

PRO  
TICA PRO



***TICA CENTRAL AIR-CONDITIONING  
TAE/TBE MODULAR AIR HANDLING UNIT***

# Established in 1991

TICA is a professional enterprise specialized in R&D, manufacturing, sales and services of environment cleaning and thermal energy utilization.

TICA is a national high-tech enterprise, a single leading enterprise cultivated by the Ministry of Industry and Information Technology, a national brand cultivation enterprise of the Ministry of Industry and Information Technology, and a vice chairman member of China Refrigeration and Air-conditioning Industry Association. It has a national-recognized enterprise technology center, an enterprise academician workstation, and a post-doctoral research workstation. Its projects cover Beijing Bird's Nest Stadium, Water Cube, Wukesong Indoor Stadium, PetroChina, Sinopec, State Grid, Nanjing Panda, Hangzhou Xiaoshan International Airport, Hainan Airlines Group, Shangri-La Hotel, Manila Ocean Park, Abu Dhabi Al Muneera, SM City in Philippines and Unilever, etc.

TICA is also the outstanding provider of central air conditioners for China's subway networks and has successfully served nearly 60 key subway lines in major cities such as Beijing, Shanghai, Guangzhou, Shenzhen, Chengdu, Suzhou, Hangzhou and Tianjin. TICA is a professional supplier and service provider in China that specializes in system integration of clean environment. While for microelectronics, hospital operating rooms, biopharmaceutical industry and other professional purification areas, our market share has achieved over 40% in each.

## TICA Quality For IAQ

TICA focuses on indoor air quality (IAQ) in clean environments. Product lines include return air purifiers, heat recovery ventilators, fresh air purifiers, air purifiers, as well as the clean air handling units and digital variable-capacity air handling units used in the professional purification field. Regarding core technology, TICA established an ISO class 1 super-clean environment integration system and won the first prize of CMIST.

TICA's product lines include modular chillers, VRF units, screw chillers, centrifugal chillers, and ORC low-temperature waste heat power generation systems. In 2015, TICA and United Technologies Corporation (UTC) established a global strategic joint venture cooperation relationship and acquired PureCycle, an ORC low-temperature power generation company owned by Pratt & Whitney under UTC. TICA obtained PureCycle trademarks and more than 100 patents and national copyrights. TICA's efficient centrifugal chillers, water-cooled screw chillers, and air-cooled screw chillers are manufactured with the technical license of Carrier under UTC.

TICA is characterized by excellent system integration capability. In the application of "Efficient Refrigeration System of Underground Railway Station", the integrated COP of the refrigeration room amounts to 6.0, and the research achievement reaches the international advanced level. In 2018, TICA merged and acquired an OFC central air conditioning enterprise **SMART**. TICA's excellent system integration capability and the **SMART** OFC water chillers help increase the integrated COP of the efficient equipment room to 6.7 to 7.0.

TICA---We're striving.

TICA aims to build itself into a world-leading system integration supplier and service provider that specializes in clean environment and thermal energy utilization.



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TICA owns five production sites in Nanjing, Tianjin, Guangzhou, Chengdu and Kuala Lumpur, and a network of over 70 sales and branches around the world.

Its Nanjing HQ base received 3-star certification for national No. 001 green industrial construction.



Malaysia Base



Nanjing Headquarter



Tianjin Base



Guangzhou Base



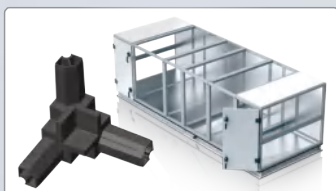
Chengdu Base

# Professional Design

## Patented cabinet

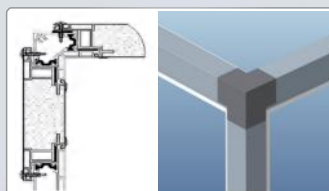
The panel is smoothly connected to the frame, with edges sealed with silicone strips to prevent dust and water accumulation.

The 3D drain pan is designed with double V-shaped structure and longitudinal grade to ensure condensate water is drained quickly. This avoids development of bacteria, therefore enabling the unit to meet sanitary requirements.



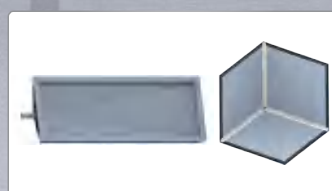
## Cold bridge proof design

Patented cold bridge proof structure: The aluminum profile with rolled nylon strip, rubber angle bracket, and new access door, are combined to make the unit more insulated and elegant. The cold bridge coefficient reaches the TB2 grade of the European air processing standard EN1886.



## Excellent thermal insulation performance

The sandwich-like cabinet panel is made of internal and external double-layer steel plates and polyurethane with low thermal conductivity through one foam molding with new generation 0-ODP environment-friendly foaming agent. The foaming density is greater than or equal to 48 kg/m<sup>3</sup>. The thermal insulation performance of the cabinet reaches the T2 grade of the European standard EN1886.



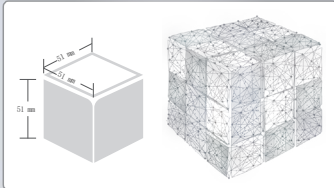
## Applications in purifying industry

The panel is smoothly connected to the frame, with edges sealed with silicone strips to prevent dust and water accumulation.

The 3D drain pan is designed with double V-shaped structure and longitudinal grade to ensure condensate water is drained quickly. This avoids development of bacteria, therefore enabling the unit to meet sanitary requirements.

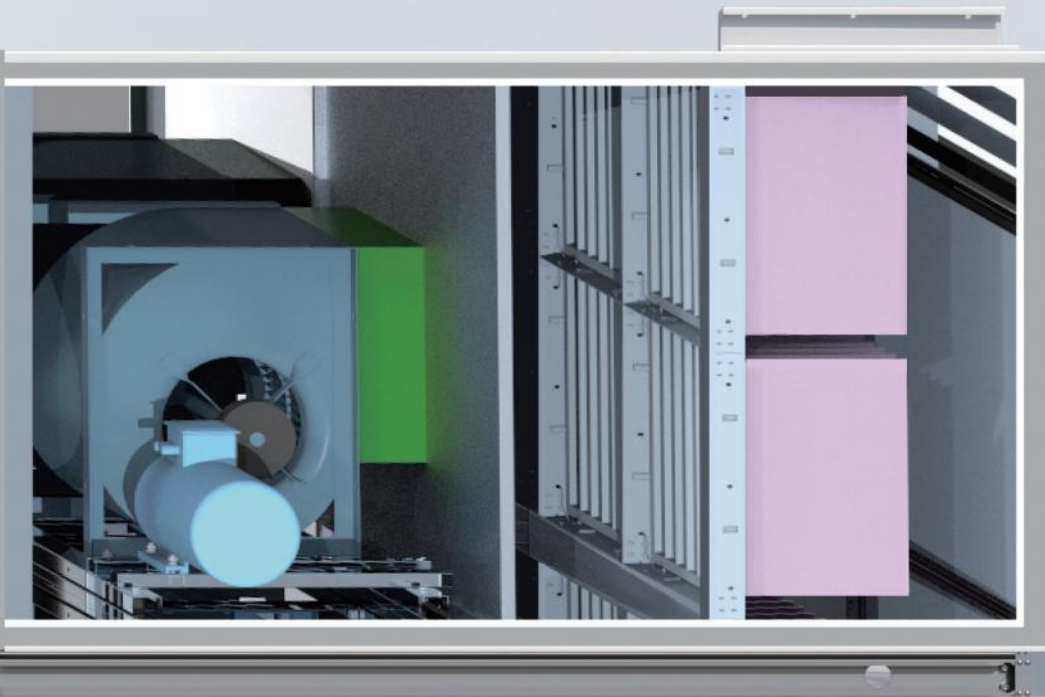
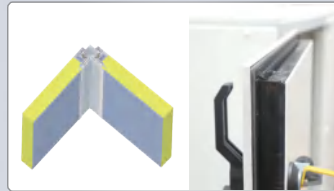
### Micro modular design

Featuring 51 mm per modulus, the unit is compact, with high utilization rate of the cabinet. With more precise control over its air flow, the unit can better meet the needs of customers.



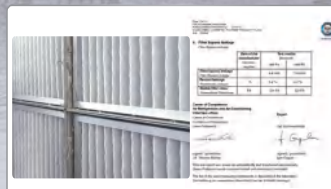
### Good air tightness

Between the patented cabinet and frame, there exists a three-layer airtight structure. The access door is provided with double-layer liquid foaming sealing. Therefore, the air leakage rate of the cabinet reaches the L1 grade of the European air processing standard EN1886, and is kept below 1% in accordance with GB/T14294.



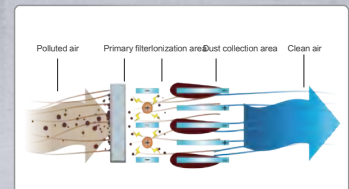
### High-efficiency heat exchanger selected by professional software

The heat exchanger is designed by using professional AHRI-certified models to ensure performance consistency between the selected model and real device. The coil is integrated with quality RoHS-certified copper tubes and hydrophilic aluminum fins through the advanced mechanical expansion tube process. The coil passes air tightness test before delivery to ensure no leakage.



### Highly-closed Filter Frame

The patented filter framework maximizes the performance of the filter section and achieves a filter bypass leak rate of up to EN1886 (F9).



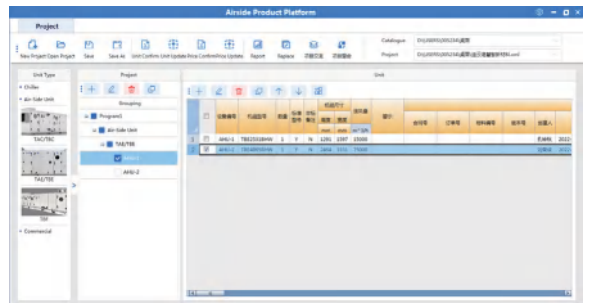
### IAQ solution

Electrostatic air purification: The built-in high-pressure dust collector can effectively remove suspended particles such as PM2.5 through positive and negative corona, and can kill bacteria and viruses attached to dust particles.

# Introduction to Model Selection Software

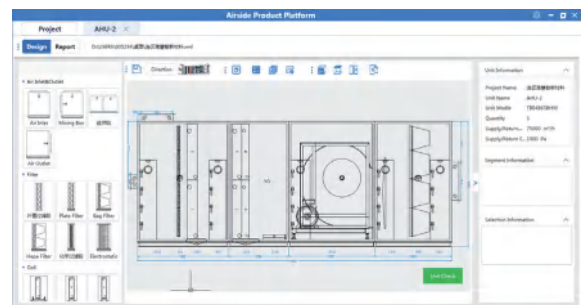
## Professional selection and customization

- Friendly interface, professional operating system, and ease of use.
- Flexible parameter design, self-check and prompt, and accurate model selection.
- Function sections are configured as needed to ensure customer's design requirements are dealt with as soon as possible. Perfect project management system is in place to improve users' work efficiency.
- Seamless switch between Chinese and English interfaces.



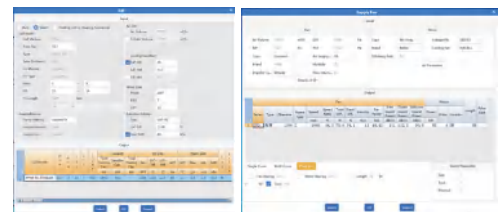
## A host of functions and configurations

- Multiple function sections are available for free combinations to meet different air handling needs.
- 70 standard models are put on the recommendation list for common scenarios and scenarios with accurate control over unit sizes.
- A variety of modules are created based on the rich design experience of TICA modular AHUs, which allows users to directly fetch models during model selection, thus speeding up the process.
- A very large database for model selection can better meet various needs of customers.



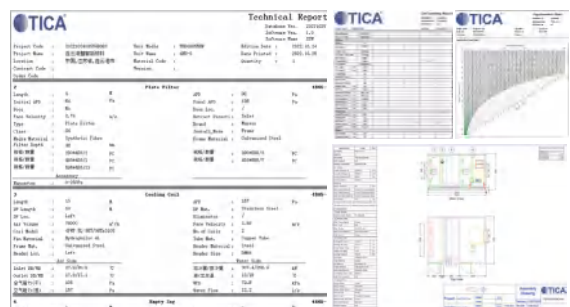
## Professional model selection of core components

- TICA uses the professional heat exchanger selection software to provide a wide range of choices for coil rows, loops, and fins based on the operation conditions of the unit. This allows the unit to adapt to different operating conditions and scenarios, realize the best configurations, and improve heat exchange efficiency.
- The coil selection software passes AHRI410 certification.
- Fan and motor selection can be determined automatically based on air flow and pressure requirements. Therefore, best fan and motor combination can be identified. Besides, models can be ranked by the performance and cost criteria.



## Comprehensive report

- The software outputs a comprehensive report on unit performance.
- The software outputs a general assembly drawing at a certain scale for use by specialists.
- The software also outputs an enthalpy chart (Figure I-D) which does not only provide air state parameters of each function section, but also give a vivid picture of how these parameters change.





## Overview

The TAE\TBE series is a modular air handling unit with a two-layer panel. With a rather compact structure and high utilization rate of the cabinet, the unit features more precise control over its air flow, which makes it possible to meet needs of a wide range of scenarios.

### Patented structure

- This series has a patented cabinet structure and excellent detailed design, as well as outstanding performance in terms of mechanical strength, air tightness, thermal insulation, and anti-cold bridge.

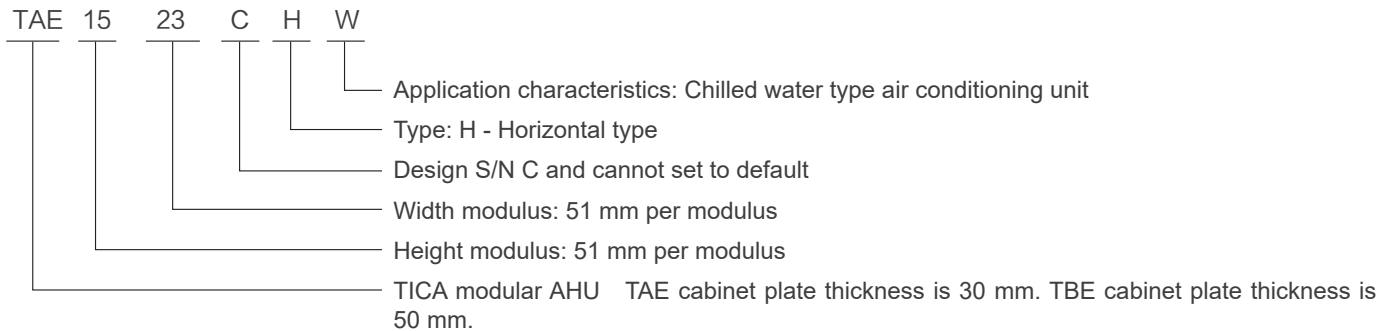
### Wide air flow range

- The unit air flow ranges from 1,000 m<sup>3</sup>/h to 100,000 m<sup>3</sup>/h with 90 specifications available.

Note: If you have other requirements, please contact your local TICA office.

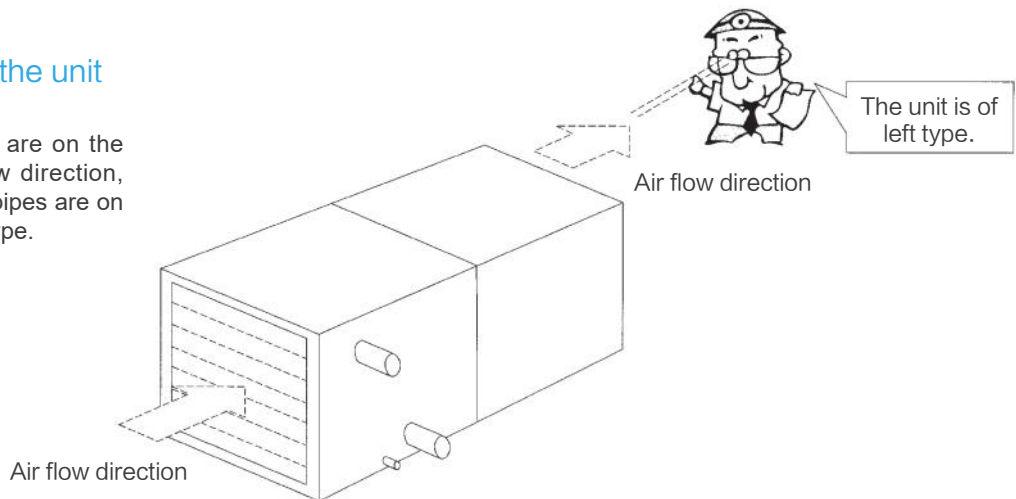


### Nomenclature

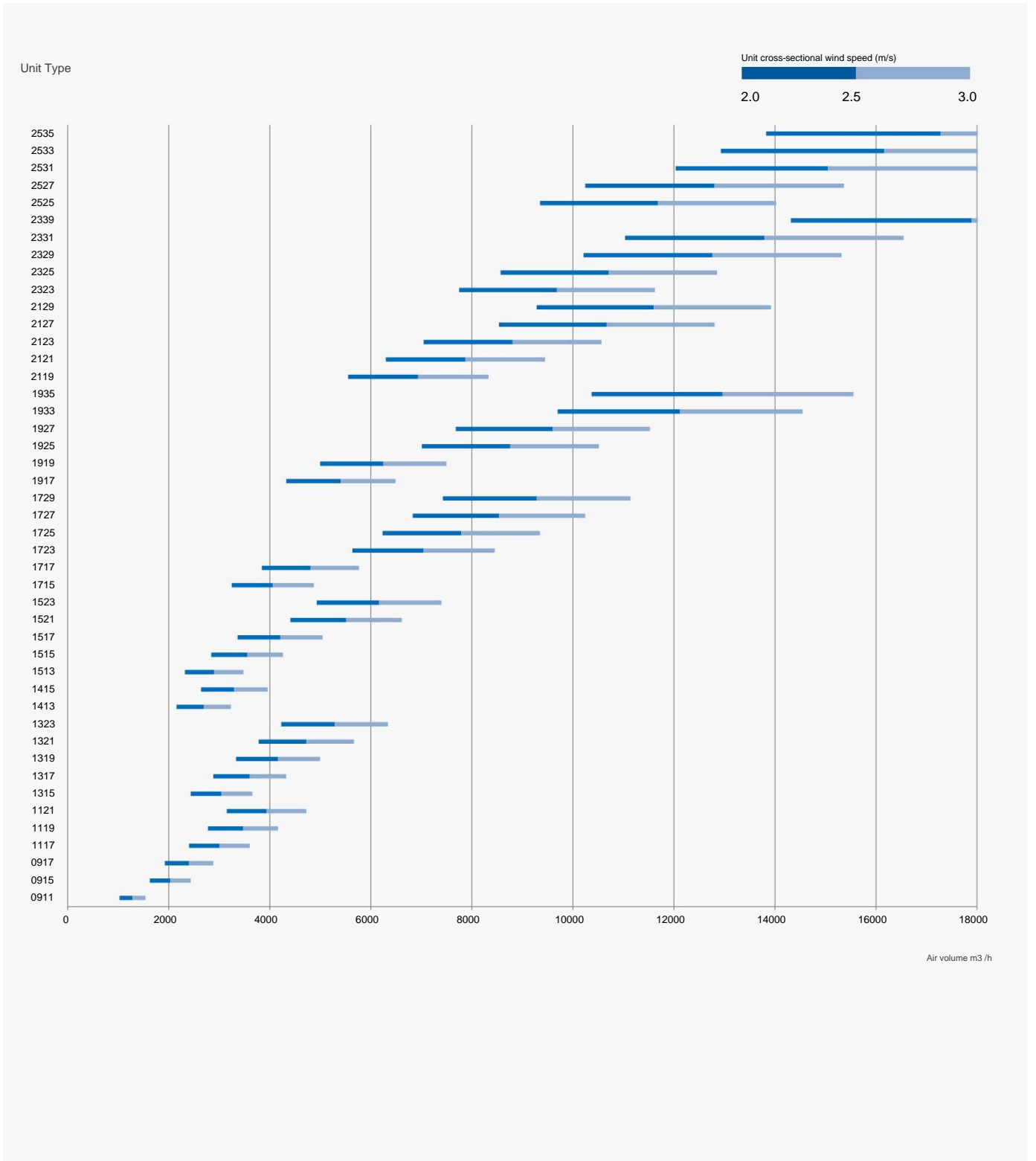


### Left/right judgment of the unit

If the inlet and outlet pipes are on the left when facing the air flow direction, the unit is of left type. If the pipes are on the right, the unit is of right type.

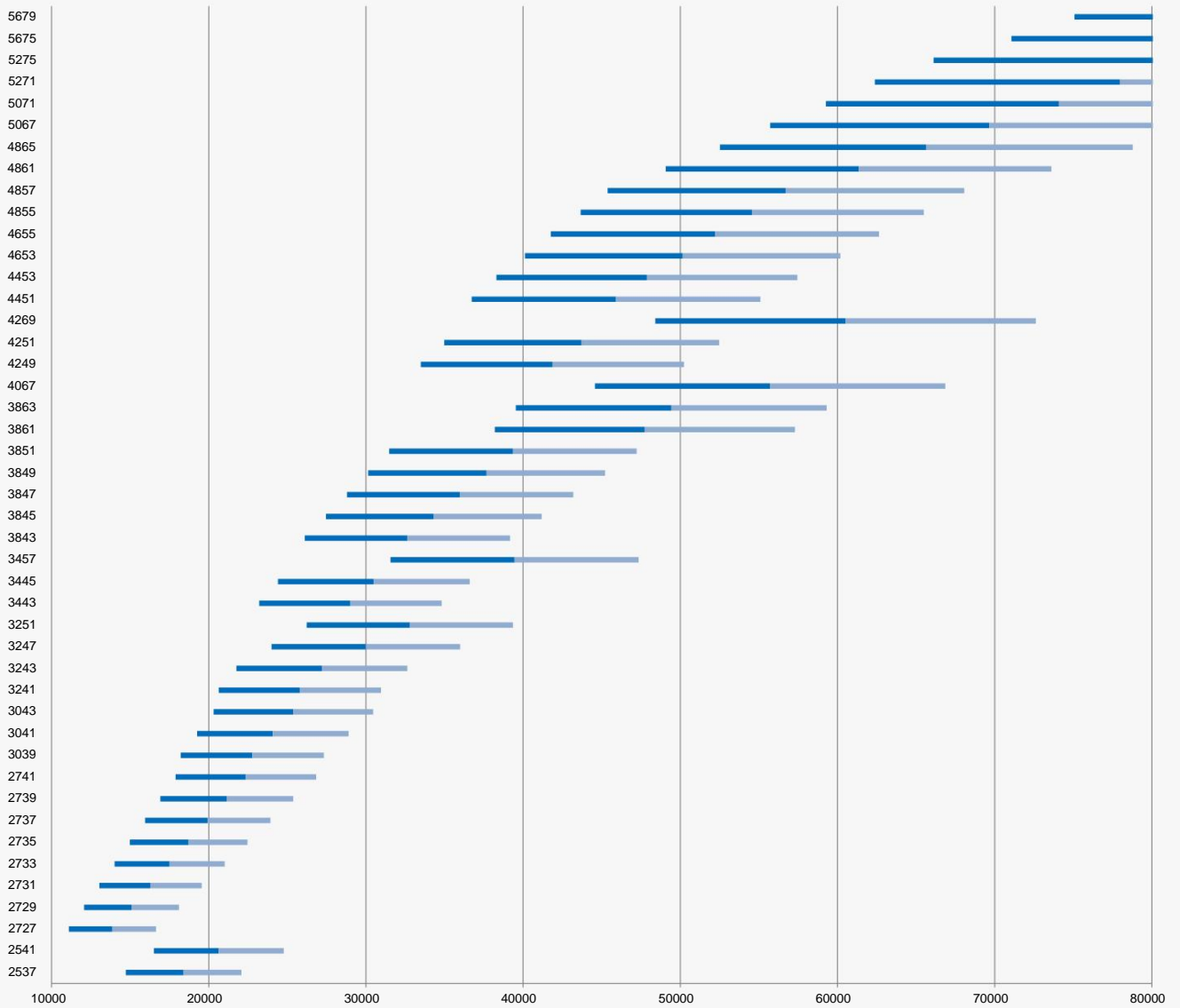
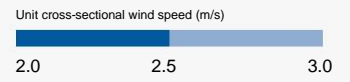


# Nomenclature





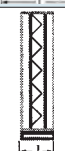


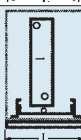
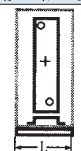
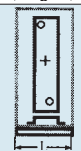

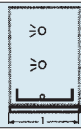


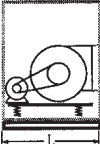
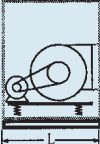




Unit Type



Air volume m³/h

## Specifications of Function Sections

Name	Symbol	Simple Diagram (→ Air Flow Direction)	Section Modulus L (M) (For Reference Only)	Optional Configurations
Air inlet section	AI		When air valve at the end surface, $L = 8 \text{ M} \sim 9 \text{ M}$ ; When air valve at the top or side surface, $L = \text{Dmp\_L} = 8 \text{ M} \sim 32 \text{ M}$ (Dmp_L is the length modulus of the side or top air valve along the airflow direction, depending on the unit model and the ventilation rate of the air valve).	Air outlet position, air outlet flange, manual air valve, air valve without actuator, air valve with switch actuator, access door, damp-proof lamp, window
Mixing section	MB		$L = \text{Dmp\_L} = 8 \text{ M} \sim 32 \text{ M}$ (Dmp_L is the maximum length modulus of the side or top air valve along the airflow direction, depending on the unit model and the ventilation rate of the air valve).	Air outlet position, fresh air ratio, air outlet flange, air valve without actuator, air valve with switch actuator, access door, damp-proof lamp, window
Built-in plate filter section	PF		$L = 4 \text{ M}$	G2/G3/G4 plate filter Without filter(With plate filter frame) With standby filter Differential pressure gauge
Built-in bag filter section	BF		$L = 9 \text{ M}$ 381 mm bag type; $L = 10 \text{ M}$ plate type + 381 mm bag type;	G2/G3/G4 plate filter; G3/G4/M5/M6/F7/F8 bag filter Single bag filter, plate and bag combined filter, no filter(With single bag filter or plate or bag filter frame),with standby filter, differential pressure gauge
Built-in high efficiency filter section	HF		$L = 8 \text{ M}$	E10/E11/E12/H13/H14 high efficiency filter Without filter (with high efficiency filter frame) With standby filter Differential pressure gauge
Chilled water coil section	CC		$L = 9 \text{ M} \sim 17 \text{ M}$ 1. Depends on the number of rows and combinations of coils 2. Wet film humidifier and waterproof board are installed at the coil section, saving the unit space	1-8R chilled water coil + 1-4R hot water coil Two chilled water coils, pipe connection, waterproof board 50/100/150/200 mm wet film humidifier
Hot water coil section	HC		$L = 5 \text{ M}$ 1R $L = 6 \text{ M}$ 2R, 3R, 4R Note: When the heating coil section contains drain pan, $L = 9 \text{ M}$	1-4R hot water coils, pipe connection, drain pan
Steam coil section	SC		$L = 5 \text{ M}$	1-4R steam coils Steam coils made of aluminum sheet of steel pipe, aluminum sheet of stainless steel pipe, and stainless steel sheet of stainless steel pipe Pipe connection
Electric heating section	EH		$L = 5 \text{ M}$	Built-in PTC electric heater
Humidification section	HM		$L = 11 \text{ M}$ electrode type humidification section (EL) $L = 11 \text{ M}$ dry steam humidification section (SH)	Manual/electric switching dry steam humidifier Electric analog electrode humidifier

Air supply fan section Dual air inlet centrifugal fan	SF_D		L = 10 M ~ 35 M Depending on the unit model, fan specification, and motor specification	Fan brand, motor brand, air outlet direction, motor position, access door, damp-proof lamp, window
Return fan section Dual air inlet centrifugal fan	RF_D		L = 10 M ~ 35 M Depending on the unit model, fan specification, and motor specification	Fan brand, motor brand, air outlet direction, motor position, access door, damp-proof lamp, window
Empty section	ES		L = 4 M ~ 15 M Selected if necessary	Access door, damp-proof lamp, window, air valve, flange
Flow equalization section	DF		L = 8 M ~ 13 M Depending on the unit model	Access door, damp-proof lamp, window
Air outlet section	AO		When air valve at the end surface, L = 8 M ~ 9 M; When air valve at the top or side surface, L = Dmp_L = 8 M ~ 32 M (Dmp_L is the length modulus of the side or top air valve along the airflow direction, depending on the unit model and the ventilation rate of the air valve).	Air outlet position, air outlet flange, manual air valve, air valve without actuator, air valve with switch actuator, access door, damp-proof lamp, window
Electrostatic dedusting	EP		L = 5 M	N/A

## Dimensions

### Length

#### Total length

30 mm unit: total length of unit = total length modulus of unit × 51 mm + number of sections for delivery × 9 mm

50 mm unit: total length of unit = total length modulus of unit × 51 mm + number of sections for delivery × 45 mm

#### Length of assembly section

30 mm unit: length of each section for delivery = length modulus of each section × 51 mm + 9 mm

50 mm unit: length of each section for delivery = length modulus of each section × 51 mm + 45 mm

Note: When the width modulus is smaller than 43 M, the length modulus of longest section L = 68 M;

When the width modulus is greater than or equal to 43 M, the length modulus of longest section L = 43 M;

The above lengths are for reference only upon initial selection. For accurate size, please consult your local TICA office.

### Height

Total height of unit = height modulus of unit × 51 mm + 75 mm (or 106 mm) + 100 mm (or 200 mm)

Width of unit = width modulus of unit × 51 mm + 75 mm (or 96 mm)

For example: If the unit TAE-53M-2331 at 53 M long is delivered in two sections, one section 23 M long, and the other section 30 M long, then:

Total length of unit:  $53 \times 51 + 2 \times 9 = 2721$  mm

Height:  $23 \times 51 + 75 + 100 = 1348$  mm

Width:  $31 \times 51 + 75 = 1656$  mm

The lengths of the two assembly sections are respectively  $23 \times 51 + 9 = 1182$  mm;  $30 \times 51 + 9 = 1539$  mm

## Applications of Function Sections

### Air inlet section, air outlet section, and mixing section

#### Air inlet section

Connected to return air pipe to bring air to AHU.

#### Air outlet section

Connected to air supply pipe to supply air to AHU.

#### Mixing section

By adjusting the ratio of return air and fresh air, this section recovers energy directly to minimize impact on the environment.

Air valve configuration:

- Air valve position: It can be placed at the air outlet at the ends, top or sides of the air inlet section, air outlet section, and mixing section.
- Air valve material: galvanized/aluminum alloy.
- Air valve actuator or air outlet flange is optional.

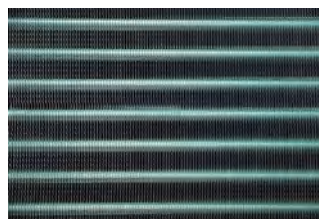


### Chilled water coil and hot water coil

- ◆ The chilled and hot water coils are made of high quality copper tubes, which are firmly combined with the fins by mechanical expansion tube, delivering great heat exchange performance and complying with AHRI 410 standard.
- ◆ All coils undergo a pressure test before delivery according to national standards to ensure no leakage during operation.
- ◆ Coils are surrounded by high quality galvanized steel plates (stainless steel frame is optional).
- ◆ All fins are made of hydrophilic aluminum foil to improve heat exchange efficiency and anti-oxidation effect.
- ◆ The drain pan is designed with double V-shaped structure and longitudinal grade to drain condensate water.
- ◆ The drain pan is available in galvanized sheet spraying and stainless steel.
- ◆ The waterproof board is provided as needed to prevent the condensate water from blowing out of the coils (to be installed when the fan speed is between 2.5-3.0 m/s).
- ◆ Flange connector is optional for inlet/outlet pipes.



Chilled/hot water coil  
Made of high-quality copper pipes and hydrophilic aluminum fins



Dipping anticorrosion coil  
Excellent cavitation resistance and water hammer resistance



AHRI 410 certified

# Applications of Function Sections

## Filter section



### Plate filter

Made of polyester synthetic fiber for filter material; aluminum mesh for filtration efficiency G3, G4, and G2.



### Bag filter

Made of polyester synthetic fiber, 381 mm long bag, and filtration efficiency at G3, G4, M5, M6, F7, and F8.



### High efficiency filter

Made of ultra-fine fiber glass filter paper, V-shaped dense-pleated type, filtration efficiency at E10/E11/E12/H13/H14. Replaced from the dirty side (upwind side).

### Electrostatic filter

By positively charging as small as 0.01  $\mu\text{m}$  particles through ionization process, the filter is able to capture as many as particles at the dust collection area, including PM10, PM2.5 and PM1.0. In addition, it effectively kills bacteria and viruses attached to these particles.

The electrostatic filter is completely washable and reusable, with no consumables required, so the cost is low.



### Maintenance:

- The frame for a frame filter can be replaced from the clean side (downwind side of filter).
- The frame for a frame filter, plate filter, and bag filter can be replaced from the dirty side (upwind side of filter).

### Accessories:

- Differential pressure gauge: gives reading of differential pressure before and after the filter, in case filtering efficiency decreases due to dust accumulation over time.



## Comparison of efficiency specifications among China, USA and Europe

China GB/T 14295-2019	Primary efficiency $\geq 2\mu\text{m}$ 10% $\leq$ efficiency<50%					Medium efficiency $\geq 0.5\mu\text{m}$ 20% $\leq$ efficiency<70%					High and medium efficiency $\geq 0.5\mu\text{m}$ 70% $\leq$ efficiency<95%			Sub-high efficiency $\geq 0.5\mu\text{m}$ 95% $\leq$ efficiency<99.9%				High efficiency $\geq 0.5\mu\text{m}$ Efficiency > 99.99% (GB13554)			
United States ASHRAE	MERV 1	MERV 2 ~ 4	MERV 5	MERV 6	MERV 7	MERV 8	MERV 9	MERV 10	MERV 11	MERV 12	MERV 13	MERV 14	MERV 15~16				H,I	J	k	F-G	
Europe EN779-2012 EN1822-2018	G1 50% $\leq$ Am <65%	G2 65% $\leq$ Am <80%	G3 80% $\leq$ Am <90%	G4 90% $\leq$ Am		M5 40% $\leq$ Em<60%		M6 60% $\leq$ Em<80%		F7 80% $\leq$ Em <90%	F8 90% $\leq$ Em <95%	F9 95% $\leq$ Em	E10 $\geq$ 85%	E11 $\geq$ 95%	E12 $\geq$ 99.5%	H13 $\geq$ 99.95%	H14 $\geq$ 99.995%	U15-U17 99.9995%			

## Applications of Function Sections

### Fan section

#### DIDW centrifugal fan

- ◆ Adopts branded double air inlet forward/backward centrifugal fan or volute-free fan,
- ◆ safe and reliable.
- ◆ The impeller and frame are made of high-strength alloy steel plate, with high structural strength.
- ◆ It has passed strict static and dynamic balance test, with less vibration and noise during running.
- ◆ An inverter is optional to adjust fan speed and improve energy efficiency of the system.
- ◆ Adopts damping spring to further reduce fan vibration and noise.
- ◆ The motor is provided with sliding rail at its bottom to facilitate adjustment of motor belt pulley.
- ◆ The fan outlet is provided with fire safety compliant canvas connection to prevent vibration transmission.



#### Belt

- ◆ Comes from a well-known brand and features high transmission power and wear resistance.
- ◆ Uses European taper sleeve belt pulley to ensure reliable operation and ease of maintenance.
- ◆ Uses well-known bearings with high assembly accuracy to ensure continuous operation of the unit.



#### Fan installation direction



### Steam heating section

- ◆ The steam coil is available in multiple options, including aluminum sheet of steel pipe, stainless steel sheet of stainless steel pipe, and aluminum sheet of stainless steel pipe.
- ◆ The allowed maximum operating pressure of the steam coil is 0.4 MPa.



### Electric heating section

Features PTC and temperature protection switch, with electric heating element attached to the frame.

When electric heater is used, distribution box should be provided by the customer. The electric heater must be associated with a fan.

Control:

- ◆ Control by multiple levels - to meet different heating requirements.
- ◆ High temperature protection - temperature protection switch is internally installed to power off the unit automatically at high temperatures.
- ◆ The silicon controlled rectifier cannot be used for controlling PTC heaters.



## Applications of Function Sections

### Humidification section

#### Wet film humidifier

- ◆ The humidifier humidifies the air by natural evaporation of water.
- ◆ The wet film humidifier does not produce any "white power" while operating.
- ◆ The saturated efficiency is up to 80%.
- ◆ Safe and long lasting.
- ◆ Adopts packing method to realize cooling by direct evaporation, with small size and great cooling effect.



#### Dry steam humidifier

- ◆ The humidifier ensures steam to be dry by separating steam from water before it is sprayed out through injection holes equipped with a metallic filter silencer.
- ◆ The unique steam supply by sleeve insulation ensures that the nozzle does not cause thermal interference to the system when humidification is not running.
- ◆ The single-, dual- or triple-spray rod dry steam humidifier is selected depending on varying steam volume and unit height.
- ◆ Adjustment signal: ON-OFF, 0-10 V/4-20 mA.
- ◆ Adjustment mode: switch type, proportional type.
- ◆ Multiple regulating valves: manual valve, solenoid valve, and electric valve.



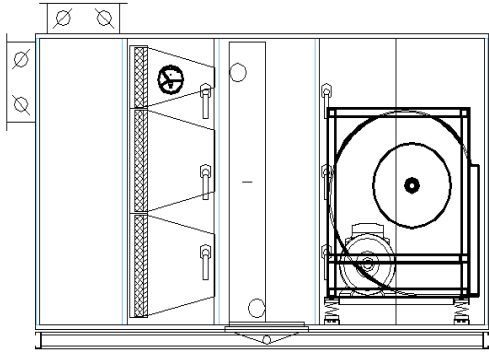
#### Electrode type humidifier

- ◆ The humidifier converts electrical energy into thermal energy by using electrodes, so that water heats up to produce steam, which is then sent to the AHU through pipes.
- ◆ Integrated with the electric control box, the humidifier is controlled by a microcomputer, which enables easy installation and use.
- ◆ Stainless steel or aluminum alloy steam distribution pipe.
- ◆ Adjustment signal: ON-OFF, 0-10 V/4-20 mA.
- ◆ Adjustment mode: switch type, proportional type.



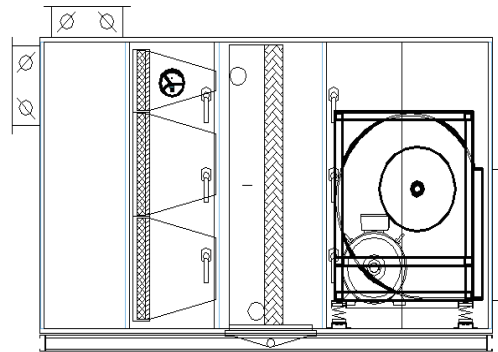
## Common Function Section Combinations

Combination 1:



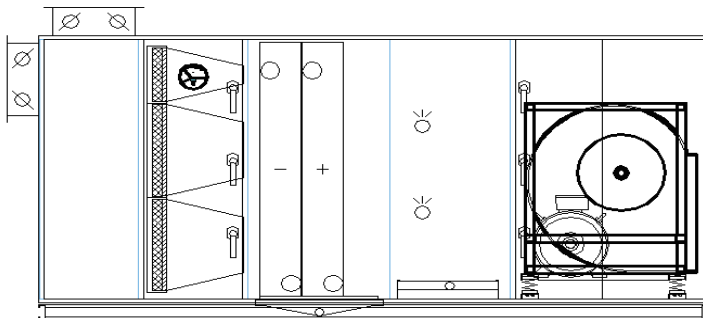
Mixing + plate (bag) filter + cooling coil + air supply fan

Combination 2:



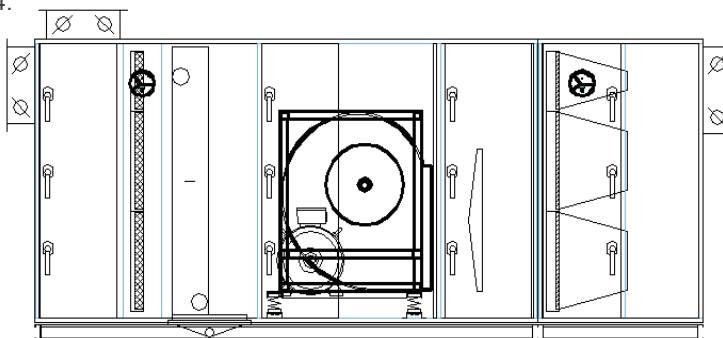
Mixing + plate (bag) filter + cooling coil + wet film humidifier + air supply fan

Combination 3:



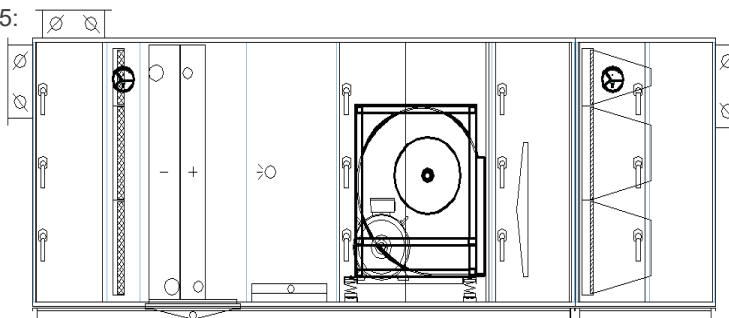
Mixing + plate (bag) filter + cooling coil + heating coil + electrode humidifier + air supply fan

Combination 4:



Mixing + plate filter + cooling coil + air supply fan + flow equalization + bag filter + air outlet

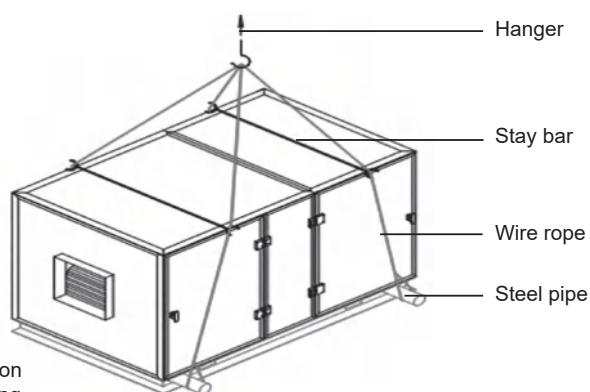
Combination 5:



Mixing + plate filter + cooling coil + hot water coil + dry steam humidifier + air supply fan + flow equalization + bag filter + air outlet



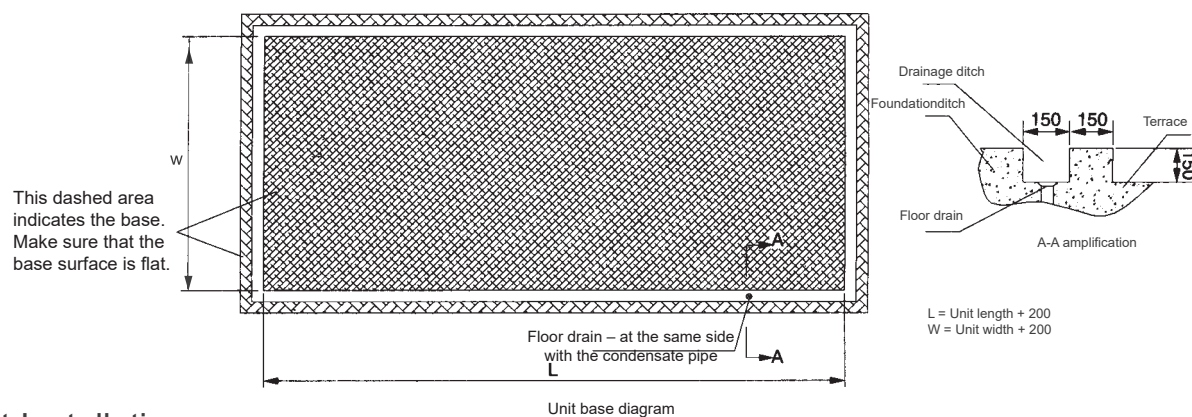
## Lifting Diagram



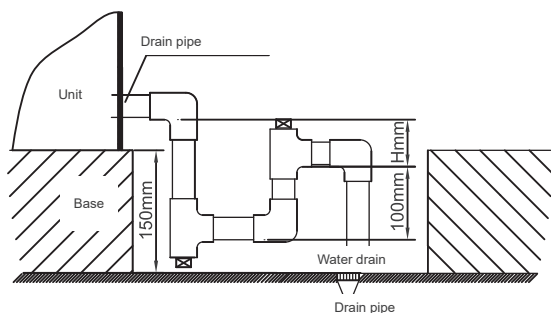
### Lifting notes

Lift the unit according to the schematic diagram for safety. Before lifting, insert materials such as hard cardboard at the position where the wire rope comes into contact with the housing, preventing the wire rope from scratching the unit.

## Foundation Drawing

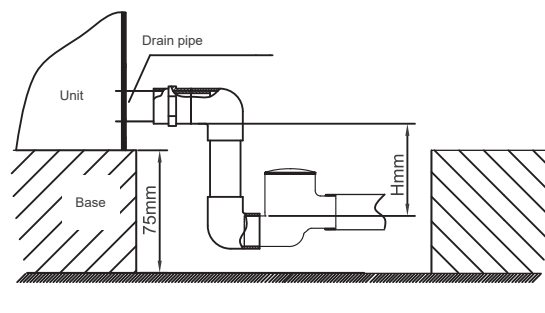


## Unit Installation



$H = \text{Unit inside static pressure}(\text{mmH}_2\text{O}) + 20$   
When the internal negative pressure exceeds 750 Pa, increase the base height

### U-shaped water seal installation diagram



$H = \text{Unit inside static pressure}(\text{mmH}_2\text{O}) + 20$   
When the internal negative pressure exceeds 750 Pa, increase the base height

### Floating ball-type water seal installation diagram

- ◆ The air conditioning units of all structure types should be installed on a horizontal base.
- ◆ A sufficient space should be reserved around the unit, especially at the access door side of unit pipes, fan and motor, so as to facilitate routine unit inspection and regular maintenance.
- ◆ A U-shaped drainage pipe must be first connected at the condensate water outlet or a floating ball-type water seal must be installed before connecting to the outer tube.
- ◆ Exert balanced force when connecting the water inlet and outlet pipes of coil. Excessive force may damage the coil.
- ◆ The motor of air conditioning unit should be connected to a power supply with overload protection, and provided with grounding protection.
- ◆ Flexible connection should be adopted between the air conditioning unit and the external air duct to avoid vibration transmission.

## Precautions for Installation & Usage

1. Never run the unit where acid, alkali, salt spray and other corrosive gases are present, as it will damage the unit casing, pipeline or electrical components.
2. Keep the surroundings around the unit clean and dry and ensure smooth ventilation for the unit. Clean the air-side heat exchanger periodically (once every one to two months) to maintain excellent heat transfer effect and save energy.
3. Install the drainage pipe according to this manual. Ensure smooth drainage. Take thermal insulation measures and prevent generation of condensing water. Make sure to check the drainage pipe before the unit operates. If it is blocked, clear the foreign matter so that condensing water can be discharged smoothly.
4. Check whether wiring of the unit power supply and electrical system is secure, and whether electrical components work abnormally. If an exception occurs, repair or replace electrical components. Regularly check whether the unit is grounded reliably.
5. The minimum starting voltage of the unit must be kept above 90% of the rated voltage, the voltage must be within  $\pm 10\%$  of the rated voltage range during operation, and the voltage difference between the phases should be within the range of  $\pm 2\%$ . An adverse impact will be caused to the unit when the voltage is too high or too low. Make sure that the power supply is stable. Otherwise, when the unit starts, it may generate excessive current, thus damaging the motor.
6. The unit can be maintained and repaired only when the unit is powered off and the power supply is cut off.
7. After the unit is faulty, find out the cause and remove the fault before restarting the unit. Do not restart the unit if the fault is not removed.
8. Never short circuit the protective device of the unit, as it may damage the unit.
9. Protect the internal cables of the unit to prevent the insulation layer from being damaged by sharp objects.
10. The wire and cable should be far away from the heat source. Do not move them frequently, and do not bend or twist them violently.
11. Control cabinet installation and usage:
  - 1) The control cabinet is embedded with AC strong power supply. Therefore, exercise caution during operation.
  - 2) The control line of the unit must be separated from the power cord of power supply to prevent interference.
  - 3) It is necessary to use the power supply that meets requirements. The use of a substandard power supply may damage the control cabinet.
  - 4) Do not place wires in the control cabinet or store long exposed wires inside the control cabinet. After the control cabinet door is repaired, install and reset it timely to prevent rainwater from entering.
  - 5) Be sure to control the running status of the air-conditioning unit through the control cabinet. It is forbidden to insert and remove the power plug to switch on/off the unit. Do not frequently shut down the unit by using the emergency stop switch.
  - 6) Do not use sharp objects when operating the controller's display. Do not impose excessive force, lest the display may be damaged.
  - 7) Do not wipe the surface of the controller's display with solvent or strong chemicals. If there is slight dust, gently clear it with a clean soft cloth or cotton yarn. If the surface is seriously dirtied, use a clean soft cloth or cotton yarn to remove the dirt and then let it air dry.
  - 8) When a control cabinet alarm is reported or displayed, do not repair the cabinet yourself. Call TICA's hotline or contact local service agency.

## 12. Air filter

Periodically (recommended twice a month) check the dust accumulation on the filter of the unit. For units equipped with a differential pressure detection device, the user should clean or replace the filter in time when the final resistance reaches the specified value. TICA recommends that the final resistance value be:

Filtering efficiency specification	Recommended final resistance (Pa)
G3 (primary efficiency)	100-200
G4 (primary efficiency)	150-250
M5-M6 (medium efficiency)	250-300
F7-F8 (high and medium efficiency)	300-400
F9-E11 (sub-high efficiency)	400-450
High efficiency and ultrahigh efficiency	400-600

## 13. Heat exchanger

Make sure that the heat exchanger coil fins and copper pipes are free from scratches and dent. Keep the coil clean and brush the fins of the coil with nylon brush. A vacuum cleaner must be used for cleaning before brushing. If compressed air is available, use a high pressure gas pipe or a spray nozzle to clean the coil. The outer surface of the coil shall be dust-free after cleaning, and the heat transfer effect of the inner surface shall reach its original heat transfer capability. In addition to cleaning fins, after the coil has been used for 2-3 years, clear the water scale inside. If possible, use softened water to produce cold/hot water for the unit coil.

## 14. Drainage pipe

Make sure to check the drainage pipe before the unit operates. If it is blocked, clear the foreign matter so that condensing water can be discharged smoothly.

15. After the unit has operated for one week, readjust tightness of the belt. After that, perform routine check every three months.

16. After the unit has operated for a period of time, the wiring pile head of electric wire will get loose. Check and tighten the wiring pile head in three days after the unit is turned on for the first time.

17. The fan and motor bearings need to be checked regularly (three times per month recommended). Check the seal ring of the motor bearing (such as V-ring), and replace it in a timely manner if necessary. Check whether the installation connection is loose. Check the operation status of bearings by monitoring whether abnormal sound is generated, vibration, and the grease consumption or vibration detection elements of the bearing. In case of any abnormality, stop the unit immediately, and locate and eliminate the cause in time. Take heating measures or use special tools to install, remove or replace bearings. Do not knock or pry bearings.

## 18. Fan bearing maintenance:

For the fan with an oil injection nozzle, charge lubricating grease that complies with specifications to the bearing regularly.

If the user selects the grease of a brand for charging, the grease of this brand should be always used.

The validity period of lubricating grease depends on the grease type, bearing rotating speed, shaft diameter and operating environment. Normally, the lubricating grease should be replaced after the fan has operated for about 1500 hours; if the fan operates continuously for 24 hours, replace the lubricating grease every 500 to 700 hours of operation.

How to charge lubricating grease: Keep the shaft rotating when charging lubricating grease, stop charging when seeing one layer of fresh grease overflowing, and use a hand to rotate the wind wheel fast to discharge excess grease.

19. Make sure that the steam valve of the steam coil is closed before the fan stops. Make sure that the steam valve of the steam humidifier is closed before the fan stops.

20. If the customer provides a power control cabinet, start electric heating only after the fan starts. Turn off electric heating 5 minutes before the fan stops. The overheat protection switch of the electric heater needs to be connected to the electric heating protection loop.



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Note: Due to constant improvement and innovation of TICA's products, the product models, specifications and parameters contained in this document are subject to change without prior notice.