

# Modular Air-cooled Inverter Scroll Chiller

## V-Series

Cooling & Heating



air

### Johnson Controls - Hitachi Air Conditioning

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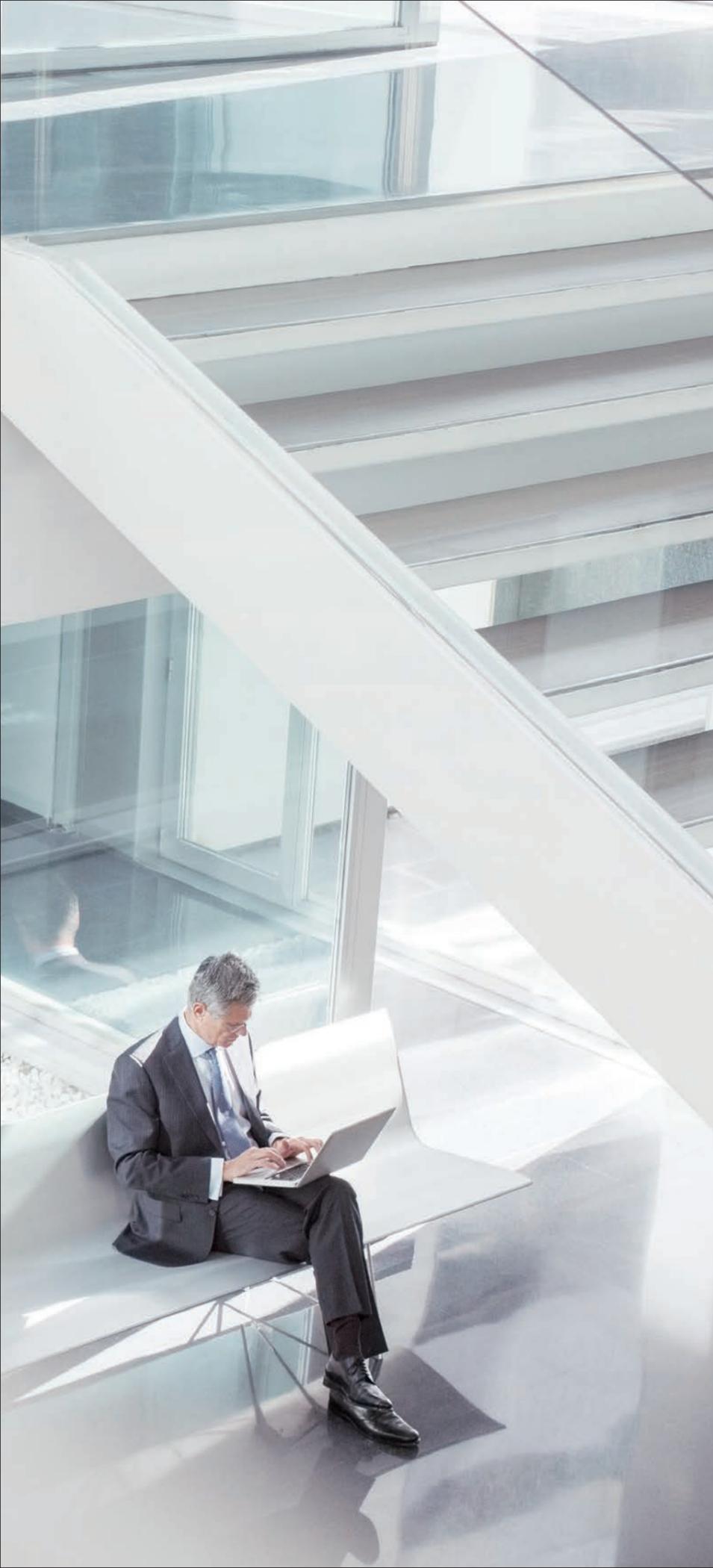
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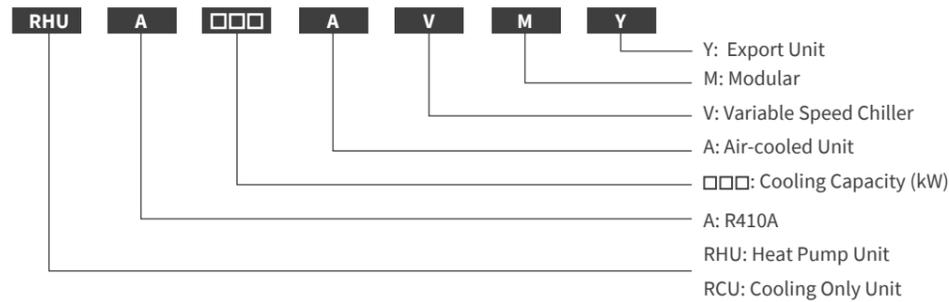


# OVERVIEW

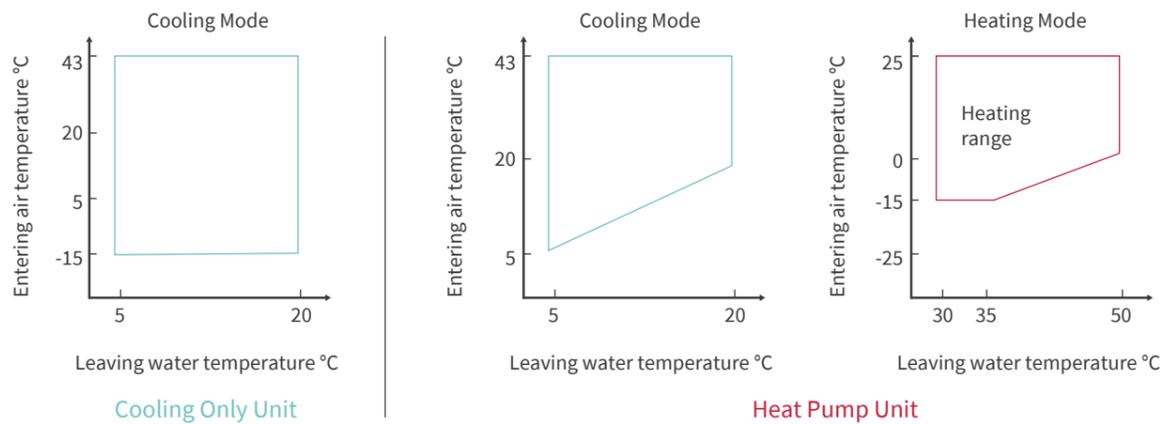
The new V Series is designed to meet demanding environmental requirements, both today and tomorrow. In an effort to reduce the energy consumed by cooling and heating, Hitachi has developed the V Series Modular Inverter Scroll Chiller by leveraging the latest inverter compressor technology. Its exceptional efficiency at both full load and part load set new benchmarks for the industry, making the new V series stand out as the premium solution for small-to-medium size commercial and industrial applications.



## NOMENCLATURE



## OPERATING RANGE



### SUPERIOR PERFORMANCE

Full Inverter Compressor  
**EER up to 3.38**  
**IPLV up to 6.0**

### GREAT FLEXIBILITY

Easy Installation | Easy Layout  
 Easy Operation | Easy Maintenance

### QUIET OPERATION

Inverter technology  
 Quiet air flow via V Coil  
 Minimized noise levels under part load

### ENVIRONMENT SOUND

R410a | 0 ODP  
 Low CO<sub>2</sub> emission

### ROBUST RELIABILITY

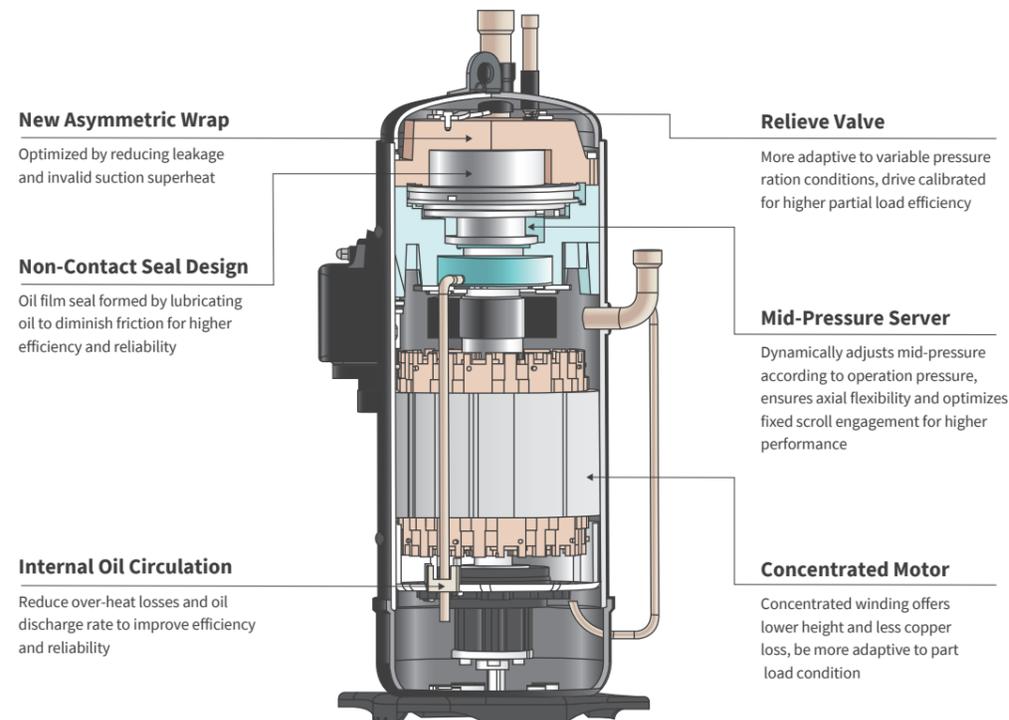
High Quality Compressor  
 Low Inrush Current  
 Factory test

## SUPERIOR PERFORMANCE

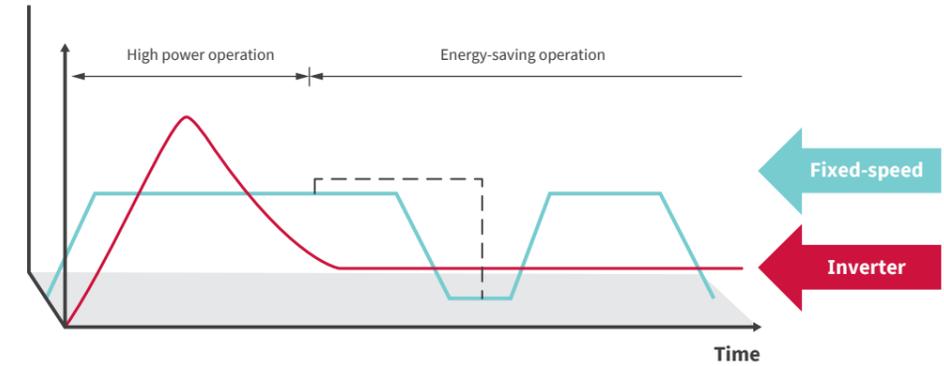
As a HVAC system can use 40-45% of a building's annual energy consumption, choosing the right chiller can significantly reduce energy cost and help users save their operational budgets. Thanks to Hitachi's latest inverter compressor technology, the new V series provides best-in class efficiency. Its full load efficiency goes up to 3.38, which far exceeds the ASHRAE90.1 building energy standard. Meanwhile, its part load efficiency is as high as 6.0, which adds up to an average annual energy savings of 15- 25%, compared to traditional air-cooled chillers.

### Hitachi DC Inverter Compressor

Since pioneering the world's first production of scroll compressors for packaged air-conditioning in 1983, Hitachi has accumulated almost 40 years of experience in the design and production of leading scroll compressors, especially in the field of HVAC applications. The V Series uses the proven design of the direct current (DC) inverter compressor, which embraces all of the design features driven for exceptional efficiency all year around. The inverter compressors deliver stepless capacity control from 25% to 100%, allowing precise capacity matching for building loads and reducing unit power input, thus providing significant energy consumption savings for the customer.



### Energy Saving At Low Load

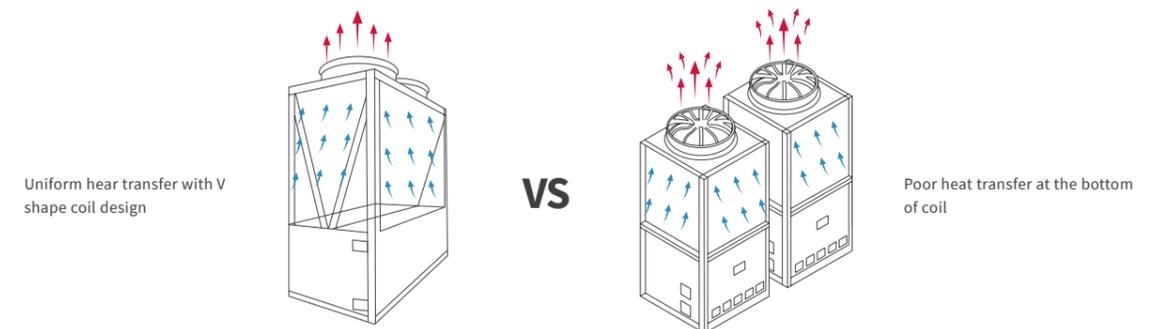


### The Variable Speed Driver

The variable speed driver make the utilization of electrical power more efficient, typically it is measured as power factor. The V Series offers an outstanding power factor, as high as 95%. The customer does not need to pay the premium for the additional power factor correction solution to meet minimum utility requirements.

### Air Side Heat Exchanger

Air side heat exchanger adopts a coils design in a V shape with open angle, which is optimized by CFD tools for air flow distribution simulation. The design ensures a uniform heat transfer with 30% efficiency improvement. Meanwhile the V shape structure effectively enhances the unit's structural strength and limits the risk of coil surface damage during the transportation and installation process.



### A High Efficiency Brazed Plate Heat Exchanger

A high efficiency brazed plate heat exchanger uses true dual circuit with cross flow design, which maximizing the heat transfer performance. The brazed plate type design ensure the less refrigerant charge and compact size compared to traditional shell tube heat exchanger.

### Electronic Expansion Device

Electronic expansion device allows dynamic super heating control, which maximizes the utilization of evaporator heat exchange, thus resulting in more efficient full load and part load operation.

# ADVANTAGES

## GREAT FLEXIBILITY

Thanks to its modular design type, the V series offers superior flexibility throughout the product's life cycle. From design engineer to installer, mechanical and electrical contactor, from end user to service people, almost every stakeholder will get substantial benefits from V series due to its great features in flexibility and practicality, making life easy and simple.

### Easy shipment & installation

- The modular design allows easy storage; each module can be transported individually, which enhances mobility and allows convenient installation.
- The system can be expanded by adding modules, which allows multi-phase investment according to each building's load.
- A quick lead time due to standardized modular design.

### Easy operation

- Systematic factory run tests before shipment ensure a trouble free start-up.
- Great system redundancy – if unexpected faults occur in one module, the remaining modules will operate as backup.

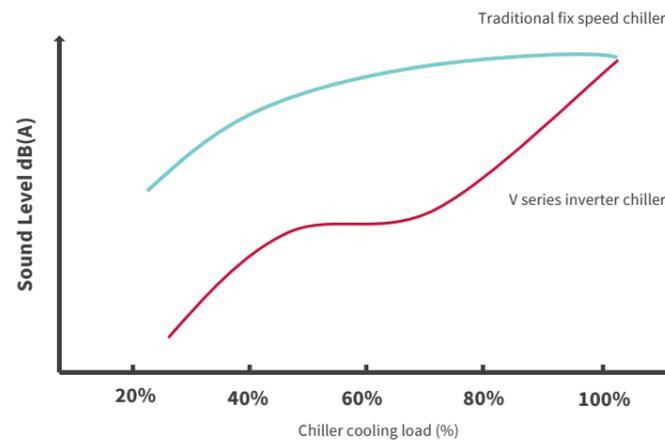
### Easy maintenance

- When one module is being serviced, the system can still keep in operation, which can minimize downtime for the customer.
- A standardized design for each module ensures availability of parts and a quick response time for replacement.

### Easy layout

- A compact structure saves layout footprint on-site.
- Single modules can be arranged flexibly according to site layout.

## QUIET OPERATION



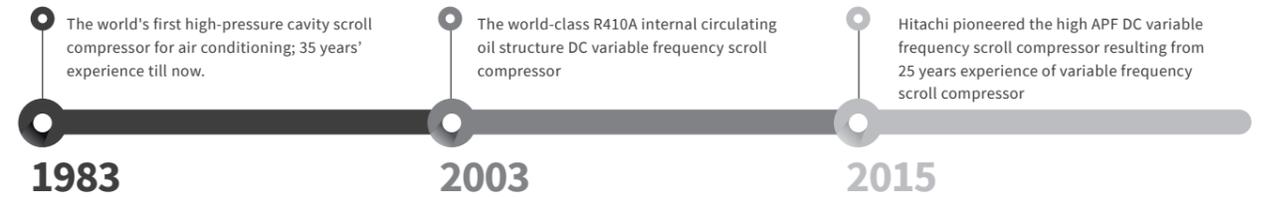
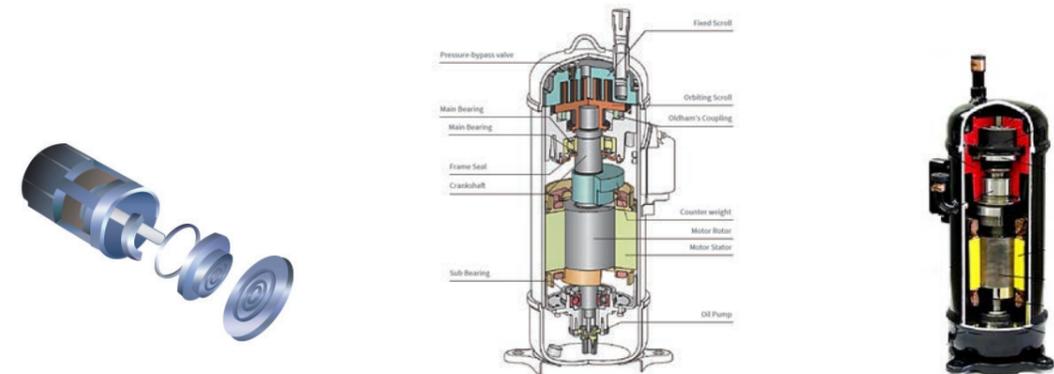
Nowadays, modern cities demand more stringent sound level requirements than years before. In the real world, chillers run 99% of the time in off-design conditions – thus the sound performance at partial load really counts. The traditional fixed speed chillers address limited reduction in sound level at partial load. While for the inverter chiller, thanks to the inverter technology, the compressor frequency can be lower down and result in a significant sound reduction, in most case, the expensive sound enclosure are not necessary.

## ROBUST RELIABILITY

Hitachi is recognized as the market leader for its outstanding reliability. This reputation is built on years of repeated iteration, improvement and research and the highest level of engineering and design development.

### Hitachi Inverter Compressor

Since introducing the world's first production of scroll compressors for packaged air-conditioners in 1983, Hitachi has built its great reputation for delivering superior products, resulting from years of research and thousands of test hours, including extensive testing under extraordinarily severe operating conditions. The V Series chiller adopts the latest generation scroll compressor which embraces all the design features that made Hitachi product such a success in HVAC application.



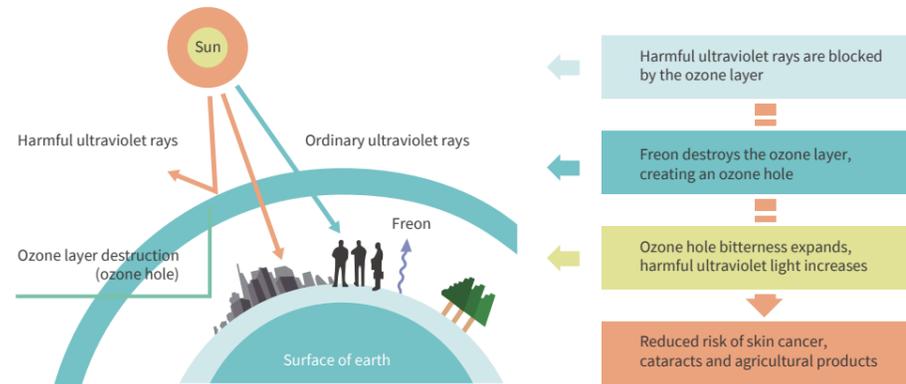
### Low Inrush Current

As V series contains variable speed drive for compressors, this avoids shocks to the motors and drives from sudden current surges during start-up. Starting the compressor at low frequency and bringing it up to full speed gradually will reduce stresses. As a result, the low current will bring less heat and help to extend the lifecycle of the motor. Meanwhile, the electronics can be planned based on minimum current capacity, which can reduce the extent of the wiring.

### Trouble-Free Start-Up

All V series chillers are given a complete functional test at the factory. This test program checks the sensors, wiring, electrical components and fans. In addition, each compressor is test-run to verify function and performance, ensuring that the chiller arrives at the job site fully tested and ready for operation.

## ENVIRONMENTAL BENEFITS



The new V Series is designed for sustainability. To reduce the direct environmental impact, it employs R410a refrigerant with zero ozone depletion potential (ODP), which is recognized as reliable replacement of R22. Meanwhile Hitachi's strict manufacturing process and factory tests before shipment ensure a leak-resistant refrigerant system.

Besides, the V Series makes the customer facility more sustainable in an invisible way: The chiller's exceptional all year round performance allows the less power consumption with reduced the power plant CO<sub>2</sub> emission, which accounts for 80% of global warming potential (GWP) associated with chillers.

## SMART CONTROL

Auto-adaptive control combines intelligence with operating simplicity. The control constantly monitors all machine parameters and precisely manages the operation of compressors, expansion devices and fans for maximum energy efficiency.

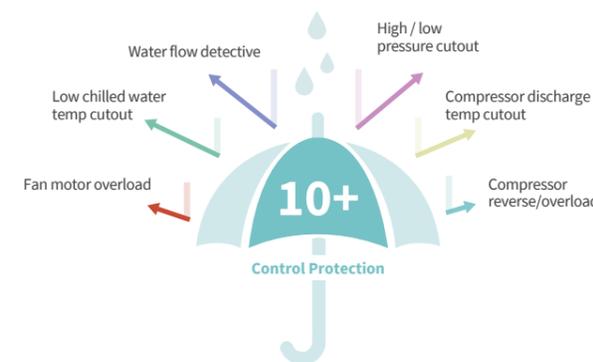


### User-friendly interface

- The standard system controller display features a 4.3" colored touch-screen, allowing access to all operational inputs and outputs.
- Units use intuitive tree-structure menus, permitting quick and easy access to available chiller data, including operating parameters of each master and slave unit: operating mode, water temperatures and set points, outdoor air temperature, set point, compressors operating status and running hours, refrigerant system parameters, etc.

### Advanced control function

- The system controller can support up to 16 modules in one system, which can offer a wide system capacity range and give flexibility for capacity extension.
- Unit basic control function including: Unit ON/OFF, user safety interlock, water pump control, operation indication, circuit alarm and alert etc.
- Time of day scheduling allows the customer to perform simple chiller scheduling without the need for an entire automation system for the building. For example, the user can easily specify start up and shut down times in a 7 day time period.
- Free switching between master and slave units to effectively improve system reliability in case a master unit experiences a problem.



### Alarm and diagnostic

- Real time monitoring of the system parameters to ensure the chiller system has a safe and stable operation. The system provides more than 10 unit control protection, such as water flow detectable, water temperature out of range protection, refrigerant high/ low pressure cutout, compressor reverse/ overload, motor overload, anti-freeze protection, etc. The diagnostic history records can be easily visited via the system controller.

### Remote control / communication

- Stand-alone controls: the unit control system is equipped with remote start and stop contacts, and users can apply remote switch control according to needs.
- Building automation system (BAS) controls: unit have standard RS-485 communication interface with built-in Modbus communication protocol, which allows networked group control via system integration with BAS.



# SPECIFICATIONS

## PERFORMANCE DATA

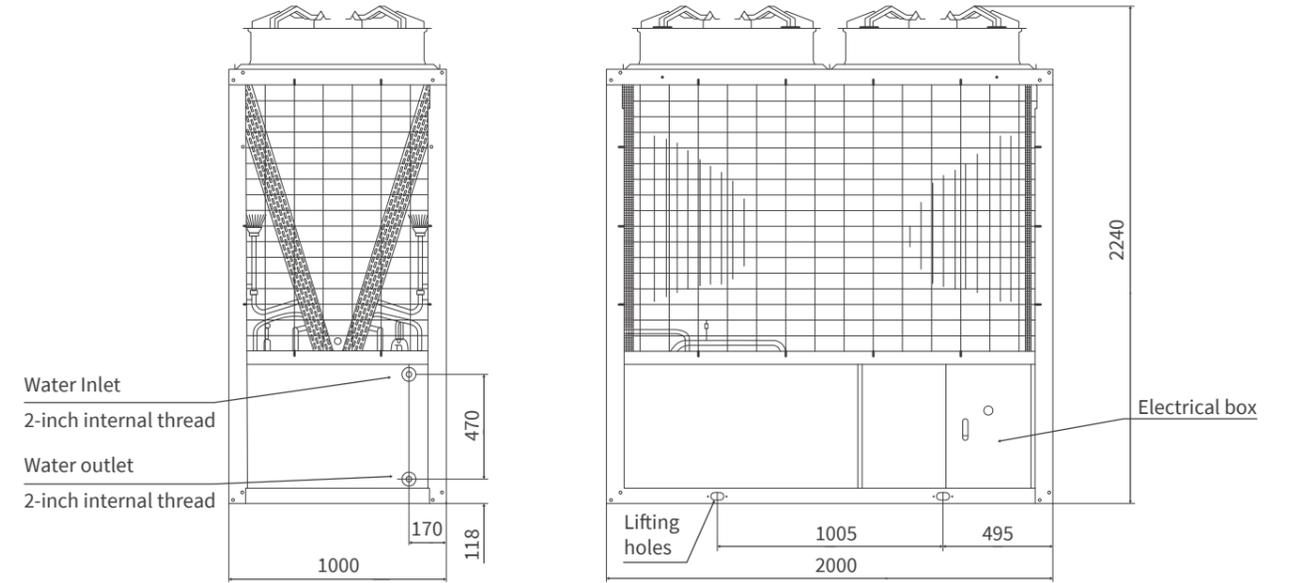
Model		RC(H)UA065AVMY	RC(H)UA130AVMY	RC(H)UA150AVMY	
Nominal cooling capacity	kW	65	130	150	
Power Input (cooling)	kW	19.2	38.5	47.2	
EER	kW/kW	3.38	3.38	3.18	
Nominal heating capacity	kW	68	136	150	
Power Input (heating)	kW	21.4	42.8	47.2	
COP	kW/kW	3.18	3.18	3.18	
IPLV	kW/kW	6.0	6.0	6.0	
Refrigerant	—	R410A			
Flow control	—	Electronic expansion valve			
Circuit No.	—	2	4	4	
Compressor	Type	Variable speed scroll compressor			
	Quantity	set	2	4	4
Compressor capacity control	%	100-25	100-25	100-25	
Water side heat exchanger	Type	Brazen plate heat exchanger			
	Water flow rate	m <sup>3</sup> /h	11.18	22.36	25.80
	Pressure drop	KPa	55	55	68
	Water connection	—	2-inch internal thread	DN65 flange	DN65 flange
	Max. water-side operating pressure	Mpa	1.0	1.0	1.0
Air side heat exchanger	Type	Grooved copper tubes and aluminum fins			
	Fan power	kW	1.5	3.0	3.0
	Quantity	—	2	4	4
	Air flow rate	m <sup>3</sup> /h	28,600	57,200	57,200
Overall dimension	Length	mm	2,000	2,063	2,063
	Width	mm	1,000	2,000	2,000
	Height	mm	2,240	2,240	2,240
Net weight	Cooling Only type	kg	490	954	974
	Heat Pump type	kg	538	1,050	1,070

Notes:  
 1. The performance data is rated according to AHRI Standard 550/590  
 2. Nominal cooling mode- evaporator entering/leaving water temperature 12/7°C, outside air temperature 35°C;  
 3. Nominal heating mode-water heat exchange entering/leaving water temperature 40/45°C, outside air temperature 7°C;  
 4. Water heat exchanger fouling factor 0.018m<sup>2</sup>/K/kW  
 5. Customer side flange and head pipe is not provided with the unit  
 6. Main power supply: 380V-3Ph-50Hz

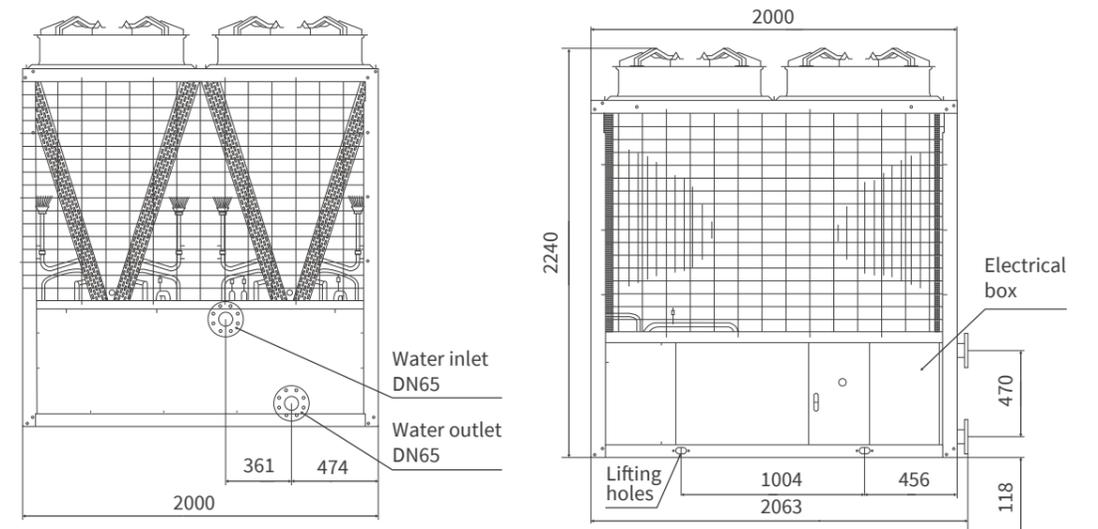


# DIMENSIONS

## RC[H]UA065AVMY

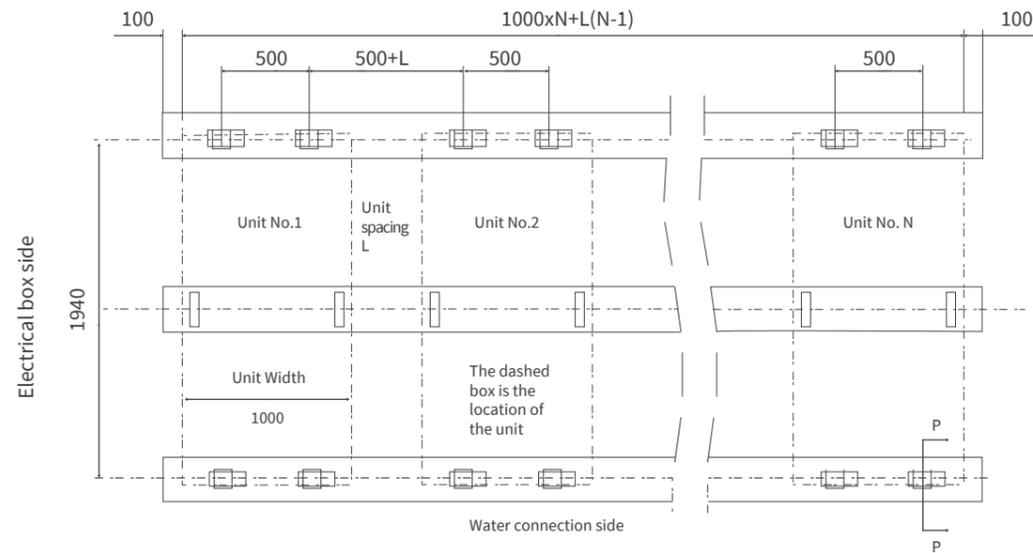


## RC[H]UA130AVMY RC[H]UA150AVMY

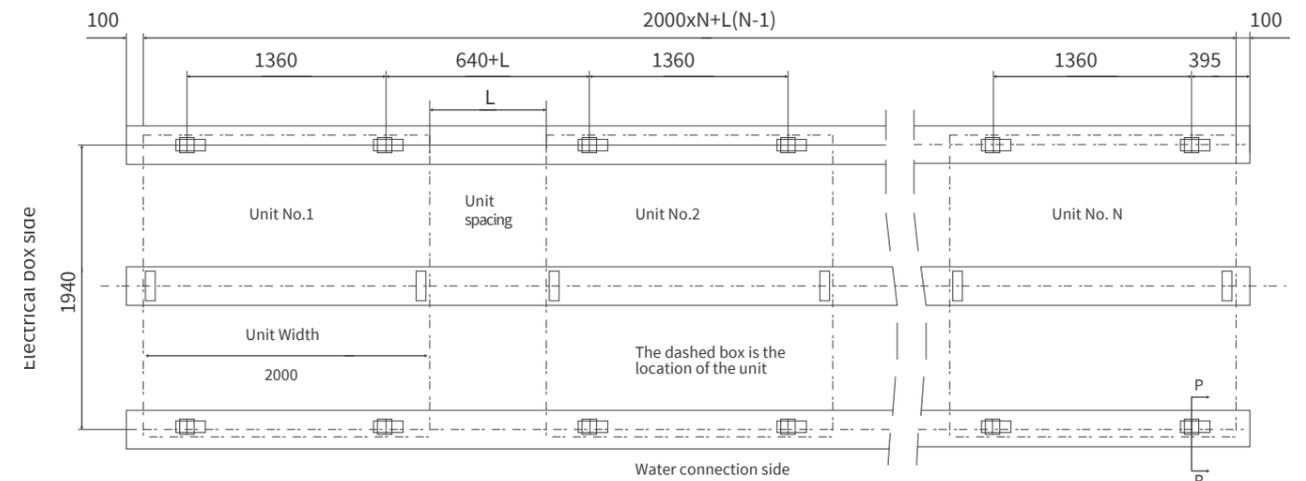


# FOUNDATION DRAWINGS

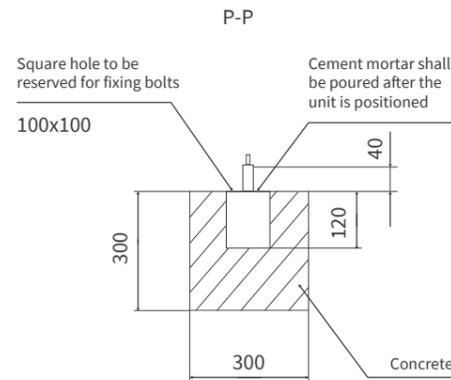
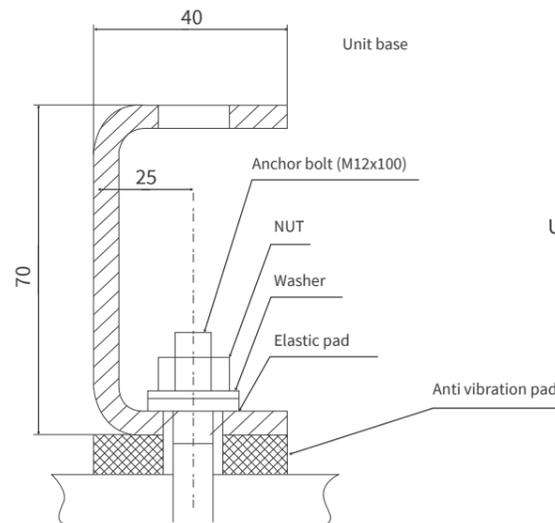
## RC[H]UA065AVMY



## RC[H]UA130AVMY RC[H]UA150AVMY



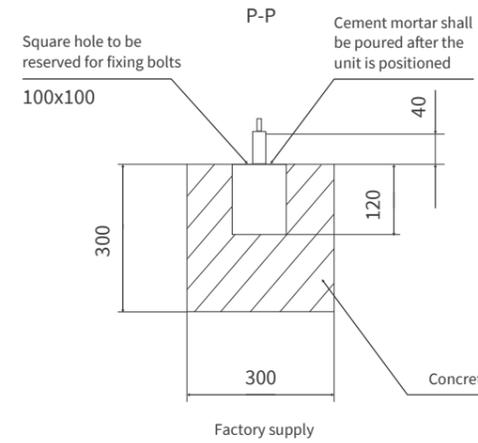
### Detail drawing of foundation installation (not to scale)



#### Applicable models

Heat Pump Unit	Cooling Only Unit
RHUA065AVMY	RCUA065AVMY

- Technical requirements:
- The anti-vibration pads shall be installed between the unit base and basement per drawing, 6 sets of pad per unit.
  - L is the minimum spacing between two modular chiller in a row, and L is  $\geq 500\text{mm}$ .
  - For multiple rows of installation, the minimum spacing between adjacent two rows is 1500mm
  - The installation basement shall be concrete structure or channel steel frame that is strong enough to support unit operating weight.
  - The unit design for low-vibration, but it is possible to generate vibration when the installation basement is poor. Please install anti-vibration table or strengthen the installation basement strength.
  - Water may be accumulated under conditions such as rain or defrost, so the foundation shall be flat with drainage holes to drain water in a timely manner
  - Please use the hose pipe when connecting the units



#### Applicable models

Heat Pump Unit	Cooling Only Unit
RHUA130AVMY	RCUA130AVMY
RHUA150AVMY	RCUA150AVMY

- Technical requirements:
- The anti-vibration pad is provided with the unit. The anti-vibration pad shall be arranged according to the drawing shown in the drawing, i. e. 6 sets of pad per unit.
  - N is the total number of modular units installed in the same row, L is the minimum spacing between sets, and L is  $\geq 800\text{mm}$ .
  - If multiple lines of installation are required, the minimum spacing between adjacent two rows is 1500mm.
  - The unit is a low-vibration unit, but it is also possible to generate vibration when the installation facility is poor. Please install the anti-vibration table or strengthen the installation facility strength.
  - In principle, the foundation shall be integrated with the floor. In other cases, in addition to calculating the vibration resistance of the unit installation, the vibration resistance of the unit+foundation shall be calculated, so as to confirm the strength situation in the case of tilting or moving.
  - Water may be accumulated under conditions such as rain or defrost, so the foundation shall be flat and the floor shall be provided with drainage holes to drain water in a timely manner
  - Please use the hose when connecting to the water pipe.

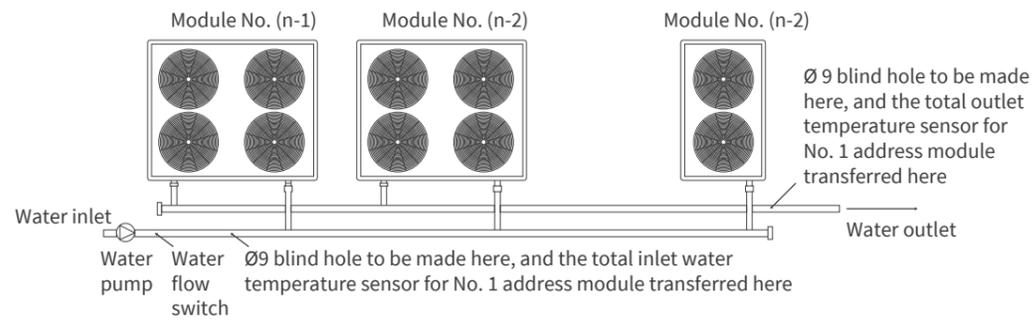
# INSTALLATION

## PIPE CONNECTION DIAGRAM

### Single modular

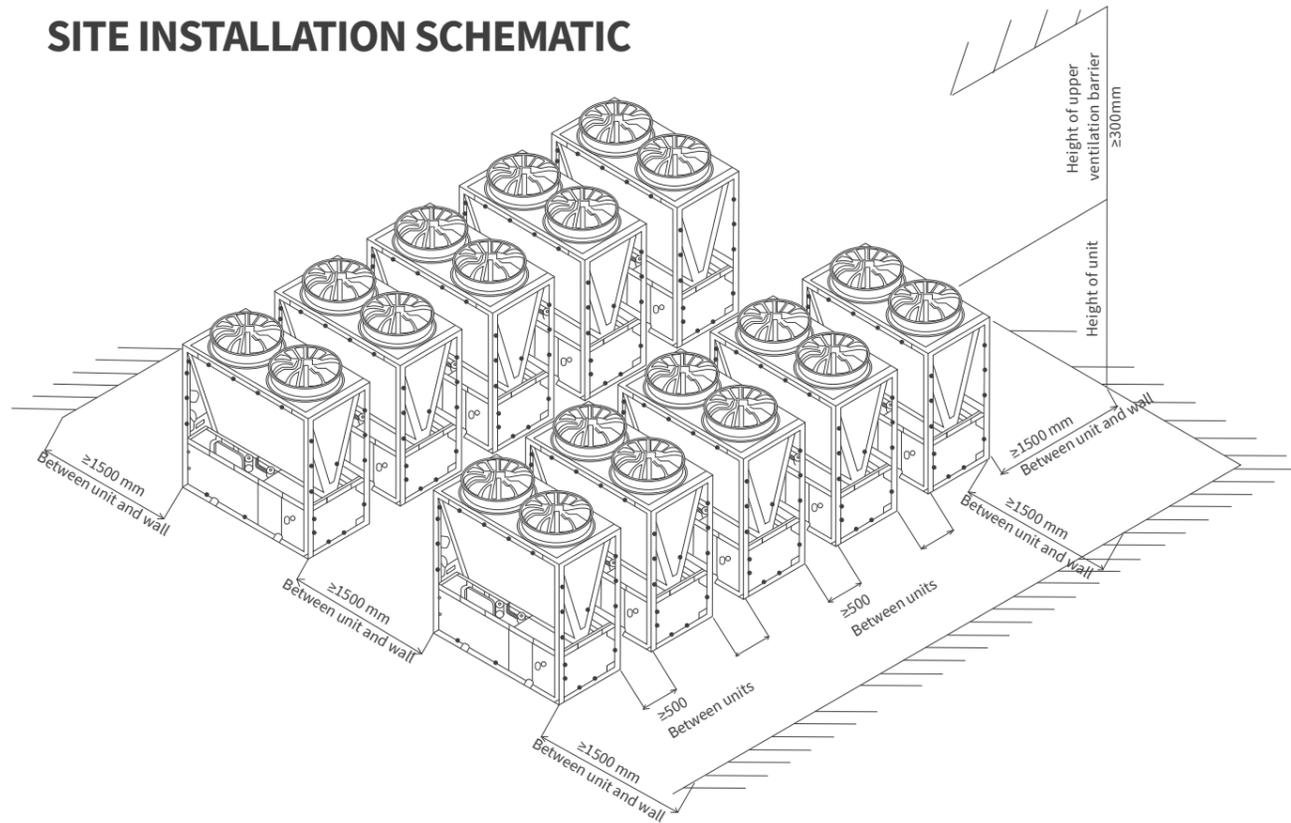


### Multi-modulars combination (up to 16nos can combine freely)

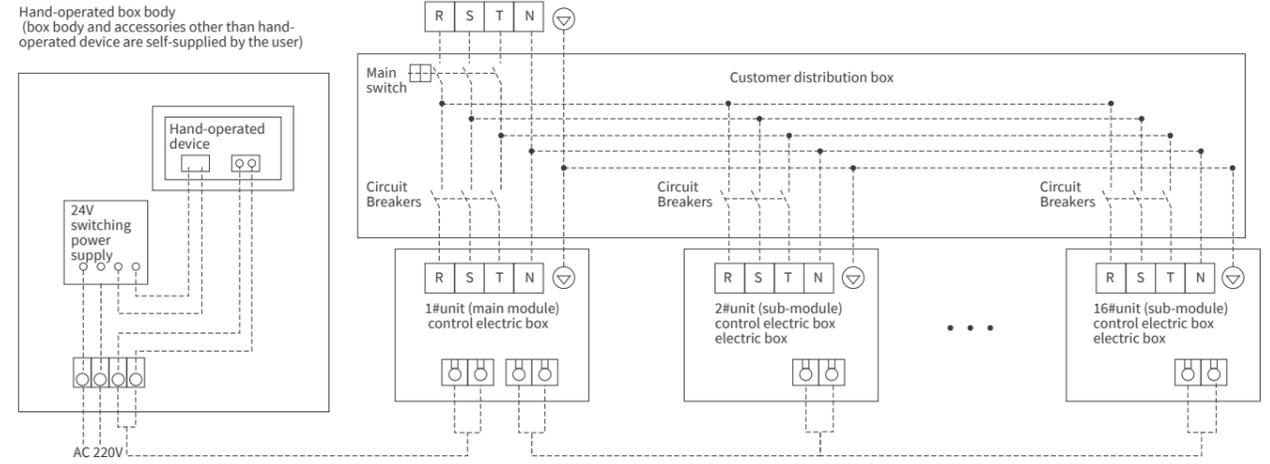


- Note
1. The unit shall supply the water inlet and outlet temperature sensor, and the user shall arrange them according to the on-site condition.
  2. The corresponding water flow switch is not supplied, and shall be provided by the user.

## SITE INSTALLATION SCHEMATIC



## WIRING DIAGRAM



- Note:
1. Wires between chiller units should be prepared by the user.
  2. Communication lines must use shielded twisted pairs that are forbidden to mix with strong electricity.
  3. The hand-operated device is an optional item with a 3 m communication line, and the communication line between the host and the hand-operated device is provided by the user.
  4. It is suggested that the hand-operated device is installed in the box body separately, and the box body, the terminal and the switch power supply are provided by the user.

## PRECAUTIONS FOR UNIT USE

### Precautions for startup and commissioning

- Confirm that the installation foundation of the unit is firm, the drainage of the on-site unit is smooth, and the on-site heat exchange ventilation effect is good;
- Check that each water carrying section has no leakage, and the heat preservation is good; check that the flow rate and head of the water pump meet engineering requirements;
- Check the phase sequence of the power supply, the power supply voltage is in the correct state, and the power line diameter can meet the maximum power load of the unit;
- After ensuring that the above items are correct, the first start-up of the unit needs to be 12 hours ahead of schedule, to prepare for the unit preheating;
- After ensuring that the unit is powered on for more than 12 hours, turn on the circulating water pump to drain the air-conditioning water system, and then restart the unit after the drain is finished;
- Check and record the measured data of the unit, including current, voltage, suction pressure, inlet and outlet temperature, fin temperature, suction and exhaust temperature, compressor running quantity, etc.

### Precautions for maintenance

- For the water system, the customer is advised to check every half month;
- When the first use during season change each year, the unit must be electrified and preheated for 24 hours before the unit is switched on;
- If the unit is not used for a long time, it is important to drain water in the unit and pipe;
- After the unit is stopped for short-term in winter, the main controller and the unit shall maintain communication and must not be powered off. If the ambient temperature is too low, a water pump can be manually started to prevent the water pipe or unit from freezing;
- The main switch shall not operate frequently, and shall not exceed twelve times per hour, and the electric cabinet shall be protected from moisture;
- Always maintain a good heat exchange environment around the unit, the unit exhaust shall not be short-circuited with the unit return air, and the air side heat exchanger shall periodically clean and remove dust;
- The water system shall be keep water quality clean and the water filter shall be cleaned regularly;
- Special personnel shall be provided for maintenance and records.