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EK EUROKLIMAT®
SINCE 1983

Give life to building & bring us back to nature™



Athena Plus

Full Inverter Air-cooled Chiller (Heat Pump)



Athena Plus

Full Inverter Air-cooled Chiller (Heat Pump)

2 Low Noise
Fine Craftsmanship
for Quality Products

**1 Inverter
Technology**
A Leader in
Energy Efficiency



3 Smart Cloud
New Experience of
Intelligent Management

**4 Enhanced
Flexibility**
Fast and Convenient
Application



EUROKLIMAT

Energy-saving Air-conditioning Expert from Europe

Origin of EK — Guangdong Euroklimat Air-Conditioning & Refrigeration Co., Ltd. ("EUROKLIMAT" for short) was founded in 2009. Till now, EUROKLIMAT products are sold in many countries and regions such as China, India, Thailand, Indonesia, Myanmar, South Africa, United Arab Emirates, Chile, and Bangladesh. Driven by technical innovations and taking energy conservation-oriented approaches, EUROKLIMAT is committed to developing into a world-leading environmental system integrator and service provider. The six main air conditioning products of EUROKLIMAT are fluorine system products, water system products, air handling units, data centers, high-efficiency equipment rooms, and smart homes. Besides, EUROKLIMAT boasts core competencies in heat recovery, condenser and evaporator capacity, and precision control.

Development of EK — After years of development and endless exploration, now EUROKLIMAT has 1200 employees in China working in many departments involving marketing, R&D, manufacturing, and after-sales services. EUROKLIMAT has over 10 testing laboratories accredited by CNAS, a technology R&D center in the Asia Pacific region, and the over-100,000m² EK industrial park. All products are manufactured through world-leading air conditioning technologies and processes. We have provided high-efficiency and energy-saving central air conditioners with an estimated value of RMB10 billion to the Chinese market. Nearly 50 sales service agencies of EK in China provide Chinese customers with a 24-hour service guarantee, with the one-stop service hotline 400-188-1963. In the era of 5G, EUROKLIMAT keeps pace with development. We have established the EK-CLOUD platform that supports real-time monitoring of devices, to provide users with comprehensive industry solutions.

Honors of EK — National High-tech Enterprise, Testing Laboratory Accredited by CNAS, Chinese Standard Innovation Contribution, Enterprise of National Major Energy-Saving Electronic Products, Guangdong Energy-Saving and Environmental-Protection Air Conditioning Engineering Research Center, IPR Superior Enterprise in Guangdong, Guangdong Enterprise Technical Center, Guangdong Enterprise with AAAA Standardized Conduct, Guangdong Famous Enterprise, Guangdong Enterprise with High Reputation, Informatization and Industrialization Integration Management System Accreditation, and IPR Management System Accreditation. EUROKLIMAT led and participated in the preparation of a series of national standards such as GB/T25857-2010 Low Ambient Temperature Air Source Multi-connected Heat Pump (Air Conditioning) Unit, GB/T 18837-2015 Multi-connected Air-condition (Heat Pump) Unit, GB/T 33658-2017 Thermal Comfort Requirements and Evaluation for Indoor Environment, and JB-T 13515-2018 Positive Displacement Water Chilling (Heat Pump) Packages with Full Heat Recovery.

Message from EK — For EUROKLIMAT, energy efficiency is the relentless pursuit, and comfort and natural life is the eternal goal. Under the concept of "Give life to building & bring us back to nature", and adhering to the commitment of energy conservation and environmental protection, EK, to achieve harmony with nature, will keep developing comfortable and energy-saving air conditioners and join hands with partners to create a bright future.

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Product Introduction



Product Introduction

In Greek mythology, Athena is the goddess of wisdom and handicrafts. Adhering to the design quintessence of European leading air-cooled heat pump chillers, the Athena Plus series inverter air-cooled chiller (heat pump) brings together the scientific and technological achievements of EK for designing and manufacturing chiller systems for more than half a century. It uses energy-efficient scroll compressors and DC inverter technologies to achieve an IPLV of up to 4.35, going far beyond the national EEI grade 1 performance. Equipped with the patented hybrid connection technology, AI defrosting technology, as well as cutting-edge microcomputer control technology, it can achieve 5G network communication. Combining with EK-CLOUD "cloud platform" monitoring system, it brings users an excellent sense of experience and achieves year-round cooling and heating in winter. Therefore, it is the first choice for the central air-conditioning systems for high-end hotels, office buildings, schools, hospitals, factories and enterprises, and many various large- and medium-sized public buildings and civil buildings.



Athena Plus inverter modular air-cooled chiller (heat pump)

Nomenclature

EKAC 460 B R 1 LH V F AA
1 2 3 4 5 6 7 8 9

1. EKAC EK Modular Air-cooled Chiller (Heat Pump)
2. 460 Cooling capacity code
3. B Design No.
4. R Functional type R: cooling and heating type; cooling type (default)
5. 1 Refrigerant code: 1: R410A; Default: R22
6. LH Product special feature: standard (omitted); low-temperature (standard)
7. V Inverter; fixed frequency (default)
8. F Power feature: F: 380V/3N~/50Hz
9. AA Specific description of product specification changes



Inverter Technology A Leader in Energy Efficiency

Adhering to the design quintessence of European leading air-cooled heat pump chillers and combining with years of experience in air conditioner R&D and design, Athena Plus inverter air-cooled modular unit has achieved energy-saving solutions for air-conditioning systems.

Inverter Technology

A Leader in Energy Efficiency

Industry-leading IPLV

Integrated Part Load Value (IPLV) is an indicator to evaluate the energy efficiency performance of air conditioning units. IPLV is a value obtained based on weighted factors of a unit within a period of running under a certain load based on performance factors in various working conditions of the system working in 100% load, 75% load, 50% load, and 25% load.

We participated in the preparation of the GB19577-2015 Minimum Allowable Values of Energy Efficiency and Efficiency Grades for Water Chillers. Our Athena Plus inverter air-cooled modular units have passed the inspection by national authorities and are considered EEI grade 1 products. EKAC460BR1LHV features an IPLV(C) of up to 4.35, and can provide users with enhanced energy efficiency, lower operating costs, and a shorter payback period.



Intelligent cooling source strategy

Intelligent cooling source, efficient and energy-saving

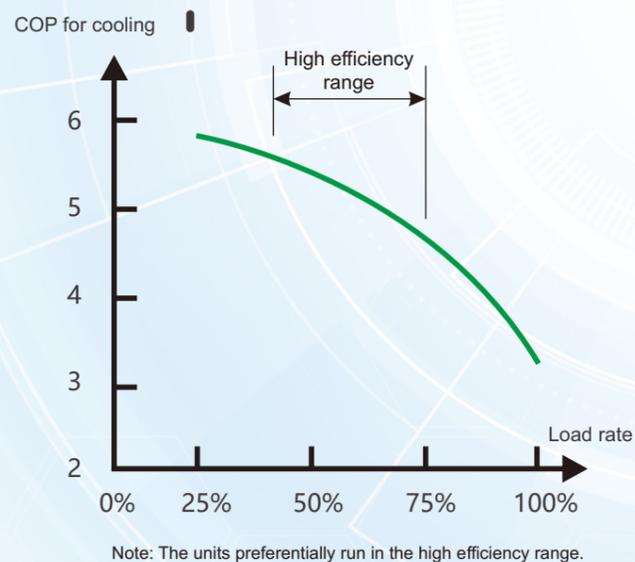
The system is inverter controlled and features an intelligent control of the cooling/heating source. In the case of multi-module operation, the smart startup of modules can maintain them running in the highest efficiency range, so that the operation efficiency of the entire system is optimal.

Energy-saving operation strategy of water pump

The number of operating units is minimized with the units operating in the high efficiency range. In addition, variable-flow operation is realized by outputting two-way valve interlock signals to significantly reduce the energy consumption of the water pumps and thus the whole system.

Automatic optimization and wear leveling

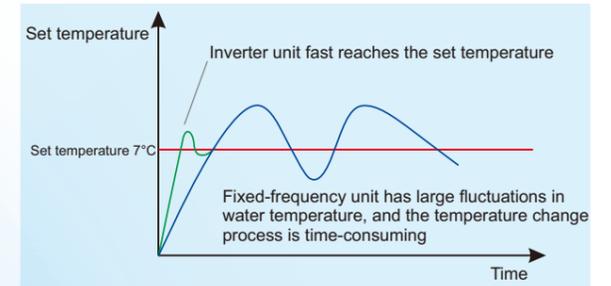
The system automatically starts the unit with the minimum uptime to level the wear of compressors and extend the service life of the system.



Excellent performance

Athena Plus inverter air-cooled modular units support different running statuses based on the change in the ambient environment. The compressor frequency can be automatically adjusted. Upon system startup and when the difference between the ambient temperature and the set temperature is large, the compressor will operate in a very short time to rapidly achieve heating (cooling) to increase (decrease) the water temperature to the set temperature and make the temperature comfortable. When the set temperature is achieved, the compressor automatically switches to low-frequency operation. The heating (cooling) effect is significant. Since the compressor does not need to frequently start, relevant electricity use and mechanical part wearing are avoided, resulting in significant energy savings. Compared with a common air-cooled chiller (heat pump), Athena Plus inverter air-cooled modular unit can save up to 48% energy consumption.

A major problem of fixed-frequency units is the great temperature fluctuations. A fixed-frequency unit keeps starting up and stopping to adjust the temperature. This can easily cause fluctuations in room temperature and consumes a lot of electricity. In contrast, an inverter air-cooled heat pump unit features a lower current upon system startup. Therefore, there will be no impact on the power grid or electric meter, thus resolving the problem of unstable voltage. The advantages of energy efficiency are more obvious for a wider frequency range.



Energy-saving mode of water pump

Taking advantage of the thermal inertia of buildings, the water pump energy-saving mode can be selected at this time to reduce the power consumption of the water pump while maintaining the basic heat required by the buildings. It is mostly used for floor heating and energy saving.

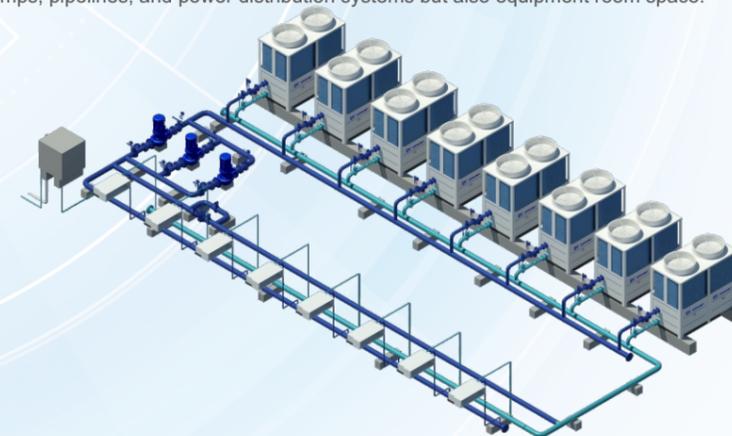
Variable primary flow system

Compared with a conventional variable secondary flow system, the variable primary flow system has its refrigerant and load varied. Besides, the system shares the same inverter pumping unit whose flow changes according to air conditioner load in inverse proportion, saving expense on running of chiller pumps significantly.

The unit can output a signal to instruct the 2-way valve so as to close the corresponding chilled water valve. When working with the inverter, the unit will automatically adjust pump flow, realizing variable primary flow.

The unit can be applicable to projects requiring changing chilling load and long load running time.

Compared with a conventional variable secondary flow system, the variable primary flow system helps users save not only CAPEX on chiller pumps, pipelines, and power distribution systems but also equipment room space.

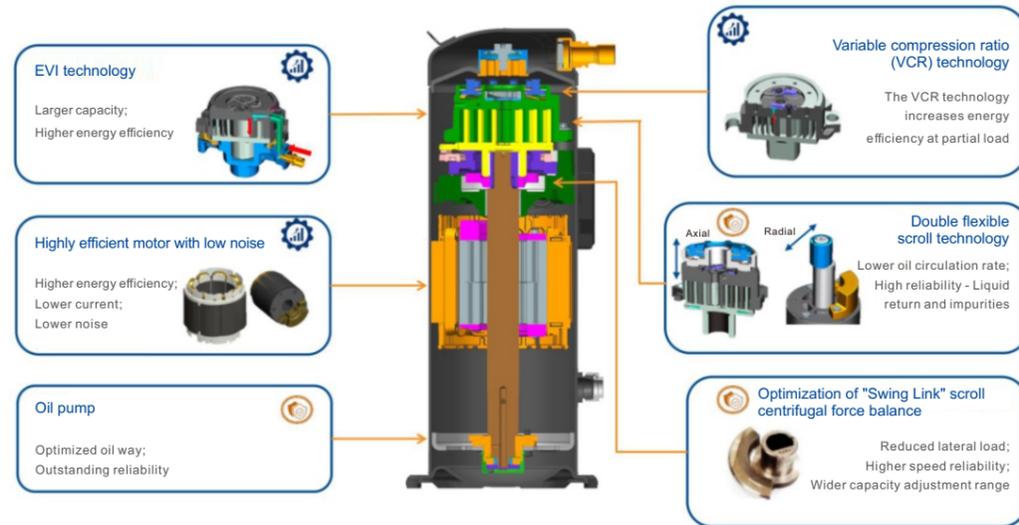


Inverter Technology

A Leader in Energy Efficiency

Leading DC inverter scroll compressor

Athena Plus inverter air-cooled modular units adopt the advanced DC inverter compressor. Together with the EVI technology, the overall unit heating capacity is increased by about 14%. This can guarantee low-temperature heating performance for users, and substantially reduce the heating operation costs. Advantages include efficient running, high stability, long service life, and low noise.



EVI principle

The EVI system is a new system consisting of EVI compressor, EVI technology, and efficient supercooler. A suction port is added to the medium pressure cavity of the compressor scroll to supplement air using medium pressure, increase the compressor's air discharge, and improve the heating capacity at low temperatures. It has the advantages of high-efficiency operation during cooling and improvement in heating performance under severe cold during heating, which is safe and reliable.

Create a second suction port in the scroll plate to supplement air through the second suction circuit, increase the refrigerant discharge, and increase the enthalpy difference of the main circulation refrigerant.

EVI advantages:

- 20% increase in refrigerant circulation
- One compressor, quasi-two compressions
- Effectively improve cooling and heating efficiency

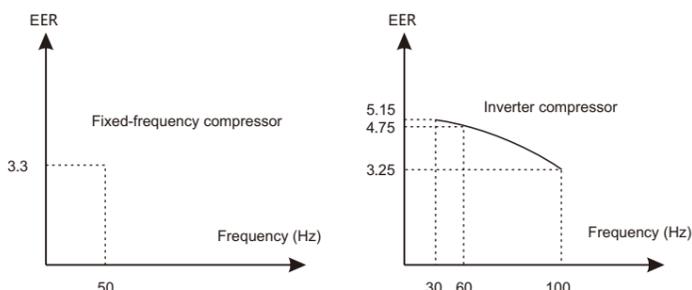
VS

Conventional system heating operation:

- Capacity attenuation, decrease in compressor volumetric efficiency
- One compressor, one compression
- Harsh working condition, exceeding the system operating range, system stop

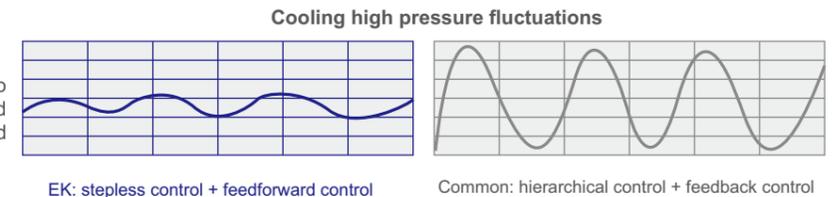
Stepless inverter technology

Fixed-frequency units adopt hierarchical energy adjustment. That is, the output of each compressor is fixed. As a result, the output capacity will exceed or be lower than the actual load requirement. In contrast, inverter units allow for stepless adjustment. The 15%–100% operating range can achieve precise output on demand based on the actual load. The compressor output matches with the load change for energy efficiency under any load conditions. There is no need to frequently start/stop the compressor, and the output and energy consumption are low under low load.



Stable fan control

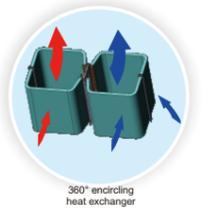
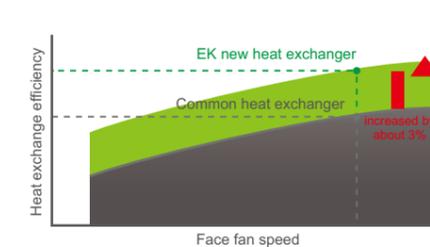
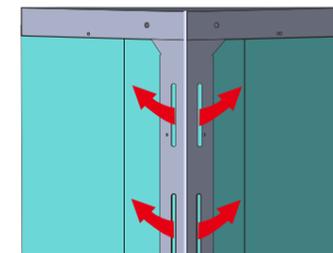
FFT feedforward control is adopted to intelligently control the fan speed and prevent system frequency fluctuations and reduce power consumption.



Air-side heat exchanger

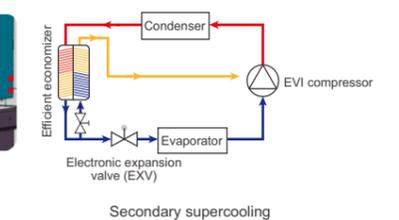
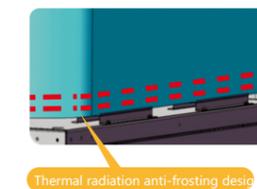
360° encircling structure ensures air intaking from all directions. The air resistance is small and the air flow is large, facilitating heat exchange. With the separate air duct, two systems inside the unit can operate independently from each other. This can reduce the fan power consumption under partial load and contribute to better performance.

The open-slot design of the unit post guarantees enhanced firmness and stability. The fan speed is more stable, and the heat exchange performance is better.



Secondary supercooling

A unique heat radiation anti-frosting device is equipped in the last refrigerant circuit at the bottom of the heat exchanger. When defrosting, high-temperature refrigerant is introduced into the bottom to prevent the bottom from freezing. The efficient supercooler with an auxiliary expansion valve is used to implement secondary supercooling for an enhanced supercooling degree. The refrigerant passing through the electronic expansion valve has a high supercooling degree. This substantially reduces the occurrence of flash gas generated by the refrigerant flowing in the pipeline, and leads to good cooling performance.



Water-side heat exchanger

The dual-system vacuum brazed plate heat exchanger is made of stainless steel. It adopts the dual-system diagonal-flow design to substantially increase the effective heat exchange area, and boasts higher heat exchange efficiency than shell-and-tube heat exchangers. The dual-system design can automatically adjust the heat balance to guarantee high efficiency and reduce the risk of freezing. The water-side 1.6 MPa pressure bearing can adapt to the requirements for water systems in ultra-high buildings. The standard water differential pressure switch monitors the unit water flow in real time and provides precise anti-freezing control.



Electronic expansion valve with accurate temperature control

The EK air-cooled modular unit adopts the quality grade-500 PMV electronic pulse for precise adjustment, to realize the precise PID control of electronic expansion valve, real-time dynamic matching, and higher precision of water temperature control.



Low Noise

Fine Craftsmanship for Quality Products

Separate soundproof box is adopted for effective compressor noise reduction and prevention. Year-round cooling with the highest water outlet temperature of 55°C provides you with a quieter and more comfortable life.

Low Noise

Fine Craftsmanship for Quality Products

Multiple functions

Year-round cooling: With the inverter design, the unit allows for cooling under the ambient temperature of 5°C to 48°C. This can meet both the requirements for ordinary commercial projects and the year-round cooling. It can be used in commercial, hotel, chemical industry, medical industry and other scenarios.

Low-temperature heating: The unit uses the EVI technology to maintain stable heating under the -25°C ambient temperature, to provide a stable hot water supply.



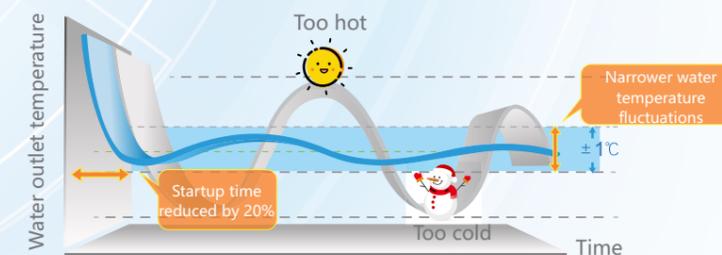
Note: For -5~5°C process cooling, contact the manufacturer for customized design.

Constant water temperature for enhanced comfort

The heating, cooling, and eco mode is selected based on the ambient temperature to make the room temperature reach the desired temperature in a short time, and achieve fast, efficient and comfortable temperature control with a relevantly smaller temperature fluctuation under low speed and low energy consumption.



- ★ The chilled water outlet temperature is controlled to an accuracy of $\pm 1^\circ\text{C}$, and various built-in sensors can accurately transmit the signal data to the controller for improved operational reliability.
- ★ The optional return water temperature control can optimize the efficiency of the unit while ensuring the dynamic balance of the end user.
- ★ Multi-level password protection prevents misoperation by non-professionals and ensures the safe operation of the unit.



More accurate outlet water control and narrower water temperature fluctuations

Low Noise

Fine Craftsmanship for Quality Products

➤ Noise reduction design for quiet operation

Overall vibration isolation: Inverter compressor, inverter motor and low-noise fan are adopted. Through noise spectrum analysis, it carries out strict comparison, selection and improvement of fans, motors and other components, and performs professional noise reduction on the structure and pipelines, to effectively reduce the vibration of the key nodes of the pipelines through elastic fixing parts, and systematically optimize the direction of the copper pipes. Innovative intelligent silent mode: Auto control of fan speed based on unit operating status and outdoor ambient temperature, to implement low-noise operation (noise reduced by 6 dB(A)).

➤ Create quiet atmosphere

15 quiet operation designs are used to implement the quiet operation of the IDU.

- Wing-type low-noise fan
- New air guide ring
- Inverter fan motor
- Shock-absorbing support for motor
- Low-noise DC inverter compressor
- Anti-vibration design to avoid resonance
- Anti-vibration design of compressor foundation
- New compressor soundproof box
- High-density acoustical materials
- Noise reduction design for refrigerant flow
- Pipeline simulated anti-vibration design
- Unit anti-vibration design
- Nighttime mute function
- Low-noise frequency-increase start technology
- EVI air loop mute design



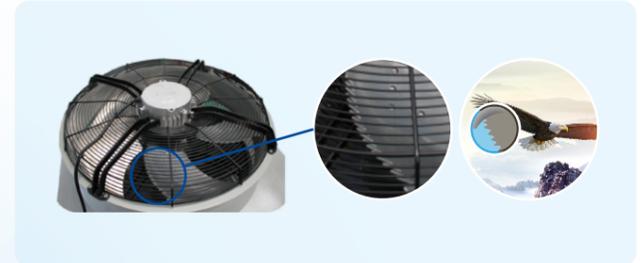
➤ New compressor soundproof box

Separate soundproof box of ODU is adopted for effective compressor noise reduction and prevention. The inner wall of the box is attached with high-density acoustical materials to form a three-layer noise reduction for the compressor. In this way, the noise generated by the compressor at high, medium, and low frequencies can be effectively absorbed or obstructed to achieve significant noise reduction of the system.

Patent No.: ZL201420515518.4

➤ Wing-type low-noise fan

- Adopt high-efficiency and low-noise airfoil axial flow fan made of aluminum alloy. The dual fans are symmetrical, and the inclination angle and edge design are optimized to effectively control air turbulence and reduce air vortex generation.
- The low-noise motor realizes silent operation at night, with greater air flow and lower noise.
- With the fan metal mesh enclosure and IP55-rated motor, the unit can be used in severe weather such as strong winds and heavy rains, ensuring safe and reliable operations.

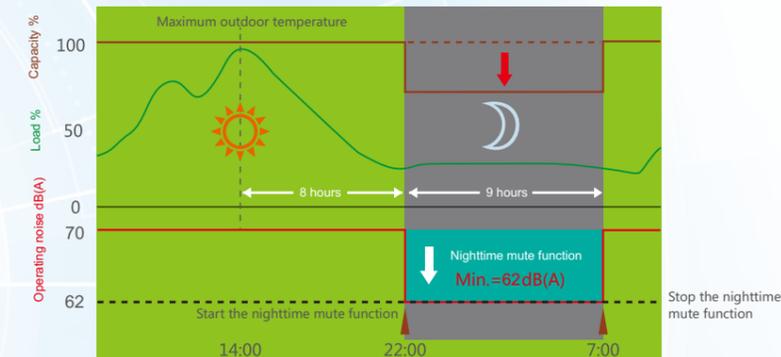


➤ Around-the-clock auto mute

When the system is partially loaded, the ODU fan automatically slows down according to the pressure, and the unit automatically adjusts to match the room load, achieving automatic noise reduction.

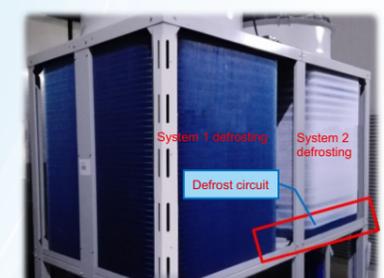
➤ Ultra-quiet mode

When the ultra-quiet mode is enabled, the unit noise can be as low as 62 dB, creating a comfortable and quiet nighttime environment. Compared with conventional units, the noise is reduced by 5~10 dB.



➤ Professional manufacturing and performance-focused

EK has national-level full-performance laboratories (registration no.: CNASL5123), which can measure up to 1800 kW. When completed, it was the largest air-cooled heat pump laboratory in Asia. It fully and accurately simulates the test conditions of all working conditions, and ensures the high reliability of the system while pursuing the excellent performance of the unit.



Fully automatic inspection is a new leap between "Internet +" and "intelligence". It can simulate various severe running conditions of units in different weathers (wind, snow, rain, frost, etc.), to guarantee the unit stability and reliability on site all year round.

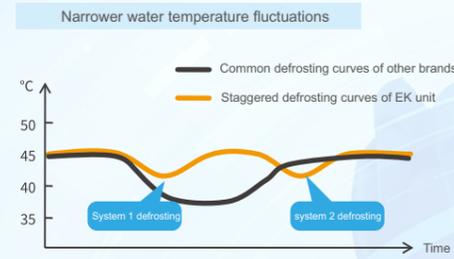
Smart Cloud

New Experience of Intelligent Management



➤ Staggered defrosting

For a single unit, the two systems are independent of each other. For heating in winters, the two systems realize smart staggered defrosting based on their frosting statuses. When a system is defrosting, the other system is heating. This can prevent substantial water temperature fluctuation during frosting. Also, a single system failure will not affect the use of the other system. In the case of a modular combination of multiple units, the system can intelligently determine when to enter the modular defrosting mode and control the number of compressors for defrosting. This can meet the heating requirements and provide users with a better experience.



➤ AI defrosting with innovative technologies

Based on the big data platform, the EK units adopt AI technology to develop AI defrosting technology for accurate and quick defrosting. AI defrosting technology has the advantages of multi-dimensional identification, correction, deep optimization, self-learning, and deregulation.

➤ Development history of defrosting technology

Heating-based Defrosting	First Generation	Second Generation	Third Generation
Mode	Time defrosting technology	Constant temperature defrosting technology	More accurate AI defrosting technology
Principle	Simple commutation time defrosting	Set temperature according to weather conditions to control the defrosting value	Accurate judgment based on the change rate of heat exchange temperature difference
Intelligence	Fixed mode	Fixed mode	Intelligent and real-time system adjustment
Adjustment range	Narrow range; defrosting can only be performed at specified time	Narrow range; defrosting can only be performed according to the set temperature	Wide range; automatically adapt to changes in local climate and weather conditions, and can determine the defrosting entry point and exit point in time, and defrost completely.
Defrosting characteristics	Unable to measure whether there is frost and frosting amount on the fin heat exchanger. Easy to cause electrical energy waste. Reduce the heat exchange efficiency of the unit and affect the normal operation of the unit.	Unable to accurately determine the defrosting entry point, which will cause delays in defrosting, resulting in incomplete defrosting or redundant defrosting operations; result in insufficient heating and waste of energy.	AI defrosting technology can better deal with multi-dimensional, uncertain and variability issues, and correct control parameters in real time to obtain the optimized heating effect.
AI defrosting application	Most manufacturers adopt the first-generation of time defrosting technology	A few manufacturers adopt the second-generation constant temperature defrosting technology	EK pioneered AI defrosting technology, leading the industry.

Development history of defrosting technology >>>



➤ Advantages of AI defrosting

For contractors and distributors:

China has a vast territory, diverse climate, obvious seasonal alternations, and large temperature differences between winter and summer. It is cold and dry in winter in the northern region, and wet all year round in the Yangtze River basin region. The frosting process of air-cooled heat pump chillers is mainly affected by the evaporating temperature and is related to changes in ambient temperature and humidity. The AI self-tuning defrosting technology of "variable temperature difference" can better consider changes in ambient temperature and humidity, thus defrosting completely and exiting in time. AI technology simplifies complex multi-variable problems, and is universally applicable to various models. It can obtain good heat pump performance in different regions and various climatic conditions, with good adaptability and broad application prospects.

For energy management:

Introducing adaptive technologies, AI defrosting can judge whether frosting occurs and the degree of frosting by collecting external temperature data, refrigerant evaporation pressure, discharge pressure change, defrosting time, cycle and other variables, and automatically enter the intelligent "cloud computing" dual-mode for defrosting. This allows the unit, which can only operate mechanically, to realize self-learning, self-adjustment, and self-optimization, thus improving the energy efficiency and reducing energy consumption.

For users:

AI defrosting technology can identify, correct, deeply optimize, and effectively delay frosting, and achieve outdoor defrosting efficiently and quickly with small water temperature fluctuations, thus improving user experience.



Smart Cloud

New Experience of Intelligent Management

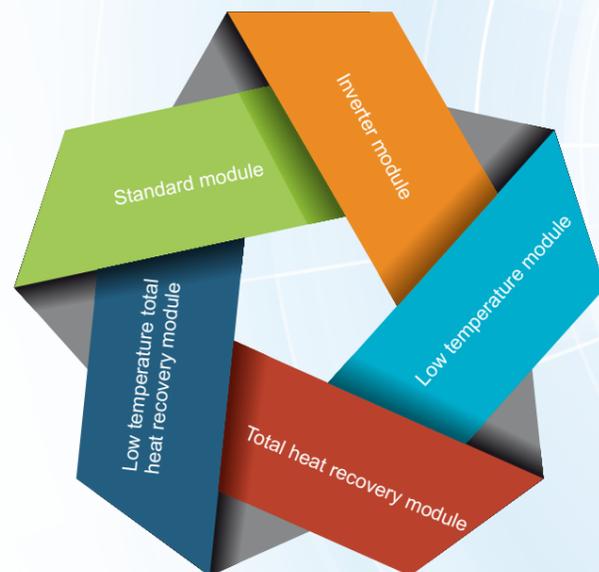


Hybrid connection control

EK modular unit products have 29 patents (including 6 national invention patents). The hybrid connection air-cooled chiller has obtained a PCT international patent certificate.



EK is the first manufacturer to launch the hybrid connection technology that combines the inverter modular air-cooled heat pump unit with the fixed-frequency air-cooled heat pump unit. With the hybrid connection control, the inverter modular unit and the standard modular unit can be combined to form the inverter+fixed-frequency system, different inverter modular units can also be combined to form the inverter+inverter system, to address different cooling/heating needs of customers. Such hybrid connection technology has passed invention patent certification and obtained a PCT international patent certificate.



Hybrid connection advantages

- ▶ Under partial load, more energy is saved. At 99% time, the unit runs under partial load. In inverter+fixed-frequency mode, the unit can preferentially start the inverter unit, thus saving more energy during operation.
- ▶ In the case of inverter+inverter combination, the unit can proportional utilization of the compressors in the complete control system. The average service life of the system is prolonged, thus avoiding long operation time of the recovery unit and short service life.
- ▶ With investment in a set of water system saved, the unit features more intelligent management.

Anti-freezing and defrosting

- ▶ **Four-step frost protection in winter**
The unit supports water pump linkage control anti-freezing, temperature sensor linkage protection, pressure sensor linkage protection, and heating and anti-freezing.
- ▶ **Suspending fin heat exchanger**
This can prevent the accumulation of rain and snow during the heating process, and avoid condensed water freezing at the bottom of the heat exchanger during the defrosting process.
- ▶ **Centralized drainage**
The drain pan with high drainage capacity is conducive to smooth drainage of condensed water during defrosting.
- ▶ **Thermal radiation anti-frosting design**
A unique heat radiation anti-frosting device is equipped in the last refrigerant circuit at the bottom of the heat exchanger. When defrosting, high-temperature refrigerant is introduced into the bottom to effectively prevent the bottom from freezing.
- ▶ **Weatherproof function**
The unit will not be covered by heavy snow when it is idle in winter.



Heat exchanger suspending design + thermal radiation anti-frosting design



Centralized drainage



Smart Cloud

New Experience of Intelligent Management



Convenient intelligent control with multiple protection

- Adopting a microcomputer control system and standard touch LCD controller, the unit is easy and fast to use. The optional RS485 standard communication interface and built-in Modbus communication protocol can achieve network group control. 7-inch touch screen is optional.
- The unit has 13 built-in powerful protection functions to achieve all-round protection, including compressor high- and low-pressure protection, power supply default phase and anti-phase protection, frequent start protection, compressor overcurrent protection, compressor discharge temperature protection, unit overheat protection, sensor failure protection, cooling anti-freeze protection, winter water system anti-freezing protection, water flow insufficiency protection, and ambient temperature protection.



Unit control function

Parameter setting function

- Time setting
- Timed ON/OFF for one week
- Cooling water inlet/outlet temp.
- Heating water inlet/outlet temp.
- "Anti-freezing temp, defrosting temp"

Defrosting function

- Auto defrosting
- Manual defrosting function

Memory function

- Memorization function in power outage case
- Permanent storage for user parameters

Other functions

- Fault diagnosis function
- Historical fault query
- Compressor average wear function and module time-sharing startup function
- Water system two-way valve control function
- Auxiliary electric heating control function
- Remote ON/OFF control function within a maximum of 1000 meters
- Start/stop control for chilled water pump
- Pump protection feedback
- Terminal two-way valve interlock control

Parameter Display Function

- Display of unit operating status
- Set water inlet and outlet temperature, actual water inlet and outlet temperature
- Timed adjustment, anti-freezing temp
- Anti-freezing temp in winter, defrosting temp

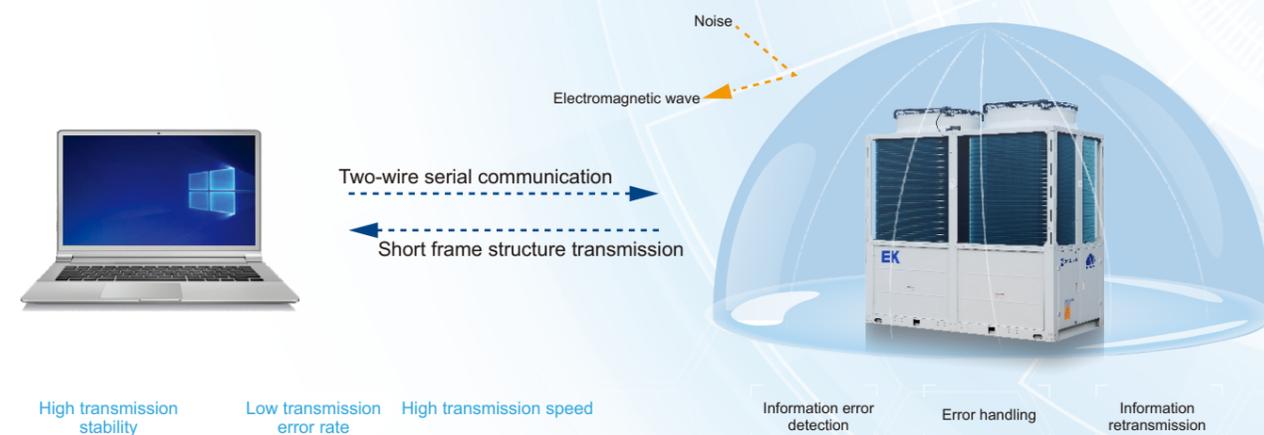
Master/slave integration

- Any slave module can be used interchangeably as a master module
- Each system can be combined with 16 modules



CAN communication

- Have the advantages of strong real-time property, long transmission distance, and strong anti-interference ability.
- Adopt two-wire serial communication with strong error detection ability, allowing it to work in an environment with high-noise interference.
- Information of short frame structure and hardware check realize small probability of interference data error.
- Reliable error handling and error detection mechanism, and automatic retransmission of information.



High transmission stability

Low transmission error rate

High transmission speed

Information error detection

Error handling

Information retransmission

Refrigerant control technology

Refrigerant pressure detection technology

The air suction and discharge pressure sensors are used together with the temperature sensor to detect the system refrigerant status accurately and ensure stable and efficient unit operation. The sensor reports the pressure change in time, and the unit responds to the indoor load rapidly to avoid the impact and influence on the compressor by instantaneous high or low voltage.



New refrigerant liquid separator

The Venturi separator with the highest processing precision in the industry is used to ensure the uniform refrigerant flow, reduce pressure loss and noise, and improve heat exchange efficiency effectively.



Inverter control technology

The EK next-generation inverter uses the advanced "refrigerant cooling + air cooling" technology to cool the main board. Air cooling is adopted as an auxiliary method for heat dissipation to ensure enhanced operation stability.



Smart Cloud

New Experience of Intelligent Management



Master/slave integration

Any slave module can be used interchangeably as a master module. A damaged master module will not affect the use of other modules. Modules of the same or different models can be connected at will. Each system supports up to 16 modules. In contrast, conventional air conditioners use a fixed unit as the master module of the system; when the master module fails, the entire system fails to work, and the maintenance and commissioning are not convenient.



If a running master module fails, the other unit switches to be the new master module.

Dual standby operation

A single unit adopts multi-compressor design. When a compressor is faulty, the other compressor in the system can still work normally. In the case of a multi-unit system, maintenance or repair of one unit does not affect the operation of the remaining units.



Hierarchical start of modules

The unit supports a hierarchical start. This can reduce the unit startup current, reduce the impact on the mains grid, and does not affect the safety of electrical devices in the same area.



Hierarchical start: Hierarchical start of modules can reduce the impact of unit startup current on the mains grid.

Modular balance

The unit monitors the running status of each compressor in real time, and intelligently balances the running time of each compressor, to prolong the service life of the unit.



Enhanced Flexibility Fast and Convenient Application

Featuring flexibility in installation, quickness in construction, and simplicity in pipelining, these units allow phase-based and moderate investment and have no requirement on the chilled water system, therefore becoming one of the best choices for users.

Enhanced Flexibility

Fast and Convenient Application

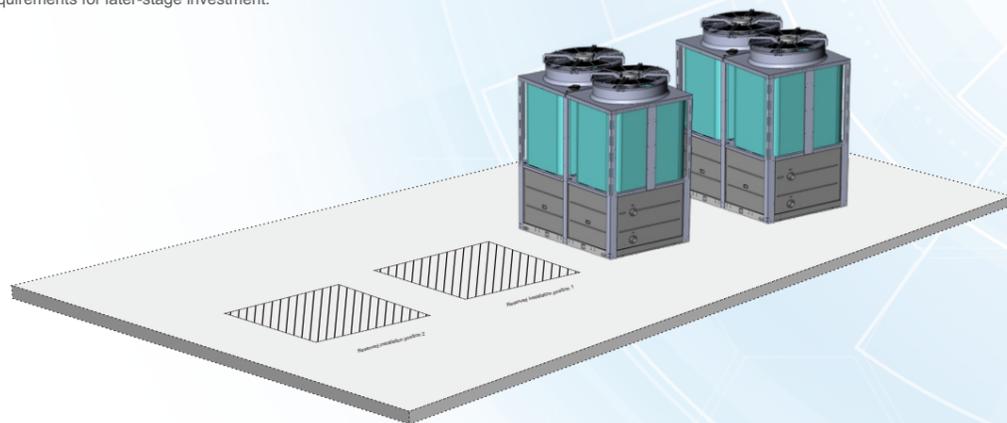
Flexible configuration

Athena Plus inverter air-cooled heat pump unit supports a flexible combination of various models of the same series. It can also be used together with EKAC inverter series. System model selection and configuration are more flexible.



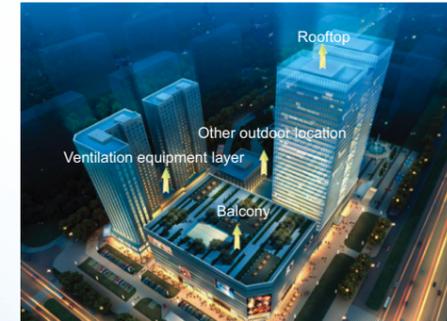
Flexible investment

Investment can be made in phases. Modules can be added at any time to meet the owners' requirements for later-stage investment.



Flexible installation position

No need for a special equipment room, cooling tower, cooling pipeline or cooling pump. It can be installed on a floor, on a roof, at the equipment layer, or in other open spaces.

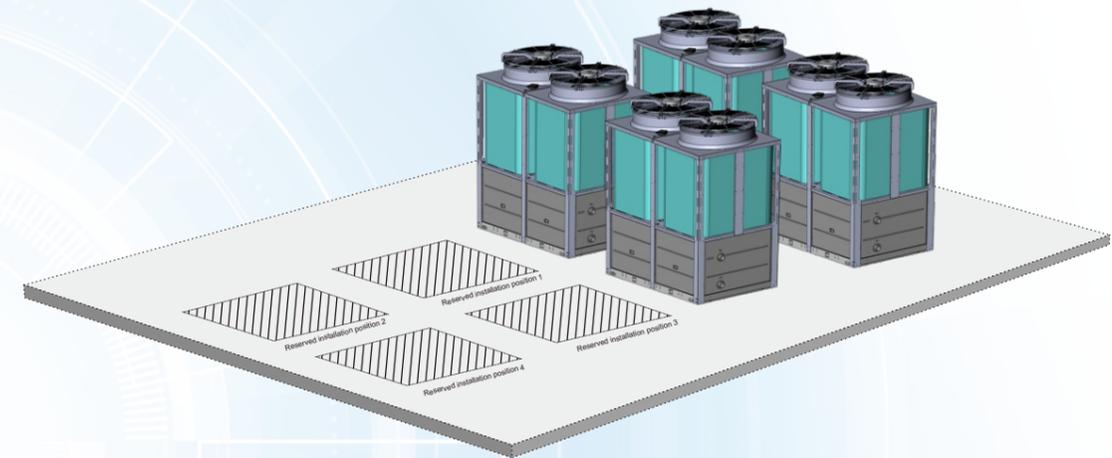


Flexible handling

Different from the conventional structure, the single module of the same cooling capacity features a compact size and lighter body. It can be easily moved with a forklift and through a cargo lift to facilitate handling on site.

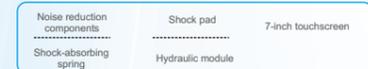
Flexible combination

When multiple modules are installed, they can be connected along the length or width direction, or in other modes, as required by users.



Flexible options

Athena Plus inverter air-cooled heat pump unit provides rich options to meet various needs of customers.



- An optional hydraulic module can integrate all necessary hydraulic components such as water pumps (one for use and one for backup), filters, expansion tanks, water pressure gauges, soft joints, and gate valves into one, which greatly saves the initial investment of the system and the design and installation workload, and helps customers be free from worry and save efforts and time.
- It can also provide a variety of combination options such as low lift/high lift/super-high lift, single and double pumps to meet the needs of different customers on site.



Note: This is the actual project application diagram of our company, and the specific hydraulic module design can be determined according to the project

Unit Specifications

EKAC230CR1LHV

Combination code		EKAC230CR1LHV	EKAC460CR1LHV	EKAC690CR1LHV	EKAC920CR1LHV	EKAC1150CR1LHV	EKAC1380CR1LHV	
Unit combination model		EKAC230CR1LHV	2×EKAC230CR1LHV	3×EKAC230CR1LHV	4×EKAC230CR1LHV	5×EKAC230CR1LHV	6×EKAC230CR1LHV	
Nominal cooling capacity	kW	65	130	195	260	325	390	
Nominal heating capacity	kW	70	140	210	280	350	420	
Total power of nominal cooling capacity	kW	20.2	40.4	60.6	80.8	101	121.2	
Operating current under nominal cooling capacity	A	33	66	99	132	165	198	
Total power of nominal heating capacity	kW	20	40	60	80	100	120	
Operating current under nominal heating capacity	A	33	66	99	132	165	198	
Maximum unit operating power	kW	26	52	78	104	130	156	
Maximum unit operating current	A	45	90	135	180	225	270	
IPLV		4.35						
Energy efficiency grade		1						
Power supply		380V/3N ~ /50Hz						
Refrigerant type		R410A						
Compressor	Type	DC Inverter Scroll Compressor						
	Lubricant	POE 32-3MAF						
	Qty	1	2	3	4	5	6	
Water-side heat exchanger	Type	High-efficiency vacuum brazed heat exchanger						
	Cooling water flow	m³/h	11.2	22.4	33.6	44.8	56.0	67.2
	Heating water flow	m³/h	12.0	24.0	36.0	48.0	60.0	72.0
	Water resistance	kPa	38					
Actual length of inlet and outlet water pipes of a single unit		DN50						
Recommended length of inlet and outlet water pipes		DN50	DN80	DN100	DN100	DN125	DN125	
Fan	Type	Axial fan						
	Qty	1	2	3	4	5	6	
Net weight of the unit	kg	400	800	1200	1600	2000	2400	
Operating weight of the unit	kg	410	820	1230	1640	2050	2460	
Unit dimensions	Length x Height	mm 1110 x 2335						
	Width	mm	1156	2912	4668	6424	8180	9936

Note:

- Working conditions of the unit for testing the nominal cooling capacity: Outlet temperature: 7°C; water flow rate: 0.172 m³/(h·kW); outdoor ambient temperature: 35°C.
- Working conditions of the unit for testing the nominal heating capacity: Outlet temperature: 45°C; water flow rate: 0.172 m³/(h·kW); outdoor dry/wet bulb temperature: 7°C/6°C.
- Water resistance includes differential water pressure of the unit and that of the affiliated Y-shape filter.
- For combined units, the manufacturer does not offer general water pipes and they must be prepared and installed on site. Diameter of the pipes should comply with design standards.
- In actual applications, it can be combined based on the same or different units as required, and the number of combined units is 1 to 16.
- For combined units, the manufacturer does not offer general water pipes and they must be prepared and installed on site. Diameter of the pipes should comply with design standards.

Unit Specifications

EKAC460BR1LHV

Combination code		EKAC460BR1LHV-A	EKAC920BR1LHV-A	EKAC1380BR1LHV-A	EKAC1840BR1LHV-A	EKAC2300BR1LHV-A	EKAC2760BR1LHV-A	
Unit combination model		EKAC460BR1LHV-A	2×EKAC460BR1LHV-A	3×EKAC460BR1LHV-A	4×EKAC460BR1LHV-A	5×EKAC460BR1LHV-A	6×EKAC460BR1LHV-A	
Nominal cooling capacity	kW	130	260	390	520	650	780	
Nominal heating capacity	kW	140	280	420	560	700	840	
Total power of nominal cooling capacity	kW	40.4	80.8	121.2	161.6	202	242.4	
Operating current under nominal cooling capacity	A	67	134	201	268	335	402	
Total power of nominal heating capacity	kW	40	80	120	160	200	240	
Operating current under nominal heating capacity	A	67	134	201	268	335	402	
Maximum unit operating power	kW	52	104	156	208	260	312	
Maximum unit operating current	A	91.5	183	274.5	366	457.5	549	
IPLV		4.35						
Energy efficiency grade		1						
Power supply		380V/3N ~ /50Hz						
Refrigerant type		R410A						
Compressor	Type	DC Inverter Scroll Compressor						
	Lubricant	POE 32-3MAF						
	Qty	2	4	6	8	10	12	
Water-side heat exchanger	Type	High-efficiency vacuum brazed heat exchanger						
	Cooling water flow	m³/h	22.4	44.8	67.2	89.6	112.0	134.4
	Heating water flow	m³/h	24.1	48.2	72.3	96.4	120.5	144.6
	Water resistance	kPa	50					
Actual length of inlet and outlet water pipes of a single unit		DN65						
Recommended length of inlet and outlet water pipes		DN80	DN100	DN125	DN150	DN150	DN200	
Fan	Type	Axial fan						
	Qty	2	4	6	8	10	12	
Net weight of the unit	kg	750	1500	2250	3000	3750	4500	
Operating weight of the unit	kg	770	1540	2310	3080	3850	4620	
Unit dimensions	Length x Height	mm 2215 x 2335						
	Width	mm	1156	3312	5468	7624	9780	11936

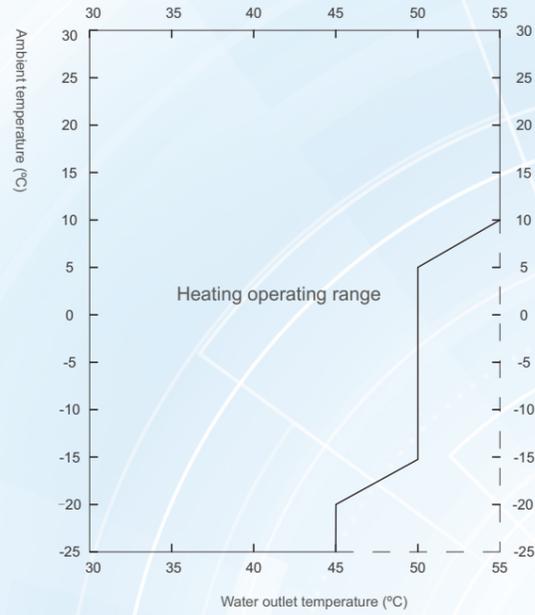
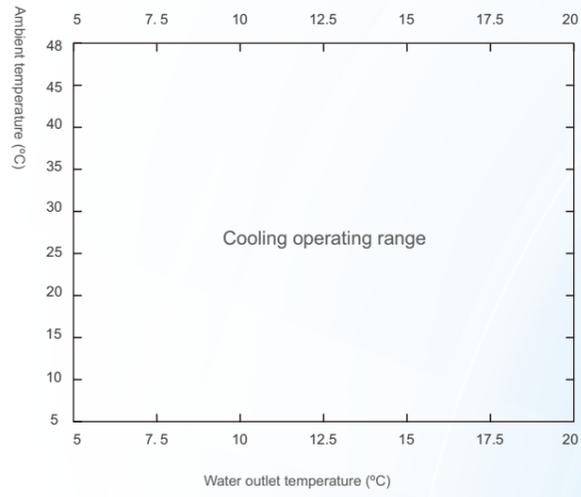
Note:

- Working conditions of the unit for testing the nominal cooling capacity: Outlet temperature: 7°C; water flow rate: 0.172 m³/(h·kW); outdoor ambient temperature: 35°C.
- Working conditions of the unit for testing the nominal heating capacity: Outlet temperature: 45°C; water flow rate: 0.172 m³/(h·kW); outdoor dry/wet bulb temperature: 7°C/6°C.
- Water resistance includes differential water pressure of the unit and that of the affiliated Y-shape filter.
- For combined units, the manufacturer does not offer general water pipes and they must be prepared and installed on site. Diameter of the pipes should comply with design standards.
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- For combined units, the manufacturer does not offer general water pipes and they must be prepared and installed on site. Diameter of the pipes should comply with design standards.

Capacity Change Table and Operating Range

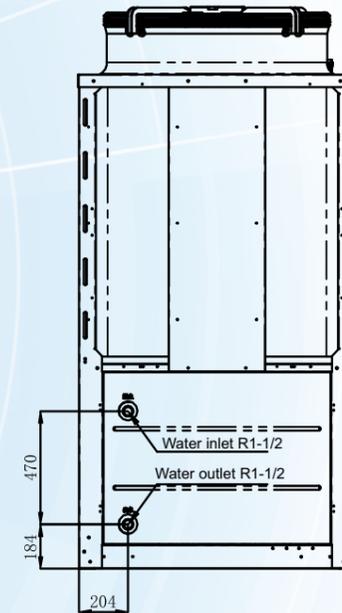
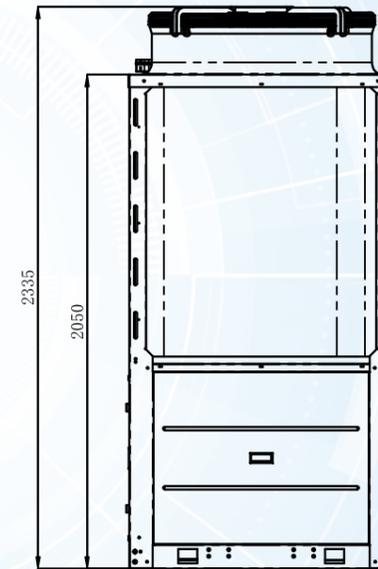
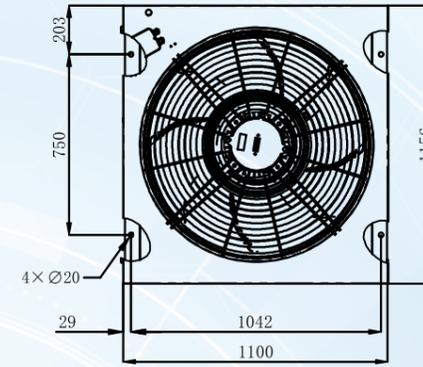
Unit Dimensions

Capacity change table

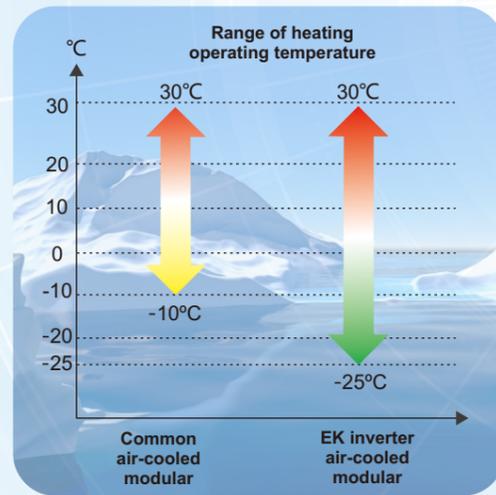
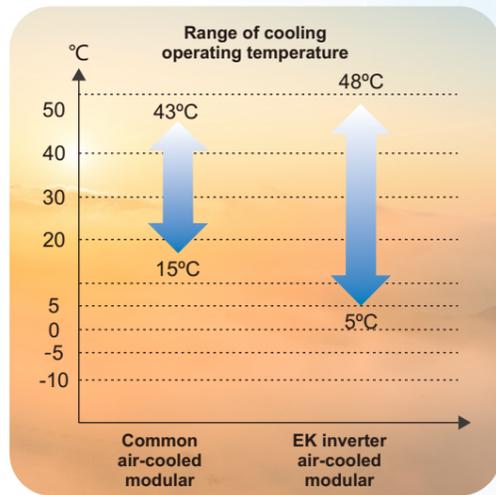


EKAC230CR1LHV

Unit: mm



Operating range



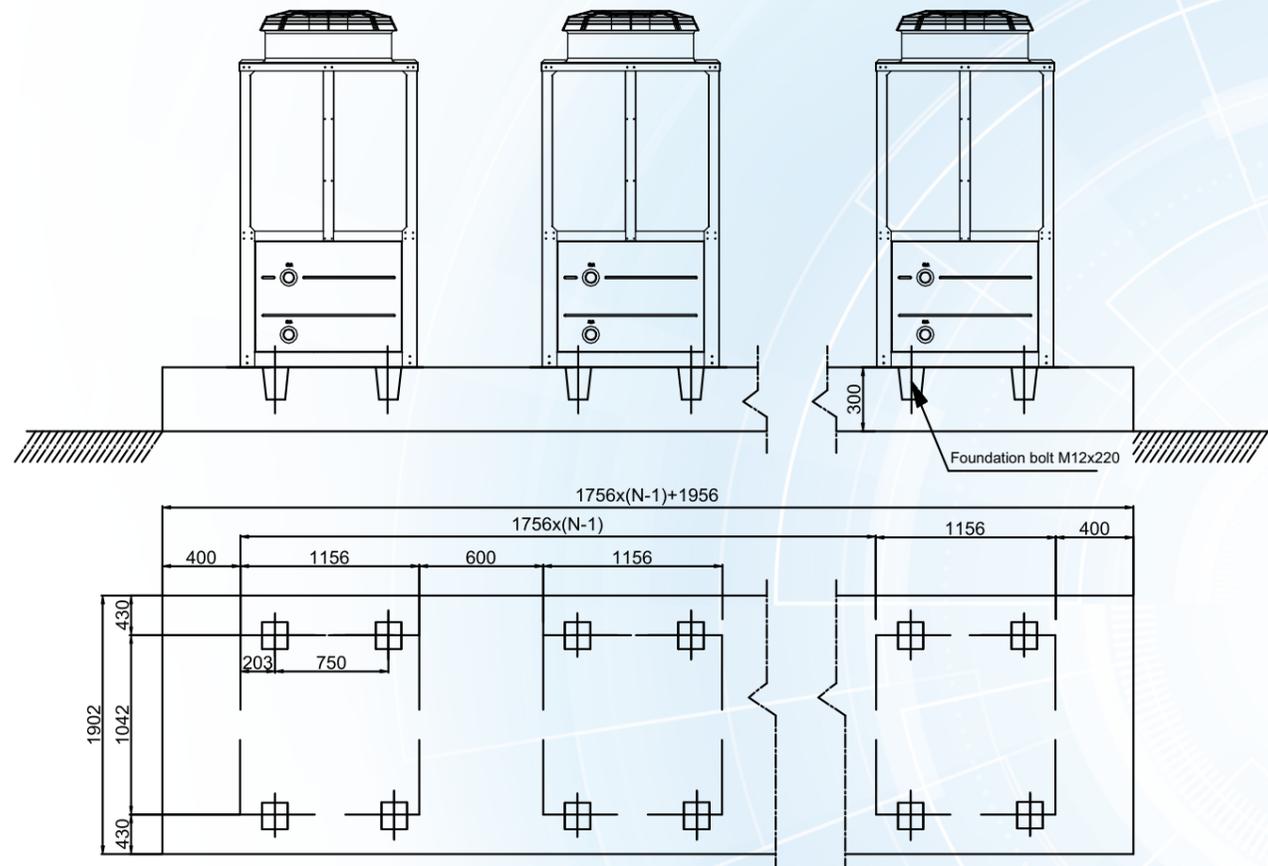
- Note:
1. The installation foundation must be a concrete floor or channel steel frame structure that can withstand the operating pressure of the unit;
 2. N indicates the total number of installed modules;
 3. Each unit is fixed with four M12 bolts;
 4. Six 20-mm thick rubber isolators should be installed between the unit and the installation foundation;
 5. The installation foundation must be equipped with drainage facilities to facilitate the drainage of condensate and defrosting water.

Unit Installation Foundation Drawing

Unit Dimensions

➔ EKAC230CR1LHV

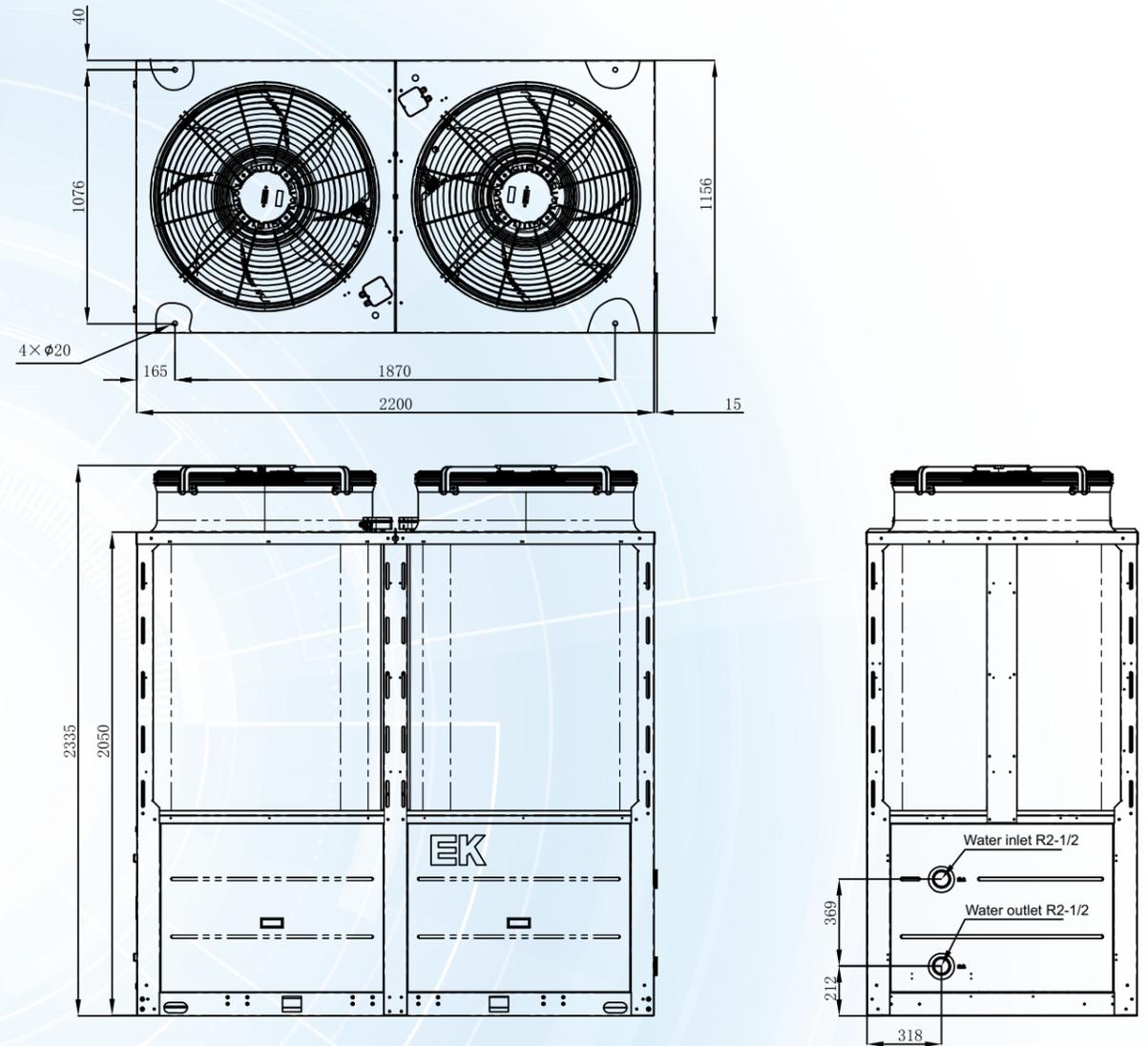
Unit: mm



- Note:
1. The installation foundation must be a concrete floor or channel steel frame structure that can withstand the operating pressure of the unit;
 2. N indicates the total number of installed modules;
 3. Each unit is fixed with four M12 bolts;
 4. Six 20-mm thick rubber isolators should be installed between the unit and the installation foundation;
 5. The installation foundation must be equipped with drainage facilities to facilitate the drainage of condensate and defrosting water.

➔ EKAC460BR1LHV-A

Unit: mm



- Note:
1. The installation foundation must be a concrete floor or channel steel frame structure that can withstand the operating pressure of the unit;
 2. N indicates the total number of installed modules;
 3. Each unit is fixed with four M12 bolts;
 4. Six 20-mm thick rubber isolators should be installed between the unit and the installation foundation;
 5. The installation foundation must be equipped with drainage facilities to facilitate the drainage of condensate and defrosting water.

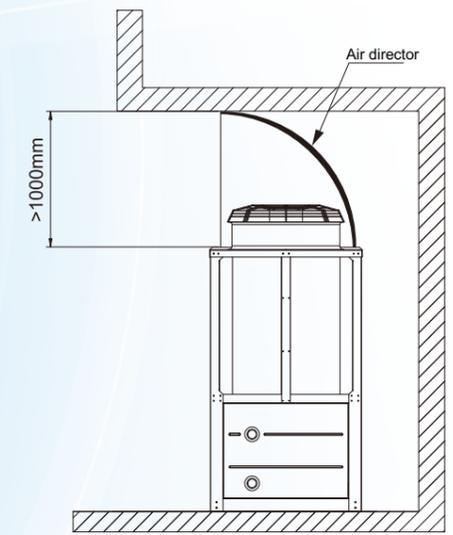
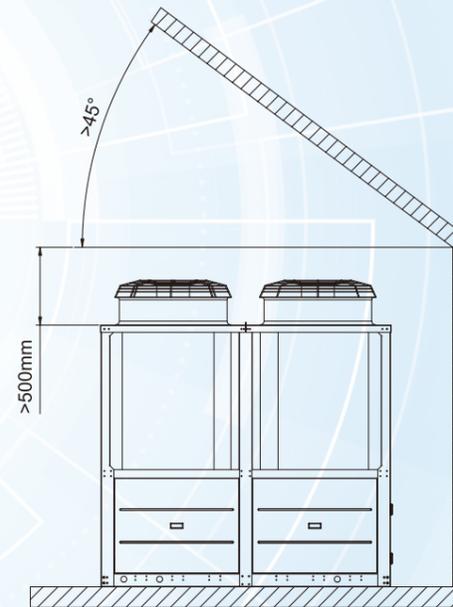
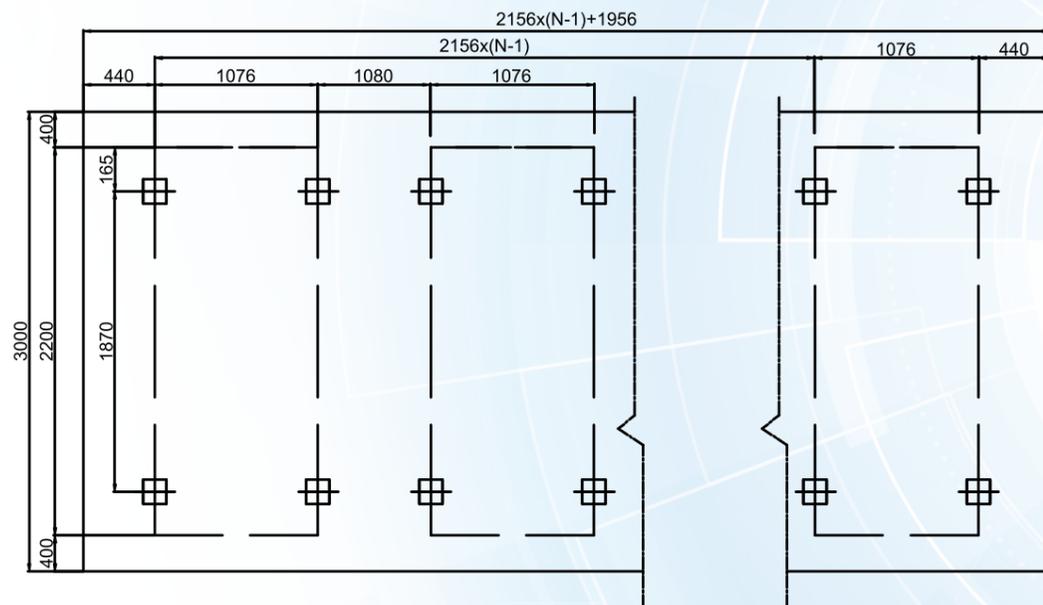
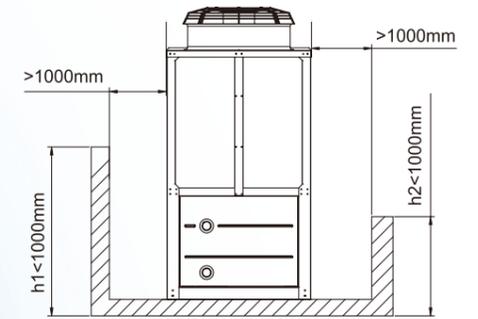
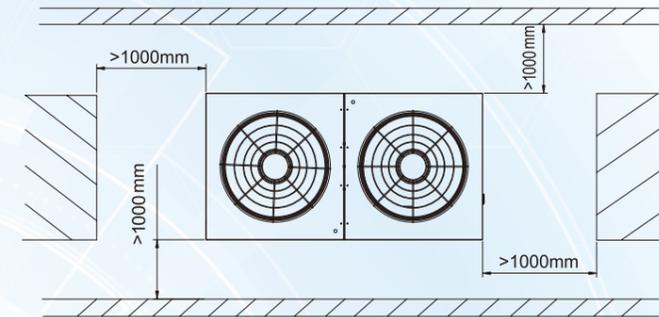
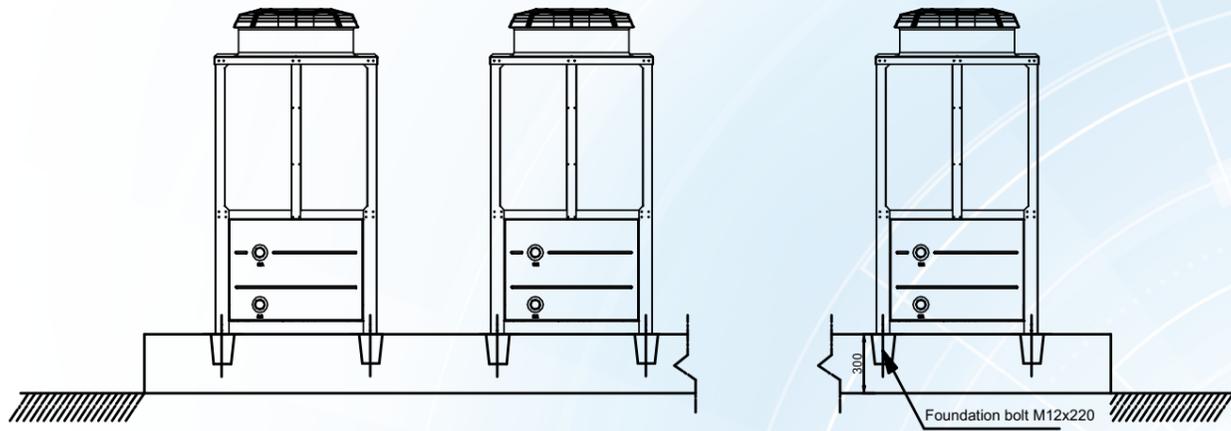
Unit Installation Foundation Drawing

Unit Installation Requirements

➤ EKAC460BR1LHV-A

Unit: mm

➤ Space of Single Unit



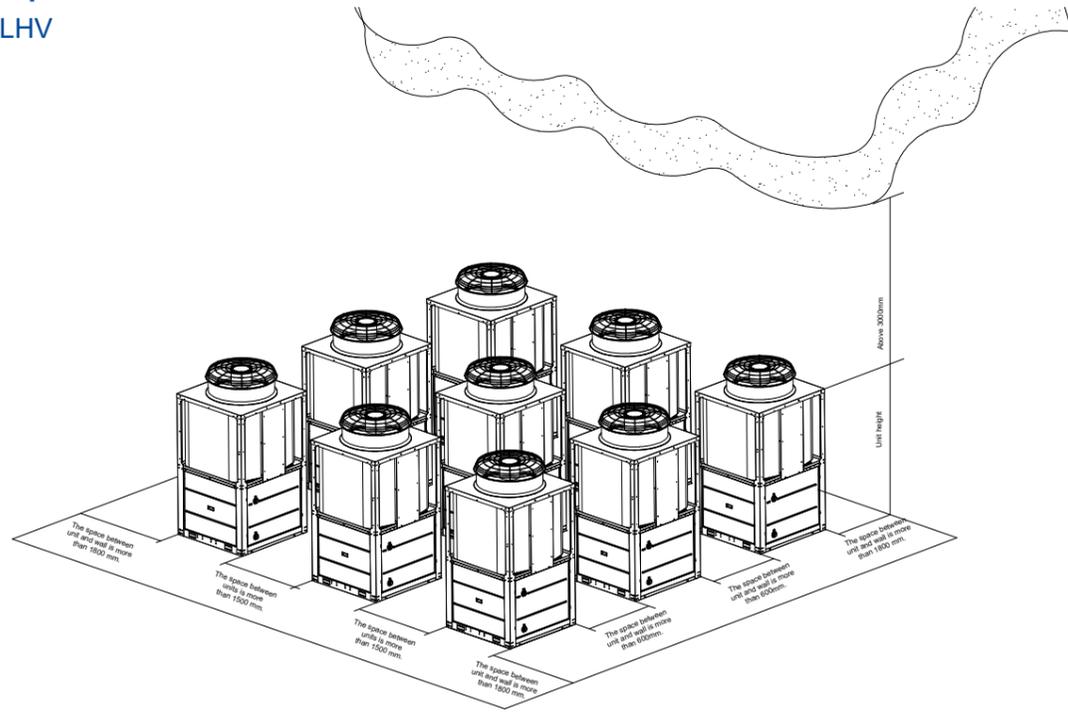
Note:

1. The installation foundation must be a concrete floor or channel steel frame structure that can withstand the operating pressure of the unit;
2. N indicates the total number of installed modules;
3. Each unit is fixed with four M12 bolts;
4. Six 20-mm thick rubber isolators should be installed between the unit and the installation foundation;
5. The installation foundation must be equipped with drainage facilities to facilitate the drainage of condensate and defrosting water.

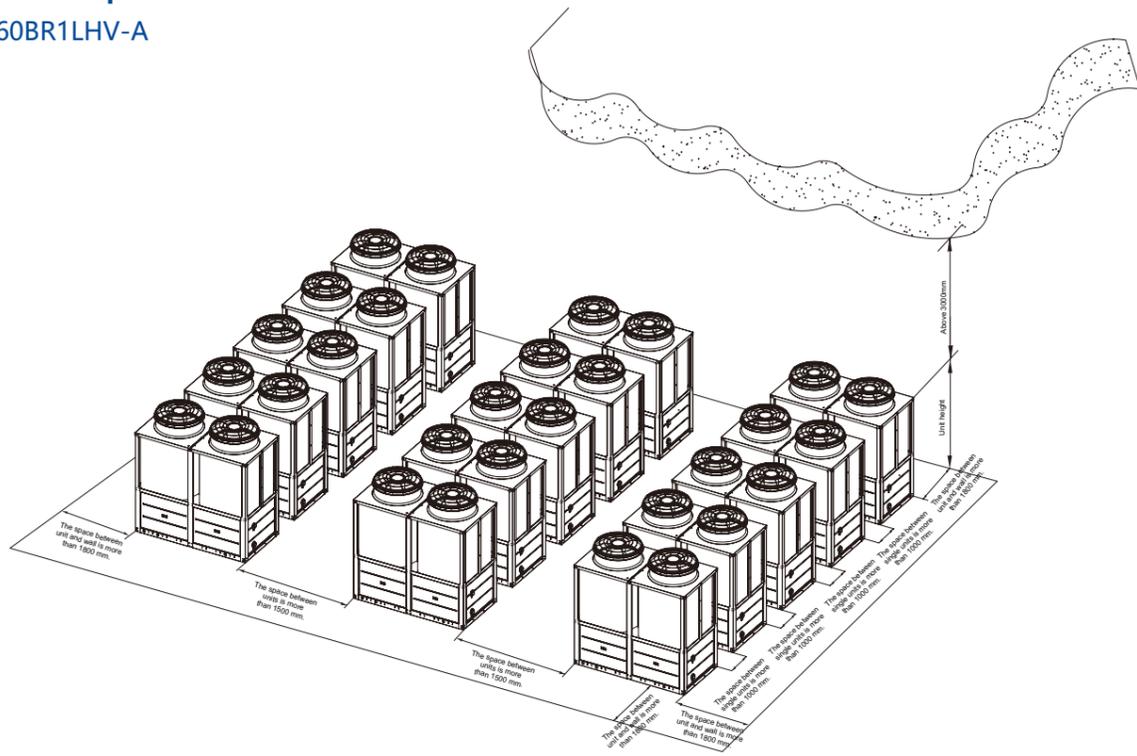
Unit Installation Requirements

Water System Reference Diagram

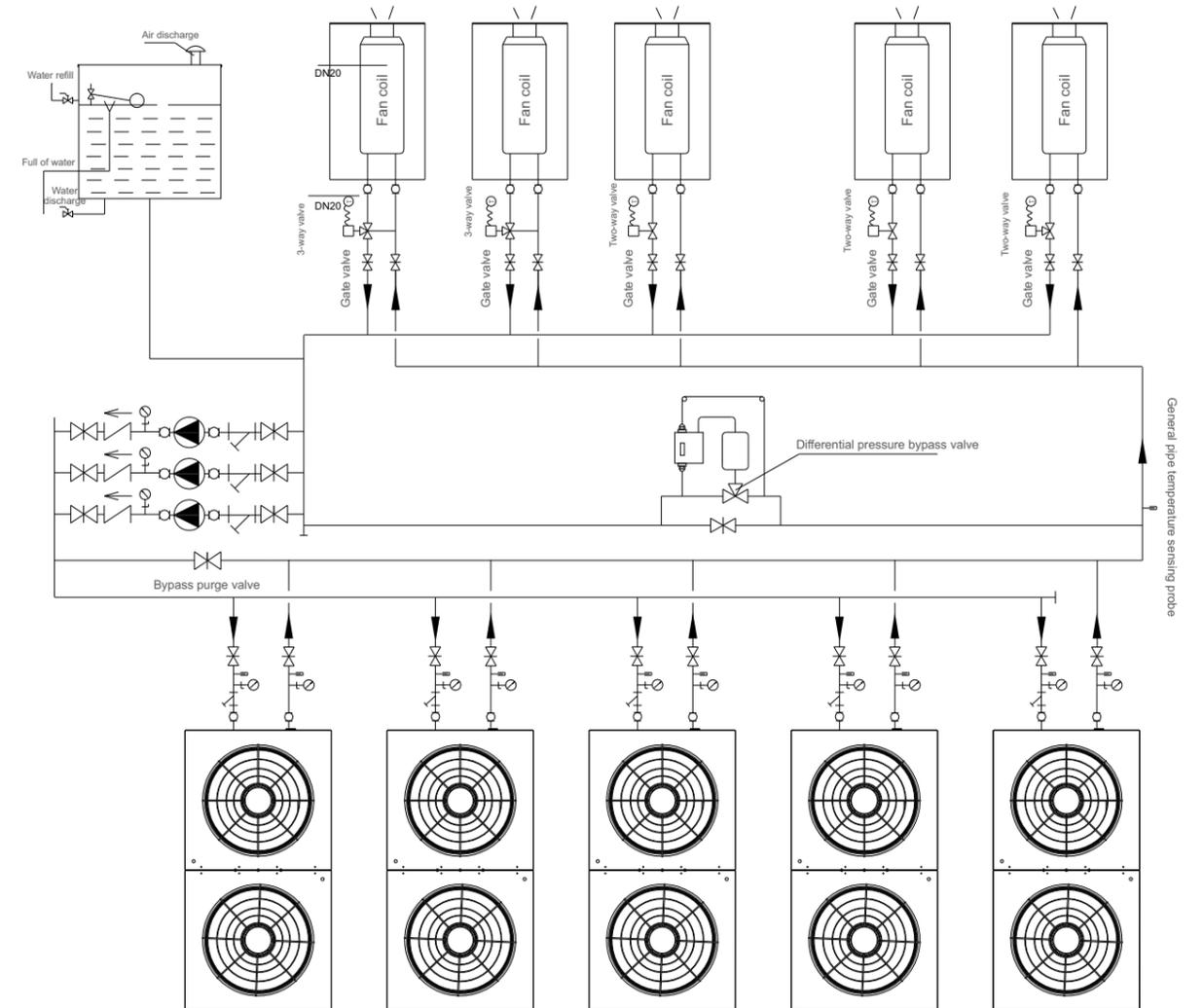
Space of Multiple Units EKAC230CR1LHV



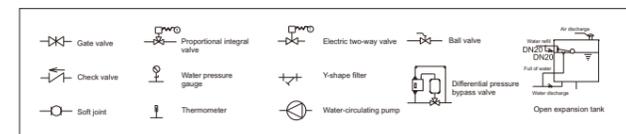
Space of Multiple Units EKAC460BR1LHV-A



Reference Diagram of Water System with Variable Water Flow for Adjusting the Room Air Conditioner Temperature by Adjusting Chilled Water Flow



Legend of water system diagram

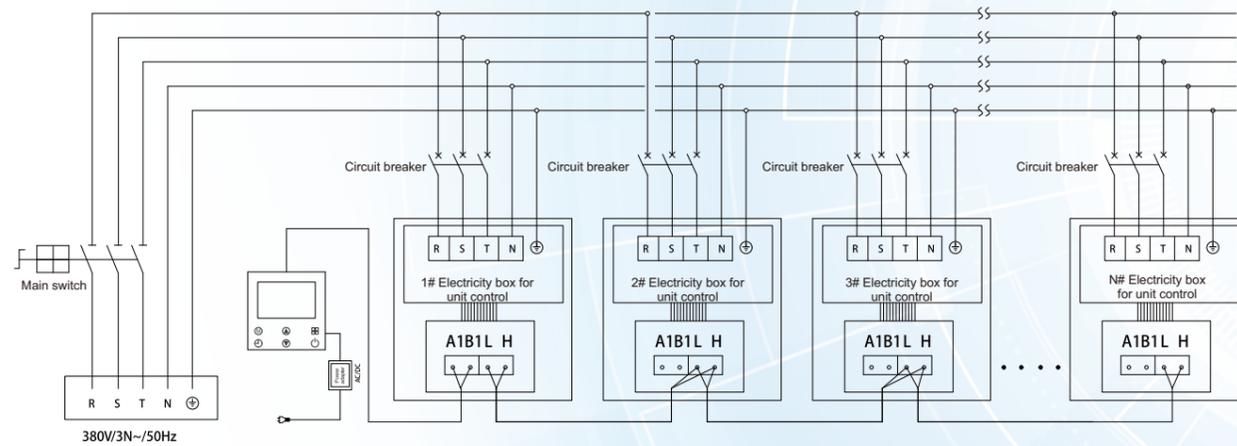


Water System Installation Precautions

➤ Precautions for installation of air-conditioning water system of the unit

- Adopt softened water for circulating water;
- Water supply safety valves are mandatory;
- The water flow cannot be lower than the nominal value of the unit;
- Set the air discharge valve at the highest point of the water system.
- Set a suitable drain valve at the lowest point of the water system;
- It is recommended to install an adiabatic water storage tank of appropriate capacity, to avoid frequent startup of the unit due to too small load;
- An expansion tank must be equipped to adapt to changes in water volume caused by changes in water temperature in the water system;
- The waterway of the unit must be equipped with a bypass valve, and it must be ensured that the water system has been cleaned before the system can be filled with water and put into operation;
- An additional water filter is included randomly. Clean the water filter regularly according to the usage;
- It is recommended to check the water system every half a month;
- When connecting pipes in a reversed return system, the water pressure gauge of each module's inlet and outlet pipes can be omitted;
- Since the wired controller can check the inlet and outlet water temperature of each module, the thermometer can also be omitted.

➤ Connection Diagram of Power Cables and Control Cables



Note:

- ◇ The main switch, circuit breakers, and wires (dotted lines in the preceding figure) are not delivered with the products. Customers should prepare by themselves.
- ◇ The accessory box is equipped with a wired controller, while the unit is not.
- ◇ The accessory box contains a communication wire connecting the wired controller, which is 40 m long, and the communication wire accompanied with the unit is 5 m long.