

# AIR-COOLED CHILLER

Free cooling (Standard)/Partial Recovery(optional)



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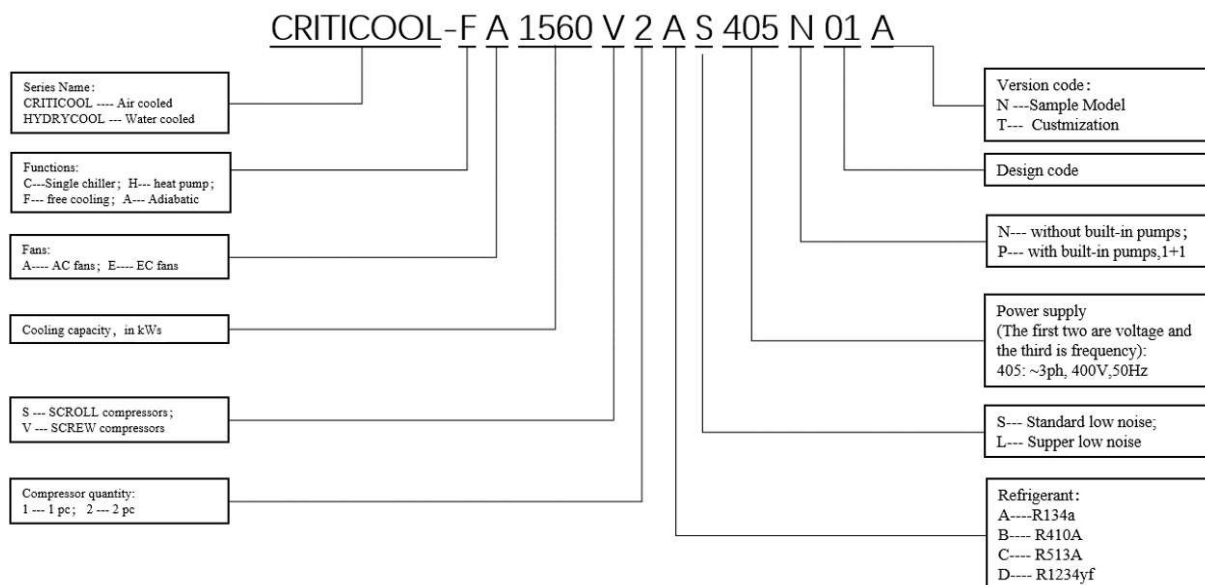
# Overview

HYDROCOOL series is the water cooled chiller that coped with screw compressors launched by AIRSYS. The products are designed and produced in accordance with ISO9000 quality system, strict pressure vessel specifications and refrigeration equipment safety standards. After continuous innovation and improvement, the unit's full load performance coefficient (COP) is as high as 5.6 or above, which greatly reduces the user's operating costs.

The perfect design, powerful control and protection system and the configuration of world-class accessories ensure that

the unit operates safely and efficiently over a wide range of loads. AIRSYS chillers are widely used in hotels, hospitals, theaters, office buildings, shopping malls, schools and other places because of their high efficiency, low noise, low failure rate, and safety and reliability. They can also be used as a cooling source for the central air-conditioning system. Textile, chemical, nuclear power, food processing and other places provide process cooling system chilled water. At the same time, the unit can also make full use of the condensed waste heat during cooling operation to provide customers with sanitary hot water.

# Nomenclature





## Characteristics

### Environmentally friendly refrigerant R134a

AIRSYS centrifugal water-cooled chiller uses completely environmentally friendly R134a refrigerant, does not contain chlorine atoms, does not damage the ozone layer, and has good safety performance (non-flammable, non-explosive, non-toxic, non-irritating, noncorrosive), R134a is a positive pressure refrigerant. Outside air will not enter the system. The AIRSYS centrifugal water-cooled chiller room using R134a refrigerant only requires general ventilation equipment.

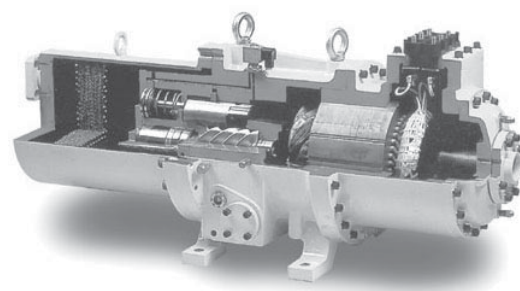
### Scroll compressor

The scroll compressor is full sealed compressor, has full advantage over traditional rotor compressor, since it consists of fewer parts. There is no need worry of refrigerant leakage and abnormal noises. And since its fews dimension and size, it can be capatible of different cooling capacity range.



### Screw compressor

The screw compressor is of two-shaft rotary displacement design with the latest patented screw rotors. The screw rotors are installed with robust ball bearings, i.e. radical bearings at both suction and discharge ends as well as angular contact ball bearings i.e. axial ball bearings at discharge end. The bearings use high-strength ball / roller bearing non-flat bearings. Stop, start interval can be shortened to 10



minutes, bearing life is up to 80,000 hours. Gears are driven at a higher speed, the starting torque of the motor is very small, the service life of the motor is prolonged, the impeller becomes smaller, and the downtime is shorter to ensure the safety of the unit.

The Screw compressor uses a semi-hermetic motor. The motor and the compressor are integrated. The flange is sealed. There is no refrigerant leakage. The liquid refrigerant is used for cooling. The operating temperature is low and the efficiency is high. The equipment room only needs general ventilation equipment. Low running noise.

### High-efficiency condenser

Improve heat exchange efficiency, reduce system condensation temperature, and reduce power consumption of compressor units. The control of the refrigerant flow rate in the condenser, the optimized tube arrangement, and the high-efficiency fin internal and external thread heat exchange tubes improve the heat exchange performance. The unique design of secondary condensation inside the condenser effectively reduces the power consumption of the unit.



### Heat recovery

The heat recovery unit can effectively heat domestic hot water or production process hot water through a specially designed heat recovery unit.

### Advanced controls

#### Microcomputer controller

AIRSYS centrifugal water-cooled chiller is equipped with an advanced microcomputer controller, adopts dual CPU core components, and has a calculation speed of only 0.25ms for executing 1K Words programs, ensuring the safe and stable operation of the unit.

#### HMI

The touch screen comes with storage space and high response speed, and users can grasp the complete operating status of the unit in real time.

#### PID control function

The microcomputer controller uses advanced PID control function to automatically adjust the load of the unit according to the cold water outlet temperature and the target temperature integral value, so that the water temperature can meet the demand in the shortest time, and the water temperature is stabilized within the target temperature  $\pm 0.2^{\circ}\text{C}$ .

#### Unit protection function

The unit has up to 30 protection functions, the main protections are: power supply error protection (voltage, under voltage, three-phase imbalance, under reverse phase protection, etc.), system high voltage protection, system low voltage protection,

compressor motor overload protection, oil level And oil flow protection, antifreeze protection, insufficient water flow protection, sensor false alarm, pump interlock protection, etc.

### Multiple anti-surge functions

The unit has advanced multiple anti-surge functions, using a combination of prevention, control, and alarm to make the unit meet the customer's cooling capacity requirements in the safe operating range. Prevention-Through accurate calculation of the surge curve, when the unit is running close to the surge curve, the unit will automatically adjust the state. Control-adjust the operating state in time when a surge is detected, and effectively control the occurrence of surge. Alarm-If the unit surge continues

for a period of time, it will alert the customer by means of alarm and perform shutdown actions.

### Reserved user connection point

(1) Reserve control points for cooling tower fans, cooling water pumps, and chilled water pumps for users, so that the fans and water pumps are controlled by the unit to optimize the user system structure

(2). The unit has reserved alarm output points for remote alarm display;

(3). A central monitoring connection point (RS-485 interface) is reserved to enable the unit to be seamlessly connected to the building monitoring system.

## Centralized control system

The standard configuration of AIRSYS centrifugal water-cooled chiller does not include the centralized control system of the unit. Users can choose different control systems according to their needs. After configuring the corresponding hardware and expanding the system software, they can realize the monitoring and management of other air conditioning equipment and systems. Monitoring and management system in logic functions, user management, event management, security management, alarm management and transmission, data exchange, real-time functions of data and curves, history records, reports and records storage printing, communication capabilities (including internal LAN communication functions, remote locations Long-distance communication functions, Internet, dial-up communication, etc.), mobile text messages, e-mail, multimedia functions, screen animation effects and other powerful functions. At the same time, the screen operation is simpler, and the management staff can easily operate it by simply training or reading the user manual.

### System Features

According to the actual conditions and functional requirements of different air conditioning systems, this group control management system is customized for the air conditioning system. This system has the following characteristics:

- All water chiller units and their valves, cooling towers, differential pressure bypass valves, pumps, hot water systems, and air handlers in water systems and air-conditioning systems can be efficiently and automatically managed 24 hours a day;
- Chinese graphic monitoring software;
- Superior performance in user management, event management, security management, etc.;
- Simple, practical and efficient operation;
- Automatic and efficient management of the partitions of the monitored equipment;
- The chiller and water system microcomputer control box displays the user functions and parameter settings that can

be realized in the monitoring computer of the group control system.

- With LAN communication function, after the monitoring center monitoring computer is incorporated into the building's internal

### Function of group control system

- Multi-unit monitoring and management function: One set of software can simultaneously monitor and manage multiple units and many devices in the system.
- Dynamic display of water system processes and information;
- The group control system selects the optimal combination of equipment according to the operating conditions, operating time, energy efficiency, alarm status, and standby status of each system equipment, and at the same time in automatic

- LAN, any computer in the LAN can implement monitoring management on the chiller after passing the "password authentication";

operation mode. Next, let the system equipment run in a predetermined order;

- User functions and parameter settings can be realized on the monitoring computer of the group control system. The main parameters and working status of the system are displayed, including: chilled water temperature, cooling water temperature, Water pressure difference, unit and system working status, compressor, water pump, protection point status, valve operating status and operating hours, etc.;

## Instructions

### Unit operating range (under rated flow)

Items	Chilled water		Cooling water	
	Inlet temp. (°C)	Outlet temp. (°C)	Inlet temp. (°C)	Outlet temp. (°C)
Refrigerating	10~20	5~15	19~35	23~40

The operating range of the standard unit is shown in the table above. If the actual operating conditions exceed the range of the table above, the unit or system needs to be specially designed according to the actual application operating conditions to ensure that the unit can operate normally.

## Water quality management

- Poor quality of chilled water and cooling water will cause a decrease in heat transfer efficiency and a decline in the performance of the unit. It will also corrode the heat transfer tube and cause a major accident in the unit. Soft water is recommended when the chilled water system is closed. During the operation of the unit, the cooling water (including the cooling water of the open system) should be sampled and analyzed regularly, and the water quality should meet the requirements of the following table;
- If the water quality requirements are not met, water quality treatment should be carried out. The company does not promise that it can use improperly treated or untreated water, nor does it promise that this series of units can use brine;
- When it is not used for a long time in winter, the water should be drained to prevent the heat exchange tube from freezing and damaging.

Items		Unit	Make up water	Chilled Water	Corrode	Scaling
Basic items	PH value (25 °C)		6.5~8.0	6.5~8.0	0	0
	Conductivity (25 °C)	μS/cm	<200	<800	0	0
	Chloride Cl <sup>-</sup>	mgCl <sup>-</sup> /L	<50	<200	0	
	Sulfate ion SO <sub>4</sub> <sup>2-</sup>	mgSO <sub>4</sub> <sup>2-</sup> /L	<50	<200	0	
	Acid consumption (PH4.8)	mgCaCO <sub>3</sub> /L	<50	<100		0
	Full hardness	mgCaCO <sub>3</sub> /L	<50	<100		0
Reference items	Iron (Fe)	mgFe/L	<0.3	<1.0	0	0
	SulfideS <sup>2-</sup>	mgS <sup>2-</sup> /L	-	-	0	
	Ammonium ion NH <sub>4</sub> <sup>+</sup>	mgNH <sub>4</sub> <sup>+</sup> /L	<0.2	<1.0	0	
	Silica SiO <sub>2</sub>	mgSiO <sub>2</sub> /L	<0.3	<50		0

ote: 0 indicates factors related to corrosion or scaling tendency



# Technical parameter table

## Standard units (Free cooling /Scroll Compressor/ Dry Evaporator):

CRITICOOL-FE		30	40	50	65	80	90	100	130	200	260	390	
Cooling capacity ①	kW	30.2	40.4	48.4	58	82.8	90.1	97.8	116	186	232	348	
Power input①	kW	9.5	12.8	15.8	18.5	25.6	29.1	30.2	34.0	59.4	68.0	102.0	
COP①	kW/kW	3.18	3.16	3.06	3.14	3.23	3.10	3.24	3.41	3.13	3.41	3.41	
Cooling capacity ②	kW	34	43.8	53	63.5	89.9	96.6	108	128	207	256	384	
Power input②	kW	10.0	13.2	16.8	19.5	26.4	29.5	31.7	35.0	61.2	70.4	105.1	
COP②	kW/kW	3.40	3.32	3.15	3.26	3.41	3.27	3.41	3.66	3.38	3.64	3.65	
Free cooling capacity	kW	34	43.8	53	64	90	96	108.2	127	206	256	381	
100% free cooling temperature	degC	3	3	3	3	3	3	3	3	3	3	3	
Power supply	-	380V,3Ph,50Hz											
Evaporator	water flow	m <sup>3</sup> /h	5	7	8	10	14	15	17	20	34	39	60
	pressure drop	kPa	52	55	52	56	60	62	58	68	50	65	72
	connection	DN	32	40	40	50	50	50	65	65	80	80	125
Fan	air flow	m <sup>3</sup> /h	6000	7200	8500	12000	14400	17000	17000	22000	34000	44000	66000
	qty	pc	1	1	2	2	2	2	2	2	4	4	6
	power input	kW	0.63	0.72	1.62	2.52	2.88	3.44	3.44	5	10	10	15
Dimension	A	mm	1600	1600	2100	2100	2100	2100	2300	2300	2300	2300	2300
	(L)												
	B	mm	1175	1175	1175	1175	1175	1175	1175	1175	2345	2345	3515
	(W)												
C	mm	2200	2200	2200	2555	2555	2555	2555	2555	2555	2555	2555	
(H)													
Weight	kg	390	480	600	780	944	1035	1150	1390	2360	2780	4000	
Operating Weight	kg	420	515	670	840	1020	1120	1250	1500	2500	2890	4150	
Refrigerant	kg	13	17	21	27	34	38	42	55	84	109	164	

1. Operating conditions: the inlet and outlet water of the evaporator is 12/7 °C, and the ambient temp is 35 °C.;

2. Operating conditions: the inlet and outlet water of the evaporator is 18/12 °C, and the inlet and the ambient temp is 35 °C. When the operating conditions of the client group change, please refer to the graph of changing operating conditions;

3. The evaporator and condenser are connected by flanges;

4. Use refrigerant: R410A;

5. Standard pressure on the water side of the unit is 1.0 MPa.

## Standard units (Free cooling /Screw Compressor/ Dry Evaporator):

CRITICOOL-FE		260	390	520	650	780	910	1040	1170	1300	1430	1560	
Cooling capacity ①	kW	221	326	450	565	679	804	929	1015	1130	1244	1358	
Power input①	kW	72	116	157	194	231	272	313	338	362	392	421	
COP①	kW/kW	3.07	2.81	2.87	2.91	2.94	2.96	2.97	3.00	3.12	3.17	3.23	
Cooling capacity ②	kW	248	381	525	658	782	915	1042	1183	1316	1440	1564	
Power input②	kW	81	118	162	197	235	277	350	388	418	453	488	
COP②	kW/kW	3.24	3.23	3.24	3.34	3.33	3.30	2.98	3.05	3.15	3.18	3.20	
Free cooling capacity	kW	255	382	509	636	764	900	1018	1145	1273	1400	1527	
100% free cooling temperature	DegC	3	3	3	3	3	3	3	3	3	3	3	
Power supply	-	380V,3Ph,50Hz											
Evaporator	water flow	m <sup>3</sup> /h	39	60	83	104	123	144	165	185	202	223	240
	pressure drop	kPa	60	48	52	65	65	42	65	85	68	66	68
	connection	DN	100	125	125	125	150	200	200	200	125*2	125/150	150*2
Fan	air flow	m <sup>3</sup> /h	88000	132000	176000	220000	264000	308000	352000	396000	440000	484000	528000
	Qty	pc	4	6	8	10	12	14	16	18	20	22	24
	power input	kW	8.4	12.6	16.8	21	25.2	29.4	33.6	37.8	42	46.2	50.4
Dimension	A	mm	2745	3910	5080	6250	7420	8590	9760	10930	12100	13270	14440
	(L)												
	B	mm	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300	2300
	(W)												
	C	mm	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600	2600
(H)													
Weight	kg	2680	4000	5300	6750	8000	9200	10680	12200	13500	14750	16000	
Operating Weight	kg	2930	4280	5600	7050	8380	9580	11050	12640	14000	15300	16560	
Refrigerant	kg	89	132	182	228	274	325	375	410	456	502	548	

1. Operating conditions: the inlet and outlet water of the evaporator is 12/7 °C, and the ambient temp is 35 °C.;

2. Operating conditions: the inlet and outlet water of the evaporator is 18/12 °C, and the inlet and the ambient temp is 35 °C. When the operating conditions of the client group change, please refer to the graph of changing operating conditions;

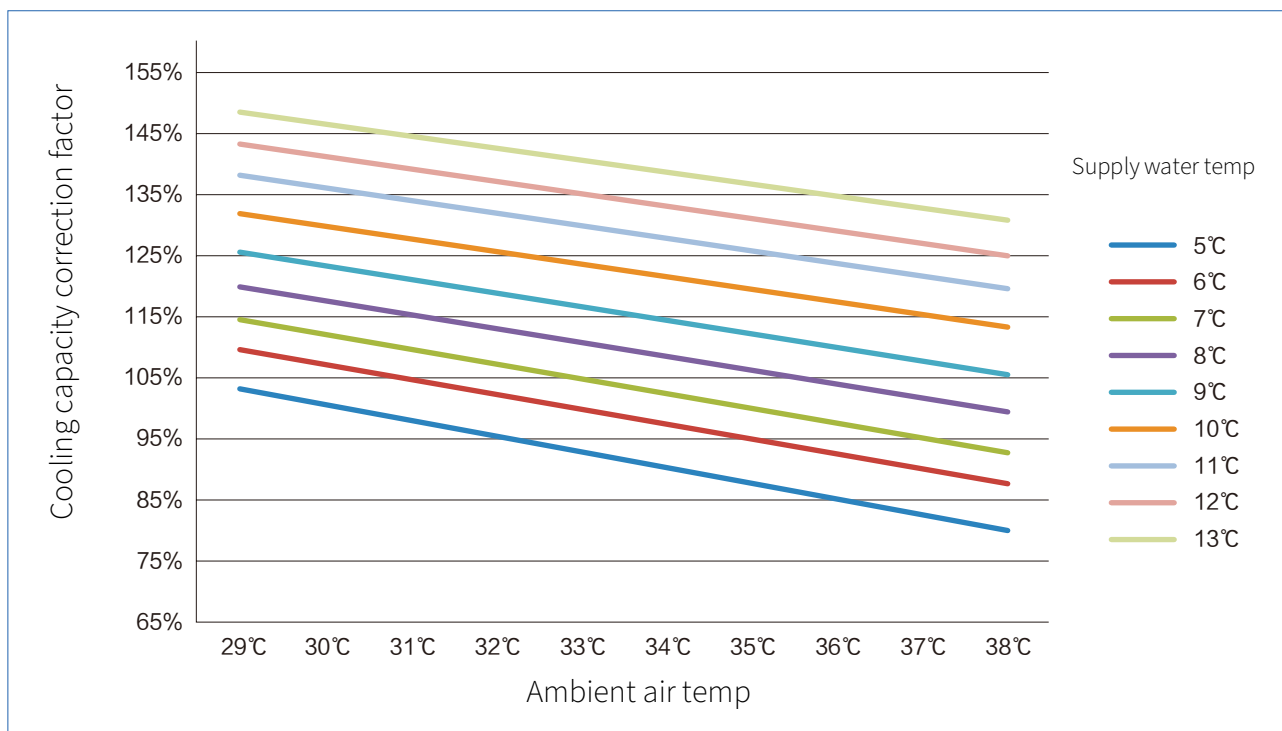
3. The evaporator and condenser are connected by flanges;

4. Use refrigerant: R134A;

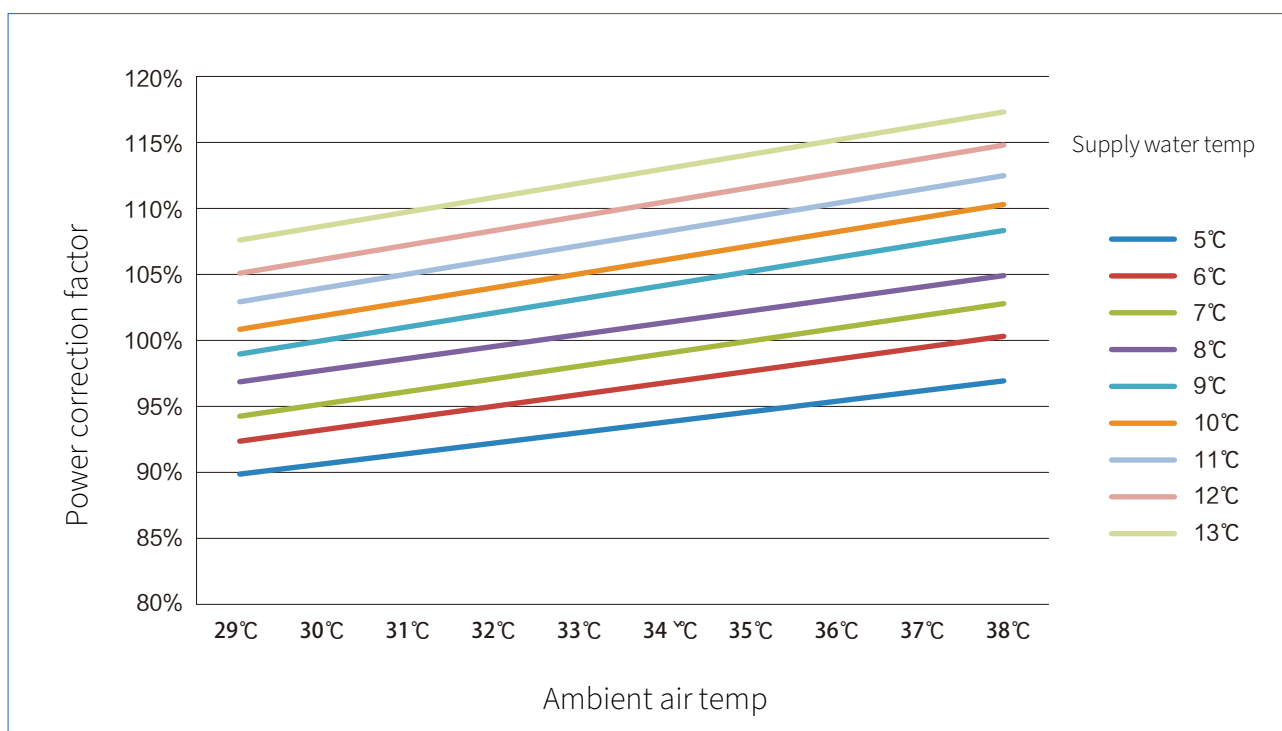
5. Standard pressure on the water side of the unit is 1.0MPa;

# Operating curves

## Cooling capacity

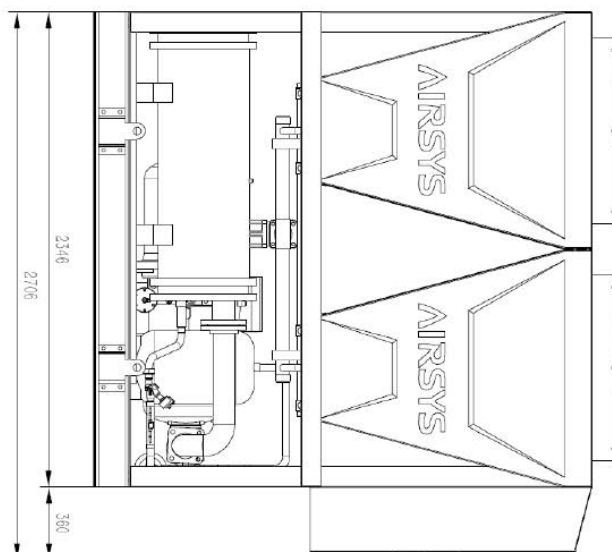
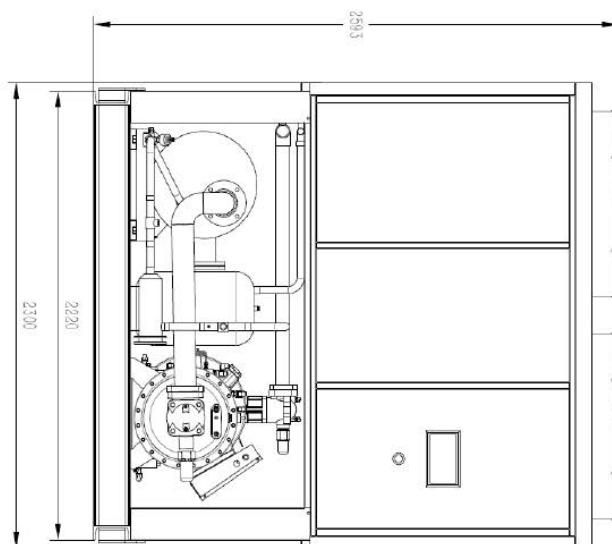
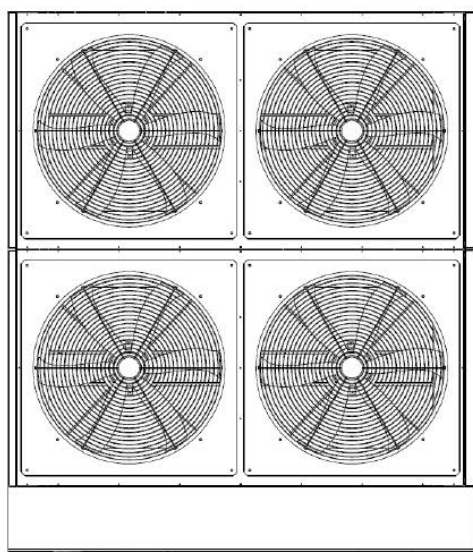


## Power input

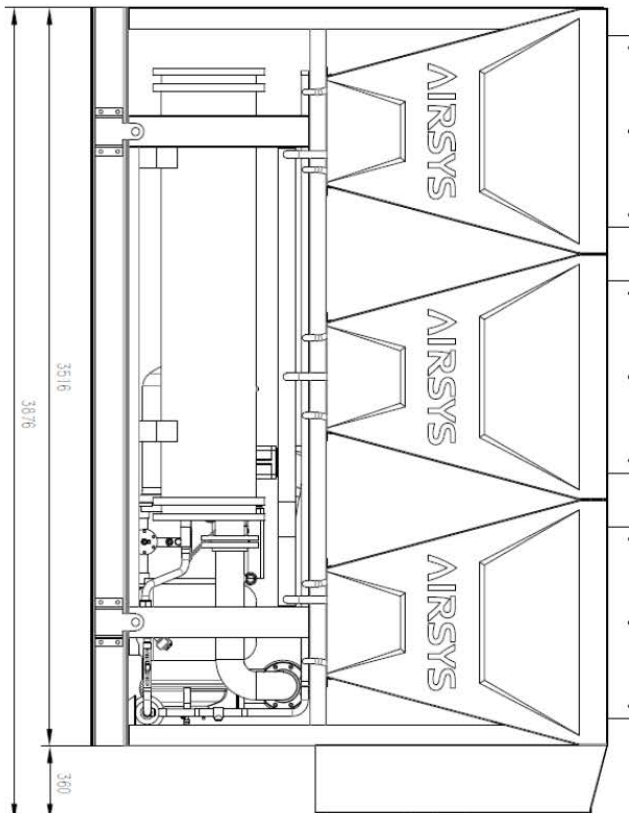
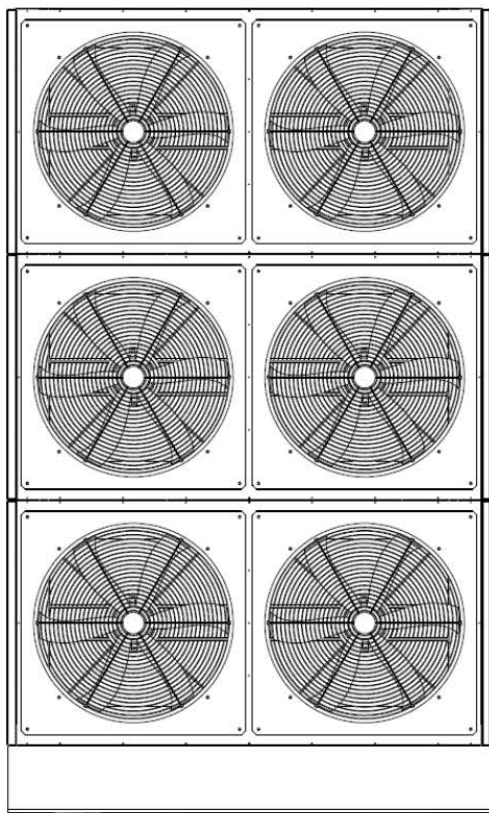
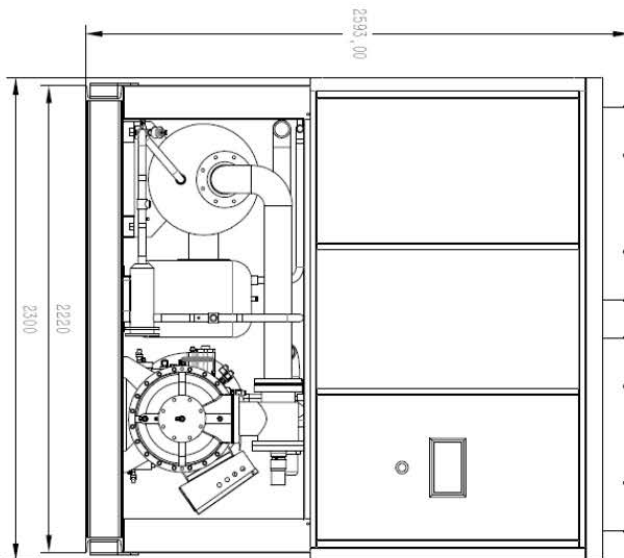


# Outline drawing

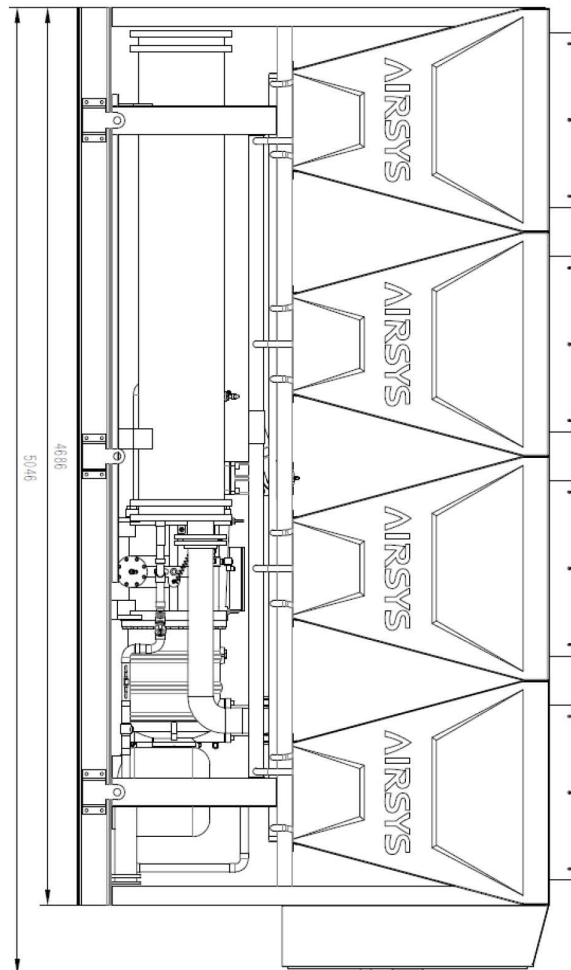
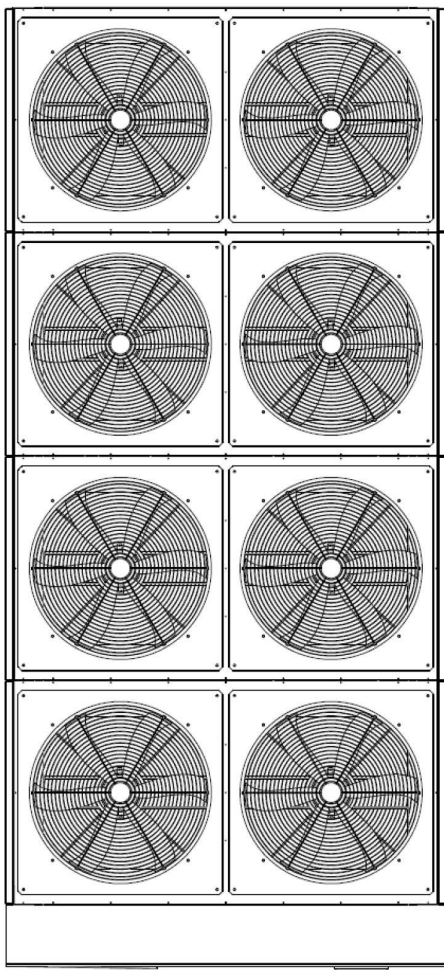
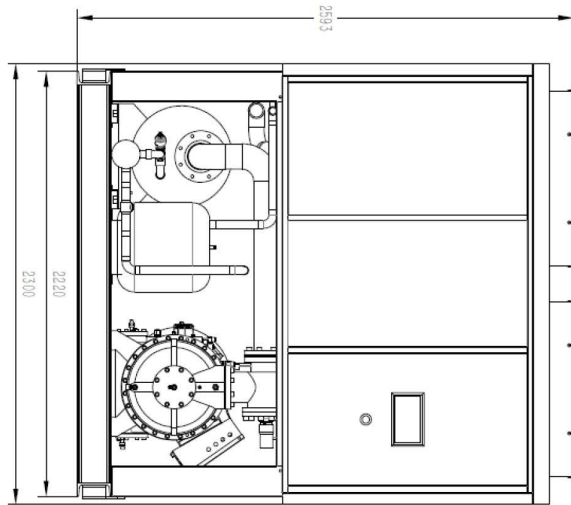
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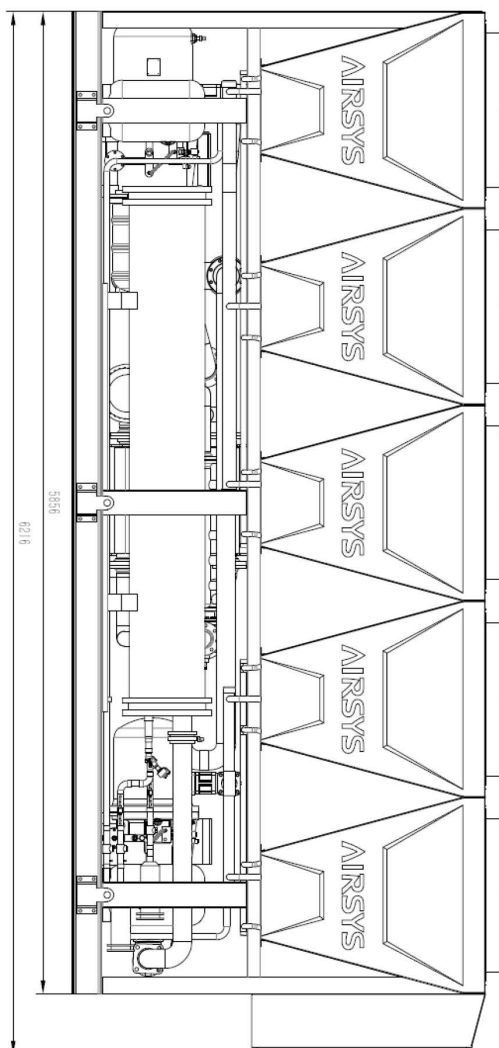
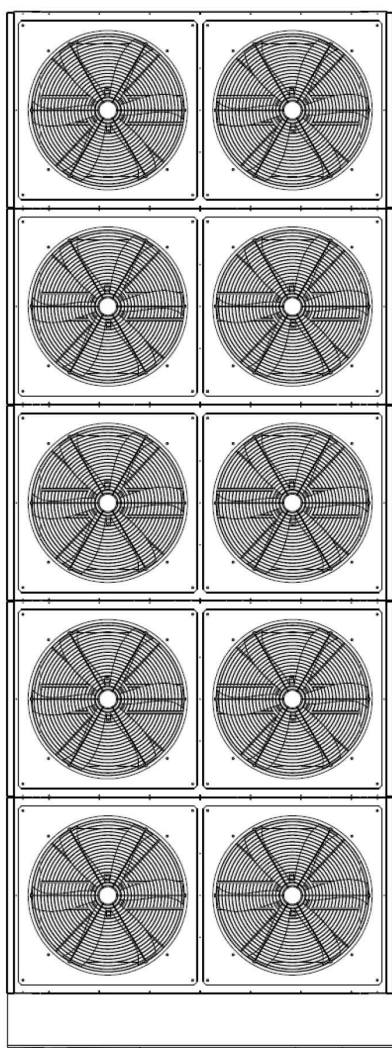
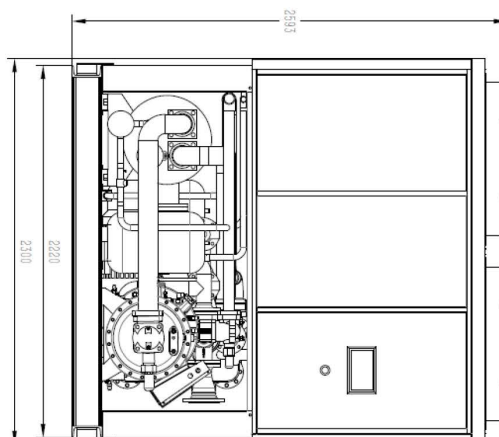


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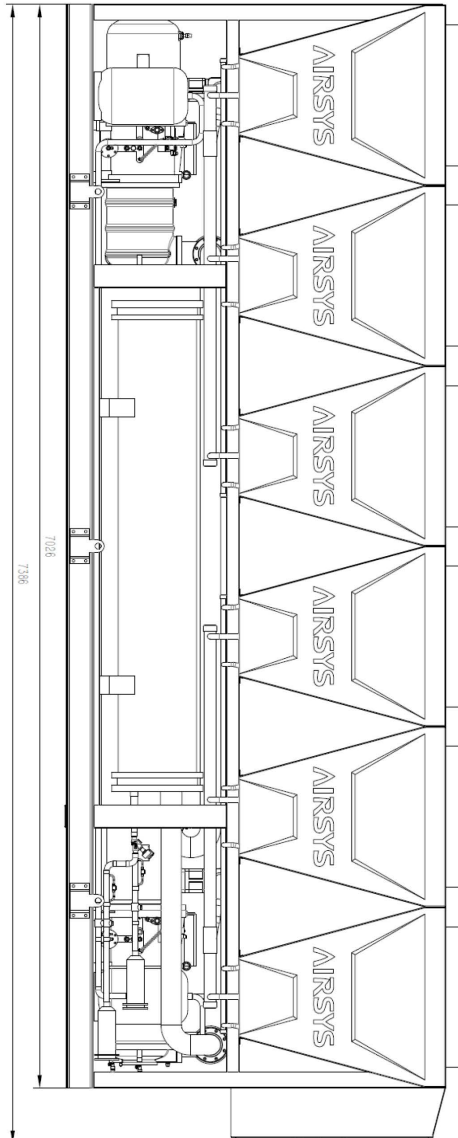
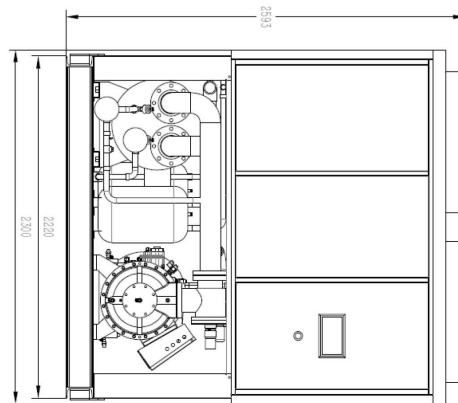
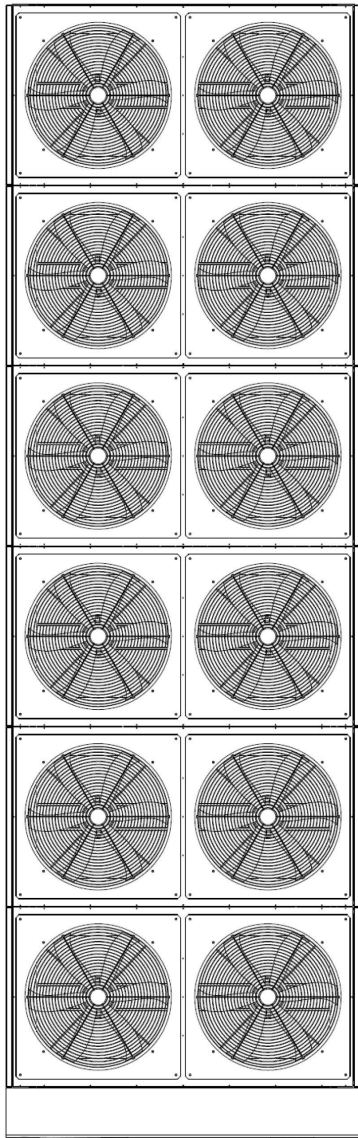




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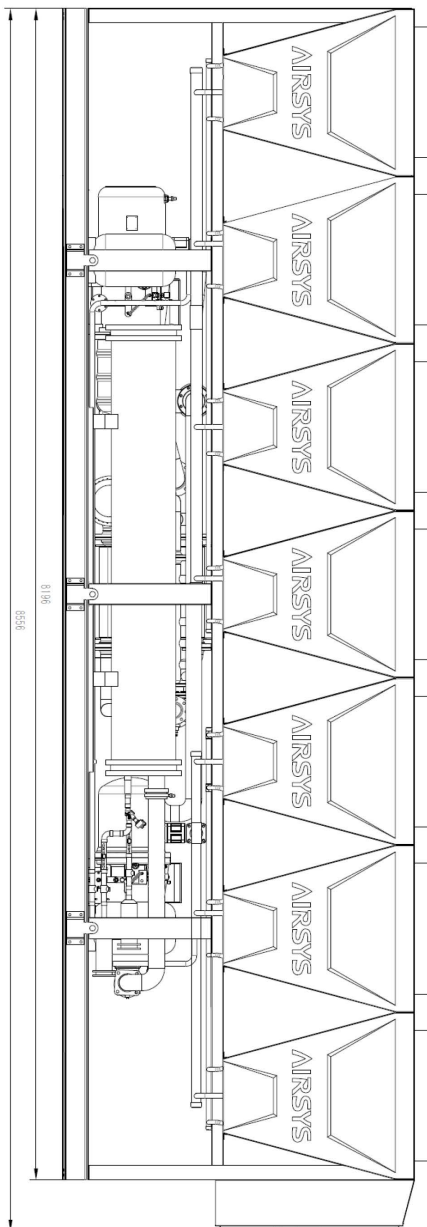
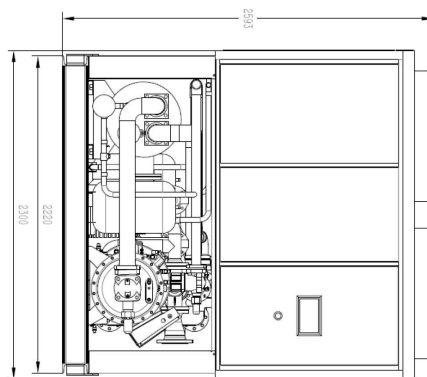
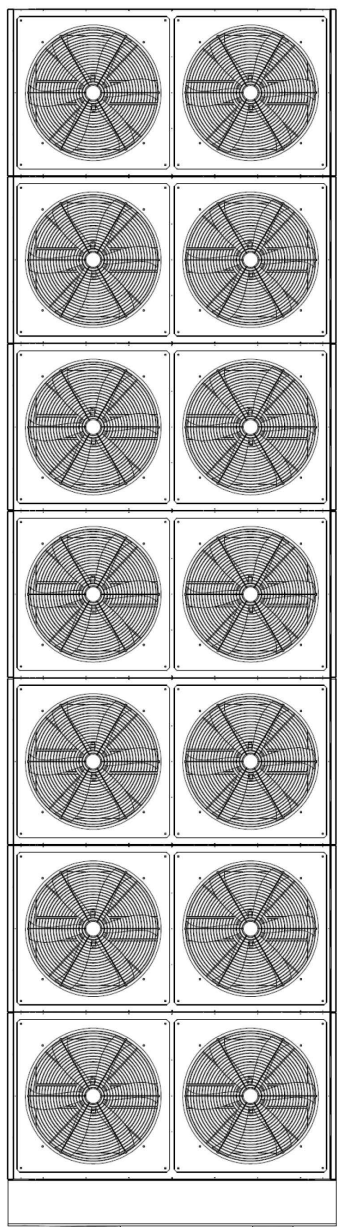


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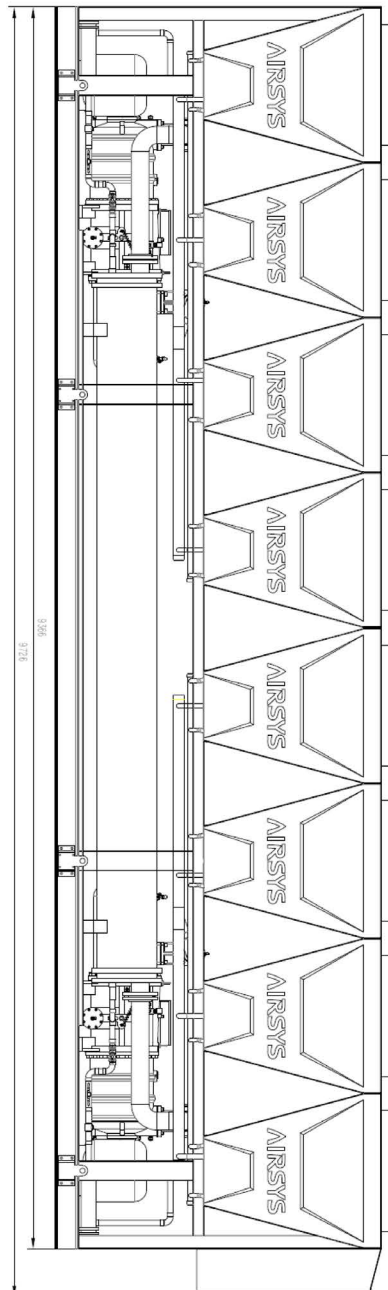
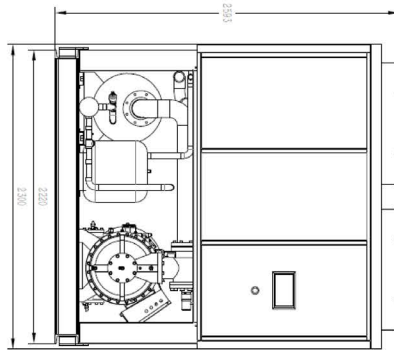
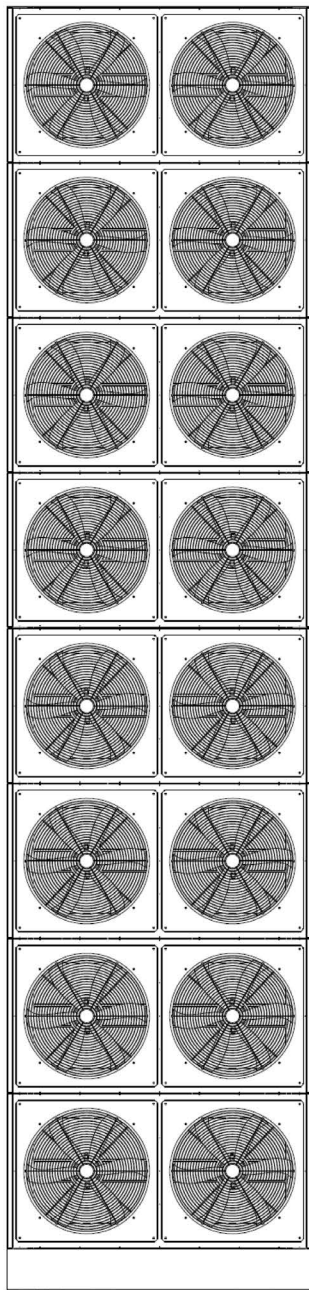




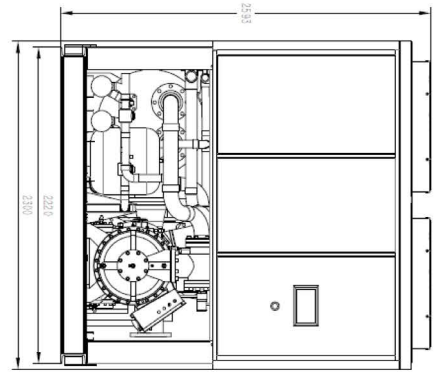
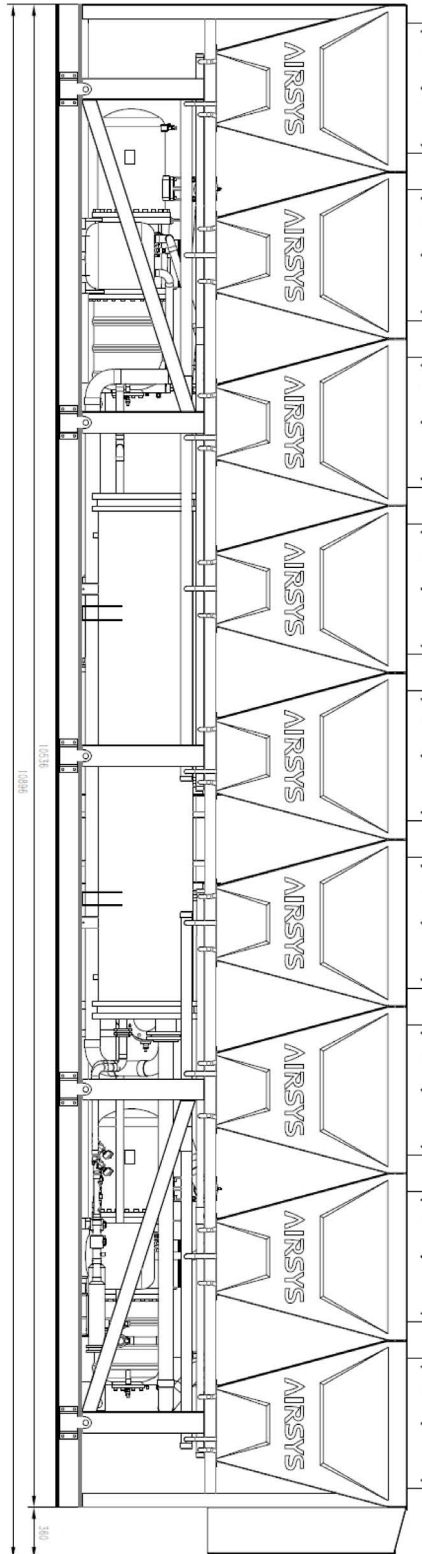
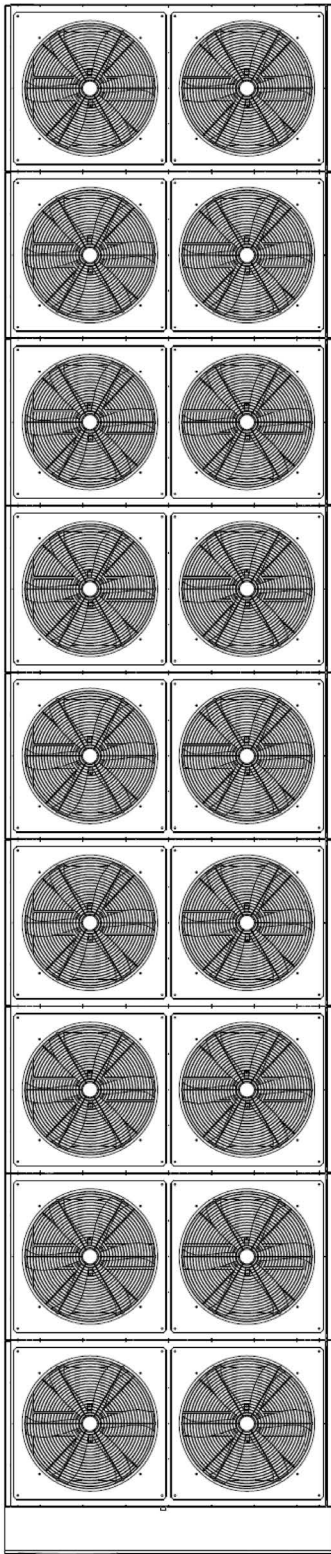
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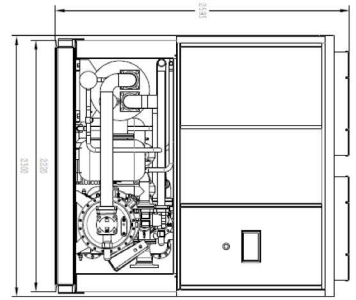
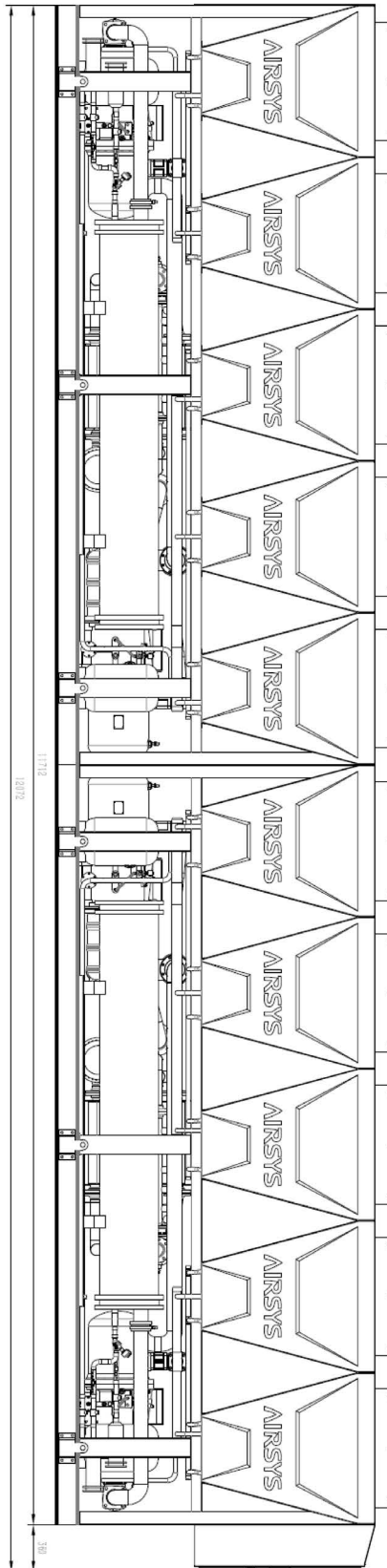
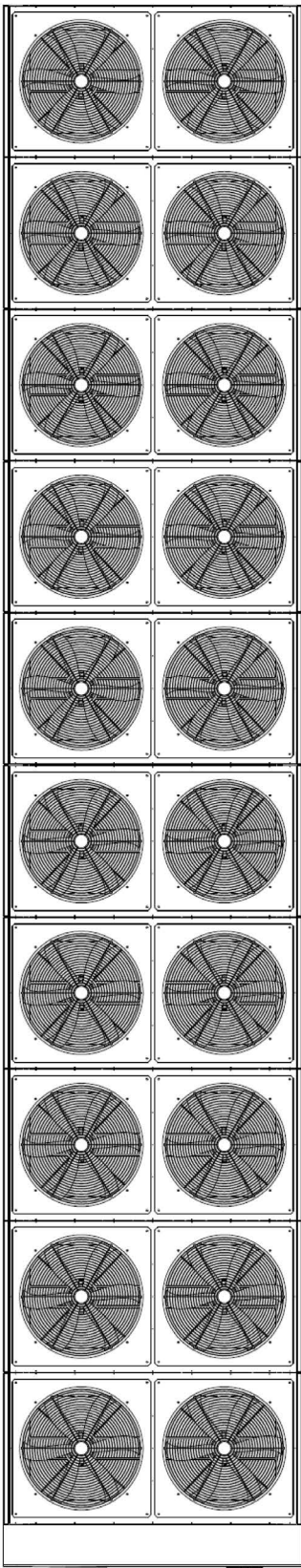


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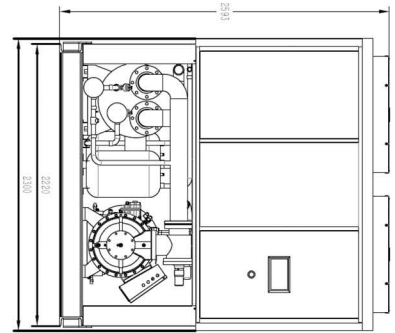
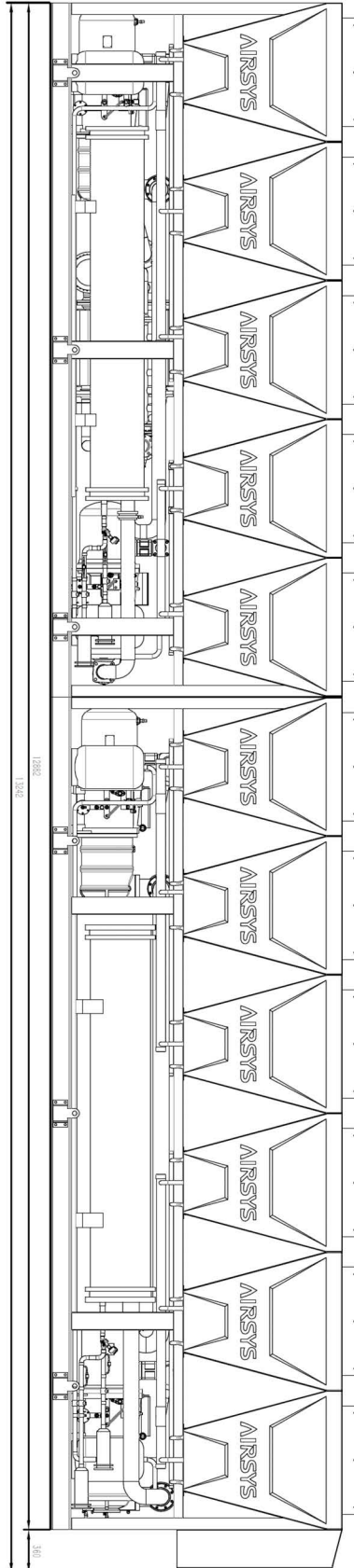
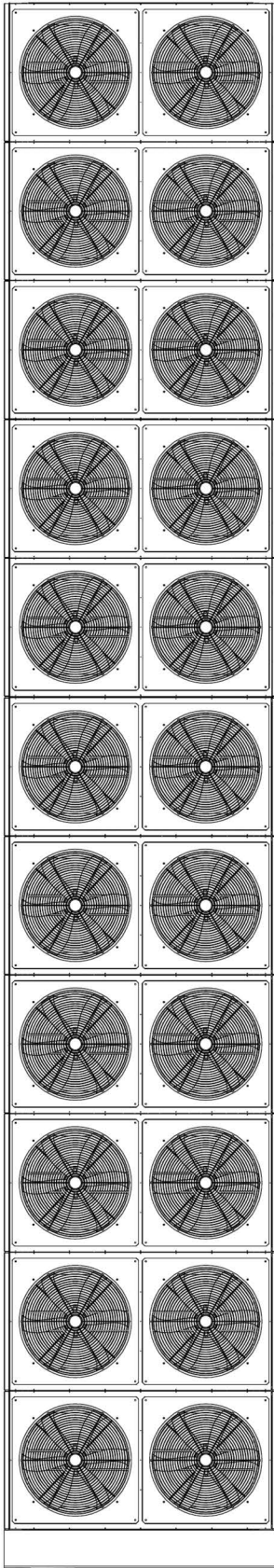




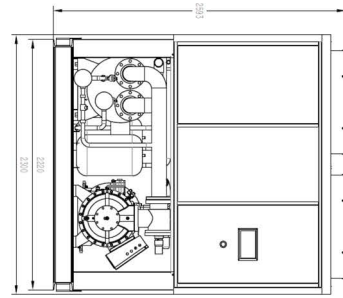
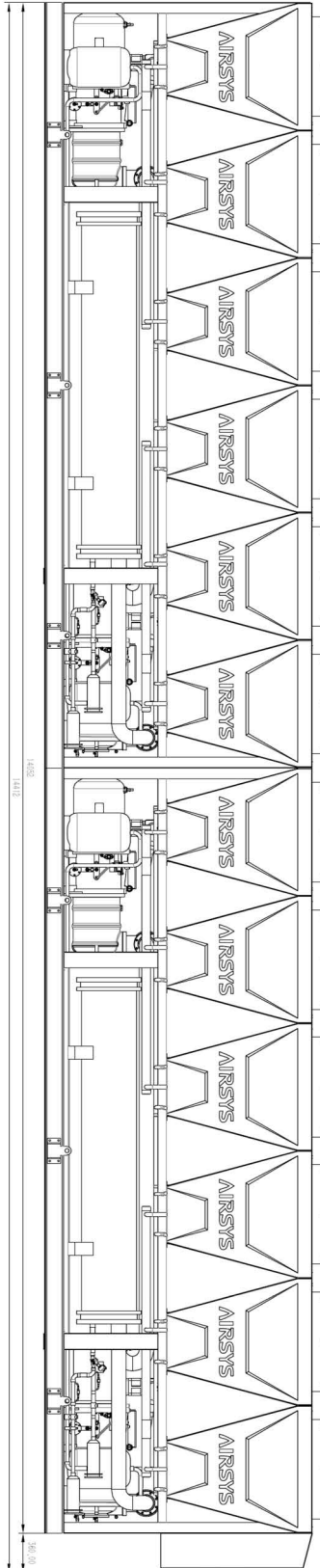
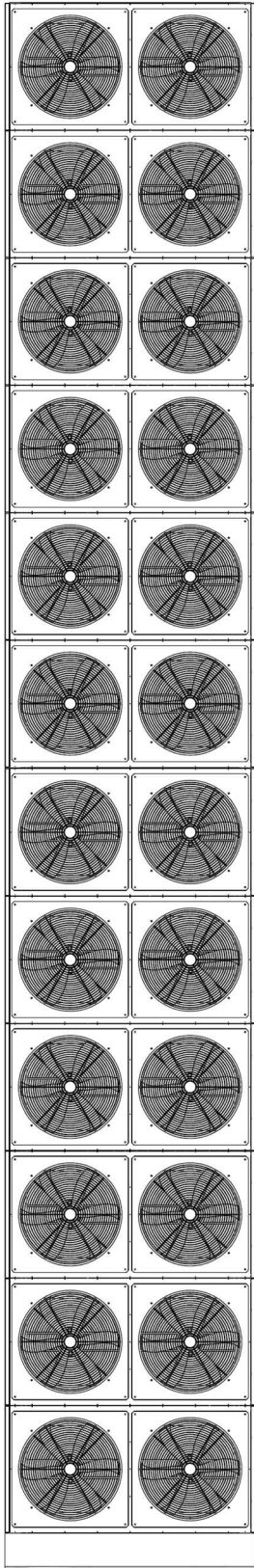
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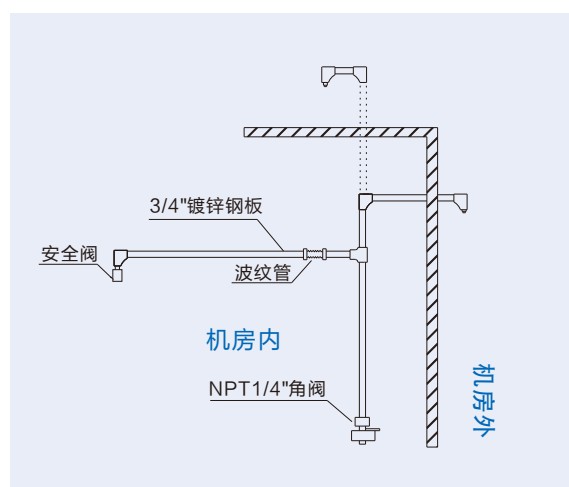


## Machine room requirements

- There should be enough space in the machine room for installation, maintenance and possible future repairs of the unit.
- The engine room should have a sufficient number of externally opened doors with good installation and fire resistance greater than 1 hour (the door should automatically close if the door is opened inside the building) to ensure the evacuation of personnel in an emergency.
- The machine room on the ground should have a natural vent with an area of not less than  $0.14G^{1/2}$  (square meters), where G is the refrigerant charge weight (kg) of the unit installed in the machine room.
- When the machine room is in the basement, a mechanical ventilation device with an exhaust volume of not less than  $13.88G^{2/3}$  (liters / second) should be set, where G is the refrigerant charge weight (kg) of the unit installed in the machine room.
- To reduce the exhaust volume in nonemergency situations, multi-speed fans are recommended. The suction end or duct of the exhaust fan should be near the unit and properly protected.
- An emergency stop or power-off switch should be provided near the computer room outside the machine room, and a mechanical ventilation fan should have a switch that can control emergency operation.
- The engine room should not store any other flammable and explosive substances other than the refrigerant used in the filling and filling unit, and the allowable storage amount of the refrigerant should not exceed 150kg.
- The design of the equipment room should be able to facilitate the drainage of water, and the refrigerant should be discharged smoothly when the safety valve is opened.

## Installation requirements for safety valve discharge pipe

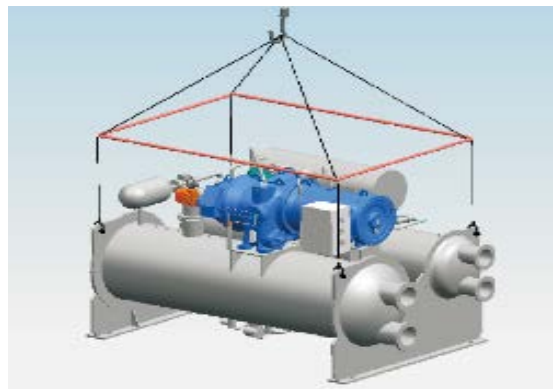
- The inner diameter of the discharge pipe should be able to meet the requirements of the safe release rate of the container;
- The drainage pipe should be set up with water drainage pipe;
- Exhaust pipes protruding outside the machine room should be able to prevent rainwater from entering, and be far away from the air inlet of the machine room and around the gas exhaust port.
- There must be no obstacles within one meter;
- If multiple units are installed at the same time, each unit must be installed with its own discharge pipe;





- Refrigerant is heavier than air. In order to prevent accidental suffocation, please do not let the refrigerant leak into the air of the equipment room.

## Hoisting diagram



## Handling and Installation foundation

- When the unit is moved or moved into the machine room, do not collide with the ground, causing too much impact.
- When lifting, avoid damage to the refrigerant pipeline, insulation material and control box.
- Installation basis:

The rotor of a centrifugal refrigeration compressor undergoes strict static and dynamic balance, so its dynamic load on the foundation is very small. In order to prevent the base of the unit from being corroded, the drainage around the unit is required to be smooth, and the base plane corresponding to the steel plate of the unit base should be smooth and flat. It is recommended that the floor designer can study with the building to ensure that the floor can bear the unit's operating load.

- Netherlands, the specific requirements are:

(1). The structure of the foundation must be carefully considered during installation, especially when the machine is placed on the middle or top floor, shock absorbers should be installed to avoid the transmission of noise and vibration;

(2). In order to conveniently exclude the cooling water and frozen water, a drainage ditch must be set around the foundation platform;

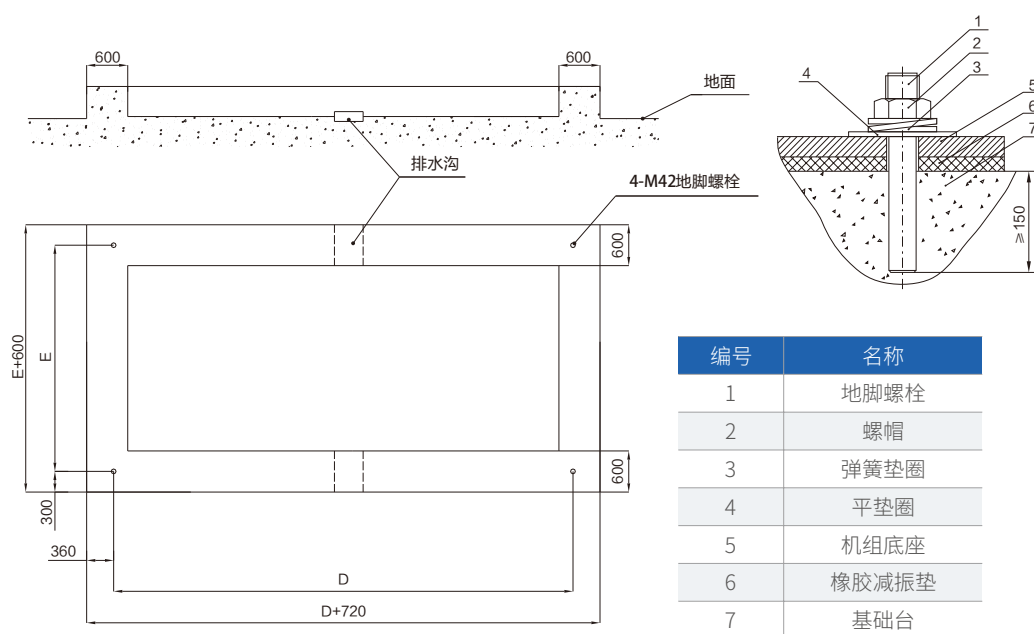
(3). The installation base and fixing method of the unit can refer to the following examples:

The maximum height difference (levelness) between each foundation surface should be within 3mm.

- For the convenience of unit maintenance and inspection, the foundation height should be 250mm higher than the ground.
- Drainage ditch should be set around the unit.
- There must be no gap between the base steel plate and the foot plate of the unit. Apply adjustment pads between the base steel plate and the concrete foundation.
- Adjust the base steel plate to a level (the height difference between them should be within 1mm per meter).
- Lift the unit, place the vibration-damping rubber pad on the steel plate of the base, and then place the unit on the vibration-damping rubber pad.



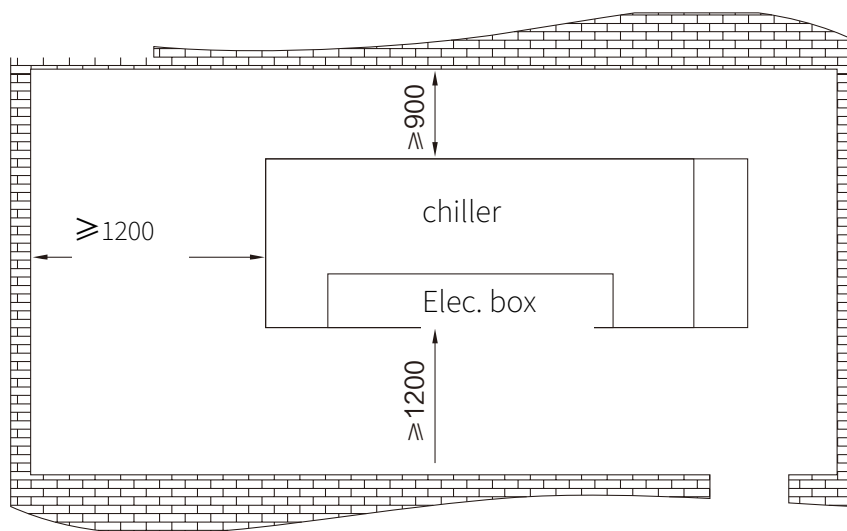
### Single compressor basic diagram



Explanation:

1. The foundation must ensure sufficient strength. It can be made of reinforced concrete or steel.
2. The level deviation of the foundation plane is not greater than 0.1%.
3. Rubber and plastic damping pads can be used during installation.

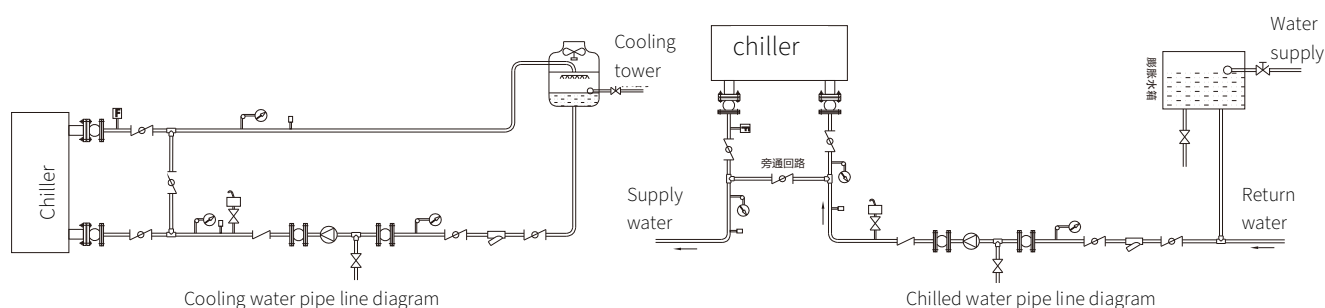
## Handling and Installation foundation



## Water system piping

Installation instructions for chilled water and cooling water systems:

- The inlet and outlet water pipes and valves of the unit should be properly insulated to avoid the loss of cooling capacity and the occurrence of condensation.
- In order to ensure that the water-side heat exchanger and piping system have sufficient water volume, to avoid the high pressure of the heat exchanger during freezing due to lack of water, and the internal cold water to freeze, the low pressure is too low and the system returns poor oil, the unit's chilled water and cooling water A water flow switch should be installed on the water outlet side and interlocked with the compressor.
- When two or more heat exchangers are used in parallel with the chiller, in order to keep the cold water flow of each heat exchanger the same while preventing the phenomenon of deflection, the resistance of the piping from the chiller to the heat exchangers must be equal. Need to install balance valve.
- If the water pipe of the evaporator adopts a closed loop type, in order to slow the expansion or contraction of the water volume caused by changes in water temperature and isolate the effect of the supply water pressure on the water pipe, an expansion water tank should be installed. Installed at the highest point of the entire water piping, the water surface in the expansion tank must be at least 1m higher than the highest point of the water piping.
- The chilled water pump should be installed on the inlet side of the evaporator.
- To avoid air trapped inside the pipe, please install an automatic exhaust valve at the highest point of the water piping, and the horizontal piping of the water piping system must be constructed at a slope of 1/250 upward.
- Please install anti-vibration hoses at the inlet and outlet of water piping to reduce the vibration of the machine body transmitted to each room through the water pipes. At the same time, the water pipes should be properly fixed. The weight of the water pipes should not be borne by the unit. Shockproof hoses or rubber joints are isolated to avoid vibration, noise transmission and mutual interference.
- A thermometer and a pressure gauge should be installed at the entrance and exit of the unit to facilitate inspection during daily operation.
- When the chiller is in operation, the chilled water flow rate must not be less than 60% of the rated water flow rate of the unit to prevent accidents.
- The chilled water and cooling water inlet and outlet piping accessories should be equipped with sockets so that they can be easily separated from the water piping during future maintenance.
- Please refer to the piping shown in Figure A for the cooling water piping of the single chiller.



# Water system piping

## Hot water system installation instructions:

- Because the thermal inertia of water is taken into consideration, and the amount of storage and storage are used at the same time, the system must be equipped with a thermal insulation water tank and a circulating water pump to keep the stored hot water at the required temperature (50 ~ 60 °C).
- The water tank must be added with thermal insulation layer to reduce heat loss. Its volume is designed by the engineering party according to the site, unit power, simultaneous usage and user requirements.
- In order to maintain the hot water temperature, the circulating water pump must be started for a long time and equipped with a pump.
- The hot water system provides users with ultra-low-cost hot water. Its flow rate and head are designed according to demand, and it is fully automatic for 24 hours by pressure control. This system provides users with a low cost
- This hot water, but the hot water supply will be determined by the unit usage and seasonality, users should install a hot water auxiliary system in parallel to use this system.
- Refer to the piping shown in Figure C for the domestic hot water piping of the heat recovery screw chiller.

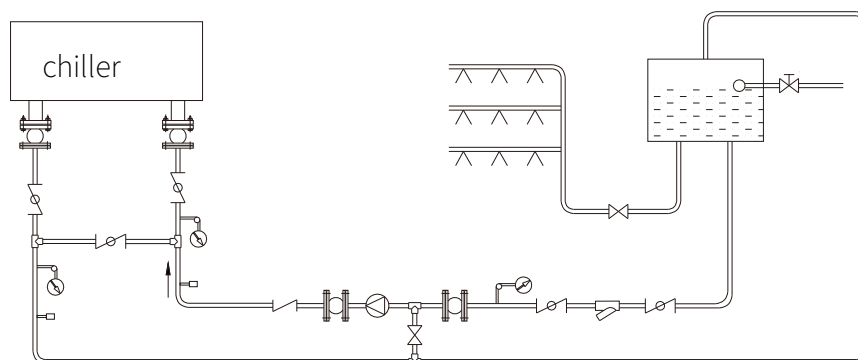


Fig. C Heat recovery unit pipe connection diagram

The specific operation of unit installation, use and maintenance is subject to the "Unit Installation and Use Manual" that comes with the unit.

Note: Because AIRSYS products will be continuously improved and innovated, the product models, specifications and parameters contained in this document are subject to change without notice, so please pay attention and understanding.



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