AIRSYS

FREECOOL–AD

Adiabatic Evaporation Cooling Unit

Air Volume: 9200~18000m³/h
Cooling Capacity：15~30kW

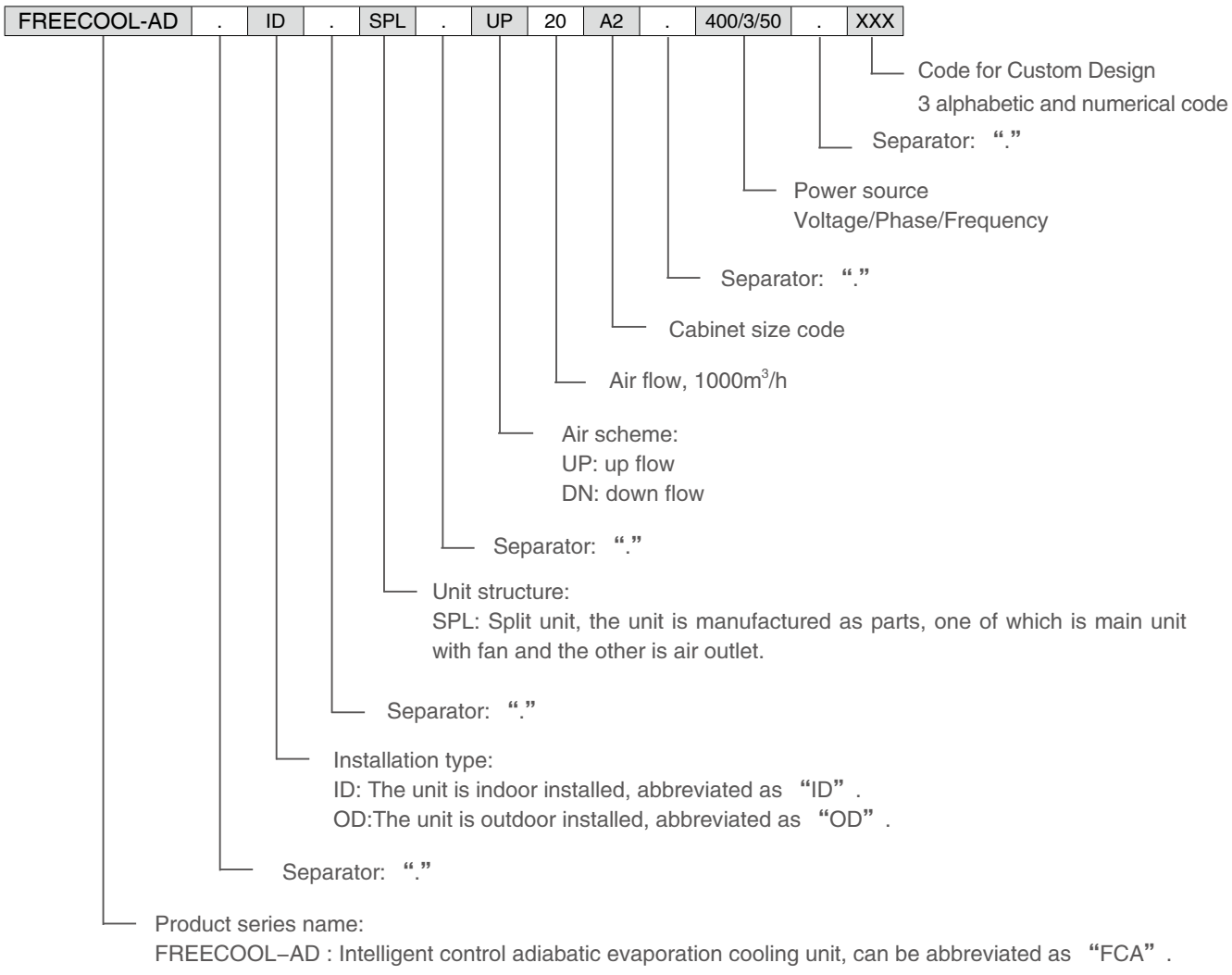
FREECOOL–AD, an adiabatic evaporation cooling unit, is designed for small/medium data center or electronic equipment room. Direct free cooling will be used when outdoor temperature is low; if ambient temperature rises, adiabatic mode will be used. Ambient air will blow through the built–in pad saturated with water, evaporating water by air flow.

By using the FREECOOL–AD unit, the running hours of other air conditioning units can be highly reduced, achieving power energy saving around 30%~90%. The FREECOOL–AD unit using EC fan can adjust the air volume automatically according to the temperature difference with the lowest power consumption.

FREECOOL–AD unit with large air volume, high cooling density and luxuriant control functions, can meet all the precision control requirements of temperature and cleanness in equipment room.

FREECOOL–AD realizes easy installation and convenient maintenance without refrigeration system. The unit only needs to connect the inlet and outlet water pipe on the work site. Down flow and up flow units using the same structure, offering more flexibility for different customers.

Unit identification



Working Range

Working Environment

Ambient temperature: –30℃~55℃

Ambient humidity: 5%~95%

Storage Environment

Temperature: –40℃~70℃

Humidity: 5%~95%

Applications

Small to mid–size switching room for telecommunication

Small to mid–size data center and computer room

UPS and battery room

Industrial process control center

Product Configuration

Standard Components

Unit base and frame:

⊙Unit base is made of folded sheet steel coated with grey epoxy resin powder.

⊙Unit frame is made of folded sheet steel and assembled by bolts or rivets. The surface of unit frame is coated with grey epoxy resin powder.

Backward curved, centrifugal fan directly coupled with 400 VAC motor.

Adiabatic evaporation pad

Primary water sump

Secondary water sump

Water pump

Aluminium alloy frame air filter

G2 nylon pre–filter

Control box, includes: controller, contactor, relay and circuit breaker etc.

Micro control system, include:

⊙Micro–processor
⊙Indoor temperature sensor
⊙Outdoor temperature sensor
⊙Supply air temperature&humidity sensor
⊙Pressure transducer
⊙Four level float switch
⊙Two level float switch
⊙Exhaust air temperature and humidity sensor
⊙Water leakage alarm
⊙Power sensor

Optional Components

G4 washable main air filter

Electric heater

Exhaust fan

Gravitational pressure relief valve (air discharge)

Electric motorized air discharge valve

Electric motorized non–return valve

Air inlet louver

Mounting plinth

RS232 communication interface card

RS485 communication interface card

Pcoweb card serve as web based server

Air Conditioner Linkage Contactor (link with existing air conditioners)

Additional room temperature sensor

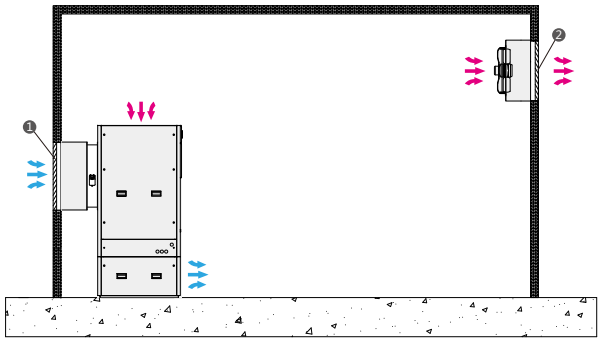
Operation principle

When FREECOOL–AD is applied in data center, FREECOOL–AD will be the main cooling providers.

When the fresh air blow through the adiabatic evaporation pad, the water on the pad vaporize into air, which causes a lowering of the temperature of the air. The energy needed to evaporate the water is taken from the air in the form of sensible heat. Evaporative cooling therefore causes a drop in the temperature of air to the sensible heat drop and an increase in humidity to the latent heat gain. The air remains at a constant enthalpy value.

When air conditioner fails and the room temperature is higher than emergency setting temperature, FREECOOL–AD will switch on to emergency mode.

Below drawing shows the air flow path of up flow FREECOOL–AD unit.



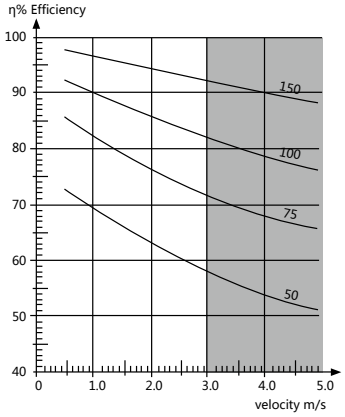
1 Air inlet louver

2 Exhaust air excess pressure damper, air outlet louver

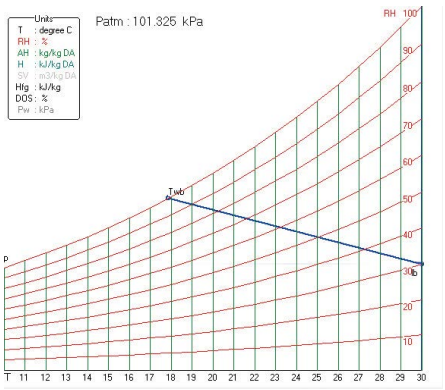
Cooling Capacity Calculation

With outside air status data(T_{db}——outside air dry bulb temperature, RH——relative humidity, T_{wb}——outside air wet bulb temperature), FCA unit cooling capacity can be calculated.

Air flow of fan Q_v=5m³/s(18000m³/h)，



Pad thickness h=100mm，according to the above graph，η=84%.



T_{db}=30℃，RH=30%，according to psychrometric chart，T_{wb}=17.9℃.

$\Delta T = \eta \times (T_{db} - T_{wb}) = T_{db} - T$

T——dry temperature after cooling through pad

$T = T_{db} - \eta \times (T_{db} - T_{wb}) = 30 - 0.84*(30 - 17.9) = 19.83$℃

Cooling loss in the unit cause temperature increase by 0.2℃，supply air temperature Ts=T+0.2=19.83+0.2=20.03℃

$Q = c \times m \times (T_{st} - T_s) = 1.006 \times 1.204 \times 18000/3600 \times (25 - 20.03) = 30.1$kW;

C——air specific heat capacity ,1.006 J /kg・℃;

ρ——air density at standard operating status, 1.204kg/m³;

m——air mass flow standard operating status;

T_{st}——Indoor setting temperature;

T_s——supply air temperature;

Besides，with local air status data, customer can calculate AIRSYS FCA cooling capacity with related software.

Product highlights

High energy efficiency

Using adiabatic evaporation pad to cool the fresh air, the running hours of other air conditioning units can be highly reduced.

Good structure design and easy maintenance

The main components such as: fans, motor, damper, controller and other related components can be accessed and maintained in front of the unit.

Easy installation, choose supply air scheme flexibly

FREECOOL–AD unit is modular design for easy transportation, joint as a package at the site.

Air supply box is separated from the main unit. Customer can choose up air flow or down air flow according to the need of different sites.

Preventing legionnaires disease

Main measures to prevent legionnaires disease conclude as below:

⊙Drain of water regularly to avoid stagnation of the water;

⊙Air flow rate is lower than 2.4m³/s in order to reduce the release of aerosols from adiabatic evaporation pad;

⊙Water operating temperature is lower than 20℃ (setting temperature, can be modified). Monitor the water scale caused by increased water volume reaching the set value, completely empty and rinse water tray;

⊙All water contacts surfaced, except the adiabatic evaporation pad are plastic or stainless steel to avoid corrosion. ⊙Adiabatic evaporation pad dry mode, make sure the pad surface is dry, reduce the risk of breed bacteria;

⊙Maintenance regularly determined by the water quality.

For high hardness water quality regions, empty after every time of supplying water;

For medium hardness water quality regions, empty after every two times of supplying water;

For low hardness water quality regions, empty after every three times of supplying water.

Humidity control

Humidity sensor can prevent from introducing high humidity inside. With humidity sensor, free cooling unit will turn off when the humidity of outdoor air is higher than humidity limitation to avoid the BTS equipment working at high humidity air environment, which may cause failures and damages of electronic devices.

Strong structure

The unit passed a transportation test to confirm the structure is strong enough to be able to transport on low grade ways.

Corrosion–proof

The unit framework is provided with corrosion protection treatment. The treatment is sufficient to provide protection for 15 years life cycle for inland installation.

If necessary, the treatment for sea air environment can be supplied as option.

Pressure transducer

The pressure difference between two sides of the filter can be checked any time, so as to easily notice the filter dirty degree and prepare maintenance in advance.

Water level sensor

Equipped with two level float switch and four level float switch to properly control the water level in water sump, avoiding water sump overflow and prevent the pump idling.

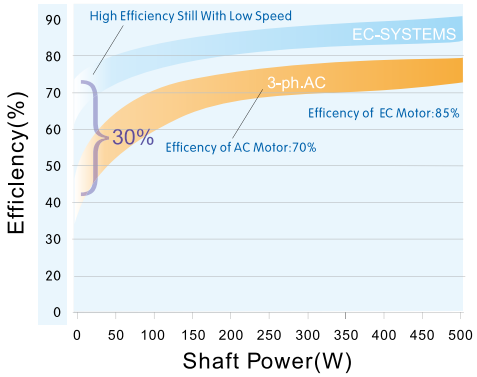
EC fan

Fan is a core component in the unit. FREECOOL–AD unit adopts bigger size EC fan, the maximum speed of fan is controlled within 80% to reduce the noise and energy consumption.

EC centrifugal fan with the following features:

⊙High efficiency of motor
Fan rotation speed is adjustable; the energy consumption at low rotation speed is much lower than the high speed.

⊙Comparing with axial fan, it would not lose much air volume due to pressure drop.



A comparison between EC motor and other motors

Intelligent Control

FREECOOL–AD unit is controlled by microprocessor. All the components in the unit work automatically, achieving maximum energy saving without manual operation.
All protections and alarms are automatically raised.

Random restart when power recovered

After a power failure, when the power is recovered, the unit will restarts automatically with a random time delay between 1 to 60 seconds to avoid many units starting at the same time.

Control the other air conditioner (Optional)

The FREECOOL–AD unit is able to control the other air conditioner.
When the FREECOOL–AD unit can fully meet the cooling demand of base station, the controller can send a signal to stop the other air conditioner in the site.

Completely auto protection

The controller monitors the running status of all the components and will stop the running of relative components and raise an alarm if any failure occurs.

Data log

The controller has a big memory to log up to 100 pieces of alarms.

Remote control and monitoring (Optional)

The unit can be installed with a RS232 or RS485 communication card to realize remote control and monitoring by the BMS system with open communication protocol.

PCOWEB internet communication (Optional)

The unit can be equipped with a PCOWEB internet communication card with TCP/IP protocol and Ethernet work to realized remote control and monitoring. Each computer can be connected to the web server by Ethernet network and understand the working status and control the unit in time everywhere.

Control functions

Parameters display

Current control temperature set
Supply air humidity
Outside air temperature
Supply air temperature
Indoor temperature
Exhaust air temperature and humidity
Water temperature
Software version

Working status display

Air supply fan speed and run hours
Air exhaust fan speed and run hours
Fresh air valve and return air valve jaw opening
The status of pump, water supply valve and water drain valve
Heater working status(Optional)
Heater working hours(Optional)
Heater startup times(Optional)

Alarm display

Controller fail alarm
Supply fan failure
Filter clogged alarm
Low temperature alarm
High temperature alarm
Fire/smoke alarm
Temperature sensor failure
Floor water leakage alarm
Exhaust fan overload

Other functions

Auto–Routining every 28 days

Remote control and monitoring

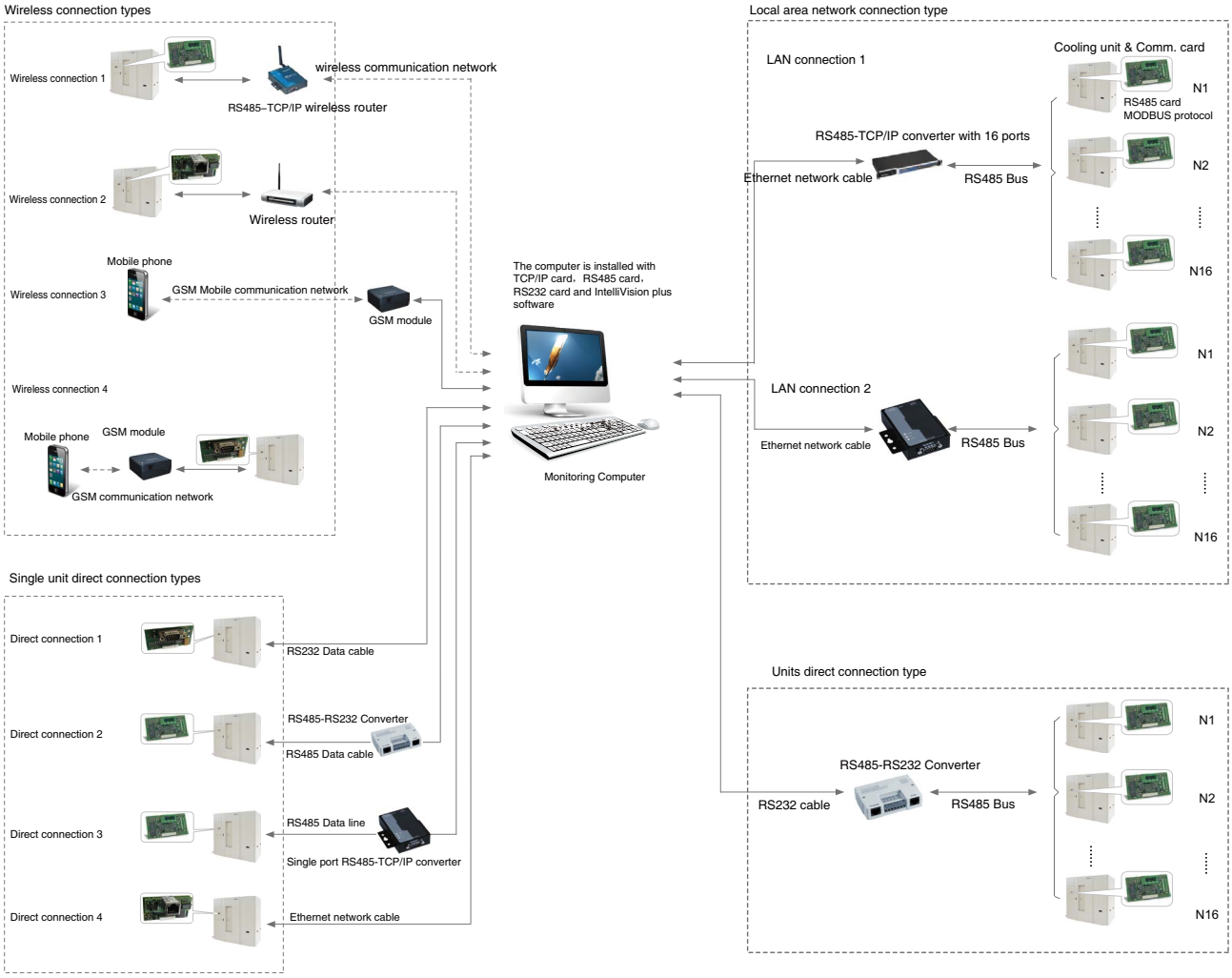
The remote monitoring and control system can be easily connected with the units to realize remote real time monitoring and control and save the running data.

The unit can be remote controlled by many kinds of methods as follows:

4 kinds of wireless network connection with computer

3 kinds of local direct connection with computer

3 kinds of LAN network connection with computer



Technical parameters

Model		10A1	20A2
Air supply scheme(1)		UP/DN	
Cooling capacity(2)	kW	15.4	30.1
Free cooling capacity(3)	kW	15.4	30.2
Supply fan			
Type		EC Centrifugal fan	
Qty.	n.	1	2
Air volume	m^3/h	9200	18000
Input power	kW	1.3	2.6
Current	A	2.0	4.0
Water consumption			
Operating condition	kg/h	45.4	90.9
Water pump			
Type		DC diaphragm pump	
Water flow	kg/h	540	540
Input power	kW	0.1	0.1
Current	A	4.0	4.0
Power supply			
Power source		400V/3Ph/50Hz	
Unit max. operating power input	kw	2.9	5.6
Unit max. operating current	A	5.0	9.2
Overall unit dimensions and weight(4)			
Width	mm	1900	1900
Depth	mm	800	1050
Height	mm	2160	2460
Weight	kg	400	570
Main unit dimensions and weight			
Width	mm	1900	1900
Depth	mm	800	1050
Height	mm	1680	1980
Weight	kg	290	420
Fan section dimensions and weight			
Width	mm	600	1900
Depth	mm	800	1050
Height	mm	500	500
Weight	kg	110	150

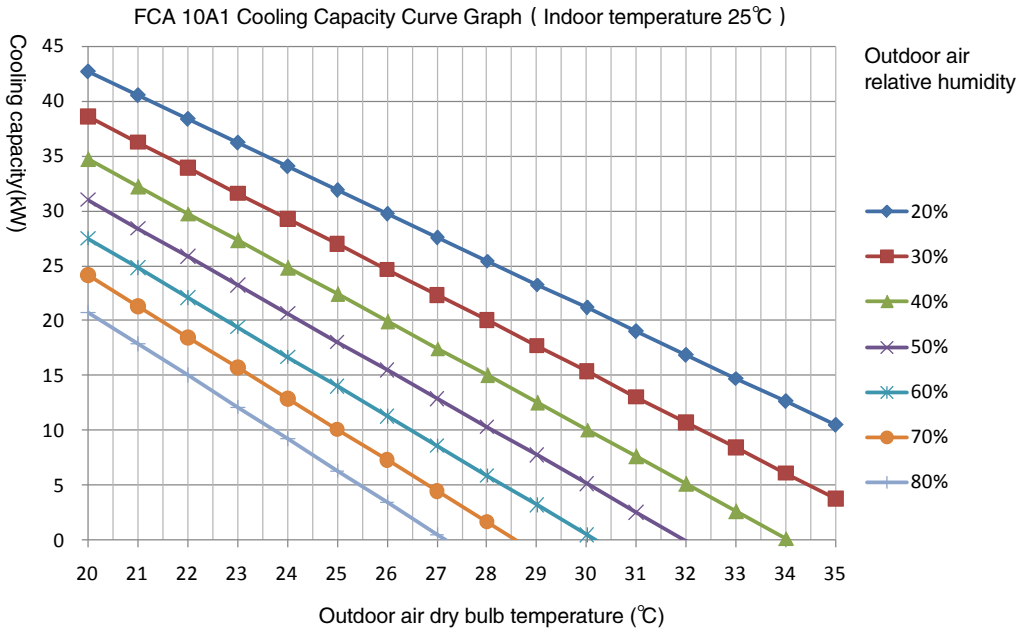
(1) UP: up flow DN: down flow;

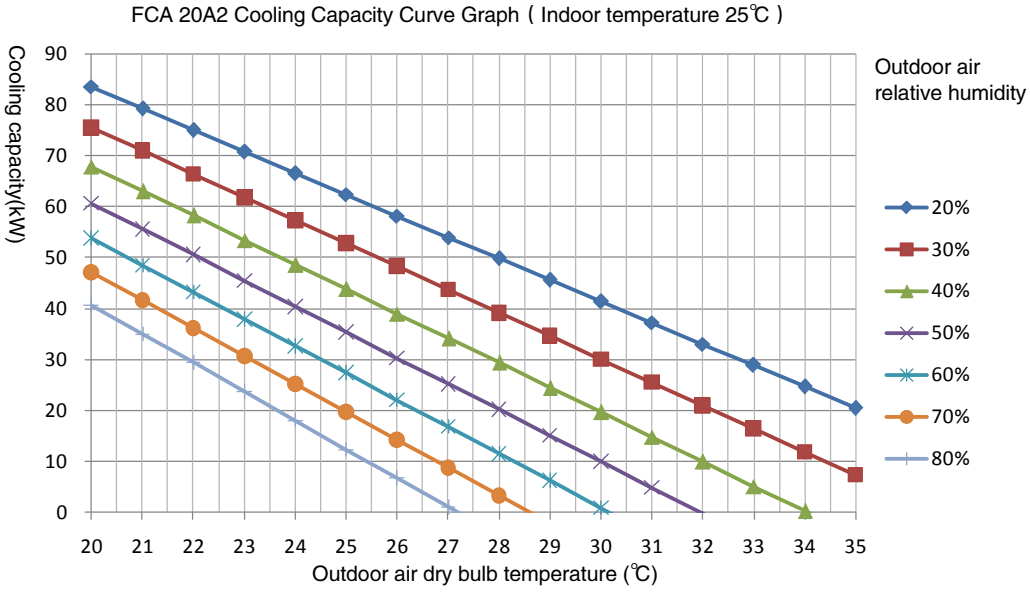
(2) The cooling capacity is closely related to temperature and humidity of inlet air. Cooling capacity at standard operating(@outside air dry bulb temperature 30℃, RH30%, adiabatic cooling mode);

(3) Indoor temperature and outdoor temperature difference(ΔT) is 5℃;

(4) Dimensions after main unit and fan section installed on site.

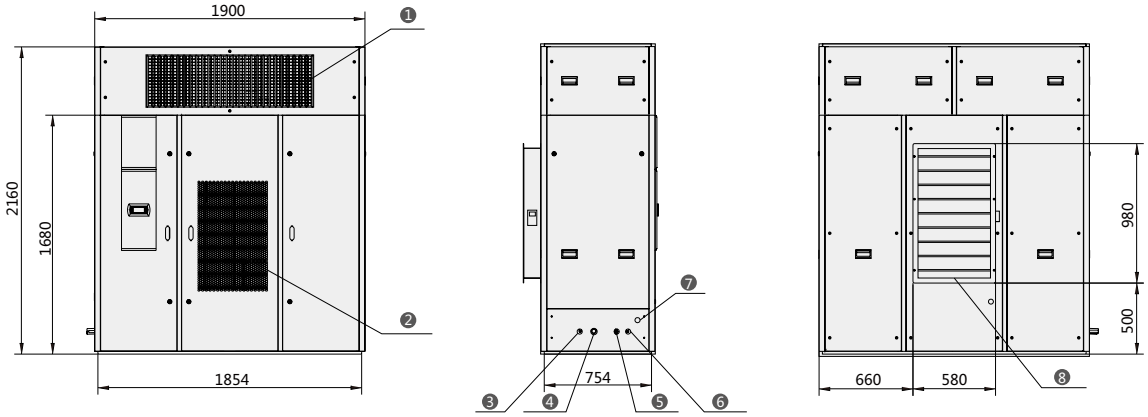
Variable Operating Status Cooling Capacity Curve Graph





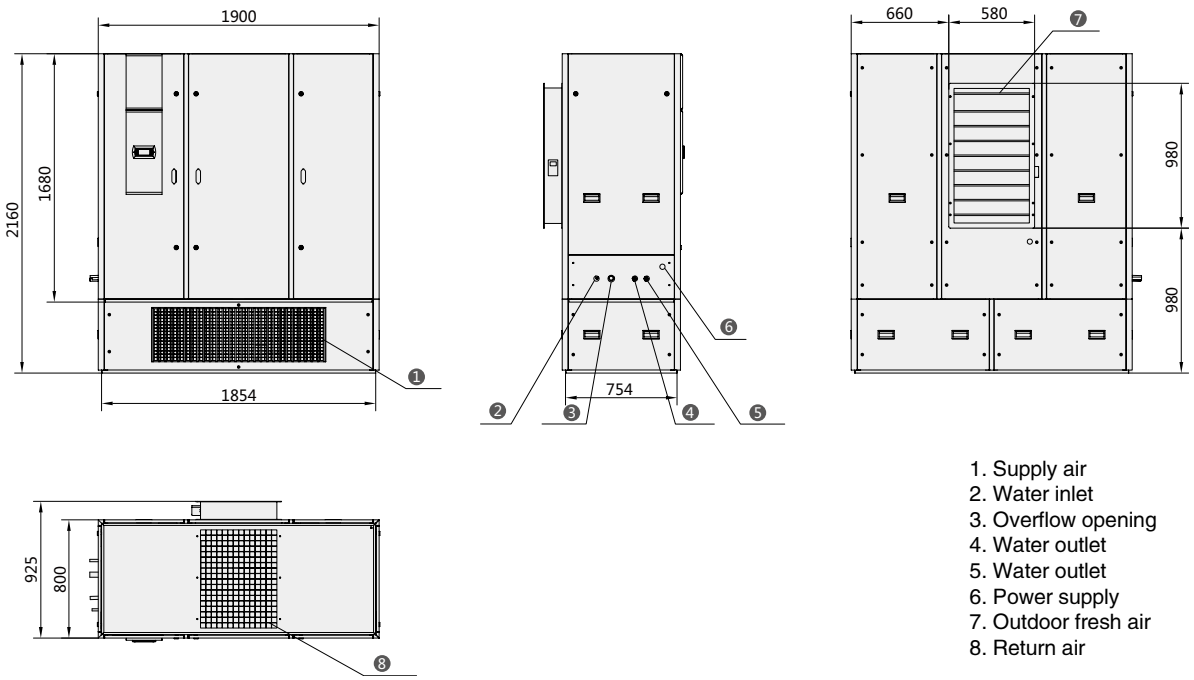
Dimensions drawing

10A1 indoor installed up flow unit



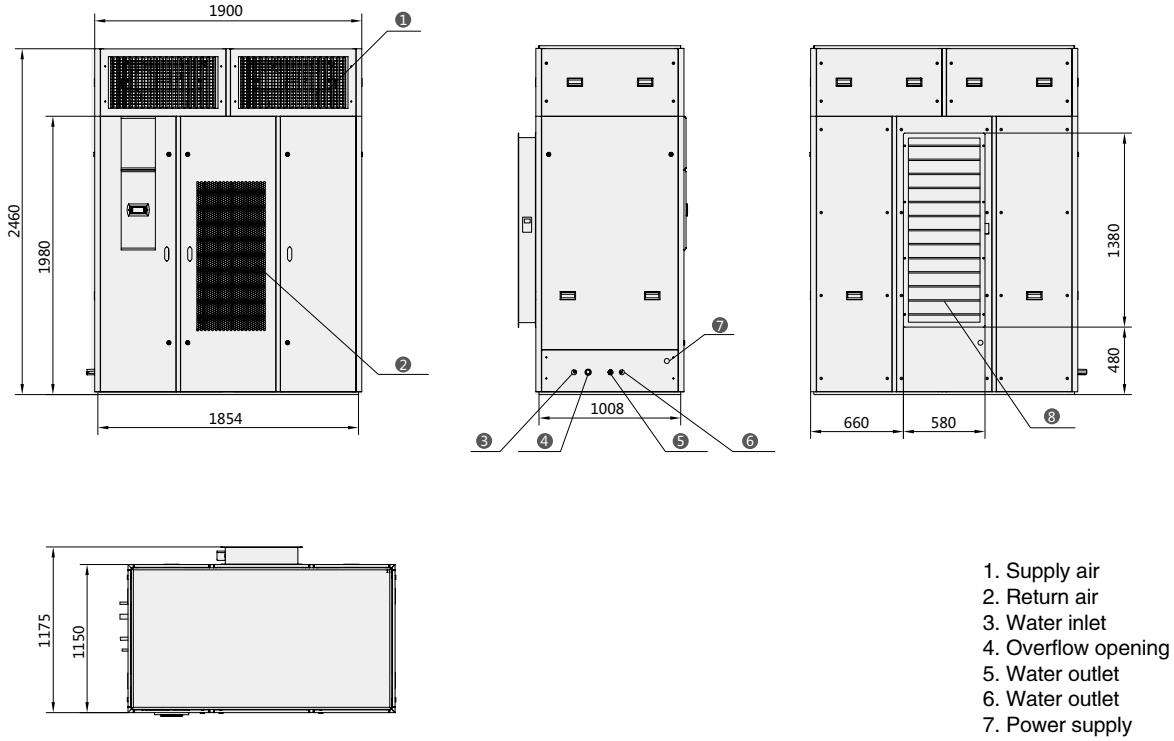
1. Supply air
2. Return air
3. Water inlet
4. Overflow opening
5. Water outlet
6. Water outlet
7. Power supply
8. Outdoor fresh air

10A1 indoor installed down flow unit



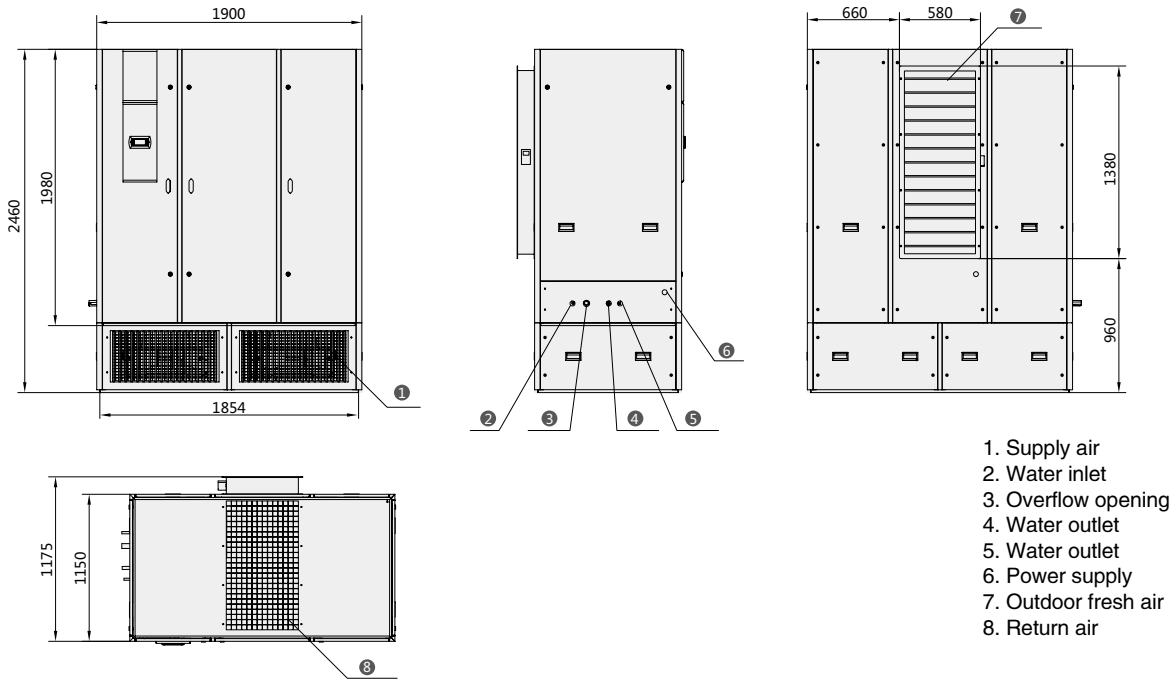
1. Supply air
2. Water inlet
3. Overflow opening
4. Water outlet
5. Water outlet
6. Power supply
7. Outdoor fresh air
8. Return air

20A2 indoor installed up flow unit



1. Supply air
2. Return air
3. Water inlet
4. Overflow opening
5. Water outlet
6. Water outlet
7. Power supply
8. Outdoor fresh air

20A2 indoor installed down flow unit



1. Supply air
2. Water inlet
3. Overflow opening
4. Water outlet
5. Water outlet
6. Power supply
7. Outdoor fresh air
8. Return air

AIRSYS

AIRSYS is a cooling product and solution provider for ICT (Information & Communication Technology) industry.

The products include:

- Air conditioner and Chiller for IT room and large data center
- Intelligent Control system (BAS) for IT room and data center
- Air conditioning equipments for telecom shelters
- Intelligent control system for shelter cooling.

Air conditioner and heat exchanger for telecom cabinets.

The solution include:

- Cooling system design
- System integration
- Installation and Commissioning
- Operation and Maintenance

AIRSYS is also a global leader in providing cooling solution for Medical Imaging System.

AIRSYS Refrigeration Engineering Technology (Beijing) Co. Ltd.

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