



# Standard Air Handling Unit – Ceiling Type



## Installation and Maintenance Manual

TFD-H

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## I. Safety Measures

TICA fully considers your safety in the design and manufacturing process. However, this cannot prevent damages caused by accidents arising from unauthorized operations or improper maintenance. The best way to ensure your safety is to conduct correct installation, proper operations and regular maintenance.

### 1.1 Safe Operations

Please carefully read through the safe operation measures prior to operation of the unit.

The safe operation measures provided in this chapter must be observed strictly.

(1) Description of signs:



Warning: The instructions must be observed; otherwise, it may cause personal injury due to improper operations of the user.



Caution: The instructions must be observed; otherwise, it may cause damages to the air conditioning unit due to improper operations of the user.



Electric shock prevention: This sign applies to electrical installation, maintenance and related operations. The wiring work of the unit can only be performed by experienced and qualified electricians.

(2) Precautions for installation:



Warning: Installation and maintenance must be authorized by the supplier, and should be performed by qualified personnel who are familiar with relevant local regulations and are experienced in installing and maintaining such equipment.

The customer cannot install the equipment independently. Improper installation will lead to water leakage, electric shock and fire hazard.



Caution: Please install the electric insulation device.

Grounding is necessary, but it cannot be connected to gas pipes, water pipes, lightning rods, etc. An improper grounding device can lead to electric shock and other hazards.

(3) Measures to be taken by users:



Warning: The instructions must be observed; otherwise, it may cause personal injury due to improper operations of the user.

The operating machine and power supply are dangerous. They may lead to serious casualties. Before maintenance, make sure to disconnect the power supply and confirm that all the moving parts have stopped.



Caution: To prevent electric shock, do not operate the air conditioner with wet hands. To avoid electric shock and other damages and losses, do not spray water to clean the air conditioner directly. Keep the air intake smooth at any time. Turn off the power supply if the unit will not be used for a long time.

Note: Due to ordering difference, your unit may not have some functions contained in this manual. You should inform TICA of the specific performance parameters before placing the order.

## 1.2 Warning Signs

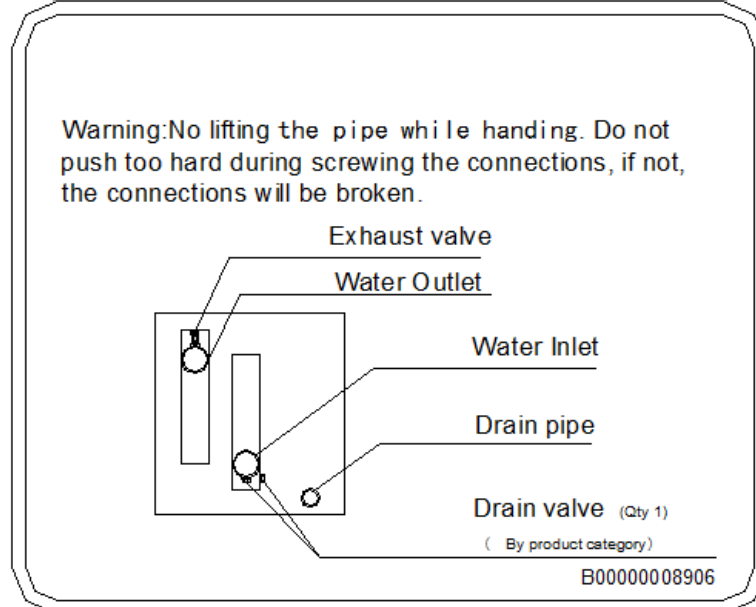
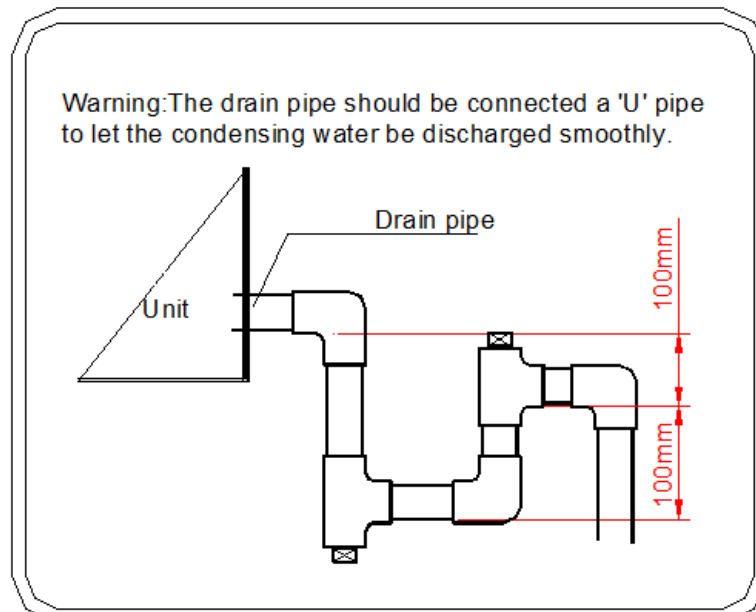


Warning label for preventing electric shock



Motor grounding sign

Other warning signs:



## II. Installation

### 2.1 Unit Handling and Lifting

The performance of the cranes, forklifts or handling tools used for unit transportation must meet the safety requirements, and the quality and transportation methods must comply with local laws and regulations to avoid accidents. The unit or packaging box should be kept horizontal when being handled and lifted, avoiding unwanted damages to the parts. The forklift loading and unloading port and lifting hole are reserved for the unit or packaging box before delivery. Operate according to the method shown in the figure during lifting, without causing danger or damaging the unit. Before lifting, insert materials such as hard cardboard at the position where the wire rope comes into contact with the housing, preventing the wire rope from scratching the unit.

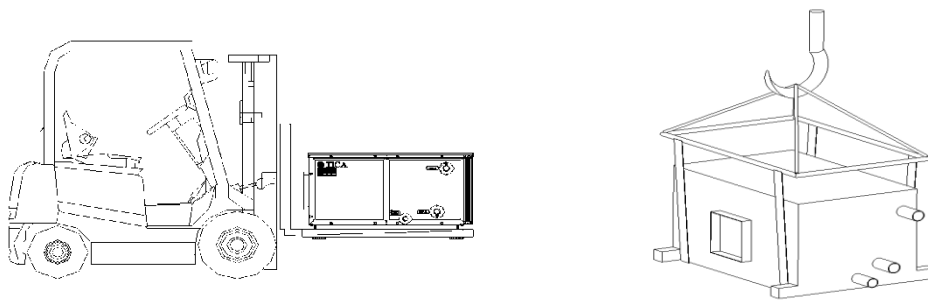


Figure 3.1 Unit lifting method



Warning: No person can stand under the unit during handling and lifting.

### 2.2 Unit Storage

If the unit needs to be kept outdoors before being installed in the equipment room, prevent the unit from being affected by dirt, rain and snow or destroyed by animals, and do not damage the protective film on the unit surface. Do not expose the unit under direct sunshine in summer; otherwise, the thermal insulation board will be deformed. If the unit needs to be installed outdoors, it should be declared when placing an order so that TICA can make special treatment. The units packaged as a whole cannot be piled up

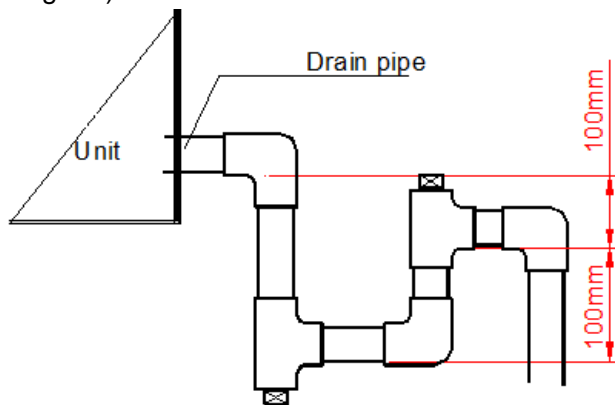
### 2.3 Installation

1. Carefully check whether the unit is damaged before unit installation. If any of the following cases occurs, contact the distributor as soon as possible for repairing or replacement:
  - a. The unit is seriously bruised or deformed outside.
  - b. Internal elements of the unit are damaged;
  - c. The fan or motor gets loose.
2. Only professionals who are familiar with this product and understand related local regulations can install the unit. During installation, do not collide or scratch the cabinet.
3. For the sake of safe use, the lifting point of ceiling type unit must be firm and hard enough to bear the weight of the unit and the vibration during unit operation. Meanwhile, the unit must be kept horizontal to prevent overflow of condensate water from the drain pan. Rubber damping sheet or shock absorber should be added in the lifting process to reduce the vibration noises of the unit. The horizontal and vertical units should be installed on a firm and flat foundation.

4. A maintenance space of at least 700 - 800 mm should be reserved around the unit, especially at the side of the access door (plate) and external water pipe, the space at the taking direction of filter is above 800 mm, and a sufficient space should also be kept during installation of pipes.
5. The water drain valve and exhaust valve are set on the heat exchanger manifold of unit. The exhaust valve is loosened to discharge air when water is supplied. The valve is tightened after air discharge. When the unit will be stopped for a long term, accumulated water in the heat exchanger pipe is drained through the water drain valve.
6. The series of products are installed at proper indoor positions according to their different forms.

## 2.4 Installation of the Water System

1. Before installation, clean the water pipe. A filter should be installed at the water inlet of the heat exchanger.
2. The condensate water pipe of unit is located at the unit bottom. The condensate water discharge elbow should be installed according to the residual pressure value of unit, ensuring smooth discharge of condensate water and preventing external odor from entering the cabinet. (As shown in the following figure.)



When the internal negative pressure is greater than 800 Pa, H needs to be increased.


3. When connecting the water inlet pipe and water outlet pipe connected to the air conditioning unit, use a double tube clamp to exert even force to the opposite direction at the same time. The torque force cannot exceed 250.8 N.m (21 Kgf.m), lest the heat exchanger would crack due to twisting and lead to water leakage. The water supply/return pipe outside the unit must be set with a valve (excluding the condensate water drain pipe) and is used to regulate the flow and cut off the water source during unit overhauling. Thermal insulation measures must be taken for the external water pipes of unit.
4. For the heat exchanger using cold/hot water as medium, the lower pipe is the water inlet pipe, and the upper pipe is the water outlet pipe; if steam is used as medium, the upper pipe is the steam inlet pipe, and the lower pipe is the water outlet pipe, connected to the steam trap. Please connect the pipes by referring to the label on the unit.
5. All the water pipe joints must be sealed, preventing water leakage.
6. The unit cannot bear the extra weight other than the water inlet pipes, water outlet pipes and drain pipes.
7. The refrigerant water temperature of the standard model cannot be less than 5°C; the hot water temperature of heating cannot be greater than 80°C, and 60°C is recommended.

## 2.5 Installation of the Air System

1. The air inlet pipe and outlet pipes for the unit should be sealed to prevent air leakage. Thermal

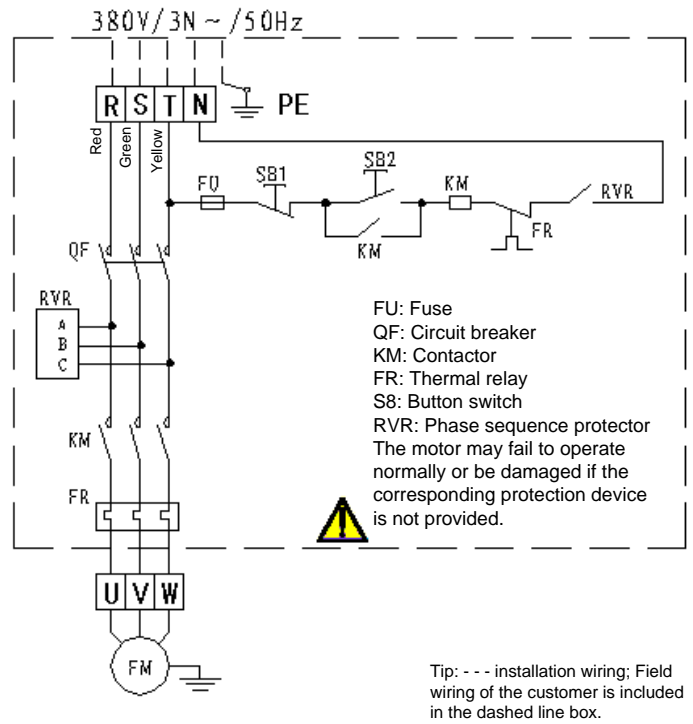
- insulation measures must be taken at the joint of the air outlet flange and air supply duct for the unit.
- Flexible connectors are used to connect the air inlet/outlet to the air duct of the unit. The unit cannot bear the air duct and other extra loads.

**2.6 Electrical Installation**

 **Warning:** Do not use the air switch as a contactor or control switch, otherwise the motor may burn out.

1. Electrical principle diagram

The figure below shows the general wiring diagram of the unit, which is used for reference only.



2. Table of Thermal Relay Protector Setting Currents and Recommended Models.

No.	Unit motor power (KW)	Setting current value (A)	Recommended thermal relay	
1	0.55	1.6	LRD07C (1.6-2.5A)	Schneider
2	0.75	2.0	LRD07C (1.6-2.5A)	Schneider
3	1.1	2.9	LRD08C (2.5-4A)	Schneider
4	1.5	3.7	LRD08C (2.5-4A)	Schneider
5	2.2	5.2	LRD12C (5.5-8A)	Schneider
6	3	6.8	LRD12C (5.5-8A)	Schneider
7	4	8.8	LRD14C (7-10A)	Schneider
8	5.5	11.8	LRD21C (12-18A)	Schneider
9	7.5	15.6	LRD21C (12-18A)	Schneider

3. Before wiring, check whether the power supply complies with the unit requirement, and whether the power voltage deviation exceeds  $\pm 10\%$  of the rated voltage. The unit adopts the three-phase voltage 380V/3~50Hz AC power supply. The motor should be connected to a power supply with a protection device, and the unit must be grounded reliably. Check whether the electrical circuit is in good conditions and meets electrical safety requirements.
4. When the motor power of the unit is smaller than 11 kW, the unit is equipped with a wiring terminal using direct starting mode. When the motor power is greater than or equal to 11 kW, a wiring terminal using the star-delta starting mode is provided. During wiring, the customer needs to set overload, short circuit and overheat protection.
5. Refer to the following table for power line diameter of different power motors

(1) The specifications of wires and terminal blocks used for fixed speed motors are as follows:

No.	Rated power	Power wire specification	Ground wire specification	Terminal blocks specification	Terminal blocks Qty
1	$\leq 4\text{kW}$	$1.5\text{mm}^2$	$1.5\text{mm}^2$	10A 4-position	1
2	5.5-7.5kW	$2.5\text{mm}^2$	$2.5\text{mm}^2$	40A 4-position	1
3	11kW	$2.5\text{mm}^2$	$2.5\text{mm}^2$	40A 6-position	1
4	15-18.5kW	$4\text{mm}^2$	$4\text{mm}^2$	40A 6-position	1
5	22kW	$6\text{mm}^2$	$6\text{mm}^2$	40A 6-position	1

**Note:** When the motor power is between 0.55 ~ 0.75kW, using direct starting mode. When the motor power is greater than or equal to 11 kW, using the star-delta starting mode.

(2) The specifications of wires and terminal blocks used for inverter motors are as follows:

No.	Rated power	Power wire specification	Ground wire specification	Terminal blocks specification	Terminal blocks Qty
1	$\leq 4\text{kW}$	$1.5\text{mm}^2$	$1.5\text{mm}^2$	10A 4-position	2
2	5.5-7.5kW	$2.5\text{mm}^2$	$2.5\text{mm}^2$	10A、40A 4-position	1 for each
3	11kW	$4\text{mm}^2$	$4\text{mm}^2$	10A、40A 4-position	1 for each
4	15kW	$6\text{mm}^2$	$6\text{mm}^2$	10A、40A 4-position	1 for each
5	18.5-22kW	$10\text{mm}^2$	$10\text{mm}^2$	10A、60A 4-position	1 for each


**Note:** Heat dissipation fans of inverter motor all adopt  $1.5\text{mm}^2$  power wire.

6. When the unit is delivered together with the control cabinet, the temperature controller is shipped together with the unit. The temperature controller is installed on the wall of the indoor operation room to implement remote control operation. Field wiring includes the controlled power cord and the signal line between the temperature controller and the control cabinet.



## III. Debugging

### 3.1 Check

1. Check whether the unit has been installed completely and whether foreign matters have been removed from the inside.
2. Before operation, the discharge valve on the outlet pipe needs to be opened, and needs to be closed after the air in the coil and the pipeline is exhausted.
3. Before operation, check whether the vibration damping system of the unit is equipped with a transport fixing block. If any, remove it first.
4. Before starting the fan, rotate the fan impeller manually to check whether there is any abnormal friction sound. If yes, eliminate the cause. After connecting the power supply, start the motor first, and check whether the fan rotation direction is correct. If it is incorrect, stop the motor and change the power phase sequence.
5. Check whether all the air valves in the air system pipeline are opened according to the designed position, and whether the locking mechanism has been locked.
6. Check whether the water system has been cleaned and air has been discharged from the system. After the pipeline system is installed, clean the pipeline first by closing the valve connected to the unit to prevent the debris in the pipeline from entering the coil, otherwise, they may block the loop. Before operating with water, open the discharge valve to drain the air in the pipeline until the water is discharged.
7. Check whether the motor insulation is qualified. The winding may be damped when the motor stops operation for a long term. Before use, use a megohmmeter to measure its insulation resistance. The insulation resistance at 25°C should exceed 2 MΩ.
8.  Note: After measurement, the winding must be discharged immediately to avoid electric shock. If the insulation resistance does not reach the reference value, the winding must be dried.
9. Check whether the power voltage meets the requirement, whether the three-phase voltage is balanced, and whether the circuit wiring is correct. Before formal startup, the motor switch can be pressed for a trial to check whether the fan rotation direction is correct.
10. If the unit needs to be stopped during operation in winter, the fresh air valve should be closed before the hot water circulation in the unit, lest the heat exchanger would be frozen.
11. The unit should be managed by professionals who should regularly check the operation status of the unit, and debug the abnormalities in time if any.

### 3.2 Trial Operation

The unit can be started after the above check work is completed. After the unit starts, note to check whether the motor operating current is normal and whether the unit sends abnormal sound. Check whether the unit air flow and air pressure are normal. The cooling capacity and humidifying capacity should be regulated according to different operating conditions. When the unit is commissioned and operated, check whether the running current of the motor exceeds the rated current to prevent the fan from burning down the motor due to overload.

The following situation should be regarded as normal:

Noise: In case of no abnormal noises, such as low-frequency noise, mechanical friction and whistle, the noise that is not higher than the value specified in the product sample, nameplate or other contract

documents can be regarded as normal.

Vibration: In case of no abnormal vibration, such as surge and unit jitter, the vibration that is not higher than the value specified in the national standard or other contract documents should be regarded as normal.

## IV. Routine Maintenance

**Note: Maintenance can be carried out only after the unit has been stopped.**

Check the unit operating status on an irregular basis, and implement long-term and effective maintenance for the unit so as to greatly improve the unit operation reliability and service life.

1. During the season when the unit is not used, fill water in the heat exchanger, reducing the possibility of pipe corrosion. However, to prevent frost crack of the heat exchanger pipe for the unit when the ambient temperature is less than 0°C in winter, water stored in the unit must be exhausted (a water drain valve is set at the lower part of the water inlet pipe for the heat exchanger of unit).
2. To ensure good ventilation and achieve high heat exchange efficiency, the air filter is usually cleaned on a monthly basis, and on a weekly basis in places where air environment is poor.
3. Ensure that the heat exchanger coil fins and copper pipes are free of scratches or distortion. Keep the coil clean and brush the fins of the coil with nylon brush. A vacuum cleaner must be used for cleaning before brushing. If compressed air is available, use high pressure air or a spray nozzle to clean the coil. After the coil is cleaned, the outer surface should be free of dust, and the heat exchange effect on the inner surface should reach the originally-designed heat exchange capacity. In addition to the fins, you also need to clean the coil after 2 to 3 years of use. If conditions permit, the chilled and hot water used in the coil of the unit should be softened. The water quality requirements are as follows:

No.	Item		Water supply
1	Suspended substance		≤10
2	pH value (25°C)	Steel equipment	10 - 12
		Copper equipment	9 - 10
3	Total hardness (mmol/L)		≤0.6
4	Oxygen capacity (mg/L)		≤0.1
5	Oil content (mg/L)		≤1
6	Chlorine ion (mg/L)	Steel equipment	≤300
		Copper equipment	≤100
7	Sulfate radical (mg/L)		≤150
8	Total Fe amount (mg/L)		≤0.5
9	Total Cu amount (mg/L)		≤0.1

4. Clean the drain pan and water seal elbow on an annual basis.
5. Check the flexible connector of air duct regularly. In case of air leakage, repair it in time.
6. For the belt-drive unit, adjust the belt tension on a regular basis. The proper belt tightness is very important to the service life. If the belt is too tight, an extra load will be generated on the belt and bearing, reducing their service life; if the belt is too loose, the belt will slip, generating heat and reducing their service life. The belt tightness can be judged using two methods. Firstly, use a belt tightness measuring tool to judge it. The measuring tool provides a scale, and the tension size can be determined according to the belt center distance and the belt model. If no belt tightness measuring tool is available, adjust the belt tightness till the belt does not give out a sharp sound when the fan starts. It is allowed if the belt gives out short sounds. After tightening the belt and before starting the fan, check the belt pulley alignment again. When necessary, readjust the belt pulley to ensure alignment. A new belt may be a little stretched when it is just used. Check the belt tightness again after operation for several days. After the unit has operated for one week, readjust tightness of the belt. After that, perform routine check

every three months.

7. Motor maintenance

- (1) The motor should be regularly inspected and cleaned, and the casing must be free of dust. Do not spray the motor with water for cleaning.
- (2) When the motor is running, the allowable bearing temperature must not exceed 95°C (thermometer method). The bearing should be inspected at least once every 2500 hours of operation (about half a year). If the bearing grease is found to be deteriorated, replace it in time. Before replacement, clean up the bearing outer cover, the waste oil in the oil storage box, and the oil pipe and oil cup of the oil discharge device. ZL3 lithium lubricating grease dedicated for small motors is recommended. TICA recommends that lubricating grease with the volume about 1/3 to 1/2 of the bearing cavity capacity be added.

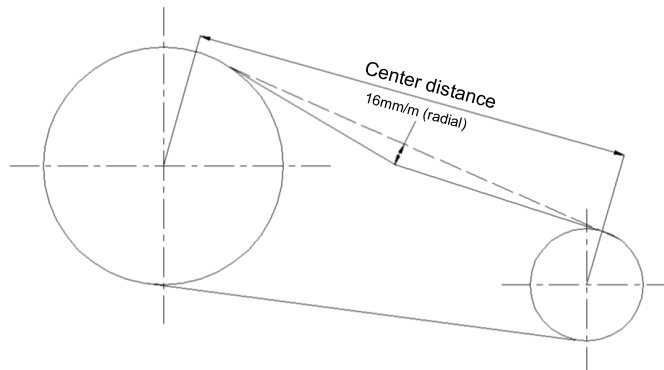
8. Consumables and wearing parts:

The following accessories are consumables or wearing parts:

- a. Air filter
- b. Belt
- c. Inspection lamp, switch, fuse, etc.

The user needs to replace them according to use conditions, lest an equipment fault may occur.

9. The fan used in this model adopts oil-free bearing, and the bearings of the fan and motor needs to be checked and maintained regularly (recommended three times a month). Check the sealing ring of the motor shaft extension (such as V-ring) and replace it in time if necessary; check whether the bearing is rusted or has ash and other faults, if any, clean them in time so as to prevent them from entering the bearing; check whether the belt tension meets the requirements in the following table - too tight or too loose belt will directly affect the service life of the bearing; check whether the bearing fastening screws are loose; monitor whether there are abnormal noises or clamping stagnation during the operation of the fan. In case of any abnormalities, stop the unit immediately to check the cause and eliminate it in time. Take heating measures or use special tools to install, remove or replace bearings. Do not knock or pry bearings.



Belt Tension Parameters Table					
Belt type	Small belt pulley diameter/mm	Tension/kgf	Belt type	Small belt pulley diameter/mm	Tension/kgf
Narrow V-belt/SPZ	≤71	0.8-1.4	Narrow V-belt/SPB	≤180	2.8-4.4
	78-85	1.0-1.9		190-236	3.3-5.2
	90-112	1.2-2.3		250-315	3.8-5.5
	118-150	1.4-2.7		335-425	4.5-7.1
	≥ 160	2.0-3.4		≥ 450	5.5-8.0

Narrow V-belt/SPA	≤112	1.7-2.8	Narrow V-belt/SPC	≤315	5.5-8.0
	118-150	2.0-3.4		335-425	6.5-9.5
	160-212	2.4-3.8		≥ 450	7.0-11.0
	224-250	3.0-4.4			
	≥ 280	3.5-5.0			

10. Access panel removal

TFD: foamed plate structure

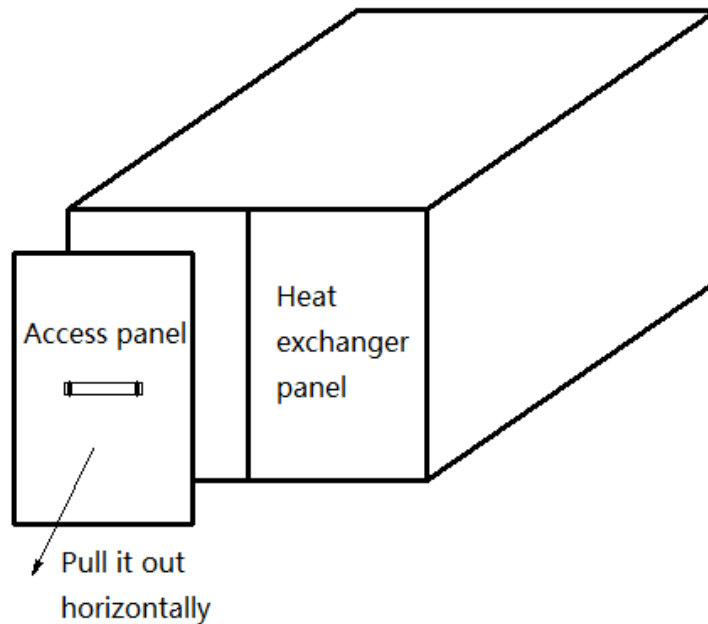
Removal of access panel: First remove the fixing screws on the three sides of the access panel, and then pull it out horizontally.

Installation of access panel: Fix the bottom screws for positioning, and then fix the other two sides screws.

TFS: Sheet metal structure

Removal of access panel: First remove the screws on the four sides of the access panel, and then pull it out horizontally.

Installation of access panel: Fix the bottom screws for positioning, and then fix the other three sides screws.



## V. Troubleshooting

Common Fault	Cause	Solution
Abnormal sound	1. The impeller or fan bearing gets loose.	1. Lock the bearing seat.
	2. There is foreign matter in the impeller or volute.	2. Clear the foreign matter.
	3. The installed air duct and regulating valve get loose.	3. Fasten them.
	4. The two V pulleys are not at the same central line, and the V belt is too loose or too tight.	4. Readjust the V pulley or V belt.
	5. The flexible connector of fan outlet is too tight.	5. Replace it with a proper flexible connector.
	6. The fan rotation speed is too high, and the operating point is not proper.	6. Match the fan and the belt pulley of motor again.
	7. The bearing contains dirt due to poor quality of the lubricating oil.	7. Use quality lubricating oil and clean the bearing.
	8. The selected fan is too small.	8. Replace the fan.
	9. The motor, fan or motor seat bolt gets loose, leading to the loosening problem.	9. Fasten the bolt.
The air supply volume is insufficient.	1. The filter screen is too dirty.	1. Clean the filter screen.
	2. The air duct sealing is poor.	2. Check the air duct and plug the pipeline leakage.
	3. There is an obstacle in the air duct or the air valve is not opened.	3. Check the pipeline and make it smooth.
	4. The fan rotates inversely.	4. Change the power phase sequence of motor.
	5. The selected fan is improper.	5. Select the proper fan and air flow rate.
	6. The rotation speed is too low.	6. Change the belt pulley to increase the rotation speed.
The air supply volume is too large.	1. The selected fan is improper.	1. Select the proper fan and air flow rate.
	2. The rotation speed is too high.	2. Change the belt pulley to reduce the rotation speed.
The unit leaks water.	1. The wind speed is too high, making water splash.	1. Reduce the unit air flow.
	2. Condensate water cannot be discharged smoothly, and water overflows from the drain pan.	2. Check whether the prepared drainage water seal is proper, and clear the dirt from the drainage pipe.
	3. Condensate water is generated due to air leakage of the unit.	3. Seal the position with air leakage.
The cooling capacity is insufficient.	1. The inlet water temperature of the heat exchanger for unit is too high.	1. Adjust the inlet water temperature of the unit.
	2. The surface of the heat exchanger for unit is blocked by dirt, affecting heat	2. Clean the heat exchanger.

	exchange.	
	3. The problem is caused by insufficient air supply volume.	3. Eliminate the cause of insufficient air supply volume and increase the air supply volume.
	4. The selected unit model is too small.	4. Reselect a model.
The air flow rate in the air conditioning room air conditioning room is too large.	1. The wind speed of the air outlet is too high.	1. Increase the air supply outlet area.
	2. The air flow organization is not reasonable.	2. Check the air duct design to make the air flow organization reasonable.
The air in the air conditioning room the air conditioning room is not fresh.	1. The fresh air volume is insufficient.	1. Increase the fresh air valve.
		2. Clean the fresh air filter screen.
		3. Increase the cross sectional area of fresh air duct.

## VI. Hazardous Substances

### Environmental Protection Description

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 products

Part name	Hazardous substance					
	Plumbum (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent chromium (Cr6+)	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
Fan	○	○	×	×	○	○
Motor	×	○	○	○	○	○
Cooling coil	○	○	○	○	○	○
Plastic parts	○	○	○	×	○	○
Guide rail, square steel and rectangular steel types	○	○	○	×	○	○
Control cabinet and connection box	×	○	○	○	○	○
Other auxiliary materials	×	○	○	×	×	×
Body and other components of the equipment	○	○	○	○	○	○

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.

x: 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.



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.