Installation, Operation, and Maintenance

Koolman
Air-Cooled Chiller and Heat pump
R410A

⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

March 2014

PKGP-SVX03A-EN

500002250200

Warnings, Cautions and Notices

Important tips:

This manual belongs to the client and shall be used with the water chiller. After the completion, please put it back into the technical information kit.

⚠ WARNING:

Before the installation or maintenance, the power supply and disconnecting switch of the water chiller shall be kept in de-energized status to avoid injury or death due to the electric shock or touch of a moving part.
All installation procedures of the air conditioner must conform to the national, provincial and local regulations.
Before the installation of the air conditioner, please carefully read this manual. Please install and maintain the water chiller according to this manual to ensure the air conditioner can operate properly and reliably. The installation of the air conditioner must be completed by the professional personnel appointed by Trane.
This manual does not aim to summarize the differences of all the water chillers or any possible problem in the installation. If the buyer needs further information or has any special problem, please contact the local sales offices of Trane.

NOTICE:

There may be warnings and cautions in this manual if applicable. In order to ensure personal safety and proper operation of the water chiller, please adhere to this manual carefully.
The manufacturer will not be liable for the installation or maintenance performed by the unqualified personnel.

⚠ CAUTION:

This machine works on R410 refrigerant. Charging of non-qualified refrigerant would damage the compressor & will be very DANGEROUS. So please charge machine with correct refrigerant. Or call customer care for help about purchasing the correct refrigerant.

Table of Contents

Table of Contents

Model Nomenclatures

C	G	A	R	0	5	0	5	R	B	N	A	R	R	N	A
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Digit 1,2,3 **CGA = Air-Cooled Chiller and Heat Pump**

Digit 4 **Model**

K = Cooling Only

R = Heat Pump

Digit 5,6,7 **Model**

030 100

050 120

060 150

075 200

Digit 8 **Power Supply**

5 = 380V/50Hz/3ph (For Model 030,050,060,07 5,100,120,150,200)

6 = 220V/50Hz/1ph (for 030 with single compressor and 060 with double compressors)

Digit 9 **Manufacturing Code (defaulted by factory)**

R = R410A

Digit 10 **Control**

B=Microprocessor- based adjustable water temperature controller

Digit 11 **Water Side Electric Heater**

N=None

Digit 12 **Service Sequence**

A=The first time

Digit 13 **Water Pump for Unit**

R=With Pump inside (standard)

N=Without Pump

Digit 14 **Applicable Ambient Temperature**

R = Standard ambinent temperature/Blue-fin

Digit 15 **Fitting Options**

N = None (Standard Unit)

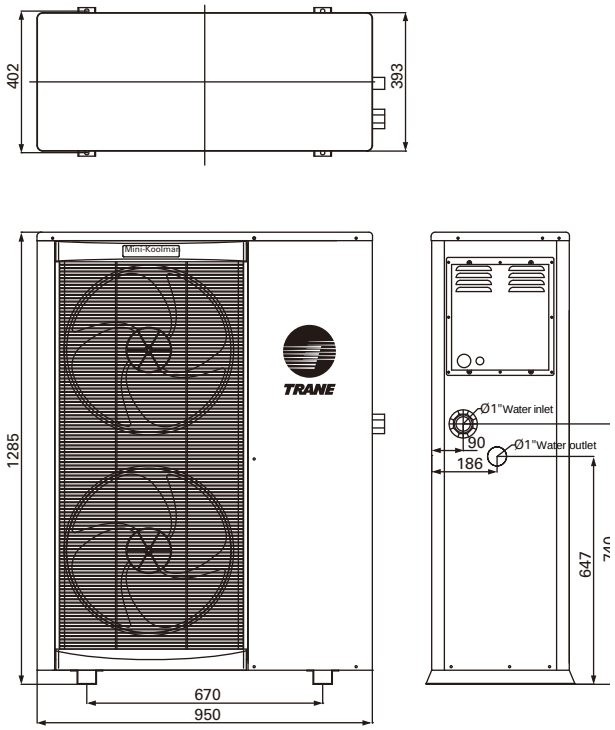
Digit 16 **Other option**

B = Export

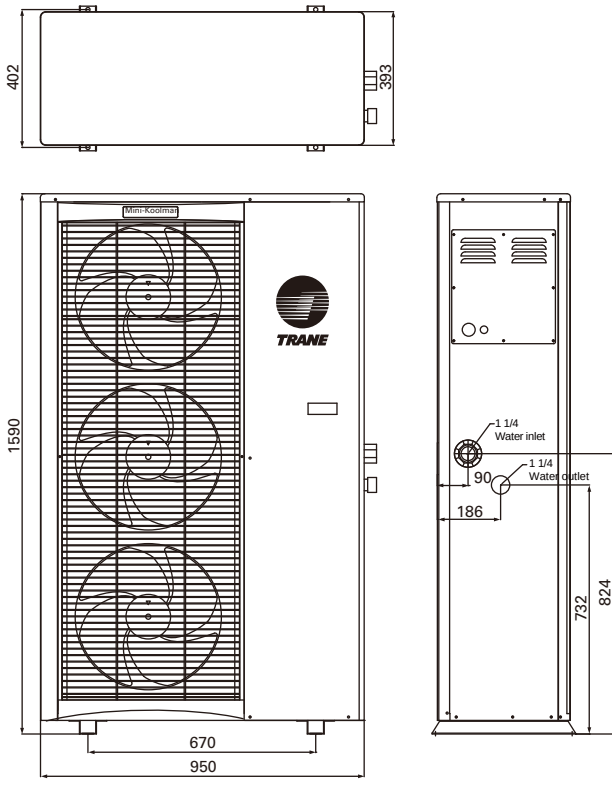
Dimensions

Mini casing

CGAK/R-0305R/0306R/0505R/0605R (Unit: mm)

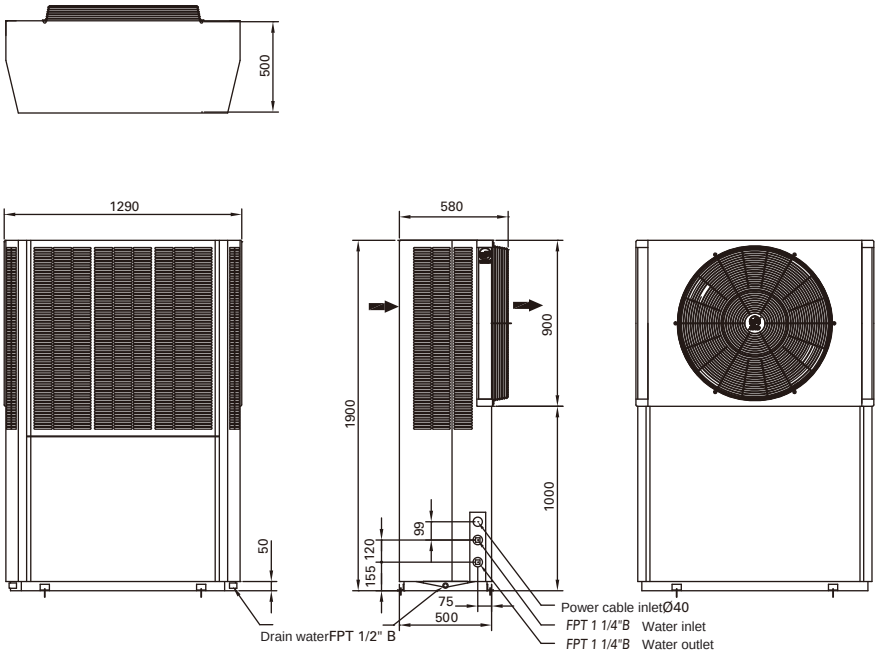


CGAK/R-0705 R (Unit: mm)

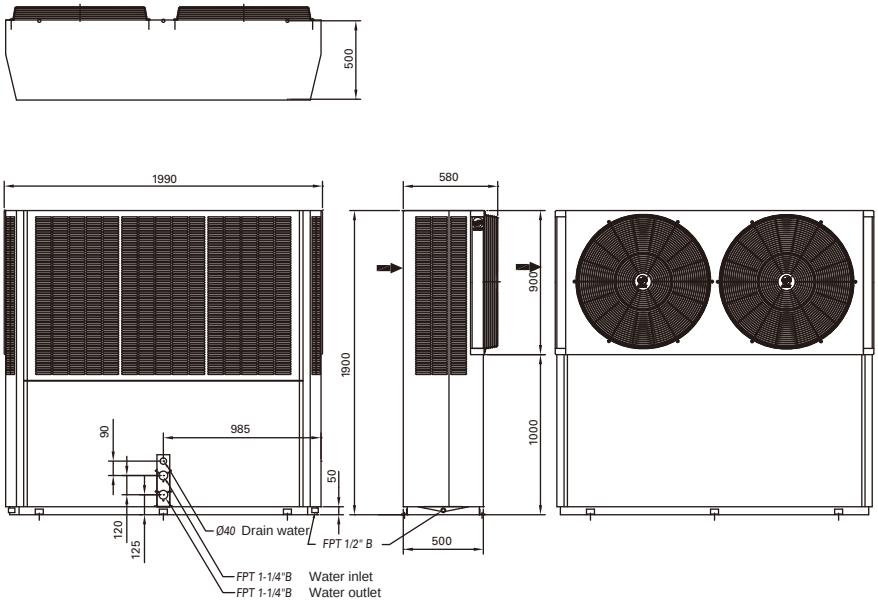


Standard casing

CGAK/R-0606R/1005R (Unit: mm)

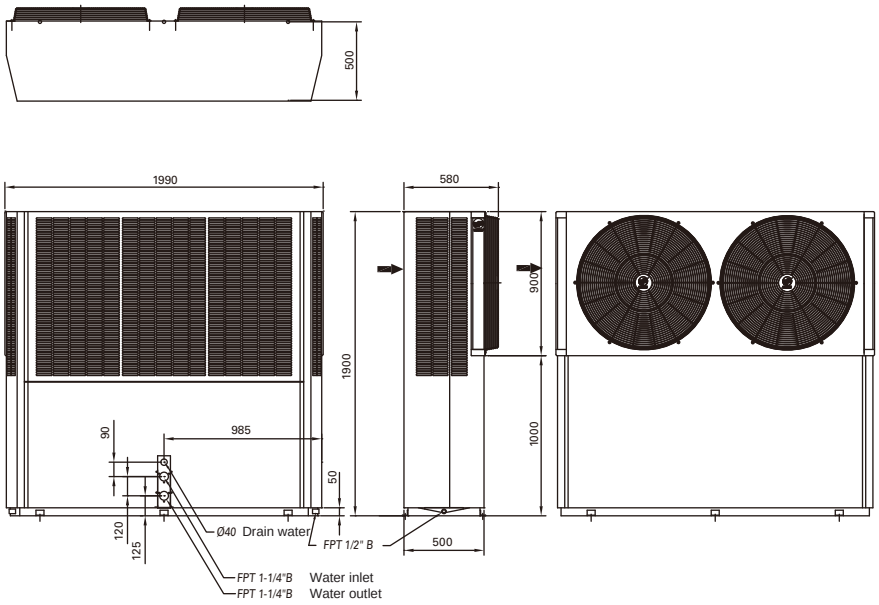


CGAR/K-1505R (Unit: mm)

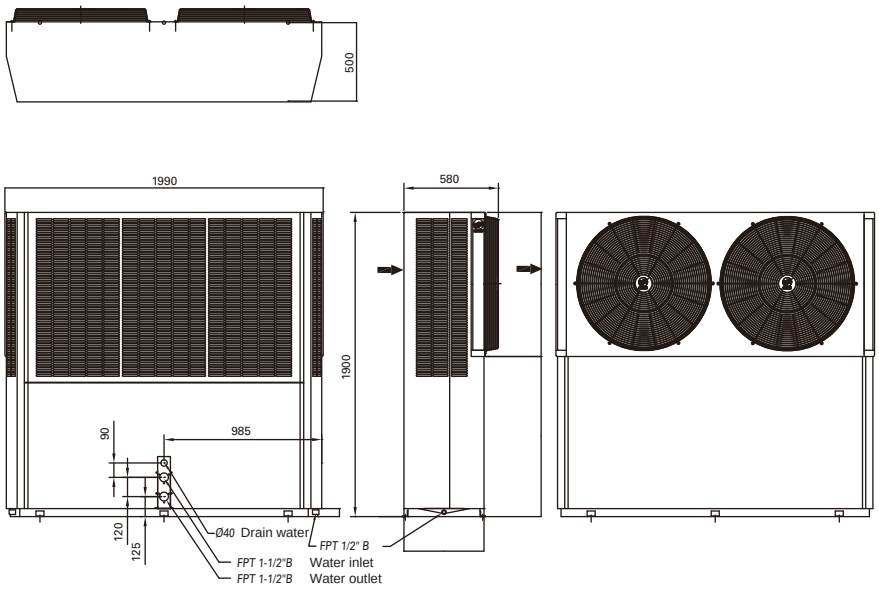


Dimensions

CGAR/K-1505R (Unit: mm)



CGAR/K-2005R (Unit: mm)



Unit Installation

Handling

Please use the forklift with proper capacity tonnage to transport and handle, for weight of each model please refer to reference table 1.

Table 1.

Model	The maximum net weight (kg)≈
0305R	130
0306R	131
0505R	141
0605R	149
0606R	320
0755R	202
1005R	449
1205R	530
1505R	530
2005R	540

Please install the water chiller at a place with well drainage facilities to facilitate massive drainage during shutdown or repair.
Please use the forklift with proper capacity tonnage to move this water chiller to its installation position. During lifting work, please use canvas sling, which shall be wrapped across the water chiller pedestal and tied tightly, as shown in Figure 1.

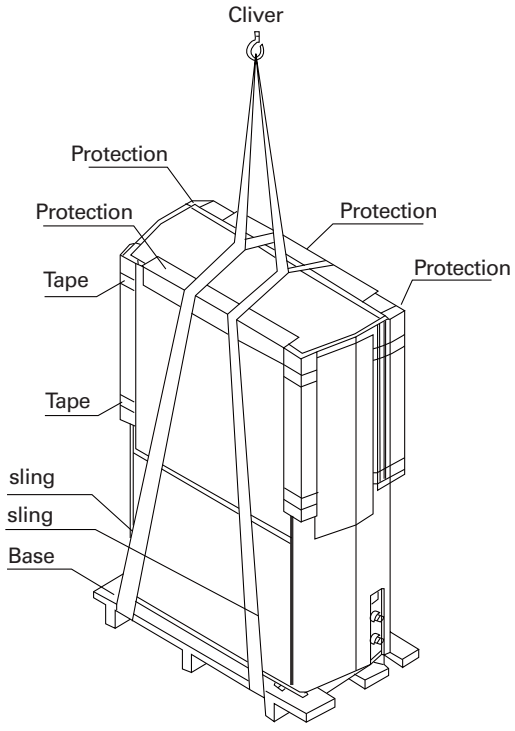


Figure 1. Hoisting diagram

Check the following items before installation

As received

If the content of the machine's name plate is the same as that of the order.

- If there is any damage or material shortage during transportation of the unit; if yes, please notify the deliverer timely.

Installation position

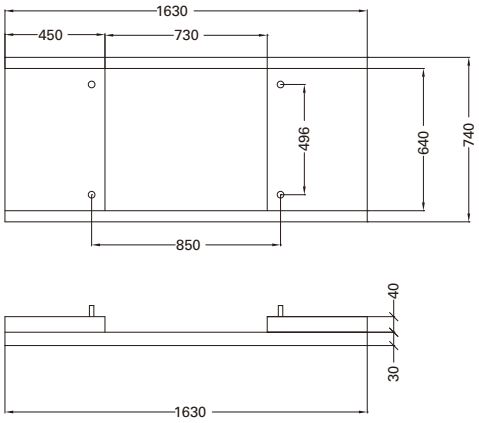
- If there is adequate ventilation available at the installation position.
- If drainage facilities are installed for handling the seeper at the pedestal.
- Unpack the water chill er and dispose the packing materials (such as paperboard, prospective film and etc.).
- If there are enough repair passages available.
- Fit springs or rubber shockproof gaskets.
- Fix the unit in its installation position.
- Adjust the levelness of the water chiller.

Adoption of the following water chiller fixing methods can minimize the noise of the water chiller:

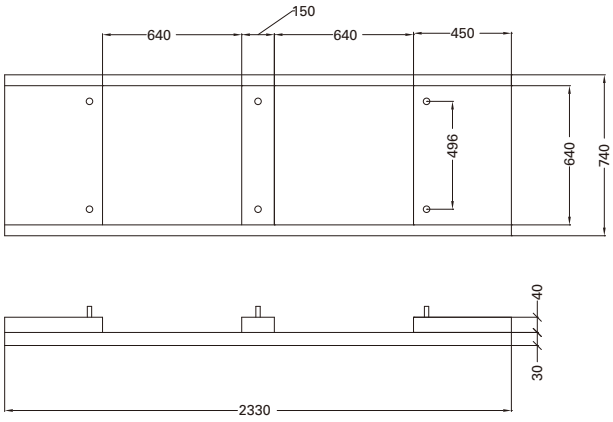
- Install the unit on an independent concrete foundation.
- Fit spring or rubber shockproof gasket at each fixing foot.

For overall dimension of the water chiller and the dimension of the foundation, please refer to Figure 2. For recommended minimum maintenance space, please refer to Figure 3.

CGAR(K)0606R/1005R



CGAR(K)1205R/1505R/2005R



CGAR(K)0305R/0306R/0505R/0605R/0755R

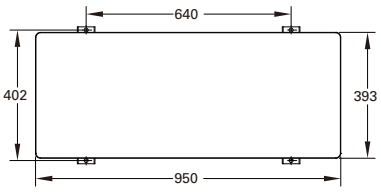


Figure 2. Installation dimensions

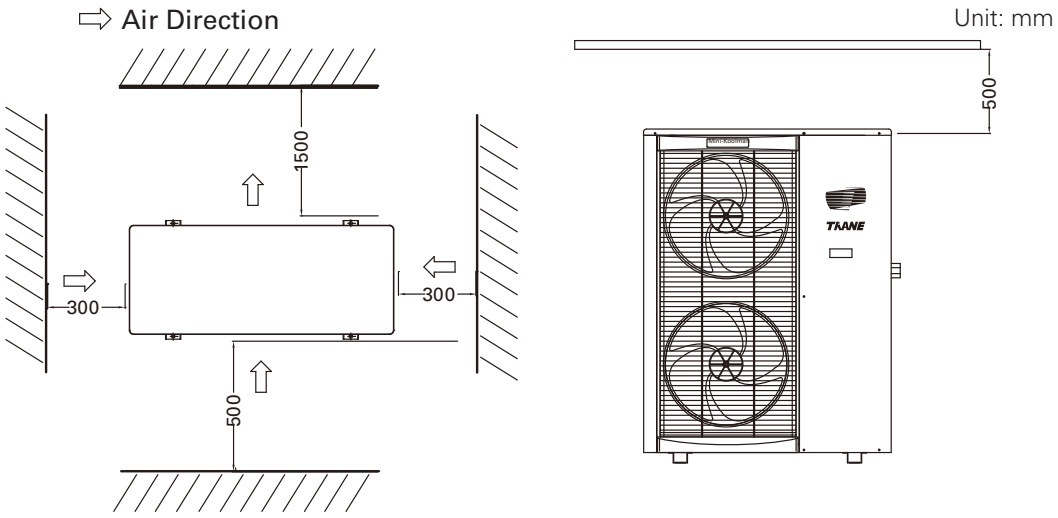


Figure 3. Service and Maintenance Space Requirement

Water supply pipe

Evaporator piping:

- Clean out all cold water piping.
- Connect the evaporator piping.
- Exhaust the air in the cold water system at the highest point of this system piping.
- Install pressure meters, temperature meters and valves at the inlet piping and outlet piping.
- Install strainer at the inlet piping of evaporator, mesh number of the strainer screen shall be equal to or more than 40 meshes.
- Install balance valve and flow switch at the outlet.

NOTICE:

If commercial acidic cleaning agent is used, a temporary bypass tube shall be set at the side of the water chiller for prevention of damage to evaporator. Please do not use untreated or improperly treated system water supply to avoid damage to machine.

For installation positions of each typical accessory on water supply piping of the water chiller, please refer to Figure 4. Piping assembly may be changed depending on positions of joint and water supply. For installation diagram of typical system piping, please refer to Figure 5.

⚠ CAUTION:

- **To avoid damaging the water chiller, the piping for system water shall not be fitted reversely. The water inlet tube must be connected to the inlet connector indicated by "water inlet". The water outlet tube must be connected to the outlet connector indicated by "water outlet".**
- **Exhaust valve shall be set at the highest point of the piping, in order to exhaust the air in the cold water system.**

⚠CAUTION:

- **Water the pressure of the evaporator shall not be more than 0.5MPa (i.e. maximum operation pressure) to avoid damage of the parts at the cold water side of the water chiller.**
- **The return water temperature of heating shall not be set more than 40℃; otherwise, the compressor will not be exchanged as per the Three Guarantees.**
- **Before the final piping connection of the water chiller, all external water supply piping systems shall be washed thoroughly. Any impurity mixed in the piping system is strictly forbidden; otherwise, we will assume no liability for any consequence so incurred.**

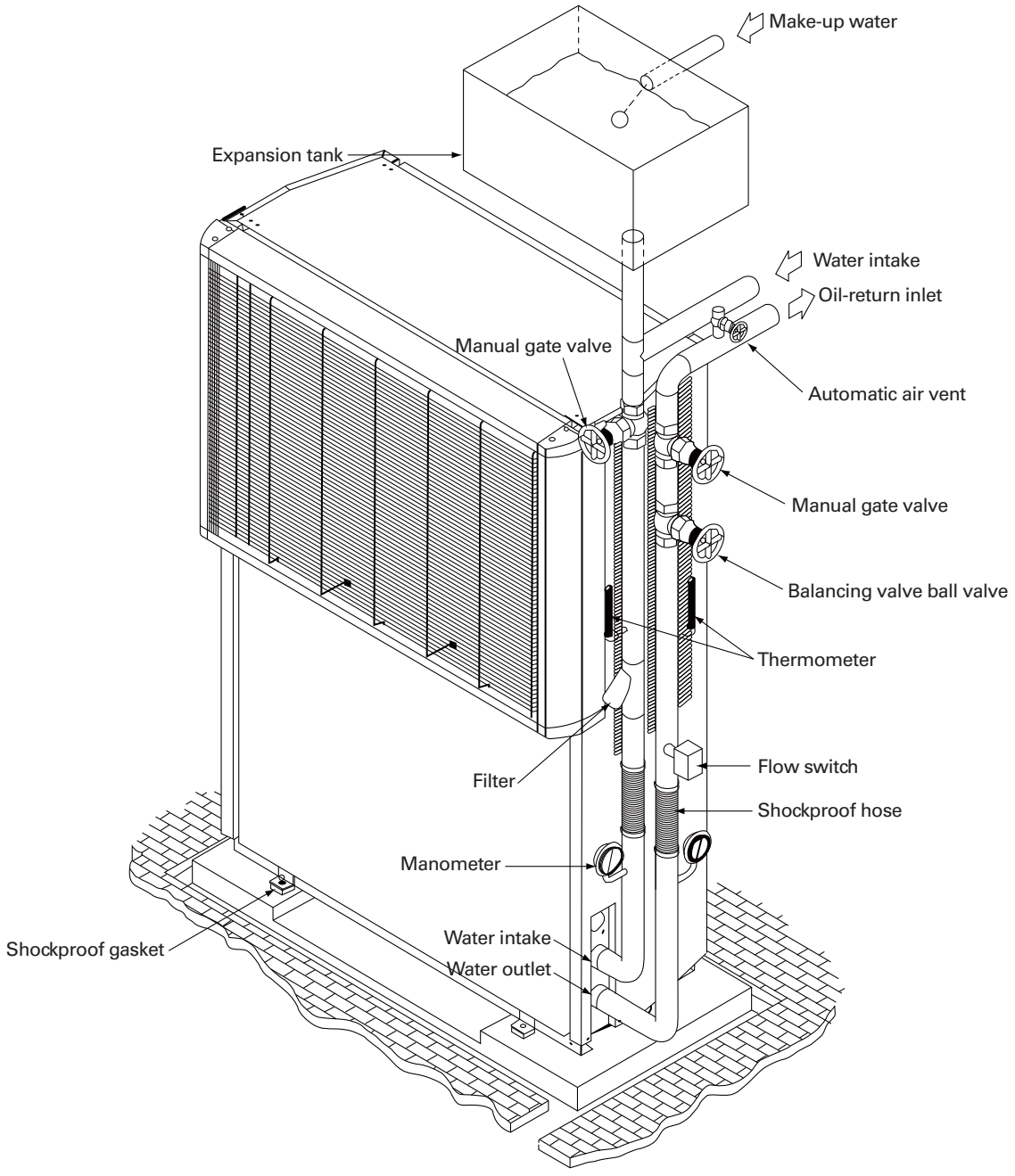


Figure 4. Installation diagram for typical piping accessories (the model of this diagram is CGAR100)

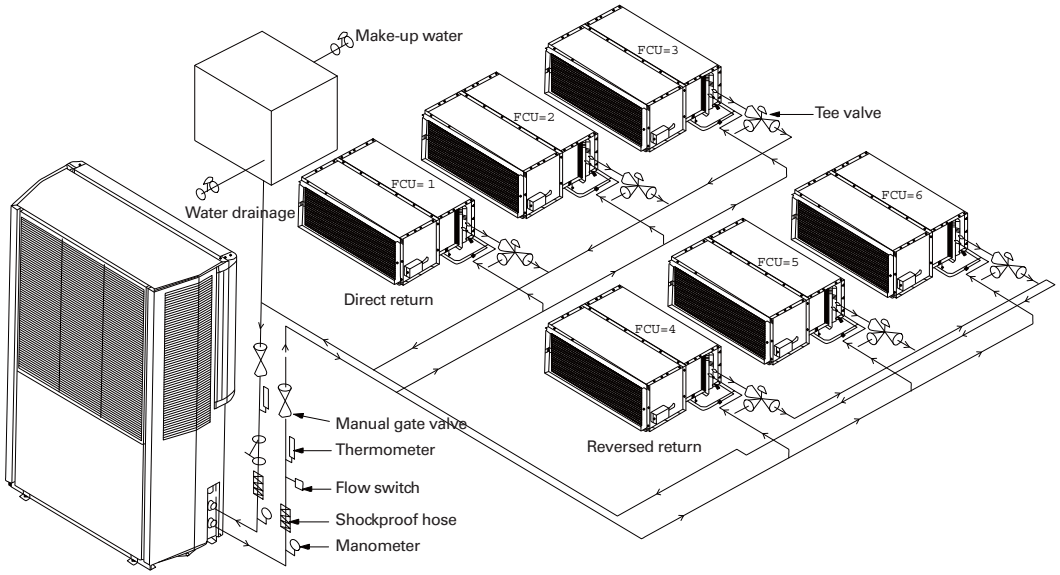
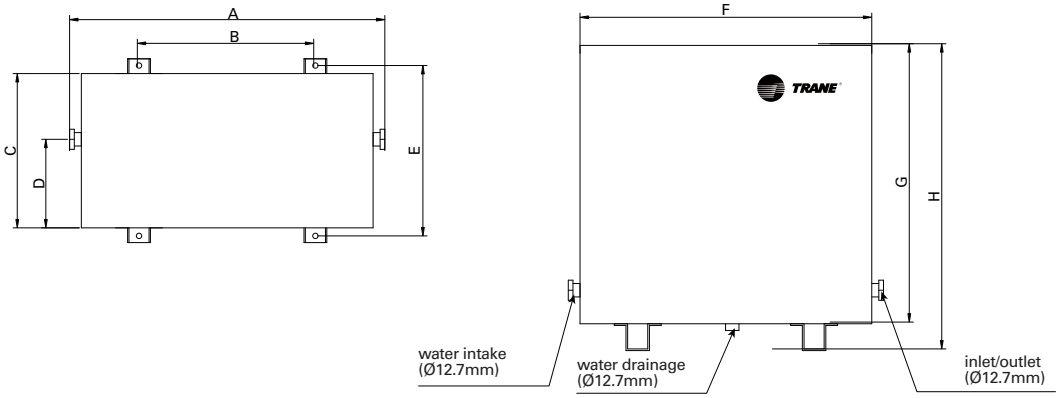


Figure 5. Installation diagram for typical system piping (the model of this diagram is CGAR100)

Pressure water tank system

This system is used for adjustment of water pressure and amount in the water loop.
Please install one manual shut-off valve at each side of the system during installation to facilitate future maintenance. Please refer to Figure 6 for the detailed installation mode.



Model \ Dimension	A	B	C	D	E	F	G	H
wtank-5	470	263	230	132	254	435	415	455
wtank-12	620	400	324	162	356	569	440	475

Electric water heater

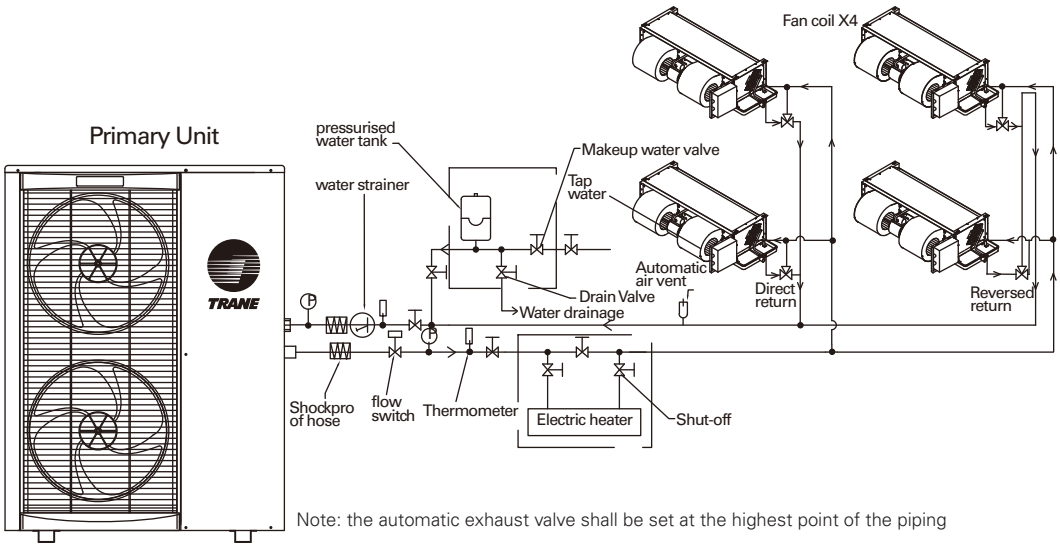


Figure 6. detailed installation mode.

Principle description

1. A pressure water tank shall be added in the piping system to avoid pipe rupture resulting from overpressure of piping due to ambient temperature fluctuation and to prevent air hammer generated in the pipe.

2. To avoid overpressure or underpressure in the pipe, a makeup water valve and a drainage valve shall be added; when the pressure is lower than 0.6bar, the makeup water valve will open to make up water automatically; and the drainage valve will open to drain water automatically while the pressure is more than 5bar.

Electrical

Electrical wiring

- Connect the power wiring to the terminal block (TB) of the water chiller distribution cabinet.
- Connect the control panel (installed indoor) and the master control board of the primary water chiller with connecting line of control panel.
- If the model is the one without water pump, please connect the power wiring of the cold water pump to the corresponding terminal of the pump.
- Earth the water chiller, cold water pump's motor (the model without water pump) and all devices needing to be grounded.
- If the electric heater is equipped, connect the power wiring and the control wiring on Terminal TB2 of the electric heater.
- If the fan coil two-way valve will be used for interlocking, jumper JP6 on the control panel shall be disconnected on site, and connect the interlocking point (dry contact) to the point between the control terminals 12 and U.
- Connect the flow switch to the point between connecting terminals U (or L) and 15 of the water chiller control box.

⚠ WARNING:

Before completion of electric wiring, please do not supply power to avoid possible injury or death.

⚠ CAUTION:

- **Only copper conductor can be used for connection to the terminals, to avoid corrosion or overheat.**

For minimum current, fuse specification and electrical specifications of motor, please refer to Table 2.

Power supply of the water chiller

Please refer to the wiring diagram on the cover plate of the water chiller control box; the installation unit shall supply power with proper voltage and provide a suitable breaker to the water chiller. For typical installation wiring diagram of the water chiller, please refer to Page 20~24. For the actual wiring diagram, please refer to the diagram on the cover plate of the control box.

NOTICE:

- **The voltage of the power supply shall change within ±10% of the standard value.**

Electrical specifications -50Hz

MODEL	Power supply (V/Hz/Ph)	Full load current of water pump FLA(A)	Full load current of chiller unit FLA(A)	Rated current of the fan RLA(A)	Minimum current of the water unit circuitMCA(A)	Recommended fuse specification REC(A)	Maximum specification of the fuse FMS(A)	Minimum specification of the power supply copper core wire diameter (mm^2)
0305R	380-415/50/3	1.1	8.6	1	12.85	15	21.45	4
0306R	220/50/1	2.4	25.6	1	35.4	41.8	61	10
0505R	380-415/50/3	1.1	9.6	1	14.1	16.5	23.7	4
0605R	380-415/50/3	1.1	13	1	18.35	21.6	31.85	6
0755R	380-415/50/3	1.4	14	1.5	20.4	23.9	34.4	6
0606R	220/50/1	2.4	51.2	4.8	63.5	71.2	85.6	16
1005R	380-415/50/3	1.4	16.4	1.6	23.5	27.6	39.9	6
1205R	380-415/50/3	3.26	22.4	3.2	34.46	40.06	58.5	10
1505R	380-415/50/3	2.6	24.6	8.4	41.75	47.9	61.15	10
2005R	380-415/50/3	3.2	26.6	8.4	44.85	51.5	68.7	16

- The difference between the power voltage and the standard voltage shall not exceed 10 percent of the standard value.
- Rated current(RLA)=the current of the machine under the ARI or UL standard conditions
- Minimum circuit current(MCA)=maximum loadx1.25+sum of the extra load (to decide the diameter of the wire)
- Recommended fuse specification(REC)=maximum loadx1.5+sum of the extra load (to select the fuse closest in specification)
- Maximum fuse specification(MFS)=maximum loadx2.25+sum of the extra load (to select the fuse same or smaller in specification)

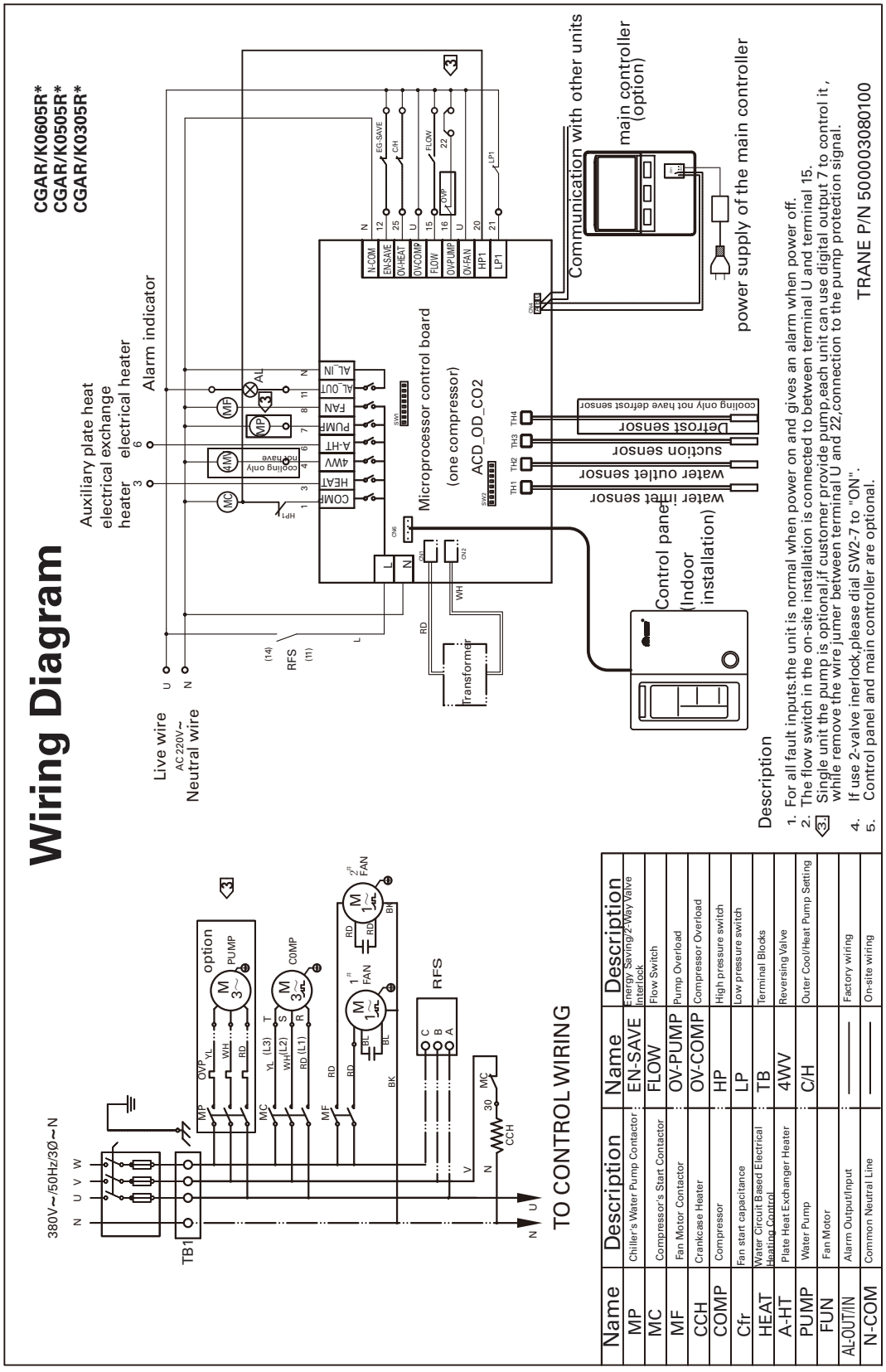
NOTICE:

Scroll compressor is adopted in 380V water chiller and power reverse-phase & open phase protection controllers are installed in the water chiller, so the water chiller shall be energized for inspection before starting. If the green light of the phase sequence control in the electric control box brightens, the phase sequence is correct. If the red light brightens, it means reverse phase, and any two phases of the power line shall be exchanged with each other. If the yellow light brightens, it means open phase and it is necessary to cut off the electricity for inspection. If the reverse phase or open phase appears, the water chiller will automatically stop running or starting.

Wiring Diagram

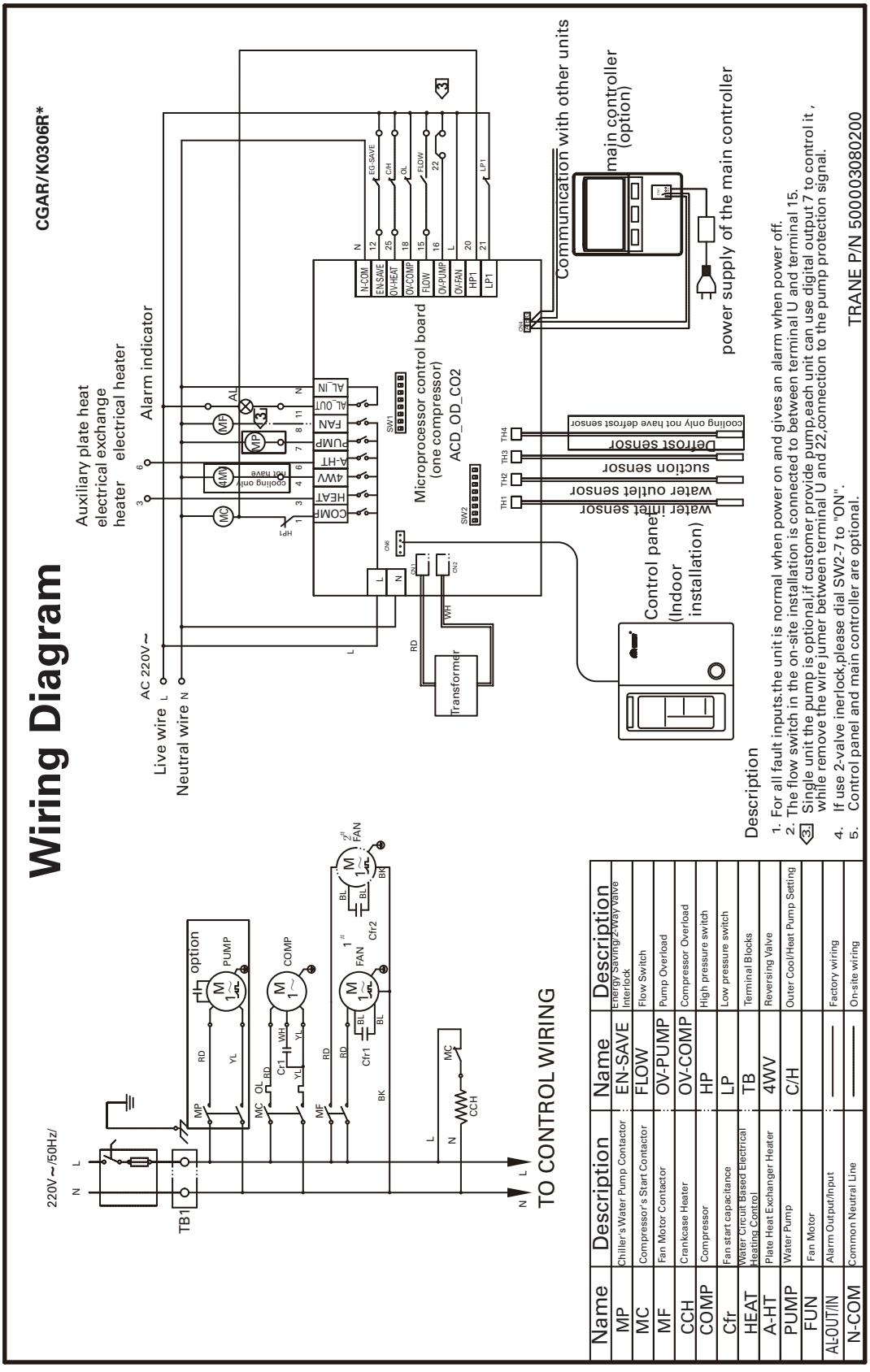
The following circuit diagrams are only for reference, and the supplied circuit diagram shall prevail.

CGAR/K0305R*/0505R*/0605R*



Name	Description	Name	Description
MP	Chiller's Water Pump Contactor	EN-SAVE	Energy Saving/2-Way Valve Interlock
MC	Compressor's Start Contactor	FLOW	Flow Switch
MF	Fan Motor Contactor	OV-PUMP	Pump Overload
CCH	Crankcase Heater	OV-COMP	Compressor Overload
COMP	Compressor	HP	High pressure switch
Cfr	Fan start capacitance	LP	Low pressure switch
HEAT	Water Circuit Based Electrical Heating Control	TB	Terminal Blocks
A-HT	Plate Heat Exchanger Heater	4WV	Reversing Valve
PUMP	Water Pump	C/H	Outer Cool/Heat Pump Setting
FUN	Fan Motor		
AL-OUT/IN	Alarm Output/Input	———	Factory wiring
N-COM	Common Neutral Line	———	On-site wiring

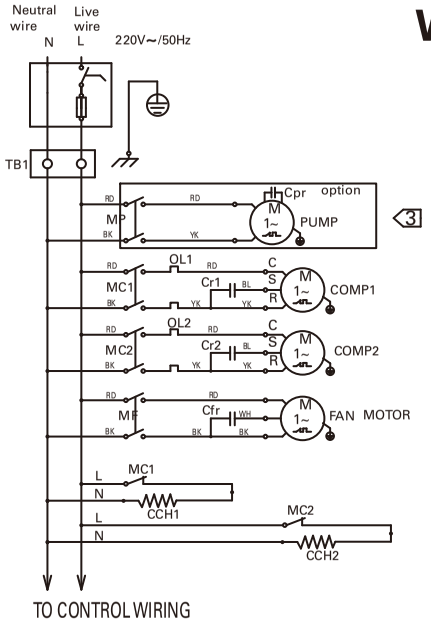
CGAR/K0306*

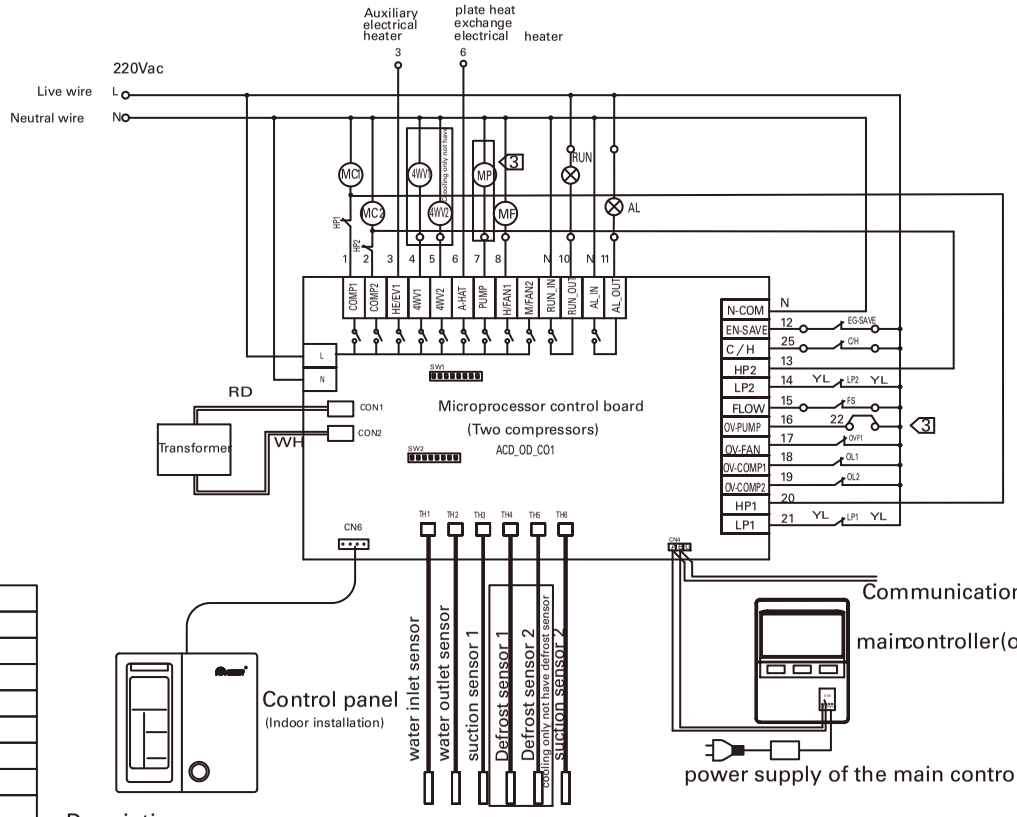


Name	Description	Name	Description
MP	Chiller's Water Pump Contactor	EN-SAVE	Energy Saving-2-Way Valve Interlock
MC	Compressor's Start Contactor	FLOW	Flow Switch
MF	Fan Motor Contactor	OV-PUMP	Pump Overload
CCH	Crankcase Heater	OV-COMP	Compressor Overload
COMP	Compressor	HP	High pressure switch
Cfr	Fan start capacitance	LP	Low pressure switch
HEAT	Water Circuit Based Electricral Heating Control	TB	Terminal Blocks
A-HT	Plate Heat Exchanger Heater	4WV	Reversing Valve
PUMP	Water Pump	C/H	Outer Cool/Heat Pump Setting
FUN	Fan Motor		
ALOUT/IN	Alarm Output/Input	———	Factory wiring
N-COM	Common Neutral Line	———	On-site wiring

Wiring Diagram

CGAR/K0606R*





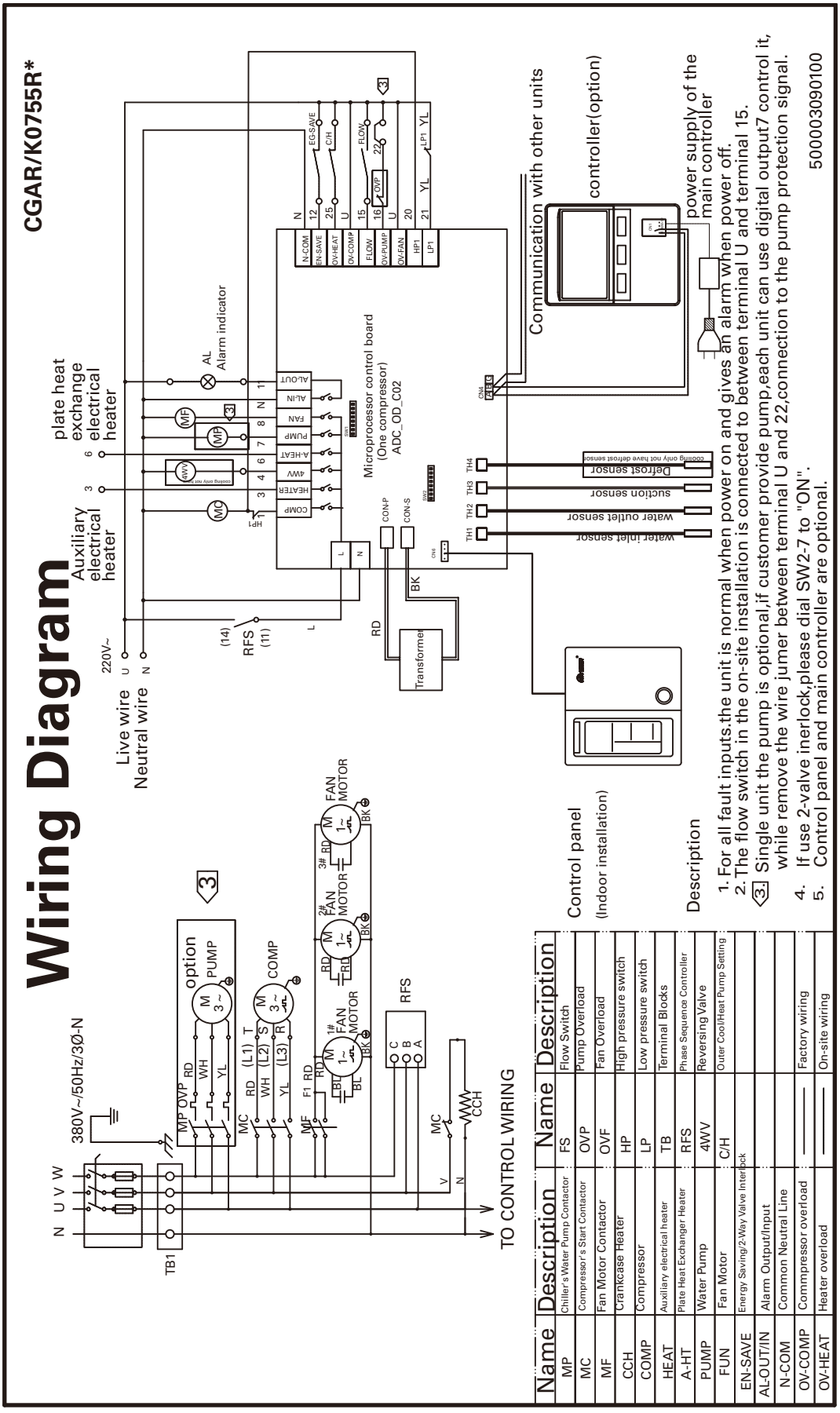
Name	Description	Name	Description
MP	Chiller's Water Pump Contactor	OV-COMP	Compressor Overload
MC	Compressor's Start Contactor	FS	Flow Switch
MF	Fan Motor Contactor	OVP	Pump Overload
CCH	Crankcase Heater	OVF	Fan Overload
COMP	Compressor	HP	High pressure switch
HT/EV1	Water Circuit Based Electrical Heating Control	LP	Low pressure switch
A-HAT	Plate Heat Exchanger Heater	TB	Terminal Blocks
PUMP	Water Pump	4WV	Reversing Valve
H/FAN	Fan Motor	OL	OVerload
AL-OUT/IN	Alarm Output/Input		
N-COM	Common Neutral Line		
EN-SAVE	Energy Saving/2-Way Valve Interlock		
RUN-OUT/IN	Run Output/Input	———	Factory wiring
C/H	Outer Cool/Heat Pump Setting	———	On-site wiring

Description

1. For all fault inputs.the unit is normal when power on and gives an alarm when power off.
2. The flow switch in the on-site installation is connected to between terminal U and terminal 15.
3. Single unit the pump is optional,if customer provide pump,each unit can use digital output 7 to control it, while remove the wire jumer between terminal U and 22,connection to the pump protection signal.
4. If use 2-valve inerlock,please dial SW2-7 to "ON".
5. Control panel and main controller are optional.

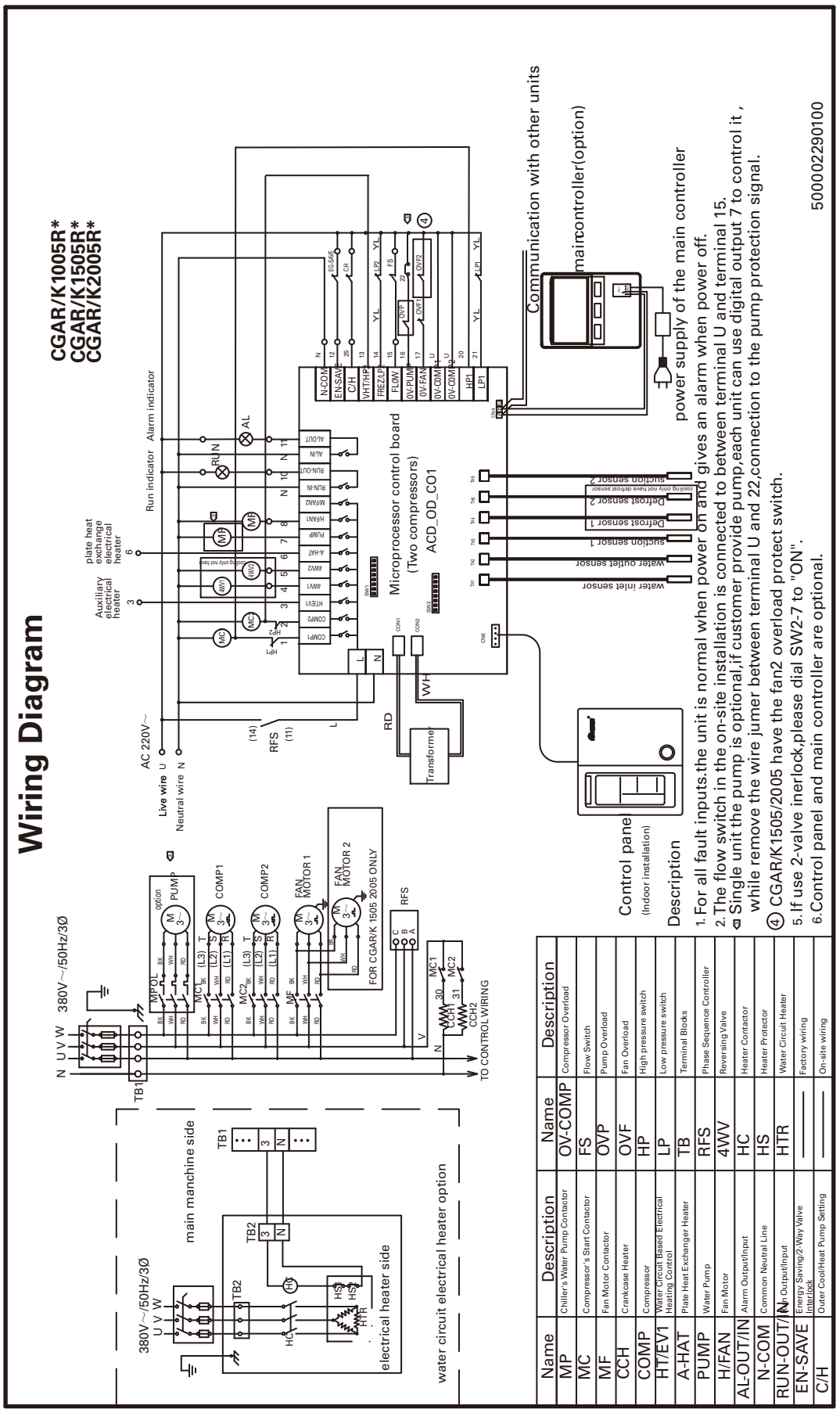
500003100100

CGAR/K0755R*



Name	Description	Name	Description
MP	Chiller's Water Pump Contactor	FS	Flow Switch
MC	Compressor's Start Contactor	OVP	Pump Overload
MF	Fan Motor Contactor	OVF	Fan Overload
CCH	Crankcase Heater	HP	High pressure switch
COMP	Compressor	LP	Low pressure switch
HEAT	Auxiliary electrical heater	TB	Terminal Blocks
A-HT	Plate Heat Exchanger Heater	RFS	Phase Sequence Controller
PUMP	Water Pump	4WV	Reversing Valve
FUN	Fan Motor	C/H	Outer Cool/Heat Pump Setting
EN-SAVE	Energy Saving/2-Way Valve Interlock		
AL-OUT/IN	Alarm Output/Input		
N-COM	Common Neutral Line		
OV-COMP	Commpressor overload	———	Factory wiring
OV-HEAT	Heater overload	———	On-site wiring

CGAR/K1005R* 1205R/1505R*/2005R*



Name	Description	Name	Description
MP	Chiller's Water Pump Contactor	OV-COMP	Compressor Overload
MC	Compressor's Start Contactor	FS	Flow Switch
MF	Fan Motor Contactor	OVP	Pump Overload
CCH	Crankcase Heater	OVF	Fan Overload
COMP	Compressor	HP	High pressure switch
HT/EV1	Water Circuit Based Electrical Heating Control	LP	Low pressure switch
A-HAT	Plate Heat Exchanger Heater	TB	Terminal Blocks
PUMP	Water Pump	RFS	Phase Sequence Controller
H/FAN	Fan Motor	4WV	Reversing Valve
AL-OUT/IN	Alarm Output/Input	HC	Heater Contactor
N-COM	Common Neutral Line	HS	Heater Protector
RUN-OUT/IN	Run Output/Input	HTR	Water Circuit Heater
EN-SAVE	Energy Saving/2-Way Valve Interlock	———	Factory wiring
C/H	Outer Cool/Heat Pump Setting	———	On-site wiring

Preparations before starting

Voltage range

Power supply of the water chiller must conform to the operation power supply marked on the name plate, and the power voltage & unbalances between each phase must be within the following scope. Gauge the voltages between each phase, readings of which must be within the acceptable voltage tolerance (±10%) marked on the name plate. If any voltage between two phases is not within the tolerance, electricity company shall be notified to correct such condition before the water chiller running. Improper voltage will result in abnormal control function, and shorten the life of various electrical parts & compressor motor.

Voltage unbalance

If there is significant voltage unbalance between each phase of the three-phase electricity system, it will result in motor overheat and then induce motor failure. The maximum allowable voltage unbalance is 2%, voltage unbalance is defined as follows:

$$\text{voltage unbalance } \% = \frac{100 \times |Va - Vd|}{Va} \%$$

Wherein:
Va=(V1+V2+V3)/3 (average voltage)
V1,V2,V3=voltage between phases
Vd=voltage between phases with maximum difference to Va

Water flow

The flow rate of the cold water passing through the water chiller must be between the upper limit and the lower limit listed in table 4. If the flow rate of the cold water coming into the evaporator is below the lower limit, it will result in discontinuous water flow and reduce the heat transfer effect, and then lead to out-of-control expansion valve or abnormal underpressure jump. Conversely, if the flow rate is above the upper limit, parts inside of the evaporator will be corroded.

Water pressure drop

Gauge the water pressure difference between the inlet and outlet of the water chiller (with water pump), then the head outside the water chiller at this water amount can be acquired, which shall be basically shown as the "head outside the water chiller " curve. When the standard model with water pump is used, for the design of piping system please refer to the "head outside the water chiller" curve. If the model without water pump is used (water pump is installed outside of the water chiller), internal water pressure drop of the water chiller shall be basically shown as the "water pressure drop of the water chiller " curve. When the model without water pump is used, for the design of piping system please refer to the "water pressure drop of the water chiller" curve.

- Check connection of all wiring, and all electric connection points shall be kept clean and locked tightly.
- Check if the power voltage of the water chiller is normal.
- Fully fill the cold water loop with water, and the exhaust valve of the system shall be kept open during filling, which shall be closed after the loop being filled fully.
- Make short circuit connection on flow switch to test the water system.
- Power on the main power and press the ON/OFF button on the control panel to start the water chiller, then the water pump shall start up and the water flows circularly in the cold water system, please check if there is any leakage at all piping connection points.
- Adjust the water flow in the cold water loop, to inspect the external water pressure of the water chiller (for the standard model) or pressure drop of the evaporator (for the model without water pump).
- Stop operation of the water pump. Shut off all power supply.
- Connect the flow switch to the connection point on the terminal block in the control box.

⚠CAUTION:

When the water pump is running, the water flow shall be adjusted to 50%of the maximum flow rate, and the connection point of the flow switch shall be adjusted as open circuit. Please use ohmmeter to verify if the connection point of the switch is open or close.

⚠ WARNING:

When the ambient temperature is below 16℃ in winter, please do not cut off the power, and preheat the water chiller 24 hours before starting it, or else the compressor will be damaged.

Table 3. Water flow of the primary water chiller m^3/h

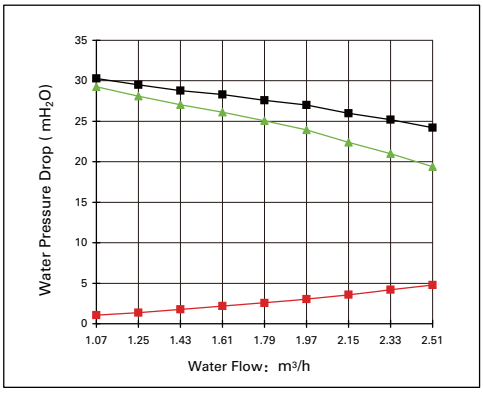
Type	Lower limit of flow	Rated flow	Upper limit of flow	Connection Dimension
CGAR0305	19.4	29.8	38.8	1"
CGAR0306	20.7	31.8	41.4	1"
CGAR0505	24.2	37.3	48.4	1"
CGAR0605	30.4	46.7	60.7	1"
CGAR0755	41.7	64.2	83.5	1 1/4"
CGAR0606	41.4	63.6	82.7	1 1/4"
CGAR1005	49.4	76.0	98.8	1 1/4"
CGAR1205	72.1	110.3	143.4	1 1/4"
CGAR1505	86.1	132.4	172.1	1 1/4"
CGAR2005	98.7	151.9	197.5	1 1/2"

NOTICE:

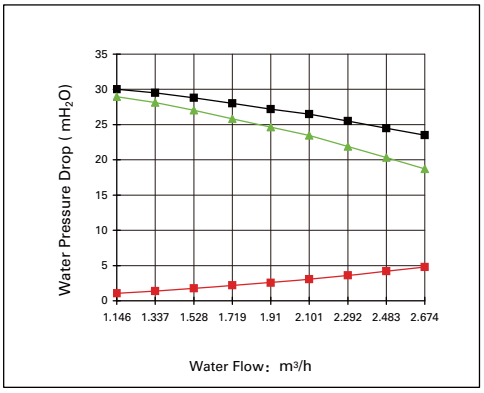
If the actual water flow rate is less than70%*rated flow, the return water temperature of refrigeration is required being set ≥10℃; or else it is necessary to add antifreezer into the water system (volume concentration of glycol in the water system has to be ≥15%);

Figure 7. Unit Hydraulic curve diagram

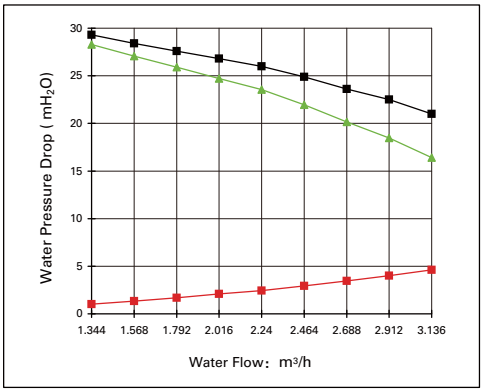
CGAR0305



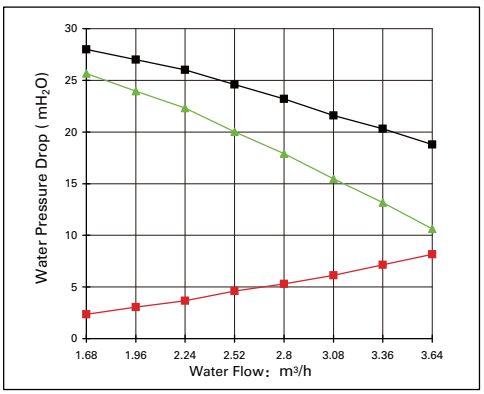
CGAR0306



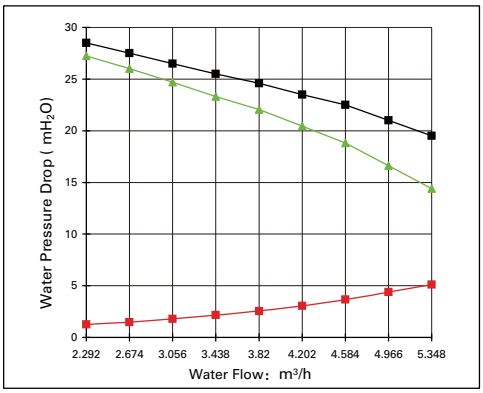
CGAR0505



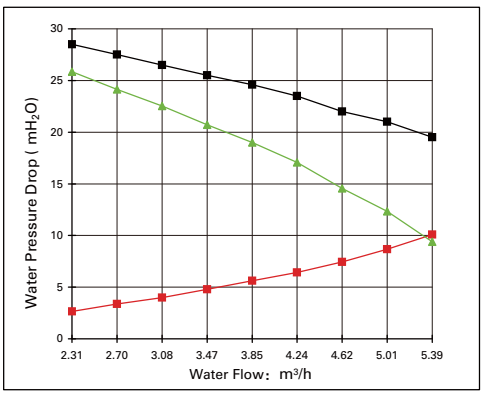
CGAR0605



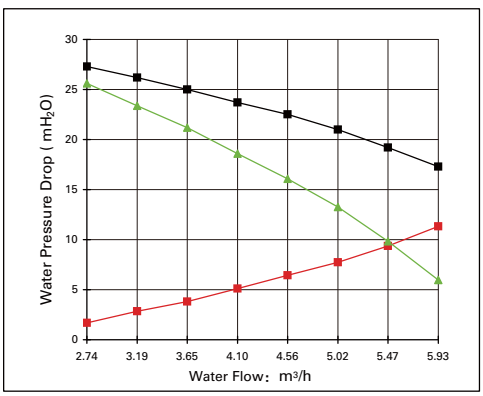
CGAR0606



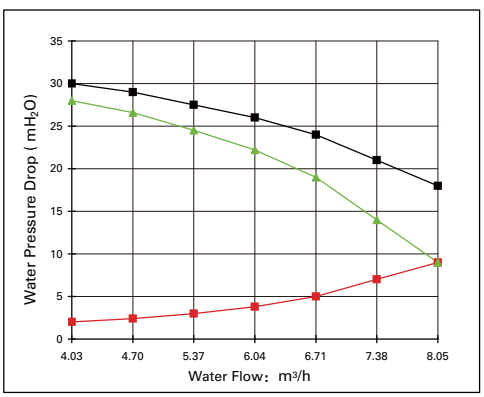
CGAR0755



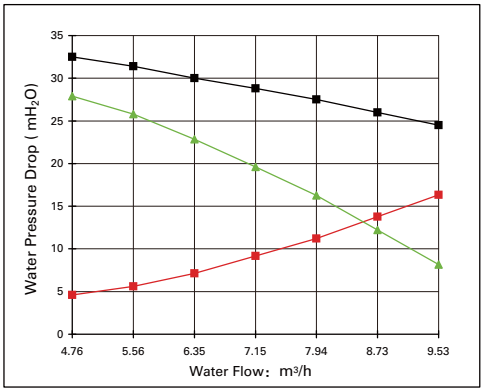
CGAR1005



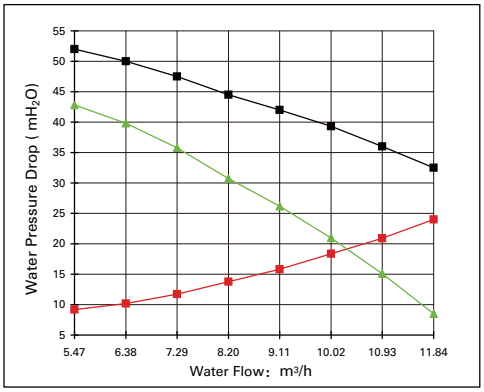
CGAR1205



CGAR1505



CGAR2005



Pump Head　Internal Pressure Drop　Allowable External Pressure Drop

Unit Settings

Before starting or debugging of the water chiller, please configure the functional parameters and operation parameters of the water chiller as per the following methods firstly. Function setting of the water chiller is mainly conducted through jumper, dial switch and system bit. Incorrect settings will result in misoperation of water chiller and even not running.

Jumper settings

Jumper JP1 is used for control in software version, and software download can be conducted with the JP1 removed; if short circuit is made to JP1, the system will operate normally.

Dial switch settings

Dial switch SW1 is used for encoding the centralized control address bit, and it is used for setting the address of each water chiller in networking control. Dial switch SW2 is used for definition of the water chiller's main functions, each bit definition of which is in the following table, wherein, Bit3 and Bit4 are only valid for the water chiller with double compressors.

Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8
Mode		C/H	Fan	type		EnSave	Control

Mode:

00 Normal operation mode　01 Computer supervision mode

10 System self-checking and configuration mode　11 On-site commissioning mode

C/H:

0 "external refrigeration/heating switch" invalid　1 "external refrigeration/heating switch" valid

Fan:

0 single fan　1 double fans

Type:

00 heat pump + electric heating　01 single refrigeration method + electric heating

10 single refrigeration method + electric heating　11 single refrigeration method

EnSave:

0 routine　1 two-way valve interlock

Control:

0 single machine control　1 module control

System position setup

System bit is a byte of memory. It can be set through a wire controller (to input "as password). Each bit is defined as below:

Bit8	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1
Temp	Flow	void	Ambient	Mode	Defrost	Pulse	Auto

Auto: (50)

0 Power-on manual start (default)

1 Power-on auto start (in the event of power failure)

Defrost: (51)

0 "Manual defrost" in vain (default)

1 "Manual defrost" in force

Flow: (52)

0 "Water switch mode" in vain (default)

1 "Water switch mode" in force (to give an alarm in 30S upon stop of water pump if switch is in closure)

Ambient: (53)

0 Ambient thermo probe in vain (default)

1 Ambient thermo probe in force

Temp: (54)

0 "Suction temperature" in force (default, new Koolman)

1 "Suction temperature" in vain (old Koolman)

Operating parameter setting

The protection and operation parameters of the water chiller can be set through the controller in a shutdown state. Default parameters are set as below:

Parameter setup	Maximum value	Minimum value	Regulation precision	Factory setting
Refrigerating return water temperature	25℃	5℃	1℃	12℃
Heating return water temperature	50℃	25℃	1℃	40℃
Winter antifreezing temperature	5℃	1℃	1℃	3℃
Defrost interval	90min	30min	1min	45min
Minimum running time of defrost	8min	1min	1min	3min
Password input range	75	50	-	50

NOTICE:

a. It is recommended that refrigerating return water temperature be kept as factory setting; otherwise low temperature setting may lead to low outlet water temperature and cause an antifreezing alarm.

b. In case actual water flow is less than 70% of rated flow, refrigerating return water temperature setting shall be at least , otherwise the addition of antifreezing agent into water system is necessary (volume concentration of ethylene glycol in the water system is not lower than 15%).

c. To prevent antifreezing alarm at low refrigerating return water temperature setting, please increase the addition of antifreezing agent or use a large flow water pump in the water system. Please consult Trane after-sales service personnel to modify the antifreezing setting.

Running Operation of the Water Chiller

Starting procedures

- Switch the water chiller power on, press MODE button on the control panel to choose refrigerating or heating, and then press ON/OFF button to start the water chiller operation.
- Keep the water chiller operating for more than 30MIN, and when system operation is stable, check the following items to ensure the normal operation of the water chiller:
  1. Check whether the water flow and pressure of the water chiller are stable in a normal range.
  2. Test high and low pressure of the water chiller. During normal operation, low pressure shall be 85-145psig (0.586-1.0MPa), while high pressure shall be 2.290-500psig (2.0-3.45MPa).
  3. Check current of compressor.
  4. Check power supply.
  5. Check whether there is water in the sight glass of liquid line.
  6. Test system superheat degree. Under ARI circumstances (inlet water temperature at , outlet water temperature at and ambient temperature at), normal system superheat degree of each circuit is 5. In case superheat degree of any circuit measured is beyond this range, superheat setting of expansion valve shall be appropriately regulated. In such case, the new setting shall be stabilized in 15-30min.
  7. Under ARI circumstances, the normal system supercooling degree of each circuit is 5. In case supercooling degree of any circuit measured is beyond this range, necessary regulation shall be carried out following the check of supercooling. In the case of normal superheat but abnormal supercooling, please contact professional maintenance personnel.
  8. In the case of inadequate cooling agent exhibited through running pressure, sight glass, superheat degree and supercooling degree, leak points shall be identified, and gaseous cooling agent shall be charged to the circuit. During the water chiller operation, cooling agent is filled from low pressure line till normal working pressure becomes available. Low running pressure gives an indication of low supercooling degree, meaning inadequate cooling agent.
  9. In case working pressure reveals excessive cooling agent, cooling agent shall be reclaimed from liquid line little by little (so as to reduce loss of refrigerant oil as far as possible).
- Ensure that all temperature sensors are correctly located with their capillary tubes firmly fixed so as to prevent vibration and abrasion.
- Check the water chiller, and clear away wastes, tools and parts. Secure all sheet metal parts of the housing, including control panel and compressor access panel, and restore all screws.

Cautions:

⚠CAUTION:

- **In winter, close water supply valve of all evaporators, open drain valve and the vent valve in the pipeline of the water chiller so as to discharge water from the evaporator, and mount a drain plug. Regarding to ultra-thin top cooling fans, completely release water in the pipeline by a drain valve, and then open the bottom drain valve to remove all residual water in the evaporator. In case water in the cold water pipe cannot be completely discharged, proper antifreezing solution can be injected so as to prevent freezing of residual water that may lead to damage of the water chiller.**

Long-term shutdown

- For long-term shutdown, the following procedures shall be carried out before system halt:
  1. Check whether cooling agent piping leaks, and if so, be sure to have it repaired.
  2. Maintain water pump and air conditioning plant as proposed by manufacturer.
  3. Discharge all circulating water from the system, unscrew dewatering outlet in the water supply and return circuit, dismantle side panel of the water chiller, and unscrew the dewatering outlet in the bottom of water pump and plate type heat exchanger so as to ensure complete discharge of circulating water.
  4. Turn off power switch of the water chiller and water pump.

⚠CAUTION:

- **In winter, close water supply valve of all evaporators, open drain valve and the vent valve in the pipeline of the water chiller so as to discharge water from the evaporator, and mount a drain plug. Regarding to ultra-thin top cooling fans, completely release water in the pipeline by a drain valve, and then open the bottom drain valve to remove all residual water in the evaporator. In case water in the cold water pipe cannot be completely discharged, proper antifreezing solution can be injected so as to prevent freezing of residual water that may lead to damage of the water chiller.**

Restarting the system after long-term shutdown

1. Open the valve of the water return and supply pipeline, and charge clean water into the cold water pipeline. Be sure to exhaust at the time of water charge, and close the vent valve when the system is full of water.
2. Bring connection of flow switch into short circuit so as to measure the water system.
3. Switch on power switch of the water chiller.
4. Press ON/OFF button on the control panel to start the water chiller. When cold water is circulated in the water system, check whether there is any piping joint leaking.
5. Regulate flow of the cold water pipeline by a balance valve, and check the water pressure of the water chiller.
6. Regulate the flow switch (arranged in the water discharge pipe of the water chiller), so as to ensure normal running.
7. Press ON/OFF button on the control panel to stop the water chiller.
8. Restore connection of the flow switch.

In this way, the water chiller can run normally at once.

⚠CAUTION:

- **During water pump operation, regulate water flow to half of maximum flow, and disconnect the contact of the flow switch. Please use ohmmeter to verify if the connection point of the switch is open or close.**

System protection

Low voltage protection (LP1, LP2)

A low voltage switch is provided to protect the water chiller. When the operation voltage is below 21±7psig(1.145±0.048MPa), compressor operation is stopped, and when it reaches 36±7psig(0.248±0.048MPa), compressor operation is automatically restored. Two-minute short circuit is necessary for starting up, in case of unnecessary trip.

High voltage protection (HP1, HP2)

A high voltage switch gear is provided to protect the water chiller. When high voltage exceeds 602±22psig(4.15±0.15MPa), compressor operation is stopped, and when the pressure is dropped to 479±22psig(3.303±0.152MPa), compressor operation is automatically restored.

Antifreezing function in winter

In winter, when the water chiller is in a standby state, if water temperature is below the winter antifreezing temperature setting, the water chiller automatically will enter antifreezing operation, displaying "AP". Therefore, the water chiller power supply in winter shall be switched on even if the water chiller is in a standby state.

Antifreezing of plate type heat exchanger

In a refrigeration state, in case outlet water temperature is below , compressor shall be closed, and water pump shall continue to run, displaying "E3".

High voltage protection of plate type heat exchanger

In the case of heating by a single compressor system, when cooling agent pressure at plate side is over a certain value, the fan or both the fan and compressor shall be closed, displaying "E.

Overload protection of motor

- Compressor motor overload and superheat protection
- Water pump motor overload protection
- Fan motor superheat protection
- Thermo probe protection

  In case the thermo probe fails, an alarm will be sent and the system will be halted.

  * As all alarm protection is subject to manual reset, before the system is restored by pressing the RESET key or being restarted, the failure needs to be eliminated firstly.

Flow protection

In order to prevent too low water flow that may lead to freezing of the evaporator, a flow switch (or any other flow sensing device) shall be arranged in the water pipe of the evaporator. Its setting shall meet the requirement that when water flow is below 70% of total design flow of the system, compressor shall be stopped immediately.

Running operation of the water chiller

Thermo probe (TH1)

Thermo probe (TH1) senses inlet water temperature of the system as a basis of starting or stopping the compressor under cold and hot states.

Cooling mode:

Dual system

When the system is started, the water pump shall run at once. After a period of 2MIN, the water pump continues to run. When return water temperature reaches or more, No.1 compressor will be started. In one minute, No. 2 compressor will be started provided return water temperature is more than . On condition that the cooling requirement is met, and return water temperature is lowered to , No. 1 compressor will be stopped. In case return water temperature continues to lower to , No. 2 compressor will also be stopped. Later on, as load is increased and return water temperature is raised to , No. 1 compressor will be started again. In case return water temperature continues to increase to , No. 2 compressor will also be started. The water pump will not stop unless the water chiller is shut down.

Single system

When the system is started, the water pump shall run at once. The water pump continues to run after 2MIN; and in case return water temperature is over , the compressor will be started. On condition that the cooling requirement is met, and return water temperature is lowered to , the compressor will be stopped. Later on, as load is increased and return water temperature is raised to , No. 1 compressor will be started again. The water pump will not stop unless the water chiller is shut down.

Heating mode:

Dual system

When the system is started, the water pump shall run at once. 2min later, the water pump remains in operation; if return water temperature is below , No. 1 compressor will be started. 1MIN later, if return water temperature is below, No. 2 compressor will be started. If the heating requirement is met and return water temperature is increased to , No. 1 compressor will be stopped; and if return water temperature continues to rise to, No. 2 compressor will also be stopped. Later on, load is changed; if return water temperature is lowered to , No. 2 compressor will be started; and return water temperature continues to drop to , No. 1 compressor will also be started. The water pump will not stop unless the water chiller is shut down.

Single system

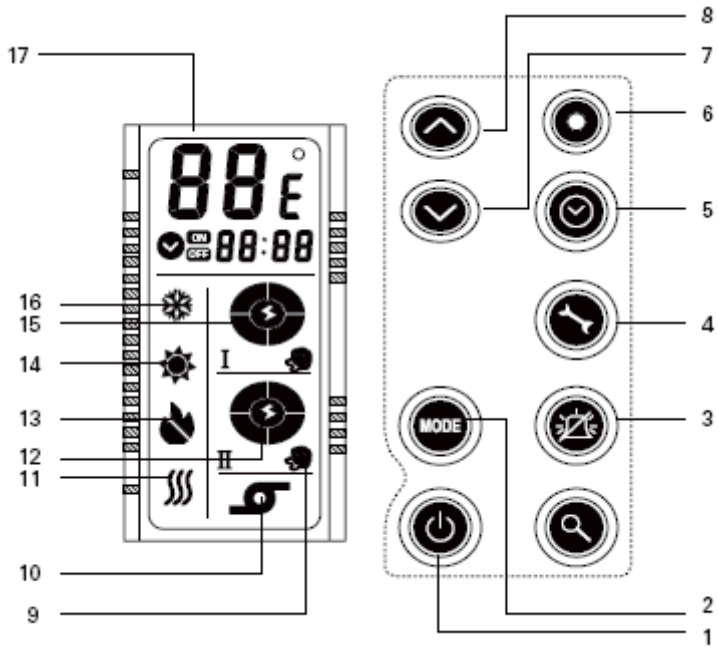
Operation of water pump, fan and compressor of single system is the same as that of dual system. The only difference is that when return water temperature of single system is below , the compressor will be started, and when return water temperature of single system is over , the compressor will be stopped.

Ambient temperature operation limit

Outdoor ambient temperature		
Cooling mode		Heating mode
mini	21℃	-7℃
max	43℃	21℃
Leaving water temperature		
Cooling mode		Heating mode
mini	5℃	40℃
max	15℃	50℃

Controller

Wired controller



Operation and display panel

Control panel

1. On/Off button
2. Mode button, controlling refrigeration and heating. Mode setting must be carried out in a shutdown state.
3. Fault resetting button, pressed for manual resetting when a failure alarm is given.
4. Parameter setting button, pressed to perform parameter setting (password is necessary).
5. Time browse/setting/timing setting button, specifying timed on/off time as 00:00-23:59.
6. Timing function option button
7. Setting button, the two buttons are pressed to examine or modify parameter setting.

Display panel

8. Defrost display
9. Water pump start display
10. Antifreezing function start display
11. Second compressor start display
12. Electric heater start display
13. Water chiller heating display
14. First compressor start display
15. Water chiller refrigeration display
16. Temperature or parameter display window

Operation instructions of the panels

1. On/off operation

Firstly choose the wanted mode, then press the key to run this mode, and again press the key to close the system.

Frequent on/off operation is strictly prohibited.

2. Mode selection

The modes of refrigeration and heating must be set in a shutdown state.

3. Parameter browse

Parameters to be browsed cover refrigerating return water temperature, heating return water temperature, winter antifreezing temperature, defrost interval and running time of defrost. By double control of the key, the five parameters can be browsed.

4. Outlet water temperature display

When the system is on, upon pressure of the mode key, the LCD displays outlet water temperature for 6 seconds by flashing.

5. Fault resetting operation

When the system is out of order, an alarm sounds for 2 seconds with backlight flashing. Press the key to remove the failure and stop alarming. If the failure cannot be removed, the alarm continues to sound for 2S with backlight flashing.

6. Parameter setup

Parameter setting refers to separate setting of the above five parameters according to user requirements. "、" key is involved. It functions as increase and decease.

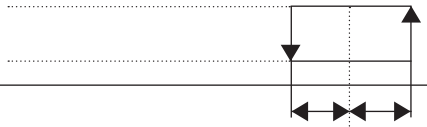
7. Normal state display

In a power-on state, current return water temperature, as well as working conditions of compressor, heater and water pump, is displayed. In a timed state, ON lights for timed start, and OFF lights for timed shutdown. The five parameters can be set in a shutdown state. If no key is in service, normal state display will be restored in 10S, with backlight stopped in 15S. Backlight flashes upon failed communication.

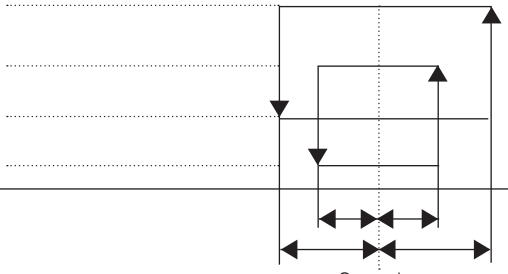
Functional description

Refrigeration state temperature control

Single compressor control

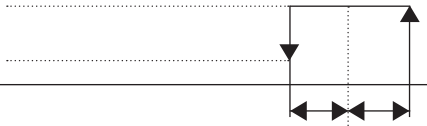
Control action	Low water temperature Change of return water temperature ..... High water temperature
compressor start compressor stop	
Temperature descriptions	Set value
Noting: Control action is performed when temperature reaches the arrow.	

Double compressor control

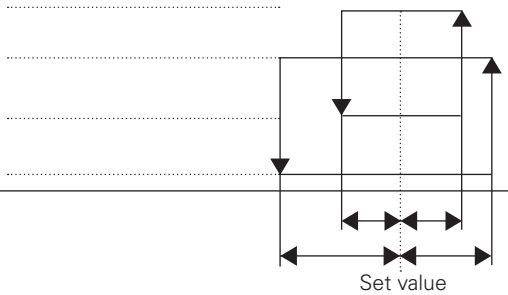
Control action	Low water temperature Change of return water temperature ..... High water temperature
compressor start	
compressor start	
compressor stop	
compressor start	
Temperature descriptions	Set value
Noting: Control action is performed when temperature reaches the arrow.	

Temperature control in the heating status

Single compressor control

Control action	Low water temperature Change of return water temperature ..... High water temperature
compressor start compressor stop	
Temperature descriptions	Set value
Noting: Control action is performed when temperature reaches the arrow.	

Double compressor control

Control action	Low water temperature Change of return water temperature ..... High water temperature
compressor start	
compressor start	
compressor stop	
compressor start	
Temperature descriptions	Set value
Noting: Control action is performed when temperature reaches the arrow.	

Compressor protection time-delay function

When the water chiller is powered on, the compressor needs to be delayed for at least 2MIN. Then when the water chiller is automatically started and stopped, the compressor needs to be delayed for at least 3min.

Electric heating control

When the return water temperature is lower than the set value of (single compressor unit) or when return water temperature is not greater than the set value of (double compressor unit), start the electric heater. When return water temperature is not lower than (set value), stop the electric heater.

Failure analysis and handling method

Failure alarming table

"EE" code is displayed as controller and control panel communication fails.
A total of 13 fault input alarm switches, as well as 1 failure output alarm switch, are provided for single compressor system

S/N	Input port	Fault Description	Type	Code	Troubleshooting
1	TH1	Return water temperature sensing line in short/open circuit	A	SE	All peripherals are to be closed.
2	TH2	Outlet water temperature sensing line in short/open circuit	A	SL	All peripherals are to be closed.
3	TH3	Suction temperature 1 in short/open circuit	A	Sd	All peripherals are to be closed.
4	TH4	Defrost temperature sensing line 1 in short/open circuit	A	S1	All peripherals are to be closed.
5	OVHT/HP2	Electric heating overload	B	H2	The electric heater is to be closed.
6	FLOW	Inadequate water flow	D	FL	All peripherals are to be closed.
7	OV-PUMP	Water pump overloaded	B	OP	All peripherals are to be closed.
8	OV-FAN	Fan overloaded	B	OF	All peripherals are to be closed.
9	OV-COMP1	Compressor 1 overloaded	C	C1	Only compressor 1 is to be shut down.
10	HP1	Compressor 1 high voltage alarming	C	H1	Only compressor 1 is to be shut down.
11	LP1	Compressor 1 low voltage alarming	C	L1	Only compressor 1 is to be shut down.
12	///	Refrigerating outlet water temperature is too low.	D	E3	The compressor is to be shut down, while the auxiliary heater of water pump is to work.
13	///	Suction temperature is too low.	D	E4	The compressor is to be shut down, while the auxiliary heater of water pump is to work.

A total of 17 failure input alarm switches, as well as 1 fault output alarm switch, are provided for dual compressor system

S/N	Input port	Fault Description	Type	Code	Troubleshooting
1	TH1	Return water temperature sensing line in short/open circuit	A	SE	All peripherals are to be closed.
2	TH2	Outlet water temperature sensing line in short/open circuit	A	SL	All peripherals are to be closed.
3	TH3	Suction temperature 1 in short/open circuit	A	Sd	All peripherals are to be closed.
4	TH4	Defrost temperature sensing line 1 in short/open circuit	A	S1	All peripherals are to be closed.
5	TH5	Defrost temperature sensing line 2 in short/open circuit	A	S2	All peripherals are to be closed.
6	TH6	Suction temperature short/open circuit	A	S3	All peripherals are to be closed.
7	OVHT/HP2	Compressor 2 high voltage alarming	E	H2	Only compressor 2 is to be shut down.
8	FLOW	Inadequate water flow	D	FL	All peripherals are to be closed.
9	OV-PUMP	Water pump overloaded	B	OP	All peripherals are to be closed.
10	OV-FAN	Fan overloaded	B	OF	All peripherals are to be closed.
11	OV-COMP1	Compressor 1 overloaded	C	C1	Only compressor 1 is to be shut down.
12	OV-COMP2	Compressor 2 overloaded	E	C2	Only compressor 2 is to be shut down.
13	HP1	Compressor 1 high voltage alarming	C	H1	Only compressor 1 is to be shut down.
14	LP1	Compressor 1 low voltage alarming	C	L1	Only compressor 1 is to be shut down.
15	FREZ/LP2	Compressor 2 low voltage alarming	E	L2	Only compressor 2 is to be shut down.
16	///	Refrigerating outlet water temperature is too low.	D	E3	The compressor is to be shut down, while the auxiliary heater of water pump is to work.
17	///	Suction temperature is too low.	D	E4	The compressor is to be shut down, while the auxiliary heater of water pump is to work.

A. Compressor cannot be started, but remains silent.

"EE" code is displayed as controller and control panel communication fails.
A total of 13 fault input alarm switches, as well as 1 failure output alarm switch, are provided for single compressor system

Possible cause	Solution
The power is not connected.	Check the following items: a. Main power switch is off. b. Fuse blows.
No refrigerating instruction is available.	Check the following items: a. Main power switch is off. b. Fuse blows. Check the following items: a. Thermo probe is damaged. b. Control wiring is disconnected or improper. c. Control power fuse blows.
Microcomputer outputs no compressor control signals.	Check the following items: a. High voltage switch trips as a result of excessive high- voltage. b. High voltage switch fails. c. Low voltage switch trips as a result of insufficient coolant. d. Flow switch or antifreezing switch trips as water valve is not switched on. e. Internal protection contact of fan trips. f. Microcomputer controller goes wrong.
Electromagnetic switch of compressor fails in exciting.	Check the following items: a. Poor function of compressor contact b. Poor wiring c. Open circuit of low voltage switch
Internal protection contact of compressor trips.	Check the following items: a. Check compressor current. b. Await restoration of internal contact (for about 10-20MIN).

B. Compressor cannot be started, but makes a sound.

Possible cause	Solution
Too low compressor voltage	Check the following items: a. Some fuses blow. b. Too low power voltage c. Electromagnetic contactor of compressor goes wrong. d. Loose wiring
Compressor failure	Check the following items: a. Motor winding is in open circuit. b. Phase current is excessive.
Starting voltage is inadequate (single phase type).	Check the following items: a. Poor starting of capacitor b. Poor starting of relay

C. Compressor 2 cannot be started.

Possible cause	Solution
No refrigeration or heating signal is available.	Check the following items: a. Temperature switch is damaged. b. Control wiring is disconnected or improper.
Microcomputer outputs no compressor control signals.	Please refer to the third item in Section A.
Electromagnetic switch of compressor fails in exciting.	Please refer to the fourth item in Section A.

D. Too short running period of compressor

Possible cause	Solution
Control circuit is intermittently connected.	Check the following items: a. Poor contact of contactor d. Loose wiring connection

E. Compressor runs without stop

Possible cause	Solution
Power of the water chiller is not enough to bear a load (unloading water temperature cannot be provided).	Check causes that lead to excessive load.
Poor thermo probe or control line	Change the thermo probe. Change or repair the control line.
Electromagnetic contactor of compressor goes wrong.	Repair or change the electromagnetic contactor.
Valve block of compressor leaks (low discharge pressure or high suction pressure)	Change the compressor
Insufficient coolant (low capacity, too high superheat degree, too low superheating degree, and low low-pressure pressure)	Identify leak points of coolant, repair, and fill with coolant.

F. Motor winding of compressor is in open circuit.

Possible cause	Solution
Too high evaporator load (high return water temperature)	Check the following items: a. Excessive water flow b. Tool high return water temperature
Inadequate motor cooling (too high superheat degree)	Check the following items: a. Improper setting of expansion valve b. Failure of expansion valve c. Blocked liquid line
Improper compressor voltage	Check the following items: a. Too low or unbalanced power voltage b. Loose power wiring c. Poor electromagnetic contactor of compressor
Internal parts of compressor are damaged.	Change the compressor

G. Too high noise of compressor

Possible cause	Solution
Internal parts of compressor are damaged or broken (compressor sounds like striking).	Change the compressor
Liquid backflow (low pressure pipe is abnormally cold and presents low superheat degree)	Check and regulate superheat degree
Liquid coolant is available in the compressor when the compressor is started (compressor housing is abnormally cold).	Check whether the coolant is excessive.

H. Inadequate air cooling capacity

Possible cause	Solution
Insufficient coolant (low superheat degree and supercooling degree)	Supply coolant.
Blocked dry filter (temperature from coolant pipe to dryer room is changed)	Change the dry filter
Improper regulation of expansion valve	Regulate the expansion valve again.
Blocked expansion valve (too high superheat degree and too high water temperature)	Repair or change the expansion valve.
Too low water flow of evaporator	Check the filter screen and regulate water flow.
Non-condensed gas in the system	Vacuumize the system and re-fill it with the coolant.
Leak of compressor valve and high suction pressure (high high-pressure pressure, and low low-pressure pressure)	Change the compressor

I. Too low suction pressure

Possible cause	Solution
Insufficient charge of coolant (high superheat degree and low supercooling degree)	Identify the leak point, repair it, and recharge the coolant.
Too low setting of temperature switch (too low low-pressure pressure and too low outlet water temperature)	Regulate the temperature switch again.
Too low cold water flow	Check whether the filter screen is blocked and whether the balance valve is correctly set.
Blocked dry filter	Check whether the dry filter is frosted, and if necessary, change it.
Blocked expansion valve (high superheat degree)	Clean or change the expansion valve.

J. Too high suction pressure

Possible cause	Solution
Too high cooling load (high supply water temperature)	Please refer to Section E.
Excessive liquid feed of expansion valve (too low superheat degree, leading to overflowing of liquid onto the compressor)	Regulate superheat setting and check whether the thermo probe is mounted in the gas line.
Rupture of air suction valve (high noise of compressor)	Change the compressor

K. Too low discharge pressure

Possible cause	Solution
Inadequate coolant (high superheat degree, low supercooling degree and air bubbles in the sight glass)	Identify the leak point, repair it, and recharge the coolant.
Rupture or leak of vent valve of compressor	Change the compressor
Poor low voltage switch	Change the poor control element.
Ensure minimum operating environmental temperature.	Exercise proper discharge pressure control or provide an ambient temperature locking switch

L. Too high discharge pressure

Possible cause	Solution
Insufficient of excessive cooling air, flow choking	Clean the coiler and check whether fan and motor are normal.
Air or non-condensed gas present in the system (abnormally hot condenser)	Vacuumize the system and re-fill it with coolant.
Excessive coolant (high supercooling degree, low superheat degree, and high suction pressure)	Reclaim redundant coolant.
Too high system load	Lower the load.
Poor pressure control over condensation fan or fan (a certain fan fails, and too high pressure of condenser)	Repair or change the switch.

M. The water chiller cannot function in heating (CGAR).

Possible cause	Solution
Wrong or poor control line	Check the control line.
Four-way valve failure	Change the four-way valve.

N. Excessively low pressure—heating condition

Possible cause	Solution
Insufficient coolant	Replenish coolant.
Too low or too cold of air entering the coiler	Clean the coiler and check whether fan and motor are normal.
The water chiller is operated at a temperature below minimum operating environmental temperature.	Provide an environmental temperature disconnecting switch.
Expansion valve failure	Change the expansion valve.

K. Too low discharge pressure

Possible cause	Solution
Too high cooling load (high supply water temperature)	Check whether the filter screen is blocked and whether the balance valve is correctly set.
Too low water flow	Check whether the filter screen is blocked and whether the balance valve is correctly set.

Trane optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, Trane offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts.
For more information, visit www.Trane.com.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

PKGP-SVX03A-EN March 2014