 | Filter Drier | 19 | Thermistor (Discharge, THMdn) |
| 5 | Electronic Expansion Valve | 20 | Thermistor (Evaporation, THMr2n) |
| 6 | Check Valve | 21 | Thermistor (Cooler water inlet, THMwi) |
| 7 | Stop Valve (with check joint) | 22 | Thermistor (Cooler water outlet, THMwon) |
| 8 | High Pressure Switch | 23 | Thermistor (Cooler water outlet, THMwon1) |
| 9 | Pressure Sensor (Low) | 24 | Thermistor (Ambient, THMa) |
| 10 | Pressure Sensor (High) | 25 | Thermistor (Liquid, THMl) |
| 11 | Pressure Relief Valve | A | High Pressure Gauge |
| 12 | Sight Glass | B | Low Pressure Gauge |
| 13 | Compressor Safety Valve (Option) | C | Stop Valve |
| 14 | Stop Valve (Option) | D | Charging Cylinder |
| 15 | Stop Valve (Option) | E | Vacuum Pump |

***NOTE:***
*R407C shall be charged by LIQUID.*

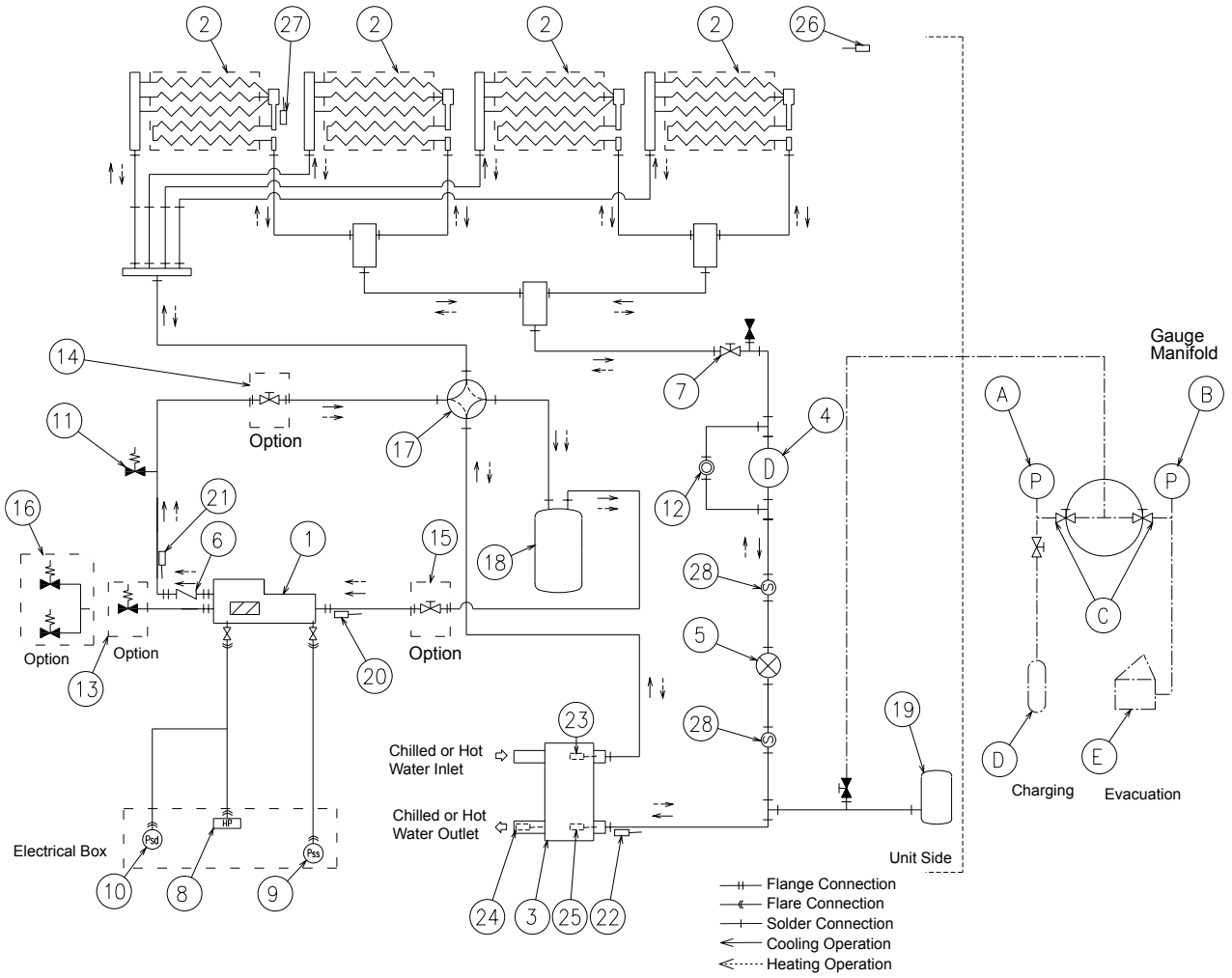
## 11.10. Refrigerant cycle diagram of Hitachi Air-Cooled Water Chiller (RCU2E80, 160, 240, 320, 400AG2) with economiser.




| Nr. | Name | Nr. | Name |
|---|---|---|---|
| 1 | Compressor | 19 | Capillary Tube |
| 2 | Air-Cooled Condenser | 20 | Economiser |
| 3 | Water Cooler | 21 | Strainer |
| 4 | Filter Drier | 22 | Stop Valve |
| 5 | Electronic Expansion Valve | 23 | Thermistor (Suction, THMsn) |
| 6 | Check Valve | 24 | Thermistor (Discharge, THMdn) |
| 7 | Stop Valve (with check joint) | 25 | Thermistor (Evaporation, THMr2n) |
| 8 | High Pressure Switch | 26 | Thermistor (Cooler water inlet, THMwi) |
| 9 | Pressure Sensor (Low) | 27 | Thermistor (Cooler water outlet, THMwon) |
| 10 | Pressure Sensor (High) | 28 | Thermistor (Cooler water outlet, THMwon1) |
| 11 | Pressure Relief Valve | 29 | Thermistor (Ambient, THMa) |
| 12 | Sight Glass | 30 | Thermistor (Liquid, THMl) |
| 13 | Compressor Safety Valve (Option) | A | High Pressure Gauge |
| 14 | Stop Valve (Option) | B | Low Pressure Gauge |
| 15 | Stop Valve (Option) | C | Stop Valve |
| 16 | Compressor Dual Safety Valve (Option) | D | Charging Cylinder |
| 17 | Pressure Switch | E | Vacuum Pump |
| 18 | Solenoid Valve | | |

***NOTE:***
*R407C shall be charged by LIQUID.*

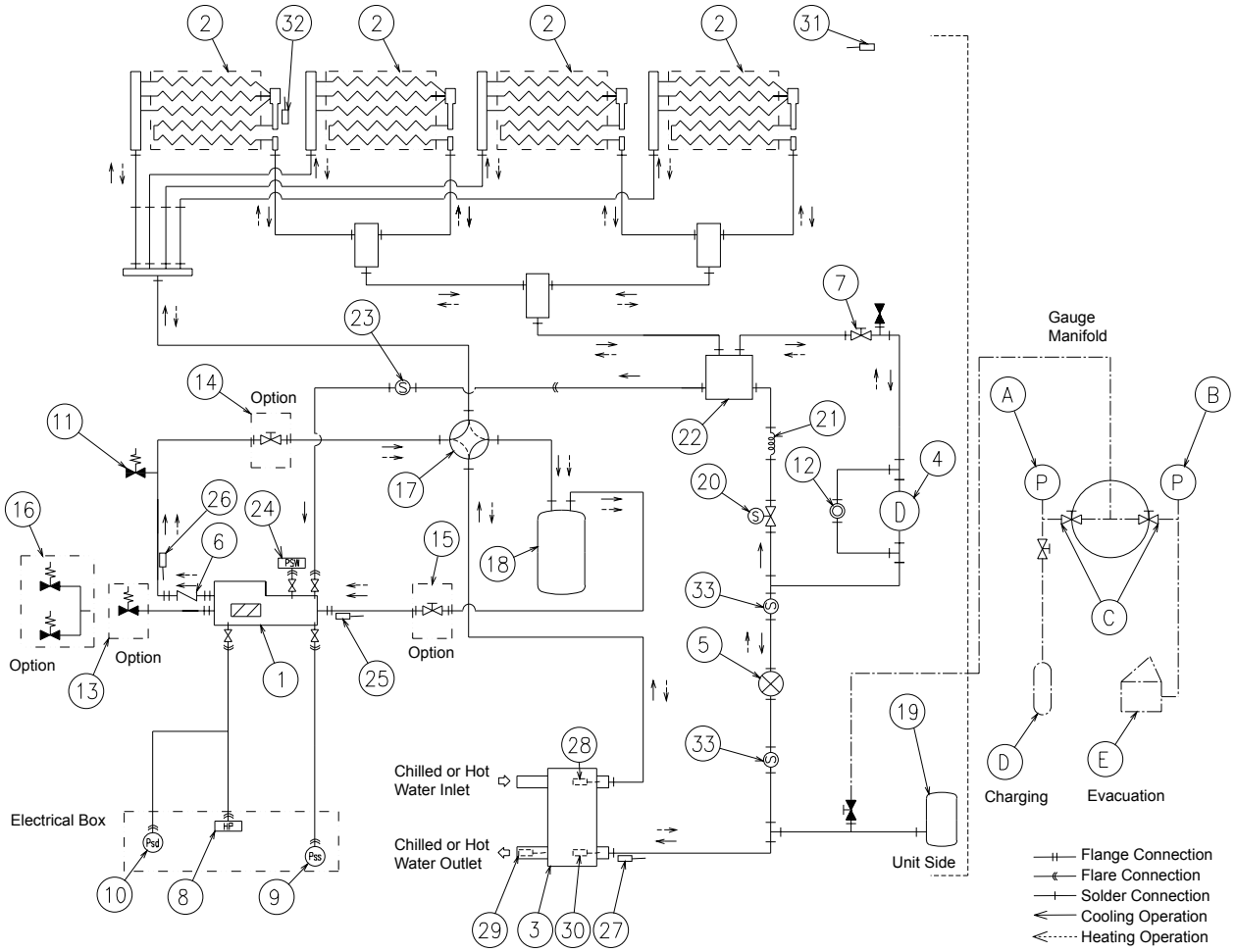
## 11.11. Refrigerant cycle diagram of Hitachi Air-to-Water Heat Pump Water Chiller (RHU2E40, 50, 60, 70, 100, 120, 140, 180, 210AG2)




| Nr. | Name | Nr. | Name |
|---|---|---|---|
| 1 | Compressor | 17 | 4-Way Valve |
| 2 | Air Side Heat Exchanger | 18 | Accumulator |
| 3 | Water Side Heat Exchanger | 19 | Liquid tank |
| 4 | Biflow drier | 20 | Thermistor (Suction, THMsn) |
| 5 | Electronic Expansion Valve | 21 | Thermistor (Discharge, THMdn) |
| 6 | Check Valve | 22 | Thermistor (Evaporation, THMr2n) |
| 7 | Stop Valve (with check joint) | 23 | Thermistor (Cooler water inlet, THMwi) |
| 8 | High Pressure Switch | 24 | Thermistor (Cooler water outlet, THMwon) |
| 9 | Pressure Sensor (Low) | 25 | Thermistor (Cooler water outlet, THMwon1) |
| 10 | Pressure Sensor (High) | 26 | Thermistor (Ambient, THMa) |
| 11 | Pressure Relief Valve | 27 | Thermistor (Liquid, THMl) |
| 12 | Sight Glass | A | High Pressure Gauge |
| 13 | Compressor Safety Valve (Option) | B | Low Pressure Gauge |
| 14 | Stop Valve (Option) | C | Stop Valve |
| 15 | Stop Valve (Option) | D | Charging Cylinder |
| 16 | Compressor Dual Safety Valve (Option) | E | Vacuum Pump |

***NOTE:***
*R407C shall be charged by LIQUID.*

## 11.12. Refrigerant cycle diagram of Hitachi Air-to-Water Heat Pump Water Chiller (RHU2E80, 160, 240AG2) with economiser.




| Nr. | Name | Nr. | Name |
|---|---|---|---|
| 1 | Compressor | 20 | Solenoid Valve |
| 2 | Air Side Heat Exchanger | 21 | Capillary Tube |
| 3 | Water Side Heat Exchanger | 22 | Economiser |
| 4 | Biflow Drier | 23 | Strainer |
| 5 | Electronic Expansion Valve | 24 | Pressure Switch |
| 6 | Check Valve | 25 | Thermistor (Suction, THMsn) |
| 7 | Stop Valve (with check joint) | 26 | Thermistor (Discharge, THMdn) |
| 8 | High Pressure Switch | 27 | Thermistor (Evaporation, THMr2n) |
| 9 | Pressure Sensor (Low) | 28 | Thermistor (Cooler water inlet, THMwi) |
| 10 | Pressure Sensor (High) | 29 | Thermistor (Cooler water outlet, THMwon) |
| 11 | Pressure Relief Valve | 30 | Thermistor (Cooler water outlet, THMwon1) |
| 12 | Sight Glass | 31 | Thermistor (Ambient, THMa) |
| 13 | Compressor Safety Valve (Option) | 32 | Thermistor (Liquid, THMl) |
| 14 | Stop Valve (Option) | 33 | Strainer |
| 15 | Stop Valve (Option) | A | High Pressure Gauge |
| 16 | Compressor Dual Safety Valve (Option) | B | Low Pressure Gauge |
| 17 | 4-Way Valve | C | Stop Valve |
| 18 | Accumulator | D | Charging Cylinder |
| 19 | Liquid Tank | E | Vacuum Pump |

***NOTE:***
*R407C shall be charged by LIQUID.*

***CAUTION:***

*Do not charge OXYGEN, ACETYLENE or other flammable and poisonous gases into the refrigeration cycle when performing a leakage test or an airtight test. These types of gases are extremely dangerous, because explosion can occur. It is recommended that compressed air or nitrogen is charged for these types of tests.*

*Mineral deposits on water cooler plates act as thermal insulators, and also act as resistance against water flow, causing a decrease of the water flow running through them, and resulting in a decreasing of the cooling capacity. Deposits on the plates should be inspected at regular intervals. Experience with the water Chiller will dictate accurate inspection intervals.*

*These deposits should be removed by circulating diluted acid through the water passes after the water has been drained. As water in different localities contains different minerals, different acids are required, depending upon the thickness of the deposits.*

*This unit is equipped with an operation hour meter. In the case that the total operation time reaches 24,000 hours or 3 years pass after installation, exchange the bearings of the compressor. For details, refer to the Service Handbook for HITACHI Screw Compressors.*

*For R407C refrigerant system, charge the refrigerant with liquid condition to avoid its composition change.*

## 11.13. Compressor Removal

◆ **When Removing the Compressor**

Remove the compressor while completing the following procedures.

1. Collect all refrigerant into a condenser before this work.
2. Turn off the switch DSW3 of the PCB in the magnetic switch box in order not to operate the compressor except for the cycle.
3. Circulate the chilled water sufficiently through the water cooler, and operate the water Chiller for 10 minutes, and check to ensure that the oil level is maintained at a stable condition.
4. Stop the water Chiller and completely close the liquid stop valve.
5. Operate the water Chiller after circulating water through the water cooler.
6. Stop the water Chiller when the low pressure reaches at approximately 0.05 MPa. Do not operate at a pressure lower than 0.05 MPa. If operated, it will cause a damage to the compressor.
7. Wait for several minutes. If the low pressure increases up to 0.45 to 0.5 MPa, repeat the above procedures 5 and 6 four or five times.
8. Turn OFF the power supply to the unit.
9. After these works above, almost all refrigerant can be collected in the condenser.
10. Recover the rest of refrigerant from the water cooler and the compressor.
11. Remove the bolts on the discharge and suction flanges of the compressor.
12. Remove all the wiring of the compressor.
13. Remove the bolts fixing the compressor.
14. Remove the compressor.

## 11.14. Safety and protection control

The safety and protective devices are equipped with the unit to ensure dependable and long life operation.

Their functions should be carefully noted, and field adjustment is not recommended, if the setting is maintained at the point listed in the table.

◆ **Compressor protection**

1. Fuse and thermal relay equipped in the control box cut out each compressor operation when the current to the compressor exceeds the setting

2. The internal thermostat embedded in the motor winding cuts out each operation, when the temperature exceeds the setting

3. The oil heater in the compressor prevents from oil foaming during cold starting. This heater warms the oil, while the compressor is stopped

◆ **Refrigeration Cycle**

1. The high pressure switch and low pressure control protect against excessive discharge pressure and exceedingly low suction pressure. The switch and control cut out compressor operation when discharge pressure or suction pressure is abnormal.

2. The pressure relief valve is equipped on discharge gas line. When high pressure exceeds the setting, gas refrigerant will be discharged to prevent abnormal high pressure

◆ **Condenser Fan Motor Protection**

Fuse and internal thermostat are equipped
The internal thermostat embedded in fan motor winding cut out fan operation and compressor operation, when the temperature of the motor winding exceeds the setting

◆ **Water Cooler**

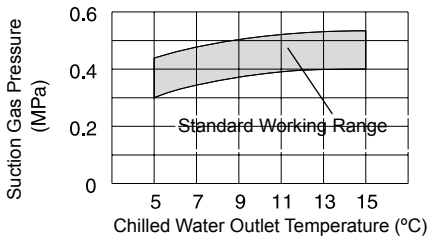
Pump interlock, freeze protection thermostat, low pressure control and suction gas thermostat can protect water cooler against water cooler freezing

| Model R(C/H)U2E – AG2 | | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 160 | 180 | 210 | 240 | 280 | 320 | 350 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| For Compressor High Pressure Switch | | Manual Reset, Non-Adjustable ( One Switch for Each Compressor Motor ) | | | | | | | | | | | | | | | |
| Cut - Out | MPa | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 | 2,80 |
| Low Pressure Control | | Electronic Control | | | | | | | | | | | | | | | |
| Cut - Out | MPa | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 |
| Internal Thermostat for Compressor | | Manual Reset, Non-Adjustable ( One Switch for Each Compressor Motor ) | | | | | | | | | | | | | | | |
| Cut - Out | °C | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 | 115 |
| Cut - In | °C | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| Compressor Motor (400V / 50Hz) | | ( 3 Fuses for Each Compressor ) | | | | | | | | | | | | | | | |
| Fuse | A | 125 | 125 | 125 | 160 | 160 | 125 | 125 | 160 | 160 | 125 | 160 | 160 | 160 | 160 | 160 | 160 |
| | | ( One Three-Phase Set for Each Compressor Motor ) | | | | | | | | | | | | | | | |
| Thermal Relay | A | 55 | 60 | 70 | 85 | 90 | 60 | 70 | 85 | 90 | 70 | 85 | 90 | 85 | 90 | 85 | 90 |
| | | Manual Reset, Adjustable ( One Three-Phase Set for Each Compressor Motor ) | | | | | | | | | | | | | | | |
| Circuit Breaker Protector (Option) | A | 112 | 112 | 136 | 160 | 160 | 112 | 136 | 160 | 160 | 136 | 160 | 160 | 160 | 160 | 160 | 160 |
| Oil Heater | | ( One Heater for Each Compressor Motor ) | | | | | | | | | | | | | | | |
| Capacity | W | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 | 150 |
| Discharge Gas Temperature Control | | ( One for Each Circuit ) | | | | | | | | | | | | | | | |
| Cut - Out | °C | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 | 140 |
| CCP Timer | | Non-Adjustable ( One Timer for Each Compressor Motor ) | | | | | | | | | | | | | | | |
| Setting Timer | s | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 | 180 |
| Star - Delta | s | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Unloading During Starting | s | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| For Control Circuit | | | | | | | | | | | | | | | | | |
| Fuse | A | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| For Refrigerant Circuit Pressure Relief Valve | | ( One for Each Circuit ) | | | | | | | | | | | | | | | |
| Setting Pressure | MPa | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 | 3,0 |
| Freeze Protection Control | | ( One for Each Water Cooler ) | | | | | | | | | | | | | | | |
| Cut - Out | °C | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Fan Motor (380-415V / 50Hz) | | ( 3 Fuses for Each Circuit ) | | | | | | | | | | | | | | | |
| Fuse | A | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 | 16 |
| | | ( One Fuse for Each Fan ( Both DC Fan and AC Fan ) ) | | | | | | | | | | | | | | | |
| Fuse | A | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 | 12,5 |
| | | ( One Protector for Each Fan ( Both DC Fan and AC Fan ) ) | | | | | | | | | | | | | | | |
| Circuit Breaker Protector (Option) | A | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 14 |

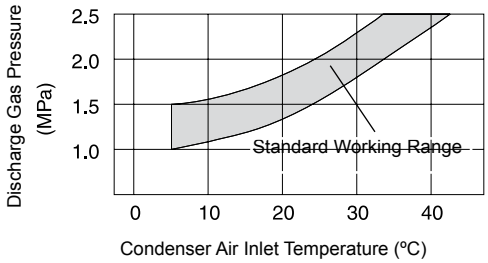
## 11.15. Normal operating pressure

Check to ensure that Chiller is operating within the working range as shown below, after at least 15 minutes operation.

◆ **Hitachi Air-Cooled Water Chiller**

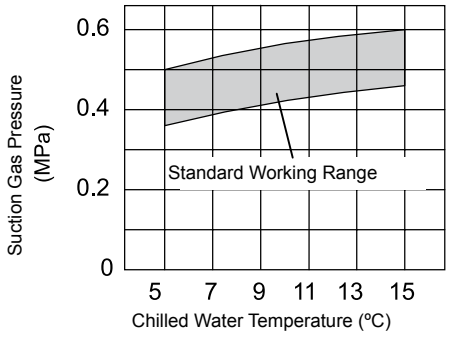


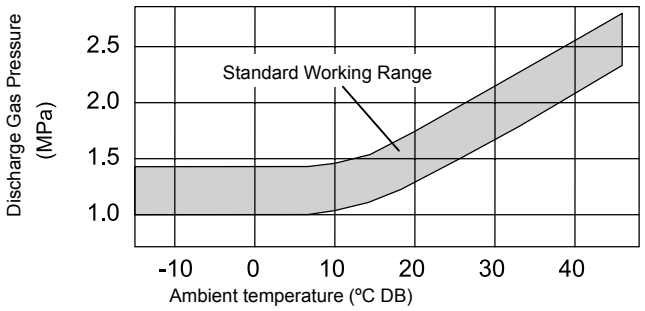

Conditions:
-Compressor: 100% Load
-Condenser Fans: 4 or 6 fans running each cycle



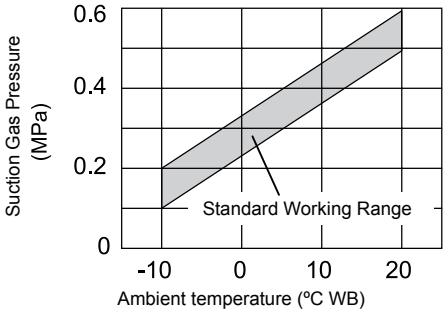

◆ **Hitachi Air-to-Water Heat Pump Water Chiller**

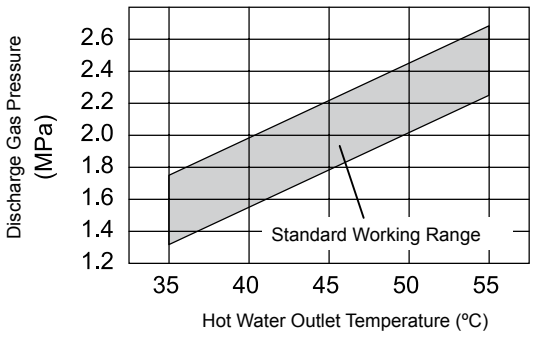
Cooling operation




Heating operation




Conditions:
-Compressor: 100% Load
-Air Side Heat Exchanger Fans: 4 or 6 fans running each cycle

***CAUTION:***

***Periodical Maintenance***
*Perform periodical maintenance according to the "INSTRUCTIONS" to maintain the unit in a good condition.*

***Fire***
*If a fire accidentally occurs, turn OFF the main switch and use an extinguisher for an oil fire and electric fire.*

***Flammable Gases***
*Do not operate the unit near the flammable gases such as lacquer, paint, oil, etc. to avoid a fire or an explosion.*

***Service Panels and Electrical Box Cover***
*Turn OFF the main switch when service panels or electrical box covers are removed for setting the temperature.*
*Do not operate the unit without fixing panels.*

***Heated Pipe***
*Do not touch the parts at discharge gas side by hand, since the pipes at the discharge side are heated by refrigerant and temperature becomes higher than 100ºC.*

***Use***
*Do not utilise this unit for cooling of drinking water or food. Comply with local codes and regulations.*

***Failure***
*Turn OFF all the main switches if refrigerant leakage or chilled water leakage occurs. Also, if the unit can not be stopped by the control switch, turn OFF all the switches for power source.*

***Activation of Safety Device***
*In the case that one of safety devices is activated and unit is stopped, remove the cause of the stoppage and restart the unit.*
*The protection devices are utilised to protect the unit from an abnormal operation.*
*Therefore, if one of safety devices is activated, remove the cause by referring the "Troubleshooting" in the "INSTRUCTION" or call the local agency.*

***Fuse***
*Utilise a fuse with specified capacity. Do not use a steel wire or a copper wire instead of a fuse. If an incorrect wire is utilised, a serious accident such as a fire will occur.*

***Safety Devices***
*Do not make a short-circuit at the protection line. If a short-circuit is made, a serious accident will occur.*

***Setting of Safety devices***
*Do not change the setting of safety devices, if changed, a serious accident will occur.*
*Do not touch any electrical parts except for the operation switches during the operation.*
*Do not press the button on the magnetic switch. If pressed, a serious accident will occur.*

## 11.16. Test Running And Maintenance Record

| | | | | |
|---|---|---|---|---|
| MODEL: | RCU2E | | MFG. NO. | |
| | | COMPRESSOR | MFG. NO. | |
| CUSTOMER NAME AND ADDRESS | | | DATE | |

| | |
|---|---|
| Is there adequate water flow for the water cooler? | |
| Has all water piping been checked for leakage? | |
| Has the unit been operated for at least twenty minutes? | |

Check Ambient Temperature:

| | |
|---|---|
| | ºC |

Check Chilled Water Temperature:

| | | | |
|---|---|---|---|
| Inlet | ºC | Outlet | ºC |

Check Water Flow:

| | |
|---|---|
| | $m^3/h$ |

Check Suction Line Temperature and Superheat:

| | | | | |
|---|---|---|---|---|
| Suction Line Temperature | ºC | ºC | ºC | ºC |
| Superheat | deg | deg | deg | deg |

Check Pressure:

| | | | | |
|---|---|---|---|---|
| Discharge Pressure | MPa | MPa | MPa | MPa |
| Suction Pressure | MPa | MPa | MPa | MPa |

Check Running Current:

| | | | | |
|---|---|---|---|---|
| | A | A | A | A |

Check Voltage for System:

| | | | | |
|---|---|---|---|---|
| R-S, S-T, T-R= | V | V | V | |

| | |
|---|---|
| Has the unit been checked for refrigerant leakage? | |
| Is the unit clean inside and outside? | |
| Are all cabinet panels free from rattling? | |

## 11.17. Daily Operating Records

Model:

Date:

Weather:

Time of Operation : Start, Stop. (Operation hour: )

| | | | | | | |
|---|---|---|---|---|---|---|
| | Sampling Time | | | | | |
| | Compressor Number | | | | | |
| | Term | | | | | |
| Ambient Temperature | DB | ºC | | | | |
| | WB | ºC | | | | |
| Compressor | High Pressure | MPa | | | | |
| | Low Pressure | MPa | | | | |
| | Voltage | V | | | | |
| | Current | A | | | | |
| Chiller Water Temperature | Inlet | ºC | | | | |
| | Outlet | ºC | | | | |
| Current for Chilled Water Pump | | A | | | | |

NOTES:

## 11.18. Servicing for R407C Refrigerant System

◆ **Refrigerant**

This R407C refrigerant is HFC type so that it has a feature of no ozone depletion. If it is mixed with another refrigerant, the serious changing would occur on its character. Therefore notice the following point when handling this refrigerant.

1. Charge the refrigerant in LIQUID condition and NOT in GAS. As “R407C” is geotropic mixed refrigerant, if gas charging is performed, only the easy vaporising refrigerant would be charged into the system and the difficult vaporising one would be remained in the charge cylinder.

The cylinder, gauge equipped manifold and charge hose are only used for R407C refrigerant.

Adjust the cylinder setting to charge in liquid.

◆ **Refrigerant Oil**

UX300, which R407C refrigerant is easy to blend into it, is used for this system. The other oil is prohibited to use, so that not to be mixed with another kind of oil at the maintenance and service work. This oil is very hygroscopic.

Therefore minimum humidity handling is necessary.

◆ **Servicing Equipment**

When servicing R407C system, servicing equipment such as Charging Cylinder, Charging Hose, Vacuum Pump and so on, shall not be mixed with R22 equipment to avoid R407C composition change.

# 12. Troubleshooting

## Contents

## 12.1.Procedures for trouble

◆ **The following table shows efficient checking procedures for trouble.**

| Fault | Possible Cause | Check/Corrective Action |
|---|---|---|
| Fan does not operate | Current to Unit is Shut Off | 1. Reset the power supply line to the unit. |
| | Fuse for Operation Circuit is Blown Out or Faulty Contact | 1. Check for shorted components.<br>2. Check for loose connection. Tighten or replace. If necessary. |
| | Contactor Holding Coil is Burned Out or Faulty Contact | 1. Find the causes, and repair or replace. |
| | Tripped Overcurrent Relay | 1. Remove the causes, and reset the overcurrent relay. |
| | Low Voltage | 1. Check the voltage of unit rating. |
| | Shorted Motor or Terminals. | 1. Check the motor and terminals. Repair or replace, if necessary. |
| Compressor does not operate | Condenser Fan is Not Operating | 1. Remove all causes of inoperative fan. |
| | Interlock Circuit for Chilled Water Pump is Open | 1. Check the pump contactor. Repair or replace, if necessary.<br>2. Check for the faulty pump. |
| | Electrical Protective Devices Are Tripped. | 1. Remove the causes, and reset the “ON” button. See the following causes. |
| | Incorrect Wiring Connection for Compressor Power Source | 1. Interchange two of three terminals R, S and T at the main power source terminals. |
| Compressor stops on High Pressure Switch | Excessively High Discharge Pressure | 1. See “High Discharge Pressure” |
| | Malfunction of High Pressure Switch | 1. Readjust the setting or replace, if defective. |
| Compressor stops on Overcurrent Relay | Excessively High Discharge Pressure and Suction Pressure | 1. See “High Discharge Pressure” and “High Suction Pressure”. |
| | High or Low Voltage, Single-Phase or Phase Imbalance | 1. Check the power supply line and contactors. Repair, if necessary. |
| | Loose connection | 1. Tighten the loose electrical connection or repair, if necessary. |
| | Faulty Compressor Motor | 1. Check the compressor motor. Repair or replace, if necessary. |
| | Faulty Overcurrent Relay | 1. Replace it, if necessary. |

◆ **The following table shows efficient checking procedures for trouble.**

| Fault | Possible Cause | Check/Corrective Action |
|---|---|---|
| Compressor Stops on Freeze Protection Control. | Excessively Low Chilled water Outlet Temperature | 1. Check for excessively low setting of the chilled water setting knob. |
| | Defective Thermistor | 1. Check for malfunction of the thermistor. Replace, if necessary. |
| | Shortage of Chilled Water Flow | 1. Check the rotation of the pump. |
| | Air in water Circuit | 1. Purge air. |
| Compressor Stops on Internal Thermostat or Discharge Gas Temperature Control. | High or Low Voltage, Single-Phase or Phase Imbalance | 1. Check the power supply line and contactor. Repair, if necessary. |
| | Excessive Superheat | 1. Check for refrigerant leakage. |
| | Defective Element | 1. Check the contact of the internal thermostat during the cold condition. |
| | Excessive High Discharge Pressure and Low Suction Pressure | 1. See “High Discharge Pressure” and “Low Suction Pressure”. |
| Insufficient Cooling | High Discharge Pressure or Low Suction Pressure | 1. See “High Discharge Pressure” and “Low Suction Pressure”. |
| | Improper Thermostat Setting | 1. Readjust the setting. |
| | Defective Unload Mechanism | 1. Adjust unload mechanism. Repair or replace unloaded parts, if necessary. |
| Noisy Compressor | Slugging Due to Liquid Flooding Back to Compressor | 1. Check the superheat of suction gas. Check the position of Expansion Valve coil. Repair or replace if necessary. |
| | Worn parts | 1. Check for the sound of internal parts. Replace the compressor, if necessary. |
| Miscellaneous Noise | Loose Fixed Screw | 1. Tighten the screws of all parts. |
| Unloaded Does not Function | Trouble with the Thermistor | 1. Adjust the setting temperature.<br>2. Replace the thermistor. |
| | Trouble with the Solenoid Valve | 1. Check the coil in the solenoid valve.<br>2. Check oil passage for clogging. |
| | Worn Unloader Mechanism | 1. Check the unloaded system parts in the compressor. |
| High Discharge Pressure | High Condenser Air Temperature or Insufficient Air Flow Through the Condenser | 1. Check the fan operation.<br>2. Check for coil clogging; clean, if necessary. |
| | Defective Check Valve or partially Closed Liquid Line Valve | 1. Check the valves and strainer. Replace, if necessary. |
| | Overcharged Refrigerant | 1. Adjust the refrigerant quantity. |
| | Air or Non-Condensable Gas in the Refrigerant Cycle. | 1. Purge the gas from the refrigerant cycle. |
| | Suction Pressure is Higher than Standard | 1. See “High Suction Pressure”. |
| Low Discharge Pressure | Extremely Cold Condenser Air | 1. Check the ambient Temperature. |
| | Insufficient Refrigerant Charge | 1. Add Refrigerant. |
| | Leakage from the Compressor Discharge Valve | 1. Replace the valves. Replace the compressor, if required. |
| | Suction Pressure is Lower than Standard | 1. See “ Low Suction Pressure” |
| High Suction Pressure | High Inlet Temperature of Chilled Water | 1. Check the insulation of the piping.<br>2. Check the installation specifications. |
| | Excessive Opening of Expansion Valve | 1. Check the position of Expansion Valve coil, or replace, if defective. |
| Low Suction Pressure | Low Inlet Temperature of Chilled Water | 1. Check the installation specifications. |
| | Improperly controlled Expansion Valve or Faulty Valve | 1. Check the position of Expansion Valve coil. Repair or replace, if necessary. |
| | Insufficient Refrigerant Charge | 1. Add Refrigerant. |
| | Excessive Oil in the Water Cooler | 1. Purge Oil. |
| | Scales on Water Cooler Plates | 1. Clean the plates. |

# 13. General Specifications

## Contents

## 13.1. General Data

◆ **Hitachi Air-Cooled Water Chiller units RCU2E40~400AG2**

| Model | | | RCU2E40AG2 | RCU2E50AG2 | RCU2E60AG2 | RCU2E70AG2 |
|---|---|---|---|---|---|---|
| Electrical Power Supply | | - | 3N~ 400V 50Hz | | | |
| Cooling Capacity | | kW | 112 | 130 | 156 | 178 |
| Total Power Input | | kW | 38.6 | 44.7 | 53.0 | 61.0 |
| EER | | - | 2.90 | 2.91 | 2.94 | 2.92 |
| ESEER | | - | 3.48 | 3.49 | 3.52 | 3.50 |
| Outer Dimension | Height | mm | 2430 | 2430 | 2430 | 2430 |
| | Width | mm | 1900 | 1900 | 1900 | 1900 |
| | Depth | mm | 2190 | 2190 | 2190 | 2790 |
| Cabinet Colour | | - | Natural Grey (Munsell code 1.0Y8.5/0.5) | | | |
| Net Weight | | kg | 1430 | 1470 | 1560 | 1760 |
| Compressor Type | | - | Semi-Hermetic Screw Type | | | |
| Models | | - | 40ASC-Z | 40ASC-Z | 50ASC-Z | 60ASC-Z |
| Quantity | | - | 1 | 1 | 1 | 1 |
| Oil Heater | | W | 150 | 150 | 150 | 150 |
| Capacity Control | | - | Continuous Capacity Control | | | |
| | | % | 15 ~ 100 | | | |
| Water Cooler Type | | - | Brazing Plate Type | | | |
| Condenser Type | | - | Multi-Pass Cross Finned Tube | | | |
| Fan Motor (pole) | | kW | 0.38 (8) | | | |
| Quantity | | - | 4 | 4 | 4 | 6 |
| Refrigerant Type | | - | R407C (Factory Charged) | | | |
| Flow Control | | - | Electronic Expansion Valve | | | |
| Number of circuits | | - | 1 | 1 | 1 | 1 |
| Oil Type | | - | JAPAN ENERGY FREOL UX300 (Ester) | | | |
| Water pipe Connection | | Inch | 3” Victaulic (1×Inlet / 1×Outlet ) | | | |
| Control System | | - | Micro-Processor Control | | | |
| Chilled Water Outlet Temperature | | °C | (-10) 5 ~ 15 | | | |
| Condenser Air Inlet Temperature | | °C | -15 ~ 46 | | | |
| Permissible Water Pressure Max. | | MPa | 1.0 | | | |
| Safety and Protection Devices | | - | Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter | | | |

***NOTE:***

*The nominal cooling capacities are based on the European Standard EN14511.*

*- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C*

*- Condenser Inlet Air Temperature : 35 °C*

| Model | | | RCU2E80AG2 | RCU2E100AG2 | RCU2E120AG2 | RCU2E140AG2 |
|---|---|---|---|---|---|---|
| Electrical Power Supply | | - | 3N~ 400V 50Hz | | | |
| Cooling Capacity | | kW | 206 | 260 | 312 | 356 |
| Total Power Input | | kW | 70.0 | 89.4 | 106 | 122 |
| EER | | - | 2.94 | 2.91 | 2.94 | 2.92 |
| ESEER | | - | 3.52 | 3.49 | 3.52 | 3.50 |
| Outer Dimension | Height | mm | 2430 | 2430 | 2430 | 2430 |
| | Width | mm | 1900 | 1900 | 1900 | 1900 |
| | Depth | mm | 2790 | 4090 | 4090 | 5290 |
| Cabinet Colour | | - | Natural Grey (Munsell code 1.0Y8.5/0.5) | | | |
| Net Weight | | kg | 1820 | 2830 | 3000 | 3420 |
| Compressor Type | | - | Semi-Hermetic Screw Type | | | |
| Model | | - | 60ASC-Z | 40ASC-Z | 50ASC-Z | 60ASC-Z |
| Quantity | | - | 1 | 2 | 2 | 2 |
| Oil Heater | | W | 150 | 150×2 | 150×2 | 150×2 |
| Capacity Control | | - | Continuous Capacity Control | | | |
| | | % | 15 ~ 100 | | | |
| Water Cooler Type | | - | Brazing Plate Type | | | |
| Condenser Type | | - | Multi-Pass Cross Finned Tube | | | |
| Fan Motor (pole) | | kW | 0.38 (8) | | | |
| Quantity | | - | 6 | 8 | 8 | 12 |
| Refrigerant Type | | - | R407C (Factory Charged) | | | |
| Flow Control | | - | Electronic Expansion Valve | | | |
| Number of circuits | | - | 1 | 2 | 2 | 2 |
| Oil Type | | - | JAPAN ENERGY FREOL UX300 (Ester) | | | |
| Water pipe Connection | | Inch | 3” Victaulic (1×Inlet / 1×Outlet ) | 3” Victaulic (2×Inlet / 2×Outlet ) | | |
| Control System | | - | Micro-Processor Control | | | |
| Chilled Water Outlet Temperature | | °C | (-10) 5 ~ 15 | | | |
| Condenser Air Inlet Temperature | | °C | -15 ~ 46 | | | |
| Permissible Water Pressure Max. | | MPa | 1.0 | | | |
| Safety and Protection Devices | | - | Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter | | | |



***NOTE:***

*The nominal cooling capacities are based on the European Standard EN14511.*

*- Chilled Water Inlet / Outlet Temperature : 12 / 7°C*

*- Condenser Inlet Air Temperature: 35 °C*

| Model | | | RCU2E160AG2 | RCU2E180AG2 | RCU2E210AG2 | RCU2E240AG2 |
|---|---|---|---|---|---|---|
| Electrical Power Supply | | - | 3N~ 400V 50Hz | | | |
| Cooling Capacity | | kW | 412 | 468 | 534 | 618 |
| Total Power Input | | kW | 140 | 159 | 183 | 210 |
| EER | | - | 2.94 | 2.94 | 2.92 | 2.94 |
| ESEER | | - | 3.52 | 3.52 | 3.50 | 3.52 |
| Outer Dimension | Height | mm | 2430 | 2430 | 2430 | 2430 |
| | Width | mm | 1900 | 1900 | 1900 | 1900 |
| | Depth | mm | 5290 | 5990 | 7790 | 7790 |
| Cabinet Colour | | - | Natural Grey (Munsell code 1.0Y8.5/0.5) | | | |
| Net Weight | | kg | 3550 | 4450 | 5070 | 5250 |
| Compressor Type | | - | Semi-Hermetic Screw Type | | | |
| Models | | - | 60ASC-Z | 50ASC-Z | 60ASC-Z | 60ASC-Z |
| Quantity | | - | 2 | 3 | 3 | 3 |
| Oil Heater | | W | 150×2 | 150×3 | 150×3 | 150×3 |
| Capacity Control | | - | Continuous Capacity Control | | | |
| | | % | 15 ~ 100 | | | |
| Water Cooler Type | | - | Brazing Plate Type | | | |
| Condenser Type | | - | Multi-Pass Cross Finned Tube | | | |
| Fan Motor (pole) | | kW | 0.38 (8) | | | |
| Quantity | | - | 12 | 12 | 18 | 18 |
| Refrigerant Type | | - | R407C (Factory Charged) | | | |
| Flow Control | | - | Electronic Expansion Valve | | | |
| Number of circuits | | - | 2 | 3 | 3 | 3 |
| Oil Type | | - | JAPAN ENERGY FREOL UX300 (Ester) | | | |
| Water pipe Connection | | Inch | 3” Victaulic (2×Inlet / 2×Outlet ) | 3” Victaulic (3×Inlet / 3×Outlet ) | | |
| Control System | | - | Micro-Processor Control | | | |
| Chilled Water Outlet Temperature | | °C | (-10) 5 ~ 15 | | | |
| Condenser Air Inlet Temperature | | °C | -15 ~ 46 | | | |
| Permissible Water Pressure Max. | | MPa | 1.0 | | | |
| Safety and Protection Devices | | - | Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter | | | |

***NOTE:***

*The nominal cooling capacities are based on the European Standard EN14511.*

*- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C*

*- Condenser Inlet Air Temperature: 35 °C*

| Model | | | RCU2E280AG2 | RCU2E320AG2 | RCU2E350AG2 | RCU2E400AG2 |
|---|---|---|---|---|---|---|
| Electrical Power Supply | | - | 3N~ 400V 50Hz | | | |
| Cooling Capacity | | kW | 712 | 824 | 890 | 1030 |
| Total Power Input | | kW | 244 | 280 | 305 | 350 |
| EER | | - | 2.92 | 2.94 | 2.92 | 2.94 |
| ESEER | | - | 3.50 | 3.52 | 3.50 | 3.52 |
| Outer Dimension | Height | mm | 2430 | 2430 | 2430 | 2430 |
| | Width | mm | 1900 | 1900 | 1900 | 1900 |
| | Depth | mm | 10290 | 10290 | 12790 | 12790 |
| Cabinet Colour | | - | Natural Grey (Munsell code 1.0Y8.5/0.5) | | | |
| Net Weight | | kg | 6750 | 7000 | 8450 | 8750 |
| Compressor Type | | - | Semi-Hermetic Screw Type | | | |
| Models | | - | 60ASC-Z | 60ASC-Z | 60ASC-Z | 60ASC-Z |
| Quantity | | - | 4 | 4 | 5 | 5 |
| Oil Heater | | W | 150×4 | 150×4 | 150×5 | 150×5 |
| Capacity Control | | - | Continuous Capacity Control | | | |
| | | % | 15 ~ 100 | | | |
| Water Cooler Type | | - | Brazing Plate Type | | | |
| Condenser Type | | - | Multi-Pass Cross Finned Tube | | | |
| Fan Motor (pole) | | kW | 0.38 (8) | | | |
| Quantity | | - | 24 | 24 | 30 | 30 |
| Refrigerant Type | | - | R407C (Factory Charged) | | | |
| Flow Control | | - | Electronic Expansion Valve | | | |
| Number of circuits | | - | 4 | 4 | 5 | 5 |
| Oil Type | | - | JAPAN ENERGY FREOL UX300 (Ester) | | | |
| Water pipe Connection | | Inch | 3” Victaulic (4×Inlet / 4×Outlet ) | | 3” Victaulic (5×Inlet / 5×Outlet ) | |
| Control System | | - | Micro-Processor Control | | | |
| Chilled Water Outlet Temperature | | °C | (-10) 5 ~ 15 | | | |
| Condenser Air Inlet Temperature | | °C | -15 ~ 46 | | | |
| Permissible Water Pressure Max. | | MPa | 1.0 | | | |
| Safety and Protection Devices | | - | Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter | | | |

***NOTE:***

*The nominal cooling capacities are based on the European Standard EN14511.*

*- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C*

*- Condenser Inlet Air Temperature: 35 °C*

## ◆ Hitachi Air-to-Water Heat Pump Water Chiller units RHU2E40~240AG2

| Model | | | RHU2E40AG2 | RHU2E50AG2 | RHU2E60AG2 | RHU2E70AG2 |
|---|---|---|---|---|---|---|
| Electrical Power Supply | | - | 3N~ 400V 50Hz | | | |
| Cooling Capacity | | kW | 106 | 123 | 148 | 169 |
| Heating Capacity | | kW | 110 | 127 | 152 | 185 |
| Total Power Input in Cooling | | kW | 37.9 | 42.7 | 52.0 | 60.0 |
| Total Power Input in Heating | | kW | 40.7 | 44.5 | 54.0 | 68.0 |
| EER | | - | 2.80 | 2.88 | 2.85 | 2.82 |
| COP | | - | 2.70 | 2.85 | 2.81 | 2.72 |
| ESEER | | - | 3.36 | 3.45 | 3.42 | 3.38 |
| Outer Dimension | Height | mm | 2430 | 2430 | 2430 | 2430 |
| | Width | mm | 1900 | 1900 | 1900 | 1900 |
| | Depth | mm | 2190 | 2190 | 2190 | 2790 |
| Cabinet Colour | | - | Natural Grey (Munsell code 1.0Y8.5/0.5) | | | |
| Net Weight | | kg | 1550 | 1600 | 1670 | 1880 |
| Compressor Type | | - | Semi-Hermetic Screw Type | | | |
| Models | | - | 40ASC-Z | 40ASC-Z | 50ASC-Z | 60ASC-Z |
| Quantity | | - | 1 | 1 | 1 | 1 |
| Oil Heater | | W | 150 | 150 | 150 | 150 |
| Capacity Control | | - | Continuous Capacity Control | | | |
| | | % | 15 ~ 100 | | | |
| Water side heat exchanger | | - | Brazing Plate Type | | | |
| Air side heat exchanger | | - | Multi-Pass Cross Finned Tube | | | |
| Fan Motor (pole) | | kW | 0.38 (8) | | | |
| Quantity | | - | 4 | 4 | 4 | 6 |
| Refrigerant Type | | - | R407C (Factory Charged) | | | |
| Flow Control | | - | Electronic Expansion Valve | | | |
| Number of circuits | | - | 1 | 1 | 1 | 1 |
| Oil Type | | - | JAPAN ENERGY FREOL UX300 (Ester) | | | |
| Water pipe Connection | | Inch | 3” Victaulic (1×Inlet / 1×Outlet ) | | | |
| Control System | | - | Micro-Processor Control | | | |
| Chilled Water Outlet Temperature | | °C | (-10) 5 ~ 15 | | | |
| Heated Water Outlet Temperature | | °C | 35 ~ 55 | | | |
| Condenser Air Inlet Temperature | | °C | -15 ~ 46 for Cooling Operation | | | |
| Evaporator Air inlet Temperature | | °C | DB: -9.5 ~ 21 / WB: -10 ~ 15.5 for Heating Operation | | | |
| Permissible Water Pressure Max. | | MPa | 1.0 | | | |
| Safety and Protection Devices | | - | Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter | | | |

***NOTES:***

1. *The nominal cooling capacities are based on the European Standard EN14511.*
   - *Chilled Water Inlet / Outlet Temperature : 12 / 7 °C*
   - *Condenser Inlet Air Temperature : 35 °C*
2. *The nominal heating capacities are based on the European Standard EN14511.*
   - *Heated Water Inlet / Outlet Temperature : 40 / 45 °C*
   - *Evaporator Air Inlet Temperature : 6 °C (WB)*

| Model | | | RHU2E80AG2 | RHU2E100AG2 | RHU2E120AG2 | RHU2E140AG2 |
|---|---|---|---|---|---|---|
| Electrical Power Supply | | - | 3N~ 400V 50Hz | | | |
| Cooling Capacity | | kW | 195 | 246 | 296 | 338 |
| Heating Capacity | | kW | 185 | 254 | 304 | 370 |
| Total Power Input in Cooling | | kW | 70.0 | 85.4 | 104 | 120 |
| Total Power Input in Heating | | kW | 68.0 | 89.0 | 108 | 136 |
| EER | | - | 2.79 | 2.88 | 2.85 | 2.82 |
| COP | | - | 2.72 | 2.85 | 2.81 | 2.72 |
| ESEER | | - | 3.34 | 3.45 | 3.42 | 3.38 |
| Outer Dimension | Height | mm | 2430 | 2430 | 2430 | 2430 |
| | Width | mm | 1900 | 1900 | 1900 | 1900 |
| | Depth | mm | 2790 | 4090 | 4090 | 5290 |
| Cabinet Colour | | - | Natural Grey (Munsell code 1.0Y8.5/0.5) | | | |
| Net Weight | | kg | 1950 | 3050 | 3250 | 3670 |
| Compressor Type | | - | Semi-Hermetic Screw Type | | | |
| Model | | - | 60ASC-Z | 40ASC-Z | 50ASC-Z | 60ASC-Z |
| Quantity | | - | 1 | 2 | 2 | 2 |
| Oil Heater | | W | 150 | 150×2 | 150×2 | 150×2 |
| Capacity Control | | - | Continuous Capacity Control | | | |
| | | % | 15 ~ 100 | | | |
| Water side heat exchanger | | - | Brazing Plate Type | | | |
| Air side heat exchanger | | - | Multi-Pass Cross Finned Tube | | | |
| Fan Motor (pole) | | kW | 0.38 (8) | | | |
| Quantity | | - | 6 | 8 | 8 | 12 |
| Refrigerant Type | | - | R407C (Factory Charged) | | | |
| Flow Control | | - | Electronic Expansion Valve | | | |
| Number of circuits | | - | 1 | 2 | 2 | 2 |
| Oil Type | | - | JAPAN ENERGY FREOL UX300 (Ester) | | | |
| Water pipe Connection | | Inch | 3” Victaulic (1×Inlet / 1×Outlet ) | 3” Victaulic (2×Inlet / 2×Outlet ) | | |
| Control System | | - | Micro-Processor Control | | | |
| Chilled Water Outlet Temperature | | °C | (-10) 5 ~ 15 | | | |
| Heated Water Outlet Temperature | | °C | 35 ~ 55 | | | |
| Condenser Air Inlet Temperature | | °C | -15 ~ 46 for Cooling Operation | | | |
| Evaporator Air inlet Temperature | | °C | DB: -9.5 ~ 21 / WB: -10 ~ 15.5 for Heating Operation | | | |
| Permissible Water Pressure Max. | | MPa | 1.0 | | | |
| Safety and Protection Devices | | - | Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter | | | |

***NOTES:***

1. *The nominal cooling capacities are based on the European Standard EN14511.*
   - *Chilled Water Inlet / Outlet Temperature : 12 / 7 °C*
   - *Condenser Inlet Air Temperature : 35 °C*
2. *The nominal heating capacities are based on the European Standard EN14511.*
   - *Heated Water Inlet / Outlet Temperature : 40 / 45 °C*
   - *Evaporator Air Inlet Temperature : 6 °C (WB)*

| Model | | | RHU2E160AG2 | RHU2E180AG2 | RHU2E210AG2 | RHU2E240AG2 |
|---|---|---|---|---|---|---|
| Electrical Power Supply | | - | 3N~ 400V 50Hz | | | |
| Cooling Capacity | | kW | 390 | 444 | 507 | 585 |
| Heating Capacity | | kW | 370 | 456 | 555 | 555 |
| Total Power Input in cooling | | kW | 140 | 156 | 180 | 210 |
| Total Power Input in heating | | kW | 136 | 162 | 204 | 204 |
| EER | | - | 2.79 | 2.85 | 2.82 | 2.79 |
| COP | | - | 2.72 | 2.81 | 2.72 | 2.72 |
| ESEER | | - | 3.34 | 3.42 | 3.38 | 3.34 |
| Outer Dimension | Height | mm | 2430 | 2430 | 2430 | 2430 |
| | Width | mm | 1900 | 1900 | 1900 | 1900 |
| | Depth | mm | 5290 | 5990 | 7790 | 7790 |
| Cabinet Colour | | - | Natural Grey (Munsell code 1.0Y8.5/0.5) | | | |
| Net Weight | | kg | 3780 | 4780 | 5440 | 5650 |
| Compressor Type | | - | Semi-Hermetic Screw Type | | | |
| Models | | - | 60ASC-Z | 50ASC-Z | 60ASC-Z | 60ASC-Z |
| Quantity | | - | 2 | 3 | 3 | 3 |
| Oil Heater | | W | 150×2 | 150×3 | 150×3 | 150×3 |
| Capacity Control | | - | Continuous Capacity Control | | | |
| | | % | 15 ~ 100 | | | |
| Water side heat exchanger | | - | Brazing Plate Type | | | |
| Air side heat exchanger | | - | Multi-Pass Cross Finned Tube | | | |
| Fan Motor (pole) | | kW | 0.38 (8) | | | |
| Quantity | | - | 12 | 12 | 18 | 18 |
| Refrigerant Type | | - | R407C (Factory Charged) | | | |
| Flow Control | | - | Electronic Expansion Valve | | | |
| Number of circuits | | - | 2 | 3 | 3 | 3 |
| Oil Type | | - | JAPAN ENERGY FREOL UX300 (Ester) | | | |
| Water pipe Connection | | Inch | 3” Victaulic (2×Inlet / 2×Outlet ) | 3” Victaulic (3×Inlet / 3×Outlet ) | | |
| Control System | | - | Micro-Processor Control | | | |
| Chilled Water Outlet Temperature | | °C | (-10) 5 ~ 15 | | | |
| Heated Water Outlet Temperature | | °C | 35~55 | | | |
| Condenser Air Inlet Temperature | | °C | -15 ~ 46 for Cooling Operation | | | |
| Evaporator Air Inlet Temperature | | | DB: -9.5 ~ 21 / WB: -10 ~ 15.5 for Heating Operation | | | |
| Permissible Water Pressure Max. | | MPa | 1.0 | | | |
| Safety and Protection Devices | | - | Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Fuse and Internal Thermostat for Fan Motor, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, High Pressure Relief Valve, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter | | | |

***NOTE:***

*1. The nominal cooling capacities are based on the European Standard EN14511.*
*- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C*
*- Condenser Inlet Air Temperature : 35 °C*
*2. The nominal heating capacities are based on the European Standard EN14511.*
*- Heated Water Inlet / Outlet Temperature : 40 / 45 °C*
*- Evaporator Air Inlet Temperature : 6 °C (WB)*

## 13.2. Options line up

Following table shows options:

(✓ mark shows available)

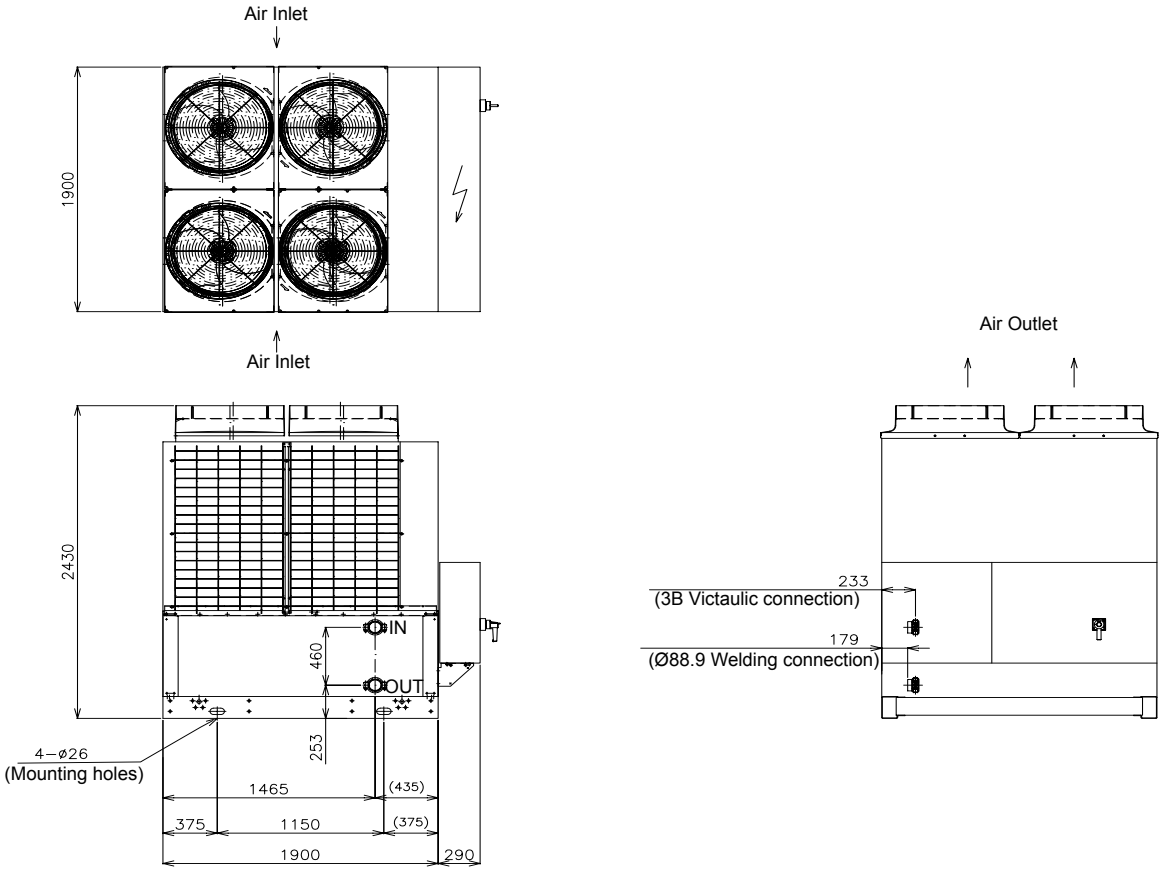
| Specifications | | Standard | Option | Remarks |
|---|---|---|---|---|
| General | Low Noise | | ✓ | |
| | Super Low Noise | | ✓ | |
| | Low Ambient Fan Control (-15ºC) | ✓ | | |
| Low Water Temperature | Outlet Temperature: 0 ~ 4ºC (Low1) | | ✓ | |
| | Outlet Temperature: -1 ~ -5ºC (Low2) | | ✓ | |
| | Outlet Temperature: -6 ~ -10ºC (Low3) | | ✓ | |
| Compressor | Compressor Enclosure | ✓ | | |
| Control System | Circuit Breaker Protector | | ✓ | For Compressor & Fans |
| | Fan Circuit Breaker Protector | | ✓ | Only for Fans |
| | Current Limiter | ✓ | | |
| | Star-Delta starting | ✓ | | For compressors |
| | Main Isolator Switch | ✓ | | |
| | Local/Remote Changeover Switch | ✓ | | |
| | Individual Alarm | ✓ | | By Alarm Code |
| | Compressor Operation Hour Meter | ✓ | | |
| | Pressure Sensor (High and Low) | ✓ | | |
| | Pump Freeze Protection Operation | ✓ | | Pump ON/OFF Operation |
| | Pump Operation Circuit | ✓ | | Pump ON/OFF Contact |
| | Non Voltage Contact for Remote indication | ✓ | | Pump, Operation, Alarm |
| | DC24V External Control | ✓ | | Level or pulse |
| | Short Period Power OFF Protection | ✓ | | |
| | Power Failure Recover Control | ✓ | | |
| | 2 Different Temperatures Setting | ✓ | | |
| | Remote Control Switch (Field Supplied) | ✓ | | AC 220-240V |
| | BMS Control (HARC-70CE1/OP) / (HC-A32MB) | | ✓ | LON-WORKS / MODBUS |
| | Remote Controller (CSC-5S) | | ✓ | |
| | Remote Controller via Intra/Internet | | ✓ | CSNETWEB |
| | Power Meter (Field installed) | | ✓ | Power Meter + CSNETWEB |
| | Numbered Cables | ✓ | | |
| | Output ON/OFF Signal for Free Cooling | ✓ | | |
| | Output ON/OFF Signal for Fan operation | ✓ | | Snow Protection |
| | Output Signal for Forcing Compressor Load | ✓ | | |
| Air Condenser | Coil Guard Nets | ✓ | | Unit both sides |
| | Coated Aluminium Fin | ✓ | | |
| | Copper Fin | | ✓ | |
| Refrigeration Cycle | Independent Circuit | ✓ | | |
| | Insulation Suction Pipe | | ✓ | Low pressure side |
| | Discharge Valve | | ✓ | |
| | Suction Valve | | ✓ | |
| | Dual Safety Valve | | ✓ | |
| | Compressor Safety Valve | | ✓ | |
| | Compressor Dual Safety Valve | | ✓ | |
| | Heat Recovery | | ✓ | Except RHU2E units with common water pipe option |
| | Heating Operation in High Ambient Temperature | | ✓ | Only RHU2E units |
| | Pressure Display (High and Low) | ✓ | | Display on Operation Panel |
| Water Cooler | Water Cooler Heater | | ✓ | |
| Water system | 10 bar Water Pressure | ✓ | | |
| | PN 16 Flange | | ✓ | With Companion Flange |
| | Differential Water Pressure Switch | | ✓ | |
| | Water Flow Switch (Field Installed) | | ✓ | |
| | Pressure port | | ✓ | Water inlet / outlet |
| | Water Strainer (Field installed) | | ✓ | |
| | Stainless Steel Water Pipe | | ✓ | AISI 304 |
| | Common Water Pipe | | ✓ | Except 40,50,60,70,80HP |
| | Hydrokit | | ✓ | Only 40, 50,60, 70, 80HP |
| Others | Foundation Rubber Mats (Field installed) | | ✓ | |
| | Spring Anti-vibration (Field installed) | | ✓ | |
| | Lower Guard Nets | | ✓ | |
| | All Painted | | ✓ | |
| | Wooden Crate | | ✓ | |
| | Witness Test | | ✓ | |

# 14. Drawings

## Contents

# 14.1. Dimensional Drawing

### 14.1.1. RCU2E40~60AG2, RHU2E40AG2~60AG2

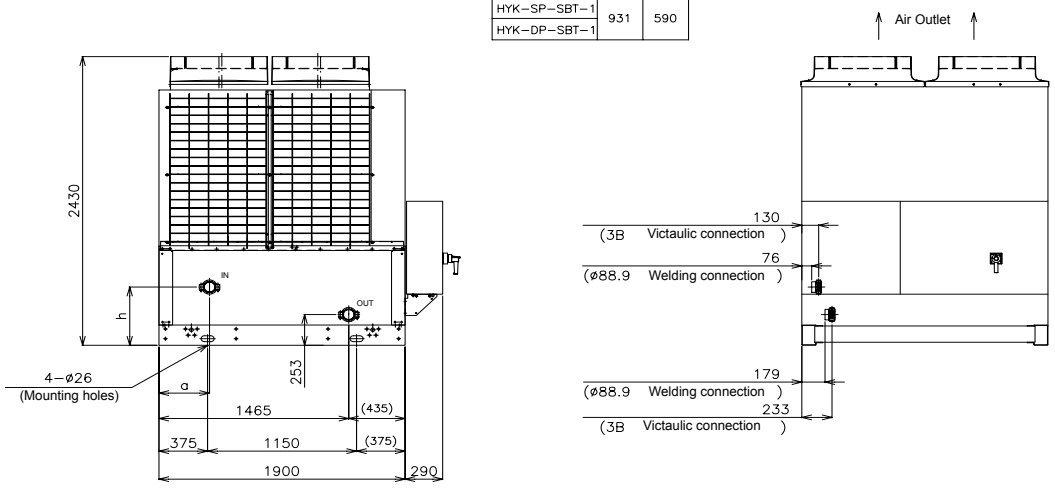



DIMENSIONAL DRAWING of Hydrokit Option

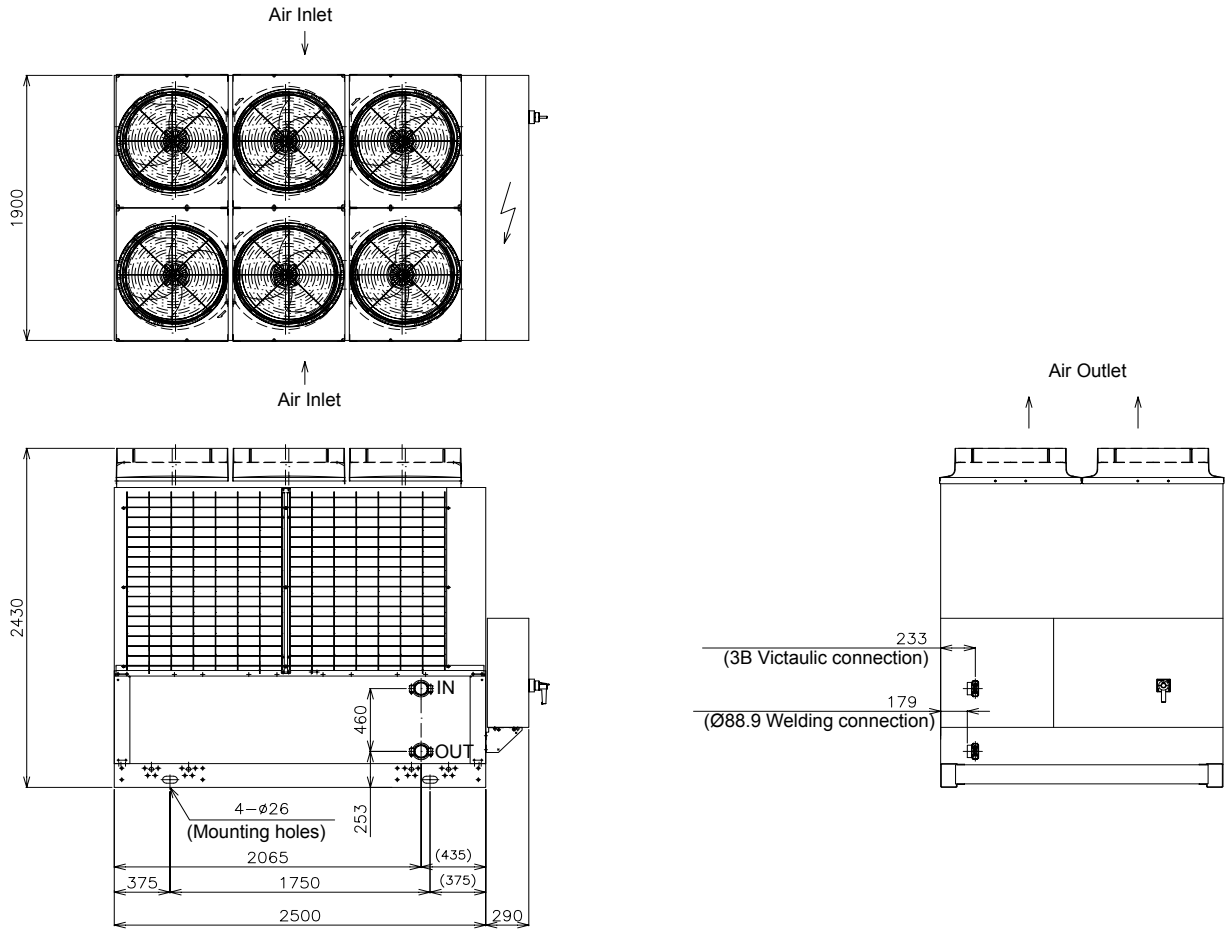
R(C/H)U2E40AG2,R(C/H)U2E50AG2,R(C/H)U2E60AG2

Dimensions Table

| Hydrokit Option | a | h |
|---|---|---|
| HYK−SP−ABT−1 | 390 | 490 |
| HYK−DP−ABT−1 | | |
| HYK−SP−SBT−1 | 931 | 590 |
| HYK−DP−SBT−1 | | |



## 14.1.2 RCU2E70,80AG2, RHU2E70,80AG2

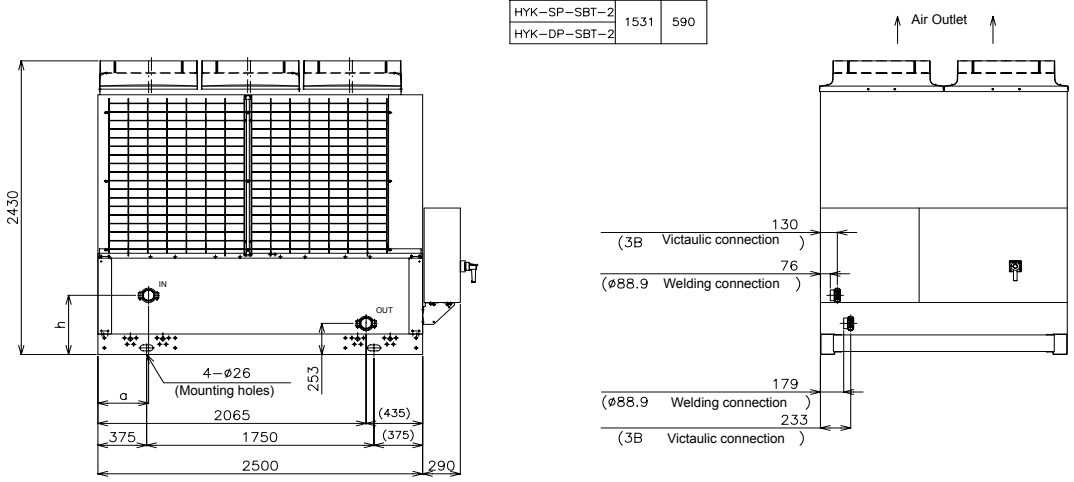



DIMENSIONAL DRAWING of Hydrokit Option

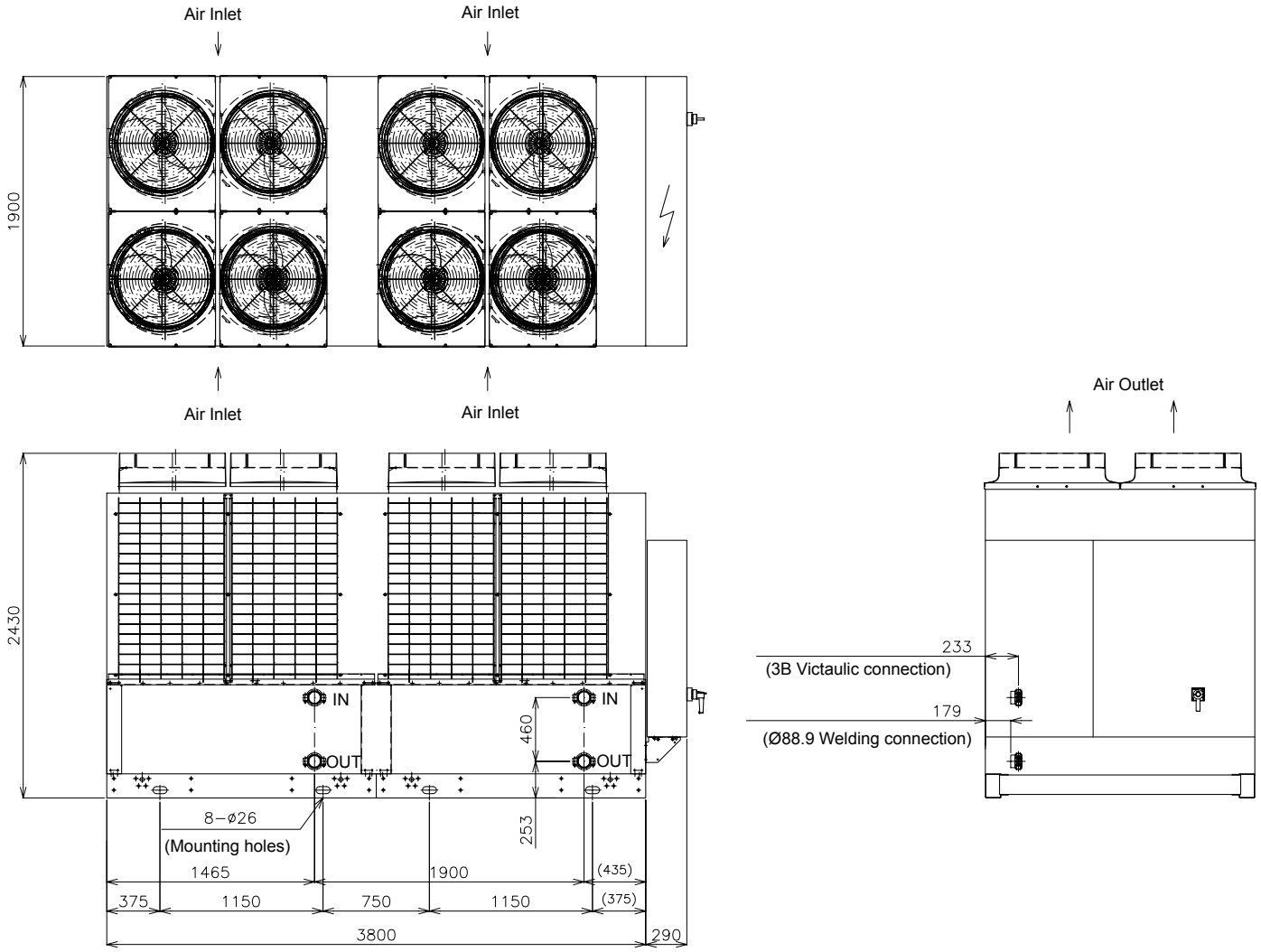
R(C/H)U2E70AG2,R(C/H)U2E80AG2

Dimensions Table

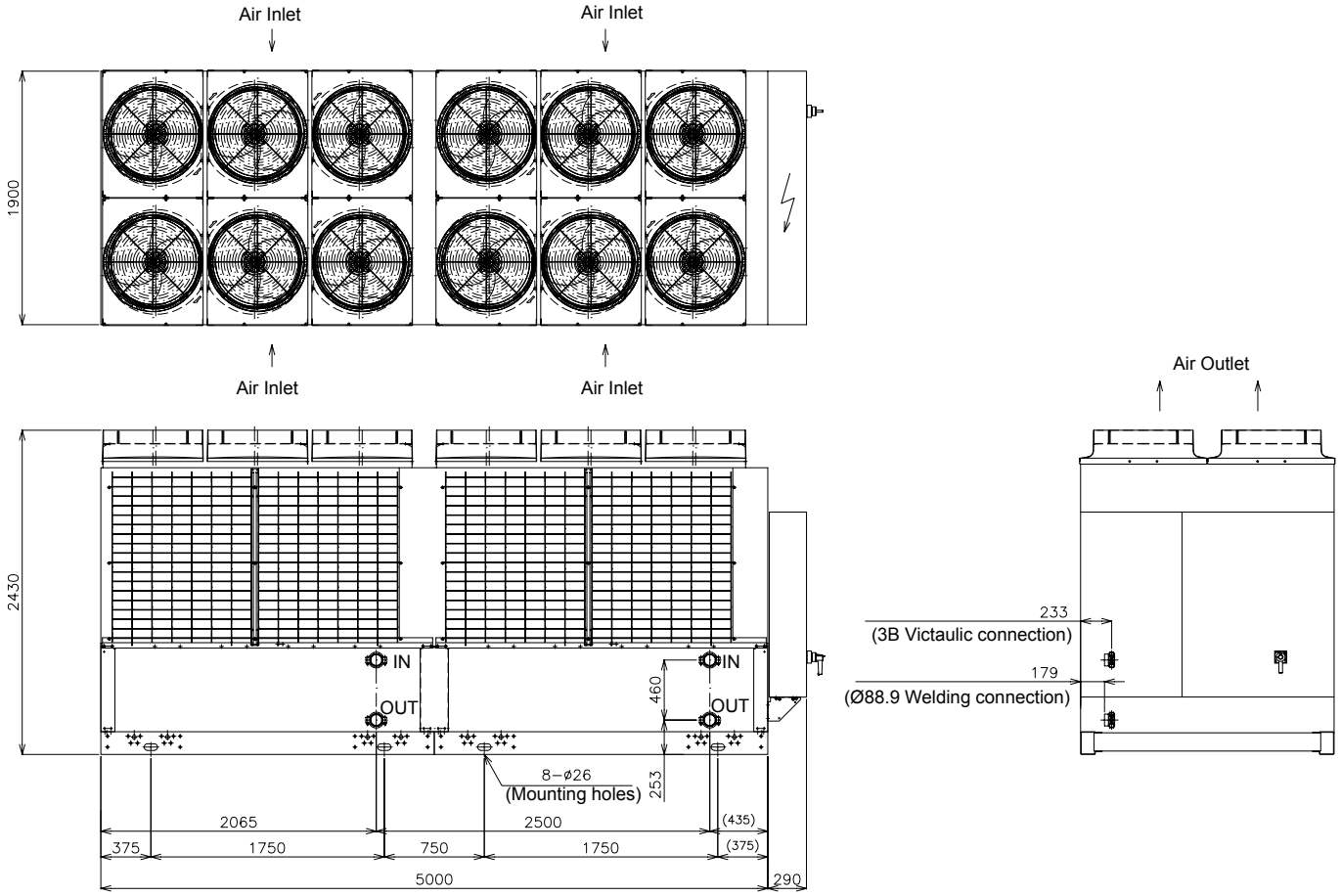
| Hydrokit Option | a | h |
|---|---|---|
| HYK−SP−ABT−2 | 390 | 490 |
| HYK−DP−ABT−2 | | |
| HYK−SP−SBT−2 | 1531 | 590 |
| HYK−DP−SBT−2 | | |



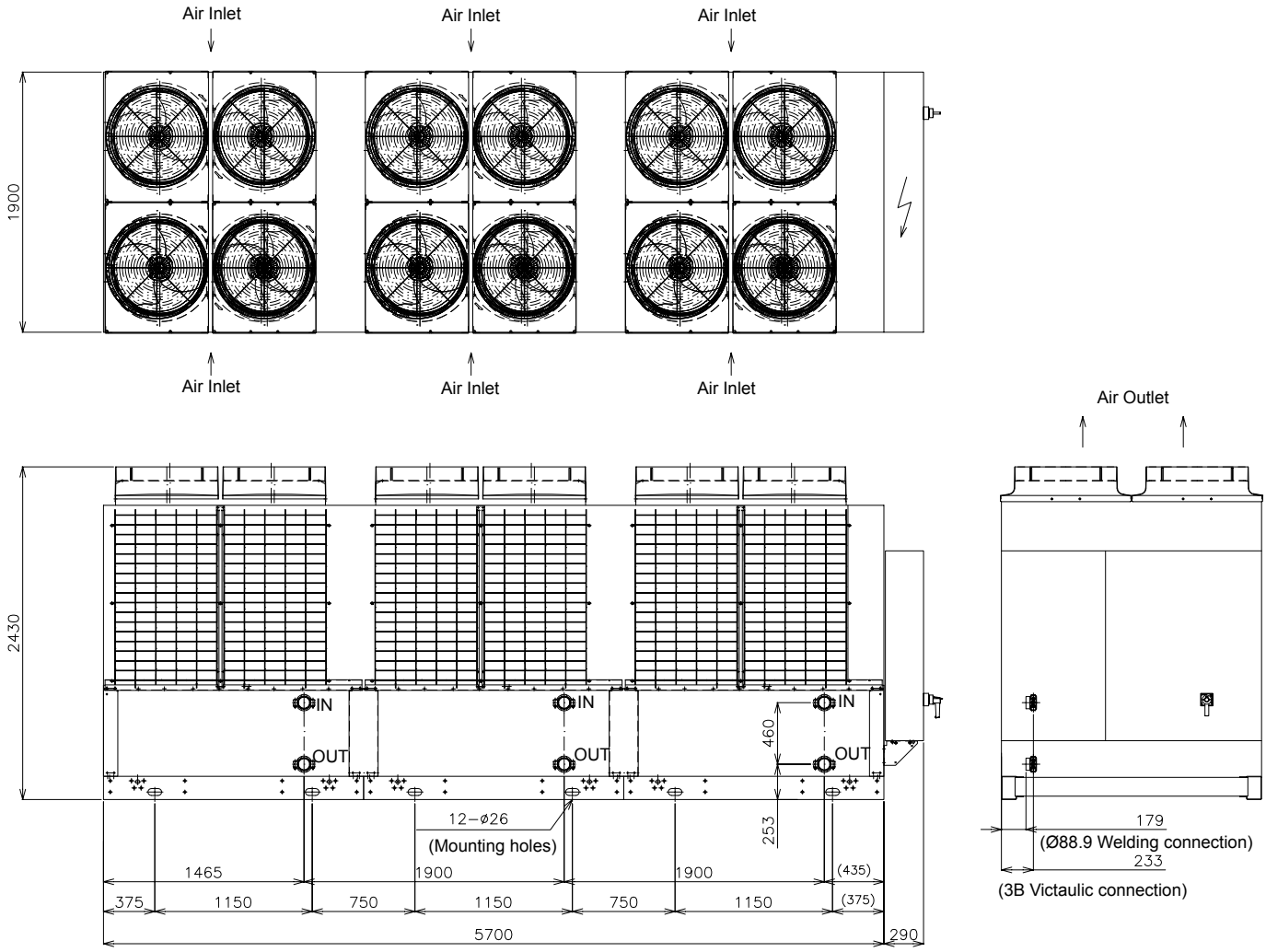
### 14.1.3 RCU2E100,120AG2, RHU2E100,120AG2



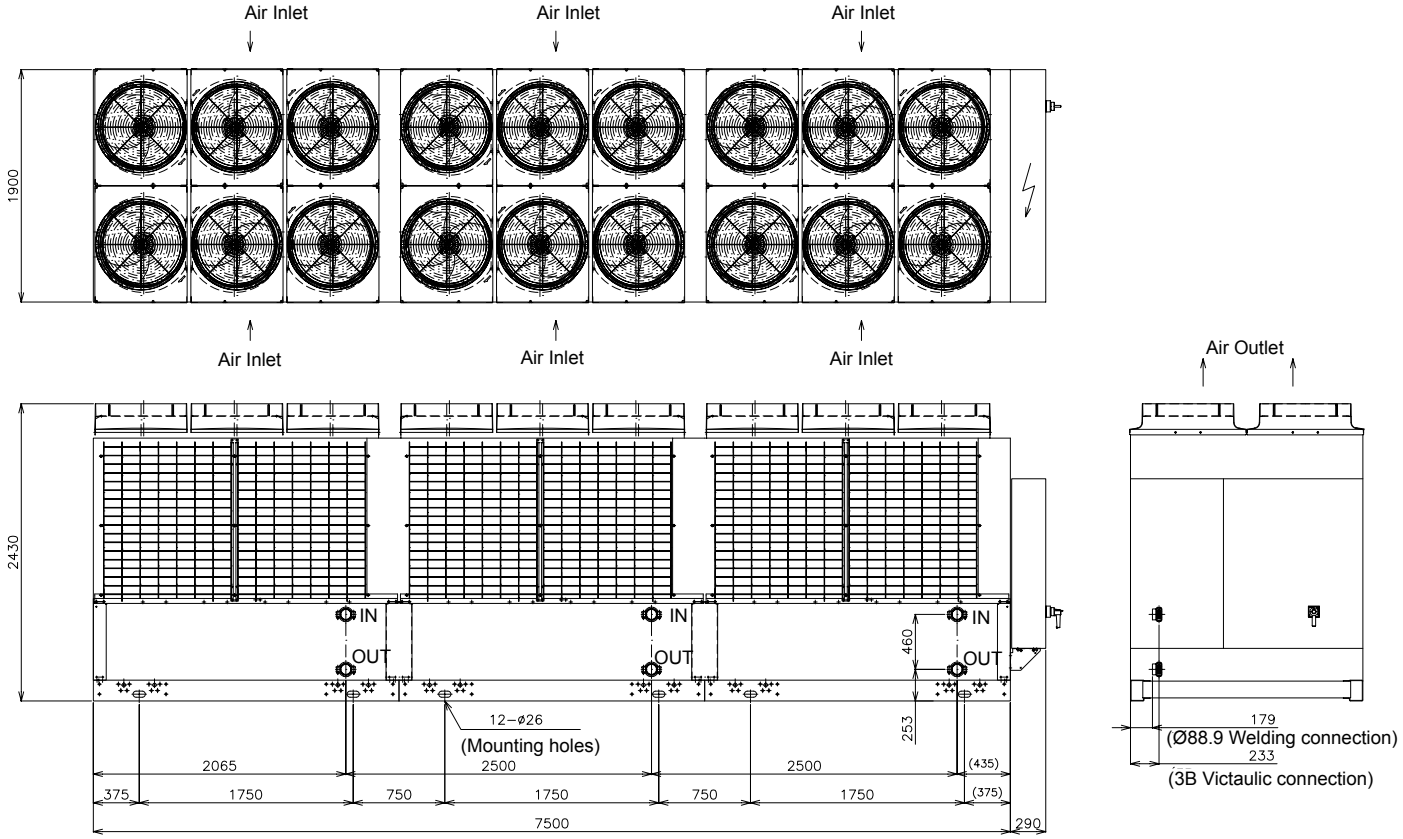
### 14.1.4 RCU2E140,160AG2, RHU2E140,160AG2



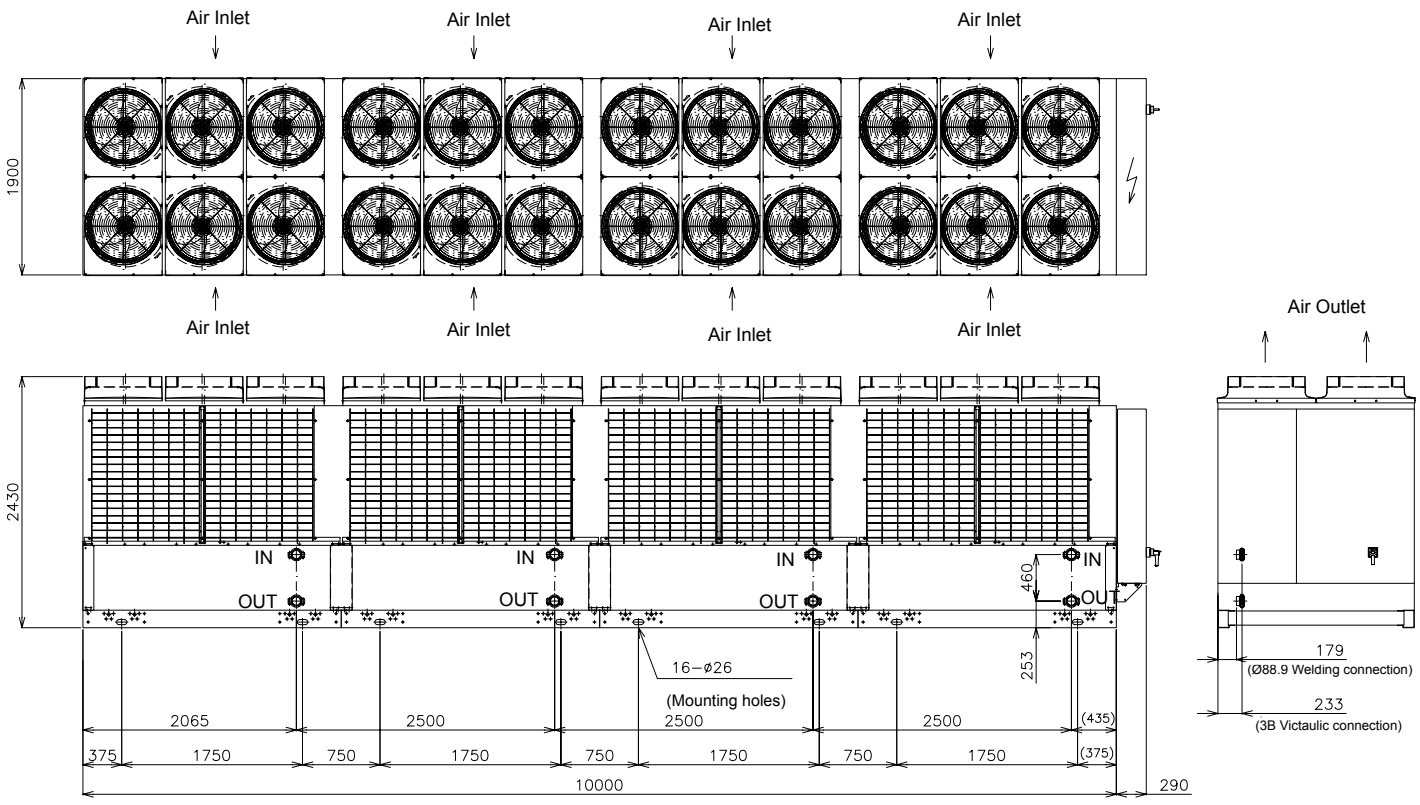
### 14.1.5 RCU2E180AG2, RHU2E180AG2



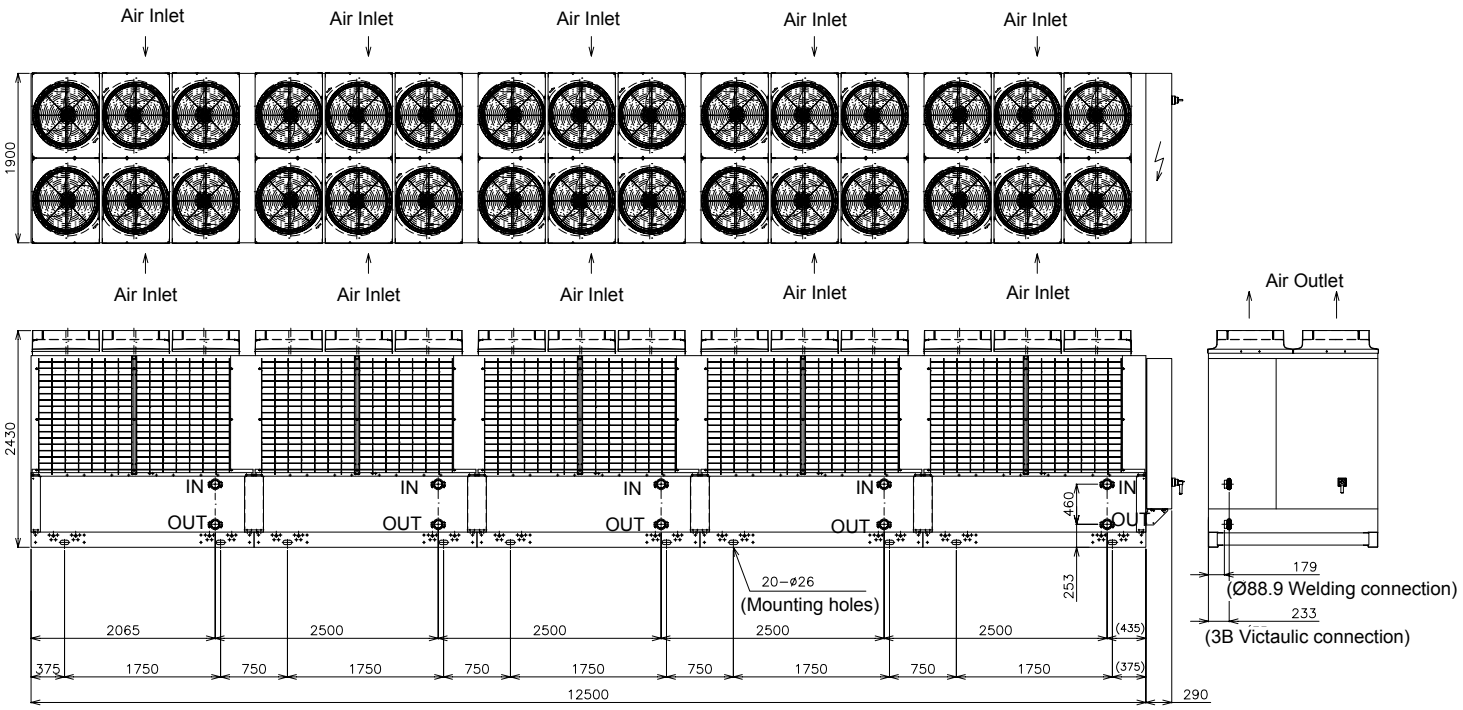
### 14.1.6 RCU2E210,240AG2, RHU2E210,240AG2



### 14.1.7 RCU2E280AG2, RCU2E320AG2

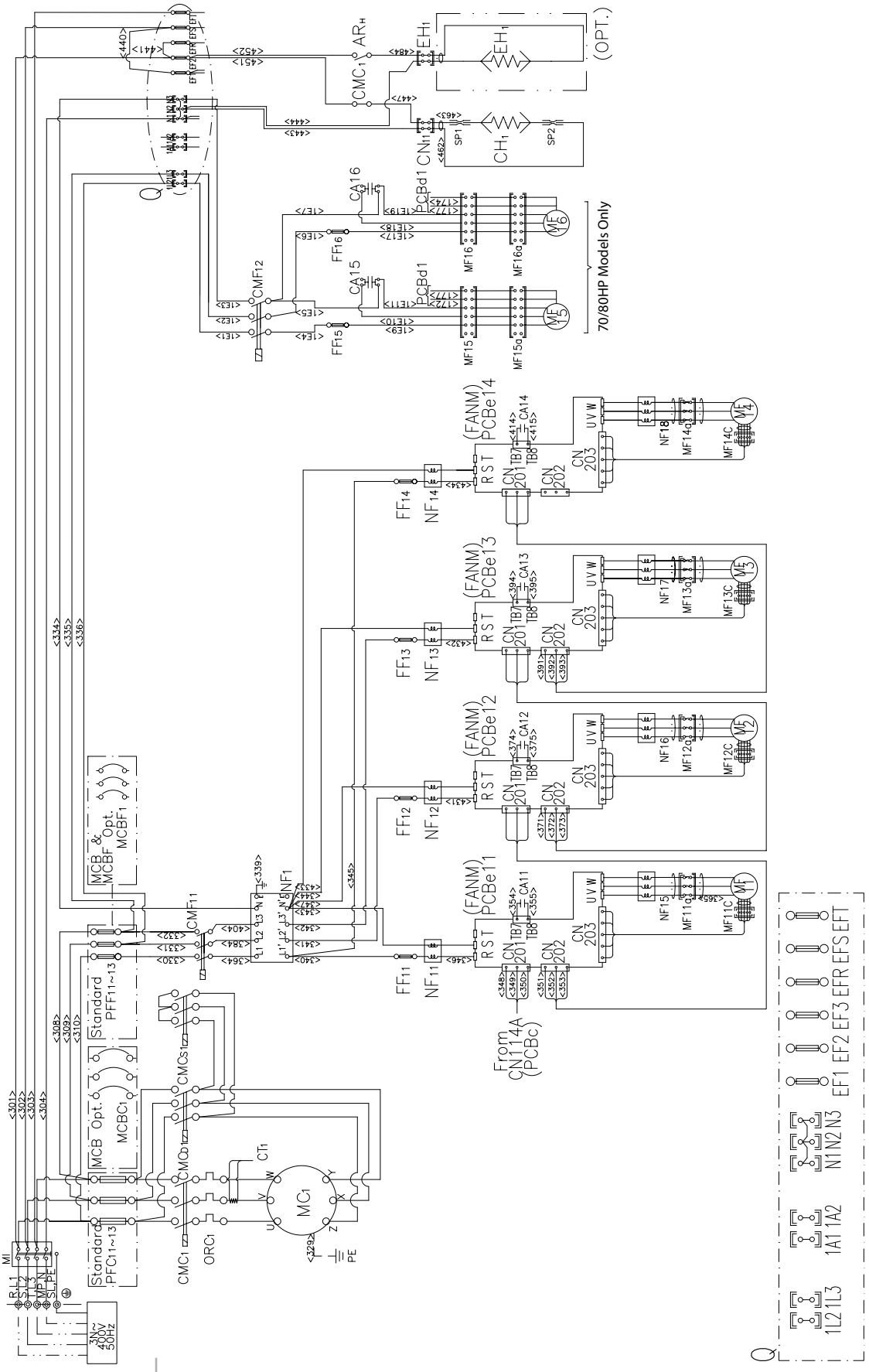


### 14.1.8. RCU2E350,400AG2

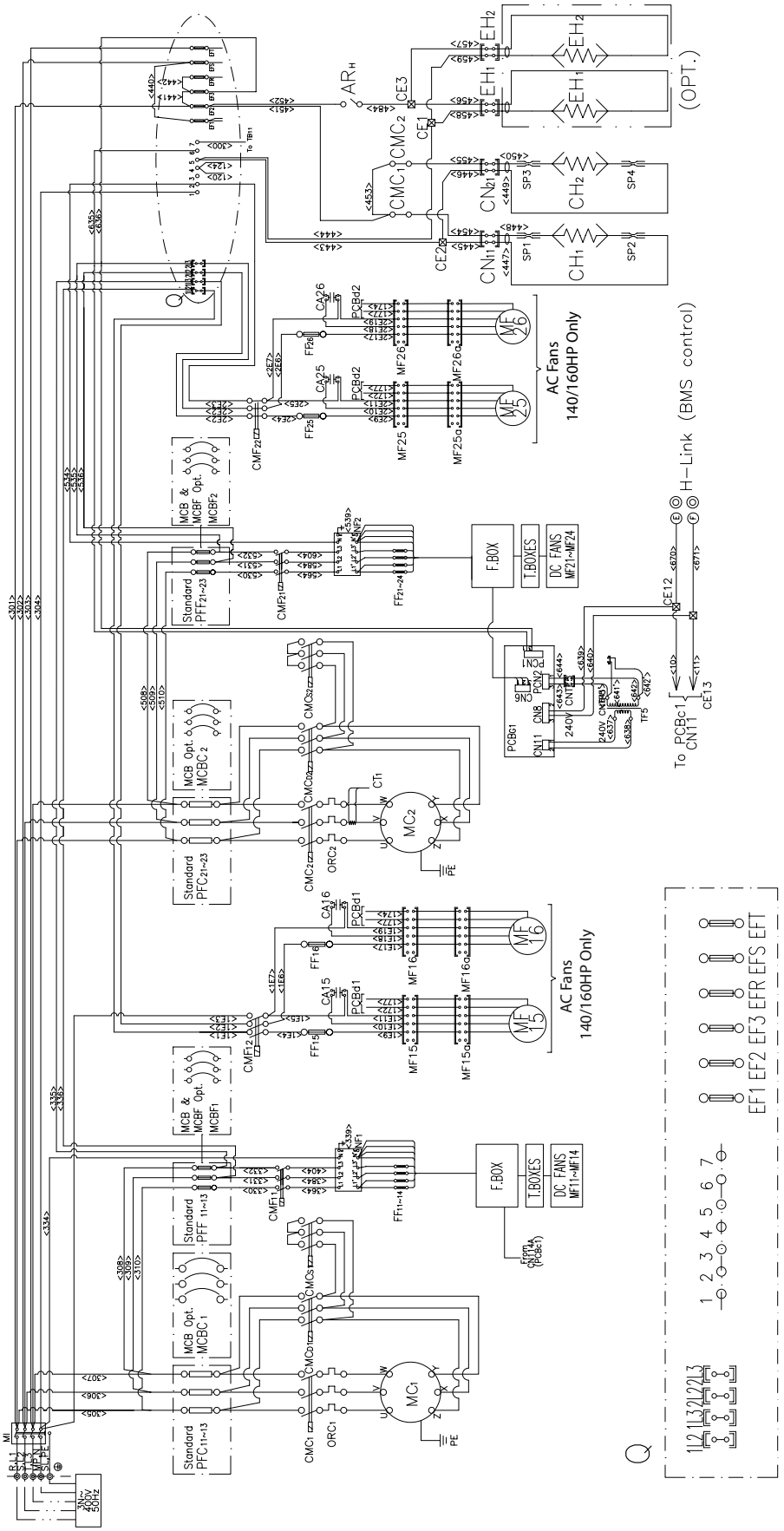


## 14.2. Wiring Diagram

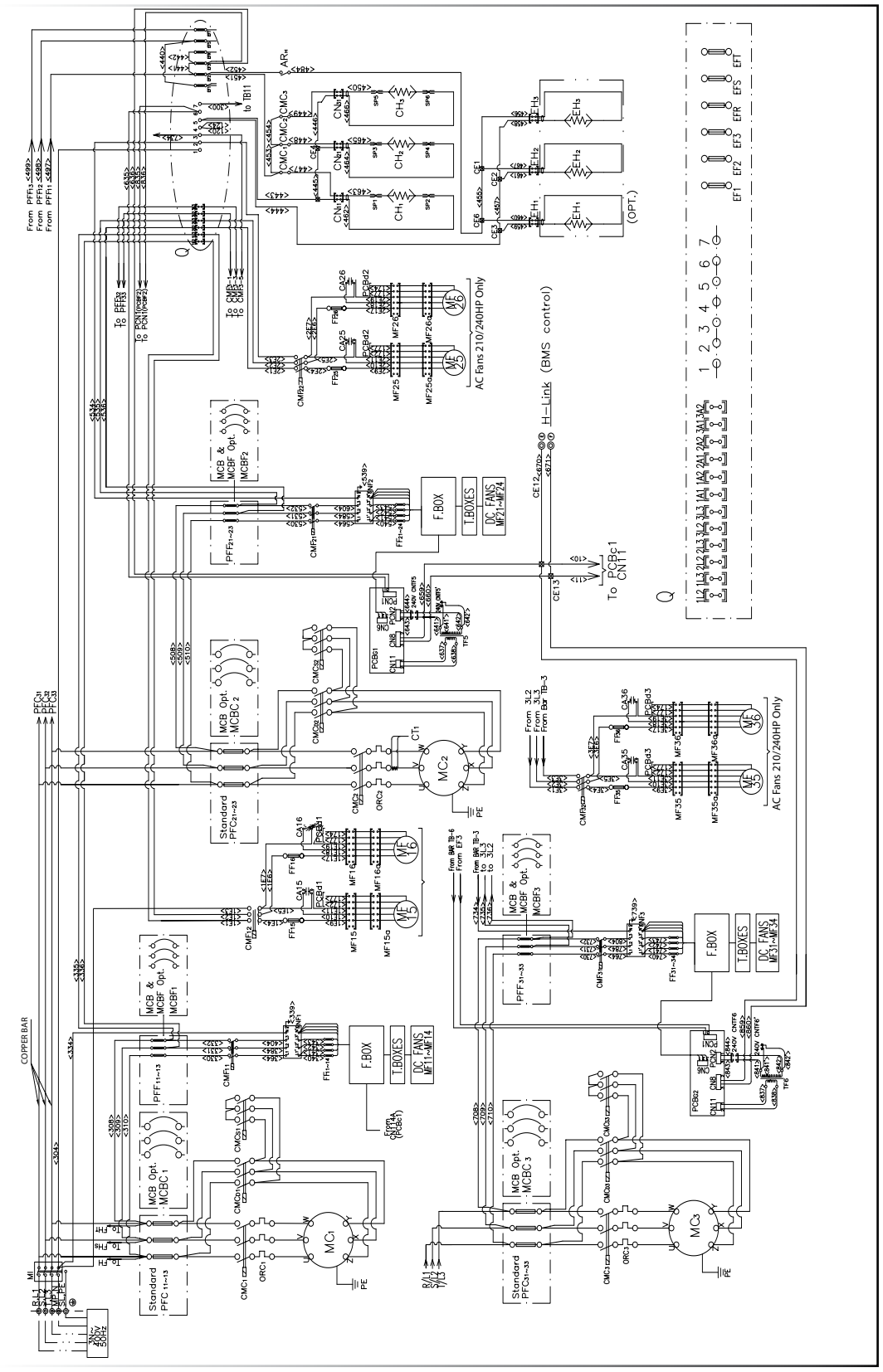
### 14.2.1 POWER CIRCUIT FOR R(C/H)U2E40AG2, R(C/H)U2E50AG2, R(C/H)U2E60AG2, R(C/H)U2E70AG2, R(C/H)U2E80AG2



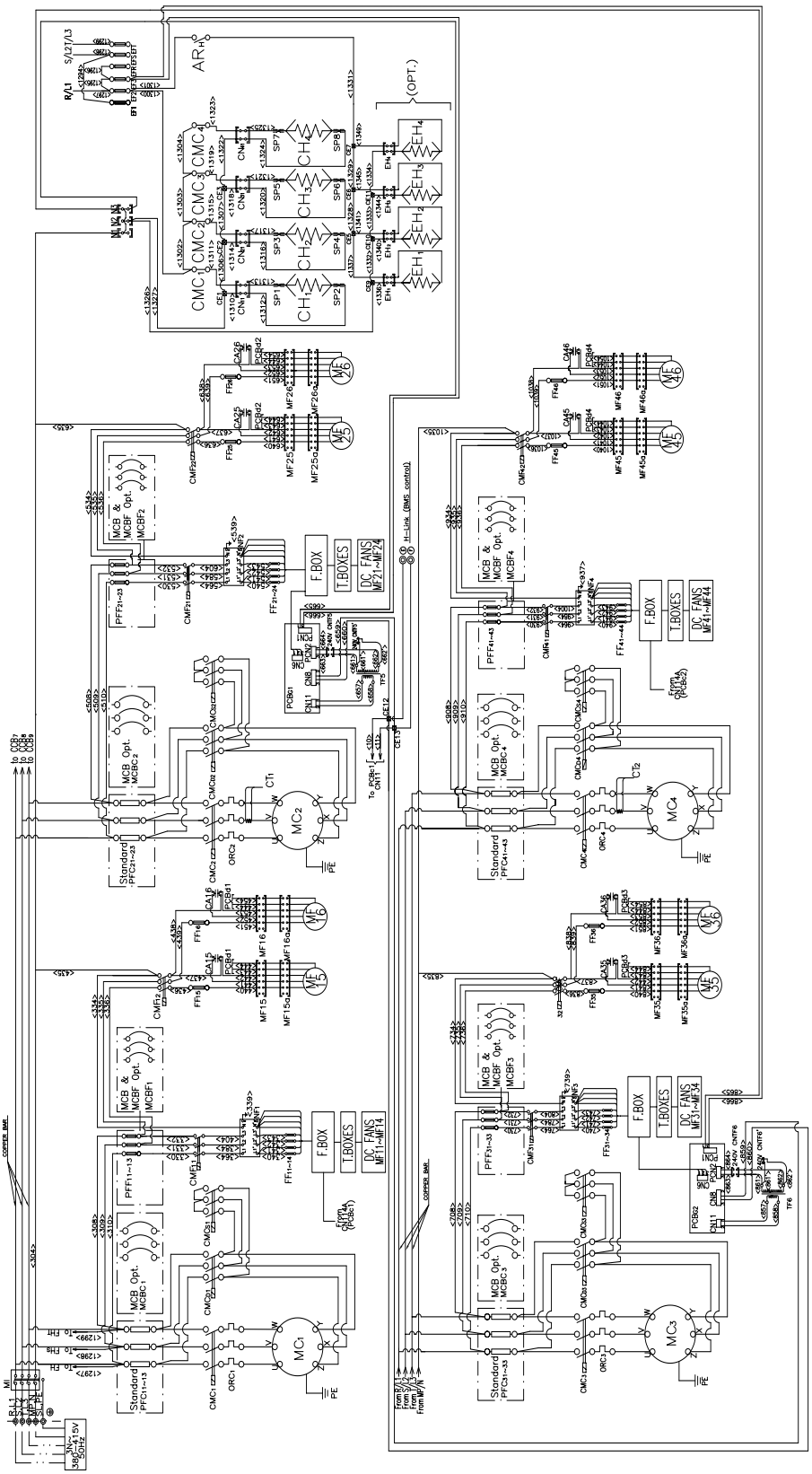
### 14.2.2 POWER CIRCUIT FOR R(C/H)U2E100AG2, R(C/H)U2E120AG2, R(C/H)U2E140AG2, R(C/H)U2E160AG2



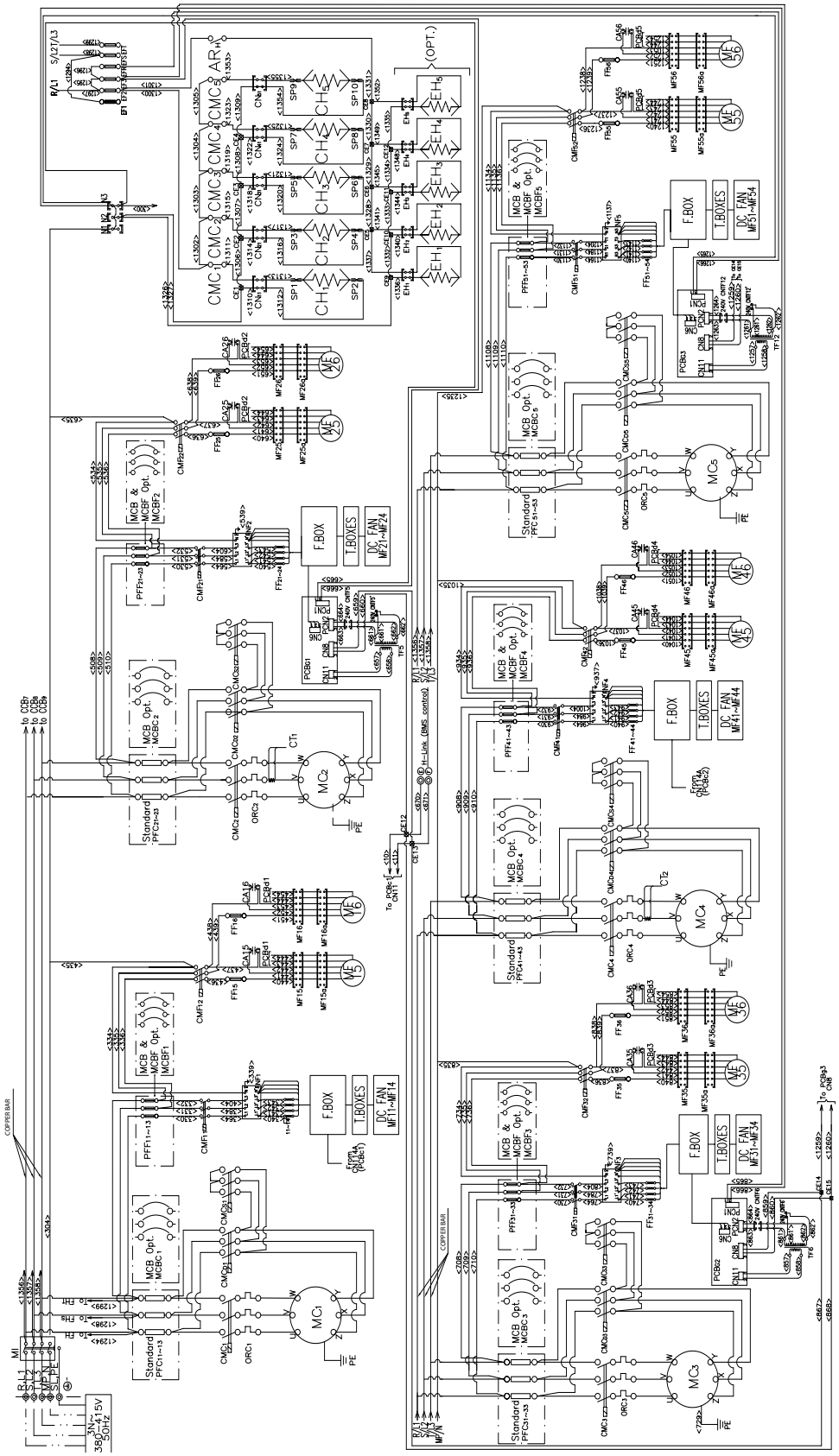
## 14.2.3 POWER CIRCUIT FOR R(C/H)U2E180AG2, R(C/H)U2E210AG2, R(C/H)U2E240AG2



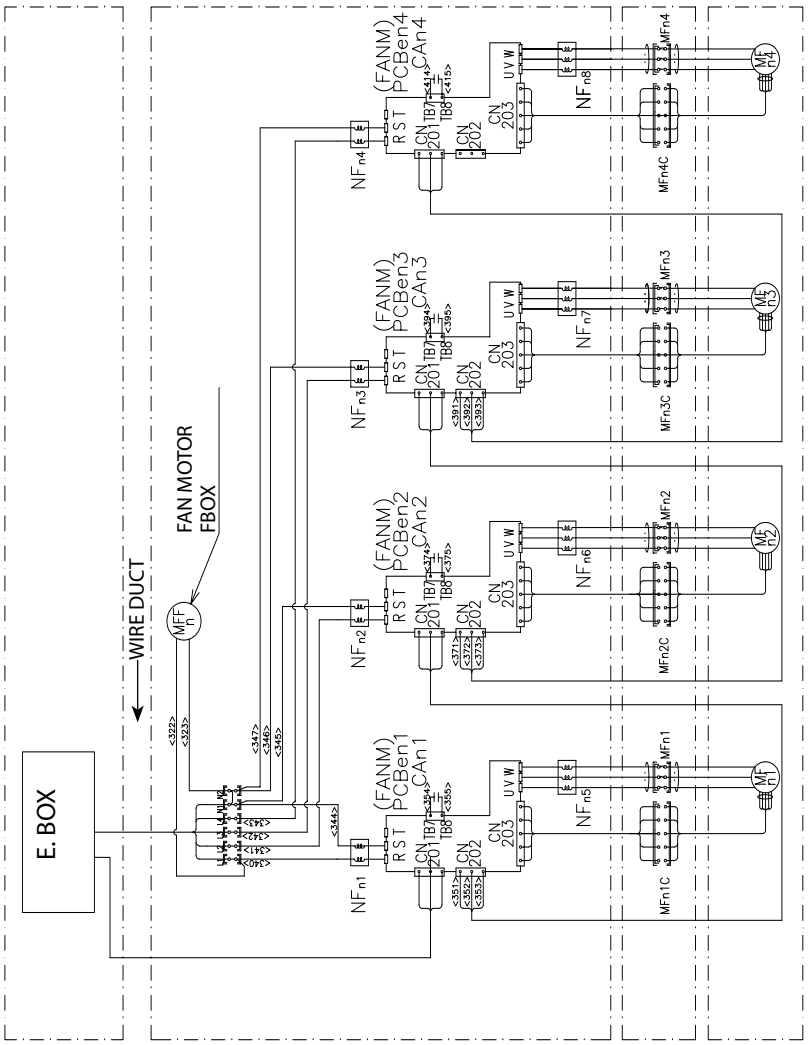
### 14.2.4 POWER CIRCUIT FOR RCU2E280AG2, RCU2E320AG2



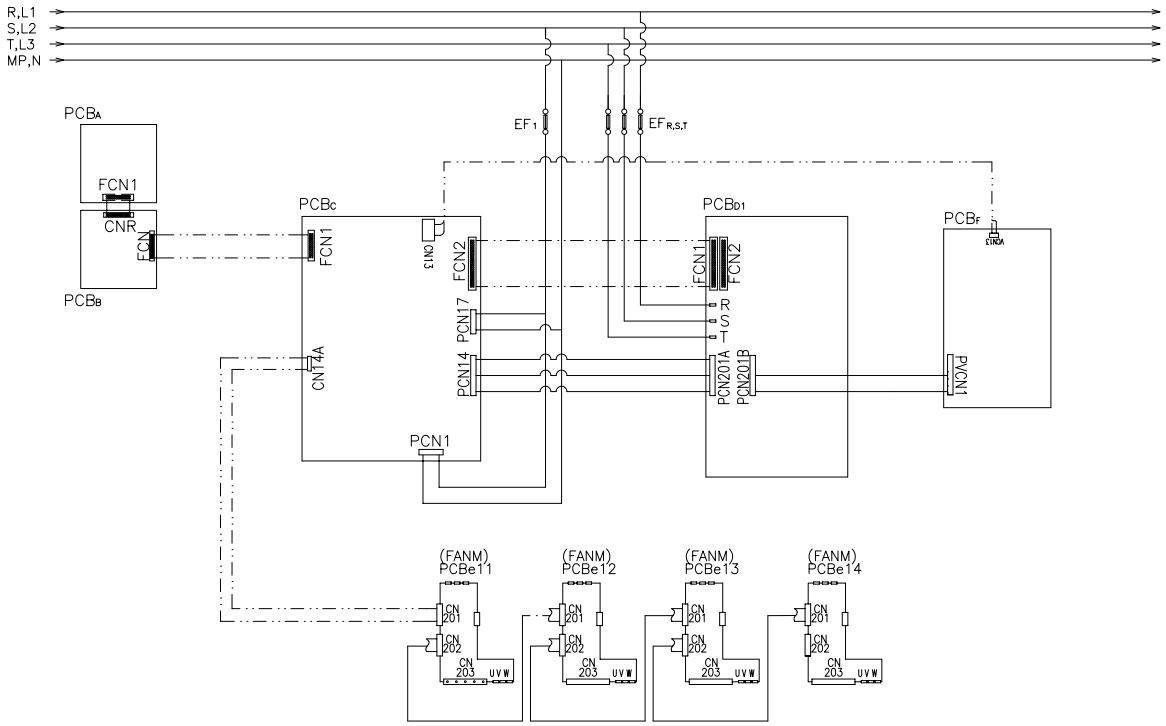
## 14.2.5 POWER CIRCUIT FOR RCU2E350AG2, RCU2E400AG2



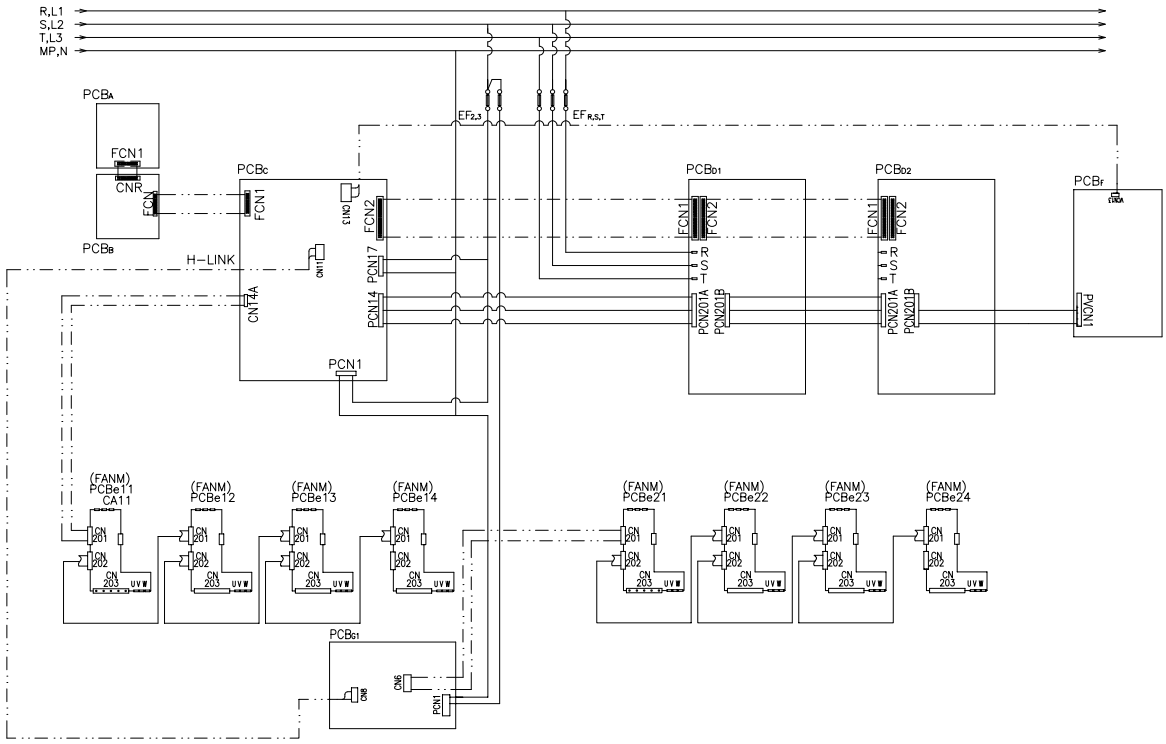
### 14.2.6 FAN BOX


E. BOX
WIRE DUCT
FAN MOTOR
FBOX
(FANM)
PCBen1
CAn1
(FANM)
PCBen2
CAn2
(FANM)
PCBen3
CAn3
(FANM)
PCBen4
CAn4
FAN BOX
T. BOXES
DC FAN MOTOR

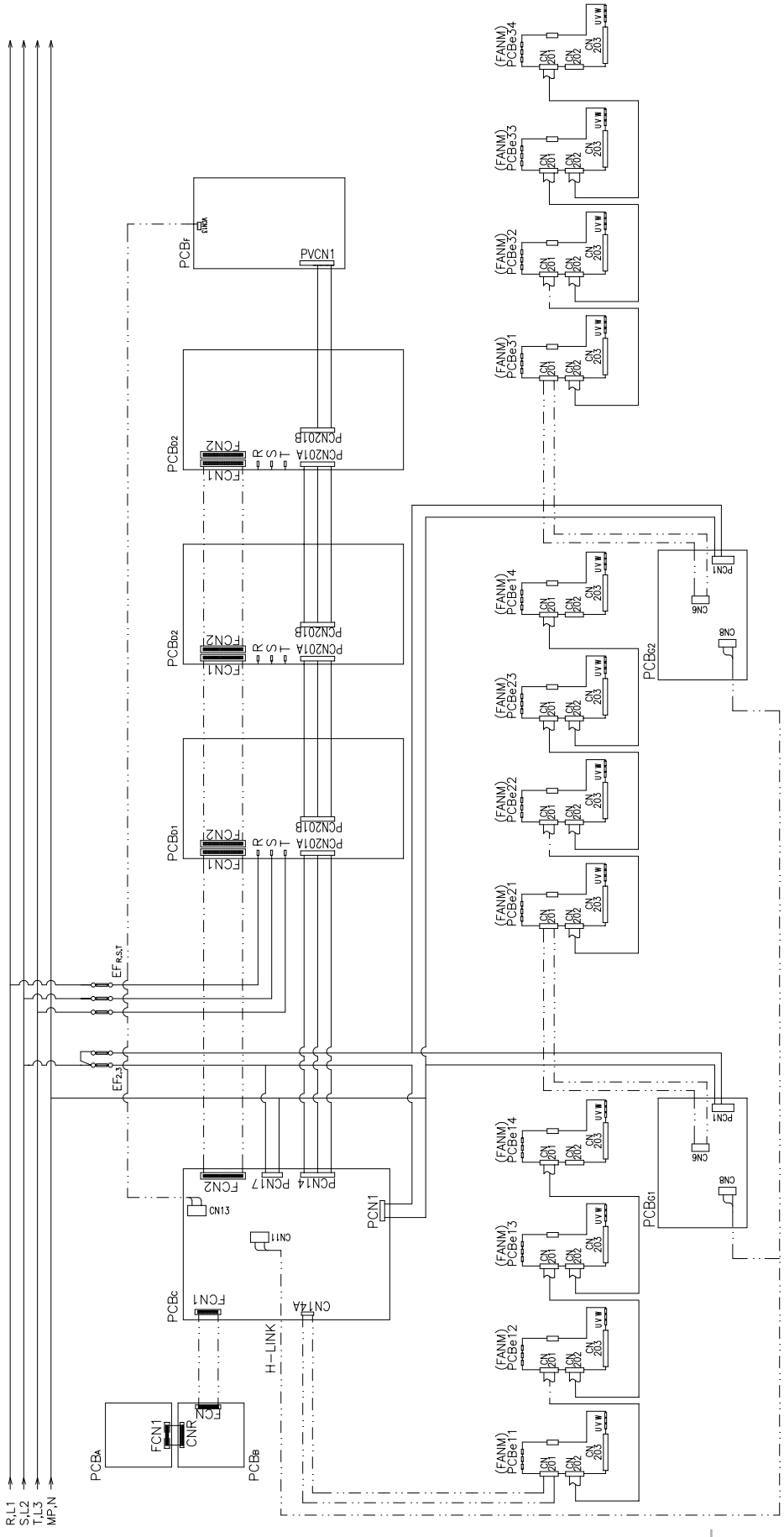
### 14.2.7 CONTROL CIRCUIT FOR R(C/H)U2E40AG2, R(C/H)U2E50AG2, R(C/H)U2E60AG2, R(C/H)U2E70AG2, R(C/H)U2E80AG2



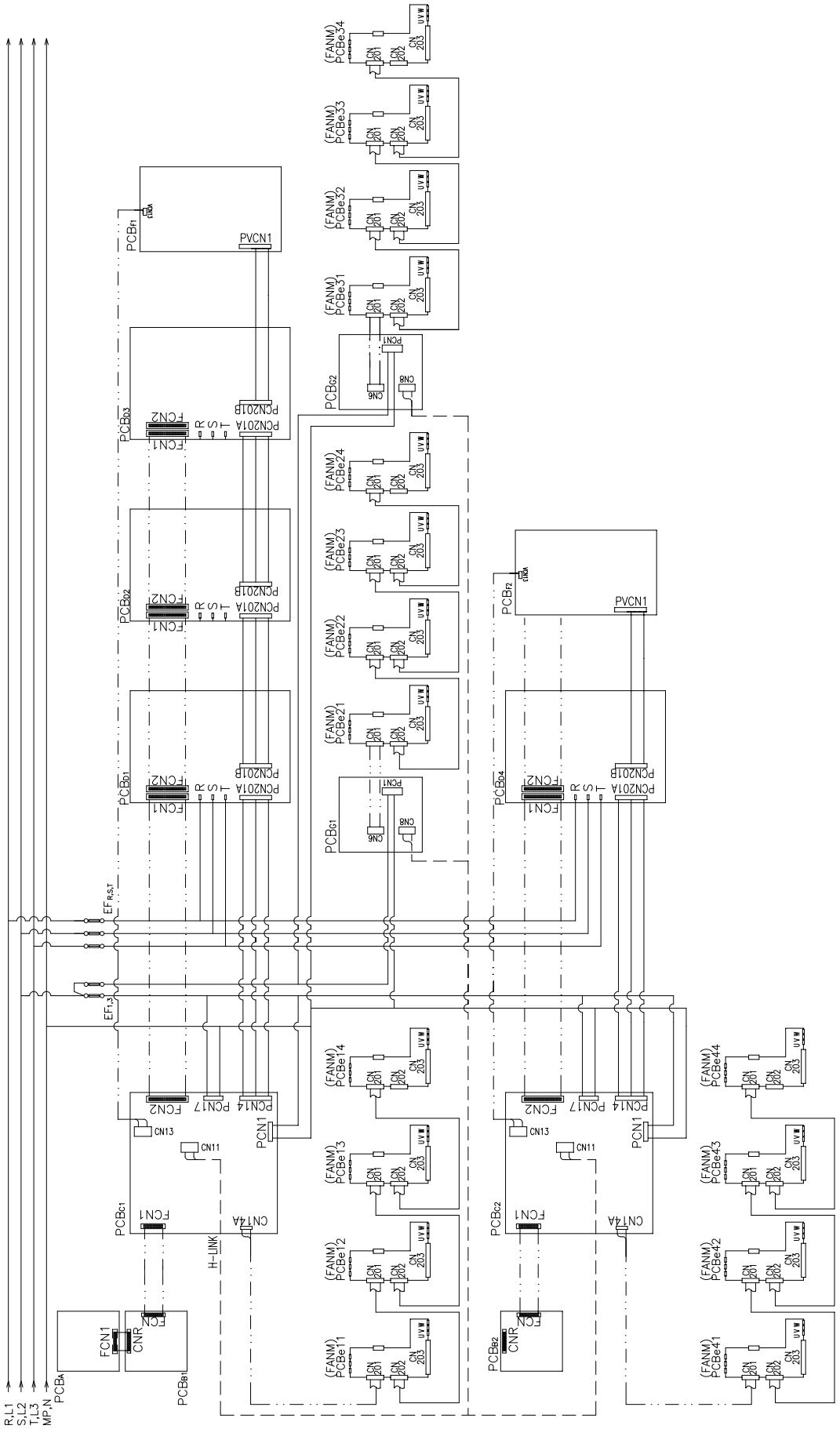

### 14.2.8 CONTROL CIRCUIT FOR R(C/H)U2E100AG2, R(C/H)U2E120AG2, R(C/H)U2E140AG2, R(C/H)U2E160AG2



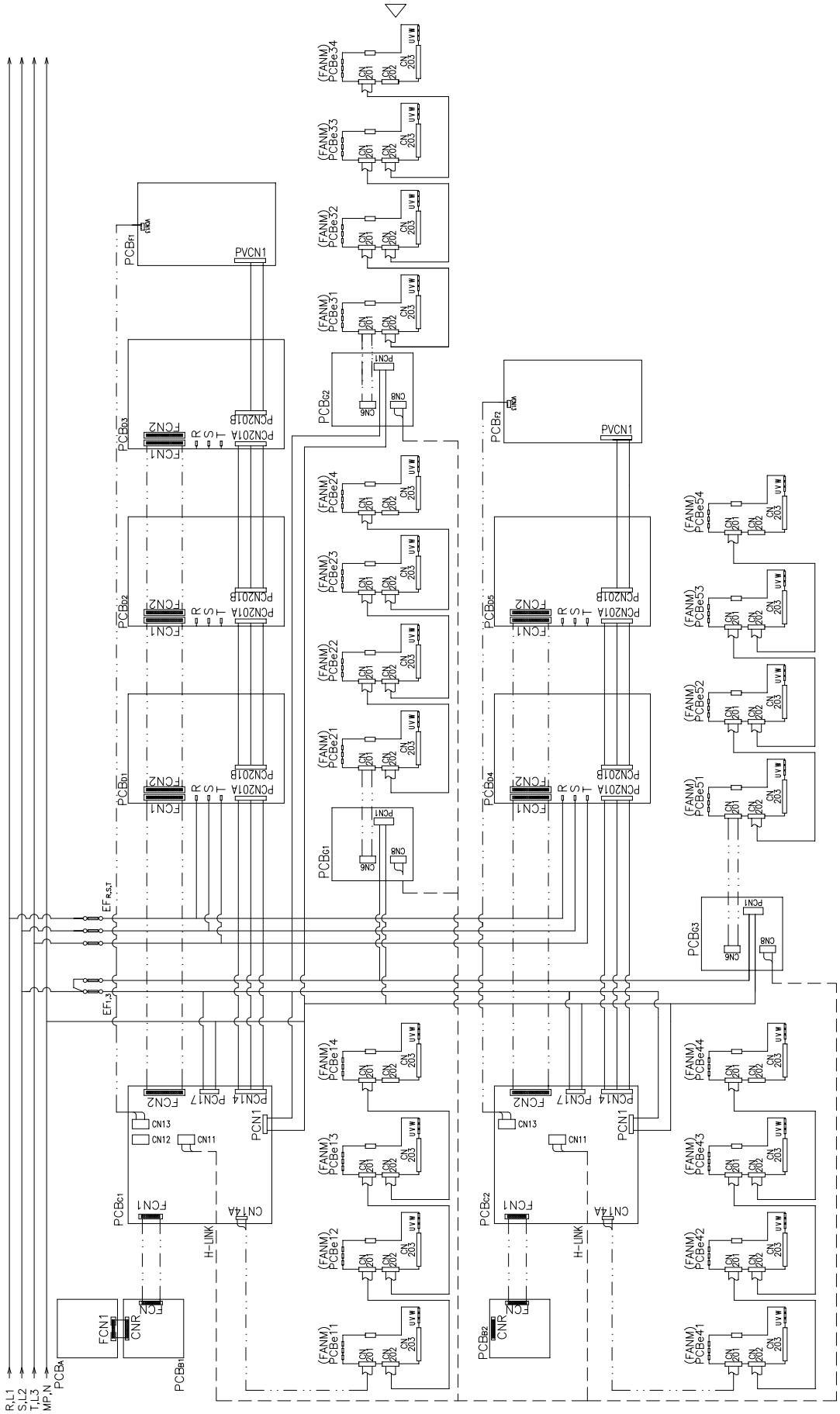
## 14.2.9 CONTROL CIRCUIT FOR R(C/H)U2E180AG2, R(C/H)U2E210AG2, R(C/H)U2E240AG2



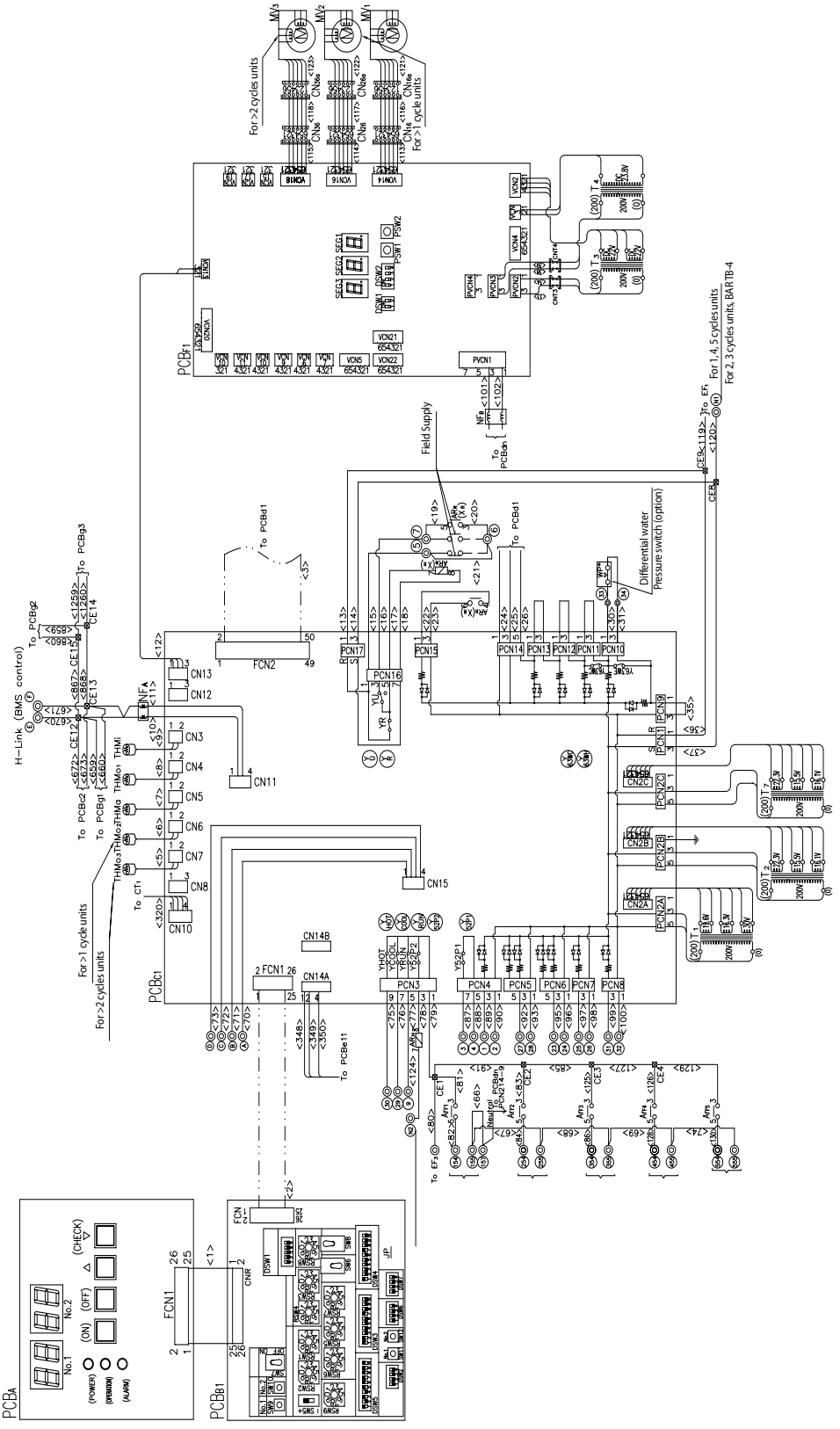
## 14.2.10 CONTROL CIRCUIT FOR RCU2E280AG2, RCU2E320AG2



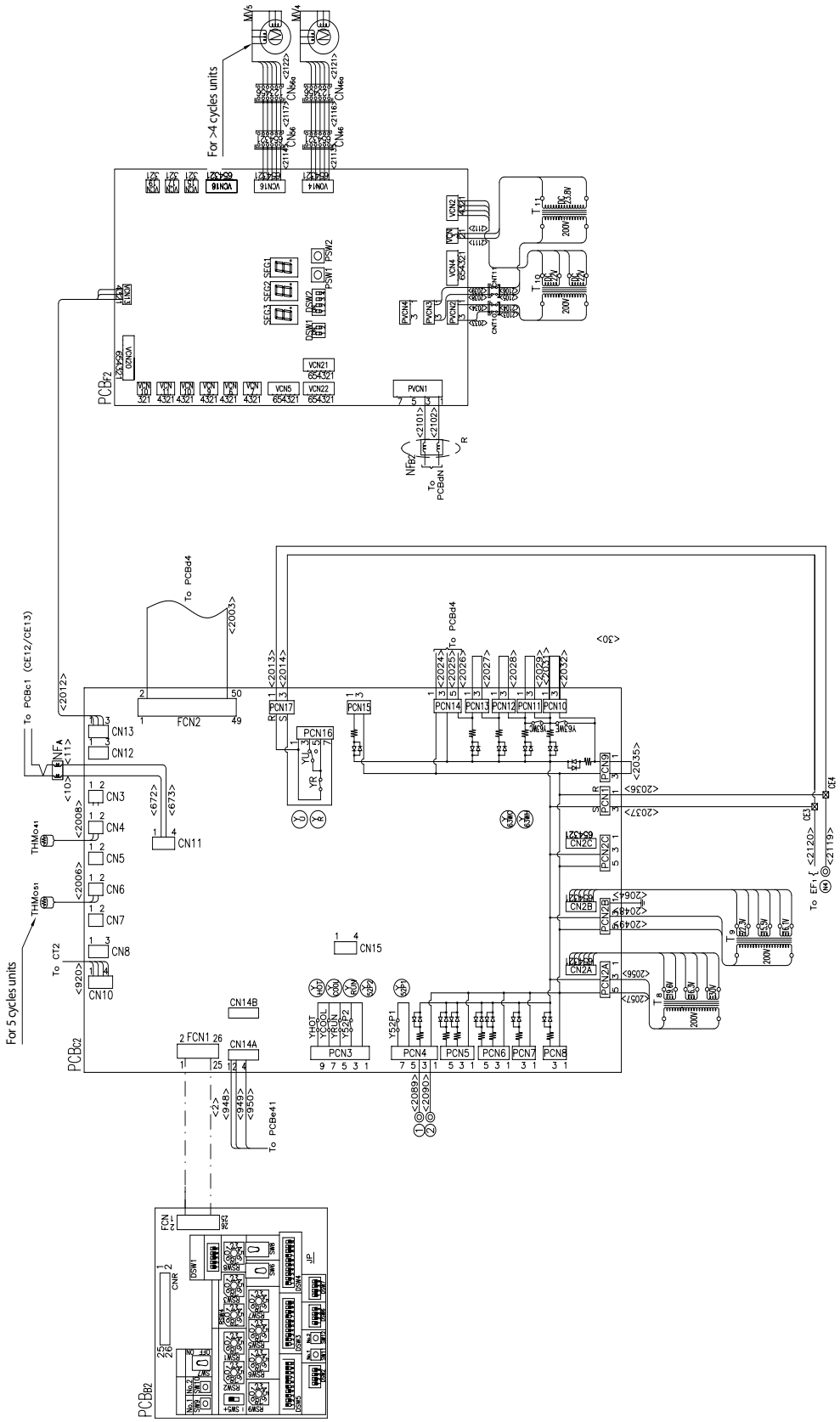
## 14.2.11 CONTROL CIRCUIT FOR RCU2E350AG2, RCU2E400AG2



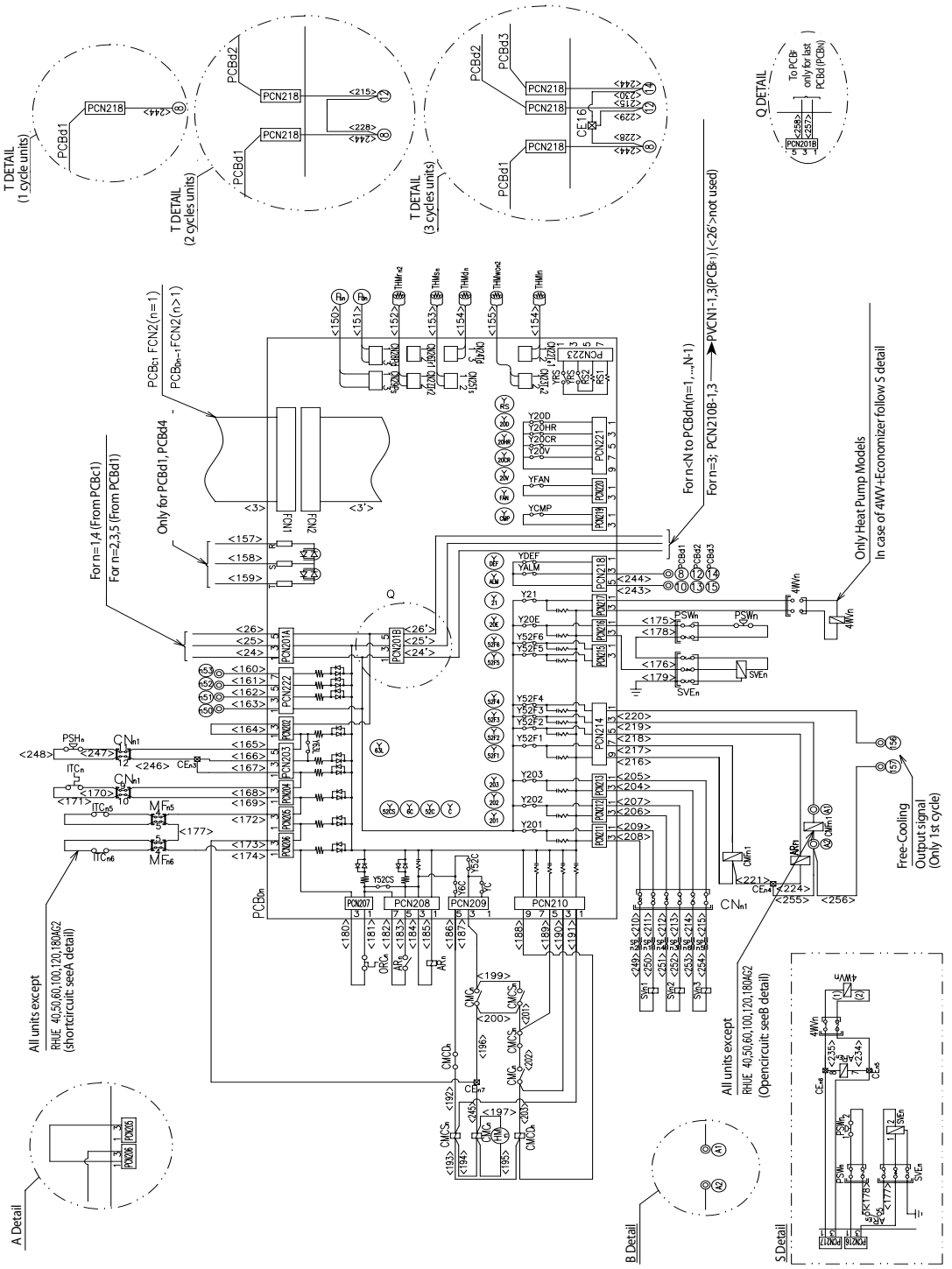
## 14.2.12 MAIN PRINTED CIRCUIT BOARD (MASTER)



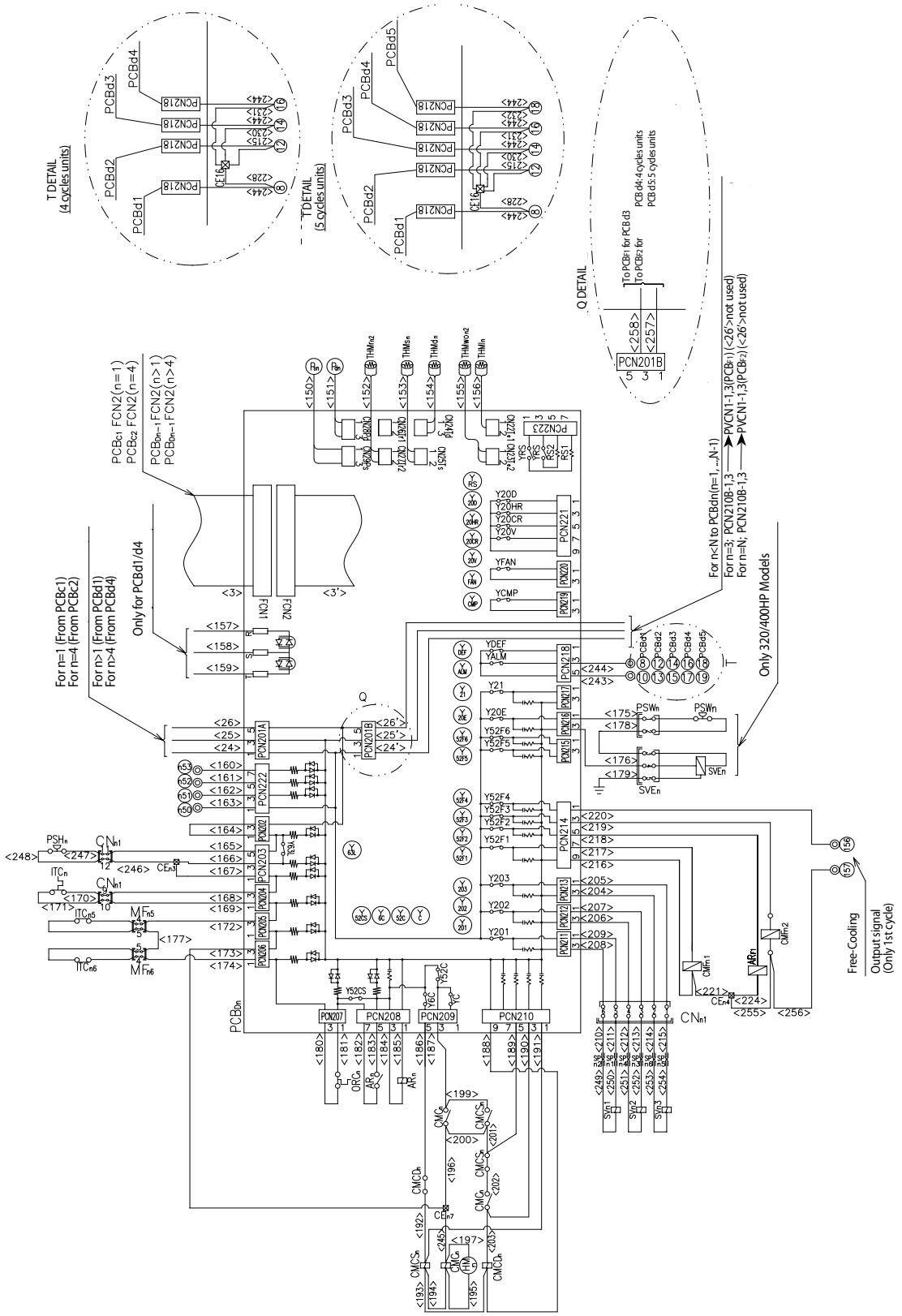
## 14.2.13 MAIN PRINTED CIRCUIT BOARD (SUBSIDIARY) (4,5 cycles units)



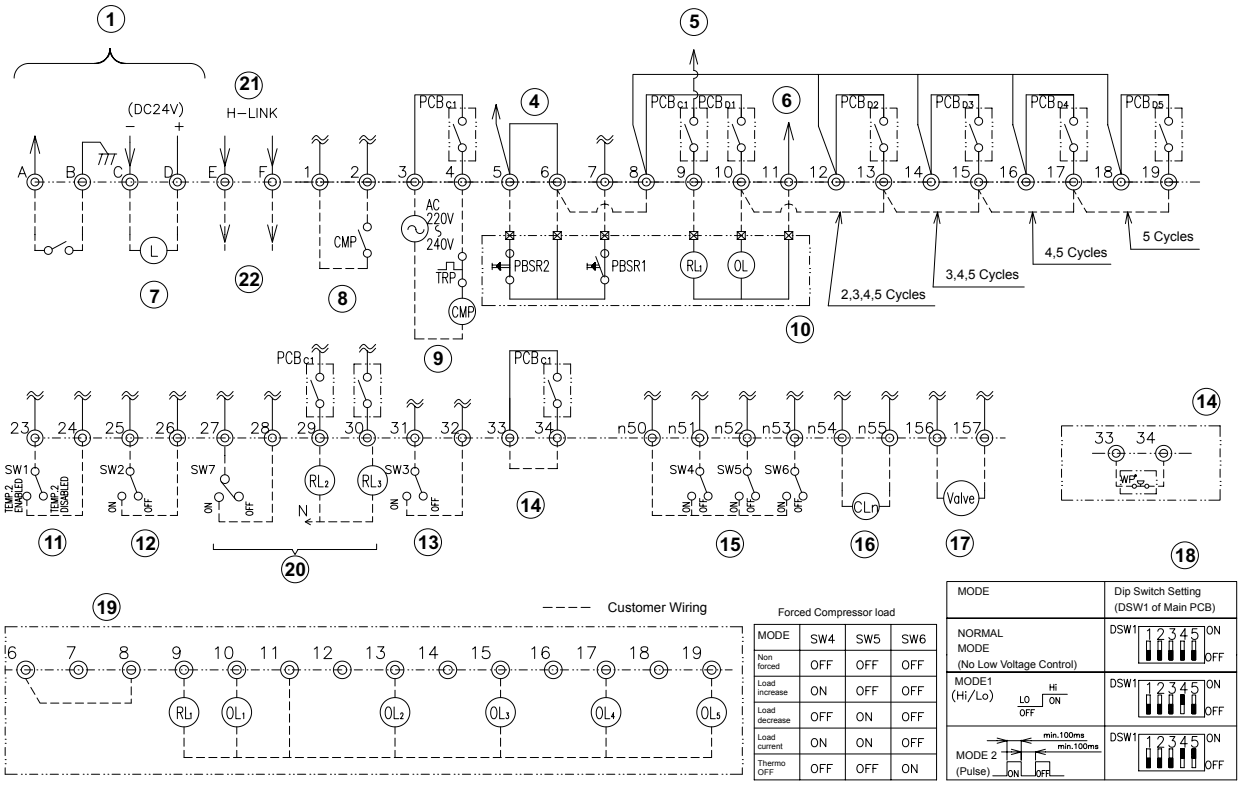
## 14.2.14 RELAYS PRINTED CIRCUIT BOARD (1, 2, 3 cycles units)



## 14.2.15 RELAYS PRINTED CIRCUIT BOARD (4, 5 cycles units)



## 14.2.16 CUSTOMER WIRING




Forced Compressor load

| MODE | SW4 | SW5 | SW6 |
|---|---|---|---|
| Non forced | OFF | OFF | OFF |
| Load increase | ON | OFF | OFF |
| Load decrease | OFF | ON | OFF |
| Load current | ON | ON | OFF |
| Thermo OFF | OFF | OFF | ON |

| MODE | Dip Switch Setting (DSW1 of Main PCB) |
|---|---|
| NORMAL MODE (No Low Voltage Control) | DSW1 1 2 3 4 5 ON OFF |
| MODE1 (Hi/Lo) LO OFF Hi ON | DSW1 1 2 3 4 5 ON OFF |
| MODE 2 (Pulse) min.100ms min.100ms ON OFF | DSW1 1 2 3 4 5 ON OFF |

| Nr. | Name |
|---|---|
| 1 | Low voltage / Remote Control |
| 2 | Run / Stop Signal |
| 3 | Alarm Signal (DC24V) |
| 4 | In case of Remote Control operation this wire shall be removed |
| 5 | 1~ 230V |
| 6 | Neutral |
| 7 | Alarm Lamp |
| 8 | Pump Interlock |
| 9 | Pump Operation |
| 10 | Remote Control Switch |
| 11 | 2nd Setting Temperature |
| 12 | External Thermostat Operation |
| 13 | External Fan Operation |
| 14 | Only used for different water pressure switch or flow switch options |
| 15 | Force Compressor load operation |
| 16 | Caution lamp for fan operation |
| 17 | Free cooling output signal |
| 18 | Setting of low voltage control |
| 19 | In case of individual indication without Remote Control Switch. |
| 20 | Operation mode switch/lamp (only for heat pumps models) |
| 21 | H-LINK |
| 22 | Connection for control devices (CSC-5S,...) |

## 14.2.17 PARTS LIST

(n=1~N)

| Mark | Name | Remark | Mark | Name | Remark |
|---|---|---|---|---|---|
| $MC_n$ | Compressor Motor | | $FF_{11\sim N4}$ | Fan fuse protection | 12A |
| $MF_{11-N6}$ | Condenser Fan Motor | | $MFF_n$ | Fan motor inside Electrical Box | |
| MI | Main Isolator | | $CA_{11\sim N6}$ | Capacitors for Fan | |
| $CMC_1$ | Contactor for Compressor Motor | | $EF_{1\sim3,\ R,S,T}$ | Fuse | 6A |
| $CMC_{sn}$ | Contactor for Compressor Motor (Star Operation) | | $SV_{11-N1}$ | Solenoid Valve for Starting | |
| $CMC_{Dn}$ | Contactor for Compressor Motor (Delta Operation) | | $SV_{12-N2}$ | Solenoid Valve for Load-down | |
| $CMF_{11-N2}$ | Contactor for Condenser Fan Motor | | $SV_{13-N3}$ | Solenoid Valve for Load-up | |
| $EFC_n$ | Fuse for Compressor Motor | or optional Circuit Breaker | $TM_n$ | Hour Meter | |
| $ORC_n$ | Overcurrent Relay for Compressor Motor | | $PCB_A$ | Printed Circuit Board for Display | |
| $EFF_{11-N4}$ | Fuse for Condenser Fan Motor | or optional Circuit Breaker | $PCB_{B1,B2}$ | Printed Circuit Board for Operation | |
| $ITC_{1-n}$ | Internal Thermostat for Compressor | | $PCB_{C1,C2}$ | Printed Circuit Board for CPU | |
| $ITF_{n5,n6}$ | Internal Thermostat for Fan Motor | | $PCB_{D1}$ | Printed Circuit Board for Relay | |
| $CH_n$ | Crankcase Heater | | $PCB_{E11\sim}$ | Printed Circuit Board for Fan Control | |
| $AR_{n,H,R}$ | Auxiliary Relay | | $PCB_{F1,F2}$ | PCB for Electronic Expansion Valve | |
| $PSH_n$ | High Pressure Switch | OFF: 2.74Mpa ON: Manual Reset | $PCB_{G1,G2,G3}$ | PCB for DC Fan control | |
| $Pd_n$ | High Pressure Sensor | | WP | Water Pressure Switch, Water Flow Switch | OPTION |
| $Ps_n$ | Low Pressure Sensor | | SVEn | Solenoid Valve for Economizer | |
| $THM_i$ | Inlet Water Temperature Thermistor | | PSWn | Pressure Switch for Economizer | |
| $THM_{W01n}$ | Outlet Water Temperature Thermistor | | $EH_n$ | Cooler Heater | |
| $THMr2_n$ | Cooler Inlet Refrigerant Thermistor | | $TF_{1,2,3,4,5,6,7}$ | Transformers | |
| $THM_n$ | Suction Gas Temperature Thermistor | | | | |
| $THMI_{won2}$ | Water Temperature cooler backside | | | | |
| $THMd_n$ | Discharge Gas Thermistor | | $SW_{2\sim8}$ | External Switch | Field Supplied |
| $PFC_n$ | Fuse holder for Compressor Motor | Or optional Circuit Breaker | CL | Pilot Lamp for caution signal (from Fans) | |
| $PFF_n$ | Fuse holder for Compressor Fan Motor | Or optional Circuit Breaker | $PBSR_1$ | Push Button Switch for Starting (REMOTE) | |
| $THM_a$ | Ambient Temperature Thermistor | | $PBSR_2$ | Push Button Switch for Stoppage (REMOTE) | |
| $NF_n$ | Noise Filter (PCB) | | $RL_n$ | Pilot Lamp for Remote Indication (Unit Operation) | |
| $NF_{A,B,11\sim9N}$ | Noise Filter (PCB) | | $OL_n$ | Pilot Lamp for Remote Indication (Alarm) | |
| $MV_n$ | Electronic Expansion Valve (Exp.v) | | CMP | Contactor for Pump | |
| $CT_{1,2}$ | Current sensor | | TRP | Thermal Relay for Pump | |

n:1~n

| Model | N |
|---|---|
| R(C/H)U2E40, 50, 60, 70, 80AG2 | 1 |
| R(C/H)U2E100, 120,140, 160AG2 | 2 |
| R(C/H)U2E180, 210, 240AG2 | 3 |
| RCU2E280, 320AG2 | 4 |
| RCU2E350,400AG2 | 5 |

# 15. Model Selection

## Contents

## 15.1. Selection Example

1. Determine the system requirements

| | |
|---|---|
| Condenser Air Inlet Temperature: | 40 °C |
| Chilled Water Inlet Temperature: | 12 °C |
| Chilled Water Outlet Temperature: | 7 °C |
| Cooling Load: | 320 kW |
| Refrigerant: | R407C |

2. Select Model and read the performance

From the performance table, model RCU2E140AG2 can be selected with the following performance:

| | |
|---|---|
| Cooling Capacity: | 333.3 kW |
| Chilled Water Flow Rate: | 57.3 m³/h |
| Water Cooler Pressure Drop: | 30.2 kPa |
| Compressor Input Power: | 122.8 kW |

3. Correct the Data

- Flow rate
  When the water Inlet/Outlet temperature difference is not 5°C, correct the flow rate by the following formula:

$$\text{Corrected Flow Rate} = \frac{5(°C) \times \text{Tabulated Flow Rate (CFR)}}{\text{Given Temp. Difference}(°C)}$$

  The corrected Flow Rate must be confirmed to be within the working range.

- Cooling capacity and compressor input.
  When the fouling factor is taken into consideration, the cooling capacity and the compressor input will be different from the value indicated in the cooling capacity table.

$$\text{Corrected Capacity} = Kfc \times CAP$$

$$\text{Corrected Input} = Kfi \times IPT$$

| | |
|---|---|
| CCAP: | Tabulated Cooling Capacity |
| IPT: | Tabulated Compressor Input |
| Kfc: | Capacity Correction Factor |
| Kfi: | Compressor Input Correction Factor |

| | Fouling Factor m²h °C/kcal (m² °C/kW) | Kfc | Kfi |
|---|---|---|---|
| Water Heat Exchanger | 0 | 1.00 | 1.00 |
| | 0.00005 (0.043) | 1.00 | 1.00 |
| | 0.0001(0.086) | 0.99 | 1.01 |

4. Water Pressure Drop

- Water pressure drop is given by the following formula

$$PD = \alpha \times Q^{\beta}$$

| | |
|---|---|
| PD: | Pressure Drop (kPa) |
| Q: | Water Flow (m³/h) |
| α, β | Parameters (table below) |

| | Model: RCU2E-AG2 | α | β |
|---|---|---|---|
| Water heat exchanger | 40 | 0.0614 | 1.9381 |
| | 50 | 0.0547 | 1.9434 |
| | 60,70,80 | 0.0418 | 1.9616 |
| | 100 | 0.0142 | 1.9434 |
| | 120,140,160 | 0.0107 | 1.9616 |
| | 180,210,240 | 0.0048 | 1.9616 |
| | 280,320 | 0.0028 | 1.9616 |
| | 350,400 | 0.0018 | 1.9616 |

| | Model: RHU2E-AG2 | α | β |
|---|---|---|---|
| Water heat exchanger | 40 | 0.0614 | 1.9381 |
| | 50 | 0.0547 | 1.9434 |
| | 60 | 0.0418 | 1.9616 |
| | 70,80 | 0.0357 | 1.9771 |
| | 100 | 0.0142 | 1.9434 |
| | 120 | 0.0107 | 1.9616 |
| | 140,160 | 0.0091 | 1.9771 |
| | 180 | 0.0048 | 1.9616 |
| | 210,240 | 0.0041 | 1.9771 |

## 15.2. Performance Table (RCU2E-AG2)

| | | RCU2E40AG2 | | | | RCU2E50AG2 | | | | RCU2E60AG2 | | | | RCU2E70AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABT | COT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT |
| | 5 | 115.4 | 19.8 | 20.1 | 30.0 | 133.9 | 23.0 | 24.3 | 34.3 | 160.7 | 27.6 | 28.1 | 41.1 | 183.4 | 31.5 | 36.4 | 46.3 |
| | 6 | 119.2 | 20.5 | 21.4 | 30.3 | 138.4 | 23.8 | 25.9 | 34.7 | 166.1 | 28.6 | 30.0 | 41.6 | 189.5 | 32.6 | 38.9 | 46.9 |
| | 7 | 123.1 | 21.2 | 22.8 | 30.7 | 142.9 | 24.6 | 27.6 | 35.1 | 171.5 | 29.5 | 31.9 | 42.1 | 195.6 | 33.6 | 41.4 | 47.4 |
| | 8 | 126.9 | 21.8 | 24.2 | 31.0 | 147.4 | 25.3 | 29.3 | 35.5 | 176.8 | 30.4 | 33.9 | 42.6 | 201.8 | 34.7 | 43.9 | 48.0 |
| | 9 | 130.8 | 22.5 | 25.6 | 31.4 | 151.8 | 26.1 | 31.0 | 35.9 | 182.2 | 31.3 | 36.0 | 43.1 | 207.9 | 35.8 | 46.6 | 48.5 |
| 25 | 10 | 134.6 | 23.2 | 27.1 | 31.7 | 156.3 | 26.9 | 32.8 | 36.3 | 187.5 | 32.3 | 38.1 | 43.6 | 214.0 | 36.8 | 49.3 | 49.1 |
| | 11 | 138.5 | 23.8 | 28.6 | 32.1 | 160.8 | 27.7 | 34.7 | 36.7 | 192.9 | 33.2 | 40.2 | 44.0 | 220.1 | 37.9 | 52.1 | 49.6 |
| | 12 | 142.4 | 24.5 | 30.2 | 32.4 | 165.2 | 28.4 | 36.6 | 37.1 | 198.3 | 34.1 | 42.5 | 44.5 | 226.2 | 38.9 | 55.0 | 50.2 |
| | 13 | 146.2 | 25.1 | 31.8 | 32.8 | 169.7 | 29.2 | 38.5 | 37.5 | 203.6 | 35.0 | 44.7 | 45.0 | 232.4 | 40.0 | 57.9 | 50.7 |
| | 14 | 150.1 | 25.8 | 33.4 | 33.1 | 174.2 | 30.0 | 40.5 | 37.9 | 209.0 | 35.9 | 47.1 | 45.5 | 238.5 | 41.0 | 61.0 | 51.3 |
| | 15 | 153.9 | 26.5 | 35.1 | 33.5 | 178.6 | 30.7 | 42.5 | 38.3 | 214.4 | 36.9 | 49.5 | 46.0 | 244.6 | 42.1 | 64.1 | 51.8 |
| | 5 | 111.5 | 19.2 | 18.8 | 32.8 | 129.4 | 22.3 | 22.7 | 37.5 | 155.3 | 26.7 | 26.3 | 45.0 | 177.2 | 30.5 | 34.1 | 50.7 |
| | 6 | 115.3 | 19.8 | 20.1 | 33.2 | 133.8 | 23.0 | 24.3 | 37.9 | 160.6 | 27.6 | 28.1 | 45.5 | 183.3 | 31.5 | 36.4 | 51.3 |
| | 7 | 119.1 | 20.5 | 21.4 | 33.5 | 138.3 | 23.8 | 25.9 | 38.3 | 165.9 | 28.5 | 29.9 | 46.0 | 189.3 | 32.6 | 38.8 | 51.9 |
| | 8 | 122.9 | 21.1 | 22.7 | 33.9 | 142.7 | 24.5 | 27.5 | 38.8 | 171.2 | 29.5 | 31.8 | 46.5 | 195.4 | 33.6 | 41.3 | 52.4 |
| | 9 | 126.8 | 21.8 | 24.1 | 34.3 | 147.1 | 25.3 | 29.2 | 39.2 | 176.6 | 30.4 | 33.8 | 47.0 | 201.5 | 34.7 | 43.8 | 53.0 |
| 30 | 10 | 130.6 | 22.5 | 25.5 | 34.6 | 151.6 | 26.1 | 30.9 | 39.6 | 181.9 | 31.3 | 35.8 | 47.5 | 207.5 | 35.7 | 46.4 | 53.5 |
| | 11 | 134.4 | 23.1 | 27.0 | 35.0 | 156.0 | 26.8 | 32.7 | 40.0 | 187.2 | 32.2 | 37.9 | 48.0 | 213.6 | 36.7 | 49.1 | 54.1 |
| | 12 | 138.2 | 23.8 | 28.5 | 35.3 | 160.4 | 27.6 | 34.5 | 40.4 | 192.5 | 33.1 | 40.1 | 48.5 | 219.7 | 37.8 | 51.9 | 54.7 |
| | 13 | 142.0 | 24.4 | 30.1 | 35.7 | 164.9 | 28.4 | 36.4 | 40.8 | 197.8 | 34.0 | 42.3 | 49.0 | 225.7 | 38.8 | 54.8 | 55.2 |
| | 14 | 145.8 | 25.1 | 31.7 | 36.1 | 169.3 | 29.1 | 38.3 | 41.3 | 203.1 | 34.9 | 44.5 | 49.5 | 231.8 | 39.9 | 57.7 | 55.8 |
| | 15 | 149.7 | 25.7 | 33.3 | 36.4 | 173.7 | 29.9 | 40.3 | 41.7 | 208.5 | 35.9 | 46.8 | 50.0 | 237.9 | 40.9 | 60.7 | 56.4 |
| | 5 | 104.6 | 18.0 | 16.6 | 35.4 | 121.4 | 20.9 | 20.1 | 40.5 | 145.7 | 25.1 | 23.2 | 48.7 | 166.3 | 28.6 | 30.1 | 54.8 |
| | 6 | 108.3 | 18.6 | 17.8 | 35.8 | 125.7 | 21.6 | 21.5 | 41.0 | 150.9 | 25.9 | 24.8 | 49.2 | 172.1 | 29.6 | 32.2 | 55.4 |
| | 7 | 112.0 | 19.3 | 19.0 | 36.2 | 130.0 | 22.4 | 22.9 | 41.4 | 156.0 | 26.8 | 26.5 | 49.7 | 178.0 | 30.6 | 34.4 | 56.0 |
| | 8 | 115.7 | 19.9 | 20.2 | 36.6 | 134.3 | 23.1 | 24.4 | 41.8 | 161.1 | 27.7 | 28.3 | 50.2 | 183.9 | 31.6 | 36.6 | 56.6 |
| | 9 | 119.4 | 20.5 | 21.5 | 37.0 | 138.6 | 23.8 | 26.0 | 42.3 | 166.3 | 28.6 | 30.1 | 50.7 | 189.7 | 32.6 | 38.9 | 57.2 |
| 35 | 10 | 123.1 | 21.2 | 22.8 | 37.3 | 142.8 | 24.6 | 27.5 | 42.7 | 171.4 | 29.5 | 31.9 | 51.2 | 195.6 | 33.6 | 41.3 | 57.7 |
| | 11 | 126.7 | 21.8 | 24.1 | 37.7 | 147.1 | 25.3 | 29.2 | 43.1 | 176.5 | 30.4 | 33.8 | 51.8 | 201.4 | 34.6 | 43.8 | 58.3 |
| | 12 | 130.4 | 22.4 | 25.5 | 38.1 | 151.4 | 26.0 | 30.8 | 43.6 | 181.7 | 31.2 | 35.8 | 52.3 | 207.3 | 35.7 | 46.3 | 58.9 |
| | 13 | 134.1 | 23.1 | 26.9 | 38.5 | 155.7 | 26.8 | 32.6 | 44.0 | 186.8 | 32.1 | 37.8 | 52.8 | 213.1 | 36.7 | 48.9 | 59.5 |
| | 14 | 137.8 | 23.7 | 28.4 | 38.8 | 159.9 | 27.5 | 34.3 | 44.4 | 191.9 | 33.0 | 39.8 | 53.3 | 219.0 | 37.7 | 51.6 | 60.1 |
| | 15 | 141.5 | 24.3 | 29.8 | 39.2 | 164.2 | 28.2 | 36.1 | 44.8 | 197.1 | 33.9 | 41.9 | 53.8 | 224.9 | 38.7 | 54.3 | 60.7 |
| | 5 | 97.8 | 16.8 | 14.6 | 38.9 | 113.5 | 19.5 | 17.6 | 44.5 | 136.2 | 23.4 | 20.3 | 53.4 | 155.4 | 26.7 | 26.3 | 60.2 |
| | 6 | 101.3 | 17.4 | 15.6 | 39.3 | 117.6 | 20.2 | 18.9 | 44.9 | 141.1 | 24.3 | 21.8 | 54.0 | 161.0 | 27.7 | 28.2 | 60.8 |
| | 7 | 104.9 | 18.0 | 16.7 | 39.7 | 121.7 | 20.9 | 20.2 | 45.4 | 146.1 | 25.1 | 23.3 | 54.5 | 166.7 | 28.7 | 30.2 | 61.4 |
| | 8 | 108.4 | 18.6 | 17.8 | 40.1 | 125.9 | 21.6 | 21.5 | 45.9 | 151.0 | 26.0 | 24.9 | 55.0 | 172.3 | 29.6 | 32.2 | 62.0 |
| | 9 | 112.0 | 19.3 | 19.0 | 40.5 | 130.0 | 22.4 | 22.9 | 46.3 | 156.0 | 26.8 | 26.5 | 55.6 | 178.0 | 30.6 | 34.3 | 62.6 |
| 40 | 10 | 115.5 | 19.9 | 20.2 | 40.9 | 134.1 | 23.1 | 24.4 | 46.8 | 160.9 | 27.7 | 28.2 | 56.1 | 183.6 | 31.6 | 36.5 | 63.2 |
| | 11 | 119.1 | 20.5 | 21.4 | 41.3 | 138.2 | 23.8 | 25.8 | 47.2 | 165.9 | 28.5 | 29.9 | 56.7 | 189.3 | 32.6 | 38.8 | 63.9 |
| | 12 | 122.6 | 21.1 | 22.6 | 41.7 | 142.4 | 24.5 | 27.4 | 47.7 | 170.8 | 29.4 | 31.7 | 57.2 | 194.9 | 33.5 | 41.1 | 64.5 |
| | 13 | 126.2 | 21.7 | 23.9 | 42.1 | 146.5 | 25.2 | 28.9 | 48.1 | 175.8 | 30.2 | 33.5 | 57.8 | 200.6 | 34.5 | 43.4 | 65.1 |
| | 14 | 129.7 | 22.3 | 25.2 | 42.5 | 150.6 | 25.9 | 30.5 | 48.6 | 180.7 | 31.1 | 35.4 | 58.3 | 206.2 | 35.5 | 45.8 | 65.7 |
| | 15 | 133.3 | 22.9 | 26.6 | 42.9 | 154.7 | 26.6 | 32.2 | 49.0 | 185.7 | 31.9 | 37.3 | 58.8 | 211.9 | 36.4 | 48.3 | 66.3 |
| | 5 | 93.6 | 16.1 | 13.4 | 41.0 | 108.7 | 18.7 | 16.2 | 46.9 | 130.4 | 22.4 | 18.7 | 56.3 | 148.8 | 25.6 | 24.2 | 63.4 |
| | 6 | 97.1 | 16.7 | 14.4 | 41.4 | 112.7 | 19.4 | 17.4 | 47.3 | 135.3 | 23.3 | 20.1 | 56.8 | 154.4 | 26.5 | 26.0 | 64.0 |
| | 7 | 100.6 | 17.3 | 15.4 | 41.8 | 116.8 | 20.1 | 18.6 | 47.8 | 140.1 | 24.1 | 21.5 | 57.4 | 159.9 | 27.5 | 27.8 | 64.7 |
| | 8 | 104.1 | 17.9 | 16.5 | 42.2 | 120.8 | 20.8 | 19.9 | 48.3 | 145.0 | 24.9 | 23.0 | 57.9 | 165.4 | 28.4 | 29.7 | 65.3 |
| | 9 | 107.5 | 18.5 | 17.5 | 42.6 | 124.8 | 21.5 | 21.2 | 48.7 | 149.8 | 25.8 | 24.5 | 58.5 | 170.9 | 29.4 | 31.7 | 65.9 |
| 43 | 10 | 111.0 | 19.1 | 18.7 | 43.0 | 128.9 | 22.2 | 22.5 | 49.2 | 154.6 | 26.6 | 26.1 | 59.1 | 176.4 | 30.3 | 33.8 | 66.5 |
| | 11 | 114.5 | 19.7 | 19.8 | 43.4 | 132.9 | 22.9 | 23.9 | 49.7 | 159.5 | 27.4 | 27.7 | 59.6 | 182.0 | 31.3 | 35.9 | 67.2 |
| | 12 | 118.0 | 20.3 | 21.0 | 43.8 | 136.9 | 23.6 | 25.4 | 50.1 | 164.3 | 28.3 | 29.4 | 60.2 | 187.5 | 32.2 | 38.0 | 67.8 |
| | 13 | 121.4 | 20.9 | 22.2 | 44.2 | 141.0 | 24.2 | 26.8 | 50.6 | 169.2 | 29.1 | 31.1 | 60.7 | 193.0 | 33.2 | 40.3 | 68.4 |
| | 14 | 124.9 | 21.5 | 23.4 | 44.6 | 145.0 | 24.9 | 28.4 | 51.1 | 174.0 | 29.9 | 32.9 | 61.3 | 198.5 | 34.1 | 42.6 | 69.1 |
| | 15 | 128.4 | 22.1 | 24.7 | 45.1 | 149.0 | 25.6 | 29.9 | 51.5 | 178.8 | 30.8 | 34.7 | 61.9 | 204.0 | 35.1 | 44.9 | 69.7 |
| | 5 | 89.5 | 15.4 | 12.3 | 43.1 | 103.9 | 17.9 | 14.8 | 49.2 | 124.7 | 21.4 | 17.1 | 59.1 | 142.3 | 24.5 | 22.1 | 66.6 |
| | 6 | 92.9 | 16.0 | 13.2 | 43.5 | 107.9 | 18.6 | 16.0 | 49.7 | 129.4 | 22.3 | 18.4 | 59.7 | 147.7 | 25.4 | 23.8 | 67.3 |
| 46 | 7 | 96.3 | 16.6 | 14.2 | 43.9 | 111.8 | 19.2 | 17.1 | 50.2 | 134.2 | 23.1 | 19.7 | 60.3 | 153.1 | 26.3 | 25.6 | 67.9 |
| | 8 | 99.7 | 17.2 | 15.1 | 44.3 | 115.7 | 19.9 | 18.3 | 50.7 | 138.9 | 23.9 | 21.1 | 60.8 | 158.5 | 27.3 | 27.4 | 68.6 |
| | 9 | 103.1 | 17.7 | 16.2 | 44.7 | 119.7 | 20.6 | 19.5 | 51.2 | 143.6 | 24.7 | 22.6 | 61.4 | 163.9 | 28.2 | 29.2 | 69.2 |
| | 10 | 106.5 | 18.3 | 17.2 | 45.2 | 123.6 | 21.3 | 20.8 | 51.6 | 148.3 | 25.5 | 24.0 | 62.0 | 169.3 | 29.1 | 31.1 | 69.8 |

Where,
**ABT:** Condenser Air Inlet Temperature (°C)
**COT:** Chilled Water Outlet Temperature (°C)
**CCAP:** Cooling Capacity (kW)
**CFR**: Chilled Water Flow Rate at 5°C ($m^3/h$)
**CPD:** Water Cooler Pressure Drop (kPa)
**IPT:** Compressor Input Power (kW)*

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

* Fan input power (kW) is included in the Electrical Data chapter

## Performance Table (cont.)

| ABT | COT | RCU2E80AG2 | | | | RCU2E100AG2 | | | | RCU2E120AG2 | | | | RCU2E140AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT |
| 25 | 5 | 212.2 | 36.5 | 48.5 | 53.8 | 267.9 | 46.1 | 24.3 | 68.5 | 321.5 | 55.3 | 28.1 | 82.3 | 366.8 | 63.1 | 36.4 | 92.7 |
| | 6 | 219.3 | 37.7 | 51.7 | 54.4 | 276.8 | 47.6 | 25.9 | 69.3 | 332.2 | 57.1 | 30.0 | 83.2 | 379.0 | 65.2 | 38.9 | 93.8 |
| | 7 | 226.4 | 38.9 | 55.1 | 55.1 | 285.8 | 49.2 | 27.6 | 70.1 | 342.9 | 59.0 | 31.9 | 84.2 | 391.3 | 67.3 | 41.4 | 94.9 |
| | 8 | 233.5 | 40.2 | 58.5 | 55.7 | 294.7 | 50.7 | 29.3 | 71.0 | 353.6 | 60.8 | 33.9 | 85.2 | 403.5 | 69.4 | 43.9 | 96.0 |
| | 9 | 240.6 | 41.4 | 62.0 | 56.3 | 303.6 | 52.2 | 31.0 | 71.8 | 364.4 | 62.7 | 36.0 | 86.1 | 415.8 | 71.5 | 46.6 | 97.1 |
| | 10 | 247.7 | 42.6 | 65.7 | 57.0 | 312.6 | 53.8 | 32.8 | 72.6 | 375.1 | 64.5 | 38.1 | 87.1 | 428.0 | 73.6 | 49.3 | 98.2 |
| | 11 | 254.7 | 43.8 | 69.4 | 57.6 | 321.5 | 55.3 | 34.7 | 73.4 | 385.8 | 66.4 | 40.2 | 88.1 | 440.2 | 75.7 | 52.1 | 99.2 |
| | 12 | 261.8 | 45.0 | 73.2 | 58.2 | 330.5 | 56.8 | 36.6 | 74.2 | 396.6 | 68.2 | 42.5 | 89.1 | 452.5 | 77.8 | 55.0 | 100.3 |
| | 13 | 268.9 | 46.3 | 77.2 | 58.9 | 339.4 | 58.4 | 38.5 | 75.0 | 407.3 | 70.1 | 44.7 | 90.0 | 464.7 | 79.9 | 57.9 | 101.4 |
| | 14 | 276.0 | 47.5 | 81.2 | 59.5 | 348.3 | 59.9 | 40.5 | 75.8 | 418.0 | 71.9 | 47.1 | 91.0 | 477.0 | 82.0 | 61.0 | 102.5 |
| | 15 | 283.1 | 48.7 | 85.4 | 60.1 | 357.3 | 61.5 | 42.5 | 76.6 | 428.7 | 73.7 | 49.5 | 92.0 | 489.2 | 84.1 | 64.1 | 103.6 |
| 30 | 5 | 205.1 | 35.3 | 45.4 | 58.9 | 258.8 | 44.5 | 22.7 | 75.0 | 310.6 | 53.4 | 26.3 | 90.0 | 354.4 | 61.0 | 34.1 | 101.5 |
| | 6 | 212.1 | 36.5 | 48.4 | 59.5 | 267.7 | 46.0 | 24.3 | 75.8 | 321.2 | 55.2 | 28.1 | 91.0 | 366.5 | 63.0 | 36.4 | 102.6 |
| | 7 | 219.1 | 37.7 | 51.6 | 60.2 | 276.5 | 47.6 | 25.9 | 76.7 | 331.9 | 57.1 | 29.9 | 92.0 | 378.7 | 65.1 | 38.8 | 103.7 |
| | 8 | 226.1 | 38.9 | 54.9 | 60.8 | 285.4 | 49.1 | 27.5 | 77.5 | 342.5 | 58.9 | 31.8 | 93.0 | 390.8 | 67.2 | 41.3 | 104.8 |
| | 9 | 233.2 | 40.1 | 58.3 | 61.5 | 294.3 | 50.6 | 29.2 | 78.3 | 353.1 | 60.7 | 33.8 | 94.0 | 402.9 | 69.3 | 43.8 | 106.0 |
| | 10 | 240.2 | 41.3 | 61.8 | 62.2 | 303.1 | 52.1 | 30.9 | 79.2 | 363.8 | 62.6 | 35.8 | 95.1 | 415.1 | 71.4 | 46.4 | 107.1 |
| | 11 | 247.2 | 42.5 | 65.4 | 62.8 | 312.0 | 53.7 | 32.7 | 80.0 | 374.4 | 64.4 | 37.9 | 96.1 | 427.2 | 73.5 | 49.1 | 108.2 |
| | 12 | 254.2 | 43.7 | 69.1 | 63.5 | 320.9 | 55.2 | 34.5 | 80.8 | 385.0 | 66.2 | 40.1 | 97.1 | 439.3 | 75.6 | 51.9 | 109.4 |
| | 13 | 261.2 | 44.9 | 72.9 | 64.1 | 329.7 | 56.7 | 36.4 | 81.7 | 395.7 | 68.1 | 42.3 | 98.1 | 451.5 | 77.7 | 54.8 | 110.5 |
| | 14 | 268.3 | 46.1 | 76.8 | 64.8 | 338.6 | 58.2 | 38.3 | 82.5 | 406.3 | 69.9 | 44.5 | 99.1 | 463.6 | 79.7 | 57.7 | 111.6 |
| | 15 | 275.3 | 47.3 | 80.8 | 65.4 | 347.4 | 59.8 | 40.3 | 83.4 | 416.9 | 71.7 | 46.8 | 100.1 | 475.7 | 81.8 | 60.7 | 112.7 |
| 35 | 5 | 192.4 | 33.1 | 40.0 | 63.6 | 242.9 | 41.8 | 20.1 | 81.1 | 291.5 | 50.1 | 23.2 | 97.3 | 332.6 | 57.2 | 30.1 | 109.7 |
| | 6 | 199.2 | 34.3 | 42.9 | 64.3 | 251.4 | 43.2 | 21.5 | 81.9 | 301.7 | 51.9 | 24.8 | 98.4 | 344.3 | 59.2 | 32.2 | 110.8 |
| | 7 | 206.0 | 35.4 | 45.8 | 65.0 | 260.0 | 44.7 | 22.9 | 82.8 | 312.0 | 53.7 | 26.5 | 99.4 | 356.0 | 61.2 | 34.4 | 112.0 |
| | 8 | 212.8 | 36.6 | 48.8 | 65.7 | 268.6 | 46.2 | 24.4 | 83.7 | 322.3 | 55.4 | 28.3 | 100.4 | 367.7 | 63.2 | 36.6 | 113.2 |
| | 9 | 219.6 | 37.8 | 51.9 | 66.4 | 277.1 | 47.7 | 26.0 | 84.5 | 332.5 | 57.2 | 30.1 | 101.5 | 379.4 | 65.3 | 38.9 | 114.3 |
| | 10 | 226.3 | 38.9 | 55.0 | 67.0 | 285.7 | 49.1 | 27.5 | 85.4 | 342.8 | 59.0 | 31.9 | 102.5 | 391.1 | 67.3 | 41.3 | 115.5 |
| | 11 | 233.1 | 40.1 | 58.3 | 67.7 | 294.2 | 50.6 | 29.2 | 86.2 | 353.1 | 60.7 | 33.8 | 103.5 | 402.9 | 69.3 | 43.8 | 116.7 |
| | 12 | 239.9 | 41.3 | 61.7 | 68.4 | 302.8 | 52.1 | 30.8 | 87.1 | 363.3 | 62.5 | 35.8 | 104.6 | 414.6 | 71.3 | 46.3 | 117.8 |
| | 13 | 246.7 | 42.4 | 65.2 | 69.1 | 311.3 | 53.5 | 32.6 | 88.0 | 373.6 | 64.3 | 37.8 | 105.6 | 426.3 | 73.3 | 48.9 | 119.0 |
| | 14 | 253.4 | 43.6 | 68.7 | 69.7 | 319.9 | 55.0 | 34.3 | 88.8 | 383.9 | 66.0 | 39.8 | 106.6 | 438.0 | 75.3 | 51.6 | 120.1 |
| | 15 | 260.2 | 44.8 | 72.4 | 70.4 | 328.4 | 56.5 | 36.1 | 89.7 | 394.1 | 67.8 | 41.9 | 107.7 | 449.7 | 77.4 | 54.3 | 121.3 |
| 40 | 5 | 179.8 | 30.9 | 35.0 | 69.9 | 227.0 | 39.0 | 17.6 | 89.0 | 272.3 | 46.8 | 20.3 | 106.8 | 310.8 | 53.5 | 26.3 | 120.4 |
| | 6 | 186.4 | 32.1 | 37.6 | 70.6 | 235.2 | 40.5 | 18.9 | 89.9 | 282.2 | 48.5 | 21.8 | 107.9 | 322.1 | 55.4 | 28.2 | 121.6 |
| | 7 | 192.9 | 33.2 | 40.2 | 71.3 | 243.5 | 41.9 | 20.2 | 90.8 | 292.1 | 50.2 | 23.3 | 109.0 | 333.3 | 57.3 | 30.2 | 122.8 |
| | 8 | 199.4 | 34.3 | 42.9 | 72.0 | 251.7 | 43.3 | 21.5 | 91.7 | 302.0 | 52.0 | 24.9 | 110.1 | 344.6 | 59.3 | 32.2 | 124.0 |
| | 9 | 206.0 | 35.4 | 45.7 | 72.7 | 260.0 | 44.7 | 22.9 | 92.6 | 311.9 | 53.7 | 26.5 | 111.2 | 355.9 | 61.2 | 34.3 | 125.3 |
| | 10 | 212.5 | 36.5 | 48.6 | 73.4 | 268.2 | 46.1 | 24.4 | 93.5 | 321.8 | 55.4 | 28.2 | 112.3 | 367.2 | 63.2 | 36.5 | 126.5 |
| | 11 | 219.0 | 37.7 | 51.6 | 74.1 | 276.5 | 47.5 | 25.8 | 94.4 | 331.7 | 57.1 | 29.9 | 113.4 | 378.5 | 65.1 | 38.8 | 127.7 |
| | 12 | 225.6 | 38.8 | 54.7 | 74.8 | 284.7 | 49.0 | 27.4 | 95.3 | 341.6 | 58.8 | 31.7 | 114.4 | 389.8 | 67.0 | 41.1 | 128.9 |
| | 13 | 232.1 | 39.9 | 57.8 | 75.5 | 292.9 | 50.4 | 28.9 | 96.2 | 351.5 | 60.5 | 33.5 | 115.5 | 401.1 | 69.0 | 43.4 | 130.2 |
| | 14 | 238.6 | 41.0 | 61.1 | 76.3 | 301.2 | 51.8 | 30.5 | 97.1 | 361.4 | 62.2 | 35.4 | 116.6 | 412.4 | 70.9 | 45.8 | 131.4 |
| | 15 | 245.2 | 42.2 | 64.4 | 77.0 | 309.4 | 53.2 | 32.2 | 98.0 | 371.3 | 63.9 | 37.3 | 117.7 | 423.7 | 72.9 | 48.3 | 132.6 |
| 43 | 5 | 172.2 | 29.6 | 32.2 | 73.6 | 217.4 | 37.4 | 16.2 | 93.7 | 260.9 | 44.9 | 18.7 | 112.5 | 297.7 | 51.2 | 24.2 | 126.8 |
| | 6 | 178.6 | 30.7 | 34.6 | 74.3 | 225.5 | 38.8 | 17.4 | 94.7 | 270.6 | 46.5 | 20.1 | 113.6 | 308.7 | 53.1 | 26.0 | 128.0 |
| | 7 | 185.0 | 31.8 | 37.1 | 75.0 | 233.5 | 40.2 | 18.6 | 95.6 | 280.2 | 48.2 | 21.5 | 114.8 | 319.8 | 55.0 | 27.8 | 129.3 |
| | 8 | 191.4 | 32.9 | 39.6 | 75.8 | 241.6 | 41.6 | 19.9 | 96.5 | 289.9 | 49.9 | 23.0 | 115.9 | 330.8 | 56.9 | 29.7 | 130.6 |
| | 9 | 197.8 | 34.0 | 42.3 | 76.5 | 249.7 | 42.9 | 21.2 | 97.5 | 299.6 | 51.5 | 24.5 | 117.0 | 341.8 | 58.8 | 31.7 | 131.8 |
| | 10 | 204.2 | 35.1 | 45.0 | 77.2 | 257.7 | 44.3 | 22.5 | 98.4 | 309.3 | 53.2 | 26.1 | 118.1 | 352.9 | 60.7 | 33.8 | 133.1 |
| | 11 | 210.6 | 36.2 | 47.8 | 78.0 | 265.8 | 45.7 | 23.9 | 99.3 | 318.9 | 54.9 | 27.7 | 119.2 | 363.9 | 62.6 | 35.9 | 134.4 |
| | 12 | 217.0 | 37.3 | 50.7 | 78.7 | 273.9 | 47.1 | 25.4 | 100.3 | 328.6 | 56.5 | 29.4 | 120.4 | 375.0 | 64.5 | 38.0 | 135.6 |
| | 13 | 223.4 | 38.4 | 53.6 | 79.4 | 281.9 | 48.5 | 26.8 | 101.2 | 338.3 | 58.2 | 31.1 | 121.5 | 386.0 | 66.4 | 40.3 | 136.9 |
| | 14 | 229.8 | 39.5 | 56.7 | 80.2 | 290.0 | 49.9 | 28.4 | 102.1 | 348.0 | 59.9 | 32.9 | 122.6 | 397.1 | 68.3 | 42.6 | 138.1 |
| | 15 | 236.1 | 40.6 | 59.8 | 80.9 | 298.0 | 51.3 | 29.9 | 103.1 | 357.7 | 61.5 | 34.7 | 123.7 | 408.1 | 70.2 | 44.9 | 139.4 |
| 46 | 5 | 164.7 | 28.3 | 29.5 | 77.3 | 207.8 | 35.7 | 14.8 | 98.5 | 249.4 | 42.9 | 17.1 | 118.2 | 284.6 | 48.9 | 22.1 | 133.2 |
| | 6 | 170.9 | 29.4 | 31.7 | 78.1 | 215.7 | 37.1 | 16.0 | 99.4 | 258.9 | 44.5 | 18.4 | 119.4 | 295.4 | 50.8 | 23.8 | 134.5 |
| | 7 | 177.2 | 30.5 | 34.0 | 78.8 | 223.6 | 38.5 | 17.1 | 100.4 | 268.3 | 46.2 | 19.7 | 120.5 | 306.2 | 52.7 | 25.6 | 135.8 |
| | 8 | 183.4 | 31.5 | 36.4 | 79.6 | 231.5 | 39.8 | 18.3 | 101.4 | 277.8 | 47.8 | 21.1 | 121.7 | 317.0 | 54.5 | 27.4 | 137.1 |
| | 9 | 189.7 | 32.6 | 38.9 | 80.3 | 239.4 | 41.2 | 19.5 | 102.3 | 287.2 | 49.4 | 22.6 | 122.8 | 327.7 | 56.4 | 29.2 | 138.4 |
| | 10 | 195.9 | 33.7 | 41.5 | 81.1 | 247.2 | 42.5 | 20.8 | 103.3 | 296.7 | 51.0 | 24.0 | 124.0 | 338.5 | 58.2 | 31.1 | 139.7 |

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
CFR: Chilled Water Flow Rate at 5°C ($m^3/h$)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

## Performance Table (cont.)

| | | RCU2E160AG2 | | | | RCU2E180AG2 | | | | RCU2E210AG2 | | | | RCU2E240AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABT | COT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT |
| 25 | 5 | 424.5 | 73.0 | 48.5 | 107.6 | 482.2 | 82.9 | 28.1 | 123.4 | 550.2 | 94.6 | 36.4 | 139.0 | 636.7 | 109.5 | 48.5 | 161.4 |
| | 6 | 438.7 | 75.4 | 51.7 | 108.9 | 498.3 | 85.7 | 30.0 | 124.9 | 568.5 | 97.8 | 38.9 | 140.7 | 658.0 | 113.2 | 51.7 | 163.3 |
| | 7 | 452.8 | 77.9 | 55.1 | 110.1 | 514.4 | 88.5 | 31.9 | 126.3 | 586.9 | 100.9 | 41.4 | 142.3 | 679.2 | 116.8 | 55.1 | 165.2 |
| | 8 | 467.0 | 80.3 | 58.5 | 111.4 | 530.5 | 91.2 | 33.9 | 127.8 | 605.3 | 104.1 | 43.9 | 144.0 | 700.5 | 120.5 | 58.5 | 167.1 |
| | 9 | 481.2 | 82.8 | 62.0 | 112.7 | 546.6 | 94.0 | 36.0 | 129.2 | 623.6 | 107.3 | 46.6 | 145.6 | 721.7 | 124.1 | 62.0 | 169.0 |
| | 10 | 495.3 | 85.2 | 65.7 | 113.9 | 562.6 | 96.8 | 38.1 | 130.7 | 642.0 | 110.4 | 49.3 | 147.2 | 743.0 | 127.8 | 65.7 | 170.9 |
| | 11 | 509.5 | 87.6 | 69.4 | 115.2 | 578.7 | 99.5 | 40.2 | 132.1 | 660.4 | 113.6 | 52.1 | 148.9 | 764.2 | 131.4 | 69.4 | 172.8 |
| | 12 | 523.7 | 90.1 | 73.2 | 116.5 | 594.8 | 102.3 | 42.5 | 133.6 | 678.7 | 116.7 | 55.0 | 150.5 | 785.5 | 135.1 | 73.2 | 174.7 |
| | 13 | 537.8 | 92.5 | 77.2 | 117.7 | 610.9 | 105.1 | 44.7 | 135.0 | 697.1 | 119.9 | 57.9 | 152.2 | 806.7 | 138.8 | 77.2 | 176.6 |
| | 14 | 552.0 | 94.9 | 81.2 | 119.0 | 627.0 | 107.8 | 47.1 | 136.5 | 715.4 | 123.1 | 61.0 | 153.8 | 828.0 | 142.4 | 81.2 | 178.5 |
| | 15 | 566.1 | 97.4 | 85.4 | 120.3 | 643.1 | 110.6 | 49.5 | 137.9 | 733.8 | 126.2 | 64.1 | 155.4 | 849.2 | 146.1 | 85.4 | 180.4 |
| 30 | 5 | 410.1 | 70.5 | 45.4 | 117.8 | 465.9 | 80.1 | 26.3 | 135.1 | 531.6 | 91.4 | 34.1 | 152.2 | 615.2 | 105.8 | 45.4 | 176.6 |
| | 6 | 424.2 | 73.0 | 48.4 | 119.1 | 481.8 | 82.9 | 28.1 | 136.6 | 549.8 | 94.6 | 36.4 | 153.9 | 636.3 | 109.4 | 48.4 | 178.6 |
| | 7 | 438.2 | 75.4 | 51.6 | 120.4 | 497.8 | 85.6 | 29.9 | 138.1 | 568.0 | 97.7 | 38.8 | 155.6 | 657.3 | 113.1 | 51.6 | 180.6 |
| | 8 | 452.3 | 77.8 | 54.9 | 121.7 | 513.7 | 88.4 | 31.8 | 139.6 | 586.2 | 100.8 | 41.3 | 157.3 | 678.4 | 116.7 | 54.9 | 182.5 |
| | 9 | 466.3 | 80.2 | 58.3 | 123.0 | 529.7 | 91.1 | 33.8 | 141.1 | 604.4 | 104.0 | 43.8 | 159.0 | 699.5 | 120.3 | 58.3 | 184.5 |
| | 10 | 480.3 | 82.6 | 61.8 | 124.3 | 545.6 | 93.8 | 35.8 | 142.6 | 622.6 | 107.1 | 46.4 | 160.6 | 720.5 | 123.9 | 61.8 | 186.5 |
| | 11 | 494.4 | 85.0 | 65.4 | 125.6 | 561.6 | 96.6 | 37.9 | 144.1 | 640.8 | 110.2 | 49.1 | 162.3 | 741.6 | 127.6 | 65.4 | 188.4 |
| | 12 | 508.4 | 87.5 | 69.1 | 126.9 | 577.5 | 99.3 | 40.1 | 145.6 | 659.0 | 113.3 | 51.9 | 164.0 | 762.6 | 131.2 | 69.1 | 190.4 |
| | 13 | 522.5 | 89.9 | 72.9 | 128.2 | 593.5 | 102.1 | 42.3 | 147.1 | 677.2 | 116.5 | 54.8 | 165.7 | 783.7 | 134.8 | 72.9 | 192.4 |
| | 14 | 536.5 | 92.3 | 76.8 | 129.6 | 609.4 | 104.8 | 44.5 | 148.6 | 695.4 | 119.6 | 57.7 | 167.4 | 804.8 | 138.4 | 76.8 | 194.3 |
| | 15 | 550.6 | 94.7 | 80.8 | 130.9 | 625.4 | 107.6 | 46.8 | 150.1 | 713.6 | 122.7 | 60.7 | 169.1 | 825.8 | 142.0 | 80.8 | 196.3 |
| 35 | 5 | 384.9 | 66.2 | 40.0 | 127.3 | 437.2 | 75.2 | 23.2 | 146.0 | 498.9 | 85.8 | 30.1 | 164.5 | 577.3 | 99.3 | 40.0 | 190.9 |
| | 6 | 398.4 | 68.5 | 42.9 | 128.6 | 452.6 | 77.8 | 24.8 | 147.6 | 516.4 | 88.8 | 32.2 | 166.3 | 597.7 | 102.8 | 42.9 | 193.0 |
| | 7 | 412.0 | 70.9 | 45.8 | 130.0 | 468.0 | 80.5 | 26.5 | 149.1 | 534.0 | 91.8 | 34.4 | 168.0 | 618.0 | 106.3 | 45.8 | 195.0 |
| | 8 | 425.6 | 73.2 | 48.8 | 131.4 | 483.4 | 83.1 | 28.3 | 150.6 | 551.6 | 94.9 | 36.6 | 169.7 | 638.3 | 109.8 | 48.8 | 197.0 |
| | 9 | 439.1 | 75.5 | 51.9 | 132.7 | 498.8 | 85.8 | 30.1 | 152.2 | 569.1 | 97.9 | 38.9 | 171.5 | 658.7 | 113.3 | 51.9 | 199.1 |
| | 10 | 452.7 | 77.9 | 55.0 | 134.1 | 514.2 | 88.4 | 31.9 | 153.7 | 586.7 | 100.9 | 41.3 | 173.2 | 679.0 | 116.8 | 55.0 | 201.1 |
| | 11 | 466.2 | 80.2 | 58.3 | 135.4 | 529.6 | 91.1 | 33.8 | 155.3 | 604.3 | 103.9 | 43.8 | 175.0 | 699.3 | 120.3 | 58.3 | 203.1 |
| | 12 | 479.8 | 82.5 | 61.7 | 136.8 | 545.0 | 93.7 | 35.8 | 156.8 | 621.9 | 107.0 | 46.3 | 176.7 | 719.7 | 123.8 | 61.7 | 205.1 |
| | 13 | 493.3 | 84.9 | 65.2 | 138.1 | 560.4 | 96.4 | 37.8 | 158.4 | 639.4 | 110.0 | 48.9 | 178.5 | 740.0 | 127.3 | 65.2 | 207.2 |
| | 14 | 506.9 | 87.2 | 68.7 | 139.5 | 575.8 | 99.0 | 39.8 | 159.9 | 657.0 | 113.0 | 51.6 | 180.2 | 760.3 | 130.8 | 68.7 | 209.2 |
| | 15 | 520.5 | 89.5 | 72.4 | 140.8 | 591.2 | 101.7 | 41.9 | 161.5 | 674.6 | 116.0 | 54.3 | 182.0 | 780.7 | 134.3 | 72.4 | 211.2 |
| 40 | 5 | 359.6 | 61.9 | 35.0 | 139.7 | 408.5 | 70.3 | 20.3 | 160.2 | 466.1 | 80.2 | 26.3 | 180.6 | 539.5 | 92.8 | 35.0 | 209.6 |
| | 6 | 372.7 | 64.1 | 37.6 | 141.1 | 423.4 | 72.8 | 21.8 | 161.9 | 483.1 | 83.1 | 28.2 | 182.4 | 559.1 | 96.2 | 37.6 | 211.7 |
| | 7 | 385.8 | 66.4 | 40.2 | 142.6 | 438.2 | 75.4 | 23.3 | 163.5 | 500.0 | 86.0 | 30.2 | 184.2 | 578.7 | 99.5 | 40.2 | 213.8 |
| | 8 | 398.9 | 68.6 | 42.9 | 144.0 | 453.1 | 77.9 | 24.9 | 165.1 | 517.0 | 88.9 | 32.2 | 186.1 | 598.3 | 102.9 | 42.9 | 216.0 |
| | 9 | 411.9 | 70.9 | 45.7 | 145.4 | 467.9 | 80.5 | 26.5 | 166.8 | 533.9 | 91.8 | 34.3 | 187.9 | 617.9 | 106.3 | 45.7 | 218.1 |
| | 10 | 425.0 | 73.1 | 48.6 | 146.8 | 482.8 | 83.0 | 28.2 | 168.4 | 550.8 | 94.7 | 36.5 | 189.7 | 637.5 | 109.6 | 48.6 | 220.2 |
| | 11 | 438.1 | 75.3 | 51.6 | 148.2 | 497.6 | 85.6 | 29.9 | 170.0 | 567.8 | 97.7 | 38.8 | 191.6 | 657.1 | 113.0 | 51.6 | 222.4 |
| | 12 | 451.1 | 77.6 | 54.7 | 149.7 | 512.5 | 88.1 | 31.7 | 171.7 | 584.7 | 100.6 | 41.1 | 193.4 | 676.7 | 116.4 | 54.7 | 224.5 |
| | 13 | 464.2 | 79.8 | 57.8 | 151.1 | 527.3 | 90.7 | 33.5 | 173.3 | 601.7 | 103.5 | 43.4 | 195.3 | 696.3 | 119.8 | 57.8 | 226.6 |
| | 14 | 477.3 | 82.1 | 61.1 | 152.5 | 542.2 | 93.3 | 35.4 | 174.9 | 618.6 | 106.4 | 45.8 | 197.1 | 715.9 | 123.1 | 61.1 | 228.8 |
| | 15 | 490.4 | 84.3 | 64.4 | 153.9 | 557.0 | 95.8 | 37.3 | 176.5 | 635.6 | 109.3 | 48.3 | 198.9 | 735.5 | 126.5 | 64.4 | 230.9 |
| 43 | 5 | 344.5 | 59.3 | 32.2 | 147.2 | 391.3 | 67.3 | 18.7 | 168.8 | 446.5 | 76.8 | 24.2 | 190.2 | 516.7 | 88.9 | 32.2 | 220.7 |
| | 6 | 357.3 | 61.5 | 34.6 | 148.6 | 405.8 | 69.8 | 20.1 | 170.5 | 463.1 | 79.6 | 26.0 | 192.1 | 535.9 | 92.2 | 34.6 | 222.9 |
| | 7 | 370.1 | 63.6 | 37.1 | 150.1 | 420.4 | 72.3 | 21.5 | 172.1 | 479.6 | 82.5 | 27.8 | 194.0 | 555.1 | 95.5 | 37.1 | 225.1 |
| | 8 | 382.8 | 65.8 | 39.6 | 151.6 | 434.9 | 74.8 | 23.0 | 173.8 | 496.2 | 85.3 | 29.7 | 195.9 | 574.3 | 98.8 | 39.6 | 227.3 |
| | 9 | 395.6 | 68.0 | 42.3 | 153.0 | 449.4 | 77.3 | 24.5 | 175.5 | 512.8 | 88.2 | 31.7 | 197.8 | 593.4 | 102.1 | 42.3 | 229.5 |
| | 10 | 408.4 | 70.2 | 45.0 | 154.5 | 463.9 | 79.8 | 26.1 | 177.2 | 529.3 | 91.0 | 33.8 | 199.6 | 612.6 | 105.4 | 45.0 | 231.7 |
| | 11 | 421.2 | 72.4 | 47.8 | 156.0 | 478.4 | 82.3 | 27.7 | 178.9 | 545.9 | 93.9 | 35.9 | 201.5 | 631.8 | 108.7 | 47.8 | 233.9 |
| | 12 | 434.0 | 74.6 | 50.7 | 157.4 | 492.9 | 84.8 | 29.4 | 180.5 | 562.5 | 96.7 | 38.0 | 203.4 | 650.9 | 112.0 | 50.7 | 236.1 |
| | 13 | 446.7 | 76.8 | 53.6 | 158.9 | 507.5 | 87.3 | 31.1 | 182.2 | 579.0 | 99.6 | 40.3 | 205.3 | 670.1 | 115.3 | 53.6 | 238.3 |
| | 14 | 459.5 | 79.0 | 56.7 | 160.3 | 522.0 | 89.8 | 32.9 | 183.9 | 595.6 | 102.4 | 42.6 | 207.2 | 689.3 | 118.6 | 56.7 | 240.5 |
| | 15 | 472.3 | 81.2 | 59.8 | 161.8 | 536.5 | 92.3 | 34.7 | 185.6 | 612.1 | 105.3 | 44.9 | 209.1 | 708.4 | 121.9 | 59.8 | 242.7 |
| 46 | 5 | 329.3 | 56.6 | 29.5 | 154.6 | 374.1 | 64.3 | 17.1 | 177.3 | 426.9 | 73.4 | 22.1 | 199.8 | 494.0 | 85.0 | 29.5 | 231.9 |
| | 6 | 341.8 | 58.8 | 31.7 | 156.1 | 388.3 | 66.8 | 18.4 | 179.1 | 443.1 | 76.2 | 23.8 | 201.8 | 512.8 | 88.2 | 31.7 | 234.2 |
| | 7 | 354.3 | 60.9 | 34.0 | 157.6 | 402.5 | 69.2 | 19.7 | 180.8 | 459.2 | 79.0 | 25.6 | 203.7 | 531.5 | 91.4 | 34.0 | 236.4 |
| | 8 | 366.8 | 63.1 | 36.4 | 159.1 | 416.7 | 71.7 | 21.1 | 182.5 | 475.4 | 81.8 | 27.4 | 205.7 | 550.2 | 94.6 | 36.4 | 238.7 |
| | 9 | 379.3 | 65.2 | 38.9 | 160.6 | 430.9 | 74.1 | 22.6 | 184.2 | 491.6 | 84.6 | 29.2 | 207.6 | 569.0 | 97.9 | 38.9 | 241.0 |
| | 10 | 391.8 | 67.4 | 41.5 | 162.2 | 445.0 | 76.5 | 24.0 | 186.0 | 507.8 | 87.3 | 31.1 | 209.5 | 587.7 | 101.1 | 41.5 | 243.2 |

Where,

**ABT:** Condenser Air Inlet Temperature (°C)
**COT:** Chilled Water Outlet Temperature (°C)
**CCAP:** Cooling Capacity (kW)
**CFR**: Chilled Water Flow Rate at 5°C ($m^3/h$)
**CPD:** Water Cooler Pressure Drop (kPa)
**IPT:** Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

## Performance Table (cont.)

| | | RCU2E280AG2 | | | | RCU2E320AG2 | | | | RCU2E350AG2 | | | | RCU2E400AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABT | COT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT |
| 25 | 5 | 733.6 | 126.2 | 36.4 | 185.4 | 849.0 | 146.0 | 48.5 | 215.2 | 917.0 | 157.7 | 36.4 | 231.7 | 1061.2 | 182.5 | 48.5 | 269.0 |
| | 6 | 758.1 | 130.4 | 38.9 | 187.6 | 877.3 | 150.9 | 51.7 | 217.7 | 947.6 | 163.0 | 38.9 | 234.5 | 1096.6 | 188.6 | 51.7 | 272.1 |
| | 7 | 782.5 | 134.6 | 41.4 | 189.8 | 905.6 | 155.8 | 55.1 | 220.3 | 978.2 | 168.2 | 41.4 | 237.2 | 1132.1 | 194.7 | 55.1 | 275.3 |
| | 8 | 807.0 | 138.8 | 43.9 | 191.9 | 934.0 | 160.6 | 58.5 | 222.8 | 1008.8 | 173.5 | 43.9 | 239.9 | 1167.5 | 200.8 | 58.5 | 278.5 |
| | 9 | 831.5 | 143.0 | 46.6 | 194.1 | 962.3 | 165.5 | 62.0 | 225.3 | 1039.4 | 178.8 | 46.6 | 242.7 | 1202.9 | 206.9 | 62.0 | 281.7 |
| | 10 | 856.0 | 147.2 | 49.3 | 196.3 | 990.6 | 170.4 | 65.7 | 227.9 | 1070.0 | 184.0 | 49.3 | 245.4 | 1238.3 | 213.0 | 65.7 | 284.8 |
| | 11 | 880.5 | 151.4 | 52.1 | 198.5 | 1019.0 | 175.3 | 69.4 | 230.4 | 1100.6 | 189.3 | 52.1 | 248.1 | 1273.7 | 219.1 | 69.4 | 288.0 |
| | 12 | 904.9 | 155.7 | 55.0 | 200.7 | 1047.3 | 180.1 | 73.2 | 232.9 | 1131.2 | 194.6 | 55.0 | 250.9 | 1309.1 | 225.2 | 73.2 | 291.2 |
| | 13 | 929.4 | 159.9 | 57.9 | 202.9 | 1075.6 | 185.0 | 77.2 | 235.5 | 1161.8 | 199.8 | 57.9 | 253.6 | 1344.5 | 231.3 | 77.2 | 294.3 |
| | 14 | 953.9 | 164.1 | 61.0 | 205.1 | 1104.0 | 189.9 | 81.2 | 238.0 | 1192.4 | 205.1 | 61.0 | 256.3 | 1380.0 | 237.4 | 81.2 | 297.5 |
| | 15 | 978.4 | 168.3 | 64.1 | 207.2 | 1132.3 | 194.8 | 85.4 | 240.5 | 1223.0 | 210.4 | 64.1 | 259.1 | 1415.4 | 243.4 | 85.4 | 300.7 |
| 30 | 5 | 708.8 | 121.9 | 34.1 | 202.9 | 820.3 | 141.1 | 45.4 | 235.5 | 886.0 | 152.4 | 34.1 | 253.6 | 1025.3 | 176.4 | 45.4 | 294.4 |
| | 6 | 733.0 | 126.1 | 36.4 | 205.2 | 848.3 | 145.9 | 48.4 | 238.1 | 916.3 | 157.6 | 36.4 | 256.5 | 1060.4 | 182.4 | 48.4 | 297.7 |
| | 7 | 757.3 | 130.3 | 38.8 | 207.4 | 876.4 | 150.7 | 51.6 | 240.8 | 946.6 | 162.8 | 38.8 | 259.3 | 1095.5 | 188.4 | 51.6 | 300.9 |
| | 8 | 781.6 | 134.4 | 41.3 | 209.7 | 904.5 | 155.6 | 54.9 | 243.4 | 977.0 | 168.0 | 41.3 | 262.1 | 1130.6 | 194.5 | 54.9 | 304.2 |
| | 9 | 805.8 | 138.6 | 43.8 | 211.9 | 932.6 | 160.4 | 58.3 | 246.0 | 1007.3 | 173.3 | 43.8 | 264.9 | 1165.8 | 200.5 | 58.3 | 307.5 |
| | 10 | 830.1 | 142.8 | 46.4 | 214.2 | 960.7 | 165.2 | 61.8 | 248.6 | 1037.6 | 178.5 | 46.4 | 267.7 | 1200.9 | 206.5 | 61.8 | 310.8 |
| | 11 | 854.4 | 147.0 | 49.1 | 216.5 | 988.8 | 170.1 | 65.4 | 251.2 | 1068.0 | 183.7 | 49.1 | 270.6 | 1236.0 | 212.6 | 65.4 | 314.1 |
| | 12 | 878.6 | 151.1 | 51.9 | 218.7 | 1016.9 | 174.9 | 69.1 | 253.9 | 1098.3 | 188.9 | 51.9 | 273.4 | 1271.1 | 218.6 | 69.1 | 317.3 |
| | 13 | 902.9 | 155.3 | 54.8 | 221.0 | 1044.9 | 179.7 | 72.9 | 256.5 | 1128.6 | 194.1 | 54.8 | 276.2 | 1306.2 | 224.7 | 72.9 | 320.6 |
| | 14 | 927.2 | 159.5 | 57.7 | 223.2 | 1073.0 | 184.6 | 76.8 | 259.1 | 1159.0 | 199.3 | 57.7 | 279.0 | 1341.3 | 230.7 | 76.8 | 323.9 |
| | 15 | 951.5 | 163.7 | 60.7 | 225.5 | 1101.1 | 189.4 | 80.8 | 261.7 | 1189.3 | 204.6 | 60.7 | 281.9 | 1376.4 | 236.7 | 80.8 | 327.2 |
| 35 | 5 | 665.1 | 114.4 | 30.1 | 219.3 | 769.8 | 132.4 | 40.0 | 254.6 | 831.4 | 143.0 | 30.1 | 274.2 | 962.2 | 165.5 | 40.0 | 318.2 |
| | 6 | 688.6 | 118.4 | 32.2 | 221.7 | 796.9 | 137.1 | 42.9 | 257.3 | 860.7 | 148.0 | 32.2 | 277.1 | 996.1 | 171.3 | 42.9 | 321.6 |
| | 7 | 712.0 | 122.5 | 34.4 | 224.0 | 824.0 | 141.7 | 45.8 | 260.0 | 890.0 | 153.1 | 34.4 | 280.0 | 1030.0 | 177.2 | 45.8 | 325.0 |
| | 8 | 735.4 | 126.5 | 36.6 | 226.3 | 851.1 | 146.4 | 48.8 | 262.7 | 919.3 | 158.1 | 36.6 | 282.9 | 1063.9 | 183.0 | 48.8 | 328.4 |
| | 9 | 758.9 | 130.5 | 38.9 | 228.7 | 878.2 | 151.1 | 51.9 | 265.4 | 948.6 | 163.2 | 38.9 | 285.8 | 1097.8 | 188.8 | 51.9 | 331.8 |
| | 10 | 782.3 | 134.6 | 41.3 | 231.0 | 905.3 | 155.7 | 55.0 | 268.1 | 977.9 | 168.2 | 41.3 | 288.7 | 1131.7 | 194.6 | 55.0 | 335.1 |
| | 11 | 805.7 | 138.6 | 43.8 | 233.3 | 932.5 | 160.4 | 58.3 | 270.8 | 1007.1 | 173.2 | 43.8 | 291.6 | 1165.6 | 200.5 | 58.3 | 338.5 |
| | 12 | 829.1 | 142.6 | 46.3 | 235.6 | 959.6 | 165.0 | 61.7 | 273.5 | 1036.4 | 178.3 | 46.3 | 294.5 | 1199.5 | 206.3 | 61.7 | 341.9 |
| | 13 | 852.6 | 146.6 | 48.9 | 238.0 | 986.7 | 169.7 | 65.2 | 276.2 | 1065.7 | 183.3 | 48.9 | 297.5 | 1233.4 | 212.1 | 65.2 | 345.3 |
| | 14 | 876.0 | 150.7 | 51.6 | 240.3 | 1013.8 | 174.4 | 68.7 | 278.9 | 1095.0 | 188.3 | 51.6 | 300.4 | 1267.2 | 218.0 | 68.7 | 348.6 |
| | 15 | 899.4 | 154.7 | 54.3 | 242.6 | 1040.9 | 179.0 | 72.4 | 281.6 | 1124.3 | 193.4 | 54.3 | 303.3 | 1301.1 | 223.8 | 72.4 | 352.0 |
| 40 | 5 | 621.5 | 106.9 | 26.3 | 240.7 | 719.3 | 123.7 | 35.0 | 279.4 | 776.9 | 133.6 | 26.3 | 300.9 | 899.1 | 154.6 | 35.0 | 349.3 |
| | 6 | 644.1 | 110.8 | 28.2 | 243.2 | 745.4 | 128.2 | 37.6 | 282.3 | 805.1 | 138.5 | 28.2 | 304.0 | 931.8 | 160.3 | 37.6 | 352.8 |
| | 7 | 666.7 | 114.7 | 30.2 | 245.6 | 771.6 | 132.7 | 40.2 | 285.1 | 833.4 | 143.3 | 30.2 | 307.0 | 964.5 | 165.9 | 40.2 | 356.4 |
| | 8 | 689.3 | 118.6 | 32.2 | 248.1 | 797.7 | 137.2 | 42.9 | 288.0 | 861.6 | 148.2 | 32.2 | 310.1 | 997.1 | 171.5 | 42.9 | 360.0 |
| | 9 | 711.9 | 122.4 | 34.3 | 250.5 | 823.9 | 141.7 | 45.7 | 290.8 | 889.8 | 153.1 | 34.3 | 313.2 | 1029.8 | 177.1 | 45.7 | 363.5 |
| | 10 | 734.5 | 126.3 | 36.5 | 253.0 | 850.0 | 146.2 | 48.6 | 293.6 | 918.1 | 157.9 | 36.5 | 316.2 | 1062.5 | 182.7 | 48.6 | 367.1 |
| | 11 | 757.1 | 130.2 | 38.8 | 255.4 | 876.1 | 150.7 | 51.6 | 296.5 | 946.3 | 162.8 | 38.8 | 319.3 | 1095.2 | 188.4 | 51.6 | 370.6 |
| | 12 | 779.6 | 134.1 | 41.1 | 257.9 | 902.3 | 155.2 | 54.7 | 299.3 | 974.6 | 167.6 | 41.1 | 322.4 | 1127.9 | 194.0 | 54.7 | 374.2 |
| | 13 | 802.2 | 138.0 | 43.4 | 260.3 | 928.4 | 159.7 | 57.8 | 302.2 | 1002.8 | 172.5 | 43.4 | 325.4 | 1160.5 | 199.6 | 57.8 | 377.7 |
| | 14 | 824.8 | 141.9 | 45.8 | 262.8 | 954.6 | 164.2 | 61.1 | 305.0 | 1031.0 | 177.3 | 45.8 | 328.5 | 1193.2 | 205.2 | 61.1 | 381.3 |
| | 15 | 847.4 | 145.8 | 48.3 | 265.2 | 980.7 | 168.7 | 64.4 | 307.9 | 1059.3 | 182.2 | 48.3 | 331.5 | 1225.9 | 210.9 | 64.4 | 384.8 |
| 43 | 5 | 595.3 | 102.4 | 24.2 | 253.6 | 689.0 | 118.5 | 32.2 | 294.3 | 744.2 | 128.0 | 24.2 | 317.0 | 861.2 | 148.1 | 32.2 | 367.9 |
| | 6 | 617.4 | 106.2 | 26.0 | 256.1 | 714.5 | 122.9 | 34.6 | 297.3 | 771.8 | 132.7 | 26.0 | 320.1 | 893.2 | 153.6 | 34.6 | 371.6 |
| | 7 | 639.5 | 110.0 | 27.8 | 258.6 | 740.1 | 127.3 | 37.1 | 300.2 | 799.4 | 137.5 | 27.8 | 323.3 | 925.1 | 159.1 | 37.1 | 375.2 |
| | 8 | 661.6 | 113.8 | 29.7 | 261.1 | 765.7 | 131.7 | 39.6 | 303.1 | 827.0 | 142.2 | 29.7 | 326.4 | 957.1 | 164.6 | 39.6 | 378.9 |
| | 9 | 683.7 | 117.6 | 31.7 | 263.7 | 791.2 | 136.1 | 42.3 | 306.0 | 854.6 | 147.0 | 31.7 | 329.6 | 989.0 | 170.1 | 42.3 | 382.6 |
| | 10 | 705.8 | 121.4 | 33.8 | 266.2 | 816.8 | 140.5 | 45.0 | 309.0 | 882.2 | 151.7 | 33.8 | 332.7 | 1021.0 | 175.6 | 45.0 | 386.2 |
| | 11 | 727.9 | 125.2 | 35.9 | 268.7 | 842.3 | 144.9 | 47.8 | 311.9 | 909.8 | 156.5 | 35.9 | 335.9 | 1052.9 | 181.1 | 47.8 | 389.9 |
| | 12 | 749.9 | 129.0 | 38.0 | 271.2 | 867.9 | 149.3 | 50.7 | 314.8 | 937.4 | 161.2 | 38.0 | 339.1 | 1084.9 | 186.6 | 50.7 | 393.5 |
| | 13 | 772.0 | 132.8 | 40.3 | 273.8 | 893.5 | 153.7 | 53.6 | 317.8 | 965.0 | 166.0 | 40.3 | 342.2 | 1116.8 | 192.1 | 53.6 | 397.2 |
| | 14 | 794.1 | 136.6 | 42.6 | 276.3 | 919.0 | 158.1 | 56.7 | 320.7 | 992.6 | 170.7 | 42.6 | 345.4 | 1148.8 | 197.6 | 56.7 | 400.9 |
| | 15 | 816.2 | 140.4 | 44.9 | 278.8 | 944.6 | 162.5 | 59.8 | 323.6 | 1020.2 | 175.5 | 44.9 | 348.5 | 1180.7 | 203.1 | 59.8 | 404.5 |
| 46 | 5 | 569.2 | 97.9 | 22.1 | 266.4 | 658.7 | 113.3 | 29.5 | 309.2 | 711.5 | 122.4 | 22.1 | 333.0 | 823.4 | 141.6 | 29.5 | 386.5 |
| | 6 | 590.7 | 101.6 | 23.8 | 269.0 | 683.7 | 117.6 | 31.7 | 312.2 | 738.4 | 127.0 | 23.8 | 336.3 | 854.6 | 147.0 | 31.7 | 390.3 |
| | 7 | 612.3 | 105.3 | 25.6 | 271.6 | 708.6 | 121.9 | 34.0 | 315.3 | 765.4 | 131.7 | 25.6 | 339.5 | 885.8 | 152.4 | 34.0 | 394.1 |
| | 8 | 633.9 | 109.0 | 27.4 | 274.2 | 733.6 | 126.2 | 36.4 | 318.3 | 792.4 | 136.3 | 27.4 | 342.8 | 917.0 | 157.7 | 36.4 | 397.8 |
| | 9 | 655.5 | 112.7 | 29.2 | 276.8 | 758.6 | 130.5 | 38.9 | 321.3 | 819.4 | 140.9 | 29.2 | 346.0 | 948.3 | 163.1 | 38.9 | 401.6 |
| | 10 | 677.1 | 116.5 | 31.1 | 279.4 | 783.6 | 134.8 | 41.5 | 324.3 | 846.3 | 145.6 | 31.1 | 349.2 | 979.5 | 168.5 | 41.5 | 405.4 |

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)

CFR: Chilled Water Flow Rate at 5°C ($m^3/h$)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

## 15.3. Performance Table (RHU2E-AG2) (Cooling Operation)

| | | RHU2E40AG2 | | | | RHU2E50AG2 | | | | RHU2E60AG2 | | | | RHU2E70AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABT | COT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT |
| 25 | 5 | 109.2 | 18.8 | 18.1 | 29.4 | 126.7 | 21.8 | 21.8 | 32.6 | 152.5 | 26.2 | 25.4 | 40.3 | 174.1 | 29.9 | 29.6 | 45.5 |
| | 6 | 112.9 | 19.4 | 19.3 | 29.7 | 131.0 | 22.5 | 23.3 | 33.0 | 157.6 | 27.1 | 27.1 | 40.8 | 179.9 | 30.9 | 31.6 | 46.1 |
| | 7 | 116.5 | 20.0 | 20.5 | 30.1 | 135.2 | 23.3 | 24.7 | 33.4 | 162.7 | 28.0 | 28.8 | 41.3 | 185.7 | 31.9 | 33.7 | 46.6 |
| | 8 | 120.1 | 20.7 | 21.7 | 30.4 | 139.4 | 24.0 | 26.3 | 33.8 | 167.8 | 28.9 | 30.6 | 41.7 | 191.6 | 32.9 | 35.8 | 47.1 |
| | 9 | 123.8 | 21.3 | 23.0 | 30.8 | 143.6 | 24.7 | 27.8 | 34.1 | 172.8 | 29.7 | 32.4 | 42.2 | 197.4 | 33.9 | 38.0 | 47.7 |
| | 10 | 127.4 | 21.9 | 24.4 | 31.1 | 147.9 | 25.4 | 29.5 | 34.5 | 177.9 | 30.6 | 34.3 | 42.7 | 203.2 | 34.9 | 40.2 | 48.2 |
| | 11 | 131.1 | 22.5 | 25.7 | 31.5 | 152.1 | 26.2 | 31.1 | 34.9 | 183.0 | 31.5 | 36.3 | 43.2 | 209.0 | 35.9 | 42.5 | 48.7 |
| | 12 | 134.7 | 23.2 | 27.1 | 31.8 | 156.3 | 26.9 | 32.8 | 35.3 | 188.1 | 32.4 | 38.3 | 43.6 | 214.8 | 36.9 | 44.9 | 49.3 |
| | 13 | 138.4 | 23.8 | 28.6 | 32.2 | 160.6 | 27.6 | 34.6 | 35.7 | 193.2 | 33.2 | 40.3 | 44.1 | 220.6 | 37.9 | 47.3 | 49.8 |
| | 14 | 142.0 | 24.4 | 30.1 | 32.5 | 164.8 | 28.3 | 36.4 | 36.1 | 198.3 | 34.1 | 42.5 | 44.6 | 226.4 | 38.9 | 49.8 | 50.3 |
| | 15 | 145.7 | 25.1 | 31.6 | 32.8 | 169.0 | 29.1 | 38.2 | 36.5 | 203.4 | 35.0 | 44.6 | 45.1 | 232.2 | 39.9 | 52.3 | 50.9 |
| 30 | 5 | 105.5 | 18.1 | 16.9 | 32.2 | 122.4 | 21.1 | 20.4 | 35.7 | 147.3 | 25.3 | 23.7 | 44.1 | 168.2 | 28.9 | 27.7 | 49.8 |
| | 6 | 109.1 | 18.8 | 18.0 | 32.5 | 126.6 | 21.8 | 21.8 | 36.1 | 152.4 | 26.2 | 25.3 | 44.6 | 174.0 | 29.9 | 29.6 | 50.4 |
| | 7 | 112.7 | 19.4 | 19.2 | 32.9 | 130.8 | 22.5 | 23.2 | 36.5 | 157.4 | 27.1 | 27.0 | 45.1 | 179.8 | 30.9 | 31.5 | 50.9 |
| | 8 | 116.4 | 20.0 | 20.4 | 33.2 | 135.0 | 23.2 | 24.7 | 36.9 | 162.5 | 27.9 | 28.7 | 45.6 | 185.5 | 31.9 | 33.6 | 51.5 |
| | 9 | 120.0 | 20.6 | 21.7 | 33.6 | 139.2 | 23.9 | 26.2 | 37.3 | 167.5 | 28.8 | 30.5 | 46.1 | 191.3 | 32.9 | 35.7 | 52.0 |
| | 10 | 123.6 | 21.3 | 23.0 | 33.9 | 143.4 | 24.7 | 27.8 | 37.7 | 172.6 | 29.7 | 32.3 | 46.6 | 197.0 | 33.9 | 37.8 | 52.6 |
| | 11 | 127.2 | 21.9 | 24.3 | 34.3 | 147.6 | 25.4 | 29.4 | 38.1 | 177.6 | 30.5 | 34.2 | 47.1 | 202.8 | 34.9 | 40.0 | 53.1 |
| | 12 | 130.8 | 22.5 | 25.6 | 34.7 | 151.8 | 26.1 | 31.0 | 38.5 | 182.6 | 31.4 | 36.1 | 47.6 | 208.6 | 35.9 | 42.3 | 53.7 |
| | 13 | 134.4 | 23.1 | 27.0 | 35.0 | 156.0 | 26.8 | 32.7 | 38.9 | 187.7 | 32.3 | 38.1 | 48.0 | 214.3 | 36.9 | 44.7 | 54.3 |
| | 14 | 138.0 | 23.7 | 28.4 | 35.4 | 160.2 | 27.5 | 34.4 | 39.3 | 192.7 | 33.1 | 40.2 | 48.5 | 220.1 | 37.9 | 47.1 | 54.8 |
| | 15 | 141.6 | 24.4 | 29.9 | 35.7 | 164.4 | 28.3 | 36.2 | 39.7 | 197.8 | 34.0 | 42.2 | 49.0 | 225.8 | 38.8 | 49.5 | 55.4 |
| 35 | 5 | 99.0 | 17.0 | 14.9 | 34.8 | 114.9 | 19.8 | 18.0 | 38.6 | 138.3 | 23.8 | 20.9 | 47.7 | 157.9 | 27.2 | 24.4 | 53.9 |
| | 6 | 102.5 | 17.6 | 16.0 | 35.1 | 119.0 | 20.5 | 19.3 | 39.0 | 143.1 | 24.6 | 22.4 | 48.2 | 163.4 | 28.1 | 26.1 | 54.4 |
| | 7 | 106.0 | 18.2 | 17.1 | 35.5 | 123.0 | 21.2 | 20.6 | 39.4 | 148.0 | 25.5 | 23.9 | 48.7 | 169.0 | 29.1 | 27.9 | 55.0 |
| | 8 | 109.5 | 18.8 | 18.2 | 35.9 | 127.0 | 21.9 | 21.9 | 39.8 | 152.9 | 26.3 | 25.5 | 49.2 | 174.6 | 30.0 | 29.8 | 55.6 |
| | 9 | 113.0 | 19.4 | 19.3 | 36.2 | 131.1 | 22.5 | 23.3 | 40.2 | 157.7 | 27.1 | 27.1 | 49.7 | 180.1 | 31.0 | 31.7 | 56.1 |
| | 10 | 116.5 | 20.0 | 20.5 | 36.6 | 135.1 | 23.2 | 24.7 | 40.6 | 162.6 | 28.0 | 28.8 | 50.2 | 185.7 | 31.9 | 33.6 | 56.7 |
| | 11 | 120.0 | 20.6 | 21.7 | 37.0 | 139.2 | 23.9 | 26.2 | 41.0 | 167.5 | 28.8 | 30.5 | 50.7 | 191.2 | 32.9 | 35.7 | 57.3 |
| | 12 | 123.4 | 21.2 | 22.9 | 37.3 | 143.2 | 24.6 | 27.7 | 41.4 | 172.4 | 29.6 | 32.3 | 51.2 | 196.8 | 33.9 | 37.7 | 57.9 |
| | 13 | 126.9 | 21.8 | 24.2 | 37.7 | 147.3 | 25.3 | 29.2 | 41.9 | 177.2 | 30.5 | 34.1 | 51.7 | 202.4 | 34.8 | 39.9 | 58.4 |
| | 14 | 130.4 | 22.4 | 25.5 | 38.1 | 151.3 | 26.0 | 30.8 | 42.3 | 182.1 | 31.3 | 35.9 | 52.2 | 207.9 | 35.8 | 42.1 | 59.0 |
| | 15 | 133.9 | 23.0 | 26.8 | 38.5 | 155.4 | 26.7 | 32.4 | 42.7 | 187.0 | 32.2 | 37.8 | 52.7 | 213.5 | 36.7 | 44.3 | 59.6 |
| 40 | 5 | 92.5 | 15.9 | 13.1 | 38.2 | 107.4 | 18.5 | 15.8 | 42.3 | 129.2 | 22.2 | 18.3 | 52.3 | 147.5 | 25.4 | 21.3 | 59.1 |
| | 6 | 95.9 | 16.5 | 14.0 | 38.5 | 111.3 | 19.1 | 17.0 | 42.8 | 133.9 | 23.0 | 19.7 | 52.9 | 152.9 | 26.3 | 22.9 | 59.7 |
| | 7 | 99.3 | 17.1 | 15.0 | 38.9 | 115.2 | 19.8 | 18.1 | 43.2 | 138.6 | 23.8 | 21.0 | 53.4 | 158.2 | 27.2 | 24.5 | 60.3 |
| | 8 | 102.6 | 17.7 | 16.0 | 39.3 | 119.1 | 20.5 | 19.3 | 43.6 | 143.3 | 24.6 | 22.4 | 53.9 | 163.6 | 28.1 | 26.2 | 60.9 |
| | 9 | 106.0 | 18.2 | 17.0 | 39.7 | 123.0 | 21.2 | 20.6 | 44.1 | 148.0 | 25.5 | 23.9 | 54.5 | 169.0 | 29.1 | 27.9 | 61.5 |
| | 10 | 109.3 | 18.8 | 18.1 | 40.1 | 126.9 | 21.8 | 21.9 | 44.5 | 152.7 | 26.3 | 25.4 | 55.0 | 174.3 | 30.0 | 29.7 | 62.1 |
| | 11 | 112.7 | 19.4 | 19.2 | 40.5 | 130.8 | 22.5 | 23.2 | 44.9 | 157.4 | 27.1 | 27.0 | 55.5 | 179.7 | 30.9 | 31.5 | 62.7 |
| | 12 | 116.1 | 20.0 | 20.3 | 40.9 | 134.7 | 23.2 | 24.6 | 45.4 | 162.1 | 27.9 | 28.6 | 56.1 | 185.1 | 31.8 | 33.4 | 63.3 |
| | 13 | 119.4 | 20.5 | 21.5 | 41.3 | 138.6 | 23.8 | 26.0 | 45.8 | 166.8 | 28.7 | 30.2 | 56.6 | 190.4 | 32.8 | 35.4 | 63.9 |
| | 14 | 122.8 | 21.1 | 22.7 | 41.6 | 142.5 | 24.5 | 27.4 | 46.2 | 171.5 | 29.5 | 31.9 | 57.1 | 195.8 | 33.7 | 37.3 | 64.5 |
| | 15 | 126.2 | 21.7 | 23.9 | 42.0 | 146.4 | 25.2 | 28.9 | 46.7 | 176.1 | 30.3 | 33.7 | 57.7 | 201.1 | 34.6 | 39.4 | 65.1 |
| 43 | 5 | 88.6 | 15.2 | 12.1 | 40.2 | 102.8 | 17.7 | 14.5 | 44.6 | 123.8 | 21.3 | 16.8 | 55.1 | 141.3 | 24.3 | 19.6 | 62.3 |
| | 6 | 91.9 | 15.8 | 12.9 | 40.6 | 106.7 | 18.3 | 15.6 | 45.0 | 128.3 | 22.1 | 18.1 | 55.7 | 146.6 | 25.2 | 21.1 | 62.9 |
| | 7 | 95.2 | 16.4 | 13.8 | 41.0 | 110.5 | 19.0 | 16.7 | 45.5 | 132.9 | 22.9 | 19.4 | 56.2 | 151.8 | 26.1 | 22.6 | 63.5 |
| | 8 | 98.5 | 16.9 | 14.8 | 41.4 | 114.3 | 19.7 | 17.9 | 45.9 | 137.5 | 23.7 | 20.7 | 56.8 | 157.0 | 27.0 | 24.2 | 64.1 |
| | 9 | 101.8 | 17.5 | 15.8 | 41.8 | 118.1 | 20.3 | 19.0 | 46.4 | 142.1 | 24.4 | 22.1 | 57.3 | 162.3 | 27.9 | 25.8 | 64.7 |
| | 10 | 105.1 | 18.1 | 16.8 | 42.2 | 121.9 | 21.0 | 20.2 | 46.8 | 146.7 | 25.2 | 23.5 | 57.9 | 167.5 | 28.8 | 27.4 | 65.4 |
| | 11 | 108.4 | 18.6 | 17.8 | 42.6 | 125.7 | 21.6 | 21.5 | 47.3 | 151.3 | 26.0 | 25.0 | 58.4 | 172.8 | 29.7 | 29.2 | 66.0 |
| | 12 | 111.6 | 19.2 | 18.9 | 43.0 | 129.6 | 22.3 | 22.8 | 47.7 | 155.9 | 26.8 | 26.5 | 59.0 | 178.0 | 30.6 | 30.9 | 66.6 |
| | 13 | 114.9 | 19.8 | 19.9 | 43.4 | 133.4 | 22.9 | 24.1 | 48.2 | 160.5 | 27.6 | 28.0 | 59.5 | 183.2 | 31.5 | 32.8 | 67.2 |
| | 14 | 118.2 | 20.3 | 21.1 | 43.8 | 137.2 | 23.6 | 25.5 | 48.6 | 165.1 | 28.4 | 29.6 | 60.1 | 188.5 | 32.4 | 34.6 | 67.8 |
| | 15 | 121.5 | 20.9 | 22.2 | 44.2 | 141.0 | 24.3 | 26.9 | 49.0 | 169.7 | 29.2 | 31.3 | 60.6 | 193.7 | 33.3 | 36.6 | 68.5 |
| 46 | 5 | 84.7 | 14.6 | 11.0 | 42.2 | 98.3 | 16.9 | 13.3 | 46.9 | 118.3 | 20.3 | 15.4 | 57.9 | 135.1 | 23.2 | 17.9 | 65.4 |
| | 6 | 87.9 | 15.1 | 11.9 | 42.6 | 102.1 | 17.6 | 14.3 | 47.3 | 122.8 | 21.1 | 16.6 | 58.5 | 140.2 | 24.1 | 19.3 | 66.1 |
| | 7 | 91.2 | 15.7 | 12.7 | 43.0 | 105.8 | 18.2 | 15.4 | 47.8 | 127.3 | 21.9 | 17.8 | 59.0 | 145.3 | 25.0 | 20.7 | 66.7 |
| | 8 | 94.4 | 16.2 | 13.6 | 43.5 | 109.5 | 18.8 | 16.4 | 48.2 | 131.8 | 22.7 | 19.0 | 59.6 | 150.5 | 25.9 | 22.2 | 67.3 |
| | 9 | 97.6 | 16.8 | 14.5 | 43.9 | 113.2 | 19.5 | 17.5 | 48.7 | 136.3 | 23.4 | 20.3 | 60.2 | 155.6 | 26.8 | 23.7 | 68.0 |
| | 10 | 100.8 | 17.3 | 15.5 | 44.3 | 117.0 | 20.1 | 18.7 | 49.1 | 140.7 | 24.2 | 21.7 | 60.7 | 160.7 | 27.6 | 25.3 | 68.6 |

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)

CFR: Chilled Water Flow Rate at 5°C ($m^3$/h)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

## Performance Table (cont.)

| | | RHU2E80AG2 | | | | RHU2E100AG2 | | | | RHU2E120AG2 | | | | RHU2E140AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABT | COT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT |
| 25 | 5 | 200.9 | 34.6 | 39.3 | 53.8 | 253.5 | 43.6 | 21.8 | 65.2 | 305.0 | 52.5 | 25.4 | 80.6 | 348.2 | 59.9 | 29.6 | 91.0 |
| | 6 | 207.6 | 35.7 | 41.9 | 54.4 | 261.9 | 45.0 | 23.3 | 66.0 | 315.2 | 54.2 | 27.1 | 81.6 | 359.9 | 61.9 | 31.6 | 92.1 |
| | 7 | 214.3 | 36.9 | 44.7 | 55.1 | 270.4 | 46.5 | 24.7 | 66.8 | 325.3 | 56.0 | 28.8 | 82.5 | 371.5 | 63.9 | 33.7 | 93.2 |
| | 8 | 221.0 | 38.0 | 47.5 | 55.7 | 278.8 | 48.0 | 26.3 | 67.5 | 335.5 | 57.7 | 30.6 | 83.5 | 383.1 | 65.9 | 35.8 | 94.3 |
| | 9 | 227.7 | 39.2 | 50.4 | 56.3 | 287.3 | 49.4 | 27.8 | 68.3 | 345.7 | 59.5 | 32.4 | 84.4 | 394.7 | 67.9 | 38.0 | 95.3 |
| | 10 | 234.4 | 40.3 | 53.3 | 57.0 | 295.7 | 50.9 | 29.5 | 69.1 | 355.9 | 61.2 | 34.3 | 85.4 | 406.4 | 69.9 | 40.2 | 96.4 |
| | 11 | 241.1 | 41.5 | 56.4 | 57.6 | 304.2 | 52.3 | 31.1 | 69.8 | 366.0 | 63.0 | 36.3 | 86.3 | 418.0 | 71.9 | 42.5 | 97.5 |
| | 12 | 247.8 | 42.6 | 59.5 | 58.2 | 312.7 | 53.8 | 32.8 | 70.6 | 376.2 | 64.7 | 38.3 | 87.3 | 429.6 | 73.9 | 44.9 | 98.6 |
| | 13 | 254.5 | 43.8 | 62.8 | 58.9 | 321.1 | 55.2 | 34.6 | 71.4 | 386.4 | 66.5 | 40.3 | 88.2 | 441.2 | 75.9 | 47.3 | 99.6 |
| | 14 | 261.3 | 44.9 | 66.1 | 59.5 | 329.6 | 56.7 | 36.4 | 72.1 | 396.6 | 68.2 | 42.5 | 89.2 | 452.8 | 77.9 | 49.8 | 100.7 |
| | 15 | 268.0 | 46.1 | 69.5 | 60.1 | 338.0 | 58.1 | 38.2 | 72.9 | 406.7 | 70.0 | 44.6 | 90.1 | 464.5 | 79.9 | 52.3 | 101.8 |
| 30 | 5 | 194.1 | 33.4 | 36.7 | 58.9 | 244.9 | 42.1 | 20.4 | 71.4 | 294.7 | 50.7 | 23.7 | 88.2 | 336.5 | 57.9 | 27.7 | 99.6 |
| | 6 | 200.8 | 34.5 | 39.3 | 59.5 | 253.3 | 43.6 | 21.8 | 72.2 | 304.7 | 52.4 | 25.3 | 89.2 | 348.0 | 59.9 | 29.6 | 100.7 |
| | 7 | 207.4 | 35.7 | 41.9 | 60.2 | 261.7 | 45.0 | 23.2 | 73.0 | 314.8 | 54.2 | 27.0 | 90.2 | 359.5 | 61.8 | 31.5 | 101.9 |
| | 8 | 214.1 | 36.8 | 44.6 | 60.8 | 270.0 | 46.4 | 24.7 | 73.8 | 324.9 | 55.9 | 28.7 | 91.2 | 371.0 | 63.8 | 33.6 | 103.0 |
| | 9 | 220.7 | 38.0 | 47.3 | 61.5 | 278.4 | 47.9 | 26.2 | 74.6 | 335.0 | 57.6 | 30.5 | 92.2 | 382.5 | 65.8 | 35.7 | 104.1 |
| | 10 | 227.3 | 39.1 | 50.2 | 62.2 | 286.8 | 49.3 | 27.8 | 75.4 | 345.1 | 59.4 | 32.3 | 93.1 | 394.1 | 67.8 | 37.8 | 105.2 |
| | 11 | 234.0 | 40.2 | 53.1 | 62.8 | 295.2 | 50.8 | 29.4 | 76.1 | 355.2 | 61.1 | 34.2 | 94.1 | 405.6 | 69.8 | 40.0 | 106.3 |
| | 12 | 240.6 | 41.4 | 56.2 | 63.5 | 303.6 | 52.2 | 31.0 | 76.9 | 365.3 | 62.8 | 36.1 | 95.1 | 417.1 | 71.7 | 42.3 | 107.4 |
| | 13 | 247.3 | 42.5 | 59.3 | 64.1 | 312.0 | 53.7 | 32.7 | 77.7 | 375.4 | 64.6 | 38.1 | 96.1 | 428.6 | 73.7 | 44.7 | 108.5 |
| | 14 | 253.9 | 43.7 | 62.5 | 64.8 | 320.3 | 55.1 | 34.4 | 78.5 | 385.5 | 66.3 | 40.2 | 97.1 | 440.2 | 75.7 | 47.1 | 109.6 |
| | 15 | 260.6 | 44.8 | 65.7 | 65.4 | 328.7 | 56.5 | 36.2 | 79.3 | 395.5 | 68.0 | 42.2 | 98.0 | 451.7 | 77.7 | 49.5 | 110.7 |
| 35 | 5 | 182.2 | 31.3 | 32.4 | 63.6 | 229.8 | 39.5 | 18.0 | 77.2 | 276.5 | 47.6 | 20.9 | 95.4 | 315.8 | 54.3 | 24.4 | 107.7 |
| | 6 | 188.6 | 32.4 | 34.7 | 64.3 | 237.9 | 40.9 | 19.3 | 78.0 | 286.3 | 49.2 | 22.4 | 96.4 | 326.9 | 56.2 | 26.1 | 108.9 |
| | 7 | 195.0 | 33.5 | 37.1 | 65.0 | 246.0 | 42.3 | 20.6 | 78.8 | 296.0 | 50.9 | 23.9 | 97.4 | 338.0 | 58.1 | 27.9 | 110.0 |
| | 8 | 201.4 | 34.6 | 39.5 | 65.7 | 254.1 | 43.7 | 21.9 | 79.6 | 305.7 | 52.6 | 25.5 | 98.4 | 349.1 | 60.0 | 29.8 | 111.1 |
| | 9 | 207.8 | 35.7 | 42.0 | 66.4 | 262.2 | 45.1 | 23.3 | 80.4 | 315.5 | 54.3 | 27.1 | 99.4 | 360.2 | 62.0 | 31.7 | 112.3 |
| | 10 | 214.2 | 36.9 | 44.6 | 67.0 | 270.3 | 46.5 | 24.7 | 81.3 | 325.2 | 55.9 | 28.8 | 100.4 | 371.4 | 63.9 | 33.6 | 113.4 |
| | 11 | 220.7 | 38.0 | 47.3 | 67.7 | 278.4 | 47.9 | 26.2 | 82.1 | 335.0 | 57.6 | 30.5 | 101.4 | 382.5 | 65.8 | 35.7 | 114.6 |
| | 12 | 227.1 | 39.1 | 50.1 | 68.4 | 286.5 | 49.3 | 27.7 | 82.9 | 344.7 | 59.3 | 32.3 | 102.5 | 393.6 | 67.7 | 37.7 | 115.7 |
| | 13 | 233.5 | 40.2 | 52.9 | 69.1 | 294.6 | 50.7 | 29.2 | 83.7 | 354.4 | 61.0 | 34.1 | 103.5 | 404.7 | 69.6 | 39.9 | 116.9 |
| | 14 | 239.9 | 41.3 | 55.8 | 69.7 | 302.7 | 52.1 | 30.8 | 84.5 | 364.2 | 62.6 | 35.9 | 104.5 | 415.9 | 71.5 | 42.1 | 118.0 |
| | 15 | 246.3 | 42.4 | 58.8 | 70.4 | 310.8 | 53.5 | 32.4 | 85.3 | 373.9 | 64.3 | 37.8 | 105.5 | 427.0 | 73.4 | 44.3 | 119.1 |
| 40 | 5 | 170.2 | 29.3 | 28.3 | 69.9 | 214.7 | 36.9 | 15.8 | 84.7 | 258.4 | 44.4 | 18.3 | 104.7 | 295.0 | 50.7 | 21.3 | 118.2 |
| | 6 | 176.4 | 30.3 | 30.4 | 70.6 | 222.5 | 38.3 | 17.0 | 85.6 | 267.8 | 46.1 | 19.7 | 105.7 | 305.8 | 52.6 | 22.9 | 119.4 |
| | 7 | 182.6 | 31.4 | 32.5 | 71.3 | 230.3 | 39.6 | 18.1 | 86.4 | 277.2 | 47.7 | 21.0 | 106.8 | 316.5 | 54.4 | 24.5 | 120.6 |
| | 8 | 188.8 | 32.5 | 34.8 | 72.0 | 238.2 | 41.0 | 19.3 | 87.3 | 286.6 | 49.3 | 22.4 | 107.9 | 327.2 | 56.3 | 26.2 | 121.8 |
| | 9 | 195.0 | 33.5 | 37.0 | 72.7 | 246.0 | 42.3 | 20.6 | 88.1 | 295.9 | 50.9 | 23.9 | 108.9 | 337.9 | 58.1 | 27.9 | 123.0 |
| | 10 | 201.2 | 34.6 | 39.4 | 73.4 | 253.8 | 43.6 | 21.9 | 89.0 | 305.3 | 52.5 | 25.4 | 110.0 | 348.7 | 60.0 | 29.7 | 124.2 |
| | 11 | 207.3 | 35.7 | 41.8 | 74.1 | 261.6 | 45.0 | 23.2 | 89.9 | 314.7 | 54.1 | 27.0 | 111.1 | 359.4 | 61.8 | 31.5 | 125.4 |
| | 12 | 213.5 | 36.7 | 44.3 | 74.8 | 269.4 | 46.3 | 24.6 | 90.7 | 324.1 | 55.7 | 28.6 | 112.1 | 370.1 | 63.7 | 33.4 | 126.6 |
| | 13 | 219.7 | 37.8 | 46.9 | 75.5 | 277.2 | 47.7 | 26.0 | 91.6 | 333.5 | 57.4 | 30.2 | 113.2 | 380.8 | 65.5 | 35.4 | 127.8 |
| | 14 | 225.9 | 38.9 | 49.6 | 76.3 | 285.0 | 49.0 | 27.4 | 92.4 | 342.9 | 59.0 | 31.9 | 114.3 | 391.6 | 67.3 | 37.3 | 129.0 |
| | 15 | 232.1 | 39.9 | 52.3 | 77.0 | 292.8 | 50.4 | 28.9 | 93.3 | 352.3 | 60.6 | 33.7 | 115.3 | 402.3 | 69.2 | 39.4 | 130.3 |
| 43 | 5 | 163.0 | 28.0 | 26.0 | 73.6 | 205.7 | 35.4 | 14.5 | 89.2 | 247.5 | 42.6 | 16.8 | 110.3 | 282.6 | 48.6 | 19.6 | 124.5 |
| | 6 | 169.1 | 29.1 | 28.0 | 74.3 | 213.3 | 36.7 | 15.6 | 90.1 | 256.7 | 44.1 | 18.1 | 111.4 | 293.1 | 50.4 | 21.1 | 125.8 |
| | 7 | 175.1 | 30.1 | 30.0 | 75.0 | 221.0 | 38.0 | 16.7 | 91.0 | 265.9 | 45.7 | 19.4 | 112.5 | 303.6 | 52.2 | 22.6 | 127.0 |
| | 8 | 181.2 | 31.2 | 32.0 | 75.8 | 228.6 | 39.3 | 17.9 | 91.9 | 275.0 | 47.3 | 20.7 | 113.6 | 314.1 | 54.0 | 24.2 | 128.2 |
| | 9 | 187.2 | 32.2 | 34.2 | 76.5 | 236.2 | 40.6 | 19.0 | 92.8 | 284.2 | 48.9 | 22.1 | 114.6 | 324.6 | 55.8 | 25.8 | 129.5 |
| | 10 | 193.3 | 33.2 | 36.4 | 77.2 | 243.8 | 41.9 | 20.2 | 93.6 | 293.4 | 50.5 | 23.5 | 115.7 | 335.0 | 57.6 | 27.4 | 130.7 |
| | 11 | 199.3 | 34.3 | 38.7 | 78.0 | 251.5 | 43.3 | 21.5 | 94.5 | 302.6 | 52.0 | 25.0 | 116.8 | 345.5 | 59.4 | 29.2 | 132.0 |
| | 12 | 205.4 | 35.3 | 41.1 | 78.7 | 259.1 | 44.6 | 22.8 | 95.4 | 311.8 | 53.6 | 26.5 | 117.9 | 356.0 | 61.2 | 30.9 | 133.2 |
| | 13 | 211.4 | 36.4 | 43.5 | 79.4 | 266.7 | 45.9 | 24.1 | 96.3 | 321.0 | 55.2 | 28.0 | 119.0 | 366.5 | 63.0 | 32.8 | 134.4 |
| | 14 | 217.5 | 37.4 | 46.0 | 80.2 | 274.4 | 47.2 | 25.5 | 97.2 | 330.1 | 56.8 | 29.6 | 120.1 | 377.0 | 64.8 | 34.6 | 135.7 |
| | 15 | 223.5 | 38.4 | 48.5 | 80.9 | 282.0 | 48.5 | 26.9 | 98.1 | 339.3 | 58.4 | 31.3 | 121.2 | 387.5 | 66.6 | 36.6 | 136.9 |
| 46 | 5 | 155.9 | 26.8 | 23.8 | 77.3 | 196.6 | 33.8 | 13.3 | 93.7 | 236.6 | 40.7 | 15.4 | 115.8 | 270.2 | 46.5 | 17.9 | 130.8 |
| | 6 | 161.8 | 27.8 | 25.6 | 78.1 | 204.1 | 35.1 | 14.3 | 94.6 | 245.6 | 42.2 | 16.6 | 117.0 | 280.4 | 48.2 | 19.3 | 132.1 |
| | 7 | 167.7 | 28.8 | 27.5 | 78.8 | 211.6 | 36.4 | 15.4 | 95.5 | 254.6 | 43.8 | 17.8 | 118.1 | 290.7 | 50.0 | 20.7 | 133.4 |
| | 8 | 173.6 | 29.9 | 29.5 | 79.6 | 219.0 | 37.7 | 16.4 | 96.5 | 263.5 | 45.3 | 19.0 | 119.2 | 300.9 | 51.8 | 22.2 | 134.7 |
| | 9 | 179.5 | 30.9 | 31.5 | 80.3 | 226.5 | 39.0 | 17.5 | 97.4 | 272.5 | 46.9 | 20.3 | 120.4 | 311.2 | 53.5 | 23.7 | 135.9 |
| | 10 | 185.4 | 31.9 | 33.5 | 81.1 | 233.9 | 40.2 | 18.7 | 98.3 | 281.5 | 48.4 | 21.7 | 121.5 | 321.4 | 55.3 | 25.3 | 137.2 |

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)

CFR: Chilled Water Flow Rate at 5°C ($m^3/h$)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

## Performance Table (cont.)

| | | RHU2E160AG2 | | | | RHU2E180AG2 | | | | RHU2E210AG2 | | | | RHU2E240AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABT | COT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT | CCAP | CFR | CPD | IPT |
| 25 | 5 | 401.8 | 69.1 | 39.3 | 107.6 | 457.5 | 78.7 | 25.4 | 120.9 | 522.4 | 89.8 | 29.6 | 136.6 | 602.7 | 103.7 | 39.3 | 161.4 |
| | 6 | 415.2 | 71.4 | 41.9 | 108.9 | 472.7 | 81.3 | 27.1 | 122.3 | 539.8 | 92.8 | 31.6 | 138.2 | 622.8 | 107.1 | 41.9 | 163.3 |
| | 7 | 428.6 | 73.7 | 44.7 | 110.1 | 488.0 | 83.9 | 28.8 | 123.8 | 557.2 | 95.8 | 33.7 | 139.8 | 643.0 | 110.6 | 44.7 | 165.2 |
| | 8 | 442.1 | 76.0 | 47.5 | 111.4 | 503.3 | 86.6 | 30.6 | 125.2 | 574.7 | 98.8 | 35.8 | 141.4 | 663.1 | 114.0 | 47.5 | 167.1 |
| | 9 | 455.5 | 78.3 | 50.4 | 112.7 | 518.5 | 89.2 | 32.4 | 126.6 | 592.1 | 101.8 | 38.0 | 143.0 | 683.2 | 117.5 | 50.4 | 169.0 |
| | 10 | 468.9 | 80.6 | 53.3 | 113.9 | 533.8 | 91.8 | 34.3 | 128.0 | 609.5 | 104.8 | 40.2 | 144.6 | 703.3 | 121.0 | 53.3 | 170.9 |
| | 11 | 482.3 | 83.0 | 56.4 | 115.2 | 549.1 | 94.4 | 36.3 | 129.5 | 627.0 | 107.8 | 42.5 | 146.2 | 723.4 | 124.4 | 56.4 | 172.8 |
| | 12 | 495.7 | 85.3 | 59.5 | 116.5 | 564.3 | 97.1 | 38.3 | 130.9 | 644.4 | 110.8 | 44.9 | 147.8 | 743.5 | 127.9 | 59.5 | 174.7 |
| | 13 | 509.1 | 87.6 | 62.8 | 117.7 | 579.6 | 99.7 | 40.3 | 132.3 | 661.8 | 113.8 | 47.3 | 149.4 | 763.6 | 131.3 | 62.8 | 176.6 |
| | 14 | 522.5 | 89.9 | 66.1 | 119.0 | 594.9 | 102.3 | 42.5 | 133.7 | 679.3 | 116.8 | 49.8 | 151.0 | 783.8 | 134.8 | 66.1 | 178.5 |
| | 15 | 535.9 | 92.2 | 69.5 | 120.3 | 610.1 | 104.9 | 44.6 | 135.2 | 696.7 | 119.8 | 52.3 | 152.7 | 803.9 | 138.3 | 69.5 | 180.4 |
| 30 | 5 | 388.2 | 66.8 | 36.7 | 117.8 | 442.0 | 76.0 | 23.7 | 132.3 | 504.7 | 86.8 | 27.7 | 149.5 | 582.3 | 100.2 | 36.7 | 176.6 |
| | 6 | 401.5 | 69.1 | 39.3 | 119.1 | 457.1 | 78.6 | 25.3 | 133.8 | 522.0 | 89.8 | 29.6 | 151.1 | 602.3 | 103.6 | 39.3 | 178.6 |
| | 7 | 414.8 | 71.3 | 41.9 | 120.4 | 472.3 | 81.2 | 27.0 | 135.3 | 539.3 | 92.8 | 31.5 | 152.8 | 622.2 | 107.0 | 41.9 | 180.6 |
| | 8 | 428.1 | 73.6 | 44.6 | 121.7 | 487.4 | 83.8 | 28.7 | 136.8 | 556.5 | 95.7 | 33.6 | 154.5 | 642.2 | 110.5 | 44.6 | 182.5 |
| | 9 | 441.4 | 75.9 | 47.3 | 123.0 | 502.5 | 86.4 | 30.5 | 138.2 | 573.8 | 98.7 | 35.7 | 156.1 | 662.1 | 113.9 | 47.3 | 184.5 |
| | 10 | 454.7 | 78.2 | 50.2 | 124.3 | 517.7 | 89.0 | 32.3 | 139.7 | 591.1 | 101.7 | 37.8 | 157.8 | 682.0 | 117.3 | 50.2 | 186.5 |
| | 11 | 468.0 | 80.5 | 53.1 | 125.6 | 532.8 | 91.6 | 34.2 | 141.2 | 608.4 | 104.6 | 40.0 | 159.4 | 702.0 | 120.7 | 53.1 | 188.4 |
| | 12 | 481.3 | 82.8 | 56.2 | 126.9 | 547.9 | 94.2 | 36.1 | 142.7 | 625.7 | 107.6 | 42.3 | 161.1 | 721.9 | 124.2 | 56.2 | 190.4 |
| | 13 | 494.6 | 85.1 | 59.3 | 128.2 | 563.1 | 96.8 | 38.1 | 144.1 | 642.9 | 110.6 | 44.7 | 162.8 | 741.9 | 127.6 | 59.3 | 192.4 |
| | 14 | 507.9 | 87.4 | 62.5 | 129.6 | 578.2 | 99.4 | 40.2 | 145.6 | 660.2 | 113.6 | 47.1 | 164.4 | 761.8 | 131.0 | 62.5 | 194.3 |
| | 15 | 521.2 | 89.6 | 65.7 | 130.9 | 593.3 | 102.1 | 42.2 | 147.1 | 677.5 | 116.5 | 49.5 | 166.1 | 781.7 | 134.5 | 65.7 | 196.3 |
| 35 | 5 | 364.3 | 62.7 | 32.4 | 127.3 | 414.8 | 71.3 | 20.9 | 143.1 | 473.6 | 81.5 | 24.4 | 161.6 | 546.5 | 94.0 | 32.4 | 190.9 |
| | 6 | 377.2 | 64.9 | 34.7 | 128.6 | 429.4 | 73.9 | 22.4 | 144.6 | 490.3 | 84.3 | 26.1 | 163.3 | 565.8 | 97.3 | 34.7 | 193.0 |
| | 7 | 390.0 | 67.1 | 37.1 | 130.0 | 444.0 | 76.4 | 23.9 | 146.1 | 507.0 | 87.2 | 27.9 | 165.0 | 585.0 | 100.6 | 37.1 | 195.0 |
| | 8 | 402.8 | 69.3 | 39.5 | 131.4 | 458.6 | 78.9 | 25.5 | 147.6 | 523.7 | 90.1 | 29.8 | 166.7 | 604.2 | 103.9 | 39.5 | 197.0 |
| | 9 | 415.7 | 71.5 | 42.0 | 132.7 | 473.2 | 81.4 | 27.1 | 149.1 | 540.4 | 92.9 | 31.7 | 168.4 | 623.5 | 107.2 | 42.0 | 199.1 |
| | 10 | 428.5 | 73.7 | 44.6 | 134.1 | 487.8 | 83.9 | 28.8 | 150.7 | 557.0 | 95.8 | 33.6 | 170.1 | 642.7 | 110.6 | 44.6 | 201.1 |
| | 11 | 441.3 | 75.9 | 47.3 | 135.4 | 502.4 | 86.4 | 30.5 | 152.2 | 573.7 | 98.7 | 35.7 | 171.9 | 662.0 | 113.9 | 47.3 | 203.1 |
| | 12 | 454.2 | 78.1 | 50.1 | 136.8 | 517.1 | 88.9 | 32.3 | 153.7 | 590.4 | 101.6 | 37.7 | 173.6 | 681.2 | 117.2 | 50.1 | 205.1 |
| | 13 | 467.0 | 80.3 | 52.9 | 138.1 | 531.7 | 91.4 | 34.1 | 155.2 | 607.1 | 104.4 | 39.9 | 175.3 | 700.5 | 120.5 | 52.9 | 207.2 |
| | 14 | 479.8 | 82.5 | 55.8 | 139.5 | 546.3 | 94.0 | 35.9 | 156.7 | 623.8 | 107.3 | 42.1 | 177.0 | 719.7 | 123.8 | 55.8 | 209.2 |
| | 15 | 492.7 | 84.7 | 58.8 | 140.8 | 560.9 | 96.5 | 37.8 | 158.2 | 640.5 | 110.2 | 44.3 | 178.7 | 739.0 | 127.1 | 58.8 | 211.2 |
| 40 | 5 | 340.4 | 58.6 | 28.3 | 139.7 | 387.6 | 66.7 | 18.3 | 157.0 | 442.6 | 76.1 | 21.3 | 177.3 | 510.7 | 87.8 | 28.3 | 209.6 |
| | 6 | 352.8 | 60.7 | 30.4 | 141.1 | 401.7 | 69.1 | 19.7 | 158.6 | 458.7 | 78.9 | 22.9 | 179.1 | 529.2 | 91.0 | 30.4 | 211.7 |
| | 7 | 365.2 | 62.8 | 32.5 | 142.6 | 415.7 | 71.5 | 21.0 | 160.2 | 474.7 | 81.7 | 24.5 | 180.9 | 547.8 | 94.2 | 32.5 | 213.8 |
| | 8 | 377.6 | 64.9 | 34.8 | 144.0 | 429.8 | 73.9 | 22.4 | 161.8 | 490.8 | 84.4 | 26.2 | 182.7 | 566.3 | 97.4 | 34.8 | 216.0 |
| | 9 | 389.9 | 67.1 | 37.0 | 145.4 | 443.9 | 76.4 | 23.9 | 163.4 | 506.9 | 87.2 | 27.9 | 184.5 | 584.9 | 100.6 | 37.0 | 218.1 |
| | 10 | 402.3 | 69.2 | 39.4 | 146.8 | 458.0 | 78.8 | 25.4 | 165.0 | 523.0 | 90.0 | 29.7 | 186.4 | 603.5 | 103.8 | 39.4 | 220.2 |
| | 11 | 414.7 | 71.3 | 41.8 | 148.2 | 472.1 | 81.2 | 27.0 | 166.6 | 539.1 | 92.7 | 31.5 | 188.2 | 622.0 | 107.0 | 41.8 | 222.4 |
| | 12 | 427.1 | 73.5 | 44.3 | 149.7 | 486.2 | 83.6 | 28.6 | 168.2 | 555.2 | 95.5 | 33.4 | 190.0 | 640.6 | 110.2 | 44.3 | 224.5 |
| | 13 | 439.4 | 75.6 | 46.9 | 151.1 | 500.3 | 86.0 | 30.2 | 169.8 | 571.3 | 98.3 | 35.4 | 191.8 | 659.1 | 113.4 | 46.9 | 226.6 |
| | 14 | 451.8 | 77.7 | 49.6 | 152.5 | 514.4 | 88.5 | 31.9 | 171.4 | 587.3 | 101.0 | 37.3 | 193.6 | 677.7 | 116.6 | 49.6 | 228.8 |
| | 15 | 464.2 | 79.8 | 52.3 | 153.9 | 528.4 | 90.9 | 33.7 | 173.0 | 603.4 | 103.8 | 39.4 | 195.4 | 696.3 | 119.8 | 52.3 | 230.9 |
| 43 | 5 | 326.1 | 56.1 | 26.0 | 147.2 | 371.3 | 63.9 | 16.8 | 165.4 | 423.9 | 72.9 | 19.6 | 186.8 | 489.1 | 84.1 | 26.0 | 220.7 |
| | 6 | 338.2 | 58.2 | 28.0 | 148.6 | 385.0 | 66.2 | 18.1 | 167.0 | 439.7 | 75.6 | 21.1 | 188.6 | 507.3 | 87.3 | 28.0 | 222.9 |
| | 7 | 350.3 | 60.3 | 30.0 | 150.1 | 398.8 | 68.6 | 19.4 | 168.7 | 455.4 | 78.3 | 22.6 | 190.5 | 525.4 | 90.4 | 30.0 | 225.1 |
| | 8 | 362.4 | 62.3 | 32.0 | 151.6 | 412.6 | 71.0 | 20.7 | 170.3 | 471.1 | 81.0 | 24.2 | 192.4 | 543.6 | 93.5 | 32.0 | 227.3 |
| | 9 | 374.5 | 64.4 | 34.2 | 153.0 | 426.3 | 73.3 | 22.1 | 172.0 | 486.8 | 83.7 | 25.8 | 194.2 | 561.7 | 96.6 | 34.2 | 229.5 |
| | 10 | 386.6 | 66.5 | 36.4 | 154.5 | 440.1 | 75.7 | 23.5 | 173.6 | 502.6 | 86.4 | 27.4 | 196.1 | 579.9 | 99.7 | 36.4 | 231.7 |
| | 11 | 398.7 | 68.6 | 38.7 | 156.0 | 453.9 | 78.1 | 25.0 | 175.3 | 518.3 | 89.1 | 29.2 | 197.9 | 598.0 | 102.9 | 38.7 | 233.9 |
| | 12 | 410.8 | 70.7 | 41.1 | 157.4 | 467.7 | 80.4 | 26.5 | 176.9 | 534.0 | 91.9 | 30.9 | 199.8 | 616.2 | 106.0 | 41.1 | 236.1 |
| | 13 | 422.9 | 72.7 | 43.5 | 158.9 | 481.4 | 82.8 | 28.0 | 178.6 | 549.7 | 94.6 | 32.8 | 201.7 | 634.3 | 109.1 | 43.5 | 238.3 |
| | 14 | 435.0 | 74.8 | 46.0 | 160.3 | 495.2 | 85.2 | 29.6 | 180.2 | 565.5 | 97.3 | 34.6 | 203.5 | 652.5 | 112.2 | 46.0 | 240.5 |
| | 15 | 447.1 | 76.9 | 48.5 | 161.8 | 509.0 | 87.5 | 31.3 | 181.8 | 581.2 | 100.0 | 36.6 | 205.4 | 670.6 | 115.3 | 48.5 | 242.7 |
| 46 | 5 | 311.8 | 53.6 | 23.8 | 154.6 | 354.9 | 61.0 | 15.4 | 173.8 | 405.3 | 69.7 | 17.9 | 196.2 | 467.6 | 80.4 | 23.8 | 231.9 |
| | 6 | 323.6 | 55.7 | 25.6 | 156.1 | 368.4 | 63.4 | 16.6 | 175.5 | 420.7 | 72.4 | 19.3 | 198.2 | 485.4 | 83.5 | 25.6 | 234.2 |
| | 7 | 335.4 | 57.7 | 27.5 | 157.6 | 381.8 | 65.7 | 17.8 | 177.1 | 436.0 | 75.0 | 20.7 | 200.1 | 503.1 | 86.5 | 27.5 | 236.4 |
| | 8 | 347.2 | 59.7 | 29.5 | 159.1 | 395.3 | 68.0 | 19.0 | 178.8 | 451.4 | 77.6 | 22.2 | 202.0 | 520.8 | 89.6 | 29.5 | 238.7 |
| | 9 | 359.0 | 61.8 | 31.5 | 160.6 | 408.8 | 70.3 | 20.3 | 180.5 | 466.8 | 80.3 | 23.7 | 203.9 | 538.6 | 92.6 | 31.5 | 241.0 |
| | 10 | 370.9 | 63.8 | 33.5 | 162.2 | 422.2 | 72.6 | 21.7 | 182.2 | 482.1 | 82.9 | 25.3 | 205.8 | 556.3 | 95.7 | 33.5 | 243.2 |

Where,
ABT: Condenser Air Inlet Temperature (°C)
COT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
CFR: Chilled Water Flow Rate at 5°C ($m^3$/h)
CPD: Water Cooler Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

## 15.4. Performance Table (RHU2E-AG2) (Heating Operation)

| | | RHU2E40AG2 | | | | RHU2E50AG2 | | | | RHU2E60AG2 | | | | RHU2E70AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABTW | HOT | HCAP | HFR | CPD | IPT | HCAP | HFR | CPD | IPT | HCAP | HFR | CPD | IPT | HCAP | HFR | CPD | IPT |
| | 35 | 135.9 | 23.4 | 27.6 | 32.7 | 156.9 | 27.0 | 33.1 | 35.2 | 187.8 | 32.3 | 38.2 | 43.3 | 228.6 | 39.3 | 50.7 | 53.9 |
| | 40 | 135.4 | 23.3 | 27.4 | 35.3 | 156.3 | 26.9 | 32.8 | 38.0 | 187.1 | 32.2 | 37.9 | 46.7 | 227.7 | 39.2 | 50.3 | 58.1 |
| 15 | 45 | 134.8 | 23.2 | 27.2 | 39.4 | 155.7 | 26.8 | 32.5 | 42.4 | 186.3 | 32.0 | 37.6 | 52.1 | 226.7 | 39.0 | 49.9 | 64.8 |
| | 50 | 134.3 | 23.1 | 27.0 | 45.0 | 155.0 | 26.7 | 32.3 | 48.4 | 185.5 | 31.9 | 37.3 | 59.5 | 225.8 | 38.8 | 49.5 | 74.0 |
| | 55 | 133.7 | 23.0 | 26.7 | 52.1 | 154.4 | 26.6 | 32.0 | 56.0 | 184.7 | 31.8 | 37.0 | 68.9 | 224.9 | 38.7 | 49.1 | 85.6 |
| | 35 | 123.3 | 21.2 | 22.9 | 32.2 | 142.4 | 24.5 | 27.4 | 34.7 | 170.4 | 29.3 | 31.5 | 42.6 | 207.4 | 35.7 | 41.9 | 53.0 |
| | 40 | 122.2 | 21.0 | 22.5 | 34.8 | 141.1 | 24.3 | 26.9 | 37.5 | 168.8 | 29.0 | 31.0 | 46.1 | 205.5 | 35.3 | 41.1 | 57.3 |
| 10 | 45 | 121.0 | 20.8 | 22.0 | 38.8 | 139.7 | 24.0 | 26.4 | 41.7 | 167.2 | 28.8 | 30.4 | 51.3 | 203.6 | 35.0 | 40.3 | 63.8 |
| | 50 | 119.9 | 20.6 | 21.6 | 44.1 | 138.4 | 23.8 | 25.9 | 47.4 | 165.7 | 28.5 | 29.8 | 58.4 | 201.6 | 34.7 | 39.6 | 72.5 |
| | 55 | 118.7 | 20.4 | 21.3 | 50.8 | 137.1 | 23.6 | 25.4 | 54.6 | 164.1 | 28.2 | 29.3 | 67.2 | 199.7 | 34.3 | 38.8 | 83.5 |
| 6 | 45 | 110.0 | 18.9 | 18.3 | 38.3 | 127.0 | 21.8 | 21.9 | 41.2 | 152.0 | 26.1 | 25.2 | 50.7 | 185.0 | 31.8 | 33.4 | 63.0 |
| | 35 | 110.7 | 19.0 | 18.5 | 31.7 | 127.8 | 22.0 | 22.2 | 34.1 | 153.0 | 26.3 | 25.5 | 41.9 | 186.2 | 32.0 | 33.8 | 52.1 |
| | 40 | 109.0 | 18.7 | 18.0 | 34.3 | 125.8 | 21.6 | 21.5 | 36.9 | 150.6 | 25.9 | 24.7 | 45.4 | 183.3 | 31.5 | 32.8 | 56.5 |
| 5 | 45 | 107.2 | 18.4 | 17.4 | 38.2 | 123.8 | 21.3 | 20.9 | 41.1 | 148.2 | 25.5 | 24.0 | 50.5 | 180.4 | 31.0 | 31.8 | 62.8 |
| | 50 | 105.5 | 18.1 | 16.9 | 43.2 | 121.8 | 21.0 | 20.2 | 46.5 | 145.8 | 25.1 | 23.2 | 57.2 | 177.5 | 30.5 | 30.8 | 71.1 |
| | 55 | 103.8 | 17.9 | 16.4 | 49.5 | 119.8 | 20.6 | 19.6 | 53.2 | 143.4 | 24.7 | 22.5 | 65.5 | 174.6 | 30.0 | 29.8 | 81.4 |
| | 35 | 98.1 | 16.9 | 14.7 | 31.2 | 113.2 | 19.5 | 17.5 | 33.5 | 135.5 | 23.3 | 20.1 | 41.2 | 164.9 | 28.4 | 26.6 | 51.3 |
| | 40 | 95.8 | 16.5 | 14.0 | 33.8 | 110.6 | 19.0 | 16.7 | 36.4 | 132.3 | 22.8 | 19.2 | 44.8 | 161.1 | 27.7 | 25.4 | 55.7 |
| 0 | 45 | 93.5 | 16.1 | 13.4 | 37.6 | 107.9 | 18.6 | 16.0 | 40.4 | 129.1 | 22.2 | 18.3 | 49.7 | 157.2 | 27.0 | 24.2 | 61.8 |
| | 50 | 91.1 | 15.7 | 12.7 | 42.4 | 105.2 | 18.1 | 15.2 | 45.6 | 126.0 | 21.7 | 17.4 | 56.1 | 153.3 | 26.4 | 23.0 | 69.7 |
| | 55 | 88.8 | 15.3 | 12.1 | 48.2 | 102.6 | 17.6 | 14.5 | 51.8 | 122.8 | 21.1 | 16.6 | 63.8 | 149.4 | 25.7 | 21.9 | 79.3 |
| | 35 | 85.4 | 14.7 | 11.2 | 30.6 | 98.7 | 17.0 | 13.4 | 33.0 | 118.1 | 20.3 | 15.4 | 40.6 | 143.7 | 24.7 | 20.3 | 50.4 |
| | 40 | 82.6 | 14.2 | 10.5 | 33.4 | 95.3 | 16.4 | 12.5 | 35.9 | 114.1 | 19.6 | 14.4 | 44.2 | 138.8 | 23.9 | 18.9 | 54.9 |
| -5 | 45 | 79.7 | 13.7 | 9.8 | 37.0 | 92.0 | 15.8 | 11.7 | 39.8 | 110.1 | 18.9 | 13.4 | 48.9 | 134.0 | 23.0 | 17.6 | 60.8 |
| | 50 | 76.8 | 13.2 | 9.1 | 41.5 | 88.6 | 15.2 | 10.9 | 44.6 | 106.1 | 18.2 | 12.5 | 54.9 | 129.1 | 22.2 | 16.4 | 68.2 |
| | 55 | 73.9 | 12.7 | 8.5 | 46.9 | 85.3 | 14.7 | 10.1 | 50.4 | 102.1 | 17.6 | 11.5 | 62.1 | 124.3 | 21.4 | 15.2 | 77.1 |
| | 35 | 72.8 | 12.5 | 8.2 | 30.1 | 84.1 | 14.5 | 9.8 | 32.4 | 100.6 | 17.3 | 11.2 | 39.9 | 122.5 | 21.1 | 14.8 | 49.5 |
| | 40 | 69.4 | 11.9 | 7.5 | 32.9 | 80.1 | 13.8 | 8.9 | 35.4 | 95.8 | 16.5 | 10.2 | 43.5 | 116.6 | 20.1 | 13.4 | 54.1 |
| -10 | 45 | 65.9 | 11.3 | 6.8 | 36.4 | 76.1 | 13.1 | 8.1 | 39.1 | 91.0 | 15.7 | 9.2 | 48.1 | 110.8 | 19.1 | 12.1 | 59.8 |
| | 50 | 62.4 | 10.7 | 6.1 | 40.6 | 72.1 | 12.4 | 7.3 | 43.7 | 86.2 | 14.8 | 8.3 | 53.8 | 105.0 | 18.1 | 10.9 | 66.8 |
| | 55 | 58.9 | 10.1 | 5.5 | 45.6 | 68.0 | 11.7 | 6.5 | 49.1 | 81.4 | 14.0 | 7.4 | 60.4 | 99.1 | 17.0 | 9.7 | 75.0 |
| | 35 | 54.2 | 9.3 | 4.6 | 29.6 | 62.6 | 10.8 | 5.5 | 31.8 | 74.9 | 12.9 | 6.3 | 39.2 | 91.1 | 15.7 | 8.2 | 48.7 |
| | 40 | 50.5 | 8.7 | 4.1 | 32.4 | 58.3 | 10.0 | 4.8 | 34.8 | 69.8 | 12.0 | 5.5 | 42.9 | 85.0 | 14.6 | 7.2 | 53.3 |
| -15 | 45 | 46.9 | 8.1 | 3.5 | 35.8 | 54.1 | 9.3 | 4.2 | 38.5 | 64.8 | 11.1 | 4.7 | 47.3 | 78.9 | 13.6 | 6.2 | 58.8 |
| | 50 | 43.2 | 7.4 | 3.0 | 39.7 | 49.9 | 8.6 | 3.6 | 42.7 | 59.7 | 10.3 | 4.0 | 52.6 | 72.7 | 12.5 | 5.3 | 65.4 |
| | 55 | 39.6 | 6.8 | 2.5 | 44.3 | 45.7 | 7.9 | 3.0 | 47.7 | 54.7 | 9.4 | 3.4 | 58.7 | 66.6 | 11.5 | 4.4 | 72.9 |

Where,
ABTW: Evaporator Air Inlet Temperature (°C)
HOT: Heated Water Outlet Temperature (°C)
HCAP: Heating Capacity (kW)

HFR: Heated Water Flow Rate at 5°C ($m^3/h$)
CPD: Water Heat Exchanger Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

## Performance Table (cont.)

| | | RHU2E80AG2 | | | | RHU2E100AG2 | | | | RHU2E120AG2 | | | | RHU2E140AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABTW | HOT | HCAP | HFR | CPD | IPT | HCAP | HFR | CPD | IPT | HCAP | HFR | CPD | IPT | HCAP | HFR | CPD | IPT |
| | 35 | 228.6 | 39.3 | 50.7 | 53.9 | 313.9 | 54.0 | 33.1 | 70.4 | 375.7 | 64.6 | 38.2 | 86.7 | 457.2 | 78.6 | 50.7 | 107.7 |
| | 40 | 227.7 | 39.2 | 50.3 | 58.1 | 312.6 | 53.8 | 32.8 | 76.0 | 374.1 | 64.4 | 37.9 | 93.5 | 455.4 | 78.3 | 50.3 | 116.2 |
| 15 | 45 | 226.7 | 39.0 | 49.9 | 64.8 | 311.3 | 53.5 | 32.5 | 84.7 | 372.6 | 64.1 | 37.6 | 104.3 | 453.5 | 78.0 | 49.9 | 129.6 |
| | 50 | 225.8 | 38.8 | 49.5 | 74.0 | 310.0 | 53.3 | 32.3 | 96.8 | 371.0 | 63.8 | 37.3 | 119.1 | 451.6 | 77.7 | 49.5 | 147.9 |
| | 55 | 224.9 | 38.7 | 49.1 | 85.6 | 308.7 | 53.1 | 32.0 | 112.0 | 369.5 | 63.6 | 37.0 | 137.8 | 449.7 | 77.4 | 49.1 | 171.3 |
| | 35 | 207.4 | 35.7 | 41.9 | 53.0 | 284.7 | 49.0 | 27.4 | 69.3 | 340.8 | 58.6 | 31.5 | 85.3 | 414.8 | 71.3 | 41.9 | 106.0 |
| | 40 | 205.5 | 35.3 | 41.1 | 57.3 | 282.1 | 48.5 | 26.9 | 74.9 | 337.6 | 58.1 | 31.0 | 92.2 | 410.9 | 70.7 | 41.1 | 114.6 |
| 10 | 45 | 203.6 | 35.0 | 40.3 | 63.8 | 279.5 | 48.1 | 26.4 | 83.4 | 334.5 | 57.5 | 30.4 | 102.7 | 407.1 | 70.0 | 40.3 | 127.6 |
| | 50 | 201.6 | 34.7 | 39.6 | 72.5 | 276.8 | 47.6 | 25.9 | 94.9 | 331.3 | 57.0 | 29.8 | 116.8 | 403.3 | 69.4 | 39.6 | 145.1 |
| | 55 | 199.7 | 34.3 | 38.8 | 83.5 | 274.2 | 47.2 | 25.4 | 109.2 | 328.2 | 56.4 | 29.3 | 134.4 | 399.4 | 68.7 | 38.8 | 167.0 |
| 6 | 45 | 185.0 | 31.8 | 33.4 | 63.0 | 254.0 | 43.7 | 21.9 | 82.4 | 304.0 | 52.3 | 25.2 | 101.4 | 370.0 | 63.6 | 33.4 | 126.0 |
| | 35 | 186.2 | 32.0 | 33.8 | 52.1 | 255.6 | 44.0 | 22.2 | 68.2 | 305.9 | 52.6 | 25.5 | 83.9 | 372.3 | 64.0 | 33.8 | 104.2 |
| | 40 | 183.3 | 31.5 | 32.8 | 56.5 | 251.6 | 43.3 | 21.5 | 73.9 | 301.1 | 51.8 | 24.7 | 90.9 | 366.5 | 63.0 | 32.8 | 112.9 |
| 5 | 45 | 180.4 | 31.0 | 31.8 | 62.8 | 247.6 | 42.6 | 20.9 | 82.1 | 296.4 | 51.0 | 24.0 | 101.1 | 360.7 | 62.0 | 31.8 | 125.6 |
| | 50 | 177.5 | 30.5 | 30.8 | 71.1 | 243.7 | 41.9 | 20.2 | 93.0 | 291.6 | 50.2 | 23.2 | 114.4 | 354.9 | 61.0 | 30.8 | 142.2 |
| | 55 | 174.6 | 30.0 | 29.8 | 81.4 | 239.7 | 41.2 | 19.6 | 106.4 | 286.8 | 49.3 | 22.5 | 131.0 | 349.1 | 60.0 | 29.8 | 162.8 |
| | 35 | 164.9 | 28.4 | 26.6 | 51.3 | 226.5 | 38.9 | 17.5 | 67.0 | 271.0 | 46.6 | 20.1 | 82.5 | 329.9 | 56.7 | 26.6 | 102.5 |
| | 40 | 161.1 | 27.7 | 25.4 | 55.7 | 221.1 | 38.0 | 16.7 | 72.8 | 264.7 | 45.5 | 19.2 | 89.6 | 322.1 | 55.4 | 25.4 | 111.3 |
| 0 | 45 | 157.2 | 27.0 | 24.2 | 61.8 | 215.8 | 37.1 | 16.0 | 80.8 | 258.3 | 44.4 | 18.3 | 99.5 | 314.3 | 54.1 | 24.2 | 123.6 |
| | 50 | 153.3 | 26.4 | 23.0 | 69.7 | 210.5 | 36.2 | 15.2 | 91.1 | 251.9 | 43.3 | 17.4 | 112.1 | 306.6 | 52.7 | 23.0 | 139.3 |
| | 55 | 149.4 | 25.7 | 21.9 | 79.3 | 205.1 | 35.3 | 14.5 | 103.7 | 245.5 | 42.2 | 16.6 | 127.6 | 298.8 | 51.4 | 21.9 | 158.5 |
| | 35 | 143.7 | 24.7 | 20.3 | 50.4 | 197.3 | 33.9 | 13.4 | 65.9 | 236.1 | 40.6 | 15.4 | 81.1 | 287.4 | 49.4 | 20.3 | 100.8 |
| | 40 | 138.8 | 23.9 | 18.9 | 54.9 | 190.6 | 32.8 | 12.5 | 71.8 | 228.2 | 39.2 | 14.4 | 88.3 | 277.7 | 47.8 | 18.9 | 109.7 |
| -5 | 45 | 134.0 | 23.0 | 17.6 | 60.8 | 184.0 | 31.6 | 11.7 | 79.5 | 220.2 | 37.9 | 13.4 | 97.9 | 268.0 | 46.1 | 17.6 | 121.6 |
| | 50 | 129.1 | 22.2 | 16.4 | 68.2 | 177.3 | 30.5 | 10.9 | 89.2 | 212.2 | 36.5 | 12.5 | 109.8 | 258.3 | 44.4 | 16.4 | 136.5 |
| | 55 | 124.3 | 21.4 | 15.2 | 77.1 | 170.6 | 29.3 | 10.1 | 100.9 | 204.2 | 35.1 | 11.5 | 124.2 | 248.5 | 42.7 | 15.2 | 154.3 |
| | 35 | 122.5 | 21.1 | 14.8 | 49.5 | 168.2 | 28.9 | 9.8 | 64.8 | 201.3 | 34.6 | 11.2 | 79.7 | 245.0 | 42.1 | 14.8 | 99.0 |
| | 40 | 116.6 | 20.1 | 13.4 | 54.1 | 160.1 | 27.5 | 8.9 | 70.7 | 191.7 | 33.0 | 10.2 | 87.0 | 233.3 | 40.1 | 13.4 | 108.1 |
| -10 | 45 | 110.8 | 19.1 | 12.1 | 59.8 | 152.1 | 26.2 | 8.1 | 78.2 | 182.1 | 31.3 | 9.2 | 96.3 | 221.6 | 38.1 | 12.1 | 119.6 |
| | 50 | 105.0 | 18.1 | 10.9 | 66.8 | 144.1 | 24.8 | 7.3 | 87.4 | 172.5 | 29.7 | 8.3 | 107.5 | 209.9 | 36.1 | 10.9 | 133.6 |
| | 55 | 99.1 | 17.0 | 9.7 | 75.0 | 136.1 | 23.4 | 6.5 | 98.1 | 162.9 | 28.0 | 7.4 | 120.7 | 198.2 | 34.1 | 9.7 | 150.0 |
| | 35 | 91.1 | 15.7 | 8.2 | 48.7 | 125.1 | 21.5 | 5.5 | 63.6 | 149.7 | 25.8 | 6.3 | 78.3 | 182.3 | 31.3 | 8.2 | 97.3 |
| | 40 | 85.0 | 14.6 | 7.2 | 53.3 | 116.7 | 20.1 | 4.8 | 69.6 | 139.7 | 24.0 | 5.5 | 85.7 | 170.0 | 29.2 | 7.2 | 106.5 |
| -15 | 45 | 78.9 | 13.6 | 6.2 | 58.8 | 108.3 | 18.6 | 4.2 | 76.9 | 129.6 | 22.3 | 4.7 | 94.7 | 157.7 | 27.1 | 6.2 | 117.6 |
| | 50 | 72.7 | 12.5 | 5.3 | 65.4 | 99.8 | 17.2 | 3.6 | 85.5 | 119.5 | 20.6 | 4.0 | 105.2 | 145.4 | 25.0 | 5.3 | 130.7 |
| | 55 | 66.6 | 11.5 | 4.4 | 72.9 | 91.4 | 15.7 | 3.0 | 95.3 | 109.4 | 18.8 | 3.4 | 117.3 | 133.1 | 22.9 | 4.4 | 145.8 |

Where,
ABTW: Evaporator Air Inlet Temperature (°C)
HOT: Heated Water Outlet Temperature (°C)
HCAP: Heating Capacity (kW)

HFR: Heated Water Flow Rate at 5°C ($m^3$/h)
CPD: Water Heat Exchanger Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

## Performance Table (cont.)

| | | RHU2E160AG2 | | | | RHU2E180AG2 | | | | RHU2E210AG2 | | | | RHU2E240AG2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABTW | HOT | HCAP | HFR | CPD | IPT | HCAP | HFR | CPD | IPT | HCAP | HFR | CPD | IPT | HCAP | HFR | CPD | IPT |
| 15 | 35 | 457.2 | 78.6 | 50.7 | 107.7 | 563.5 | 96.9 | 38.2 | 130.0 | 685.9 | 118.0 | 50.7 | 161.6 | 685.9 | 118.0 | 50.7 | 161.6 |
| | 40 | 455.4 | 78.3 | 50.3 | 116.2 | 561.2 | 96.5 | 37.9 | 140.2 | 683.0 | 117.5 | 50.3 | 174.3 | 683.0 | 117.5 | 50.3 | 174.3 |
| | 45 | 453.5 | 78.0 | 49.9 | 129.6 | 558.9 | 96.1 | 37.6 | 156.4 | 680.2 | 117.0 | 49.9 | 194.4 | 680.2 | 117.0 | 49.9 | 194.4 |
| | 50 | 451.6 | 77.7 | 49.5 | 147.9 | 556.6 | 95.7 | 37.3 | 178.6 | 677.4 | 116.5 | 49.5 | 221.9 | 677.4 | 116.5 | 49.5 | 221.9 |
| | 55 | 449.7 | 77.4 | 49.1 | 171.3 | 554.2 | 95.3 | 37.0 | 206.7 | 674.6 | 116.0 | 49.1 | 256.9 | 674.6 | 116.0 | 49.1 | 256.9 |
| 10 | 35 | 414.8 | 71.3 | 41.9 | 106.0 | 511.2 | 87.9 | 31.5 | 127.9 | 622.2 | 107.0 | 41.9 | 159.0 | 622.2 | 107.0 | 41.9 | 159.0 |
| | 40 | 410.9 | 70.7 | 41.1 | 114.6 | 506.5 | 87.1 | 31.0 | 138.3 | 616.4 | 106.0 | 41.1 | 171.8 | 616.4 | 106.0 | 41.1 | 171.8 |
| | 45 | 407.1 | 70.0 | 40.3 | 127.6 | 501.7 | 86.3 | 30.4 | 154.0 | 610.7 | 105.0 | 40.3 | 191.4 | 610.7 | 105.0 | 40.3 | 191.4 |
| | 50 | 403.3 | 69.4 | 39.6 | 145.1 | 497.0 | 85.5 | 29.8 | 175.1 | 604.9 | 104.0 | 39.6 | 217.6 | 604.9 | 104.0 | 39.6 | 217.6 |
| | 55 | 399.4 | 68.7 | 38.8 | 167.0 | 492.3 | 84.7 | 29.3 | 201.6 | 599.1 | 103.0 | 38.8 | 250.5 | 599.1 | 103.0 | 38.8 | 250.5 |
| 6 | 45 | 370.0 | 63.6 | 33.4 | 126.0 | 456.0 | 78.4 | 25.2 | 152.1 | 555.0 | 95.5 | 33.4 | 189.0 | 555.0 | 95.5 | 33.4 | 189.0 |
| 5 | 35 | 372.3 | 64.0 | 33.8 | 104.2 | 458.9 | 78.9 | 25.5 | 125.8 | 558.5 | 96.1 | 33.8 | 156.4 | 558.5 | 96.1 | 33.8 | 156.4 |
| | 40 | 366.5 | 63.0 | 32.8 | 112.9 | 451.7 | 77.7 | 24.7 | 136.3 | 549.8 | 94.6 | 32.8 | 169.4 | 549.8 | 94.6 | 32.8 | 169.4 |
| | 45 | 360.7 | 62.0 | 31.8 | 125.6 | 444.6 | 76.5 | 24.0 | 151.6 | 541.1 | 93.1 | 31.8 | 188.4 | 541.1 | 93.1 | 31.8 | 188.4 |
| | 50 | 354.9 | 61.0 | 30.8 | 142.2 | 437.4 | 75.2 | 23.2 | 171.7 | 532.4 | 91.6 | 30.8 | 213.3 | 532.4 | 91.6 | 30.8 | 213.3 |
| | 55 | 349.1 | 60.0 | 29.8 | 162.8 | 430.3 | 74.0 | 22.5 | 196.5 | 523.7 | 90.1 | 29.8 | 244.1 | 523.7 | 90.1 | 29.8 | 244.1 |
| 0 | 35 | 329.9 | 56.7 | 26.6 | 102.5 | 406.5 | 69.9 | 20.1 | 123.7 | 494.8 | 85.1 | 26.6 | 153.8 | 494.8 | 85.1 | 26.6 | 153.8 |
| | 40 | 322.1 | 55.4 | 25.4 | 111.3 | 397.0 | 68.3 | 19.2 | 134.4 | 483.2 | 83.1 | 25.4 | 167.0 | 483.2 | 83.1 | 25.4 | 167.0 |
| | 45 | 314.3 | 54.1 | 24.2 | 123.6 | 387.4 | 66.6 | 18.3 | 149.2 | 471.5 | 81.1 | 24.2 | 185.4 | 471.5 | 81.1 | 24.2 | 185.4 |
| | 50 | 306.6 | 52.7 | 23.0 | 139.3 | 377.9 | 65.0 | 17.4 | 168.2 | 459.9 | 79.1 | 23.0 | 209.0 | 459.9 | 79.1 | 23.0 | 209.0 |
| | 55 | 298.8 | 51.4 | 21.9 | 158.5 | 368.3 | 63.3 | 16.6 | 191.4 | 448.2 | 77.1 | 21.9 | 237.8 | 448.2 | 77.1 | 21.9 | 237.8 |
| -5 | 35 | 287.4 | 49.4 | 20.3 | 100.8 | 354.2 | 60.9 | 15.4 | 121.7 | 431.1 | 74.2 | 20.3 | 151.2 | 431.1 | 74.2 | 20.3 | 151.2 |
| | 40 | 277.7 | 47.8 | 18.9 | 109.7 | 342.2 | 58.9 | 14.4 | 132.5 | 416.5 | 71.6 | 18.9 | 164.6 | 416.5 | 71.6 | 18.9 | 164.6 |
| | 45 | 268.0 | 46.1 | 17.6 | 121.6 | 330.3 | 56.8 | 13.4 | 146.8 | 402.0 | 69.1 | 17.6 | 182.4 | 402.0 | 69.1 | 17.6 | 182.4 |
| | 50 | 258.3 | 44.4 | 16.4 | 136.5 | 318.3 | 54.7 | 12.5 | 164.7 | 387.4 | 66.6 | 16.4 | 204.7 | 387.4 | 66.6 | 16.4 | 204.7 |
| | 55 | 248.5 | 42.7 | 15.2 | 154.3 | 306.3 | 52.7 | 11.5 | 186.2 | 372.8 | 64.1 | 15.2 | 231.4 | 372.8 | 64.1 | 15.2 | 231.4 |
| -10 | 35 | 245.0 | 42.1 | 14.8 | 99.0 | 301.9 | 51.9 | 11.2 | 119.6 | 367.4 | 63.2 | 14.8 | 148.6 | 367.4 | 63.2 | 14.8 | 148.6 |
| | 40 | 233.3 | 40.1 | 13.4 | 108.1 | 287.5 | 49.5 | 10.2 | 130.5 | 349.9 | 60.2 | 13.4 | 162.2 | 349.9 | 60.2 | 13.4 | 162.2 |
| | 45 | 221.6 | 38.1 | 12.1 | 119.6 | 273.1 | 47.0 | 9.2 | 144.4 | 332.4 | 57.2 | 12.1 | 179.5 | 332.4 | 57.2 | 12.1 | 179.5 |
| | 50 | 209.9 | 36.1 | 10.9 | 133.6 | 258.7 | 44.5 | 8.3 | 161.3 | 314.9 | 54.2 | 10.9 | 200.4 | 314.9 | 54.2 | 10.9 | 200.4 |
| | 55 | 198.2 | 34.1 | 9.7 | 150.0 | 244.3 | 42.0 | 7.4 | 181.1 | 297.4 | 51.1 | 9.7 | 225.0 | 297.4 | 51.1 | 9.7 | 225.0 |
| -15 | 35 | 182.3 | 31.3 | 8.2 | 97.3 | 224.6 | 38.6 | 6.3 | 117.5 | 273.4 | 47.0 | 8.2 | 146.0 | 273.4 | 47.0 | 8.2 | 146.0 |
| | 40 | 170.0 | 29.2 | 7.2 | 106.5 | 209.5 | 36.0 | 5.5 | 128.6 | 255.0 | 43.9 | 7.2 | 159.8 | 255.0 | 43.9 | 7.2 | 159.8 |
| | 45 | 157.7 | 27.1 | 6.2 | 117.6 | 194.4 | 33.4 | 4.7 | 142.0 | 236.6 | 40.7 | 6.2 | 176.5 | 236.6 | 40.7 | 6.2 | 176.5 |
| | 50 | 145.4 | 25.0 | 5.3 | 130.7 | 179.2 | 30.8 | 4.0 | 157.8 | 218.1 | 37.5 | 5.3 | 196.1 | 218.1 | 37.5 | 5.3 | 196.1 |
| | 55 | 133.1 | 22.9 | 4.4 | 145.8 | 164.1 | 28.2 | 3.4 | 176.0 | 199.7 | 34.4 | 4.4 | 218.7 | 199.7 | 34.4 | 4.4 | 218.7 |

Where,
ABTW: Evaporator Air Inlet Temperature (°C)
HOT: Heated Water Outlet Temperature (°C)
HCAP: Heating Capacity (kW)

HFR: Heated Water Flow Rate at 5°C ($m^3/h$)
CPD: Water Heat Exchanger Pressure Drop (kPa)
IPT: Compressor Input Power (kW)

Conversion Multiplier:
1 kW = 860 kcal/h
= 3412 Btu/h
1 kPa = 0.102 mAq

## 15.5. Electrical Data

### ◆ Air-Cooled Water Chiller units (RCU2E-AG2)

| Model | Unit Main Power | | | Applicable Instantaneous Voltage (V) | | Compressor Motor | | | Condenser Fan Motor | | Maximum Unit Current | STC*2 Unit Maximum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | STC*1 | RNC | IPT | RNC | IPT | | |
| | Ph | (V) | (Hz) | Maximum | Minimum | (A) | (A) | (kW) | (A) | (kW) | (A) | (A) |
| RCU2E40AG2 | 3N~ | 400 | 50 | 440 | 360 | 125 | 60,1 | 36,2 | 12,0 | 2,4 | 94 | 125 |
| RCU2E50AG2 | 3N~ | 400 | 50 | 440 | 360 | 125 | 68,7 | 41,4 | 12,0 | 3,3 | 105 | 125 |
| RCU2E60AG2 | 3N~ | 400 | 50 | 440 | 360 | 161 | 82,5 | 49,7 | 12,0 | 3,3 | 123 | 161 |
| RCU2E70AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 92,9 | 56,0 | 12,0 | 5,0 | 137 | 195 |
| RCU2E80AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 108 | 65,0 | 12,0 | 5,0 | 157 | 195 |
| RCU2E100AG2 | 3N~ | 400 | 50 | 440 | 360 | 125 | 137 | 82,8 | 24,0 | 6,6 | 211 | 154 |
| RCU2E120AG2 | 3N~ | 400 | 50 | 440 | 360 | 161 | 165 | 99,4 | 24,0 | 6,6 | 247 | 194 |
| RCU2E140AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 186 | 112 | 24,0 | 10,0 | 274 | 230 |
| RCU2E160AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 216 | 130 | 24,0 | 10,0 | 314 | 230 |
| RCU2E180AG2 | 3N~ | 400 | 50 | 440 | 360 | 161 | 247 | 149 | 36,0 | 9,9 | 370 | 226 |
| RCU2E210AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 279 | 168 | 36,0 | 15,0 | 412 | 265 |
| RCU2E240AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 324 | 195 | 36,0 | 15,0 | 471 | 265 |
| RCU2E280AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 372 | 224 | 48,0 | 20,0 | 549 | 301 |
| RCU2E320AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 431 | 260 | 48,0 | 20,0 | 628 | 301 |
| RCU2E350AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 465 | 280 | 60,0 | 25,0 | 686 | 336 |
| RCU2E400AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 539 | 325 | 60,0 | 25,0 | 784 | 336 |

**RNC:** Running Current (A)
**STC:** Starting Current (A)
**IPT:** Input (kW)
**Ph:** Nº of phases

***NOTES:***

1. *This data is based on the following conditions:*
   *Chilled Water Inlet/Outlet Temperature: 12/7ºC, Ambient Temperature: 35ºC.*
2. *The "Maximum Unit Current" shown in the above table is the maximum total unit running current at the following conditions.*
   *Supply Voltage: 90% of the rated voltage, Unit Capacity: 100% at max. operating conditions*
3. *The power supply cables must be sized to cover this maximum current value.*
4. *Starting Current (*1,*2) means as follows.*
   **1:First Compressor Starting Current*
   **2:Unit Maximum Starting Current, when Last Compressor starts.*
5. *Compressor motor is star-delta starting.*

### ◆ Air-to-Water Heat Pump Water Chiller (RHU2E-AG2)

| Model | Unit Main Power | | | Applicable Instantaneous Voltage (V) | | Compressor Motor | | | | | Air Side Heat Exchanger Fan Motor | | Maximum Unit Current | STC*2 Unit Maximum |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | STC*1 (A) | Cooling Operation | | Heating Operation | | | | | |
| | Ph | (V) | (Hz) | Maximum | Minimum | | RNC (A) | IPT (kW) | RNC (A) | IPT (kW) | RNC (A) | IPT (kW) | (A) | (A) |
| RHU2E40AG2 | 3N~ | 400 | 50 | 440 | 360 | 125 | 58.9 | 35.5 | 63.5 | 38.3 | 12.0 | 2.4 | 99 | 125 |
| RHU2E50AG2 | 3N~ | 400 | 50 | 440 | 360 | 125 | 65.4 | 39.4 | 68.4 | 41.2 | 12.0 | 3.3 | 105 | 125 |
| RHU2E60AG2 | 3N~ | 400 | 50 | 440 | 360 | 161 | 80.8 | 48.7 | 84.1 | 50.7 | 12.0 | 3.3 | 126 | 161 |
| RHU2E70AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 91.2 | 55.0 | 105 | 63.0 | 12.0 | 5.0 | 153 | 195 |
| RHU2E80AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 108 | 65.0 | 105 | 63.0 | 12.0 | 5.0 | 157 | 195 |
| RHU2E100AG2 | 3N~ | 400 | 50 | 440 | 360 | 125 | 131 | 78.8 | 137 | 82.4 | 24.0 | 6.6 | 210 | 153 |
| RHU2E120AG2 | 3N~ | 400 | 50 | 440 | 360 | 161 | 162 | 97.4 | 168 | 101 | 24.0 | 6.6 | 251 | 193 |
| RHU2E140AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 182 | 110 | 209 | 126 | 24.0 | 10.0 | 305 | 230 |
| RHU2E160AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 216 | 130 | 209 | 126 | 24.0 | 10.0 | 314 | 230 |
| RHU2E180AG2 | 3N~ | 400 | 50 | 440 | 360 | 161 | 242 | 146 | 252 | 152 | 36.0 | 9.9 | 377 | 225 |
| RHU2E210AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 274 | 165 | 314 | 189 | 36.0 | 15.0 | 458 | 265 |
| RHU2E240AG2 | 3N~ | 400 | 50 | 440 | 360 | 195 | 324 | 195 | 314 | 189 | 36.0 | 15.0 | 471 | 265 |

**RNC:** Running Current (A)
**STC:** Starting Current (A)
**IPT:** Input (kW)
**Ph:** Nº of phases

***NOTES:***

1. *This data is based on the following conditions...*
   *Cooling operation: Chilled Water Inlet/Outlet Temperature: 12/7ºC, Ambient Temperature: 35ºC.*
   *Heating operation: Hot Water Inlet/Outlet Temperature 40/45ºC. Ambient Temperature: 6ºC (WB).*
2. *The "Maximum Unit Current" shown in the above table is the maximum total unit running current at the following conditions.*
   *Supply Voltage: 90% of the rated voltage, Unit Capacity: 100% at max. operating conditions*
3. *The power supply cables must be sized to cover this maximum current value.*
4. *Starting Current (*1,*2) means as follows.*
   **1:First Compressor Starting Current*
   **2:Unit Maximum Starting Current, when Last Compressor starts.*
5. *Compressor motor is star-delta starting.*

## 15.6. Sound Data

### ◆ Standard Models

| Model | Sound Power Level (dB) | | | | | | | | Overall (dBA) |
|---|---|---|---|---|---|---|---|---|---|
| | Frequency Band (Hz) | | | | | | | | |
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| R(C/H)U2E40AG2 | 89 | 87 | 82 | 77 | 80 | 72 | 62 | 57 | 82 |
| R(C/H)U2E50AG2 | 91 | 89 | 84 | 79 | 80 | 72 | 63 | 59 | 83 |
| R(C/H)U2E60AG2 | 91 | 89 | 84 | 79 | 82 | 74 | 64 | 59 | 84 |
| R(C/H)U2E70AG2 | 92 | 90 | 85 | 83 | 81 | 74 | 64 | 60 | 85 |
| R(C/H)U2E80AG2 | 92 | 90 | 85 | 83 | 81 | 74 | 64 | 60 | 85 |
| R(C/H)U2E100AG2 | 94 | 92 | 87 | 82 | 83 | 75 | 66 | 62 | 86 |
| R(C/H)U2E120AG2 | 94 | 92 | 87 | 82 | 85 | 77 | 67 | 62 | 87 |
| R(C/H)U2E140AG2 | 95 | 93 | 88 | 86 | 84 | 77 | 67 | 63 | 88 |
| R(C/H)U2E160AG2 | 95 | 93 | 88 | 86 | 84 | 77 | 67 | 63 | 88 |
| R(C/H)U2E180AG2 | 96 | 94 | 89 | 87 | 85 | 78 | 68 | 64 | 89 |
| R(C/H)U2E210AG2 | 98 | 96 | 91 | 89 | 87 | 80 | 70 | 66 | 91 |
| R(C/H)U2E240AG2 | 98 | 96 | 91 | 89 | 87 | 80 | 70 | 66 | 91 |
| RCU2E280AG2 | 99 | 97 | 92 | 90 | 88 | 81 | 71 | 67 | 92 |
| RCU2E320AG2 | 99 | 97 | 92 | 90 | 88 | 81 | 71 | 67 | 92 |
| RCU2E350AG2 | 101 | 99 | 94 | 92 | 90 | 83 | 73 | 69 | 94 |
| RCU2E400AG2 | 101 | 99 | 94 | 92 | 90 | 83 | 73 | 69 | 94 |

### ◆ Low Noise Option

| Model | Sound Power Level (dB) | | | | | | | | Overall (dBA) |
|---|---|---|---|---|---|---|---|---|---|
| | Frequency Band (Hz) | | | | | | | | |
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| R(C/H)U2E40AG2 | 87 | 85 | 80 | 75 | 78 | 70 | 60 | 55 | 80 |
| R(C/H)U2E50AG2 | 89 | 87 | 82 | 77 | 78 | 70 | 61 | 57 | 81 |
| R(C/H)U2E60AG2 | 89 | 87 | 82 | 77 | 80 | 72 | 62 | 57 | 82 |
| R(C/H)U2E70AG2 | 90 | 88 | 83 | 81 | 79 | 72 | 62 | 58 | 83 |
| R(C/H)U2E80AG2 | 90 | 88 | 83 | 81 | 79 | 72 | 62 | 58 | 83 |
| R(C/H)U2E100AG2 | 92 | 90 | 85 | 80 | 81 | 73 | 64 | 60 | 84 |
| R(C/H)U2E120AG2 | 92 | 90 | 85 | 78 | 83 | 75 | 65 | 60 | 85 |
| R(C/H)U2E140AG2 | 93 | 91 | 86 | 84 | 82 | 75 | 65 | 61 | 86 |
| R(C/H)U2E160AG2 | 93 | 91 | 86 | 84 | 82 | 75 | 65 | 61 | 86 |
| R(C/H)U2E180AG2 | 94 | 92 | 87 | 85 | 83 | 76 | 66 | 62 | 87 |
| R(C/H)U2E210AG2 | 96 | 94 | 89 | 87 | 85 | 78 | 68 | 64 | 89 |
| R(C/H)U2E240AG2 | 96 | 94 | 89 | 87 | 85 | 78 | 68 | 64 | 89 |
| RCU2E280AG2 | 97 | 95 | 90 | 88 | 86 | 79 | 69 | 65 | 90 |
| RCU2E320AG2 | 97 | 95 | 90 | 88 | 86 | 79 | 69 | 65 | 90 |
| RCU2E350AG2 | 99 | 97 | 92 | 90 | 88 | 81 | 71 | 67 | 92 |
| RCU2E400AG2 | 99 | 97 | 92 | 90 | 88 | 81 | 71 | 67 | 92 |

### ◆ Super Low Noise Option

| Model | Sound Power Level (dB) | | | | | | | | Overall (dBA) |
|---|---|---|---|---|---|---|---|---|---|
| | Frequency Band (Hz) | | | | | | | | |
| | 63 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | |
| R(C/H)U2E40AG2 | 85 | 83 | 78 | 73 | 76 | 68 | 58 | 53 | 78 |
| R(C/H)U2E50AG2 | 87 | 85 | 80 | 75 | 76 | 68 | 59 | 55 | 79 |
| R(C/H)U2E60AG2 | 87 | 85 | 80 | 75 | 78 | 70 | 60 | 55 | 80 |
| R(C/H)U2E70AG2 | 88 | 86 | 81 | 79 | 77 | 70 | 60 | 56 | 81 |
| R(C/H)U2E80AG2 | 88 | 86 | 81 | 79 | 77 | 70 | 60 | 56 | 81 |
| R(C/H)U2E100AG2 | 90 | 88 | 83 | 78 | 79 | 71 | 62 | 58 | 82 |
| R(C/H)U2E120AG2 | 90 | 88 | 83 | 76 | 81 | 73 | 63 | 58 | 83 |
| R(C/H)U2E140AG2 | 91 | 89 | 84 | 82 | 80 | 73 | 63 | 59 | 84 |
| R(C/H)U2E160AG2 | 91 | 89 | 84 | 82 | 80 | 73 | 63 | 59 | 84 |
| R(C/H)U2E180AG2 | 92 | 90 | 85 | 83 | 81 | 74 | 64 | 60 | 85 |
| R(C/H)U2E210AG2 | 94 | 92 | 87 | 85 | 83 | 76 | 66 | 62 | 87 |
| R(C/H)U2E240AG2 | 94 | 92 | 87 | 85 | 83 | 76 | 66 | 62 | 87 |
| RCU2E280AG2 | 95 | 93 | 88 | 86 | 84 | 77 | 67 | 63 | 88 |
| RCU2E320AG2 | 95 | 93 | 88 | 86 | 84 | 77 | 67 | 63 | 88 |
| RCU2E350AG2 | 97 | 95 | 90 | 88 | 86 | 79 | 69 | 65 | 90 |
| RCU2E400AG2 | 97 | 95 | 90 | 88 | 86 | 79 | 69 | 65 | 90 |

***NOTE:***

*Operating conditions for all sound data are as follows.*
*Water Inlet/Outlet Temperature 12/7 °C, Ambient Temperature 35 °C, All Fans Running*

# 16. Application Data

## Contents

## 16.1. Working Range

### ◆ Air-Cooled Water Chiller units RCU2E-AG2

| Item | | Description | Remarks |
|---|---|---|---|
| Power Supply | Working Voltage | 90%~110% of Rated Voltage | |
| | Voltage Imbalance | Within ±3% Deviation from Each Voltage at Compressor Terminals | |
| | Starting Voltage | Higher than 85% of Rated Voltage | |
| Ambient Temperature | | -15 ~ 46ºC | |
| Water Outlet Temperature | Standard | 5 ~ 15ºC | Water |
| | Low Water Temperature Option | 4 ~ 0ºC (Low 1)<br>-1 ~ -5ºC (Low2)<br>-6 ~ -10ºC (Low3) | Ethylene glycol |
| Maximum Permissible Water Pressure | | 1.0 MPa | |
| Humidity | | ≤ 50% (40 °C) (1) | |
| Altitude | | ≤ 1000 m (1) | |

(1) Minimum working range requirements according to EN60204-1. In case of different working range conditions, ask conformity to HITACHI Distributor.)

### ◆ Air-to-Water Heat Pump Water Chiller units RHU2E-AG2

| Item | | Description | | Remarks |
|---|---|---|---|---|
| | | Cooling operation | Heating operation | |
| Power Supply | Working Voltage | 90%~110% of Rated Voltage | | |
| | Voltage Imbalance | Within ±3% Deviation from Each Voltage at Compressor Terminals | | |
| | Starting Voltage | Higher than 85% of Rated Voltage | | |
| Ambient Temperature | Standard | -15 ~ 46ºC | -9,5 ~ 21ºC DB<br>-10 ~ 15,5ºC WB | |
| | Heating operation in High Ambient Temperature Option | | -9,5 ~ 35ºC DB | |
| Water Outlet Temperature | Standard | 5 ~ 15ºC | | Water |
| | Low Water Temperature Option | 4 ~ 0ºC (Low 1)<br>-1 ~ -5ºC (Low2)<br>-6 ~ -10ºC (Low3) | | Ethylene glycol / Propylene glycol |
| Maximum Permissible Water Pressure | | 1.0 MPa | | |
| Humidity | | ≤ 50% (40 °C) (1) | | |
| Altitude | | ≤ 1000 m (1) | | |

(1) Minimum working range requirements according to EN60204-1. In case of different working range conditions, ask conformity to HITACHI Distributor.)

◆ **Water Flow Range**

| MODEL RCU2E- AG2 | | | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 160 | 180 | 210 | 240 | 280 | 320 | 350 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Flow Range | Min. | m³/h | 12.0 | 13.9 | 16.6 | 19.0 | 22.0 | 27.8 | 33.2 | 38.0 | 44.0 | 49.8 | 57.0 | 66.0 | 76.0 | 88.0 | 95.0 | 110 |
| | Max. | m³/h | 32.2 | 37.4 | 45.0 | 51.0 | 59.0 | 74.8 | 90.0 | 102 | 118 | 135 | 153 | 177 | 204 | 236 | 255 | 295 |

| MODEL RHU2E- AG2 | | | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 160 | 180 | 210 | 240 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water Flow Range | Min. | m³/h | 12.0 | 13.9 | 16.6 | 19.0 | 22.0 | 27.8 | 33.2 | 38.0 | 44.0 | 49.8 | 57.0 | 66.0 |
| | Max. | m³/h | 32.2 | 37.4 | 45.0 | 51.0 | 59.0 | 74.8 | 90.0 | 102 | 118 | 135 | 153 | 177 |

## 16.2. Part Load Performance

**Model: RCU2E40AG2 ~ RCU2E400AG2 & RHU2E40AG2 ~ RHU2E240AG2**

| Ambient Temperature (°C) | Performance | Compressor Load 15~99% | | | | | | | | | | | FULL LOAD | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 43 | Capacity | 18 | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 75 | 80 | 89 | | |
| | Input | 24 | 26 | 31 | 36 | 45 | 54 | 65 | 79 | 87 | 96 | 117 | | |
| | EER | 74 | 76 | 80 | 84 | 89 | 92 | 92 | 89 | 87 | 83 | 76 | | |
| 40 | Capacity | 19 | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 75 | 80 | 90 | 94 | |
| | Input | 24 | 25 | 30 | 34 | 42 | 51 | 60 | 71 | 77 | 84 | 102 | 110 | |
| | EER | 79 | 80 | 85 | 89 | 95 | 99 | 100 | 98 | 97 | 95 | 88 | 85 | |
| 35 | Capacity | | 20 | 25 | 30 | 40 | 50 | 60 | 70 | 75 | 80 | 90 | 100 | |
| | Input | | 23 | 27 | 31 | 38 | 45 | 53 | 61 | 66 | 72 | 84 | 100 | |
| | EER | | 87 | 92 | 97 | 105 | 111 | 114 | 114 | 113 | 112 | 107 | 100 | |
| 30 | Capacity | | 21 | 25 | 30 | 40 | 50 | 60 | 70 | 75 | 80 | 90 | 100 | 106 |
| | Input | | 24 | 27 | 30 | 37 | 43 | 50 | 57 | 61 | 66 | 76 | 89 | 99 |
| | EER | | 87 | 93 | 99 | 109 | 115 | 120 | 122 | 122 | 121 | 118 | 112 | 108 |
| 25 | Capacity | | 22 | 25 | 30 | 40 | 50 | 60 | 70 | 75 | 80 | 90 | 100 | 110 |
| | Input | | 25 | 27 | 30 | 36 | 42 | 48 | 55 | 59 | 64 | 74 | 89 | 100 |
| | EER | | 88 | 94 | 100 | 111 | 120 | 125 | 127 | 126 | 125 | 121 | 113 | 110 |
| 20 | Capacity | | 22 | 25 | 30 | 40 | 50 | 60 | 70 | 75 | 80 | 90 | 100 | 110 |
| | Input | | 20 | 21 | 24 | 29 | 33 | 38 | 43 | 46 | 49 | 56 | 65 | 76 |
| | EER | | 113 | 119 | 123 | 139 | 150 | 158 | 163 | 164 | 164 | 161 | 155 | 145 |

:Standard Condition
(Ambient: 35°C, Water Inlet/Outlet: 12/7°C, Full Load)

***NOTE:***

1. *Capacity: Cooling Capacity (kW)*
   *Input: Total Input Power (Compressor + Fans) (kW)*
   *COP: Capacity/Input (kW/kW)*
2. *Operating Conditions:*
   *Chilled Water Outlet Temperature: 7°C*
   *Water Flow Rate: Constant*
   *Condenser Fan: All Fans Running*
3. *Above Table shows the percentage of Capacity, Input and COP based on the standard condition. Therefore, each value can be calculated as below example:*

Example: Model RCU2E100AG2

| *Standard Condition* | | *Ambient: 30°C, Capacity 70%* | |
|---|---|---|---|
| *Capacity:* | *260 kW* | *Capacity:* | *260 × 0.70 = 182 kW* |
| *Input:* | *89.4 kW* | *Input:* | *89.4 × 0.57 = 51.0 kW* |
| *COP:* | *2.91* | *COP:* | *2.91 × 1.22= 3.5* |

## 16.3. Ethylene Glycol Application

### ◆ Low Ambient Application

Under the condition where the ambient temperature is low in winter, there is a case where the unit and piping will become damaged by freezing during the shutdown periods.

To prevent freezing, it is effective to operate the pump. This Chiller has the pump ON/OFF operation control to avoid freezing. This control becomes available by connecting Pump Operation circuit. (See Wiring Diagram).

Additionally, in a case where measures such as water raining are difficult, utilise antifreeze mixture of ethylene glycol.

Below table shows the ethylene glycol percentage suggested for the different temperature values.

The table also shows the correction factors, since unit with antifreeze mixture have a slight different performance compared with no glycol.

Example:

- Cooling Capacity with ethylene glycol = Kc × Cooling Capacity without ethylene glycol
- Input Power, Flow Rate and Pressure Drop is calculated in the same way as Cooling Capacity

(Water Outlet Temperature: 5 ~ 15°C)

| Minimum Ambient Temperature | °C | -3 | -7 | -13 | -22 |
|---|---|---|---|---|---|
| Required Ethylene Glycol Percentage | wt% | 10 | 20 | 30 | 40 |
| Cooling Capacity Correction Factor | Kc | 0.99 | 0.98 | 0.97 | 0.96 |
| Input Power Correction Factor | Ki | 1.00 | 0.99 | 0.99 | 0.98 |
| Flow Rate Correction Factor | Kf | 1.00 | 1.01 | 1.04 | 1.08 |
| Pressure Drop Correction Factor | Kp | 1.04 | 1.11 | 1.18 | 1.29 |

### ◆ Low Water Temperature Application (Option)

When utilising water less than 5 °C, antifreezing mixture of ethylene glycol shall be input to the water system.

Low water temperature Option is categorised 3 level depending on water outlet temperature.

Therefore, please specify the level when ordering .

Freeze Protection Thermostat has been set in the factory.

Table shows Required Ethylene Glycol percentage for each category.

1. Category

| Category | Outlet Water Temp. (°C) | Required Ethylene Glycol (wt%) | Ethylene Glycol Freezing Temp. (°C) |
|---|---|---|---|
| Low 1 | 4 ~ 0 | 20 | -7 |
| Low 2 | -1 ~ -5 | 30 | -13 |
| Low 3 | -6 ~ -10 | 40 | -22 |

***NOTE:***
*Freeze Protection Thermostat is the electronic control, but non-adjustable.*

For the performance, each value can be given by using following table. (See below example)

Performance

| Ethylene Glycol (wt%) | Outlet Water Temp. (°C) | Flow Rate Correction Factor (Kf) | Pressure Drop Correction Factor (Kp) | Ambient Temperature (°C) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 25 | | 30 | | 35 | | 40 | | 43 | |
| | | | | CAP (%) | IPT (%) | CAP (%) | IPT (%) | CAP (%) | IPT (%) | CAP (%) | IPT (%) | CAP (%) | IPT (%) |
| 20 | 4 | 1.011 | 1.15 | 98 | 82 | 93 | 90 | 87 | 97 | 81 | 106 | 78 | 112 |
| | 3 | 1.012 | 1.16 | 94 | 81 | 89 | 89 | 83 | 96 | 77 | 106 | 75 | 111 |
| | 2 | 1.013 | 1.17 | 92 | 81 | 86 | 88 | 80 | 96 | 75 | 105 | 72 | 111 |
| | 1 | 1.013 | 1.18 | 88 | 80 | 82 | 87 | 77 | 95 | 72 | 104 | 69 | 110 |
| | 0 | 1.014 | 1.19 | 86 | 79 | 80 | 87 | 75 | 94 | 70 | 103 | 66 | 109 |
| 30 | -1 | 1.034 | 1.30 | 83 | 78 | 78 | 86 | 73 | 94 | 68 | 103 | 64 | 109 |
| | -2 | 1.035 | 1.32 | 80 | 78 | 75 | 86 | 71 | 93 | 65 | 102 | 62 | 108 |
| | -3 | 1.037 | 1.34 | 78 | 77 | 74 | 85 | 68 | 92 | 63 | 102 | 60 | 108 |
| | -4 | 1.037 | 1.36 | 75 | 77 | 71 | 85 | 66 | 92 | 61 | 101 | 58 | 107 |
| | -5 | 1.038 | 1.38 | 74 | 76 | 69 | 84 | 64 | 91 | 59 | 101 | 57 | 106 |
| 40 | -6 | 1.073 | 1.50 | 71 | 76 | 66 | 84 | 61 | 91 | 57 | 100 | 55 | 106 |
| | -7 | 1.075 | 1.52 | 69 | 75 | 64 | 83 | 59 | 91 | 55 | 100 | 52 | 106 |
| | -8 | 1.076 | 1.54 | 66 | 75 | 61 | 83 | 58 | 90 | 53 | 100 | 50 | 105 |
| | -9 | 1.076 | 1.56 | 63 | 75 | 59 | 83 | 55 | 90 | 51 | 99 | 48 | 105 |
| | -10 | 1.077 | 1.58 | 61 | 74 | 57 | 82 | 53 | 90 | 49 | 99 | 46 | 105 |

***NOTE:***

1. *CAP: Cooling Capacity, IPT: Compressor Input*
2. *Capacity and Compressor Input show the percentage of the standard condition: Ambient temperature: 35°C, Chilled Water Inlet/Outlet: 12/7 °C*
3. *Water flow rate and pressure drop can be calculated by the Correction Factor Kf and Kp.*
4. *Example:*

*a) Model: RCU2E140AG2*

*b) Standard Condition: Capacity: 356 kW, Compressor Input: 112 kW*

*c) Outlet/Inlet Water Temperature: -3/2°C, Ambient Temperature: 40°C*

*- Ethylene glycol: 30%*

*- Capacity = 356*0.63=224.3 kW*

*Compressor Input = 112*1.02=114.2 kW*

*- Water Flow($m^3/h$) = Kf*Capacity(kW)*0.86/$\Delta T$ ($\Delta T$=Inlet Temp.- Outlet Temp.)*

*= 1.037*224.3*0.86/(2-(-3))*

*= 40.0 $m^3/h$*

*- Pressure Drop = Kp*Pressure Drop (water)*

*= $1.34*0.0107*40.0^{1.9616}$*

*= 19.9 kPa*

*where Pressure Drop(water)= $\alpha \times Q^{\beta}$ : see Chapter 15.1.*

# 17. Components Data

## Contents

## 17.1. Compressor

| Model | | | 40ASC-Z | 50ASC-Z | 60ASC-Z |
|---|---|---|---|---|---|
| Type | | | Semi-Hermetic | | |
| Revolution | | rpm | 2880 | | |
| Displacement | | $m^3/h$ | 137.4 | 169.5 | 208.7 |
| Capacity Control | | % | 100 ~ 15, 0 | | |
| Pneumatic Pressure | High Side | MPa | 3.0 | | |
| | Low Side | MPa | 2.0 | | |
| Motor | Type | | Special Squirrel Cage, Three-Phase Motor | | |
| | Starting Method | | Star-Delta Starting | | |
| | Nominal Output | kW | 30 | 37 | 45 |
| | Poles | | 2 | | |
| | Insulation | | E | | |
| Oil | Name | | JAPAN ENERGY, FREOL UX300 | | |
| | Charge | Litre | 6 | | |
| Net Weight | | kg | 400 | 440 | 460 |

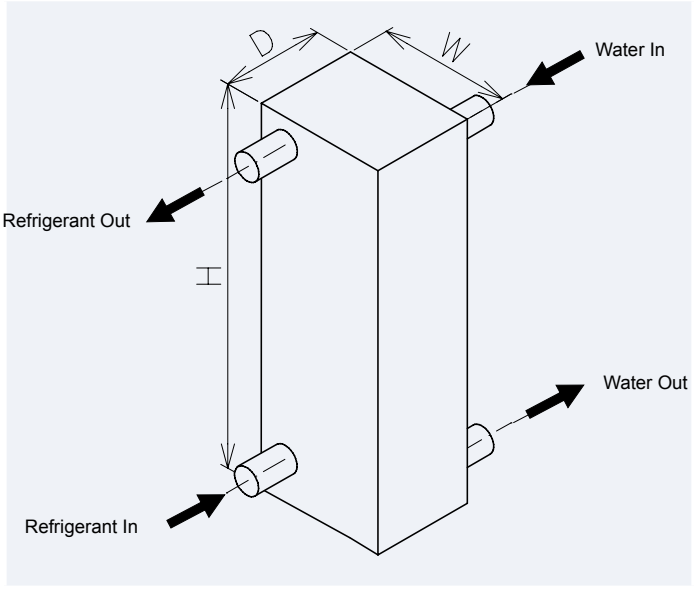
## 17.2. Air Heat Exchanger and fan

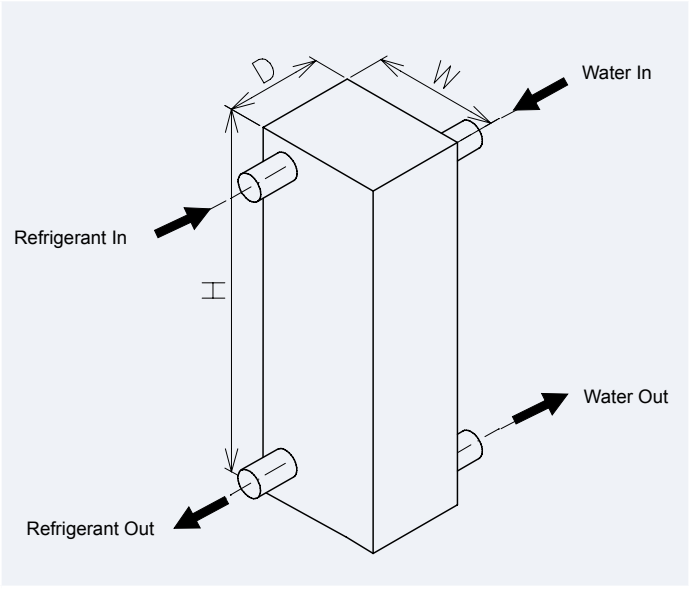
| | Model RCU2E-AG2 | | | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 160 | 180 | 210 | 240 | 280 | 320 | 350 | 400 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Model RHU2E-AG2 | | | 40 | 50 | 60 | 70 | 80 | 100 | 120 | 140 | 160 | 180 | 210 | 240 | | | | |
| Air Heat Exchanger | Type | | | Multi-pass cross finned tube | | | | | | | | | | | | | | | |
| | Piping | Material | | Copper Tube | | | | | | | | | | | | | | | |
| | | Outer Diameter | mm | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 | 9.53 |
| | | Rows | | 3/3 | 3/4 | 4/4 | 3/4 | 4/4 | 3/4 | 4/4 | 3/4 | 4/4 | 4/4 | 3/4 | 4/4 | 3/4 | 4/4 | 3/4 | 4/4 |
| | Fin | Material | | Aluminium | | | | | | | | | | | | | | | |
| | | Pitch | mm | 2.1/2.1 | 2.1/2.2 | 2.2/2.2 | 2.1/2.2 | 2.2/2.2 | 2.1/2.2 | 2.2/2.2 | 2.1/2.2 | 2.2/2.2 | 2.2/2.2 | 2.1/2.2 | 2.2/2.2 | 2.1/2.2 | 2.2/2.2 | 2.1/2.2 | 2.2/2.2 |
| | Quantity | | | 4 | 4 | 4 | 4 | 4 | 8 | 8 | 8 | 8 | 12 | 12 | 12 | 16 | 16 | 20 | 20 |
| | Maximum operating Pressure | | MPa | 3.0 | | | | | | | | | | | | | | | |
| Fan | Type | | | Direct-driven propeller fan | | | | | | | | | | | | | | | |
| | Fan | Quantity | | 4 | 4 | 4 | 6 | 6 | 8 | 8 | 12 | 12 | 12 | 18 | 18 | 24 | 24 | 30 | 30 |
| | | Outer diameter | | 644 | 644 | 644 | 644 | 644 | 644 | 644 | 644 | 644 | 644 | 644 | 644 | 644 | 644 | 644 | 644 |
| | | Revolution | | 870 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 | 999 |
| | | Air Flow | $m^3/min$ | 750 | 860 | 860 | 1330 | 1330 | 2*860 | 2*860 | 2*1330 | 2*1330 | 3*860 | 3*1330 | 3*1330 | 4*1330 | 4*1330 | 5*1330 | 5*1330 |
| | Motor | Type | | Drip-proof type enclosure | | | | | | | | | | | | | | | |
| | | Type | | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC | DC AC |
| | | Poles | | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 | 8 6 |
| | | Quantity | | 4 - | 4 - | 4 - | 4 2 | 4 2 | 8 - | 8 - | 8 4 | 8 4 | 12 - | 12 6 | 12 6 | 16 8 | 16 8 | 20 10 | 20 10 |
| | | Nominal output | kW | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 | 0.38 0.28 |
| | | Starting method | | Direct-On-Line Starting | | | | | | | | | | | | | | | |

## 17.3. Water Heat Exchanger

| Type | | | A | B | C | D |
|---|---|---|---|---|---|---|
| Dimensions | Height (H) | mm | 532 | 532 | 532 | 532 |
| | Width (W) | mm | 271 | 271 | 271 | 271 |
| | Depth (D) | mm | 249.5 | 272 | 344 | 411.5 |
| Maximum Permissible Pressure | Refrigerant Side | MPa | 3.0 | 3.0 | 3.0 | 3.0 |
| | Water Side | MPa | 3.0 | 3.0 | 3.0 | 3.0 |
| Internal Volume | Refrigerant Side | Liter | 12.0 | 13.1 | 16.8 | 20.2 |
| | Water Side | Liter | 12.2 | 13.3 | 17.0 | 20.5 |
| Material | | | Stainless Steel | | | |

| Cooling Operation | Heating Operation |
|---|---|
| Dimension | Dimension |




| Model RCU2E-AG2 | 40 | 50 | 60, 70, 80 | 100 | 120, 140, 160 | 180, 210, 240 | 280, 320 | 350, 400 |
|---|---|---|---|---|---|---|---|---|
| Water Heat Exchanger | Brazed Type Plate Heat Exchanger | | | | | | | |
| Type (Quantity) | A (1) | B (1) | C (1) | B (2) | C (2) | C (3) | C (4) | C (5) |

| Model RHU2E-AG2 | 40 | 50 | 60 | 70, 80 | 100 | 120 | 140, 160 | 180 | 210, 240 |
|---|---|---|---|---|---|---|---|---|---|
| Water Heat Exchanger | Brazed Type Plate Heat Exchanger | | | | | | | | |
| Type (Quantity) | A (1) | B (1) | C (1) | D (1) | B (2) | C (2) | D (2) | C (3) | D (3) |

# 18. Hydrokit (option)

## Contents

## 18.1.Compatibility

The Hydrokit option is available for the following products:

Air-cooled Water Chillers: RCU2E40AG2 ~ RCU2E80AG2

Air-to-Water Heat Pump Water Chillers: RHU2E40AG2 ~ RHU2E80AG2

There are different combinations of this Hydrokit option according to customer installation demands. The following table shows the availability of the different options for each model:

| COMBINATIONS | | Single Pump (SP) | | Double Pump (DP) | |
|---|---|---|---|---|---|
| | | with Buffer Tank | without Buffer Tank | with Buffer Tank | without Buffer Tank |
| RCU2E-AG2 | RCU2E40AG2 | HYK-SP-ABT-1 | HYK-SP-SBT-1 | HYK-DP-ABT-1 | HYK-DP-SBT-1 |
| | RCU2E50AG2 | | | | |
| | RCU2E60AG2 | | | | |
| | RCU2E70AG2 | HYK-SP-ABT-2 | HYK-SP-SBT-2 | HYK-DP-ABT-2 | HYK-DP-SBT-2 |
| | RCU2E80AG2 | | | | |
| RHU2E-AG2 | RHU2E40AG2 | n.a. | HYK-SP-SBT-1 | n.a. | HYK-DP-SBT-1 |
| | RHU2E50AG2 | | | | |
| | RHU2E60AG2 | | | | |
| | RHU2E70AG2 | HYK-SP-ABT-2 | HYK-SP-SBT-2 | HYK-DP-ABT-2 | HYK-DP-SBT-2 |
| | RHU2E80AG2 | | | | |

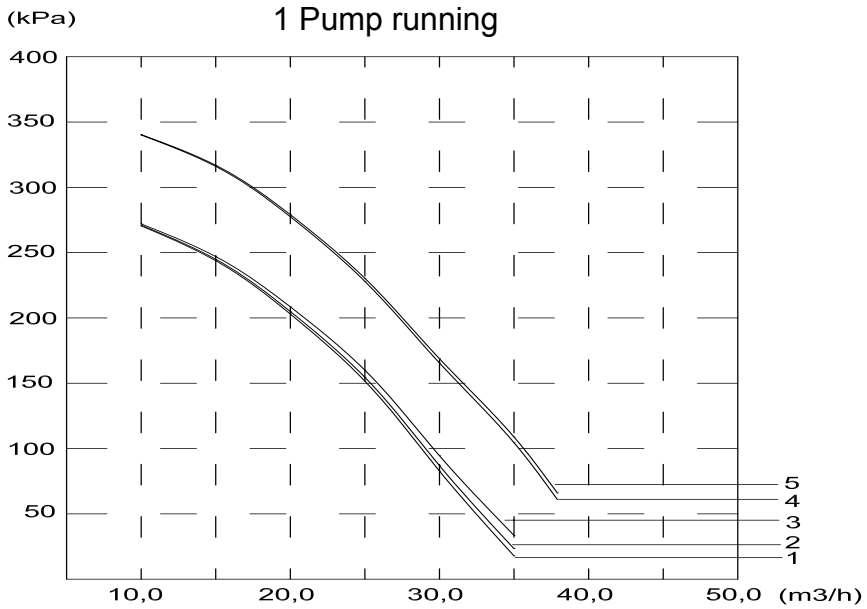
Where: –SP: Single Pump –DP: Dual Pump –ABT: with Buffer Tank –SBT: without Buffer Tank

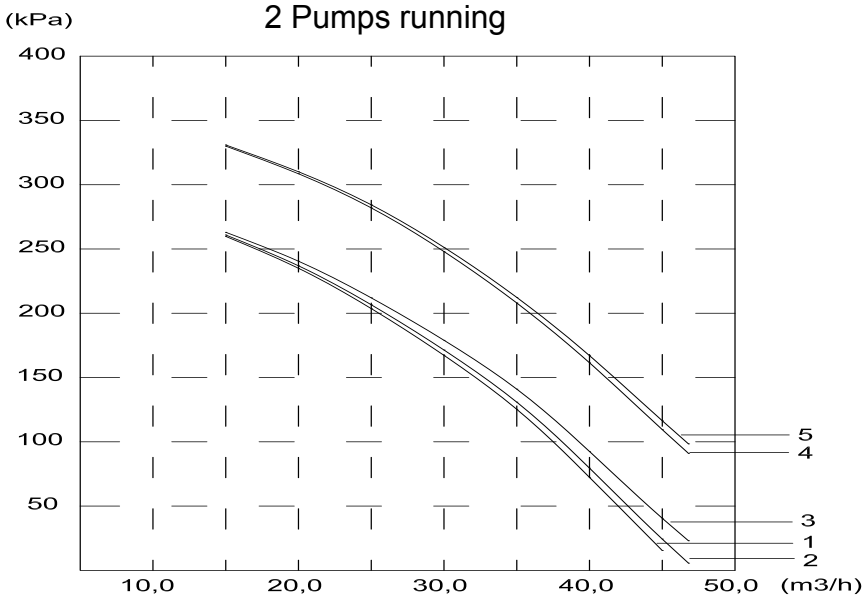
***CAUTION:***

*Water circuit must be also protected by a flow switch or differential water pressure switch (field supplied) in order to avoid the Chiller operation without water either low water flow.*

## 18.2.General Data

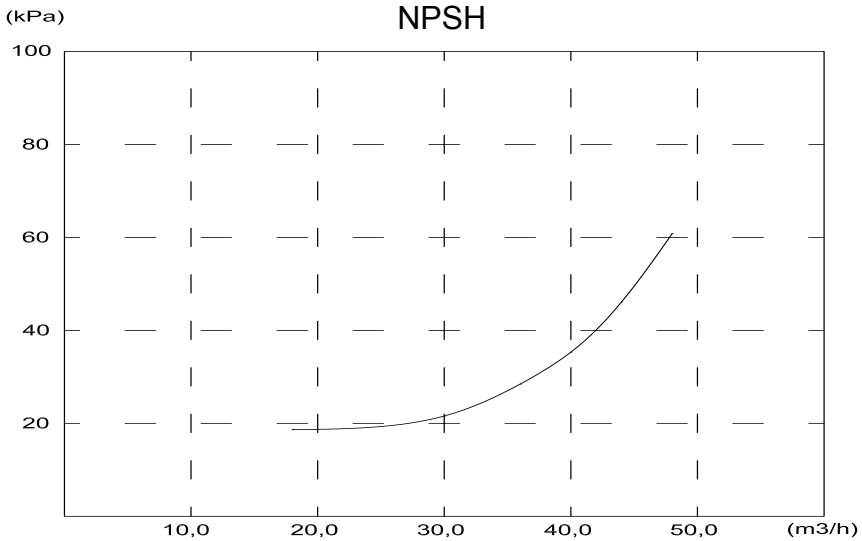
### 18.2.1. Available Pressure




| Nr. | Model |
|---|---|
| 1 | R(C/H)U2E40AG2 |
| 2 | R(C/H)U2E50AG2 |
| 3 | R(C/H)U2E60AG2 |
| 4 | RCU2E70AG2, RCU2E80AG2 |
| 5 | RHU2E70AG2, RHU2E80AG2 |

### 18.2.2. Net Positive Suction Head




### 18.2.3. Weight

Additional weight of the Hydrokit options is as follows:

| Hydrokit model | Shipping Weight (kg) | Operating Weight (kg) |
|---|---|---|
| HYK-SP-ABT-1 | 154 | 356 |
| HYK-SP-ABT-2 | 183 | 533 |
| HYK-SP-SBT-1 | 112 | 140 |
| HYK-SP-SBT-2 | 121 | 155 |
| HYK-DP-ABT-1 | 218 | 424 |
| HYK-DP-ABT-2 | 253 | 607 |
| HYK-DP-SBT-1 | 182 | 223 |
| HYK-DP-SBT-2 | 198 | 245 |

***NOTE:***

*Above weight shall be added to the standard unit weight.*

### 18.2.4. Hydraulic Data

| | MODEL | Exp. Vessel Volume (l) | Buffer Tank Volume* (l) | Max. Working Pressure (bar) | Pump Output (kW) | Max. Brine Water (%) | Water Connections (Victaulic type) |
|---|---|---|---|---|---|---|---|
| Single Pump Option | 40 HP | 12 | 180 | 3 | 3 | 30 | 3 in / 88.9 mm |
| | 50 HP | 12 | 180 | 3 | 3 | 30 | 3 in / 88.9 mm |
| | 60 HP | 12 | 180 | 3 | 3 | 30 | 3 in / 88.9 mm |
| | 70 HP | 18 | 320 | 3 | 4 | 30 | 3 in / 88.9 mm |
| | 80 HP | 18 | 320 | 3 | 4 | 30 | 3 in / 88.9 mm |
| Double Pump Option | 40 HP | 12 | 180 | 3 | 3x2 | 30 | 3 in / 88.9 mm |
| | 50 HP | 12 | 180 | 3 | 3x2 | 30 | 3 in / 88.9 mm |
| | 60 HP | 12 | 180 | 3 | 3x2 | 30 | 3 in / 88.9 mm |
| | 70 HP | 18 | 320 | 3 | 4x2 | 30 | 3 in / 88.9 mm |
| | 80 HP | 18 | 320 | 3 | 4x2 | 30 | 3 in / 88.9 mm |

*(*) Buffer Tank is optional according to customer requirements*

### 18.2.5. Electrical Data

| | MODEL | Voltage (V) | Connection type | IPT (W) | MAX. CUR. (A)** | MCBP Set up (A) |
|---|---|---|---|---|---|---|
| Single Pump Option | 40 HP | 400 | Star | 2500 | 6,25 | 7 |
| | 50 HP | 400 | Star | 2700 | 6,25 | 7 |
| | 60 HP | 400 | Star | 2800 | 6,25 | 7 |
| | 70 HP | 400 | Delta | 3750 | 7,71 | 9 |
| | 80 HP | 400 | Delta | 3900 | 7,71 | 9 |
| Double Pump Option | 40 HP | 400 | Star | 5000 | 12,5 | 7 |
| | 50 HP | 400 | Star | 5400 | 12,5 | 7 |
| | 60 HP | 400 | Star | 5600 | 12,5 | 7 |
| | 70 HP | 400 | Delta | 7500 | 15,4 | 9 |
| | 80 HP | 400 | Delta | 7800 | 15,4 | 9 |

IPT: Input Power (W)

MAX. CUR. (A)**: Maximum Input Current at Max. Input Power

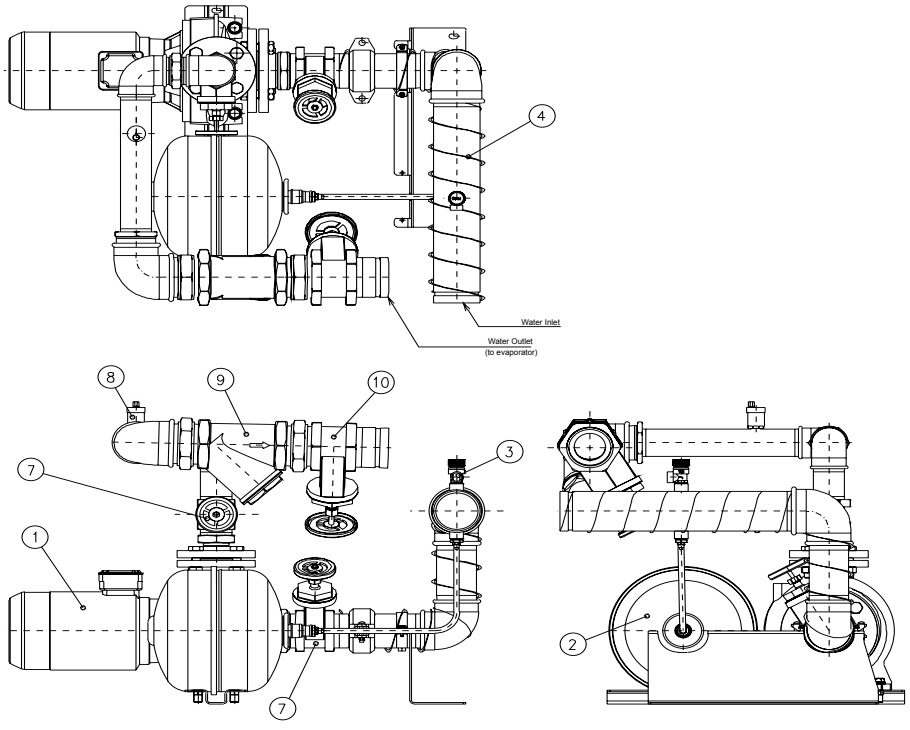
### 18.2.6. Electric Heater Output

| Hydrokit model | Heater Output (W) |
|---|---|
| HYK-SP-ABT-1 | 300 |
| HYK-SP-ABT-2 | 300 |
| HYK-SP-SBT-1 | 132 |
| HYK-SP-SBT-2 | 132 |
| HYK-DP-ABT-1 | 300 |
| HYK-DP-ABT-2 | 300 |
| HYK-DP-SBT-1 | 300 |
| HYK-DP-SBT-2 | 300 |

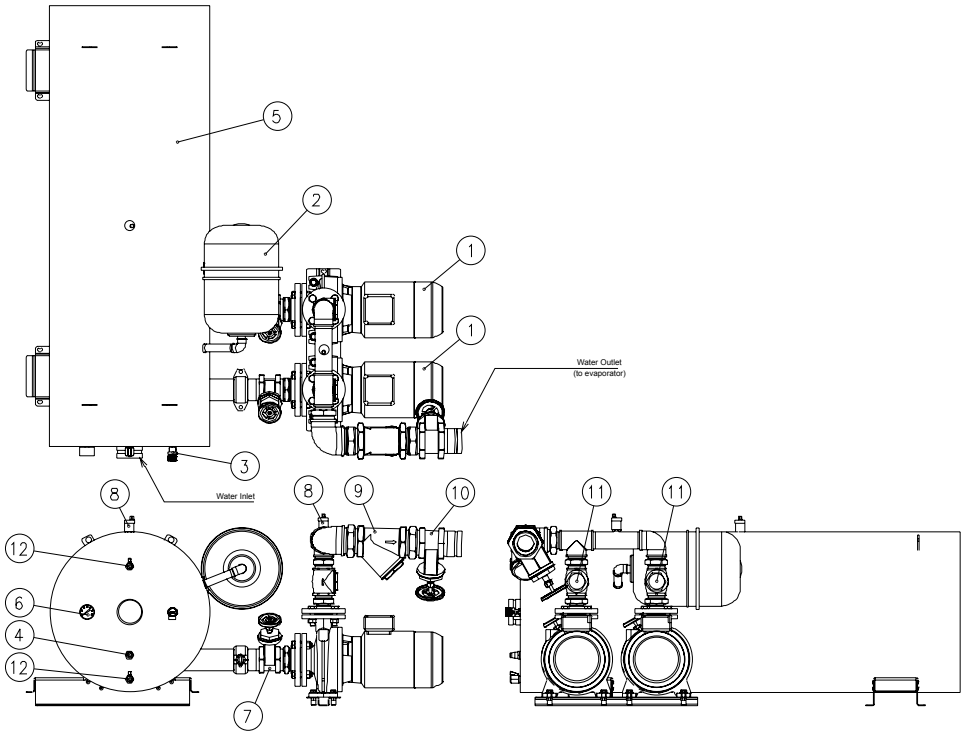
## 18.3. Drawings

### 18.3.1. Structural Drawing

Example of Hydrokit assembly with single pump and without buffer tank:



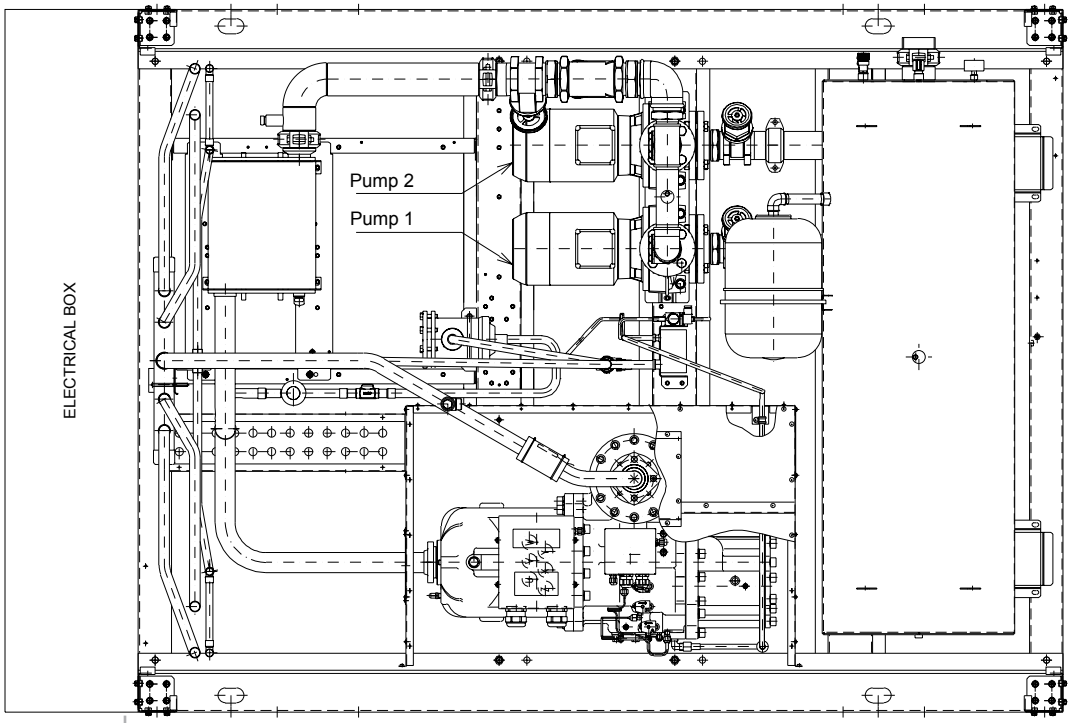
Example of Hydrokit assembly with double pump and with buffer tank:



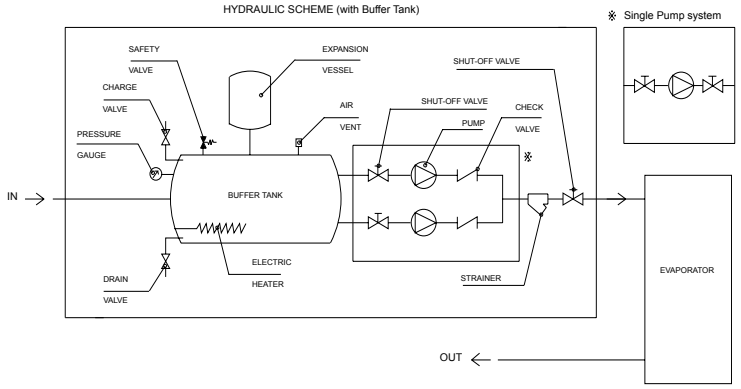

Where:

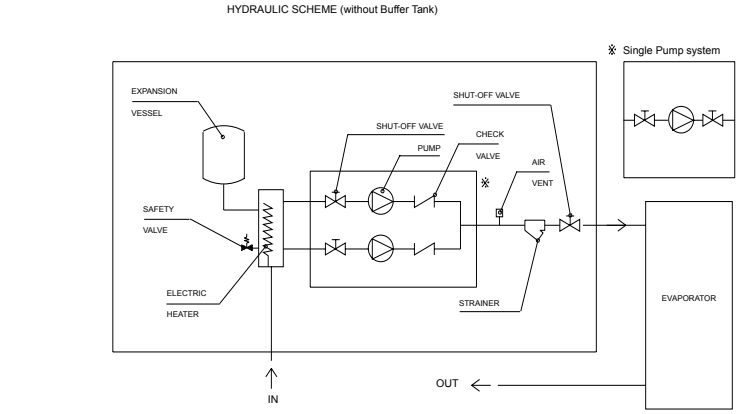
| Nr. | Name | Nr. | Name |
|---|---|---|---|
| 1 | Water Pump | 7 | Shut-off Valve |
| 2 | Expansion Vessel | 8 | Air Vent |
| 3 | Safety Valve | 9 | Water Strainer |
| 4 | Electric Heater | 10 | Flow Regulation Valve |
| 5 | Buffer Tank | 11 | Check Valve |
| 6 | Pressure Gauge | 12 | Charge/Drain Valve |

View of assembly of Hydrokit inside the chiller (example with double pump and with buffer tank):



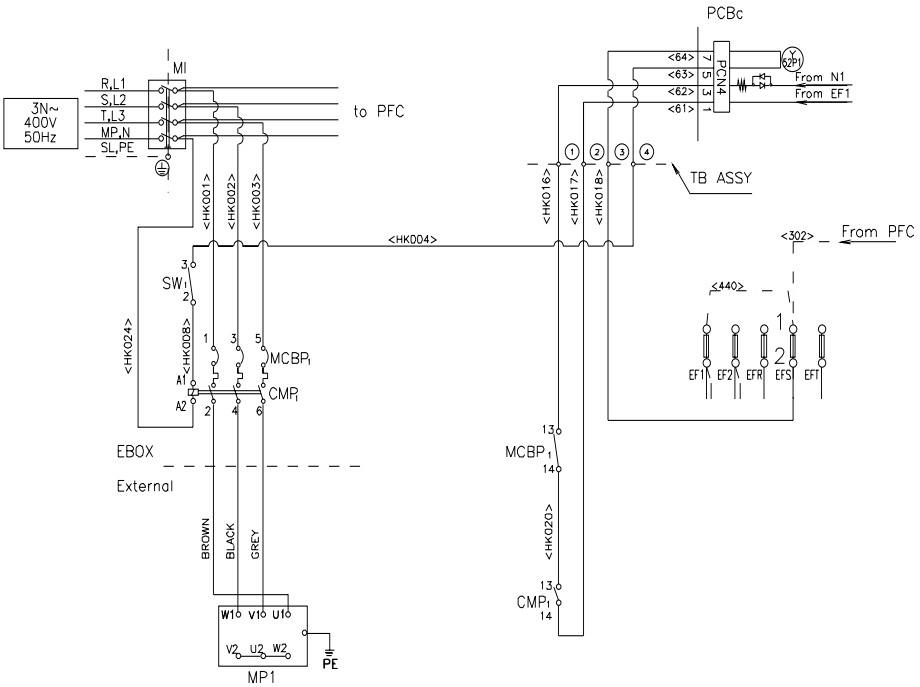
### 18.3.2. Hydraulic Schemes



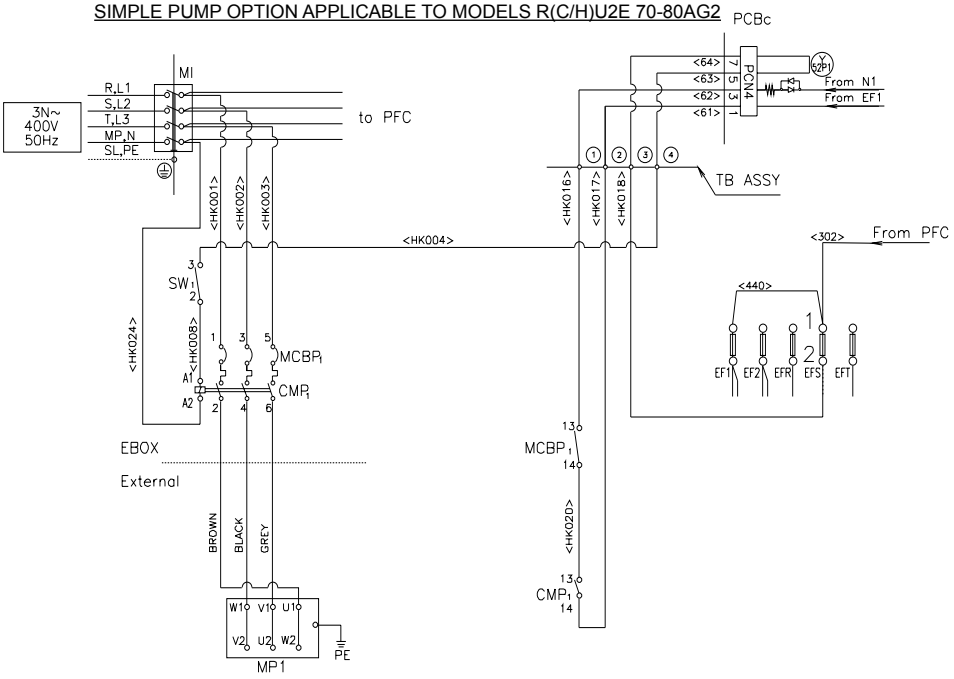




### 18.3.3. Wiring Diagram

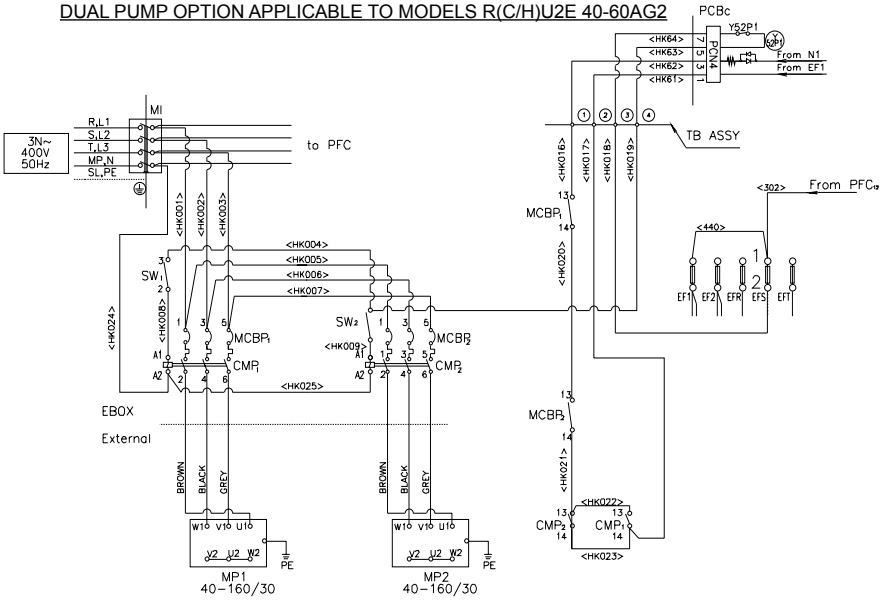
SINGLE PUMP OPTION APPLICABLE TO MODELS R(C/H)U2E 40-60AG2



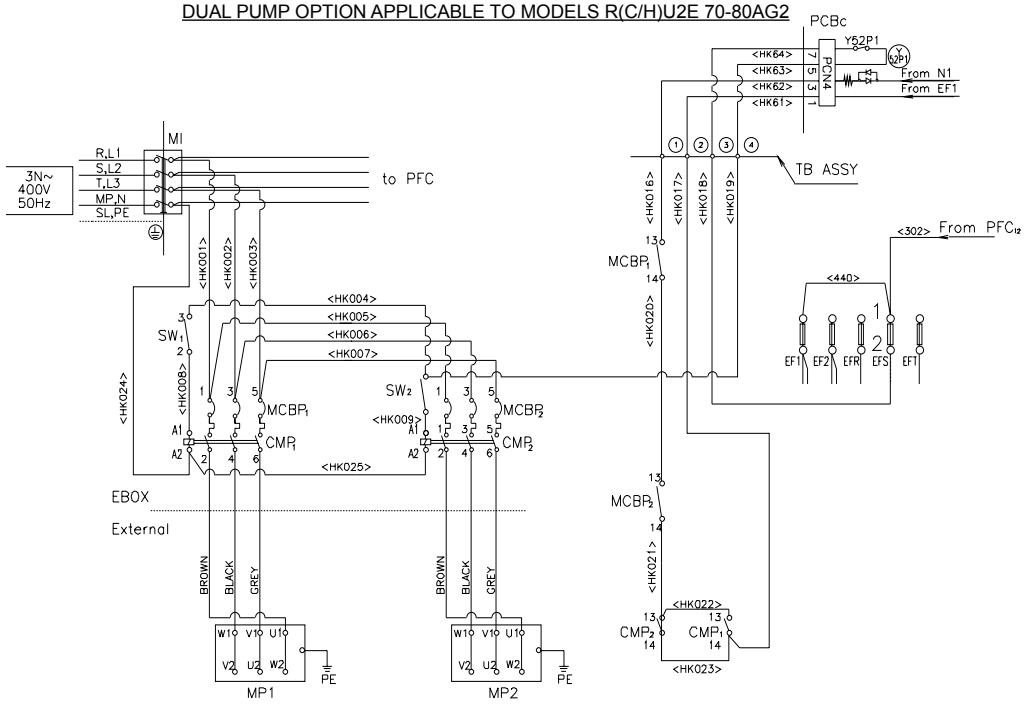
SIMPLE PUMP OPTION APPLICABLE TO MODELS R(C/H)U2E 70-80AG2




DUAL PUMP OPTION APPLICABLE TO MODELS R(C/H)U2E 40-60AG2



DUAL PUMP OPTION APPLICABLE TO MODELS R(C/H)U2E 70-80AG2




| Mark | Name | Remark |
|---|---|---|
| MI | Main Isolator | |
| $PCB_c$ | Control PCB (Main) | |
| $MCBP_n$ | Magnetic Circuit Breaker for Pump | n: 1,2 |
| $CMP_n$ | Contactor for Pump | n: 1,2 |
| $MP_n$ | Pump | n: 1,2 |
| $EF_n$ | Electric Fuse | n: 1,2,R,S,T |

## 18.4.Components Data

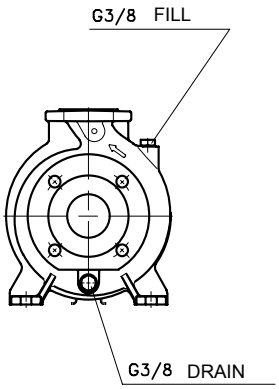
### 18.4.1. Water Pump

Centrifugal electric pumps in compliance with EN 733 - DIN 24255, with cast iron body and AISI 316L stainless steel impeller. Main specifications are the following:

| Concept | Pumps specifications |
|---|---|
| Standard Voltage | 380~415V, 50Hz |
| Nr. of phases | 3 |
| Output Power | 3~4kW |
| Nr. of poles | 2 |
| Pump Motor Revolutions | ~2900rpm |
| Maximum Working Pressure | 12bar (PN12) |
| Temperature Range of Pumped Liquid | -20ºC~+85ºC |
| Maximum Ambient Temperature | 50ºC |
| Discharge Port Nominal Diameter | 40mm |
| Suction Port Nominal Diameter | 65mm |
| Impeller Nominal Diameter | 160mm |
| Protection Grade | IP55 |
| Insulation Class | F |
| Sound Pressure Level (*) | <70dBA |
| Maximum Nr. of Starts per Hour | 20 |

*(*) Measured at 1m distance from the pump in an open field*

The pump is equipped with two G3/8 ports for filling and draining the liquid (see below scheme).




Fill port: to prime the pump. Pump shall not run until it is filled with liquid.

Drain port: to drain the pump. Pump shall be drained whenever it remains inactive at freezing temperatures.

In case of 2 pumps equipped, the unit can work with only 1 pump (the second as back up) or 2 in parallel.

### 18.4.2. Expansion Vessel

Expansion Vessel with fixed membrane type. The Expansion Vessel is calculated based on the size of factory supplied Buffer Tank. Additional Expansion Vessel shall be installed at customer site; its size shall be fixed depending on customer installation size. See below the volume of the Expansion Vessel factory-equipped.

| Chiller Model | Expansion Vessel Volume (l) |
|---|---|
| 40HP<br>50HP<br>60HP | 12 |
| 70HP<br>80HP | 18 |

The internal air pressure of the Expansion Vessel shall be adapted by the installer to the water volume of the final installation. Pre-charge pressure is 1.5 bar (factory supplied).

### 18.4.3. Buffer Tank

Optionally, a buffer tank can be equipped from factory side. However, an additional buffer tank could be needed depending on customer installation size. The buffer tank includes a pressure gauge at water inlet.

See below the volume of the buffer tank factory-equipped.

| Chiller Model | Buffer Tank Volume (l) |
|---|---|
| 40HP<br>50HP<br>60HP | 180 |
| 70HP<br>80HP | 320 |

### 18.4.4. Safety Valve

Pressure setting = 3 bar.

Inlet connection: G 1/2” male

Outlet connection: G 1/2” female. Discharge pipe is not included.

This valve is placed directly on the buffer tank in case of it is included, or directly in the piping in case of the option without Buffer Tank.

### 18.4.5. Air Vent

Threaded connection: G 3/8”

The cap attached in the air purge is screwed from factory. It shall be unscrewed when chiller is installed in order to purge all the air inside the circuit. Hitachi recommends putting additional air purges if the customer piping has a higher position.

### 18.4.6. Charge and Drain Valve

Mini ball valve type. Only included in version with Buffer Tank.

Threaded connection: R 1/2”

This valve is closed from factory. This ball valve is a valve of interception and not of regulation, therefore it must be opened or closed completely; if it is left in an intermediate position, the seals can be damaged. If it is necessary to empty the tube for danger of frost, the valve must be opened at intermediate position (45°) up to the complete exit of the liquid and then it can be opened totally.

### 18.4.7. Shut-off Valve

All the valves equipped are opened from factory side. They should be closed in case of maintenance or in case of 2 pumps equipped and only one running.

### 18.4.8. Water Strainer

This strainer is 20 mesh hole size.

After the cleaning of the strainer, check carefully the cap seal and do not hesitate to replace it if you have doubts. After few hours of work of the installation, it is advisable to open the strainer for cleaning out the typical residues of new tubes.

## 18.5.Operation instructions

### 18.5.1. Circuit Water Filling-in

- The Installation shall be filled in through the charge valve (factory supplied).
- Charge the water circuit until reaching a water pressure of 1.7~2.0 bar (1.8 bar recommended).

***CAUTION:***

*- The maximum water pressure is 3 bar (Safety Valve nominal opening pressure).*

*- Make sure that all field supplied components installed in the piping circuit can withstand the water pressure.*

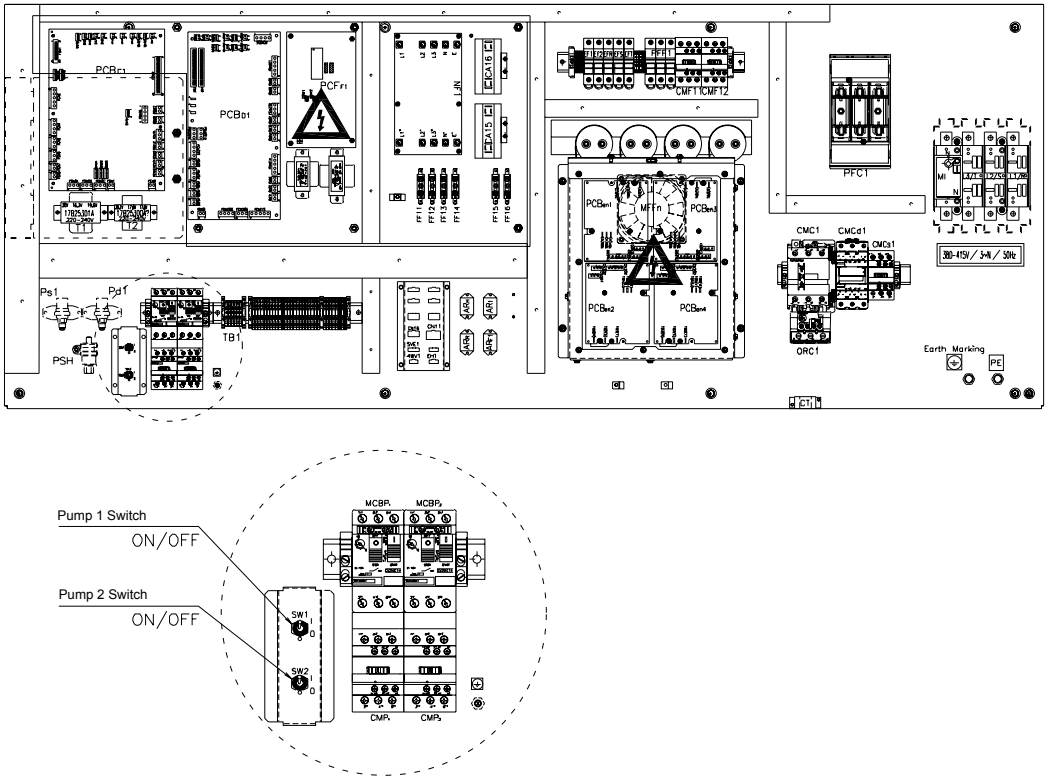
*- An automatic air vent is provided with the unit. Check that the air vent cap is not tightened too much so that automatic release of air in the water circuit remains possible. Additional air vents shall be provided at all high points of the circuit. The air vents should be located at points which are easily accessible for servicing.*

### 18.5.2. Water Flow Adjustment

The water flow shall be adjusted by closing the Flow Regulation Valve (Shut-off valve hand operated located between the Water Strainer and the Evaporator) until the pressure matches with the Pump performance curves.

### 18.5.3. Power Switch

Hydrokit Power Switch ON/OFF position:




In case of Dual Pump system, the unit is set from factory as default with the 2 pumps enabled; it means that both pumps will run when the unit is Power ON.

If customer prefers to run only one pump and keep the second one as a “back up” pump, any of both pumps can be disabled by turning to OFF position the lever of the Pump Switch.

Warning: it is not recommended to stop 1 pump while the other is running. Both pumps should be stopped at the same time, otherwise water hammer phenomenon may happen.

## 18.6.Troubleshooting

| Chiller Display | Description | Check points |
|---|---|---|
| PUPU | Waiting Pump feedback signal | 1. Ensure that SW1 (or SW2 for dual pump) are enabled (ON).<br>2. Ensure that there is power in MCBP1-1,3,5 terminals (also in MCBP2 for dual pump).<br>3. Ensure that MCBP1 (and MCBP2 for dual pump) are enabled (ON).<br>4. Ensure that CMP1 (and/or CMP2) coils A1/A2 are correctly connected.<br>5. Check Pump is not locked. |
| SPSP | Pump Operation Alarm | |
| EGEE | Flow or Differential Water Pressure Activation (Alarm) | 1. Ensure that there is water inside the hydraulic circuit.<br>2. Ensure that there is water pressure enough inside the hydraulic circuit.<br>3. Check Pump is not locked. |

See chiller technical catalogue and pump product manual for more information.

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