

PRO
TICA PRO



INSTALLATION & OPERATION MANUAL

AHU KIT



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I. Safety Precautions



Caution: Read this manual carefully before installation and use of the unit.

This installation manual is applied to TICA TMDK VRF AHU flow control box. The manual is subject to change based on improvement on the unit without further notice.

Preparations before installation

- Ask the professional technician who has obtained a qualification certificate for air conditioner installation to install the unit. Users are not allowed to install, repair or relocate the unit independently.
- Ask the professional electrician who has obtained a qualification certificate to connect electric wires, check whether the line capacity is enough, and whether power cords are damaged, etc.
- Install the air conditioning unit following this document. Improper installation may result in water leakage, electric shock or fire.

Precautions during installation

- Places unsuitable for installation:
 - ◆ The place where flammable gases or volatile combustibles (e.g., gasoline and combustible dust) may leak and lead to a fire.
 - ◆ The place where acid or alkaline substance or corrosive gas (e.g., sulfur dioxide and hydrogen sulfide) may be produced, easily corroding the unit and leading to refrigerant leakage.
 - ◆ The place where dust, steam, lampblack or special spraying agent is diffused, e.g., a kitchen.
- Set a dedicated circuit that complies with the "Electrical equipment engineering standards" and "Indoor electrical wiring specifications".
- The unit must be properly grounded. The grounding wire must be reliably connected to the earth. Do not connect the grounding wire to the water pipe, gas pipe, and telephone line.
- Use the power cords with enough current capacity and rated power. Do not make the power cords too tight.
- **All the IDUs and ODU's of the same system must be supplied with power simultaneously.**
- Fix the power cord firmly so that external force is not imposed on the terminal board. If the power cord is not securely connected or fixed, heat is generated, which will cause an electric shock or fire.
- Electric parts of the unit shall be moisture-proof and far away from the water source. Do not install the wired controller at the places where the flammable gas, sulfide gas, or engine oil is accessible.
- When the unit is installed in a small room, take necessary measures to prevent refrigerant concentration from exceeding the limit in case refrigerant leaks.
- During installation, if refrigerant leaks, ventilate the room because toxic gas may be generated when refrigerant encounters fire.
- After installation, make an air tightness test to check for leak.
- For air conditioning units adopting the R410A refrigerant, use the tools and accessories dedicated to R410A.

Precautions at trial operation

- Do not operate the device with wet hand, or splash water into the device.
- Do not pull or bend wired controller and centralized wired controller cables forcibly, and do not press the button with sharp objects to avoid abnormal connection.
- Do not touch refrigerant pipeline during operation or just at the end of operation, as it can lead to scald or frostbite.
- Do not turn off power immediately after the unit stops; wait at least 5 minutes.

II. Control Box Installation

1. Precautions

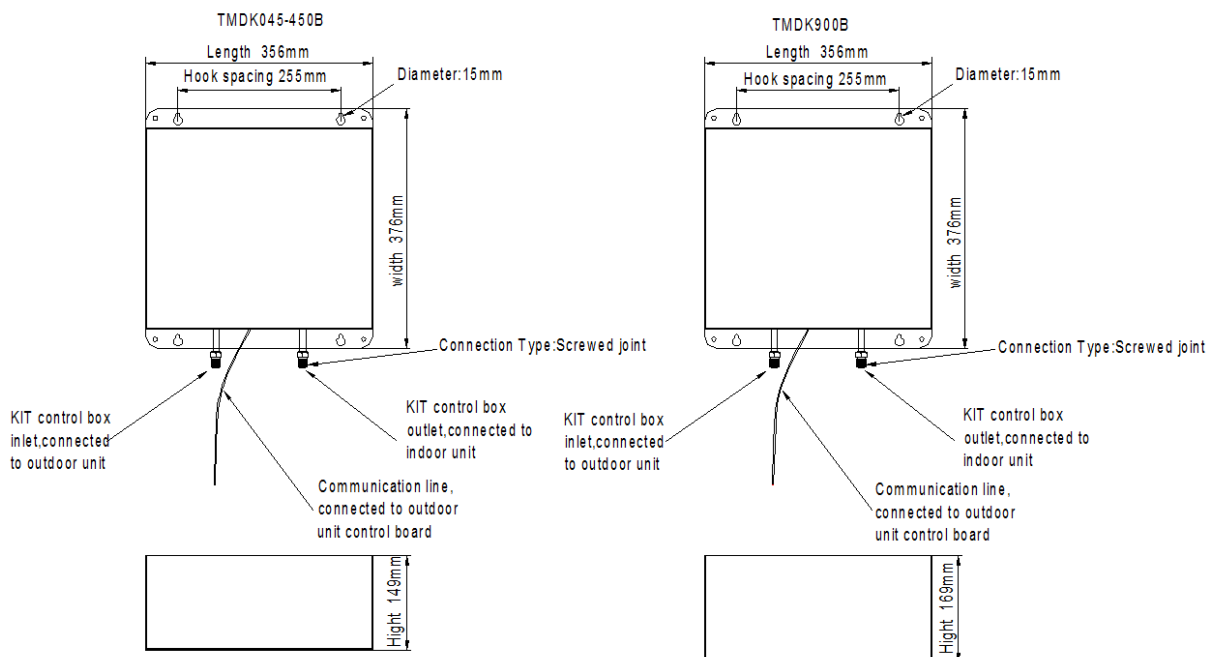
- Carefully hold the lifting point or other force bearing parts when taking the control box from the package. Do not apply force to the liquid pipe.
- Install the control box in a position where the air duct is shorter and the workload is less to facilitate wiring and pipe connection.
- **Install the control box perpendicularly to the ground and ensure that the load-bearing wall or frame is strong enough to bear the weight of the unit. The unit weights 10 kg.**
- Reserve sufficient space for maintenance and repair, and take safety protection measures.
- Keep the installation position away from lighting facilities equipped with electrical ballasts.

2. Control box selection and installation

1) Precautions

- Make sure that the control box is placed straight up.
- The control box must be installed in the liquid pipe of the corresponding IDU, by screwing the control box to the flared joint of the liquid pipe.
- The inlet of the control box is connected to the copper pipe from the ODU liquid pipe, and the outlet is connected to the IDU liquid pipe.
- The sensor of the control cable led from the control box must be securely connected to the control module of the corresponding IDU.
- **The pipe connecting the control box and the IDU should be no longer than 1 m.**
- The copper pipe connecting the control box and the IDU must be properly insulated to avoid drip.
- **Control box TMDK180B and above can be connected in one-to-one manner.**

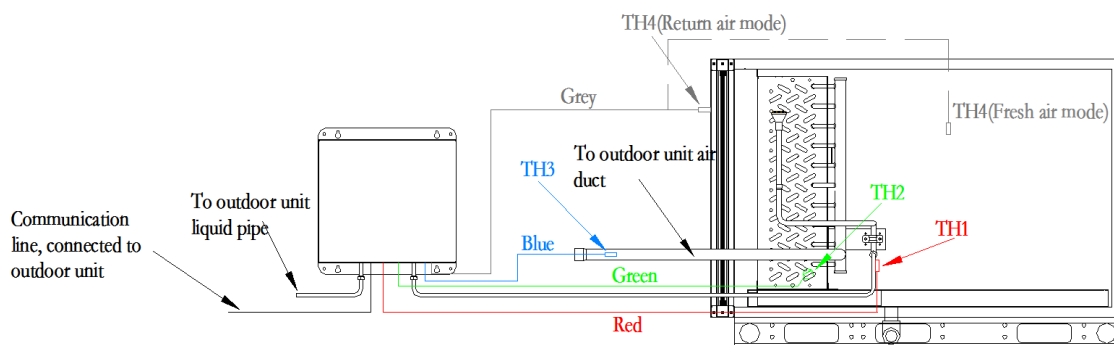
2). Dimensions



Model	L (mm)	W (mm)	H (mm)	Liquid pipe diameter (mm)
TMDK045B	356	376	149	6.35
TMDK090B				9.52
TMDK180B				
TMDK280B				
TMDK450B			169	15.88
TMDK900B				

Note: The control box needs to be horizontally installed and cannot tilt.

3). Installation diagram



Notes:

1. TH1 (D41027300005) (red) is the inlet temperature sensor of the indoor evaporator.
2. TH2 (D41027300004) (green) is the intermediate temperature sensor of the indoor evaporator.
3. TH3 (D41027300003) (blue) is the outlet temperature sensor of the indoor evaporator.
4. TH4 (D41027300002) (gray) is the air temperature sensor. It is installed at the air inlet of the IDU in circulating air mode and at the air outlet of the IDU in fresh air mode.
5. The standard sensor length is 2.5 m.

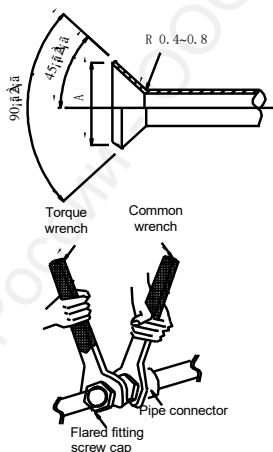
III. Refrigerant Pipe Connection

1. Principles of refrigerant pipe connection

□	Possible Cause	Preventive Measures
Dry	<ul style="list-style-type: none"> External water intrusion (rain, water supply for construction, etc) 	Piping processing → blowing → vacuum drying
	<ul style="list-style-type: none"> Condensate water intrusion from inside the pipe 	
Clean	<ul style="list-style-type: none"> Oxide generation inside the pipe when welding 	Replacement of nitrogen
	<ul style="list-style-type: none"> Dust or other foreign object entering 	Blowing
Airtight	<ul style="list-style-type: none"> Incomplete welding 	Use proper material → (copper pipe, welding rod)
	<ul style="list-style-type: none"> Flare pipe leak 	Operate in strict accordance with relevant requirements on flare pipe usage
	<ul style="list-style-type: none"> Edge leak 	Operate in strict accordance with relevant requirements on welding Operate in strict accordance with relevant requirements on piping

2. Connection to flared joint of refrigerant pipe

- Use a special cutting tool to cut the pipe. For pipes with too large diameter, a metal cut saw may be used, but make sure to avoid the saw dust from entering the pipe.
- Use the delivery-attached flared joint screw cap only. Before flaring, install the screw cap on the copper pipe first.
- Verify that the flared joints are concentric, and the surface is free from damage and defects such as burr, crack and wrinkle.
- Before connecting the flared joint, apply ester oil or ethereal oil on both sides of the flared joint, and finger-tight the screw cap for 3 to 4 screws.
- Fasten the screw cap with a proper torque. Use two wrenches to hold the pipe.

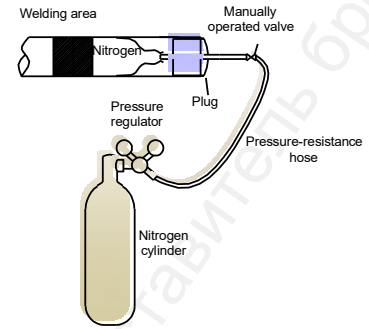


Diameter (mm)	Torque	Pipe flared joint size A (mm)
φ6.35	14.2-17.2 N·m (144-176 kgf·cm)	8.7-9.1
φ9.52	32.7-39.9 N·m (333-407 kgf·cm)	12.8-13.2
φ12.70	49.5-60.3 N·m (504-616 kgf·cm)	16.2-16.6
φ15.88	61.8-75.4 N·m (630-770 kgf·cm)	19.3-19.7
φ19.05	92.7-118.6 N·m (990-1210 kgf·cm)	23.1-23.7

3. Welding of refrigerant pipe

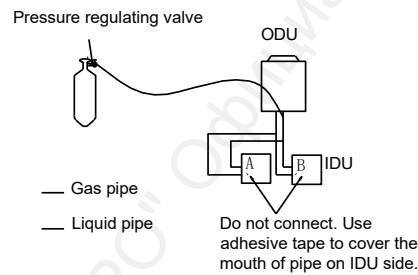
- Perform welding downward or horizontally. Avoid overhead welding if possible.
- Install the liquid pipe and gas pipe in proper direction and angle to avoid inadequate supply of refrigerant and build-up of oil.
- Replacement of nitrogen during welding: During welding, fill nitrogen of 0.02-0.05 MPa into the pipe to avoid system block due to oxide generation. After welding, use nitrogen to blow or let it cool down. Do not spray cold water for cooling to prevent cracking upon sudden cooling of the weld junction.
- Try to reduce bended piping and use bends with larger radius.
- Requirement for distance between supports of horizontal pipeline is listed in the following table:

Pipe diameter	< 20 mm	20-45 mm	Above 45 mm
Max distance (m)	1.0	1.5	2.0



4. Blowing of refrigerant pipe

Entering of dust and moisture into the pipe is unavoidable during installation and construction. Therefore, the pipe must be blown dry with nitrogen after pipe construction is completed.



- Use nitrogen for blowing. The nitrogen cylinder should be equipped with a pressure regulating valve.
- Use an inflation tube to connect the pressure regulating valve to the inlet on the liquid pipe side of the ODU.
- Use blind plugs to block up all copper pipe connectors on the liquid pipe side, except for IDU A.
- Open the nitrogen cylinder and set the pressure to 0.5 MPa.
- Check whether the nitrogen flows through the liquid pipe leading to IDU A (the corresponding connector on the IDU must be sealed with adhesive tape to prevent dirt from entering the pipe).
- Blowing:
 - a) Use insulating material to block up the liquid pipe of IDU A.
 - b) When you feel that you cannot block up the pipe anymore as the pressure increases, remove the insulating material quickly and let the nitrogen release quickly from the pipe (first blowing).
 - c) Use insulating material to block up the liquid pipe again (second blowing).
 - d) Place a clean cloth at the pipe mouth. You may find the dirt brought out by the nitrogen on the cloth. If the cloth turns a bit damp, there is water inside the pipe.
- Blow the pipe repeatedly until nothing can be blown out and the cloth is no longer damp.
- Repeat the above steps on IDU B.
- After blowing the liquid pipe, blow the gas pipe.

5. Leakage detecting and insulation of refrigerant pipe

- After piping work is completed, make sure to do air tightness test for the entire refrigeration system (IDU and piping). Fill nitrogen from both the gas pipe and liquid pipe sides simultaneously until the pressure reaches the stipulated value (R410A model: 4.0 MPa). Maintain the pressure for 24 hours. Then, check if the pressure changes. In this way, you can determine the air tightness of the connections (welding joint or flare) and the entire system and find the leak source (if any).

Note: If the temperature during pressure increasing is different from the temperature when observing, adjust according to the following formula:

$$\text{Actual value} = \text{Pressure during pressure increasing} + (\text{Temperature during pressure increasing} - \text{Temperature when observing}) \times 0.1 \text{ kgf/cm}^2$$

- When there is no leak, insulate the piping. The gas pipe and liquid pipe need to be insulated separately.

IV. Electric Control Installation

The circuit for the TMDK VRF flow control box is divided into the high current (power) line and control (communication, sensor, and signal) line. The high current part is for the power supply of the control board. The communication lines include the communication line between the IDU and ODU and that between the master unit and slave unit. The sensors include temperature sensors, and the signal circuit is used for the controller. Moreover, in manual mode, circuits for power-on/off, mode switching, and capacity control are also involved.

- Select cables in accordance with relevant local or national regulations. The model of cable must comply with relevant local and national specifications.
- The air conditioner must use the special power supply, and the supply voltage must comply with the rated voltage.
- The cables must be securely connected. Do not exert force on the terminal strip.
- Set an electric leakage protection device according to requirements of the related national technical standard of electrical equipment.
- The power cord and signal cable should be laid neatly and reasonably without interfering with each other, and cannot come into contact with the connection pipe and valve body.

1. Power supply wiring specifications and precautions

For the power supply specifications of the master unit and IDU, refer to the installation instruction. The power cord specifications of the control box are listed as follows:

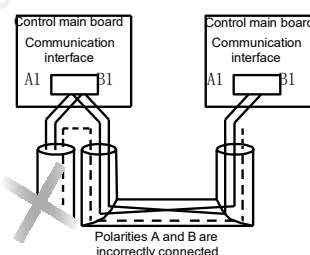
Power supply	Power supply range	Power cord	Earth line	ODU and IDU communication line	Master & slave unit Communication line
Single phase 220 V, 50/60 Hz	242/198	3×1.5 mm ²	1.5 mm ²	0.75–1.25 mm ² three-core shielded cable	0.75–1.25 mm ² three-core shielded cable

Notes:

- The distribution box shall be provided with a set of electric leakage protection device and air switch for each module.
- A circuit breaker with larger capacity is required for connection to multiple IDUs.
- If the power cord is damaged, it must be replaced by a professional from the manufacturer or its maintenance department or similar department for safety.
- The power cord needs to be a double insulated cable.
- An earth line is mandatory.

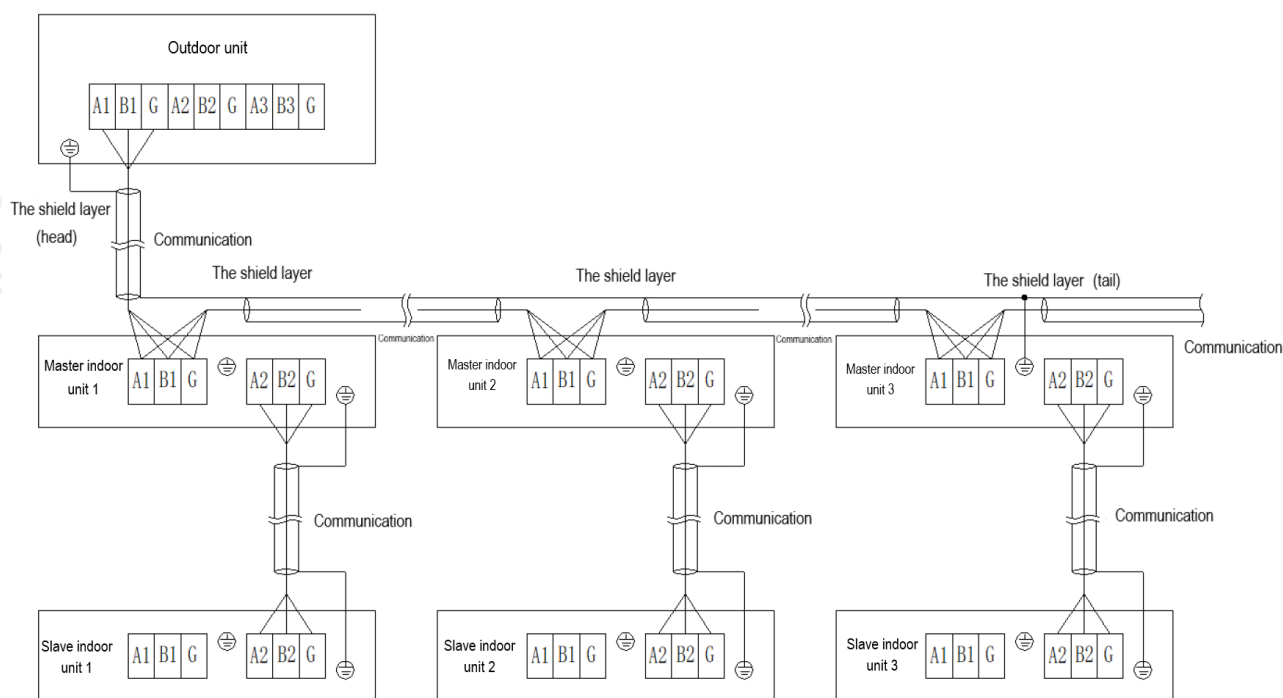
2. Communication line specifications and precautions

- **Do not connect power cord to the connecting terminal of communication cables.**
 - The total length of communication cable is less than 1000 m.
 - The communication cable, the shield layer and the chiller must be grounded.
 - Communication cable is well connected before being powered on. Do not remove the power plug with power on, lest the communication chips would be damaged.
 - To prevent interference from high voltage signal to control signal, use a shielded three-core wire for the control signal cable.
- Try to select network connection wire with dense shielding layers and smaller lay.



- Control signal has two polarities, namely polarity A and polarity B, and different polarities cannot be connected; otherwise, communication failures may occur, as shown in the right figure.
- When the power cord is parallel with the communication cable, they shall be covered by respective conduits and kept at some distance away.
- After installation, protect the communication cables of the wired controller or the centralized controller and ensure good connection.

Diagram of communication wiring between the control box and ODU

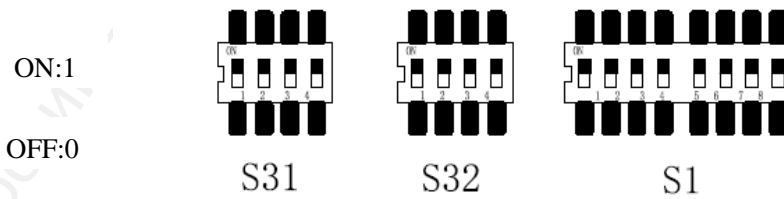


Note: The shielding layer must be connected to the earth line and cannot be connected to the GND of the control board.

V. Setting of the TMDK VRF AHU Control Box

The control box capacity code and model code need to be set on site. Check if they are correct after the setting.

1. DIP switch type



S31: Function code

S32: Model code

S1: Capacity code

1) S1: IDU capacity code

Capacity/ DIP switch	S1-1	S1-2	S1-3	S1-4	S1-5	S1-6	S1-7	S1-8
2 HP	0	0	0	0	0	0	1	0
4 HP	0	0	0	0	0	1	0	0
6 HP	0	0	0	0	0	1	1	0
8 HP	0	0	0	0	1	0	0	0
10 HP	0	0	0	0	1	0	1	0
12 HP	0	0	0	0	1	1	0	0
14 HP	0	0	0	0	1	1	1	0
16 HP	0	0	0	1	0	0	0	0
18 HP	0	0	0	1	0	0	1	0
20 HP	0	0	0	1	0	1	0	0
22 HP	0	0	0	1	0	1	1	0
24 HP	0	0	0	1	1	0	0	0
26 HP	0	0	0	1	1	0	1	0
28 HP	0	0	0	1	1	1	0	0
30 HP	0	0	0	1	1	1	1	0
32 HP	0	0	1	0	0	0	0	0
34 HP	0	0	1	0	0	0	1	0
36 HP	0	0	1	0	0	1	0	0
38 HP	0	0	1	0	0	1	1	0
40 HP	0	0	1	0	1	0	0	0
42 HP	0	0	1	0	1	0	1	0

2) S31: Function code

DIP switch	S31-1	S31-2	S31-3	S31-4
DIP switch description	Slave unit: 0	Addresses of slave units: Slave unit 1: 0 1; Slave unit 2: 1 0; Slave unit 3: 1 1;		Auto mode: 0
	Master unit: 1	Number of slave units: Quantity 1: 0 0; Quantity 2: 0 1; Quantity 3: 1 0;		Manual mode: 1

Note:

- 1) In auto mode, when the port has strong current output, the fan is on; when the port has no strong current output, the fan is off.
- 2) In manual mode, when the port has strong current output, the fan is off; when the port has no strong current output, the fan is on.

3) S32: Model code

DIP switch	S3			
	1	2	3	4
Return air control	0	0	0	0
Fresh air control	0	0	0	1

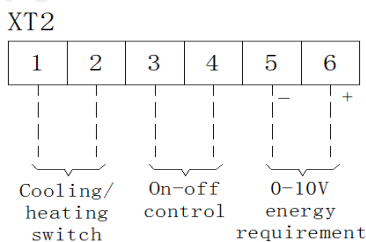
Note:

- 1) When you select fresh air mode, change the position of the temperature sensor TH4 to the air outlet (see the control box installation diagram).
- 2) In fresh air mode, the unit is completely and automatically controlled, and the user can only power on or off the unit.

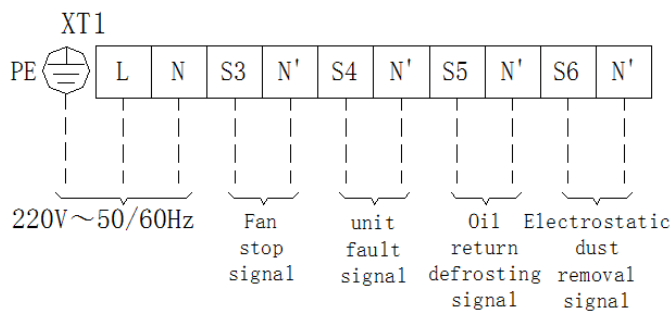
2. Wiring

1. See the electrical schematic diagram inside the control box cover.

Input signal



Output signal



Notes:

- Power-on/off (terminals 3 and 4): passive dry contacts. When they are connected, the unit is on; when they are disconnected, the unit is off. (The interval between power-on and power-off is at least 180 seconds. When the PLC sends a DX power-on command, the system detects whether there is a power-off command within 180 seconds before the power-on command. If so, the unit can be powered on only upon the expiration of 180 seconds.)
- Cooling/Heating switching (terminals 1 and 2): passive dry contacts. When they are connected, the unit works in heating mode; when they are disconnected, the unit works in cooling mode.
- Capacity adjustment (terminals 5 and 6): 0-10 V signal, a total of eleven levels with a step of 1 V (The adjustment feedback stabilization time is 40 seconds.)
- Fault feedback (terminals S4 and N'): 220 V output signal
- Fan interlock (terminals S3 and N'): both 220 V output signal (Users can decide whether to use it as required.)
- Defrosting and oil return feedback (terminals S5 and N'): When the ODU works in defrosting or oil return mode, the system provides a 220 V switch signal, and the PLC determines whether the turn off the IDU fan.

2. Before the first power-on, temperature sensors TH1, TH2, TH3, and TH4 must be connected to the main control board of each system.

3. TH1 (D41027300005) is the inlet temperature sensor of the indoor evaporator. It is installed at the inlet of the temperature evaporator.

4. TH2 (D41027300004) is the intermediate temperature sensor of the indoor evaporator. It is installed in the middle of the temperature evaporator.

5. TH3 (D41027300003) is the outlet temperature sensor of the indoor evaporator. It is installed at the outlet of the temperature evaporator.

6. TH4 (D41027300002) is the indoor temperature sensor. It is installed at the air inlet of the IDU in circulating air mode and at the air outlet in fresh air mode.

7. In master/slave mode, connect only the master kit to temperature sensors and the slave kit to the electronic expansion valve.

VI. Functions

1. Control box classification

The control box is divided into two forms: master unit kit and slave unit kit according to different functions. The master unit kit needs to be connected to temperature sensors and send valve opening adjustment commands to the slave unit kit. The master unit kit and slave unit kit are distinguished by the DIP switch. For details, see section V.

2. Control introduction

This device can be controlled automatically or manually. In auto control mode, the user can use a wired controller to adjust the cooling/heating mode. In manual control mode, the user can operate the device according to the following content, implement mode control, cooling/heating control, fan start/stop control, and capacity control, and feed back ODU fault signals as well as oil return and defrosting signals. To use this mode, set the DIP switch to manual mode.

The control functions are described as follows.

1) Switch control

The X8A port of the control board (terminals 3 and 4) is used for power-on/off control.

2) Cooling/heating control

The X18A port of the control board (terminals 1 and 2) is used for cooling/heating mode control. **Before switching the mode, power off the unit, and power on the unit after the mode is switched.**

3) Capacity control

This device enables the capacity control of a third party through the X16A port of the control board (terminals 5 and 6). Adjust the input voltage signal to control the energy demand scope according to the following table.

Capacity adjustment with 0–10 V voltage signal:

Normal	voltage	Capacity %
1	0	0
2	1	10
3	2	20
4	3	30
5	4	40
6	5	50
7	6	60
8	7	70
9	8	80
10	9	90
11	10	100

Note: The voltages allow ± 0.2 V deviation.

4) Fan motor start-stop signal

The X3 port of the control board (terminals S3 and N') is used for fan start-stop signal control:

In auto mode, when the port has strong current output, the fan is on; when the port has no strong current output, the fan is off.

In manual mode, when the port has strong current output, the fan is off; when the port has no strong current output, the fan is on.

When debugging on the customer's site, confirm whether the fan needs to be shut down in advance or after a delay.

5) ODU fault signal

The X4 port of the control board (terminals S4 and N') is used for ODU fault signal control. When the ODU fails, a strong current signal is produced, indicating that the ODU is failed and shut down. The user can troubleshoot the fault based on the signal.

6) Oil return and defrosting signal

The X5 port of the control board (terminals S5 and N') is used for oil return and defrosting signal control. When the ODU works in oil return or defrosting mode, the port produces a strong current signal. When the ODU is not in either of the two modes, no strong current signal is produced. If the ODU enters defrosting or oil return mode in heating mode, cold air will be produced for a short period of time. This is normal. After defrosting or oil return ends, the unit works in heating mode.

Electrostatic dedusting signal

The X6 port of the control board (terminals S6 and N') is used for electrostatic dedusting control.

Notes:

The fan start-stop signal, ODU fault signal, oil return/defrosting signal, and electrostatic dedusting signal are AC 220 V strong current output signals. The cooling/heating control signal, power-on/off signal, and capacity adjustment signal are DC input signals.

The output of AC 220 V strong current signals cannot be connected to load.

VII. Names and Content of Hazardous Substances in the Product

- This product complies with the environmental protection requirements of the Measures for the Administration of the Restricted Use of the Hazardous Substances Contained in Electrical and Electronic Products.
- Environmental protection service life: In the environmental protection service life, the user's normal use of this product will not cause serious pollution to the environment or cause serious damages to persons and properties. The service life is specified by TICA. The environmental protection service life is not equivalent to the service life of safe use.
- Recycling: When this product is not needed or its service life ends, recycle it according to the related national regulations on recycling of waste electrical and electronic products. Do not discard it at will.
- **Names and content of hazardous substances in the product**

Part Name	Hazardous Substance					
	Plumbum (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr(VI))	Polybrominated Biphenyl (PBB)	Polybrominated Diphenyl Ether (PBDE)
Pipeline fittings and valves	×	○	○	○	○	○
Screws, bolts, and other fasteners	○	○	○	×	○	○
Other metal parts	○	○	○	×	○	○
Controller and electrical components	×	○	○	○	○	○
Sponge	○	○	○	○	○	○
Foam	○	○	○	○	×	○
Rubber parts	○	○	○	○	○	○
Other printed matters	○	○	○	○	○	○

This table is prepared according to the provisions of SJ/T 11364.

O: It indicates that the content of this hazardous substance in all homogeneous materials in this part is below the limit requirement defined in GB/T 26572.

×: It indicates that the content of this hazardous substance in at least one homogeneous material in this part exceeds the limit requirement defined in GB/T 26572. Moreover, substitution cannot be implemented at present due to technical reasons, and it will be improved gradually along with technical progress in the future.

*: It indicates that the environmental-protection service life of the battery matched with the product is 2 years.



The number in this identification indicates that the environmental protection service life of the product under the normal use status is 15 years. Some parts may also have the identification of environmental protection service life, and their environmental protection service life is subject to the number in the identification. The product configuration may be different due to different models or product improvements. The actual configuration of sold products should prevail.

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