| YORK® | **YSM**<br>**Air Handling Unit** |
| --- | --- |
| Installation, Operation and Maintenance Manual | FORM NO.: 6A4O-A01A-NK-EN |

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# 1. Safety Precautions and Important Instructions

- This manual is intended to guide the customer- authorized professionals for the installation, operation and maintenance work. All related personnel should be familiar with applicable local laws, regulations and national standards. Please read this manual carefully before performing any operations.
- The installation, operation and maintenance procedures for Johnson Controls' YSM air handling units are relatively complicated. During these procedures, the related personnel may be in direct contact with the cabinet and other parts or exposed in a high-pressure environment. Under such circumstances, there are potential safety risks which, if not being handled properly, may cause performance degradation or damage of the machine as well as personal injuries. Therefore, each related operator shall identify potential safety risks and take appropriate self-protection measures before carrying out the corresponding work.
- As each Johnson Controls' YSM air handling unit is manufactured according to the specific requirements of the costumers, this manual can not cover all the questions related with installation, operation and maintenance. For any questions, please contact the local office of Johnson Controls Inc.

## 1.1 Warning Signs

The meanings of the following warning signs attached on the air handling unit are:

1) Never turn the pulley by hand.
2) Never touch the impeller by fingers.
3) Electrical warning.
4) UV radiation warning.

Figure 1.1 Warning of Hand Injury by Belt

Figure 1.2 Warning of Finger Injury by Fan

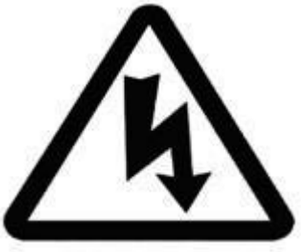


Figure 1.3 Electrical Warning


Figure 1.4 UV Radiation Warning

Please pay attention to the warning signs mentioned above as well as other text warning signs attached on the exterior and interior surfaces of the air handling unit during operation!

## 1.2 Safety Identification

Only authorized personnel who have received special training can carry out the installation, operation and maintenance work for the air handling unit. During the following operations, the personnel shall identify the following potential safety risks:

- Transportation, lifting and forklifting of the machine
- Connection of water pipes
- Connection of air ducts
- Electrical wiring and commissioning
- Initial running of the machine

# 2. Shipping and Storage

## 2.1 Handling

Each YSM air handling unit is shipped with plastic film and wood package. After being delivered to the site, the air handling unit can be transferred to desired location by using a crane (Figure 2.1) or forklift (Figure 2.2).

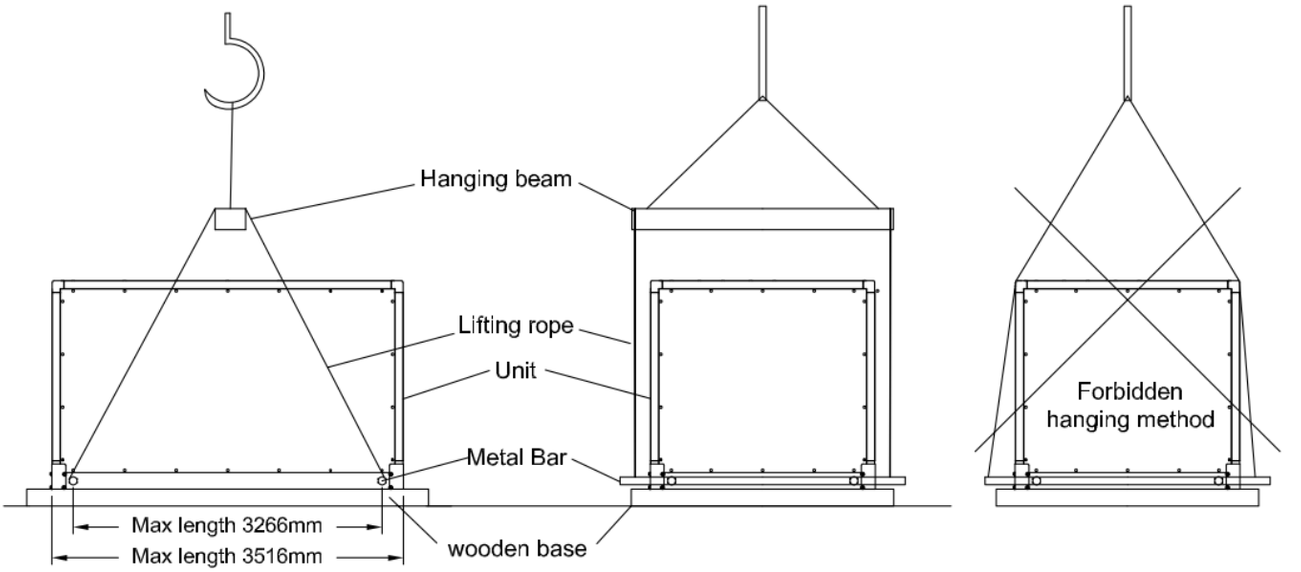



Figure 2.1 Schematic Diagram –Transfer the AHU with a Crane

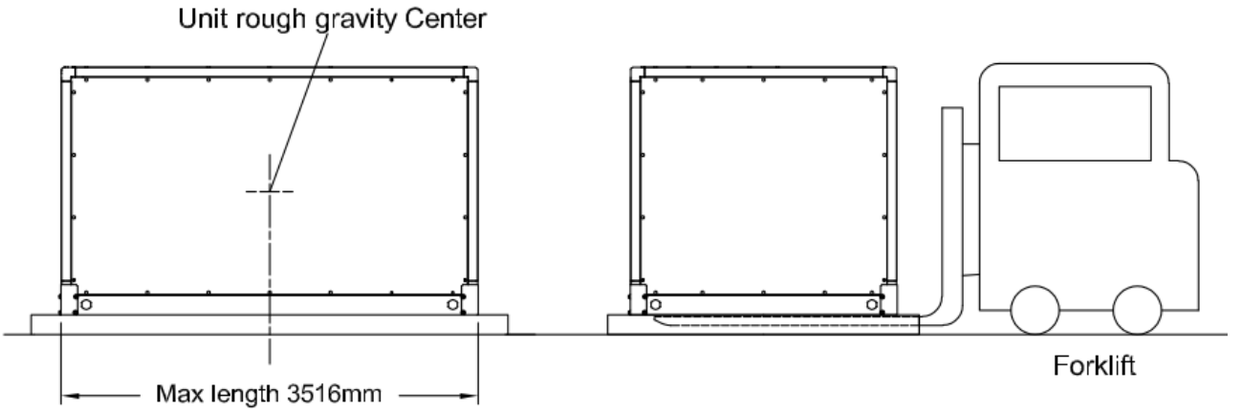



Figure 2.2 Schematic Diagram –Transfer the AHU with a Forklift

Notice:

1) There are some Φ50mm eyelets already provided on the base. Make sure to insert blocks or metal rods under the base. When lifting the AHU, the hanging beam width should be wider than the unit lifting width, to avoid unit damaged by lifting rope friction and unit top frame damaged by lifting rope extrusion.
2) To avoid frame deformation by compression, lifting rope or metal chain can't contact with the unit top frame directly; otherwise necessary protection should be done to make the compression force on the side and top panel of the unit.
3) Before lifting the air handling unit, raise it up slightly to test if the machine is balanced and stabilized. Otherwise, adjust the position of the hanging hook accordingly.

4) Be careful during the lifting operation. Never overload the crane. Prevent the slings from damaging the air handling unit.
5) To transfer the air handling unit with a forklift, the length of the forklift arms shall be equal to or slightly longer than the width of the air handling unit. Otherwise extension arms can be used. The length of the forklift arms shall not be less than 2/3 of the width of the air handling unit in the direction of inserting the arms.
6) The weight of the air handling unit may not be distributed evenly as there are different parts assembled inside the machine. It is relatively heavier where is mounted with the fan and coils. Therefore, please make sure to select a correct position before loading the machine onto the forklift.
7) Never use any pipe or manifold as a supporting or hanging point while transferring the air handling unit.
8) Do not remove the protective materials provided at the coil connections before mounting the pipes.
9) Always maintain the lining and protective materials before the air handling unit is finally positioned or assembled.
10) The mounting blocks under the fan and motor base rail are specially designed to fix the fan and motor during transportation and installation of the air handling unit. Do not remove these blocks until the air handling unit is permanently mounted and positioned.

## 2.1 Receiving

Each air handling unit and its accessories have been inspected rigorously and carefully at factory before delivery, and appropriate protective measures have been taken to prevent the air handling unit and its accessories from being damaged during transportation. After unloading the goods, please check the air handling unit and its components carefully and confirm if they are consistent with the order and free of any damages, by paying special attention to:

1) Framework and access doors.
2) Pipe connections.
3) Internal appurtenances (coil, fan, motor, filter bracket, eliminator, humidifier, etc.).
4) Loose parts (damper, humidification tank, frequency converter, etc.).
5) Materials and relevant drawings supplied with the machine.

If the air handling unit is completely-knocked-down shipped, please inspect if the materials are complete and free of damages according to the packing list supplied with the machine. After finishing inspection, check the specification and quantity of the product as well as its accessories item by item according to the Product Delivery and Acceptance Form, and sign on this form for confirmation. For any questions, please contact the local office of Johnson Controls Inc. without delay.

## 2.2 Storage

After the air handling unit is approved for receiving, the user shall provide an area to store the air handling unit and installation tools, and shall take protective measures for the important and fragile parts to prevent losses and damages. The storage area shall be kept clean, dry, fireproof, rainproof, ventilated and free of corrosive gases. The motor shall be stored in a dry environment, with an ambient air temperature not greater than 40°C and a relative humidity not greater than 90%.

If the air handling unit is not to be installed within two weeks after its arrival at the site, following protective measures should be taken:

1) Select an even and dry area to store the air handling unit, and keep the machine from vibration and stress to avoid damages to the cabinet or parts.

2) If the air handling unit is shipped as a complete machine, it has been packaged with protective plastic films before delivery. However, these protective films may be damaged during transportation or inspection. So make sure to cover the complete machine by using tarpaulins or protective films and extending them to the bottom of the machine.
3) If the air handling unit is to be stored for a long time, it is recommended to enter the fan chamber from the access door or the entrance of the fan section and rotate the fan and motor gently at least once a month, in order to help lubrication and rust resistance of the bearing.
4) The air handling unit with electrostatic precipitator should be stored in a dry condition (relative humidity <65%) space without acid and alkali harmful gas, otherwise the ionization wire (tungsten wire and molybdenum wire) of ESP will break due to oxidation

# 3. Installation

## 3.1 Pre-installation Inspection

To install the air handling unit, always check the site and confirm the conditions for installation are in place before unpacking the machine. The AHU room shall be kept clean, and the foundation for mounting the machine shall be even and integrated, with such dimensions that meet relevant installation requirements.

Unpack the machine and check it according to the packing list. Inspect if the components, accessory materials, technical drawings and relevant documents are complete and if the product nameplate is qualified, clear and correct.

Before installing the air handling unit, it is also required to conduct inspection for the appearance and important components of the machine, and check if the exterior surface of the machine is free of damages, if the access door and sealing surfaces are in good conditions, and if each major component is complete, free of damages and loose connections.

For the purifying unit, after inspecting its appearance and important components, make sure to clean the panels, filter tray, coil, heater, fan and motor to remove dust, oil and debris from the surface.

Before installing the air handling unit, all related personnel shall be familiar with relevant drawings, instructions for installation manual as well as the warning signs attached on the surface of the machine. If shipping splits connection is required, the sequence of splits shall be consistent with relevant drawings.

## 3.2 Installation Location

Reserve some space beside the air handling unit for maintenance and repair purposes. For a floor-type air handling unit, the following requirements shall be satisfied:

1) The maintenance and repair space to be reserved on the side of the coil shall be at least equal to the width of the air handling unit B≥W (the width of the air handling unit). The maintenance and repair space to be reserved on the other sides shall be A≥600mm.
2) If the air handling unit is to be installed against the wall, the maintenance and repair space to be reserved on the side of the wall shall be A≥600mm.
3) If the air supply port /air return port is facing toward the wall, the distance between the air supply port/air return port and the wall shall be A≥600mm.

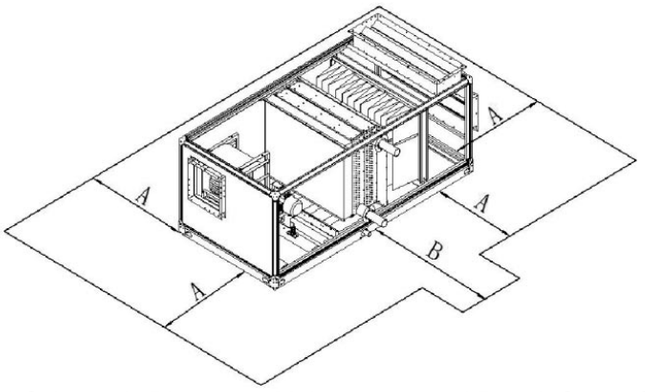



Figure 3.1 Schematic Diagram – Maintenance and Repair Space for Floor-Type AHU

If the air handling unit is to be installed outdoor or in a corrosive environment (e.g., close to the sea), the electrical junction box shall be protected with a rainproof device.

For a concealed ceiling-type air handling unit, a flexible access hole shall be reserved to facilitate the maintenance and repair work. A sufficient space shall be reserved between the ceiling and the air handling unit to arrange the drainage trap and condensate pipes.

### 3.3 Foundation Support

For a floor-type air handling unit, in order to ensure smooth drainage of water, a concrete or metal platform shall be established as the foundation for the air handling unit, which shall be equal to the length of the machine +a(a>100mm), the width of the machine ＋ a(a>100mm) and the height (H ≥ A + B, the height is closely related with the drainage trap. Refer 3.8 for specific values). Drainage ditches and floor drains shall be provided around the foundation.
The foundation surface shall be even and level in order to ensure smooth drainage of condensed water. The diagonal level error shall preferably not exceed 5mm.

### 3.4 Assembly of Knock-Down Kit

A knock-down air handling unit must be assembled on site by the authorized personnel who have been trained specially.

### 3.5 Connection of shipping splits

If the air handling unit has been divided into two or more shipping splits due to limitation of transportation conditions or the customer's requirements, it shall be connected on site.

#### 3.5.1 Connection of Floor-Type Single-Tier Air Handling Unit

For a single-tier air handling unit, the assembly procedures include following:

1） Assemble the air handling unit according to the general assembly drawing (supplied with the machine) in numerical sequence of the shipping splits.
2） Place rubber pads with a minimum thickness of 5mm under the base for final leveling purpose. If the air handling unit includes only one assembly section, go to Step 8directly.
3） If there is diffuser segment after supply fan, and they belong to different transport section, it should remove diffuser plate fixed on fan outlet firstly(figure 3.2), then re-install diffuser plate according to figure 3.3. Accessory list for re-installing diffuser can be found in table 3-1.

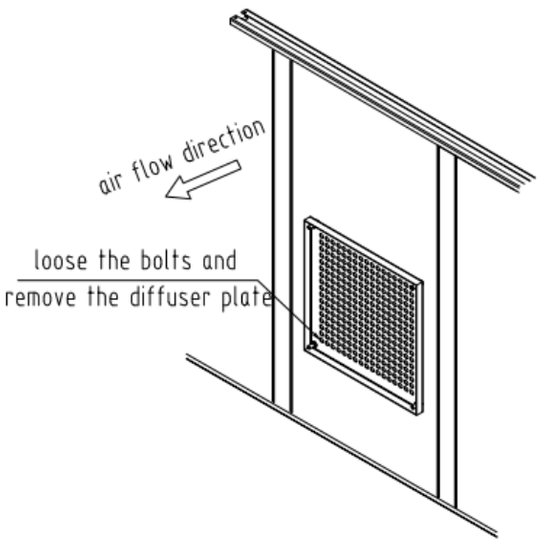



Figure 3.2 Remove Diffuser Plate

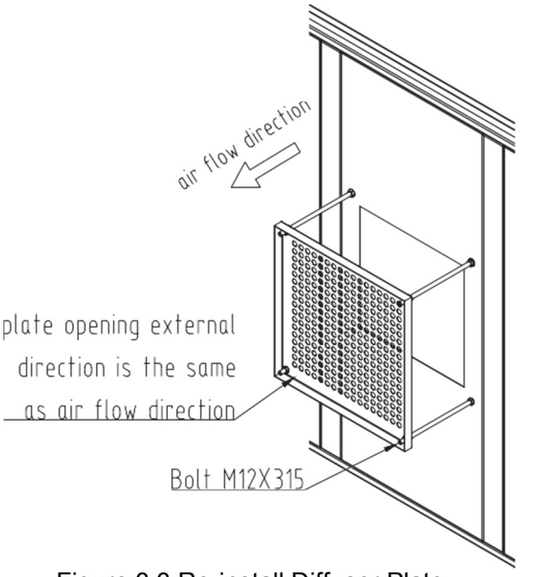



Figure 3.3 Re-install Diffuser Plate

| Item | Description | Qty/pcs | |
|---|---|---|---|
| | | Fan 160~630 | Fan 710~1250 |
| 1 | Bolt M12 x 315 | 4 | 8 |
| 2 | Nut M12 | 16 | 32 |
| 3 | Washer M12 | 16 | 32 |
| 4 | Spring washer M12 | 16 | 32 |

Table 3-1 Accessary List for Diffuser Installation

4） Pasted the 6mm insulation tapes (shipped in separated box) onto each connection surface of the side profile (or called corner post) of the air handling unit.

Notice: The insulation tapes shall be flush with the end of side profile when pasted onto the connection surface. See Figure 3.4.

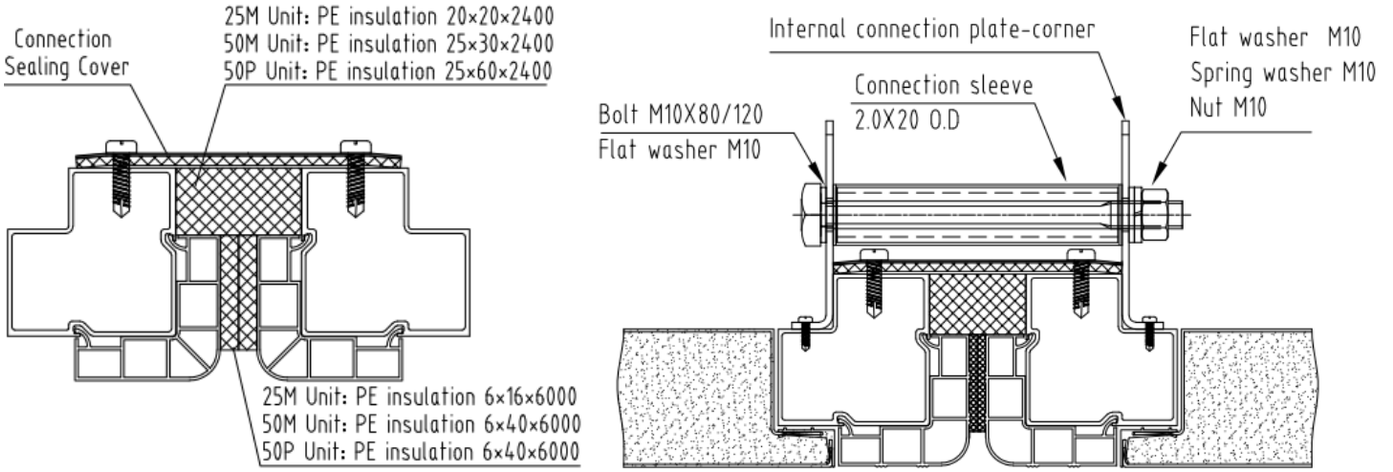



Figure 3.4 Splits Thermal Insulation & Connection Instruction

5） Remove the L-shaped plates (located on the connection section) of base, and re-install the plates onto left & right sides according to Figure 3.5, then fix two adjacent plates with disassembled M8 bolts and M8 nuts in accessory box according to Figure 3.6.

6） Move the two adjacent splits to be close to each other without obvious gap. Keep the top and both sides belonging two splits are straight and aligned before install connection plates and cover plates.

7） Filled corresponding insulation strips in the groove between adjacent side profiles, and then use the connection sealing covers with corresponding module to cover the side profiles.

8） For the splits that can be connected with internal connection plates and fasteners, internal connection plates have been installed at four corners of each connection section before delivery, so users just adopt the connection fasteners (M10 series) and sleeves to lock the connection plates, as shown in Figure 3.4; after the connection plates are locked, next step is to fix the connection sealing covers onto side profiles with ST5.5 self tapping screws, finally sealant shall be glued at the joint of four sealing covers to prevent air leakage, as shown in Figure 3.7.

9） For the splits that can't be connected with internal connection plates and fasteners, internal connection plates haven't been installed at four corners of each connection section before delivery, so after finishing operations in above point 7, users just fix the connection sealing covers onto side profiles with ST5.5 self tapping screws, finally sealant shall be glued at the joint of four sealing covers to prevent air leakage, as shown in Figure 3.7.

10） After locking the internal connection plates and fixing the sealing covers, tight blots for the two adjacent plates of base again for better effect,, as shown in Figure 3.6.

11） Fix the base of the unit with the foundation by using anchor bolts, and ensure the bottom surface of the unit is even and level.

12） If unit includes several shipping splits in horizontal, glues should be used on the connection of two shipping splits.(glues aren't provided from factory).

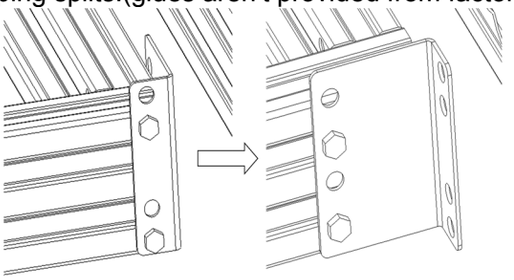


Figure 3.5 Base Limiting Plate Re-install

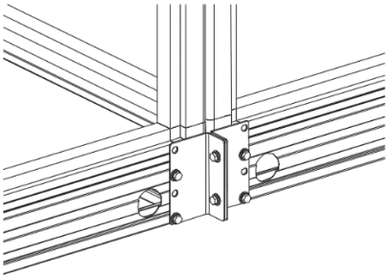


Figure 3.6 Base Connection

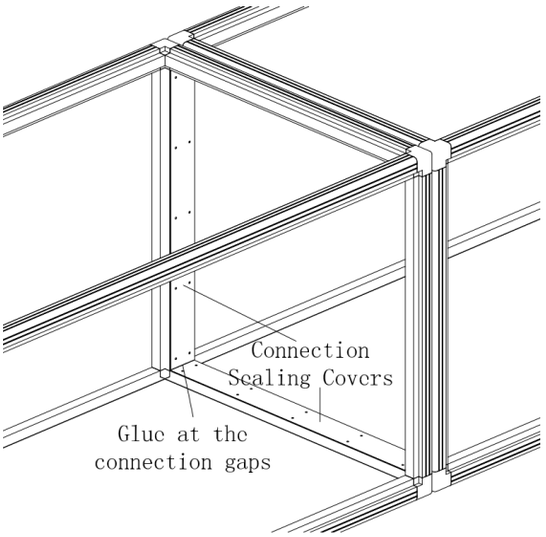



Figure 3.7 Internal Connection Sealing Cover Installation

| Item | Description | Qty | Unit | Note |
|---|---|---|---|---|
| 1 | Connection Sealing Cover 1 | 2 | pcs | |
| 2 | Connection Sealing Cover 2 | 2 | pcs | |
| 3 | Self-screws ST5.5 x 17 | some | pcs | |
| 4 | Hexagon Bolts M8×20 8.8 Zn-Ni | 4 | pcs | base fastening |
| 5 | Hex nuts M8 | 4 | pcs | base fastening |
| 6 | Spring washers M8 | 4 | pcs | base fastening |
| 7 | Flat washer M8 | 4 | pcs | base fastening |
| 8 | Glue | some | pcs | |
| 9 | Internal Connection Plates | 8 | pcs | |
| 10 | Connection Sleeve,2.0×OD20x52 | 4 | pcs | 25mm unit |
| 11 | Connection Sleeve,2.0×OD20x102 | 4 | pcs | 50mm unit |
| 12 | Hexagon Bolts M10×80 8.8 Zn-Ni | 4 | pcs | 25mm unit |
| 13 | Hexagon Bolts M10×120 8.8 Zn-Ni | 4 | pcs | 50mm unit |
| 14 | Nut hexagon M10 | 4 | pcs | |
| 15 | Spring Washer M10 | 4 | pcs | |
| 16 | Flat Washer M10 | 8 | pcs | |

Table 3-2 Part List for Each Split Connection Set

### 3.5.2 Assembly of Floor-Type Double-Tier Air Handling Unit

The upper segment and bottom segment will need to connect and fasten on site if the upper segment and bottom segment are shipped separately. There are two kinds connecting methods, internal connection and external connection. Internal connection is standard method, external connection will be used on some special situation.

**Internal Connection:**

1) Assemble the air handling unit according to the general assembly drawing (supplied with the machine) in numerical sequence of the shipping splits.
2) Place rubber pads with a minimum thickness of 5mm under the base for final leveling purpose. If the air handling unit includes only one assembly split, go to Step 7 directly.
3) Paste the insulation tapes (13*38) onto the side profiles of certain splits at bottom tier, which have the same length as splits at the upper tier.
4) Move the upper tier splits onto the bottom tier and keep them flush on end surfaces. Pay attention to the fore-and-aft orientation of the splits for different tiers. Do not place them in a reverse direction.
5) Clean holes using for panel connection.
6) Refer to figure 3.8, put connection sleeve into the hole which thread the panels of upper and bottom unit, then fix internal connection plates to side profiles or mullions of the upper& bottom tier splits, then fasten the internal connection plates with M10 series fasteners, connection parts list is as Table 3-3.

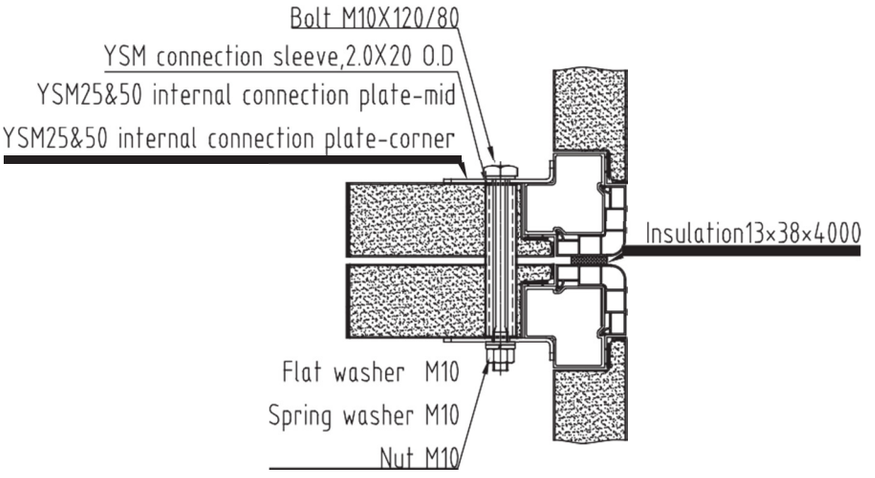



Figure 3.8 Internal Connection between Upper and Bottom Splits

| Item | Description | Qty | Unit | Note |
|---|---|---|---|---|
| 1 | Internal connection plate-corner (GI) | 2 | pcs | |
| | Internal connection plate-corner (Painted) | 2 | pcs | |
| 2 | Internal connection plate-mid (GI) | 2 | pcs | |
| | Internal connection plate-mid (Painted) | 2 | pcs | |
| 3 | Connection Sleeve,2.0×OD20x52 | 1 | pcs | 25mm unit |
| | Connection Sleeve,2.0×OD20x102 | 1 | pcs | 50mm unit |
| 4 | Hexagon Bolts M10×80 8.8 Zn-Ni | 1 | pcs | 25mm unit |
| 5 | Hexagon Bolts M10×120 8.8 Zn-Ni | 1 | pcs | 50mm unit |
| 6 | Nut hexagon M10 | 1 | pcs | |
| 7 | Spring Washer M10 | 1 | pcs | |
| 8 | Flat Washer M10 | 2 | pcs | |
| 9 | Self-screws ST5.5 x 17 | 8 | pcs | |
| 10 | Insulation 13 x 38 x 4000 | some | pcs | |

Table 3-3 Internal Connection Part List

**External Connection:**

If the upper and bottom tiers of a double-tier air handling unit are shipped separately, start assembly from Step 1. If there are no splits divided in height direction, start assembly from Step 6. The assembly procedures include following:

1) Assemble the air handling unit according to the general assembly drawing (supplied with the machine) in numerical sequence of the shipping splits.
2) Place rubber pads with a minimum thickness of 5mm under the base for final leveling purpose. If the air handling unit includes only one assembly split, go to Step 7 directly.
3) Attach the insulation tapes (13*38) along the contact edges of the upper and bottom tiers of the air handling unit. See Figure 3.9.

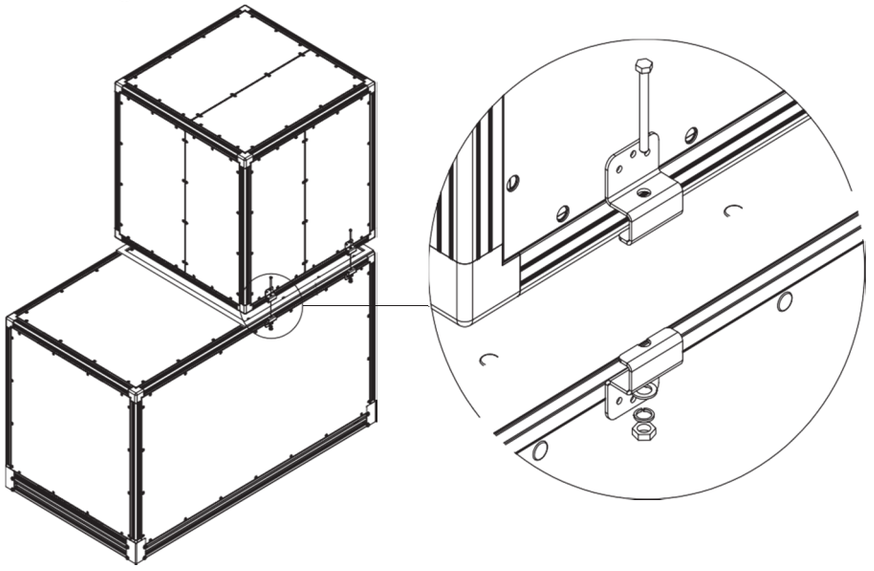


Figure 3.9 External Connection & Insulation between Upper and Bottom Splits

4) Move the upper tier onto the bottom tier and keep them flush on their end surfaces. Pay attention to the fore-and-aft orientation of the upper and bottom tiers. Do not place them in a reverse direction.
5) Mount external connectors between the bottom profile of the upper tier and the top profile of the bottom tier, find split external connection and the fastenings for split-split connection in Figure 3.8 and the part list in Table 3-4. The quantity of connectors required for a single side of the air handling unit length and width is listed in Table 3-5.

| Item | Description | Qty/set | Unit | Remark | |
|---|---|---|---|---|---|
| 1 | Insulation Tape 13*38 | some | m | YSM25/50 | IU / OU |
| 2 | External Connector | 2 | pcs | YSM25/50 | IU / OU |
| 3 | ZINC-NICKEL HEXAGON BOLTS M10*80-8.8 | 1 | pcs | YSM25 | IU / OU |
| 4 | ZINC-NICKEL HEXAGON BOLTS M10*120-8.8 | 1 | pcs | YSM50 | IU / OU |
| 5 | ZINC-NICKEL NUT HEXAGON M10 | 1 | pcs | YSM25/50 | IU / OU |
| 6 | ZINC-NICKEL SPRING WASHER M10 | 1 | pcs | YSM25/50 | IU / OU |
| 7 | ZINC-NICKEL PLAIN WASHER M10 | 1 | pcs | YSM25/50 | IU / OU |
| 8 | SELF-TRAP. SCREW ST5.5x25 W/I RUBBER MAT | 6 | pcs | YSM25 | IU |
| 9 | SCREW ST5.5×25 S.S316 CUSHION GB/T15856.4 | 6 | pcs | YSM25 | OU |
| 10 | HEXAGON SCREWST ST6.3×38 8.8ZN-NI | 6 | pcs | YSM50 | IU / OU |

Table 3.4 External Connection Part List per Set

| YSM25 DT Unit Outer Connection Plate Rule(Length) | | | | | |
|---|---|---|---|---|---|
| Length Model | 5M~10M | 11M~18M | 19M~25M | 26M~32M | 33M~36M |
| Connection Plate Set | 2 | 3 | 4 | 5 | 6 |

| YSM25 DT Unit Outer Connection Plate Rule(Width) | | | |
|---|---|---|---|
| Width Model | 5M~15M | 16M~25M | 26M~36M |
| Connection Plate Set | 2 | 3 | 4 |

| YSM50 DT Unit Outer Connection Plate Rule(Length) | | | | | |
|---|---|---|---|---|---|
| Length Model | 5M~10M | 11M~18M | 19M~25M | 26M~32M | 33M~36M |
| Connection Plate Set | 2 | 3 | 4 | 5 | 6 |

| YSM50 DT Unit Outer Connection Plate Rule(Width) | | | |
|---|---|---|---|
| Width Model | 5M~15M | 16M~25M | 26M~36M |
| Connection Plate Set | 2 | 3 | 4 |

Table 3.5 Connector Quantity Sets at Length and Width Edge

6) If there are some splits to be assembled in horizontal direction, connect them one by one horizontally according to 3.5.1 step 1 to 12.
7) Fix the base of the air handling unit and the foundation by using anchor bolts, and ensure the bottom surface of the air handling unit is even and level.

### **3.5.3** Special Support in for Certain Bottom Tier Casing of Double Tiers Unit

For some double tiers unit, when one fan segment is on the upper tier and the corresponding bottom casing can't be installed any support at or near connection section, after the bottom splits are finished connection horizontally, then 1~2 square steel support should be installed across adjacent side profiles at the special required connection section, see Figure 3.10.

Note: square steel support above stated is separately delivered without installed before delivery.

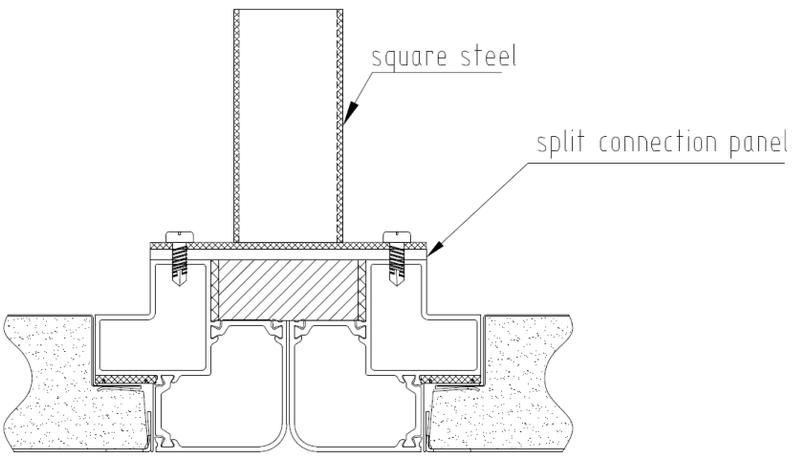



Figure 3.10 Square Steel Installation at Bottom Tier Casing

### 3.5.4 Installation of Ceiling-Type Air Handling Unit

If a ceiling-type air handling unit includes two or more assembly splits, they shall be assembled on site. The splicing method for the ceiling frame is shown in the following figure:

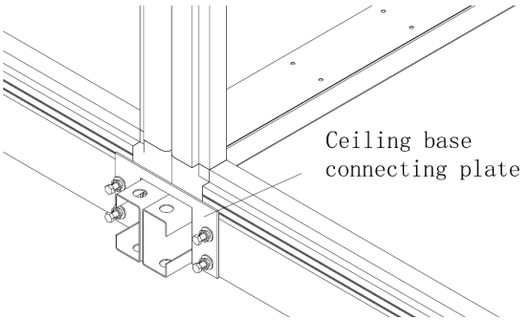



Figure 3.11 Schematic Diagram – Ceiling Base Connection

See internal connection in Step 3 to 9 in 3.5.1.

For a ceiling-type air handling unit, make sure the suspension brackets are stable, solid and in correct positions. Select suitable suspension rods according to the weight of the air handling unit in order to ensure the required strength. Connect the suspension rods and the air handling unit by using double nuts. Level and align them to apply a uniform stress to each suspension point. Mount a suitable shock absorber at the bottom of the suspension rod.

### 3.5.5 Installation of Damper

1) The CKD damper fixed in other position of the unit should be removed first, then install it at the configured corresponding position;
2) Check if the damper can be opened or closed smoothly before installing it.
   A. Turn the handle to adjust the damper to the desired degree of opening and fix it at this degree of opening. Then mount the damper on the air handling unit.
   B. The diameter of the damper actuating lever is 12.5mm. For a manually-controlled damper, the drive shaft protrudes 65mm±5 over the damper body. Please pay attention to the above dimensions during installation of the actuator.

### 3.5.6 Installation of Outdoor Canopy

**For Single tier unit, installation process is as follow:**

1) Fix parts 1/2/3/4 to unit casing top face with self-tapping screw, referring to the following picture:

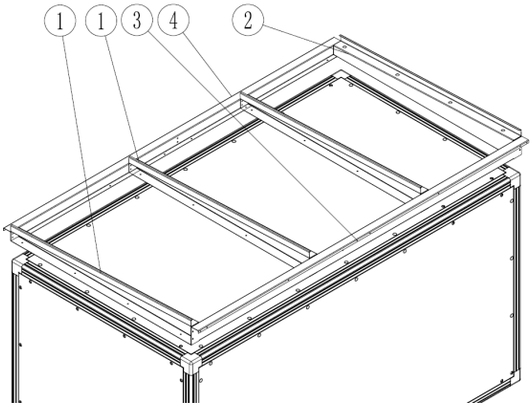



Figure 3.12 Outdoor Canopy Installation 1

2) Cover canopy top plate(Parts 5/6),and connecting with self-tapping screw, then fix connection plate 7,referring to following figure:

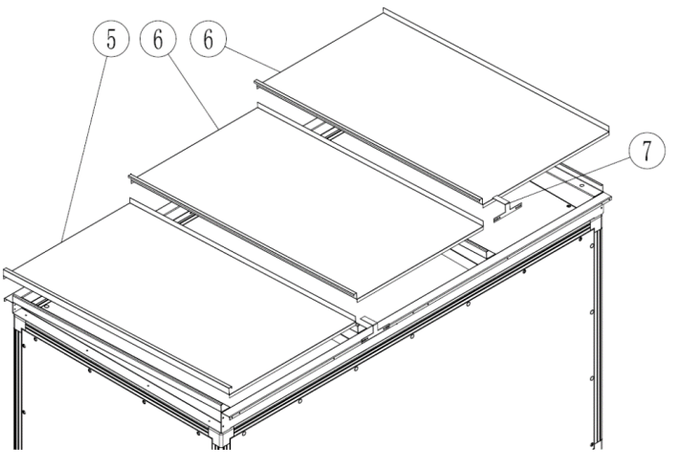



Figure 3.13 Outdoor Canopy Installation 2

3) If two or more segments are included, part10/11/12 should be installed between two segments canopy referring to the following figure:

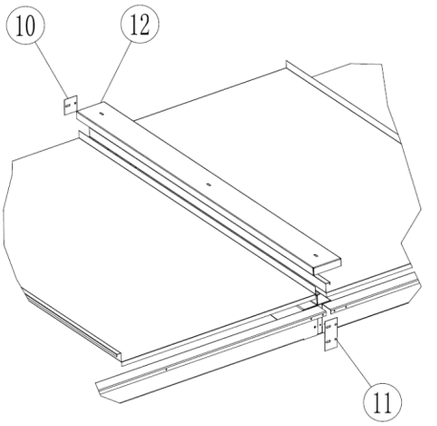



Figure 3.14 Canopy Installation between Adjacent Splits

4) Seal the connection between canopy plate and unit casing with glue;

**For Bottom &Top tier unit**

1) If the bottom segment length is the same as top segment, canopy installation can refer to single tier unit;
2) If the bottom segment length – top segment length ≤4M,and ≥1M,top segment installation refer to single unit, bottom segment install plate 9, referring to the following figure:

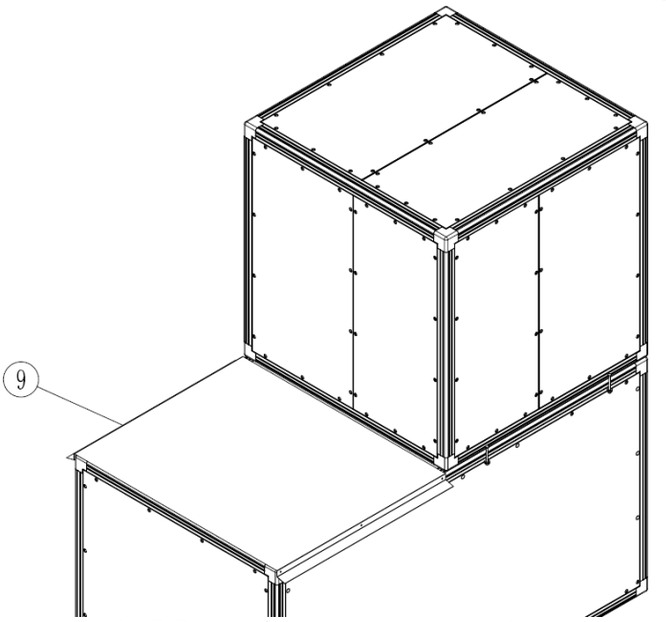



Figure 3.15 Bottom & Top Tier canopy Installation 1

3) If the bottom segment length – top segment length ⩾5M,and ⩽31M,and unit casing insulation thickness is 25mm,then install part 8 after installing canopy referring to single unit, referring the following figure:

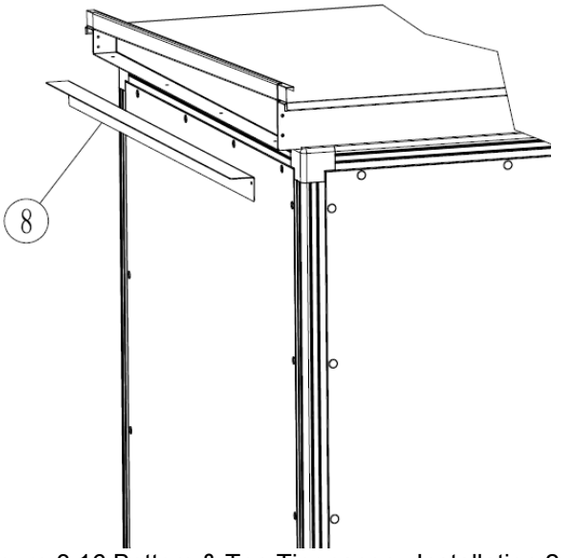



Figure 3.16 Bottom & Top Tier canopy Installation 2

4) If the bottom segment length – top segment length ⩾5M,and ⩽31M,and unit casing insulation thickness is 50mm,then install canopy referring to single unit;
5) Seal the connection between canopy plate and unit casing with glue;

| Item | Description | Qty/segment | Note |
|---|---|---|---|
| 1 | canopy front& back support plate 1 | some | |
| 2 | canopy front& back support plate 2 | 1 | |
| 3 | canopy left& right support plate1 | 1 | |
| 4 | canopy left& right support plate2 | 1 | |
| 5 | canopy top plate 1 | 1 | |
| 6 | canopy top plate 2 | some | |
| 7 | canopy top connection plate | some | |

| | | | |
|---|---|---|---|
| 8 | canopy extending support plate | 1 | |
| 9 | simple canopy | 1 | |
| 10 | canopy left& right support connection plate 1 | some | |
| 11 | canopy left& right support connection plate 2 | some | |
| 12 | canopy segments connection top cover plate | some | |
| 13 | self-tapping screw ST5.5x19 | some | |
| 14 | self-tapping screw ST5.5x25 SUS | some | 25mm unit |
| 15 | self-tapping screw ST6.3x45 SUS | some | 50mm unit |
| 16 | Glue | some | |

Note: the quantity in the table is for one assembly segment parts.

Table 3-6 Canopy Installation Parts List

### 3.5.7 Outdoor unit hood installation

1) Fix end plates(Part 2&3) with damper(or flange)with bolt(or screw);
2) Fix top plate and end plates with damper(or flange),referring to following figure;
3) Pre-install filter sliding rail 2(part 7) and part 5, then fix part 5 with damper(or flange),then fix filter sliding rail 1 with top plate(part 4),referring to figure 3.18;
4) Install filter into filter sliding rail;
5) Seal connection between hood plate and casing with glue;

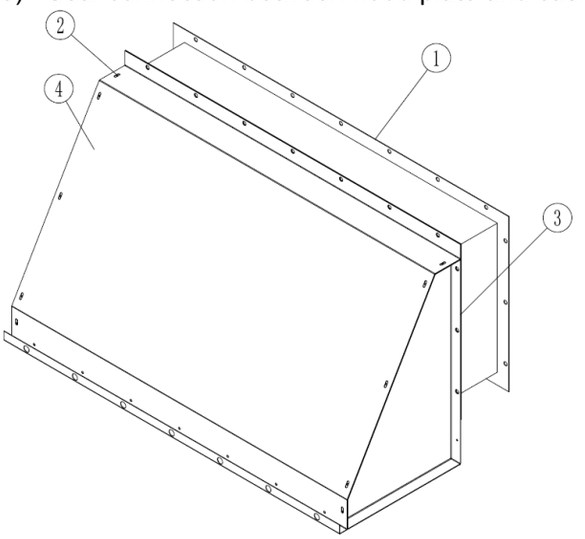



Figure 3.17 Hood Installation 1

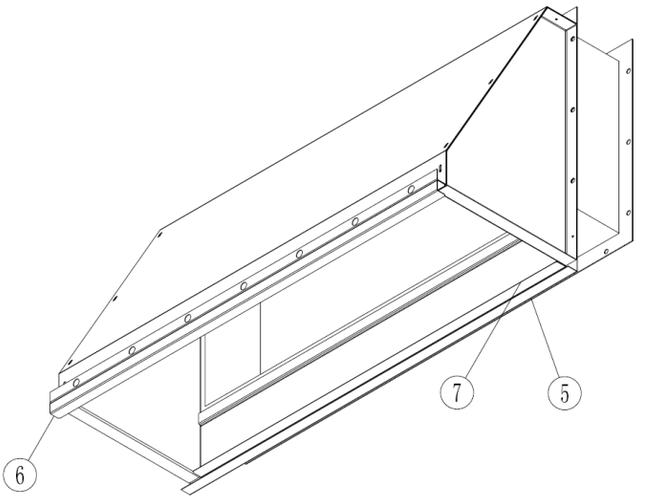



Figure 3.18 Hood Installation 2

| Item | Description | Qty/PCS |
|---|---|---|
| 1 | Damper/Flange | 1 |
| 2 | Hood end plate 1 | 1 |
| 3 | Hood end plate 2 | 1 |
| 4 | Hood top plate | 1 |
| 5 | Hood back plate | 1 |
| 6 | Hood filter sliding rail 1 | 1 |
| 7 | Hood filter sliding rail 2 | 1 |
| 8 | Filter | some |
| 9 | Self-tapping screw ST5.5x19 | some |
| 10 | Bolt M10/nut | some |
| 11 | Glue | some |

Table 3-7 hood installation part list

### 3.5.8 Outdoor unit louver installation

1) Fix part7 with damper(flange),then install part 4&5,referring to following figure;
2) Fix part 1&2 with part 7, then install part 6,referring to the following figure;

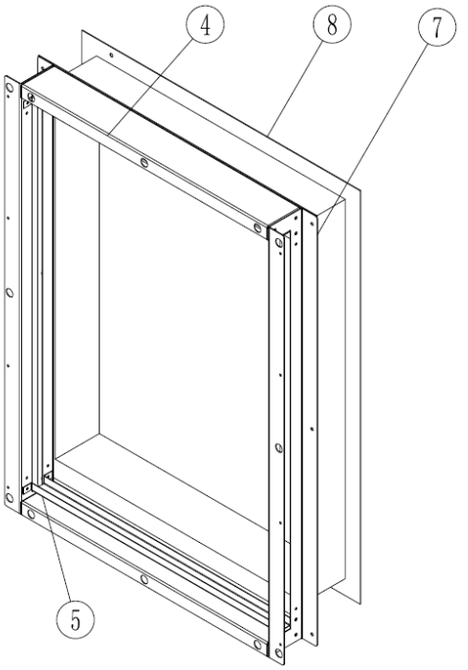



Figure3.19 Louver Installation 1

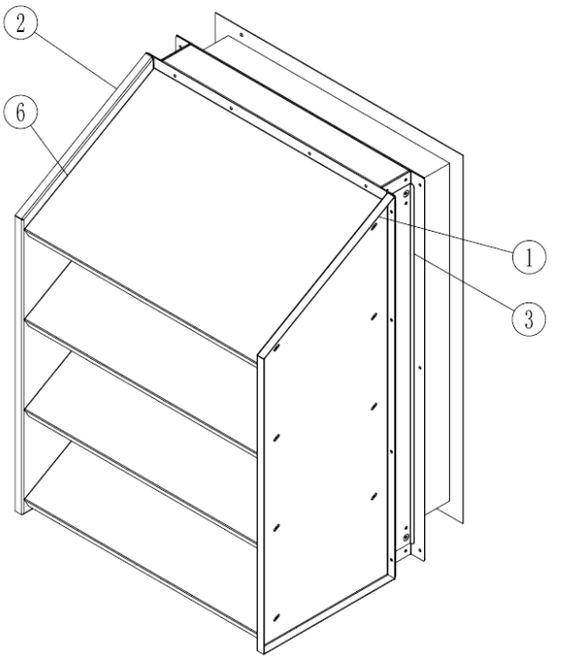



Figure3.20 Louver Installation 2

3) Install filter into part 7, then fix part 3;
4) Seal connection between louver plate and casing with glue;

| Item | Description | Qty/pcs | Note |
|---|---|---|---|
| 1 | Louver plate 1 | 1 | |
| 2 | Louver Plate 2 | 1 | |
| 3 | Louver Filter fasten plate | 2 | |
| 4 | Louver top cover plate | 2 | |
| 5 | Louver filter rail | some | |
| 6 | Louver breakwater plate | some | |
| 7 | Louver pattern C support plate | 2 | If louver is on left/right,connect part 7 to frame or mid-frame |
| 8 | Damper/flange | 1 | If louver is on front/back, connect part 7 to part 8 |
| 9 | Self-tapping screw ST5.5x19 | some | |
| 10 | Bolt M10/nut/washer | some | |
| 11 | Glue | some | |

Table 3-8 Louver Installation Parts List

## 3.6 Disassembly of Panel

The coils and large appurtenances are accessible for maintenance purpose by disassembling panels.

The steps are as follows:

1) Remove the plastic cover on the panel.
2) Loosen the screws by using an air screwdriver.

The panel can be re-assembled in reverse order.

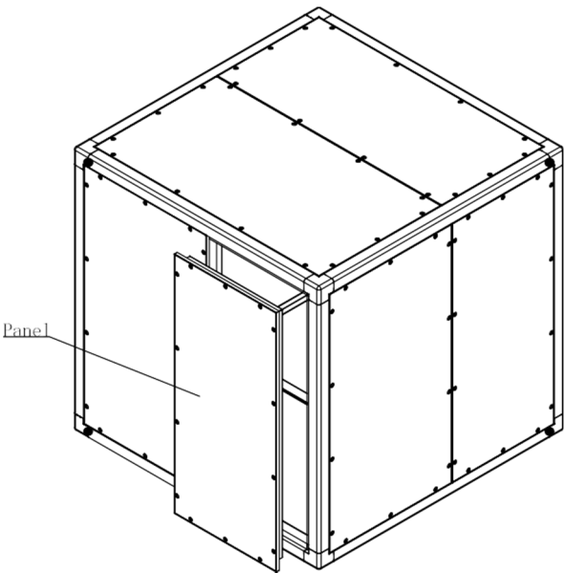



Figure 3.21 Schematic Diagram – Panel Disassembly Instruction

**Notice: Make sure to use a plastic or wood hammer during installation in order to avoid damages to panels and plastic covers.**

## 3.7 Connection of Coil

The coils are design based on the principle of counter flow heat exchange. The water supply and discharge pipes shall be connected according to the marks on the side of the panels. The collector pipe for the cooling and heating coils is designed with a vent valve and a drainage trap. The vent valve is located at the highest point of the water discharge pipe outside the air handling unit; and the drainage trap is located at the lowest point of the water inflow pipe outside the air handling unit.

To connect the pipes, it is preferably to install a water filter to prevent dust from blocking the coils. Meanwhile, the chilled water and hot water shall be subject to softening treatment in order to prolong the service life of the coils.

Appropriate external insulation measures shall be taken for the pipes. Generally the water inlets and outlets of the coils shall be provided with flexible pipes. The pipelines shall be supported by separate brackets, instead of loading their weight onto the machine. To tighten an external pipe, always hold the coil pipe by using a pipe wrench to avoid damages to the manifold, as shown in the following figure:

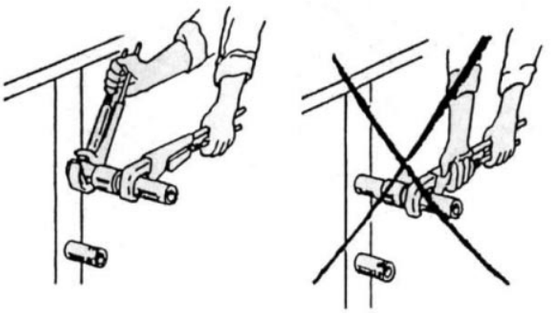


Figure 3.22 Schematic Diagram – Pipe Connection

Please see the conventional method for connecting the cooling/heating coils in Figure 3.23.

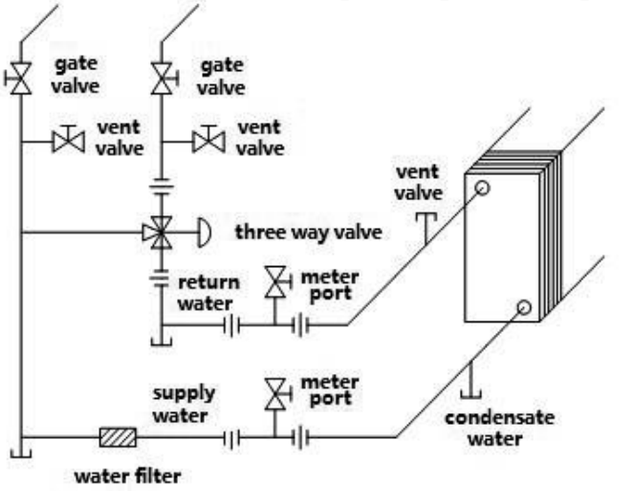



Figure 3.23 Schematic Diagram – Pipe Connection for cooling/heating Coil

Please see the conventional method for connecting the steam heating coils in Figure 3.24. When the steam pressure is greater than 0.4MPa, it shall be reduced below 0.4MPa through a pressure reducing valve.

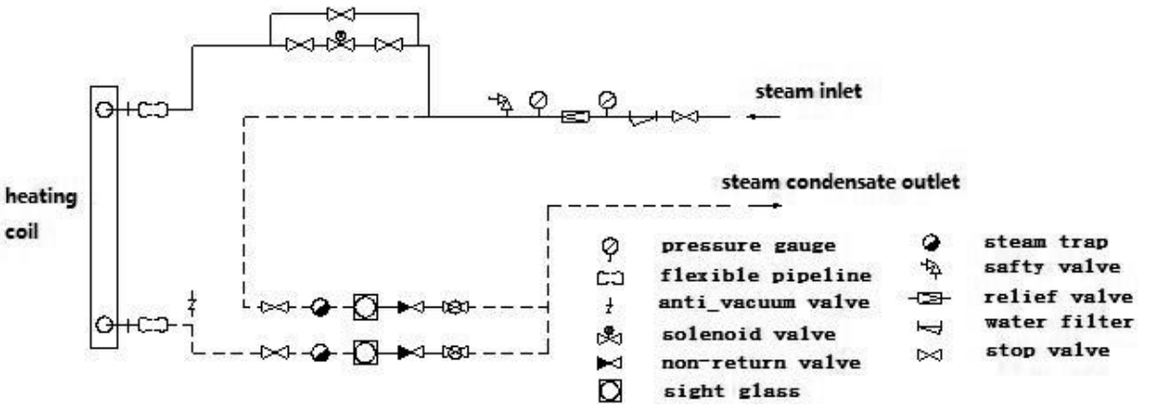



Figure 3.24 Schematic Diagram – Pipe Connection for Steam Heating Coil

The pipelines of the water system shall also be provided with vent valves and drainage valves.
Appropriate safety devices (e.g., solenoid valves – not supplied by the manufacturer) shall be mounted in the water/steam supply system for the hot water and steam coils, in order to cut off the hot water and steam supply when the fan stops running and prevent the temperature inside the air handling unit from exceeding 60°C.

### 3.8 Drainage of Condensate Water

Before conduct installation commissioning for the air handling unit, make sure to set a water trap for the condensate water drainage pipes (not supplied by the manufacturer) according to Figure 3.25.

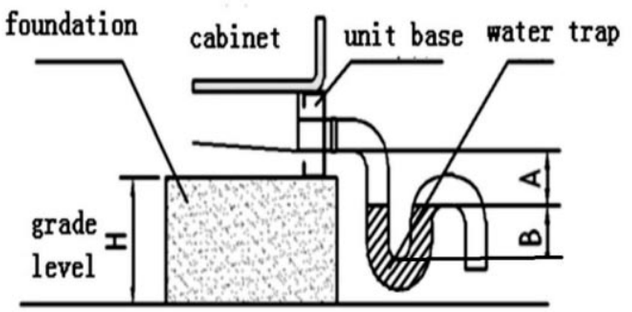


Figure 3.25 Schematic Diagram –Condensate Water Drainage Pipe Installation

Coil located in the negative pressure side: A≥ P/10+20(mm); B≥ P x 0.075 (mm)
Coil located in the positive pressure side: A≥ 35(mm); B≥P/10+50(mm)
P - Absolute value of the static pressure inside the coil segment (Pa)
In some places, it is not able to set a water trap on the floor as it is not possible to establish a foundation with a sufficient height due to limited conditions. If the air handling unit is to be mounted on the ground floor, it is practical to make a pit on the floor to set the water trap into the pit. If the air handling unit is to be mounted on the roof, and the foundation is too low to make a pit or set a water trap, it is practical to extend the water drainage pipe outside the wall and set the water trap on the external wall by connecting the outlet of the water trap with the water drainage pipe on the roof. See Figure 3.26.

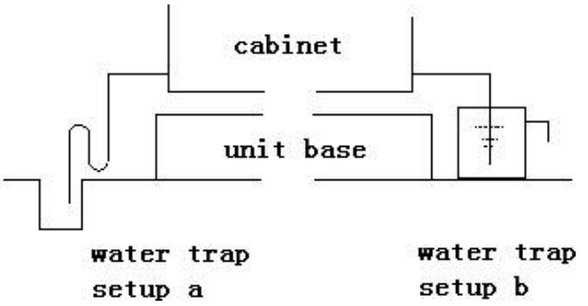



Figure 3.26 Water Trap Setting Method

A float-ball water trap can be used if the foundation or water trap cannot be established according relevant requirements due to limited space. For details, please consult the local office of Johnson Controls Inc.

## 3.9 Humidifier

### 3.9.1 Evaporative Humidifier

The humidification elements, internal water pipes and solenoid valves for control function (optional) of the evaporative humidifier have been mounted in the air handling unit at the factory. After the machine arrives at the site, the installation personnel only need to connect the tap water system with the water supply pipe of the humidifier. For water conservation considerations, interlock control can be realized for the solenoid valve and activation/deactivation of the fan. **Please pay special attention to mount an 80-100 mesh water filter on the water supply pipe of the humidifier to improve water quality.**

### 3.9.2 Steam Humidifier

Attach the cylinder of the steam humidifier onto the panel of the air handling unit by using a flange and triangle bracket, and fix the spray bar onto the bracket inside the air handling unit. See the schematic diagram for installation and connection of the cylinder, steam humidifier and other related accessories (not supplied by the manufacturer) in Figure 3.27. To connect other accessories of the steam humidifier, please refer to the installation and operation instructions for the steam humidifier.

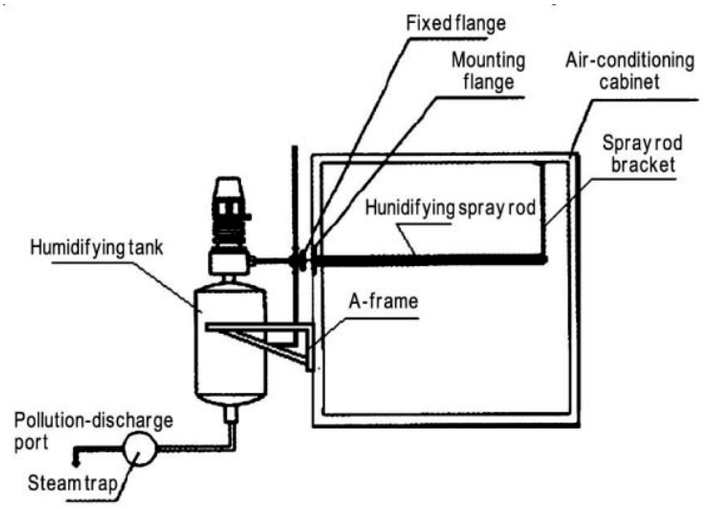



Figure 3.27 Installation System Diagram for Steam Humidifier

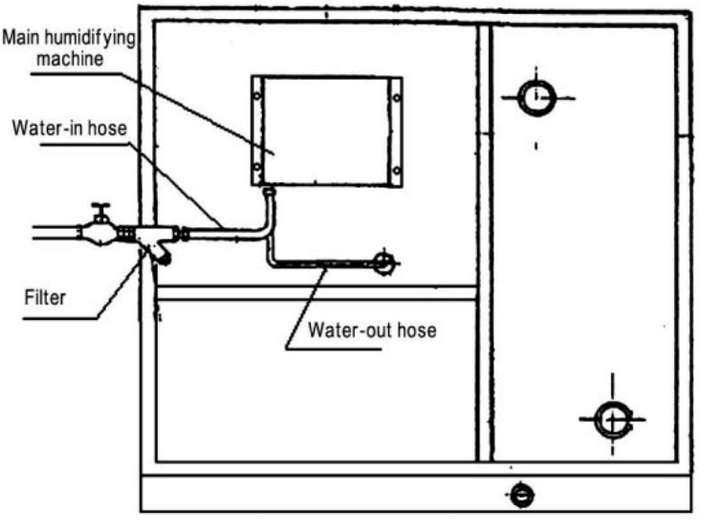



Figure 3.28 Installation System Diagram for HP Spray Humidifier

### 3.9.3 HP Spray Humidifier

The main unit of the HP spray humidifier is to be mounted on the exterior panel, and connected to the locknut of the internal spray bar via a hose. Please see its installation system diagram in Figure 3.16. To connect the HP spray humidification system and other accessories, please refer to the installation instruction for the HP spray humidifier.

The HP spray humidifier is additionally equipped with a stiffener for the main unit, which shall be mounted on the interior surface of the air handling unit to reinforce the main unit.

This humidifier has been mounted with a necessary spray bar at the factory, while the main unit and brackets need to be mounted on site.

**For installation precautions for other types of humidifiers, please refer to the corresponding installation and operation manual. Notice: When an electrode/electrical humidification system is selected, it is recommended to use metal pipes as much as practical due to high drainage water temperature.**

## 3.10 Filter

If the filters are shipped as loose parts, they shall be assembled on site according to the following figure.

1) Snap-type filter frame (Figure 3.29): Release the snap by hand, then put the filter in place and tighten the snap.
2) Bolt-type filter frame (Figure 3.30): First loosen the bolt, then put the filter in place and tighten the bolt

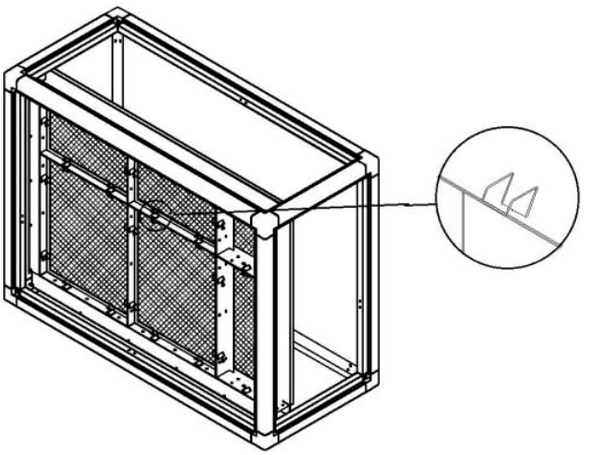


Figure 3.29 Snap-Type Filtering Framework

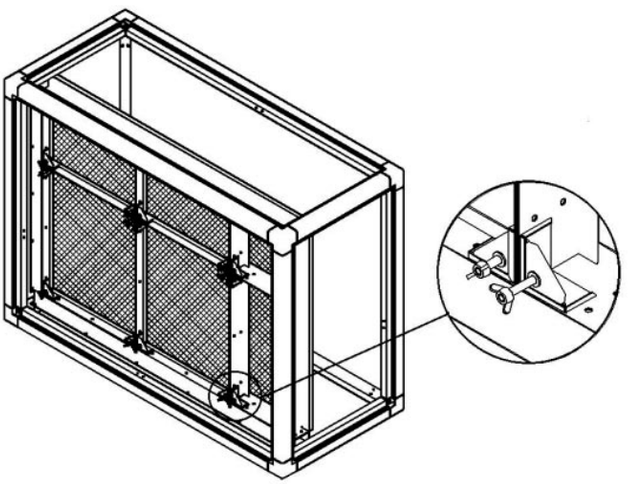


Figure 3.30 Bolt-Type Filtering Framework

**Please pay attention to the air flow direction during installation of the filter. When the filter is to be mounted opposite to the air flow direction, it shall be fixed with screws**

When the air handling unit is equipped with sub-HEPA or HEPA filter, the filter shall be mounted only after the air handling unit has been assembled and cleaned on site.

When a BF or HF is configured downstream of a DF, and the diffuser plate affects filter maintenance, please adjust the position of the diffuser plate towards the fan outlet, and adjust the diffuser plate back after the new or cleaned filters are reset.

After the filter is mounted, please pay attention to calibrate the pressure difference gauge and the pressure difference transmitter (optional). The measuring range of the pressure difference gauge shall be suitable for specific application. During normal operation, the initial resistance shall preferably point to 1/3 of the measuring range and the final resistance preferably point to 2/3 of the measuring range.

### 3.11 TiO2 Sterilization Module

A TiO2 sterilization module is to be mounted in a TiO2 sterilization segment or an external filtering section (TiO2). It mainly includes three function parts: TiO2 lamp holder framework, TiO2-coated aluminum mesh and double U-shaped UV lamps with screw base.

The TiO2 lamp holder framework and TiO2-coated aluminum mesh have been assembled at the factory. The UV lamps are shipped with the air handling unit as loose parts and need to be assembled on site as the following steps:

- TiO2 sterilization section:

1) Loosen the screws used to fix slide rail bulkhead in the TiO2 segment, and then remove it.
2) Remove the outside TiO2-coated aluminum mesh from the slipway slot of each layer.
3) Mount the double U-shaped UV lamp with screw base into the ceramic lamp holder.
4) Re-assemble the outside TiO2-coated aluminum mesh and fix the slide rail bulkhead in the TiO2 segment.

- Open Return Filter (TiO2)

1) Loosen the knurled screws with small head used to fix the open return filter segment (TiO2) on the operating side of the air handling unit, and then remove it;
2) Remove the panel filter and the outside TiO2-coated aluminum mesh from the slide rail of each layer on the operating side of the air handling unit.
3) Mount the double U-shaped UV lamp with screw base into the ceramic lamp holder from the end surface.
4) Re-assemble the outside TiO2-coated aluminum mesh and the panel filter and fix it.

**Notice:**

1) TiO2 should be interlocked control with fan motor, the Tio2 starts when the fan motor starts; the Tio2 cut off when the fan motor cut off.
2) Don’t start and cut off Tio2 frequently, to avoid influencing the Tio2 service life.
3) Some parts need to wash or change after TIO2 running for a period, please notice: be careful when washing filter, to avoid damaging filter; Tio2 can only be washed by high pressure air, and be careful to avoid damaging TIO2 coating, water is forbidden to use.
4) Power supply must be cut off before changing lamps; open maintenance plate on both side, then remove filters and take out lamps. After cleaning the lamps, install them carefully, then install filter and sealing plate, check whether it is dry in the TIO2, then turn on power.
5) It is necessary to prevent UV radiation: TIO2 UV disinfection has a strong lethal, power supply must be cut off before working in TIO2 segment. UV light should avoid direct exposure to the human body, don’t watch the light, so as not to damage the eyes;
6) Do not tighten the double U-shaped UV lamp with excessive torque to avoid damages to its screw base.
7) External filter segment with TiO2 is accessible on the end surface. If there is no space for maintenance and repair on the end surface, it is required to push the lamp holder framework out from the other side.

### 3.12 UV Germicidal Lamp

The UV germicidal lamp module has been assembled at the factory.
If the UV germicidal section is located in the end of a split, and the limit switch linked with the germicidal segment is located in another shipping split, the electrical technicians, after splits connection is completed, shall connect the electrical circuits between the limit switch and the UV lamp according to the drawings supplied with the air handling unit, seal the outlet terminals and conduct a power-on test.
Power supply must be cut off before going into UV germicidal lamp module.

### 3.13 Electrostatic Precipitation

1) Electrostatic Precipitation should be interlocked control with fan motor, Electrostatic Precipitation turn on when the fan motor start; Electrostatic Precipitation turn off when the fan motor stop.
2) There will be high-voltage when EP is working, don't touch EP or get into EP segment when EP is running to avoid Electrical shock.
3) Don't start and cut off EP frequently, to avoid influencing the service life.
4) EP should be maintained regularly, the maintenance person must be specialized and qualified; power supply must be cut off before maintenance.
5) To ensure EP run normally, dust collector must be washed regularly, normally, a thorough cleaning each two months, and more frequent cleaning is needed(one time per month) if the working condition is special.
6) After running for a period, the ionizer wire may break, the efficiency will decrease slightly. However, the unit will continue to operate with a broken ionizing wire as long as the broken wire has not caused a short circuit of the unit. Remove all loose and broken wires as soon as they are identified.
7) If EP is installed in a location that is dusty and dirty, the sensor will be coated with dirt and lint, and this coating will keep sensors from operating properly. Inspection regularly is needed and clean the sensor in time.

### 3.14 Connection of Air Ducts

1) Always connect the air inlets and outlets of the air handling unit with flexible air ducts and seal the connecting surfaces by using the insulation tapes.
2) The air ducts shall be supported by separate brackets, instead of loading their weight onto the machine.
3) As there are large local resistance losses at the corners and expansion joints of all air intake/discharge ducts, make sure to arrange the pipelines in a reasonable manner.
4) Always connect a length of straight duct with an air outlet before connecting an expansion or elbow joints in order to avoid excessive resistance losses. The length of the straight duct shall not be less than 1.5 times the diameter of the fan impellers. The expanding angle of the expansion joint shall not be greater than 30°.The orientation of the elbow joint shall be consistent with the rotating direction of the impellers. Otherwise, it will generate an excessive resistance.

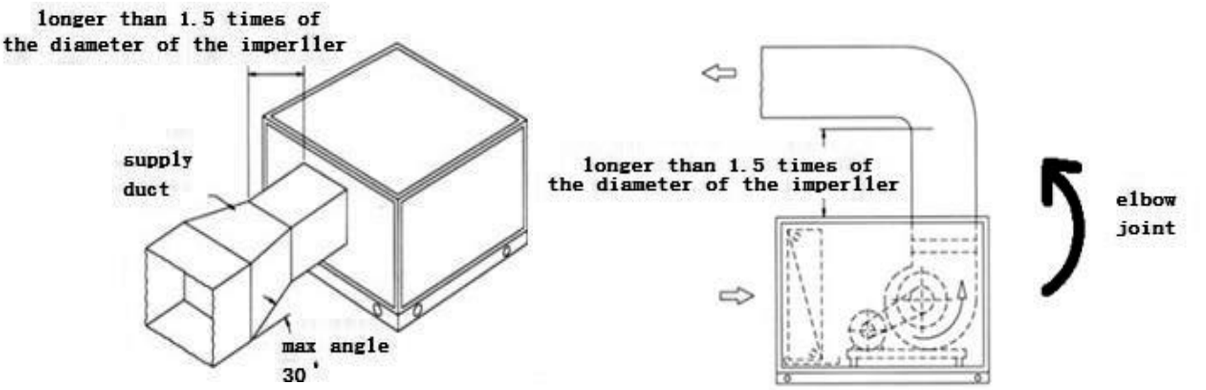



Figure 3.31 Schematic Diagram – Pipe Connection

## 3.15 Cleaning of the Machine

The air handling unit shall be cleaned thoroughly after it has been assembled, After cleaning the air handling unit, make sure to drain up the residual water in the machine so as not to reduce the air quality. Dustproof and waterproof measures should be taken on units before debugging it.

**Notice: The installation personnel shall wear soft-soled shoes before entering the machine to avoid damages to the floor panel.**

# 4. Startup

## 4.1 Pre-Start Check

When conducting pre-start check or maintenance in AHU casing, the AHU must be in stopped status. Make sure to check the following items before starting the air handling unit:

Figure 4-1 Pre-Start Checklist

| YSM Air Handling Unit Pre-Start Checklist | |
|---|---|
| Unit | □ Remove dust and debris inside and outside of the machine. |
| | □ Check if any components of the machine are loose, especially doors and panels. |
| | □ Check if the accessories supplied with the machine have been assembled properly. |
| | □ Check if the anchor bolts used to fix the machine is tightened properly. |
| | □ Check the complete machine as well as each individual component and determine if there is a leakage of water or steam, or poor air tightness. |
| | □ Check the entire air duct system and open the desired dampers before starting the motor. |
| Fan & Motor | □ Check the fan & motor module to see if the shock absorber is functional; if the flexible duct at the air outlet is free of tension; if the V-belt of the motor/fan is aligned accurately; and if the tension of the belt is in compliance with requirements. |
| | □ Drive the fan via the belt and check if the fan impellers are free of clogging or friction. |
| | □ Check and remove debris inside the fan housing, around the coupler and at the belt cover that may affect smooth movements of the fan. Check if the tension of the drive belt is correct (while the belt is driving the fan). |
| | □ Check if anchor bolts used to fix the fan, bearing seat and motor base or the damping bearings and shock absorbers for the fan are free of looseness, deformation, inclination or damages. If any, take appropriate measure accordingly. |
| | □ Remove the transportation protection blocks for the shock absorbers located under the fan & motor base (detailed illustration are showed on the label pasted on fan segment). |
| | □Check if the connecting pipes meet the requirement of countercurrent distribution, and if water flow, water temperature and steam pressure meet the standards. |
| Coil | □ Clean all the water traps, and add water to the required level. |
| | □ Check if the surface of the coil fins is free of damages, and if necessary, repair the damages by using a “coil comb”. |
| | □Check if the connecting pipes meet the requirement of countercurrent distribution, and if water flow, water temperature and steam pressure meet the standards. |
| Other Parts | □ Check the flexible pipes or flexible connections for the air ducts. |
| | □ Check if the damper can rotate smoothly (disengage the driving lever from the actuator) and lubricate the bearing if necessary. |
| | □ Check if the damper functions normally; if the blades are fully engaged when it is closed; and if the interlocked synchro-adjustable damper reacts correctly. |

| | |
|---|---|
| Electrical System | □ Check if the electrical connectors for the motor are consistent with the drawing supplied with the machine. Check the nameplate of the motor to see if the voltage, phase and frequency of the motor comply with the power supply available on site. |
| | □ Check if the electrical connections for all the electrical devices, lights and controls are correct. |
| | □ Check if the power supply and the wiring are correct and take appropriate protective measures for short circuit, open circuit and phase loss. |
| | □ Check the insulation resistance of the motor. |
| | □ Check all the grounding devices. |

## 4.2 Precautions for Fan Startup and Safety Information

Please strictly follow the required operation procedures when starting the fan:

1) For large-sized air handling units featuring multiple systems and centralized control, a local start method shall be adopted as it is possible to identify problems occurring during the startup process and avoid equipment accidents.
2) To start an air conditioning system including multiple air handling units, start these units one by one in order. That means, start the first unit and wait until the starting current reaches the peak value and drop back to the normal level, and then start the second equipment in the same manner. Otherwise, starting multiple units simultaneously will generate an excessive instantaneous current that may lead to a failure of the fuse in the protective circuit and then cause downtime incidents.
3) After confirming all the electrical and mechanical systems are functional, start the fan briefly (3-6 seconds) and check if its rotation direction is correct. If the fan rotates in a reverse direction, the wiring shall be adjusted accordingly. Do not restart the fan only until the impellers stop rotation completely.
4) The impellers are only intended for the transfer of air or air-like mixtures. They cannot be used in hazardous areas for the transfer of gas, mist, vapors or mixtures. Nor can they be used for the transfer of solids, or solid components in the transfer medium.
5) Only operate the fan according to the intended application, and only up to the maximum permissible speed given in the information on the fan/impeller rating plate. Exceeding the maximum permissible speed leads, as a result of the high kinetic energy (mass x rotation rate), to a hazard situation. The impeller can disintegrate- lethal hazard! The maximum permissible operating data given on the rating plate are valid from air density $\rho$=1.2 kg/m$^3$.

## 4.3 Precautions for Motor Startup

Make sure to carry out a series of electrical and mechanical inspections before running the motor:

- Once the grease used to lubricate the bearing is in contact with air, it will be oxidized, or even deteriorated. If such oxidized grease is used in the motor, the motor bearing will soon be damaged. It is required to lubricate the motor depending on its storage duration, as shown in Table 4-2:

Table 4-2 Lubrication for Motor by Storage Duration

| Storage Duration | <6 Months | 6 Months – 1 Year | >1 Year |
|---|---|---|---|
| Lubrication | Use the motor directly without lubrication if it is stored properly. | Lubricate the motor before running it. | Lubricate the motor several times and replace the lubricant completely. |

**Notice:**

1) If the motor of the air handling unit is not used for a long time, the situations mentioned above may occur. In order to avoid the above problems, it is recommended to use an anti-condensation heater and conduct routine maintenance.
2) Inspect motor bolt and other fastener regularly to prevent parts loosening.
3) Power supply voltage deviation can't be bigger than 10% of rating voltage.
4) Transport protection device should be removed before operation.
5) When the motor power is equal to or bigger than 7.5kW, reduce-voltage starting method should be used to avoid too big starting current.

## 4.4 Adjustment of Belt and Pulley

1) Calibrate the flatness of the fan/motor pulley before starting the machine. Point A, B, C and D shall be in a straight line as shown in Figure 4.1. Otherwise, the pulley flatness shall be re-adjusted accordingly.

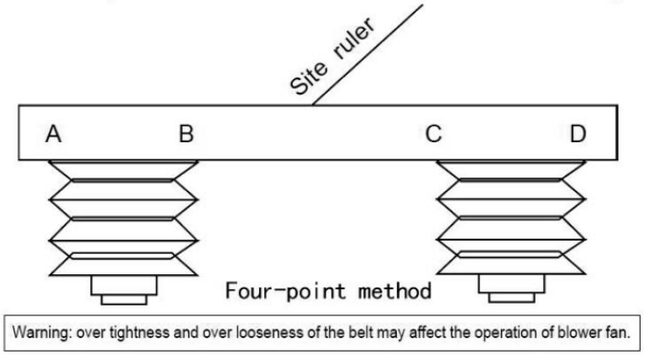



Figure 4.1 Schematic Diagram – Calibration of Pulley Flatness

2) After running for a week, the belt will be elongated slightly. So the belt tension shall be re-adjusted accordingly. For the measurement method and requirements for the belt tension, please see Figure 4.2. Belt tension shall be checked and adjusted based on checklist of Annex 1.

| Belt model | Diameter of small belt pulley | The force required to deflect the belt for 16mm per 1m span | |
|---|---|---|---|
| | | Newton (N) | Kilogram force (kgf) |
| SPZ | 56to95 | 13to20 | 1.3to2.0 |
| | 100to140 | 20to25 | 2.0to2.5 |
| SPA | 80to132 | 25to35 | 2.5to3.6 |
| | 140to200 | 35to45 | 3.6to4.6 |
| SPB | 112to224 | 45to65 | 4.6to6.6 |
| | 236to315 | 65to85 | 6.6to8.7 |
| SPC | 224to355 | 85to115 | 8.7to11.7 |
| | 375to560 | 115to150 | 11.7to15.3 |

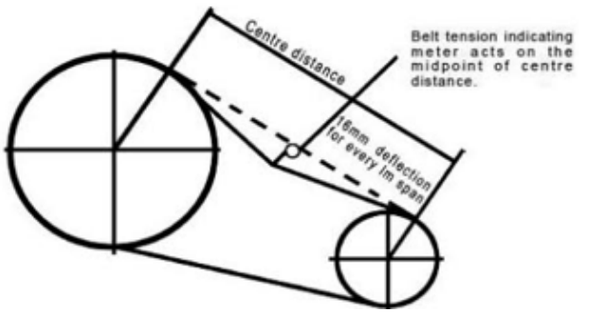



Figure 4.2 Criteria and Measurement Method for Belt Tension

## 4.5 Electrical Connection

The wiring for direct start and star-delta start of motor can be made by the customer according to the wiring diagram (dashed line) shown in Figure 4.3 or 4.4. It is not included in the standard configuration.

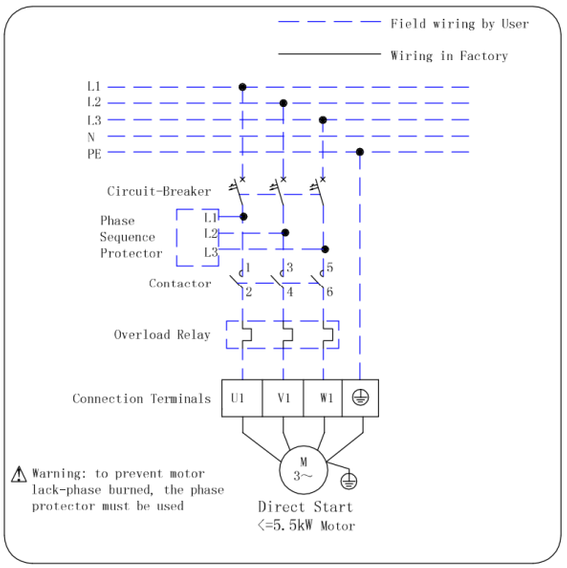



Figure 4.3 Schematic Diagram – Direct Start

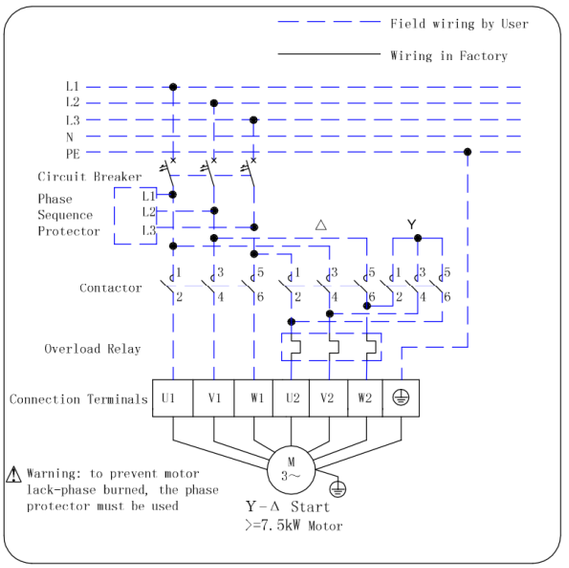
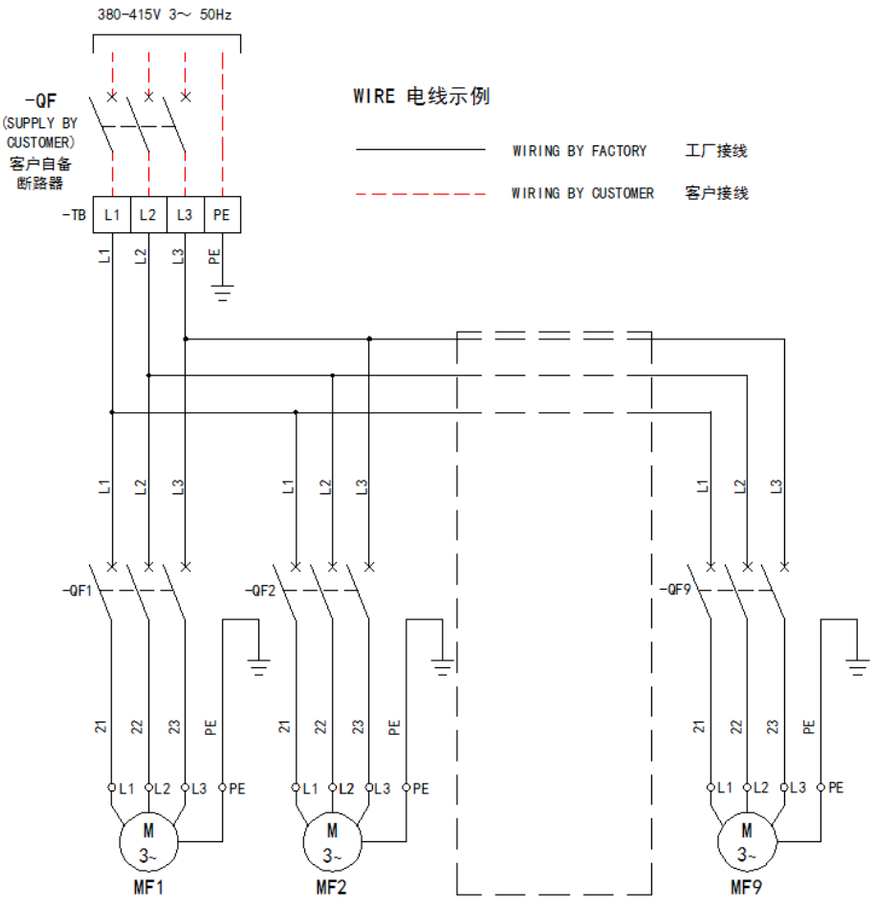



Figure 4.4 Schematic Diagram - Y-△ Start (≥ 7.5KW Motor)

1) The electrical wiring shall be in compliance with the local regulations on electrical installation.
2) The grounding points provided on the machine shall be connected to the grounding terminals inside the control box.
3) Check if the power supply is consistent with the nameplate and take suitable safety measures for the power supply.
4) The “Phase Sequence Protector” shall be installed and connect its normally open contact to the AC contactor in order to avoid motor burn down due to phase loss.
5) All the function segments, e.g., electrical heating segment, steam heating segment (evaporative humidification) shall be interlocked with the fan.
6) Before running the machine, check each neutral line of the PTC electrical heater and measure its resistance. Make sure the resistance between the input terminal of the neutral line of the electrical cabinet and the short-circuit copper of each neutral line of the electrical heater is ≤1 Ω.
7) The motor starter equipped by customer should have the function of short-circuit protection, thermal overload protection, phase failure protection, overvoltage/under voltage protection, power indicator, operation indication, failure indication.

## 4.6 EC Fan Segment Electrical Connection

The wiring of EC fan segment can be made by the customer according to the wiring diagram (red dashed line) shown in Figure 4.5.



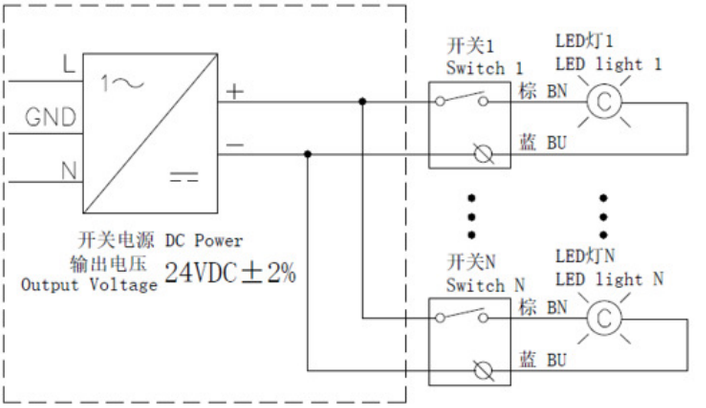

| CODE 代号 | DESCRIPTION | 描述 |
|---|---|---|
| QF | USER CIRCUIT BREAKER | 客户自备断路器 |
| QF1～QF9 | CIRCUIT BREAKER | 断路器 |
| TB | TERMINAL BLOCK FOR USER | 客户接线端子 |
| MF1～MF9 | FAN MOTOR | 风机电机 |

Figure 4.5 Schematic Diagram – EC Fan Segment

NOTES:

1. Figure 4.5 shows the power supply wiring diagram of the EC fan in common use. The fans number is 1~9 (the dotted box indicates that 9 fans are not listed entirely, and the wiring of fans in dotted box is the same as MF1, MF2 or MF9), circuit breaker number (QF1 to QF9) depends on the fans' number.
2. The control type wiring for fan speed regulation and communication is handled by users according to the port type and control function of the EC fan.

## 4.7 LED moisture-proof lamp electrical connection




Parts in the dotted line box are provided or selected and connected by the user

Figure 4.6 Schematic Diagram –Service Light Wiring

## 4.8 Startup

Precautions for startup:

- Always open the coil vent valve to vent air before starting the air handling unit.
- The unit can be started after all parts are checked with normal status, first step is to jog the machine to start the blower fan, and check its rotation direction. If fan impeller rotates in opposite direction, the machine should be stopped to exchange the phase sequence of power supply, then reconnect it. Machine can be switched on for operation without abnormal conditions.
- Monitor the operating current of the motor and compare it with the parameters on the nameplate of the motor, operation current recommended should be lower than the 90% current of motor nameplate. If the motor is overloaded, stop the machine immediately, identify the causes and take rectification measures before restarting the machine.
- Adjustment of damper blades shall be done under the condition that the operating current of the motor is lower than nameplate value.
- To start the machine, always first switch on the fan, then turn on the heater, the cooling/heating coil and the humidifier. To stop the machine, always first close the hot/cold water pipelines, steam pipelines, then turn off the humidifier and the heater, finally switch off the fan. This can avoid damages to the components of the air handling unit caused by an excessive high or low temperature inside the machine.
- While the air handling unit is running, the water pressure shall not exceed 1.6Mpa and the steam pressure shall not exceed 0.4Mpa.
- Observe if any shock absorbers is abnormal during operation of the machine.
- Never close an inlet/outlet damper suddenly when the fan is running normally. Otherwise, the cabinet structure may be damaged due to an excessive pressure.
- When the air handling unit is shut down due to a sudden loss of power, make sure to close the hot/cold medium pipelines immediately to prevent the cabinet from becoming an “oven” or a “refrigerator” due to an excessive high or low temperature inside the cabinet.
- To use the heating function in cold winter areas, first run the heater for 5-10 minutes and then start the fan to prevent formation of ice clogging inside the coils due to a large volume of cold air. To stop the machine, first close the fresh air damper and keep the hot water flowing inside the coils continuously to prevent the coil from being frozen. Then turn off the heating and steam coils and drain up the residual water inside the coils. Finally turn off the blower.

- If there is no abnormality found after the air handling unit is running for 24 hours, it is required to shut down the machine to re-adjust the belt tension.

**In case of any problem found during the startup process, disconnect the power supply immediately and identity the root causes.**

## 4.9 Field Test

If the machine operates normally, field test of “air flow, air pressure and input power” can be conducted according to Appendix B of GB/T14294 standard.

# 5. Maintenance

## 5.1 Routine Check for Air Handling Unit

Designate professional personnel to conduct maintenance, routine monitoring and regular service for the air conditioning unit. It is required to formulate a strict job responsibility system and relevant operating procedures to strengthen regular maintenance and inspection.

After putting the air conditioning unit into service, please conduct routine maintenance and service according to Annex 1.

## 5.2 Maintenance for Components

### 5.2.1 Service and Maintenance of Fan

Please pay attention to the following items when running a dual fans air conditioning system:

1) Maintain a negative pressure in the fresh air ducts and air mixing chamber of the air conditioning system, and maintain a positive static pressure at the exhaust outlet. Otherwise, fresh air can not enter the system, return air can not enter the air mixing chamber and exhaust air can not be discharged.
2) For a system requiring a positive static pressure in an air-conditioned room, always keep the total supply air volume being greater than the total return air volume.
3) If it is impossible to stop the system when one of the fans fails, the system can be operated according to the following emergency plan:
   - If the return air fan in the air conditioning system fails, the supply fan in the system will perform both air supply and air return functions. In this case, the exhaust damper shall be closed. Otherwise, fresh air will be sucked in from the fresh air inlet and the exhaust outlet simultaneously. The volume of return air will be reduced due to the resistance in the air return duct.
   - When the supply fan in the air conditioning system fails, the return air fan will perform the functions for operation of the system. In this case, the fresh air inlet and the exhaust outlet shall be closed to prevent leakage of the return air from the fresh air inlet and the exhaust outlet. Now the system will be a pure return air circulation system without supplement of fresh air.

**Caution: Power supply must be shut off before getting into any fan segment so as not to be injured.**

### 5.2.2 Service and Maintenance of Bearing

1) For the technical data of the bearing, please refer to the corresponding catalogue.
2) To install and disassemble the bearing, please refer to the instructions provided by the bearing manufacturer.
3) Keep the motor clean and circulation of air.

### 5.2.3 Maintenance and Lubrication of Bearing

1) For the fan with grease nipple, it is necessary to lubricate the fan bearing with grease periodically after the unit has been running for a period.
2) The grease lubricating interval time in the following table is based on 8-10 hours running per day. If the unit runs 24 hours per day, the bearing maintenance time should be halved. When the operation time is different, It should be calculated in proportion. The reliable interval time is adjusted according to project application experience on site and experiment data, if grease is found to be oxidized seriously and black or lacking, interval time should be halved; if grease is founded to be normal, interval time can be prolonged. The grease lubricating interval time shouldn't be adjusted optionally after confirmation to avoid unnecessary damage to bearing.

| Operation Temp. ℃ | Grease Lubricating Interval Time | | | Bearing |
|---|---|---|---|---|
| | Clean | Dusty | Dusty&Damp | |
| ＜50 | one year | 6 months | 3 months | Normal Bearing |
| 50~60 | 8 months | 4 months | 2 months | |
| 60~70 | 6 months | 3 months | 30 days | |
| 70~85 | 5 months | 2 months | 20 days | |
| 85~100 | 4 months | 30 days | 15 days | |
| 100~120 | 30 days | 15 days | 5 days | high-temperature bearing |
| 120~150 | 15 days | 5 days | 2 days | |
| 150~180 | 7 days | 2 days | 1 days | |

Table 5.1 Grease Lubricating Interval Time Table

3) It should be noted that if the user selects a grade of grease for lubrication, it is necessary to keep using the grade of grease. If changing the grease grade, it is easy to cause the bearing failure. When using other greases is unavoidable, it should be at least the same type (thickener) as the initially lubricated grease. When refueling, and the old grease should be drained thoroughly before lubricating.
4) Lubricating grease method: clean lubricating nipple and the surrounding parts, grease gun firstly; fill the grease gun with clean grease, the shaft should keep rotating while lubricating grease slowly, stop lubricating while there is fresh grease overflowing on the dust cover stop the fat liquoring, then turn the wind wheel by hand quickly to remove excess grease, then cover the bearing seat nozzle after lubricating grease.
5) If the interval time from shipped out till the first time operation exceeds half a year, the grease must be replaced before operation.
6) The fan without seat bearing is equipped with a bracket damping rubber ring. The bearing which has been pre-lubricated is a maintenance-free bearing. It does not need to lubricate grease. If there is abnormality, replace the bearing directly.
7) Please refer to the following table for different brand bearing grease information, fan type can be found on unit nameplate.

| 风机品牌 Fan Brand | 风机系列 Fan Type | 轴承型号 Bearing | 润滑脂牌号 Lubricating Grease |
|---|---|---|---|
| 亿利达 Yilida | SYD-K | PEER HCP206~212 | Mobil Polyrex EM |
| | SYQ-R/SYQ-A | PEER HCP205-25mm~HCP210-50mm | Mobil Polyrex EM |
| | SYQ-K | NSK UKP207+H2307X~UKP215+H2315X | ALVANIA RL2 |
| | SYQ-Z | GLH SNG509+22209K+H309~SNG519-616+22219K+H319 | Gadus S2 V100 2 |
| 康美风 Comefri | TLZ/THLZ/VTZ-T | SY 25 FM~SY 60 FM | MOBIL（Mobilux EP3） |
| 科禄格 Kruger | FDA | UKP206~UKP218 | ALVANIA No.2 /GOLD No.3 |
| | BDB | UKP207~UKP218 | ALVANIA No.2 /GOLD No.3 |
| | | SNL518~SNL520 | LGMT 3 |

Table 5.2 Lubricating Grease Table

8) For a fan bearing that requires refilling grease (lubricant) regularly, make sure to open the bearing box cover at least once a year, even if the fan is operating normally, to carry out the following checks (except for the bearing unit) :

If the surface and each part of the bearing surface is free of damages and cracks.

If the matching surface between the bearing outer ring and the bearing box is correct and if movement of the free end is normal.

If the centers of the shaft and the bearing seat are aligned correctly, if the screws are loose and if the clearance adjustment shims are normal. Replace grease according to the requirements after cleaning the bearing. Please motor bearing maintenance guideline in the following tables:

| Motor Brand | | Wolong Motor | | | Huali Motor | | ABB Motor | | SIEMENS Motor | |
|---|---|---|---|---|---|---|---|---|---|---|
| Item | Motor frame size | grease Nozzle | Service life/refill grease interval time(regular maintenance) | | grease Nozzle | Service life/refill grease interval time(regular maintenance) | grease Nozzle | Service life/refill grease interval time(regular maintenance) | grease Nozzle | Service life/refill grease interval time(regular maintenance) |
| | | | 2 Poles | 4/6 Poles | | | | | | |
| | 80 | Without | 10 years | | Without | 15000hrs | Without | 20000hrs | Without | 20000hrs |
| 2 | 90 | Without | 10 years | | Without | 15000hrs | Without | 20000hrs | Without | 20000hrs |
| 3 | 110 | Without | 10 years | | Without | 15000hrs | Without | 20000hrs | Without | 20000hrs |
| 4 | 112 | Without | 10 years | | Without | 15000hrs | Without | 20000hrs | Without | 20000hrs |
| 5 | 132 | Without | 10 years | | Without | 15000hrs | Without | 20000hrs | Without | 20000hrs |
| 6 | 160 | with | 2000hrs | 4000hrs | with | 5000hrs | Without | 20000hrs | Without | 20000hrs |
| 7 | 180 | with | 2000hrs | 4000hrs | with | 5000hrs | Without | 20000hrs | Without | 20000hrs |
| 8 | 200 | with | 2000hrs | 4000hrs | with | 5000hrs | Without | 20000hrs | Without | 20000hrs |
| 9 | 225 | with | 2000hrs | 4000hrs | with | 5000hrs | Without | 20000hrs | Without | 20000hrs |
| 10 | 250 | with | 2000hrs | 4000hrs | with | 5000hrs | with | 6500hrs | Without | 20000hrs |
| 11 | 280 | with | 2000hrs | 4000hrs | with | 5000hrs | with | 6500hrs | Without | 20000hrs |
| 12 | 315 | with | 2000hrs | 4000hrs | with | 5000hrs | with | 6500hrs | with | 3000hrs |

Note: Free of maintenance for motors without grease nozzle.

| Dongguan Motor | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Motor frame size | Oiling | RPM (r/min) | | | | | | |
| | | 3600 | 3000 | 1800 | 1500 | 1200 | 1000 | 900-500 |
| | | Working Time (h) | | | | | | |
| 80-132 | Without | / | / | / | / | / | / | / |
| 160-180 | 30g | 2400 | 3400 | 6000 | 7000 | 8000 | 9000 | 10000 |
| 200-225 | 50g | 1100 | 2400 | 5200 | 6200 | 7200 | 8200 | 9500 |
| 250-280 | 70g | 1000 | 2200 | 3800 | 4800 | 5400 | 6400 | 8000 |
| 315-355 | 100g | 600 | 1000 | 2000 | 3000 | 4000 | 5000 | 6400 |

Table 5.3 Motor Run and Maintenance Interval Time Table

### 5.2.4 Precautions on Operation of Coils

1) If the air handling unit is used in outdoors or an area with a risk of freezing in winter, make sure to drain up the liquid by using the drain valve at the bottom of coil before winter to avoid breakage of the coil tubes. The hot water coils shall be drained up when the machine is not used in winter.
2) For a fresh air unit, make sure to close the fresh air damper if the machine don't operate at night in winter, and keep hot water flowing in the coils continuously. It is not suitable to install electric valves for the water supply/discharge pipes of the fresh air handling unit.
3) The coils shall use treated water as much as possible to avoid corrosion and degradation of performance effectively.
4) Before starting unit, discharge the air in coil by turning on the vent valve on coil, and keep the cool/hot water in coil flowing normally.
5) Check the scaling status on coil fins, and clean it asnecessary.
6) Total maintenance is necessary to take after 2~3 years operation, cleaning scaling in heat exchange tubes by mechanical method to keep heat exchange efficiency.
7) Inject water into water trap fully.

### 5.2.5 Use and Maintenance of Steam Heating Coil

Please pay attention to the following items during operation of the steam heating system:

1) Adjust the steam pressure relief device correctly to keep a relatively stable steam pressure for heating air and avoid excessive pressure fluctuations. During operation of the heating system, if the fluctuations of steam supply pressure are too intensive and frequent, the air temperature to be proceed by the coil will fluctuate frequently and difficult to keep stable.
2) Prevent internal leakage of the valves in the steam pipelines of the heating system (including cut-off valves, electric control valves), in order to avoid maladjustment of the air supply temperature in the heating coil. Normally it is not easy to identify internal leakage (i.e., leakage through the valve body spool) occurring in the heating system, either in an electric control valve (or manual control valve), or a bypass valve. Once leakage occurs, particularly when the air volume to be heated is small or there is no need to heat air that will cause heating malfunction. It, if used to adjust the supply air temperature, will not be able to satisfy the required adjustment parameters.
3) Before starting the heating system, make sure to check all the valves in the system and set them in the desired on/off position respectively. Then drain up the condensation water accumulated inside the coil through the bypass pipe of the steam trap or the flushing pipe located upstream of the steam trap, so as to prevent slow temperature rise or capability decreasing of the heating system.
4) During operation of the heating system, never open the bypass pipe for heating adjustment and the valve on the bypass pipe of the condensate trap in order to avoid heating malfunction.
5) Check if the surface temperature of the coil is generally uniform while running. If there is a large temperature difference between the upper part and the lower part of the coil surface, it may be caused by excessive condensation water accumulated in the lower part of the coil. Therefore, it is required to drain up the condensation water to recovery normal operation.
6) Pay attention to operation of the coil and prevent the air conditioned room from becoming too wet due to steam leakage in the coil body or at the connections.

### 5.2.6 Maintenance and Replacement of Filter

After being used for a period, the filter may accumulate a lot of dust and solid particles on the surface, which, once reaching a certain amount, will affect the filtering effect and increase the internal resistance of the air handling unit. When the resistance reaches the final resistance of the filter, it is required to replace or clean the filter accordingly. For the final resistance of various filters, please refer to the table below.

| Filter Class | Final Resistance(Pa) |
|---|---|
| Plate Filter,G1/G3/G4 | 200 |
| Plate Filter,F5 | 250 |
| Bag Filter,G3/G4 | 200 |
| Bag Filter,F5/F6/F7/F8 | 250 |
| HEPA Filter,F9 | 350 |
| HEPA Filter,H11 | 450 |
| HEPA Filter,H13 | 500 |

Table 5.4 Filter Final Resistance

See 3.10 for assembly and disassembly of the filter as well as precautions.

### 5.2.7 Operation and Maintenance of Electric Heater

Please pay attention to the following items while the electric heater of the air conditioning system is running:

1) There is an overheating protection switch located downstream of the electric heater. Make sure to connect this overheating protection switch into the control circuit of the power supply for the heater so that the power supply can be disconnected when the electric heater exceeds the predefined temperature.
2) Never connect the power supply to the electric heater before starting the fan of the air conditioning system. Always turn off the electric heater before stopping the fan of the air conditioning system.
3) If the electric heater and the fan are interlocked in the air conditioning system, pay attention to operation of the fan to avoid such situation that the fan pilot lamp in the control system is still lit even when the fan stops running (e.g., the belt is broken). In such situation, make sure to cut off the power supply for the electric heater immediately.
4) During operation of the air conditioning system, if there is an abnormal burnt odor in the air-conditioned room or the system, cut off the power supply for the heater first, and check if the electric heater is abnormal. Make sure to identify and eliminate the root causes before operating the system.
5) Check the system frequently during its operation. If the temperature in the air conditioned room is always below the required value when the system is operating normally, a possibility of short circuit in the electric heater shall be considered. Cut off the power supply and check the electric heater first. Then take rectification measures before re-operating the system.
6) If the electric heating air conditioning system is equipped with a function of “power off if no air supply” (i.e., overheating protection), make sure to check the condition and sensitivity of the overheating protection switch (or the electric contact thermometer) frequently, and take rectification measures immediately if any abnormality detected.

### 5.2.8 Maintenance of Evaporative Humidification System

When the air conditioning system is using an evaporative humidification function, the operator shall pay attention to the following items:

1) The evaporative humidifier shall be interlocked with the fan. Always turn on the fan first whenever practical and let it run for 5 minutes before starting the evaporative humidifier. To stop the machine, turn off the fan only after the evaporative humidifier has stopped water supply for 15 minutes.
2) For application in winter, the evaporative humidifier shall be used with the heater simultaneously. Never start the evaporative humidifier when the fresh air handling unit is operating without any heat source at an outdoor temperature below 5°C, in order to avoid damages.
3) The water distribution rate of the evaporative can be adjusted by the user according to actual needs. First open the access door of the humidification segment and then adjust the water distribution rate by using the manual valve of the water supply pipe or the humidification control. It is an ideal water distribution effect when a small amount of water penetrates the humidifier and flow into the drain pan evenly and stably.
4) For an evaporative humidifier with a straight drainage function, pay attention to observe if the drainage capacity and the water distribution rate are matching while adjusting the water distribution rate. If there is an obvious accumulation of water in the drain pan, reduce the water distribution rate to avoid overflow that may affect normal operation of the system.
5) The filter located upstream of the evaporative humidifier features a protection function, and shall be cleaned or replaced regularly during operation. Never remove the filter for purpose of reducing the resistance in the system. That may cause clogging of water system.
6) It is recommended to remove the evaporative module to clean it before and after the winter. Flush the evaporative humidifier repeatedly along the pore direction by using clean tap water.
7) Replace the evaporative module promptly if severe clogging or corrosion damage occurs.

### 5.2.9 Operation and Maintenance of Humidification system

1) Water filter at inlet pipe should be equipped for humidifier adopting water to ensure the normal work of the machine.
2) The electric power and water intake valve equipped of humidifier shall not be connected with public utilities directly.
3) Measures of frostbite prevention and heat preservation used in freezing areas should be taken for the inlet and outlet pipes. If the humidifier won't operate for a long time in winter, the water in the machine and pipes should be drained to avoid frost crack of the water storage parts and pipes.
4) Rainproof measure should be adopted when humidifier is installed outside.

### 5.2.10 Unit Maintenance Space

Normal maintenance or repair is necessary in unit lifetime, so use or field creation of unit maintenance space should follow the rules below.

1) Open the access door belonging to the function segment or adjacent segment;
2) Disassemble access door or panels belonging to the function segment or adjacent segment.
3) Disassembly access door or panels or not should be evaluated based on actual needs of the unit.

## Annex 1 Checklist of Routine Maintenance for YSM Air Handling Unit

| Component | 1 Month | 3 Months | 12 Months | Others | Item |
|---|---|---|---|---|---|
| Cabinet | √ | | | | Check if it is clean inside the machine. |
| | | | | 6 Months | Refill lubricant for the moving components, e.g., access doors, damper levers. |
| | | √ | | | Check if the sealing strip of the access door is intact and elastic and if the access door is free of deformation. |
| | | | | 6 Months | Check if the anchor bolts are loose and the foundation is in poor condition. |
| Fan/Motor | | | | Routine | Check if the transmission components (e.g., supply fan, return fan) are functional and measure the temperature of the fan bearing (approx. 60-80°C). |
| | | √ | | | Check if the instruments (e.g., ammeters, voltmeters, tachometers) are defective and if the displays are abnormal. |
| | | | | Routine | Check and record the three-phase operating current of the fan, and make sure it does not exceed the rated current and the three-phase unbalance is less than10%. |
| | √ | | | | Check the belt tension. |
| | | √ | | | Refill lubricant for the bearing of the fan/motor (except for a maintenance-free bearing). |
| | | √ | | | Check if the vibration isolator of the fan is normal, and replace it if necessary. |
| | | √ | | | Check the transmission components for the fan/motor. |
| | | √ | | | Check if the locking screws of the fan/motor are loose. |
| | | | √ | | Clean the volute and impellers of the fan and apply anti-rusty oil on the shaft. |
| | | | √ | | Check if the fan bearing is in good condition, and replace it if necessary. |
| | | √ | | | Check the shaft seal ring (e.g., V seal ring), and replace it if necessary. |
| | | | √ | | Check the belt for wear, and replace it if necessary. |
| Coil | | | | Routine | Check if the drainage system of the air handling unit is normal and if it is necessary to refill the drainage trap. |
| | | | | Routine | Check if the accessories on the pipelines in the cooling / heating water system and steam system are normal. |
| | √ | | | | Vent air from the coils. |
| | √ | | | | Check and clean the drain pan under the coils (during operation in summer). |
| | | √ | | | Check if the filter is dust or clogged, and clean it accordingly. |

| | | | | | |
|---|---|---|---|---|---|
| Coil | | √ | | | Check if the water separator for compressed air is dirty or clogged, and clean it accordingly. |
| | | | √ | | Check and clean the surface of the cooling/heating water coils (flush it by using HP tap water). |
| Filter | | | | Routine | Check and record dust accumulation of the primary, medium and high-efficiency filters and if the pressure difference is normal. |
| | | | | Routine | Clean dust accumulated in the filter segment and check if there is leakage on the pulse jet device. |
| | | | | Routine | Check if the jet-type compressed air filter is functional. |
| | √ | | | | Check the condition of the high-efficiency filter cartridge. |
| | √ | | | | Check the primary efficiency filter, and clean or replace it accordingly. |
| | | √ | | | Check if the medium efficiency filter is damaged and if the resistance exceeds the upper limit, and clean or replace it accordingly. |
| Others | √ | | | | Check if the evaporative humidifier is functional, and clean it if necessary. |
| | √ | | | | Check if the electrode-type humidifier is functional, and clean the humidification barrel accordingly. |
| | | √ | | | Check if the Moisture-proof light and its switch is in good condition. |
| | | √ | | | Check if the drainage valve of the heating/humidification steam system is functional, and clean it accordingly. |
| | | | √ | | Clean the sound attenuator and check if there is any deformation or server damage. |
| | | | √ | | Check if the opening of the canvas for the fan interface is intact. |
| | | | √ | | Replace the humidification barrel or electrode of the electrode-type humidifier. |
| | √ | | | | Check rotation and tightness of the blade of the damper, and clean and lubricate it promptly. |
| | √ | | | | Check whether each EP module is working normally, clean dust collector. |

## Annex 2 Troubleshooting List

| Problem | Possible Cause | Countermeasures |
|---|---|---|
| Noise | Fan impeller friction | Adjust and correct the contact position. |
| | Fan impeller deformed or damaged | Replace the fan. |
| | Fan bearing | Impurities fall into the bearing. Clean the bearing. |
| | | The bearing has cracks or damages. Replace the bearing. |
| | | Lubricant volatiles. Refill lubricant. |
| | | The shaft is worn out. Replace the shaft. |
| | Fan surge | The model selection of the fan is not suitable. Change the air volume or pressure. |
| | | The duct system is defective. Re-modify the system. |
| | Poor duct connection | Re-adjust it. |
| | Impurities in duct | Clean it. |
| | Excessive air velocity, calculation error of duct resistance | Adjust the motor speed by replacing the pulley (adjust the frequency of the inverter, if equipped). |
| | Motor not work or under speed | Missing phase. Cut off the power supply to repair the problem immediately. |
| | | The rotor circuit is broken or has poor contact. Cut off the power supply to repair the problem immediately. |
| | | The motor or the motor-driven pump/fan is jammed. Cut off the power supply to repair the problem immediately. |
| | | The stator winding is connected incorrectly. Re-connect it according to the requirements. |
| | | There is a short circuit in the motor or wiring. Cut off the power supply to repair the problem immediately. |
| | | The actuating current set for the short-circuit protection device is too small. The time limit set for the overload protection device is insufficient. |
| | Belt damaged | Replace the belt. |
| | Sudden change of motor noise, sudden increase/decrease of current | One phase in the stator circuit is cut. |
| | | There is a system voltage drop. |
| | | There is a short circuit among the windings. |
| | | The driven device is defective. |

| Problem | Possible Cause | Countermeasures |
|---|---|---|
| Vibration | Vibration isolator broken or severely deformed | Replace the Vibration isolator. |
| | Impeller unbalanced (with deposit) | Sweep the impellers. |
| | Bearing damaged | Please refer to the item of temperature rise under “Noise” |
| | Shaft worn | Replace it. |
| | Belt slippage | Adjust the belt tension. |
| | External vibration transferred to fan | Use an anti-vibration pad and a flexible duct to prevent vibration. |
| | Excessive air velocity, calculation error of duct resistance | Adjust the motor speed by replacing the pulley (adjust the frequency of the inverter, if equipped) |
| | Dis-alignment of motor axis and motor-driven fan axis | Align the two axes concentrically. |
| | Looseness of motor components | Check and adjust it. |
| Air Volume Insufficient | Designed static pressure too small | Re-evaluate the design. |
| | Air duct leakage | Check if the split connecting surface, end surface damper, flange and other parts with leakage risks are sealed tightly. |
| | Damper opening too small | Adjust the opening of the damper. |
| | Fan rotation direction error | Make the wiring in a reverse direction and correct the error immediately. |
| | Speed decrease due to triangle belt slippage | Adjust the tension of the triangle belt. |
| | Severe filter clogging | Clean or replace the filter. |
| | Severe coil dust accumulation and clogging | Clean the coils. |
| | Short circuit | There is air leakage and short circuit at the air inlet/outlet partition board of the fan. |
| Current Overload | Triangle belt overtighten | Adjust the tension of the triangle belt. |
| | Motor selection unsuitable | Change a motor model. |
| | Designed static pressure too large | Reduce the speed. |
| | Poor function of adjusting valve | Re-adjust it. |
| | Motor failure | Repair or replace it. |
| | Cyclic current change | The copper (aluminum) strip of the squirrel cage rotor is damaged. |
| | | The weld head of the wound rotor winding is damaged. |
| | | The slip ring short circuit device or rheostat of the wound motor has poor contact. |
| Others | Motor spark or smoke | Adjust the bearing. |

| Problem | Possible Cause | Countermeasures |
|---|---|---|
| Others | Water accumulation | The copper (aluminum) strip of the squirrel cage rotor is broke or has poor contact. |
| | | Check if the drainage trap is designed correctly and the pressure inside the air handling unit exceeds the limit. |
| | | Check if the height of the foundation is sufficient. If not, select a float-ball water seal. |
| | Dewdrop | Check if there is air leakage at the dewdrop position and if there is a cold bridge effect. |
| | Water splash | Reduce the air velocity. Provide a water eliminator when the velocity is greater than 2.5m/s. |

## Annex 3 Spare Parts and Wearing Parts

In order to ensure smooth running of the air handling unit, it is recommended to reserve a certain number of related spare parts and wearing parts for emergent situations.

1、 Routine Repair

Make sure to reserve a sufficient quantity of spare filters required for operation of the machine in one year.

Each air handling unit shall be equipped with:

——6 sets of primary efficiency filter

——3 sets of medium efficiency filter

The quantity listed above may vary from different situations.

2、 Major Repair

Each device shall be equipped with a certain number of the following spare parts on the project site. For example, one spare part shall be reserved for every 10 operating parts

| Location | Description of Part | Required QTY |
|---|---|---|
| Fan | Motor | 1 pcs |
| | Fan bearing | 2 pcs |
| | Vibration isolator | 3 sets |
| | Motor pulley | 1 set |
| | Fan pulley | 1 set |
| | Drive belt | 3 sets |
| | Air outlet flexible duct | 1 set |
| Damper | Complete damper blade | 2 pcs |
| | Connecting bar | 2 pcs |
| | Wind shield | 5 pcs |
| | Manual control device | 1 pcs |
| Coil | U-bend | 20 |
| | Vent valve/plug | 1 for each |
| HP Spray Humidifier | Water pump | 1 pcs |
| | Nozzle(with screwing device) | 10 |
| Others | Insulation gasket (5mm thickness) | 5000mm |
| | Polyethylene insulation board | 5$m^2$ |
| | Coil comb | 1 pcs |
| | Door lock | 2 pcs |
| Optional Devices | Flexible pipe for water pipeline | 1 pcs |
| | Service Light | 1 pcs |
| | Viewport and related gasket | 1 pcs |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**This manual is for reference only. For the specific product specifications and performance,
Please refer to the purchase agreement.

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