The Samurai Range

HITACHI
Inspire the Next

Technical Catalog

Installation, Operation and Maintenance Instructions.
Design Information

WATER COOLED WATER CHILLERS -SCREW TYPE-

RCUE40WG2-240WG2 (R407C)
Capacity 134 kW-696 kW
Heat Pump Option
Heating Capacity 161 kW-824 kW

TABLE OF CONTENTS

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 sever 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 cooled water Chiller which you operate as well as for other models.
This water cooled water Chiller has been designed for the following temperatures. Operate the water cooled water Chiller within this range.

Working Range		°C
	Maximum	Minimum
Condenser Water Outlet Temperature	45 *(55)	22
Chilled Water Outlet Temperature	15	5 **(-10)

(*) In case of High Condensing option and Heat Pump operation option.

(**) In case of low water temperature option.

This instructions should be considered as a permanent part of the water cooled water Chiller equipment and should remain with the water cooled water Chiller equipment.

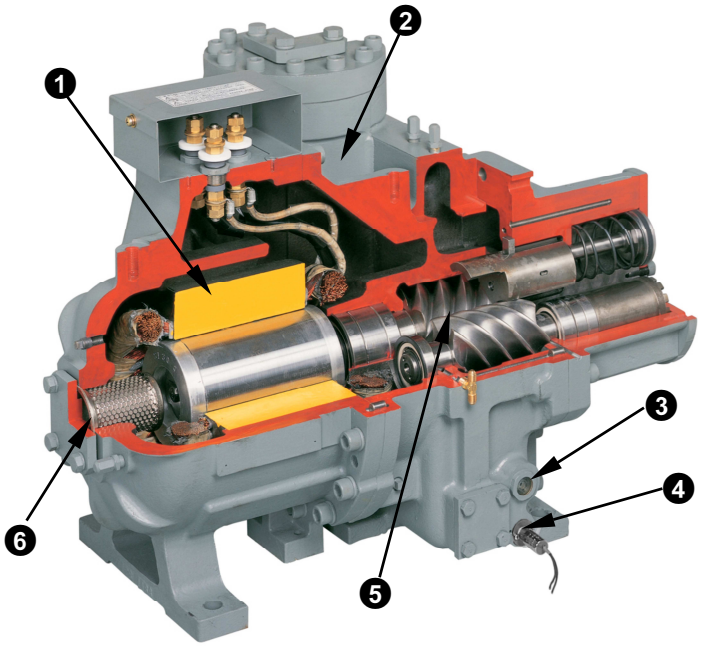
2. FEATURES AND BENEFITS

2.1. NEW CHILLER PICTURE

HITACHI is a world leader in technology and with continual research and product development, now offers a screw type **Water Cooled Chiller**.

A wide range of capacities are available from 134 kW to 696 kW.
Heating operation is available for option. Heating Capacities are available from 161 kW to 824 kW.

2.2. COMPRESSOR



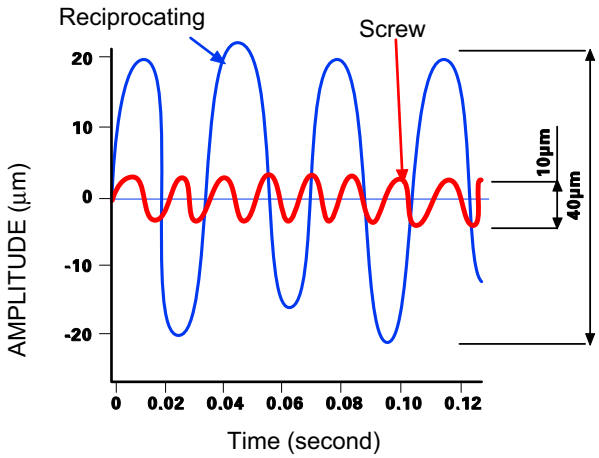
■ **THE SAMURAI RANGE INCORPORATES THE LATEST DEVELOPMENT OF HITACHI´S SCREW COMPRESSOR TECHNOLOGY FOR THE NEW MILLENNIUM.**

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

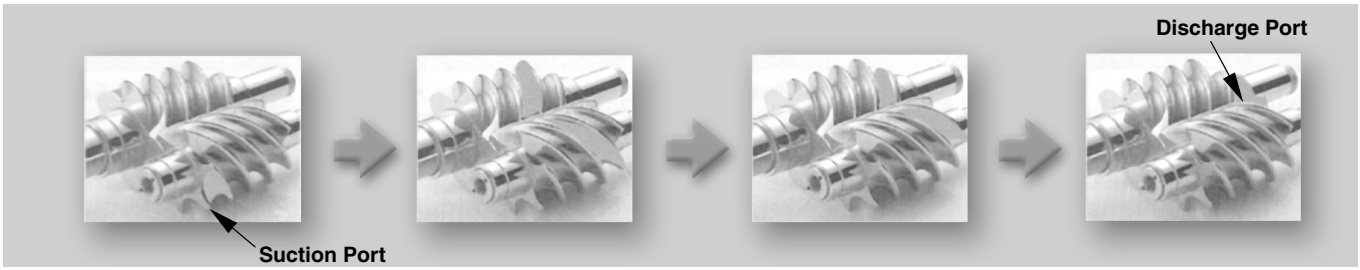
■ TWIN SCREW COMPRESSOR

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

-LOW VIBRATION-

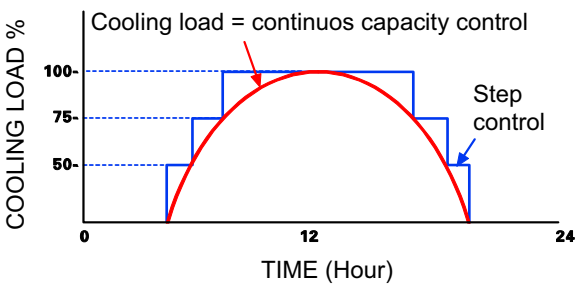


■ PRINCIPLE OF COMPRESSION



■ 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

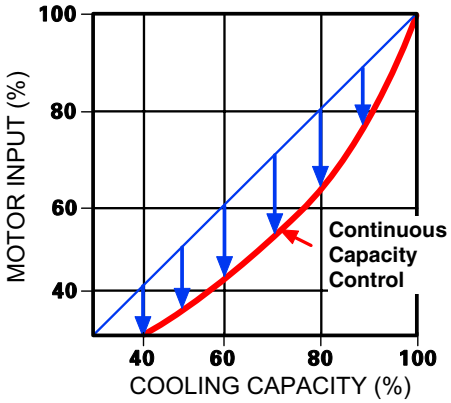
Thanks to Continuous Capacity Control, 15~20% energy saving is possible compared with current step control systems due to the following:

-The cooling load can be more closely matched

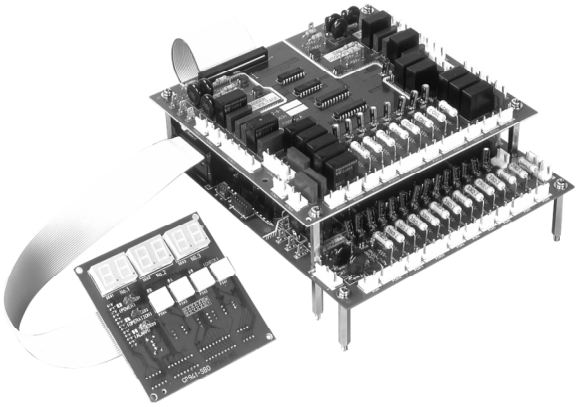
-Continuous Capacity Control takes advantage of high efficiency part load performance.

-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.

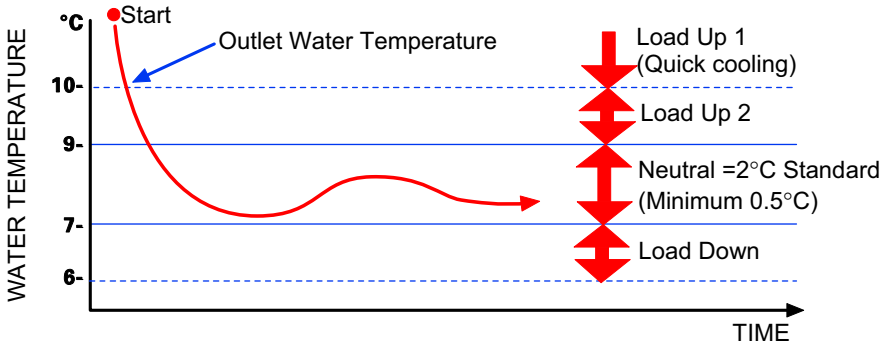
- Forced compressor load control
- 2 Different temperature setting
- Memory data in alarm
- Automatic restart after power failure
- Heating operation (Heat pump operation option)

etc...

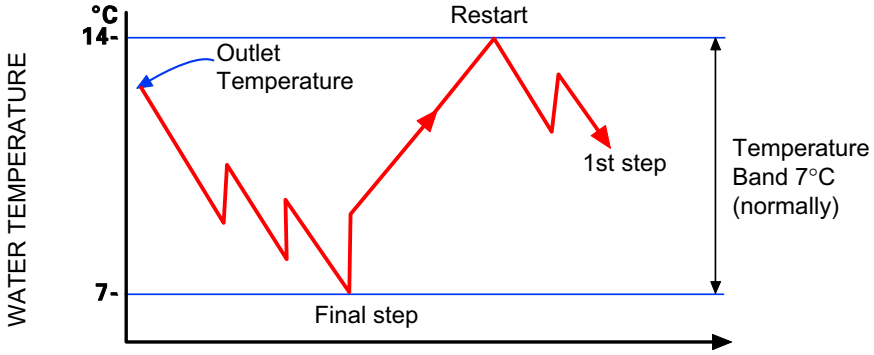
■ PRECISE TEMPERATURE CONTROL

Combination of "Continuous Capacity Control Compressor" and "HITACHI´s unique electronic controls" enable the Chiller to control outlet water temperature precisely, independent of cooling load. This control benefits not only air-conditioning but also industrial process use.

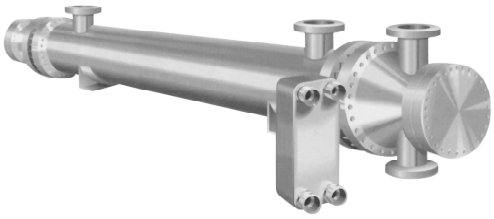
-CONTINUOUS CAPACITY CONTROL-



-CONVENTIONAL STEP CONTROL-



2.4. HEAT EXCHANGER

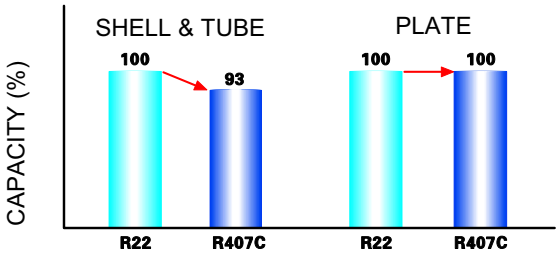


■ **PLATE TYPE HEAT EXCHANGER**

The new Samurai Chillers are equipped with plate type Heat Exchangers, which have many advantages when compared with conventional Shell & Tube heat exchanger as described beside:

Less Refrigerant (Small Internal Volume)
-Clean (Stainless Steel)
-High efficiency (closer approach temperature)

Plate type heat exchanger can provide improved cooling capacity for R407C



2.5. NEW ELECTRONIC EXPANSION VALVE

This unit is 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.

3. OPERATION INSTRUCTIONS

3.1. HITACHI WATER COOLED WATER CHILLER MODELS: RCUE 40-240 WG2

■ **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 to "cool" or "Heat" (In case of Heat Pump operation option)
5.Fully open the liquid line stop valves.
6.Operate the cooling (Hot) and chilled water pump.
7.Set the Dip SW at the desired temperature
8.Depress the "ON" push button of the operation Switch

■ **To Stop the Unit**

1.Depress the "OFF" push button of the operation switch.
2.Switch OFF the main power source when the unit is shut down for a long period of time.

■ **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 shop, if this condition is detected.

■ **Daily Checking**

1.Check the power supply to ensure that it is proper.
2.Check for abnormal sounds and vibration.
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 cooling (Hot) and chilled water running?
4.Are the setting temperature calling for the cooling operation?

■ **Poor Cooling (Heating) Operation**

1.Is there sufficient water supplied to the condenser and the cooler?
2.Is the setting temperature correct?
3.Is the operating pressures normal?

■ **Maintenance**

1.Replace the oil, if it has been deteriorated
2.Clean the unit with a cleaner.
3.Clean the condenser and the water cooler . (It is recommended that a specialist will be contacted for this type of work.)

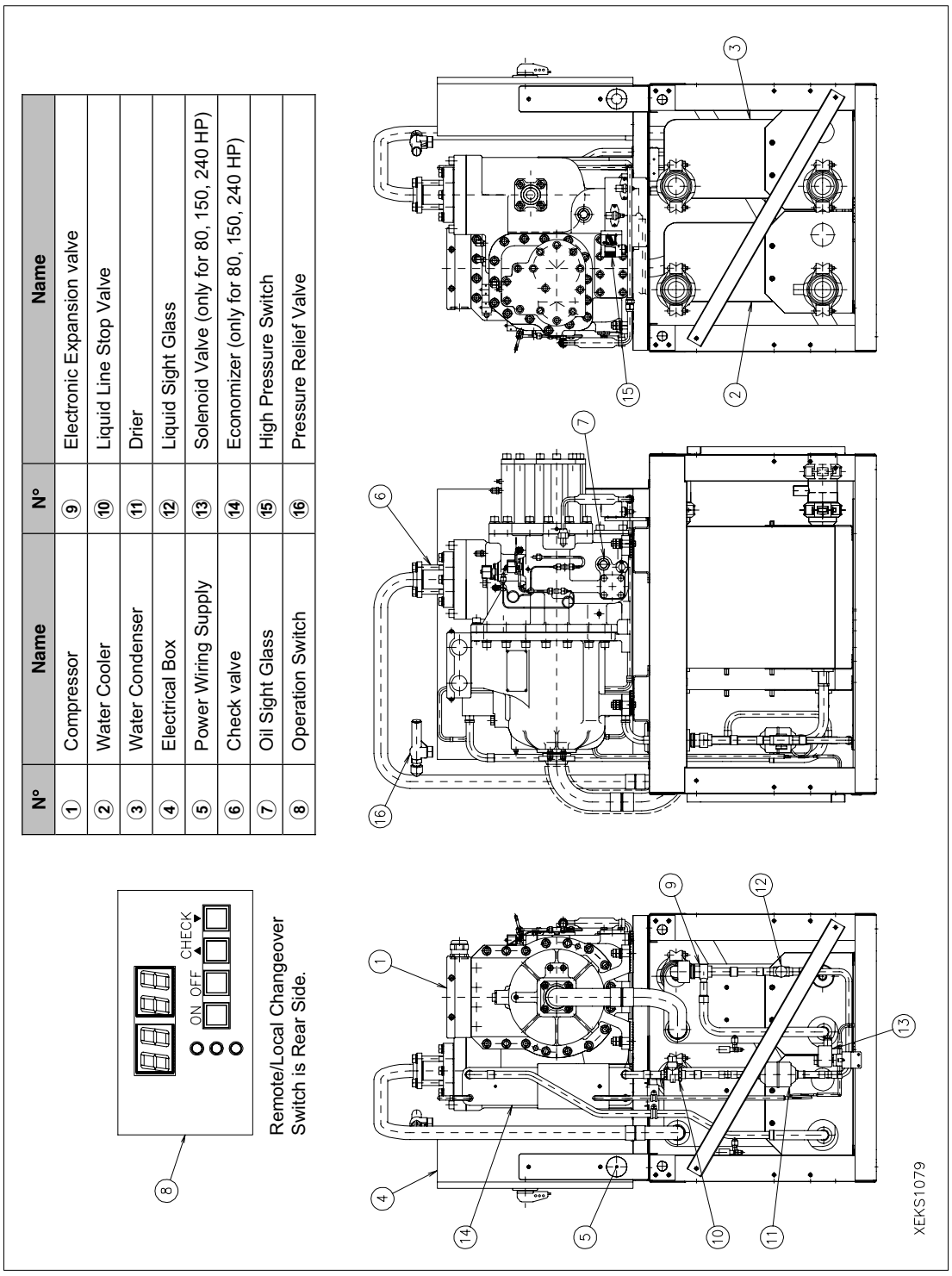
4. COMPONENTS OF CHILLER

4.1. STRUCTURE DRAWING

■ **HITACHI Water cooled Water Chiller (Example of 1 Compressor Chiller)**

STRUCTURE DRAWING OF HITACHI WATER COOLED-WATER CHILLER UNIT (Example: RCUE80WG2)

N°	Name	N°	Name
①	Compressor	⑨	Electronic Expansion valve
②	Water Cooler	⑩	Liquid Line Stop Valve
③	Water Condenser	⑪	Drier
④	Electrical Box	⑫	Liquid Sight Glass
⑤	Power Wiring Supply	⑬	Solenoid Valve (only for 80, 150, 240 HP)
⑥	Check valve	⑭	Economizer (only for 80, 150, 240 HP)
⑦	Oil Sight Glass	⑮	High Pressure Switch
⑧	Operation Switch	⑯	Pressure Relief Valve



5. PREPARATION INITIAL CHECK

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.

■ Installation Space

Check for obstacles which 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 chap. 5.4.

In order to obtain proper clearance beneath the unit for on-the-ground installation, where foundation bolts should be sunk into concrete.

■ 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 “Unit General Data” in Catalogue).

5.2. PLACING THE UNIT

DANGER:

-Do not install the unit outdoors. If installed outdoor, an electrical leakage will occur, since the unit has not been designed for dew protection

-If leakage is detected, stop the unit and contact the installer or a 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 abnormally high pressure.

■ Tools And Instruments

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

■ Transportation

Transportation 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.

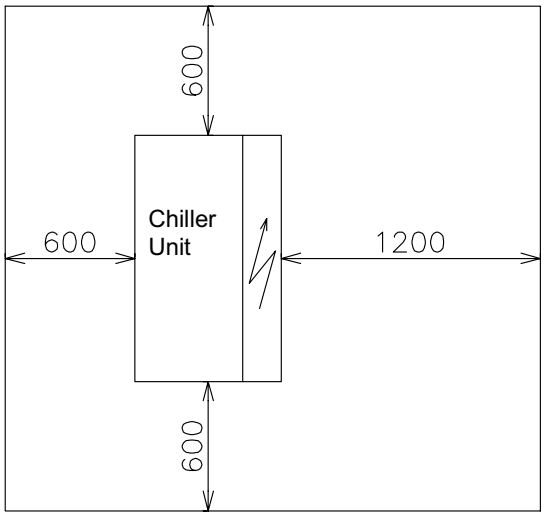


Fig. 1

■ Maximum Foundation Gradient

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

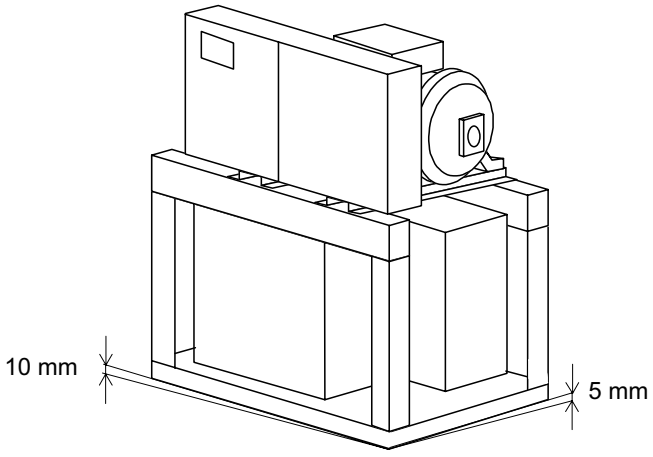
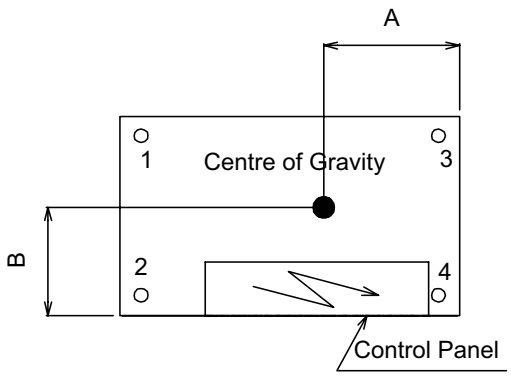


Fig. 2

5.3. CENTRE OF GRAVITY

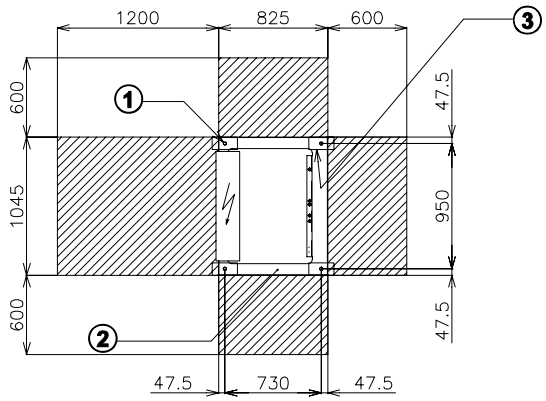
Centre of Gravity



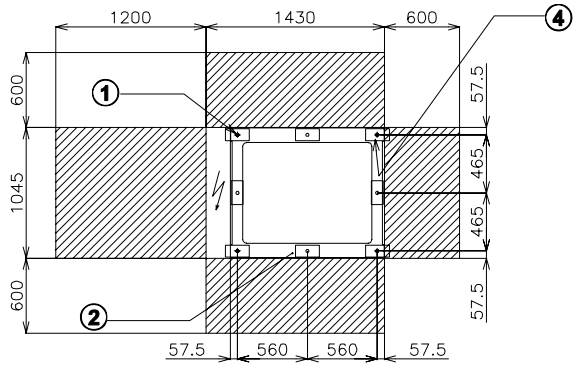
Model	RCUE - WG2									
	40	50	60	80	100	120	150	180	200	240
Location	**Weight Distribution (kg)**									
1	225	230	245	275	410	430	445	600	610	620
2	175	175	190	215	415	440	465	700	710	735
3	215	225	250	285	415	445	470	625	645	675
4	165	170	190	225	415	450	485	730	750	795
Operating Weight										
(kg)	780	800	875	1000	1655	1765	1865	2655	2715	2825
Location of Center of Gravity (mm)										
Dimension A	538	531	522	509	521	516	509	511	508	501
Dimension B	490	490	490	482	815	813	803	1262	1263	1259

5.4. SERVICE SPACE AND FOUNDATION

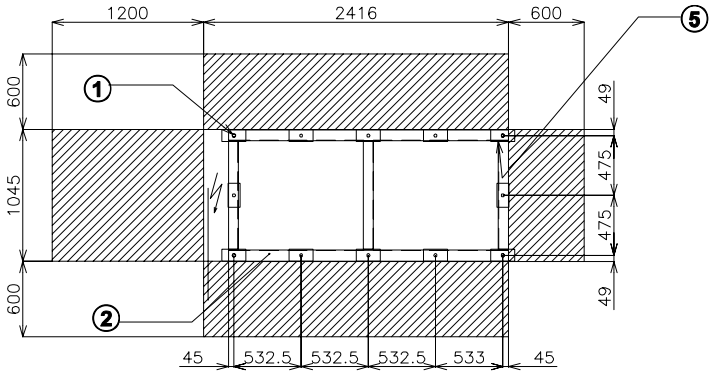
RCUE 40, 50, 60, 80WG2



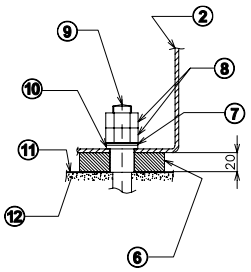
RCUE 100, 120, 150WG2



RCUE 180, 200, 240WG2



Detail Of Foundation



N°	Name	N°	Name
1	4-∅ 26 (Mounting Holes)	7	Washer
2	Bottom Frame	8	Nut
3	Vibration proof Rubber Mat (4 positions)	9	Foundation bolt (M20)
4	Vibration proof Rubber Mat (8 positions)	10	Rubber Bush (OPTION)
5	Vibration proof Rubber Mat (12 positions)	11	Steel Plate (1 mm)
6	Vibration proof Rubber Mat (1 mat per position) OPTION	12	Concrete

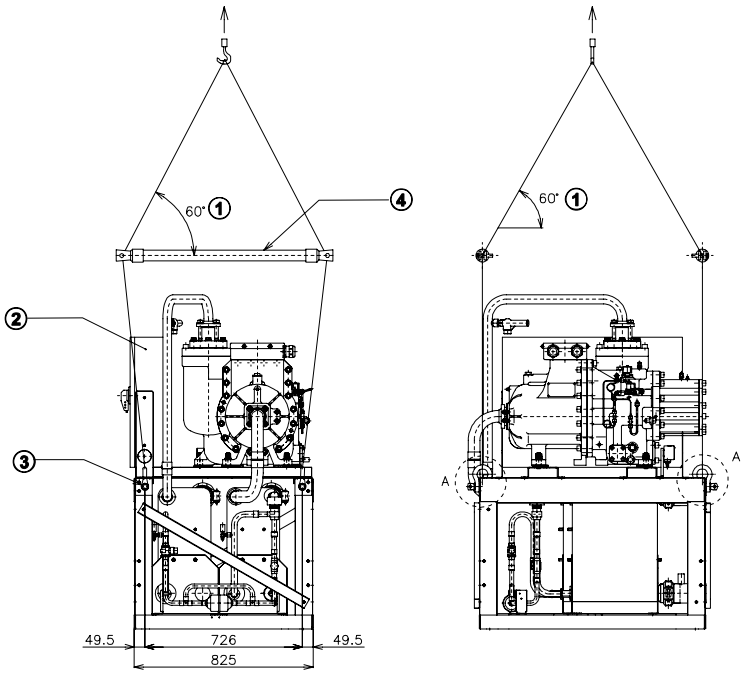
5.5. TRANSPORTATION BY RIGGING

5.5.1. TRANSPORTATION BY RIGGING

Hook wire cables and apply field-supplied spreader bars on the top of the unit (see below figure) to prevent the unit 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 greater than 60° as shown. The weight of the unit is indicated on the unit label.

DANGER:
Do not stand below the unit when rigging.

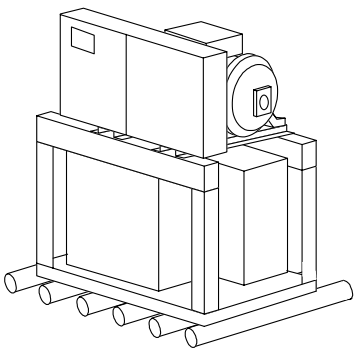
CAUTION:
Put clothes between wires and the unit to avoid damages.



N°	Name
1	60° (or more)
2	Electrical Box
3	4 x Ø 30 Rigging Holes
4	Spreader Bar (Field supplied)
5	Lifting Bracket (Field supplied)

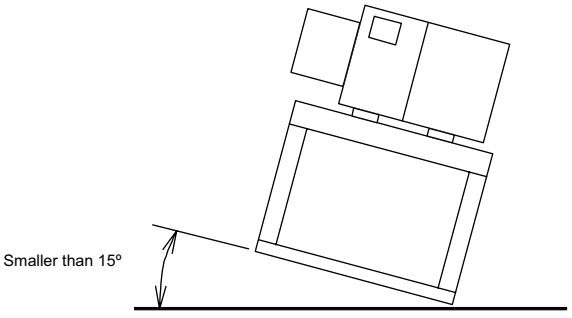
5.5.2. TRANSPORTATION BY ROLLER

When rolling the unit, put at least 6 equal-sized rollers under the base frames. Each roller must carry both the outer frames, and must be suited to balance the unit (see the centre of gravity in page 5/7).



5.5.3. DECLINING THE UNIT DURING TRANSPORTATION

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



6. INSTALLATION

6.1. ELECTRICAL WIRING

■ **Tools and Instruments**

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

■ **Schedule Check**

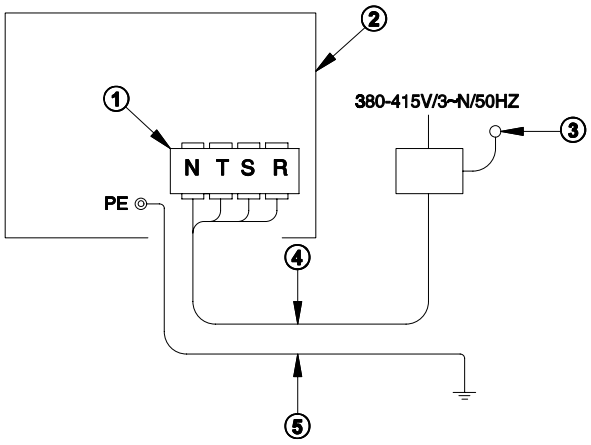
⚠ ***WARNING:***

- *Confirm that the field-selected electrical components (main power switch, fuses, wires, conduit connections, wire terminals and others) are properly selected according to the "Electrical Data" in this Technical Catalogue, and ensure that they comply with national and local codes.*
- *It is recommended that the main power switch be locked in the "OFF" position, to prevent against accidental supply of power during equipment servicing.*
- *Check to ensure that an earthling wire is correctly connected to the unit. This wire protects from an electric shock. Utilisation of an earth leakage breaker is necessary.*

■ **Main Power Wiring Procedures**

Confirm that electrical power is not being supplied to the installation location prior to any electrical installation work.

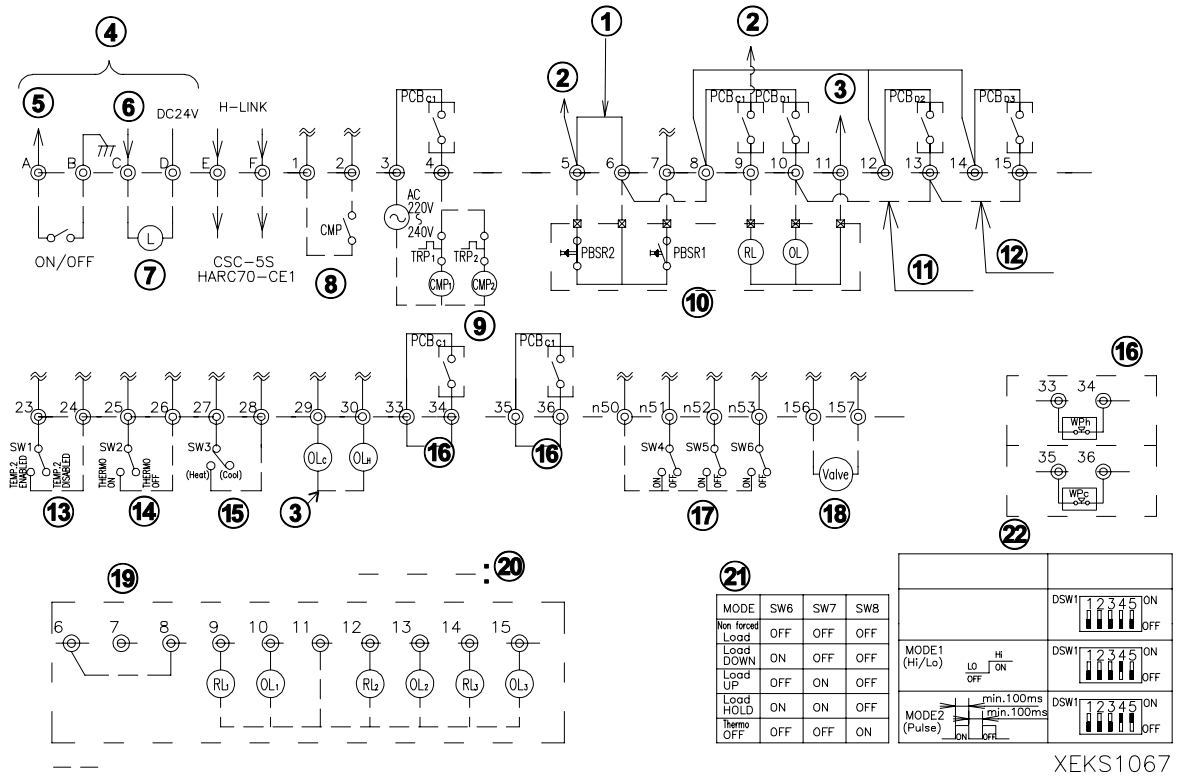
1. Install the field-supplied main switch box (es) at a properly selected location.
2. Install conduit connectors in the hole for the power wiring.
3. Lead main power wires and the earthling wire through the connector to the screw terminals for main power and earthling in the magnetic switch box. The neutral wires for 380/50 Hz and 415 V/50 Hz power supply should also be led through the connector.
4. Firmly connect the wires with wire terminals to unit screw terminals R, S, T and N according to below figure.
5. Connect the wires between the power source and the field-supplied magnetic switches.
6. Consider that the main power source will not be left turned OFF, easily, because it is necessary to energise the oil heater even during unit stoppage.



N°	Name
1	Main Power/Terminal Board (R,S,T,N)
2	Electrical Box
3	Main Power Switch
4	Main Power Wiring
5	Earth Wiring

■ **Control Wiring**

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



N°	Name
1	In case of remote control operation this wire shall be removed.
2	R Phase
3	Neutral
4	Low Voltage / Remote Control
5	Run/Stop Signal
6	Alarm Signal
7	Alarm Lamp
8	Pump Interlock
9	Pump operation
10	Remote Control Switch (RSW-A) (OPTION)
11	2,3 cycles
12	3 cycles

N°	Name
13	2 nd. Setting Temperature
14	External Thermostat Operation
15	Operation Mode (OPTION)
16	Only used for: -Diff. Water Pressure switch (OPTION) -Flow Switch (OPTION)
17	Force Compressor Load Operation
18	Free Cooling Output signal (Only cycle Nº 1)
19	In case of individual indication without Remote Control Switch
20	Customer wiring
21	Force compressor load
22	Setting of low voltage control

NOTE:

1.All the setting shall be performed before Power ON.

2.Remote / Local Change over Switch on Operation Switch shall be set, to Remote.

3.Terminals 1 ◎~/21◎ are for AC220-240V,Terminals A ◎~D ◎ are for DC24V. Terminals E ◎~F ◎ are H-link (Low signal)

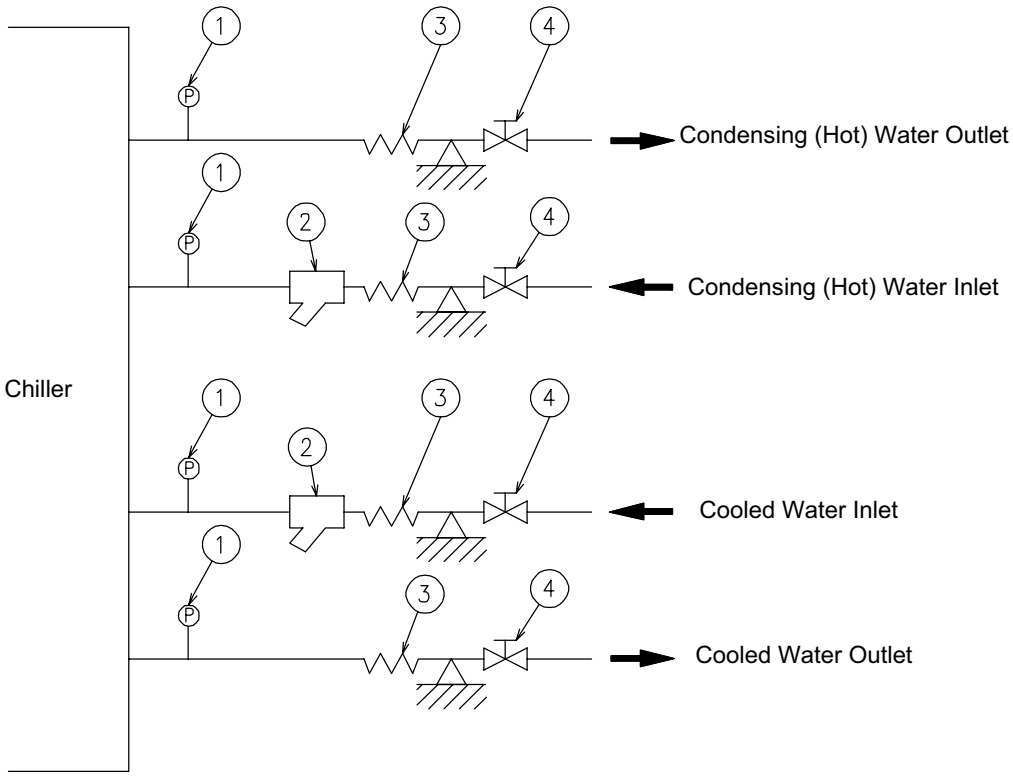
6.2. WATER PIPING

■ 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 condenser and 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 utilized for water piping, in order to minimize flow resistance and to mantain sufficient water flow.
5. Proper inspection should be performed to check for leaking parts inside and outside the system, by completely opening the condenser and chilled water inlet and outlet valves to the condenser and water cooler.Additionally, equip valves to the inlet and outlet piping.Equip an air purge cock and a drain cock on the water 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 even during shutdown period.
   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, utlize antifreeze mixture of ethylene glycol type or propylenen glycol type.
8. The common water pipes (Inlet/Outlet of condenser and cooler, field supplied, should be connected to condenser and cooler directly.

⚠ ***CAUTION:***

- *Never use an antifreeze mixture of the salt type, because it possesses strong corrosion characteristics, and water equipment will be damaged*
- *This product is equipped with plate type heat exchangers. 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 dusts are clogged. In order to avoid this clogging, provide a. 20 mesh water strainer at the inlet of condenser and chilled water piping near the product. A 20 mesh water strainer is available as an option.*

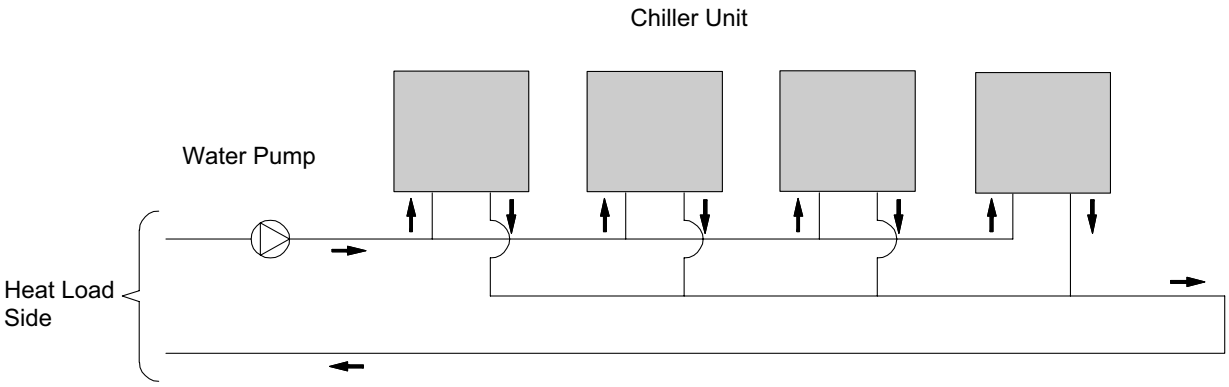


N°	Name
1	Pressure Gauge
2	Strainer
3	Flexible Joint
4	Valve

NOTE:

HITACHI chiller has the pump ON/OFF operation control (see wiring diagram)

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.



6.3. 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 as shown below.

NOTE:
Minimum internal system water volume written below is for standard ON/OFF differential, minimum internal system water volume shall be increased by the setting of differential
.

MODEL RCUE WG2			40	50	60	80	100	120	150	180	200	240
Condenser Water Flow Range	Max.	m^3/h	48.1	57.4	69.8	82.3	114.9	139.6	157.8	186.2	214.9	246.8
Chilled Water Flow Range	Min.	m^3/h	14.3	17.1	20.7	24.7	38.0	41.4	47.4	56.0	64.0	74.2
	Max.	m^3/h	38.6	45.9	55.8	66.6	91.9	111.4	127.8	150.8	172.3	199.9
Minimum Internal System Water Volume		m^3	0.42	0.51	0.61	0.73	1.01	1.23	1.41	1.66	1.89	2.20
Internal Volume in Water Cooler		Liter	15.1	16.7	21.5	23.9	44.8	44.8	44.8	64.4	64.4	71.6
Internal Volume in Condenser		Liter	14.8	18.6	23.9	27.6	40.2	49.4	49.4	71.6	71.6	82.7

6.4. 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 check.

The following is the recommended standard water quality.

Item	Chilled Water System		Tendency [1]	
	Circulating Water (20 ºC 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 Cupper (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	-	❍	❍

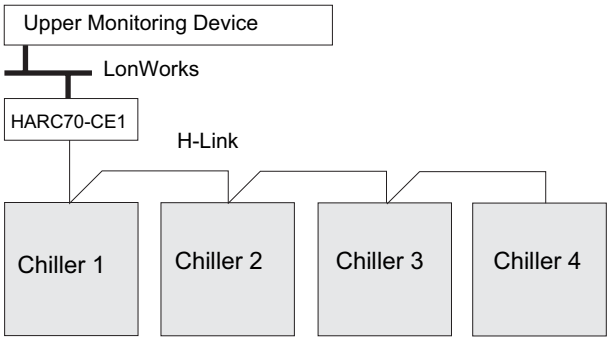
NOTE:

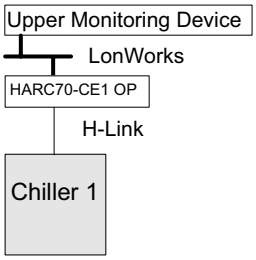
1. *The mark "❍" in the table means the factor concerned with the tendency of corrosion or deposits of scales.*
2. *The value showed in "{}" are for reference only according to the former unit.*

6.5. BMS CONNECTION

6.5.1. SYSTEM

BMS connection is available by using
HARC70-CE1(OP), optional BMS interface unit.





One interface HARC70-CE1 can connect up to 4 Chillers from a remote place using H-Link connection (Hitachi communications protocol).
Protocol used by HARC70-CE1 (OP) is LonWorks. It can connect only one Chiller.
Physical channel connection with interface is FTT-10ª

6.5.2. 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

6.5.3. CAUTION ON USE HARC70-CE1 (OP)

Please use it correctly according to the following "CAUTION ON USE."

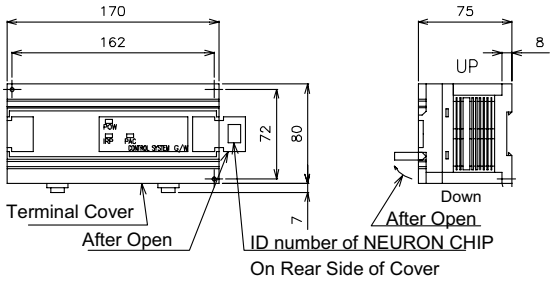
As for the following:

- *"HARC" indicate " HARC70-CE1" or "HARC70-CE1 OP"*
- *"Monitoring Device " indicate " upper connecting device for supervise ", and "Control Panel" indicate "Control panel of Chiller unit".*
- *"SNVT" Indicate "Standard Network Variables Types"*

1. Install HARC in a grounded metal box.
2. Install a short circuit breaker in the power supply of HARC.
3. The transmission line between HARC and Chiller unit should be "0.75mm2 twisted-Pair cable". If it is not used, then it cannot communicate between HARC and Chiller unit, and it does not work properly.
4. After an abnormal transmitting occurs between HARC and Chiller unit, and Chiller unit stops, in the case of operation starting by the hand operation, then once turn off Chiller unit's power supply, and turn on the power supply. If it isn't carried out, then Chiller unit keeps the condition of transmission alarm.
5. After an abnormal transmitting occurs between HARC and Chiller unit, and Chiller unit stops, in the case of operation starting by Monitoring Device, then transmit an operation order after you transmit a stop order once. If it isn't carried out, it can't start.
6. After Chiller unit, under control by HARC, is stopped by the control panel, and operation is done from the Monitoring Device, then transmit an operation order after you transmit a stop order once. If it isn't carried out, it can't start.
7. Don't set the setting temperature to Chiller unit, under control by HARC, by the control panel. If it is done, the setting temperature is changed. And, as for the setting temperature, which changed in this case, transmit to Monitoring device.
8. After the setting temperature is changed by Monitoring Device, in the case of turned off Chiller unit's power supply, set the setting temperature by Monitoring device again. If it isn't carried out, then the setting temperature becomes to the temperature by setting control panel.
9. If power failure occurs in Chiller unit, under control by HARC, it may not revert to the condition before the power failure. Try to detect that the operation condition of Chiller unit changed, by the Monitoring Device. If Chiller unit stopped due to the power failure, then transmit an operation order from the Monitoring Device after the power supply restoration. And, transmit the setting temperature, mode from the Monitoring device. If it isn't carried out, and then Chiller unit is stopping, and the setting temperature, mode is the initialisation value by Chiller unit.
10. When SNVT, which is transmitted from HARC, is used by other control device, premise that there is two minutes delay between the transmitting SNVT and the movement Chiller unit . If it isn't premised, then a problem may occurs in the control system.
11. Don't interrupt the power supply of HARC when you use SCPT in HARC. Even if it exceeds MaxSendTime, when SNVT is not transmitted from HARC, and SNVT is transmitted below with the setting value of MinSendTime, then transmit SCPT again . If it isn't carried out, SCPT value continues maintaining "0".
12. If the setting of control panel change Remote to Locally, and set Remote again, then set the setting temperature and mode from the Monitoring Device again. If it does not set, then the setting temperature and mode continue maintaining the initialisation value by Chiller unit.
13. When the abnormal transmitting occurs between the Monitoring Device and HARC, then the condition of the Monitoring Device may not correspond with the condition of HARC. Set MaxSendTime and try that the condition of the Monitoring Device corresponds with the condition of HARC in the interval of MaxSendTime .
14. It can't be used with the except for " stop signal of input terminal of Chiller unit ".

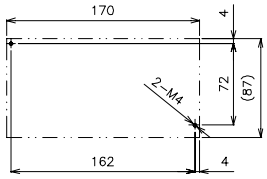
6.5.4. DIMENSIONAL DRAWING AND SPECIFICATIONS OF HITACHI GATEWAY (MODEL HARC70-CE1/HARC70-CE1 0P)

■ Structural Drawing

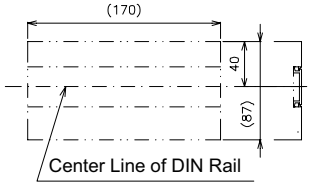


■ Mounting Dimensions

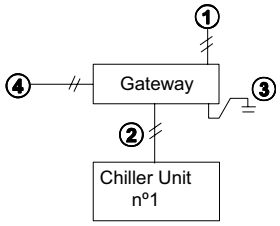
Mounting by Screw



Mounting on DIN Rail

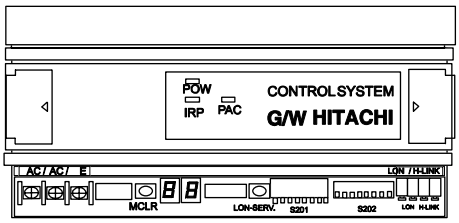


■ System Wiring



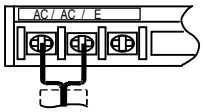
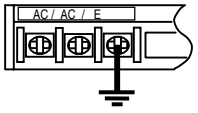
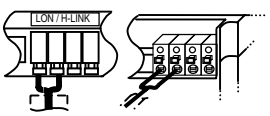
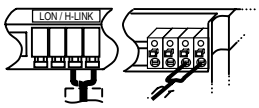
N°	Description	Wire Size
①	Power Supply Power Wire AC 220/240V (Field Supplied)	2mm^2 shielded
②	Connection Wiring Between Chiller Signal Wiring DC 5V (Field Supplied)	0.75mm^2 twisted-pair cable Max. length 1000m
③	Ground Earth Wire (Field Supplied)	-
④	Connection Wire Between LonWorks Signal Wire DC 5V (Field Supplied)	-

■ Marking of Terminals



Mark	Indication
POW	Red: Power Supply (AC220/240V)
IRP	Green: Lighted During Transmission Between LONWORKS
PAC	Yellow: Lighted During Transmission Between Chiller

■ Wiring Procedures

	Section	Wiring Method	Remark
Power Line	1 220-240V Power Source HARC70-CE1(OP)		
	Earthing Wire		
Control Circuit	Upper System HARC70-CE1(OP)		Non-polar
	HARC70-CE1(OP) Water Chillers		Non-polar

■ Network Variables and Setting (HARC70-CE1)

Chiller Number	Water Cooled	Condenser less	Air Cooled	Air Heat Pump	SVNT Number	Name	Type	LONMARK SNVT No	Description	Contents	Remarks
0	O	O	O	O	nv0	nviChillerEnable_0	SNVT_switch	95	On/Off Order	Byte 1: Value 0 (Fixed) Byte 2: State 0/1 = STOP/RUN	Provide an interval of 5 seconds of more between each setting
0	O	O	O	O	nv1	nviCoolSetpt_0	SNVT_temp_p	105	Cool Water Temperature Setting	2 Bytes: -2000 ~ 2500 = -20 ~ 25 ºC	
0	O	O	O	O	nv2	nviMode_0	SNVT_hvac_mode	108	Operation Mode Setting	1 byte: 1 = HVAC_HEAT (Heating) 3 = HVAC_COOL (Cooling)	
0	-	-	-	O	nv3	nviHeatSetpt_0	SNVT_temp_p	105	Hot Water Temperature Setting	2 bytes: 3000 ~ 6000 = 30 ~ 60 ºC	
0	O	O	O	O	nv4	nvoOnOff_0	SNVT_switch	95	On/Off state	Byte 1: Value 0 (Fixed) Byte 2: State 0/1 = STOP/RUN	Those values are updated each 60 seconds. When setting points are changed from HARC change to related point is detected not waiting 60 seconds. If no water chiller is connected these values are set to 0
0	O	O	O	O	nv5	nvoActiveSetpt_0	SNVT_temp_p	105	Temperature Setting	2 Bytes: -2000 ~ 6000 = -20 ~ 60 ºC	
0	-	-	-	-	nv6	nvoActualCapa_0	SNVT_lev_percent (Not Available)	81	Operation Capacity (Not used for continous capacity)	NOT USED	
0	O	O	O	O	nv7	nvoLvgCHWTemp_0	SNVT_temp_p	105	Chilled outlet temperature	2 Bytes: -2000 ~ 6000 = -20 ~ 60 ºC	
0	O	O	O	O	nv8	nvoEntCHWTemp_0	SNVT_temp_p	105	Chilled inlet temperature	2 Bytes: -2000 ~ 6000 = -20 ~ 60 ºC	
0	O	O	O	O	nv9	nvoAlarmDescr_0	SNVT_str_asc	36	Alarm code	31 Bytes: 4 first bytes alarm description as shown in chiller. 5th byte always 0. Others undefined	
0	O	O	O	O	nv10	nvoChillerStat_0	SNVT_chlr_status	127	Chiller Status	3 bytes: Byte 1: Chiller Run Mode 0: Chlr_Off (OFF Mode) 2:Chlr_Run (Run Mode) Byte 2: Chiller Operation Mode 1: HVAC_HEAT (Heating) 3:HVAC_COOL (Cooling) A: HVAC_FREE_COOL (Cooling Thermostat Off) Byte 3: Chlr State bit 0: 0/1 (no alarm / alarm) bit 1: 0/1 (run not available / run available) bit 2: 0/1 (central / local) bits 3 ~ 7: Not used	
0	-	-	-	-	nv11	untest_0	SNVT_press (Not Available)	30	NOT USED	NOT USED	Not used
0	-	-	-	-	nv12	untest_1					
0	-	-	-	-	nv13	untest_2					
0	-	-	-	-	nv14	untest_3					
1	O	O	O	O	nv15	nviChlrEnable_1	SNVT_switch	95	On/Off Order	Same than nv0	Provide an interval of 5 seconds of more between each setting
1	O	O	O	O	nv16	nviCoolSetpt_1	SNVT_temp_p	105	Cool Water Temperature Setting	Same than nv1	
1	O	O	O	O	nv17	nviMode_1	SNVT_hvac_mode	108	Operation Mode Setting	Same than nv2	
1	-	-	-	O	nv18	nviHeatSetpt_1	SNVT_temp_p	105	Hot Water Temperature Setting	Same than nv3	
1	O	O	O	O	nv19	nvoOnOff_1	SNVT_switch	95	On/Off state	Same than nv4	Those values are updated each 60 seconds. When setting points are changed from HARC change to related point is detected not waiting 60 seconds. If no water chiller is connected these values are set to 0
1	O	O	O	O	nv20	nvoActiveSetpt_1	SNVT_temp_p	105	Temperature Setting	Same than nv5	
1	-	-	-	-	nv21	nvoActualCapa_1	SNVT_lev_percent (Not Available)	81	Operation Capacity (Not used for continous capacity)	NOT USED	
1	O	O	O	O	nv22	nvoLvgCHWTemp_1	SNVT_temp_p	105	Chilled outlet temperature	Same than nv7	
1	O	O	O	O	nv23	nvoEntCHWTemp_1	SNVT_temp_p	105	Chilled inlet temperature	Same than nv8	
1	O	O	O	O	nv24	nvoAlarmDescr_1	SNVT_str_asc	36	Alarm code	Same than nv9	
1	O	O	O	O	nv25	nvoChillerStat_1	SNVT_chlr_status	127	Chiller Status	Same than nv10	
1	-	-	-	-	nv26	untest_4	SNVT_press (Not Available)	30	NOT USED	NOT USED	Not used
1	-	-	-	-	nv27	untest_5					
1	-	-	-	-	nv28	untest_6					
1	-	-	-	-	nv29	untest_7					
2	O	O	O	O	nv30	nviChlrEnable_2	SNVT_switch	95	On/Off Order	Same than nv0	Provide an interval of 5 seconds of more between each setting
2	O	O	O	O	nv31	nviCoolSetpt_2	SNVT_temp_p	105	Cool Water Temperature Setting	Same than nv1	
2	O	O	O	O	nv32	nviMode_2	SNVT_hvac_mode	108	Operation Mode Setting	Same than nv2	
2	-	-	-	O	nv33	nviHeatSetpt_2	SNVT_temp_p	105	Hot Water Temperature Setting	Same than nv3	
2	O	O	O	O	nv34	nvoOnOff_2	SNVT_switch	95	On/Off state	Same than nv4	Those values are updated each 60 seconds. When setting points are changed from HARC change to related point is detected not waiting 60 seconds. If no water chiller is connected these values are set to 0
2	O	O	O	O	nv35	nvoActiveSetpt_2	SNVT_temp_p	105	Temperature Setting	Same than nv5	
2	-	-	-	-	nv36	nvoActualCapa_2	SNVT_lev_percent (Not Available)	81	Operation Capacity (Not used for continous capacity)	NOT USED	
2	O	O	O	O	nv37	nvoLvgCHWTemp_2	SNVT_temp_p	105	Chilled outlet temperature	Same than nv7	
2	O	O	O	O	nv38	nvoEntCHWTemp_2	SNVT_temp_p	105	Chilled inlet temperature	Same than nv8	
2	O	O	O	O	nv39	nvoAlarmDescr_2	SNVT_str_asc	36	Alarm code	Same than nv9	
2	O	O	O	O	nv40	nvoChillerStat_2	SNVT_chlr_status	127	Chiller Status	Same than nv10	
2	-	-	-	-	nv41	untest_8	SNVT_press (Not Available)	30	NOT USED	NOT USED	Not used
2	-	-	-	-	nv42	untest_9		30			
2	-	-	-	-	nv43	untest_10		30			
2	-	-	-	-	nv44	untest_11		30			
3	O	O	O	O	nv45	nviChlrEnable_3	SNVT_switch	95	On/Off Order	Same than nv0	Provide an interval of 5 seconds of more between each setting
3	O	O	O	O	nv46	nviCoolSetpt_3	SNVT_temp_p	105	Cool Water Temperature Setting	Same than nv1	
3	O	O	O	O	nv47	nviMode_3	SNVT_hvac_mode	108	Operation Mode Setting	Same than nv2	
3	-	-	-	O	nv48	nviHeatSetpt_3	SNVT_temp_p	105	Hot Water Temperature Setting	Same than nv3	
3	O	O	O	O	nv49	nvoOnOff_3	SNVT_switch	95	On/Off state	Same than nv4	Those values are updated each 60 seconds. When setting points are changed from HARC change to related point is detected not waiting 60 seconds. If no water chiller is connected these values are set to 0
3	O	O	O	O	nv50	nvoActiveSetpt_3	SNVT_temp_p	105	Temperature Setting	Same than nv5	
3	-	-	-	-	nv51	nvoActualCapa_3	SNVT_lev_percent (Not Available)	81	Operation Capacity (Not used for continous capacity)	NOT USED	
3	O	O	O	O	nv52	nvoLvgCHWTemp_3	SNVT_temp_p	105	Chilled outlet temperature	Same than nv7	
3	O	O	O	O	nv53	nvoEntCHWTemp_3	SNVT_temp_p	105	Chilled inlet temperature	Same than nv8	
3	O	O	O	O	nv54	nvoAlarmDescr_3	SNVT_str_asc	36	Alarm code	Same than nv9	
3	O	O	O	O	nv55	nvoChillerStat_3	SNVT_chlr_status	127	Chiller Status	Same than nv10	
3	-	-	-	-	nv56	untest_12	SNVT_press (Not Available)	30	NOT USED	NOT USED	NOT USED
3	-	-	-	-	nv57	untest_13		30			
3	-	-	-	-	nv58	untest_14		30			
3	-	-	-	-	nv59	untest_15		30			
	O	O	O	O	nv60	nciMaxSendTime					
	O	O	O	O	nv61	nciMinSendTime					

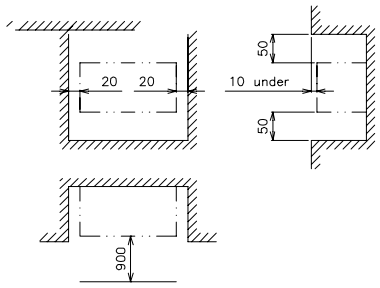
■ Network Variables and Setting (HARC70-CE1 OP)

Water Cooled	Condenser less	Air Cooled	Air Heat Pump	SVNT Number	Name	Type	LONMARK SNVT No	Description	Contents	Remarks
O	O	O	O	nv0	nviChillerEnable_0	SNVT_switch	95	On/Off Order	Byte 1: Value 0 (Fixed) Byte 2: State 0/1 = STOP/RUN	
O	O	O	O	nv1	nviCoolSetpt	SNVT_temp_p	105	Cool Water Temperature Setting	2 Bytes: -2000 ~ 2500 = -20 ~ 25 ºC	Provide an interval of 5 seconds of more between each setting
O	O	O	O	nv2	nviMode	SNVT_hvac_mode	108	Operation Mode Setting	1 byte: 1 = HVAC_HEAT (Heating) 3 = HVAC_COOL (Cooling)	
-	-	-	O	nv3	nviHeatSetpt	SNVT_temp_p	105	Hot Water Temperature Setting	2 bytes: 3000 ~ 6000 = 30 ~ 60 ºC	
O	O	O	O	nv4	nvoOnOff	SNVT_switch	95	On/Off state	Byte 1: Value 0 (Fixed) Byte 2: State 0/1 = STOP/RUN	
O	O	O	O	nv5	nvoActiveSetpt	SNVT_temp_p	105	Temperature Setting	2 Bytes: -2000 ~ 6000 = -20 ~ 60 ºC	
-	-	-	-	nv6	nvoActualCapa	SNVT_lev_percent (Not Available)	81	Operation Capacity (Not used for continous capacity)	NOT USED	
O	O	O	O	nv7	nvoLvgCHWTemp	SNVT_temp_p	105	Chilled outlet temperature	2 Bytes: -2000 ~ 6000 = -20 ~ 60 ºC	
O	O	O	O	nv8	nvoEntCHWTemp	SNVT_temp_p	105	Chilled inlet temperature	2 Bytes: -2000 ~ 6000 = -20 ~ 60 ºC	
O	O	O	O	nv9	nvoAlarmDescr	SNVT_str_asc	36	Alarm code	31 Bytes: 4 first bytes alarm description as shown in chiller. 5th byte always 0. Others undefined	
O	O	O	O	nv10	nvoChillerStat	SNVT_chlr_status	127	Chiller Status	3 bytes: Byte 1: Chiller Run Mode 0: Chlr_Off (OFF Mode) 2:Chlr_Run (Run Mode) Byte 2: Chiller Operation Mode 1: HVAC_HEAT (Heating) 3:HVAC_COOL (Cooling) A: HVAC_FREE_COOL (Cooling Thermostat Off) Byte 3: Chlr State bit 0: 0/1 (no alarm / alarm) bit 1: 0/1 (run not available / run available) bit 2: 0/1 (central / local) bits 3 ~ 7: Not used	
O	O	O	O	n11	nvoDpress1	SNVT_press	30	Discharge Pressure 1	2 Bytes:0~30000 = 0~3,000 kPa	
O	O	O	O	n12	nvoDpress1	SNVT_press	30	Discharge Pressure 2	2 Bytes:0~30000 = 0~3,000 kPa	
O	-	O	-	n13	nvoDpress1	SNVT_press	30	Discharge Pressure 3	2 Bytes:0~30000 = 0~3,000 kPa	
O	-	O	-	n14	nvoDpress1	SNVT_press	30	Discharge Pressure 4	2 Bytes:0~30000 = 0~3,000 kPa	
-	-	O	-	n15	nvoDpress1	SNVT_press	30	Discharge Pressure 5	2 Bytes:0~30000 = 0~3,000 kPa	
-	-	O	-	n16	nvoDpress1	SNVT_press	30	Discharge Pressure 6	2 Bytes:0~30000 = 0~3,000 kPa	
O	O	O	O	n17	nvoSpress1	SNVT_press	30	Suction Pressure 1	2 Bytes:0~30000 = 0~3,000 kPa	
O	O	O	O	n18	nvoSpress2	SNVT_press	30	Suction Pressure 2	2 Bytes:0~30000 = 0~3,000 kPa	
O	-	O	-	n19	nvoSpress3	SNVT_press	30	Suction Pressure 3	2 Bytes:0~30000 = 0~3,000 kPa	Those values are updated each 60 seconds. When setting points are changed from HARC change to related point is detected not waiting 60 seconds. If no water chiller is connected these values are set to 0
O	-	O	-	n20	nvoSpress4	SNVT_press	30	Suction Pressure 4	2 Bytes:0~30000 = 0~3,000 kPa	
-	-	O	-	n21	nvoSpress5	SNVT_press	30	Suction Pressure 5	2 Bytes:0~30000 = 0~3,000 kPa	
-	-	O	-	n22	nvoSpress6	SNVT_press	30	Suction Pressure 6	2 Bytes:0~30000 = 0~3,000 kPa	
O	O	O	O	n23	nvoDtemp1	SNVT_temp_p	105	Discharge Temp 1	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	O	O	O	n24	nvoDtemp2	SNVT_temp_p	105	Discharge Temp 2	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	-	O	-	n25	nvoDtemp3	SNVT_temp_p	105	Discharge Temp 3	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	-	O	-	n26	nvoDtemp4	SNVT_temp_p	105	Discharge Temp 4	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
-	-	O	-	n27	nvoDtemp5	SNVT_temp_p	105	Discharge Temp 5	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
-	-	O	-	n28	nvoDtemp6	SNVT_temp_p	105	Discharge Temp 6	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	O	O	O	n29	nvoSTemp1	SNVT_temp_p	105	Suction Temp 1	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	O	O	O	n30	nvoSTemp2	SNVT_temp_p	105	Suction Temp 2	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	-	O	-	n31	nvoSTemp3	SNVT_temp_p	105	Suction Temp 3	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	-	O	-	n32	nvoSTemp4	SNVT_temp_p	105	Suction Temp 4	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
-	-	O	-	n33	nvoSTemp5	SNVT_temp_p	105	Suction Temp 5	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
-	-	O	-	n34	nvoSTemp6	SNVT_temp_p	105	Suction Temp 6	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
-	-	O	O	n35	nvoODtemp	SNVT_temp_p	105	Outdoor Temperature	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	O	O	O	n36	nvoCompOnOff1	SNVT_state x 16	83	Compressor Information	32 Bytes: Byte 1: b0: 0/1 = STOP/RUN	
O	O	O	O	n37	nvoCompOnOff2	SNVT_state x 16	83	Compressor Information	32 Bytes: Byte 1: b0: 0/1 = STOP/RUN	
O	-	O	-	n38	nvoCompOnOff3	SNVT_state x 16	83	Compressor Information	32 Bytes: Byte 1: b0: 0/1 = STOP/RUN	
O	-	O	-	n39	nvoCompOnOff4	SNVT_state x 16	83	Compressor Information	32 Bytes: Byte 1: b0: 0/1 = STOP/RUN	
-	-	O	-	n40	nvoCompOnOff5	SNVT_state x 16	83	Compressor Information	32 Bytes: Byte 1: b0: 0/1 = STOP/RUN	
-	-	O	-	n41	nvoCompOnOff6	SNVT_state x 16	83	Compressor Information	32 Bytes: Byte 1: b0: 0/1 = STOP/RUN	
O	O	O	O	n42	nvoLvgCHWTemp 1	SNVT_temp_p	105	Outlet Water Temp 1	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	-	O	O	n43	nvoLvgCHWTemp 2	SNVT_temp_p	105	Outlet Water Temp 2	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	-	O	-	n44	nvoLvgCHWTemp 3	SNVT_temp_p	105	Outlet Water Temp 3	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	O	-	-	n45	nvoLvgCHWTemp 4	SNVT_temp_p	105	Water Temp in Cooler BackSide 1	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	-	-	-	n46	nvoLvgCHWTemp 5	SNVT_temp_p	105	Water Temp in Cooler BackSide 2	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
O	-	-	-	n47	nvoLvgCHWTemp 6	SNVT_temp_p	105	Water Temp in Cooler BackSide 3	2 Bytes: -12700 ~12700 = -127 ~ 127 ºC	
-	-	-	-	n48	unused 1	SNVT_temp_p	105	NOT USED	NOT USED	NOT USED
-	-	-	-	n49	unused 2	SNVT_temp_p	105	NOT USED	NOT USED	NOT USED
-	-	-	-	n50	unused 3	SNVT_temp_p	105	NOT USED	NOT USED	NOT USED
-	-	-	-	n51	unused 4	SNVT_temp_p	105	NOT USED	NOT USED	NOT USED
-	-	-	-	n52	unused 5	SNVT_temp_p	105	NOT USED	NOT USED	NOT USED
-	-	-	-	n53	unused 6	SNVT_temp_p	105	NOT USED	NOT USED	NOT USED
-	-	-	-	n54	unused 7	SNVT_temp_p	105	NOT USED	NOT USED	NOT USED
-	-	-	-	n55	unused 8	SNVT_temp_p	105	NOT USED	NOT USED	NOT USED
-	-	-	-	n56	unused 9	SNVT_temp_p	105	NOT USED	NOT USED	NOT USED
O	O	O	O	nv57	nciMaxSendTime					
O	O	O	O	nv58	nciMinSendTime					

NOTE:

Set and use the variables in accordance with the above tables. (The variables based on "Chiller Part of LonMark® Function Profile", however, some function and setting range have limitation)

■ Space Requirements



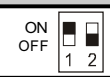
NOTE:

1. *Before operating this gateway, initial settings by a system integrator for the local LonWorks system are necessary.*
2. *This gateway is designed to be connected with LonWorks network, and will not function by itself when it is not connected.*
3. *The power lines and the signal lines shall be separated with a minimum distance of 15cm.*
4. *It is necessary to set and adjust the Chillers and gateway before operating the system.*
5. *"LonWork" "LonMark" are trademarks of Echelon Corporation registered in the USA and other countries.*

■ Specifications

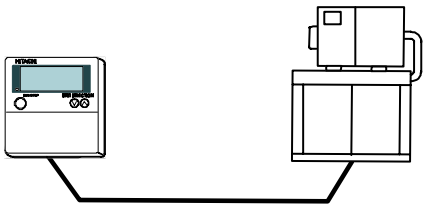
Item	Specifications
Connection Capacity	Maximum 4H-Link PCBs of Hitachi Chiller
Power Supply	AC 1-PH, 220~240V±10% 50/60Hz
Power Consumption	Maximum 10W
Ambient Condition Temperature Relative Humidity	0-45°C 10-80% (with condition of no condensation)
Net weight	0.6kg
Colour	Grey (Munsell 5Y7/1 or similar)
Material of Box	ABS resin molding material
Mounting Method	Wall Mount (By 2 x M4 Screws), or on DIN Rail (35mm)
Mounting Location	In Weather and Dust-Proofed Control Panel
Accessories	Core x 1, Capacitor x 1
Transceiver	Using FTT-10A
Warranty	No warranty shall be applied for the control and operation of the upper "LonWorks" side. Hitachi's liability shall cover only Hitachi Chillers, this gateway, and accessibility by "LonWorks"

■ Transmitting Setting (On Chiller Control PCB)

Operation	DSW
Before shipment, No. 1 pin of DSW10 is set at ON side	
In case that Chiller Unit quantity in the same H-Link is 2 or more, set No. 1 pin of DSW10 at the OFF side from 2nd Unit. If only one Chiller Unit is used, no setting is required.	
In case of applying high voltage to the terminal TB1 (E,F), the fuse on the PCB is cut. In such a case, first connect the wiring to TB1 (E,F) and then turn “ON” DSW-2	

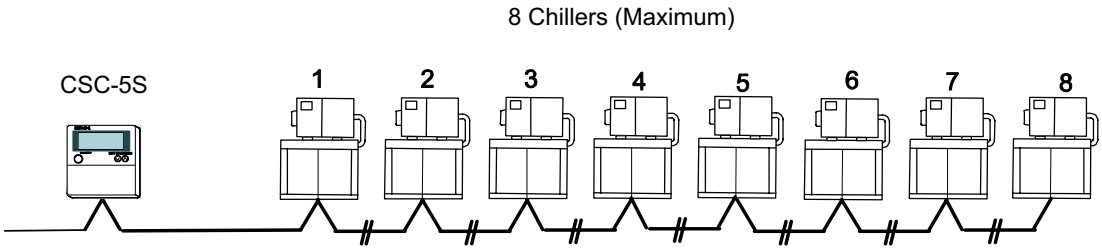
6.6. CSC-5S

CSC-5S is a remote controller for Hitachi Water Chillers



6.6.1. SYSTEM

CSC-5S allows the individual control of a Chiller Unit as well as it allows a centralized and grouped controls of a maximum number of 8 chillers.



6.6.2. SIGNAL

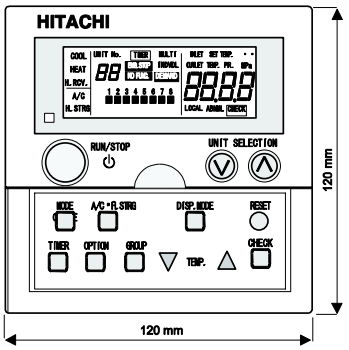
Indication code	Indication Content	Unit	Remark	Control Monitoring
	ON/OFF unit operation			Control Data
	Setting Temperature COOL	°C		
	Setting Temperature HEAT	°C		
	Operation Mode			
C1Pd ~ C2Pd	Discharge Pressure	MPa	Indicate Max. 6 Refrigerant Circuit Data	Monitoring Data
C1Ps ~ C2Ps	Suction Pressure	MPa		
C1td ~ C2td	Discharge Gas Temperature	°C		
C1ts ~ C2ts	Suction Gas Temperature	°C		
C1tr ~ C2tr	Liquid Refrigerant Temperature	°C		
CEL	Inlet Water Temperature	°C		
CoL	Outlet Water Temperature	°C		
CcoL	Individual Water Piping Outlet Temperature	°C	The display contents depend on chiller unit.	
tSC	Setting Temperature of Chilled Water	°C		
tSH	Setting Temperature of Hot Water	°C		
tSCd	Setting Analog Temperature of Chilled Water	°C	Not available	
tSHd	Setting Analog Temperature of Hot Water	°C	Not available	
dF	Differential Setting	°C		
tA	Ambient Temperature (Not available)	°C		
Crno	ROM No. of Chiller Unit			
CvEr	Version No. of Chiller Unit			
rno	ROM No. of Controller (CSC-5S)			

6.6.3. CAUTION ON USE OF CSC-5S

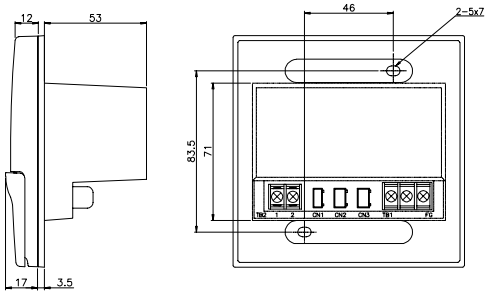
Follow strictly instructions of CSC-5S Installation Manual. This controls requires power supply ~1 220-240 V.

6.6.4. DIMENSIONAL DRAWING AND SPECIFICATIONS OF CSC-5S

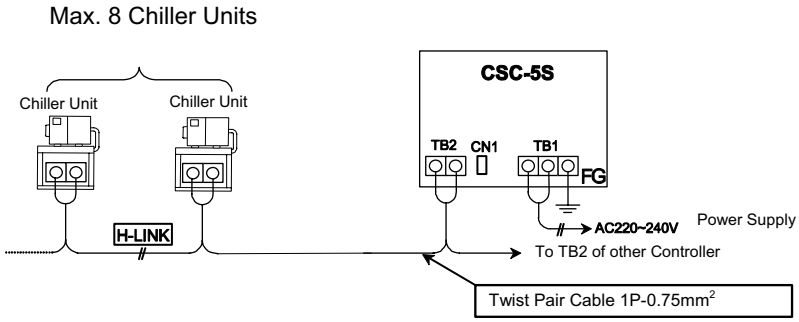
■ **Structural Drawing**



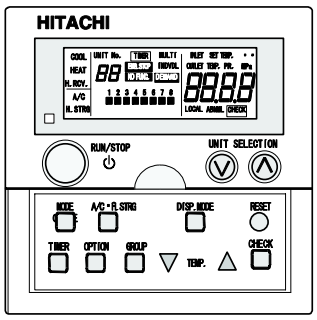
■ **Mounting Dimensions**



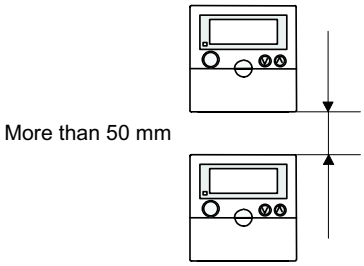
■ **System Wiring**

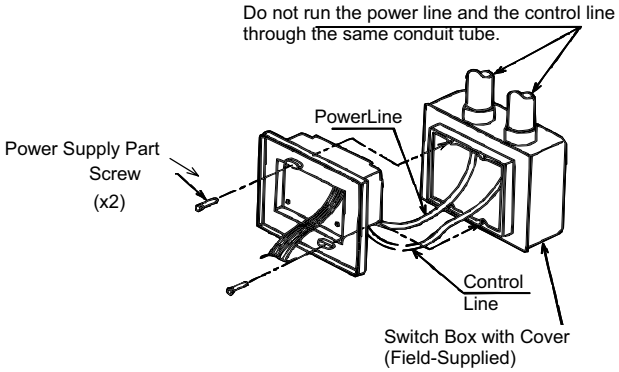


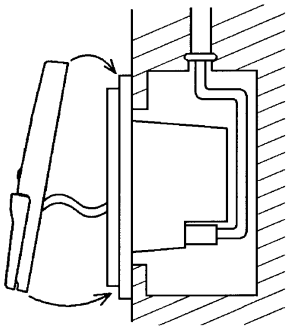
■ CSC-5S LAYOUT



■ SPACE REQUIREMENTS







■ TRANSMITTING SETTING (ON CHILLER CONTROL PCB)

Operation	DSW
Before shipment, No. 1 pin of DSW10 is set at ON side	ON OFF 1 2
In case that Chiller Unit quantity in the same H-Link is 2 or more, set No. 1 pin of DSW10 at the OFF side from 2nd Unit. If only one Chiller Unit is used, no setting is required.	ON OFF 1 2
In case of applying high voltage to the terminal TB1 (E,F), the fuse on the PCB is cut. In such a case, first connect the wiring to TB1 (E,F) and then turn “ON” DSW-2	ON OFF 1 2

6.7. INSTALLATION FINAL CHECK

Inspect the installation work according to all documents and drawings. Table below shows the minimum check points.

6.7.1. INSTALLATION WORK CHECK LIST

1. Is the unit solidly mounted and levelled?
2. Is the installation location adequate?

- ☐ Indoor Installation
- ☐ Space for Maintenance Work
- ☐ Noise and Vibration
- ☐ Sunshine and other Heat Sources
- ☐ Appearance

3. Is the water piping system adequate?

- ☐ Tube Size
- ☐ Length
- ☐ Flexible Joint
- ☐ Insulation
- ☐ Strainer
- ☐ Common Pipes (for 3 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

7.1. PREPARATION

■ **Tools and instruments**
High Pressure Compound Gauge. Low Pressure Compound Gauge. Electrical Tester and General Tools.

⚠ ***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.*
- *Remove the foreign particles and substances from the water piping without going through the water coolers and condensers, and cleaning the water strainer filter before test runningg. Check to ensure that no foreign particle and substance exists in the water piping*

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 the cooling tower, and the pump and cooling tower will be started immediately. Check the condition and operation state of these components
2. Fully open the liquid line stop valve.
3. Set the operation switch to "ON", and the compressor will be started in a few minutes after this operation, according to the following Operation Sequence Chart (Refer to pages 36 to 38).

Test running should be accomplished as follows.

⚠ ***CAUTION:***
- *When the unit is wired according to the HITACHI standard wiring shown on the wiring label. Switch ON the main power switch, and energize the oil heater for 12 hours before start-up to sufficiently warm the oil.*
- *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 is correctly connected. The correct phase connection can be checked by a phase sequence indicator. If not, the compressor does not start due to 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.

1. 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 operate properly.
2. Set the switch at the desired temperature.
3. Depress the “ON“ push button, the compressor will be started.
4. After system operation becomes stabilized, check the discharge and suction pressures by 7-segment on control panel.
5. Check to ensure that the thermostat functions properly.
6. Check to ensure that the control and protective devices function properly.
7. Starting timer and unload-starting timer are set at five (5), thirty (30) seconds, respectively, in accordance with operation characteristics. Therefore, local adjustment should be avoided.

ⓘ ***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 values of running current due to individual capacity control for each compressor. This is not abnormal.*

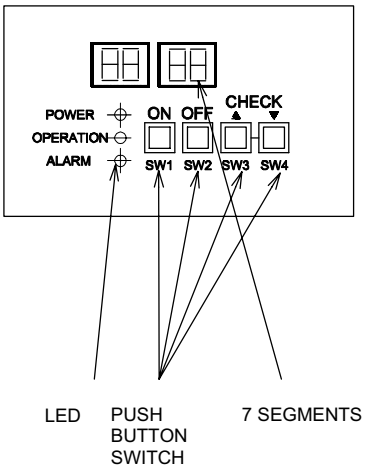
7.3. INSTRUCTIONS AFTER TEST RUNNING

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

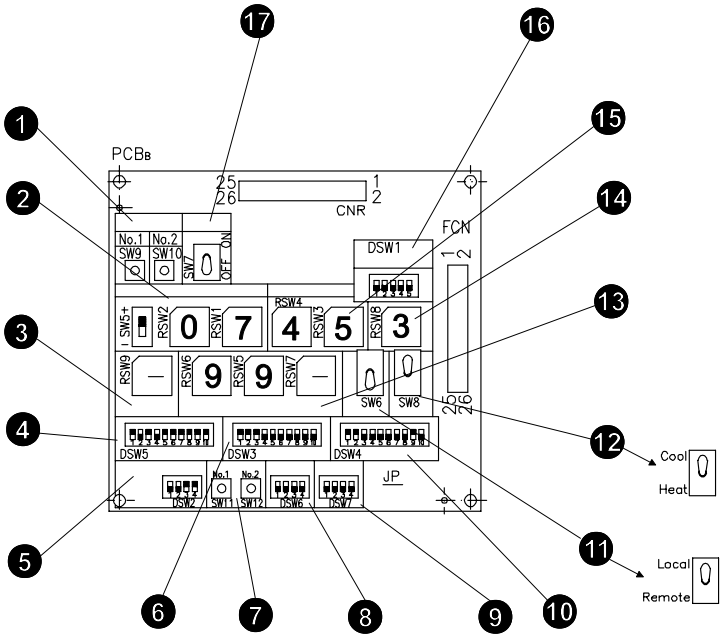
⚠ ***CAUTION:***

- *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



SWITCH POSITION	
ON / OFF ■	ON
ON / OFF ■	OFF



❶ High Cut Check (Fan Stop for Checking)
(NOT AVAILABLE)

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: "Local")

⓬ Cool/Heat Changeover Switch
(STANDARD: "Cool", “Heat” is available only for Heat Pump operation Option)

⓭ Current Limitation
(Not Available)

⓮ Neutral Zone Setting
(STANDARD: "3")

⓯ Hot Water Temperature Setting for Heat Pump
(STANDARD: "45", Available only for Heat Pump operation option)

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

⓱ Pump Operation (STANDARD: OFF)

8.1. CONTROL SYSTEM

Electrical Operation Control 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 function 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.

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 devices, 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 Short Period Power-Failure.
In the case that a power failure shorter than 2 seconds occurred, compressors can be restarted automatically within 3 minutes after power supply.
If power failure longer than 2 seconds occurres, compressor also can be restarted by selection switch setting.

Power Supply
All models need only single power supply . Control circuit is powered from main power circuit. For remote control, pump interlock and pump operation, see the diagram of "Customer Wiring".

8.2. CONTROLLER ADJUSTMENT

Layout of control panel of printed circuit board is shown in the Figure of the last page.
Setting functions are followings:

■ Chilled Water Outlet Temperature Setting Switch = RSW1 and RSW2

= 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.

■ Hot Water Outlet Temperature Setting

Switch = RSW3 and RSW4 (Available only for Heat Pump operation option) = 45ºC for hot water Outlet temperature is recommended. The RSW3 and RSW4 dials are already set at 5 and 4.

■ Current limitation = RSW5, 6, 7

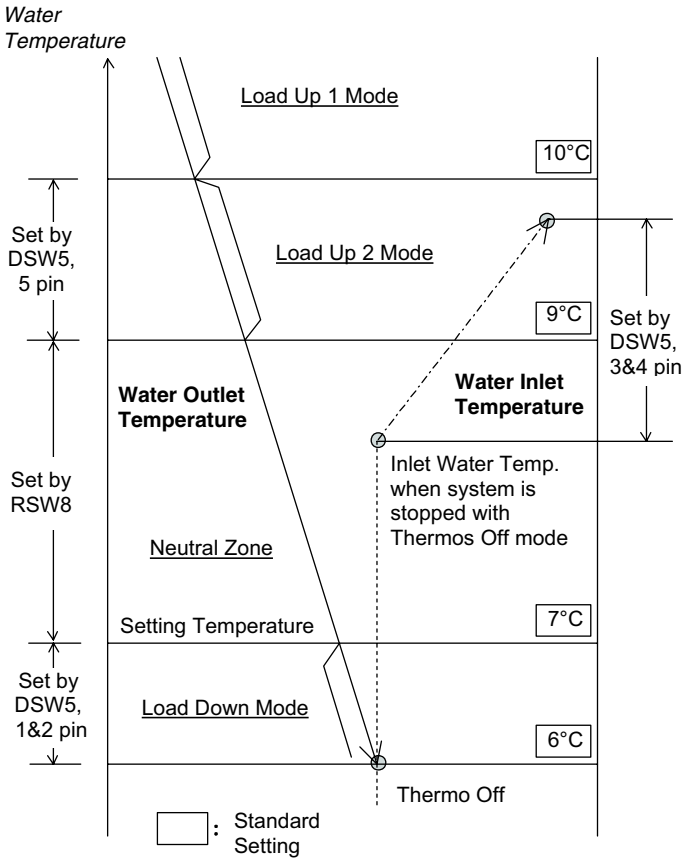
= The RSW5, RSW6 and RSW7 should not be permitted.

■ 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 means 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 = DSW5Definition of Special Terms.



■ Continuos Capacity Control Setting Switch=DSW5

Temperature Band for Stop Setting Switch
= 1 degree is 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 degree is 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 degree is 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 is 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 is 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 means 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 is 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 o f 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 is 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 *
Switches "DSW3-1" is for No.1 compressor, "DSW3-2" for No.2, and "DSW3-3" for No.3.
If necessary to stop any compressors, turn these switches (DSW3-1, DSW3-2 and DSW3-3 to the OFF side, the compressors corresponding to these switches are turned to the OFF side will be stopped).
The figures of the DSW3 switch are initially set as follows depend on the compressor quantity.
This switch is for servicing, therefore, all the compressors shall be ON for normal operation.

Figure	1	2	3	1	2	3
Location	ON	OFF	OFF	ON	ON	OFF
Model	1 Comp. System			2 Comp. System		

Figure	1	2	3
Location	ON	ON	ON
Model	3 Comp. System		

Setting at the figures from 4 to 10 of the DSW3 switch should not be permitted (always at OFF side).

Note: *The figures 2 and 3 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 2, 6 and 7 of the DSW4 switch must be turned to the ON side.
Setting at the figures 1,3, 4, 5 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 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		50 HP		60 HP		80 HP	

■ Selection Switch for Cooling/ Heating Operation = SW8

The SW8 selection SW is used for selecting cooling or heating operation. However, Standard model in this series are for cooling only. So that Heating function is available only for Heat Pump operation option.
Turn SW8 to the upper side for cooling operation or lower side for heating operation.

■ Selection Switch for Local/ Remote Operation = SW6

= Local operation is standard. So that the SW6 selection switch is turned to the ***upper side***.
If Remote 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, RSW9 and DSW1

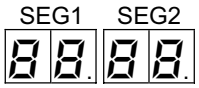
This control panel is equipped with other switches:
The SW5 selection switch for chilled water/brine water, so that this switch must be turned to the ***upper side ("water")***. DSW6 and RSW9 for operation mode and setting change of these switches are not available.
The figure 2 of DSW6 must be turned to the upper side.
It is recommended that the setting is not changed at site.
Also, the DSW1 switch is equipped with. This switch is used for only checking, resulting in easy troubleshooting.

9. SELF-INSPECTION FUNCTIONS

9.1. ALARM INDICATION

■ Alarm Indication

If the unit is operated under abnormal conditions, an alarm code(refer to the table below) is indicated and the "Alarm" LED 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	
C1H1	C2H2	C3H3	Activation of High Pressure Switch
C1L1	C2L2	C3L3	Activation of Low Pressure Control
C1S1	C2S2	C3S3	Activation of Thermal Relay for Compressor or Malfunction of Auxiliary Relay Arn
C161	C262	C363	Activation of Discharge Gas Thermistor
C171	C272	C373	Activation of Compressor Internal Thermostat
C191	C292	C393	Excess Low Temperature of Cooler Inlet Refrigerant
C1t1	C2t2	C3t3	Activation of Suction Gas Thermistor
C105	C205	C305	Phase Abnormally (Only for 3 cycle unit)
C112	C212	C312	Failure of Water Outlet Thermistor (Only for 3 cycle unit)
C113	C213	C313	Activation of Freeze Protection Control (Only for 3 Cycle Unit)
C121	C221	C321	Failure of Cooler inlet Refrigerant Thermistor (Open / Short)
C123	C223	C323	Failure of Discharge Gas Thermistor (Open / Short)
C124	C224	C324	Failure of Thermistor set before Expansion Valve
C125	C225	C325	Failure of Water Outlet Thermistor (Rear side of Water Cooler)
C126	C226	C326	Failure of Suction Gas Thermistor (Open / Short)
C127	C227	C327	Failure of Discharge Gas Pressure Sensor (Open / Short)
C128	C228	C328	Failure of Suction Gas Pressure Sensor (Open / Short)
C132	C232	C332	Failure of Hot Water Outlet Temperature Thermistor (Only for 3 Cycle Unit of Heat Pump Operation Option)
	0505		Phase Abnormally (Only for 1 and 2 Cycle Unit)
	1111		Failure of Water Inlet Temperature Thermistor
	1212		Failure of Water Outlet Thermistor. (Only for 1 and 2 Cycle Unit)
	1313		Activation of Freeze Protection Control (Only for 1 and 2 Cycle Unit)
	3131		Failure of Hot Water Inlet Temperature Thermistor (Only for Heat Pump Operation Option)
	3232		Failure of Hot Water Outlet Temperature Thermistor (Only for 1 and 2 Cycle Unit of Heat Pump Operation Option)
	SPSP		No Feedback Signal from Water Pump
	4040		Incorrect Operation
	EUEU		Error Communication between Expansion Valve PCB and Control PCB
	"PU" "PU"		Alarm of Excessively High Water Temperature
	6E6E		Alarm of Water Failure for Water Cooler (Differential Pressure Switch or Flow Switch Option)
	6C6C		Alarm of Water Failure for Condenser (Differential Pressure Switch or Flow Switch Option)
	APAP		Activation of Additional Protection Device
	0303		Error Communication between Chiller and Remote Controller (If CSC-5S is connected.)
C1P6	C2P6	C3P6	Retry Operation (by Alarm Cx-9x or Cx-Lx, x: Cycle No.)

"-" : Flickering

9.2. NORMAL INDICATION

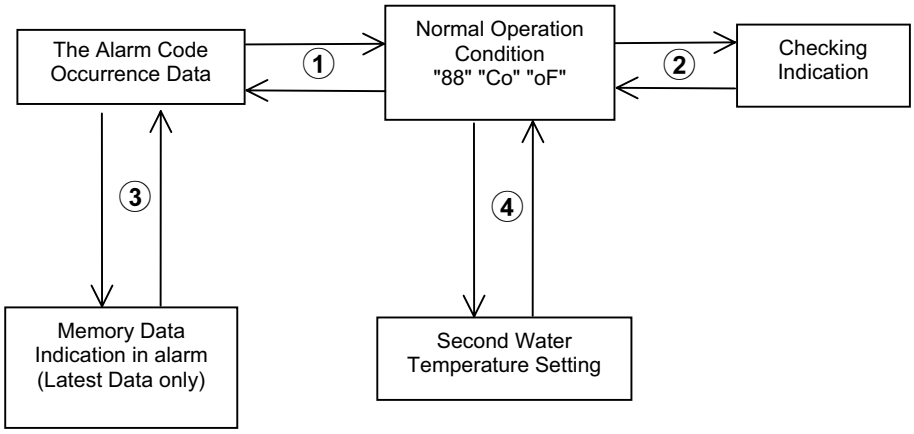
If the unit is operated under a normal operation condition, the operation code (refer to the table below) is indicated on 7-Segment LEDs of the control panel.

Code			Content
No.1 Cycle	No.2 Cycle	No.3 Cycle	
C1 88	C2 88	C3 88	Power Supply, After Stoppage
C1 Co	C2 Co	C3 Co	Cooling Operation
C1 HE	C2 HE	C3 HE	Heating Operation (Only for Heat Pump Operation Option)
C1 oF	C2 oF	C3 oF	Stoppage by Thermo-OFF or Retry by Alarm Cx-5x
	PU PU		Pump Operation, Warning of Pump Feedback
C1 E0	C2 E0	C3 E0	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 coad.

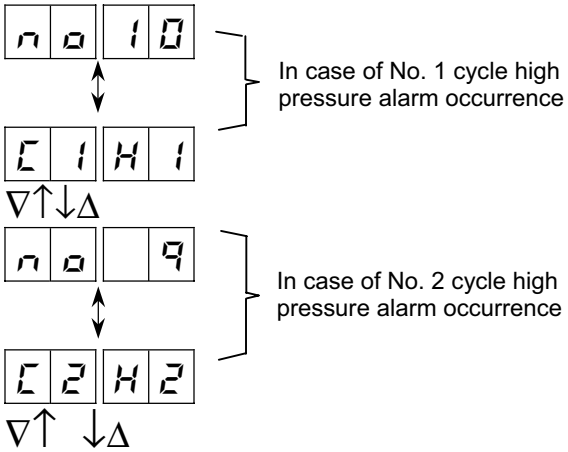
④ Press the check "∇" switch for more than 3 seconds. It is changed to the normal mode by pressing the "Δ" switch for more than 3 sec. Again.

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

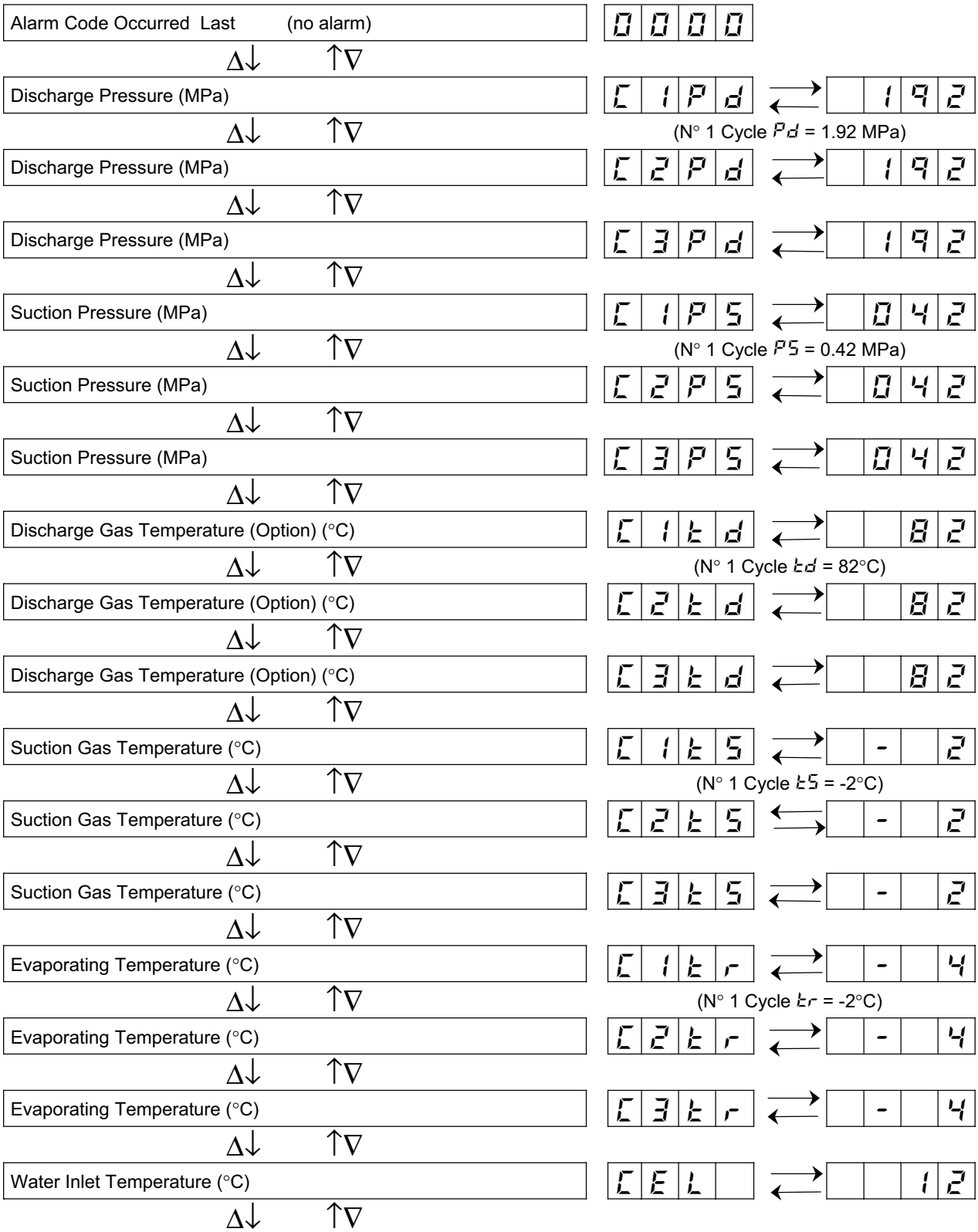
Alarm Occurrence Data (Max.10 data)



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

■ Checking Indication ③

Back to "CPU ROM numbre" ↑∇



Average Water Outlet Temperature (°C) — CoL ⇄ 7

Δ↓ ↑∇

Water Outlet 1 Temperature (°C) — CoL1 ⇄ 7

∇↑ ↓Δ

Water Outlet 2 Temperature (°C) — CoL2 ⇄ 6

∇↑ ↓Δ

Water Outlet 3 Temperature (°C) — CoL3 ⇄ 7

∇↑ ↓Δ

Setting Water Outlet Temperature (°C) (Cooling) — tSC ⇄ 7

∇↑ ↓Δ

Setting Water Outlet Temperature (°C) (Heating) — tSH ⇄ 45

Δ↓ ↑∇

Second Setting Water Outlet Temperature (°C) (Cooling) — tSCd ⇄ 5

Δ↓ ↑∇

Second Setting Water Outlet Temperature (°C) (Heating) — tSHd ⇄ 40

Δ↓ ↑∇

Setting Neutral Zone Temperature Difference (°C) — dF ⇄ 2

Δ↓ ↑∇

Compressor Capacity Control (°C) — C1Ld ⇄ UP (Load up)

Δ↓ ↑∇

Compressor Capacity Control (°C) — C2Ld ⇄ nU (Hold)

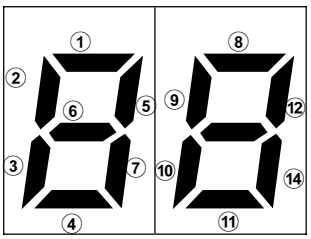
Δ↓ ↑∇

Compressor Capacity Control (°C) — C3Ld ⇄ d0 (Load down)

Δ ∇

-- (Thermo-off)

Alarm Control Status



①	Discharge Pressure Control	⑧	Not available
②	Suction Pressure Control	⑨	Not available
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	Not available	⑭	Not Available

Control Status — C1PC ⇄ Co1 (Compressor start control)

Δ↓ ↑∇

Control Status — C2PC ⇄ Co1 (Suction pressure control activated)

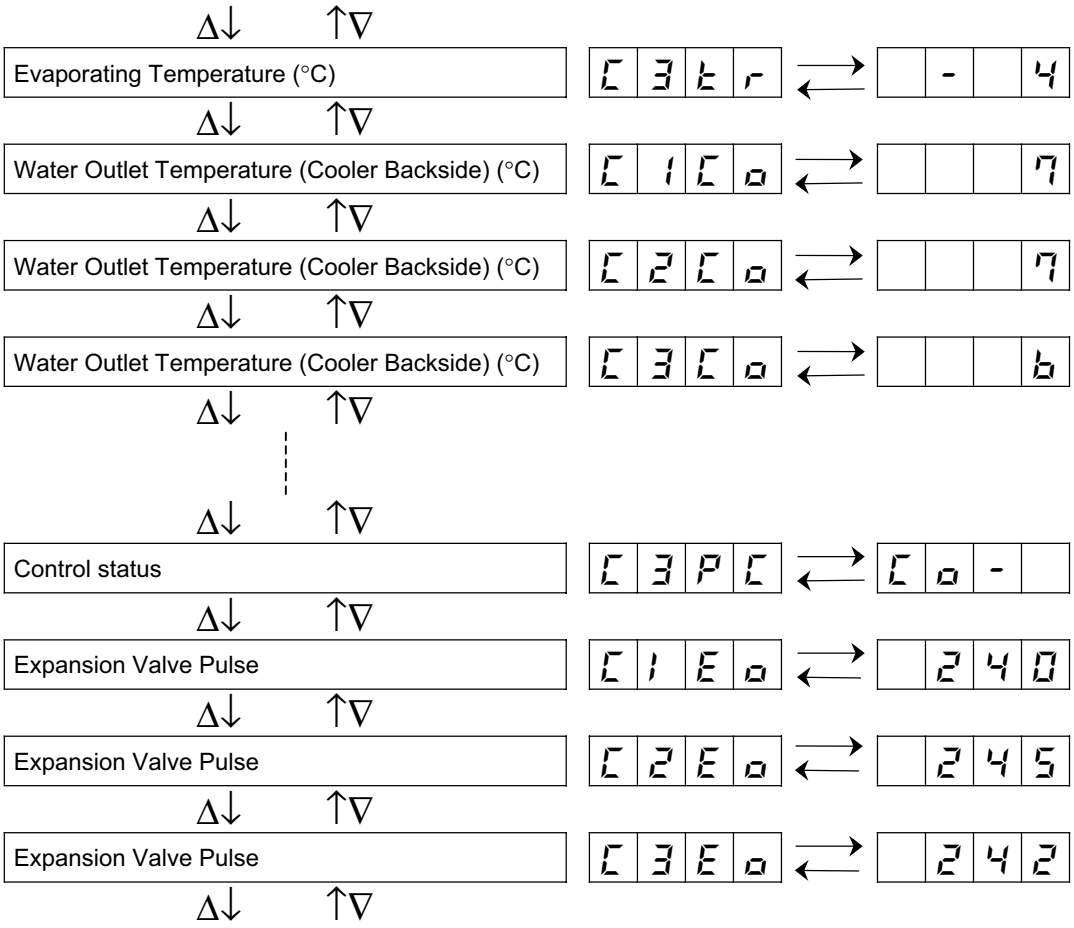
Δ↓ ↑∇

Control Status — C3PC ⇄ Co- (Discharge pressure control activated)

Δ↓ ↑∇

■ Memory Data Indication in Alarm ③

Data is indicated same as Checking Indication.
In addition the checking data, below data is added.



■ Second Water Temperature Setting ④

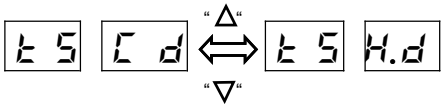
This temperature setting can provide another setting value for water temperature.
It can be changed by external signal

Second Water Temperature Setting Procedure

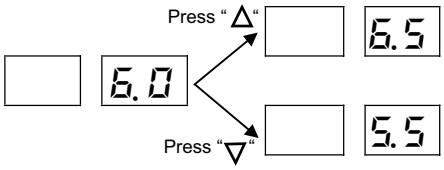
1)Press the check " ▽" switch for more than 3 seconds.
Then, display shows the current setting value.

* This shows the setting value is 6ºC.

If press the check " ▽ " or " △ " in this mode, the display is changed to either "Hot Water Temperature Setting" or "Chilled Water Temperature Setting" alternatively.



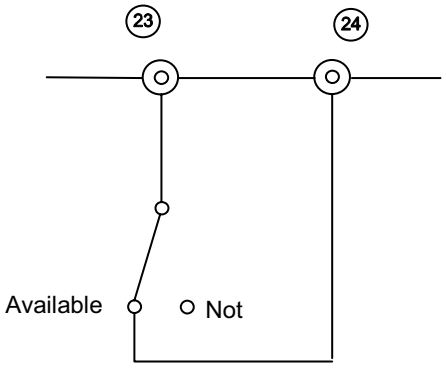
2)Press the check " △" and "▽ " switches simultaneously for more than 3 seconds.The mode is changed to setting mode.
Then, the setting value can be changed by pressing the check "△ " and "▽ " switches.
However, the setting value shown on display, is not available in this moment.



3)Press the check " △" 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.
* Hot water temperature setting change is performed by same procedure mention above.

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



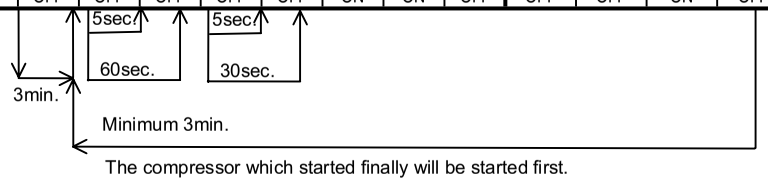
10.CONTROL SYSTEM

■ **Standard Operating Sequence for RCUE 40WG2, RCUE 50WG2, RCUE 60WG2 and RCUE 80WG2**

Control Devices \ Control Stage		Starting Control								Capacity Control						Safety Devices			Shut Down		
Main Power Switch		OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Chilled Water Pump		-	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Condenser Water Pump		-	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Operation Switch (ON/OFF)		-	-	-	ON	-	-	-	-	-	-	-	-	-	-	-	-	OFF	-	OFF	-
Controller	Load Up	-	-	-	-	-	-	0	0	-	-	-	-	-	-	-	-	-	-	-	
	Neutral	-	-	-	-	-	-	-	-	0	-	-	-	0	0	-	-	-	0	-	
	Load Down	-	-	-	-	-	-	-		0	-	0	0	-	-	-	-	-	-	-	
Safety Devices	Nº 1	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	OPN	CLS	CLS	CLS	CLS	CLS	CLS
Power Supply Lamp		OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Operation Lump		OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	ON	OFF	OFF
Alarm Lumpr		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	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	ON	ON	ON	OFF
Motor for Compressor	MC1	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%-99%	DLT (FLD) 100%	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	DLT (ULD) 15%	OFF	DLT (ULD) 15%-99%	OFF	OFF	DLT (FLD) 100%	OFF	OFF	OFF	OFF
Solenoid Valve	SV11	OFF	OFF	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV13	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Time Schedule					3min.	5sec.	30sec.			Minimum 3min.											

CLS: Close, OPN: Open, STA: Star, DLT: Delta
ULD: Unload, FLD: Full Load

Control Stage / Control Devices		Starting Control											Capacity Control				Safety Devices				Shut Down		
Main Power Switch		OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Chilled Water Pump		-	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Condenser Water Pump		-	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Operation Switch (ON/OFF)		-	-	-	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OFF	-	OFF	-
Controller	Load Up	-	-	-	-	-	-	-	-	O	O	-	-	-	-	-	-	O	O	-	-	-	-
	Neutral	-	-	-	-	-	-	-	-	-	-	O	-	-	-	-	O	-	-	-	O	-	-
	Load Down	-	-	-	-	-	-	-	-	-	-	-	O	O	O	O	-	-	-	-	-	-	-
Safety Devices	Nº 1	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	OPN	OPN	CLS	CLS	CLS	CLS
	Nº 2	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	CLS	OPN	CLS	CLS	CLS	CLS
Power Supply Lamp		OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Operation Lump		OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	ON	OFF	OFF
Alarm Lumpr		OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON			OFF	ON	OFF	OFF
Oil Heater	CH1	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	ON	ON	OFF
	CH2	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	ON	ON	OFF
Motor for Compressor	MC1	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%-99%	DLT (FLD) 100%	DLT (FLD) 100%	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	DLT (ULD) 15%	0FF	DLT (ULD) 15%-99%	OFF	OFF	OFF	DLT (FLD) 100%	OFF	OFF
	MC2	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%-99%	DLT (ULD) 15%	OFF	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	OFF	OFF	DLT (FLD) 100%	OFF	OFF
Solenoid Valve	SV11	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV13	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV21	OFF	OFF	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV22	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV23	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
Time Schedule																							



CLS: Close, OPN: Open, STA: Star, DLT: Delta
ULD: Unload, FLD: Full Load

■ Standard Operating Sequence for RCUE 180WG2, RCUE 200WG2, and RCUE 240WG2

Control Stage / Devices		Starting Control													Capacity Control				Safety Devices					Shut Down		
Main Power Switch		OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Chilled Water Pump		-	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Condenser Water Pump		-	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF
Operation Switch (ON/OFF)		-	-	-	ON	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OFF	-	OFF	-
Controller	Load up	-	-	-	-	-	-	-	-	-	-	O	O	-	-	-	-	-	-	-	O	O	-	-	-	-
	Neutral	-	-	-	-	-	-	-	-	-	-	-	-	O	-	O	-	-	O	O	-	-	-	O	-	-
	Load down	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	O	O	-	-	-	-	-	-	-	-
Safety Devices	No. 1	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
	No. 2	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
	No. 3	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
Power Supply Lamp		OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
Operation Lump		OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	ON	OFF	OFF
Alarm Lump		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	OFF	ON	OFF	OFF
Oil Heater	CH1	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	ON	ON	ON	OFF	ON	OFF
	CH2	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	ON	ON	ON	OFF	ON	OFF
	CH3	OFF	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	OFF	ON	OFF
Motor for compressor	MC1	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) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	OFF	DLT (ULD) 15%-99%	OFF	OFF	OFF	OFF	DLT (FLD)	OFF	OFF
	MC2	OFF	OFF	OFF	OFF	OFF	OFF	STA (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	DLT (ULD) 15%	OFF	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	OFF	OFF	OFF	DLT (FLD) 100%	OFF	OFF
	MC3	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%-99%	DLT (ULD) 15%	OFF	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	DLT (ULD) 15%-99%	OFF	OFF	DLT (FLD) 100%	OFF	OFF
Solenoid Valve	SV11	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV13	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV21	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV22	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV23	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
	SV31	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV32	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	SV33	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
Time Schedule						3 min.	5 sec. / 60 sec.		5 sec. / 60 sec.		5 sec. / 30 sec.															

Minimun 3min.

The Compressor which started finally will be restarted first.

CLS: Close, OPN: Open, STA: Star, DLT: Delta
ULD: Unload, FLD: Full Load

11. MAINTENANCE

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 lacquer, 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.

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 utilize 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 / hot 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.

■ 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 11.

11.2. LUBRICATION

■ Compressor

The compressors are charged at the factory with the correct oil listed in “Component Data” and the compressor nameplate. It is not necessary to add oil, if the refrigerant cycle remains sealed.

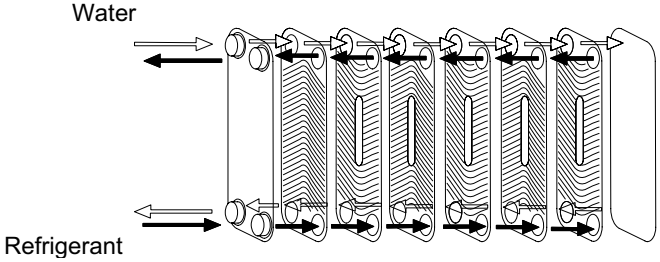
11.3. DEPOSITS

Slime and other minerals in the condenser water or chilled water tend to deposit on inside surfaces of plates over a long period of operation. As deposits of these minerals increase, excessive high discharge pressure or lower operation pressure are detected, indicating evidence of deposits on the condenser or the water cooler. The figure in page 41 indicates the range where cleaning is required.

CAUTION:
- *Cleaning of plate type heat exchangers shall be performed by specialists. Please contact your contractor or dealer of HITACHI.*
- *Clean the water strainer filter periodically according to its clogging degree. If not cleaned periodically, the water strainer will be broken due to an excessive pressure to the strainer screen.*

WARNING:
- *This product is equipped with plate type heat exchangers. In the plate type heat exchanger, water flows through a narrow space between plates. Therefore, there is a possibility that freezing may occur if foreign particles or dusts are clogged. In order to avoid this clogging, provide a 20 mesh water strainer at the inlet of the chilled water piping near the product. If clogging in the plate type heat exchanger occurs seriously, this will cause insufficient cooling performance or local freezing in the plate type heat exchanger. It is strongly recommended that the heat exchanger be cleaned at the same time when the filter is cleaned.*

Pay attention to the following caution and normal cleaning method. For details, 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.

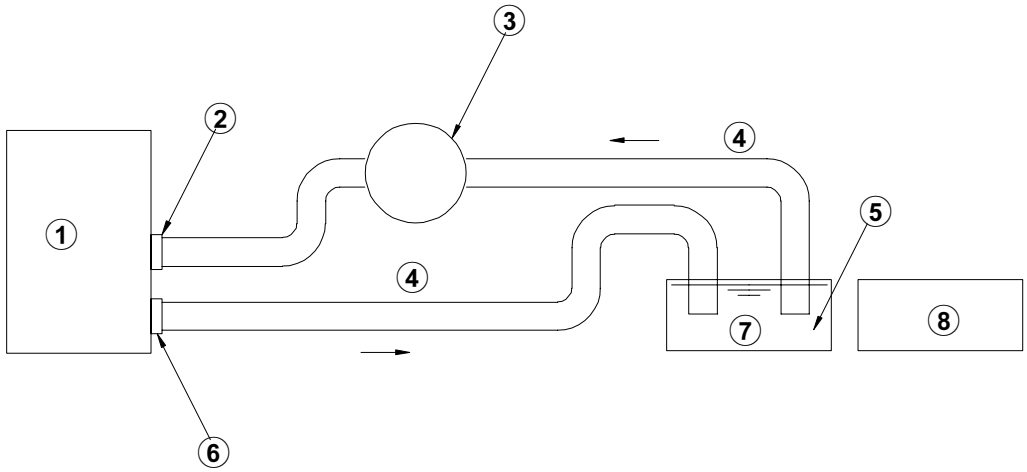
-After cleaning with cleaning agent, clean inside of water piping including the heat exchangers by using clean water. Perform water treatment (preventive treatment) in order to prevent the water circuit from corrosion or re-adhering of scales after cleaning.

-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 neutralizing agent are erosive and stimulative 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



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

1. Installation of Cleaning Circuit

-Stop the water Chiller unit.
-Stop the circulating water pump.
-Disconnect the connections at the chilled water inlet or cooling 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

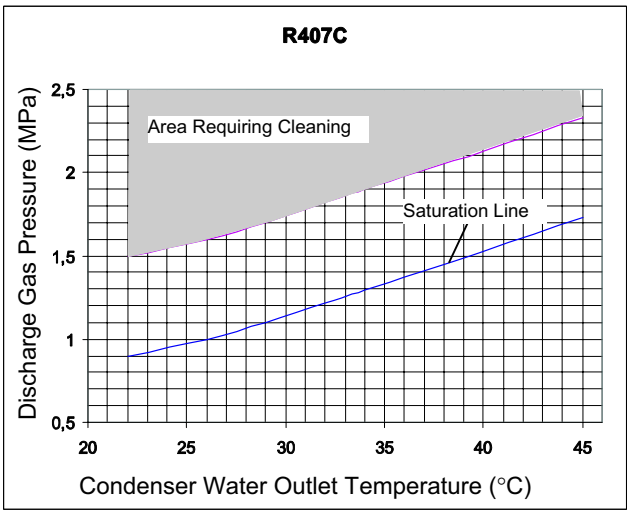
-Stop the acid-resistant pump.
-Put the waste fluid into the waste fluid tank.
-Supply water into the cleaning tank and operate the pump for water cleaning.
-Put the cleaning water into the waste fluid tank as same as the waste fluid.
-Measure pH degree by using a pH test sheet and neutralize the waste fluid by gradually adding neutralizing agent.
-After neutralization ask a waste fluid treatment contractors to handle it.

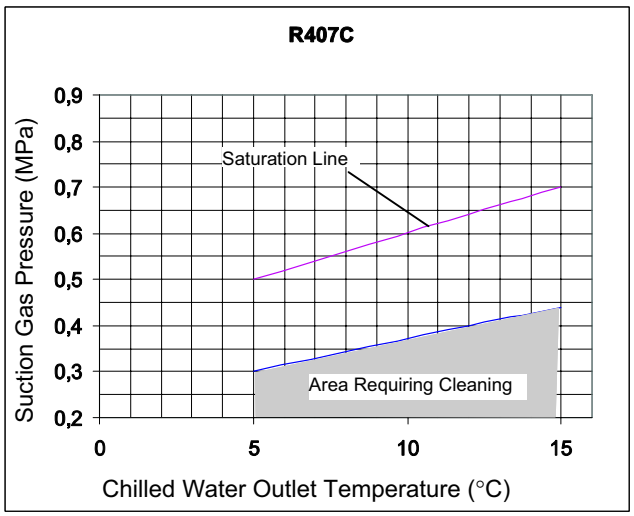
5. Neutralisation Treatment in the Water Piping

-Put water into the cleaning tank.
-Operate the acid-resistant pump after air-purging.
-Measure the pH degree and gradually add neutralizing agent until the pH reaches pH = 7.
-Operate the pump for a specified period of time for neutralization.
-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.





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 condenser and 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.
3. Inspect the pump, the cooling tower and/or regulating valve.
4. 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

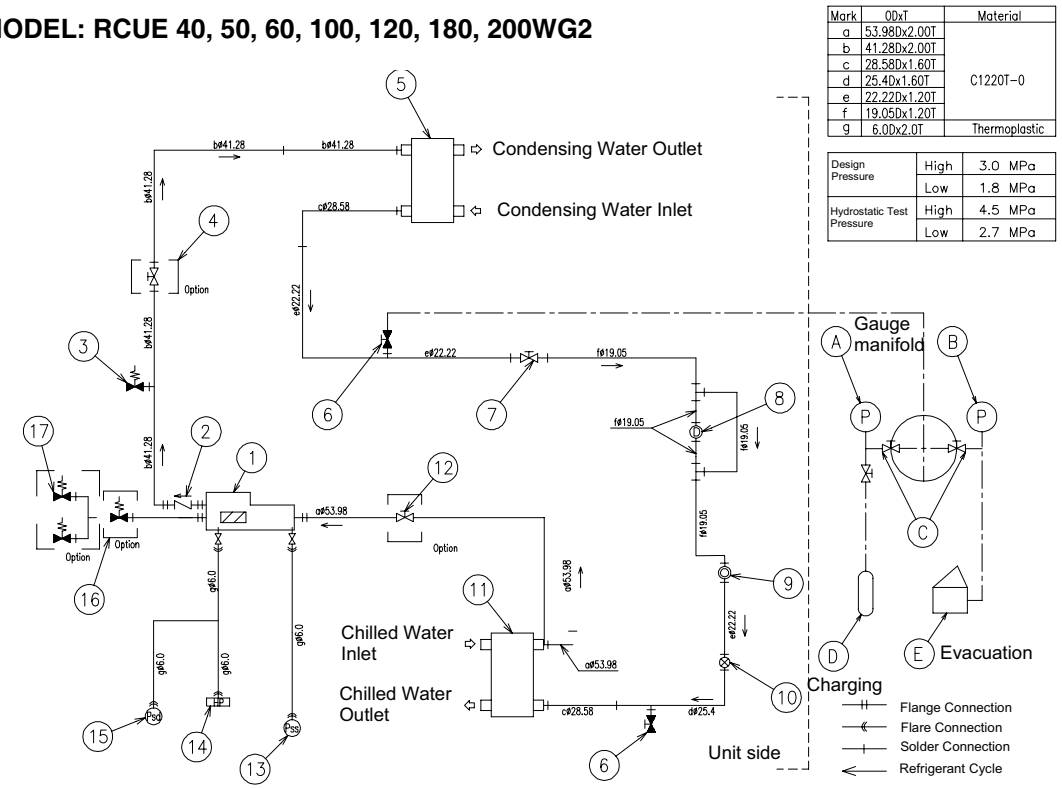
Inspect the refrigerant charge of the system by checking the discharge and suction pressures. Perform a leakage test, if any leakage is suspected, and always perform such a test after a refrigeration cycle component is replaced. When refrigerant charge is required, follow the following instructions given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

   Repeat the following procedure until pressure becomes proper (refer to page 46)
   - 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 WATER COOLED CHILLER

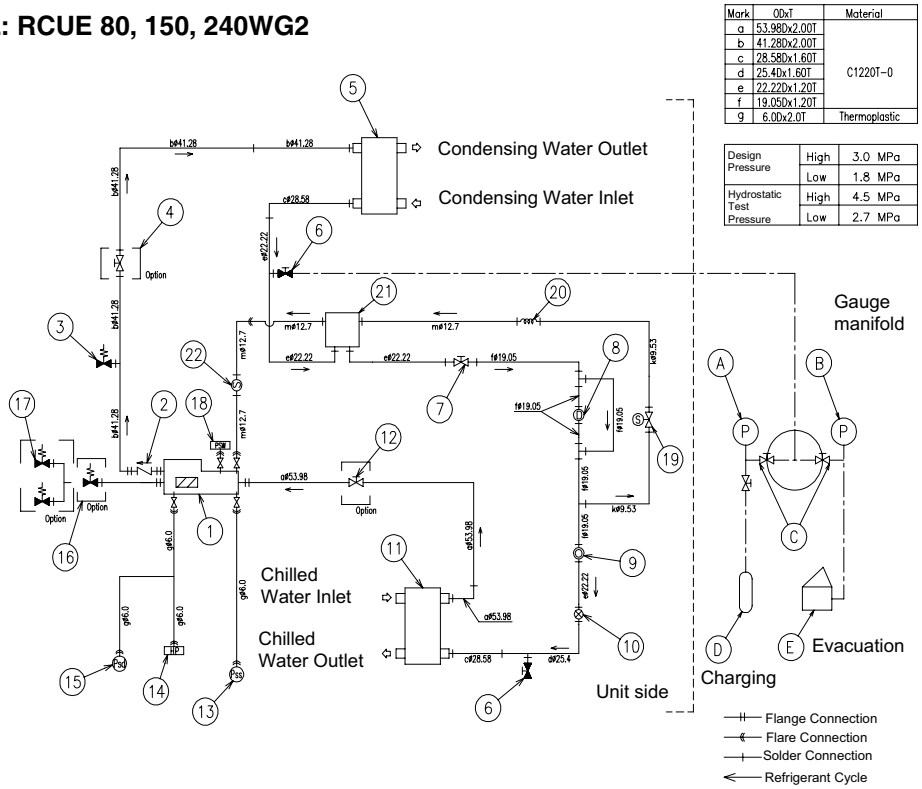
■ MODEL: RCUE 40, 50, 60, 100, 120, 180, 200WG2



No.	Name	No.	Name
1	Compressor	12	Stop Valve (Option)
2	Check Valve	13	Pressure Sensor (Low)
3	Pressure Relief Valve	14	High Pressure Switch
4	Stop Valve (Option)	15	Pressure Sensor (High)
5	Water Condenser	16	Compressor Safety Valve (Option)
6	Stop Valve	17	Compressor Dual Safety Valve (Option)
7	Stop Valve	A	High Pressure Gauge
8	Drier	B	Low Pressure Gauge
9	Sight Glass	C	Stop Valve
10	Electronic Expansion Valve	D	Charging Cylinder
11	Water Cooler	E	Vacuum Pump

NOTE:
R407C shall be charged by LIQUID.

■ MODEL: RCUE 80, 150, 240WG2



Mark	ODxT	Material
a	53.98Dx2.00T	C1220T-O
b	41.28Dx2.00T	
c	28.58Dx1.60T	
d	25.4Dx1.60T	
e	22.22Dx1.20T	
f	19.05Dx1.20T	
g	6.0Dx2.0T	Thermoplastic

Design Pressure	High	3.0 MPa
	Low	1.8 MPa
Hydrostatic Test Pressure	High	4.5 MPa
	Low	2.7 MPa

No.	Name	No.	Name
1	Compressor	15	Pressure Sensor (High)
2	Check Valve	16	Compressor Safety Valve (Option)
3	Pressure Relief Valve	17	Compressor Dual Safety Valve (Option)
4	Stop Valve (Option)	18	Pressure Switch
5	Water Condenser	19	Solenoid Valve
6	Stop Valve	20	Capillary Tube
7	Stop Valve	21	Economizer
8	Drier	22	Strainer
9	Sight Glass	A	High Pressure Gauge
10	Electronic Expansion Valve	B	Low Pressure Gauge
11	Water Cooler	C	Stop Valve
12	Stop Valve (Option)	D	Charging Cylinder
13	Pressure Sensor (Low)	E	Vacuum Pump
14	High Pressure Switch		

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 be 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 the water flow to decrease 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 40,000 hours or 5 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.

11.10. 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 electrical box in order not to operate the compressor except for the cycle.

3.Circulate the chilled and cooling water sufficiently through the water cooler and condenser, 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 and condenser.

6.Stop the water Chiller when the low pressure reaches at approximately 0.05 MPa. Do not operate at the pressure lower than 0.05 MPa. If operated, it will cause a damages to the compressor.

7.Wait for several minutes. If the low pressure increase up to 0.15 to 0.2 MPa, repeat the above procedures 5 and 6 four or five times.

8.Turn OFF the power supply to the unit.

9. Remove the bolts on the discharge and suction flanges of the compressor.

11.11. 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

■ **Water Cooler**

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

11.11.1. SAFETY AND CONTROL DEVICE SETTING

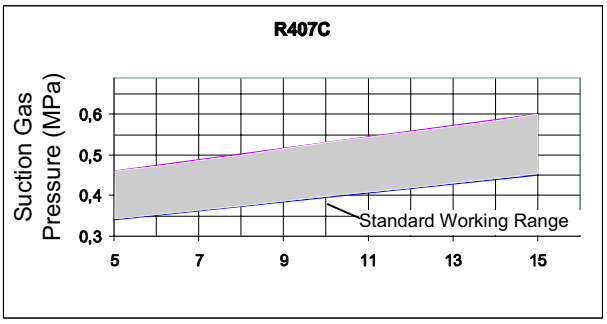
Model	RCUE -WG2	40	50	60	80	100	120	150	180	200	240
For Compressor											
High Pressure Switch	Manual Reset, Non-Adjustable (One Switch for Each Compressor Motor)										
Cut-Out	MPa	2,74	2,74	2,74	2,74	2,74	2,74	2,74	2,74	2,74	2,74
Low Pressure Switch (Pressure Sensor)	Electronic Control										
Cut-Out	MPa	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,05
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
Cut- In	°C	93	93	93	93	93	93	93	93	93	93
Compressor Motor (380-415V/50Hz)											
Fuse	A	100	100	125	125	100	125	125	100	125	125
Thermal Relay	Manual Reset, Adjustable (One Three-Phase Set for Each Compressor Motor)										
	A	48	55	70	75	55	70	75	55	70	75
Magnetic circuit Protection (Option)	Manual Reset, Adjustable (One Three-Phase Set for Each Compressor Motor)										
	A	90	107	127	127	107	127	127	107	127	127
Oil Heater	One Heater for Each Compressor Motor										
Capacity	W	150	150	150	150	150	150	150	150	150	150
Discharge Gas (Electronic Control)	(One for Each Cycle)										
Cut-Out	°C	140	140	140	140	140	140	140	140	140	140
CCP Timer	Non-Adjustable (One Timer for Each Compressor)										
Setting Time	S	180	180	180	180	180	180	180	180	180	180
Star-Delta	S	5	5	5	5	5	5	5	5	5	5
Unloading during Starting	S	30	30	30	30	30	30	30	30	30	30
For Refrigerant Circuit	(One for Each Circuit)										
Pressure Relief Valve Setting Pressure	MPa	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0	3,0
Freeze Protection Thermostat	(One for Each Water Cooler)										
Cut-Out	°C	2	2	2	2	2	2	2	2	2	2

11.12. NORMAL OPERATING PRESSURE

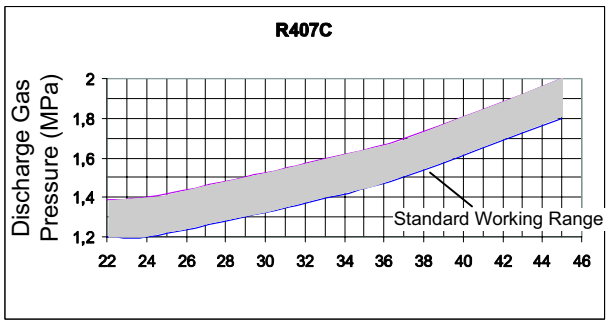
Check to ensure that Chiller is operating within the working range as shown below, after at least 15 minutes operation.
Low Pressure: The normal operating low pressure of the water chiller is indicated in the figure below; lower than 0.3 Mpa indicates an abnormal condition.

Discharge Pressure: Normal operating discharge pressure is indicated in the figure below; low than 0.9 Mpa or higher than 2.2 Mpa indicates an abnormal condition

■ **For R407C**



Chilled Water Outlet Temperature (°C)



Condenser Water Outlet Temperature (°C)

⚠ ***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 100 °C.
- ***Use***
  Do not utilize 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 utilized 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**
  Utilize a fuse with specified capacity. Do not use a steel wire or a copper wire instead of a fuse. If an incorrect wire is utilized, 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.

11.13. TEST RUNNING AND MAINTENANCE RECORD

MODEL: RCUE MFG. NO.
COMPRESSOR MFG. NO.

CUSTOMER'S NAME AND ADRESS:

DATE:

1. Is there adequate water flow for the condenser and the water cooler? ☐
2. Has all water piping been checked for leakage? ☐
3. Have the cooling water pump, fan and motor been lubricated? ☐
4. Has the unit been operated for at least twenty minutes? ☐

5. Check Chilled Water Temperature:

   Inlet ☐ °C Outlet ☐ °C

6. Check Condenser Water Temperature:

   Inlet ☐ °C Outlet ☐ °C

7. Check Suction Line Temperature and Superheat:

Suction Line Temperature:	☐ °C	☐ °C	☐ °C
Superheat:	☐ °C	☐ °C	☐ °C

8. Check Pressure:

Discharge Pressure:	☐ MPa	☐ MPa	☐ MPa
Suction Pressure:	☐ MPa	☐ MPa	☐ MPa

9. Has the unit been checked for refrigerant leakage? ☐
10. Is the unit clean inside and outside? ☐
11. Are all cabinet panels free from rattling? ☐

11.14. DAILY OPERATING RECORDS

Model: Date: Weather: Time of Operation Start:			Stop. ( )			
Ambient Temperature	DB	°C				
	WB	°C				
Room Temperature		°C				
Compressor	High Pressure	Mpa				
	Low Pressure	Mpa				
	Voltage	V				
	Current	A				
Condenser Water Temperature	Inlet	°C				
	Outlet	°C				
Chilled Water Temperature	Inlet	°C				
	Outlet	°C				
Current for Condenser Water Pump		A				
Current for Chilled Water Pump		A				
Current for Cooling Tower		A				
NOTES:						

11.15. 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.

- 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

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

Fault	Possible Cause	Check/Corrective Action
Compressor Does Not Operate	Interlock Circuit for Chilled Water Pump is Open	1.Check the pump contactor. Repair or replace, if necessary. 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 Overcurrent Relay	1.Replace it, if necessary.
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 Thermostat	High or Low Voltage, Single-Phase or Phase Imbalance	1.Check the power supply line and contactors. 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 “High 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. Keep the superheat in proper range.
	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. 2.Replace the thermistor.
	Trouble with the Solenoid Valve	1.Check the coil in the solenoid valve. 2.Check oil passage for clogging.
	Worn Unloader Mechanism	1.Check the unloaded system parts in the compressor.
High Discharge Pressure	Warm inlet water or Insufficient Water Flow Through the Condenser	1.Open the valve
	Gas Outlet Valve on the Condenser Not Completely Open	1.Check the valves, capillary tubes and strainer. Replace, if necessary.
	Overcharged Refrigerant	1.Purge the refrigerant.
	Condenser Plates Coated with Scales, Slime, Corrosion and Others	1.Clean the Condenser water plates by chemical cleaner
	Suction Pressure is Higher than Standard	1.See “High Suction Pressure”.

Fault	Possible Cause	Check/Corrective Action
Low Discharge Pressure	Too Much Water Flowing through the Condenser, or Water is too Cold	1. Adjust the water cock or the regulating valve. 2. Check the operation of cooling tower.
	Insufficient Refrigerant Charge	1. Add Refrigerant.
	Leakage from the Condenser Gas Outlet Valve	1. Check to determine how long it takes to balance high and low
	Liquid Refrigerant Flooding Back from the Water Cooler, Causing Oil to Foam..	1. Check the operation and the position of expansion valve coil. Repair or replace if necessary. 2. Inlet water temperature is considerably lower than the limited temperature.
	Suction Pressure is lower than Standard	1. See “Low Suction Pressure”
High Suction Pressure	High Discharge Pressure	1. See “High Discharge Pressure”
	Refrigerant Overcharged	1. Purge the refrigerant
	Liquid Refrigerant Flooding Back from the Water Cooler	1. Check the operation and the position of expansion valve coil. Repair or replace if necessary. 2. Inlet chilled water temperature to the unit is considerably higher than the standard temperature.
	Leakage from the Condenser Gas Outlet Valve	1. Check the condenser gas outlet valve
	Insufficient Insulation for the Chilled Water Piping	1. Check the insulation of the piping
Low Suction Pressure	Condenser Liquid Outlet Valve Not Completely Open	1. Open the valve.
	Expansion Valve not properly controlled, or faulty valve	1. Check the position of Expansion Valve coil. Repair or replace if necessary.
	Inlet Chilled Water Temperature is Considerably lower than standard Temperature.	1. Check the insulation specifications
	Insufficient Refrigerant Charge	1. Add Refrigerant
	Excessive Oil Circulatin in the System	1. Check the oil charge
	Insufficient Chilled Water Flow through the water cooler.	1. Check the chilled water piping lines for pressure loss.
	Low Discharge Pressure	1. Adjust the water shutoff valve
	Scales on Water Cooler Plates	1. Clean the plates

13. GENERAL SPECIFICATIONS

13.1. GENERAL DATA

Model			RCUE40WG2	RCUE50WG2	RCUE60WG2	RCUE80WG2
Cooling Capacity *1		kW	134	160	194	232
Power Input for Cooling *1		kW	33.5	40	49.1	54.5
COP		-	4.0	4.0	4.0	4.3
Heating Capacity *2		kW	161.1	192.3	233.9	274.7
Power Input for Heating *2		kW	39.8	47.5	58.3	64.7
Outer Dimension	Height	mm	1520	1520	1520	1520
	Width	mm	1105	1105	1105	1105
	Depth	mm	850	850	850	850
Cabinet Colour		-	Natural Gray			
Shipping Weight		kg	750	765	830	950
Compressor Type		-	Semi-Hermetic Screw Type			
Models		-	40ASC-Z	50ASC-Z	60ASC-Z	60ASC-Z
Quantity		-	1	1	1	1
Oil Heater		W	150	150	150	150
Capacity Control		-	Continuous Capacity Control			
		%	15 ～ 100			
Cooler Type		-	Brazing Plate Type			
Condenser Type		-	Brazing Plate Type			
Refrigerant Type		-	R407C (Factory Charged)			
Flow Control		-	Electronic Expansion Valve			
Number of Independent Circuits		-	1	1	1	1
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)			
Evaporator Connection		Inch	3” Victaulic (1×Inlet / 1×Outlet)			
Option Common Water Piping		Inch	-			
Condenser Connection		Inch	3” Victaulic (1×Inlet / 1×Outlet)			
Option Common Water Piping		Inch	-			
Control System		-	Micro-Processor			
Chilled Water Outlet Temperature		°C	(-10) 5 ～ 15			
Cooling Water Outlet Temperature *3		°C	22 ～ 45 (55)			
Permissible Water Pressure Max.						
Cooler		MPa	1.03			
Condenser		MPa	1.03			
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter			
Power Supply		-	3～, N / 380 - 415V / 50Hz			

NOTES:

***1** The nominal cooling capacities are based on the European Standard EN12055.

- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C
- Cooling Water Inlet / Outlet Temperature : 30 / 35 °C

***2** The nominal heating capacities are only for Heat Pump Operation Option and based on following conditions.

- Chilled Water Inlet / Outlet Temperature : 12 / 7 °C
- Hot Water (Condenser) Inlet / Outlet Temperature : 40 / 45 °C

***3** ( ) is in case of high condensing option and heat pump operation option.

Model			RCUE100WG2	RCUE120WG2	RCUE150WG2
Cooling Capacity *1		kW	320	388	445
Power Input for Cooling *1		kW	80	98.2	104.5
COP		-	4.0	4.0	4.3
Heating Capacity *2		kW	384.7	467.9	526.9
Power Input for Heating *2		kW	95	116.6	124.1
Outer Dimension	Height	mm	1700	1700	1700
	Width	mm	1105	1105	1105
	Depth	mm	1465	1465	1465
Cabinet Colour		-	Natural Gray		
Shipping Weight		kg	1570	1670	1770
Compressor Type		-	Semi-Hermetic Screw Type		
Models		-	50ASC-Z	60ASC-Z	60ASC-Z
Quantity		-	2	2	2
Oil Heater		W	150 x 2	150 x 2	150 x 2
Capacity Control		-	Continuous Capacity Control		
		%	7.5, 15 ～ 100		
Cooler Type		-	Brazing Plate Type		
Condenser Type		-	Brazing Plate Type		
Refrigerant Type		-	R407C (Factory Charged)		
Flow Control		-	Electronic Expansion Valve		
Number of Independent Circuits		-	2	2	2
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)		
Evaporator Connection		Inch	3” Victaulic (1×Inlet / 1×Outlet)		
Option Common Water Piping		Inch	-		
Condenser Connection		Inch	3” Victaulic (1×Inlet / 1×Outlet)		
Option Common Water Piping		Inch	-		
Control System		-	Micro-Processor		
Chilled Water Outlet Temperature		°C	(-10) 5 ～ 15		
Cooling Water Outlet Temperature *3		°C	22 ～ 45 (55)		
Permissible Water Pressure Max.					
Cooler		MPa	1.03		
Condenser		MPa	1.03		
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter		
Power Supply		-	3～, N / 380 - 415V / 50Hz		

NOTES:

***1** The nominal cooling capacities are based on the European Standard EN12055.

・Chilled Water Inlet / Outlet Temperature : 12 / 7 °C

・Cooling Water Inlet / Outlet Temperature : 30 / 35 °C

***2** The nominal heating capacities are only for Heat Pump Operation Option and based on following conditions.

・Chilled Water Inlet / Outlet Temperature : 12 / 7 °C

・Hot Water (Condenser) Inlet / Outlet Temperature : 40 / 45 °C

***3** ( ) is in case of high condensing option and heat pump operation option.

Model			RCUE180WG2	RCUE200WG2	RCUE240WG2
Cooling Capacity *1		kW	525	600	696
Power Input for Cooling *1		kW	123.5	148.5	163.5
COP		-	4.3	4.0	4.3
Heating Capacity *2		kW	621.9	719.5	824.2
Power Input for Heating *2		kW	146.7	176.4	194.2
Outer Dimension	Height	mm	1580	1580	1580
	Width	mm	1105	1105	1105
	Depth	mm	2350	2350	2350
Cabinet Colour		-	Natural Gray		
Shipping Weight		kg	2500	2580	2670
Compressor Type		-	Semi-Hermetic Screw Type		
Models		-	50ASC-Z	60ASC-Z	60ASC-Z
Quantity		-	3	3	3
Oil Heater		W	150 x 3	150 x 3	150 x 3
Capacity Control		-	Continuous Capacity Control		
		%	5, 15 ～ 100		
Cooler Type		-	Brazing Plate Type		
Condenser Type		-	Brazing Plate Type		
Refrigerant Type		-	R407C (Factory Charged)		
Flow Control		-	Electronic Expansion Valve		
Number of Independent Circuits		-	3	3	3
Oil Type		-	JAPAN ENERGY FREOL UX300 (Ester)		
Evaporator Connection		Inch	3” Victaulic (3×Inlet / 3×Outlet)		
Option Common Water Piping		Inch	5” Victaulic (1×Inlet / 1×Outlet)		
Condenser Connection		Inch	3” Victaulic (3×Inlet / 3×Outlet)		
Option Common Water Piping		Inch	5” Victaulic (1×Inlet / 1×Outlet)		
Control System		-	Micro-Processor		
Chilled Water Outlet Temperature		°C	(-10) 5 ～ 15		
Cooling Water Outlet Temperature *3		°C	22 ～ 45 (55)		
Permissible Water Pressure Max.					
Cooler		MPa	1.03		
Condenser		MPa	1.03		
Safety and Protection Devices		-	Reverse Phase Protection, Fuse and Thermal Relay for Compressor, Internal Thermostat for Compressor, Compressor Oil Heater, Control Circuit Fuse, High Pressure Switch, Low Pressure Control, Discharge Gas Temperature Control, Suction Gas Temperature Control, Freeze Protection Control and Compressor Operation Hour Meter		
Power Supply		-	3～, N / 380 - 415V / 50Hz		

NOTES:

***1** The nominal cooling capacities are based on the European Standard EN12055.

・Chilled Water Inlet / Outlet Temperature : 12 / 7 °C

・Cooling Water Inlet / Outlet Temperature : 30 / 35 °C

***2** The nominal heating capacities are only for Heat Pump Operation Option and based on following conditions.

・Chilled Water Inlet / Outlet Temperature : 12 / 7 °C

・Hot Water (Condenser) Inlet / Outlet Temperature : 40 / 45 °C

***3** ( ) is in case of high condensing option and heat pump operation option.

13.2. OPTION LINE UP

Following table shows options:

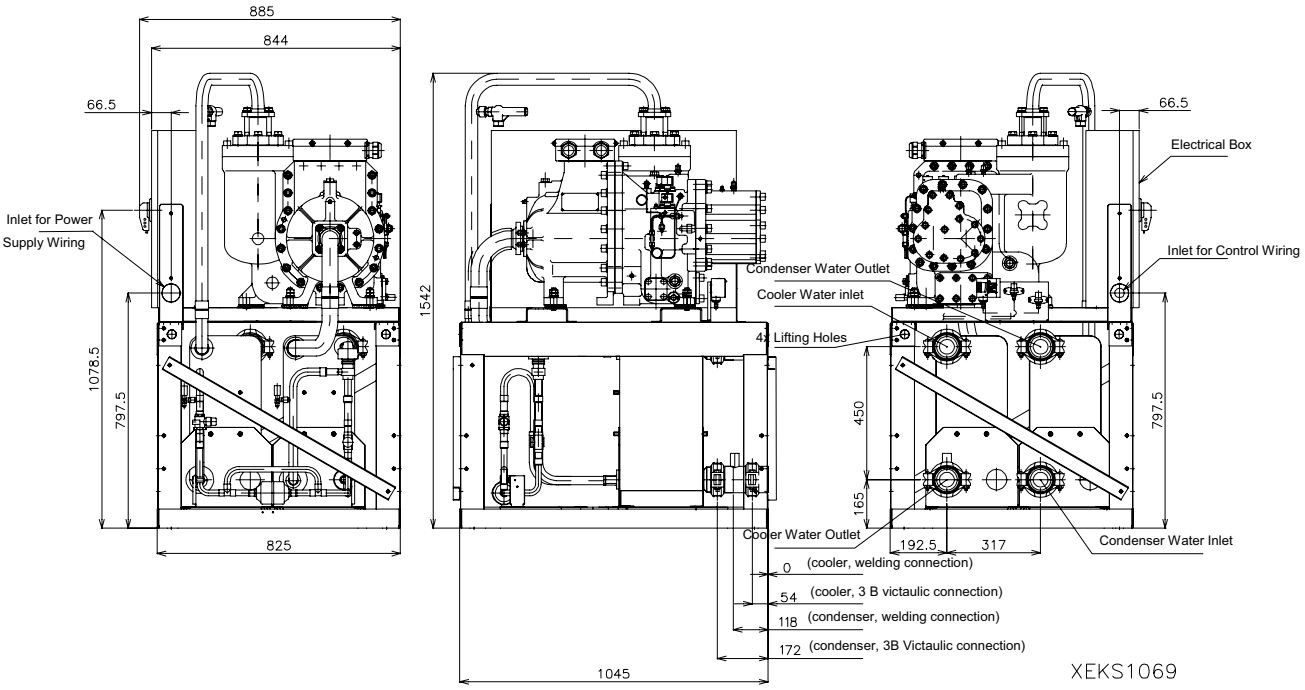
(✓ mark shows available)

Specifications		Standard	Option	Remarks
Low Water Temperature	Outlet Temperature: 0 ～4℃(Low1)		✓	
	Outlet Temperature: -1 ～-5℃(Low2)		✓	
	Outlet Temperature: - 6 ～-10℃(Low3)		✓	
Compressor	Extended Minimum Capacity Control	✓		DSW 7-3 ON
Control System	Compressor Circuit Breaker Protector		✓	For Each Compressor
	Main Isolator Switch	✓		
	Local/Remote Changeover Switch	✓		
	Individual Alarm	✓		By Alarm Code
	Operation Hour Meter	✓		
	Pressure Sensor (High and Low)	✓		
	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 Temperature Setting	✓		
	Remote Control Switch		✓	AC 220-240V
	BMS Control (HARC-70CE1)/OP		✓	LON-WORKS
	CSC-5S		✓	
	Number Cable		✓	
Condenser	High Condensing Temperature		✓	
	Heat Pump Operation		✓	
Refrigeration Cycle	Independent Circuit	✓		
	Discharge Valve		✓	
	Suction Valve		✓	
	Dual safety valve		✓	
	Compressor Safety Valve		✓	
	Compressor Dual Safety Valve		✓	
	Pressure Display (High and Low)	✓		Standard: Display on Operation Panel
Water Cooler	PED Certificate (97/23/EC)	✓		PED: Pressure Equipment Directive
	10 bar Water Pressure	✓		
	PN 16 Flange		✓	With Companion Flange
	Differential Water Pressure Switch		✓	
	Water Flow Switch (Field Install)		✓	
	Water Cooler Heater		✓	
	Common Water Pipe		✓	(Only 180, 200 and 240 HP)
Others	Witness Test		✓	
	Foundation Rubber Mats		✓	

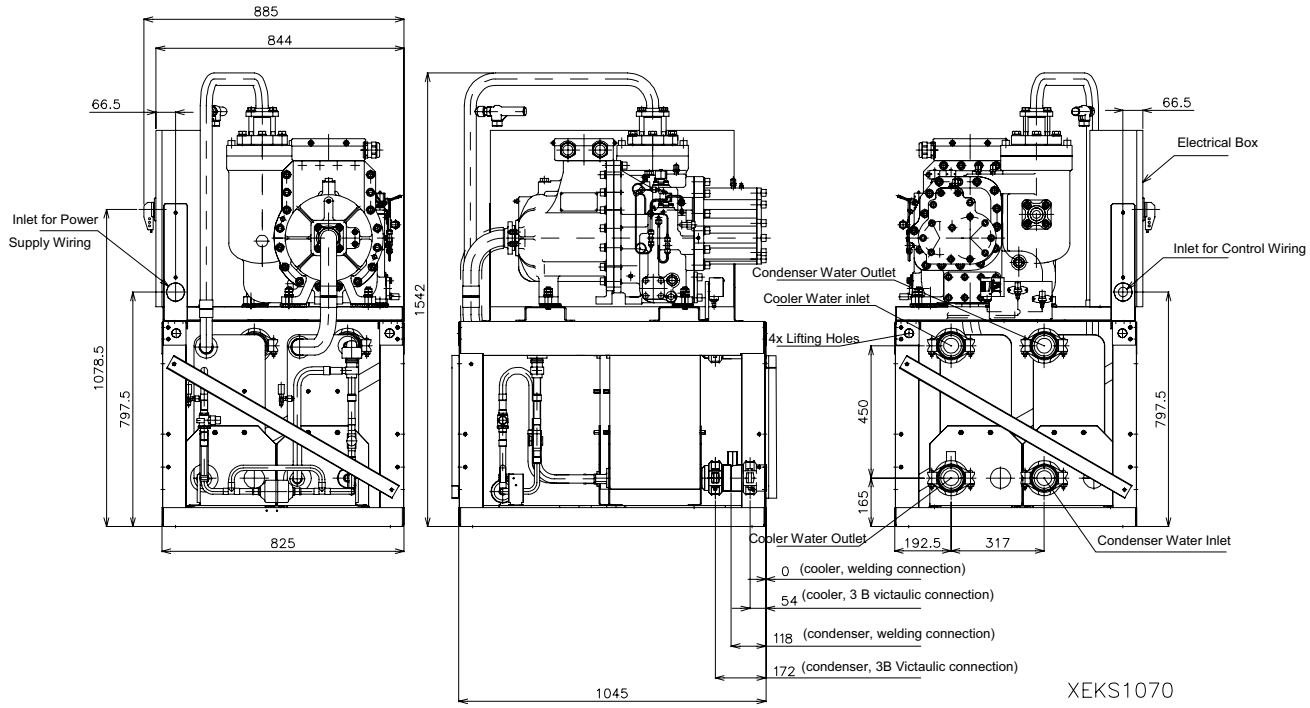
14. DRAWINGS

14.1. DIMENSIONAL DRAWINGS

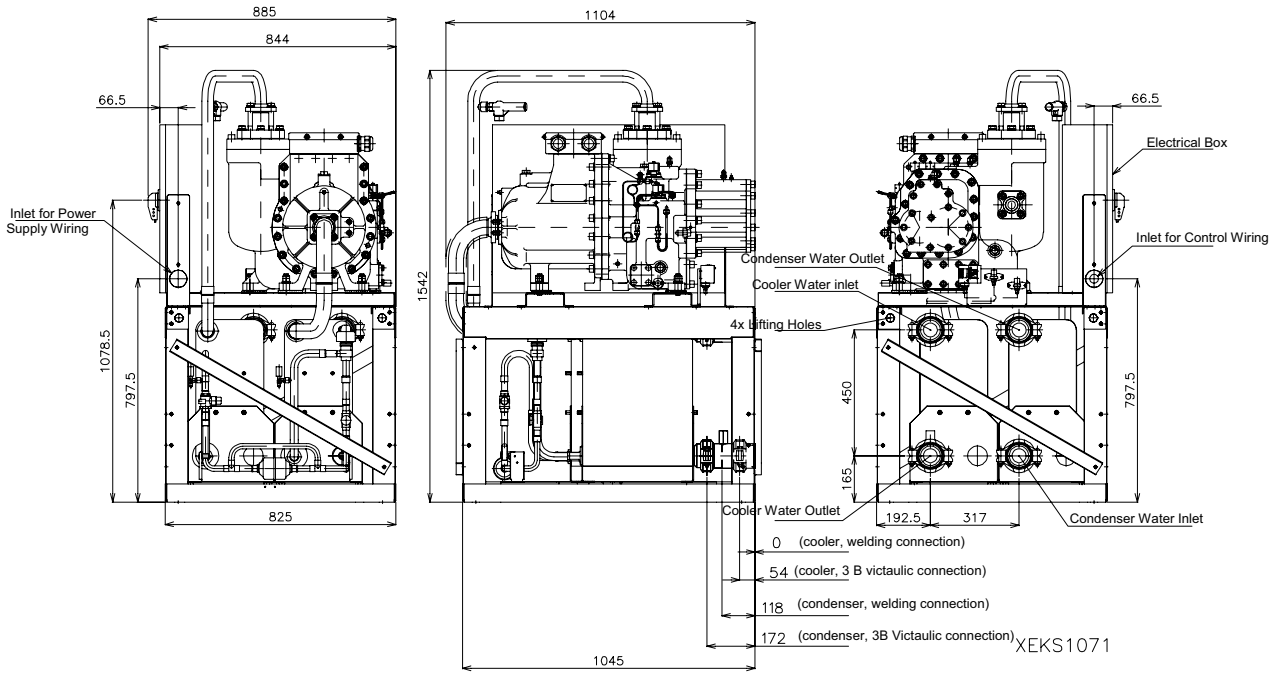
RCUE 40WG2



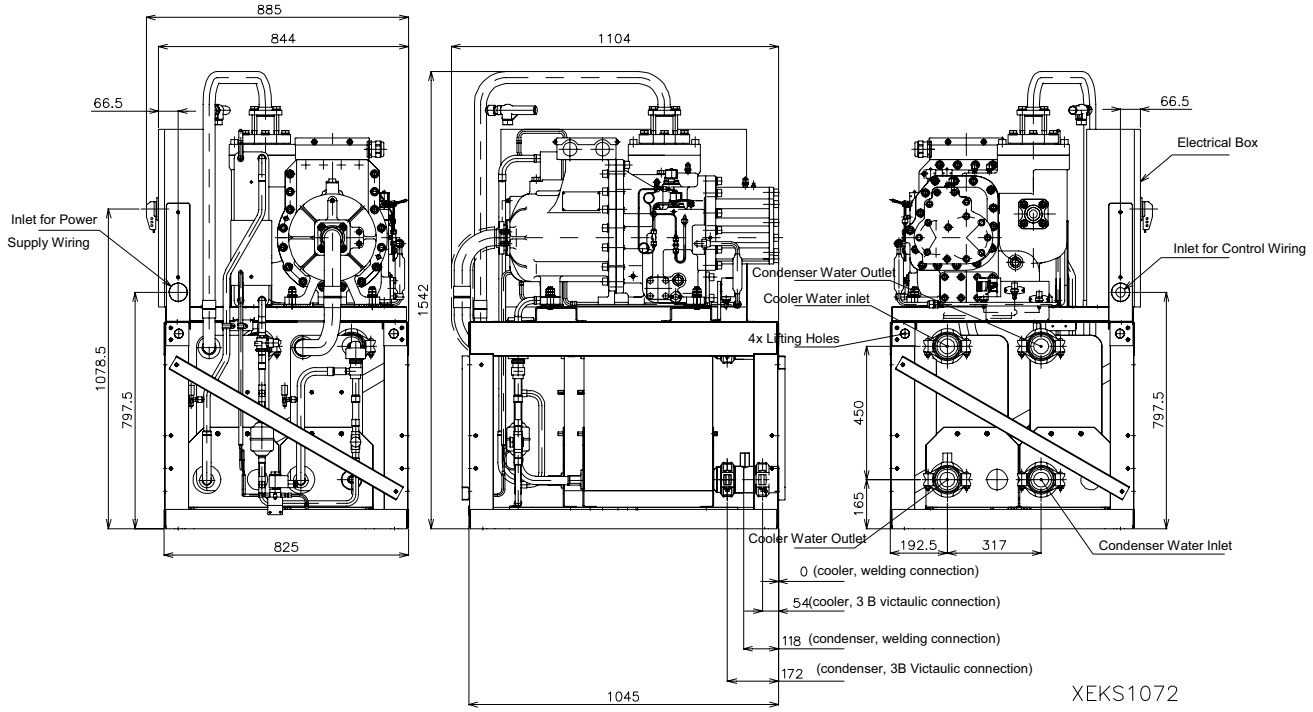
RCUE 50WG2



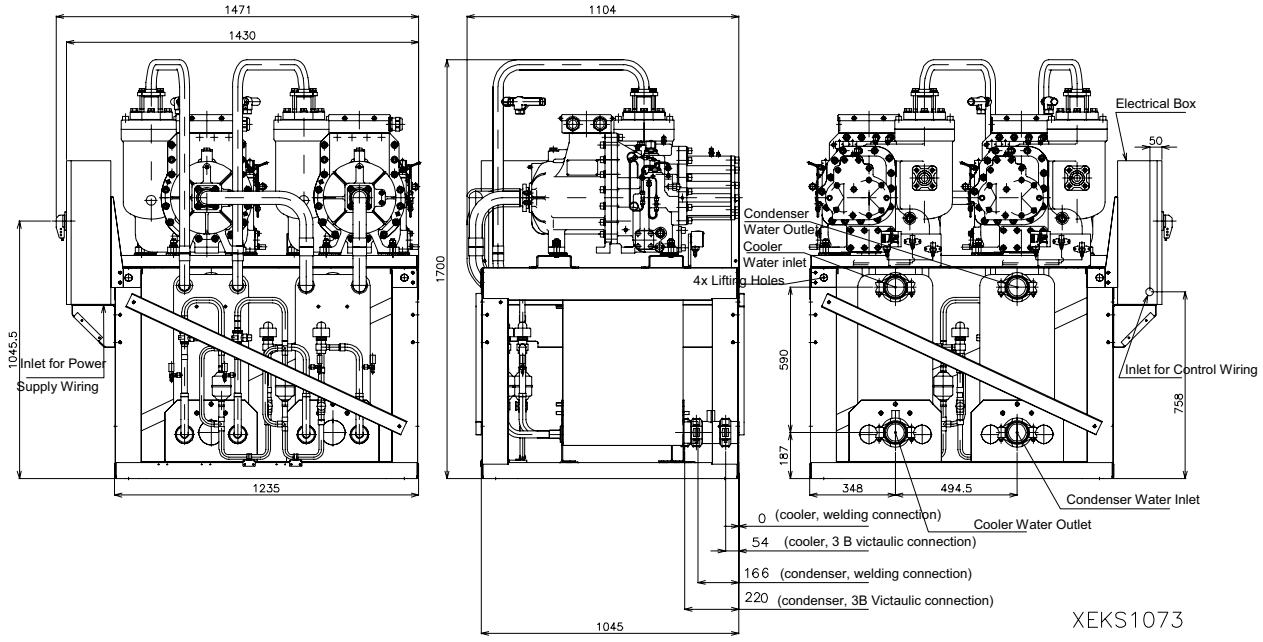
RCUE 60WG2



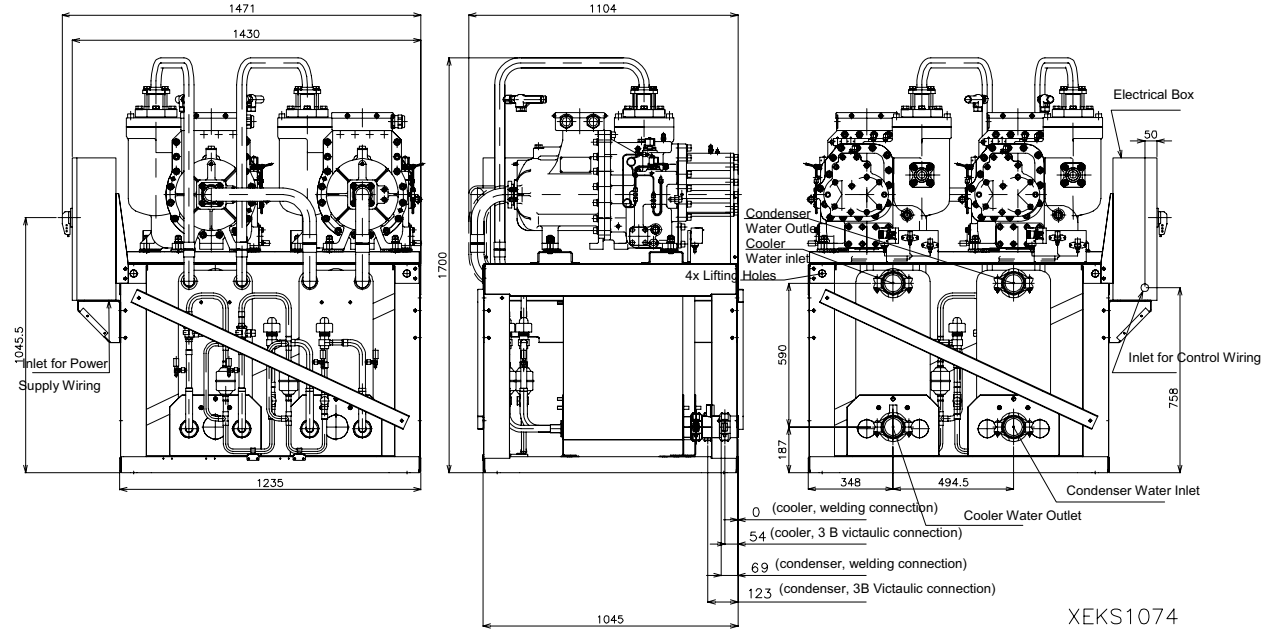
RCUE 80WG2



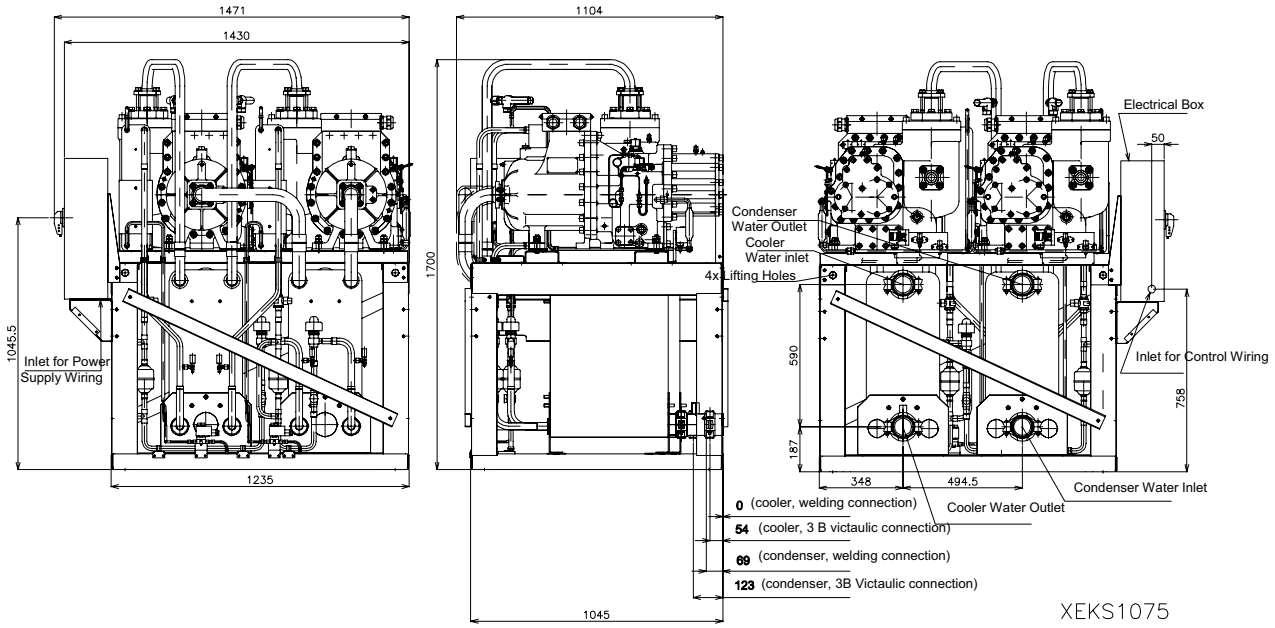
RCUE 100WG2



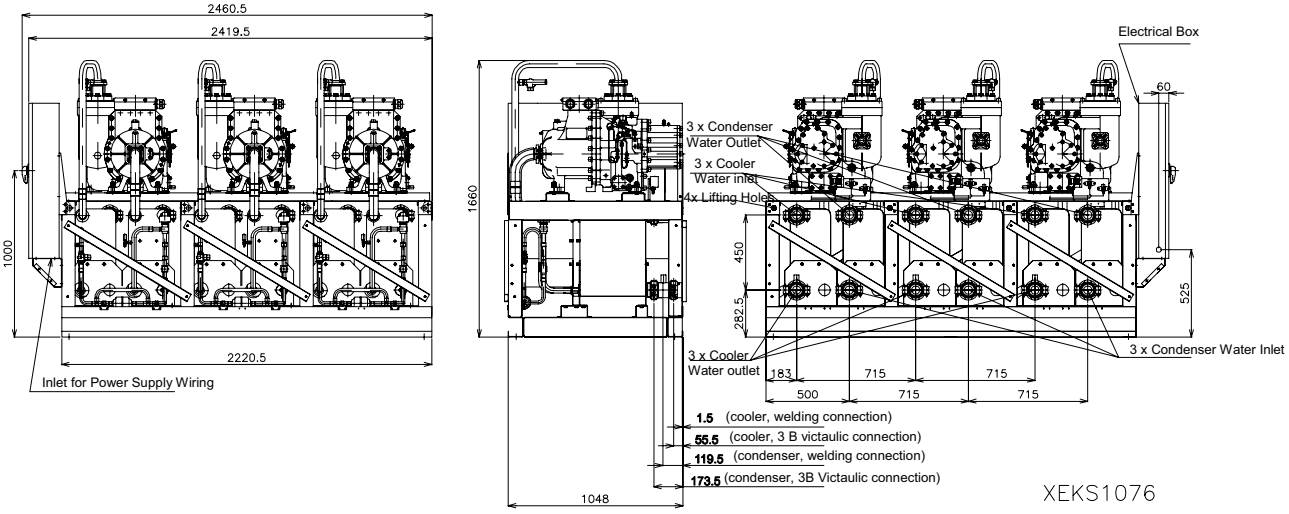
RCUE 120WG2



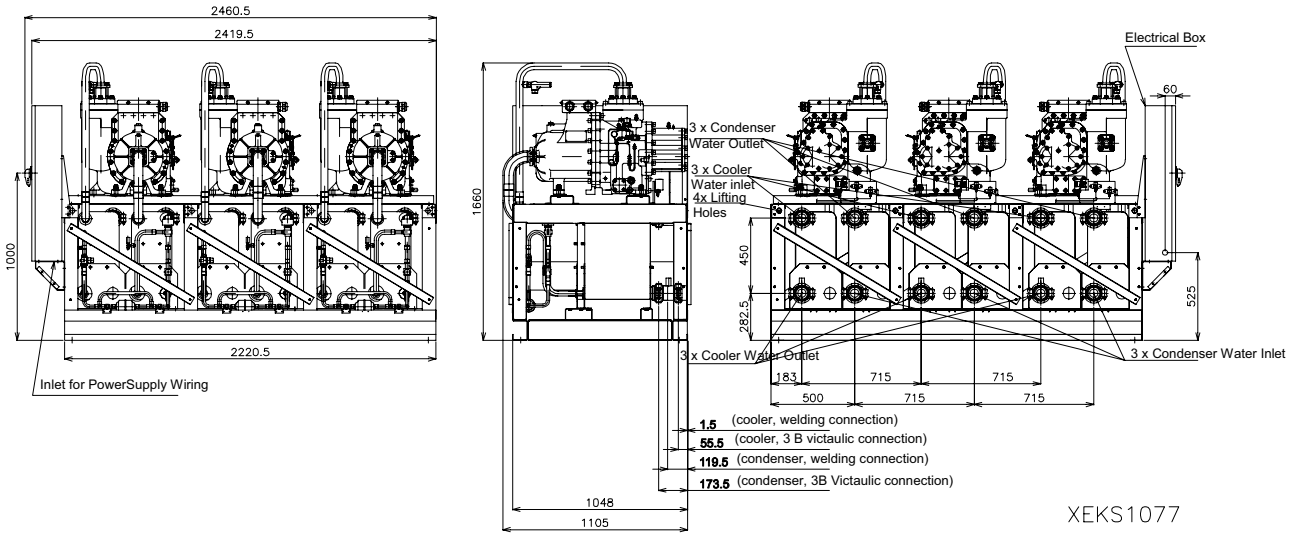
RCUE 150WG2



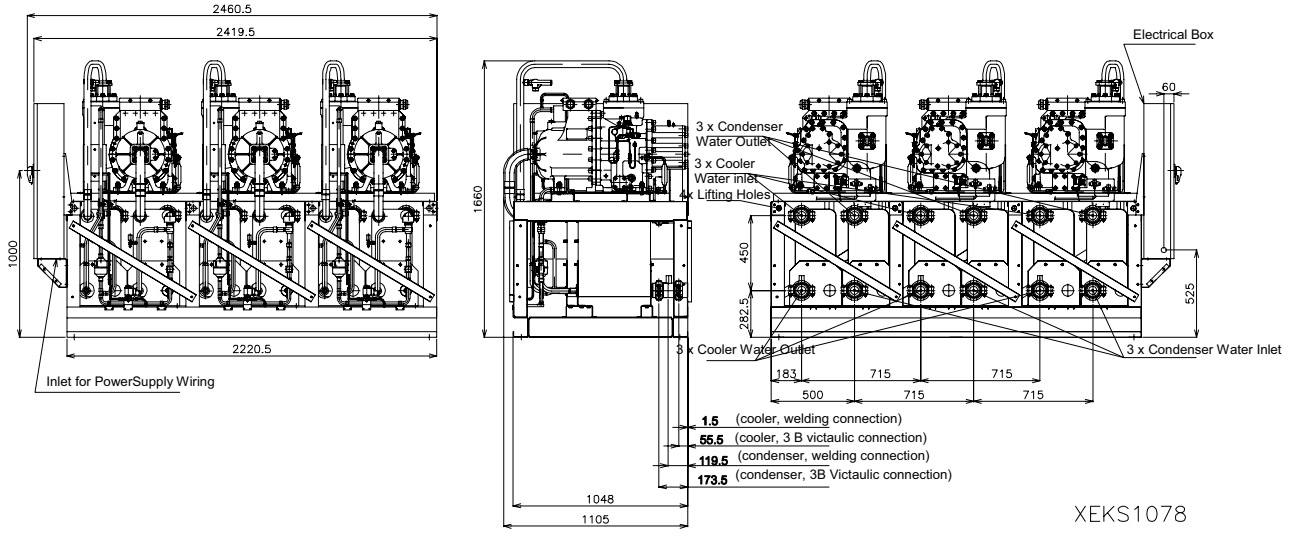
RCUE 180WG2



RCUE 200WG2

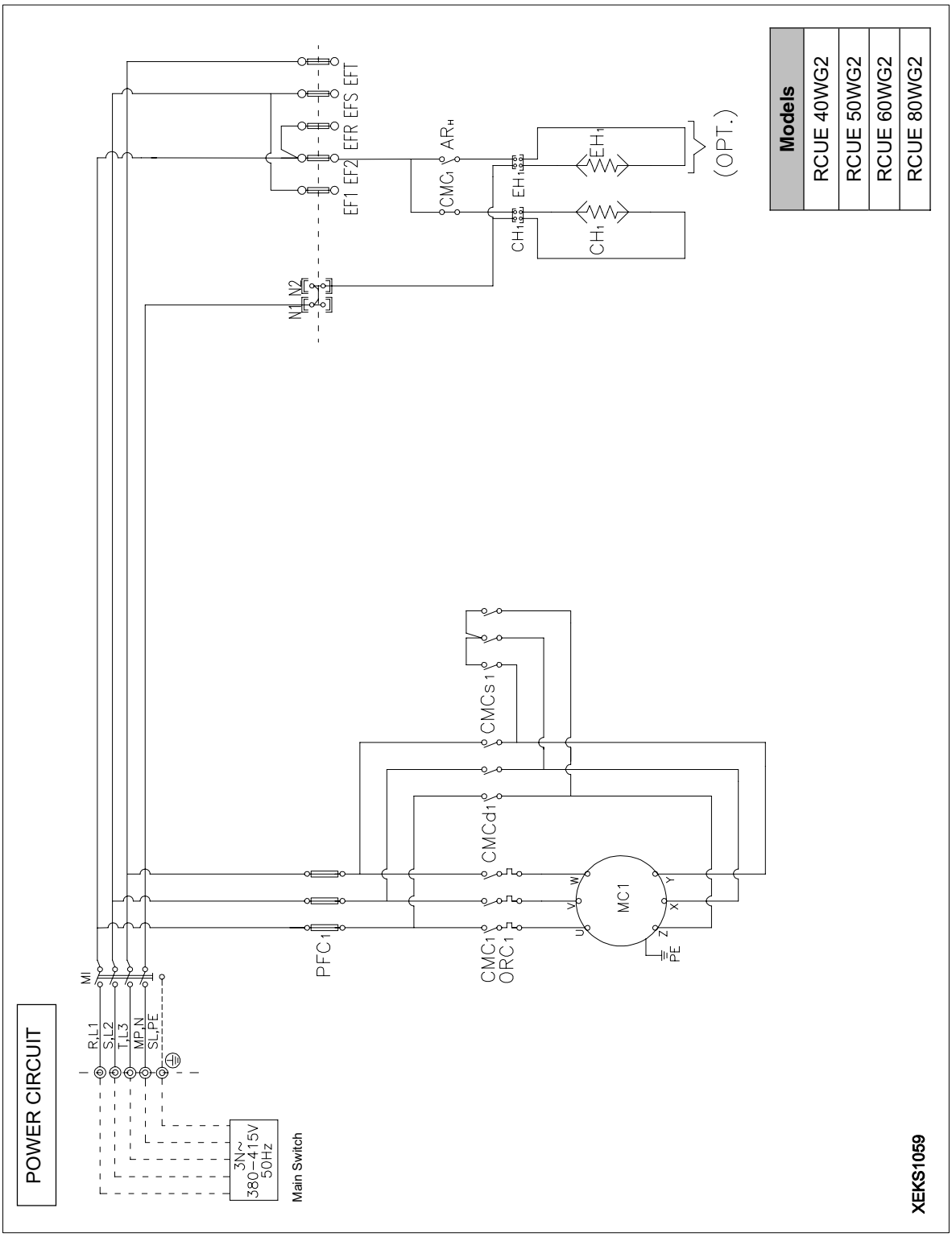


RCUE 240WG2

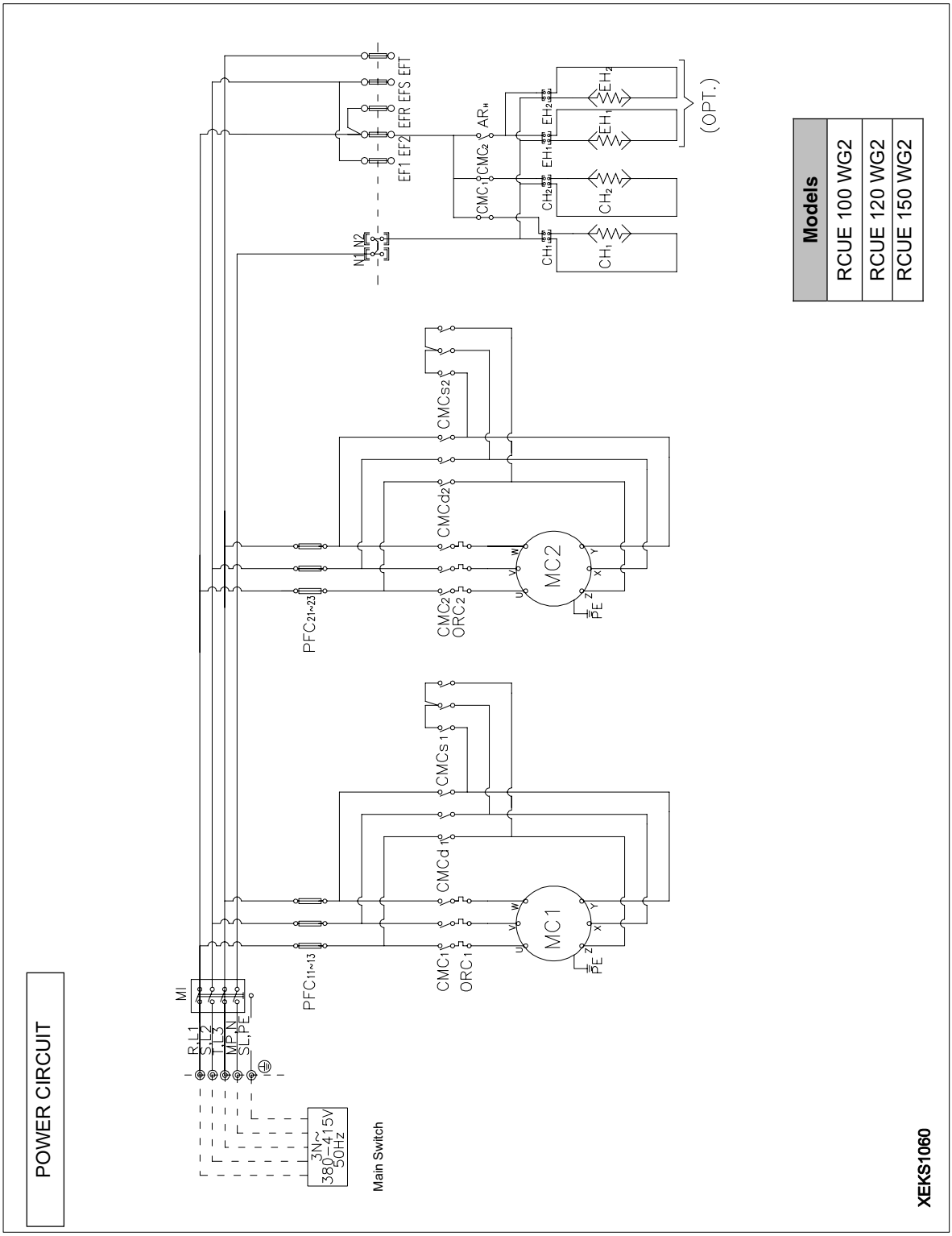


14.2. WIRING DIAGRAMS

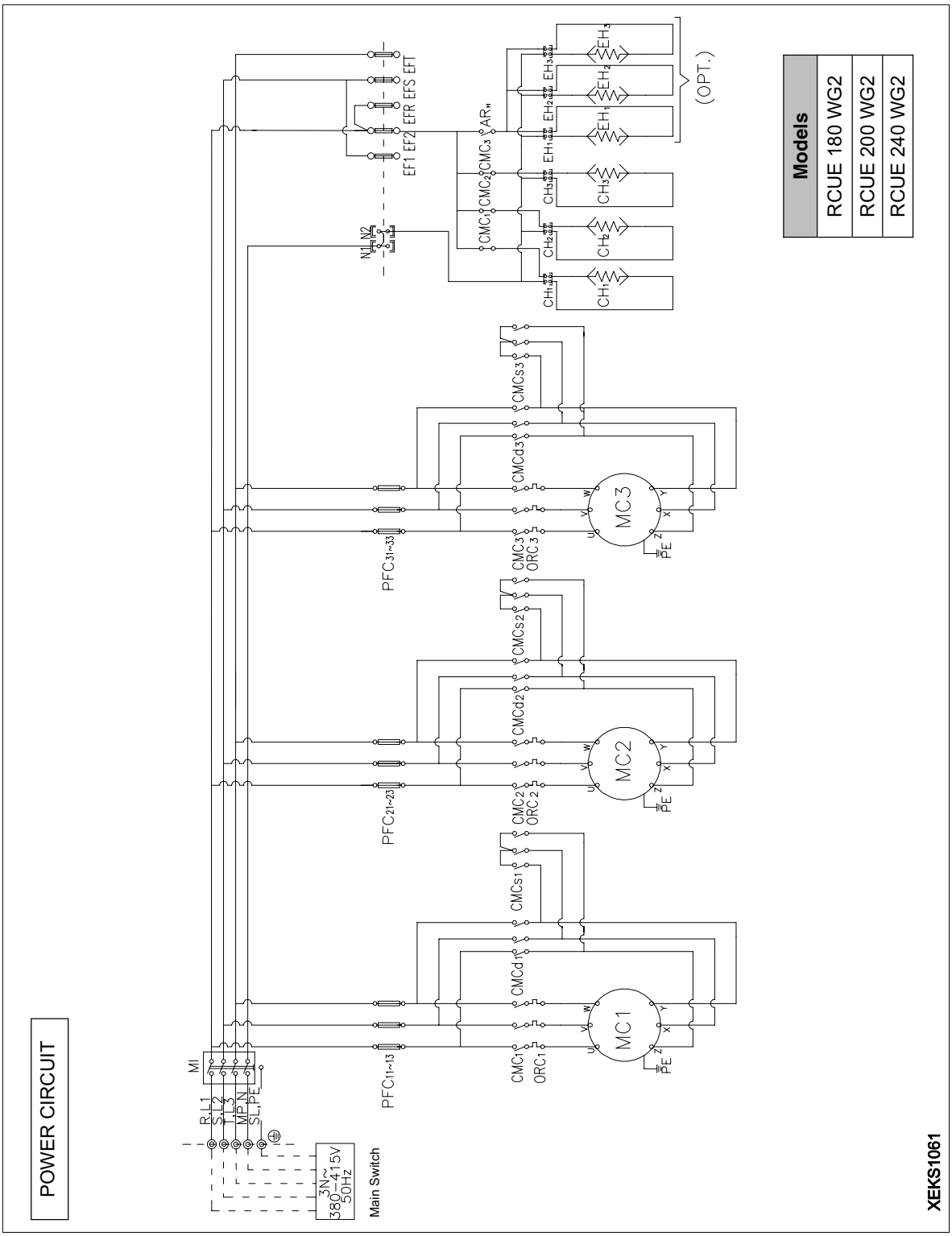
POWER CIRCUIT FOR RCUE 40WG2, RCUE 50WG2, RCUE 60WG2 and RCUE 80WG2



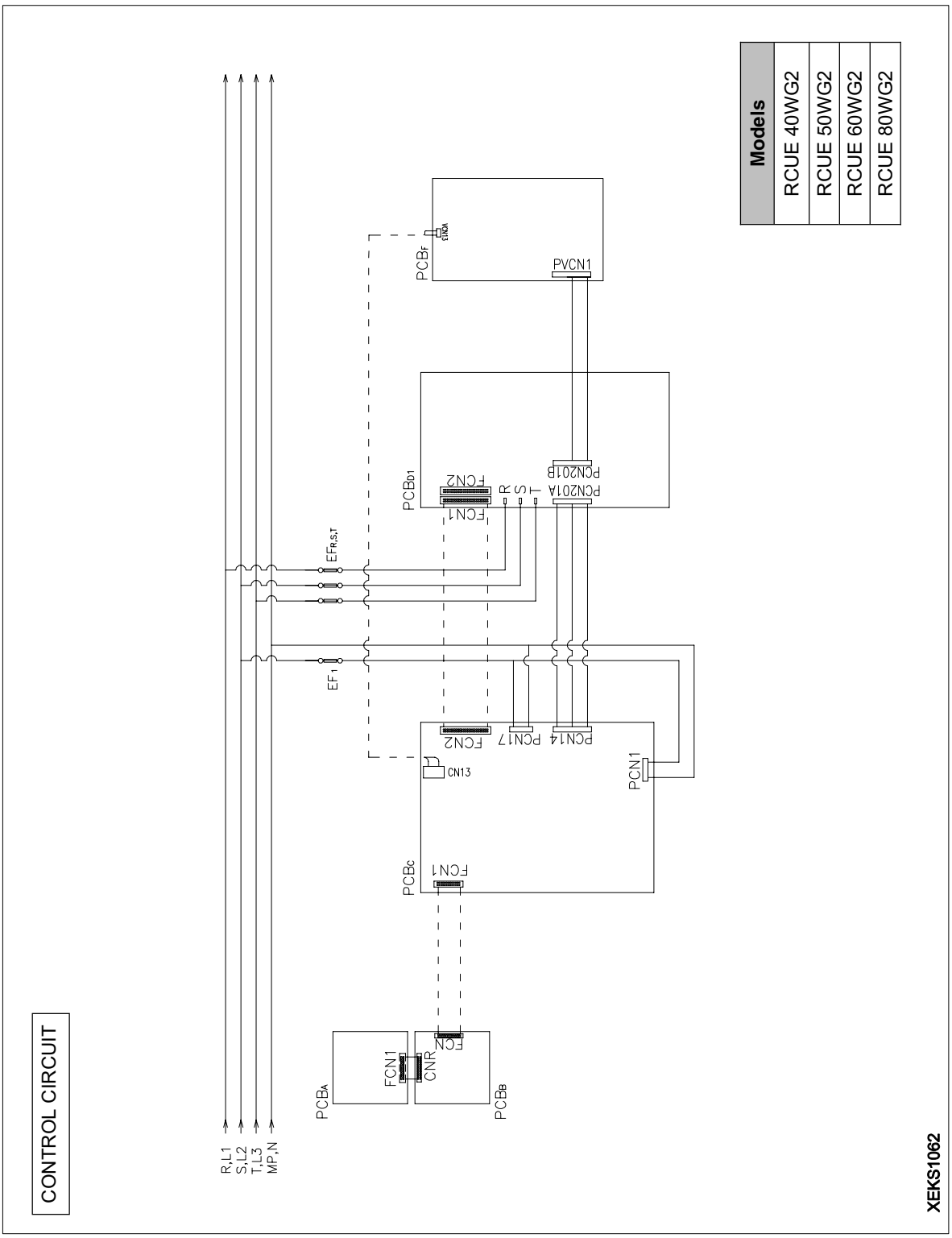
POWER CIRCUIT FOR RCUE 100WG2, RCUE 120WG2 and RCUE 150WG2



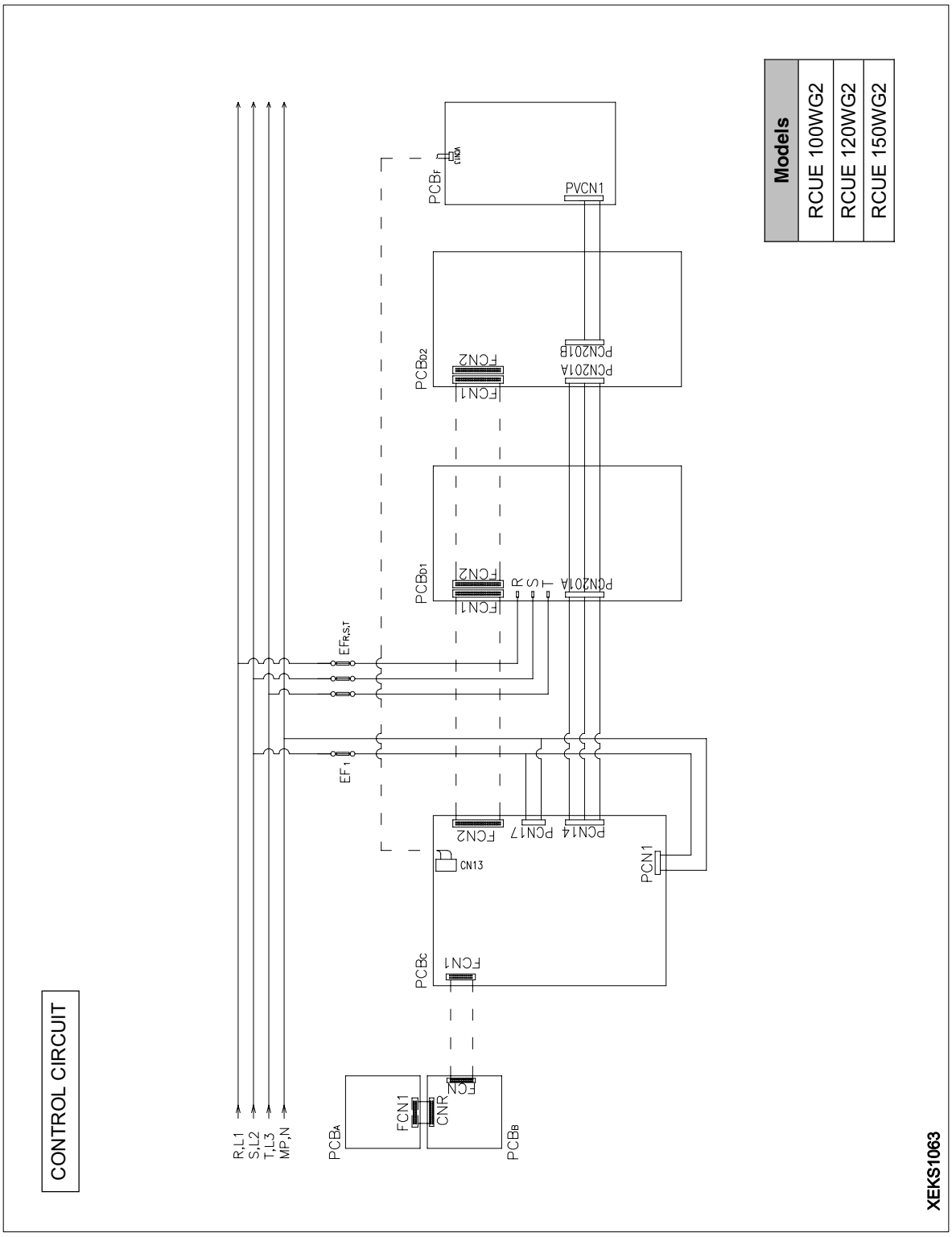
POWER CIRCUIT FOR RCUE 180WG2, RCUE 200WG2 and RCUE 240WG2



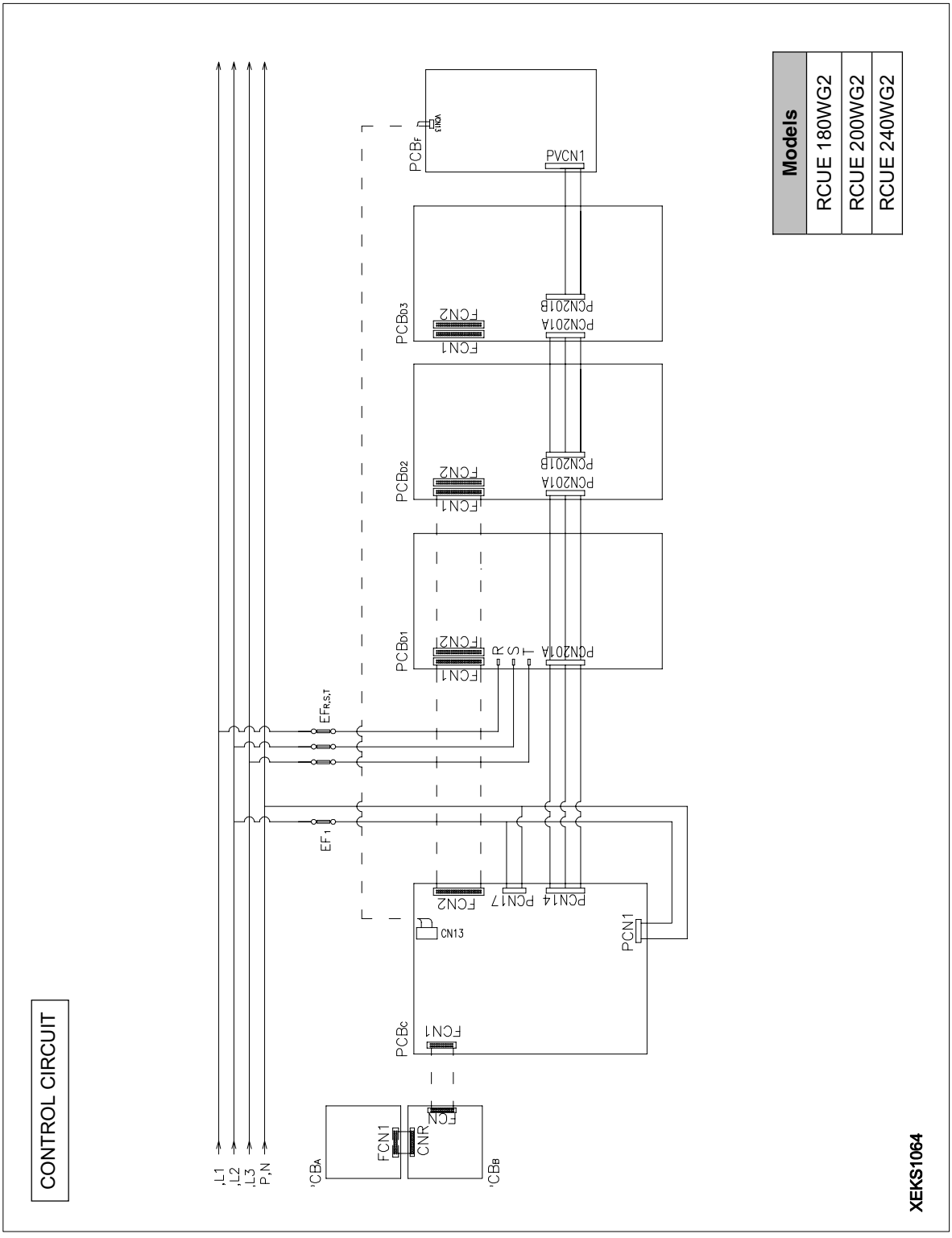
CONTROL CIRCUIT FOR RCUE 40WG2, RCUE 50WG2, RCUE 60WG2 and RCUE 80WG2



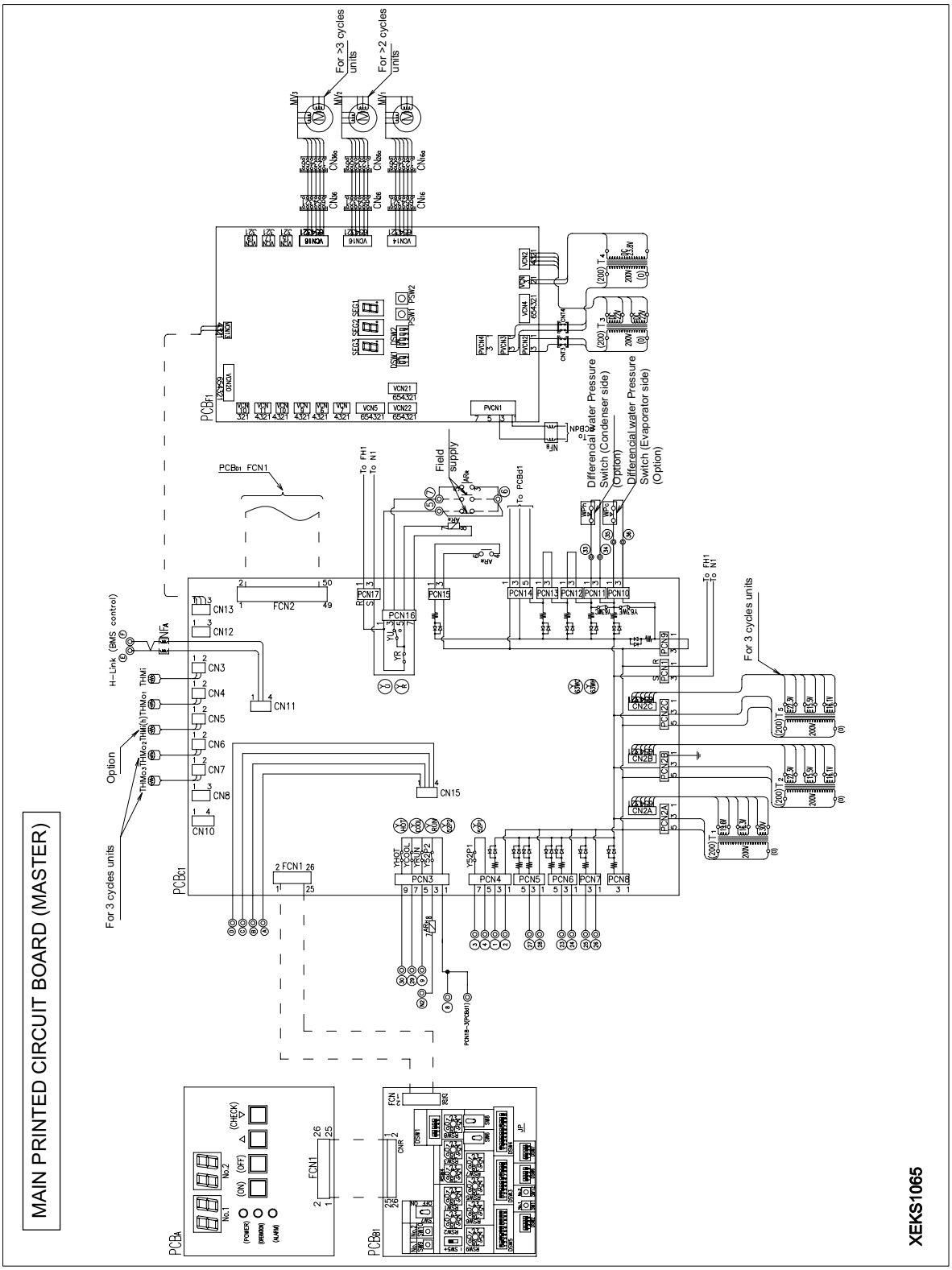
CONTROL CIRCUIT FOR RCUE 100WG2, RCUE 120WG2, RCUE 150WG2



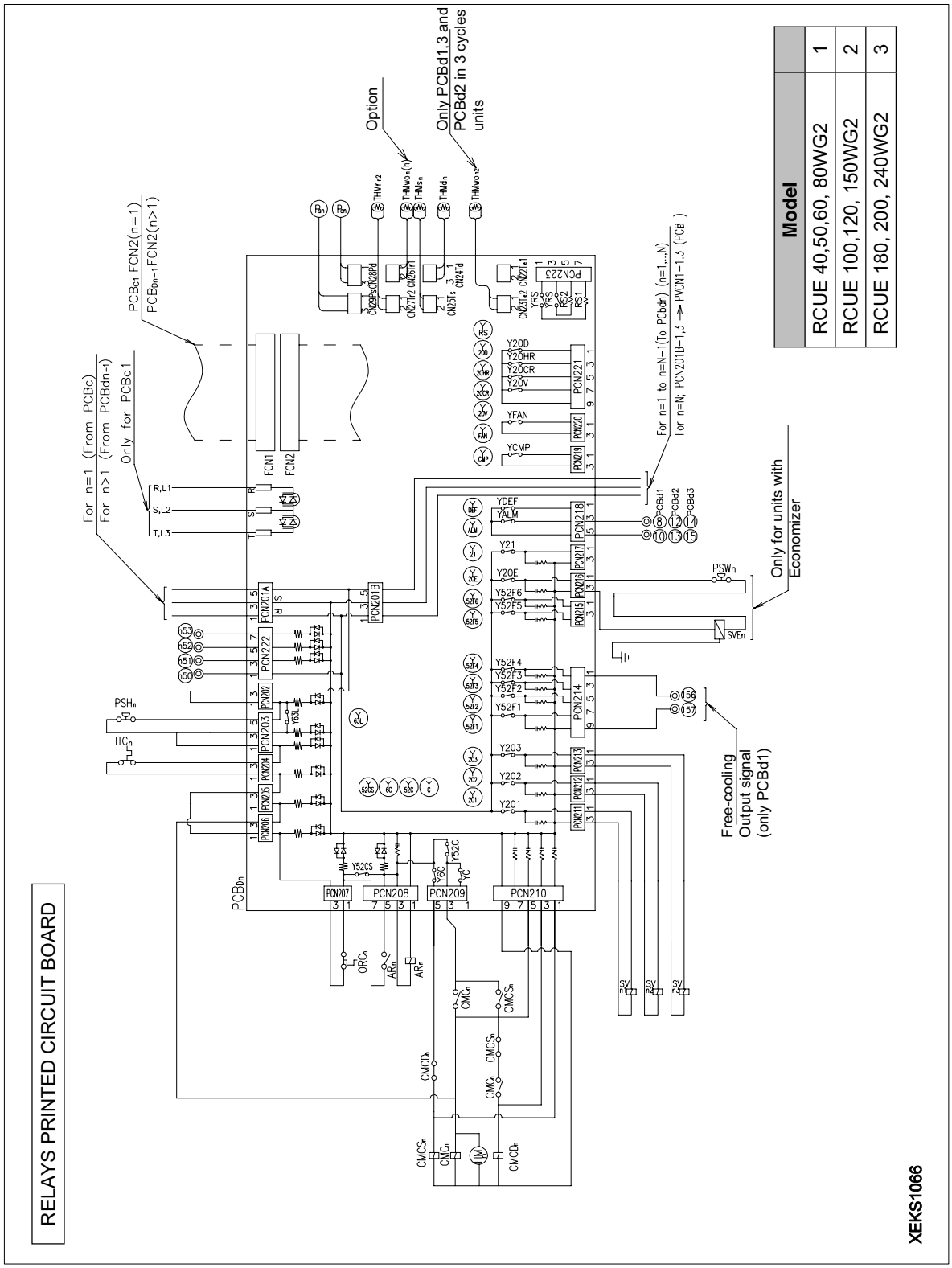
CONTROL CIRCUIT FOR RCUE 180WG2, RCUE 200WG2 and RCUE 240WG2



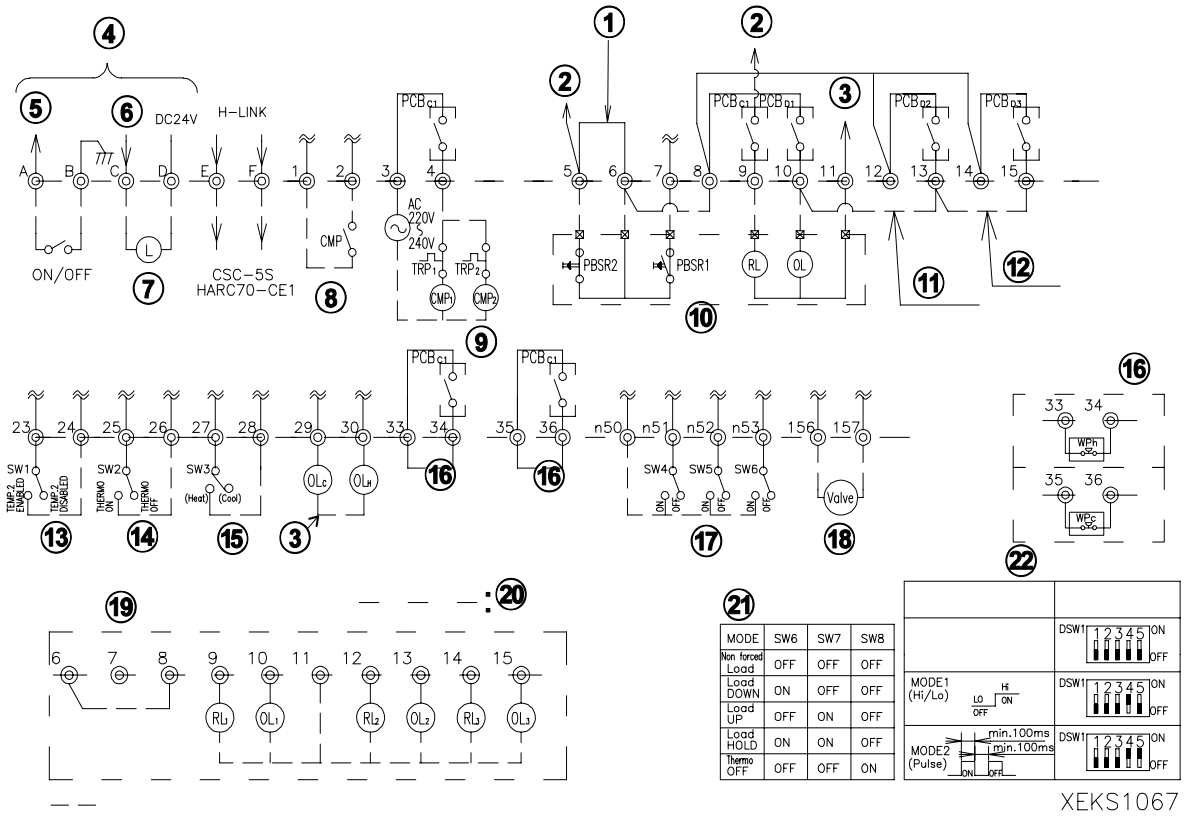
MAIN PRINTED CIRCUIT BOARD



RELAYS PRINTED CIRCUIT BOARD



CUSTOMER WIRING



NOTE:

1. All the setting shall be performed before Power ON.

2. Remote/Local Change over Switch on Operation Switch shall be set to "Remote".

3. Terminals 1◎ ~ n57 ◎ are for AC220-240V –Terminals A◎ ~ D ◎ are for DC24V. Terminals E◎ ~ F ◎ are H-Link (Low signal)

N°	Name
1	In case of remote control operation this wire shall be removed.
2	R Phase
3	Neutral
4	Low Voltage / Remote Control
5	Run/Stop Signal
6	Alarm Signal
7	Alarm Lamp
8	Pump Interlock
9	Pump operation
10	Remote Control Switch (RSW-A) (Option)
11	2,3 cycles
12	3 cycles

N°	Name
13	2 nd. Setting Temperature
14	External Thermostat Operation
15	Operation Mode (OPTION)
16	Only used for: -Diff. Water Pressure switch (OPTION) -Flow Switch (OPTION)
17	Force Compressor Load Operation
18	Free Cooling Output signal (Only cycle Nº 1)
19	In case of individual indication without Remote Control Switch
20	Customer wiring
21	Force compressor load
22	Setting of low voltage control

PARTS LIST

(n=1~N)

Mark	Name	Remark	Mark	Name	Remark
MC_{1-n}	Compressor Motor		$EF_{1~5}$	Fuse	6A
MI	Main Isolator		SV_{11-n1}	Solenoid Valve for Starting	
CMC_{1-n}	Contactor for Compressor Motor		SV_{12-n2}	Solenoid Valve for Load-down	
CMC_{s1-sn}	Contactor for Compressor Motor (Start Operation)		SV_{13-n3}	Solenoid Valve for Load-up	
CMC_{D1-Dn}	Contactor for Compressor Motor (Delta Operation)		TM_{1-n}	Hour Meter	
PFC_{1-n}	Fuse holder for Compressor Motor	or optional Circuit Breaker	PCB_A	Printed Circuit Board for Display	
EFC_{11-n} [3]	Fuse for Compressor Motor	or optional Circuit Breaker	PCB_B	Printed Circuit Board for Operation	
ORC_{1-n}	Overcurrent Relay for Compressor Motor		PCB_{C1}	Printed Circuit Board for CPU	
$ITC_{1- n}$	Internal Thermostat for Compressor		PCB_{D1-Dn}	Printed Circuit Board for Relay	
CH_{1-n}	Crankcase Heater		PCB_F	Printed Circuit Board for Expansion valve	
$AR_{,h,r,1-n}$	Auxiliary Relay		WP_C	Water Pressure Switch, Water Flow Switch, Evaporator Circuit	OPTION
PSH_{1-n}	High Pressure Switch	OFF: 2.75Mpa ON: Manual Reset	$PBSR_1$	Push Button Switch for Starting (REMOTE)	Field Supplied
$TF_{1,2,3,4,5}$	Transformer		$PBSR_2$	Push Button Switch for Stoppage (REMOTE)	
Pd_{1-n}	High Pressure Sensor		$RL_{(1-n)}$	Pilot Lamp for Remote Indication (Unit Operation, Cool/Heat)	
Ps_{1-n}	Low Pressure Sensor		$OL_{(1-n, C, H)}$	Pilot Lamp for Remote Indication (Alarm)	
EHF_{1-n}	Cooler Heater	OPTION	CMP_{1-2}	Contactor for Pumps	
THM_i	Inlet Water Temperature Thermistor		TRP_{1-2}	Thermal Relay for Pump	
$THM_{O\ 1,2,3}$	Outlet Water Temperature Thermistor		WP_H	Water Pressure Switch, Water Flow Switch, Condenser Circuit	
THM_{S1-n}	Suction Gas Temperature Thermistor		CMT	Contactor for Tower	
$THMd_{1-n}$	Discharge Temperature Thermistor		MV_n	Electronic Expansion Valve (Exp V.)	
$THMr2_{1-n}$	Temperature Thermistor Before Exp. Valve		PSW_n	Pressure switch for Economizer	
$THM_{O\ 11~31}$	Outlet Water Temperature Thermistor (Evap.)		SVE_n	Solenoid Valve for Economizer	
$THM_{i\ (h)}$	Inlet Water Temperature Thermistor (heat)	OPTION	EH_n	Electric Heater for Evaporator	
$THM_{O\ n}(h)$	Outlet Water Temperature Thermistor (heat)	OPTION	$SW_{1~6}$	Switches field supplied	
MF_A	Noise Filter (Ring Cores)				

Model	N
RCUE 40, 50, 60, 80 WG2	1
RCUE 100, 120, 150 WG2	2
RCUE 180, 200, 240 WG2	3

15. MODEL SELECTION

15.1. SELECTION EXAMPLE

1. Determine the system requirements

Condenser Water Inlet Temperature:	32 °C
Condenser Water Outlet Temperature:	37 °C
Chilled Water Inlet Temperature:	12 °C
Chilled Water Outlet Temperature:	7 °C
Cooling Load:	300 kw

2. Select Model and Read the Performance

From the cooling capacity table, model RCUE100WG2 can be selected with the following performance.

Cooling Capacity:	316.3 kW
Chilled Water Flow Rate:	54.4 m³/h
Water Cooler Pressure Drop:	36.9 kPa
Condenser Water Flow Rate:	68.7 m³/h
Condenser Pressure Drop:	67.5 kPa
Compressor Input Power:	83 kW

3. Correct the Data

1. 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.

2. 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.

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

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

CAP: Tabulated Cooling Capacity
IPT: Tabulated Compressor Input
Kfc: Capacity Correction Factor
Kfi: Compressor Input Correction Factor

	Fouling Factor $m^2h\ °C/kcal$ ($m^2\ °C/kW$)	Kfc	Kfi
Water Cooler	0	1.00	1.00
	0.00005(0.043)	1.00	1.00
	0.0001(0.086)	0.99	1.01
Condenser	0	1.00	1.00
	0.0001(0.086)	0.98	1.03
	0.0002(0.172)	0.96	1.06

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 (m^3/h)
α, β β Parameters (table below)

	Model:	Parameter	
	RCUE-WG2	α	β
Cooler	40	0.0764	1.912
	50	0.0648	1.912
	60	0.0437	1.912
	80	0.0374	1.912
	100	0.0188	1.897
	120	0.0188	1.897
	150	0.0188	1.897
	180	0.0053	1.912
	200	0.0053	1.912
	240	0.0046	1.912
Condenser	40	0.0688	1.872
	50	0.0480	1.881
	60	0.0328	1.897
	80	0.0358	1.912
	100	0.0225	1.893
	120	0.0160	1.901
	150	0.0160	1.901
	180	0.0041	1.897
	200	0.0041	1.897
	240	0.0044	1.912

15.2. PERFORMANCE TABLE

		RCUE40WG2							RCUE50WG2							RCUE60WG2						
CDOT	CLOT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT
22,0	5,0	137,9	23,7	32,5	162,8	28,0	35,2	25,0	164,6	28,3	38,7	194,4	33,4	35,4	29,8	199,6	34,3	37,8	236,2	40,6	37,0	36,6
	6,0	140,9	24,2	33,9	166,0	28,6	36,5	25,2	168,2	28,9	40,4	198,3	34,1	36,7	30,0	204,0	35,1	39,4	240,8	41,4	38,4	36,9
	7,0	143,9	24,8	35,3	169,3	29,1	37,8	25,3	171,9	29,6	42,1	202,1	34,8	38,1	30,2	208,4	35,8	41,0	245,5	42,2	39,8	37,1
	8,0	147,0	25,3	36,8	172,5	29,7	39,2	25,5	175,5	30,2	43,8	206,0	35,4	39,5	30,5	212,8	36,6	42,7	250,2	43,0	41,2	37,4
	9,0	150,0	25,8	38,3	175,7	30,2	40,6	25,7	179,1	30,8	45,5	209,8	36,1	40,9	30,7	217,2	37,4	44,4	254,8	43,8	42,7	37,7
	10,0	153,1	26,3	39,7	178,9	30,8	42,0	25,9	182,8	31,4	47,3	213,6	36,7	42,3	30,9	221,6	38,1	46,1	259,5	44,6	44,2	37,9
	11,0	156,1	26,8	41,3	182,2	31,3	43,4	26,0	186,4	32,1	49,1	217,5	37,4	43,7	31,1	226,0	38,9	47,9	264,2	45,4	45,7	38,2
	12,0	159,1	27,4	42,8	185,4	31,9	44,8	26,2	190,0	32,7	51,0	221,3	38,1	45,2	31,3	230,4	39,6	49,7	268,8	46,2	47,3	38,4
	13,0	162,2	27,9	44,4	188,6	32,4	46,3	26,4	193,7	33,3	52,9	225,2	38,7	46,7	31,5	234,8	40,4	51,5	273,5	47,0	48,8	38,7
	14,0	165,2	28,4	46,0	191,8	33,0	47,8	26,6	197,3	33,9	54,8	229,0	39,4	48,2	31,7	239,2	41,1	53,4	278,2	47,8	50,4	39,0
	15,0	168,3	28,9	47,6	195,0	33,5	49,3	26,8	200,9	34,6	56,7	232,9	40,1	49,7	32,0	243,6	41,9	55,3	282,8	48,6	52,0	39,2
25,0	5,0	135,4	23,3	31,4	162,3	27,9	35,0	26,9	169,1	29,1	40,8	201,2	34,6	37,8	32,1	205,0	35,3	39,8	244,4	42,0	39,5	39,4
	6,0	138,5	23,8	32,8	165,6	28,5	36,3	27,1	174,7	30,1	43,4	207,0	35,6	39,8	32,3	211,8	36,4	42,3	251,5	43,3	41,7	39,7
	7,0	141,6	24,4	34,3	168,9	29,0	37,6	27,2	180,4	31,0	46,1	212,9	36,6	42,0	32,5	218,7	37,6	45,0	258,6	44,5	43,9	39,9
	8,0	144,8	24,9	35,7	172,1	29,6	39,0	27,4	186,0	32,0	48,9	218,7	37,6	44,2	32,7	225,5	38,8	47,7	265,7	45,7	46,2	40,1
	9,0	147,9	25,4	37,2	175,4	30,2	40,4	27,5	191,6	33,0	51,8	224,5	38,6	46,4	32,9	232,4	40,0	50,5	272,7	46,9	48,6	40,4
	10,0	151,0	26,0	38,7	178,7	30,7	41,9	27,7	197,3	33,9	54,8	230,4	39,6	48,7	33,1	239,2	41,1	53,4	279,8	48,1	51,0	40,6
	11,0	154,1	26,5	40,3	182,0	31,3	43,3	27,9	202,9	34,9	57,8	236,2	40,6	51,1	33,3	246,1	42,3	56,4	286,9	49,3	53,5	40,9
	12,0	157,2	27,0	41,8	185,3	31,9	44,8	28,0	208,6	35,9	60,9	242,1	41,6	53,5	33,5	252,9	43,5	59,4	294,0	50,6	56,0	41,1
	13,0	160,3	27,6	43,4	188,5	32,4	46,3	28,2	214,2	36,8	64,1	247,9	42,6	55,9	33,7	259,7	44,7	62,5	301,1	51,8	58,6	41,3
	14,0	163,5	28,1	45,1	191,8	33,0	47,8	28,4	219,9	37,8	67,4	253,7	43,6	58,4	33,9	266,6	45,9	65,7	308,2	53,0	61,2	41,6
	15,0	166,6	28,7	46,7	195,1	33,6	49,3	28,5	225,5	38,8	70,7	259,6	44,6	61,0	34,1	273,4	47,0	68,9	315,2	54,2	63,9	41,8
30,0	5,0	131,3	22,6	29,7	161,4	27,8	34,6	30,1	156,8	27,0	35,3	192,7	33,2	34,8	35,9	190,1	32,7	34,4	234,2	40,3	36,4	44,1
	6,0	134,6	23,1	31,1	164,8	28,3	36,0	30,2	160,7	27,6	37,0	196,8	33,8	36,2	36,1	194,8	33,5	36,1	239,1	41,1	37,9	44,3
	7,0	137,8	23,7	32,5	168,2	28,9	37,4	30,4	164,6	28,3	38,7	200,8	34,5	37,6	36,2	199,5	34,3	37,7	244,0	42,0	39,3	44,5
	8,0	141,1	24,3	34,0	171,6	29,5	38,8	30,5	168,4	29,0	40,5	204,8	35,2	39,1	36,4	204,2	35,1	39,5	248,9	42,8	40,8	44,7
	9,0	144,3	24,8	35,5	174,9	30,1	40,2	30,6	172,3	29,6	42,3	208,9	35,9	40,5	36,6	208,9	35,9	41,2	253,8	43,7	42,4	44,9
	10,0	147,5	25,4	37,1	178,3	30,7	41,7	30,8	176,2	30,3	44,1	212,9	36,6	42,0	36,7	213,6	36,7	43,0	258,7	44,5	44,0	45,1
	11,0	150,8	25,9	38,6	181,7	31,3	43,2	30,9	180,0	31,0	46,0	217,0	37,3	43,5	36,9	218,3	37,5	44,8	263,6	45,3	45,5	45,3
	12,0	154,0	26,5	40,2	185,1	31,8	44,7	31,1	183,9	31,6	47,9	221,0	38,0	45,0	37,1	223,0	38,4	46,7	268,5	46,2	47,2	45,5
	13,0	157,3	27,1	41,9	188,5	32,4	46,2	31,2	187,8	32,3	49,8	225,0	38,7	46,6	37,2	227,7	39,2	48,6	273,4	47,0	48,8	45,7
	14,0	160,5	27,6	43,5	191,8	33,0	47,8	31,3	191,7	33,0	51,8	229,1	39,4	48,2	37,4	232,4	40,0	50,5	278,3	47,9	50,5	45,9
	15,0	163,8	28,2	45,2	195,2	33,6	49,4	31,5	195,5	33,6	53,8	233,1	40,1	49,8	37,6	237,1	40,8	52,5	283,2	48,7	52,2	46,1
35,0	5,0	127,3	21,9	27,9	160,5	27,6	34,2	33,3	149,5	25,7	32,2	189,2	32,5	33,6	39,7	181,2	31,2	31,4	230,0	39,6	35,2	48,8
	6,0	130,6	22,5	29,4	164,0	28,2	35,6	33,4	154,7	26,6	34,4	194,6	33,5	35,5	39,9	187,6	32,3	33,6	236,5	40,7	37,1	48,9
	7,0	**134,0**	**23,0**	**30,8**	**167,5**	**28,8**	**37,1**	**33,5**	**160,0**	**27,5**	**36,7**	**200,0**	**34,4**	**37,3**	**40,0**	**194,0**	**33,4**	**35,8**	**243,1**	**41,8**	**39,1**	**49,1**
	8,0	137,4	23,6	32,3	171,0	29,4	38,5	33,6	165,3	28,4	39,0	205,4	35,3	39,3	40,1	200,4	34,5	38,1	249,7	42,9	41,1	49,3
	9,0	140,7	24,2	33,9	174,5	30,0	40,0	33,7	170,5	29,3	41,5	210,8	36,3	41,2	40,3	206,8	35,6	40,4	256,2	44,1	43,1	49,4
	10,0	144,1	24,8	35,4	177,9	30,6	41,5	33,8	175,8	30,2	43,9	216,2	37,2	43,2	40,4	213,2	36,7	42,8	262,8	45,2	45,3	49,6
	11,0	147,5	25,4	37,0	181,4	31,2	43,1	34,0	181,1	31,1	46,5	221,6	38,1	45,3	40,5	219,5	37,8	45,3	269,3	46,3	47,4	49,8
	12,0	150,8	25,9	38,6	184,9	31,8	44,6	34,1	186,3	32,0	49,1	227,0	39,0	47,4	40,7	225,9	38,9	47,9	275,9	47,4	49,6	49,9
	13,0	154,2	26,5	40,3	188,4	32,4	46,2	34,2	191,6	33,0	51,8	232,4	40,0	49,5	40,8	232,3	40,0	50,5	282,4	48,6	51,9	50,1
	14,0	157,6	27,1	42,0	191,9	33,0	47,8	34,3	196,9	33,9	54,5	237,8	40,9	51,7	41,0	238,7	41,1	53,2	289,0	49,7	54,2	50,3
	15,0	160,9	27,7	43,7	195,3	33,6	49,4	34,4	202,1	34,8	57,4	243,2	41,8	53,9	41,1	245,1	42,2	55,9	295,5	50,8	56,6	50,4
37,0	5,0	125,6	21,6	27,2	160,2	27,6	34,1	34,5	145,5	25,0	30,6	186,8	32,1	32,8	41,2	176,5	30,4	29,8	227,1	39,1	34,3	50,6
	6,0	129,1	22,2	28,7	163,7	28,2	35,5	34,7	150,7	25,9	32,7	192,1	33,0	34,6	41,4	182,8	31,4	31,9	233,6	40,2	36,2	50,8
	7,0	132,5	22,8	30,2	167,2	28,8	37,0	34,8	155,9	26,8	34,9	197,4	34,0	36,4	41,5	189,1	32,5	34,1	240,0	41,3	38,1	50,9
	8,0	135,9	23,4	31,7	170,7	29,4	38,4	34,9	161,1	27,7	37,2	202,7	34,9	38,3	41,6	195,4	33,6	36,3	246,5	42,4	40,1	51,1
	9,0	139,3	24,0	33,2	174,3	30,0	39,9	35,0	166,3	28,6	39,5	208,1	35,8	40,2	41,8	201,6	34,7	38,5	252,9	43,5	42,1	51,3
	10,0	142,7	24,5	34,8	177,8	30,6	41,5	35,1	171,5	29,5	41,9	213,4	36,7	42,2	41,9	207,9	35,8	40,8	259,3	44,6	44,2	51,4
	11,0	146,1	25,1	36,4	181,3	31,2	43,0	35,2	176,7	30,4	44,4	218,7	37,6	44,2	42,0	214,2	36,8	43,2	265,8	45,7	46,3	51,6
	12,0	149,6	25,7	38,0	184,8	31,8	44,6	35,3	181,9	31,3	46,9	224,0	38,5	46,2	42,1	220,5	37,9	45,7	272,2	46,8	48,4	51,7
	13,0	153,0	26,3	39,7	188,4	32,4	46,2	35,4	187,1	32,2	49,5	229,3	39,4	48,3	42,3	226,8	39,0	48,2	278,7	47,9	50,6	51,9
	14,0	156,4	26,9	41,4	191,9	33,0	47,8	35,5	192,3	33,1	52,1	234,6	40,4	50,4	42,4	233,1	40,1	50,8	285,1	49,0	52,9	52,0
	15,0	159,8	27,5	43,2	195,4	33,6	49,5	35,6	197,4	34,0	54,9	239,9	41,3	52,6	42,5	239,4	41,2	53,5	291,6	50,2	55,1	52,2
40,0	5,0	123,2	21,2	26,2	159,7	27,5	33,9	36,5	147,1	25,3	31,2	190,6	32,8	34,1	43,5	178,4	30,7	30,5	231,8	39,9	35,7	53,4
	6,0	126,7	21,8	27,7	163,2	28,1	35,3	36,6	151,3	26,0	33,0	194,9	33,5	35,6	43,6	183,4	31,5	32,1	237,0	40,8	37,2	53,6
	7,0	130,2	22,4	29,2	166,8	28,7	36,8	36,6	155,4	26,7	34,7	199,2	34,3	37,1	43,8	188,5	32,4	33,8	242,2	41,7	38,8	53,7
	8,0	133,7	23,0	30,7	170,4	29,3	38,3	36,7	159,6	27,5	36,5	203,5	35,0	38,6	43,9	193,5	33,3	35,6	247,4	42,5	40,4	53,8
	9,0	137,2	23,6	32,2	174,0	29,9	39,8	36,8	163,8	28,2	38,4	207,7	35,7	40,1	44,0	198,6	34,2	37,4	252,5	43,4	42,0	54,0
	10,0	140,7	24,2	33,8	177,6	30,5	41,4	36,9	167,9	28,9	40,3	212,0	36,5	41,7	44,1	203,6	35,0	39,2	257,7	44,3	43,6	54,1
	11,0	144,1	24,8	35,4	181,1	31,2	42,9	37,0	172,1	29,6	42,2	216,3	37,2	43,3	44,2	208,7	35,9	41,1	262,9	45,2	45,3	54,2
	12,0	147,6	25,4	37,1	184,7	31,8	44,5	37,1	176,3	30,3	44,2	220,6	37,9	44,9	44,3	213,7	36,8	43,1	268,1	46,1	47,0	54,4
	13,0	151,1	26,0	38,8	188,3	32,4	46,2	37,2	180,4	31,0	46,2	224,8	38,7	46,5	44,4	218,8	37,6	45,0	273,3	47,0	48,8	54,5
	14,0	154,6	26,6	40,5	191,9	33,0	47,8	37,3	184,6	31,8	48,2	229,1	39,4	48,2	44,5	223,8	38,5	47,0	278,5	47,9	50,5	54,6
	15,0	158,1	27,2	42,3	195,5	33,6	49,5	37,4	188,8	32,5	50,3	233,4	40,1	49,9	44,6	228,9	39,4	49,1	283,7	48,8	52,3	54,8
45,0	5,0	119,1	20,5	24,6	158,8	27,3	33,5	39,7	129,9	22,3	24,6	177,2	30,5	29,7	47,3	157,5	27,1	24,0	215,6	37,1	31,1	58,1
	6,0	122,7	21,1	26,1	162,5	27,9	35,0	39,7	134,8	23,2	26,4	182,2	31,3	31,3	47,4	163,4	28,1	25,8	221,6	38,1	32,8	58,2
	7,0	126,4	21,7	27,5	166,1	28,6	36,5	39,8	139,6	24,0	28,3	187,1	32,2	32,9	47,5	169,3	29,1	27,6	227,6	39,2	34,5	58,3
	8,0	130,0	22,4	29,1	169,8	29,2	38,0	39,8	144,5	24,9	30,2	192,1	33,0	34,6	47,6	175,2	30,1	29,4	233,6	40,2	36,2	58,4
	9,0	133,6	23,0	30,6	173,5	29,8	39,6	39,9	149,4	25,7	32,2	197,1	33,9	36,3	47,7	181,2	31,2	31,4	239,7	41,2	38,0	58,5
	10,0	137,2	23,6	32,2	177,2	30,5	41,2	40,0	154,3	26,5	34,2	202,0	34,8	38,1	47,7	187,1	32,2	33,4	245,7	42,3	39,8	58,6
	11,0	140,8	24,2	33,9	180,9	31,1	42,8	40,0	159,2	27,4	36,3	207,0	35,6	39,8	47,8	193,0	33,2	35,4	251,7	43,3	41,7	58,7
	12,0	144,4	24,8	35,6	184,5	31,7	44,5	40,1	164,1	28,2	38,5	212,0	36,5	41,7	47,9	198,9	34,2	37,5	257,7	44,3	43,6	58,8
	13,0	148,0	25,5	37,3	188,2	32,4	46,1	40,2	169,0	29,1	40,7	216,9	37,3	43,5	48,0	204,9	35,2	39,7	263,8	45,4	45,6	58,9
	14,0	151,7	26,1	39,1	191,9	33,0	47,8	40,2	173,9	29,9	43,0	221,9	38,2	45,4	48,1	210,8	36,3	41,9	269,8	46,4	47,6	59,0
	15,0	155,3	26,7	40,9	195,6	33,6	49,6	40,3	178,7	30,7	45,4	226,9	39,0	47,3	48,1	216,7	37,3	44,2	275,8	47,4	49,6	59,1

Where,
CDOT: Condenser Water Outlet Temperature (°C)
CLOT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
HCAP: Condenser Heat Rejection (Kw)
HFR: Condenser Water Flow Rate at 5°C (m^3/h)
HPD: Condenser Water Pressure Drop (kPa)
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.)

		RCUE80WG2							RCUE100WG2							RCUE120WG2						
CDOT	CLOT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT
22,0	5,0	238,7	41,1	45,5	279,3	48,0	58,8	40,6	329,2	56,6	39,8	388,8	66,9	64,2	59,6	399,2	68,7	57,3	472,4	81,2	68,3	73,2
	6,0	243,9	42,0	47,4	284,9	49,0	61,1	40,9	336,5	57,9	41,5	396,5	68,2	66,6	60,1	408,0	70,2	59,8	481,7	82,9	70,9	73,7
	7,0	249,2	42,9	49,4	290,4	50,0	63,4	41,2	343,7	59,1	43,2	404,2	69,5	69,1	60,5	416,8	71,7	62,2	491,0	84,5	73,6	74,3
	8,0	254,5	43,8	51,4	296,0	50,9	65,7	41,5	351,0	60,4	44,9	411,9	70,8	71,6	60,9	425,6	73,2	64,8	500,4	86,1	76,2	74,8
	9,0	259,7	44,7	53,5	301,5	51,9	68,1	41,8	358,3	61,6	46,7	419,6	72,2	74,2	61,3	434,4	74,7	67,3	509,7	87,7	79,0	75,3
	10,0	265,0	45,6	55,6	307,1	52,8	70,5	42,1	365,5	62,9	48,5	427,3	73,5	76,8	61,8	443,2	76,2	69,9	519,0	89,3	81,7	75,8
	11,0	270,3	46,5	57,7	312,6	53,8	73,0	42,4	372,8	64,1	50,4	435,0	74,8	79,4	62,2	452,0	77,7	72,6	528,4	90,9	84,6	76,4
	12,0	275,5	47,4	59,9	318,2	54,7	75,5	42,7	380,0	65,4	52,3	442,7	76,1	82,1	62,6	460,8	79,3	75,3	537,7	92,5	87,4	76,9
	13,0	280,8	48,3	62,1	323,8	55,7	78,0	43,0	387,3	66,6	54,2	450,4	77,5	84,8	63,1	469,6	80,8	78,1	547,0	94,1	90,3	77,4
	14,0	286,1	49,2	64,3	329,3	56,6	80,6	43,2	394,6	67,9	56,1	458,1	78,8	87,6	63,5	478,4	82,3	80,9	556,4	95,7	93,3	77,9
	15,0	291,3	50,1	66,6	334,9	57,6	83,2	43,5	401,8	69,1	58,1	465,8	80,1	90,4	63,9	487,2	83,8	83,7	565,7	97,3	96,3	78,5
25,0	5,0	234,4	40,3	44,0	278,2	47,8	58,4	43,7	323,4	55,6	38,5	387,6	66,7	63,8	64,2	392,1	67,4	55,4	470,9	81,0	67,9	78,8
	6,0	239,8	41,3	45,9	283,8	48,8	60,7	44,0	330,8	56,9	40,2	395,4	68,0	66,3	64,6	401,1	69,0	57,9	480,4	82,6	70,6	79,3
	7,0	245,2	42,2	47,9	289,5	49,8	63,0	44,3	338,3	58,2	41,9	403,2	69,4	68,8	65,0	410,1	70,5	60,4	489,9	84,3	73,2	79,8
	8,0	250,6	43,1	50,0	295,2	50,8	65,4	44,5	345,7	59,5	43,7	411,1	70,7	71,3	65,4	419,2	72,1	62,9	499,4	85,9	76,0	80,3
	9,0	256,0	44,0	52,0	300,8	51,7	67,8	44,8	353,1	60,7	45,5	418,9	72,1	73,9	65,8	428,2	73,6	65,5	508,9	87,5	78,7	80,7
	10,0	261,4	45,0	54,2	306,5	52,7	70,3	45,1	360,6	62,0	47,3	426,8	73,4	76,6	66,2	437,2	75,2	68,2	518,4	89,2	81,6	81,2
	11,0	266,8	45,9	56,3	312,2	53,7	72,8	45,3	368,0	63,3	49,2	434,6	74,7	79,3	66,6	446,2	76,8	70,9	527,9	90,8	84,4	81,7
	12,0	272,2	46,8	58,5	317,8	54,7	75,3	45,6	375,5	64,6	51,1	442,4	76,1	82,0	67,0	455,3	78,3	73,6	537,4	92,4	87,3	82,2
	13,0	277,6	47,7	60,8	323,5	55,6	77,9	45,9	382,9	65,9	53,0	450,3	77,4	84,8	67,3	464,3	79,9	76,4	546,9	94,1	90,3	82,7
	14,0	283,0	48,7	63,0	329,2	56,6	80,5	46,1	390,3	67,1	55,0	458,1	78,8	87,6	67,7	473,3	81,4	79,2	556,5	95,7	93,3	83,2
	15,0	288,4	49,6	65,3	334,8	57,6	83,2	46,4	397,8	68,4	57,0	465,9	80,1	90,4	68,1	482,3	83,0	82,1	566,0	97,3	96,4	83,6
30,0	5,0	227,4	39,1	41,5	276,3	47,5	57,6	48,9	313,6	53,9	36,3	385,5	66,3	63,2	71,8	380,3	65,4	52,3	468,5	80,6	67,3	88,2
	6,0	233,0	40,1	43,5	282,2	48,5	60,0	49,2	321,4	55,3	38,0	393,5	67,7	65,7	72,2	389,7	67,0	54,8	478,3	82,3	70,0	88,6
	7,0	238,6	41,0	45,5	288,0	49,5	62,4	49,4	329,1	56,6	39,8	401,6	69,1	68,3	72,5	399,1	68,6	57,3	488,1	83,9	72,7	89,0
	8,0	244,2	42,0	47,6	293,8	50,5	64,8	49,6	336,9	57,9	41,6	409,7	70,5	70,9	72,8	408,4	70,3	59,9	497,9	85,6	75,5	89,4
	9,0	249,8	43,0	49,7	299,7	51,5	67,3	49,8	344,6	59,3	43,4	417,8	71,9	73,6	73,2	417,8	71,9	62,5	507,6	87,3	78,4	89,8
	10,0	255,5	43,9	51,8	305,5	52,5	69,8	50,1	352,3	60,6	45,3	425,8	73,2	76,3	73,5	427,2	73,5	65,2	517,4	89,0	81,3	90,2
	11,0	261,1	44,9	54,0	311,4	53,6	72,4	50,3	360,1	61,9	47,2	433,9	74,6	79,0	73,8	436,6	75,1	68,0	527,2	90,7	84,2	90,6
	12,0	266,7	45,9	56,3	317,2	54,6	75,0	50,5	367,8	63,3	49,1	442,0	76,0	81,8	74,2	446,0	76,7	70,8	537,0	92,4	87,2	91,0
	13,0	272,3	46,8	58,5	323,0	55,6	77,7	50,8	375,6	64,6	51,1	450,1	77,4	84,7	74,5	455,4	78,3	73,6	546,8	94,1	90,3	91,4
	14,0	277,9	47,8	60,9	328,9	56,6	80,4	51,0	383,3	65,9	53,1	458,1	78,8	87,6	74,8	464,8	79,9	76,5	556,6	95,7	93,4	91,9
	15,0	283,5	48,8	63,2	334,7	57,6	83,2	51,2	391,0	67,3	55,2	466,2	80,2	90,5	75,2	474,1	81,6	79,5	566,4	97,4	96,5	92,3
35,0	5,0	220,3	37,9	39,1	274,5	47,2	56,9	54,1	303,9	52,3	34,2	383,4	65,9	62,5	79,5	368,5	63,4	49,3	466,0	80,2	66,6	97,5
	6,0	226,2	38,9	41,1	280,5	48,2	59,3	54,3	312,0	53,7	35,9	391,7	67,4	65,1	79,7	378,3	65,1	51,8	476,1	81,9	69,4	97,9
	7,0	**232,0**	**39,9**	**43,1**	**286,5**	**49,3**	**61,8**	**54,5**	**320,0**	**55,0**	**37,7**	**400,0**	**68,8**	**67,8**	**80,0**	**388,0**	**66,7**	**54,3**	**486,2**	**83,6**	**72,2**	**98,2**
	8,0	237,8	40,9	45,2	292,5	50,3	64,3	54,7	328,0	56,4	39,5	408,3	70,2	70,4	80,3	397,7	68,4	57,0	496,3	85,4	75,1	98,5
	9,0	243,7	41,9	47,3	298,5	51,3	66,8	54,9	336,1	57,8	41,4	416,6	71,7	73,2	80,5	407,5	70,1	59,6	506,4	87,1	78,0	98,9
	10,0	249,5	42,9	49,5	304,5	52,4	69,4	55,1	344,1	59,2	43,3	424,9	73,1	76,0	80,8	417,2	71,8	62,4	516,4	88,8	81,0	99,2
	11,0	255,3	43,9	51,8	310,6	53,4	72,1	55,2	352,2	60,6	45,2	433,3	74,5	78,8	81,1	427,0	73,4	65,2	526,5	90,6	84,0	99,5
	12,0	261,1	44,9	54,0	316,6	54,5	74,8	55,4	360,2	62,0	47,2	441,6	75,9	81,7	81,4	436,7	75,1	68,0	536,6	92,3	87,1	99,9
	13,0	267,0	45,9	56,4	322,6	55,5	77,5	55,6	368,2	63,3	49,2	449,9	77,4	84,6	81,6	446,5	76,8	70,9	546,7	94,0	90,2	100,2
	14,0	272,8	46,9	58,8	328,6	56,5	80,3	55,8	376,3	64,7	51,3	458,2	78,8	87,6	81,9	456,2	78,5	73,9	556,8	95,8	93,4	100,6
	15,0	278,6	47,9	61,2	334,6	57,6	83,1	56,0	384,3	66,1	53,4	466,5	80,2	90,6	82,2	466,0	80,1	76,9	566,9	97,5	96,7	100,9
37,0	5,0	217,5	37,4	38,1	273,7	47,1	56,6	56,2	300,0	51,6	33,4	382,5	65,8	62,3	82,5	363,8	62,6	48,1	465,1	80,0	66,3	101,3
	6,0	223,4	38,4	40,1	279,8	48,1	59,0	56,4	308,2	53,0	35,1	390,9	67,2	64,9	82,7	373,7	64,3	50,6	475,3	81,7	69,1	101,6
	7,0	229,4	39,4	42,2	285,9	49,2	61,5	56,5	316,3	54,4	36,9	399,4	68,7	67,5	83,0	383,6	66,0	53,2	485,5	83,5	72,0	101,9
	8,0	235,3	40,5	44,3	292,0	50,2	64,0	56,7	324,5	55,8	38,7	407,8	70,1	70,3	83,3	393,5	67,7	55,8	495,7	85,3	74,9	102,2
	9,0	241,2	41,5	46,4	298,1	51,3	66,6	56,9	332,7	57,2	40,6	416,2	71,6	73,0	83,5	403,4	69,4	58,5	505,9	87,0	77,8	102,5
	10,0	247,1	42,5	48,6	304,2	52,3	69,2	57,1	340,8	58,6	42,5	424,6	73,0	75,8	83,8	413,2	71,1	61,2	516,1	88,8	80,9	102,8
	11,0	253,0	43,5	50,9	310,2	53,4	71,9	57,2	349,0	60,0	44,4	433,0	74,5	78,7	84,0	423,1	72,8	64,1	526,3	90,5	83,9	103,1
	12,0	258,9	44,5	53,2	316,3	54,4	74,6	57,4	357,1	61,4	46,4	441,4	75,9	81,6	84,3	433,0	74,5	66,9	536,5	92,3	87,0	103,4
	13,0	264,8	45,6	55,5	322,4	55,5	77,4	57,6	365,3	62,8	48,5	449,8	77,4	84,6	84,5	442,9	76,2	69,9	546,7	94,0	90,2	103,7
	14,0	270,8	46,6	57,9	328,5	56,5	80,2	57,7	373,4	64,2	50,5	458,2	78,8	87,6	84,8	452,8	77,9	72,8	556,8	95,8	93,4	104,0
	15,0	276,7	47,6	60,4	334,6	57,5	83,1	57,9	381,6	65,6	52,7	466,6	80,3	90,7	85,0	462,7	79,6	75,9	567,0	97,5	96,7	104,4
40,0	5,0	213,3	36,7	36,7	272,6	46,9	56,2	59,3	294,2	50,6	32,1	381,3	65,6	61,9	87,1	356,7	61,4	46,3	463,6	79,7	65,9	106,9
	6,0	219,3	37,7	38,7	278,8	48,0	58,6	59,5	302,5	52,0	33,9	389,8	67,0	64,5	87,3	366,8	63,1	48,9	474,0	81,5	68,8	107,1
	7,0	225,4	38,8	40,8	285,0	49,0	61,1	59,6	310,9	53,5	35,7	398,4	68,5	67,2	87,5	376,9	64,8	51,4	484,3	83,3	71,7	107,4
	8,0	231,4	39,8	42,9	291,2	50,1	63,7	59,8	319,2	54,9	37,5	406,9	70,0	70,0	87,7	387,0	66,6	54,1	494,7	85,1	74,6	107,7
	9,0	237,5	40,8	45,1	297,4	51,1	66,3	59,9	327,5	56,3	39,4	415,5	71,5	72,8	87,9	397,1	68,3	56,8	505,1	86,9	77,6	107,9
	10,0	243,5	41,9	47,3	303,6	52,2	69,0	60,1	335,9	57,8	41,3	424,0	72,9	75,7	88,2	407,3	70,0	59,6	515,5	88,7	80,7	108,2
	11,0	249,6	42,9	49,6	309,8	53,3	71,7	60,2	344,2	59,2	43,3	432,6	74,4	78,6	88,4	417,4	71,8	62,4	525,8	90,4	83,8	108,5
	12,0	255,6	44,0	51,9	315,9	54,3	74,5	60,3	352,6	60,6	45,3	441,1	75,9	81,5	88,6	427,5	73,5	65,3	536,2	92,2	87,0	108,7
	13,0	261,6	45,0	54,2	322,1	55,4	77,3	60,5	360,9	62,1	47,4	449,7	77,3	84,6	88,8	437,6	75,3	68,3	546,6	94,0	90,2	109,0
	14,0	267,7	46,0	56,7	328,3	56,5	80,2	60,6	369,2	63,5	49,5	458,2	78,8	87,6	89,0	447,7	77,0	71,3	556,9	95,8	93,5	109,3
	15,0	273,7	47,1	59,1	334,5	57,5	83,1	60,8	377,6	64,9	51,6	466,8	80,3	90,8	89,2	457,8	78,7	74,4	567,3	97,6	96,8	109,5
45,0	5,0	206,2	35,5	34,4	270,8	46,6	55,4	64,5	284,5	48,9	30,2	379,2	65,2	61,2	94,7	344,9	59,3	43,5	461,2	79,3	65,3	116,2
	6,0	212,5	36,6	36,4	277,1	47,7	58,0	64,6	293,1	50,4	31,9	388,0	66,7	63,9	94,8	355,4	61,1	46,0	471,8	81,2	68,2	116,4
	7,0	218,8	37,6	38,5	283,5	48,8	60,5	64,7	301,7	51,9	33,7	396,8	68,2	66,7	95,0	365,9	62,9	48,6	482,5	83,0	71,1	116,6
	8,0	225,0	38,7	40,7	289,9	49,9	63,2	64,8	310,4	53,4	35,6	405,5	69,8	69,5	95,2	376,3	64,7	51,3	493,1	84,8	74,2	116,8
	9,0	231,3	39,8	42,8	296,2	51,0	65,8	64,9	319,0	54,9	37,5	414,3	71,3	72,4	95,3	386,8	66,5	54,0	503,8	86,7	77,2	117,0
	10,0	237,5	40,9	45,1	302,6	52,0	68,6	65,0	327,6	56,4	39,4	423,1	72,8	75,4	95,5	397,3	68,3	56,8	514,5	88,5	80,4	117,2
	11,0	243,8	41,9	47,4	309,0	53,1	71,4	65,2	336,3	57,8	41,4	431,9	74,3	78,3	95,6	407,7	70,1	59,7	525,1	90,3	83,6	117,4
	12,0	250,1	43,0	49,7	315,3	54,2	74,2	65,3	344,9	59,3	43,5	440,7	75,8	81,4	95,8	418,2	71,9	62,7	535,8	92,2	86,8	117,6
	13,0	256,3	44,1	52,2	321,7	55,3	77,1	65,4	353,5	60,8	45,6	449,5	77,3	84,5	95,9	428,7	73,7	65,7	546,5	94,0	90,1	117,8
	14,0	262,6	45,2	54,6	328,1	56,4	80,0	65,5	362,2	62,3	47,7	458,3	78,8	87,7	96,1	439,1	75,5	68,7	557,1	95,8	93,5	118,0
	15,0	268,8	46,2	57,1	334,4	57,5	83,0	65,6	370,8	63,8	49,9	467,1	80,3	90,9	96,3	449,6	77,3	71,9	567,8	97,7	97,0	118,2

Where,
CDOT: Condenser Water Outlet Temperature (°C)
CLOT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
HCAP: Condenser Heat Rejection (Kw)
HFR: Condenser Water Flow Rate at 5°C (m^3/h)
HPD: Condenser Water Pressure Drop (kPa)
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 (R407C) (cont.)

		RCUE 150 WG2							RCUE 180 WG2						
CDOT	CLOT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT
22,0	5,0	457,8	78,7	74,4	535,7	92,1	86,8	77,9	540,1	92,9	31,0	632,2	108,7	29,8	92,1
	6,0	467,9	80,5	77,5	546,4	94,0	90,1	78,5	552,0	94,9	32,3	644,7	110,9	30,9	92,7
	7,0	478,0	82,2	80,7	557,0	95,8	93,5	79,0	563,9	97,0	33,7	657,3	113,1	32,1	93,4
	8,0	488,1	84,0	84,0	567,7	97,6	96,9	79,6	575,8	99,0	35,1	669,9	115,2	33,2	94,0
	9,0	498,2	85,7	87,3	578,3	99,5	100,4	80,1	587,8	101,1	36,5	682,5	117,4	34,4	94,7
	10,0	508,3	87,4	90,7	589,0	101,3	104,0	80,7	599,7	103,1	37,9	695,0	119,5	35,6	95,4
	11,0	518,4	89,2	94,2	599,7	103,1	107,6	81,3	611,6	105,2	39,3	707,6	121,7	36,9	96,0
	12,0	528,5	90,9	97,7	610,3	105,0	111,2	81,8	623,5	107,2	40,8	720,2	123,9	38,1	96,7
	13,0	538,6	92,6	101,2	621,0	106,8	114,9	82,4	635,4	109,3	42,3	732,8	126,0	39,4	97,3
	14,0	548,7	94,4	104,9	631,6	108,6	118,7	82,9	647,3	111,3	43,8	745,4	128,2	40,7	98,0
	15,0	558,8	96,1	108,6	642,3	110,5	122,6	83,5	659,3	113,4	45,4	757,9	130,4	42,0	98,7
25,0	5,0	449,7	77,3	71,9	533,6	91,8	86,1	83,9	530,5	91,2	30,0	629,6	108,3	29,6	99,1
	6,0	460,0	79,1	75,1	544,4	93,6	89,5	84,4	542,7	93,3	31,3	642,5	110,5	30,7	99,7
	7,0	470,4	80,9	78,3	555,3	95,5	92,9	84,9	554,9	95,5	32,7	655,3	112,7	31,9	100,3
	8,0	480,7	82,7	81,6	566,1	97,4	96,4	85,4	567,2	97,6	34,0	668,1	114,9	33,1	100,9
	9,0	491,1	84,5	85,0	577,0	99,2	100,0	85,9	579,4	99,7	35,5	680,9	117,1	34,3	101,5
	10,0	501,4	86,2	88,4	587,9	101,1	103,6	86,4	591,6	101,8	36,9	693,7	119,3	35,5	102,2
	11,0	511,8	88,0	91,9	598,7	103,0	107,2	86,9	603,8	103,9	38,4	706,5	121,5	36,8	102,8
	12,0	522,1	89,8	95,5	609,6	104,8	111,0	87,5	616,0	106,0	39,9	719,4	123,7	38,1	103,4
	13,0	532,5	91,6	99,1	620,5	106,7	114,8	88,0	628,2	108,1	41,4	732,2	125,9	39,3	104,0
	14,0	542,8	93,4	102,8	631,3	108,6	118,6	88,5	640,4	110,2	43,0	745,0	128,1	40,7	104,6
	15,0	553,2	95,1	106,5	642,2	110,5	122,5	89,0	652,6	112,3	44,5	757,8	130,3	42,0	105,2
30,0	5,0	436,2	75,0	67,9	530,0	91,2	85,1	93,8	514,6	88,5	28,3	625,5	107,6	29,2	110,9
	6,0	446,9	76,9	71,1	541,2	93,1	88,5	94,3	527,3	90,7	29,6	638,7	109,9	30,4	111,4
	7,0	457,7	78,7	74,3	552,4	95,0	92,0	94,7	540,0	92,9	31,0	651,9	112,1	31,6	111,9
	8,0	468,5	80,6	77,7	563,6	96,9	95,6	95,1	552,7	95,1	32,4	665,1	114,4	32,8	112,4
	9,0	479,2	82,4	81,1	574,8	98,9	99,2	95,6	565,4	97,2	33,8	678,3	116,7	34,0	112,9
	10,0	490,0	84,3	84,6	586,0	100,8	102,9	96,0	578,1	99,4	35,3	691,5	118,9	35,3	113,5
	11,0	500,7	86,1	88,2	597,2	102,7	106,7	96,4	590,8	101,6	36,8	704,7	121,2	36,6	114,0
	12,0	511,5	88,0	91,8	608,4	104,6	110,6	96,9	603,5	103,8	38,3	718,0	123,5	37,9	114,5
	13,0	522,3	89,8	95,5	619,6	106,6	114,5	97,3	616,2	106,0	39,9	731,2	125,8	39,2	115,0
	14,0	533,0	91,7	99,3	630,8	108,5	118,4	97,7	628,9	108,2	41,5	744,4	128,0	40,6	115,5
	15,0	543,8	93,5	103,1	642,0	110,4	122,5	98,2	641,6	110,3	43,1	757,6	130,3	42,0	116,0
35,0	5,0	422,6	72,7	63,9	526,4	90,5	84,0	103,8	498,6	85,8	26,6	621,3	106,9	28,8	122,7
	6,0	433,8	74,6	67,2	538,0	92,5	87,5	104,1	511,8	88,0	28,0	634,9	109,2	30,0	123,1
	7,0	**445,0**	**76,5**	**70,5**	**549,5**	**94,5**	**91,1**	**104,5**	**525,0**	**90,3**	**29,4**	**648,5**	**111,5**	**31,3**	**123,5**
	8,0	456,2	78,5	73,9	561,0	96,5	94,8	104,9	538,2	92,6	30,8	662,1	113,9	32,5	123,9
	9,0	467,4	80,4	77,4	572,6	98,5	98,5	105,2	551,4	94,8	32,3	675,7	116,2	33,8	124,3
	10,0	478,5	82,3	80,9	584,1	100,5	102,3	105,6	564,6	97,1	33,8	689,3	118,6	35,1	124,8
	11,0	489,7	84,2	84,5	595,6	102,5	106,2	105,9	577,7	99,4	35,3	702,9	120,9	36,4	125,2
	12,0	500,9	86,2	88,2	607,2	104,4	110,1	106,3	590,9	101,6	36,8	716,6	123,2	37,8	125,6
	13,0	512,1	88,1	92,0	618,7	106,4	114,2	106,7	604,1	103,9	38,4	730,2	125,6	39,1	126,0
	14,0	523,2	90,0	95,8	630,3	108,4	118,2	107,0	617,3	106,2	40,0	743,8	127,9	40,5	126,5
	15,0	534,4	91,9	99,8	641,8	110,4	122,4	107,4	630,5	108,4	41,7	757,4	130,3	42,0	126,9
37,0	5,0	417,2	71,8	62,4	525,0	90,3	83,5	107,8	492,2	84,7	26,0	619,6	106,6	28,7	127,4
	6,0	428,6	73,7	65,6	536,7	92,3	87,1	108,1	505,6	87,0	27,3	633,4	108,9	29,9	127,7
	7,0	439,9	75,7	69,0	548,3	94,3	90,7	108,4	519,0	89,3	28,7	647,1	111,3	31,1	128,1
	8,0	451,3	77,6	72,4	560,0	96,3	94,4	108,7	532,4	91,6	30,2	660,9	113,7	32,4	128,5
	9,0	462,6	79,6	75,9	571,7	98,3	98,2	109,1	545,8	93,9	31,6	674,7	116,0	33,7	128,9
	10,0	474,0	81,5	79,4	583,4	100,3	102,1	109,4	559,2	96,2	33,1	688,5	118,4	35,0	129,3
	11,0	485,3	83,5	83,1	595,0	102,3	106,0	109,7	572,5	98,5	34,7	702,2	120,8	36,3	129,7
	12,0	496,6	85,4	86,8	606,7	104,4	110,0	110,1	585,9	100,8	36,2	716,0	123,2	37,7	130,1
	13,0	508,0	87,4	90,6	618,4	106,4	114,0	110,4	599,3	103,1	37,8	729,8	125,5	39,1	130,5
	14,0	519,3	89,3	94,5	630,0	108,4	118,2	110,7	612,7	105,4	39,5	743,5	127,9	40,5	130,8
	15,0	530,7	91,3	98,4	641,7	110,4	122,4	111,0	626,1	107,7	41,1	757,3	130,3	41,9	131,2
40,0	5,0	409,1	70,4	60,1	522,9	89,9	82,9	113,7	458,3	78,8	22,6	592,7	101,9	26,4	134,4
	6,0	420,7	72,4	63,4	534,7	92,0	86,5	114,0	474,9	81,7	24,3	609,7	104,9	27,8	134,7
	7,0	432,3	74,4	66,7	546,6	94,0	90,2	114,3	491,6	84,6	25,9	626,7	107,8	29,3	135,1
	8,0	443,9	76,4	70,2	558,5	96,1	94,0	114,6	508,2	87,4	27,6	643,7	110,7	30,8	135,4
	9,0	455,5	78,3	73,7	570,4	98,1	97,8	114,9	524,9	90,3	29,4	660,7	113,6	32,4	135,7
	10,0	467,1	80,3	77,3	582,2	100,1	101,7	115,1	541,6	93,1	31,2	677,6	116,6	34,0	136,1
	11,0	478,7	82,3	80,9	594,1	102,2	105,7	115,4	558,2	96,0	33,0	694,6	119,5	35,6	136,4
	12,0	490,3	84,3	84,7	606,0	104,2	109,7	115,7	574,9	98,9	34,9	711,6	122,4	37,3	136,7
	13,0	501,9	86,3	88,5	617,9	106,3	113,8	116,0	591,5	101,7	36,9	728,6	125,3	39,0	137,1
	14,0	513,5	88,3	92,5	629,7	108,3	118,0	116,3	608,2	104,6	38,9	745,6	128,2	40,7	137,4
	15,0	525,0	90,3	96,5	641,6	110,4	122,3	116,6	624,8	107,5	41,0	762,6	131,2	42,5	137,7
45,0	5,0	395,6	68,0	56,4	519,3	89,3	81,8	123,7	466,7	80,3	23,5	612,9	105,4	28,1	146,2
	6,0	407,6	70,1	59,7	531,5	91,4	85,5	123,9	480,9	82,7	24,8	627,3	107,9	29,3	146,4
	7,0	419,6	72,2	63,1	543,7	93,5	89,3	124,1	495,1	85,1	26,3	641,7	110,4	30,6	146,7
	8,0	431,6	74,2	66,5	555,9	95,6	93,1	124,3	509,2	87,6	27,7	656,1	112,9	32,0	146,9
	9,0	443,6	76,3	70,1	568,1	97,7	97,1	124,5	523,4	90,0	29,2	670,5	115,3	33,3	147,1
	10,0	455,6	78,4	73,7	580,4	99,8	101,1	124,7	537,5	92,5	30,7	684,9	117,8	34,7	147,4
	11,0	467,6	80,4	77,4	592,6	101,9	105,2	124,9	551,7	94,9	32,3	699,3	120,3	36,1	147,6
	12,0	479,6	82,5	81,3	604,8	104,0	109,3	125,1	565,9	97,3	33,9	713,8	122,8	37,5	147,9
	13,0	491,7	84,6	85,2	617,0	106,1	113,5	125,3	580,0	99,8	35,5	728,2	125,2	38,9	148,1
	14,0	503,7	86,6	89,1	629,2	108,2	117,9	125,5	594,2	102,2	37,2	742,6	127,7	40,4	148,4
	15,0	515,7	88,7	93,2	641,4	110,3	122,2	125,7	608,4	104,6	38,9	757,0	130,2	41,9	148,6

Where,
CDOT: Condenser Water Outlet Temperature (°C)
CLOT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
HCAP: Condenser Heat Rejection (Kw)
HFR: Condenser Water Flow Rate at 5°C (m^3/h)
HPD: Condenser Water Pressure Drop (kPa)
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.)

		RCUE 200 WG2							RCUE 240 WG2						
CDOT	CLOT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT	CCAP	CFR	CPD	HCAP	HFR	HPD	IPT
22,0	5,0	617,2	106,2	40,0	728,0	125,2	38,9	110,7	716,0	123,2	45,5	837,9	144,1	58,8	121,9
	6,0	630,9	108,5	41,7	742,4	127,7	40,4	111,5	731,8	125,9	47,4	854,6	147,0	61,1	122,8
	7,0	644,5	110,9	43,5	756,8	130,2	41,9	112,3	747,6	128,6	49,4	871,2	149,9	63,4	123,6
	8,0	658,1	113,2	45,2	771,2	132,6	43,4	113,1	763,4	131,3	51,4	887,9	152,7	65,7	124,5
	9,0	671,7	115,5	47,1	785,6	135,1	45,0	113,9	779,2	134,0	53,5	904,6	155,6	68,1	125,4
	10,0	685,3	117,9	48,9	800,0	137,6	46,6	114,7	795,0	136,7	55,6	921,3	158,5	70,5	126,3
	11,0	699,0	120,2	50,8	814,4	140,1	48,2	115,5	810,8	139,5	57,7	937,9	161,3	73,0	127,1
	12,0	712,6	122,6	52,7	828,8	142,6	49,8	116,3	826,6	142,2	59,9	954,6	164,2	75,5	128,0
	13,0	726,2	124,9	54,6	843,3	145,0	51,4	117,1	842,4	144,9	62,1	971,3	167,1	78,0	128,9
	14,0	739,8	127,3	56,6	857,7	147,5	53,1	117,8	858,2	147,6	64,3	987,9	169,9	80,6	129,7
	15,0	753,4	129,6	58,6	872,1	150,0	54,8	118,6	874,0	150,3	66,6	1004,6	172,8	83,2	130,6
25,0	5,0	606,3	104,3	38,7	725,5	124,8	38,7	119,2	703,3	121,0	44,0	834,6	143,5	58,4	131,2
	6,0	620,3	106,7	40,4	740,2	127,3	40,2	119,9	719,5	123,8	45,9	851,5	146,5	60,7	132,0
	7,0	634,2	109,1	42,2	754,9	129,8	41,7	120,6	735,7	126,5	47,9	868,5	149,4	63,0	132,8
	8,0	648,2	111,5	44,0	769,6	132,4	43,2	121,4	751,9	129,3	50,0	885,5	152,3	65,4	133,6
	9,0	662,1	113,9	45,8	784,2	134,9	44,8	122,1	768,1	132,1	52,0	902,5	155,2	67,8	134,4
	10,0	676,1	116,3	47,6	798,9	137,4	46,4	122,8	784,3	134,9	54,2	919,5	158,2	70,3	135,2
	11,0	690,0	118,7	49,5	813,6	139,9	48,1	123,6	800,4	137,7	56,3	936,5	161,1	72,8	136,0
	12,0	704,0	121,1	51,5	828,3	142,5	49,7	124,3	816,6	140,5	58,5	953,5	164,0	75,3	136,8
	13,0	718,0	123,5	53,4	843,0	145,0	51,4	125,0	832,8	143,2	60,8	970,5	166,9	77,9	137,6
	14,0	731,9	125,9	55,4	857,6	147,5	53,1	125,7	849,0	146,0	63,0	987,5	169,8	80,5	138,4
	15,0	745,9	128,3	57,5	872,3	150,0	54,9	126,5	865,2	148,8	65,3	1004,4	172,8	83,2	139,2
30,0	5,0	588,1	101,2	36,5	721,4	124,1	38,3	133,3	682,2	117,3	41,5	829,0	142,6	57,6	146,8
	6,0	602,6	103,6	38,2	736,6	126,7	39,8	134,0	699,0	120,2	43,5	846,5	145,6	60,0	147,5
	7,0	617,1	106,1	40,0	751,7	129,3	41,4	134,6	715,8	123,1	45,5	864,0	148,6	62,4	148,2
	8,0	631,6	108,6	41,8	766,8	131,9	43,0	135,2	732,7	126,0	47,6	881,5	151,6	64,8	148,8
	9,0	646,1	111,1	43,7	781,9	134,5	44,6	135,8	749,5	128,9	49,7	899,0	154,6	67,3	149,5
	10,0	660,6	113,6	45,6	797,1	137,1	46,2	136,4	766,4	131,8	51,8	916,6	157,6	69,8	150,2
	11,0	675,2	116,1	47,5	812,2	139,7	47,9	137,0	783,2	134,7	54,0	934,1	160,7	72,4	150,9
	12,0	689,7	118,6	49,5	827,3	142,3	49,6	137,7	800,0	137,6	56,3	951,6	163,7	75,0	151,6
	13,0	704,2	121,1	51,5	842,5	144,9	51,3	138,3	816,9	140,5	58,5	969,1	166,7	77,7	152,3
	14,0	718,7	123,6	53,6	857,6	147,5	53,1	138,9	833,7	143,4	60,9	986,6	169,7	80,4	152,9
	15,0	733,2	126,1	55,6	872,7	150,1	54,9	139,5	850,5	146,3	63,2	1004,1	172,7	83,2	153,6
35,0	5,0	569,9	98,0	34,4	717,3	123,4	37,8	147,5	661,0	113,7	39,1	823,4	141,6	56,9	162,4
	6,0	584,9	100,6	36,1	732,9	126,1	39,4	148,0	678,5	116,7	41,1	841,5	144,7	59,3	162,9
	7,0	**600,0**	**103,2**	**37,9**	**748,5**	**128,7**	**41,0**	**148,5**	**696,0**	**119,7**	**43,1**	**859,5**	**147,8**	**61,8**	**163,5**
	8,0	615,1	105,8	39,8	764,1	131,4	42,7	149,0	713,5	122,7	45,2	877,5	150,9	64,3	164,1
	9,0	630,1	108,4	41,6	779,7	134,1	44,3	149,5	731,0	125,7	47,3	895,6	154,0	66,8	164,6
	10,0	645,2	111,0	43,6	795,2	136,8	46,0	150,0	748,4	128,7	49,5	913,6	157,1	69,4	165,2
	11,0	660,3	113,6	45,5	810,8	139,5	47,7	150,5	765,9	131,7	51,8	931,7	160,2	72,1	165,7
	12,0	675,4	116,2	47,5	826,4	142,1	49,5	151,0	783,4	134,7	54,0	949,7	163,4	74,8	166,3
	13,0	690,4	118,8	49,6	842,0	144,8	51,3	151,6	800,9	137,8	56,4	967,8	166,5	77,5	166,9
	14,0	705,5	121,3	51,7	857,6	147,5	53,1	152,1	818,4	140,8	58,8	985,8	169,6	80,3	167,4
	15,0	720,6	123,9	53,8	873,1	150,2	55,0	152,6	835,9	143,8	61,2	1003,9	172,7	83,1	168,0
37,0	5,0	562,6	96,8	33,5	715,7	123,1	37,7	153,1	652,6	112,2	38,1	821,2	141,2	56,6	168,6
	6,0	577,9	99,4	35,3	731,5	125,8	39,3	153,6	670,3	115,3	40,1	839,4	144,4	59,0	169,1
	7,0	593,2	102,0	37,1	747,2	128,5	40,9	154,1	688,1	118,3	42,2	857,7	147,5	61,5	169,6
	8,0	608,5	104,7	38,9	763,0	131,2	42,5	154,5	705,8	121,4	44,3	875,9	150,7	64,0	170,1
	9,0	623,7	107,3	40,8	778,7	133,9	44,2	155,0	723,5	124,4	46,4	894,2	153,8	66,6	170,7
	10,0	639,0	109,9	42,8	794,5	136,7	45,9	155,5	741,3	127,5	48,6	912,5	156,9	69,2	171,2
	11,0	654,3	112,5	44,8	810,3	139,4	47,7	155,9	759,0	130,6	50,9	930,7	160,1	71,9	171,7
	12,0	669,6	115,2	46,8	826,0	142,1	49,5	156,4	776,8	133,6	53,2	949,0	163,2	74,6	172,2
	13,0	684,9	117,8	48,8	841,8	144,8	51,3	156,9	794,5	136,7	55,5	967,2	166,4	77,4	172,7
	14,0	700,2	120,4	50,9	857,6	147,5	53,1	157,3	812,3	139,7	57,9	985,5	169,5	80,2	173,2
	15,0	715,5	123,1	53,1	873,3	150,2	55,0	157,8	830,0	142,8	60,4	1003,7	172,6	83,1	173,7
40,0	5,0	551,6	94,9	32,3	713,3	122,7	37,4	161,6	639,9	110,1	36,7	817,8	140,7	56,2	177,9
	6,0	567,3	97,6	34,1	729,3	125,4	39,1	162,0	658,0	113,2	38,7	836,4	143,9	58,6	178,4
	7,0	582,9	100,3	35,9	745,3	128,2	40,7	162,4	676,2	116,3	40,8	855,0	147,1	61,1	178,8
	8,0	598,5	102,9	37,7	761,3	131,0	42,4	162,8	694,3	119,4	42,9	873,6	150,3	63,7	179,3
	9,0	614,1	105,6	39,6	777,4	133,7	44,1	163,2	712,4	122,5	45,1	892,1	153,4	66,3	179,7
	10,0	629,8	108,3	41,6	793,4	136,5	45,8	163,6	730,5	125,7	47,3	910,7	156,6	69,0	180,2
	11,0	645,4	111,0	43,6	809,4	139,2	47,6	164,0	748,7	128,8	49,6	929,3	159,8	71,7	180,6
	12,0	661,0	113,7	45,6	825,5	142,0	49,4	164,4	766,8	131,9	51,9	947,8	163,0	74,5	181,0
	13,0	676,7	116,4	47,7	841,5	144,7	51,2	164,8	784,9	135,0	54,2	966,4	166,2	77,3	181,5
	14,0	692,3	119,1	49,9	857,5	147,5	53,1	165,2	803,1	138,1	56,7	985,0	169,4	80,2	181,9
	15,0	707,9	121,8	52,0	873,6	150,3	55,0	165,6	821,2	141,2	59,1	1003,6	172,6	83,1	182,4
45,0	5,0	533,4	91,7	30,3	709,2	122,0	37,0	175,8	618,7	106,4	34,4	812,3	139,7	55,4	193,5
	6,0	549,6	94,5	32,1	725,7	124,8	38,7	176,1	637,5	109,7	36,4	831,4	143,0	58,0	193,8
	7,0	565,8	97,3	33,9	742,1	127,6	40,4	176,4	656,3	112,9	38,5	850,5	146,3	60,5	194,2
	8,0	582,0	100,1	35,8	758,6	130,5	42,1	176,6	675,1	116,1	40,7	869,6	149,6	63,2	194,5
	9,0	598,2	102,9	37,7	775,1	133,3	43,8	176,9	693,9	119,3	42,8	888,7	152,9	65,8	194,8
	10,0	614,3	105,7	39,7	791,6	136,1	45,6	177,2	712,6	122,6	45,1	907,8	156,1	68,6	195,1
	11,0	630,5	108,5	41,7	808,0	139,0	47,4	177,5	731,4	125,8	47,4	926,9	159,4	71,4	195,5
	12,0	646,7	111,2	43,8	824,5	141,8	49,3	177,8	750,2	129,0	49,7	946,0	162,7	74,2	195,8
	13,0	662,9	114,0	45,9	841,0	144,7	51,2	178,1	769,0	132,3	52,2	965,1	166,0	77,1	196,1
	14,0	679,1	116,8	48,0	857,5	147,5	53,1	178,4	787,7	135,5	54,6	984,2	169,3	80,0	196,4
	15,0	695,3	119,6	50,3	874,0	150,3	55,0	178,7	806,5	138,7	57,1	1003,3	172,6	83,0	196,7

Where,
CDOT: Condenser Water Outlet Temperature (°C)
CLOT: Chilled Water Outlet Temperature (°C)
CCAP: Cooling Capacity (kW)
HCAP: Condenser Heat Rejection (Kw)
HFR: Condenser Water Flow Rate at 5°C (m^3/h)
HPD: Condenser Water Pressure Drop (kPa)
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 (Heating Operation, Only for Heat Pump Operation Option)

		RCUE40WG2							RCUE50WG2							RCUE60WG2						
CLOT	HOT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT
5,0	25,0	162,3	27,9	35,0	135,4	23,3	31,4	26,9	193,8	33,3	35,2	161,7	27,8	37,4	32,1	235,5	40,5	36,8	196,0	33,7	36,5	39,4
	30,0	161,4	27,8	34,6	131,3	22,6	29,7	30,1	192,7	33,2	34,8	156,8	27,0	35,3	35,9	234,2	40,3	36,4	190,1	32,7	34,4	44,1
	35,0	160,5	27,6	34,2	127,3	21,9	27,9	33,3	191,7	33,0	34,5	152,0	26,1	33,3	39,7	233,0	40,1	36,0	184,3	31,7	32,4	48,8
	40,0	157,2	27,0	32,9	120,7	20,8	25,3	36,5	187,7	32,3	33,1	144,2	24,8	30,1	43,5	228,2	39,3	34,6	174,8	30,1	29,3	53,4
	45,0	154,0	26,5	31,7	114,4	19,7	22,8	39,7	183,9	31,6	31,9	136,6	23,5	27,1	47,3	223,7	38,5	33,3	165,6	28,5	26,4	58,1
	50,0	151,0	26,0	30,5	108,2	18,6	20,5	42,8	180,3	31,0	30,7	129,1	22,2	24,4	51,2	219,4	37,7	32,1	156,6	26,9	23,7	62,8
	55,0	148,1	25,5	29,5	102,1	17,6	18,3	46,0	176,9	30,4	29,6	121,9	21,0	21,8	55,0	215,3	37,0	31,0	147,8	25,4	21,3	67,5
7,0	25,0	168,9	29,0	37,6	141,6	24,4	34,3	27,2	201,6	34,7	37,9	169,1	29,1	40,8	32,5	245,0	42,1	39,6	205,1	35,3	39,8	39,9
	30,0	168,2	28,9	37,4	137,8	23,7	32,5	30,4	200,8	34,5	37,6	164,6	28,3	38,7	36,2	244,0	42,0	39,3	199,5	34,3	37,7	44,5
	35,0	167,5	28,8	37,1	134,0	23,0	30,8	33,5	200,0	34,4	37,3	160,0	27,5	36,7	40,0	243,1	41,8	39,1	194,0	33,4	35,8	49,1
	40,0	164,2	28,2	35,7	127,6	21,9	28,1	36,6	196,1	33,7	36,0	152,3	26,2	33,4	43,8	238,4	41,0	37,6	184,7	31,8	32,6	53,7
	45,0	**161,1**	**27,7**	**34,5**	**121,3**	**20,9**	**25,5**	**39,8**	**192,3**	**33,1**	**34,7**	**144,8**	**24,9**	**30,3**	**47,5**	**233,9**	**40,2**	**36,3**	**175,6**	**30,2**	**29,6**	**58,3**
	50,0	158,1	27,2	33,3	115,2	19,8	23,1	42,9	188,8	32,5	33,5	137,5	23,7	27,5	51,3	229,7	39,5	35,1	166,8	28,7	26,8	62,9
	55,0	155,3	26,7	32,2	109,2	18,8	20,8	46,1	185,4	31,9	32,4	130,4	22,4	24,8	55,0	225,6	38,8	33,9	158,1	27,2	24,2	67,5
10,0	25,0	178,7	30,7	41,9	151,0	26,0	38,7	27,7	213,4	36,7	42,2	180,3	31,0	46,1	33,1	259,2	44,6	44,1	218,6	37,6	44,9	40,6
	30,0	178,3	30,7	41,7	147,5	25,4	37,1	30,8	212,9	36,6	42,0	176,2	30,3	44,1	36,7	258,7	44,5	44,0	213,6	36,7	43,0	45,1
	35,0	177,9	30,6	41,5	144,1	24,8	35,4	33,8	212,5	36,5	41,8	172,1	29,6	42,2	40,4	258,2	44,4	43,8	208,6	35,9	41,1	49,6
	40,0	174,8	30,1	40,1	137,8	23,7	32,5	36,9	208,7	35,9	40,4	164,6	28,3	38,7	44,1	253,7	43,6	42,3	199,6	34,3	37,8	54,1
	45,0	171,7	29,5	38,8	131,7	22,7	29,8	40,0	205,0	35,3	39,1	157,3	27,1	35,5	47,7	249,3	42,9	41,0	190,7	32,8	34,6	58,6
	50,0	168,8	29,0	37,6	125,7	21,6	27,3	43,0	201,5	34,7	37,9	150,1	25,8	32,5	51,4	245,1	42,2	39,7	182,0	31,3	31,7	63,1
	55,0	166,0	28,6	36,5	119,9	20,6	24,9	46,1	198,2	34,1	36,7	143,1	24,6	29,7	55,1	241,2	41,5	38,5	173,6	29,9	28,9	67,6
15,0	25,0	195,1	33,6	49,3	166,6	28,7	46,7	28,5	233,0	40,1	49,7	198,9	34,2	55,6	34,1	283,0	48,7	52,1	241,2	41,5	54,2	41,8
	30,0	195,2	33,6	49,4	163,8	28,2	45,2	31,5	233,1	40,1	49,8	195,5	33,6	53,8	37,6	283,2	48,7	52,2	237,1	40,8	52,5	46,1
	35,0	195,3	33,6	49,4	160,9	27,7	43,7	34,4	233,3	40,1	49,9	192,2	33,1	52,1	41,1	283,4	48,8	52,3	233,0	40,1	50,8	50,4
	40,0	192,3	33,1	48,0	154,9	26,6	40,7	37,4	229,6	39,5	48,4	185,0	31,8	48,4	44,6	279,1	48,0	50,7	224,3	38,6	47,2	54,8
	45,0	189,4	32,6	46,7	149,1	25,6	37,8	40,3	226,1	38,9	47,0	178,0	30,6	45,0	48,1	274,9	47,3	49,3	215,8	37,1	43,9	59,1
	50,0	186,6	32,1	45,4	143,3	24,6	35,0	43,3	222,8	38,3	45,7	171,1	29,4	41,7	51,6	270,9	46,6	48,0	207,5	35,7	40,7	63,4
	55,0	183,9	31,6	44,1	137,7	23,7	32,5	46,2	219,5	37,8	44,5	164,4	28,3	38,6	55,2	267,0	45,9	46,7	199,3	34,3	37,7	67,7

		RCUE80WG2							RCUE100WG2							RCUE120WG2						
CLOT	HOT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT
5,0	25,0	278,2	47,8	58,4	234,4	40,3	44,0	43,7	387,6	66,7	63,8	323,4	55,6	38,5	64,2	470,9	81,0	67,9	392,1	67,4	55,4	78,8
	30,0	276,3	47,5	57,6	227,4	39,1	41,5	48,9	385,5	66,3	63,2	313,6	53,9	36,3	71,8	468,5	80,6	67,3	380,3	65,4	52,3	88,2
	35,0	274,5	47,2	56,9	220,3	37,9	39,1	54,1	383,4	65,9	62,5	303,9	52,3	34,2	79,5	466,0	80,2	66,6	368,5	63,4	49,3	97,5
	40,0	268,3	46,2	54,5	209,0	36,0	35,3	59,3	375,4	64,6	60,1	288,3	49,6	30,9	87,1	456,5	78,5	64,0	349,6	60,1	44,6	106,9
	45,0	262,5	45,2	52,3	198,0	34,1	31,8	64,5	367,8	63,3	57,8	273,1	47,0	27,9	94,7	447,4	76,9	61,6	331,1	57,0	40,2	116,2
	50,0	256,9	44,2	50,2	187,3	32,2	28,6	69,7	360,6	62,0	55,7	258,3	44,4	25,1	102,3	438,7	75,5	59,4	313,2	53,9	36,2	125,6
	55,0	251,7	43,3	48,2	176,8	30,4	25,6	74,9	353,8	60,8	53,7	243,8	41,9	22,5	109,9	430,6	74,1	57,3	295,7	50,9	32,4	134,9
7,0	25,0	289,5	49,8	63,0	245,2	42,2	47,9	44,3	403,2	69,4	68,8	338,3	58,2	41,9	65,0	489,9	84,3	73,2	410,1	70,5	60,4	79,8
	30,0	288,0	49,5	62,4	238,6	41,0	45,5	49,4	401,6	69,1	68,3	329,1	56,6	39,8	72,5	488,1	83,9	72,7	399,1	68,6	57,3	89,0
	35,0	286,5	49,3	61,8	232,0	39,9	43,1	54,5	400,0	68,8	67,8	320,0	55,0	37,7	80,0	486,2	83,6	72,2	388,0	66,7	54,3	98,2
	40,0	280,5	48,2	59,3	220,9	38,0	39,2	59,6	392,2	67,5	65,3	304,7	52,4	34,3	87,5	476,8	82,0	69,6	369,4	63,5	49,5	107,4
	45,0	274,7	47,3	57,0	210,0	36,1	35,6	64,7	384,7	66,2	62,9	289,7	49,8	31,2	95,0	467,9	80,5	67,1	351,2	60,4	45,0	116,6
	50,0	269,3	46,3	54,9	199,4	34,3	32,3	69,8	377,6	64,9	60,7	275,1	47,3	28,3	102,5	459,3	79,0	64,8	333,5	57,4	40,8	125,8
	55,0	264,0	45,4	52,8	189,1	32,5	29,2	74,9	370,8	63,8	58,7	260,8	44,9	25,6	110,0	451,3	77,6	62,7	316,2	54,4	36,9	135,0
10,0	25,0	306,5	52,7	70,3	261,4	45,0	54,2	45,1	426,8	73,4	76,6	360,6	62,0	47,3	66,2	518,4	89,2	81,6	437,2	75,2	68,2	81,2
	30,0	305,5	52,5	69,8	255,5	43,9	51,8	50,1	425,8	73,2	76,3	352,3	60,6	45,3	73,5	517,4	89,0	81,3	427,2	73,5	65,2	90,2
	35,0	304,5	52,4	69,4	249,5	42,9	49,5	55,1	424,9	73,1	76,0	344,1	59,2	43,3	80,8	516,4	88,8	81,0	417,2	71,8	62,4	99,2
	40,0	298,7	51,4	66,9	238,6	41,0	45,5	60,1	417,3	71,8	73,4	329,2	56,6	39,8	88,2	507,3	87,3	78,3	399,1	68,6	57,3	108,2
	45,0	293,1	50,4	64,5	228,0	39,2	41,7	65,0	410,0	70,5	71,0	314,5	54,1	36,5	95,5	498,6	85,8	75,7	381,4	65,6	52,6	117,2
	50,0	287,7	49,5	62,3	217,7	37,4	38,2	70,0	403,1	69,3	68,7	300,3	51,6	33,4	102,8	490,2	84,3	73,3	364,1	62,6	48,2	126,2
	55,0	282,6	48,6	60,2	207,6	35,7	34,8	75,0	396,4	68,2	66,6	286,3	49,2	30,5	110,1	482,3	83,0	71,1	347,1	59,7	44,0	135,2
15,0	25,0	334,8	57,6	83,2	288,4	49,6	65,3	46,4	465,9	80,1	90,4	397,8	68,4	57,0	68,1	566,0	97,3	96,4	482,3	83,0	82,1	83,6
	30,0	334,7	57,6	83,2	283,5	48,8	63,2	51,2	466,2	80,2	90,5	391,0	67,3	55,2	75,2	566,4	97,4	96,5	474,1	81,6	79,5	92,3
	35,0	334,6	57,6	83,1	278,6	47,9	61,2	56,0	466,5	80,2	90,6	384,3	66,1	53,4	82,2	566,9	97,5	96,7	466,0	80,1	76,9	100,9
	40,0	329,0	56,6	80,5	268,3	46,1	56,9	60,8	459,2	79,0	88,0	370,0	63,6	49,7	89,2	558,2	96,0	93,9	448,6	77,2	71,6	109,5
	45,0	323,7	55,7	78,0	258,1	44,4	52,8	65,6	452,2	77,8	85,5	356,0	61,2	46,2	96,3	549,8	94,6	91,2	431,6	74,2	66,5	118,2
	50,0	318,5	54,8	75,6	248,1	42,7	49,0	70,4	445,5	76,6	83,1	342,2	58,9	42,8	103,3	541,7	93,2	88,7	414,9	71,4	61,7	126,8
	55,0	313,5	53,9	73,4	238,3	41,0	45,4	75,2	439,1	75,5	80,8	328,7	56,5	39,7	110,3	534,0	91,9	86,3	398,6	68,6	57,2	135,4

Where,
CLOT: Chilled Water Outlet Temperature (°C)
HOT: Hot Water Outlet Temperature (°C)
HCAP: Heating Capacity (kW)
CCAP: Cooling Capacity (kW)

HFR: Condenser Water Flow Rate at 5°C (m3/h)
HPD:Condenser Water Pressure Drop (kPa)
CFR:Chilled Water Flow Rate at 5°C (m3/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 (Heating Operation, Only for Heat Pump Operation Option)

		RCUE150WG2							RCUE180WG2						
CLOT	HOT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT
5,0	25,0	533,6	91,8	86,1	449,7	77,3	71,9	83,9	629,6	108,3	29,6	530,5	91,2	30,0	99,1
	30,0	530,0	91,2	85,1	436,2	75,0	67,9	93,8	625,5	107,6	29,2	514,6	88,5	28,3	110,9
	35,0	526,4	90,5	84,0	422,6	72,7	63,9	103,8	621,3	106,9	28,8	498,6	85,8	26,6	122,7
	40,0	514,7	88,5	80,4	400,9	69,0	57,8	113,7	607,4	104,5	27,6	473,0	81,4	24,1	134,4
	45,0	503,5	86,6	77,1	379,8	65,3	52,2	123,7	594,2	102,2	26,5	448,1	77,1	21,7	146,2
	50,0	492,8	84,8	74,1	359,2	61,8	46,9	133,6	581,7	100,0	25,4	423,7	72,9	19,5	157,9
	55,0	482,7	83,0	71,2	339,1	58,3	42,1	143,6	569,7	98,0	24,4	400,0	68,8	17,5	169,7
7,0	25,0	555,3	95,5	92,9	470,4	80,9	78,3	84,9	655,3	112,7	31,9	554,9	95,5	32,7	100,3
	30,0	552,4	95,0	92,0	457,7	78,7	74,3	94,7	651,9	112,1	31,6	540,0	92,9	31,0	111,9
	35,0	549,5	94,5	91,1	445,0	76,5	70,5	104,5	648,5	111,5	31,3	525,0	90,3	29,4	123,5
	40,0	538,0	92,5	87,5	423,7	72,9	64,2	114,3	634,9	109,2	30,0	499,8	86,0	26,7	135,1
	45,0	526,9	90,6	84,1	402,8	69,3	58,4	124,1	621,9	107,0	28,9	475,3	81,7	24,3	146,7
	50,0	516,4	88,8	81,0	382,5	65,8	52,9	133,9	609,5	104,8	27,8	451,3	77,6	22,0	158,2
	55,0	506,4	87,1	78,0	362,7	62,4	47,8	143,7	597,7	102,8	26,8	427,9	73,6	19,9	169,8
10,0	25,0	587,9	101,1	103,6	501,4	86,2	88,4	86,4	693,7	119,3	35,5	591,6	101,8	36,9	102,2
	30,0	586,0	100,8	102,9	490,0	84,3	84,6	96,0	691,5	118,9	35,3	578,1	99,4	35,3	113,5
	35,0	584,1	100,5	102,3	478,5	82,3	80,9	105,6	689,3	118,6	35,1	564,6	97,1	33,8	124,8
	40,0	572,9	98,5	98,6	457,7	78,7	74,4	115,1	676,1	116,3	33,8	540,0	92,9	31,0	136,1
	45,0	562,1	96,7	95,1	437,4	75,2	68,2	124,7	663,4	114,1	32,6	516,0	88,8	28,4	147,4
	50,0	551,8	94,9	91,8	417,5	71,8	62,5	134,3	651,3	112,0	31,5	492,6	84,7	26,0	158,7
	55,0	542,0	93,2	88,7	398,1	68,5	57,1	143,9	639,7	110,0	30,5	469,7	80,8	23,7	170,0
15,0	25,0	642,2	110,5	122,5	553,2	95,1	106,5	89,0	757,8	130,3	42,0	652,6	112,3	44,5	105,2
	30,0	642,0	110,4	122,5	543,8	93,5	103,1	98,2	757,6	130,3	42,0	641,6	110,3	43,1	116,0
	35,0	641,8	110,4	122,4	534,4	91,9	99,8	107,4	757,4	130,3	42,0	630,5	108,4	41,7	126,9
	40,0	631,1	108,5	118,5	514,5	88,5	92,8	116,6	744,8	128,1	40,6	607,0	104,4	38,8	137,7
	45,0	620,8	106,8	114,9	495,0	85,1	86,3	125,7	732,6	126,0	39,4	584,0	100,5	36,0	148,6
	50,0	610,8	105,1	111,4	475,9	81,9	80,1	134,9	720,9	124,0	38,2	561,5	96,6	33,4	159,5
	55,0	601,3	103,4	108,1	457,2	78,6	74,2	144,1	709,7	122,1	37,1	539,3	92,8	30,9	170,3

		RCUE200WG2							RCUE240WG2						
CLOT	HOT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT	HCAP	HFR	HPD	CCAP	CFR	CPD	IPT
5,0	25,0	725,5	124,8	38,7	606,3	104,3	38,7	119,2	834,6	143,5	58,4	703,3	121,0	44,0	131,2
	30,0	721,4	124,1	38,3	588,1	101,2	36,5	133,3	829,0	142,6	57,6	682,2	117,3	41,5	146,8
	35,0	717,3	123,4	37,8	569,9	98,0	34,4	147,5	823,4	141,6	56,9	661,0	113,7	39,1	162,4
	40,0	702,2	120,8	36,3	540,6	93,0	31,1	161,6	805,0	138,5	54,5	627,1	107,9	35,3	177,9
	45,0	687,8	118,3	34,9	512,1	88,1	28,0	175,8	787,5	135,5	52,3	594,0	102,2	31,8	193,5
	50,0	674,2	116,0	33,6	484,3	83,3	25,2	189,9	770,8	132,6	50,2	561,8	96,6	28,6	209,1
	55,0	661,3	113,7	32,4	457,2	78,6	22,5	204,1	755,0	129,9	48,2	530,3	91,2	25,6	224,7
7,0	25,0	754,9	129,8	41,7	634,2	109,1	42,2	120,6	868,5	149,4	63,0	735,7	126,5	47,9	132,8
	30,0	751,7	129,3	41,4	617,1	106,1	40,0	134,6	864,0	148,6	62,4	715,8	123,1	45,5	148,2
	35,0	748,5	128,7	41,0	600,0	103,2	37,9	148,5	859,5	147,8	61,8	696,0	119,7	43,1	163,5
	40,0	733,7	126,2	39,5	571,2	98,3	34,5	162,4	841,5	144,7	59,3	662,6	114,0	39,2	178,8
	45,0	719,5	123,8	38,1	543,1	93,4	31,3	176,4	824,2	141,8	57,0	630,1	108,4	35,6	194,2
	50,0	706,0	121,4	36,7	515,7	88,7	28,4	190,3	807,8	138,9	54,9	598,3	102,9	32,3	209,5
	55,0	693,2	119,2	35,5	489,0	84,1	25,6	204,2	792,1	136,2	52,8	567,3	97,6	29,2	224,8
10,0	25,0	798,9	137,4	46,4	676,1	116,3	47,6	122,8	919,5	158,2	70,3	784,3	134,9	54,2	135,2
	30,0	797,1	137,1	46,2	660,6	113,6	45,6	136,4	916,6	157,6	69,8	766,4	131,8	51,8	150,2
	35,0	795,2	136,8	46,0	645,2	111,0	43,6	150,0	913,6	157,1	69,4	748,4	128,7	49,5	165,2
	40,0	780,8	134,3	44,5	617,2	106,2	40,0	163,6	896,1	154,1	66,9	715,9	123,1	45,5	180,2
	45,0	767,0	131,9	43,0	589,8	101,4	36,7	177,2	879,3	151,2	64,5	684,1	117,7	41,7	195,1
	50,0	753,8	129,7	41,6	563,0	96,8	33,6	190,8	863,1	148,5	62,3	653,0	112,3	38,2	210,1
	55,0	741,2	127,5	40,3	536,8	92,3	30,6	204,4	847,8	145,8	60,2	622,7	107,1	34,8	225,1
15,0	25,0	872,3	150,0	54,9	745,9	128,3	57,5	126,5	1004,4	172,8	83,2	865,2	148,8	65,3	139,2
	30,0	872,7	150,1	54,9	733,2	126,1	55,6	139,5	1004,1	172,7	83,2	850,5	146,3	63,2	153,6
	35,0	873,1	150,2	55,0	720,6	123,9	53,8	152,6	1003,9	172,7	83,1	835,9	143,8	61,2	168,0
	40,0	859,4	147,8	53,3	693,8	119,3	50,1	165,6	987,1	169,8	80,5	804,8	138,4	56,9	182,4
	45,0	846,2	145,5	51,8	667,5	114,8	46,5	178,7	971,0	167,0	78,0	774,3	133,2	52,8	196,7
	50,0	833,4	143,3	50,3	641,7	110,4	43,1	191,7	955,5	164,3	75,6	744,3	128,0	49,0	211,1
	55,0	682,5	117,4	34,4	477,7	82,2	24,5	204,8	779,7	134,1	51,3	554,2	95,3	27,9	225,5

Where,
CLOT: Chilled Water Outlet Temperature (°C)
HOT: Hot Water Outlet Temperature (°C
HCAP: Heating Capacity (kW)
CCAP: Cooling Capacity (kW)

HFR: Condenser Water Flow Rate at 5°C (m3/h)
HPD:Condenser Water Pressure Drop (kPa)
CFR:Chilled Water Flow Rate at 5°C (m3/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. ELECTRICAL DATA

Model	Unit Main Power		Applicable Instantaneous Voltage (V)		Commpressor Motor			Maximum Unit Current (A)	STC*2 Unit Maximum (A)
					STC*1 (A)	RNC (A)	IPT (kW)		
	(V)	(Hz)	Maximum	Minimum					
RCUE 40WG2	400	50	440	360	121	54,9	33,5	69	121
RCUE 50WG2	400	50	440	360	155	65,6	40,0	82	155
RCUE 60WG2	400	50	440	360	188	80,5	49,1	101	188
RCUE 80WG2	400	50	440	360	188	89,4	54,5	112	188
RCUE100WG2	400	50	440	360	155	131,2	80,0	164	172
RCUE120WG2	400	50	440	360	188	161,1	98,2	201	209
RCUE150WG2	400	50	440	360	188	171,4	104,5	214	209
RCUE180WG2	400	50	440	360	155	202,6	123,5	253	190
RCUE200WG2	400	50	440	360	188	243,6	148,5	304	230
RCUE240WG2	400	50	440	360	188	268,2	163,5	335	230

NOTES:

1. *This data is based on the following conditions*
   Chilled Water Inlet/Outlet Temperature: 12/7°C,
   AmbientTemperature: 35°C.
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*

VOL: Rated Unit Supply Voltage(V)

STC: Starting Current(A)

Hz: Frequency(Hz)

RNC: Running Current(A)

IPT: Input(kW)

15.4. SOUND DATA

■ **Standard Models**

Model	Sound Pressure Level (dB) Frequency Band (Hz)								Overall
	63	125	250	500	1000	2000	4000	8000	
RCUE40WG2	77	69	71	63	62	61	53	37	68
RCUE50WG2	74	76	71	64	65	64	51	35	69
RCUE60WG2	77	69	67	62	68	66	53	35	71
RCUE80WG2	77	70	70	71	62	64	50	39	71
RCUE100WG2	79	71	70	67	68	67	54	38	72
RCUE120WG2	80	72	70	65	71	69	56	38	74
RCUE150WG2	81	73	72	69	70	69	56	40	74
RCUE180WG2	82	74	73	71	70	69	56	41	75
RCUE200WG2	83	75	74	71	72	71	58	42	76
RCUE240WG2	84	76	75	71	73	72	59	42	77

Model	Sound Power Level (dB) Frequency Band (Hz)								Overall (dBA)
	63	125	250	500	1000	2000	4000	8000	
RCUE40WG2	92	84	86	78	77	76	68	52	83
RCUE50WG2	89	91	86	79	80	79	66	50	84
RCUE60WG2	92	84	82	77	83	81	68	50	86
RCUE80WG2	92	85	85	86	77	79	65	54	86
RCUE100WG2	95	87	86	83	84	83	70	54	88
RCUE120WG2	96	88	86	81	87	85	72	54	90
RCUE150WG2	97	89	88	85	86	85	72	56	90
RCUE180WG2	98	90	89	87	86	85	72	57	91
RCUE200WG2	99	91	90	87	88	87	74	58	92
RCUE240WG2	100	92	91	87	89	88	75	58	93

NOTE:

1. The sound pressure is based on the following conditions.

- 1 meter from the control panel surface and 1.5 meter from the floor level.

- Voltage of the power source is 380V.

- The above data was measured in an anechoic chamber, so that reflected sound should be taken into consideration in the field.

2. Operating conditions are as follows.
Standard Models: Cooler Water Inlet/Outlet Temperature 12/7 °C, Condenser Water Inlet / outlet 30°C/35°C.

16. APPLICATION DATA

16.1. WORKING RANGE

■ **Working Range**

Item		Description	Remark
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	
Condenser Water Outlet Temperature	Standard	22 ～ 45℃	
	High Condensing Temperature and Heat Pump operation option	22 ～ 55℃	
Cooler Water Outlet Temperature	Standard	5 ～ 15℃	Water
	Low Temperature Option	4 ～0℃(Low 1) -1 ～-5℃(Low2) -6 ～-10℃(Low3)	Ethylene glycol
Maximum Permissible Water Pressure		1.0 MPa	

16.2. PART LOAD PERFORMANCE

The European Seasonal Energy Efficiency Ratio is a weighted formula enabling to take into account the variation of EER with the load rate and the variation of water inlet condenser temperature.

$$ESEER = A \cdot EER_{100} + B \cdot EER_{75} + C \cdot EER_{50} + D \cdot EER_{25}$$

With the following weighting coefficients:

A = 0.03
B = 0.33
C = 0.41
D = 0.23

The following part-load ratings shall be considered:

Load Ratio (%)	Water temperature at condenser inlet (ºC)
100	30
75	26
50	22
25	18

Model RCUE-WG2	40	50	60	80	100	120	150	180	200	240
ESEER	4,52	4,52	4,52	4,86	4,52	4,52	4,86	4,86	4,52	4,86

16.3. ETHYLENE GLYCOL APPLICATION

■ Low Water Temperature Application (Option)

When utilizing 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)

2. Performance

Ethylene Glycol (wt%)	Outlet Water Temp. (°C)	Flow Rate Correction Factor (Kf)	Pressure Drop Correction Factor (Kp)	Condenser Water Outlet Temperature (°C)									
				25		30		35		40		45	
				CAP (%)	IPT (%)	CAP (%)	IPT (%)	CAP (%)	CAP (%)	IPT (%)	IPT (%)	CAP (%)	IPT (%)
20	4	1.011	1.15	97	79	94	88	91	98	88	107	84	117
	3	1.012	1.16	94	78	91	88	88	98	85	107	82	117
	2	1.013	1.17	92	78	89	88	86	97	82	107	79	117
	1	1.013	1.18	90	78	87	87	83	97	80	107	77	116
	0	1.014	1.19	88	77	84	87	81	97	77	106	74	116
30	-1	1.034	1.30	84	77	81	86	78	96	74	106	71	116
	-2	1.035	1.32	82	76	79	86	75	96	71	106	68	116
	-3	1.037	1.34	80	76	76	86	73	96	69	106	65	116
	-4	1.037	1.36	78	75	74	85	70	95	66	105	63	115
	-5	1.038	1.38	75	75	72	85	68	95	64	105	60	115
40	-6	1.073	1.50	72	73	69	84	65	94	61	104	57	114
	-7	1.075	1.52	70	73	66	83	62	93	58	103	54	114
	-8	1.076	1.54	68	72	64	83	60	93	56	103	52	113
	-9	1.076	1.56	66	72	62	82	57	93	53	103	49	113
	-10	1.077	1.58	64	71	59	82	55	93	51	103	46	113

NOTE:

1.CAP: Cooling Capacity, IPT: Compressor Input

2.Capacity and Compressor Input show the percentage of the standard condition: Condenser Water Inlet / Outlet 30/35°c, Cooler.

3.Water Flow Rate and Pressure Drop can be calculated by the Correction Factor Kf and Kp.

4.Example:

a)Model: RCUE120 WG2

b)Standard Condition: Capacity 388kW, Compressor Input 98.2kW

c)Outlet/Inlet Water Temperature -3/2°C, Condenser Water Outlet Temp. 30°C

- Ethylene glycol: 30%

*- Capacity = 388*0.76=295 kW, Compressor Input = 98.2*0.86=84.5 kW*

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

*= 1.037*295*0.86/(2-(-3))*

= 52.6 m^3/h

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

= $1.34*0.0188*52.6^{1.897}$

= 46 kPa

where, Pressure Drop(water)= α x Q^{β}: see "Water Pressure Drop"

17. COMPONENTS DATA

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. CONDENSER AND WATER COOLER

■ **CONDENSER**

Model RCUE-WG2	40	50	60	80	100	120, 150	180, 200	240
Condenser	Brazed Type Plate Heat Exchanger							
Type (Quantity)	A (1)	B (1)	C (1)	D (1)	E (1)	F (1)	C (3)	D (3)

TYPE		A	B	C	D	E	F
REFRIGERANT CYCLE		40HP	50HP	60HP	80HP	100HP	120, 150HP
Dimensions							
Height (H)	mm	525	525	525	525	694	694
Width (W)	mm	243	243	243	243	304	304
Depth (D)	mm	272	338	431	497	441	538
Maximum Permissible Pressure							
Refrigerant Side	MPa	1.8	1.8	1.8	1.8	1.8	1.8
Water Side	MPa	1.0	1.0	1.0	1.0	1.0	1.0
Internal Volume							
Water Side	Liter	14.8	18.6	23.9	27.6	40.2	49.4
Material		Stainless Steel					
Approval		PED (1)					

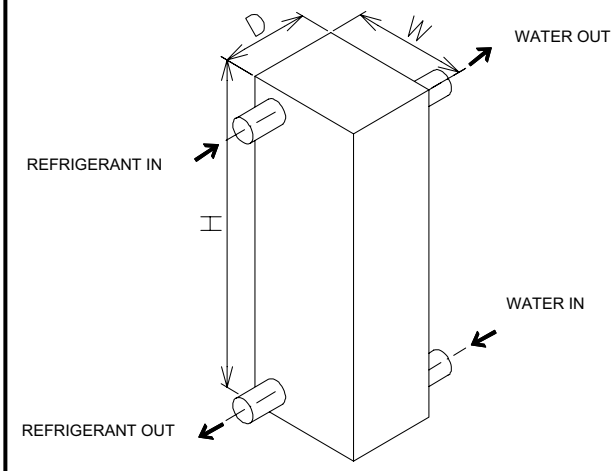
■ WATER COOLER

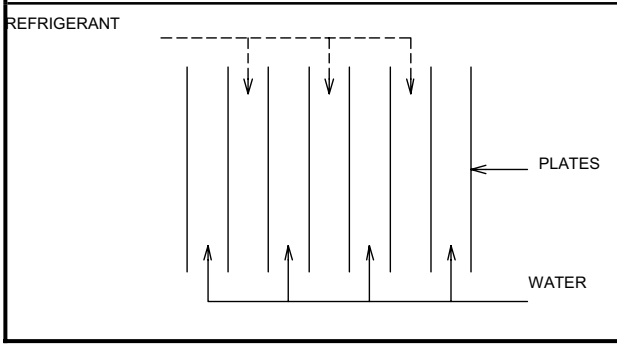
Model RCUE-WG2	40	50	60	80	100, 120, 150	180, 200	240
Water Cooler	Brazed Type Plate Heat Exchanger						
Type (Quantity)	A (1)	B (1)	C (1)	D (1)	E (1)	C (3)	D (3)

TYPE		A	B	C	D	E
REFRIGERANT CYCLE		40HP	50HP	60HP	80HP	100, 120, 150HP
Dimensions						
Height (H)	mm	525	525	525	525	694
Width (W)	mm	243	243	243	243	304
Depth (D)	mm	227	305	389	431	489
Maximum Permissible Pressure						
Refrigerant Side	MPa	1.8	1.8	1.8	1.8	1.8
Water Side	MPa	1.0	1.0	1.0	1.0	1.0
Internal Volume						
Water Side	Liter	15.1	16.7	21.5	23.9	44.8
Material		Stainless Steel				
Approval		PED (1)				

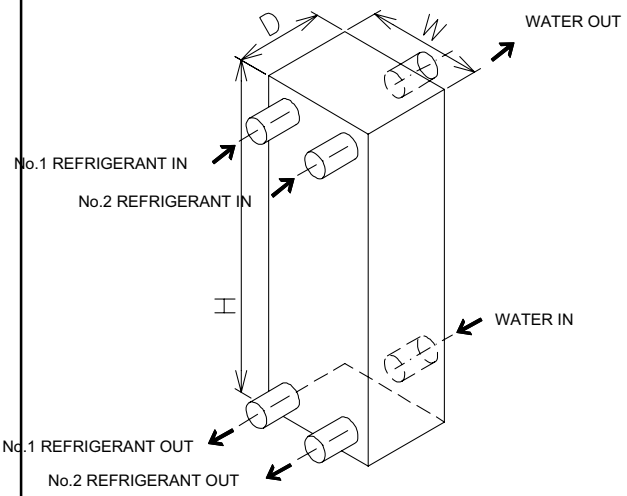
NOTE:
Pressure equipment Directive (97/23/EC)

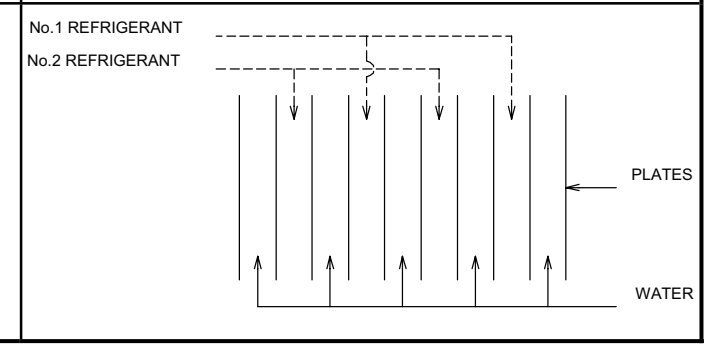
SINGLE TYPE CONDENSER AND WATER COOLER





DUAL TYPE CONDENSER AND WATER COOLER





HITACHI

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