Maintenance Manual

Modular Air-cooled Water Chiller (Heat Pump)

CXAJ/CGAJ065~130

R410A

⚠SAFETY WARNNING

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 pers on 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.

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CG-SVM002A-EN

Contents

Safety Precautions

⚠ **WARNINGS** — There will be a risk of serious damage to the air conditioning unit or casualty if the manual is not strictly followed.

⚠ **NOTICE** — If the manual is not strictly followed, there will be a risk of light or moderate damage to the air conditioning unit, property damage, personal injury or environmental pollution. It also provides useful help information which may be beneficial to the operation of the unit or to the service life extension of the unit. However, it does not indicate that the help information is optimal or directly related to the improvement of unit operation.

⚠ WARNINGS

- All installation procedures of the air-conditioning unit shall conform to the national and local regulations.
- For the installation of the equipment, please consult with the local sales office. Professional technicians with the installation certificate of air conditioning unit shall be required to install the air conditioning unit. Users shall not install, repair or move the air conditioning unit. If the users construct by themselves, leakage, electric shock or fire may be caused.
- Before installation or maintenance, lock the power supply and the cut-off switch of the unit in the power-off state to avoid personal injury caused by electric shock or contact with a moving part.
- Please set up a dedicated circuit. The fluctuation of voltage supply shall not exceed 10% of the rated voltage. The power supply line must be separated from the welding transformer, which will cause large voltage fluctuation.
- Professional electricians with certificates shall be required to strictly carry out installation operations in accordance with the national power standards and the regulations of the local power department, inspect whether the line capacity meets the requirements and whether the power line is loose or damaged.
- The cover plate of the electric cabinet must be firmly installed to prevent dust, water and other foreign matters from entering. The electrical part must be moisture-proof and away from water source, or it will cause electric shock, fire and other accidents.
- Please use the fuse with correct current strength. Do not use temporary substitutes, such as a piece of wire. This may not only damage the unit itself, but also cause fire.
- The power supply and electric auxiliary heating power supply of the unit must be equipped with leakage protection devices, and the earth wire must be connected, otherwise there will be injuries or even casualties and other accidents in the absence of protection.
- All electric auxiliary heating wires shall be connected in accordance with the wiring diagram. Directly energizing the electric auxiliary heating wires will lead to the failure of some control functions of the unit and damage the unit.
- Please strictly follow the wiring diagram in this manual. Incorrect wiring or manual wiring change will cause unit failure, damage or personal safety.
- When cleaning the unit, do not sprinkle water directly on the unit, which may cause electric shock.
- Cut off all power supplies before contacting the wiring device.
- Before maintenance, please confirm that the unit is in the power-off state.
- Maintenance can only be carried out by professional maintenance personnel. For maintenance and repair, contact Trane sales office. Improper maintenance and repair may result in water leakage, electric shock or fire.
- Do not use flammable materials (e.g. hairspray or pesticides) near this product. Do not clean the product with organic solvents such as paint thinner.
- Cracks, electric shock or fire may be caused if organic solvents are used.
- Optional accessories shall be installed by professionals. Be sure to use the optional accessories designated by the company. Improper.
- Do not use unqualified refrigerants, refrigerant substitutes or refrigerant additives. Incorrect use method or use of unqualified refrigerants, refrigerant substitutes or refrigerant additives will cause damage to the unit and various safety risks. Please select qualified refrigerant or call 8008208676 to purchase qualified refrigerant. All technicians operating refrigerants must be certified, and be familiar with and strictly comply with the relevant technical requirements, laws and regulations regarding the use, handling, recovery and recycling of refrigerants.
- No open flames are allowed when the refrigerant leaks. If the air conditioning unit fails to refrigerate or heat properly, the refrigerant may leak. Contact Trane sales office at this time.
- The refrigerant used in the air conditioning unit and will not leak in normal conditions. In case of indoor refrigerant leakage, toxic gases will be produced after the refrigerant is in contact with the flame of heater, electric furnace and stove. Please extinguish the fire of the burning appliances, ventilate the room and contact Trane sales office.

- When the unit is repaired in case of refrigerant leakage, please operate the machine after the maintenance personnel confirm that the leakage repair is completed.
- Do not start the air conditioning unit when the panel or protective net is removed. Rotating parts in the air conditioning unit may injure people or other articles.
- Prevent objects, such as sticks, sand or stones, from entering the air inlet or outlet grid. The fan rotates at high speed and is very dangerous. Special care must be taken of children.
- The strength of ordinary air conditioner support may not be suitable for this product. Please choose the support according to the weight design of the unit. The support with insufficient bearing strength will cause great safety accidents and hidden dangers.
- In the seasons with frequent use of air conditioning unit and if the machine stops using for a short period of time in winter, please keep the machine in the power-on state to ensure that the machine can be normally ant freezing.Otherwise, the machine may be frozen to be out of service.
- If the system is powered on for the first time or used after the power supply is cut off for a long time, it shall be powered on for 24 hours before starting up, so as to ensure that the unit is fully preheated, otherwise it may cause the burning of compressor.
- In the season when the air conditioning unit is not used for a long time, please cut off the main power supply of the system to extend the service life of the unit and save electrical energy.

⚠ NOTICE

- Do not touch the fins of the heat exchanger. Otherwise, it may damage the fins to cause the reduction of machine performance or cut fingers.
- After the installation, the air tightness test shall be carried out on the pipeline to check whether the pipeline leaks.
- Do not touch the refrigerant pipeline during or immediately after the operation of the unit. When the air conditioning unit runs, the pipeline may be very hot or cold, leading to burn or frostbite.
- Do not sit on the direct air duct for a long time. Long-time sitting on the direct air port not good for your health.Special attention should be paid when you sleep or there is an infant, the elderly or the sick in the room.
- Do not place the heating device or other heat sources under or near the air conditioning unit. The machine body will be deformed after being heated.
- Whenever you operate the unit, make sure the air filter is properly installed. Otherwise, dirt may enter into the internal moving parts and cause damage.
- Do not block or cover the inlet or outlet grid. This may cause performance degradation and affect the normal running ability.
- The chassis of the outdoor unit is provided with a defrosting waterspout ensure the smooth water drainage of the unit.
- It is recommended that the snow shade be installed for the outdoor unit to ensure the better operation of the machine on snowy days. installation may cause water leakage, electric shock and fire.

1 Limitations and Warnings

1-1. Unit Application Range

Temperature Range	Ambient Temperature	Leaving Water Temperature
Cooling	18℃ ~ 46℃	5℃ ~ 15℃
Heating	-15℃ ~ 25℃	30℃ ~ 50℃

1-2. Notes for Long-term Shut Down Between Seasons

- The unit should be connected to power to prevent freezing if it is shut down for a short period of time between seasons.
- For long-term shut down, the unit should be disconnected to power and drain the water inside the unit, water tank and pipeline,and turn off the water discharge valve after the water is drained. Long time exposure to freezing environment would damage the water storage tank and pipeline.

1-3. Notes for Starting the Unit

- When starting the unit for the first time or after long-term shut down, user should connect the main power switch at least 24hours in ad vance to warm up the compressor.
- Do not disconnect the main power switch of the unit when the unit is turned off in winter, otherwise the anti-freezing function will be invalid and the unit will be damaged.
- The Y type filter in water system must be cleaned on a regular basis.
- Check the water system on a regular basis: confirm the normal operation of exhaust and water refill in water system.
- Make sure the water temperature meets the operation requirements.
- The air condition water pipeline and hot water pipeline must go through pressure test to ensure there is no water leakage.

1-4. Inspections before Start-up

1.Water pipeline inspection

Before starting the unit, make sure the pump can run normally and there is no leakage in the pipeline.

2.Air exhaust of water pipeline

Before starting the unit, make sure to exhaust the air in the water pipeline as below:

- Open the valve on the water pipeline.
- Open the pump.
- Open the air exhaust value at indoor end and the air exhaust value on the water pipeline.
- When the reading of the water pressure gauge of air condition water pipeline is above 2 bar and the pointer stops vibrating and there is no air coming out of the air exhaust valve, the air exhaust is completed.

3.Parameter setup

- User parameter setup table

Control by leaving water temperature

No.	Parameter Setup	Maximum Value	Minimum Value	Adjustment Precision	Factory Setting
1	Set temperature for cooling℃	25	5	1	7
2	Set temperature for heating℃	50	25	1	45

⚠ WARNINGS — It is prohibited to conduct parameter change without the guidance from professionals. Wrong parameter changes can cause freezing damage to the unit or lead to abnormalities such as frequent protection.

- Voltage range

  The power supply of the unit must comply with the operation power specified on the nameplate of the unit. The power supply must meet the demand of the unit, with allowable fluctuation range of main voltage: ±10%, and maximum phase unbalance: ±2%.

- Water flow

  The flow goes through the unit must meet the basic demand for heat exchange, with as less deviation as possible. If the cold water flow going into the evaporator is too low, it will cause discontinued flow and affect the heat transfer effect which can lead to out of control of expansion valve or abnormal low voltage jumping. On the contrary, if the water flow is too big, the internal parts of the evaporator will be corroded. As for condenser, if the water flow is too low, it will activate high pressure protection or cause excessive air exhaust temperature will can affect the normal operation and reduce the service life of the unit.

  Flow fluctuation range: lower limit=0.60*rated flow; upper limit=1.30*rated flow.

- Water pressure drop

  Make sure the lift of the pump meets the requirement before running the unit. If the actual water pressure drop is too big, please add additional pumps.

- DIP switch setup

  SW1: Function definitions

Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8
Code address					Type	Two-way valve interlock	Control

The default mode is single unit control, if modular control is needed, the bit8 of SW2 should be set to ON; the Bit1-5 of SW1 is set to OFF by default, if modular control is needed, user should set the code on-site as needed.

The Bit1-5 of the switch is used for code address of centralized control. (Note: The modular host of must set to 00)

SW1: Centralized control address setup

Unit Number (Centralized controller shows A0)	SW1 Switch				
	1	2	3	4	5
0 (Centralized controller shows A0)	OFF	OFF	OFF	OFF	OFF
1 (Centralized controller shows A1)	ON	OFF	OFF	OFF	OFF
2 (Centralized controller shows A2)	OFF	ON	OFF	OFF	OFF
3 (Centralized controller shows A3)	ON	ON	OFF	OFF	OFF
4 (Centralized controller shows A4)	OFF	OFF	ON	OFF	OFF
5 (Centralized controller shows A5)	ON	OFF	ON	OFF	OFF
6 (Centralized controller shows A6)	OFF	ON	ON	OFF	OFF
7 (Centralized controller shows A7)	ON	ON	ON	OFF	OFF
8 (Centralized controller shows A8)	OFF	OFF	OFF	ON	OFF
9 (Centralized controller shows A9)	ON	OFF	OFF	ON	OFF
10 (Centralized controller shows AA)	OFF	ON	OFF	ON	OFF
11 (Centralized controller shows AB)	ON	ON	OFF	ON	OFF
12 (Centralized controller shows AC)	OFF	OFF	ON	ON	OFF
13 (Centralized controller shows AD)	ON	OFF	ON	ON	OFF
14 (Centralized controller shows AE)	OFF	ON	ON	ON	OFF
15 (Centralized controller shows AF)	ON	ON	ON	ON	OFF
16 (Centralized controller shows B0)	OFF	OFF	OFF	OFF	ON
17 (Centralized controller shows B1)	ON	OFF	OFF	OFF	ON

18 (Centralized controller shows B2)	OFF	ON	OFF	OFF	ON
19 (Centralized controller shows B3)	ON	ON	OFF	OFF	ON
20 (Centralized controller shows B4)	OFF	OFF	ON	OFF	ON
21 (Centralized controller shows B5)	ON	OFF	ON	OFF	ON
22 (Centralized controller shows B6)	OFF	ON	ON	OFF	ON
23 (Centralized controller shows B7)	ON	ON	ON	OFF	ON
24 (Centralized controller shows B8)	OFF	OFF	OFF	ON	ON

Type: 0 - cooling + heating 1 - cooling only

Two-way valve interlock: 0 - normal 1 - two-way valve interlocking

Note: The function is invalid if “Modular control” is selected

Control: 0 - single unit control 1 - modular control

1–5. Anti–freezing Measures in Winter

If the heat exchanger pipeline at water side is frozen, it will be seriously damaged, namely the heat exchanger will break or leak. Such freezing damage is not covered in warranty, therefore user should take anti-freezing measures.

- If the unit is shut down for standby under low temperature environment (outdoor environment with temperature below 2℃), user should drain the water in the water system.
- During operation, the water pipeline can be frozen if the chilled water target flow controller and the anti-freezing temperature sensor are invalid. Therefore, user must connect the target flow controller according to the wiring diagram.
- During maintenance, the heat exchanger at water side can be frozen when refilling refrigerant to the unit or discharging refrigerant for repair. Therefore, user must keep the water moving inside the heat exchanger or completely drain the water.

2 Nomenclature and Performance Data

2-1. Nomenclature

Model	C	X	A	J	0	6	5	5	B
	1	2	3	4	5	6	7	8	9

Additional options	1	H	S	F	R	A	M	A	A
	10	11	12	13	14	15	16	17	18

Maintenance code	C	X	A	J	0	6	5	5	B	1	H	S	F	R	A	M	A	A
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Digit 1	C = Chiller
Digit 2	X = Heat Pump G = Cooling Only
Digit 3	A = Air Cooled
Digit 4	J = Modular Type
Digit 5,6,7	Model (Cooling Capacity) 065 (65kW) 130 (130kW)
Digit 8	Voltage/Hertz/Phase 5 = 380V/50Hz/3PH
Digit 9	Design Sequence B = R410A
Digit 10	Fan Speed 1 = Single Speed
Digit 11	Energy Efficiency N = Standard Efficiency H = High Efficiency
Digit 12	Controller S = Modular Controller (units ≥ 2) U = Unit Controller (unit = 1) N = None
Digit 13	Service Sequence F = 6th Time
Digit 14	Ambient Temperature R = Standard
Digit 15	Connector Option A = Without 2 pcs. of DN125 rubber connectors B = With 2 pcs. of DN125 rubber connectors
Digit 16	BMS Interface M = Modbus Component N = NONE
Digit 17	Refrigerant Charged A = Without B = With
Digit 18	Option A = Default B = Special Requirement

2-2. Performance Data

Standard-efficiency Model (N type)

	Model		CXAJ065	CXAJ130	CGAJ065	CGAJ130
Cooling	Rated Cooling Capacity	kW	65	130	65	130
	Rated Input Power	kW	21.6	43.2	21.6	43.2
	Rated Operating Current	A	42.0	81.0	42.0	81.0
Heating	Rated Heating Capacity	kW	67	137	-	-
	Rated Input Power	kW	21	41.00	-	-
	Rated Operating Current	A	41.5	74	-	-
Max. Operating	Max. Input Power	kW	29.2	60	29.2	60
	Max. Current	A	55	120	55	120
Compressor	Category		Hermetic scroll			
	No.	Pieces	2	2	2	2
	Rated Cooling Power	kW	10.1	20.0	10.1	20.0
	Rated Cooling Current	A	19.2	38.0	19.2	38.0
	Rated Heating Power	kW	9.5	19.0	-	-
	Rated Heating Current	A	18.5	34.0	-	-
Refrigerant	Category		R410A			
	Charge	kg	13	12.5*2	13	12.5*2
Water Side	Category of Heat Exchanger		High-efficiency shell-tube heat exchanger			
	Rated Water Flow	CMH	11.2	22.4	11.2	22.4
	Water Pressure Drop	kPa	60	70	60	70
	Connections	mm	DN125	DN125	DN125	DN125
Air Side	Category of Heat Exchanger		High-efficiency fin-coil heat exchanger			
	Fan No.	Pieces	2	2	2	2
	Rated Input Power of Fan	kW	0.75	1.5	0.75	1.5
	Rated Current of Fan	A	2.1	3.96	2.1	3.96
	Air Flow	CMH	12000	20000	12000	20000
Unit	Power Supply	V/PH/Hz	380/3N~/50			
	Noise	dB(A)	69	70	69	70
	Net Weight	kg	710	1050	710	1050
	Operating Weight	kg	780	1150	780	1150
Dimension	Length	mm	2145	2400	2145	2400
	Width	mm	1000	1200	1000	1200
	Height	mm	2155	2380	2155	2380

High-efficiency Model (H type)

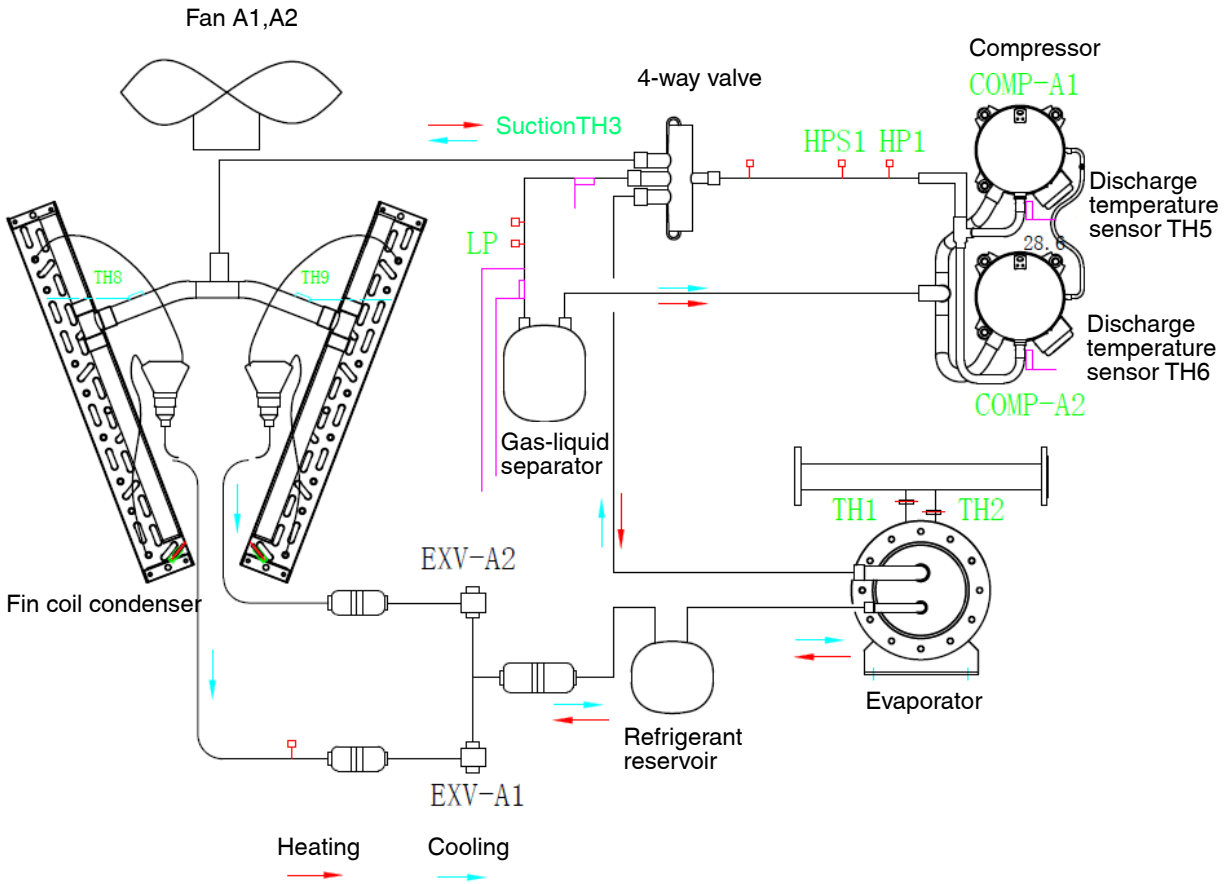
	Model		CXAJ065	CXAJ130	CGAJ065	CGAJ130
Cooling	Rated Cooling Capacity	kW	65	130	65	130
	Rated Input Power	kW	21.0	40.9	21.0	40.9
	Rated Operating Current	A	41	78.0	41	78.0
Heating	Rated Heating Capacity	kW	67	137	-	-
	Rated Input Power	kW	21.5	40.0	-	-
	Rated Operating Current	A	41	71.0	-	-
Max. Operating	Max. Input Power	kW	29.2	57.2	29.2	57.2
	Max. Current	A	55.0	98.2	55.0	98.2
Compressor	Category		Hermetic scroll			
	No.	Pieces	2	4	2	4
	Rated Cooling Power	kW	9.2	9.2	9.2	9.2
	Rated Cooling Current	A	18	18	18	18
	Rated Heating Power	kW	9.1	9.1	-	-
	Rated Heating Current	A	18	18	-	-
Refrigerant	Category		R410A			
	Charge	kg	15	15*2	15	15*2
Water Side	Category of Heat Exchanger		High-efficiency shell-tube heat exchanger			
	Rated Water Flow	CMH	11.2	22.4	11.2	22.4
	Water Pressure Drop	kPa	60	70	60	70
	Connections	mm	DN125	DN125	DN125	DN125
Air Side	Category of Heat Exchanger		High-efficiency fin-coil heat exchanger			
	Fan No.	Pieces	2	2	2	2
	Rated Input Power of Fan	kW	0.75	1.5	0.75	1.5
	Rated Current of Fan	A	2.1	3.96	2.1	3.96
	Air Flow	CMH	12000	20000	12000	20000
Unit	Power Supply	V/PH/Hz	380/3N~/50			
	Noise	dB(A)	69	70	69	70
	Net Weight	kg	730	1150	730	1150
	Operating Weight	kg	800	1250	800	1250
Dimension	Length	mm	2145	2400	2145	2400
	Width	mm	1000	1200	1000	1200
	Height	mm	2155	2380	2155	2380

1. The cooling capacity is measured in the conditions of water outlet at 7℃ and air inlet at the ambient temperatureof 35℃ .
2. The heating capacity is measured in the conditions of water outlet at 45℃ and air inlet at the ambient dry bulb temperature of 7℃ and the wet bulb temperature of 6℃ .

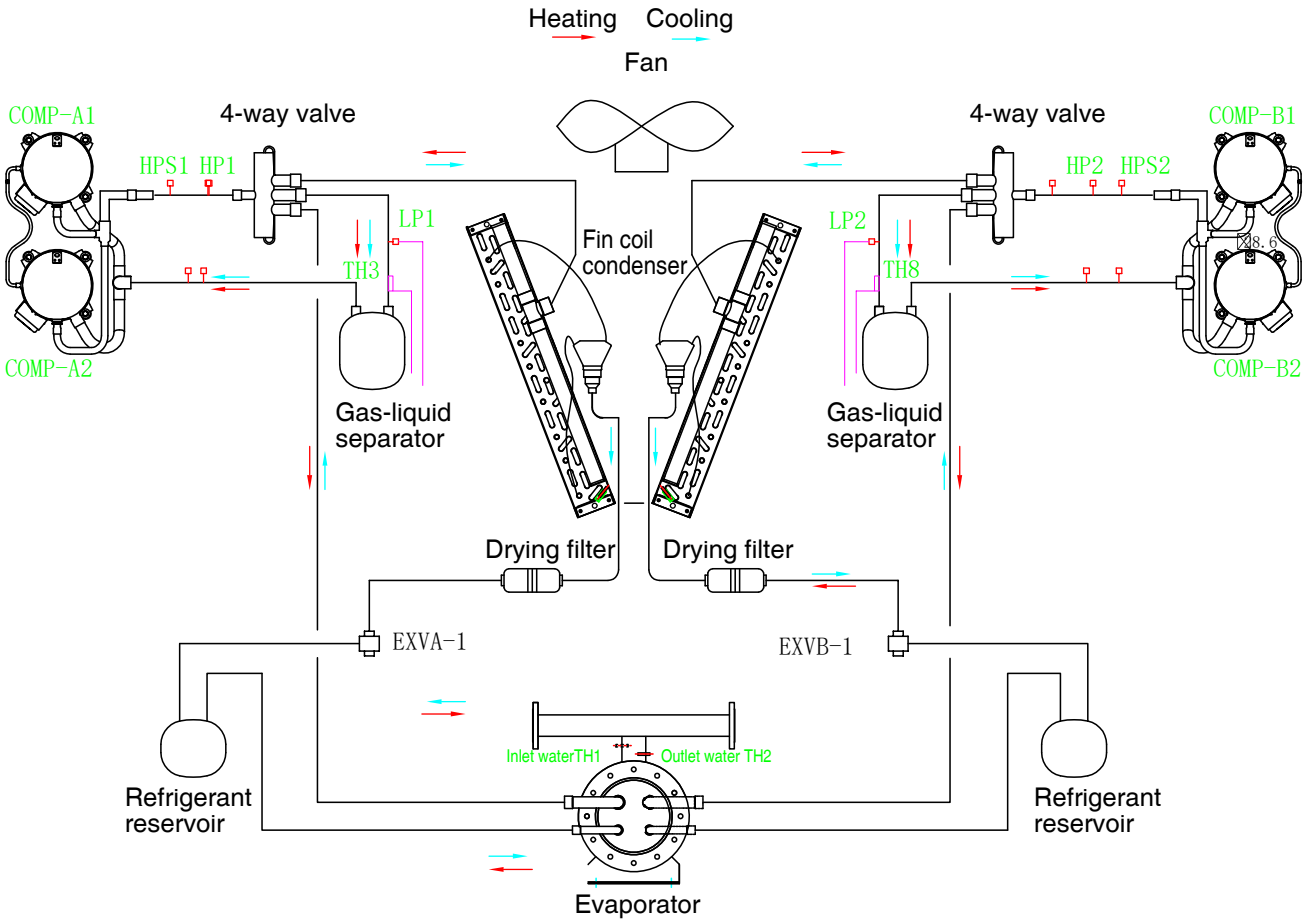
3.Unit Introduction

3-1. Cooling System Diagram

CXAJ065 System Diagram(F-N,F-H)



CXAJ130 System Diagram(F-N,F-H)



Facing control box, left side is system1,right is system 2 close to left of control box is outlet water, right is inlet water for F-N model, single system is one 25HP compressor, while F-H is 2 12HP compressors

Basic configuration:

Model	65	130	65	130
Efficiency	3	3	2	2
Refrigerant	R410A	R410A	R410A	R410A
PCB	Koolman+HW plus			
Structure	Parallel system, compressors can start separately	2 compressors, 2 independent systems	Parallel system, compressors can start separately	
Defrost	Defrost in and out judging condition: pressure			
Compressor	VP144-KFE-420	CH290	VP144-KFE-420	
Evaporator	Water flow: one pipe inlet and one outlet	Water flow: two pipes inlet and two outlet	Water flow: one pipe inlet and one outlet	Water flow: two pipes inlet and two outlet
Condenser	2.5row-7mm	4row-7mm	3row-7mm	5row-7.94mm
EXV	DPF(TS1)3.2C	DPF(O)8.0C	DPF(TS1)3.2C	DPF(O)8.0C

Short circuit chart(search code 142)

Model	Capacity Sequence Efficiency	IND2	IND7	TH4	Controller Code
CX(G)AJ1305B1H***	130-F-H				0
CX(G)AJ1305B1N***	130-F-N			Short circuit	2
CX(G)AJ0655B1H*** CX(G)AJ0655B1N***	065-F-N 065-F-H		Short circuit		3
NA					99

Distinguishing code when electricity on. no influence while unit is running. alarm if it's not a valid code in this chart.

3-2. Main Components and Function Chart

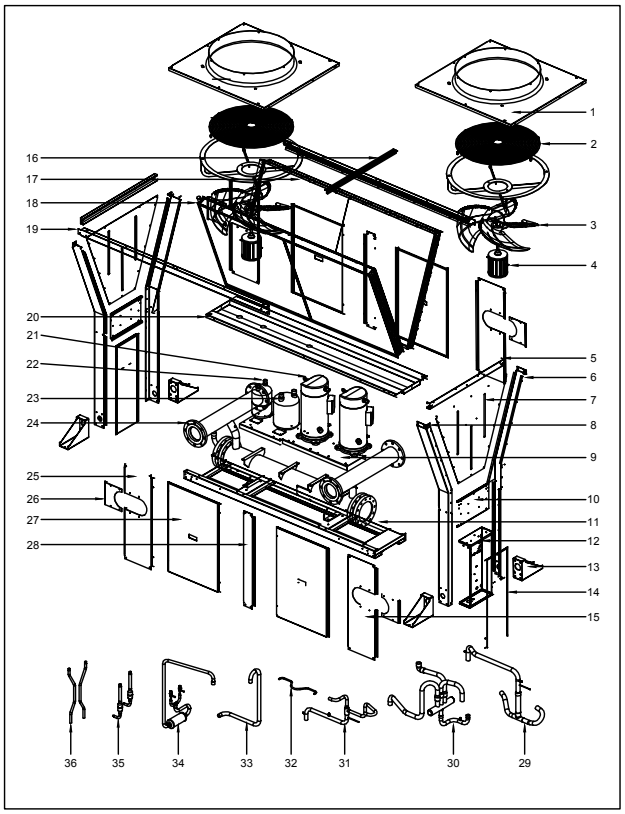
Main Components	Function Description
Compressor	Supply power, compress refrigerant and force to circulate in the system
EXV	Control refrigerant flow rate by adjusting opening through pressure or temperature changes
Fin-coil Heat Exchanger	Heat exchange with outdoor air
Gas-liquid Separator	Separate gas and liquid to prevent liquid hammer to compressor
Shell-tube Heat Exchanger	Exchange heat between refrigerant and water, conduct cooling capacity to indoor unit by water
4-way Valve	Change refrigerant flow way between cooling and heating mode
High Pressure Switch	Prevent compressor discharge pressure over high, acting pressure is 4.2 MPa, recover pressure is 3.3MPa
Low Pressure Switch	Compressor low pressure protection, acting pressure is 0.15MPa, recover pressure is 0.25MPa
Liquid Receiver	Receive liquid refrigerant when heating
Temperature Sensor	Detect temperature as the judging condition of unit operation and adjustment
Filter	Filt impurities to avoid to go into refrigerant system
Liquid Injection EXV	Inject liquid to make sure compressor discharge temperature is normal based on discharge temperature
Liquid Injection Solenoid Valve	Doordinate inject liquid EXV on-off based on discharge temperature

3-3. Unit Appearance and Structure

CXAJ065 (F-N, F-H)

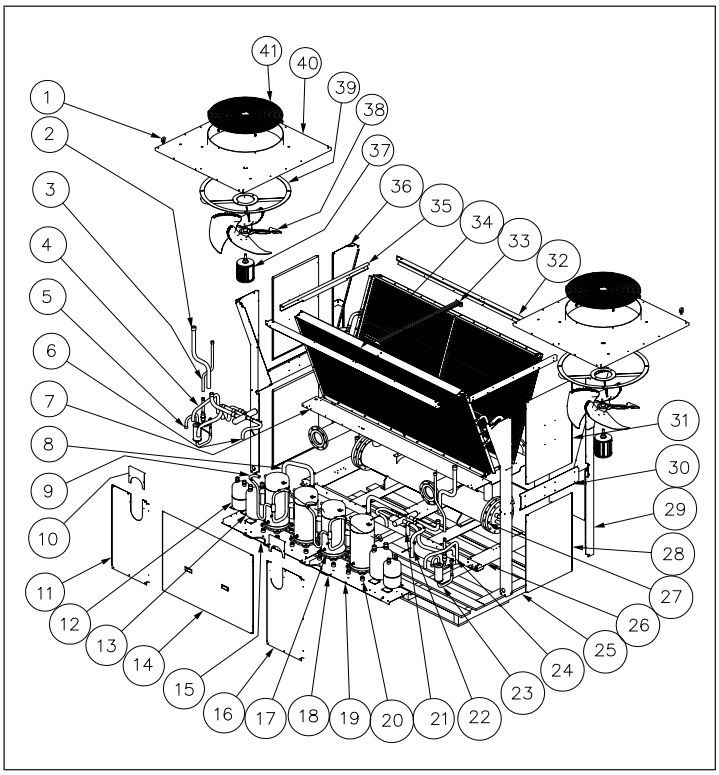
No.	Part	QTY	REMARK
1	Plate of fan	2	
2	Mesh enclosure of fan	2	
3	Fan	2	
4	Motor of fan	2	
5	Top plate C	2	
6	Column support plate A	2	
7	Cover plate D	2	
8	Column support plate B	1	
9	Support plate of compressor	1	
10	Row support plate	2	
11	Baseplate assembly	1	
12	Control box	1	
13	Support plate of foot	4	
14	Cover plate C	2	
15	Cover plate of shell-tube HX - A	2	
16	Top plate B	1	
17	Fin-condensor-A	1	
18	Fin-condensor-B	1	
19	Top plate A	2	
20	Water pan	1	
21	Compressor	2	
22	Liquid receiver	1	*
23	Gas-liquild separator	1	
24	Shell-tube HX	1	
25	Cover plate of shell-tube HX - B	2	
26	Cover plate of shell-tube HX - C	4	
27	Cover plate A	4	
28	Support plate B	2	
29	Suction tube	1	
30	4-ways-valve assembly	1	*
31	Discharge tube	1	
32	Oil tube	1	
33	Tube 1	1	**
34	Drier&EXV assembly	1	
35	Tube 2	2	
36	Tube 3	2	

*	No these parts in CGAJ
**	CXAJ is diffrent with CGAJ



CXAJ130（F-H）

No.	Part	QTY	REMARK
1	Lifting	2	
2	Tube 1	2	
3	Tube 2	2	
4	Tube 3	1	
5	Drier&EXV assembly - A	1	
6	4-ways-valve assembly - A	1	*
7	Water pan	1	
8	Suction tube A	1	
9	Discharge tube	2	
10	Cover plate of shell-tube HX - C	4	
11	Cover plate of shell-tube HX -B	2	
12	Liquid receiver	2	*
13	Gas-liquild separator	2	
14	Cover plate A	2	
15	Support plate of compressor - A	1	
16	Cover plate of shell-tube HX - A	2	
17	Compressor	4	
18	Tube 4	2	**
19	Support plate of compressor B	1	
20	Shock pad	16	
21	Suction tube B	1	
22	4-ways-valve assembly B	1	*
23	Drier&EXV assembly B	1	
24	Tube 5	1	**
25	Wood pallet	1	
26	Baseplate assembly	1	
27	Shell-tube HX	1	
28	Cover plate C	2	
29	Column support plate A	2	
30	Row support plate	2	
31	Cover plate D	2	
32	Top plate A	2	
33	Top plate B	1	
34	Fin-condensor	2	
35	Top plate C	2	
36	Column support plate B	2	
37	Motor of fan	2	
38	Fan	2	
39	Support of fan	2	
40	Plate of fan	2	
41	Mesh enclosure of fan	2	

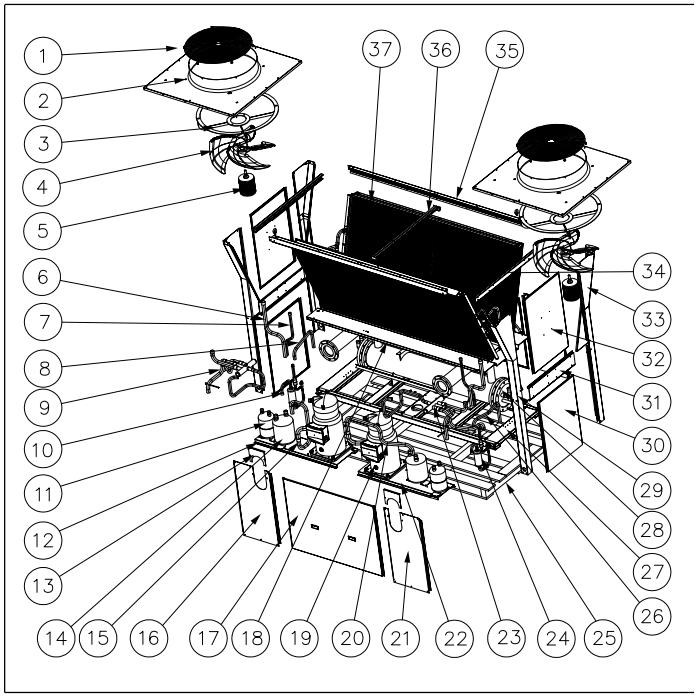


*	No these parts in CGAJ
**	CXAJ is diffrent with CGAJ

CXAJ130（F–N）

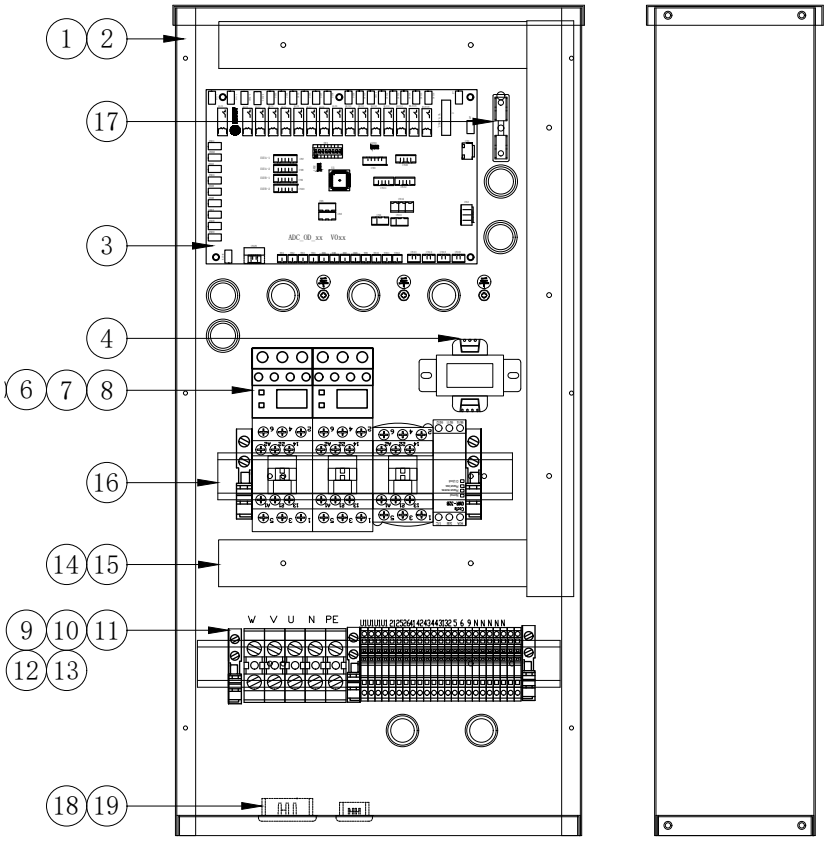
No.	Part	QTY	REMARK
1	Mesh enclosure of fan	2	
2	Plate of fan	2	
3	Support of motor	2	
4	Fan	2	
5	Motor of fan	2	
6	Tube 1	2	
7	Tube 2	2	
8	Tube 3	1	**
9	4-ways-valve assembly - A	1	*
10	Drier&EXV assembly - A	1	
11	Liquid receiver	2	*
12	Support plate of compressor - A	2	
13	Cover plate of shell-tube HX - C	4	
14	Gas-liquild separator	2	
15	Suction tube A	1	
16	Cover plate of shell-tube HX - B	2	
17	Cover plate C	4	
18	Water pan	1	
19	Compressor	2	
20	Suction tube B	1	
21	Cover plate of shell-tube HX -A	1	
22	Support plate of compressor - B	1	
23	4-ways-valve assembly - B	1	*
24	Drier&EXV assembly - B	1	
25	Wood pallet	1	
26	Tube 4	1	**
27	Baseplate assembly	1	
28	Shell-tube HX	1	
29	Column support plate A	2	
30	Cover plate C	2	
31	Row support plate	2	
32	Cover plate D	2	
33	Column support plate B	2	
34	Top plate C	2	
35	Top plate A	2	
36	Top plate B	1	
37	Fin-condensor	2	

*	No these parts in CGAJ
**	CXAJ is diffrent with CGAJ



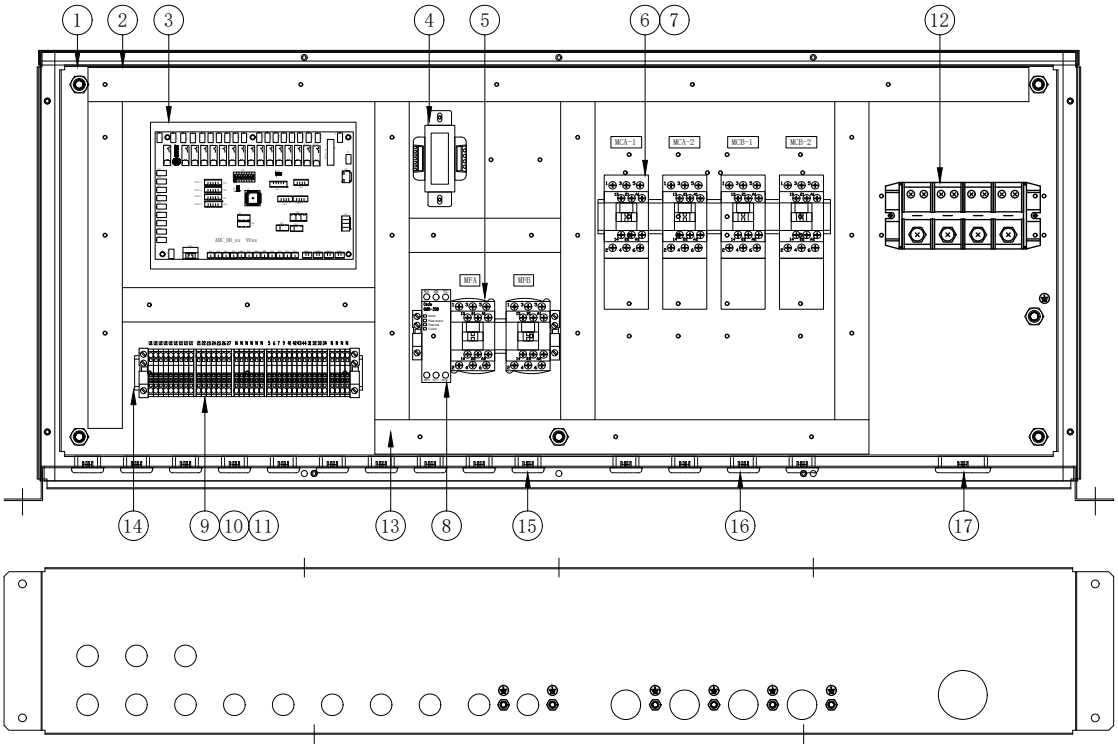
3-4. Control Box Introduction

CXAJ065 (F-N, F-H)



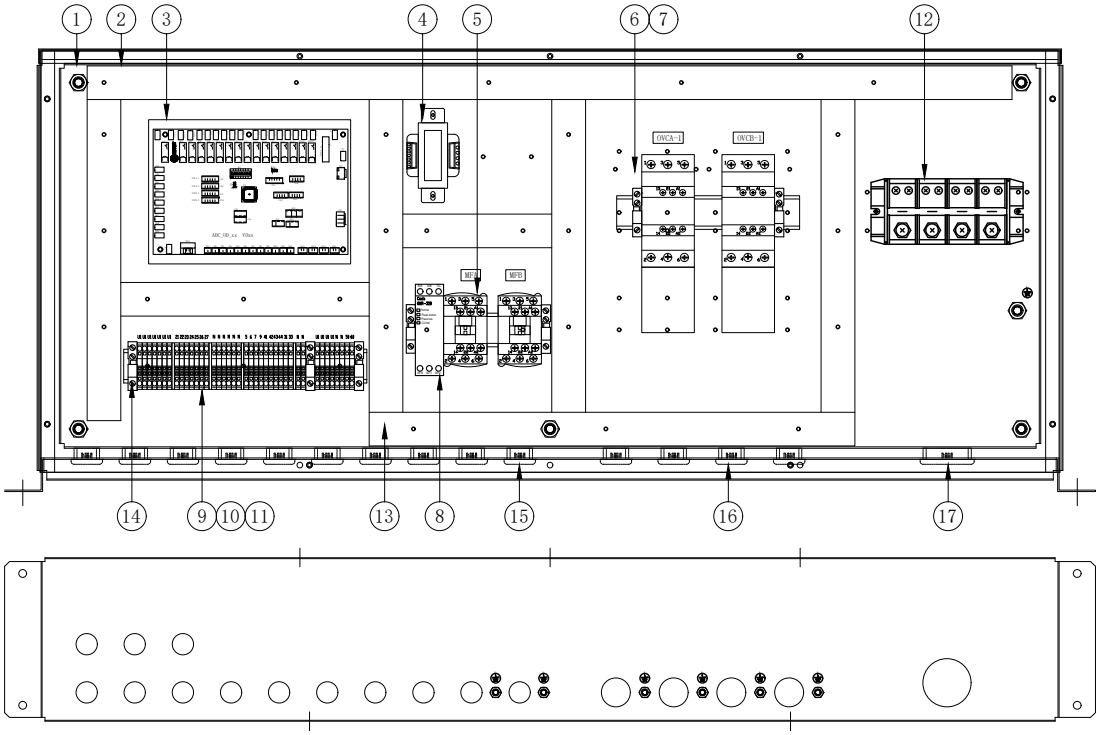
No.	Part	QTY
1	Plate sheet box-A	1
2	Plate sheet box-B	1
3	PCB board	1
4	Transformer	1
5	Contactors of fan	1
6	Contactors of compressor	2
7	Thermal relay	2
8	Phase sequence protection relay	2
9	Terminal block-A	5
10	Terminal block-B	1
11	Terminal block-C	1
12	Terminal block-D	4
13	Center jumper	6
14	Wiring duct-slot	2
15	Wiring duct-slot	1
16	Rail bracket	1
17	Terminal block	1
18	Snap busing-A	9
19	Snap busing-B	1

CXAJ130（F-H）



No.	Part	QTY
1	Plate sheet box	1
2	Install plate	1
3	PCB board	1
4	Transformer	1
5	Contactors of fan	2
6	Contactors of compressor	2
7	Thermal relay	2
8	Phase sequence protection relay	1
9	Terminal block-A	34
10	Terminal block-B	6
11	Center jumper	12
12	Main terminal block	1
13	Wiring duct-slot	1
14	Rail bracket	1
15	Snap busing-A	13
16	Snap busing-B	4
17	Snap busing-C	1

CXAJ130（F-N）



No.	Part	QTY
1	Plate sheet box	1
2	Install plate	1
3	PCB board	1
4	Transformer	1
5	Contactors of fan	2
6	Contactors of compressor	2
7	Thermal relay	2
8	Phase sequence protection relay	1
9	Terminal block-A	34
10	Terminal block-B	6
11	Center jumper	12
12	Main terminal block	1
13	Wiring duct-slot	1
14	Rail bracket	1
15	Snap busing-A	13
16	Snap busing-B	4
17	Snap busing-C	1

4 Unit Installation Requirements

4-1. Outdoor Unit Installation

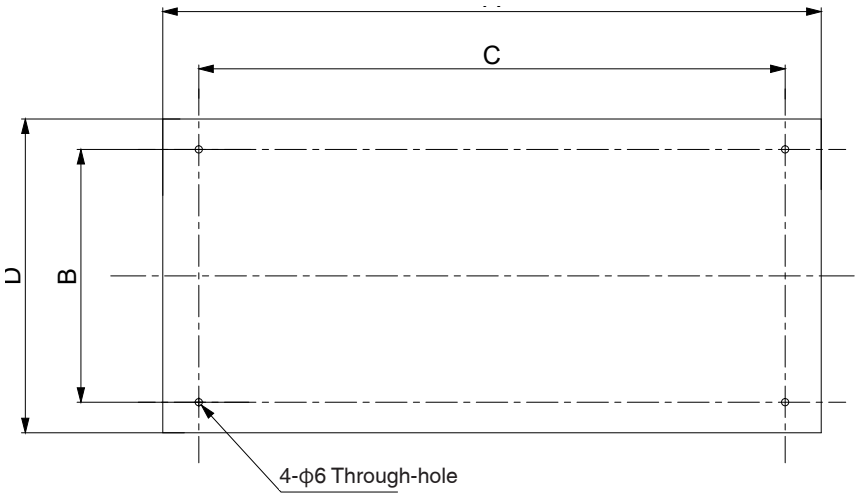
1. Select installation location

- The unit can be installed on the roof, ground or other places that are easy for installation and with reliable load bearing capacity;
- Do not install the unit near other heat sources that can affect the normal operation of the unit;
- Do not install the unit at places where corrosive or flammable gases exist;
- The operation noise and air exhaust should cause as less impact on surroundings as possible;
- If the unit is installed at places that are accessible to non-professional personnel, a protective barrier should be installed;
- The unit should be installed at places with sufficient ventilation and space for maintenance and repair;
- The unit should be installed on a level surface with reliable load bearing capacity, please refer to the parameter table for unit weight and outline dimensions;
- It is preferred to install a damping rubber pad with thickness of 8-10mm. The rubber pad should be placed between the unit and the load bearing surface to absorb vibration.

2. Requirements for installation base

- Steel structure (such as channel steel) can be chosen as base.
- Reinforced concrete can be chosen as base.
- The base should be completely level and provides even contact for the unit.
- The base should possess the required strength to support the weight of the unit.
- Drainage ditch should be prepared around the base to prevent ponding.
- A damping pad with thickness of 8-10mm should be placed between the base and the unit.
- The diameter of the preformed hole for fixing bolts on the base is ϕ6.

3. Fixing bolt positions



Dimensions \ Model	065	130
A	2145	2400
B	951	880
C	2038	2293
D	927	837

4-2. Installation of Air Condition Water Pipeline

1. The installation of air condition water pipeline should comply with the following requirements:

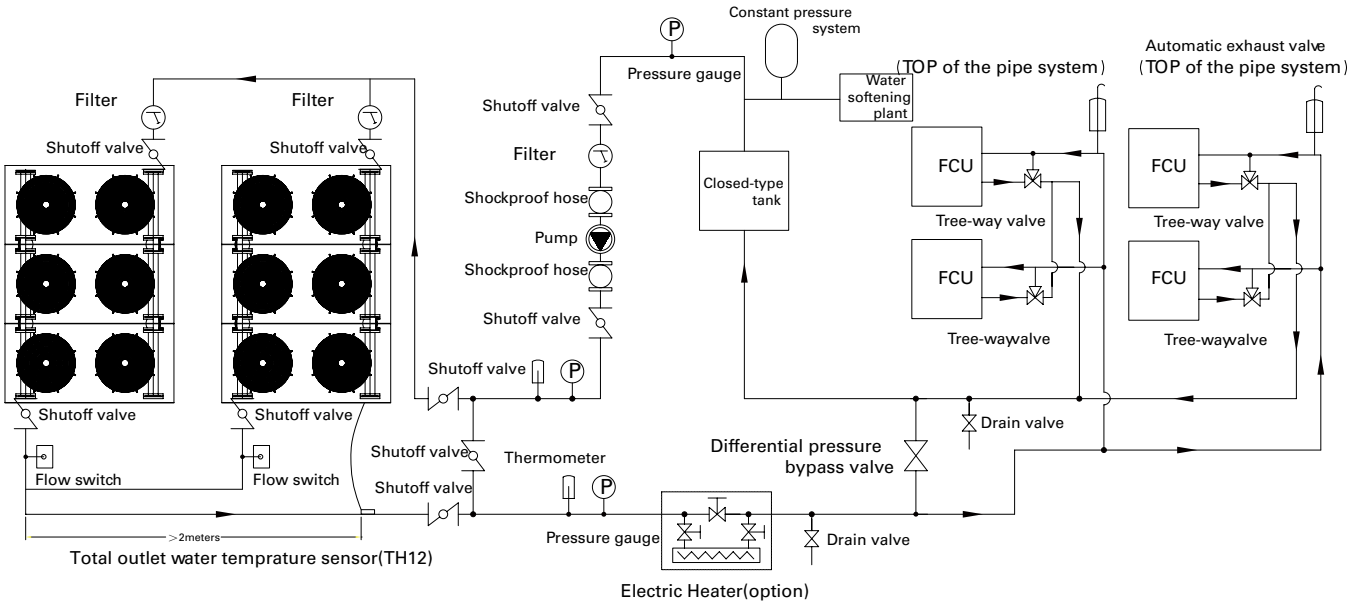
- The length of the pipeline should be as short as possible;
- The diameter of the pipeline should meet the requirement of the unit;
- There should be as less bends as possible, and the radius of the bends should be as big as possible;
- The thickness of the insulation layer should meet the requirements;
- Water quality control.

To avoid the reduction in flow and heat exchange effect in evaporator caused by sediments such as scales and sands due to the use of well water or other types of water at user side, the water and refill water at user side must be filtered and softened (if necessary), and the PH value, conductivity, chloride ion concentration and sulfur ion concentration of the water must comply with the requirements in Water Quality for Heating and Air Conditioning Systems.

2. Installation procedure of air condition water pipeline

- Install all the water pipelines;
- Water pipeline Leakage test;
- Clean the water pipelines;
- Connect to evaporator after leakage test;
- Install air exhaust valve in the system, install pressure gauge, thermometer and valve in the inlet and outlet water pipelines;
- Install filter in the inlet pipeline of the evaporator, the mesh number of the filter should be ≥40;
- Install water discharge value and pipeline at the bottom of water pipeline and connect it with sewer.

3. Installation requirements of water system pipelines



Note: 1)Each branch needs to install a water flow switch, which is connected to the A0 host chiller in series.

2)The total outlet water temperature sensor(TH12) must be connected to the A0 host chiller.

3)The unit must be connected to the closed water system, the water quality must meet the water treatment requirements (P18) of this book, and the secondary heat transfer must be carried out when the water quality does not meet the requirements.

4)The secondary heat transfer must be carried out when the chillers is applied for domestic hot water.

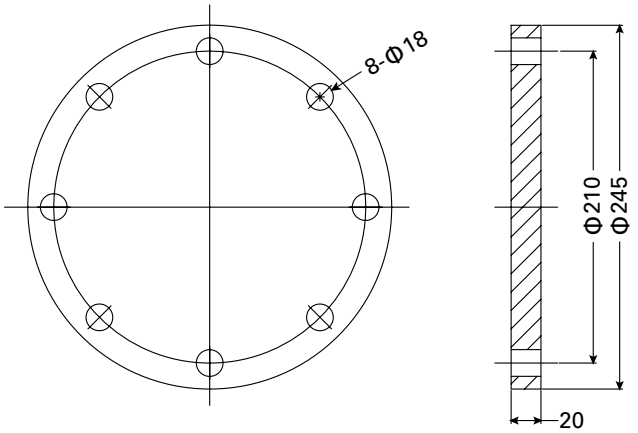
4-3. Installation of Water System

1. Requirements for pipeline prefabrication:

- The diameter of the inlet and outlet water pipes for the water system shall not be smaller than that of the unit joints (DN125);
- The connections between the pipeline and the water pump and between the pipeline and the air conditioner must be flexible pipes, which shall not be forcibly connected to reduce the vibration transmission;
- The pipes shall be connected through welding flanges, and the secondary galvanization or antiseptic treatment shall be performed on the welding seam and the surface of the heat affected area;

The blind flange shall be installed for the unit at the end, as shown below.

Blind flange



2.Requirements for pipe installation

All water pipes shall be connected in accordance with the relevant regulations and comply with the local plumbing regulations and rules. Refer to the schematic diagram for the installation of typical accessories for the water system. Please strictly comply with the following installation requirements for the water system pipeline, otherwise it will affect the normal operation of the unit, or even cause malfunction or damage to the unit.

- Water flow rate of air conditioning unit: the water flow rate of the water system must be firstly designed in a standard way by profession al designers, so that the flow rate of water flowing through the water side heat exchanger of the air conditioning unit is matched with the cooling capacity of the unit. Otherwise, the heat exchange easily gets worse, affecting the air conditioning effect or even causing alarm and shutdown. When the terminal fan coils are fully turned off or a single fan coil is turned on, the air conditioner is turned on for steady operation for a period of time, and the temperature difference between the inlet water and the outlet water shall be controlled to 4 and 6 degrees Celsius. If this requirement is not met, the water system resistance or pump head shall be adjusted until the requirement is met.
- Water volume: the water volume of the water system will affect the start/stop times of the compressor for the air conditioning unit and cause the cold-state ventilation during the defrosting process of air-cooled fins in the heating mode. It is required that the whole water system shall be provided with 10 liters/Kw water. If this requirement cannot be met, an energy storage tank shall be installed in order to meet this requirement.
- Pipe size: The water pipe size must be determined through the water system design to ensure the water flow of the unit.
- Terminal water flow rate: the water flow rate of the terminal product on the air side of the water system must be firstly designed by professional designers in a standard way, so that the flow rate of water flowing through each water coil on the air side is matched with the cooling capacity of the terminal product on the air side.
- Inlet and outlet pipes: the pipes must be supported independently and shall not be supported on the unit. In order to avoid damage to the unit, the system water pipes shall not be installed in reverse. The inlet pipe of the unit must be connected to the water inlet joint marked with “water inlet”; the outlet pipe must be connected to the water outlet joint marked with “water outlet”.
- Anti-vibration hose: the inlet and outlet pipes of the unit must be connected with anti-vibration hoses to avoid long-distance noise transfer. If there is an external water pump, the anti-vibration hoses must be installed at the inlet and outlet pipes of the pump, and the outlet water of the pump shall flow to the air conditioning unit.
- Water pressure gauge: the pressure gauge and the cut-off valve shall be installed at the inlet of the inlet pipe and the outlet of the outlet pipe for the air conditioning unit. If there is an external pump, the pressure gauge and the cut-off valve shall be installed at the water inlet of the pump in order to understand the water system resistance and pump head consumption of the unit, facilitate the monitoring and adjustment of water flow and cut off the water flow during maintenance.

- Water filter: Y-shaped water filter must be installed within 50cm of the water inlet pipe of the air conditioning unit to prevent impurities in the pipe from blocking the water-side heat exchanger and causing unit failure. The number of meshes for the filter shall be 40. If there is an external pump, the water filter must also be installed at the water inlet of the pump. The number of meshes for the filter shall be 40 to avoid pump damage.
- Water flow switch: the water flow switch must be installed at the water outlet of the unit. The straight distance at least 5 times of the pipe diameter shall be reserved at the front and rear ends. If there is an internal water flow switch, the switch will not be installed again.
- Exhaust valve: the automatic exhaust valve shall be arranged at the top of the main outlet pipeline and the main return pipeline for the water system to exhaust the air in the cold water system, ensure that the water flow of the unit meets the requirements of the product and avoid cavitation noise and damage to the water pump. The exhaust valve of the water system is generally installed at the top of the junction between the vertical pipe and the horizontal pipe for the water system and is 0.5 meters higher than the upper horizontal plane of the fan coil at the highest position of the water system. When the exhaust valve is installed in the horizontal manifold, it shall be installed on a pipe section with 2 to 3specifications larger than the manifold, and straight pipes at least 4 times the pipe diameter are arranged on both sides, so that water and air are discharged through the exhaust valve after separation.
- Leakage prevention of exhaust valve: for the exhaust device, it is necessary to consider the cut-off measures for easy replacement when it is damaged or fails. All exhaust pipes shall be connected to the sink and the floor drain in order to discharge water and prevent the exhaust device from damage, failure or leakage to destroy the household environment.
- Expansion tank: the expansion tank shall be arranged in the water system to adapt to the water pressure fluctuation caused by the water temperature change in the water supply system. The gravity expansion tank shall be installed on the top of the main water return riser of the pump for the unit, the make-up pipe is connected to the water return pipe of the pump, and the overflow device is provided; or the pressure type expansion tanks installed on the main water return pipe, and the automatic make-up valve and the automatic pres sure relief valve are provided. The size of expansion tank can be selected by 3% of the total water volume of the water system for the air conditioning unit.
- Operating water pressure: the water pressure of the water side heat exchanger for the air conditioning unit shall not exceed 0.5MPa(i.e. the maximum operating pressure), so as to avoid damage to the parts on the cold water side of the unit.
- Two-way/three-way valve installation: the two-way valve or three-way solenoid valve shall be installed at the outlet of the fan coil to avoid complaints of waterway vibration and noise.
- Two-way valve installation: the water system cannot completely use two-way solenoid valves. If the two-way valve is used, it can be mixed with the three-way valve. The quantity ratio can be 1/3 of two-way valves and 2/3 of three-way valves. The two-way valve can be installed on the fan coil near the air conditioning unit, and the threeway valve can be installed in the far end. If only two-way valves are installed, the pressure differential bypass valve can be added between the main water supply and return pipes of the air conditioning unit at the same time.
- Differential pressure bypass valve: if the differential pressure bypass valve is used in the system, it is necessary to ensure that the short circulation loop of the bypass valve contains an energy storage tank and also meets the water volume requirements, that is, 10 liters of water per kilowatt of cooling capacity. When all fan coils are turned off and the two-way valve is closed, the opening size of the differential pressure bypass valve and the bypass valve flow must ensure that the inlet and outlet water temperature difference is controlled between 4-6 °C to ensure the water flow requirements of the unit.
- Parallel units: when two or more units are used in parallel, it is recommended that a manifold should be installed on the main water return pipe to ensure the return water supply and correct flow distribution of the unit. When water chilling units with different cooling capacities are connected in parallel in a water system (not recommended), a hydraulic balance valve must be installed to ensure different water flow requirements of the water-side heat exchangers for the water chilling units with different cooling capacities. It is recommended that the water pipes for the parallel water chilling units be installed in the same way as the reversed return pipes.
- Check valve: if the unit is located at the lower position of the whole water system, the check valve shall be installed on the outlet pipe of the unit to prevent the impact of water hammer on the water system parts of the unit.
- Bypass pipeline: the bypass pipelines and the bypass valves must be installed at the inlet and outlet of the water system for the unit. All external water supply pipeline systems shall be thoroughly flushed prior to the final connection of the unit. It is strictly prohibited to mix sundries in the water system, otherwise serious consequences may be caused. The bypass valves shall be used to bypass the unit and the terminal heat exchanger for flushing. After flushing, the bypass valves shall be closed, and the drain valves on the inlet and outlet pipes shall be opened.
- Drainage: drainage pipes and drainage valves shall be installed at the lowest point of the water system and the lower part of the equip ment to be drained, and the floor drain or funnel shall be connected to facilitate the cleaning and maintenance of the water system.

- Thermal insulation: the chilled water pipe shall be thermally insulated to prevent water dripping due to heat loss and pipe surface condensation. The exterior of the water-side parts in the water system in contact with the air shall be thermally insulated to prevent water dripping due to condensation. The water system parts that may be damaged by freezing in winter shall be thermally insulated, and the thickness of the insulation layer shall meet the requirement that freezing is not caused at the local minimum ambient temperature. Espe cially for the make-up system pipeline of the gravity expansion tank or the automatic make-up valve pipeline of the pressure expansion tank in the water system, sufficient insulation measures shall be considered or the pipeline shall be installed in a suitable place indoors to avoid freezing damage.
- Anti-freezing: when the ambient temperature is low and the unit is not used for a long time, please drain off water in the unit to avoid freezing damage to the water-side parts of the unit. If the water is not drained, do not cut off the power supply of the unit, so that the unit can operate automatically against freezing. During the period, if there is a fault alarm that cannot be repaired within a short time, the water must be drained. In winter, the water in the system of the single-chiller unit must be drained off to prevent the water in the system from being frozen to damage water pipelines, pumps, heat exchangers and other main components of the unit. Other antifreezing methods are not recommended. The unit damage caused by the non-recommended antifreezing methods are not within the scope of warranty.
- Modular unit: Main leaving water temperature sensor(TH12): if the units are installed in modular mode, a place for installing the temperature sensor must be reserved on the main outlet pipe of the water system, so as to install the outlet water temperature sensor of the system.
- Pressure maintaining and leakage detection: after the installation and connection of water system pipelines, the water pressure test shall be carried out. The accuracy of the pressure gauge shall be greater than 0.01MPa.The test pressure shall be 1.5 times the operating pressure. If the pressure is maintained together with the heat exchanger of the unit, the maximum pressure shall not exceed 0.5MPa (i.e. the maximum operating pressure), so as to avoid damaging the parts on the cold water side of the unit. When water is filled in the water system, the exhaust valve must be opened and closed after the air is exhausted and water is filled. If any leak is found during the pressure maintaining process, repair it immediately and repeat the pressure maintaining test.
- Cleaning: the water system must be cleaned before unit starting and commissioning. During cleaning, the water system must be sep arated from the unit and cleaned separately, and it can be connected to the unit for starting and commissioning only after there are no impurities in the water system. In the process of unit operation, the Y-shaped water filter shall be cleaned regularly depending on the cleanliness of the water system, so as to avoid the situations that the air conditioning effect is poor due to too small water flow, even the water flow alarm of the unit occurs and the outlet water antifreezing alarm lamp has a failure to cause shutdown.
- Control wire of external pump: the external pump shall be equipped with a starter, and its control wire shall be connected to the pump output port of the unit and link-controlled by the unit to ensure the automatic protection function of the unit.

5 Electrical Installation

5-1. Electrical Wiring and Electric Control Box

1. Saftey precautions

The following contents are related to safety, please strictly follow them!

⚠ Warnings

- All wires and grounds shall conform to the local electrical regulations.
- Refer to the electrical parameters and the wiring diagram to complete layout and wiring and ensure firm wiring.
- Provide the independent power supply with a current circuit breaker matched with the working voltage of the unit. Do not share power supply with other electrical products to avoid overload risk.
- The wire shall not be in contact with sharp metal plate edges, screw tips, copper pipes, compressors, motors or other moving parts to avoid damage to the wire to cause danger.
- The manufacturer will not be responsible for any problems caused by unauthorized changes to the internal wiring.
- After the completion of wiring, fix with wire clips to prevent wire damage caused by falling and collision with other parts to cause danger.
- Separate unit wiring by strong and weak current, so as not to affect the communication and operation of the unit.
- All units shall be safely grounded. Improper grounding may cause electric shock. Please ensure that the earth wire is firmly connected to the grounding terminal and grounding electrode of the unit.
- There is strong current in the electric cabinet. Before the completion of electrical wiring for the unit, do not power on to avoid causing casualties.
- Before cutting off the power supply of the unit at any time, do not touch the control components and terminal components to avoid electric shock injury.
- Only connect the terminals with copper wires to avoid corrosion or overheating.
- Refer to the circuit diagram of the unit for the connection of water flow switch and water pump wires.

2. Electrical wiring

- Connect the power line to the main terminal (TB) of the unit distribution box.
- Connect the PCB board of chiller and the modular or unit controller with the wires.
- If the unit is not equipped with a pump, connect the power line of the cold water pump to the corresponding terminal of the cold water pump.
- Ground the unit, the cold pump motor (unit without pump) and all devices to be grounded.
- If the electric heater is provided, connect the power line and the control line to the terminal of the electric heater.
- Refer to the circuit diagram for specific wiring.

⚠ Warnings

- The installer shall provide the unit with a power supply with correct voltage and a suitable circuit breaker, and the supply voltage shall fluctuate within the range of ±10% of the standard value.
- Before the completion of electrical wiring,do not power on to avoid causing casualties.

5-2. Electrical Specification

Please refer to the following table for the minimum current, the fuse specification and the electrical specification of motor.

Type	Model	Power Supply (V/Hz/ph)	Max. current of No.1 compressor MOC (A)	Max. current of No.2 compressor MOC (A)	Max. current of No.3 compressor MOC (A)	Max. current of No.4 compressor MOC (A)	Rated current of No.1 fan FLA (A)	Rated current of No.2 fan FLA (A)	Max. operating current of unit MOC (A)	Recommended fuse specification REC(A)	Recommended circuit breaker specification In (A)	Min. specification of the power supply copper core wire diameter mm^2
Standard	CX(G)AJ0655	380/50/3	24	24			2.1	2.1	55	91	69	16
	CX(G)AJ01305	380/50/3	56	56			3.96	3.96	120	207	154	50
High Efficiency	CX(G)AJ065	380/50/3	24	24			2.1	2.1	55	91	69	16
	CX(G)AJ0130	380/50/3	24	24	24	24	2.1	2.1	98.2	143	133	50

⚠ Notice

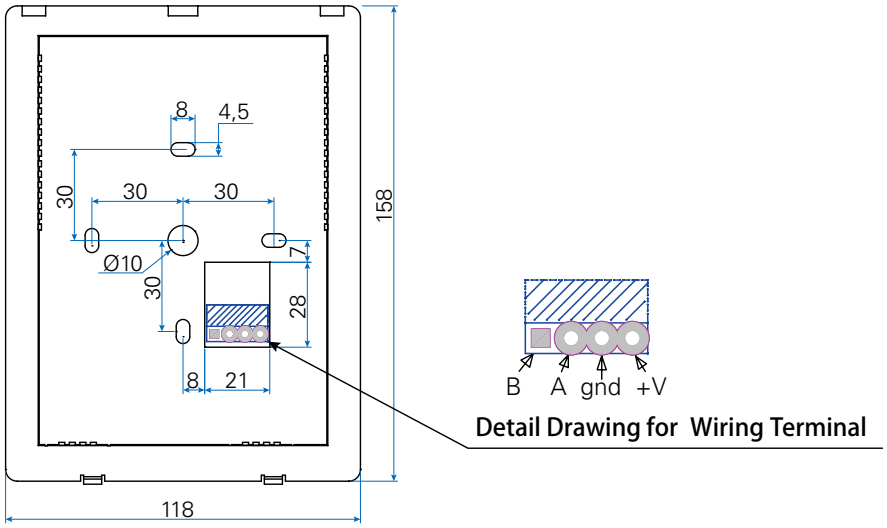
The unit shall be energized for inspection before starting. If the green light is on, it will indicate that the unit is normal; if the red light is on, it will indicate that the phases are reverse and any two phases shall be exchanged in the three-phase power supply. If the yellow light is on, it will indicate that the power supply is lack of phase and shall be powered off for inspection. In the case of reverse phase or lack of phase, the unit will be automatically prohibited from running or starting. The phase loss protection is only for the input power supply of the unit.

5-3. Electrical System Wiring

- No additional control element (such as relay) is needed inside the electric control box. It is not allowed to let the power supplies and control lines that do not connect with the electric control box to go through the electric control box. Otherwise, the unit and control elements can break down or being damaged due to electromagnetic interference and the protection will become invalid.
- All the cables connected with the electric control box should be supported independently instead of being supported by the electric control box.
- Usually, there is strong current lines going through the electric control box, and 220V AC current going through the control panel, therefore the connections for strong current and weak current should be separated. The distance between power line and control line should be at least 100mm.
- Only 380V, 3N-50Hz rated power supply can be used for the unit, the maximum voltage fluctuation range is 342V-418V.
- All the electrical lines must comply with local wiring specifications. An appropriate cable should be used to connect the power terminal from the bottom wiring hole of the electric control box. According to the standards in China, user has the responsibility to provide voltage and current protections for the input power supply of the unit. To prevent cable from loosening, please use closed end terminals for wiring.
- All the power supplies connected to the unit must have a manual switch to make sure that the voltages on all the circuit nodes can be released when the switch is disconnected.
- User must use cables with proper specifications to supply power to the unit. Independent power supply should be used for the unit. It is pro hibited to share power supply with other appliances to avoid overload risks. The fuse and manual switch of the power supply should match with the operating voltage and current of the unit. If multiple modules are connected in parallel, please refer to the figure below for the wiring method and parameter setup of the unit.
- The internal interface of the electric control box is switching signal which needs power supply provided by user, with rated voltage of 220VAC. User must make sure that all the provided power supplies must be equipped with circuit breaker (provided by user) to make sure that the voltages on all the power circuit nodes can be released when the circuit breaker is disconnected.

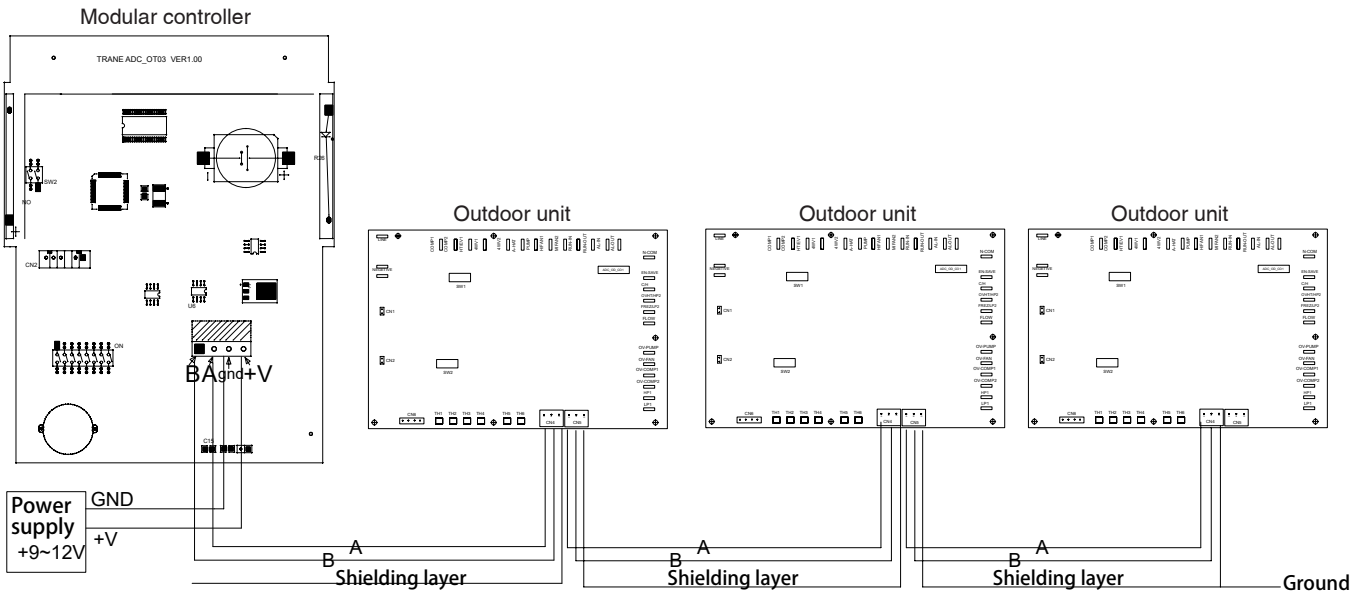
5-4. Installation of Modular Controller

- There are four mounting holes at the back of the modular controller, which can be conveniently connected to the standard 86 box.
- A 4-core wiring terminal is arranged on the circuit board at the back of the modular controller. Seen from the back of the board, they are 485 signal B, 485 signal A, DC power supply ground (gnd) and DC power supply positive pole (+V). The DC power supply is connected with the communication line through the terminal.
- The modular controller is provided with a 220VAC/12VDC, 500mA DC power accessory.
- Optimal operating temperature of modular controller: 0-45℃



Dimensional Drawing for Modular Controller

1.Wiring diagram for modular controller



2.Instructions on ground terminal of 485 control line

It is forbidden to connect to the strong current 220V ground terminal for the metal plate of the electric cabinet.

485 grounding port G is the ground terminal for DC power supply of the electric control board.

3.Installation requirements of 485 communication line

- Requirements of communication line: RS485 wire must be AWG # 18 ~ 22 wire with the wire diameter more than 0.75mm^2,and be a twisted pair with a shielding layer and twist pitch not more than 5cm.
- Hand-in-hand connection requirements: each system module is equipped with two terminals A and B for RS485 connection. In addition to two terminals A and B, the outdoor unit module also has a terminal G for connecting the shielding layer of the communication line. The shielded twisted pair must be connected hand in hand, and no star connection shall be allowed, namely, 1 is connected to 2, 2 is connected to 3, and 3 is connected to 4;
  If 1 is connected to 2, 2 is connected to 3, and 2 is connected to 4, that connection will be wrong.
- Wiring requirements of shielding layer: after being twisted, the shielding layer shall be wrapped with adhesive tape to prevent it from being connected with 220Vground. One end of the shielding layer shall be connected to the ground point G of the control cabinet for the outdoor unit. When the outdoor unit module is connected, the shielding layer shall be connected to the terminal G.It is forbidden to connect it to the 220V ground terminal of the metal plate for the electric cabinet.
- When the network is unstable, 120ohms and 1uFnetwork terminal resistors connected in series shall be added and installed on the communication ports A and B of the last unit on the network in parallel.

5-5. Electrical Circuit Diagram

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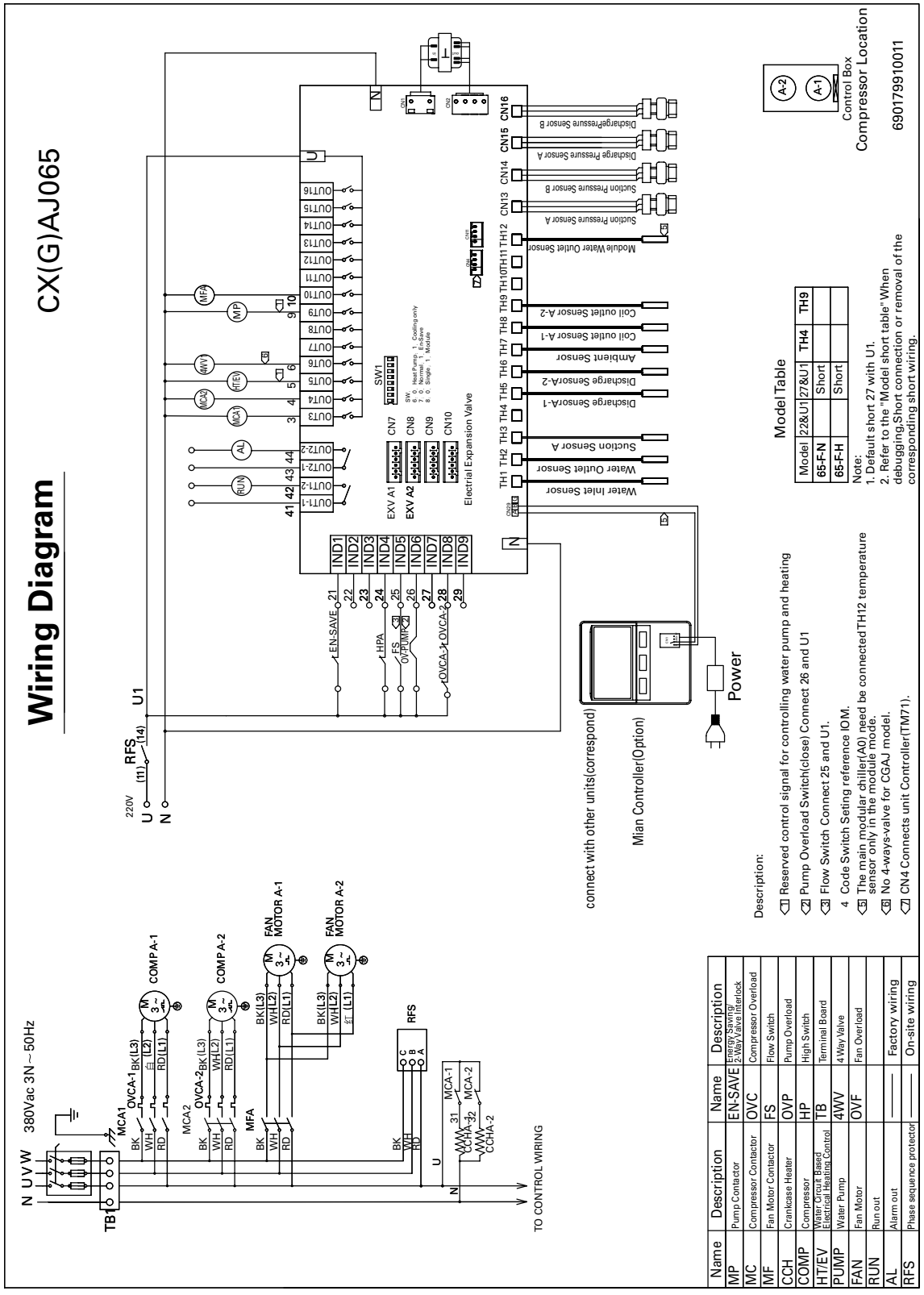


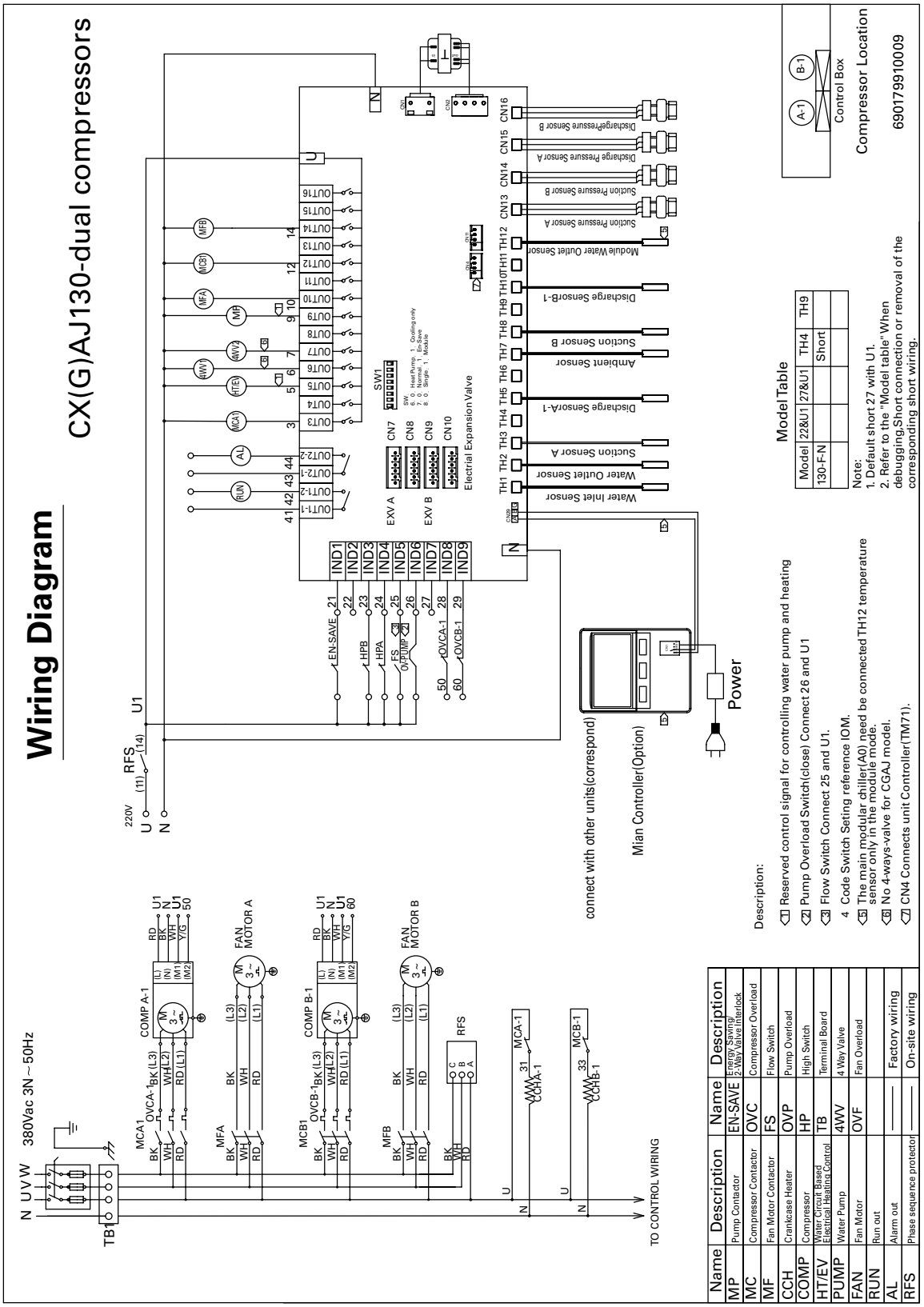
Name	Description	Name	Description
MP	Pump Contactor	EN-SAVE	Energy Saving/ 2-Way Valve Interlock
MC	Compressor Contactor	OVC	Compressor Overload
MF	Fan Motor Contactor	FS	Flow Switch
CCH	Crankcase Heater	OVP	Pump Overload
COMP	Compressor	HP	High Switch
HT/EV	Water Circuit Based Electrical Heating Control	TB	Terminal Board
PUMP	Water Pump	4WV	4 Way Valve
FAN	Fan Motor	OVF	Fan Overload
RUN	Run out		
AL	Alarm out	———	Factory wiring
RFS	Phase sequence protector	———	On-site wiring

Model	228U1	278&U1	TH4	TH9
65-F-N		Short		
65-F-H		Short		

Note:
1. Default short 27 with U1.
2. Refer to the "Model short table" When debugging,Short connection or removal of the corresponding short wiring.

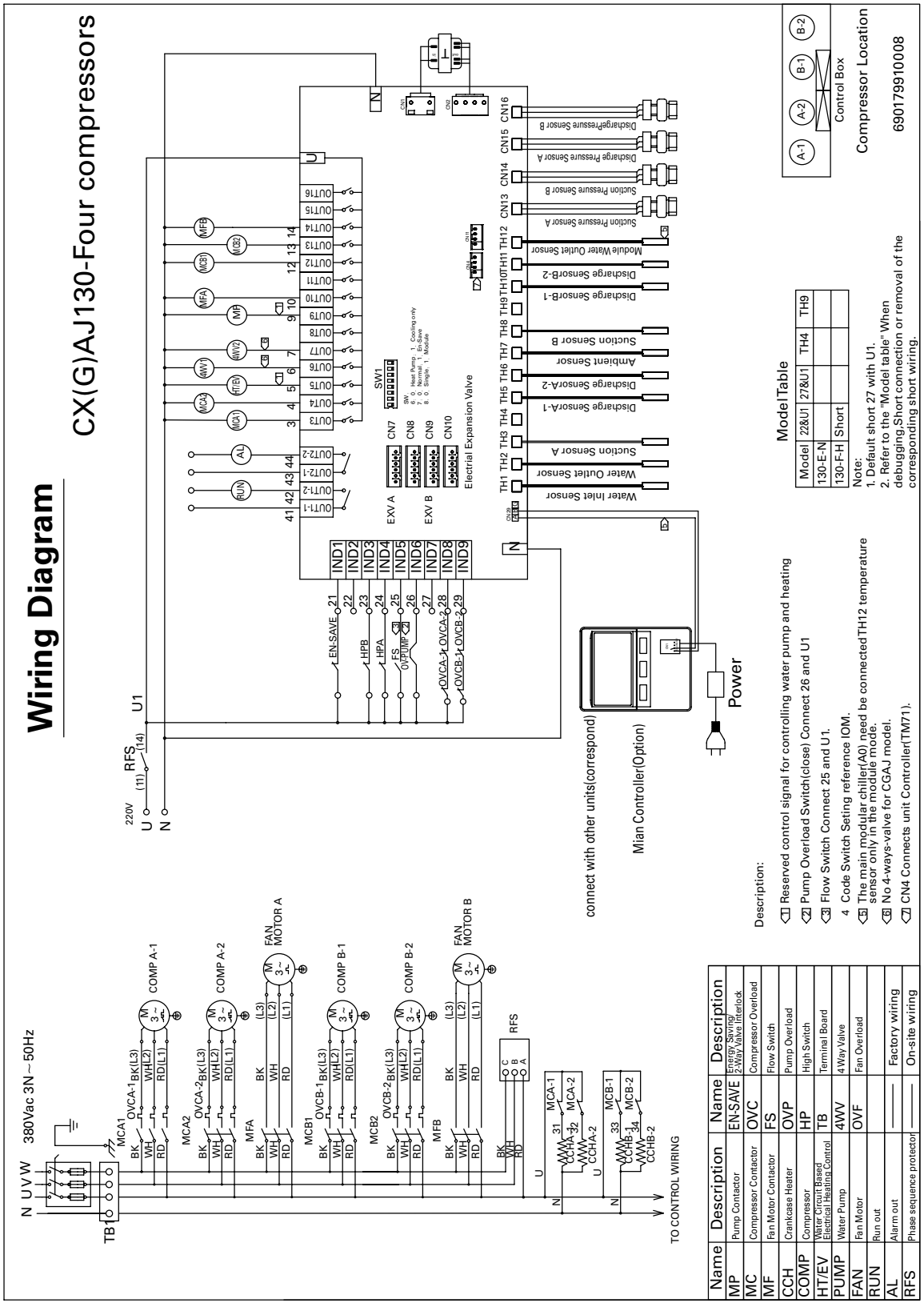
Description:
1 Reserved control signal for controlling water pump and heating
2 Pump Overload Switch(close) Connect 26 and U1
3 Flow Switch Connect 25 and U1.
4 Code Switch Seting reference IOM.
5 The main modular chiller(A0) need be connectedTH12 temperature sensor only in the module mode.
6 No 4-ways-valve for CGAJ model.
7 CN4 Connects unit Controller(TM71).

CX(G)AJ130N



Name	Description	Name	Description
MP	Pump Contactor	EN-SAVE	Energy Saving
MC	Compressor Contactor	OVC	4-Way Valve Interlock
MF	Fan Motor Contactor	FS	Compressor Overload
CCH	Crankcase Heater	OVP	Flow Switch
COMP	Compressor	HP	Pump Overload
HT/EV	Water Circuit Based Electrical Heating Control	TB	High Switch
PUMP	Water Pump	4WV	Terminal Board
FAN	Fan Motor	OVF	4 Way Valve
RUN	Run out		Fan Overload
AL	Alarm out	———	Factory wiring
RFS	Phase sequence protector	———	On-site wiring

CX(G)AJ130H



Name	Description	Name	Description
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COMP	Compressor	HP	High Switch
HT/EV	Water Circuit Based Electrical Heating Control	TB	Terminal Board
PUMP	Water Pump	4WV	4 Way Valve
FAN	Fan Motor	OVF	Fan Overload
RUN	Run out		
AL	Alarm out	———	Factory wiring
RFS	Phase sequence protector	———	On-site wiring

6 Commissioning

6-1. Inspections before Commissioning

- Appearance inspection
  Check the appearance and internal parts of the unit for any damage.
- Fan and motor inspection
  Check whether the fan is straight and if there is any foreign matter and dirt on the blades and whether the blades are damaged.
- Electrical wiring inspection
  Check if the power line and communication line are installed as required, make sure the cooling system and the electrical system are the same.
- Power supply inspection
  Check and make sure the wirings of L1, L2, L3, N and PE are correct and the voltage frequency of the power supply is consistent with the requirements on the unit nameplate.
- Toggle switch setup inspection
  Check whether the outdoor toggle switch setup is correct. If module combination is used, check if the settings of host module and sub mod ule are correct.
  Note: All the toggle switches must set to valid under power off condition.
- Power-on time inspection
  Make sure the power supply is on for at least 24 hours to guarantee the complete warm up of the compressor.
- Water quality inspection for water system, check if the system is rinsed.
- Pump commissioning
  Open the pump manually, check if the water flow direction and the current are correct.
- Check if the rotation direction of the inching fan is correct.

6-2. Unit Commissioning

- As soon as the unit is turned on, use ampere meter to check if the phase currents of the compressor and the fan and the total voltage are correct; check if the reading of the pressure gauge is correct;
- Check if the water pressure of water system is normal;
- Check if all the terminal controls and all the temperatures are normal;
- After running the unit for an hour, check if each parameter is normal every half an hour and make records.
- Starting order of the unit
  Cooling mode
  1) Starting process for cooling mode: Select cooling mode – start the unit – display water temperature – the electronic expansion valve reaches initial opening after 5s – pump starts to run when the electronic expansion valve reaches required opening – no flow switch detection for 100s – the fan starts to operate after 15s – one compressor starts to operate after 5s – end of starting process.
  2) Stopping process for cooling mode: Stop cooling – compressor B-2 stops after 5s - compressor A-2 stops after 2s - compressor B-1 stops after 2s - compressor A-1 stops after 2s – the electronic expansion valve closes after 2s – the fan stops after 60s – the pump stops after 90s – end of stopping process.

  Heating mode
  1) Starting process for heating mode: Select heating mode – start the unit – display return water temperature – the four-way valve starts running and the electronic expansion valve reaches initial opening after 5s – pump starts to run when the electronic expansion valve reaches required opening – no flow switch detection for 100s – the fan starts to operate and initiate return loop electric heating after 15s – one compressor starts to operate after 5s – end of starting process.
  2) Stopping process for heating mode: Stop heating – compressor B-2 stops after 5s - compressor A-2 stops after 2s - compressor B-1 stops after 2s - compressor A-1 stops after 2s – the return loop electric heating stops and the electronic expansion valve closes after 2s – the fan stops after 60s – the pump stops after 90s – the four-way valve stops after 1s - end of stopping process.

  For CXAJ130 unit, each system will start one compressor first before initiating the second compressor.

After finishing unit module setup, the units will start one by one based on code address (from low to high) upon first start-up; the execution temperature for adding and removing of units is different based on different codes, please refer to unit code setup for details.

• Water loop electric heating conditions

During heating, when the discharge water temperature < "set heating temperature" – "heater start-up temperature difference", the water loop electric heating will be activated; when the discharge water temperature ≥ "set heating temperature" - "heater stop temperature difference", the water loop electric heating will be turned off.

6-3. Controller Operation Instructions

Centralized controller (MC-11) is used for the start/stop control of multiple units. Please refer to instructions for the operation of centralized controller. For single unit, user can use TM71 controller to control the unit.

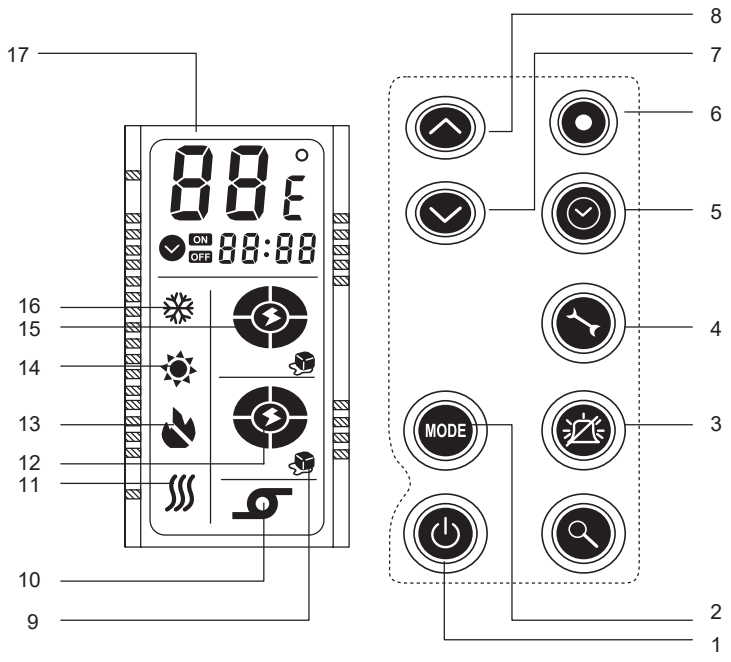
The controller is connected to the CN4 interface of the mainboard of electric control box. The centralized controller uses CN29 interface.

1. Introduction

User can use this controller for operation mode selection, start/stop, timed start/stop, fault clearing and parameter setup.

The controller can display return water temperature, discharge water temperature and operation status of compressor and pump in real time.

2. Illustration of control and display panel



• Control panel

1.ON/OFF button.

2.MODE button.
Press this button before start-up to choose cooling or heating.

3.RESET button.
When malfunction alarm, press this button to reset system manually.

4.SETTING button.
Press this button to set values (Password needed).

5.Time query/ setting button.

6.Timer button, Press this button to select the desired timer function.

7,8.Press these two buttons to view or modify the set values.

• Display panel

9.Defrosting operation display.

10.Water pump start-up display.

11.Anti-freeze mode display.

12.Compressor #2 start-up display.

13.Auxiliary electrical heater start-up display.

14.Heating mode display.

15.Compressor #1 start-up display.

16.Cooling mode display.

17.Window for temperature and values display.

3. Operation introduction

• On-off
Choose required mode firstly, press ⏻ then unit will run on this mode. Press this button again to shut down. Do not press ⏻ frequently.

• Mode selection
Includeing cooling mode and heating mode. Mode should be selected after shut-down.

• Value browse
Press 🔍 firstly, then press ⌄, ⌃ to browse the value.

• Leaving water temperature display During operation, press MODE button to show leaving water temperature for 6 seconds.

• Reset
When malfunction display, press RESET .

• Value Setting
The five values mentioned above may be set through ◔ and ⌄, ⌃.

• Normal display
On normal condition,entering water temperature,compressor, heater and water pump parameters are displayed. There will be backlight when communication fails.

4. Customer setting

Code in controller	Name of parameter	MAX.	MIN.	Regulation accuracy	Default setting
016	COOLING SETTING TEMP	15℃	5℃	1℃	7℃
017	HEATING SETTING TEMP	50℃	25℃	1℃	45℃
022	Freeze - proofing entre Temp of winter	8℃	1℃	1℃	5℃
001	Defrosting Time lag	90min	30min	3min	40min
	Password range	75	50	1	50

Pass word Enter

Press 5 seconds, after display "50" , press or , when display "66" and press .

Cooling Setting Temperature Modification

Range: 10 ℃ ~ 25 ℃.

Operation: after confirm password, press or , when display "16" in time area (88:88), press and adjust the value, press and adjust the value, press again to exit.

5. Factory setting

Code in controller	Name of parameter	MAX.	MIN.	Regulation accuracy	Default setting
3	Max. time of defrost	15min	8min	1min	10min
5	Water fiow switch delay time (after water pump running)	600s	60s	10s	10(100s)
6	No detect time of low pressure switch (after compressor running)	600s	10s	10s	4(40s)
10	Min.running time of compressor	4min	2min	1min	3min
11	Min.stop time of compressor	4min	2min	1min	3min
14	Lock time of cooling antifreeze	60min	3min	1min	3min
20	Cooling antifreeze enter temperature (outlet water)	5℃	-20℃	1℃	3℃
21	Cooling antifreeze exit temperature (inlet water)	10℃	-5℃	1℃	8℃
23	Standby antifreeze exit temperature (winter)	15℃	1℃	1℃	15℃
26	Ambient temperature of allowing access to defrost	20℃	10℃	1℃	15℃
30	Temperature difference of loading	3℃	0℃	1℃	1℃
31	Loading and unloading cycle	300s	10s	10s	9(90s)
32	480 step EXV opening value (in defrost)	480step	100step	10step	48(480step)
35	Temperature difference of electric heater start	20℃	0℃	1℃	10℃
36	Temperature difference of electric heater stop	20℃	0℃	1℃	6℃
45	Mandatory defrosting interval	12h	1h	1h	4h
61	2000 step EXV opening value (in defrost)	200step	400step	100step	18(1800step)

6. Parameter modification

- Password Enter
  Press 5 seconds, after display "50", press or ,when display"72" and press .
- Water Switch Delay Time
  Range: 60S ~ 600S.
  Operation: after confirm password, press or ,when display "05" in time area (88:88), press and adjust the value, press again to exit.
- Query Software Version
  Press 5 seconds, after display"50" , and press again Main display area " 88 " show the version of single unit controller Time diplay area" 88:88 "show the version of software.

7. Time setting

- Clock Setting
  Time setting range: 00:00 ~ 23:59
  Operation: press , choose " " flash display, and " 88:88 "also flash display, press or to adjust time, if press or for 2 seconds, the time will decrease or increase quickly, press to exit.
- Setting Open Time
  Time setting range: 00:00 ~ 23:59
  Operation: press ,choose" ON " flash display, and " 88:88 " also flash display, press or to adjust time, if press or for 2 seconds, the time will decrease or increase quickly, press to exit.
- Setting Close Time
  Time setting range: 00:00 ~ 23:59
  Operation: press ,choose "OFF" flash display, and " 88:88 " also flash display, press or to adjust time, if press or for 2 seconds, the time will decrease or increase quickly, press to exit.
- Timer Function
  Operation: press , when " ON " display, ON timer is activated;
  press , when " OFF " display , OFF timer is activated;
  press , when " ON OFF " display, ON OFF timer is activated;
  press , when " ON OFF " disappear, ON OFF timer is inactivated;

8. Date review

Press and then press or to view the data.

Item	Code
Inlet water temperature	080
Outlet water temperature	081
Suction temperature A	087
Default	085
Discharge temperature A-1	105
Discharge temperature A-2	106
Ambient temperature	084
Suction temperature B	088
Default	086
Discharge temperature B-1	107
Discharge temperature B-2	108
Total outlet temperature of modular	083
Suction pressure A (pressure /100kPa)	111
Suction pressure B (pressure /100kPa)	112
Step of EXV A-1 (step/10) / (step/100)	121
Step of EXV A-2 (step/10) / (step/100)	122
Step of EXV B-1 (step/10) / (step/100)	123
Step of EXV B-2 (step/10) / (step/100)	124
Version of single unit controller (fractional part)	129
Version of single unit controller (integer part)	131
IP address in the modular mode	128

6-4. Adjustment and Judgement of Refrigerant Volume

Status		Determination
1	The air exhaust temperature of compressor is too high	Insufficient refrigerant
2	The low pressure is too low	
3	The air return temperature is too high	
4	The current is too small	
5	The air exhaust temperature of compressor is too low	Too much refrigerant
6	The air return temperature is too low	
7	The current is too big	

6-5. Judgement of Water Flow in Water System

User can determine the water flow in air condition water pipeline as below:

- Check if the water flow switch is disconnected. If yes, check whether the water supply switch is open and water refill is finished.
- Check if the inlet/outlet temperature difference of the water system of outdoor unit is too big. If the temperature difference is larger than 10 degrees, check if the water flow is normal.
- Check if the water pressure gauges on the inlet/outlet pipeline are shaking. If yes, please drain the pipeline.

6-6. Non-fault Phenomenon

Phenomenon	Fault Display	Reason
The outdoor fan does not operate during heating	None	Defrosting
Part of the fan does not operate	None	The heating ambient temperature is higher than 13℃; the cooling ambient temperature is lower than 25℃
The air condition pump is running when the unit is off	None	Anti-freezing
The unit does not start after pressing the start button	None	The set temperature does not meet the energy requirement for start

7 Fault Handling

7-1. Fault Alarm Table

If the controller and the control panel are faulty, the code "EE/ED" will be displayed.

No.	Input Port	Fault Description	Code of Single Unit Controller	Code of Centralized Controller	Fault Handling
1	TH1	No.1 analog sensor fault (water inlet temperature)	20	20	Turn off devices
2	TH2	No.2 analog sensor fault (water outlet temperature)	21	21	Turn off devices
3	TH3	No.3 analog sensor fault (suction temperature A)	22	22	Turn off devices
4	TH4	No.4 analog sensor fault	23	23	Turn off devices
5	TH5	No.5 analog sensor fault (discharge temperature A-1)	24	24	Turn off devices
6	TH6	No.6 analog sensor fault (discharge temperature A-2)	25	25	Turn off devices
7	TH7	No.7 analog sensor fault (ambient temperature)	26	26	Turn off devices
8	TH8	No.8 analog sensor fault (suction temperature B)	27	27	Turn off devices[2]
9	TH9	No.9 analog sensor fault	28	28	Turn off devices[2]
10	TH10	No.10 analog sensor fault (discharge temperature B-1)	29	29	Turn off devices[2]
11	TH11	No.11 analog sensor fault (discharge temperature B-2)	2A	2A	Turn off devices[2]
12	TH12	No.12 analog sensor fault (total water outlet temperature)	2B	2B	Turn off devices[4]
13	CN13	No.13 analog sensor fault (suction pressure A)	2C	2C	Turn off devices
14	CN14	No.14 analog sensor fault (suction pressure B)	2D	2D	Turn off devices[2]
15	IND3	High-pressure switch of system B	H2	65	Turn off devices[2]
16	IND4	High-pressure switch of system A	H1	65	Turn off devices
17	IND5	Water flow switch alarm	FL	6D	Turn off devices
18	IND6	Overload of water pump	OP	6A	Turn off devices
19	IND8	Overload of compressor A-1 or A-2	C1	68	Turn off devices
20	IND9	Overload of compressor B-1 or B-2	C2	69	Turn off devices[2]
21	CN13	Low-pressure of system A	L1	66	Turn off devices
22	CN14	Low-pressure of system B	L2	67	Turn off devices[2]
23	TH1,TH2 and TH1TH2	Refrigeration antifreezeing alarm	E3	8D	Switch off all compressors. The water pump continuously operates.[1]
24	TH3, TH8	Abnormal suction temperature	E4	91	Switch off all compressors. The water pump continuously operates.[12]
25	CN13	Low pressure overrun of system A	78	78	Switch off the compressor of the system A. If this fault occurs twice, switch off and give an alarm.
26	CN14	Low pressure overrun of system B	7A	7A	Switch off the compressor of the system B. If this fault occurs twice, switch off and give an alarm.
27	CN15	High pressure overrun of system A	2E	2E	Switch off the compressor of the system A. If this fault occurs twice, switch off and give an alarm.
28	CN16	High pressure overrun of system B	2F	2F	Switch off the compressor of the system B. If this fault occurs twice, switch off and give an alarm.
29	TH7	The ambient temperature exceeds the working range	87	87	Turn off devices
30	CN29	Communication fault between control panel and modular controller	ED	--	Turn off devices[2]
31	CN4/XP1	Communication fault between single unit controller and mainboard	--	EE	Turn off devices
32	TH5/TH6/ TH10/TH11	Abnormal discharge temperature	AC/AD/ AE/ AF	AC/AD/ AE/ AF	Turn off devices
33	--	Inlet and outlet of water pipe is reversed	A0	A0	Turn off devices
34	--	Configuration error of model	E1	E1	Turn off devices

Note: The faults in this table are only displayed on the single unit controller and the modular controller.

Note 1: When this fault occurs, switch off all compressors. The water pump will continuously operate.

Note 2: Lock "antifreezing locking time of plate type heat exchanger for refrigeration unit". the fault is permitted to be manually reset only when the water temperature is recovered to the normal state.

Note 3: This alarm code will be displayed only when "module control" is selected. Note 4: This alarm code will be displayed only when "module control" is selected and it is a host unit (A0).

In case of fault, the controller and the centralized controller will show corresponding fault code and conduct fault handling, the alarm output relay will be closed.

When all the fault input terminals are disconnected, it means fault alarm; when all the fault input terminals are closed, it means normal.

After the fault is cleared, the system will maintain fault status (to remind user for unit inspection). The system will restore the operating status before the fault only after user press the "Reset" key (only reset one fault at a time in case of multiple faults) or restart the unit.

All the faults must be reset manually.

7-2. Fault Handling for Outdoor Unit (Refer to outdoor unit fault code table for fault code)

1. Power supply fault

Fault phenomenon: Phase sequence protector flashes.

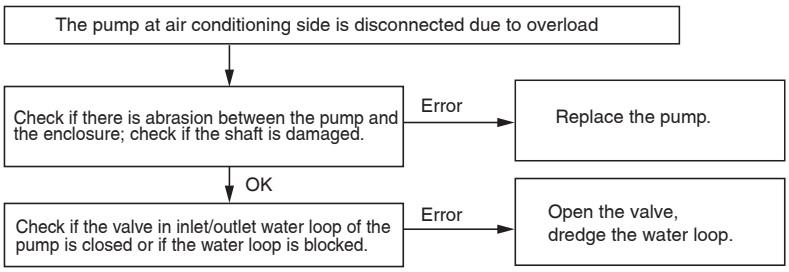
Fault reason: Check if the power supply circuit is correct (if there is phase loss or negative phase sequence).

2. Air condition pump overload

Fault phenomenon: The alarm indicator on the control panel flashes, the control panel displays corresponding alarm code.

Fault description: The water loop is blocked or the pump is damaged.

Fault handling process:

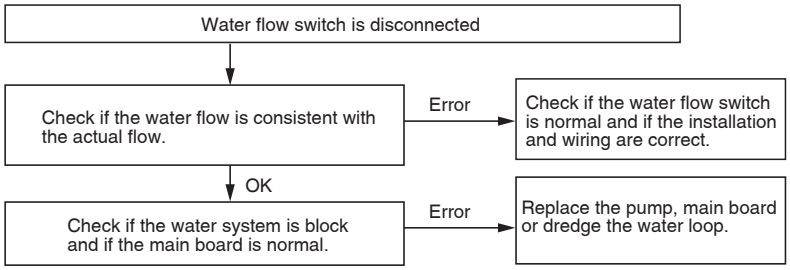


3. Insufficient flow for air condition pump

Fault phenomenon: The alarm indicator on the control panel flashes, the control panel displays corresponding alarm code.

Fault description: The water flow in the system is smaller than 60% of rated flow, the water flow switch is disconnected, the unit cannot be started.

Fault handling process:

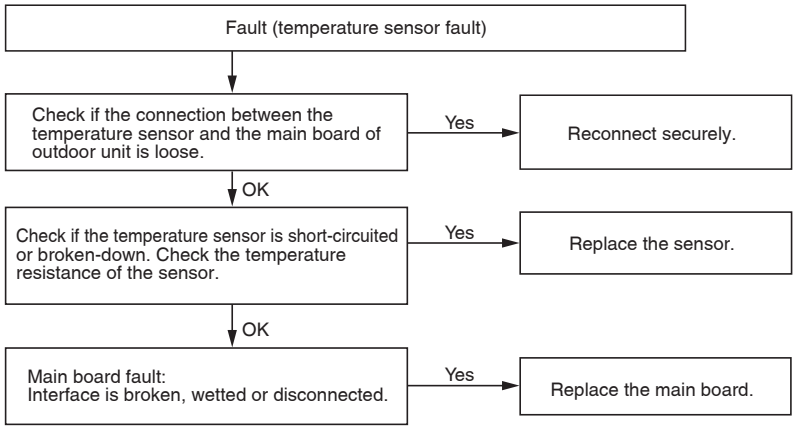


4. Temperature sensor fault (see attachment for temperature resistance)

Fault phenomenon: The alarm indicator on the control panel flashes, the control panel displays corresponding alarm code.

Fault reason: The interface is loose, open-short of the sensor, the main control interface is disconnected or short-circuited.

Fault handling process:

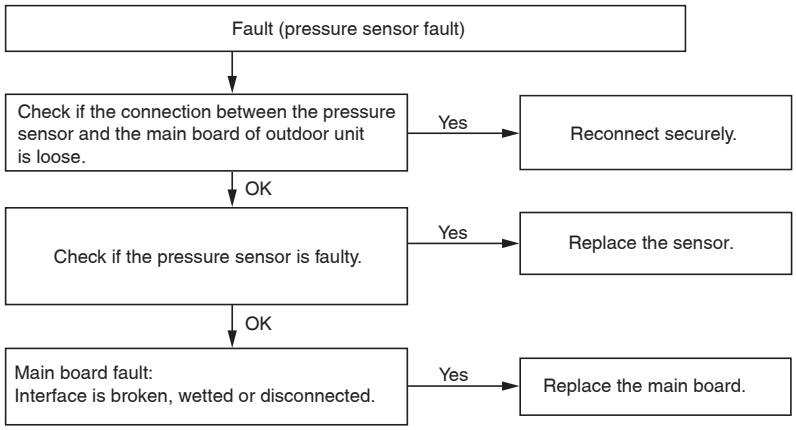


5. Pressure sensor fault

Fault phenomenon: The alarm indicator on the control panel flashes, the control panel sends 2C 2D 2E 2F alarm.

Fault reason: The interface is loose, open-short of the sensor, the main control interface is disconnected or short-circuited.

Fault handling process:



6. ED fault

Fault phenomenon: The centralized controller displays ED.

Fault reason: The centralized controller is broken or disconnected; main board test port fault; check if the shielded wire is connected properly and correctly.

7. EE fault

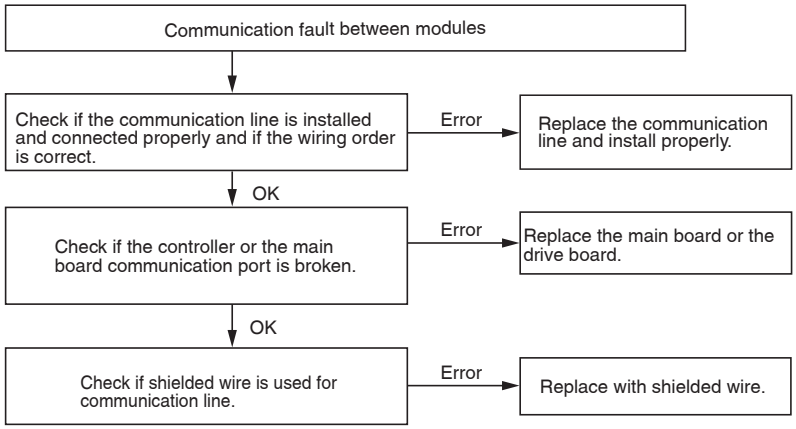
Fault phenomenon: The controller of outdoor unit displays EE.

Fault reason: The controller is broken or disconnected; main board test port fault.

8. Communication fault between modules

Fault description: Communication failure between modules, unable to start the unit.

Fault handling process:



In addition, if the input voltage of the transformer provided with PCB is too low, it will cause low voltage in PCB and the unit will go off-line.

9. Reduction in module number

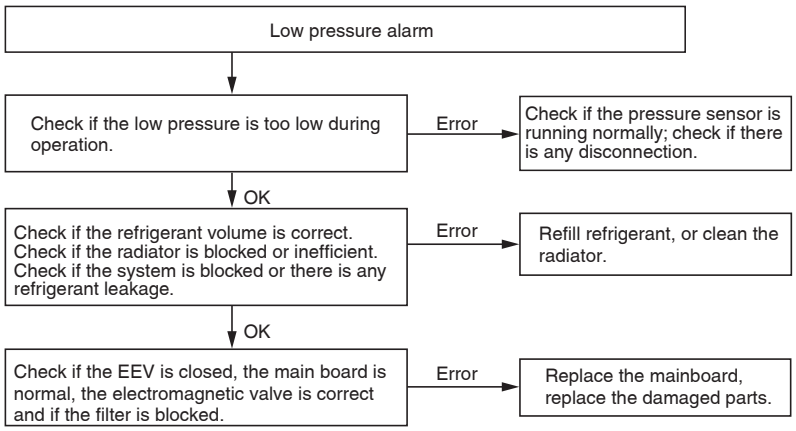
Fault reason and handling process is similar with 8), please handle the fault according to 8).

10. Low pressure sensor disconnected

Fault phenomenon: The alarm indicator on the control panel flashes, the control panel displays corresponding alarm code.

Fault description: The low pressure alarm will be triggered when the low pressure of the system is below 1.5bar (gauge pressure).

Fault handling process:

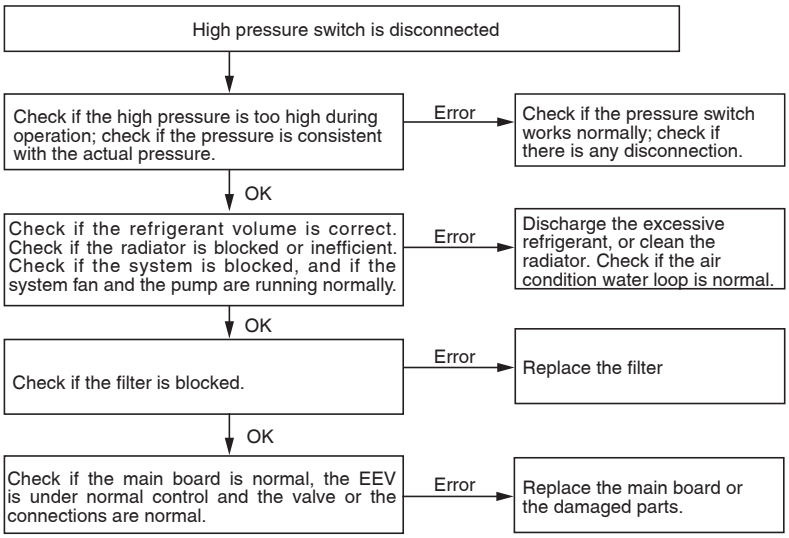


11. High pressure switch disconnected

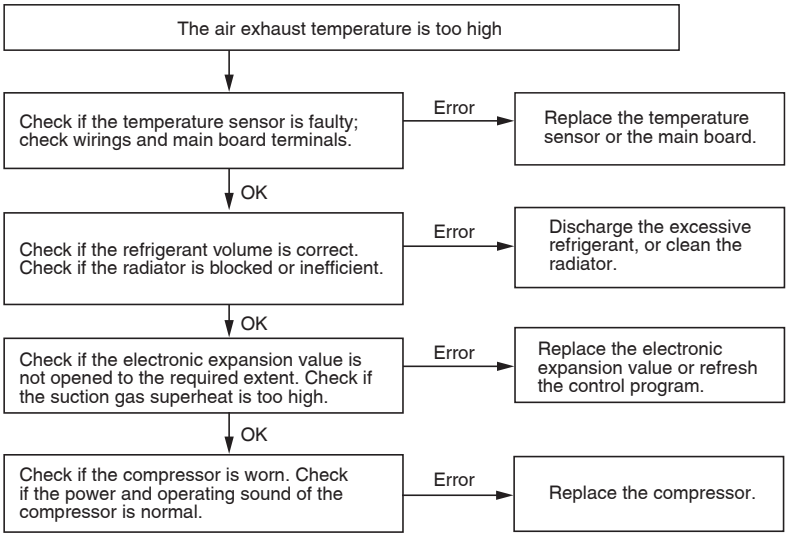
Fault phenomenon: The alarm indicator on the control panel flashes, the control panel displays corresponding alarm code.

Fault description: The high pressure switch will be disconnected when the high pressure of the system is above 4.2bar.

Fault handling process:



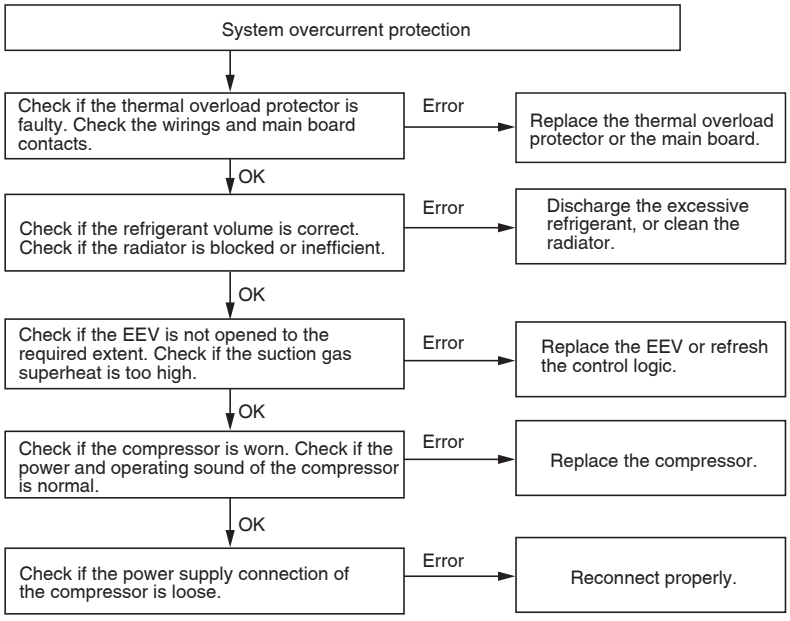
Fault handling process:



12. System overcurrent protection

Fault phenomenon: Overload protection trips

Fault handling process:

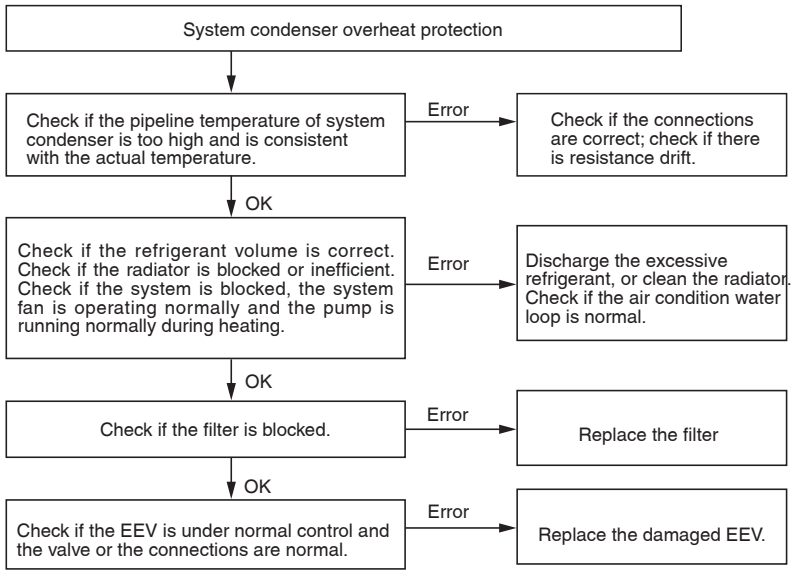


13. System condenser overheat protection

Fault phenomenon: The alarm indicator on the control panel flashes, the control panel displays "98" alarm;

Fault description: The protection is activated when the pipeline temperature of system condenser is higher than 68℃.

Fault handling process:



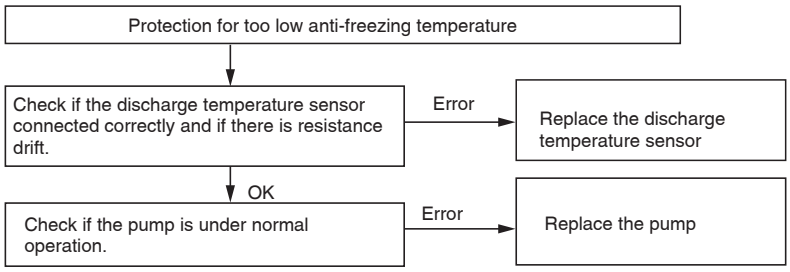
14. Protection for too low anti-freezing temperature

Fault phenomenon: The alarm indicator on the control panel flashes, the control panel displays E3 alarm.

Fault description: When the discharge temperature≤"Cooling anti-freezing starting temperature (fan coil/plate type heat exchanger)" or the return water temperature – discharge temperature ＞10℃, the timing will be activated, and if the above conditions remains unchanged after 30s, the alarm will be triggered.

When the discharge temperature≥"Cooling anti-freezing stopping temperature (fan coil/plate type heat exchanger)" , the electric heating of water loop will be stopped. When the fault occurs, the “Cooling plate type heat exchanger anti-freezing locking time” will be triggered, when the time is over and the discharge temperature≥"Cooling anti-freezing stopping temperature (fan coil/plate type heat exchanger)", the fault can be reset by controller or centralized controller. After resetting the fault, the pump will continue to run a period of time before stopping.

Fault handling process:



15. Ambient temperature off-limit protection

See P6 for the ambient temperature range for the reasonable operation of the unit. If the range is exceeded before starting the unit, the unit will not be able to be started and a fault code will be displayed. If the range is exceeded for 3 mins during operation, the unit will turn off auto matically and displays fault code. Fault code: 87.

16. Air exhaust overheat protection (units with air exhaust temperature)

If any air exhaust temperature is ＞135℃ for 10s, the unit will identify it as air exhaust overheat and the unit will turn off and send an alarm. Fault code: AC/AD/AE.

7-3. Service Guidance for Key Parts

1.Compressor

Compressor is the most important component in air condition system. The performance of the overall air condition system is closely related to the operating performance of the compressor.

• Compressor fault

The common faults that can happen to the compressor are listed below:

A. Short circuit of compressor coil:

The resistance measured by multimeter between terminals or between terminal and the ground is 0 Ω when the compressor is in cold state.

(1) Specific fault phenomenon: The air switch will trip as soon as the power of the compressor is turned on.

(2) Common reasons:

a. Air and moisture enters cooling system and causes deviation of the coil insulation. Long term operation under high temperature and high voltage makes short circuit of the compressor coil;

b. Poor power supply quality which leads to extremely low or extremely high voltage, phase loss, phase off-set, and consequently cause coil short circuit;

c. Sundries enter the system and block the filter, circulation volume of refrigerant is too small, the operating pressure is too low, the compressor operate with over temperature, causing short circuit of the compressor coil;

d. Coil short circuit cause by contactor binding.

Note: The resistances between three phases are similar and related to temperature. The resistance rises as the temperature increases. If there is quality issue in the compressor, user needs to test the contact resistance to ground which should be at MΩ level. If the resistance is of KΩ level, the coil insulation might have been damaged.

B. Open circuit of compressor coil:

The resistance measured by multimeter between terminals is ∞ ohm when the compressor is in cold state.

(1) Specific fault phenomenon:

a. If open circuit occurs to any group of coil, the compressor cannot be started. If open circuit occurs to any group of coil during operation, the current in other two groups of coil will be too big, if the compressor runs under such conditions for a long time, the built-in protection or the other two groups of coil will be burnt;

b. If open circuit occurs to any two groups of coil, the compressor cannot be started.

c. If open circuit occurs to all three groups of coil, the compressor cannot be started. There is no current in any group of coil.

(2) Common reasons:

a. There is air and moisture in the cooling system which affects the coil insulation and leads to long-term operation under high temperature and high pressure, and consequently causes coil open circuit;

b. Poor power supply quality which leads to extremely low or extremely high voltage, phase loss, phase off-set, and consequently cause coil open circuit;

c. The filter is blocked by foreign objects, the circulation volume of refrigerant is too low, the operating pressure is too low, the compressor is overheat during operation, which all can cause coil open circuit;

d. Coil open circuit cause by contactor binding.

C. Compressor motor jamming:

Poor lubrication of compressor bearing or running with insufficient oil can cause bearing wear or jamming.

(1) Specific fault phenomenon: Current protection is activated or the built-in protector trips as soon as the compressor is started.

(2) Reasons:

a. Refrigerant leakage in cooling system which causes lubricant leakage, therefore the lubricant in the compressor is not enough;

b. There is air and moisture in the system which turns lubricant into gel-like matter due to acidification and thermalization after long-term operation under high temperature and pressure and cause jamming;

c. Usually, carbon tetrachloride (or other cleaning agent) is used to remove the residual acidified oil inside the air conditioning system. Some times, the residual carbon tetrachloride can be diluted by refrigerant and air condition oil, and after long-term operation under high temper ature and pressure the air condition oil will turn into gel-like matter due to acidification and thermalization and cause jamming;

d. There is foreign objects, dirt or welding flux in the system and brought into the compressor chamber by refrigerant during operation which cause jamming to compressor drive.

D. Liquid hammer：

Too much unevaporated liquid refrigerant is absorbed by the compressor which causes rotor damage.

(1) Specific fault phenomenon:

a. The compressor cannot be started, the current protection is activated or the built-in protector trips;

b. After the rotor is broken by liquid hammer, its fragments fall onto the motor coil and damage the coil insulation layer which cause coil burn out;

(2) Reasons:

a. Too much refrigerant is refilled into the system which causes liquid hammer;

b. The water flow is too small or the water system is blocked during cooling which causes incomplete evaporation of refrigerant and leads to liquid hammer;

c. The fan of the outdoor unit does not rotate or rotates at low speed due to reduced capacitance, or blocked air duct, or dirty heat exchanger during heating can all cause incomplete evaporation of refrigerant and leads to liquid hammer;
d. Refrigerant migration: Insufficient warm up of heating belt under low temperature environment which causes refrigerant migrating into gas-liquid separator and compressor and leads to liquid hammer;
e. Unsuitable superheat or too big valve opening can also cause liquid hammer.

E. Compressor wear:

Compressor wear is usually caused by poor lubrication or solid foreign objects. Usually, we can identify compressor wear based on the status of compressor oil. Normally, the compressor oil should be yellowish clear liquid. If the oil turns into reddish liquid, it means the compressor is slightly worn but the operation is not affected. If the oil turns into black thick liquid with sediment, it means the compressor is seriously worn and the oil is carbonized. In this case, user should replace the compressor, drain the oil and clean the system before refilling.

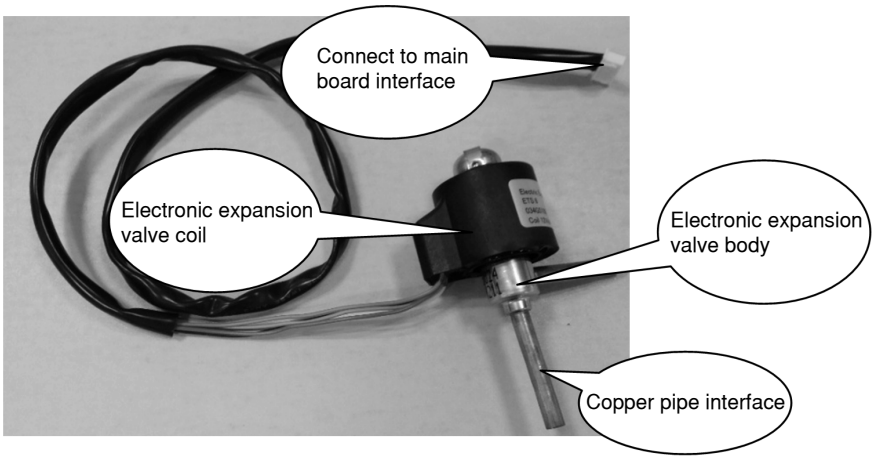
Long-term heavy duty operation can also cause the compressor wear due to high compression ratio.

2.Electronic expansion valve

The electronic expansion valve will adjust the flow of refrigerant based on system load to ensure the normal operation.

A. Basic structure of electronic expansion valve

The electronic expansion valve consists two parts: coil and valve body, as shown below:



Picture of real electronic expansion valve

B. Working principle of electronic expansion valve

The control principle of electronic expansion valve: The motor rotor uses permanent magnet. The rotor rotates based on the attracting or re pelling effect generated by the magnetic pole of rotor and the magnetic pole of stator winding.

The coil (pulse motor) is controlled by control panel. The control command is sent from the main board and a pulse voltage is applied on the motor stator winding which drives the rotor to operate. If a command with reverse signal sequence is sent, the motor will rotate reversely. In this way, the pulse signal controls the up and down movement of valve rod, the opening of valve needle and the flow by adjusting the forward and reverse rotation of the motor. The maximum and minimum opening of the valve is controlled by corresponding position limiting mechanism.

C. Common faults of electronic expansion valve

Common faults:

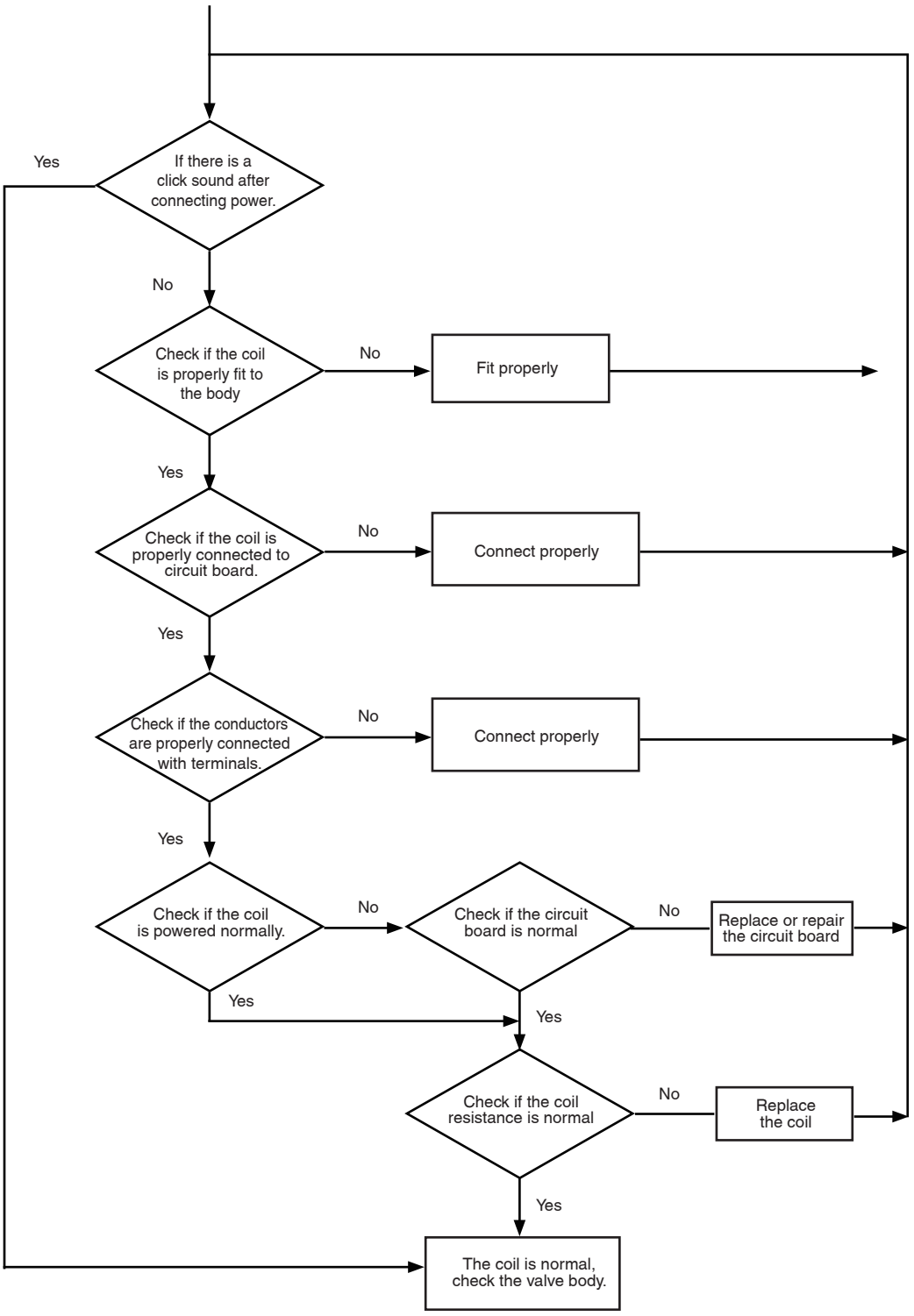
(1) The coil lead is broken or the connector is loose.
(2) The coil is not properly fit.
(3) The coil is partly damaged, with abnormal resistance which causes invalid adjustment.
(4) The main board of the air condition system is faulty, with output error.
(5) The electronic expansion valve body is jammed by foreign objects which affect normal rotation.
(6) There is leakage in the pipeline or body of electronic expansion valve.
(7) Part of the rotor is jammed due to impact on electronic expansion valve body.

D. Troubleshooting and fault handling of electronic expansion valve

There are two steps for troubleshooting and fault handling of electronic expansion valve. First, inspect the coil of electronic expansion valve. If the coil part is normal, check the valve body.

(1) Fault analysis and handling of electronic expansion valve: follow the procedure below.

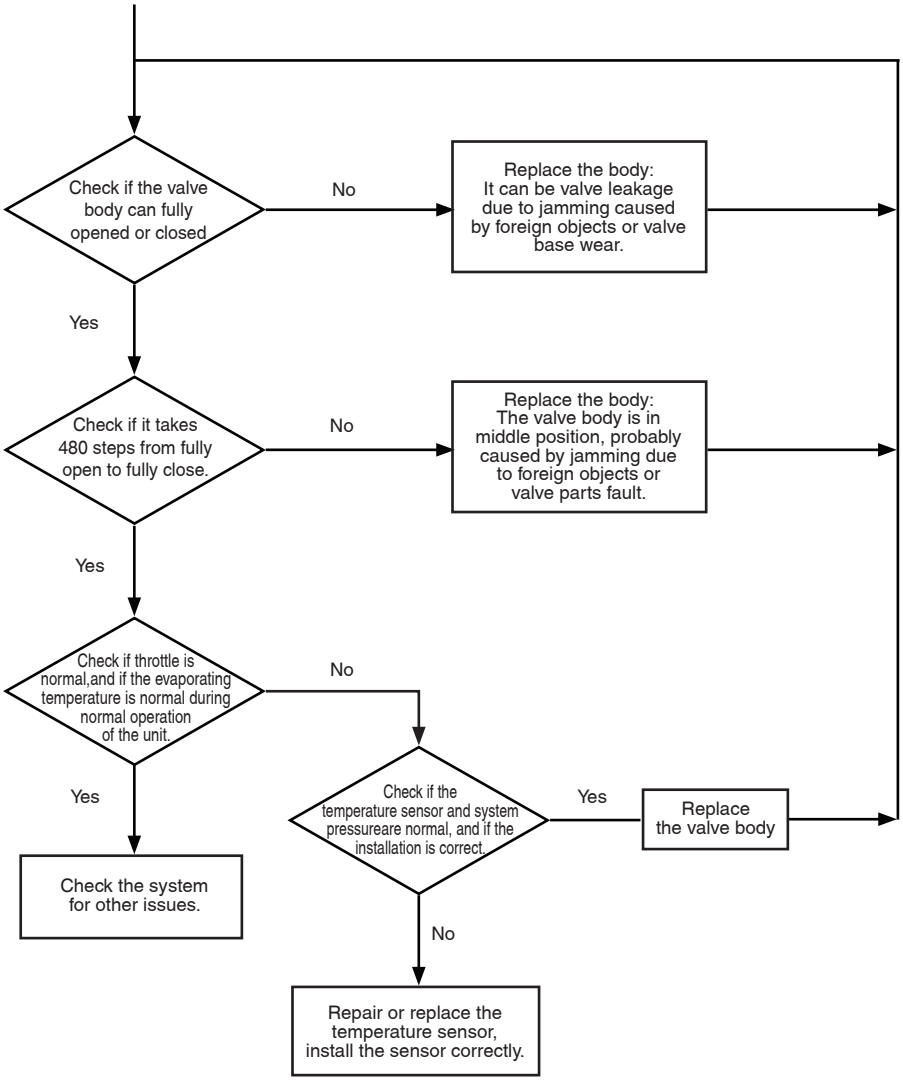
Inspection and repair process of electronic expansion valve



(2) Fault analysis and handling of electronic expansion valve:

After confirming that the coil part is normal, user should conduct valve body inspection according to the process below.

Inspection and repair process of electronic expansion valve body



When inspecting the valve body, make sure the coil resistance and connectors are normal, then power on the unit. Hold the valve body with your hands to feel if it is operating. It will take about 6 seconds for the valve body to switch from fully open to fully close. If voltage is applied when the valve body is at fully open or fully close position, you will hear a loud click sound. If the operation time is too short or there is no operation at all, it means the position limiting mechanism or the valve needle is jammed, in this case you can take the following measures:

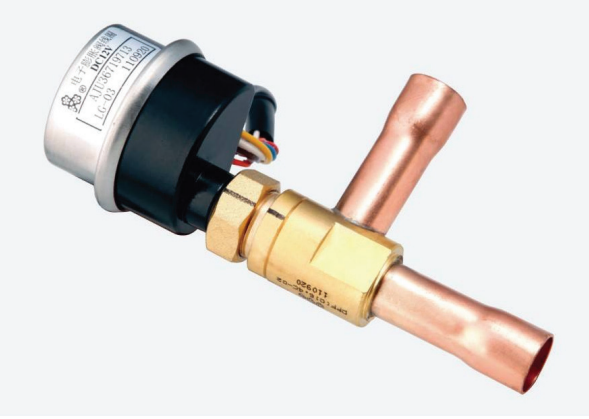
a. Remove the coil and inspect the stainless steel enclosure of the valve body for any sign of collision. If yes, please replace the valve body.
b. If the valve body does not operate, slightly knock the body, if it doesn't work, proceed to next step.
c. Start and stop the unit repeatedly. For cooling-heating air condition, repeat the cooling/heating switch for 3 times. If the valve body starts to operate after the unit is powered-on, it means the system is jammed by foreign objects. If the valve body does not operate, remove the electronic expansion valve.
d. Use clean nitrogen to purge the electronic expansion valve both in forward and reverse direction, then apply a pulse signal to see if the valve body operates. If the valve body does not operate, send it back to factory for further analysis.
e. After the above steps, the valve body can be reinstalled for use. Remember to clean the cooling system before installation to prevent foreign objects from jamming the valve body again.

E. Notes for use of electronic expansion valve

a. Do not use valve body and coil with different brands, otherwise the adjustments can be invalid.
b. Do not carry the coil by the lead, otherwise the lead can be broken.
c. Do not apply external pressure (collision) to the stainless steel enclosure and welding part of the body, otherwise jamming or leakage can occur to the position limiting mechanism. Make sure to handle the valve with care.
d. The coil must be removed before soldering. During soldering, use wet towel to wrap the valve body or put it in the water to make sure the temperature of the valve body is below 120 degrees so as to prevent water from entering the body which can cause freezing or rusting and lead to poor operation. Do not point the flame directly at the body.
e. Fully open the valve body before welding. During welding, fill the valve body with inactive gas (nitrogen, CO2, etc.) to prevent generation of oxides.
f. The coil will generate heat during the operation of valve body. Therefore, do not use insulation for the coil or put inflammable materials near the coil, otherwise they can be lit up.
g. When installing the coil, vertically insert it into the enclosure of valve body. The convex part of the coil support must be fully inserted into the concave part of the enclosure.

F. The DPF (O) 8.0C electronic expansion valve used in CXAJ130-N

a. Integrated valve body and coil. The coil cannot be removed;
b. Maximum steps: 2000.



G. For units with two electronic expansion valves, user can switch the sockets to confirm whether the valve body or the coil is normal.

3.Pressure switch

A. Working principle of pressure switch

There are two working status of pressure switch: open or close. The opening and closing pressure for different model of pressure switch is different, which will be marked on the switch.

The opening and closing pressure for high pressure switch is 4.2/3.3Mpa, which means when the pressure reaches 4.2Mpa, the switch will open automatically and disconnect the line; if you use a multimeter to measure the resistance at both ends of the switch at this time, the result will be infinite; when the pressure drops below 3.3Mpa, the pressure switch will close automatically, if you use a multimeter to measure the resistance at both ends of the switch at this time, the result will be very small. The opening and closing pressure for low pressure switch is 0.15Mpa /0.25Mpa, which means when the pressure drops below 0.15Mpa, the pressure switch will open automatically and disconnect the line; if you use a multimeter to measure the resistance at both ends of the switch at this time, the result will be infinite; when the pressure rises above 0.25Mpa, the pressure switch will close automatically, if you use a multimeter to measure the resistance at both ends of the switch at this time, the result will be very small.

B. Common Faults for Pressure Switch

The pressure switch is a switching type electronic component. The most common fault for pressure switch is normally open or normally close, which means the pressure is always in open or close status and does not respond to pressure changes no matter the system pressure. If you use a multimeter to measure the resistance at both ends of the switch in normally open status, the result will be infinite. Normally, the pressure switch is closed.

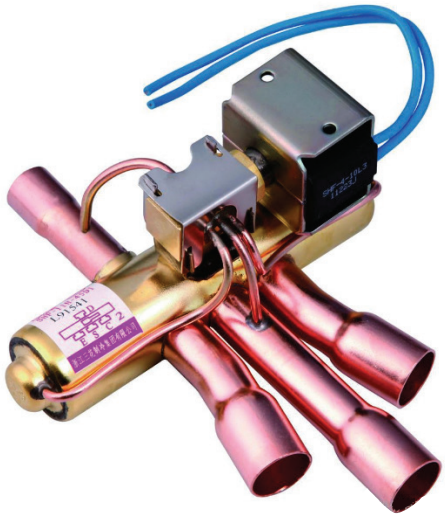
C. Repair guidance for pressure switch

a. The damaged pressure switch must be replaced;
b. If the pressure switch does not operate when the pressure limit is reached, please check the connections first to see if there is short circuit. If there is no short circuit and the main board is normal, it is recommended to replace the switch;
c. If the pressure switch is normally open, please check the connections first to see if there is loose connection or disconnection. If the connections and the main board are good, it is recommended to replace the switch;
d. Since the pressure switch is sealed in a plastic package and welded onto a copper pipeline, user must drain the refrigerant before replacing the switch; do not weld the switch directly;
e. Emergency operation in case the pressure switch is broken: If emergency operation is needed in case the pressure switch is broken. User can short circuit the pressure switch by using an electric wire as long as the system safety is guaranteed. After the switch is short circuited, the system will no longer be protected by the switch. In this case, long-term operation is not allowed and user should replace with a new pressure switch as soon as possible to prevent the system from serious damage.

4.Four-way reversing valve

A. Basic structure of four-way reversing valve

The four-way reversing valve mainly consists two parts: coil and valve body, as shown below:



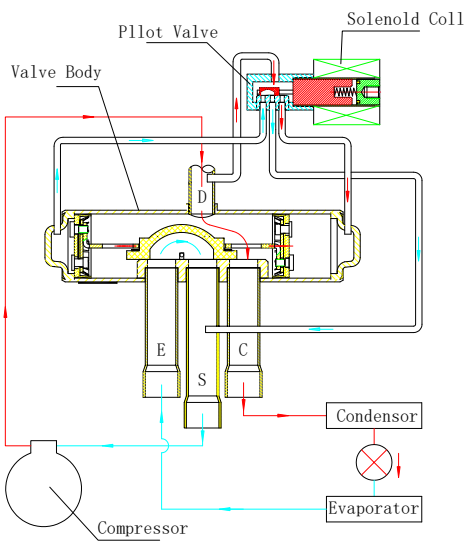
B. Working principle of four-way reversing valve

Working principle:

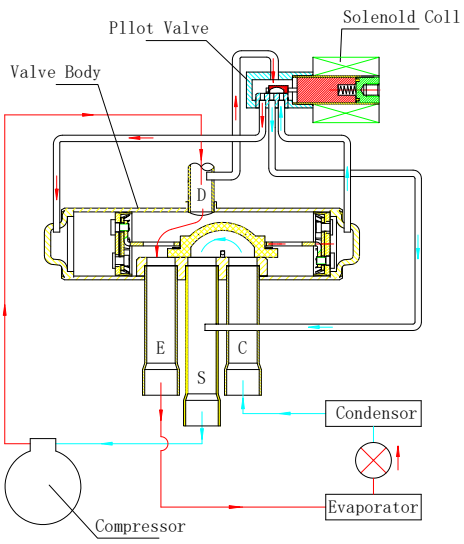
When the solenoid coil is off, the compression spring at the right side will drive the pilot valve to move leftwards; high pressure gas will enter the capillary (1) before entering the piston chamber at right end. In the meantime, the gas in the piston chamber at left end will be discharged. The piston and the main valve will move to leftwards due to the pressure difference between the two ends so that the air exhaust pipe is connected with outdoor unit and the other two pipes are also connected to create a cooling cycle.

When the solenoid coil is on, the magnetic effect generated by the solenoid coil will overcome the force of the compression spring and drive the pilot valve to move rightwards; high pressure gas will enter the capillary (1) before entering the piston chamber at left end. In the meantime, the gas in the piston chamber at right end will be discharged. The piston and the main valve will move to rightwards due to the pressure difference between the two ends so that the air exhaust pipe is connected with indoor unit and the other two pipes are also connected to create a heating cycle.

Cooling mode (power off)



Heating mode (power on)



C. Common faults for four-way reversing valve

a. The coil is broken or the voltage does not match with the performance of the coil which prevents the valve element of the pilot valve from operating;

b. Partial deformation of the pilot valve due to external reasons which prevents the valve element from operating;

c. Deformation of capillary of the pilot valve due to external reasons which causes insufficient flow and insufficient pressure difference for direction change;

d. Deformation of the main valve due to external reasons which prevents the piston from operating due to jamming;

e. The foreign objects in the system block enter into the four-way valve and blocks the piston or main valve;

f. The temperature of main valve exceeds 120 degrees during soldering which causes thermal deformation of internal parts;

g. Refrigerant leakage in air condition system causes insufficient pressure difference needed for direction change;

h. The circulation volume of refrigerant in compressor does not meet the requirement for direction change of four-way valve;

i. The necessary flow for direction change cannot be guaranteed due to low rotation speed of inverter compressor;

j. The scroll compressor generates liquid impact which breaks the piston of four-way valve.

D. Judgement of back flow of four-way reversing valve

a. Touch the lower three pipes of the valve with your hands, if the pipes are warm, it means the direction change is not properly done due to back flow;

b. You can also check the high and low pressure when the unit is operating. If the high and low pressure is basically the same which means there is no pressure difference, it is probably caused by back flow.

E. Troubleshooting and fault handling of four-way reversing valve

a. The troubleshooting and fault handling of four-way reversing valve consists two steps. First inspect the coil of electronic expansion valve. If the coil is normal, start the valve body fault analysis and conduct further.

7-4. Unit Protection Functions

1.Extreme low pressure detection

If the low pressure of any system is below 1.5bar, the unit will shut down and send alarm. The controller will display "L1" (System A) or "L2" (System B); otherwise the unit will continue running.

For units with low pressure sensor, a pressure alarm will be sent by; for units without low pressure sensor, a low pressure switching alarm will be sent.

2.Low cooling suction pressure protection

In cooling mode, if the low pressure of any system is below 6.2bar (gauge pressure), a 60s continuous detection will be initiated. If the low pressure is still below 6.2bar after 60s, the compressor of the system will be shut down mandatorily, otherwise the system will continue running. The judgement will not be initiated for the first 3 mins upon first startup of any compressor of any system; the determination will not be initiated during defrosting. The compressor can only be started when the low pressure is higher than 8bar (gauge pressure). The protection can only be initiated once an hour; if the protection is initiated twice in an hour, the unit will shut down and send alarm. The controller will display "78" (System A) or "7A" (System B).

In case of this alarm, please check the following:

- Check if there is refrigerant leakage;
- Check if the refrigerant system is dirty or blocked;
- Check if the water temperature or ambient temperature is too low.

3.High pressure switch detection

If the high pressure of any system trips, the system will shut down and send alarm. The controller will display "H1" (System A) or "H2" (System B); otherwise the system will continue running. The disconnecting value is 4.4Mpa, the reconnect value is below 3.5Mpa.

In case of this alarm, please check the following:

- Check if the fan is running normally during cooling;
- Check if the refilled refrigerant is too much;
- Check if the ventilation is good enough during cooling;
- Check if the throttle device is working normally;
- Check if the system is dirty or blocked;
- Check if the water temperature is too high during heating.

4.Water flow switch detection

The water flow switch will conduct detection after the pump is started. If the switch is not closed, the system will shut down and send an alarm, the controller will display "FL".

If “Full flow switch detection” is enabled, and the flow switch is still closed after the pump is shut down, a fault alarm will be sent.

5.Pump overload detection

If the pump trips due to overload, the system will shut down and send alarm. The controller will display "FL"; otherwise the system will continue running.

6.Compressor overload detection

If the compressor of any system trips due to overload, the system will shut down and send alarm. The controller will display "C1" (System A) or "C2" (System B); otherwise the system will continue running.

In case of this alarm, please check the following:

- Check if the fan is running normally during cooling;
- Check if the refilled refrigerant is too much;
- Check if the ventilation is good enough during cooling;
- Check if the throttle device is working normally;
- Check if the system is dirty or blocked;
- Check if the water temperature is too high during heating.

7.Anti-freezing in winter

If the toggle switch is in "Single unit control" position, this function is valid.

If the toggle switch is in "Modular control" position, this function is only valid for number 0 unit.
If the pump is overload during anti-freezing operation, it will be stopped immediately. The system will exit anti-freezing mode and the controller will display pump overload alarm.
If the toggle switch is in "Heating pump" position:
Operation process: Under OFF or two-way valve interlock status, if the ambient temperature is < 5℃ and the return water temperature is < "Anti-freezing starting temperature" -1℃, the unit will activate heating automatically to prevent freezing→the controller displays "AP", the pump starts to run→the electronic expansion valve, four-way valve, fan and compressor start to run→discharge water temperature > "Anti-freezing stopping temperature", the devices will be shut down one by one and the system will return to shut down or interlock status.
If the ambient temperature is < 5℃ and the return water temperature is < "Anti-freezing starting temperature", the pump will start to run. When the return water temperature > "Anti-freezing starting temperature"+-1℃ and the heating is not started, the pump will stop.
During anti-freezing operation, press ON/OFF key to enter heating mode directly.
If the toggle switch is in "Cooling only" position:
If the ambient temperature is < 5℃ and the return water temperature is < "Anti-freezing starting temperature", the pump will start to run. When the return water temperature > "Anti-freezing starting temperature"+-1℃, the pump will stop.

8.Anti-freezing protection

If the conditions below are met in cooling mode, the compressor will be shut down and the electric heating for water loop will be activated. The pump will continue running and the controller will display "E3".
If the discharge temperature ≤ "Anti-freezing starting temperature (fan coil/plate type heat exchanger)" or the return water temperature – discharge temperature > 10℃, the timing will be activated, and if the above conditions remains unchanged after 30s, the alarm will be triggered.
If the discharge temperature ≥ "Cooling anti-freezing stopping temperature (fan coil/plate type heat exchanger)" , the electric heating of water loop will be stopped. When the fault occurs, the "Cooling plate type heat exchanger anti-freezing locking time" will be triggered, when the time is over and the discharge temperature≥"Cooling anti-freezing stopping temperature (fan coil/plate type heat exchanger)", the fault can be reset by controller or centralized controller. After resetting the fault, the pump will continue to run a period of time before stopping.

9.Suction anti-freezing protection

If the conditions below are met in cooling mode, the compressor will be shut down and the electric heating for water loop will be activated. The pump will continue running and the controller will display "E4".
If the suction temperature of any system ≤ "Suction anti-freezing starting temperature", the timing will be activated;
When the discharge temperature ≥ "Cooling anti-freezing stopping temperature (fan coil/plate type heat exchanger)" , the electric heating of water loop will be stopped. When the fault occurs, the "Cooling plate type heat exchanger anti-freezing locking time" will be triggered, when the time is over and the suction temperature≥"Suction anti-freezing stopping temperature", the fault can be reset by controller or centralized controller. After resetting the fault, the pump will continue to run a period of time before stopping.

10.Cooling fin overheat protection

In cooling mode, if the fin temperature of any system > 68℃, the system will identify it as fin overheat. In this case, the system will shut down and send alarm. Alarm code: "98".
In cooling mode, the compressor of any system is only allowed to run when the fin temperature of the system ≤58℃.

11.Ambient temperature off-limit protection

A. Normal temperature E type unit
The ambient temperature range for reasonable operation of the unit: cooling: 6℃~50℃; heating: -15℃~26℃.
If the temperature range is exceeded before startup, the unit cannot be started and a fault code will be reported; if the temperature range is exceeded during operation for 3 min, the unit will shut down automatically and a fault code will be reported. Fault code: "87".
For cooling startup:
The second compressor in a parallel system can only be started when the ambient temperature > 46℃ and the return water temperature≤15℃;
If 2 compressors are running in a parallel system, one will be shut off mandatorily if the ambient temperature > 46℃ and the return water temperature≥18℃.
For heating startup:

The second compressor in a parallel system can only be started when the ambient temperature < -10℃ and the return water temperature ≤ 30℃; If 2 compressors are running in a parallel system, one will be shut off mandatorily if the ambient temperature < -10℃ and the return water temperature ≥ 35℃.

B Low temperature unit
The ambient temperature protection range for low temperature module unit: cooling: 16℃~50℃; heating: -28℃~26℃.
For cooling startup:
The second compressor in a parallel system can only be started when the ambient temperature > 43℃ and the return water temperature ≤ 15℃; If 2 compressors are running in a parallel system, one will be shut off mandatorily if the ambient temperature > 43℃ and the return water temperature ≥ 18℃.

12.Compressor operation protection and average wear
The minimum time from start to stop of any compressor during normal operation is the "Minimum operation time of compressor".
The minimum time from stop to start of any compressor is the "Minimum stop time of compressor".
For CXAJ130 unit:
Upon each startup of the unit, the compressor with minimum total working hours among the four compressors will be selected as the first compressor to be started; then the compressor with less total working hours of the two compressors in the other system will be selected as the second compressor to be started; then the remained compressor in the system where the first compressor is picked will be selected as the third compressor to be started; the final compressor will be the fourth to be started. The order is reversed for unloading.
For CXAJ065/045 unit:
Upon each startup of the unit, the compressor with less total working hours of the two compressors will be selected as the first compressor to be started; the remained compressor will be the second to be started. The order is reversed for unloading.

13.Power supply protection
Phase failure and phase loss detection for 3-phase power supply (once only upon power-on).
The corresponding unit will be shut down if power supply protection is activated;

14.Insufficient flow protection
All the units will be shut down if insufficient flow alarm is triggered;

15.Current protection
The protection current of regular compressor is set to 23A; the protection current of low temperature compressor is set to 27A/29A.
If the measured current I ≥ protection current, the corresponding system will be shut down and an overcurrent protection alarm will be sent.

16.Excessive air exhaust temperature protection
A. Normal temperature unit:
If the air exhaust temperature of any system is > 125℃ for 10s, it will be identified as excessive air exhaust temperature, the system will shut down and send an alarm.

B. Low temperature unit:
If the air exhaust temperature of any system is > 135℃ for 10s, it will be identified as excessive air exhaust temperature, the system will shut down and send an alarm.

7-5. Unit Defrosting

Start pressure and stop pressure:

Different start pressures for defrosting corresponding to ambient temperature changes:

Stop conditions for defrosting:

During the defrosting of any system, if the air exhaust pressure is >2967kPa for 10s, or the defrosting operation period is > "Maximum defrosting operation time", or the high pressure switch trips, or the discharge water temperature ≤ "Cooling anti-freezing starting temperature (fan coil/plate type heat exchanger)" +2℃, the system will switch from defrosting to heating mode. The low pressure switch detection will not be activated within 1 minute after the defrosting is stopped.

If the defrosting is stopped due to high pressure tripping, the high pressure detection will be stopped for 20s.

After the defrosting is stopped, the fan will be activated first, the four-way valve will be turned on 15s later, and the system will switch to heating.

Attached Table

The effective sensing range for 10K temperature sensor is -40℃ to 110℃, see the table below for corresponding resistance:

T [℃]	Rmin [KΩ]	Rnom [KΩ]	Rmax [KΩ]		T [℃]	Rmin [KΩ]	Rnom [KΩ]	Rmax [KΩ]		T [℃]	Rmin [KΩ]	Rnom [KΩ]	Rmax [KΩ]
-40	194.5	208.7	224		11	17.1	17.47	17.83		62	2.719	2.816	2.917
-39	183.7	196.9	211.1		12	16.43	16.76	17.1		63	2.635	2.731	2.83
-38	173.6	185.9	199		13	15.78	16.09	16.4		64	2.553	2.648	2.746
-37	164.1	175.5	187.6		14	15.16	15.45	15.73		65	2.475	2.569	2.665
-36	155.2	165.8	177.1		15	14.57	14.83	15.09		66	2.4	2.492	2.587
-35	146.9	156.7	167.2		16	14.1	14.24	14.48		67	2.327	2.418	2.512
-34	139	148.2	157.9		17	13.47	13.68	13.9		68	2.257	2.346	2.439
-33	131.7	140.1	149.2		18	12.95	13.15	13.35		69	2.189	2.277	2.368
-32	124.7	132.6	141		19	12.46	12.64	12.82		70	2.123	2.21	2.3
-31	118.2	125.6	133.4		20	11.98	12.15	12.31		71	2.06	2.146	2.234
-30	112.1	118.9	126.2		21	11.53	11.68	11.83		72	1.999	2.083	2.171
-29	106.4	112.7	119.4		22	11.1	11.23	11.37		73	1.94	2.023	2.109
-28	100.9	106.9	113.1		23	10.68	10.8	10.92		74	1.884	1.965	2.05
-27	95.79	101.3	107.2		24	10.28	10.39	10.5		75	1.829	1.909	1.992
-26	90.98	96.15	101.6		25	9.9	10	10.1		76	1.776	1.855	1.937
-25	86.45	91.27	96.34		26	9.525	9.629	9.732		77	1.724	1.802	1.883
-24	82.17	86.66	91.39		27	9.167	9.273	9.379		78	1.675	1.751	1.831
-23	78.14	82.32	86.72		28	8.824	8.933	9.042		79	1.627	1.702	1.781
-22	74.33	78.23	82.33		29	8.495	8.606	8.718		80	1.581	1.655	1.732
-21	70.74	74.37	78.19		30	8.181	8.294	8.408		81	1.536	1.609	1.685
-20	67.34	70.73	74.28		31	7.88	7.995	8.11		82	1.493	1.564	1.639
-19	64.17	67.34	70.65		32	7.591	7.708	7.825		83	1.451	1.521	1.595
-18	61.17	64.12	67.21		33	7.315	7.433	7.551		84	1.41	1.479	1.552
-17	58.33	61.08	63.96		34	7.051	7.169	7.289		85	1.371	1.439	1.511
-16	55.63	58.2	60.89		35	6.797	6.916	7.036		86	1.333	1.4	1.47
-15	53.07	55.47	57.98		36	6.554	6.673	6.794		87	1.296	1.362	1.431
-14	50.65	52.89	55.22		37	6.321	6.441	6.562		88	1.26	1.325	1.393
-13	48.35	50.44	52.61		38	6.097	6.217	6.339		89	1.226	1.29	1.357
-12	46.17	48.12	50.14		39	5.883	6.003	6.124		90	1.193	1.255	1.321
-11	44.09	45.91	47.8		40	5.677	5.797	5.918		91	1.16	1.222	1.287
-10	42.12	43.82	45.58		41	5.479	5.599	5.72		92	1.129	1.19	1.253
-9	40.25	41.84	43.48		42	5.29	5.409	5.53		93	1.099	1.158	1.221
-8	38.48	39.95	41.48		43	5.108	5.226	5.347		94	1.07	1.128	1.19
-7	36.79	38.17	39.59		44	4.933	5.051	5.171		95	1.041	1.099	1.159
-6	35.18	36.47	37.79		45	4.765	4.882	5.002		96	1.014	1.07	1.13
-5	33.66	34.85	36.09		46	4.603	4.72	4.839		97	0.987	1.043	1.101
-4	32.21	33.32	34.47		47	4.448	4.564	4.682		98	0.961	1.016	1.074
-3	30.82	31.86	32.93		48	4.299	4.414	4.531		99	0.936	0.99	1.047
-2	29.51	30.47	31.47		49	4.156	4.27	4.386		100	0.912	0.965	1.021
-1	28.26	29.15	30.08		50	4.018	4.131	4.246		101	0.888	0.941	0.996
0	27.06	27.9	28.76		51	3.886	3.997	4.112		102	0.865	0.917	0.9713
1	25.93	26.71	27.5		52	3.758	3.869	3.982		103	0.843	0.894	0.9475
2	24.85	25.57	26.31		53	3.636	3.745	3.857		104	0.822	0.872	0.9243
3	23.81	24.49	25.17		54	3.518	3.626	3.737		105	0.801	0.85	0.9019
4	22.83	23.45	24.09		55	3.404	3.511	3.621		106	0.781	0.829	0.8801
5	21.89	22.47	23.06		56	3.295	3.4	3.509		107	0.761	0.809	0.8589
6	21	21.53	22.08		57	3.19	3.294	3.401		108	0.742	0.789	0.8383
7	20.15	20.64	21.15		58	3.088	3.191	3.297		109	0.724	0.77	0.8183
8	19.33	19.79	20.26		59	2.991	3.092	3.197		110	0.706	0.751	0.7989
9	18.55	18.98	19.41		60	2.897	2.997	3.1					
10	17.81	18.21	18.6		61	2.806	2.905	3.007					

Attached Table

The effective sensing range for 100K temperature sensor is -30℃ to 140℃, see the table below for corresponding resistance:

T [℃]	Rmin [KΩ]	Rnom [KΩ]	Rmax [KΩ]		T [℃]	Rmin [KΩ]	Rnom [KΩ]	Rmax [KΩ]		T [℃]	Rmin [KΩ]	Rnom [KΩ]	Rmax [KΩ]
-30	1500	1618	1744		31	75.31	77.24	79.18		92	7.913	8.483	9.089
-29	1417	1526	1643		32	72.13	74.05	75.98		93	7.668	8.225	8.819
-28	1339	1441	1549		33	69.11	71	72.92		94	7.432	7.977	8.558
-27	1266	1360	1461		34	66.23	68.1	69.99		95	7.204	7.737	8.305
-26	1197	1285	1379		35	63.49	65.33	67.2		96	6.984	7.505	8.062
-25	1132	1214	1301		36	60.87	62.69	64.54		97	6.772	7.281	7.826
-24	1071	1147	1228		37	58.37	60.17	61.99		98	6.567	7.065	7.598
-23	1014	1084	1160		38	55.99	57.76	59.56		99	6.369	6.856	7.378
-22	959.3	1025	1095		39	53.72	55.46	57.24		100	6.177	6.654	7.165
-21	908.4	970	1035		40	51.55	53.27	55.02		101	5.993	6.459	6.959
-20	860.5	917.8	978.5		41	49.48	51.17	52.89		102	5.814	6.27	6.76
-19	815.2	868.5	925		42	47.51	49.17	50.86		103	5.642	6.088	6.567
-18	772.5	822.1	874.6		43	45.62	47.25	48.92		104	5.475	5.912	6.381
-17	732.2	778.4	827.2		44	43.82	45.42	47.06		105	5.314	5.741	6.2
-16	694.3	737.3	782.7		45	42.1	43.67	45.28		106	5.159	5.577	6.026
-15	658.5	698.6	740.7		46	40.45	41.99	43.58		107	5.008	5.417	5.857
-14	624.8	662.1	701.3		47	38.88	40.39	41.95		108	4.863	5.263	5.693
-13	592.9	627.6	664.1		48	37.37	38.86	40.39		109	4.722	5.114	5.535
-12	562.9	595.2	629.1		49	35.93	37.39	38.89		110	4.587	4.969	5.382
-11	534.5	564.6	596.1		50	34.56	35.99	37.46		111	4.455	4.83	5.233
-10	507.7	535.7	565		51	33.24	34.64	36.09		112	4.328	4.694	5.09
-9	482.3	508.4	535.7		52	31.98	33.35	34.77		113	4.205	4.563	4.951
-8	458.4	482.7	508		53	30.78	32.12	33.51		114	4.086	4.437	4.816
-7	435.7	458.3	481.9		54	29.62	30.94	32.3		115	3.97	4.314	4.685
-6	414.3	435.4	457.3		55	28.51	29.81	31.14		116	3.859	4.195	4.559
-5	394.1	413.7	434		56	27.46	28.72	30.03		117	3.751	4.08	4.436
-4	374.9	393.1	412.1		57	26.44	27.68	28.96		118	3.646	3.968	4.317
-3	356.8	373.7	391.4		58	25.47	26.68	27.94		119	3.545	3.86	4.202
-2	339.6	355.4	371.8		59	24.54	25.72	26.95		120	3.447	3.756	4.09
-1	323.3	338	353.2		60	23.64	24.8	26.01		121	3.352	3.654	3.982
0	307.9	321.6	335.7		61	22.79	23.92	25.1		122	3.261	3.556	3.877
1	293.3	306.1	319.2		62	21.97	23.08	24.23		123	3.172	3.461	3.775
2	279.5	291.3	303.5		63	21.18	22.26	23.4		124	3.086	3.369	3.677
3	266.4	277.4	288.7		64	20.42	21.48	22.59		125	3.002	3.28	3.581
4	253.9	264.2	274.7		65	19.7	20.74	21.82		126	2.921	3.193	3.489
5	242.1	251.6	261.4		66	19	20.02	21.08		127	2.843	3.109	3.399
6	230.9	239.8	248.8		67	18.33	19.33	20.37		128	2.767	3.028	3.312
7	220.3	228.5	236.9		68	17.69	18.66	19.68		129	2.694	2.949	3.227
8	210.2	217.8	225.6		69	17.07	18.02	19.02		130	2.622	2.872	3.145
9	200.6	207.7	214.9		70	16.48	17.41	18.39		131	2.553	2.798	3.065
10	191.5	198.1	204.8		71	15.91	16.82	17.78		132	2.486	2.726	2.988
11	182.9	189	195.2		72	15.37	16.2	17.19		133	2.421	2.656	2.913
12	174.7	180.3	186.1		73	14.84	15.71	16.62		134	2.358	2.588	2.84
13	166.9	172.1	177.4		74	14.34	15.19	16.08		135	2.297	2.523	2.769
14	159.5	164.3	169.2		75	13.85	14.68	15.56		136	2.238	2.459	2.7
15	152.4	156.9	161.4		76	13.38	14.2	15.05		137	2.18	2.397	2.634
16	145.7	149.8	154		77	12.94	13.73	14.57		138	2.125	2.337	2.569
17	139.3	143.1	147		78	12.5	13.28	14.1		139	2.07	2.278	2.506
18	133.2	136.7	140.3		79	12.09	12.85	13.65		140	2.018	2.221	2.445
19	127.4	130.7	134		80	11.69	12.43	13.21		141	1.967	2.166	2.385
20	121.9	124.9	127.9		81	11.3	12.03	12.8		142	1.917	2.113	2.328
21	116.7	119.4	122.2		82	10.93	11.64	12.39		143	1.869	2.061	2.271
22	111.7	114.2	116.8		83	10.58	11.27	12		144	1.823	2.01	2.217
23	106.9	109.2	111.6		84	10.23	10.91	11.63		145	1.777	1.961	2.164
24	102.4	104.5	106.6		85	9.9	10.57	11.27		146	1.733	1.914	2.112
25	98	100	102		86	9.584	10.24	10.92		147	1.691	1.868	2.062
26	93.74	95.73	97.72		87	9.279	9.916	10.59		148	1.649	1.823	2.014
27	89.68	91.66	93.65		88	8.986	9.609	10.27		149	1.609	1.779	1.966
28	85.81	87.79	89.77		89	8.703	9.312	9.959		150	1.569	1.736	1.92
29	82.14	84.1	86.08		90	8.43	9.026	9.659					
30	78.64	80.59	82.55		91	8.167	8.749	9.369					

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