



CyberMate Series Air Conditioner

User Manual

CHAPTER 1 OVERVIEW.....	5
1.1 STANDARDS.....	5
1.2 APPLICATIONS.....	5
1.3 MODEL DESCRIPTION.....	5
1.4 SYSTEM DIAGRAM.....	7
CHAPTER 2 ONSITE PREPARATION AND INSTALLATION.....	8
2.1 PRECAUTIONS FOR INSTALLATION.....	8
2.1.1 STORAGE AND OPERATION ENVIRONMENT REQUIREMENTS OF CYBERMATE SERIES AIR CONDITIONER.....	8
2.1.2 PREPARATION OF THE COMPUTER ROOM.....	9
2.1.3 INSTALLATION SITE TIPS.....	9
2.2 MECHANICAL PARAMETERS.....	10
2.2.1 OUTLINE DIMENSIONS.....	10
2.2.2 INSTALLATION AND MAINTENANCE SPACE REQUIREMENTS.....	15
2.2.3 PACKAGE SIZE AND GROSS WEIGHT.....	18
2.3 INSPECTION OF INCOMING GOODS.....	19
2.4 UNIT INSTALLATION.....	19
2.4.1 UNIT FIXATION.....	19
2.4.2 SCHEMATIC DIAGRAM FOR SYSTEM INSTALLATION.....	21
2.4.3 PIPE CONNECTION AND REFRIGERANT REQUIREMENT.....	23
2.4.4 REMOVAL OF COMPRESSOR FOOTER HOLDER.....	28
2.4.5 ONSITE FIXATION OF FLOODING SENSOR.....	29
2.4.6 ELECTRIC CONNECTION.....	29
2.5 ITEMS FOR VERIFICATION WHEN THE INSTALLATION IS COMPLETED (CHECKLIST).....	36
CHAPTER 3 CONTROLLER.....	37
3.1 UNIT DISPLAY.....	37
3.2 SYSTEM MENU STRUCTURE.....	37
3.2.1 SYSTEM STANDBY INTERFACE.....	37
3.2.2 SYSTEM INITIALIZATION INTERFACE.....	38
3.2.3 PASSWORD INPUT INTERFACE.....	38
3.2.4 NORMAL DISPLAY INTERFACE.....	39
3.2.5 TIME SETTING.....	39
3.2.6 PARA SETTING.....	40
3.2.7 SYSTEM STATE.....	40
3.2.8 CURRENT ALARM.....	41
3.2.9 HISTORY ALARM.....	42

3.2.10 TEMPERATURE/HUMIDITY CURVE.....	42
3.2.11 SHUTDOWN INTERFACE.....	43
CHAPTER 4 SYSTEM OPERATION.....	44
4.1 TEMPERATURE CONTROL.....	44
4.1.COOLING/REHEATING.....	44
4.1.2 COOLING.....	44
4.1.3 HEATING.....	44
4.2 HUMIDITY CONTROL.....	44
4.2.1 HUMIDIFYING.....	44
4.3 SYSTEM PROTECTION.....	45
4.4 COMMUNICATION.....	45
CHAPTER 5 ALARM.....	46
5.1 ALARM: INTERPRETATION & TROUBLESHOOTING.....	46
5.1.1 HIGH PRESSURE ALARM.....	46
5.1.2 LOW PRESSURE ALARM.....	46
5.1.3 HUMIDITY.....	47
5.1.4TEMPERATURE.....	47
5.1.5POWER SUPPLY.....	47
5.1.6COMMUNICATION FAULT.....	48
5.1.7SENSOR FAULT.....	48
CHAPTER 6 SYSTEM TESTING AND MAINTENANCE.....	49
6.1 TEMPERATURE CONTROL.....	49
6.1.1COOLING.....	49
6.1.2HEATING.....	49
6.1.3HUMIDIFYING.....	49
6.1.4FLOOR FLOODING DETECTION.....	49
6.1.5SHUT DOWN VIA REMOTE CONTROL.....	49
6.2 MAINTENANCE.....	50
6.2.1CIRCUIT BOARD.....	50
6.2.2AIR FILTER.....	50
6.2.3 FAN.....	51
6.2.4 COOLING SYSTEM.....	51
6.2.5 HUMIDIFIER.....	54
CHAPTER 7 MAINTENANCE INSPECTION CHECKLIST.....	56

CHAPTER 8 TROUBLESHOOTING.....	57
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Chapter 1 Overview

1.1 Standards

CyberMate series air conditioners meet the GB/T 19413-2010 Unitary Air Conditioners for Computer and Data Processing Room standard.

1.2 Applications

CyberMate series cooling units are dedicated unitary air-conditioning system developed for Internet Data Center.

1.3 Model description

For the model description of the indoor units and outdoor units of the CyberMate DX series air conditioners, please refer to Table 1-1 and Table 1-2 respectively.

➤ Table 1-1 Model description of the indoor units of CyberMate series air conditioners

SN	Function	Code	Description
1	Series name	CyberMate	CyberMate CRAC cooling unit
2	Series code	6	DX Single compressor unit
3	Cooling capacity code	0~999	For example: 020 represents 20kW
4	Function	B	Cooling function
		H	Cooling and heating function
		P	Cooling, heating and humidifying function
5	Fan type	I	AC fan
		E	EC fan
6	Air outlet condition	F	Downflow
		S	Downflow with fans under floor
		U	Upflow with plenum
		D	Upflow with duct
7	Power system	1	380V 3Ph-50Hz
		2	220V 1Ph-50Hz
		3	Other power system
8	Cooling method	A	Air cooled
		F	Dual cycle: iFreecooling /air cooled
		W	Water cooled

		G	Glycol cooled
		N	Integrated fresh air and evaporative cooling pad
		C	Chilled water; single coil
		T	Chilled water; double coil
		D	Double cooling source: air cooled/chilled water
		R	Double cooling source: water cooled (glycol cooled)/chilled water
9	Custom code	C	Containers of communication data centers
		X	Custom function code

Table 1-2 Model description of the outdoor units of CyberMate series air conditioners

CyberMate60	16	E	C
CyberMate60 Outdoor CRAC cooling unit	16 16.8kW refrigerating output 20 20.2kW refrigerating output	Outdoor unit	C:Standard design S:Quiet design

1.4 System diagram

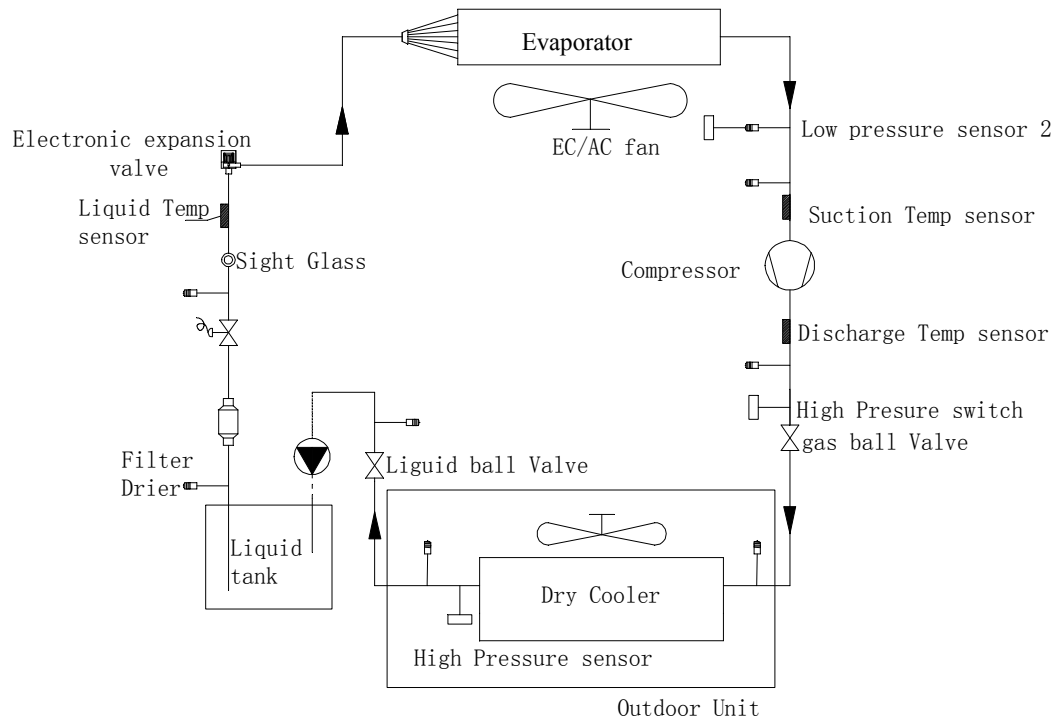


Fig.1-1 System diagram of unit

Chapter 2 Onsite Preparation and Installation

2.1 Precautions for installation

Note

When handling the unit, you must keep the unit vertical. It is prohibited to handle the unit horizontally or upside down. Any damage caused to the unit for failing to observe this instruction shall not be covered by the warranty.

Before installing the equipment, you should decide how to modify the building to facilitate the piping, cabling and duct construction. Please install the units strictly according to the relevant drawings. For the reserved installation and maintenance space, please refer to the engineering dimension drawing provided by the manufacturer.

2.1.1 Storage and operation environment requirements of CyberMate series air conditioner

For the storage and operation environment requirements of the CyberMate series air conditioner, please refer to Table 2-1 and Table 2-2.

Table 2-1 Storage environment requirement

Item	Requirement
Storage environment	Indoor, clean, dust free, etc
Ambient temperature	-40°C~70°C
Relative humidity	5%RH-90%RH
Storage time	The total transportation and storage time shall not exceed 6 months; otherwise, the performance shall be recalibrated.

Table 2-2 Operation environment requirement

Item	Requirement
------	-------------

Installation mode	Indoor unit: vertical installation; Outdoor unit: vertical installation
Connecting pipe length (DX unit)	Maximum equivalent length for indoor/outdoor unit (horizontal): 60m; extension component shall be configured when the length exceeds 30m.
Drop height (DX unit)	Maximum drop height when the outdoor unit is above the indoor unit (positive drop height): 20m; extension component shall be configured when the drop height exceeds 10m. Maximum drop height when the outdoor unit is below the indoor unit (negative drop height): -5m
Indoor ambient temperature	0°C~45°C
Outdoor ambient temperature	Standard configuration: -15°C~45°C; Low temperature kits configured: -40°C~45°C
Relative humidity	20%RH~80%RH
IP class of outdoor unit	IPX4
Altitude	<1000m, derated when the altitude exceeds 1000m
Operating voltage range	Three-phase power supply: 380V(-15%~+15%), deviation 3%

Note: If the relevant values in the actual application exceed the recommended values in the above tables, please consult the technical department of our company.

2.1.2 Preparation of the computer room

Computer room shall have good insulation and a sealed moisture-proof layer. Ceilings and walls shall be equipped with sealed moisture-proof layers.

The computer room shall minimize the entry of outdoor air, which will increase the cooling, reheating and humidification load of the system. Therefore, it is suggested that the amount of outdoor air intake shall below 5% of the total amount of indoor circulated air. All doors shall be fully sealed and the sealed gap of the door shall be as small as possible.

2.1.3 Installation site tips

Warning

Since the equipment can generate condensate water, the lower precise equipment may be damaged due to water leakage. Do not install the air conditioner above the precise equipment. Drainage pipelines shall be provided at the installation site of the equipment, which will be installed below the indoor unit.

To ensure the normal operation of the indoor unit, you shall try to select a spacious area as the installation site of the indoor unit. Avoid placing it in a narrow place; otherwise it will affect the air flow organization, resulting in air intake and return air short circuit and air noise. Avoid placing it at the end of a recess or a long and narrow room. Avoid installing multiple units one

next to another closely, which can cause overlapped air supply flow between different units, unbalanced load and the mode that heating and refrigeration of different units compete for operation simultaneously. Do not add extra devices to the case (such as the smoke detector), which will hinder daily maintenance and repair.

The schematic diagram of the air conditioning equipment installation location is shown in Figure 2-1.

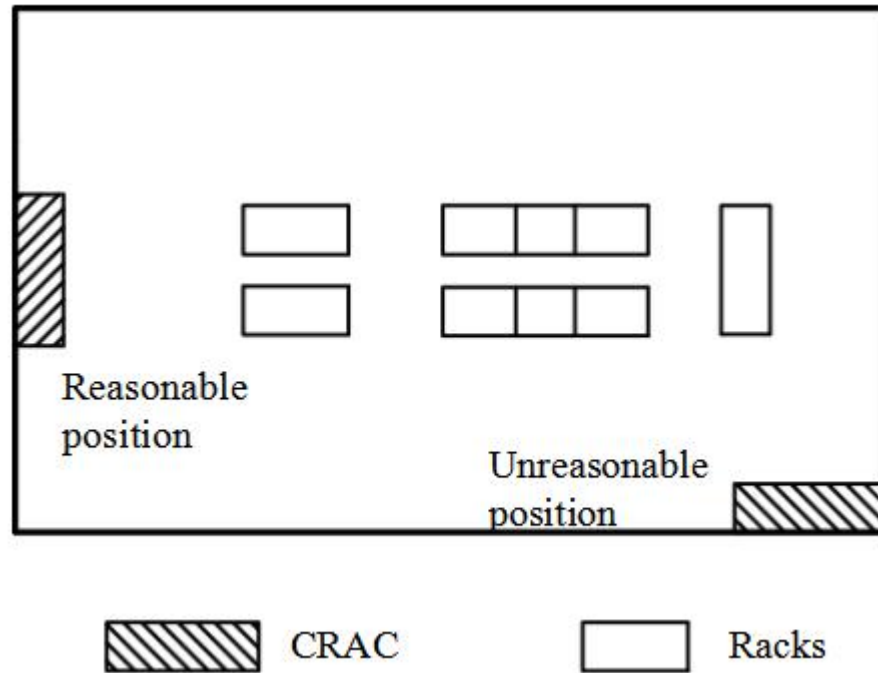


Fig.2-1 Installation position of CRAC

2.2 Mechanical parameters

ⓘ Warning

You must strictly comply with the recommended installation and maintenance space requirement of the relevant equipment.

You should decide whether to modify the building to facilitate the piping, cabling and duct construction.

2.2.1 Outline dimensions

- For the outline dimensions of the unit, please refer to Fig.2-1 and Fig.2-2, Table 2-3.

- Outline dimensions of CyberMate6005~6020 upflow series indoor and outdoor unit are seen in Fig.2-1.

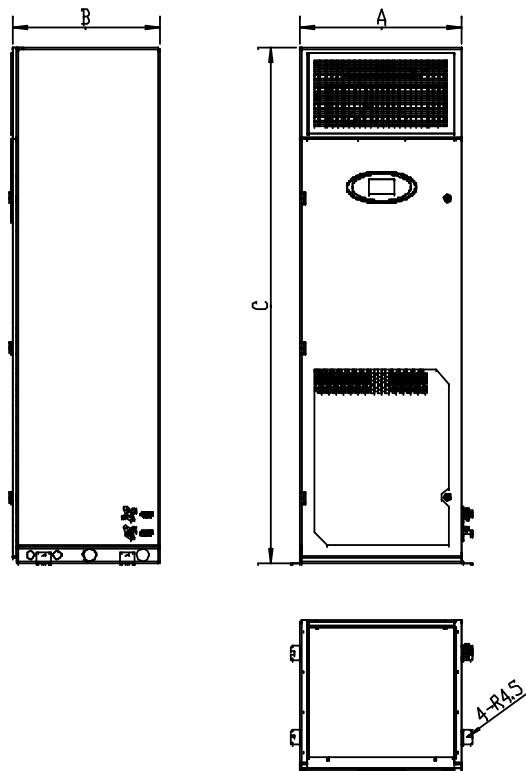


Fig.2-1(a) Outline Dimensions of indoor units of the upflow CyberMate6005/6007/6012

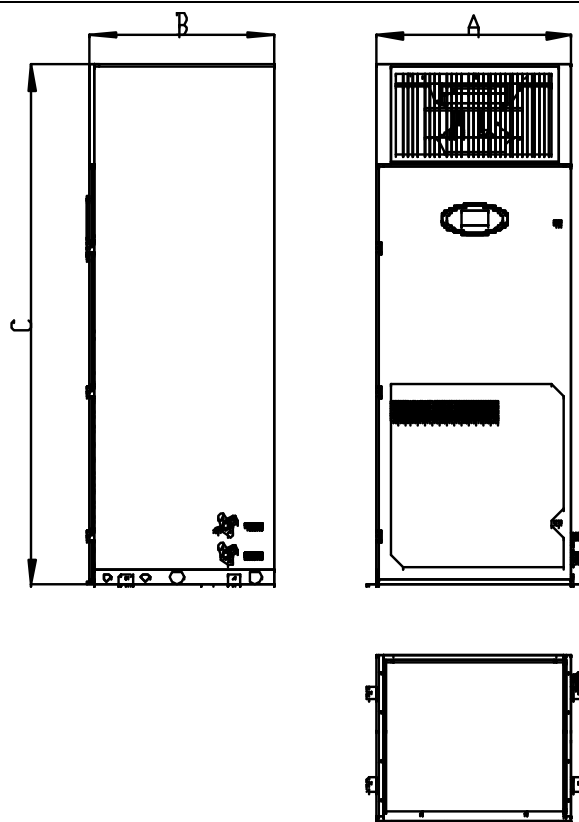


Fig.2-1 (b) Outline Dimensions of indoor units of the upflow CyberMate6016/6020

- Outline Dimensions of indoor units of the downflow CyberMate6005~6020 are seen in Fig.2-2.

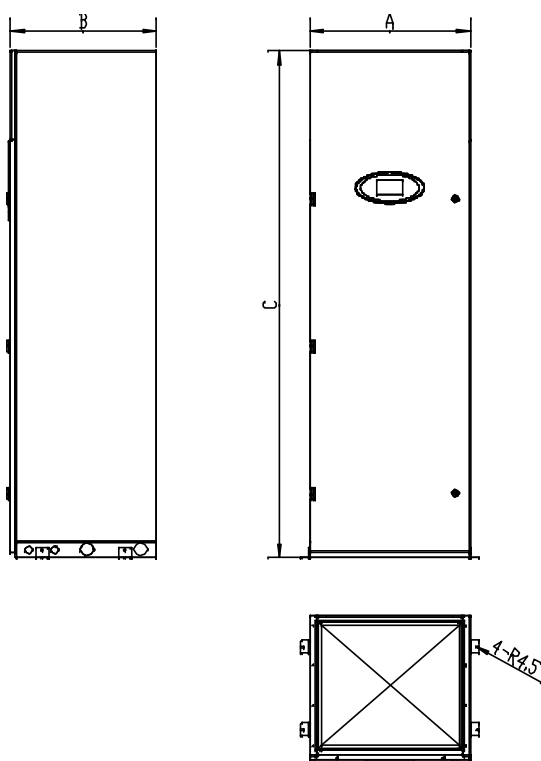


Fig.2-2 (a)Outline Dimensions of indoor units of the downflow CyberMate6005/6007/6012

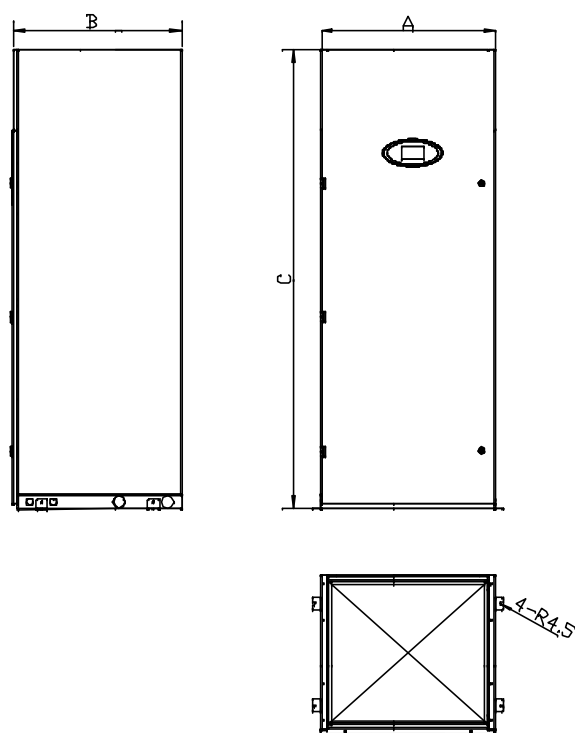


Table 2-3 Outline Dimensions of the indoor units of CyberMate6016/6020

Model	A	B	C
CyberMate6005/6007/6012	600	550	1900
CyberMate6016/6020	750	750	1950

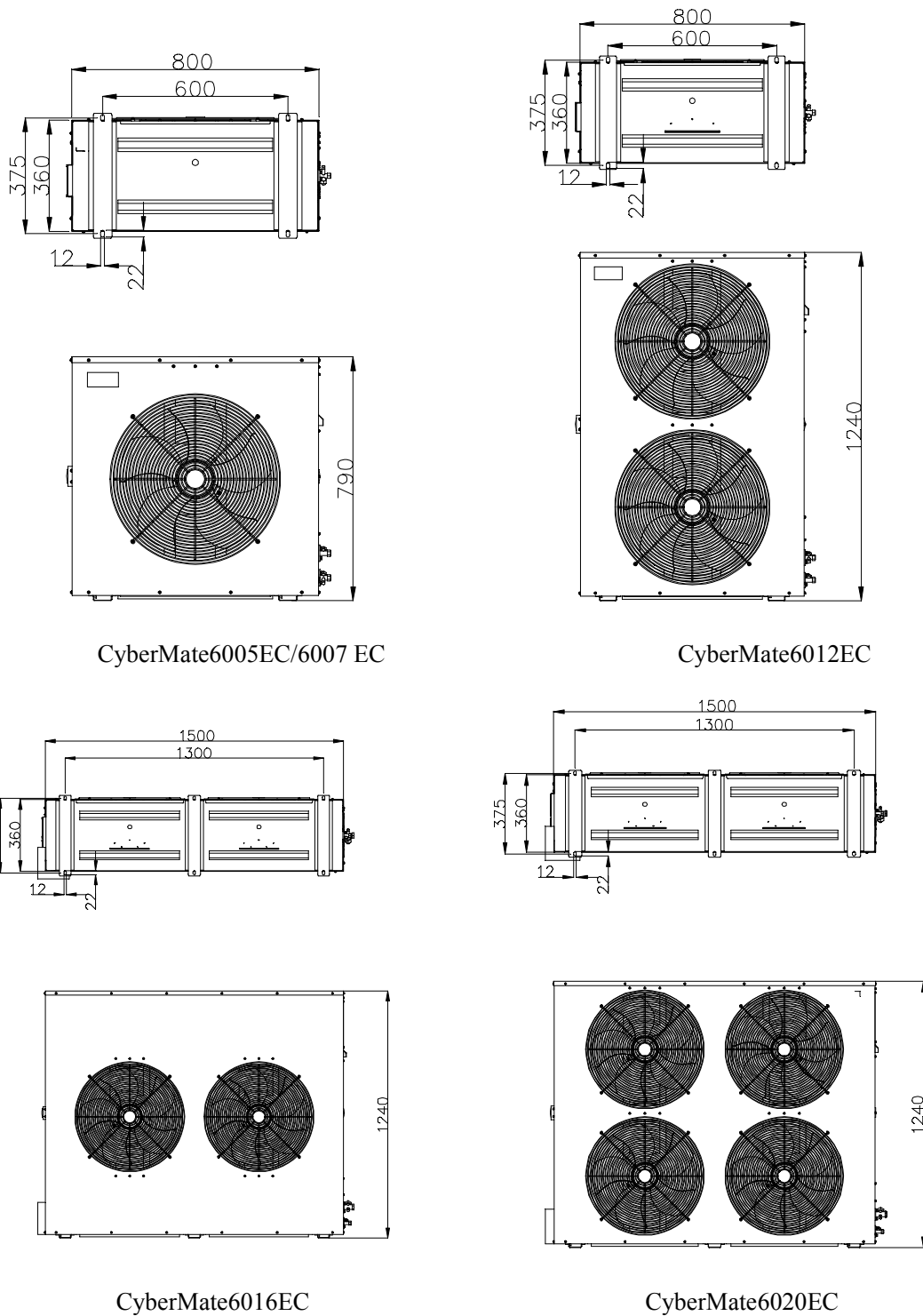


Fig.2-2 Outline Dimensions of the outdoor units of the CyberMate6005~6020

2.2.2 Installation and maintenance space requirements

When reserving the installation and maintenance space, the pipe connecting and front access space shall be considered. The maintenance and heat dissipation requirement of the compressor shall also be taken into consideration for the outdoor unit.

For the installation and maintenance space requirements of the indoor/outdoor units of the CyberMate series air conditioner, please refer to Fig.2-3/ Fig.2-4and Table2-5.

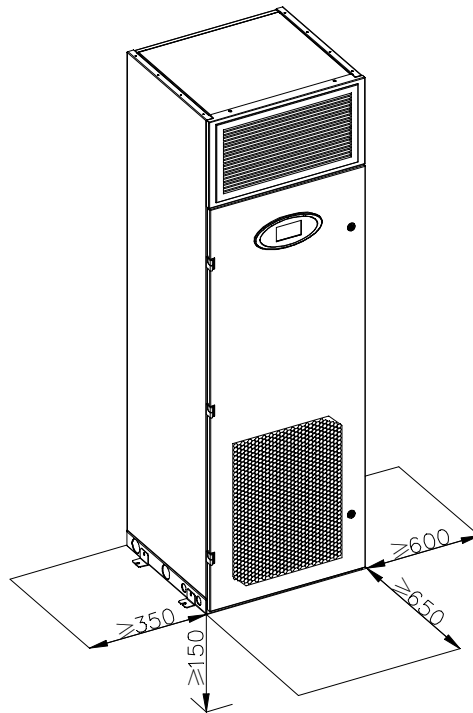


Fig.2-3(a) Schematic diagram for the installation and maintenance space of the indoor unit of the upflow CyberMate6005~6020

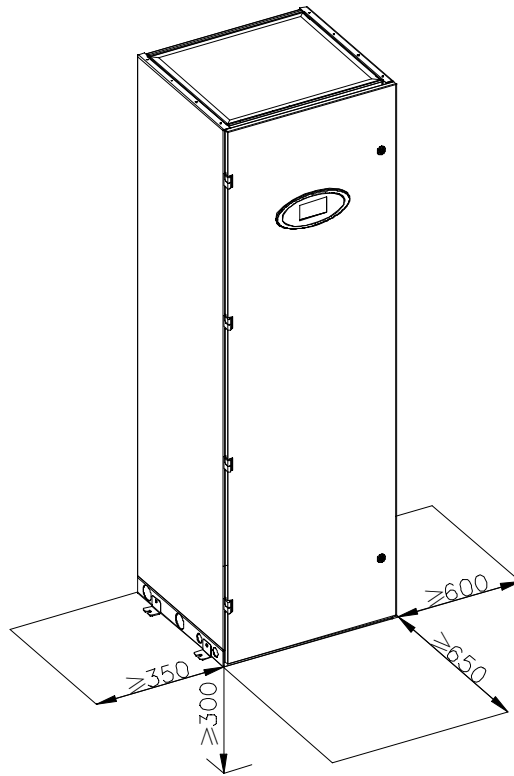


Fig.2-3(b) Schematic diagram for the installation and maintenance space of the indoor unit of the downflow CyberMate6005~6020

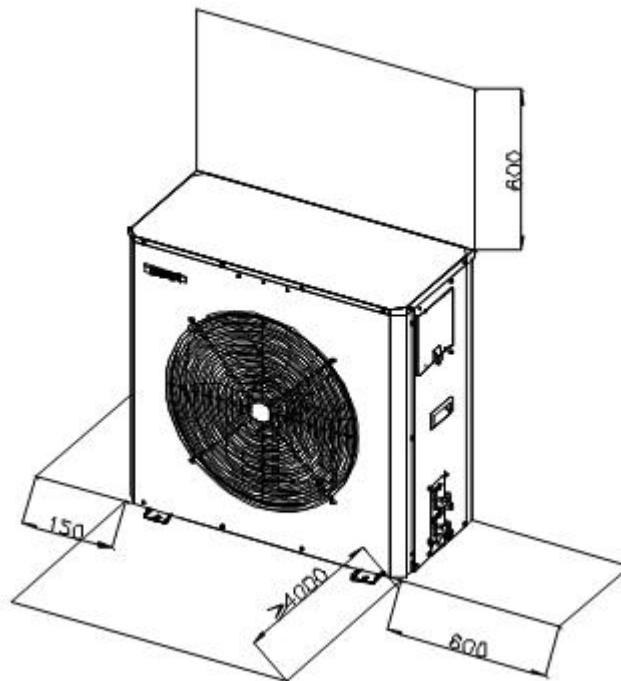


Fig.2-4(a) Schematic diagram for the installation and maintenance space of the outdoor unit of the CyberMate6005/6008

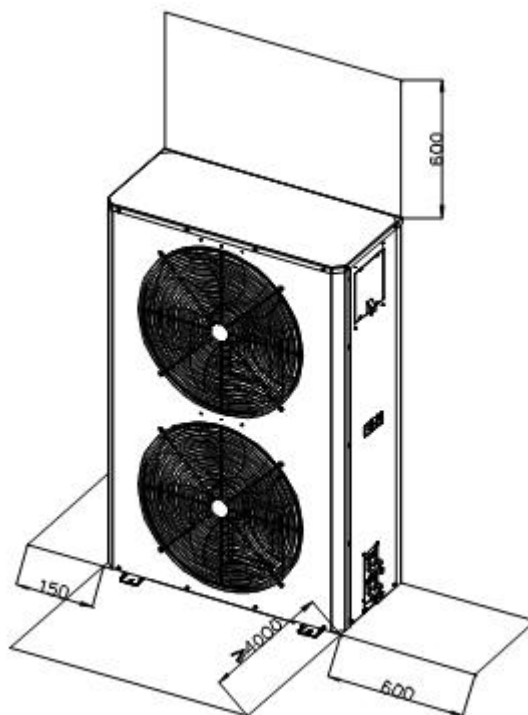


Fig.2-4(b) Schematic diagram for the installation and maintenance space of the outdoor unit of the CyberMate6012

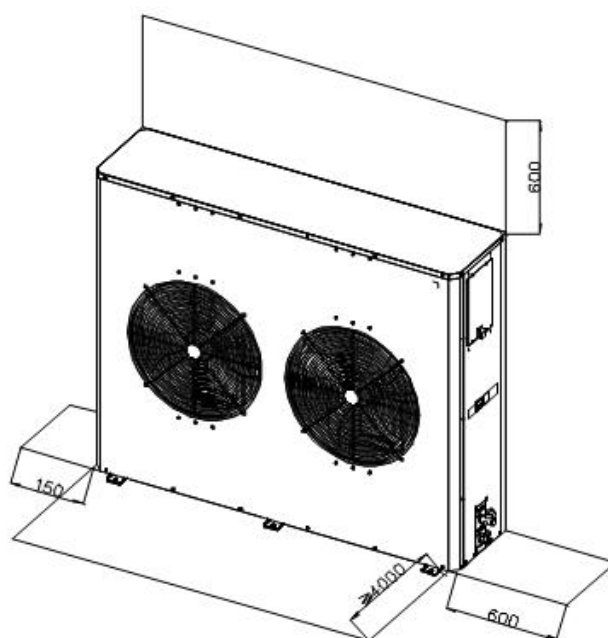


Fig.2-4(c) Schematic diagram for the installation and maintenance space of the outdoor unit of the CyberMate6016

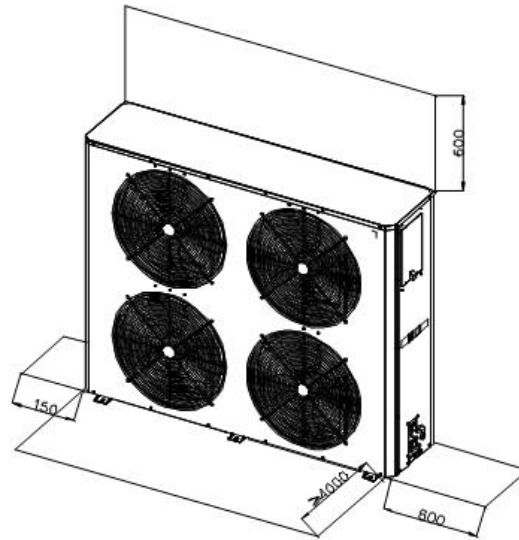


Fig.2-4(d) Schematic diagram for the installation and maintenance space of the outdoor unit of the CyberMate6020

⊗ Note

1. The installation and maintenance space diagram of the indoor unit of the CyberMate series upper/lower air supply series is for reference only. The actual installation shall prevail.

2.2.3 Package size and gross weight

The package size and gross weight of different models are listed in Table 2-4.

Table 2-4 Package size and gross weight of different models

Model	Package size (L×W×H, mm)	Gross weight (kg)
indoor unit		
CyberMate6005/6007	746×636×2060	120/130
CyberMate6012	746×636×2060	150
CyberMate6016	896×836×2150	280
CyberMate6020	896×836×2150	300
outdoor unit		
CyberMate6005/6007EC	916×471×950	45
CyberMate6012EC	916×471×1400	60
CyberMate6016EC	1626×471×1400	100
CyberMate6020EC	1626×471×1400	110

2.3 Inspection of incoming goods

When possible, the equipment shall be transported to the place nearest to the final installation site before unpacking. All the components are separately packaged before they are packed into the box for delivery. When receiving the CyberMate series products, you shall check their appearance to see whether all the components are intact. When any damage is found upon unpacking inspection, report to the transportation agent immediately. If any hidden damage is found, please report to the transportation agent and Envicool.

2.4 Unit Installation

2.4.1 Unit fixation

2.4.1.1 Fixation of outdoor unit

Remove the cabinet handling pallet of the outdoor unit and fix the outdoor unit reliably to the outdoor ground with the expansion bolt. The outdoor unit must be placed at the position where safety and convenient maintenance can be ensured. Do not place the outdoor unit at the first floor of the public site.

To ensure the proper heat dissipation, the outdoor unit shall be installed horizontally at the clean place and free from any dust or foreign object, because they may block the coil. The outdoor unit cannot be installed near the steam, hot air or hot exhaust gas. A clearance of at least 400mm shall be maintained between the outdoor unit and the wall, obstacle or adjacent equipment. The equipment shall not be installed at the place where the snow may accumulate at the air inlet and outlet.

2.4.1.2 Fixation and connection of indoor unit

Dismantled the handling trays of indoor unit , and securely fixed the indoor unit on the ground or stand. In order to ensure the normal operation of the unit, the entire unit must be level.

Base stand can be made by Channel. User can mounting brackets refer to Fig 2-5.

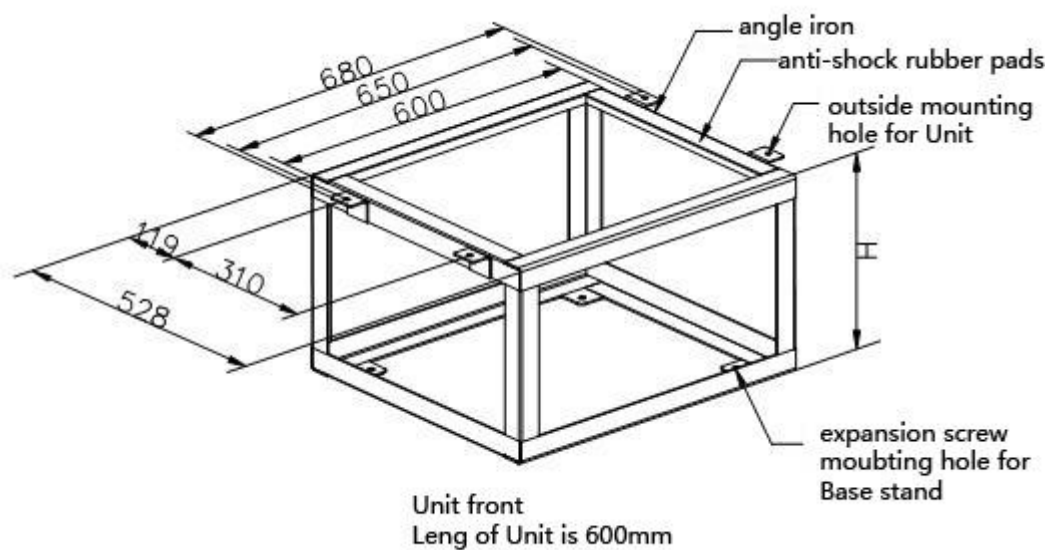


Fig 2-5 (a) Base stand of CyberMate6005/6007/6012

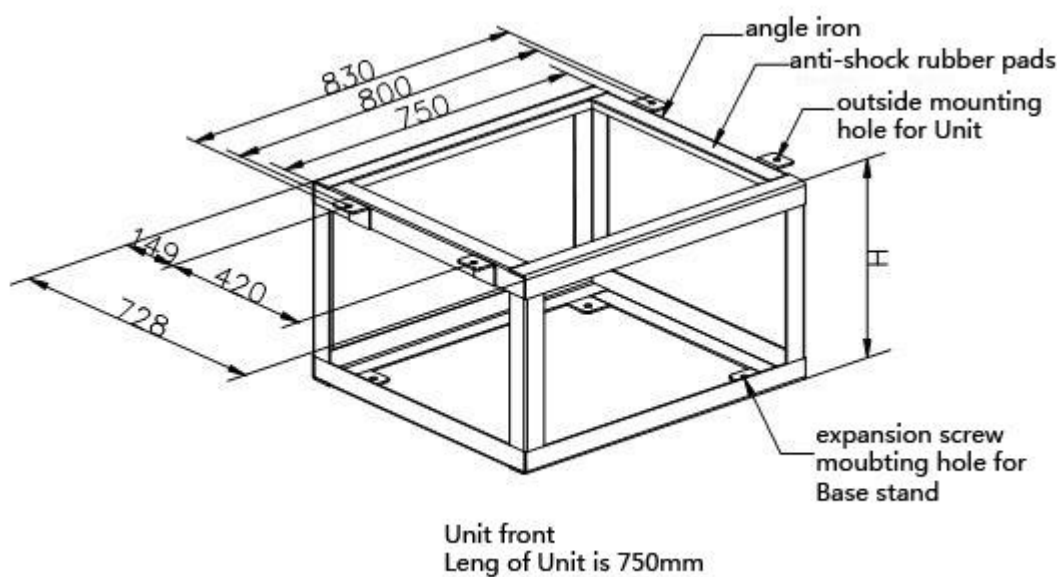


Fig 2-5 (b) Base stand of CyberMate6016/6020

Table 2-5 Installation base size of the indoor unit

Item		Requirement	Remark
Angle iron		40mm×40mm×3mm	/
Anti-shock rubber pads	Upper part	Thickness: 3.0mm	Rubber pads is Vertically symmetrical
	Bottom part	Thickness: 3.0mm	

Item		Requirement	Remark
expansion screw mounting hole		4-Ø12mm	/
Mounting hole for Unit		4-Ø10mm	/
Base height	CyberMate6005~6020	H≥150mm (Upflow) H≥300mm (Downflow, determined by the height of the floor; The minimum requirement is 400mm when it is downflow with fans under floor)	For reference only, it should be determined according to the actual needs of the user.

2.4.2 Schematic diagram for system installation

For the unit installation mode, please refer to Fig.2-6 and Fig.2-7.

⊗ Note

- In case that the outdoor unit is installed higher than the indoor unit (see Fig.2-6), note that in the outdoor unit condenser air side pipe and the liquid pipe installed on the reverse side bending, avoid the liquid refrigerant flow when unit stopping, when installing reverse bending, make sure that reverse bending top elbow higher than the top row condenser tubes; if their installation height difference is 6m, an oil trap shall be installed for every 6m of the gas side pipe, to ensure that when the compressor is shut down and restarted, the compressor oil in the higher gas side pipe (vertical height) that reflows to the oil trap can be taken away quickly.
- When the pipe length exceeds 30m or the outdoor unit is installed 10m higher than the indoor unit, extension component shall be configured and installed. The check valve of the extension component shall be installed near the gas side pipe of the outdoor unit condenser, while the solenoid valve shall be installed on the liquid side pipe of the indoor unit. The solenoid valve can act synchronously with the compressor contactor.
- In order to ensure compressor oil return smooth, level of gas side line in the left compressor direction to have a 1:100 zero gradient, namely gas side pipe road, away from the far end of the compressor every 1 m than leave compressor of the proximal low 10 mm.

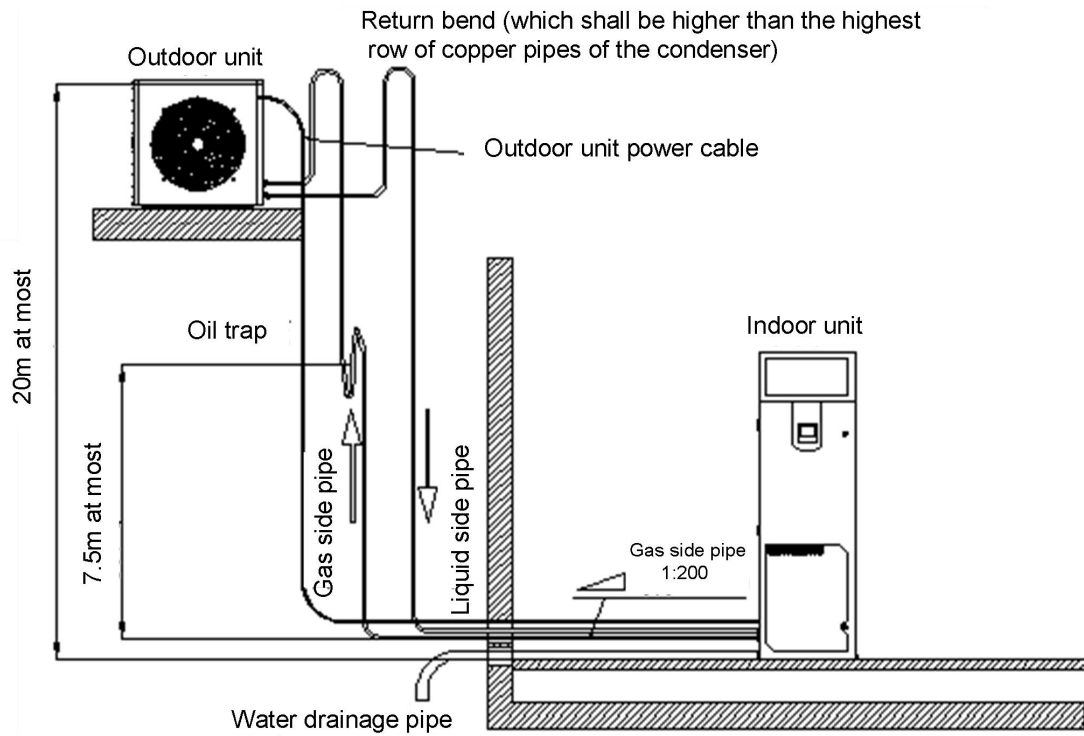


Fig.2-6 Installation diagram (in case the outdoor unit is installed higher than the indoor unit)

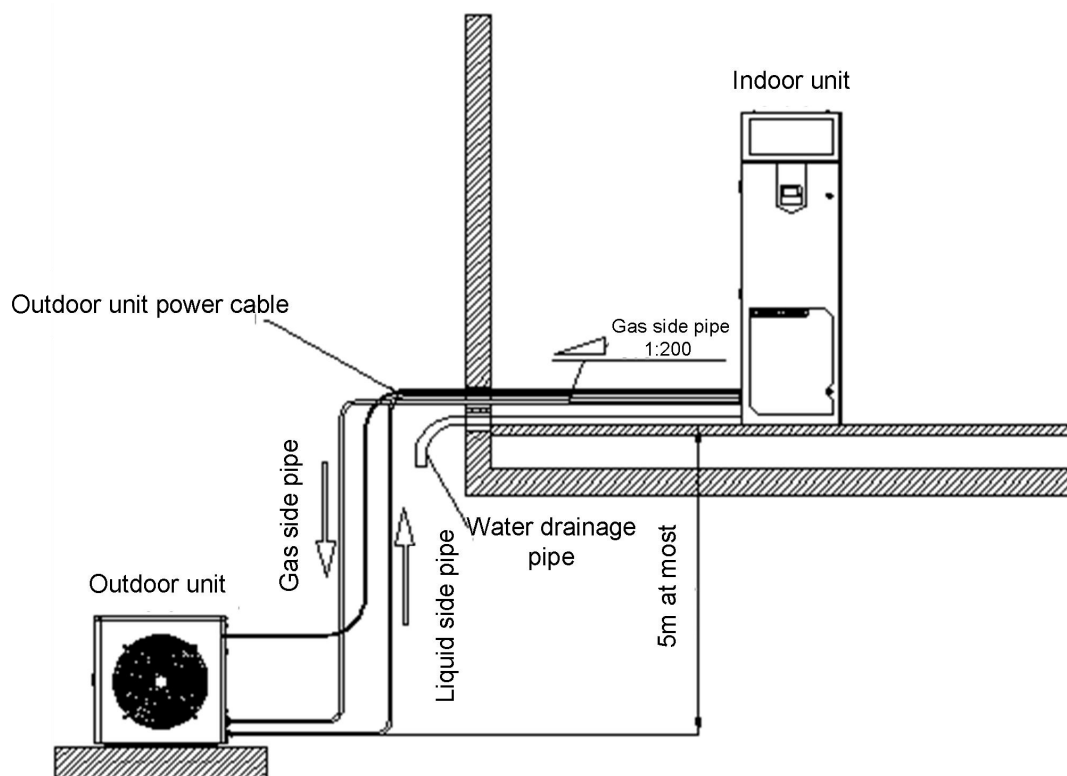


Fig.2-7 Installation diagram (in case the outdoor unit is installed lower than the indoor unit)

2.4.3 Pipe connection and refrigerant requirement

The pipes to be connected are as follows:

1. The water drainage pipe of indoor unit which shall be connected to the place outside the data center.
2. Humidifier of water supply pipe.
3. Refrigerant connecting copper pipe: thermal-insulating refrigerant connecting copper pipe for the indoor unit and outdoor unit, including the gas side pipe and liquid side pipe.

⊗ Note

1. Before starting the equipment, check and ensure that there is no leakage or seepage from all the connected pipes and joints.
 2. The water drainage pipe of the unit shall not be higher than the water drainage outlet of the humidifier.
-

2.4.3.1 Water drainage pipe of indoor unit

The specifications for the condensing water drainage pipe diameter refer to Table 2-6. The external pipe shall be fixed with the pipe hoop. The water drainage pipe shall not be placed in a place where the temperature is lower than 0°C. The fixation of the water drainage pipe shall comply with the local or state engineering regulations.

Table 2-6 The diameter of drainage pipe of CyberMate6005~6020.

Model		Diameter of drainage pipe
CyberMate6005~6012	Cooling, heating and humidifying	Φ19(inner diameter) ~Φ26(outer diameter)
CyberMate6016~6020	Cooling	Φ19(inner diameter) ~Φ26(outer diameter)
CyberMate6016~6020	Cooling, heating and humidifying	Φ25((inner diameter ~Φ33(outer diameter)

⊗ Note

For the unit configured with humidifier, the material of its external water drainage pipe shall be able to withstand the high temperature of 100°C. It is recommended to adopt galvanized steel pipe, hot water type aluminum-plastic composite pipe or hot water type PPR pipe.

2.4.3.2 Connection of the water supply pipe of the humidifier (optional)

The unit provides a quick connector for the water supply pipe (1/2" GAS female thread) of the humidifier. The users are suggested to install the cut-off valve and water supply filter for the water supply pipe to isolate the humidifier during the maintenance.

⊗ Note

1. The water supply shall adopt the ordinary tap water with the conductivity within the range of 300 μ S/cm~1250 μ S/cm.
 2. The water supply pressure for the humidifier system shall be 0.1~0.8MPa.
-

2.4.3.3 Refrigerant connecting copper pipe

2.4.3.3.1 System pipe connection

Four refrigerant pipes (double system) are needed to connect the indoor unit and the outdoor unit, i.e. thermal-insulating copper gas pipe and liquid pipe. The connecting pipe with the indoor and outdoor units are connected by welding, the factory indoor and outdoor unit over side are made flaring, therefore no flaring processing. Indoor unit connection pipe in the side with the ball valve, for the ball valve connection, please refer to figure 2-8. Unit configuration of the connecting pipe specifications please refer to table 2-6. If more than the length of the signal in the table, please consult the Envicool technical departments for connecting pipe actual specifications.

- Note: 1、 While connecting the pipes between the indoor unit and the outdoor unit, make sure the pipes penetrate the wall horizontally and are sleeved with protective tube when penetrating the wall. To protect the pipes against damage when the pipes penetrate the wall and to reduce vibration, the pipes shall be wound with protective tape and the hole shall be sealed with plaster. The protective plug of the pipe connector cannot be removed until it has penetrated the wall and begins to connect the external equipment.
- 2、 All the refrigeration return pipes shall be subject to high temperature soldering and be filled with nitrogen to prevent from oxidation. The pipe must be cleaned before welding system pipe, such as using high pressure nitrogen to purge.
- 3、 After welding, inspect the air tightness of the connecting pipe. HP nitrogen should be filled in the pipe to maintain pressure. It is recommended that the pressure should be 4.0MPa and the pressure retaining time should be no

less than 24 hours. After the connecting pipe passes the air tightness inspection, vacuumize the pipe. The vacuum-pumping time should be no less than 1 hour. The pressure retaining operation and vacuum-pumping operation are performed by connecting the compound pressure gauge dedicated for R410A with the valve core of the indoor unit connection tube side ball valve.

- 4 、 The pressure retaining operation and vacuum-pumping operation are passed, then proceed the next operation(such as: the refrigeration line for support, and the refrigerant pipes shall be isolated from the building with the vibration-proof isolation frame.).
- 5、 In addition to the above mentioned tools, protective gear, the site also need to consider the preparation tools are: copper tube expander.
- 6 、 The above operations of each step, shall be based on industry general operation standard.

Table 2-6 Specifications for the connecting pipes (Drop height is 0m)

Model	Length(m)	10	20	30	40	50	60
CyberMate6005*	Gas(mm)	12.7	12.7	12.7	12.7	12.7	12.7
	Liquid(mm)	9.52	9.52	12.7	12.7	12.7	12.7
CyberMate6007*	Gas(mm)	12.7	12.7	12.7	15.88	15.88	15.88
	Liquid(mm)	9.52	12.7	12.7	12.7	12.7	12.7
CyberMate6012*	Gas(mm)	15.88	15.88	15.88	15.88	15.88	15.88
	Liquid(mm)	12.7	12.7	12.7	15.88	15.88	15.88
CyberMate6016*	Gas(mm)	19	19	19	19	19	22
	Liquid(mm)	12.7	15.88	15.88	15.88	15.88	15.88
CyberMate6020*	Gas(mm)	19	19	19	22	22	22
	Liquid(mm)	12.7	15.88	15.88	15.88	19	19

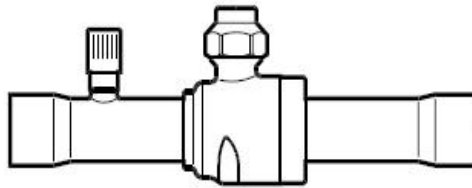


Fig.2-8 Schematic Diagram for indoor unit connection pipe side ball valve

2.4.3.4.2 Refrigerant filling

The units have been not filled with a certain amount of refrigerant upon delivery. The actual refill volume needed by the system can be judged according to the condensate depression of the liquid pipe through commissioning on site. The condensate depression of the liquid pipe equals to the difference between the refrigerant saturation temperature corresponding to the pressure in front of the electronic expansion valve (as indicated by the pressure gauge) and the temperature of the liquid pipe in front of the electronic expansion valve. The condensate depression of the liquid pipe shall be controlled within the range of 5~8K. The condensate depression varies according to the refill volume. The more the refill volume is, the larger the condensate depression will be. The condensate depression of the liquid pipe is the best way to judge the refill volume on site.

Note: the actual needed filling quantity and configuration size of the system, connecting pipe specifications and the length, all closely related.

2.4.3.4.3 Adding of refrigeration oil

The adding of refrigerant will dilute the refrigeration oil in the system and affect the lubrication and cooling effect of the refrigeration oil. Therefore, you have to add the refrigeration oil. The formula for the addition is as follows:

Additional refrigeration oil needed (ml) = adding volume of refrigerant × 15.0ml

Special oil pump shall be used to supplement the refrigeration oil when the refrigeration oil is added after the refrigerant refilling. The refrigeration oil can be supplemented through the negative pressure caused by vacuumizing the unit before refilling the refrigerant (pressure gauge shall be used). After the adding of the refrigeration oil, the vacuum-pumping operation can be continued. Therefore, it is necessary to estimate the adding volume of the refrigerant.

The adding volume of the refrigerant can be calculated according to the following formula:

Adding volume of the refrigerant (kg) = adding volume of the refrigerant in unit length of liquid pipe (kg/m) × total length of the extension liquid pipe (m)

Where, the “adding volume of the refrigerant in unit length of liquid pipe” is as shown in Table 2-7;

Total length of the extension liquid pipe (m) = Total length of the liquid pipe (m) – 20m

Table 2-7 Adding volume of the refrigerant in unit length of liquid pipe for liquid pipes of different outer diameters

Liquid pipe outer diameter (mm)	Adding volume of the refrigerant in unit length of liquid pipe (kg/m)
9.52	0.055
12.7	0.107
16	0.176
19.0	0.246

2.4.4 Removal of compressor footer holder

The four footers of the compressor are equipped with the vibration isolating rubber gasket to reduce the vibration during the compressor operation. To prevent the compressor shaking during the transportation and the resulting pipe damage, three footers of the compressor are mounted with holders upon the delivery of the unit. The three holders are used for transportation only, and must be removed when installing the unit. The footer fixing bolts shall be tightened after the three holders are removed. The schematic diagram for the removal of the footer holders is as shown in Fig.2-9.

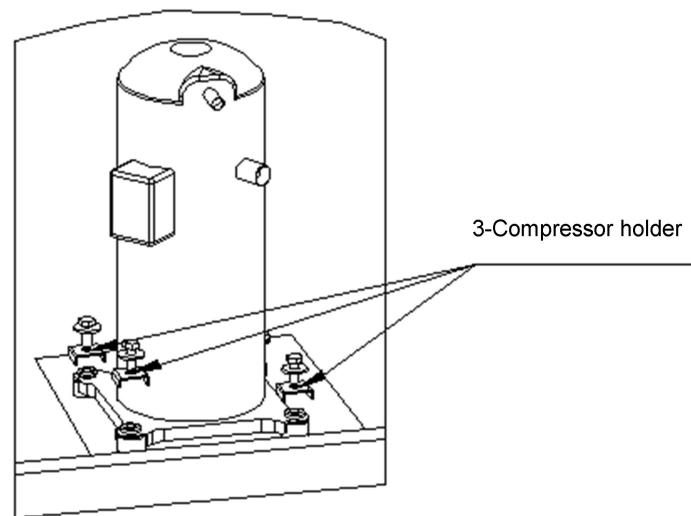


Fig.2-9 Schematic diagram for the removal of the compressor footer holder

⊗ Note

If the compressor runs before the holders are removed, large vibration will be caused.

2.4.5 Onsite fixation of flooding sensor

The flooding sensor is tied to the inside of the indoor unit upon delivery, as shown in Fig.2-10.

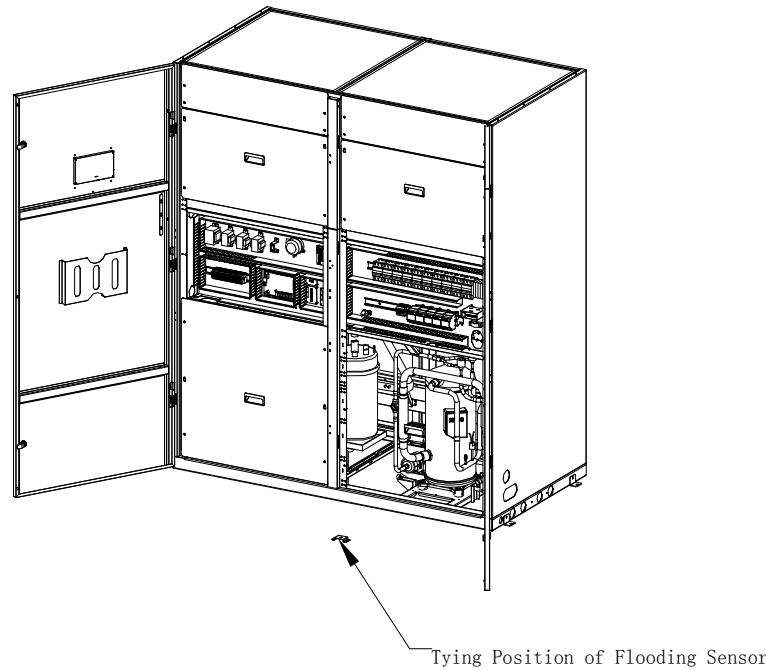


Fig.2-10 Schematic Diagram for Tying Position of Flooding Sensor

⊗ Note

The operation environment for the flooding sensor shall be free from any conductive dust, or metal corroding and insulator damaging gas.

2.4.6 Electric connection

⊗ Note

The unit has high voltage. The power supply must be cut off before any troubleshooting is conducted inside the unit.

Each unit is configured with complete set of internal wire upon delivery. Please refer to the internal circuit diagram upon wiring. The wires to be connected onsite include:

- Power cable of indoor unit: three-phase five-wire (3×L+N+PE);
- Power cable of outdoor unit: three-phase four-wire (3×L+PE);
- Outdoor unit control cable: 2 sets of 2-core wire;

-
- Connection of communication cable between indoor unit and upstream device (optional);
 - Indoor unit: Wiring of smoke sensor (optional).

ⓘ Note

1. Only the multi-core copper cable can be used as the power cable of the indoor/outdoor unit; make sure that all the connections are firm. Pay attention that the power supply voltage shall be the same as the rated voltage on the equipment nameplate.
 2. DISCONNECT switch shall be installed in the distribution cabinet to disconnect the power supply to the equipment during the maintenance. The DISCONNECT switch of the distribution cabinet shall be selected according to the optional current value in Table 2-9.
 3. To control the outdoor unit, it is suggested not to provide separate power supply to the outdoor unit. As the standard configuration, the outdoor unit is powered from the indoor unit.
 4. The connection of all the power cables, control cables and grounding wires shall comply with the national and local electrician regulations.
-

Table 2-8 Cable diameters of the power cables for indoor and outdoor units

Model	Function	Cable diameter of power cable of Indoor (mm ²)	Optional current value (A)
CyberMate6005 (1N~220V)	Cooling	3x4	3x1.5
	Cooling, heating and humidifying	3x6	
CyberMate6005 (3N~380V)	Cooling	— —	3x1.5
	Cooling, heating and humidifying	5x4	
CyberMate6007 (1N~220V)	Cooling	3x4	3x1.5
	Cooling, heating and humidifying	3x10	
CyberMate6007 (3N~380V)	Cooling	5x1.5	3x1.5
	Cooling, heating and humidifying	5x4	
CyberMate6012 (3N~380V)	Cooling	5x2.5	3x1.5
	Cooling, heating and humidifying	5x6	
CyberMate6016 (3N~380V)	Cooling	5x2.5	3x1.5
	Cooling, heating and humidifying	5x6	
CyberMate6020 (3N~380V)	Cooling	5x4	3x1.5
	Cooling, heating and humidifying	5x6	

Table 2-9 Optional current for the DISCONNECT switch of the Power distribution cabinet

Model	Function	Optional current value (A)
CyberMate6005 (1N~220V)	Cooling	20
	Cooling, heating and humidifying	40
CyberMate6005 (3N~380V)	Cooling	— —
	Cooling, heating and humidifying	32
CyberMate6007 (1N~220V)	Cooling	32
	Cooling, heating and humidifying	63
CyberMate6007 (3N~380V)	Cooling	10
	Cooling, heating and humidifying	32
CyberMate6012 (3N~380V)	Cooling	20
	Cooling, heating and humidifying	32
CyberMate6016 (3N~380V)	Cooling	20
	Cooling, heating and humidifying	32
CyberMate6020 (3N~380V)	Cooling	32
	Cooling, heating and humidifying	40

2.4.6.1 Connection between indoor unit and outdoor unit power cord

After the outdoor unit input power is taken out from the indoor unit, it is connected to the outdoor unit terminal block shown in Figure 2-11. In order to control the outdoor unit, it is not recommended to connect the outdoor unit power separately.

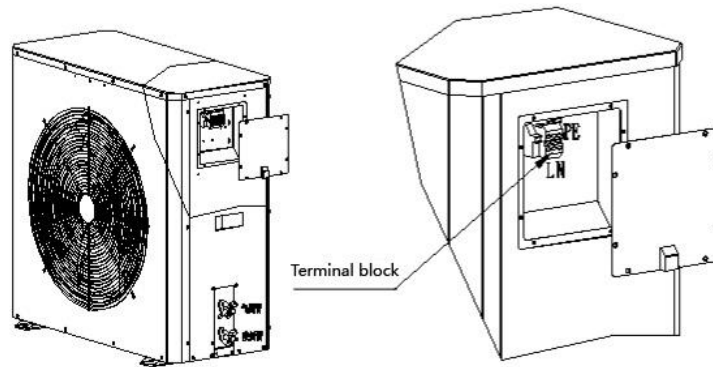


Figure 2-11 Schematic diagram of electrical connection of the outdoor unit

Note

The schematic diagram of control interface of CyberMate5005 ~CyberMate5020 series indoor unit is for reference only and the dedicated wiring diagram pasted on the unit shall prevail in terms of installation.

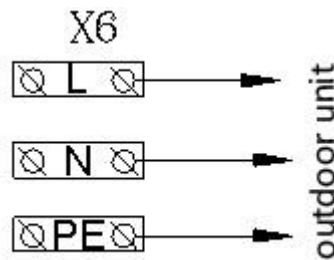


Figure 2-12 Schematic diagram of power supply connection of the outdoor unit

2.4.6.2 Unit function output

Note

The schematic diagram of control interface of CyberMate5005 ~CyberMate5020 upper/lower series indoor unit is for reference only and the dedicated wiring diagram pasted on the unit shall prevail in terms of installation.

CyberMate series control interface location is shown in Figure 2-13. The enlarged view of part of control interface is shown in Figure 2-14 - Figure 2-17. The upper part of the terminal block is connected to the unit, and the lower part is the user control signal line interface.

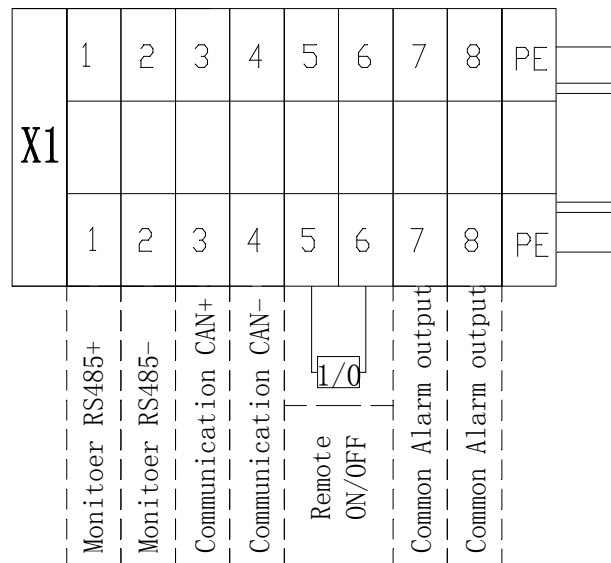


Figure 2-13 Schematic diagram of CyberMate series control interface

2.4.6.3 Communication between indoor unit and upstream device

The unit can communicate with the upstream device through the RS485 port. The communication cable shall adopt shielded cable with the diameter of 2×0.5 mm². The wiring diagram is as shown in Fig.2-14.

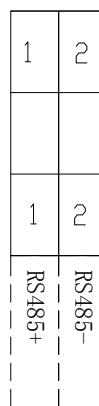


Fig.2-14 Schematic diagram for connection of the communication cable between indoor unit and upstream device

2.4.6.4 communication between units

It is recommended to use twisted pair shielded cable for the communication between units.

The cable diameter is 2 x 0.5 mm².The wiring diagram is as shown in Fig.2-15.

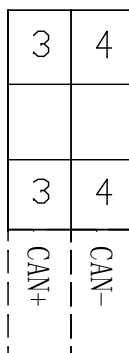


Fig.2-15 Schematic diagram for communication between units

2.4.6.5 Remote ON/OFF

The remote ON/OFF control cable shall adopt shielded cable with the diameter of 2×0.5 mm².The wiring diagram is as shown in Fig.2-16.

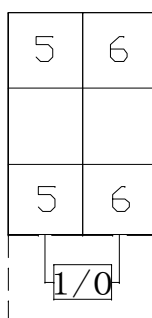


Fig.2-16 Remote ON/OFF Wiring Diagram

2.4.6.6 Common alarm output

The common alarm output cable shall adopt shielded cable with the diameter of 2×0.5 mm².The wiring diagram is as shown in Fig.2-17.

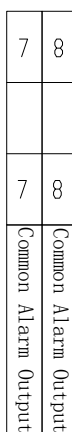


Fig. 2-17Common alarm output wiring diagram

2.5 Items for verification when the installation is completed (checklist)

After the unit installation is completed, verify the following items. The unit can be powered on only when it completely passes the verification.

1. The equipment is horizontally placed, and the fasteners have been tightened.
2. All the pipe joints have been tightened
3. The connecting copper pipe between the indoor unit and the outdoor unit has been connected properly, the refrigerant has been filled, and the refrigeration oil has been supplemented (if necessary).
4. All the ball valves of the indoor unit have been opened.
5. All the necessary water pipes of the indoor unit and humidifier module have been connected.
6. The water supply pipe of the humidifier has been connected.
7. The mating and connection relations between the indoor unit and the humidifier module are correct and there is no air leakage.
8. The air pipe and air valve have good connection and sealing.
9. All the cables and circuit connectors have been tightened.
10. The power supply voltage is the same as the rated voltage on the equipment nameplate.
11. The circuit breakers or fuses have the correct ratings.
12. The power cables and grounding cables to the circuit breaker, indoor unit and outdoor unit have been connected properly.
13. The control cables to the circuit breaker, indoor unit and outdoor unit, as well as the control cables for the optional devices have been connected properly.
14. The sundries inside and around the equipment (such as transportation materials, tools, etc) have been cleared after the equipment installation is completed.
15. The fan rotates smoothly and without any noise.

⊗ Note

Check if the pipe joints have any leakage at the beginning of the operation. There shall be no leakage.

Chapter 3 Controller

The controller adopts menu operation, with the operation result and running status displayed on the Color touch screen. It is very easy to use. This chapter introduces the relevant menu operation and control features.

3.1 Unit display

The unit adopts 7-inch touch screen. The following information is provided through the interface: parameter setting, alarm record, system running status, etc. The menu adopts touch operation for menus.

3.2 System menu structure

3.2.1 System standby interface



Press the blue Start button to start the unit.

3.2.2 System initialization interface:



After startup, the system will be initialized for 10s and then enter the normal display interface.

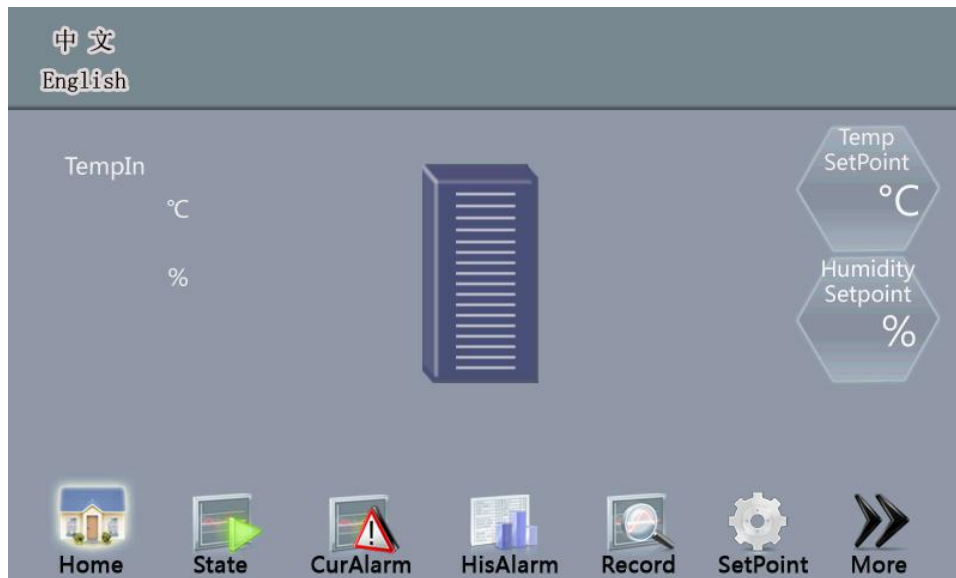
In case of system power cycle, the system will automatically enter the state before power down. (For instance, if the system is on before power down, It will automatically start up and enter the normal display interface.)

3.2.3 Password input interface



The default password is "0001", the user can change the temperature ,humidity and alarm set point, check the alarm recording, alarm history and system status.

3.2.4 Normal display interface



On the normal display interface, the current value and set value of the indoor return air temperature, the current value and set value of the indoor humidity, the indoor return air temperature curve, indoor humidity curve, unit operating state and the latest alarm will be displayed.

If there is no keyboard operation for consecutively 180s under any interface after startup, it will automatically return to the normal display interface.

When any button is pressed after the system is powered up, the backlight will turn on. If there is no keyboard operation for consecutively 60s, the backlight will be off.

3.2.5 Time setting

Time setting is in the main menu at the top right of this screen;

Time Setting

Year	Hour
Mon	Min
Day	Sec

 Home
 State
 CurAlarm
 HisAlarm
 Record
 SetPoint
 More

3.2.6 Para setting

Para Setting

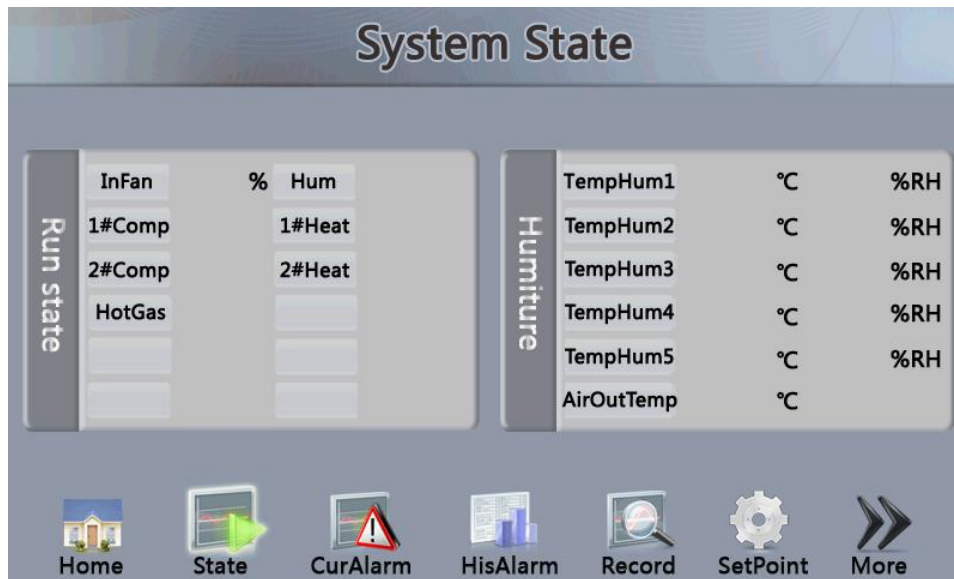
TempSet °C	HighTemp °C
TempDevia °C	LowTemp °C
HumSet %	HighHum %
HumDevia %	LowHum %
MonAddr H	

 Home
 State
 CurAlarm
 HisAlarm
 Record
 SetPoint
 More

System setting point can be browsed or modified via this menu.

3.2.7 System state

In this interface, you can view the system and environmental status;.



3.2.8 Current alarm



This menu displays the currently active alarm. The current alarm will be numbered. The latest alarm is always on top and you can view the previous/next alarm by pressing the UP/DOWN button. The alarm occurrence time is also recorded and displayed. This menu can be used to check how many alarms it had in total.

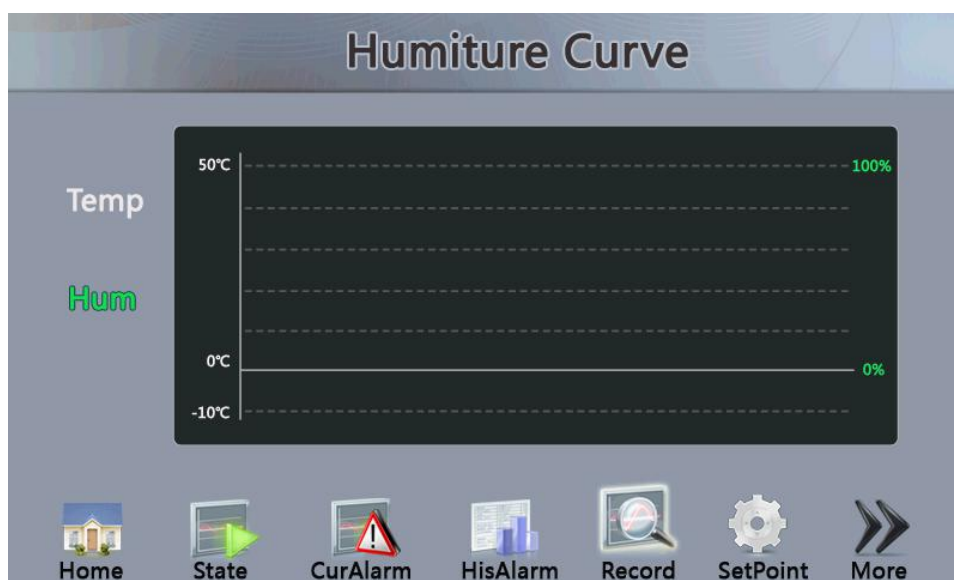
3.2.9 History Alarm



Alarms and the time of alarm can be viewed through the historical contents of the alarm history.

3.2.10 Temperature/humidity curve

The curve of the sensor detection values will be displayed.



3.2.11 Shutdown interface

Select "More" button, a "confirm shutdown" shows, For shutdown, click "YES" to.



Chapter 4 System Operation

This chapter elaborates on how the CyberMate series air conditioners operate in accordance with the operation control of the operator and the indoor temperature and humidity status.

4.1 Temperature control

4.1.1. Cooling/Reheating

The microprocessor carries out the temperature control according to the cooling/Reheating requirements calculated based on the difference between the return air temperature and the set value.

4.1.2 Cooling

When the cooling requirement calculated via the temperature control reaches 100%, the compressor will be started. When the cooling requirement is less than 0%, the compressor will be shut down.

4.1.3 Heating

The electric heater will start when the electric heating requirement calculated via the temperature control reaches 100%. When the heating requirement is less than 0%, the electric heater will be shut down.

4.2 Humidity control

4.2.1 Humidifying

When the humidification requirement calculated via the humidity control reaches 100%, the container-shaped humidifier will start. When the humidification requirement reduces to less than 50%, the humidifier will stop working.

4.3 System protection

To protect the compressor and avoid frequent power-on/off cycle of the compressor, the compressor shall be restarted three minutes after its interrupted operation.

4.4 Communication

The control system communicates with the equipment via RS232/485 port or SNMP protocols.

- **Remote control**

You can start/shut down the air conditioner through the monitoring background.

- **Parameter setting**

You can set the parameters of the air conditioner through the monitoring background.

- **Monitoring data**

The monitoring data includes the following environment parameters:outlet air temperature, return air temperature,return air humidity, and the running status of each device (internal fan, electric heater and humidifier).

Other monitoring data: current alarm.

Chapter 5 Alarm

The control system can display the alarm information. The special alarms can be selected through the optional alarm list. The alarm will automatically reset after removed.

5.1 Alarm: interpretation & troubleshooting

The following contents introduce the possible causes for each alarm and explain the methods of troubleshooting. For detailed explanation, please refer to Chapter 8 – Troubleshooting.

5.1.1 High pressure alarm

The high pressure of the compressor is monitored by high pressure switch. If the pressure is higher than 4.0MPa during the unit operation, the pressure switch will action and the controller will send out the alarm signals and shut down the compressor. The alarm will be removed automatically after the high pressure protection is cancelled.

When the high pressure alarm appears, please detect whether the outdoor unit power supply is disconnected, whether the fan speed controller works normally, whether the outdoor unit fan works normally, whether the high pressure switch is damaged and whether the outdoor unit coil is dirty or blocked, etc.

5.1.2 Low pressure alarm

Low pressure of the compressor is monitored by the low-pressure sensor. If the low pressure is lower than the set value during the operation of the unit, refer to Table 5-1, and the controller will send an alarm signal and turn off the compressor. The alarm will be automatically eliminated when the low pressure is canceled.

When the low pressure alarm appears, please detect whether the refrigerant leaks, whether the indoor unit fan works normally, whether the low pressure switch is damaged, whether the electronic expansion valve works normally, etc.

Table 5-1 High and low pressure protection value of the refrigeration system of the compressor

Refrigerant model	Compressor high pressure protection value	Compressor low pressure protection value
R410A	4.0MPa	0.25MPa

5.1.3 Humidity

The humidity alarm will be triggered in the following situations:

High humidity: indoor return air relative humidity is higher than the pre-set high humidity alarm setting value. Check whether the equipment is dehumidified.

Low humidity: indoor return air relative humidity is lower than the pre-set low humidity alarm setting value. Check whether humidification is set for the equipment.

⊗ Note

Check whether the setting value is suitable. Check whether the room has the steam isolation zone to isolate the outdoor humidity, and whether the door and window are open.

5.1.4 Temperature

The temperature alarm will be triggered in the following situations:

High temperature: indoor return air temperature higher than the high temperature alarm set value. Check whether the set value is appropriate, whether the indoor load exceeds the design capacity of the equipment (e.g. the refrigerant output of the equipment is too small), and whether the cooling parts work normally (whether the compressor or valve has been started).

Low temperature: indoor return air temperature lower than the low temperature alarm set value. Confirm whether the set value is appropriate and whether all the heating parts work normally (i.e., contactors, heaters, etc). Check whether the working current of the heater is appropriate (refer to the current ratings on the nameplate of the equipment).

5.1.5 Power supply

The power supply alarm will be triggered under the following situations:

Overvoltage alarm: it alarms when the grid voltage of the equipment is higher than the input voltage range. The alarm will automatically restore when the voltage of the power grid returns to normal.

Undervoltage alarm: it alarms when the grid voltage of the equipment is lower than the input voltage range. The alarm will automatically restore when the voltage of the power grid returns to normal.

Phase loss/reverse phase fault: if the equipment uses three-phase input power, when the input power has reverse phase or phase loss fault, the equipment will stop operating. The alarm will automatically restore when the phase sequence is normal or the user manually changes the input phase sequence. If the optional automatic phase sequence switching component is configured, the unit will automatically adjust the phase sequence to ensure its normal operation.

5.1.6 Communication fault

It alarms if the communication cable between the display and the control input and output board fails.

5.1.7 Sensor fault

The sensor fault will occur under the following situations:

Temperature sensor fails: when the temperature sensor has open circuit or short circuit, the alarm will be triggered. Check if the sensor has physical damages. The alarm will be removed automatically after the sensor is replaced.

Humidity sensor fails: On the screen , humidity display is "--", in this case control system to stop humidification, check if there is a circuit loose or the sensor has physical damages. The alarm will be removed automatically after the sensor is replaced.

Chapter 6 System testing and maintenance

This chapter details the control and operation of CyberMate series air conditioner.

6.1 Temperature Control

6.1.1 Cooling

To test the cooling function, make the temperature set value 10°C lower than the indoor temperature. The system will make cooling request and start the refrigeration cycle (regardless of the temperature alarm). Adjust the temperature set value back to the desired value after finishing the test.

6.1.2 Heating

To test the heating function, make the temperature set value 10°C higher than the indoor temperature. The system will make heating request and start the heating cycle (regardless of the temperature alarm). Adjust the temperature set value back to the desired value after finishing the test.

6.1.3 Humidifying

To test the humidifying function, make the humidity set value 10% higher than the indoor humidity value RH. After a short delay, the humidifier will fill in water gradually and produce the steam. Adjust the humidity set value back to the desired value after finishing the test.

6.1.4 Floor flooding detection

Put the immersion electrode in the water (running water), then the unit will display the floor flooding alarm and shut down. Dry the immersion electrode after the test. The alarm display will disappear when you manually reset the flooding alarm in the alarm menu. The fan will start up after time delay, and the alarm will not occur again.

6.1.5 Shut down via remote control

In addition to the remote ON/OFF port, Remote ON/OFF operation can also be realized via the communication with the upstream device.

6.2 Maintenance

6.2.1 Circuit board

The circuit board should be checked once a year, to see if the cable connection is loose and if the cable is aging.

6.2.2 Air filter

The filter is an easy consumable component subject to daily maintenance, and its replacement period is directly related to the sealing condition and the cleanness of the equipment room. It shall be cleaned promptly when it is dirty.

➤ Maintenance of indoor unit air filter

You can extract the filter for maintenance after opening the front panel of the unit, as shown in Fig.6-1.

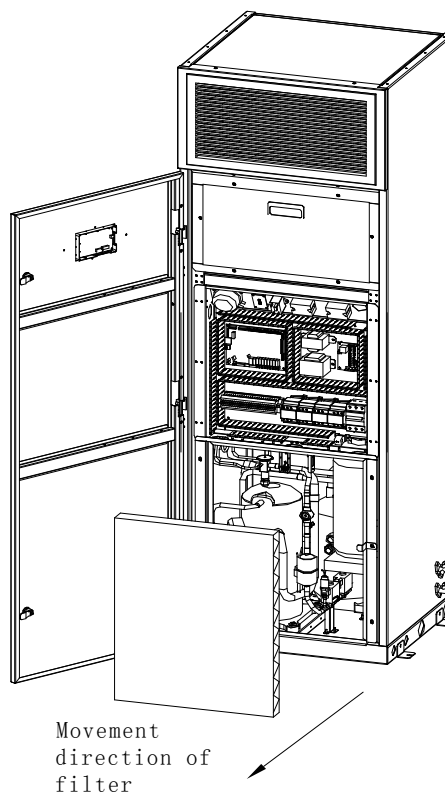


Fig. 6-1 Schematic diagram for the maintenance of indoor unit air filter

6.2.3 Fan

The fan components to be checked every month include the fan blades and motor. Replace the blade if it is broken. Check if the blade is firmly fixed on the motor bearings and if the blade grates the outside grille while turning. Though the motor bearings are permanently sealed and self-lubricating (which means there is no need to add the lubricant oil), you should check them once every month to see if they are worn down.

Airflow organization

The equipment of all models is designed to discharge abundance of air uninterruptedly, so any abnormal airflow block near the indoor and outdoor units should be removed at once.

6.2.4 Cooling system

The components of the cooling system should be checked every month to see if there are faults or worn down components. In most cases, the system breaks down first, and then the component wears down. Periodic inspection can prevent most components from wearing down. The cooling pipe must be firmly fixed without vibrating with the frames on the floor or of the equipment. Check if the cooling pipe is worn down and if it is firmly fixed every six months. Check the capillary tube and balance pipe of the thermo-bulb in the expansion valve.

Intake pressure

The intake pressure is mainly subject to the temperature and humidity of indoor environment and the heat exchange conditions of the evaporator. The range of pressure depends on the specific refrigerant model. For specific values, seen in Table 6-1.

Exhaust pressure

The exhaust pressure is mainly subject to the temperature of outdoor environment and the heat exchange conditions of the condenser. The range of pressure depends on the specific refrigerant model. For specific values, seen in Table 6-1.

Table 6-1 Parameters of the pressure operating range of the refrigeration system

Refrigerant model	Suction pressure of the compressor	Discharge pressure of the compressor
R410A	700~1200kPa	2100~3400kPa

Expansion valve

The expansion valve can ensure supply appropriate amount of refrigerant to the evaporator, meeting the load requirement and ensuring certain return air superheat. By measuring the return air superheat, you can confirm if the expansion valve works normally. If there is less refrigerant in the evaporator, the superheat will be higher than normal value. Vice versa, if there is too much refrigerant in the evaporator, the superheat will be lower than normal value. The normal return air superheat is 5K to 10K.

Air-cooled condenser

If the air flow in the condenser coil is blocked, it will affect the heat exchange efficiency and cause high exhaust pressure and cooling loss to the compressor. Clean the coil with the compressed air, coil cleaner and water to clear away the dust and impurities that block the air flow. Do not let the snow pile up above or around the condenser in winter. Meanwhile, check if the coil fin is backwound or damaged, repair it if necessary. Check all the connecting pipes to see if they vibrate, and fix them if necessary. Check all the cooling pipes carefully to see if there is any oil leakage.

Replacement steps

➤ Compressor replacement

If the compressor motor is burnt down (it seldom happens if the system is correctly installed): Usually, the motor is burnt down after the mechanical or lubrication faults happen.

Early detection can avoid lots of problems, such as compressor damage. Periodic maintenance and inspection conducted by the maintenance person can effectively save the maintenance cost. To do necessary preventive maintenance, which is easy to operate with low cost, is much better than ignoring the problem until the compressor is damaged and replaced with high cost. When repairing the compressor, check all the electronic components to see if they operate normally.

Warning

Avoid directly touching the gas and machine oil with your skin. Direct touch may cause injuries. Wear long rubber gloves when disposing the polluted component.

- 1) Check all the fuses and circuit breakers.
- 2) Check the operating condition of the pressure switch.
- 3) When the compressor fails, confirm whether it is circuit fault or mechanical fault, and take corresponding measures.

If it is the compressor that fails, replace it. If the motor is burnt down, replace it and clean up the unit. Please note that if one system is burnt down successively, it is probably caused by incomplete clean. When a serious burnout happens, the machine oil will be black and acid. In this case, clean the whole cooling system (including the indoor evaporator, outdoor condenser, refrigerant connecting pipes and expansion valve) before replacing the compressor, and then replace the drying filter.

You can get another compressor from the product supplier of Envicool and the supplier will transfer the compressor packaged in a reusable wooden box to the site (in accordance with the after-sales service). If the compressor to be replaced is under warranty, it shall be sent back to Envicool to get warranty service. The compressor should be placed in its original packaging box used when it is purchased. Fill in the possible cause or conditions that cause the damage on the maintenance sheet enclosed with the compressor.

The correct steps to remove and replace the compressor are as follows:

- a) Cut off the power supply;
- b) Install the low pressure and high pressure gauges to the corresponding connectors.
- c) Recycle the refrigerant with standard steps and equipments.

Note

Refrigerant recovery or recycling must comply with the state and local laws and regulations.

1. Remove the damaged compressor.
2. Blow the whole system with clean nitrogen, and if there are lots of black impurities in the pipe, use the cleaner to clean the cooling system. For related operation practices,

please refer to local and industrial related practices, and assign the qualified professional maintenance persons to operate.

3. Install and replace the compressor, replace the dry filter and connect all components. Carry out the nitrogen pressure maintaining (time of pressure maintaining is not less than 24h) and leak-proof test, R410A pressure maintaining shall be not less than 3000kPa.
4. Vacuumize the system to the pressure of 150Pa for the first two times and 60~80Pa for the third time. Add nitrogen to the system after each vacuum-pumping at the first two times, and then vacuumize it again to bring out the moisture in the system.
5. Add the refrigerant according to the condensate depression requirements in “2.4.3.3.1”.
6. Power on the equipment to see if it works normally.

6.2.5 Humidifier

The humidifier system includes a humidifying container with electrodes embedded, water supply pipe, water drainage valve, steam transferring pipe, steam distributing pipe and humidifying control panel, etc.

The humidifier's automatic water drainage /manual water drainage switch is located near the humidifying container. When the humidifier works normally, the switch should be at the automatic water drainage position, and when it requires manual water drainage, the switch should be at the manual water drainage position.

When the humidifier operates, the hydraulic pressure of the water supply system should be 0.1 to 0.8MPa.

ⓘ Warning

Since the surface temperature of the humidifying container may be too high, when replacing it, let it cool down first or wear protective gloves before touching.

-
- Steps to replace the humidifying container:
 1. Drain off the water in the humidifier container manually.
 2. Shut off the power supply of the unit.
 3. Pull out the steam transferring pipe on the humidifying container.
 4. Rive the power connecting cables of the main electrode.

5. Pull out the connecting cable of the detector of high water level.
6. Loosen the fixing belt on the humidifying container, and lift up the container to remove it.
7. Fix the new humidifying container, and connect the steam transferring pipe.
8. Connect the cable between the main electrode and the detector of high water level.
9. Set the humidify switch at the automatic water drainage status, and check it again to finish the replacement.

① Note

The drain pipe of the unit shall not be higher than the water drainage outlet of the humidifier.

Chapter 7 Maintenance inspection checklist

CyberMate series

Date: _____ Defender: _____

model: _____ NO: _____

Maintenance Project Quarterly

Component	Maintenance work
Air filter	Clean filter.
Cooling System	Check and clean up equipment drain.
	Check and clean up the condensed water.
	Check high and low pressure of system.
	Check whether there is abnormal vibration system.
	Check if there is a dirty wall heat exchange coil.
Fan	No debris between the blades.
	No abnormal sound .
	No abnormal vibration.
Humidifier	Check mineral deposition.
	Check electrode.
	Check whether connection hose is connected reliably.
	Check whether valve is blocking or drain.
Controller	Whether circuit connectors are loose.
	Whether connecting cable is aging.
Heater	Whether there is corrosion.
	Whether cable is loose.

Remark:

Sign:

Copy this table in order to make records

Chapter 8 Troubleshooting

Failures	Causes	Check or maintenance
The equipment does not start up.	The equipment is not connected to power supply.	Check the voltage of air switch of the unit.
	The breaker for voltage control has been opened (on the transformer).	Check short circuit and reset circuit breaker.
	Remote startup and shutdown positions are incorrect.	Check whether the cable of remote startup and shutdown ports of electric control box gets loose.
	Control panel does not display “refrigeration” command.	Regulate the temperature control set value to the refrigerating temperature.
The equipment does not refrigerate or refrigerating effect is poor.	Startup interval is too short.	Control program controls the delay time of compressor’s shutdown and startup to be 3 minutes.
	Compressor contactor has poor contact.	Check the contactor.
	The discharge pressure of compressor is too high.	Refer to 5.1.1 instructions for high pressure alarm.
	Dry filter is blocked.	Replace dry filter.
	Refrigerant is filled little.	Check condensate depression of pressure and liquid pipe. Under low temperature, sufficient refrigerant is very important to low-temperature startup subassemblies.
	The air volume for condenser coil is insufficient.	Clear the coil or impurities entering into air inlet.
	Refrigerant pump cavitation is serious.	Check whether there is any abnormal sound or vibration during pump operation.

Failures	Causes	Check or maintenance
The condensing pressure of compressor is too high.	The air flow of condenser coil is insufficient.	Remove the coil and the sundries nearby the vent.
	The blower of outdoor unit does not rotate.	Check voltage of blower and motor, rotary speed controller output of blower and blower operation.
Humidifier does not work.	The control panel does not display “humid” command.	Improve humidifying control set value and induction value to have the system humidified.
	Cable board or humidifier’s cable board has failures.	Check cable connection or replace interface board. Check the cable connection between control board and humidifier’s circuit board.
	Humidifying sensor fails.	Humidity displays interface dash. Check the cable connection between temperature/humidity circuit board and control board, remote control and control board. Check temperature/humidity circuit board.
	There is no water flow.	Ensure that humidifier is at “operation” position. Check water supply of humidifier, including filter screen.
	The water injection rate of humidifying tank cannot match with the rate of vapor discharge.	Check whether sieve pores of water valve and capillaries are blocked. Check the pressure of water supply (10~40kPa).
Display does not response or control key has no response.	The circuit is open or there is short circuit.	Check the open circuit or short circuit, and carry out maintenance.
Refrigeration is continuous.	There is short circuit or control board failure.	Check cable connection or replace control board.
Heating is invalid.	Control board does not display “heating” command.	Increase the temperature set value to meet the heating requirement.
	The heating protection is open, and there is heating contactor failure or interface board failure.	Check the heating contactor and heating protection. In case of no problem, check the circuit.
	The complements are burned out.	Cut the power supply. Use ohmmeter to inspect the heating components.
	The temperature sensor fails.	Replace the temperature sensor.

Statement:

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