AIRSYS

Optima -FC-INV

DC Inverter Precision Air Conditioner Integrated with Free Cooling for Critical Application

Cooling capacity: 18.2kW~115.4kW

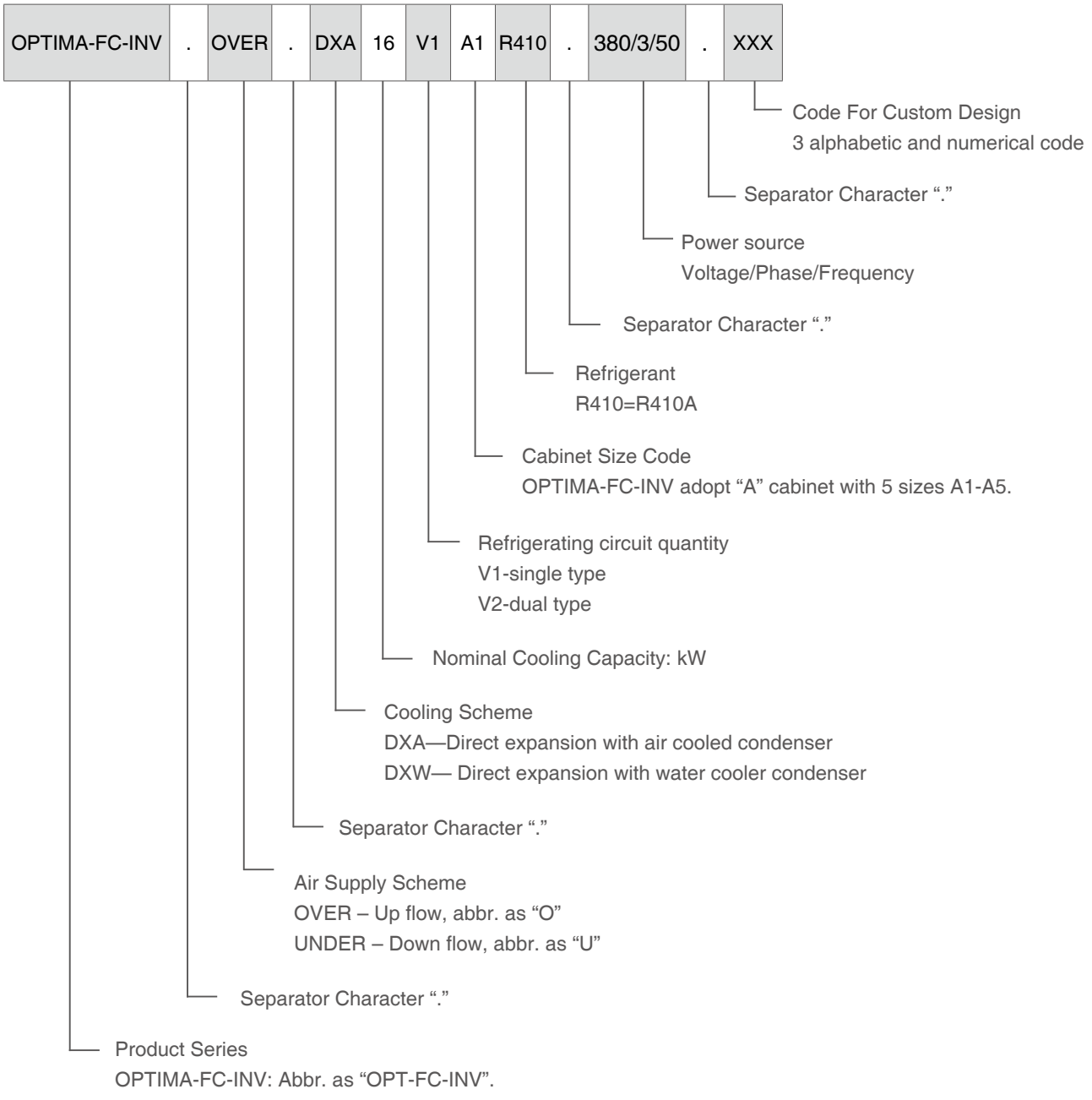
OPTIMA–FC–INV product family is designed for medium to large data center. OPTIMA–FC–INV provides precise temperature and humidity control, outstanding reliability and energy efficiency, 24*7 operation.

OPTIMA–FC–INV precision air conditioner integrated with free cooling offers two kinds of cold source: mechanical cooling and free cooling. When outdoor temperature meets the requirements of free cooling operating conditions, free cooling system starts priority operating, minimizing the runtime of mechanical cooling, so as to lower the power consumption.

OPTIMA–FC–INV product family come with two cooling schemes, including air cooled direct expansion (DXA), water cooled direct expansion (DXW). Series segmentation is shown as below:

Unit type	Cooling scheme		Air supply scheme		Cooling capacity	Cabinet size code
	DXA	DXW	OVER	UNDER	kW	
OPTIMA–FC–INV.DXA	●		●	●	16.3~112.8	A1–A5
OPTIMA–FC–INV.DXW		●	●	●	17.2~115.4	A1–A5

Unit Identification



Operating Range and Control Accuracy

OPTIMA–FC–INV.DXA

Operating Range

Outdoor Temperature:
－40℃～＋55℃ （special options are available for extreme temperature condition）
Piping Length:
Total length of 30 meters of gas and liquid refrigeration piping loop (consult Airsys sales representative for specific installation condition)
Piping Vertical Distance:
Condenser above indoor unit: max. 20m
Condenser below indoor unit: max. 5m
(consult Airsys sales representative for specific installation condition)

Control Accuracy

Temperature Range and Accuracy:
Range: 15℃~35℃, Accuracy: ±1℃;
Humidity Range and Accuracy:
Range: 35%~80%, Accuracy: ±5%

OPTIMA–FC–INV.DXW

Operating Range

Water pressure specification:
Higher than the system total pressure drop, lower than 1250kPa

Control Accuracy

Temperature Range and Accuracy:
Range: 15℃~35℃, Accuracy: ±1℃;
Humidity Range and Accuracy:
Range: 35%~80%, Accuracy: ±5%

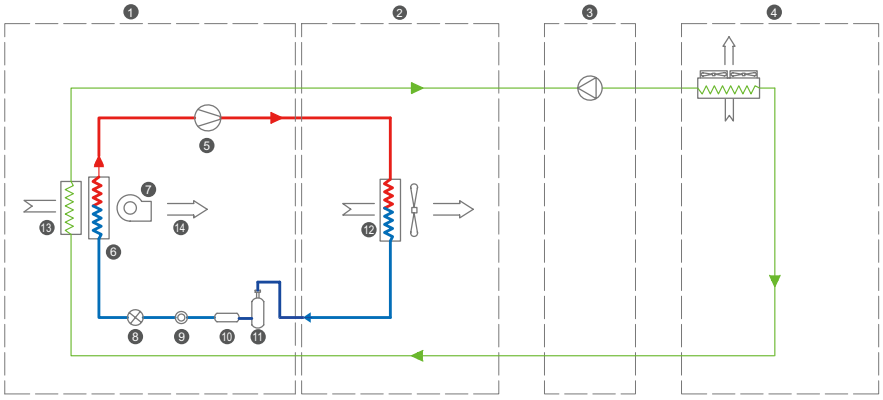
Application

Computer Room and Data Center
Telecom Equipment Room and Shelter
Other Electronic Equipment Room
Healthcare Equipment Room
Laboratory with precision environment
Manufacturing facility requiring precision environment
Storage facility requiring precision environment such as museum, wine cellar

Working Principles

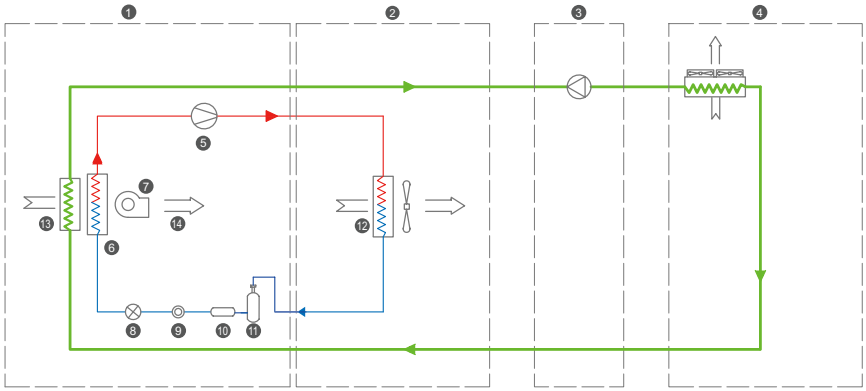
OPTIMA–FC–INV.DXA System Schematic

Flow circuit for mechanical cooling



1 Indoor unit
2 Outdoor unit
3 Pump group(optional)
4 Dry cooler(optional)
5 Compressor
6 Evaporator
7 Supply fan
8 Expansion valve
9 Sight glass
10 Dry filter
11 Liquid receiver
12 Air cooled condenser
13 Return air
14 Supply air

Flow circuit for full free cooling



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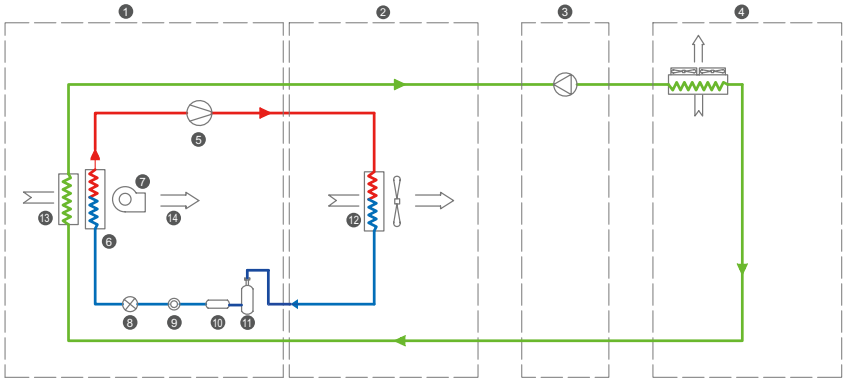
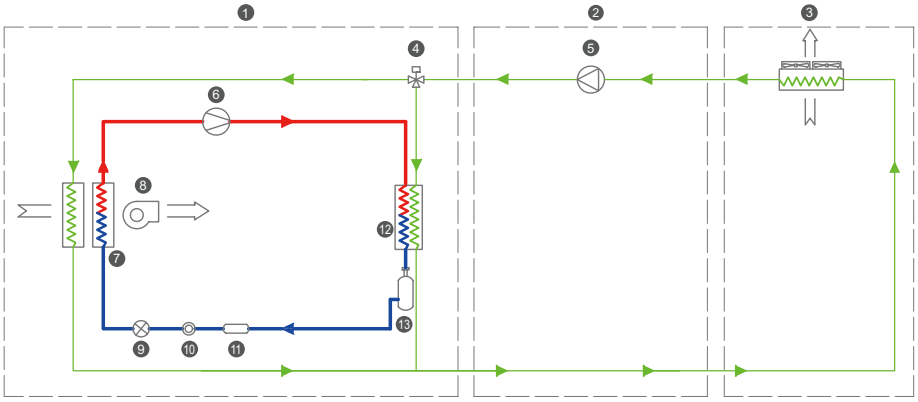
Flow circuit for partial free cooling



1 Indoor unit
2 Outdoor unit
3 Pump group(optional)
4 Dry cooler(optional)
5 Compressor
6 Evaporator
7 Supply fan
8 Expansion valve
9 Sight glass
10 Dry filter
11 Liquid receiver
12 Air cooled condenser
13 Return air
14 Supply air

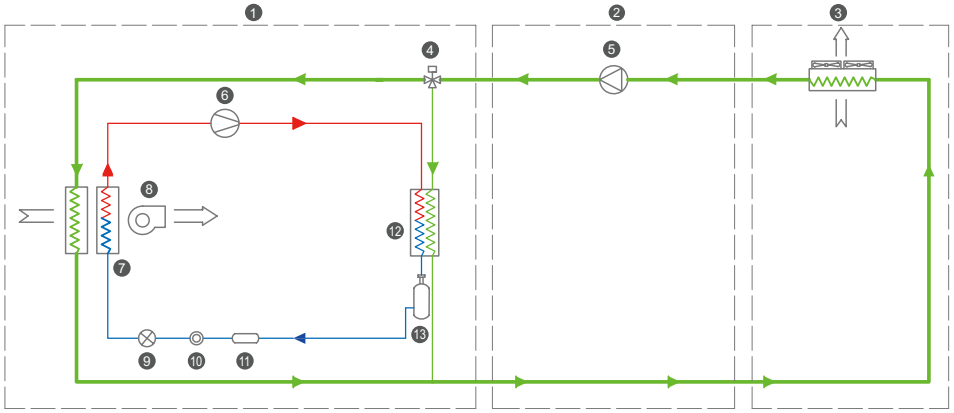
OPTIMA–FC–INV.DXW System Schematic

Working circuit for mechanical cooling



1 Indoor unit
2 Pump group(optional)
3 Dry cooler(optional)
4 3–way valve
5 Pump
6 Compressor
7 Evaporator
8 Supply fan
9 Expansion valve
10 Sight glass
11 Dry filter
12 Plate Heat Exchanger
13 Receiver

Working circuit for full free cooling



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2 Pump group(optional)
3 Dry cooler(optional)
4 3–way valve
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8 Supply fan
9 Expansion valve
10 Sight glass
11 Dry filter
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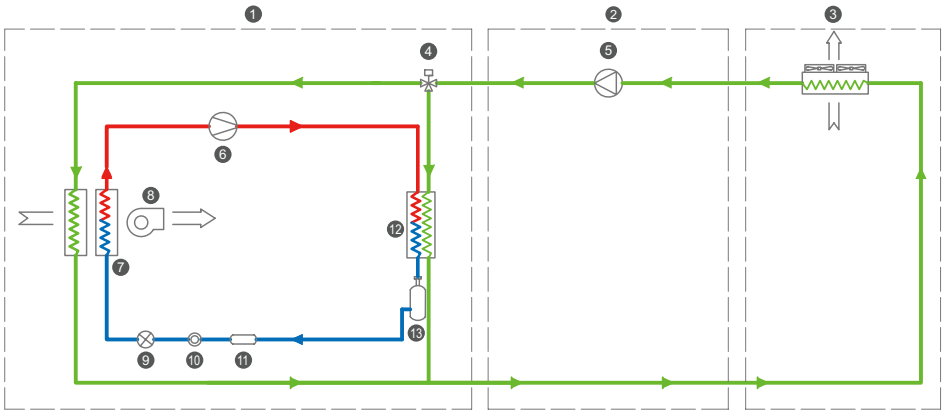
13 Receiver

Working circuit for partial free cooling



1 Indoor unit
2 Pump group(optional)
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4 3–way valve
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13 Receiver

High Lights

High Efficiency

OPTIMA–FC–INV product family incorporates various energy saving technologies. The average EER of DXA units is above 3.0.

Precise Control

The control accuracy for temperature is ±1℃ and for Relative humidity is ±5%.

Various Cooling Schemes Available

The cooling schemes, including DX air cooled, DX water cooled, are available.

Various Air Supply Schemes Available

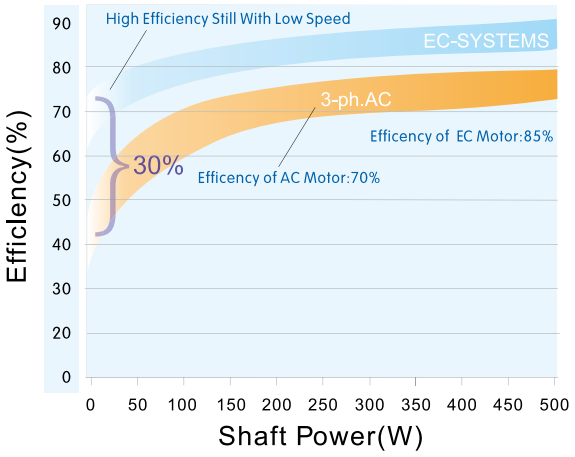
The supply air schemes, include up flow and down flow; The return air schemes, include up return, bottom return, front return and backward return to meet all different requirements of ICT sites.

EC Fan

EC motor with external rotor, is highly efficient, reliable and compact. Taking advantage of its' speed variation ability, the unit can achieve:

1 Energy–saving by reducing the fan speed when necessary.

2 Adjusting external static pressure and air volume according to the external static pressure change.



DC Inverter Scroll Compressor

DXA, DXW units are equipped with international advanced DC inverter scroll compressor, which can adjust its speed to match the cooling demand in an instant. Besides, the compressor has longer life without frequent on and offs.

Air Filter

A washable, easy maintainable and endurable G4 class air filter is a standard configuration for OPTIMA family. With optional air pressure switch, a clogged filter alarm can be triggered when the filter is dirty.

Electronic Expansion Valve

Electronic expansion valve operates more swiftly and precisely than thermal expansion valve, resulting a better control of the system and energy– efficiency.

Continuous Control System for Condensing Pressure

DXA

The unit is installed with pressure sensor which is used for the fan speed control of outdoor unit and maintains the high pressure of refrigeration system within a proper range and keeps the stable operation of the system.

Comparing with On/Off condensing control. The system increases the energy saving significantly and extends the working life of compressor.

The system makes the unit to be able to startup and work at low temperature ambient, up to –40 ℃ or lower.

DXW

The unit is installed with pressure sensor which is used for the water flow valve control of outdoor unit and maintains the high pressure of refrigeration system within a proper range and keeps the stable operation of the system.

Forced Dehumidification System

The dehumidification is realized by decreasing the evaporator coil surface or by reducing the air flow. These features enable faster dehumidification, increase saving energy and more precise humidity control.

Optional Energy Saving Running Modes

Two kinds of running modes can be chosen:

Standard running mode: In this mode the temperature and humidity controlled in narrower range;

Energy saving mode: In this mode, good energy saving can achieve, and the temperature and humidity controlled in a wider range.

The two running modes can be flexibly selected through controller display.

Green Refrigerant

R410A refrigerant is used for DXA and DXW units.

Electrode Humidifier

Electrode humidifier is controlled by microprocessor monitor which can adjust the humidifying capacity precisely. With self washable function, the humidifier can extend the maintenance interval and prolong the working life.

Electric Heater

It is stainless steel pipe twisted with fins around the pipe and it works with a reduced superficial temperature eliminating ionization, thus avoiding peculiar smell.

Isolated Control Panel

All the electrical and control components are installed on an isolated control panel with orderly wiring and clear labeling, meeting the IEC norm.

Self–diagnosis

All the components connected to microprocessor are continuously monitored and controlled and, in case of malfunction, the unit is shut up and the failure is shown on the display.

Easy Maintenance

Technical compartment recessed from the air flow, housing compressor, humidifier, control and safety devices for ordinary service and preventive maintenance during operation.

Unit configuration

OPTIMA–FC–INV Standard Configuration

Standard Configuration	OPTIMA–FC–INV.DXA	OPTIMA–FC–INV.DXW
Powder painted steel frame	●	●
Powder painted steel panel with inside thermal and acoustic insulation	●	●
Backward curve, single inlet, centrifugal fan with 3 phase EC powered Electronic Commuted motor	●	●
Copper tube aluminum fin coil	●	●
Condensing water tray	●	●
G4 class air filter	●	●
Temperature and RH sensor at return air inlet	●	●
Air Pressure Switch for supply fan protection	●	●
Microprocessor control	●	●
Electrical control panel	●	●
Proportional controlled electrode type humidifier, various capacity available	●	●
Stainless steel electric heater, various capacity available	●	●
Compressor inverter	●	●
Hermetic DC inverter scroll compressor	●	●
Rubber vibration absorber for compressor	●	●
Plate heat exchanger as water cooled condenser	—	●
External equalizer thermostatic expansion valve	●	●
Sight glass	●	●
Dry filter	●	●
High pressure transducer	●	●
Pressure switch for high/low pressure protection	●	●
Continuous control system for condensing pressure	●	●
Electronic expansion valve	●	●
Motorized 3–way valve	—	●

Note: “●” standard configuration, “—” no optional available.

(1) Required when using cooling tower.

Optionals for OPTIMA–FC–INV

Optional	OPTIMA–FC–INV.DXA	OPTIMA–FC–INV.DXW
Air pressure switch for clogged filter alarm	○	○
Motorized no–return damper for up flow unit	○	○
Supply air plenum for up flow unit	○	○
Supply air plenum for down flow unit	○	○
Backward air return for up flow unit	○	○
Installation support stand legs	○	○
Supply air temperature sensor.	○	○
Floor water leakage alarm kit.	○	○
Colored touch screen graphical user interface.	○	○
RS232 communication	○	○
R485 communication	○	○
Pcoweb card serve as web based server	○	○
Clock card	—	—
Low temperature operation kit for outdoor temperature below–20℃	○	—
Phase sequence protection relay for power supply	—	—
Motorized 3–way valve	—	○

Note: “○” optional available， “—” no optional available.

Electric Heater/Humidifier Selection Sheet

		A1	A2	A3	A4	A5
Heat capacity (kW)	6	●	—	—	—	—
	9	○	●	—	—	—
	12	○	○	—	—	—
	13.5	—	○	●	—	—
	18	—	○	○	●	●
	27	—	—	—	○	○
	36	—	—	—	—	○
Humidification capacity (kg/h)	3	●	—	—	—	—
	5	○	●	—	—	—
	8	○	○	●	●	●
	10	—	—	○	○	○
	13	—	—	○	○	○
	15	—	—	○	○	○

Note: “●” standard configuration, “○” optional available， “—” no optional available.

Supply Air Plenum (Optional) Dimensions and Weight

Cabinet size		A1	A2	A3	A4	A5
Width	mm	875	1480	1750	2490	3095
Depth	mm	470	470	470	470	470
Height	mm	890	890	890	890	890
Weight	kg	32	55	66	87	95

Functions of Microprocessor Control System

Main Indications

Temperature and humidity

Return air temperature
Return air relative humidity

Working Status

Supply fans
Compressor
Condenser fan
Humidifier water filling and drain valves
Dehumidification activation valve
2 stages electric heater working status
Automatic or manual status
High pressure of refrigeration system

Working Hours of Every Main Component

Supply fans
Each compressor
humidifier
Heaters

Alarm Display

Display effective alarms, store and track up to 100 historical alarms (including alarm code, date, time and alarm description)

Other Control Functions

Self–diagnosis

The microprocessor will continuously monitor its own circuit and shut off automatically in case of malfunction.

Pressure Protections for Compressors

Double protection on high pressure by both high pressure transducer and pressure switch.
Protection on low pressure by pressure switch.

Motor Overload Alarm for Compressor, Supply Fan, Electric Heater and Condenser fan

Prevent damages of component motor from voltage unbalance, low voltage and phase loss.

On–off Control of Compressor

By setting the start–up relay time, minimum working time, minimum on–off interval and number of start–ups per hour to assure the reliability and to prolong the life of the compressor.

Sensor Failure Alarm

The microprocessor will shut down the unit and send out alarm signal in case of any failure of temperature sensor and pressure transducer.

Power Supply Failure Alarm

The microprocessor will shut down the unit and send out alarm signal in case of any failure of the power supply such as phase loss, phase sequence mistake, and voltage out of range.

Unit Random Insertion

The units can start–up automatically after the power recovery. The microprocessor has 2–60 seconds of random insertion to avoid current shock caused by multiple unit start–up at the same time.

Floor Water Leakage Alarm

When detecting the water on the floor with the water leakage alarm kit, the microprocessor will send out an alarm.

Humidification System Alarm

Microprocessor provides various alarms to the humidification system, such as high/low current, high/low water level, cylinder life, high/low conductivity, to assure the reliability and to prolong the life of the humidifier.

Condenser Pressure Control

Microprocessor monitor the compressor discharge pressure and control the steadily control the pressure by changing the speed of the condenser fan. This feature enable more stable operation, low noise, energy saving and low ambient temperature start–up and operation.

Manual Control

It is able to manually switch on/off all the major components during the commissioning and service of the unit.

Operating Scheduling

This function allows the user to set daily or weekly operating schedule.

Multi–unit Group Control

When multiple units are installed in one room, the operating strategy such as rotation, standby, can be achieved by group networking.

Acoustic and Optical Alarm Signaling

The room temperature, humidity and working status of all the components are displayed on the controller. When a failure occurs, acoustic buzzer is energized and the failure message is displayed on the controller display.

4 Levels of Password

Unit has 4 password dedicated to different operation and maintenance jobs, this will prevent the unit from wrong or unauthorized operation.

Modifiable Parameters

Basic Running Parameters

Basic Running Parameters can be modified by customers according to the customer need, for example: temperature and humidification setting.

Routine Parameters

The default parameters can be modified by service engineer during regularly maintenance, for example: temperature and humidity range, precision adjustment, temperature and humidity dead zone setting, highest and lowest temperature and humidity setting, high pressure alarm setting, start and stop schedule setting.

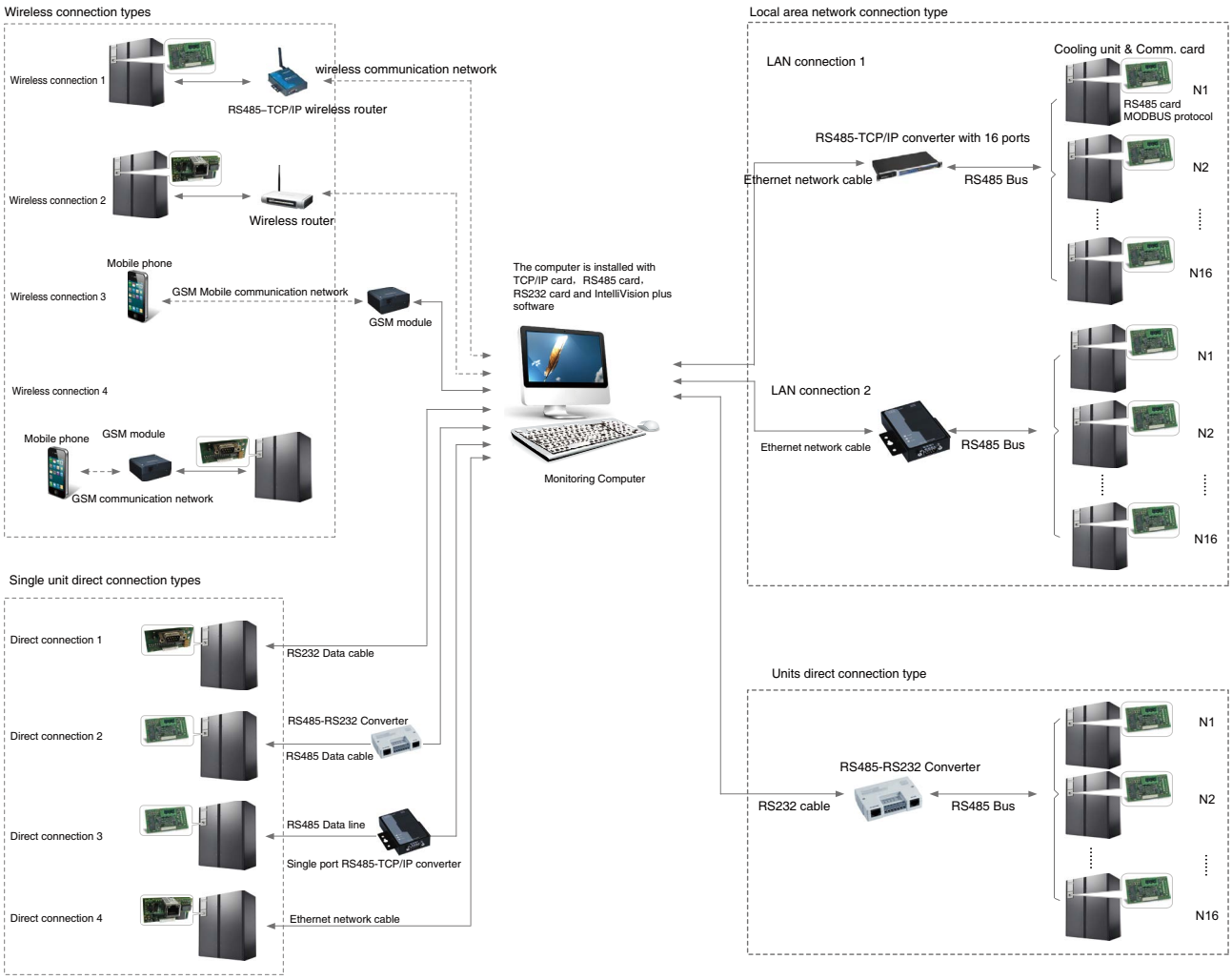
Advanced Parameters

For example: alarm delay adjustment, backup rotation setting, condensing fan working point setting, the compressor minimum start interval setting.
The unit can be initialized if necessary.

Note: more details, please refer to the User Manual.

Remote Control and Monitoring Network

The unit can be remote controlled or monitored by many kinds of methods as follows:
3 kinds of local direct cable connection
3 kinds of LAN network connection
4 kinds of wireless network connection



Technical Parameters

Unit Model		16V1A1	22V1A2	30V1A2	35V2A3	45V2A3	55V2A3	60V2A4	70V2A4	80V2A4	90V2A5	110V2A5
Supply air scheme (1)							O/U					
Power supply							380V/3Ph/50HZ					
Cooling capacity												
Total (2)	kW	18.2	23.8	32.1	37.6	48.3	56.3	63.5	73.5	82.3	93.7	115.4
Sensible(2)	kW	16.7	21.9	29.5	35.7	45.4	51.2	57.8	66.2	74.1	84.3	103.9
Free cooling												
Total (3)	kW	17.1	23.5	34.5	37.8	41.7	57.1	63.6	75.3	84.4	93.4	114.6
Sensible(3)	kW	15.6	21.4	31.4	35.5	39.2	53.7	59.8	70.8	79.3	87.8	107.7
Compressor												
Type(4)							Hermetic DC inverter scroll compresser					
Power input(2)	kW	3.8	5.1	7.1	8.8	11.3	12.4	14.2	16.1	18.4	21.1	26.4
Supply fan												
Type							Caseless(EC) backward centrifugal fan					
Qty. of fan	n.	1	1	2	2	2	3	3	3	3	3	3
Power input	kW	1.0	1.4	1.6	2.1	2.1	2.7	3.2	4.2	3.8	4.2	4.5
Free cooling coil												
Water flow	m^3/h	3.2	5.7	7.3	7.8	8.1	9.5	10.8	12.9	13.6	16.2	17.8
Preesure drop	kPa	26.2	42.1	37.7	68.3	77.2	62.3	76.2	63.5	69.1	100.3	118.1
Air filter							G4 panel					
Electric heater(5)												
Type							Stainless steel electric heater					
Heating capacity	kW	6	9	9	13.5	13.5	13.5	18	18	18	18	18
Working steps	n.	2	2	2	2	2	2	2	2	2	2	2
Humidifier(5)												
Type							Electrode					
Capacity	kg/h	3	5	5	8	8	8	8	8	8	8	8
Power input	kW	2.3	3.8	3.8	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Air cooled condenser(for DXA unit)												
Model*Qty		AMAE6*1	AMAE8*1	AMAE10*1	AMAE6*2	AMAE8*2	AMAE8*2	AMAE10*2	AMAE12*2	AMAE15*2	AMAE18*2	AMAE20*2
Water condenser(for DXW unit)												
Water flow	m^3/h	3.9	6.2	7.3	9.6	11.7	13.6	14.1	16.0	18.1	20.3	23.7
Pressure drop	kPa	27.0	28.6	26.0	41.3	47.5	45.5	44.8	46.3	48.4	34.3	36.7
Pressure drop(with valve)	kPa	33.5	44.6	47.5	56.3	64.3	63.4	58.3	61.3	69.9	51.8	55.2
Water volum	L	1.1	1.8	2.2	3.2	4.2	4.7	5.2	5.8	6.4	7.3	8.1
Dry cooler												
Model*Qty		CMEH20*1	CMEH30*1	CMEH40*1	CMEH50*1	CMEH60*1	CMEH70*1	CMEH80*1	CMEH50*2	CMEH50*2	CMEH60*2	CMEH70*2
Unit piping connection												
Humidifier water supply Φ	in	1/2″	1/2″	1/2″	1/2″	1/2″	1/2″	1/2″	1/2″	1/2″	1/2″	1/2″
Condensing water drainage Φ	in	3/4″	3/4″	3/4″	3/4″	3/4″	3/4″	3/4″	3/4″	3/4″	3/4″	3/4″
Refrigerant gas Φ (for DXW unit)	mm	19	19	22	2*19	2*19	2*19	2*22	2*22	2*22	2*22	2*28
Refrigerant liquid Φ (for DXW unit)	mm	16	16	16	2*16	2*16	2*16	2*16	2*16	2*16	2*19	2*19
Inlet/outlet chilling water Φ (for DXW unit)	in	1–1/4″	1–1/4″	1–1/4″	1–1/2″	1–1/2″	1–1/2″	1–1/2″	2″	2″	2″	2″
Unit external dimensions and weight												
Width	mm	875	1480	1480	1750	1750	1750	2490	2490	2490	3095	3095
Depth	mm	890	890	890	890	890	890	890	890	890	890	890
Height	mm	1960	1960	1960	1960	1960	1960	1960	1960	1960	2050	2050
Weight(for DXA unit)	kg	348	440	475	710	750	790	960	1010	1150	1270	1350
Weight(for DXW unit)	kg	395	490	510	750	810	860	1080	1130	1250	1430	1540

(1) O：Up flow; U：Down flow. If customer choose down flow type, a down flow hood is needed;

(2) Return air dry bulb temperature 24℃, RH50%，condensing temperature 45℃, variable speed compressor is operating at economic speed;

(3) Return air dry bulb temperature 24℃, RH50%，Outdoor dry bulb temperature 2℃, standard water flow；

(4) For dual refrigerating circuit units, including a hermetic fixed frequency scroll compressor except for a hermetic DC inverter scroll compressor;

(5) The default capacity option, please refer to "electric heater/ humidifier selection sheet" for other capacity；

(6) Condenser works when environment temperature≤40℃.

CMEH dry cooler technical parameters

Unit model		CMEH20	CMEH30	CMEH40	CMEH50	CMEH60	CMEH70	CMEH80
Capacity (1)	kW	23.2	31.2	45.3	56.7	61.5	75.2	83.1
Water flow	m^3/h	3.5	5.2	6.2	9.3	10.2	10.6	11.8
Pressure drop	kpa	71.1	68.2	58.7	57.6	69.1	72.3	78.5
Fan								
Air flow rate	m^3/h	12100	11200	22800	23200	21800	33600	32400
Fan Qty.	n.	1	1	2	2	2	3	3
Input power	kW	0.75	0.75	1.5	1.5	1.5	2.3	2.3
Input current	A	3.3	3.3	6.6	6.6	6.6	10.1	10.1
Connection tube size								
Gas pipe Φ	in	1−1/4″	1−1/4″	1−1/2″	1−1/2″	1−1/2″	2″	2″
Liquid pipe Φ	in	1−1/4″	1−1/4″	1−1/2″	1−1/2″	1−1/2″	2″	2″
Dimensions								
Length	mm	1350	1350	1980	2700	2700	3580	3580
Width	mm	620	620	620	620	620	620	620
Height	mm	1070	1070	1120	1120	1120	1120	1120
Weight	kg	95	115	145	175	195	235	255

(1) The capacity is rated at entering air temperature 35℃ and inlet water temperature 45℃ condition.

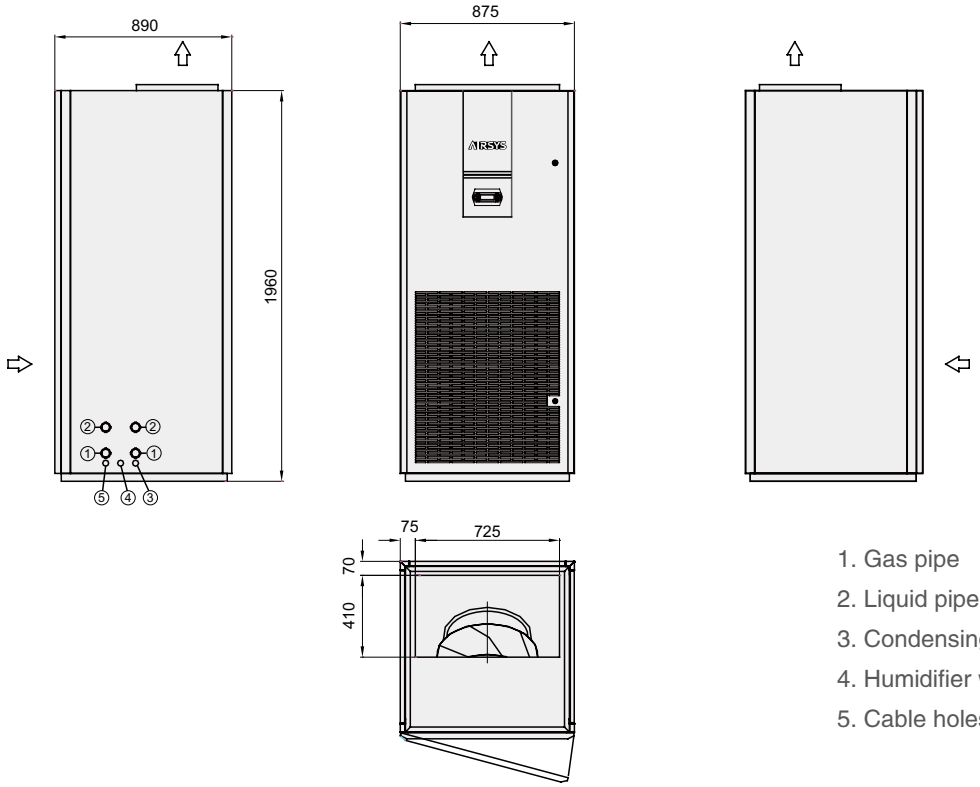
PUG Technical Parameters

Unit model		PUG5	PUG10	PUG15	PUG20	PUG25
Water flow	m^3/h	23.2	31.2	45.3	56.7	61.5
Pump head	m	26	27	28	26	26
Pump qty.	n.	1	1	2	2	2
Input power	kW	0.75	0.75	1.5	1.5	1.5
Input current	A	3.3	3.3	6.6	6.6	6.6
Connection tube size						
Water inlet Φ	in	1−1/2″	1−1/2″	2″	2″	2″
Water outlet Φ	in	1−1/2″	1−1/2″	2″	2″	2″
Physical data and weight						
Length	mm	1390	1390	1390	1390	1390
Width	mm	750	750	750	750	750
Height	mm	1050	1050	1050	1050	1050
Weight	kg	115	120	150	163	180

(1) Each unit is equipped with two pumps, use one and the other one stand by. Above parameters is rated at signal pump works.

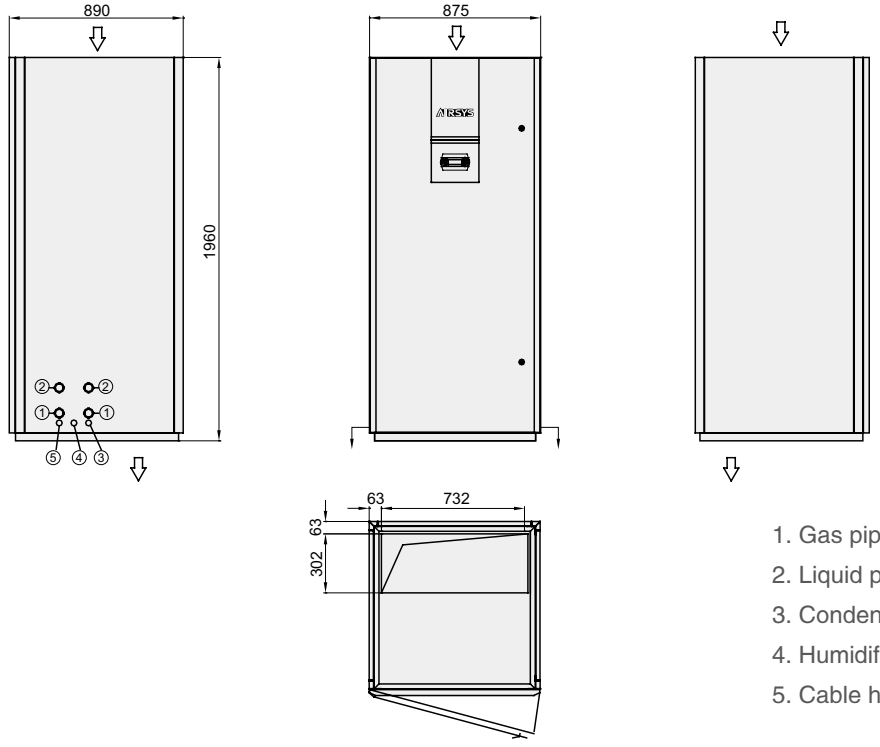
Unit Dimension Drawing

A1 unit cabinet dimension drawing for up flow unit



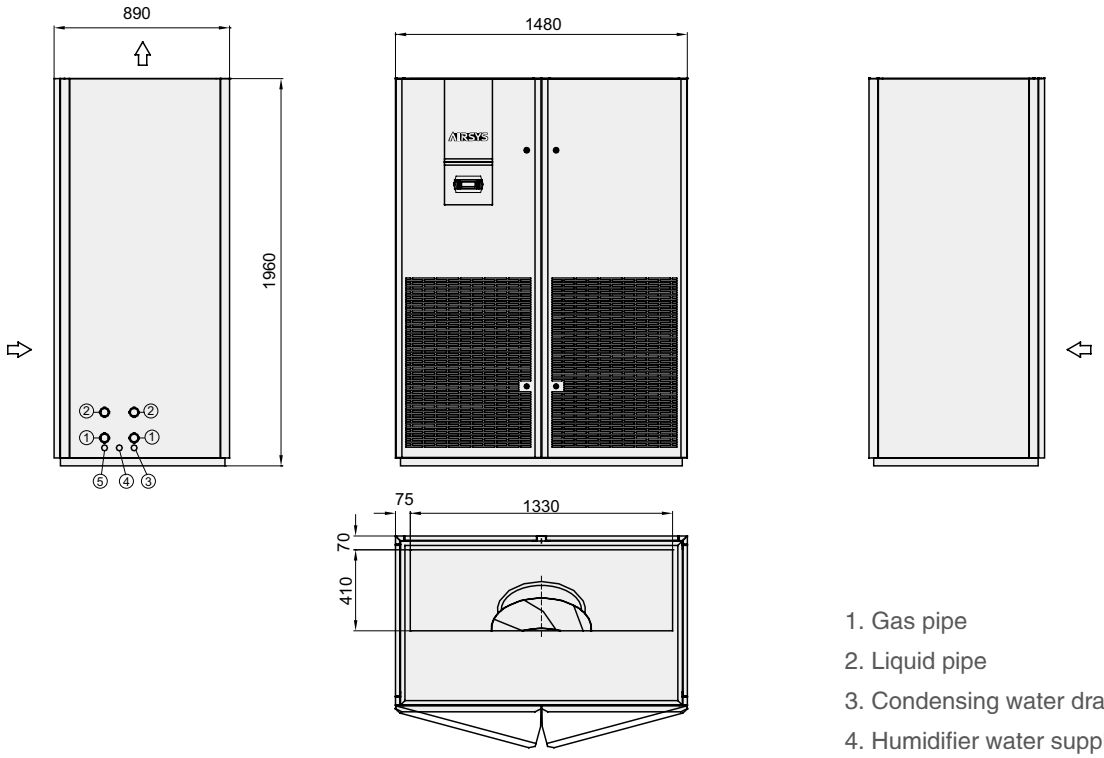
1. Gas pipe
2. Liquid pipe
3. Condensing water drainage
4. Humidifier water supply
5. Cable holes

A1 unit cabinet dimension drawing for down flow unit



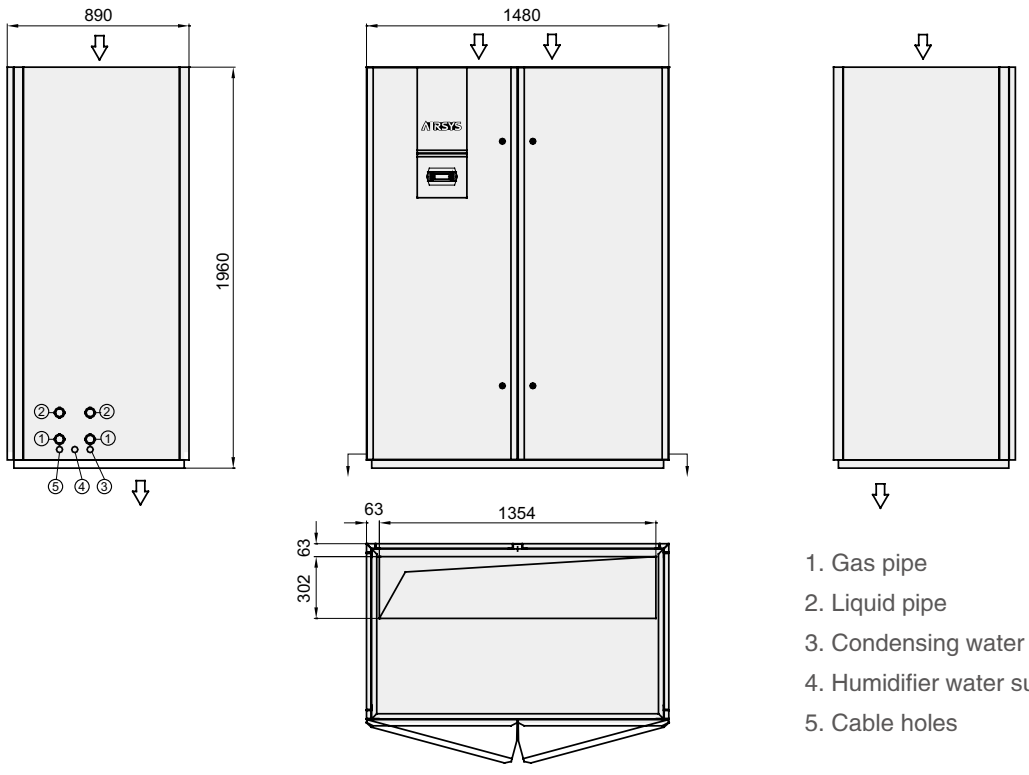
1. Gas pipe
2. Liquid pipe
3. Condensing water drainage
4. Humidifier water supply
5. Cable holes

A2 unit cabinet dimension drawing for up flow unit



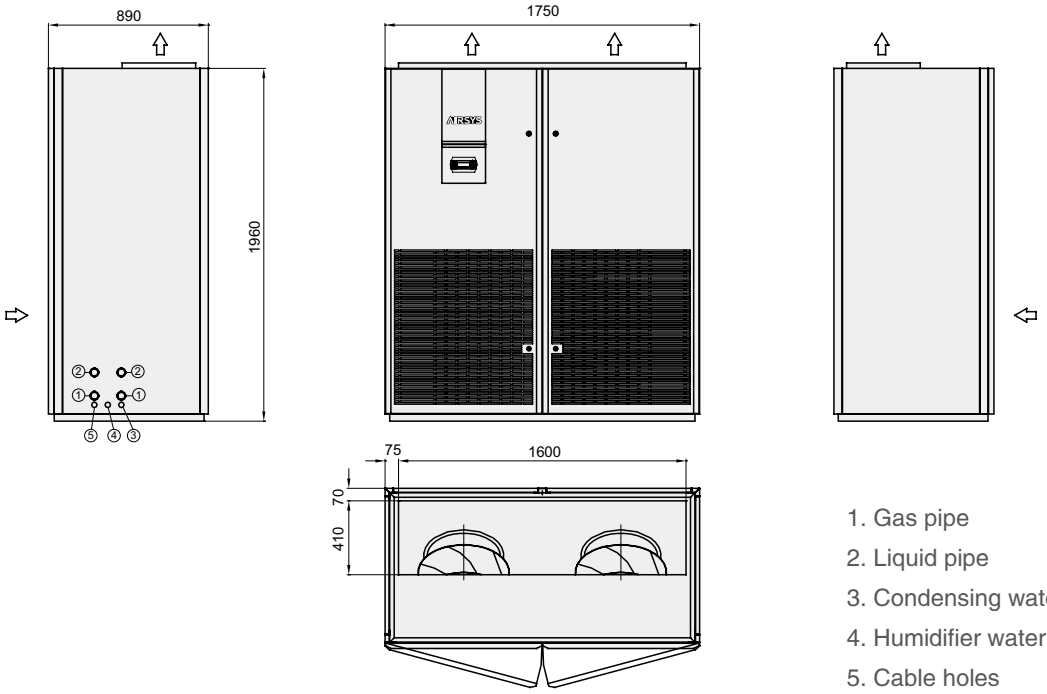
1. Gas pipe
2. Liquid pipe
3. Condensing water drainage
4. Humidifier water supply
5. Cable holes

A2 unit cabinet dimension drawing for down flow unit



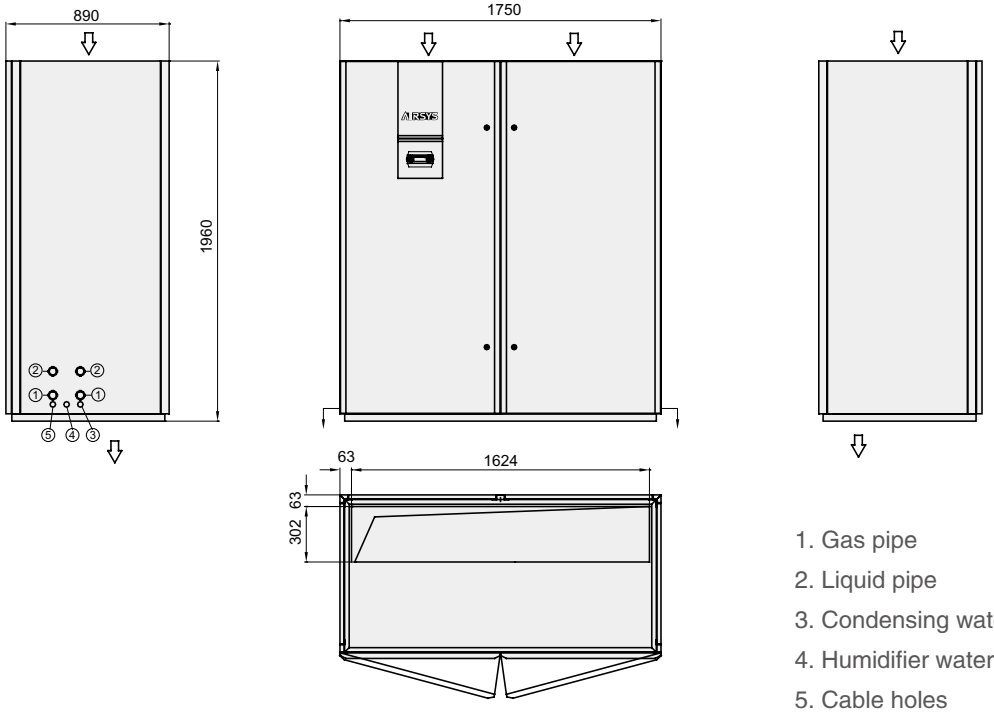
1. Gas pipe
2. Liquid pipe
3. Condensing water drainage
4. Humidifier water supply
5. Cable holes

A3 unit cabinet dimension drawing for up flow unit



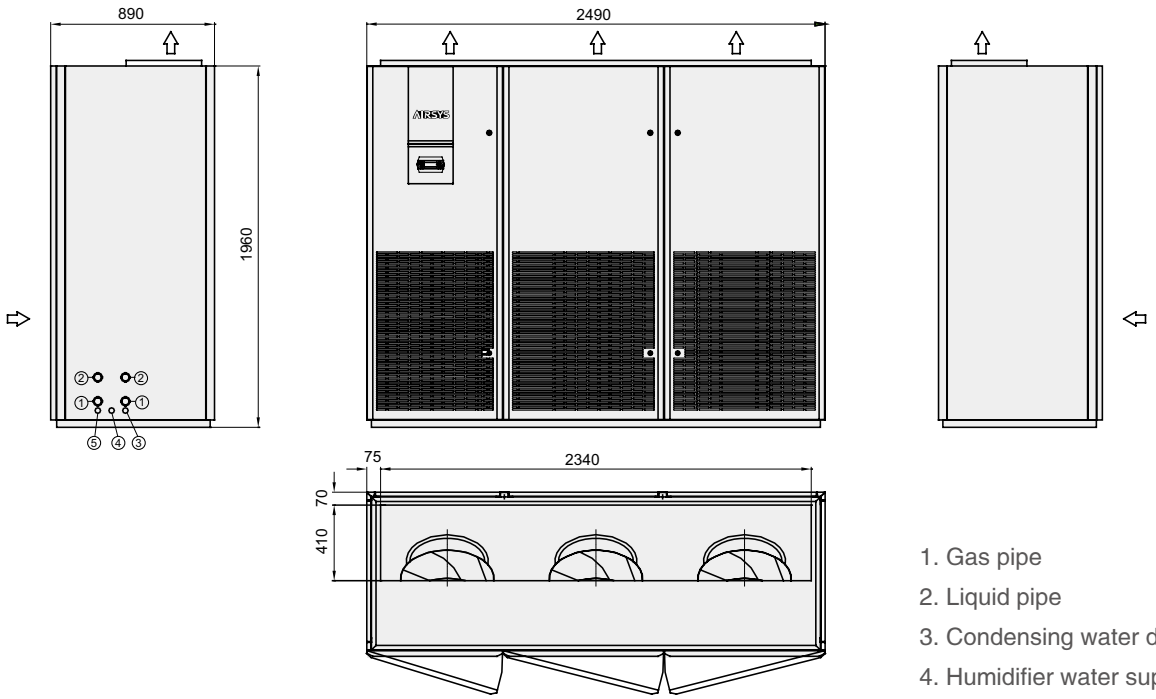
1. Gas pipe
2. Liquid pipe
3. Condensing water drainage
4. Humidifier water water supply
5. Cable holes

A3 unit cabinet dimension drawing for down flow unit



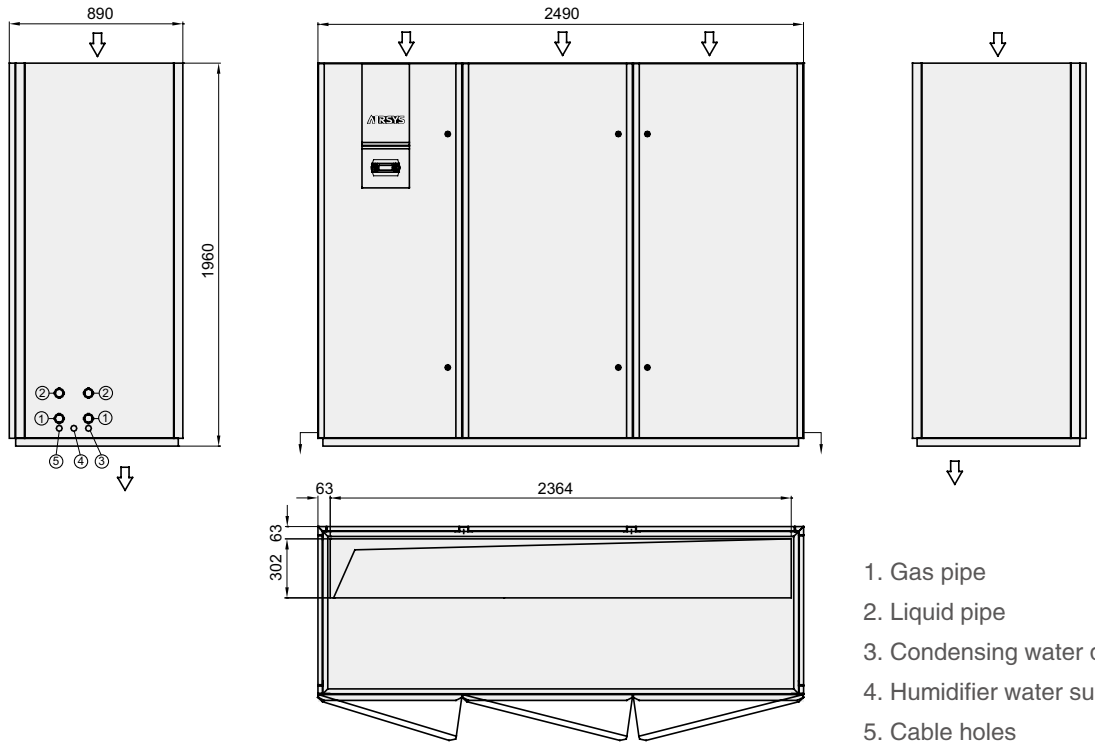
1. Gas pipe
2. Liquid pipe
3. Condensing water drainage
4. Humidifier water water supply
5. Cable holes

A4 unit cabinet dimension drawing for up flow unit



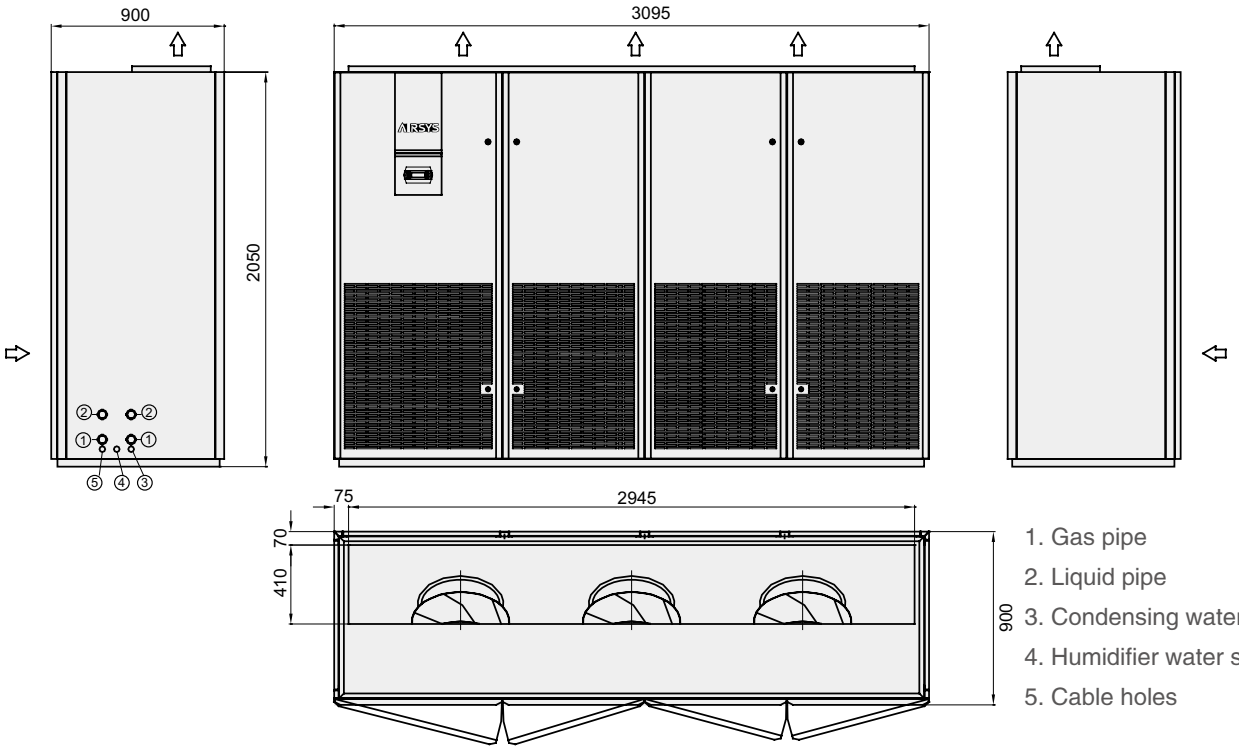
1. Gas pipe
2. Liquid pipe
3. Condensing water drainage
4. Humidifier water supply
5. Cable holes

A4 unit cabinet dimension drawing for down flow unit

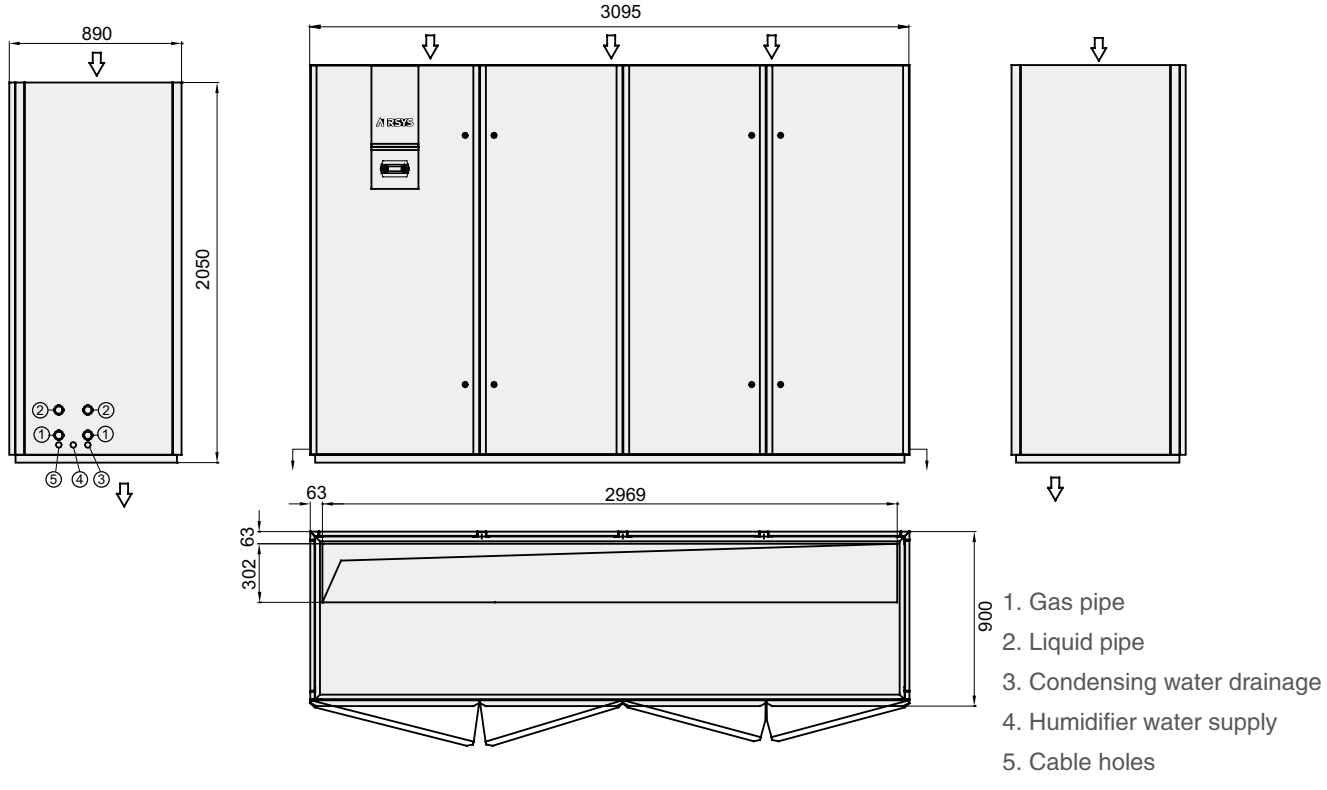


1. Gas pipe
2. Liquid pipe
3. Condensing water drainage
4. Humidifier water supply
5. Cable holes

A5 unit cabinet dimension drawing for up flow unit

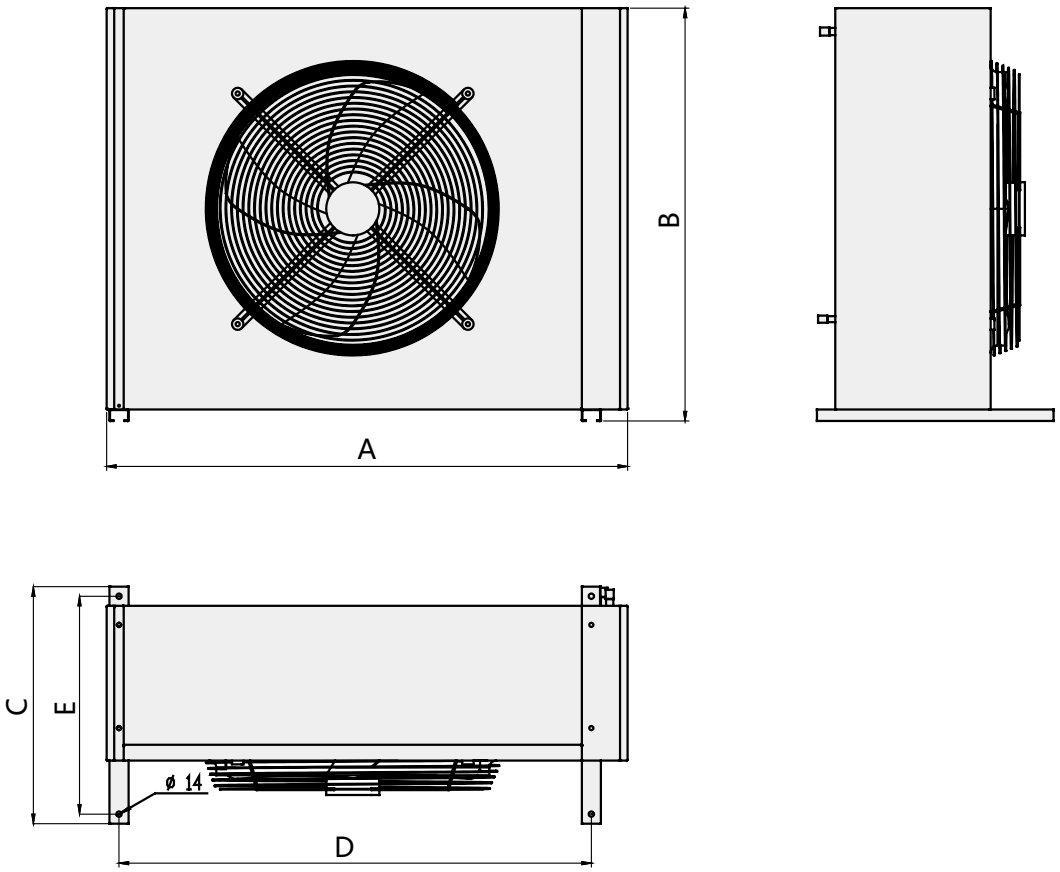


A5 unit cabinet dimension drawing for down flow unit



AMAE Dimension Drawing

AMAE6/AMAE8

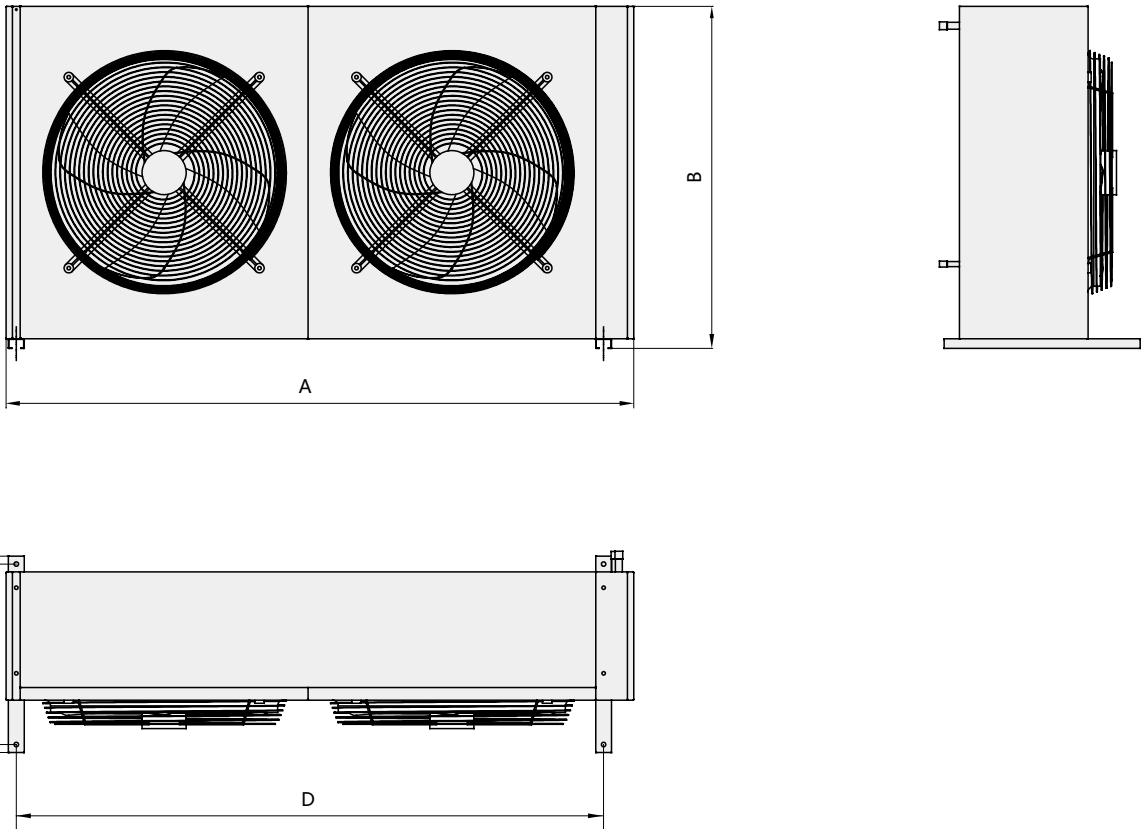


	AMAE6	AMAE8
A	1365	1665
B	1080	1080
C	620	620
D	1237	1537
E	570	570

Remark: Vertical installation type is default, please indicate in the contract if horizontal installation type is required.

AMAE Dimension Drawing

AMAE10~AMAE20

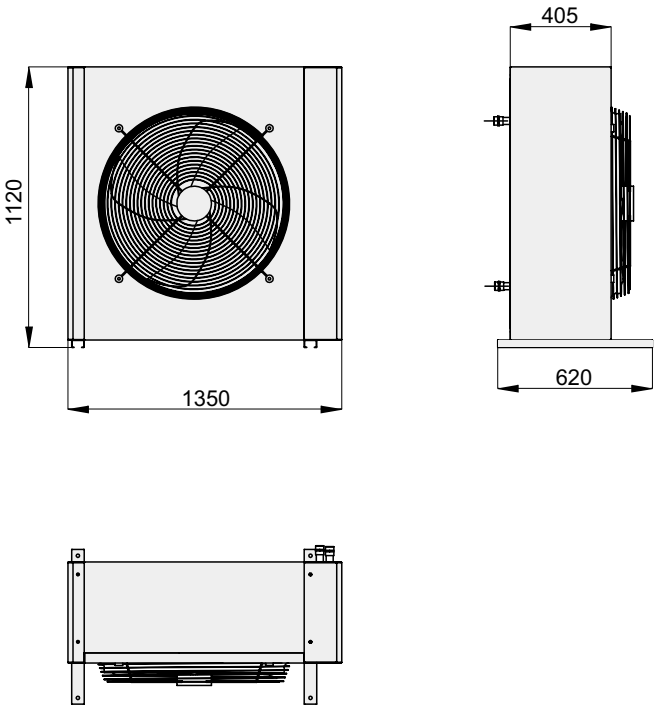


	AMAE10	AMAE12	AMAE15	AMAE18	AMAE20
A	1985	1985	1985	2785	2785
B	1080	1080	1080	1080	1080
C	620	620	620	620	620
D	1857	1857	1857	2657	2657
E	570	570	570	570	570

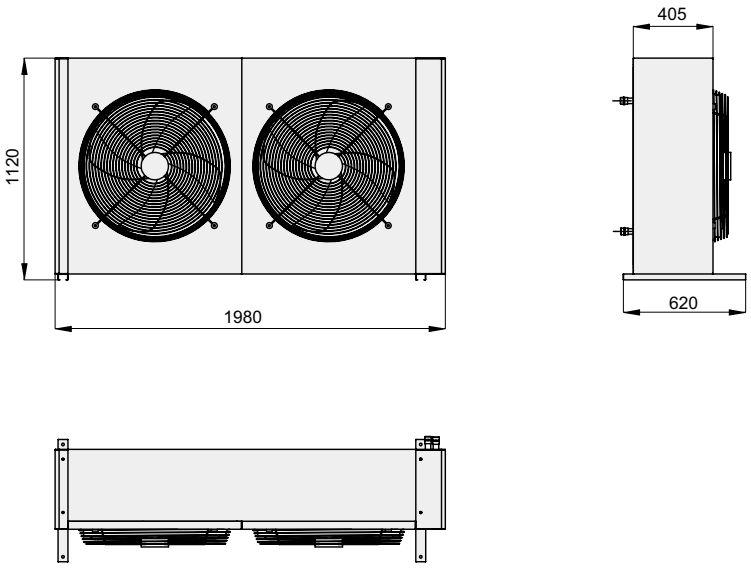
Remark: Vertical installation type is default, please indicate in the contract if horizontal installation type is required.

CMEH Dimension Drawing

CMEH20/CMEH30

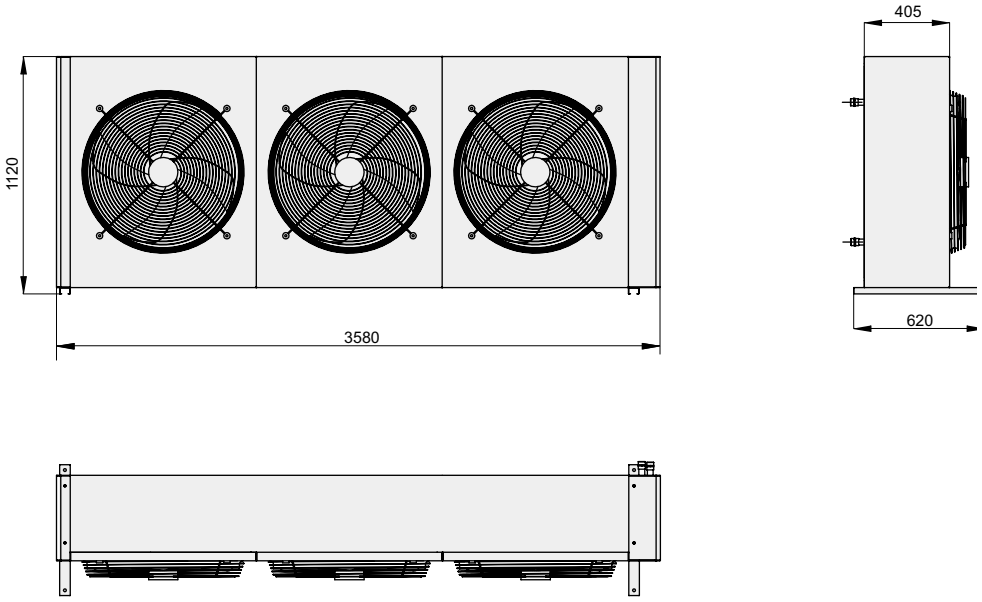


CMEH40/CMEH50/CMEH60

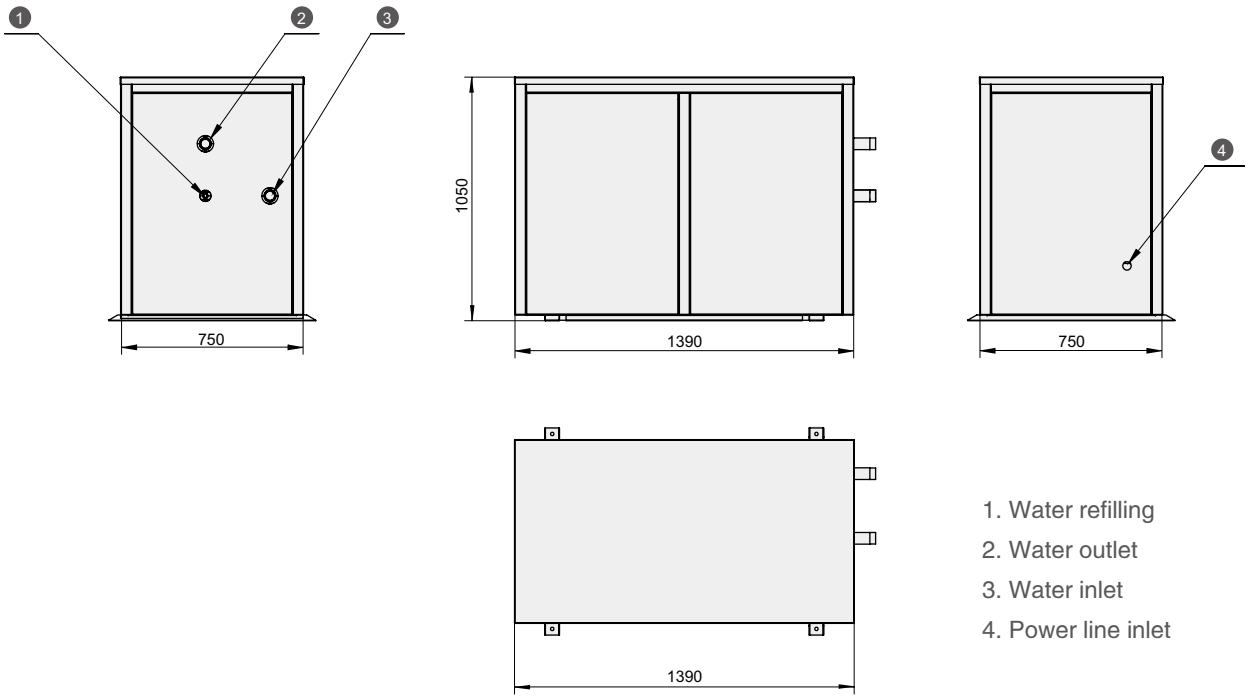


	CMEH40	CMEH50	CMEH60
A	1980	2700	2700
B	1120	1120	1120
C	620	620	620
D	405	405	405

CMEH70/CMEH80



PUG Dimension Drawing



1. Water refilling
2. Water outlet
3. Water inlet
4. Power line inlet

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

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