

PRO
TICA PRO



INSTALLATION & OPERATION MANUAL

AIR HANDLING UNIT

TFS Series

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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.



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(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

注意：为保证冷凝水排除顺畅，请在排水管上接驳水封！
 Warning: The drain pipe should be connected a 'U' pipe to let the condensing water be discharged smoothly.

机组 Unit

排水管 Drain pipe

100mm

100mm

注意：在搬运过程中，严禁抬水管。配管时请勿施力过度以免损坏接头！
 Warning: No lifting the pipe while handing. Do not push too hard during screwing the connections, if not, the connections will be broken.

排气阀 Exhaust valve

出水管 Water Outlet

进水管 Water Inlet

排水管 Drain pipe

放水阀 Drain valve (Qty 1)
 (视机型标配一个 By product category)

B00000008906

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

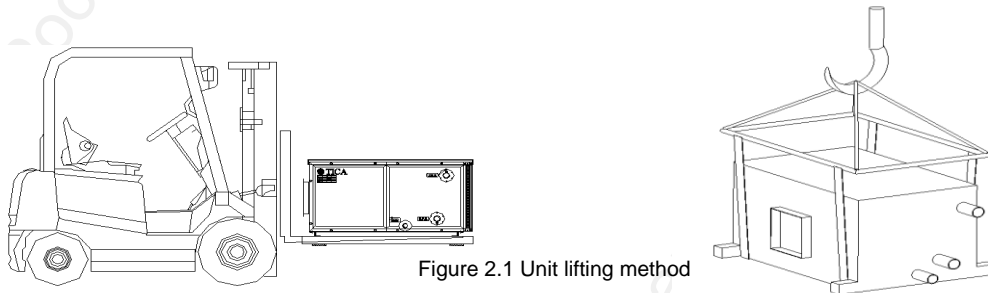


Figure 2.1 Unit lifting method



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 unit packed with the whole machine cannot be stacked.

2.3 Installation of the Unit

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. The recommended foundation height is 150 mm. The length and width dimensions should be determined by referring to the external unit dimensions, and a water tank should be set around the 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 600 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

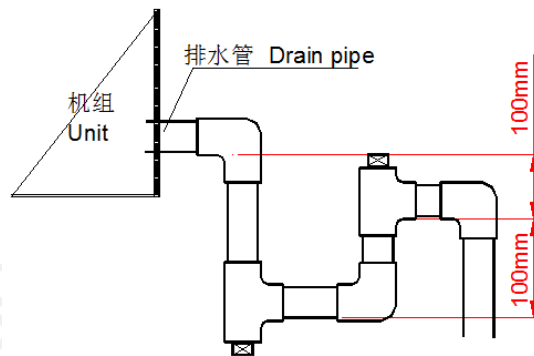
1. Before installation, clean the water pipe. A filter should be installed at the water inlet of the user's water pump.

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

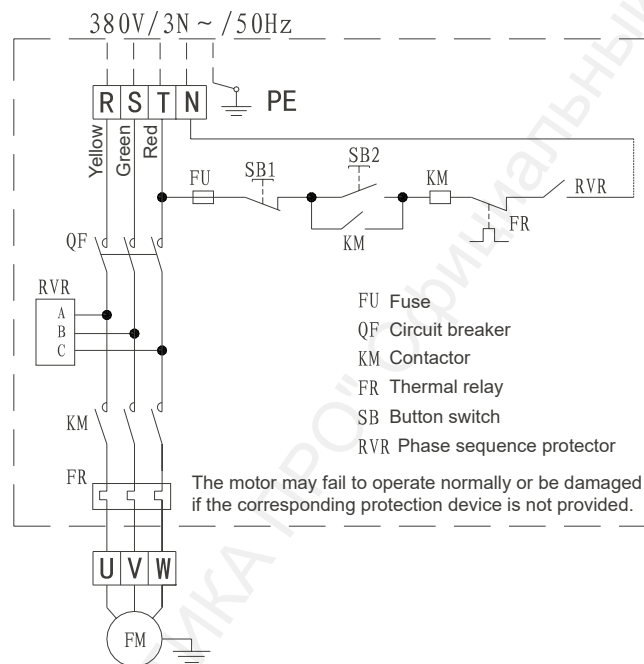
1. The air inlet pipe and outlet pipes for the unit should be sealed to prevent air leakage. Thermal insulation measures must be taken at the joint of the air outlet flange and air supply duct for the unit.
2. Flexible connectors are used to connect the air inlet/outlet to the air duct of the unit. The 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 it is easy to cause the motor to burn.

1. Electrical principle diagram

The following figure shows the general wiring diagram of the standard unit, which is 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	3.0	6.8	LRD12C(5.5-8A)	Schneider
7	4.0	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 requirements, 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 less than 11kW, the unit is provided with direct start terminals. When the motor power is greater than (inclusive) 11kW, star delta start terminals are provided. Overload, short circuit and overheat protectors should be installed when customer wiring.

For the power cord diameters of different power motors, please refer to the following table:

(1) The specifications of wires and terminal blocks used in fixed-frequency motors are as follows:

NO.	Rated power	Power cord specifications	Ground specification	Terminal block specification	Number of terminal blocks
1	$\leq 4\text{kW}$	1.5mm^2	1.5mm^2	10A four	1
2	5.5-7.5kW	2.5mm^2	2.5mm^2	40A four	1
3	11kW	2.5mm^2	2.5mm^2	40A six	1
4	15-18.5kW	4mm^2	4mm^2	40A six	1
5	22kW	6mm^2	6mm^2	40A six	1

Notes: The rated power of 0.55~7.5kW motor adopts direct start mode, and the motor of 11kW and above adopts star delta start mode!

(2) The specifications of the wires and terminal blocks used in the inverter motor are as follows:

NO.	Rated power	Power cord specifications	Ground specification	Terminal block specification	Number of terminal blocks
1	$\leq 4\text{kW}$	1.5mm^2	1.5mm^2	10A four	2
2	5.5-7.5kW	2.5mm^2	2.5mm^2	10A、40A four	1 / 1
3	11kW	4mm^2	4mm^2	10A、40A four	1 / 1
4	15kW	6mm^2	6mm^2	10A、40A four	1 / 1
5	18.5-22kW	10mm^2	10mm^2	10A、60A four	1 / 1


Notes: The inverter motor cooling fans all use 1.5mm power cords!

When the unit with control cabinet leaves the factory, the thermostat will be shipped in random groups. Installed on the wall of the indoor operation room on site to realize remote control operation, the on-site wiring includes the controlled power cord and the signal cable between the thermostat and the control cabinet.

III. Debugging

3.1 Check

Before debugging and operation, the unit should be checked comprehensively. The check work should include the following aspects at least:

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. Check whether the filter material of filter is damaged or contaminated. Cover a layer of nylon filter mesh before the filter of air inlet section, preventing dust in the pipeline from contaminating the filter. The medium-efficiency filter should be installed after commissioning. When conditions permit, the customer can prepare one set of primary efficiency filters to be used during debugging.
5. 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.
6. Do not run the motor without phase, and avoid repeated starting to prevent overload.
7. 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.
8. 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.
9. 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.
10.  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.
11. 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.
12. 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.
13. 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.

VI. Routine Maintenance

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

Regular unit operation status inspection, long-term and effective maintenance of the unit, the reliability and service life of the unit will be greatly improved.

1. In the season when the unit is not in use, the coil should be filled with water to reduce the corrosion of the pipe. However, in winter, if the ambient temperature is below 0 ° C to prevent the coil of the unit from freezing and cracking, the water in the unit must be drained with high pressure air (a drainage plug is provided at the lower part of the inlet pipe of the unit heat exchanger).
2. In order to maintain air flow and achieve high heat exchange efficiency, air filters are typically cleaned once a month, and once a week in cases with poor air conditions.
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	PHvalue (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 Fe(mg/L)		≤0.5
9	Total Cu amount Cu(mg/L)		≤0.1

4. The drain pan and water seal elbow are cleaned once a year.
5. Regularly check the soft joints of the air duct, and repair any air leaks in a timely manner.
6. For the belt drive unit, the tightness of the belt should be adjusted regularly. The appropriate belt tightness is very important to the service life. If it is too tight, it will bring additional load to the belt and bearings. If it is too loose, the belt will slip and generate too much heat. Both of these situations will reduce the service life of the belt and fan bearings. The tightness of the belt can be judged by two methods: First, it can be judged by using a belt tightness gauge. The gauge itself has a ruler meter to determine the size of the belt tension force according to the belt center distance and belt model. If there is no belt tension gauge, the belt tightness should be adjusted until the belt does not make a scream when the fan starts. If a short scream is allowed. After tightening the belt, before starting the fan, re-check the alignment of the pulley and readjust the alignment if necessary. The unit should be readjusted after one week of operation. The tightness of the belt should be checked routinely every three months after operation.

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 :

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

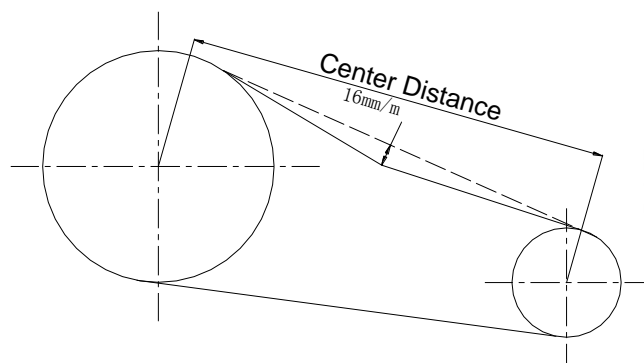
The user needs to replace them according to use conditions in time, lest an equipment fault may occur.

The user needs to replace them according to use conditions in time, 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.

Indication diagram of belt tension related to the center distance



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.Maintenance panel removal:

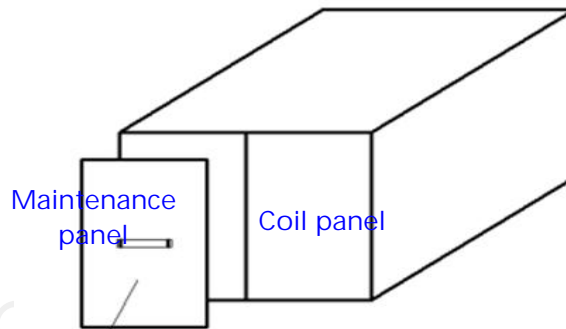
TFD model: foam panel structure

Maintenance panel removal: first remove the fixing screws on three sides of the maintenance board, and then pull them out horizontally. Maintenance panel installation: first fix the bottom screws for positioning, and then fix the other screws on both sides.

TFS model: sheet metal structure

Maintenance panel removal: first remove the four screws of the maintenance panel, and then pull it out horizontally.

Maintenance panel installation: first fix the bottom screw for positioning, and then fix the other three-sided screws.



positioning, and then fix the other screws on both sides.

VII. Troubleshooting

Common Fault	Causes	Solution
Abnormal sound	1. The impeller or fan bearings are loose.	1. Fasten the bearing seat.
	2. There are foreign matters in the impeller or volute.	2. Remove the foreign matters.
	3. The air duct and regulating valve are loose.	3. Fasten the air duct and regulating valve.
	4. The two V-belt wheels are not on the same center line, and the V-belt is too loose or too tight.	4. Readjust the same.
	5. Looseness caused by loose bolts of motor, fan or motor base.	5. Fasten the bolts.
	6. The flexible connector on the fan outlet is too tight.	6. Replace with a suitable flexible connector.
	7. The fan speed is too high, the working point is not suitable.	7. Rematch the belt pulley.
	8. There is dirt in the bearing due to poor quality of lubricant.	8. Replace with high-quality lubricant or clean the bearing.
	9. Noise occurs because the deflector is too small or the air duct turns too sharply.	9. Change the deflector.
	10. The fan is too small.	10. Change the fan.
The rotation speed is correct, but the air supply rate is insufficient.	1. The filter is too dirty.	1. Clean the filter.
	2. The air duct is not well sealed.	2. Check and plug pipe leaks.
	3. There is an obstacle in the air duct or the air valve is not open.	3. Check and make the air duct open.
	4. The fan rotates reversely.	4. Change the phase sequence of the motor power supply.
	5. The belt is loose or the motor and fan belt pulley are not aligned.	5. Adjust the belt and belt pulley.
	6. The fan is improper.	6. Properly choose the fan and air volume.
The rotation speed is correct, but the air volume is too large.	1. The fan is improper.	1. Properly choose the fan and air volume.
	2. There are serious air leaks in the air return duct.	2. Check and plug pipe leaks.
The gas flow rate in the air conditioning room is too large.	1. The air speed in the air inlet is excessive.	1. Increase the air outlet area.
	2. The air distribution is unreasonable.	2. Change the form of the air outlet or add a windshield to make the air distribution reasonable.
The air in the air conditioning room is not fresh.	The fresh air flow is not enough.	1. Open wide the fresh air valve.
		2. Clean the fresh air filter.
		3. Increase the cross-sectional area of the fresh air duct.

VIII. Hazardous Substances

Environmental Protection Description

of the Restricted Use of the Hazardous Substances Contained in Electrical and Electronic Products.

of this product will not cause serious pollution to

is not equivalent to the service life of safe use.

Recycling: When this product is not needed or its service life has ended, please refer to the 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	×	○	○	○	○	○
Electric heater	○	○	○	○	○	○
Cooling coil	○	○	○	○	○	○
Humidifier type	×	○	×	×	○	○
Dehumidifier	○	○	○	×	○	○
Heat recovery type	×	○	○	○	○	○
Filter type	○	○	×	×	○	○
Overhaul lamp	×	○	○	○	○	○
Control cabinet and connection box	×	○	×	○	○	○
Guide rail, square steel and rectangular steel types	○	○	○	×	○	○
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.

IX. After-sales Service and Warranty

After-sales Service

— Ask your distributor to perform maintenance work; improper maintenance or repair may lead to water leakage, electric shock, or fire.

— When the equipment needs to be moved or reinstalled, ask your distributor to do it; improper maintenance or repair may lead to water leakage, electric shock or fire.

Provide the following information when you request repair:

Air conditioner model;

Factory number and installation date (for details, refer to the warranty application form);

Details of the fault;

Your name, address and telephone number.

Repair after the warranty period

Please contact your distributor.

Warranty check

After operation for several seasons, performance of air conditioners will be reduced on account of internal dust accumulation.

You are advised to sign a maintenance check contract with us. For details of the special service, contact your distributor.

Inquiry

For the after-sales service, contact your distributor.



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