



# AIR HANDLING UNIT

## Installation Operating and Maintenance Manual



Please read the manual before install and Operat the unit, in order to carry out the proper and safly installation method .

The manual must be properly preserved while the unit Operaing.

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# 1 Safety

## 1.1 Safety Identification

In order to prevent misoperation due to equipment resulting from personal injury and property damage, the equipment and the equipment manual uses the following safety signs that the relevant security information and risk rating.

Before using and installing the equipment, you must have been well aware of these signs mean.

The equipment, may not use some or all of the signs, or did not address some of the following security matters. In addition, the illustrations in this manual, the equipment safety signs may not be drawn..

### 1.1.1 Safety Identification Of Manual Used

 **danger!** The signs indicate that this is a very dangerous operation or action, if the improper operation will result in serious injury or even death.

 **Warning!** The signs indicate that this is a dangerous or unsafe operation, if the improper operation will result in serious injury or even death.

 **Caution!** The signs indicate that this is a dangerous operation, or have a certain amount of harm, if not careful will lead to misoperation due to mild or serious injury and loss.

**Attention !** The signs indicate when the operation could lead to inappropriate use of the product or property damage. Or on the use and maintenance of helpful tips of information.

### 1.1.2 Safety Identification Of Equipment And Manuals Used

Operation of this equipment may exist due to the inevitable other dangers. Therefore, before operating the equipment should be carefully read this manual and read the device's security ID.

On the device and equipment operating position in the vicinity and the manual annotation of the following safety signs to provide the relevant security information, prompts the user to be careful in handling.

Before using and installing the equipment, you must have clearly understood the meaning of these signs and take the necessary preventive measures.

Safety identification and safety instructions is to prevent damage and accidents. Safety instructions must be strictly to ensure the implementation.

 The sign indicates a prohibited operation. The circle with a slash mark on top of or beside the operation.

 The sign specified for an operation, must be careful. Circle marked in the operation above or beside.

 The sign indicates warning and carefully. Related contents in the triangle or nearby.

 The sign indicates an explanation. Related contents listed in a box.



These signs indicate labeled parts should be recycled.

Different security risk level, have different safety warning logo.

Warning Identifies	Safety Risk
	Used to prompt the injury would lead to very serious risk of personal injury.
	Used to prompt the injury may cause serious or very serious risk of personal injury.
	Used to prompt the injury may lead to a general or a slight risk of personal injury.
	Used in damage occurs only will lead to loss of property, won't cause injury.

## 1.2 Safety Precautions

### 1.2.1 Storage ,Handling And Discharging Attention

 <b>Danger!</b>	
	<ol style="list-style-type: none"> <li>1. Lifting, prohibit stood unit below! Lifting unit shall establish special command, and a warning.</li> <li>2. Prohibited shifting! Lifting it sets no more than 10 degrees tilt Angle!</li> <li>3. Be careful when lifting and shifting unit, prohibit excessive shaking and collision! So as to avoid damage to units and cause injury to personnel and buildings.</li> </ol>
 <b>Warning !</b>	
<ol style="list-style-type: none"> <li>1. Unit lifting and shifting must be holders of cranes, forklifts and other professional personnel machine operators certificate!</li> <li>2. Is strictly prohibited lifting to hook unit such as pipeline.! Only allow hook units discharging by special hoisting hole.</li> <li>3. Please select the appropriate lifting methods and hoisting equipment!</li> </ol>	

<b>Attention !</b>	
<ol style="list-style-type: none"> <li>1. Do not place the unit in a corrosive gas stored liquid or moisture, high temperature place.</li> <li>2. Unit lifting and shifting should avoid scratching or body deformation, harnesses contact with the body parts should be placed protecting cushion or stick adhesion.</li> <li>3. Be prohibited equipment safety identification shift or remove.</li> <li>4. Hanging unit should be checked before discharge , suffered damage during transport, it should be assessing whether it could continue to use and conduct of claims.</li> </ol>	

### 1.2.2 Installation Notes

 <b>Danger!</b>	
	To prohibit the non-explosion-proof unit installed in a place where combustible gas!

 <b>Warning!</b>	
<ol style="list-style-type: none"> <li>1. The unit installation and moving must be carried out by qualified company ,and the company hold professional certificates of refrigeration,air conditioning welders and electrician in the corresponding job!</li> <li>2. Prohibition units installed in humid places (such as the hot spring area and the beach, etc.),installation poor , vulnerable to electric shock and fire.</li> <li>3. Prohibit the use of cold water, hot water unit mounted directly to the use of steam.</li> </ol>	

 <b>Warning!</b>	
	<ol style="list-style-type: none"> <li>1. Unit wiring endpoint marking on the ground sign must grounding! Grounding line should not be a separate fuse or cut-off switch! During power equipment, no ground or bad ground can easily result in an accident or fatal electric shock .Grounding system must be constructed according to the electrica design documents, errors construction can also cause electric shock or fatal electric shock accidents.</li> <li>2. Forbidden to use of various types of natural gas pipelines, water pipes, lightning rod and telephone lines,as the earth fault protection! According to the electrical construction specifications grounding.</li> </ol>

### Attention !

1. Do not install the unit in a corrosive gas, liquid or wet places, otherwise the unit would be subjected to corrosion or electrical components condensation and electric shock accident occurred.
2. Do not supply the power requirements of the non-unit access unit, or units may result in damage or personal security incidents.
3. Electrical installation of the optional electrical components (such as the main power isolation switch or circuit breakers, fuses, power cables, wires, wire ducts, duct connectors, terminal blocks and wiring blocks, etc.) should be suitable, inferior, and ensure comply with the local laws and regulations. Suggested using the leakage protector, the main power of installing isolating switch or circuit breaker is near to the power cabinet layout.
4. In the installation process before the unit unfinished, all the power switch at the "off" position, prevent accidents.
5. The unit inner section should be cleaned, not laying of wires, cables and transport of toxic, flammable, explosive gas or liquid pipelines.
6. Don't flush dirt and slag inside the pipeline engineering into the unit water system.
7. Electric heater circuit must be interlocked with the fan motor, the electric heater must be used when the fan motor working.
8. Do not use flammable, explosive medium as a heat transfer medium in the water system units.
9. When the miscellaneous personnel or the animal may approach the unit installation site, it should be set up guardrail and warning marks, etc.

### 1.2.3 Operation And Maintenance Attention

#### **Danger!**

#### **DANGER HIGH VOLTAGE!**



When the power supply for equipment, prohibit improper opening of electrical control cabinet or junction box, may result in fatal electric shock!

#### **Warning!**

1. The manual must be carefully read before the unit operation !
2. Unit operations, maintenance, etc. must be held by refrigeration, electrical and other professional staff for the corresponding certificate of operation!
3. Factory units in the relevant location of different types of labels affixed, please strictly abide by its provisions!
4. When the operations have safety signs posted near the area, you should first look at manual. If during operation or other activities, unaware of the recommendations contained in operating manuals, there will be danger of causing bodily harm, or may result in reduced performance of the device. Safety signs are sometimes used together .

 **Warning!**

5. Prohibited the wet-handed power switch! Otherwise, it will easily lead to electric shock accident.
6. Confirm air damper in the unit inlet outlet and wind pipe valve has been opened to the designed position before the unit starting .
7. Electrical heater thermostat protection switch must be connected in the interlocking control wire and it can not be short circuit.After fan motor working normally, electric heater then start-up. When shutting down, after electrical heater has been turned off for 3 minutes, only then can stop the fan operating.
8. During fan blower repairing and maintenance,power supply must be cut off, and wait at least two minutes to confirm fan speed slowed down and tends to rest, to avoid cause accidents.
9. Do not short circuit protection circuit and forcibly, otherwise will cause damage to units, fire or personal injury.
10. The maintenance company should have a qualified maintenance, and the company holds refrigeration, welder and electrician certificate of corresponding homework! Improper repair could easily lead to damage, electric shock and fire.
11. Prohibited the wet-handed power switch! Otherwise, the easily lead to electric shock accident.
12. Abnormal operation (such as the charred flavor, an unusual noise) requested emergency stop operation or maintenance of units to the company's professional inquiry. Continue to operate under abnormal conditions can cause an electric shock, fire, etc.
13. Electrical heater thermostat protection switch must be connected in the interlocking control wire and it can not be short circuit.After the fan motor working normally, electrical heaters can then start-up. When shutting down, after electrical heater has been turned off for 3 minutes, only then can the fan stop operating.
14. During fan blower repairing and maintenance power supply must be cut off, and wait at least two minutes to confirm fan speed slowed down and tends to rest, to avoid cause accidents.
15. Do not short circuit protection circuit and forcibly, otherwise will cause damage to units, fire or personal injury.
16. The maintenance company should have a qualified maintenance, and the company holds refrigeration, welder and electrician certificate of corresponding homework!
17. Improper repair could easily lead to damage, electric shock and fire.
18. In the unfortunate event of fire, should immediately cut off the main power unit and used for electric fire class fire extinguisher. If you can not fight a fire, please immediately call.

**Attention !**

1. Foundation and damping device can not be destroyed. If not the unit can easily result in damage.
2. Fan motor start-up before the cooling coil running.In winter ,the fan motor start-up after the heater coil,and then the humidifier.Only after shutting down cooled water , heater water and humidifier , then can cut off the fan motor.

<b>Attention !</b>
<ol style="list-style-type: none"> <li>3. The cooling coil of the low-temperature (5-9 ° c, minimum 5 ° c) and high temperature (40-60 ° , maximal 60 ° c)water must be clean and softened, in order to reduce fouling.</li> <li>4. Heat exchanger out the season can be filled with water, in order to reduce corrosion of pipes. In winter, the water must be drained off to prevent coil frost crack in low temperature .</li> <li>5. Unit inspection door, holes must be closed tight. All drainage facilities, and can not be blocked.</li> </ol>

## 2 Introduction

KLAN series of air handling units (abbreviated as AHU) for the air-conditioned room to meet the requirements of the state, while the outdoor fresh air or indoor return air processing to the design requirements of the air supply status. According to the functional requirement , unit can provide air supply or exhaust from the most simple process to air mixing, filtration, heating, cooling, humidification, drying, energy recovery , sound attenuation and so on.

KLAN series of air-conditioning unit assembly formed by the PVC or aluminum frame and chamber casing, chamber casing through an effective seal to eliminate thermal bridge effects.

This series of units have three characteristics, ceiling hang type, horizontal and vertical type . the optional.wind direction is horizontal and vertical .

There are three standard type of thickness available: 25mm, 30mm and 50mm . This series widely used in commercial centers, office buildings ,hotels ,restaurants and the comfort of air-conditioned places.

## 3 Installation

 <b>Warning!</b>
Indoor-mount units must be installed indoors. Otherwise, easy to cause the leakage accident and the unit performance reduces.
 <b>Caution!</b>
The unit have to install the anchor bolt is fixed to prevent earthquake disasters resulting in injuries and property damage.
<b>Attention !</b>
<ol style="list-style-type: none"> <li>1. Before installation, the unit should check whether suffered damage in transport, unloading and storage process such as should assess ,whether can continue to use and conduct of claims.</li> <li>2. Foundation can use pouring of concrete or channel steel, and the surface is flattened.Diagonal leveling correction not more than <math>\pm 5</math>mm depending on the situation, installing anti-vibration pad or shock absorber in the basic bolt location</li> <li>3. Installation places are likely to suffer interference, without affecting the surrounding residents or office staff in place to avoid noise or vibration of a relatively strict demands on location.</li> </ol>

### 3.1 Installation Sites And Foundation

#### 3.1.1 Selection Site Of The Unit Installation

- a . Installation of a well-ventilated place, dust lest grease or not to have the vapor or the greasy dirt place.
- b. Install places can not be with acid-base gas or inflammable store.
- c. Installation site reserved appropriate services space,Figure 3-2 shows, Suggest reserving minimal space ,Range A=800mm, B=800mm.(The Figure may not the same as your purchase,Actual contour with products)

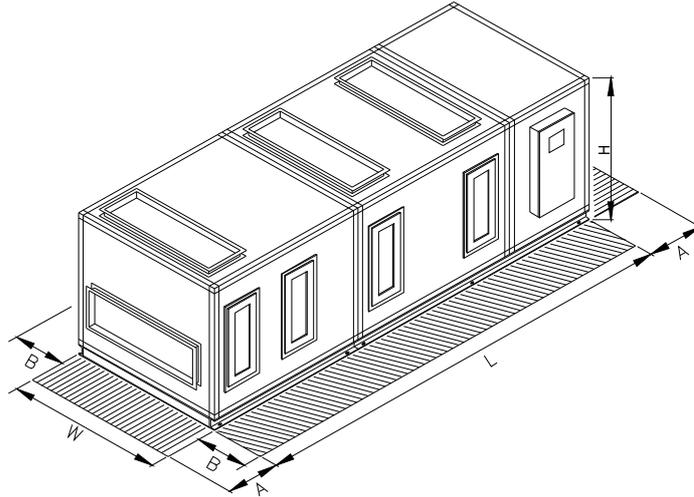


Figure 3-1 Indoor unit service maintenance reserve space

#### 3.1.2 The Unit Foundation

Steel-based station in accordance with GB 50204-2001 《Steel Construction Quality Acceptance》 .

Concrete foundation platform in accordance with the GB 50204-2002 《Concrete Structure Construction Quality Acceptance 》 .The production base of concrete,and the unit installation see below.

- a. The unit of cement base, according to the carrying capacity greater than or equal to 1.5 times the weight of unit operation to the design and construction.
- b. When doing the cement pedestal on the original concrete, you must roughen the original surface (old facing set to fall, to make into first rough surface).After cleaning, the water used passes superficial and the internal pouring. And then thoroughly infiltrated in order to re-construction, otherwise, the old and new concrete can not be fit.
- c. And the cement foundation uses 1:2:4 proportion concretes and tamping to make firmly , and reserve the number of secondary grouting anchor bolt hole.the surface should be level and smoothing.
- d. The concrete foundation, shall be maintained to fully dry before you place the machine. Put the appropriate anchor bolt in the anchor bolt hole ,aligned with secondary grout holes in the base unit. After leveling of the unit, put straight anchor bolt, and a second grouting. To be the second hole of concrete grout dries, locking anchor bolts. Only after operation.
- e. Drainage around the base station should be good and have no seeper,so as not to affect the surrounding environment and the unit corrosion.
- f. The dimension of the foundation is the unit length plus the 500 mm and the width plus the 400mm,The foundation height needs to consider water trap. See Figure 3-2, there is no shock absorber illustration.

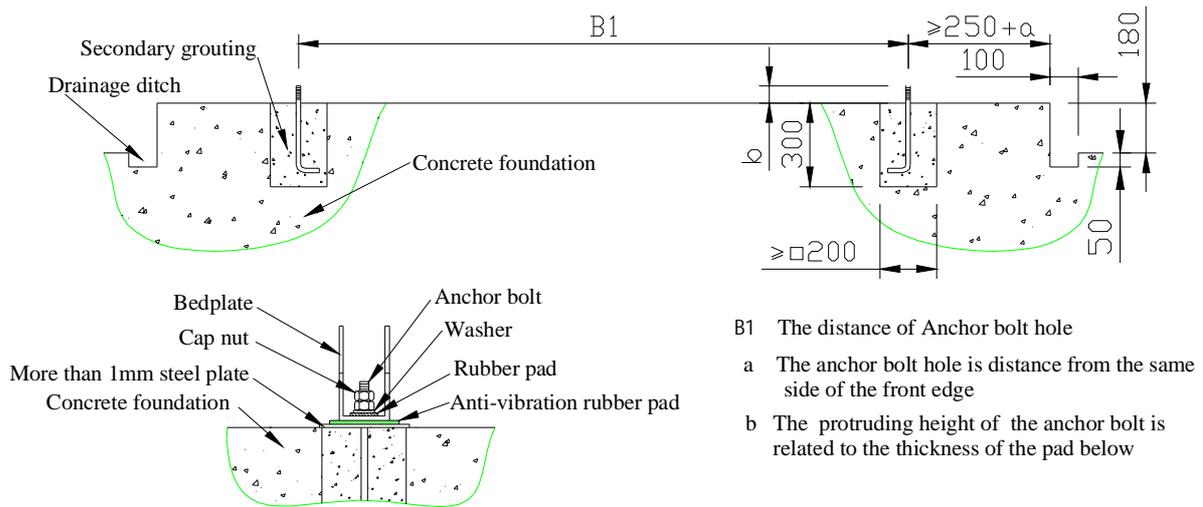
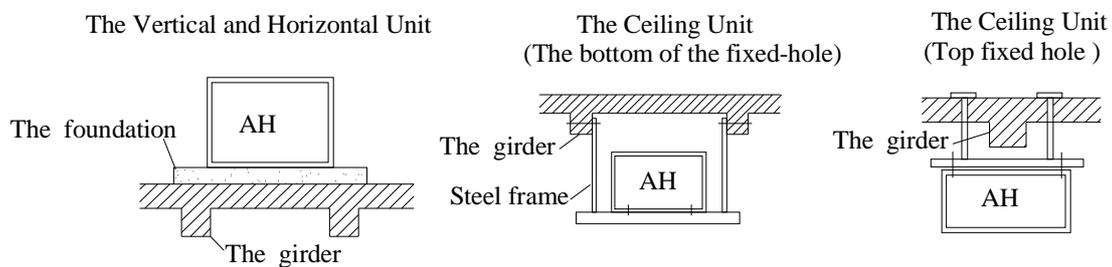


Figure 3-2 Foundation Schematic Drawing

### 3.1.3 The Unit Installation Reference Diagram

- Install on ground: The unit direct install on the foundation, with internal vibration absorber the external could be omitted, rubber plate mat can stop slides .
- Install on ceiling : The vertical and horizontal unit can be built foundation to install, The ceiling unit used to install.on steel frame. The foundation or the steel frame is mounted as close to the beam of building as possible. With internal vibration absorber the external could be omitted. Reference diagram 3-3.



AH is expressed as the air handing unit in the above figure.

Figure 3 - 3 Unit Installation Diagram

## 3.2 Air Duct Installation

The ventilating duct should be designed in accordance with GB50019-2003 《heating, ventilation and air conditioning design specification》, and construction and completion of acceptance should be carried out in accordance with the relating content of GB50243-2002 《Ventilation and Air Conditioning Engineering Construction Quality Acceptance 》 .

The air unit should be installed manually or motor damper . The places where requirements of low noise, should install plenum chamber ,muffle and so on .

Before installation, Each air damper of the unit shut down or padded partitions to prevent the debris dust into the unit.

The air Duct design and installment must facilitate cleaning, and set a certain distance from a removable section for partition cleaning.Support and hanger of duct should not be set up in the vicinity of air inlet, valves, checking doors or control device.

Air Duct may contain condensing water or other liquids, the slope should be consistent with the design requirements, and in the lowest place locate drainage device.

Air Duct should be removed internal and external debris before installation, And do cleaning and protection work. After installation, the duct should be partition sub-blown debris.

To avoid vibrations from the body to duct, duct is flexible connection with the unit ,The flexible joint length is approximately 150mm .

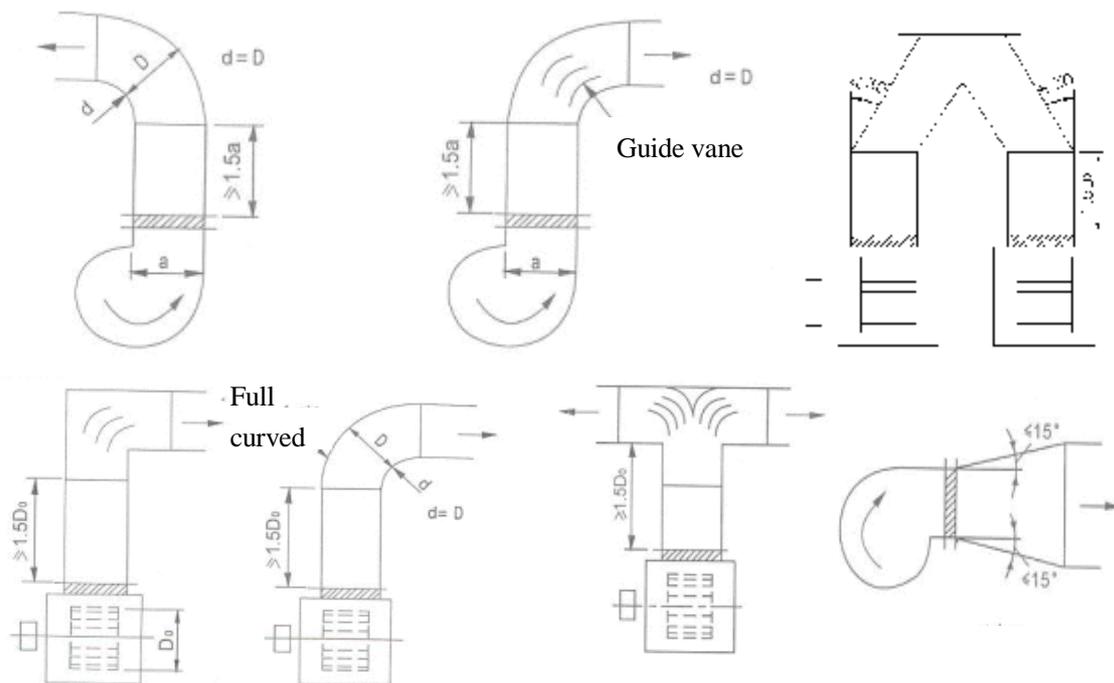
The air duct must have their own supporting support or suspension, All duct subject to an external thermal insulation, to prevent wear and tear.

After duct system installation, you must undertake strict inspection, After the qualified then can do the next working procedure. Inspection of duct tightness mainly on the main duct. In the process of guaranteed premise, low-pressure duct system can adopt light leak detection..

The fresh air intake must install roughing filter to prevent the debris and dust into the unit and accumulate on the the top of coil.

The unit exhaust outlet must draw out through the air duct, and can not be arranged together with the fresh air intake, otherwise, dirty air will be inhaled through the fresh air inlet again.

Direction of the duct should be designed to eliminate noise and reduce the pressure loss in the ventilation system, the pipe connections reference to Figure 3-4:



$D_0$  -Represented as the diameter of the wind wheel in icons

**Figure 3-4 Pipe Connection Diagram**

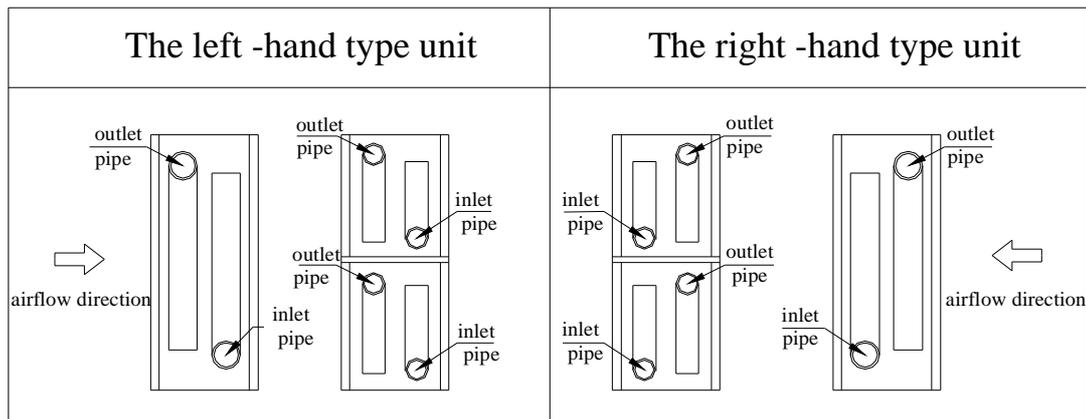
<b>Attention!</b>	
1.	During the duct installation , not allowed to trample the unit panel. Otherwise, the unit will be distortion and leakage.
2.	The unit outlet can not be used to bear the weight of the duct or generated by other forces. Otherwise, the unit will be distortion and leakage.
3.	Unit duct damper settings according to fire safety requirements.

### 3.3 Water Pipeline Installation

For piping circuit installation must comply with the construction of HVAC piping specification and GB50243-2002 《Code of acceptance for construction quality of ventilation and air conditioning works》 .

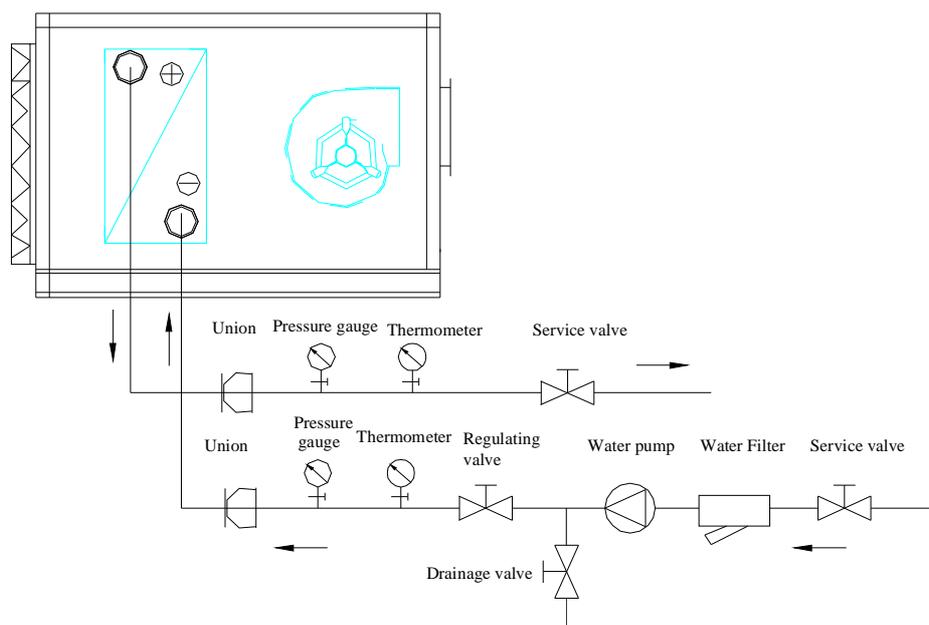
#### 3.3.1 The Inlet And Outlet Pipe Installation

Cold(hot) water runs in lower inlet and out from the outlet of the coil.The steam runs separately from the upper inlet and out from lower outlet of the coil. Pipeline connection reference figure 3-6:



**Figure 3-5 Cold (Hot) water coil pipe flow**

The external water pipe and the inlet ,outlet of the coil should have flexible pipe (Metallic or non-metallic hose )and vaves. The flexible pipe pressure value should be greater than or equal 1.5 times the highest working pressure .The flexible pipe should reliable, not have twisting or shrivelled tube, in order to reduce vibration.The valve makes it easy to cut off the flow of water or proper regulation of flow., simultaneously should add union to facilitate maintenance. The inlet and outlet of the coil should have thermometers and pressure gauges for inspection. After the piping finished ,the pressure test is done ,then insulate the piping. Piping connections refer to Figure 3-6.



**Figure 3-6 The inlet and outlet pipe of the unit connection diagram**

### Attention!

1. Please take over the balance of force when install piping in order to avoid coil damage.
2. Hot water below 60°C could be used in the same cooling coil in common, as for the hot water above 60°C or steam should be used in a separate coil.
3. The steam evaporator pipe installation should be according to the heating professional norms.
4. In cold areas, when inhaled outdoor air temperature is below 0 °C, must be taken the effective measures to prevent the coil freezing, otherwise the coil will be frost crack.

### 3.3.2 Condensation Pipe Installation

When in refrigeration and dehumidification, the unit will have more condensation water discharged from the cabinets, in order to facilitate the smooth discharge condensate, water-sealed (water trap) must be installed. Specifically shown in Figure 3-7 and Figure 3-8 below.

When the condensate drain pan section of the unit is operating on the negative pressure, the water trap height should satisfy the following diagram request:

$$A \geq P/9.8 + 20, \quad (\text{Type 3-1})$$

$$B \geq P/9.8 + 20, \quad (\text{Type 3-2})$$

When the condensate drain pan section of the unit is operating on the positive pressure, the water trap height should satisfy the following diagram request:

$$A \geq P/9.8 + 20, \quad (\text{Type 3-3})$$

$$B \geq 35,$$

Type 3-1~type 3-3:

B - the height of the unit condensate outlet from the water cover, mm;

A - effective height of water seal, mm;

P - the absolute value of the outside atmospheric pressure within the hydrostatic pressure difference, Pa;

When the condensate drain pan section of the unit is operating on the negative pressure,

$$P = P1 - P2 - P3, \quad (\text{Type 3-4})$$

P1 - air-conditioned room pressure, Pa;

P2 - return air pipe resistance (positive values), Pa;

P3 - the differential pressure of return air section to drainage section of the unit (positive values), Pa;

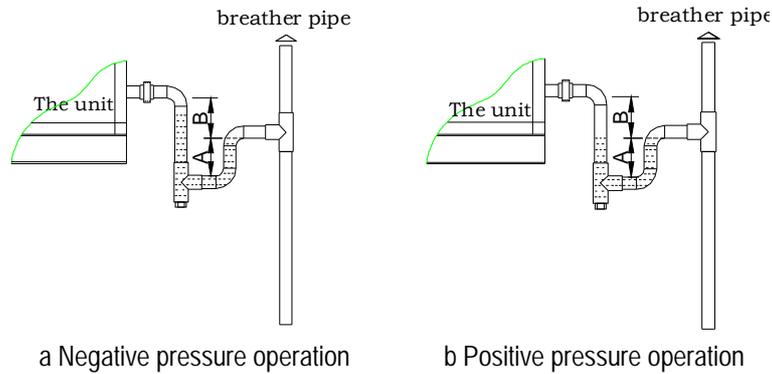
When the condensate drain pan section of the unit is operating on the positive pressure,

$$P = P1 + P4 + P5, \quad (\text{Type 3-5})$$

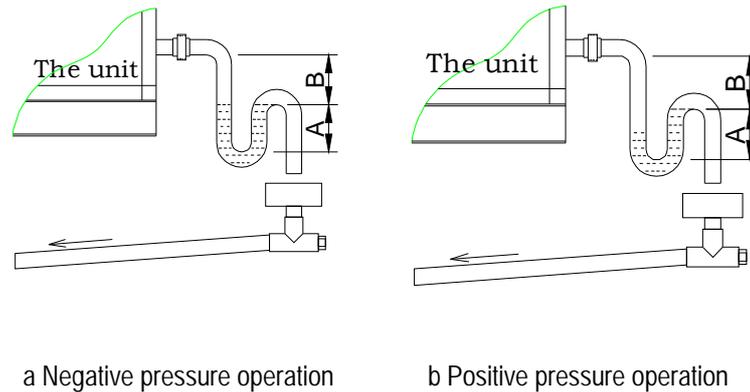
P1 - air-conditioned room pressure, Pa;

P4 - supply air pipe resistance (positive value), Pa;

P5 - the differential pressure of supply air section to drainage section of the unit (positive value),



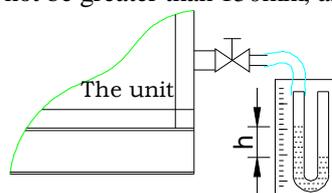
**Figure 3-7 The trap of condensate drain pipe riser arrangement**



**Figure3-8 The trap of condensate drain pipe horizontal arrangement**

The actual outlet pressure can be measured in the field. The hosepipe connect the Glass U-tube differential pressure meter with the condensate drain pan of the the unit cooling coil section, when the air handing unit is running stability, Measure actual difference “ h” of the water column height ,and consider the changes of factor of the filter resistance , that is the minimum water seal height A. See figure 3-9.

The level of the condensate water drainage gradient of  $\geq 0.8\%$ , slope drains ,horizontal tube should not be too long, and should be set clean-out hole at the beginning. Condensed water standpipe must be vertical, ventilation piper should be designed at the top of the vertical tube leading to the atmosphere. The top of the air vent should install hood or the net cover. When the condensate pipe has a flexible hose connecting, the length of the flexible hose should not be greater than 150mm, and there is no distortion or shrivelled tube



**Figure 3-9 On-site measurement of outlet pressure**

### Attention!

1. After water pipe has been completed, close the in and out valve, and then carry on the hydraulic pressure test and the leak detection. Only washed away the dirt inside the piping, the in and out of the valve can be open. After water pipe hydrostatic testing leak detection, if the outside temperature is below  $0^{\circ}\text{C}$ , the water of the hydrostatic testing must be drained away.

**Attention!**

- |                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>2. After the drainpipe have been installed ,it should be tested to see if the water in the drainpipe can be discharged freely. The condensate drain pan has no seeper and leakage. Condensation water must be thermally insulated, to prevent the condensate water pipe outside dew condensation.</p>                              |
| <p>3. The condensate water should be reused for toilet flushing or sanitary water, The condensed water is not a sanitation water, it can not be directly discharged into the personnel or vehicular traffic areas.When the outside temperature is below 0 °C, the condensed water will be freezing and may cause people injuries.</p> |

### 3.4 Electrical Installation

Unit electrical installation must comply with electrical rules and regulation.

Generally the domestic installment, the construction and installation of power cables should be carry out in accordance with GB 50168-2006 《Code for construction and acceptance of cable levels electric equipment installation engineering》, The construction of Power supply cabinet and Pump control cabinet of unit should be in accordance with GB 50254-1996 《Low-voltage electrical installation works of electrical installations in construction and acceptance of norms》, The grounding installation of the unit should be in accordance with GB 14050-2008 《Types and safety technical requirements of system earthing》 , 《Erection works of electrical installations code for construction and asseptance of earthed devices》 and so on, The whole electrical installation inspection and new buildings of units installation should be perform in accordance with the relevant content of the《Code acceptance of construction quality of electrical in stallation in building》 .

#### 3.4.1 The Unit Wiring Requirements

For the 3N-380V-50Hz power supply requirements of the main unit, the layout of the main power wiring should be meet the requirement of GB -16895 《Building electrical installations》 .

Power line without fire protection or other special requirements, should be selected 0.6/1kV voltage rating of the VV PVC copper power cable , Cable manufacturer must have a production license for this product and have CCC mandatory testing and certification. The electric cable standard is GB / T 12706.1-2008 idt IEC 60502-1:2004 《Rated voltage 1kV (Um = 1.2kV) to 35kV (Um = 40.5kV) power cable with extruded insulation and accessories-Part 1: rated voltage 1kV (Um = 1.2kV) and 3kV (Um = 3.6kV) cable》 .

Calculation of the main power diameter should be according to the GB 16895.15-2002 idt IEC 60364-5-523:1999 《 Building electrical installations Part 5: The selection and installation of electrical equipment Section 523: wiring system carrying capacity 》 .

#### 3.4.2 The Unit Wiring Material Selection

The power of the Standard unit is three-phase four-wire system, 3Φ-380V-50Hz AC power, Motor rated at 15KW and below, can be directly started, and above using the the voltage drop start-up methord (star –delta connection). Specific to motor terminal box wiring diagram shall prevail.

Distribution material selection are shown in Tables 3-1, when wiring is too long, must take into account the voltage drop, and increase diameter.

**Table 3-1 Distribution material capacity selection table (3Ph380V50Hz)**

Power kW	Electric Current A	MainWire Current A	MainWire Diameter mm <sup>2</sup>	Terminal Blocks A	ContactCurrent A	Thermal Overload Themiddle-current A	Wire Current A	wire Diameter mm <sup>2</sup>	
3	6	9	1	10	9	7.5	9.0	1	
4	8	12	1.5	20	12	10.0	12.0	1.5	
7.5	15	22.5	4	30	20	18.8	22.5	4	
11	22	33	6	60	30	27.5	33.0	6	
15	30	45	10	60	40	37.5	45.0	10	
18.5	37	55.5	16	60	△	30	26.7	32.0	6
					Y	16	13.4	16.0	2.5
22	44	66	25	100	△	40	31.8	38.1	10
					Y	16	15.9	19.1	4
30	60	90	35	100	△	50	43.3	52.0	16
					Y	25	21.7	26.0	6
37	74	111	50	200	△	60	53.4	64.1	25
					Y	30	26.7	32.0	6
45	90	135	70	200	△	70	65.0	77.9	35
					Y	35	32.5	39.0	10
55	110	165	95	200	△	80	79.4	95.3	50
					Y	40	39.7	47.6	16
75	150	225	150	300	△	115	108.3	129.9	70
					Y	60	54.1	65.0	25

Less than 3KW motor designed in accordance with the requirements of 3kW, Neutral line (zero line) diameter is consistent with the main line, grounding wire diameter maily for the half of the main Wire. Overload trip current setting value 1.25In, In for the motor rated current.

<b>Attention!</b>
<ol style="list-style-type: none"> <li>1. Unit wiring should be completed by certified and qualified person, and carry out. according to the national standards and rules.</li> <li>2. Before installment, inspects the main supply voltage, the frequency and the fuse or the protective device capacity whether to be consistent with the information on the unit data plate, if there are differences, the device cannot connect.</li> <li>3. The unit must have a reliable grounding.</li> <li>4. Electrical wiring to electrical wiring box wiring diagram shall prevail.</li> <li>5. The unit must be configured over-current protection device and overload protection device, when the motor running current is too large, more than the full load motor current,the protector escape and the motor stops running,otherwise the motor will burn down.</li> <li>6. After the unit running, if the measured motor current exceeds the full load current, it should be immediately shut down.</li> </ol>

## 4 Operation

### 4.1 Commissioning

When the unit first installed and long-term shutdown after running, it should be commissioning. The first trial operation is generally carried out by our company service personnels, which carried out within a

specific sales contract depends on whether to include this service.

The needs of instrumentation and tools: multimeter, insulation resistance meter and a screwdriver, wrenches and so on.

Before the unit commissioning, you should have a full-scale inspection. The inspection should at least include the following points:

1. The power distribution tank and the unit electric control box does not have residuum, the main power supply wiring, grounding lines, and electric control box for all wiring are reliable connection, no twist, squash, protective layer fracture and so on, Wiring neat, solid, correct and clearly identified.
2. Power supply cabinet requirements in line with unit power supply, shown in Table 4-1. Grounding is consistent with the grid grid line.
3. Water pipeline has been washed, pipe valve opening and closing correctly, piping has been filled with water. Drain acceptance has been qualified. The air damper in the air dust system is operating as designed, The filter have already been cleaned or replaced.
4. The unit insulation resistance meet the requirements shown in Table 4-1.

**Table 4-1 The unit and electrical power requirements**

Voltage range	<sup>1</sup> rated voltage $\pm 10\%$
Frequency range	<sup>2</sup> rated frequency $\pm 2\%$
Range of three-phase voltage unbalance	$\leq \pm 2.25\%$
<sup>3</sup> Range of three-phase current unbalance	$\leq \pm 2.25\%$
Insulation Resistance	$\geq 10M\Omega$
<sup>1</sup> Rated voltage, <sup>2</sup> Rated frequency——see unit nameplate <sup>3</sup> Three-phase current——on condition with unit operation condition, measuring unit operating current.	

5. All test items pass the inspection, will be closing the main power switch. Check the Power phase detector of the unit electric control box is directed normal, if the instructions for the wrong phase, will be switch off the main power. The unit into the main terminal block line side three-phase power line L1, L2, and L3, the location of one of two wire exchange and re-lock, and then re-closing the main power switch. At this point the phase detector instructions as normal.

### Attention!

- 1 Roughing and medium efficiency filter should only be installed after inner cleaning of the air duct and the water piping.
- 2 Open air supply valve before the fan starting and turn down the fresh air valves and the return air valve, Close the inspection door of the unit, the inspection hole of the air duct and the rest of adjusting valve, fire dampers should fully open. Connected to the power, start fans, so that air supply achieve rating.
- 3 Fan rotation direction must be the same with the arrow on the chassis direction.
- 4 After the fan starts running, with the ammeter measuring the motor current value, if the

### Attention!

current value more than the rating, turn down the total airflow control valve, until it reaches the rating.

- 5 After a period of time operating of the fan, with the surface thermometer measuring the bearing temperature, and ensure that the bearing temperature rise of 40 °C, the maximum does not exceed 80 °C.
- 6 When the unit start, first open fan, and then cooling coils or humidifiers. In winter, first open the heater, after fan and then humidifiers. When unit shuts down, you should close the cold and hot water and steam pipe, then close fan (not including the electric heater).
- 7 Steam, air heater should be excluded from the condensed water and preheating the approximately 5~10 minutes before each use, when the heating medium is hot water, it must be softened to reduce scale formation.

## 4.2 Trial Operation

### 4.2.1 Daily Inspection

Daily inspection on the following projects: all qualified the unit can be start.

Appearance inspection: Check whether the appearance damage have impact on operating units, If there are forbidden to run!

Valve inspection: Check valves throughout the unit and the terminus circulatory system are in the correct state. If the error please correct them.

Electrical Inspection: Check the power supply cabinet, the power is specified for unit.

### 4.2.2 Starting

Start power switch, close observation unit starting current, If an exception the unit shutdown or an emergency stop. All normal, then the starting is completed.

## 4.3 Long-term Shutdown

The unit hasn't a long time using, the power supply should be cut off and the air damper closed. The Inlet and outlet valve of the water-side heat exchanger closed and the water inside the heat exchanger discharged clean. Especially when the ambient temperature below 5 °C, The water inside the heat exchanger must be discharged clean to avoid freezing. It also can be adding some non-corrosive antifreeze. Do not use salts solution in the non-anti-corrosion water system of unit to prevent freezing! As such there is a strong corrosive will result in unit damage.

## 4.4 Emergency Stop

When the following phenomena occur or have emergency fault, you should immediately stop the unit, cut off the power and check repair.

1. Unit starting difficult or can not start.
2. Motor current exceeds the normal load of 15 percent or in excess of over-temperature protection device settings, the unit has not automatically shut down.
4. Next to the equipment, the environmental needs emergency stop.

## 5 Maintenance

### 5.1 Spare Parts List

The main spare parts unit in the table below, the following spare parts are not to supply generally ( see sales contract) ,Please user-prepared inventory.

Spare Name	Brand	Specifications	Quantity	Place	Remarks
Air filter		See Unit	See Unit	Fresh air inlet or Return air inlet	Only for non-washable type
V belt		See Unit	See Unit	Fan belt transmission	Suggested all changes

### 5.2 Common Tools And Professional Tools

The main unit common tool in the table below. The following tools are not scope of supply unit (see sales contract), if the user self-maintenance, please prepare.

Name of the tool	Number	Application	Remarks
Tonometer	1	Belt adjustment	
Adjustable wrench	1 set	Fastening bolts or pipe fittings	
Torque wrench	1set	Check fastening bolts	
Ruler	1set	Belt adjustment	1.5m
Screwdriver	1set	Check and repair electrical components	Contain straight and cross screwdriver

### 5.3 Maintenance Operation

Most of the maintenance and repair operation are dangerous, please abide by the state, local regulations and regulations in this manual, Please read carefully again "safe" section.

#### Warning!

When the unit in the mechanical and electrical maintenance, it must be cut off the total power, and forbid to switch on!

#### Attention!

The unit is serviced and maintained by our company's professional services personnel. Due to limited conditions, our company has not signed a maintenance contracts with customers, and we can not be given maintenance services, the user must choose a qualified maintenance personnel. But due to the maintenance of other company causing damage to the unit ,our company does not undertake the corresponding loss !

#### 5.3.1 Clean Or Replace Air Filter

The air filter of the standard unit can be cleaned with nylon or yarn-lun. The dirty filter should be take out from the unit maintenance door, and do not put the dirty dust in the unit interior .

The dirty filter placed in a clean concrete floor, and strike the filter frame gently with the thin wooden

bat, on-line heavy particle will shake falls, then use the clear water flushing. When the necessary ( $\leq 40^{\circ}\text{C}$ ) add neutral detergent cleaning with the lukewarm water, then set upright air dries. The filter cannot insolation or roasting. And then re-install back to the unit.

For the use of glass fiber filter or chemical fiber filter in the initial effect and medium efficiency filter, When the pressure reached its twice initial resistance should be replacement. Washable filter can be blew by the compressed air, for non-woven filter can be first rinsed with soap and water ,and then washed by the clean water. But the filter in general can be reused three times or so.

The unit is strictly prohibited running without the filter .

### 5.3.2 Electrical Cleaning

Too much dust on the electrical equipment will reduce the level of insulation of electrical equipment and cause the equipment can not work normally. It also will produce a loop creepage, arc discharge ,pull arc, endangering equipment, secondary circuit leakage, short circuit, and out of control.

Even endanger personal safety.

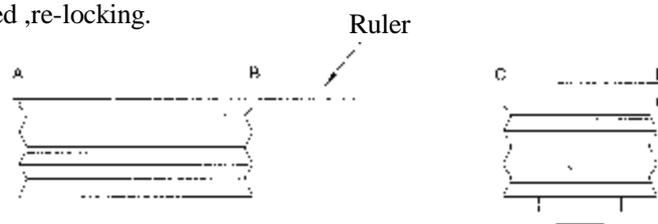
When clean electric appliance equipment, the main power source separation, with the clean dry hair brush gently outwash dust, or blow with the dry compressed air sweeps, as well as clean up the dust with the industry vacuum cleaner. Prohibition of washing.

If use a wet rag wiping ,then need to use the hair dryer drying (hot blast  $\leq 40^{\circ}\text{C}$ ) .

### 5.3.3 Fan Belt Adjustment And Replacement

The driving pulley, the driven wheel and V belt have been adjusted before completion in the factory. The new unit installed and running after a week, then readjust the V belt tension to the appropriate value, To run a month later, once again adjust the V belt Preload. Be adjusted once every three months after the inspection.

Measurement of belt tightening force at the same time, first with 4-point method check and adjust the V pulley of the flatness ,make the pulley and driven pulley axis parallel to the corresponding, pulley V belt groove coincide with the symmetry plane, accurate alignment. The following figure, using a ruler close to motor pulley and fan pulley of the face, check whether the four points ABCD in a straight line. If you need to adjust, loosen the taper sleeve to adjust the plane. Adjust the motor positioning bolt to adjust the axis parallelism. When it finished ,re-locking.



**Figure 5-2 Four-point method checks the initiative driven pulley groove straightness diagram**

The preload of belt have a significant effect on transmission capacity, life and axial pressure. Preload inadequate, reduce the ability of transmitted load, low efficiency and the rapid heating of small pulleys, tape wear and tear. Preload is too large, then the life will bring down the shaft and bearing load increases, bearing fever. Therefore, the appropriate preload is an important factor to ensure the belt drive to work normally.

In order to determine the preload with  $F_0$ , usually impose a requirement of the load  $G$  (vertical force) at midpoint of the belt cutting-edge, so that the cut length in each of the 100 mm deflection produced 1.6mm, that is, flexivity  $f = 1.6t/100$ . Figure 5-3.

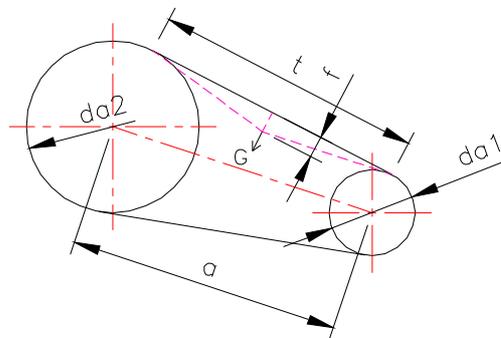
Commonly using the belt tension meter to measure, shown in Figure 5-3 and Figure 5-4, Measure or calculate the actual “t”, calculated by the deflection  $f = 1.6t/100$  adjusted so as to get “f”, look-up table 5-1,

Check the Vertical force G, The belt tension meter vertical arrives at the section of the mid-point . To exert force, so the piston of the vertical force directed to the provisions of “G”, read out the current value of “f1”, according to determination results to adjust belt tightness, until the deflection in the vertical force “G” (skewness ) directing the value of “f1” = “f”, point belt tensioning force compliance at which point belt tension is appropriate..

Required vertical force directed by belt tension meter in the following table, the table of high -values are used to a new installation of v-belt or maintaining a high tension of transmission (such as high-speed, packet angle, overloading start, frequent high-torque start and so on ).

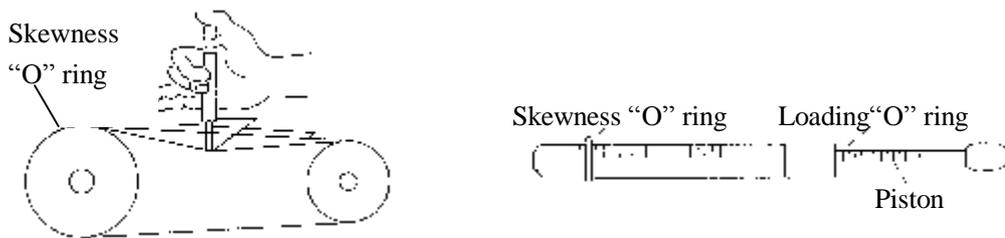
**Table 5-1 Determination of narrow V belt preload the necessary vertical force G (N / root)**

Belt Type	Baseline Diameter of Small Pulley $d_{d1}$ (mm)	Belt Velocity (m/s)		
		0~10	10~20	20~30
SPZ	67~95	9.5~14	8~13	6.5~11
	>95	14~21	13~19	11~18
SPA	100~140	18~26	15~21	12~18
	>140	26~38	21~32	18~27
SPB	160~265	30~45	26~40	22~34
	>265	45~68	40~52	34~47
SPC	224~355	58~82	48~72	40~64
	>355	82~106	72~96	64~90



t -Cutting length, f -Deflection, a -Center Distance between driving wheel and driven wheel ,  
 $d_{a1}$  -Small pulley diameter,  $d_{a2}$  -Large Pulley Diameter, G -Imposed load (vertical force)

**Figure 5-3 Belt Drive preload force control diagram**



**a. Determination of preload**

**b. belt tension meter**

**Figure 5-4 Tonometer determination of preload-belt drive diagram**

<b>Attention!</b>
<ol style="list-style-type: none"> <li>1. V belt too loose or too tight will affect the amount of air pressure and damage to the fan system ,and make a noise!</li> <li>2. The timely replacement of the damaged belt, as the belt with tolerance distribution unit, the whole group must all be replaced.</li> </ol>

### 5.3.4 Cleaning Heat Exchanger

For cleaning of heat exchangers, the Company can not provide maintenance services (not signed Maintenance Contract), you must have the professional qualification of experienced personnel or contact us directly.

In order to ensure good air quality ,air flow and the best effect of heat transfer. After a period of unit operating time, heat exchangers should be fully maintained.

Cleann the internal pipe of the heat exchanger with chemically to remove fouling, with compressed air or water in line with the vacuum cleaning to clean the external heat exchanger fins.

When using chemical solvent cleaning, select the correct cleaning agent according to the fouling of heat exchanger. Cleaning chemicals species, concentration, cleaning cycle time and temperature vary with the different sistuation of fouling. Do not use chlorine acid or fluoride cleaning agents, otherwise the heat exchanger.will corrode damage .

After cleaning with chemical, the water pipe and the heat exchanger need to clean with fresh water circulation,to avoid water system corrosion and the dissolved scale re-absorption into the water wall.

<b>Attention!</b>
<ol style="list-style-type: none"> <li>1. Upon completion of cleaning with acid, the liquid waste disposal with neutralizer , and contact the wastewater treatment company for liquid waste disposal.</li> <li>2. Chemical and neutralizer have corrosion and stimulating effect on eyes, skin, nasal and so on, therefore must wear PPE (such as protective glasses, plastic gloves, shoe protection, protection masks, protective suits and so on) during the cleaning work, in case the inhalation or exposure to these agents,and work in the ventilated place.</li> </ol>

If you use high-pressure cleaning pump (similar to the car wash pumps), the pressure will be exported to lower, and do not close flushing to avoid wrecking the fin. When washing the coil with water it can be used soft brush gently scrub the surface coil, with cold water and neutral detergent clean the coil (do not use acidic or alkaline cleaning solution on the aluminum, corrosive), and then be washed clean with water.In the event of careless felling fin, please immediately be repaired. In the temperature below 0 °C, the surface water will be drained to avoid freezing and expansion due to coil.damage..

 <b>Caution!</b>
Fin cleaning must wear protective gloves in order to avoid scratching the palm.

### 5.3.5 Cleaning Condensate Drain Pan And Drain Pipe

After the unit operatiing a period of time, the fine dust will be accumulated in the condensate drain pan and drain pipe ,if it is not cleared in time will plug the drain, causing condensation of water overflow. It also can cause the microbial and bacteria.

Regularly clear up the rubbish accumulating in the drain and waterspout to prevent clogging and simultaneously disinfect. Proposed together with cleaning filter, please clean the inner drain and waterspout before the unit running, and confirm whether it needs repairing.

### **5.3.6 Other Matters**

Fan bearing lubrication interval 3 ~ 6 months time to replace, is appropriate filled with 2 / 3 bearings of space. After several lubrication, open the bearing cap to row out of used lubricating oil, and re-add the new lubricant.

## **5.4 Routine and Periodic Maintenance**

### **5.4.1 Routine Maintenance Inspection Items**

The person is responsible for the unit operating ,starting, shutdown and maintenance to extend the operating life .

Record the indoor and outdoor temperature, and water temperature, inspection voltage and current ,to adjust and maintenance for future reference.

Clean machine appearance.

### **5.4.2 Monthly Inspection Items**

Inspect whethe the unit screw is loose.

Inspect whether the leaking pipe joint.

Inspect whether the wire wear and tear, the connection is firmly, and whether the burning of the phenomenon of the contact point.

Inspect whether the motor casing clean, dirty is not conducive to electric heat.

Inspect whether the water system is an air infiltration and to make the exhaust treatment.

Inspect fan bearing lubricant.

### **5.4.3 Annual Inspection Items**

Monthly inspection project implementation.

Inspect electrical machine insulation resistance.

Coil clean and dust removal.

## **5.5 Failure Analysis And Exclusion**

### Common Faults And Processing

Phenomenon	Analysis	Cause	Remedies
Correct fan speed but insufficient air volum	Fan	Impeller Misplaced	Contact distributor
		Reverse fan rotation	Adjust the power supply phase sequence
		Belt is too loose	Adjust the belt
	Air duct system	The actual resistance system of air duct exceeds the design	Re-design system
		Duct leakage	Brush fluid sealant
		Fire damper closed	Open fire damper
	Air filter	Dirty ,even clogging	Cleaning or replacement
	Coil	Dirty ,even clogging	Cleaning
	Short-circuit loop wind	Supply air zone and return air zone short-circuit	Add partition
	Fan inlet and outlet blocked	Bend of the air duct is too close the box board of the unit	Add straight duct
		The obstacle in air opening	Removal of obstacles
	Obstacles in the wind system	Obstruction in the air duct	Remove obstruction
Bend in the air outlet		Re-design the air duct	
Correct fan speed but the air volume is too larg	System	Duct Size inappropriate	Re-design the air duct
		Open the accessdoor	Close the accessdoor
		The actual resistance lower than the design of hydrostatic	Re-design system
		Not installed air damper	Installed air damper
		Air filter drop or forget to install	Install air filter
	Over-opened fresh air damper	Transfer a small opening	
Air duct	Return air duct leaks	Plus sealant	
Not cooling	Duct and System Duct and System	Insufficient air supply	See above
		The poor quality of air duct insulation	Check air duct insulation cracking or shedding
		Heat load is too large	Inspection whether the doors, curtains shut, or contact the relevant engineers
	Coil and water pipeline	Temperature in and out of the water of coil is too high	Generally entering water temperature is 7℃
		Coil air blocking	Open coil outlet exhaust valve exhaust
		Temperature in and out of the water of coil is too high	Generally entering water temperature is 7℃
		Water pipe valve closed	Adjust the valve
		Too dirty coil heat transfer surface	Professionals to wash

### Common Faults And Processing (Continued table1)

Phenomenon	Analysis	Cause	Remedies
Unit poor drainage, leaking	Drain	Waterspout drain plug	Clean drain and the outfall
	Drainage pipe	Drain slope incorrect, joint loose or siphon	Re-design and installate the drainage pipes
	Unit installed level degrees	The horizontality installation error	Outlet side of the lower
	Air filter	Dirty ,even clogging	Cleaning or replacement
	Air duct	Return air control damper adjust too small	Open damper
High noise indoor	Fan	Loose pulley	Adjust the key and locking screws
		Fan noise is too large	Check fans and damping
		Velocity of wind is too large, resulting in airflow noise	Suitably reducing the wind speed
	Air supply system	Muffler bad air supply system	Added ductmuffler equipment
Abnormal sound	Impeller	Balance block loose	Fastening balance block
		Impeller eccentric	Contact distributor
		Barrier between bearing and bearing block is too large	Contact distributor
		Impeller loose	Contact distributor
		Shaft and bearing loose	Contact distributor
		Impeller damaged	Contact distributor
		Fan Casing or foot block bolt loose	Fastening bolt
		There are debris fan	Clear debris
Abnormal Sound	Fan transmission parts	Pulley and the shaft does not meet the tight	Fastening sleeve and the key
		V belt loose	Adjust the belt
		V belt too tight	Adjust the belt
		V belt is damaged	Replace the belt
		Inconsistent with the use of V-belt type	Replace the correct belt
		Multiple V belt wronglength	Replacement of the entire group of belts, length consensus
		Fan pully and motor pully are not on the same centre line	Readjust.
		Motor bracket bolts loosen	Tighten the bolts.

### Common Faults And Processing (Continued table 2)

Phenomenon	Analysis	Cause	Remedies
	Fan bearing	Bearing lack of lubricating oil	Re-add the lubricating oil
		Bearing lubricant aging	Replacement of lubricant oil
		Bearing loose	Tighten bearing
		Installation is not right	Correction, re-install
		Bearing rust	Derust or replace
		Bearing dirt	Clear the debris
		Bearing failure or damage	Replace bearings
	Fan volute	There are debris volute	Clear the debris
		Volute fixed bolts loosening	Tightening bolts
		Inlet volute damaged	Replace the volute
	Fan electrical Part	Wire loose	Tighten wiring
		Motor issued hum	Replace the motor after the exclusion of electrical power,
		Power supply harmonic currents	Eliminating harmonic currents
		Lacking phase	Adjust the power supply
	Fan shaft	Bending, deformation.	Replacement shaft
		Balanced block loose	Tighten balanced block
		Shaft loose	Tighten shaft
	Wind speed is too high	Duct is too small	Redesign and installation of air duct
		The actual static pressure does not meet the design value	Replacement pulleys to reduce speed
	Periodic vibration	Duct is too small	Redesign and installation of air duct
		System instability	Adjust the stability of the system
Duct follow the pulse of the vibration		Adjust the fan speed or support of duct	
Abnormal Sound	The noise caused by high-speed winds through the cracks, holes	Duct leakage	Locking interface, plus sealant
		Box subjected to deformation and leakage	Correct deformation of parts, or replacement
	High-speed air blocked issued rattle or sharp howling	Duct turning too fast or turning continuous,	Redesign and installate air duct
		Duct dramatically increasing	Redesign and installation of air duct
		Duct sharp contraction	Redesign and installation of air duct
		Velocity of wind is too high in duct	Redesign and installation of air duct
		Damping joint too tight	Adjust the damping joints



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