



Liebert® CRV4 Series

Air-cooled Precision Air Conditioners

User Manual (Original Instructions)

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

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1 Product Overview

The Vertiv™ Liebert® CRV4 series air-cooled precision air conditioner (hereafter referred to as CRV4 or the unit) is a professional equipment suitable for places that are not easily accessible to the general public. This section describes the model description, product introduction, features, and main components of the unit.

1.1 Product Introduction

CRV4 is a precision environment control system for high heat-density environment. It provides a suitable operating environment for sensitive equipment, industrial process equipment, communication equipment, and computers in small, medium, and large equipment rooms.

The unit features high reliability, high sensible heat ratio, and large air volume. It is equipped with an electrode humidifier or a wet film humidifier and uses R410A refrigerant which is environmentally-friendly and meets international requirements.

The unit is configured with the high-efficiency variable-capacity compressor and the hot-swappable, direct-current, variable-speed axial flow fans (EC fans).

CRV4 includes two parts: indoor unit and outdoor unit. The condenser adjusts the speed of the fan through pressure, minimizing the noise pollution to the environment while meeting the cooling requirements, improving the operation reliability, and reducing the footprint of the outdoor unit.

1.2 Model Nomenclature

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
C	R	0	3	6	R	A	1	N	8	S	7	1	2	E	3	0	0	0	0	P	V	0	4	0

Digit	Feature	Value	Description
1, 2	Product model	CR	CRV
3, 4, 5	Cooling capacity	025/035/ 036/045/066	Nominal cooling capacity, kW
6	Air supply type	R H	Horizontal airflow with baffle Horizontal airflow without baffle
7	System type	A P	Air-cooled, cooling-only model (reheat and humidification are optional) Refrigerant pump cooling
8	Fan type	1	EC fan
9	Power supply	N	380-415 V, 50/60 Hz, 3 Ph + N + PE
10	System configuration	8 L	Variable speed compressor, R410A refrigerant (single compressor single circuit) Single circuit, variable speed compressor, R410A refrigerant, single pump
11	Humidification	0 S W	None Electrode humidifier Wet film humidifier
12	Display	S 7	Standard display Global HMI 7-inch screen

Digit	Feature	Value	Description
13	Reheat	0	None
		1	Electric heater (single-stage)
14	Filtration	2	G4 (EU4) filter
		0	G4 (EU4) filter + filter clog switch
15	Coil and valves	E	Standard DX air-cooled coil, electronic expansion valve (EEV)
16	Appearance	3	EG7021 (black)
17	Mains disconnect switch high voltage options	0	None
		A	Dual power supply (interlocking contactor)
		T	Dual power supply (ATS)
18	Installation options	0	None, standard pipe, no low ambient kit
		H	Reheat and humidification lockout
		L	Air-cooled, long pipe > 30 m
		C	Low ambient kit
		B	Low ambient kit + long pipe
19	Monitoring	0	RS485 interface
		S	SIC card
		7	Unity card
20	Sensor	0	None
21	Packaging	P	Standard packaging
		C	Packaging for ocean shipping
22	Special requirements	A	None
		V	Condensate pump
23	Piping	0	Bottom piping
		1	Top Piping
24	Order special identifier	4	CRV4
25	Order special identifier	0	Industry version - 1100 mm
		1	Telecom version
		2	Industry version - 1200 mm

1.3 Product Appearance

Figure 1.1 Product Appearance



1.4 Main Components

The indoor unit of CRV4 includes DC brushless compressor, evaporator, EEV, humidifier, EC fan, electric heater, sight glass, filter dryer, and display screen.

Compressor

The DC brushless compressor features low vibration, low noise, and high reliability. It is connected with suction and discharge pipes with threaded connectors. It is convenient and easy to replace.

Evaporator

The evaporator uses high-efficiency, finned tube heat exchanger. It has a larger windward area and a smaller pressure drop. The flow path is specially optimized to improve the utilization rate of the heat exchanger and ensure that the supply air temperature is uniform. The surface is hydrophilic. There are condensate drainage pans in the middle and bottom of the evaporator.

EEV

The EEV monitors temperature and pressure signals to provide accurate regulation of the refrigerant flow.

Humidifier

The unit can be equipped with electrode humidifier or wet film humidifier. CR025, CR035, and CR045 are equipped with electrode humidifier as standard configuration. CR035 and CR045 can be configured with wet film humidifier. CR036 and CR066 are equipped with wet film humidifier as standard configuration and cannot be installed with electrode humidifier.

The electrode humidifier has a simple structure and is easy to disassemble and maintain. It has a short humidification time and provides a large amount of humidification. The wet film humidifier is simple to control and has low water quality requirements and low energy consumption.

Fan

EC fan provides high efficiency and saves energy and space. It is hot-swappable.

Electric Heater

PTC electric heater has fast heating speed and provides uniform heat. It is safe and reliable.

Sight Glass

Sight glass serves as the window of system circulation. Through it, you can observe the status of the refrigerant and detect the water content of the system. When the water content exceeds the standard, the sight glass background color will change.

Filter Drier

Filter drier can effectively remove the moisture present in the system, filter the impurities generated by the long-term operation of the system, and ensure the normal operation of the system. It is connected to the air conditioner with threaded connectors, making it easy to replace.

Display Screen

The unit is configured with 7-inch color screen or LCD screen. The user interface operation is simple. The multi-level password protection can effectively prevent unauthorized operation. It also provides power failure auto-restoration and high & low voltage protection functions. The operation status of the components are available on the respective menus. The expert-level fault diagnosis system can automatically display the current fault information, facilitating easy maintenance. It can store up to 1,000 historical event records.

Remote Monitoring Software

The unit adopts the standard communication protocol (industry standard Modbus protocol) of the Ministry of Industry and Information Technology of China. The unit communicates with the back end computer and is controlled by the back end software via the RS485 interface.

2 Pre-installation Guidance

CRV4 is professional equipment and its installation is complicated. This section details the preparation for installation, including the requirements for the machine room, preparing installation space and reserving maintenance space, the operating and storage environment requirements, and unpacking and inspecting.

2.1 Equipment Room Requirements

The requirements for the equipment room are as follows:

- The equipment room requires moisture-proof and thermal insulation to ensure the normal operation of the unit.
- The equipment room should have good heat insulation and a closed moisture-proof layer. Moisture barriers to ceilings and walls must be made of polyethylene film material or brushed with moisture-proof paint.
- Outdoor air entry may increase the load of system heating, cooling, humidification and dehumidification, so it is necessary to minimize the outdoor air entering the room. It is recommended that the intake of outdoor air be kept below 5% of the total amount of air circulating throughout the room.
- All doors and windows should be fully enclosed, and the gap should be as small as possible.



WARNING! The indoor unit of CRV4 is prohibited from use in open, harsh outdoor environments.

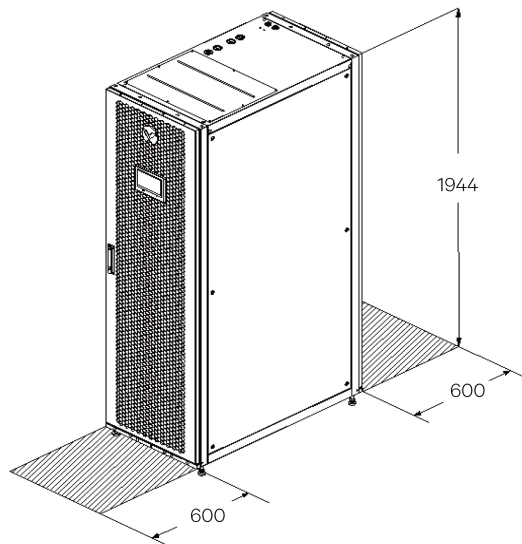
2.2 Installation Space Requirements

CRV4 is a full-featured air-cooled refrigeration unit. It is recommended to install it in a row of computer cabinets in a high heat-density "hot aisle cold aisle" layout.

Maintenance Space Requirements

Reserve a maintenance space of 600 mm in front of and behind the air conditioner.

Figure 2.1 Maintenance Space Requirements (Unit: mm)



The minimum maintenance space requirements are listed in the table below.

Table 2.1 Maintenance Space Requirements (Unit: mm)

Space Location	CR025	CR035	CR036	CR045	CR066
Front	600	600	600	600	600
Rear	600	600	600	600	600

Note: The space is reserved for routine maintenance, such as replacing filter, fan, and humidifier

NOTE: For special applications, consult Vertiv™.

2.3 Environmental Requirements

2.3.1 Operating Environment

The operating environment should meet the requirements of GB4798.3-2007.

Table 2.2 Operating Environment Requirements

Item	Requirement	
Ambient temperature	Indoor	18 °C to 40 °C, 20% to 60% RH
	Outdoor	-20 °C to +45 °C. If a low ambient kit is configured, the lowest outdoor operation temperature is -34 °C
Protection level (outdoor unit)	IP20	
Altitude	<1000 m. Contact Vertiv™ if altitude is above 1000 m	
Operation voltage range	380-400 V ± 15%, 50 / 60 Hz, 3 Ph + N + PE	

2.3.2 Storage Environment

The storage environment should meet the requirements of GB4798.1-2005.

Table 2.3 Storage Environment Requirements

Item	Requirement
Storage environment	Indoor, clean, no dust
Ambient humidity	< 95% RH
Ambient temperature	-40 °C to +70 °C
Storage time	Total transportation and storage time should not exceed six months; otherwise the performance of the system needs to be re-calibrated

2.4 Refrigerant Requirement

Inferior or counterfeit refrigerant can seriously damage the system. Please use a refrigerant certified by Vertiv™. The refrigerant brand certified by Vertiv™ is Honeywell.

Honeywell



WARNING! Do not use inferior refrigerant which can seriously damage the system. Vertiv™ is not responsible for any consequences caused by the use of inferior refrigerant.

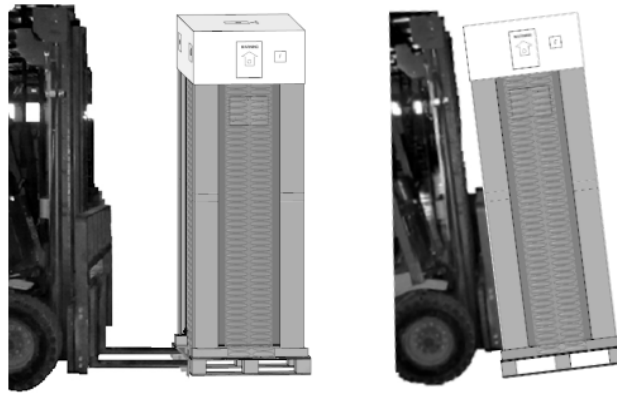
2.5 Handling, Unpacking, and Inspecting the Unit

2.5.1 Transporting and Handling the Unit

It is recommended to use rail transportation or waterway transportation. If you choose road transportation, choose a road with better conditions to prevent excessive bumps.

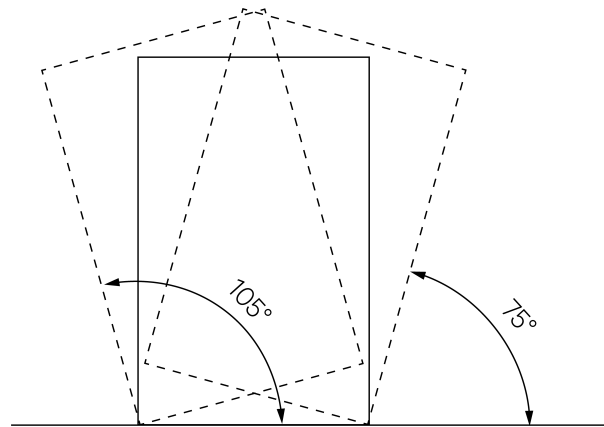
The unit is heavy. The weight is listed in Table 3.1 Indoor Unit Dimensions and Weight. It is recommended to use the mechanical equipment like electrical forklift to move the unit. When handling, move the unit to a place closest to the installation site. If an electric forklift is used, insert the tines below the pallet as shown in the figure below. Mind the center of gravity of the packaged unit to prevent tipping.

Figure 2.2 Transporting the Unit



When handling, the inclination angle of the unit should be kept in the range of 75 to 105 degrees.

Figure 2.3 Inclination Angle

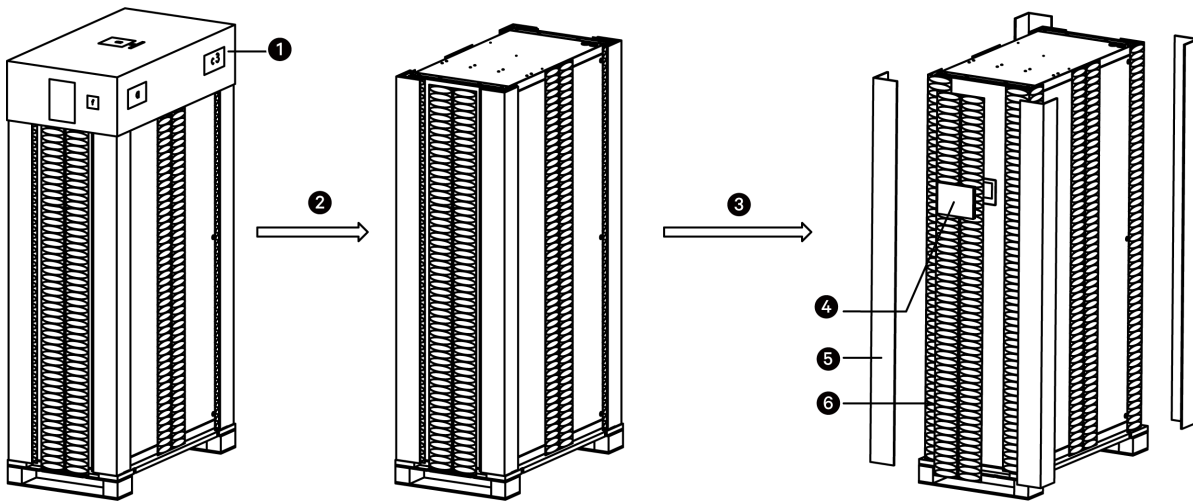


2.5.2 Unpacking the Unit

The unit is surrounded with air column bags and stretch film. To unpack the unit:

1. Remove the stretch film and the top cover, and then remove the paper corner protector and air column bags.

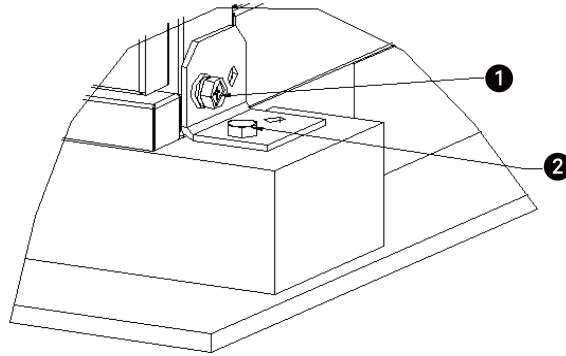
Figure 2.4 Removing the Package



Item	Description	Item	Description
1	Top cover	4	EPE on display screen
2	Removing the top cover	5	Paper corner protector
3	Removing stretch film, paper corner protector, and air column bag from the unit. Removing EPE from display screen	6	Air column bag

2. Remove the bottom pallet by removing the M8 screws with a 17 mm blank wrench, ratchet wrench, or socket. When removing the bottom pallet, keep the cabinet moving smoothly and avoid clashing with and damaging the product appearance and internal components.

Figure 2.5 Removing Screws from Pallet



Item	Description
1	M8 hex head screw
2	M8 hex head screw

2.5.3 Inspecting the Unit

After unpacking, check that the accessories are complete according to the packing list and check that all the parts are not damaged. If any parts are found to be missing or damaged, report to the carrier immediately. If hidden damage is found, report to the carrier and Vertiv™ local office.

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3 Mechanical Installation

Proper installation is essential to achieve the design performance and maximize the life of the equipment. This section introduces installation precautions, system layout, installation procedure, pipeline connection, removal of transport fasteners and vibration absorbers, and inspection. During installation, follow regional and local mechanical and electrical installation regulations.

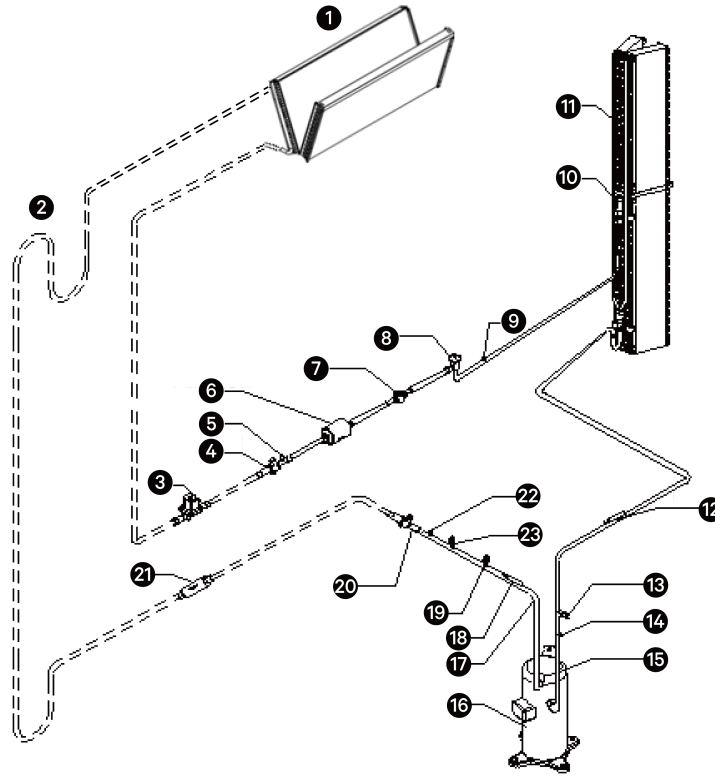
3.1 Installation Precautions

- CRV4 indoor unit and outdoor unit are installed on the ground, in separate places. The indoor unit must be installed on the ground of the equipment room or computer room, and the outdoor unit can be installed on the ground of a room or an outdoor environment.
- Check that the installation environment meets the requirements (see Section 2.3.2 Storage Environment) and that the building is modified for laying pipelines and installing ventilation ducts.
- Strictly follow the design drawings and leave room for daily maintenance.

3.2 System Installation Layout

3.2.1 System General Layout

Figure 3.1 System General Layout



Item	Description	Item	Description
1	Condenser coil	13	Low pressure sensor
2	Oil trap (installing one oil trap at every 7.5 m vertical rise)	14	Schrader valve 3
3	Solenoid valve	15	Suction line
4	Ball valve 1	16	Variable speed compressor
5	Schrader valve 1	17	Discharge line
6	Filter drier	18	Discharge temperature sensor
7	Sight glass	19	High pressure sensor
8	EEV	20	Ball valve 2
9	Schrader valve 2	21	Check valve
10	Distribution board	22	Schrader valve 4
11	Evaporator coil	23	High pressure switch
12	Suction temperature sensor		

NOTE: CR036/066 does not contain ball valves.

NOTE: _____ indicates the pipeline provided by the manufacturer.

NOTE: - - - - - indicates the pipes that are laid on site (completed by technicians).

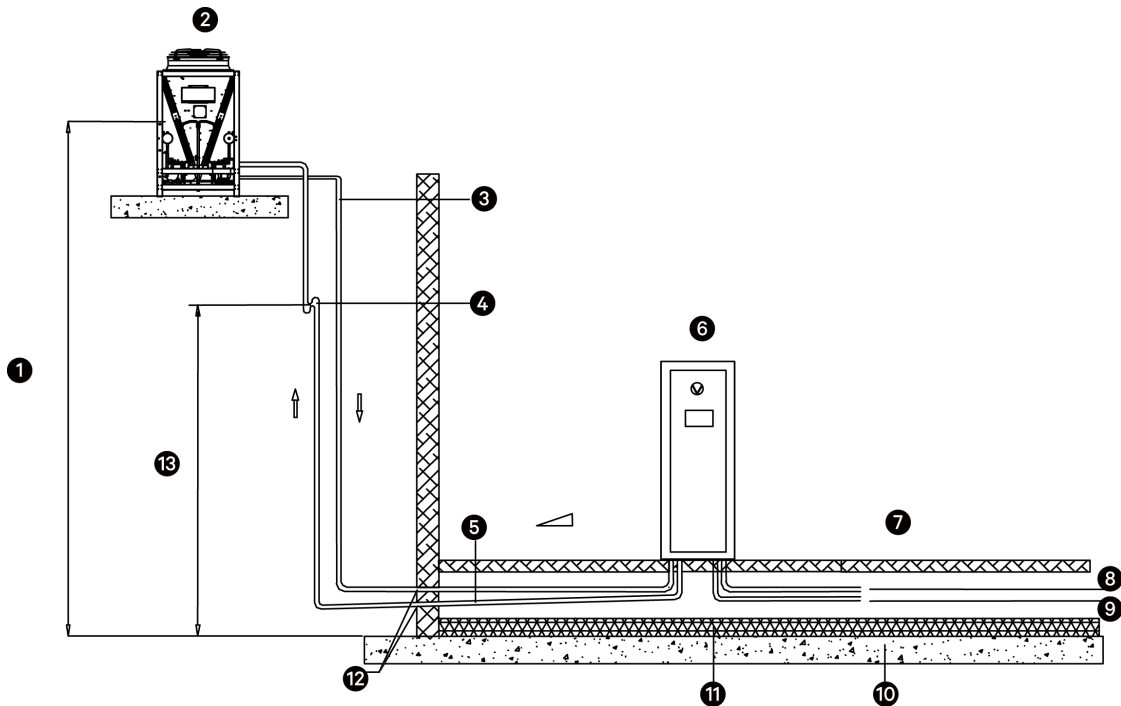
NOTE: Oil trap is not provided by Vertiv™. It is recommended to install it to ensure normal operation and convenient maintenance.

NOTE: Solenoid valve and check valve are required when the equivalent pipe length is larger than 30 m.

3.2.2 System Installation Diagram

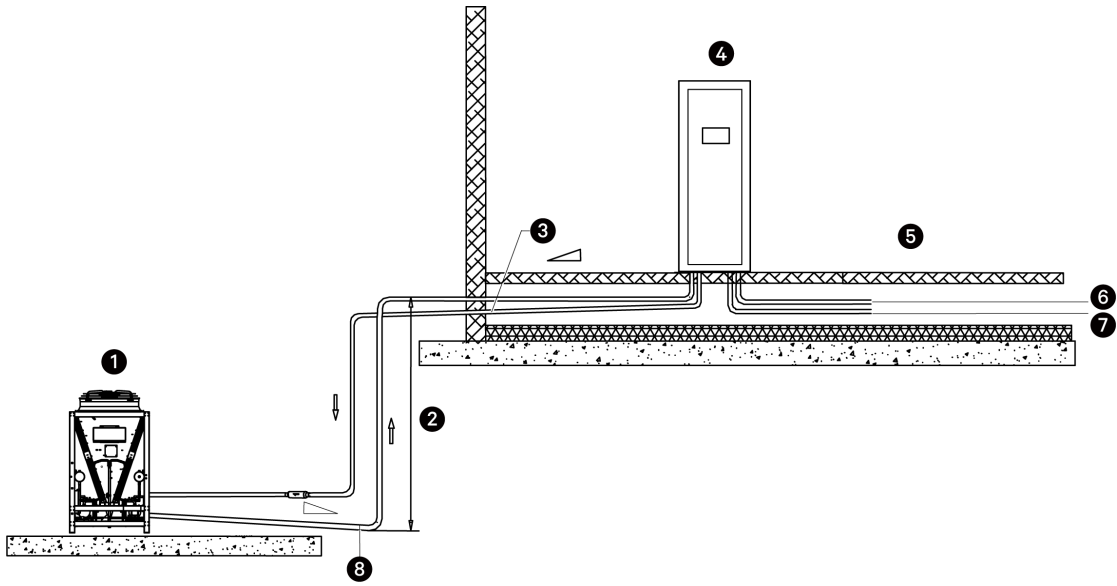
CRV4 system installation diagram is shown in the figure below.

Figure 3.2 System Installation Diagram (Condenser Higher Than Compressor)



Item	Description	Item	Description
1	Maximum height 30 m	8	Humidifier water inlet pipe
2	Outdoor unit (condenser)	9	Condensate drainage pipe
3	Liquid pipe, away from direct sunlight	10	Floor
4	Oil trap	11	Insulated layer
5	Gas pipe needs to be tilted	12	Gap needs to be sealed
6	Indoor unit	13	Maximum height 7.5 m
7	Raised floor		

Figure 3.3 System Installation Diagram (Condenser Lower Than Compressor)



Item	Description	Item	Description
1	Outdoor unit (condenser)	5	Raised floor
2	Maximum height 8 m	6	Humidifier water inlet pipe
3	Gas pipe needs to be tilted	7	Condensate drainage pipe
4	Indoor unit	8	Liquid pipe needs to be tilted

3.2.3 Mechanical Parameters

Indoor Unit Mechanical Parameters

Figure 3.4 Indoor Unit Dimensions

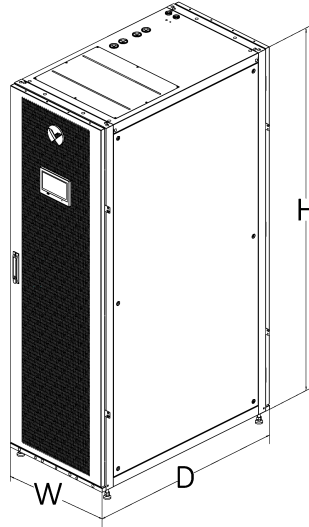
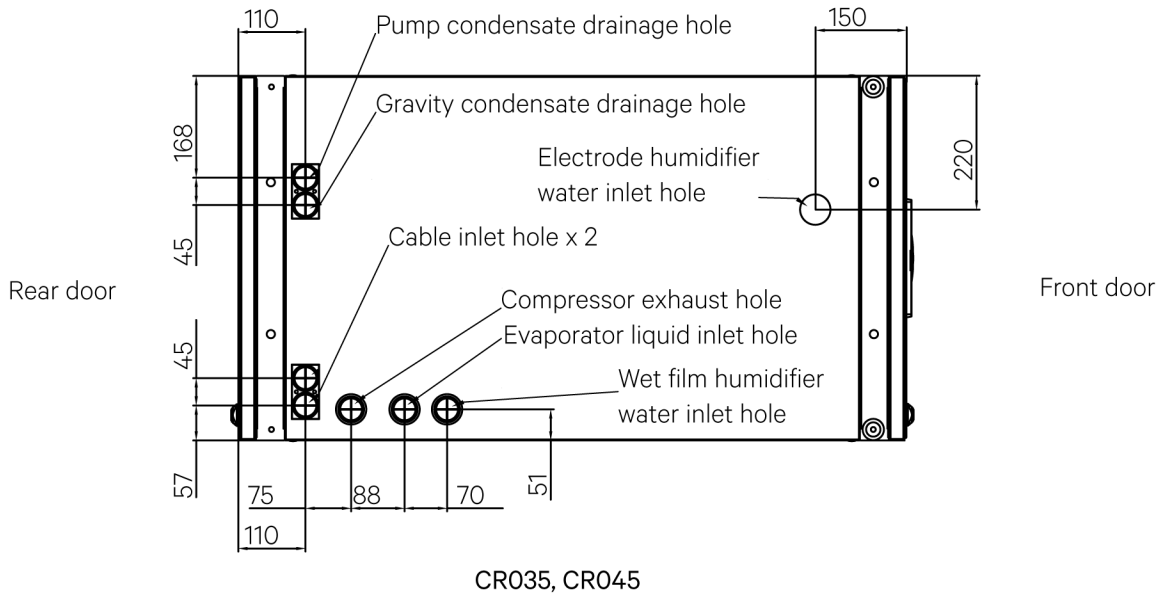
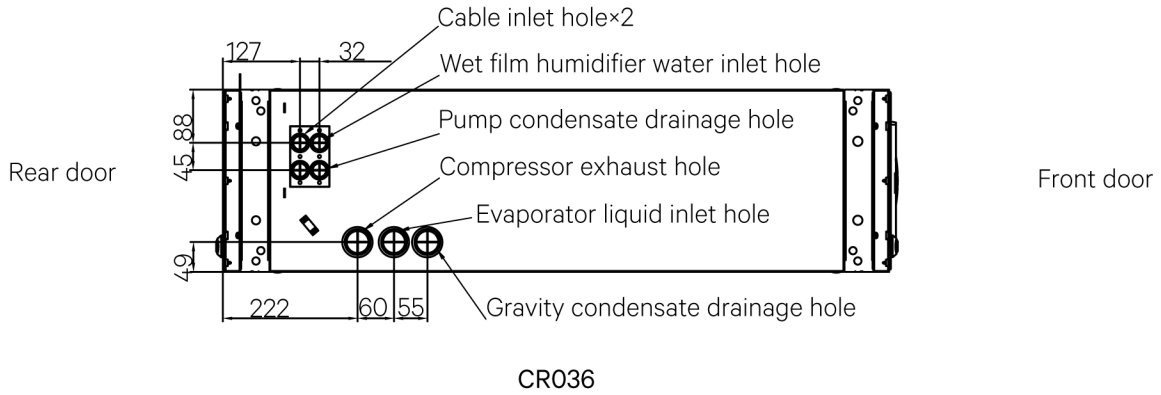
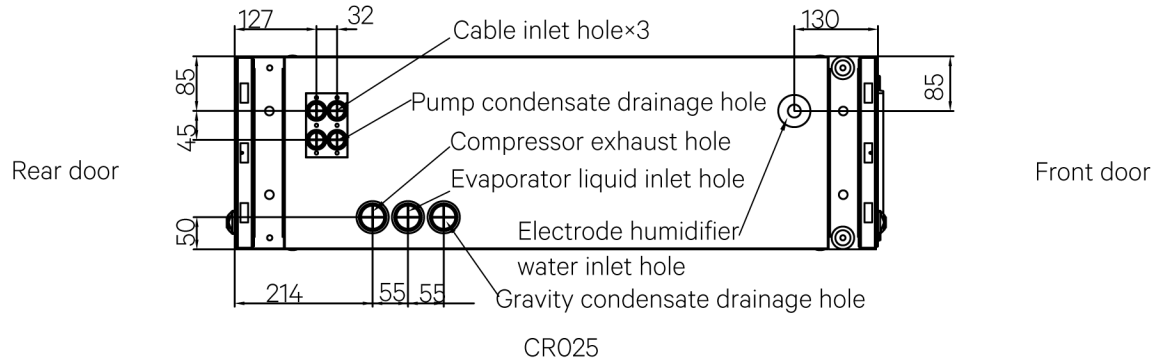


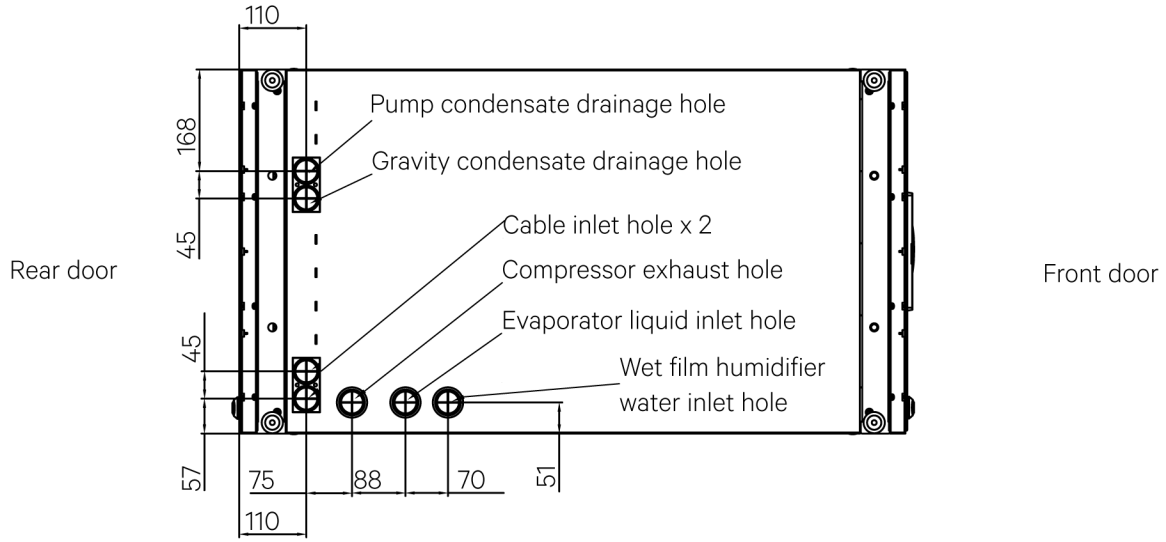
Table 3.1 Indoor Unit Dimensions and Weight

Model	W×D×H mm	Unit Weight kg
CR025RA1N8W712E30000PV040	300×1100×2000 (including leveling feet)	235
CR025RA1N8W712E30000PV042	300×1200×2000 (including leveling feet)	255
CR035RA1N8S712E30000PV040	600×1100×2000 (including leveling feet)	320
CR035RA1N8S712E30000PV042	600×1200×2000 (including leveling feet)	350
CR045RA1N8S712E30000PV040	600×1100×2000 (including leveling feet)	335
CR045RA1N8S712E30000PV042	600×1200×2000 (including leveling feet)	365
CR036RA1N8W712E30000PV040	300×1100×2000 (including leveling feet)	260
CR036RA1N8W712E30000PV042	300×1200×2000 (including leveling feet)	290
CR066RA1N8W712E30000PV040	600×1100×2000 (including leveling feet)	360
CR066RA1N8W712E30000PV042	600×1200×2000 (including leveling feet)	390

Positioning of Bottom Plate Inlet and Outlet Access

Figure 3.5 Positioning of Bottom Plate Inlet and Outlet Access (Unit: mm)





CR066

Table 3.2 Bottom Plate Pipe Outlet Size (Unit: mm)

Model	CR025	CR035	CR045	CR036	CR066
Compressor air discharge pipe opening	Ø16	Ø22	Ø22	Ø19	Ø22
Evaporator liquid inlet pipe opening	Ø12.7	Ø16	Ø16	Ø16	Ø16
Cable inlet hole	Ø22	Ø36	Ø36	Ø22	Ø36
Wet film humidifier water inlet pipe	ID9 x T3	ID9 x T3	ID9 x T3	ID9 x T3	ID9 x T3
Pump condensate drainage pipe	ID9 x T3	ID9 x T3	ID9 x T3	ID9 x T3	ID9 x T3
Gravity condensate drainage pipe	ID16 x T4	ID16 x T4	ID16 x T4	ID19 x T4.5	ID19 x T4.5
Electrode humidifier water inlet pipe connector	1/2"-BSP thread	1/2"-BSP thread	1/2"-BSP thread	-	-

Positioning of Top Plate Inlet and Outlet Access

Figure 3.6 Positioning of Top Plate Inlet and Outlet Access (Unit: mm)

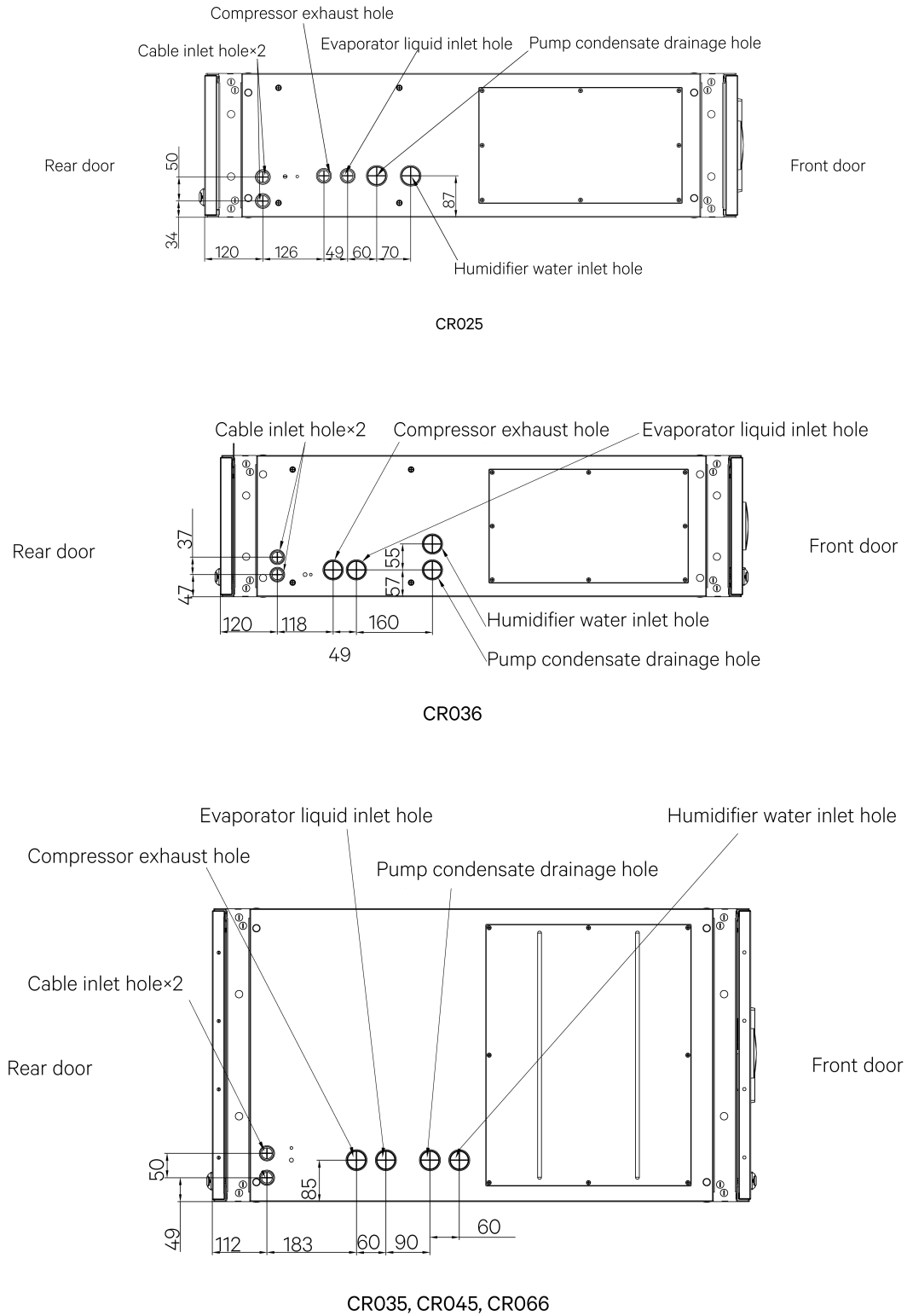
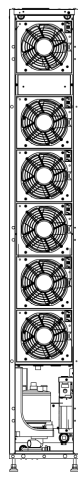


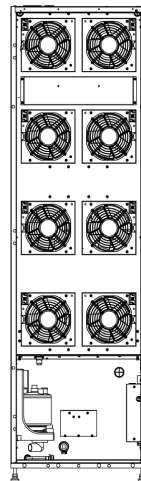
Table 3.3 Top Plate Pipe Outlet Size (Unit: mm)

Model	CR025	CR035	CR045	CR036	CR066
Compressor air discharge pipe opening	Ø16	Ø22	Ø22	Ø19	Ø22
Evaporator liquid inlet pipe opening	Ø12.7	Ø16	Ø16	Ø16	Ø16
Cable inlet hole	Ø22	Ø22	Ø22	Ø22	Ø22
Humidifier water inlet pipe	1/2"-BSP thread	1/2"-BSP thread	1/2"-BSP thread	1/2"-BSP thread	1/2"-BSP thread
Pump condensate drainage pipe	1/2"-BSP thread	1/2"-BSP thread	1/2"-BSP thread	1/2"-BSP thread	1/2"-BSP thread

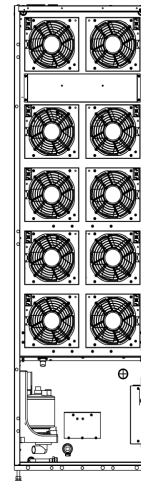
Figure 3.7 Air Supply on Unit Front Side



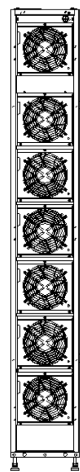
CR025



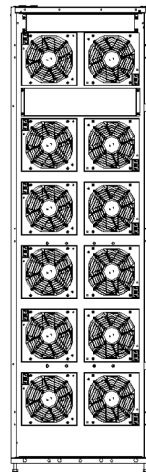
CR035



CR045



CR036



CR066

NOTE: To prevent cuts to the power cables, the protective holes for the cables are fitted with wire sheaths.

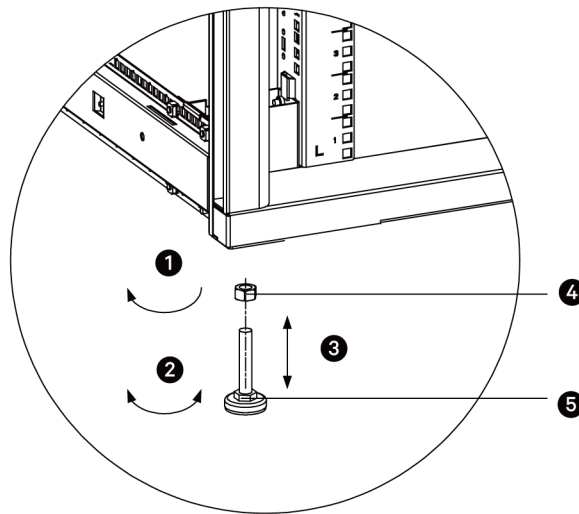
3.3 Installing the Indoor Unit

3.3.1 Leveling the Unit

CRV4 is in-row air conditioner. At least one side of the unit is adjacent to a server cabinet. After installing the unit, you need to level it.

1. Place the unit on a flat, open floor.
2. Use an adjustable wrench to loosen the fastening nuts on the four leveling feet in clockwise direction.
3. Rotate the hex bolts at the bottom of the feet until the feet is raised or lowered to the desired position. Use a spirit level to ensure that the unit is in a horizontal position.

Figure 3.8 Leveling the Unit



Item	Description	Item	Description
1	Rotating in clockwise direction	4	Fastening nut
2	Rotating in counter-clockwise direction or rotating in clockwise direction	5	Hex bolt
3	Leveling foot is raised or lowered		

4. Tighten the fastening nuts on the feet in counter-clockwise direction to complete the adjustment. If there is a mounting bracket in the equipment room and the width of the bracket is not larger than 30 mm, you need to remove the feet and fix the unit to the mounting bracket.

3.3.2 Removing the Leveling Feet and Fixing the Unit

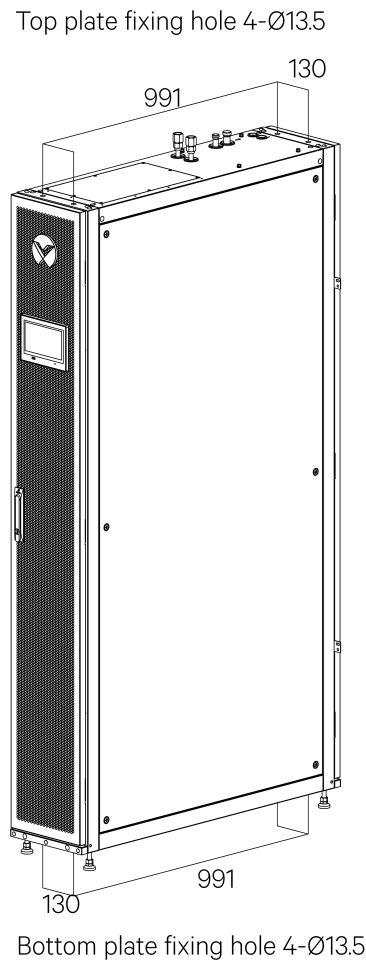


CAUTION: To avoid personal injury and damage to the unit, this operation should be performed by two installers.

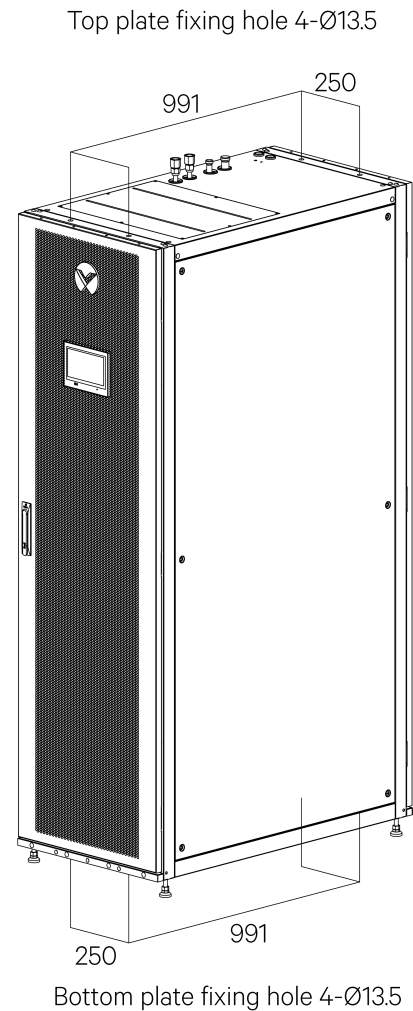
1. Remove the leveling feet.
 - a. Use an adjustable wrench to rotate the fastening nuts on the leveling feet in clockwise direction to loosen the nuts.
 - b. Rotate the hex bolts on the leveling feet in clockwise direction until the bolts fall from the feet.
2. Fixing the unit.

There are two holes (diameter: 13.5 mm) on the front top, rear top, front bottom, and rear bottom of the unit. The four holes on the bottom plate can be used for installing screws to fix the unit on the equipment room floor. The four holes on the top plate can be used for installing screws to fix the unit to the bracket on the equipment room ceiling.

Figure 3.9 Holes for Fixing the Unit (Unit: mm)



CR025, CR036



CR035, CR045, CR066

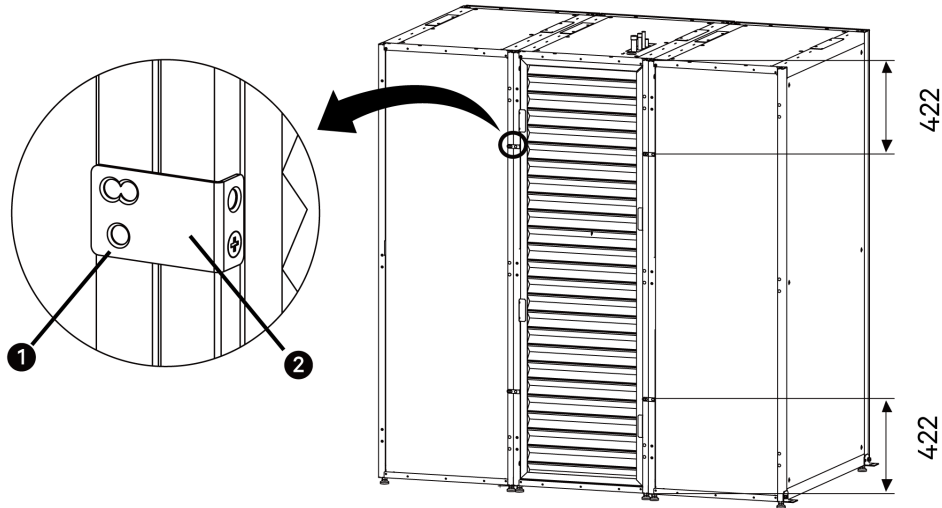
3.3.3 Baying the Unit

Baying brackets are supplied as accessories with the unit. You can bay the unit with adjacent cabinets using the baying brackets.

NOTE: Before baying the unit, level the cabinet by referring to Section 3.3.1 Leveling the Unit.

To bay the unit, use M5 countersunk screw to fix the baying bracket (L shape) on the installation holes of the cabinet frame adjacent to the air conditioner.

Figure 3.10 Fixing the Baying Bracket (Unit: mm)



Item	Description
1	Hole for installing GB819-85_M5x12 screw
2	Baying bracket

3.4 Installing Pipelines

Install four types of pipelines: condensate drainage pipe for indoor unit, water inlet pipe for humidifier, copper pipes (gas and liquid pipes) between indoor unit and outdoor unit, and extension kit (optional).

NOTE: All refrigeration pipe connections must be welded with silver brazing.

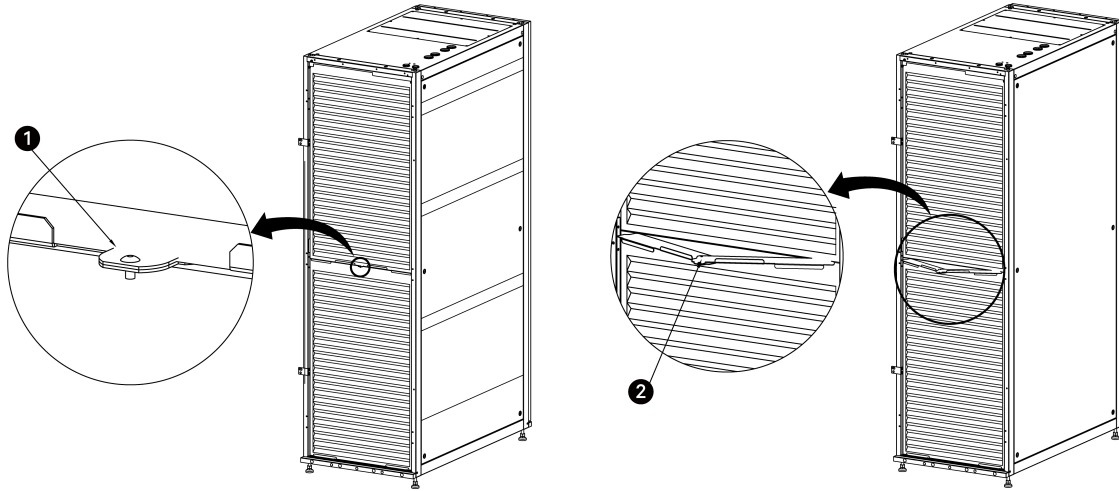
NOTE: Selecting, arranging, and fixing pipes, vacuuming system, and charging refrigerant must be operated in accordance with industry standards.

NOTE: Pipeline pressure drop, compressor oil return, and reducing noise and vibration must be taken into consideration for the design and construction process.

3.4.1 Removing the Filter

Remove the filters from the indoor unit before installing pipes on the unit. Open the rear door, pull the filter flap to remove the flap, and then remove the upper filter and lower filter.

Figure 3.11 Removing the Filter



Item	Description
1	Filter flap
2	Pulling the filter flap to remove the flap

3.4.2 Connecting Condensate Drainage Pipe on Indoor Unit

The condensate water from the humidifier and from the evaporator is gathered in the condensate pan and is then discharged.

To discharge the condensate from the bottom plate, route the discharge hose out of the gravity condensate drainage hole or the pump condensate drainage hole, connect the hose with a connector, and then connect it to your drainage system.

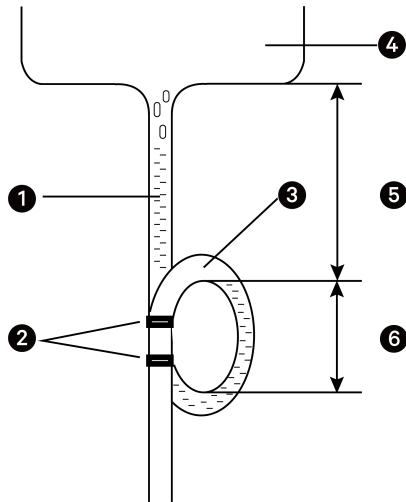
To discharge the condensate from the top plate, the discharge copper pipe has been routed out of the top plate. You only need to connect the copper pipe connector (1/2"-BSP) to your drainage system.

To use only gravity drainage, route the discharge pipe (inner diameter: 16 mm) out of the gravity condensate drainage hole and connect the pipe to your drainage system. To ensure that the condensate water can be discharged, set a water trap.

Note the following requirements:

- Use electroplated steel pipe, PVC, or polyethylene pipe with good flexibility as the water pipe.
- Tilt the water pipe 2% along the draining direction.
- Set a water trap 30 cm under the condensate water pan. Place the water trap under the raised floor.
- Fill water into the water trap.

Figure 3.12 Water Trap



Item	Description	Item	Description
1	Filling water to the water trap	4	Condensate pan
2	Bracket	5	Minimum 20 cm
3	Water trap	6	Minimum 10 cm

NOTE: Do not cut the bracket of the water trap. Otherwise, the water drainage will be affected.

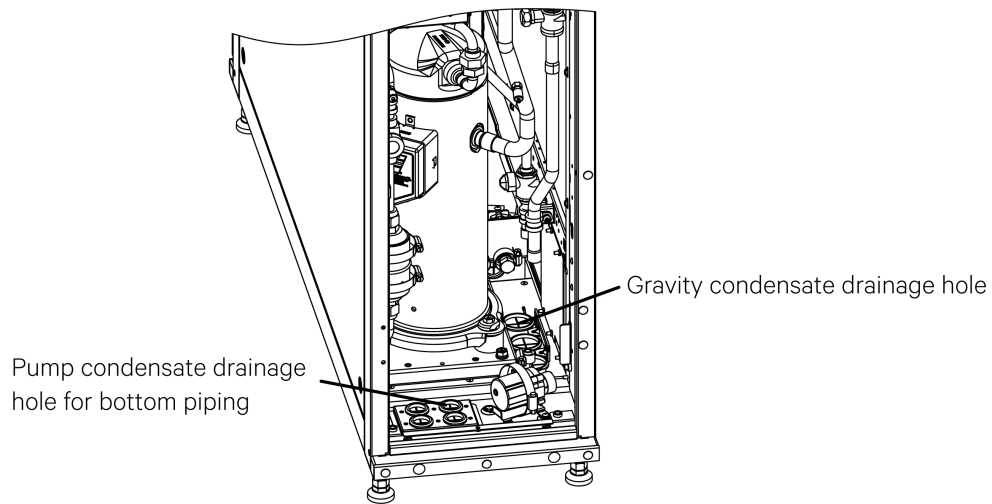
NOTE: Before starting the unit, fill water to the water trap to avoid water from blowing out of the pan.

NOTE: To avoid leakage, use Teflon raw material belt between the drainage pipe and the connector.

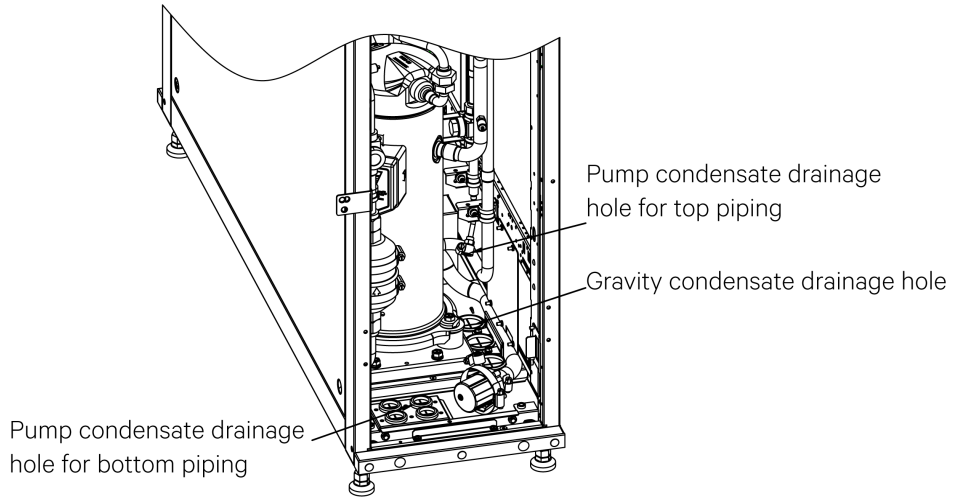
NOTE: For the model with an electrode humidifier, because high-temperature water flows in the electrode humidifier, you must use the water pipe with a heat resistance higher than 90°C.

NOTE: For the unit with condensate pump, the pump head should not exceed 5 m.

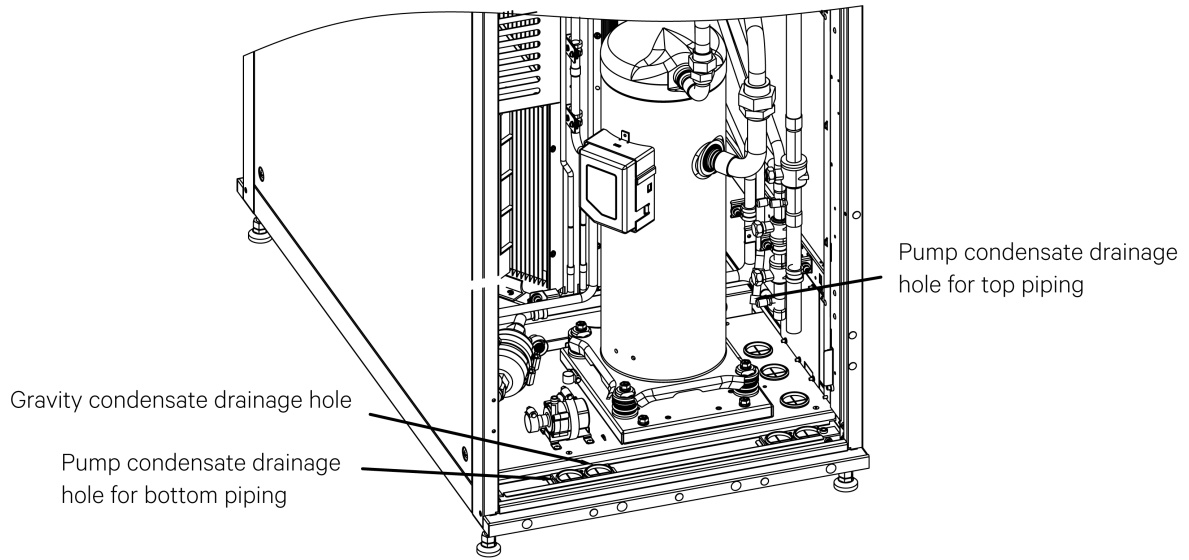
Figure 3.13 Discharging Condensate Water from Bottom Plate



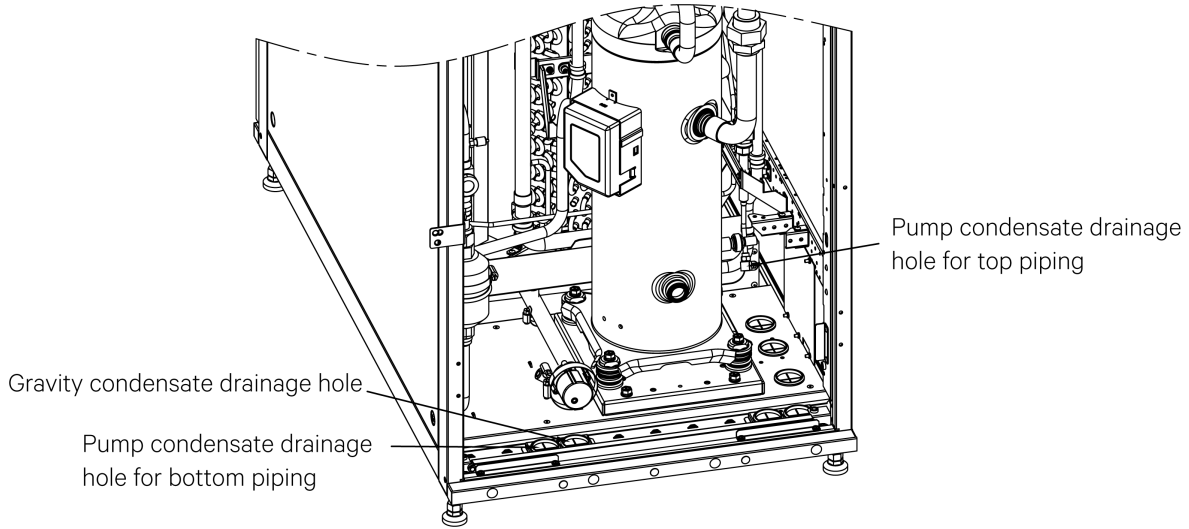
CR025



CR036



CR035&CR045



CR066

3.4.3 Connecting Electrode Humidifier Water Inlet Pipe

To supply water to the humidifier from the bottom plate, route the hose (which is reserved inside the unit and has a threaded connector) out of the water inlet hole on the bottom plate, and connect the hose to your drainage system using the 1/2"-BSP connector.

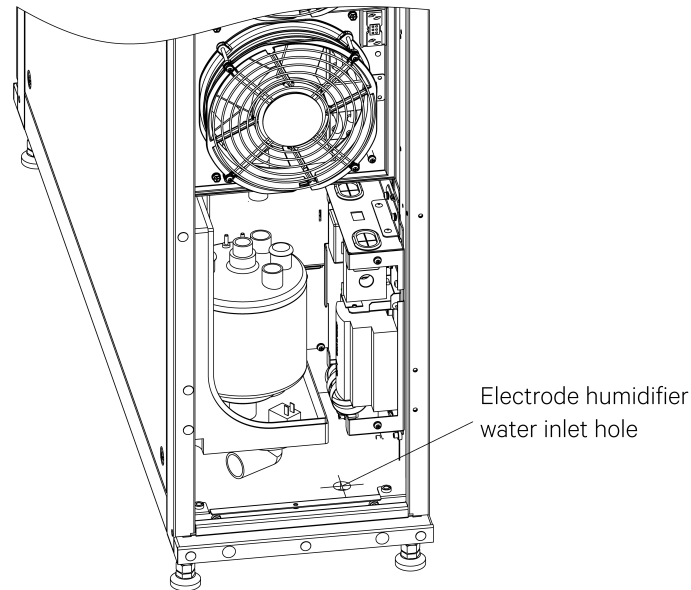
To supply water to the humidifier from the top plate, a pipe connector has been installed on the humidifier water inlet hole on the top plate. Connect the connector to your drainage system.

The connection must be sealed to prevent water leakage, and the main line pressure range should be 100 kPa to 700 kPa. Where the main pipe pressure may exceed 700 kPa, a pressure reducer should be installed. Where the main pipe pressure is less than 100 kPa, there should be a collection tank and a water pump system.

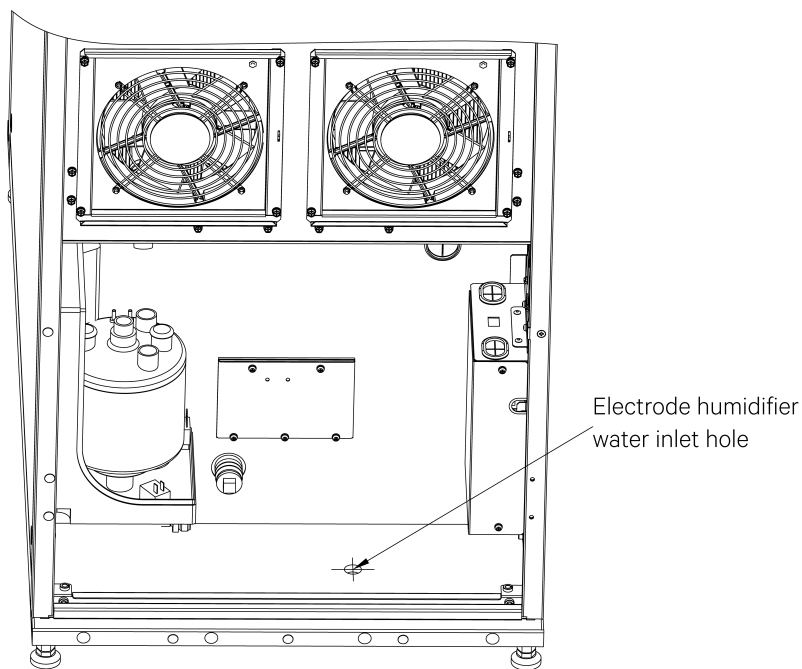
Water quality requirements: conductivity between 125 and 1250 $\mu\text{s}/\text{cm}$.

NOTE: Some products may contain parts that are subject to local regulations

Figure 3.14 Bottom Piping for Electrode Humidifier Water Inlet Pipe



CR025



CR035, CR045

3.4.4 Connecting Wet Film Humidifier Water Inlet Pipe

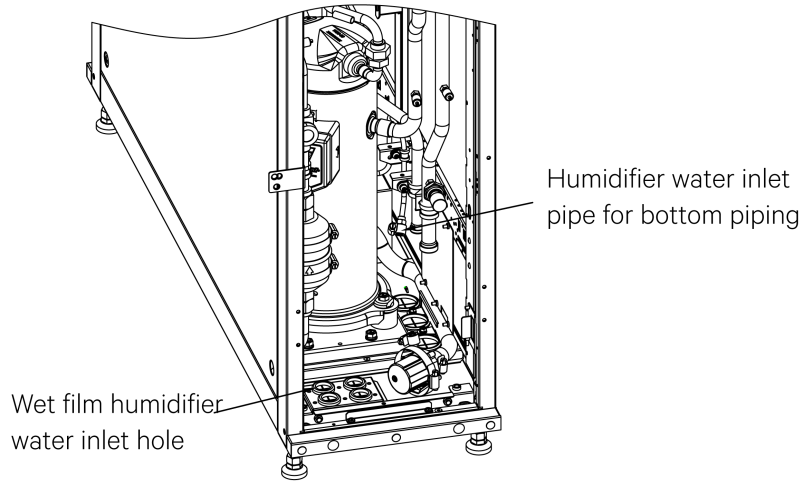
To supply water to the humidifier from the bottom plate, route the hose (reserved inside the unit) out of the water inlet hole on the bottom plate, and connect the hose to your drainage system.

To supply water to the humidifier from the top plate, a pipe connector (1/2"-BSP) has been installed on the humidifier water inlet hole on the top plate. Connect the connector to your drainage system.

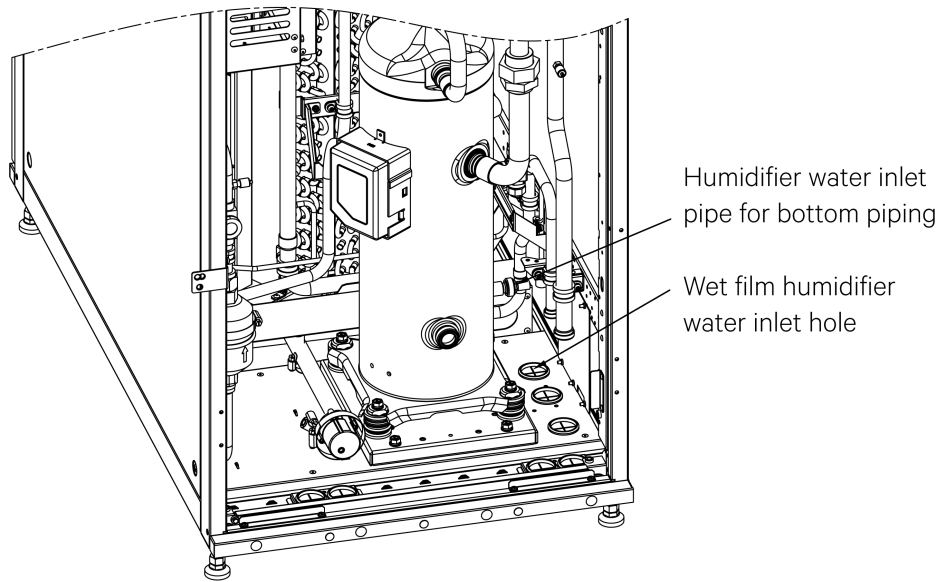
The connection must be sealed to prevent water leakage, and the main line pressure range should be 100 kPa to 700 kPa. Where the main pipe pressure may exceed 700 kPa, a pressure reducer should be installed. Where the main pipe pressure is less than 100 kPa, there should be a collection tank and a water pump system.

NOTE: The field-supplied water pipe should be cleaned to prevent impurities from entering the humidifier.

Figure 3.15 Connecting Wet Film Humidifier Water Inlet Pipe



CR036



CR035, CR045, CR066

3.4.5 Connecting Gas and Liquid Pipes Between Indoor and Outdoor Units

Connect the gas pipe and liquid pipe between indoor and outdoor units by welding. Considering the influence of pipe diameter on system pressure drop, select the pipe diameter of the copper pipe by referring to Table 3.4 Recommended Size of the Pipe (Unit: mm), or consult Vertiv™. For the vertical height difference between the indoor and outdoor units, see Table 3.5 Vertical Height Difference Between the Indoor Unit and The Outdoor Unit. For the equivalent length of liquid pipe components, see Table 3.6 Equivalent Length of Components.

For top piping, the compressor exhaust pipe and evaporator liquid inlet pipe have been installed on the top plate. When welding, connect pipes according to the labels.

For bottom piping, see Figure 3.17 Bottom Plate Connections for Refrigeration. When welding, connect pipes according to the labels and do not burn the labels. The gas pipe routing out of the compressor needs to be tilted at 1:200 (lowering 5 mm for every 1 m). If the gas pipe is in a place affected by cooling equipment or under the raised floor, the gas should be insulated.

NOTE: For bottom piping, before welding the compressor exhaust pipe and liquid pipe, open the ball valve on the pipes of CR025, CR035, and CR045, and then weld off the copper cap that seals the pipe opening.

NOTE: The exposure time of the pipeline should not exceed 15 minutes. Otherwise this will affect the service life of key components and the stability of system operation, if the compressor lubricating oil absorbs moisture.

Table 3.4 Recommended Size of the Pipe (Unit: mm)

Model	CR025		CR035		CR045		CR036		CR066	
	Gas pipe	Liquid pipe	Gas pipe	Liquid pipe	Gas pipe	Liquid pipe	Gas pipe	Liquid pipe	Gas pipe	Liquid pipe
10 m	19	12.7	19	16	22	16	19	16	25	19
20 m	19	16	22	16	25	19	22	16	25	19
30 m	22	16	25	16	28	19	25	16	28	22
40 m*	22	16	25	19	28	22	25	19	28	22
50 m*	22	19	25	22	28	22	25	19	32	25

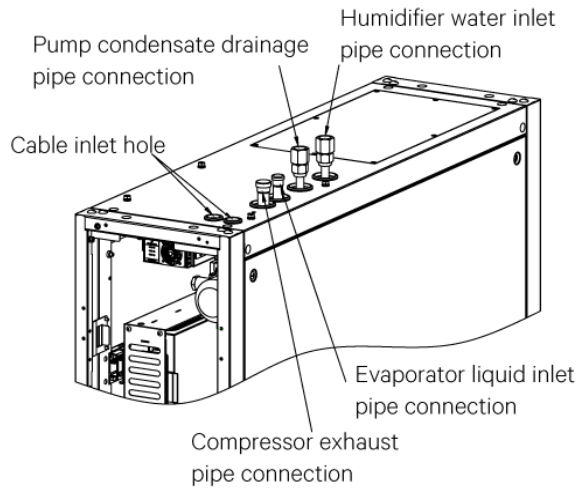
Note:

- * indicates that a pipe extension kit needs to be added
- If the length of the pipe exceeds 50 m, consult Vertiv™
- If the outdoor ambient temperature is lower than -20 °C, the low ambient kit needs to be used. Please consult Vertiv™

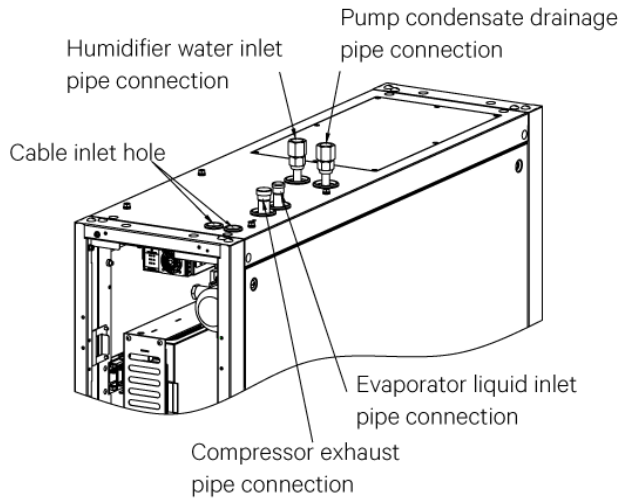
Copper pipe thickness should meet the following requirements:

Pipe diameter	Pipe thickness
16	≥ 1
19	≥ 1
22	≥ 1
25	≥ 1.1
28	≥ 1.2
32	≥ 1.5

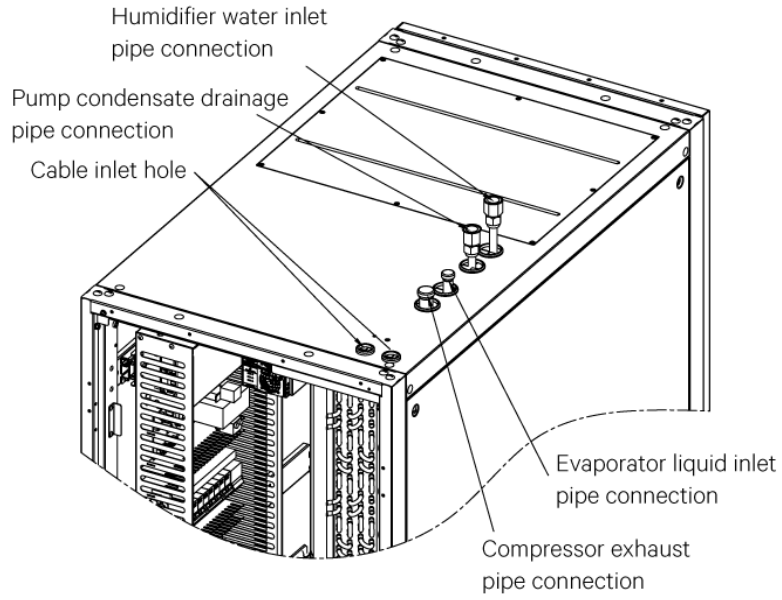
Figure 3.16 Top Plate Connections



CR025

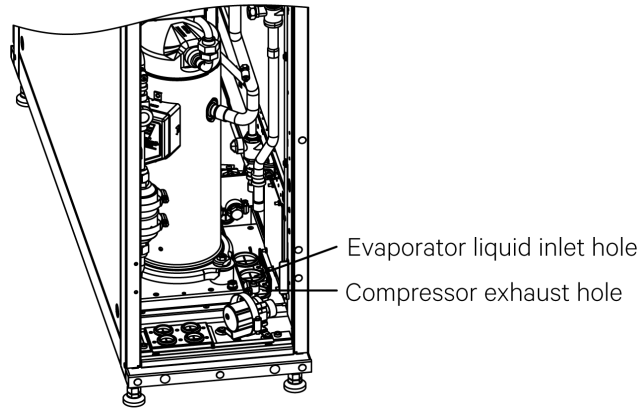


CR036

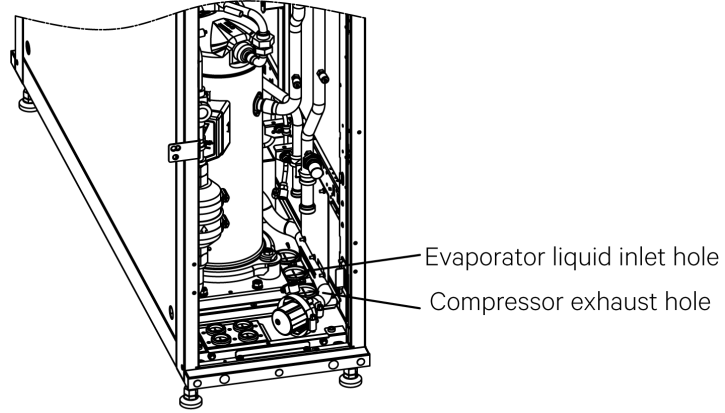


CR035, CR045, CR066

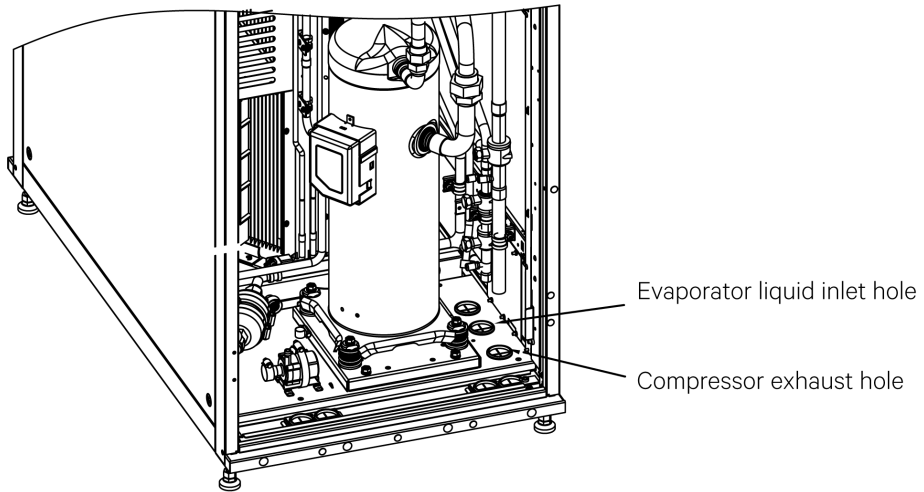
Figure 3.17 Bottom Plate Connections for Refrigeration



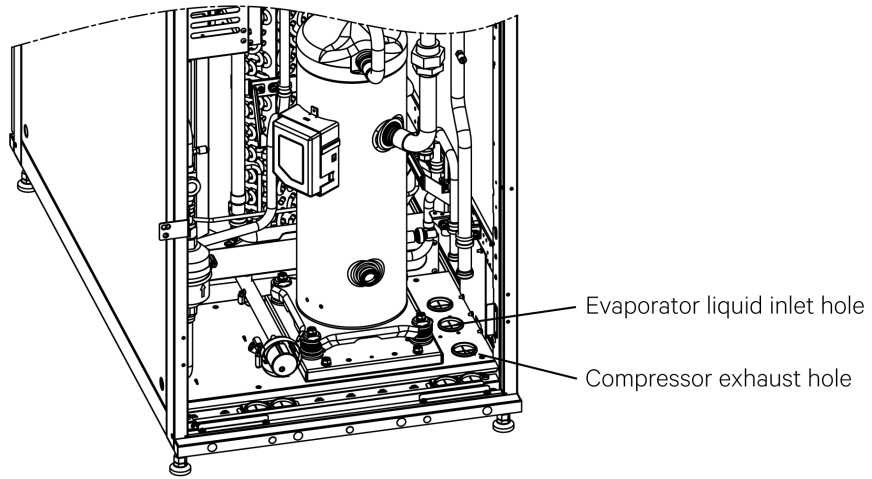
CR025



CR036



CR035, CR045



CR066

3.4.6 Adding Extension Kits (On-site Installation)

If the one-way equivalent length exceeds 30 m, or if the vertical height difference between the indoor unit and the outdoor unit exceeds the value shown in Table 3.5 Vertical Height Difference Between the Indoor Unit and The Outdoor Unit, please consult Vertiv™ before installation to confirm whether to add pipeline extension kits or take other measures. The "equivalent length" of the recommended line includes the calculated resistance losses due to bends. These extension kits should be selected according to the site situation.

Table 3.5 Vertical Height Difference Between the Indoor Unit and The Outdoor Unit

Relative position	Drop
The outdoor unit is higher than the indoor unit	Maximum: +30 m
The outdoor unit is lower than the indoor unit	Maximum: -8 m

Table 3.6 Equivalent Length of Components

Liquid pipe outer diameter (inch)	Equivalent length (m)		
	90° bend	45° bend	T-type three way
3/8	0.21	0.10	0.76
1/2	0.24	0.12	0.76
5/8	0.27	0.15	0.76
3/4	0.3	0.18	0.76
7/8	0.44	0.24	1.1
1-1/8	0.56	0.3	1.4

NOTE: An oil trap should be installed at every 7.5 m of vertical height. For more information, please consult Vertiv™.

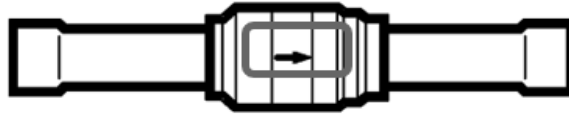
When installing extension kits on site, in order to prevent pipeline exposure, it is recommended that the check valve of the extension kit is installed on the engineering pipeline on the outside of the gas pipe, and that the solenoid valve body is installed on the outer engineering pipeline of the liquid pipe ball valve, that is, on the outside or bottom of the equipment.

In this way, in the process of installing check valves and solenoid valves, you do not need to cut the pipeline of the indoor unit, but open the ball valve for pressure holding and vacuum operations after the installation of the entire system. This avoids the moisture absorption of the compressor lubricating oil and ensures the safety and life of the compressor. For electrical wiring of extension kits, see Section 4.2.4 Connecting Extension Kit Solenoid Valve (Optional for On-site Installation).

Notice on Installing Check Valve

- For the unit with bottom piping, the check valve can be installed on the gas pipe between the floor and the ground under the indoor unit. For the unit with upper piping, the check valve can be installed on the gas pipe above the indoor unit.
- Whether the unit is upper piping or bottom piping, the position of the check valve should be as close as possible to the indoor unit.
- When welding the check valve, pay attention to the arrow on the valve body, which indicates the refrigerant flow direction in the valve body. Make sure that the arrow is facing the condenser.

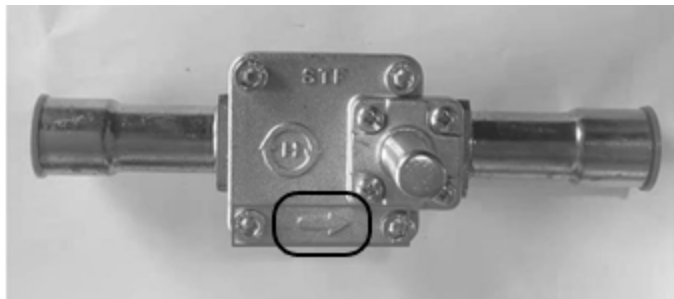
Figure 3.18 Discharge Check Valve Mounting Direction



Notice on Installing Solenoid Valve

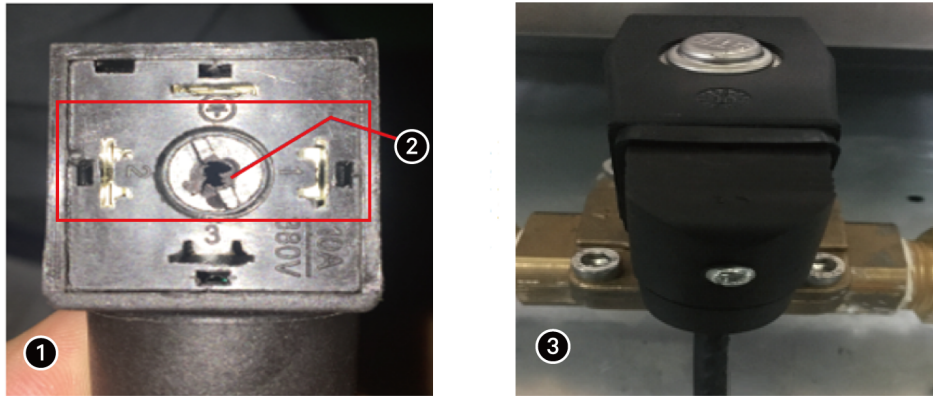
- For the unit with bottom piping, the solenoid valve can be installed near the floor and the ground under the indoor unit. For the unit with upper piping, the solenoid valve can be installed near the indoor unit.
- Whether the unit is upper piping or bottom piping, the position of the solenoid valve should be as close as possible to the indoor unit.
- The valve body and solenoid valve coil delivered to the site are separated. The valve body should be installed on the refrigerant liquid pipe horizontally. Pay attention to the arrow on the valve body. The arrow indicates the refrigerant flow direction in the valve body, and ensure that the arrow is facing the indoor unit.

Figure 3.19 Horizontally Mounted Solenoid Valve



- After welding the solenoid valve on the liquid pipe, install the coil. Remove the cover of the wiring terminals, remove the cap by switching the slot in the middle, direct the cable through the cable hole in the cover, plug the two terminals (black wire to pin 1 and brown wire to pin 2), reinstall the cap by switching the slot in the middle, and reinstall the cover.

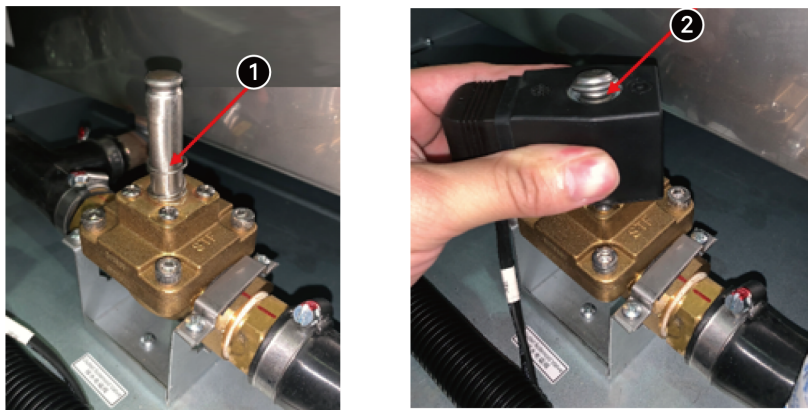
Figure 3.20 Connecting Solenoid Valve Cable



Item	Description	Item	Description
1	Wire connection base	3	Reinstalling the screw that was removed from the coil
2	Removing the cap by switching the slot in the middle, connecting the wires, and reinstalling the cap		

- Clip the coil of the valve body and press the coil tightly to ensure complete contact between the coil and valve body. Please be noted to first install the spring provided with the valve onto the valve.

Figure 3.21 Fixing the Coil



Item	Description
1	Installing the valve spring onto the valve
2	Clipping the coil of the valve body and pressing the coil tightly

3.4.7 Charging Refrigerant and Adding Lubricating Oil

Charging Refrigerant

The unit is charged in the factory with 2 bar nitrogen for shipping.

Table 3.7 LSF Outdoor Unit Recommended Refrigerant Charge (Unit: kg)

Outdoor unit model	LSF38	LSF42	LSF52	LSF62	LSF76	LSF85
Recommended charge (kg)	3.93	4.12	5.12	5.86	6.72	7.9

Table 3.8 LVC Outdoor Unit Recommended Refrigerant Charge (Unit: kg)

Outdoor unit model	LVC088	LVC106	LVC140	LVC152	LVC170
Recommended charge (kg)	4.12	5.12	5.86	6.72	7.90

Table 3.9 Indoor Unit Recommended Refrigerant Charge (Unit: kg)

Indoor unit model	CR025	CR035	CR045	CR036	CR066
Standard charge (kg)	2.47	3.12	3.44	2.76	6.0

The recommended amount of refrigerant charge is calculated according to the following formula:

Recommended refrigerant charge (kg) = Recommended outdoor unit refrigerant charge + Recommended indoor unit refrigerant charge + Recommended amount of refrigerant per unit length (kg/m) × Total length of liquid pipe (m)

Where Recommended amount of refrigerant per unit length (kg/m) is shown in the table below.

Table 3.10 Recommended Amount of Refrigerant per Unit Length

Liquid pipe outer diameter (mm)	Amount of refrigerant per unit length (kg/m)	Liquid pipe outer diameter (mm)	Amount of refrigerant per unit length (kg/m)
12.7	0.107	22	0.321
16	0.174	25	0.431
19	0.245	28	0.517

For details on charging refrigerant, see Section 5.2.2 Commissioning Procedures.

Adding Lubricating Oil

Adding refrigerant will lead to the dilution of the lubricating oil in the system, affecting the lubrication and cooling effect of the oil. Therefore it is necessary to add lubricating oil.

Table 3.11 Type of Lubricating Oil

Unit model	Type of lubricating oil
CR025	POE (32-3MAF)
CR035	PVE (FVC68D)
CR045	POE (32-3MAF)
CR036	POE (32-3MAF)
CR066	POE (32-3MAF)

Table 3.12 Additional Charge of Lubricating Oil

Liquid pipe diameter mm	CR025, CR035, CR045, CR036, CR066	
	Within 30 m	> 30 m
12.7	No need to add extra lubricating oil	Recommended amount of additional charge of lubricating oil = Amount of refrigerant to add when the pipe length exceeds 30 m × 10%
16		
19		
22		
25		
28		

NOTE: CR025, CR045, CR036, and CR066 units use POE (32-3MAF) lubricating oil. CR035 uses PVE (FVC68D) lubricating oil.

NOTE: For adding lubricating oil, please contact Vertiv™.



WARNING! Adding inferior lubricating oil or adding an incorrect type of lubricating oil can damage the system. The quality issues caused by this are not covered by the warranty.

3.5 Removing Transportation Fastener and Vibration Absorber

To prevent some parts from being deformed and damaged by bumps, shocks and resonances during transportation, fasteners or vibration absorbers have been added at the factory. After the installation of the unit, remove the fasteners and vibration absorbers before commissioning.

Removing the Compressor Fixing Plate from Compressor

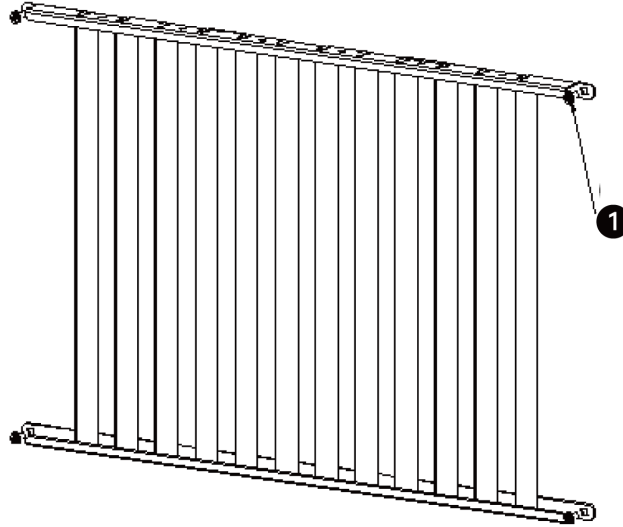
To reduce the vibration of compressor during operation and reduce vibration noise, vibration damping rubber pads have been installed at the bottom foot of the compressor. However, this is not suitable for suppressing the compressor vibration during transportation and may cause loose connections or wear of some parts. To eliminate this possibility, three fixing plates (two for CR025 and CR036) have been installed before transportation.

After installation of the unit, remove these fixing plates before commissioning, and install the bolts and gaskets in the reverse order of removal.

Adjusting the Baffle

Depending on where unit is installed on site, the baffle direction can be adjusted to the left or right. The baffle is composed of several pieces. Remove the screws on the left and right sides of each piece, rotate each piece 180 degrees, and then reinstall the piece to change the wind direction.

Figure 3.22 Adjusting the Baffle



Item	Description
1	GB9074_13-88_M4x12_ZB cross hexagonal head combination bolt

3.6 Inspection After Mechanical Installation

Check against the following table after completing mechanical installation.

Item	Result
Space is reserved for maintenance of the equipment	
Unit is placed upright and the fastening parts are tightened	
The pipes connecting the indoor and outdoor units are installed, and the indoor and outdoor unit ball valves are fully opened	
The wind direction of the baffle is adjusted (if necessary)	
The drainage pipe is connected	
The humidifier water inlet pipe is connected	
All fittings are fastened	
Transportation fasteners and vibration absorbers are removed	
Debris (such as transportation materials, structural materials, and tools) inside or around the unit is removed	

4 Electrical Installation

This section describes the electrical installation precautions, wiring of the indoor unit, and inspections.

NOTE: The unit is professional equipment, used in industrial, commercial, or other professional occasions. It is not accessible to the general public. Its total nominal capacity is greater than 1 kW, in line with the IEC61000-3-12 standard. An interface with a short-circuit ratio greater than or equal to 350 needs to be provided between your power supply and the power grid. You need to obtain permission from the power supply department to ensure that the air conditioner is connected to the power supply with a short-circuit ratio greater than or equal to 350.

4.1 Precautions and Procedures

4.1.1 Cables to Connect at Installation Site

The cables to connect at installation site are:

- Indoor power cable.
- Extension kit solenoid valve cable (optional for field installation).
- Outdoor unit (air-cooled): control signal cable and power cable.

4.1.2 Installation Precautions

- All power, control and ground cable connections must comply with national and local electrical regulations.
- For full load current, refer to the device nameplate. The cable size should match local wiring rules.
- Main power requirements: 380-400V±15%, 50 /60 Hz, 3 Ph + N + PE.
- The power cord is a Y-type connection. If the power cable is damaged, it must be replaced by a professional personnel from the manufacturer to avoid damage.
- Electrical installation and repair work must be carried out by authorized professional installers.
- Before connecting the circuit, use a voltmeter to determine the input supply voltage and make sure the power supply is turned off.
- The unit should be firmly fixed by screws, guide rails, or other means to avoid shaking during start-up or operation.
- For the unit with EC fan, the power grid of the unit must adopt TN, TT star connection method. If you need to use other connection method, please consult Vertiv™.
- A suitable omnipolar disconnect device should be provided with a disconnect from the power supply.
- For SCCR, see nameplate.
- The power supply cable should not be lighter than the 53 line of the ordinary PVC sheathed flexible wire GB5023.1 (idt IEC60277).
- The power supply cable for the device used outdoors should not be lighter than the neoprene armored soft wire (line 57 in IEC 60245).

4.2 Wiring for Indoor Unit

4.2.1 Indoor Unit Wiring Position

Low-voltage components can be seen after opening the rear door of the unit. The labels of the components help distinguish them.

Figure 4.1 Electric Control Box (with Rear Door Opened at 120 Degrees)

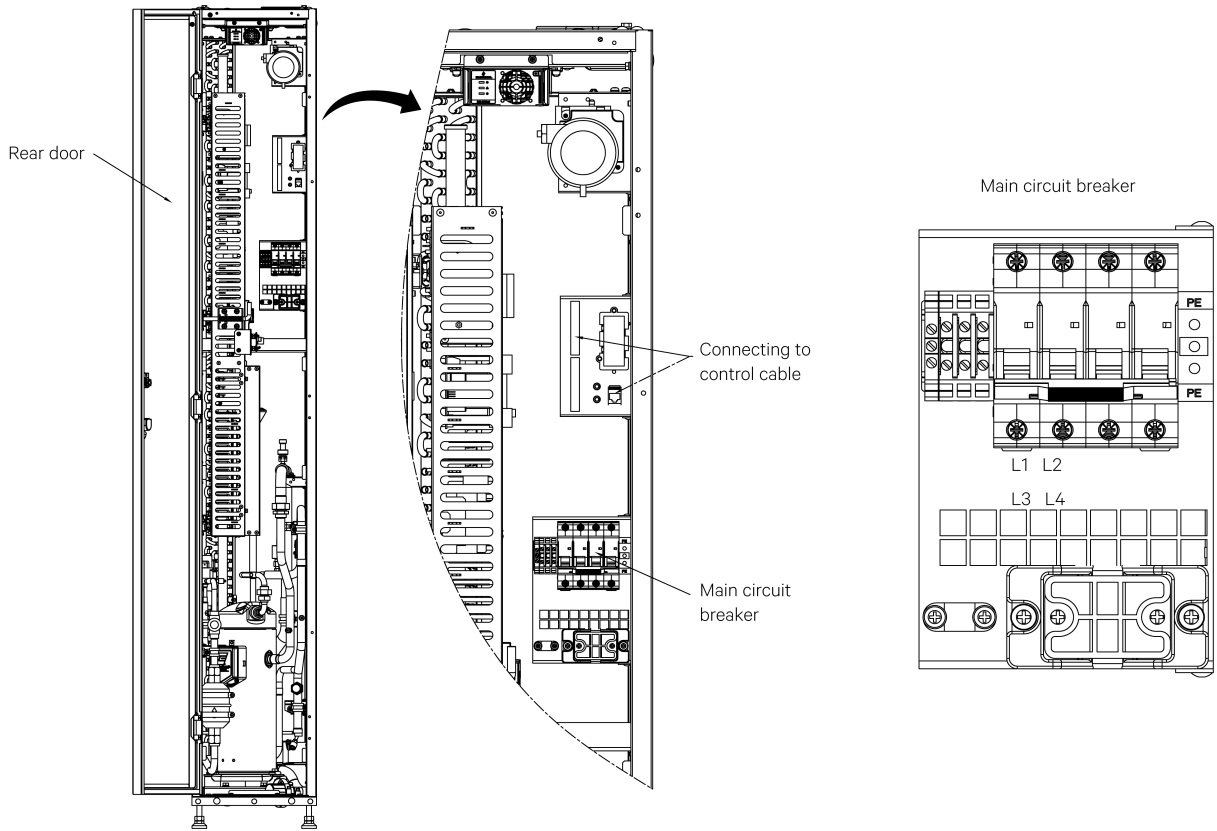


Table 4.1 Main Circuit Breaker Type

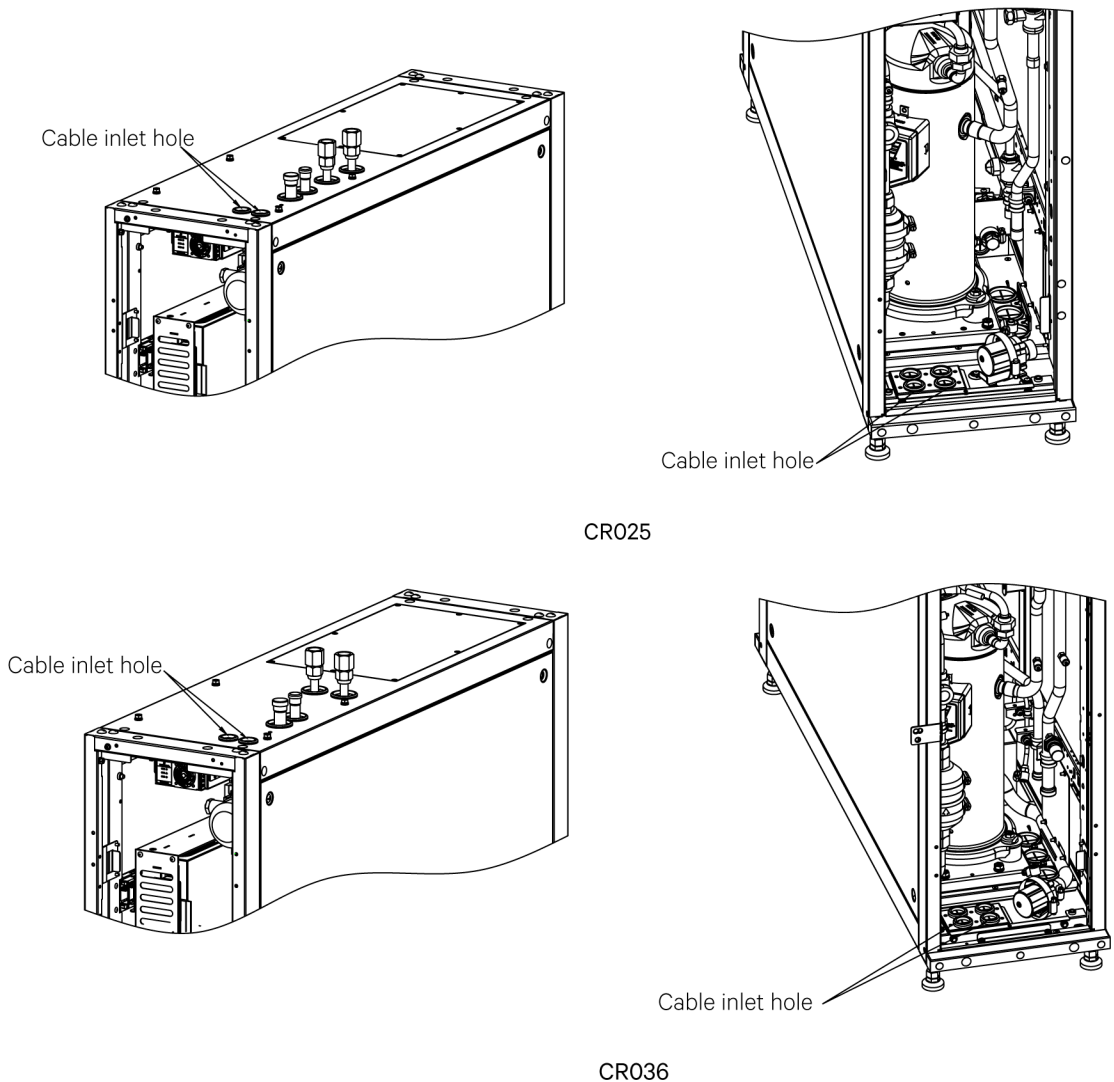
Unit model	Main circuit breaker type	Current (A)
CR025	NDM1-63C40/3	40
CR035	NDM1-63C50/3	50
CR045	NDM1-63C63/3	63
CR036	NDM1-63C40/4	40
CR066	NDM1-63C63/4	63

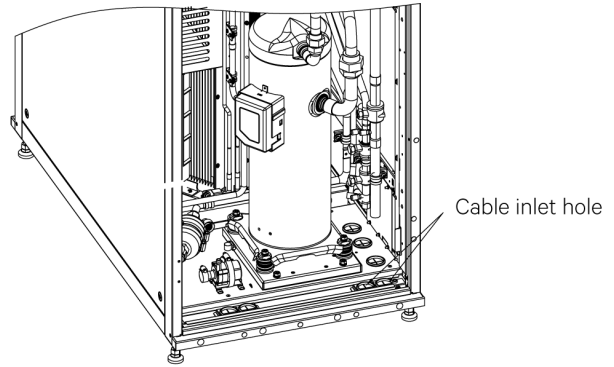
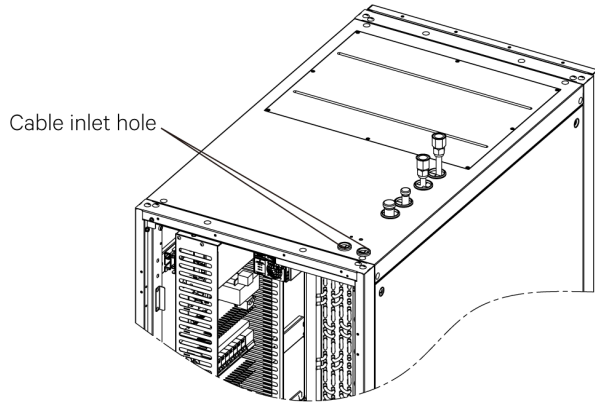
4.2.2 Connecting Power Supply Cable for Indoor Unit

Figure 4.1 show the location of indoor unit power supply cable connection. Connect the L1, L2, L3, N, and PE to corresponding terminals of the field power supply. Reserve a certain margin of the inlet cable and fix it to the clips on the inner side of the unit. Figure 4.2 show the cable access on the top plate and bottom plate.

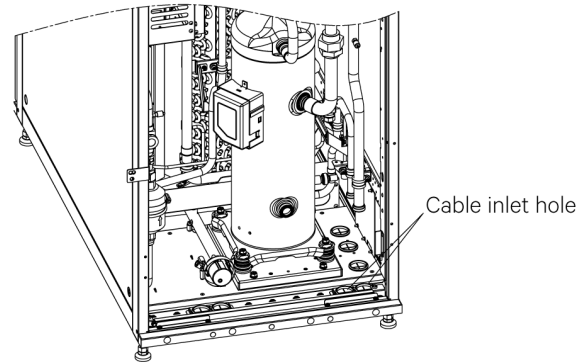
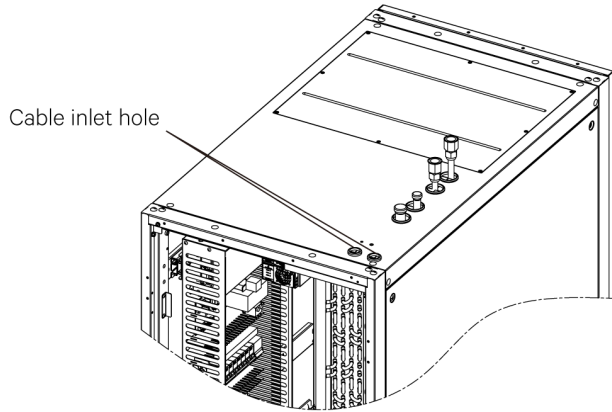
For the cable model selection, refer to the rated full load current value (FLA) of the unit.

Figure 4.2 Cable Access on the Top Plate and Bottom Plate





CR035, CR045



CR066

NOTE: The cable size should match local wiring rules

Table 4.2 Full Load Current Value (Unit: A)

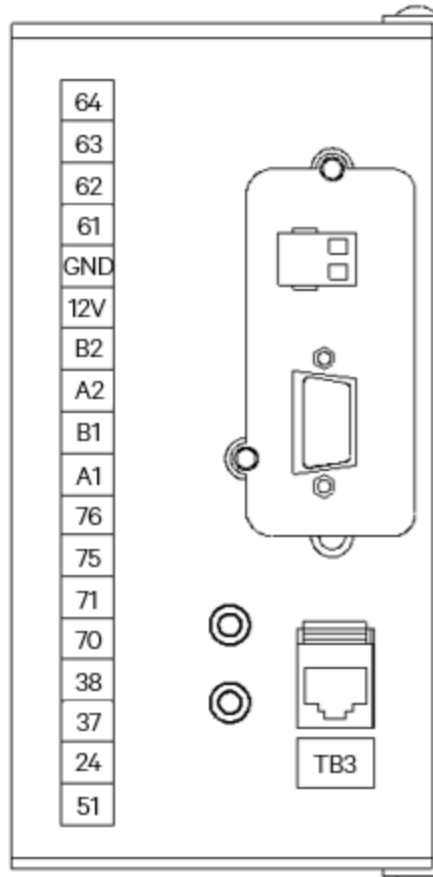
FLA(A)	Cooling-only model	With single-stage electric heater	With electrode humidifier	With single-stage electric heater and electrode humidifier
CR025	21.7	22.7	23.4	23.4
CR035	29.3	36.9	30.8	36.9
CR045	39.1	44.3	39.1	44.3

FLA(A)	Cooling-only model	With single-stage electric heater	With wet film humidifier	With single-stage electric heater and wet film humidifier
CR036	31.2	32.1	31.2	32.1
CR066	47.5	51	47.5	51

NOTE: The cooling-only model is not equipped with electric heater and humidifier.

4.2.3 Connecting the Control Cables

Figure 4.3 Terminal Block (Enlarged View)



Terminal	Description	Terminal	Description
51, 24	Water underfloor sensor	61, 62	CAN communication
37, 38	Remote power on/off	63, 64	Solenoid valve
70, 71	Outdoor unit control cable	A2, B2, 12V, GND	SIC card
75, 76	Common alarm	A1, B1	Outdoor communication, for the unit with refrigeration pump or the EBM version



WARNING! Before connecting the control cable, take appropriate anti-static measures.

Water Underfloor Sensor

Water underfloor sensor is optional. If it is selected for the unit, connect one end of the sensor to terminal 51 of the terminal block. Connect the other end to the common terminal of 24. Any number of sensors can be connected in parallel. Each unit has only one water underfloor alarm.

SIC Card

SIC card is optional. If it is selected for the unit, connect the A, B, GND, and 12 terminals of the SIC card to the A2, B2, GND, and 12V terminals of the terminal block respectively. The connection of Unity card is like SIC card. Details are shown in Appendix A Circuit Diagram.

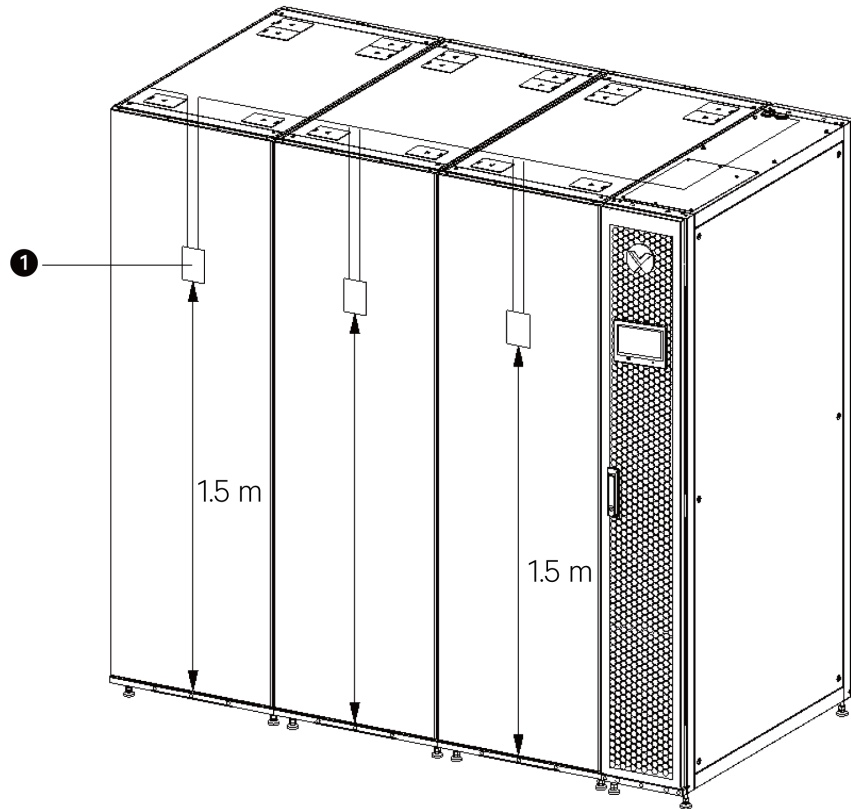
Rack Temperature Sensors

Rack temperature sensor is optional. Each unit can be equipped with up to 6 rack temperature sensors. It is recommended to place the sensor in front of the thermal load to obtain the most accurate temperature value. If the sensors are connected in series, each sensor monitors the air temperature entering each rack device and the temperature values are used to control the operation of the unit. The standard position of the sensor is 1.5 m high. Therefore, the sensor should be placed in the position shown in the figure below.

Otherwise the device will not operate properly. Plug the connector of the rack temperature sensor into the TB3 connector. After connecting the cable, route the cable from the top or bottom of the unit and connect the cable to the first sensor, then from the first sensor to the second sensor, and so on, to form a connection chain. Secure the temperature sensor in front of the hottest heat source in the rack and do not fix it in front of an empty slot. During operation, attach the magnet of each sensor to the surface of the rack. The sensor should be fixed where there is most likely a lack of sufficient cold air.

The IRM-S02TH address settings for the rack temperature sensor are shown in Table 4.3 Rack Temperature Sensor IRM-S02TH Address Setting.

Figure 4.4 Rack Temperature Sensor Position



Item	Description
1	Rack temperature sensor

Table 4.3 Rack Temperature Sensor IRM-S02TH Address Setting

Sensor	1	2	3	4	5	6	ID number	
Rack temperature 1	0	0	0	1	0	0	10	1: ON 0: OFF
Rack temperature 2	0	0	0	1	0	1	11	
Rack temperature 3	0	0	0	1	1	0	12	
Rack temperature 4	0	0	0	1	1	1	13	
Rack temperature 5	0	0	1	0	0	0	20	
Rack temperature 6	0	0	1	0	0	1	21	

Remote Shutdown

The 37 and 38 terminals can be connected to the remote shutdown switch. The terminals are short circuited at the factory. For connecting the remote shutdown device, you need to remove the short circuit.

NOTE: When the 37 and 38 terminals are disconnected, the unit will shut down.

Outdoor Unit Signal Control

The 70 and 71 terminals are the control signal terminals of the outdoor unit, and their switching state is the same as the switching state of the compressor. Compressor speed control terminals can be connected to the control panel of the outdoor unit, or they can be selected as not connected.

Common Alarms

Common alarms can be connected to the 75 and 76 terminals. The output is used to connect external alarm devices, such as alarm lights. When a critical alarm occurs, the contacts are closed. This can be used to issue remote alarms to signal building management systems or automatically dial paging systems. You need to provide power supply to the common alarm system loop circuit.

For other terminal definitions, see Appendix A Circuit Diagram.

4.2.4 Connecting Extension Kit Solenoid Valve (Optional for On-site Installation)

The extension kit solenoid valve has two control cables. Connect them to the corresponding terminals on the control board. For details on terminal number, see Appendix A Circuit Diagram.

4.3 Inspection After Electrical Installation

Check against the following table after completing electrical installation.



WARNING! Do not power on the unit before professional personnel authorized by Vertiv™ has completed the inspection.

Table 4.4 Electrical Inspection

Item	Result
The supply voltage is the same as the rated voltage on the unit nameplate	
There is no open circuit or short circuit in the electrical circuit of the system	
The power and grounding cables to the disconnect switch, indoor unit, and outdoor unit are connected	
The circuit breaker or fuse is rated correctly (please refer to the current values in Table 4.1 Main Circuit Breaker Type for the appropriate circuit breaker or fuse)	
The control cable is connected	
All cables and circuit connectors have been tightened, and the fastening screws are not loosened	

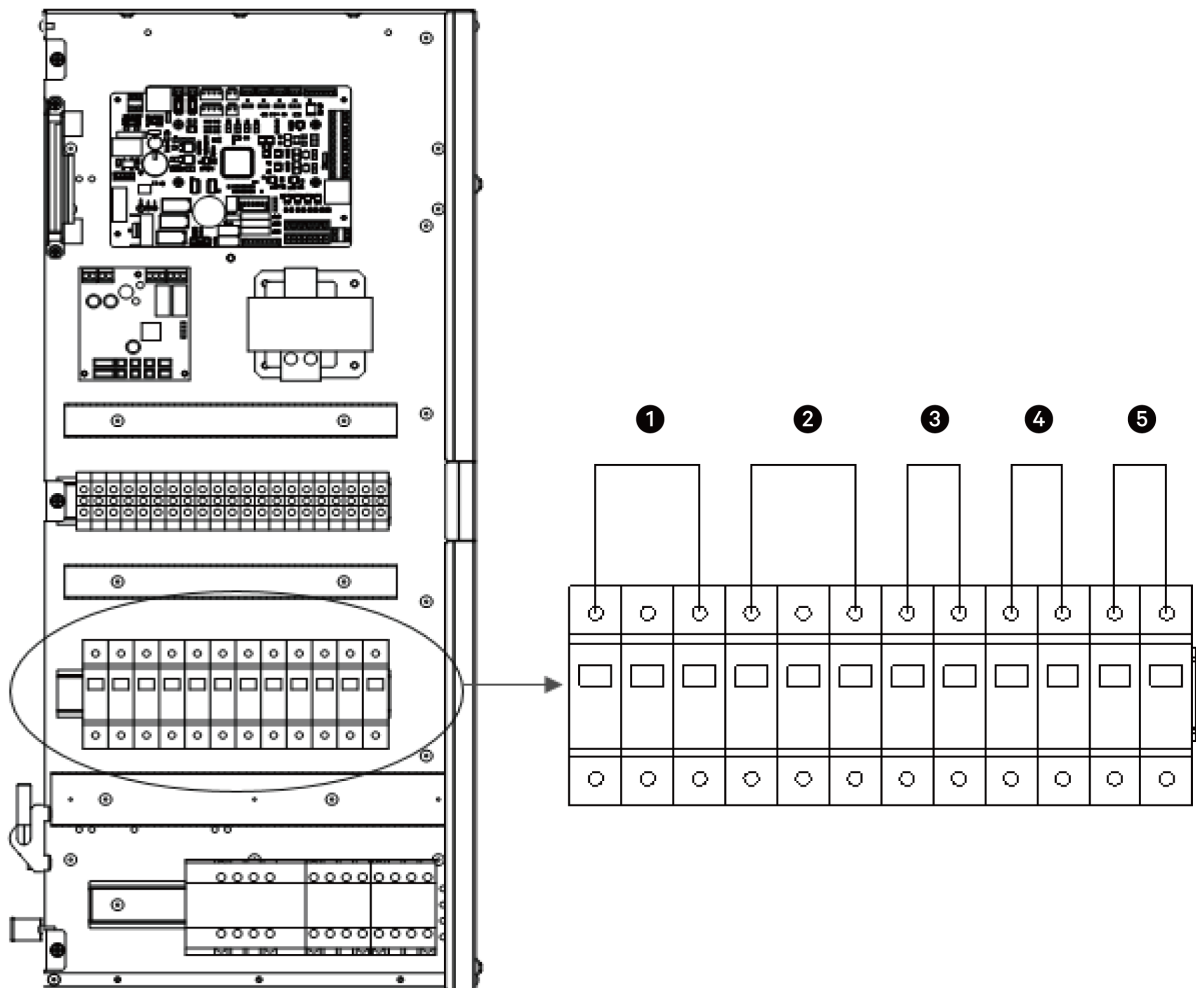
5 Commissioning the Unit

This section introduces the system start-up commissioning, including the position of the circuit breaker and the commissioning procedures.

5.1 Position of Circuit Breaker

Position of Circuit Breaker below shows the position of the circuit breaker. The actual position varies with unit models. Please refer to the labels on the unit.

Figure 5.1 Position of Circuit Breaker



Item	Description	Item	Description
1	Compressor circuit breaker	4	Fan circuit breaker
2	Electric heater circuit breaker	5	Humidifier circuit breaker
3	Voltage transformer circuit breaker		

5.2 Commissioning Before Start-up

5.2.1 Preparation for Commissioning

Mechanical Part

- All valves in the refrigerant circuit are opened in accordance with the instruction labels.
- A pressure leak test is performed for the refrigeration line system and the test result is qualified.
- The refrigerant is charged correctly.
- The total system charge is calculated. If the required charge exceeds the standard charge, additional lubricating oil is charged.
- The water supply and drainage line system of the humidifier is reliably connected. Leak test is performed according to the specified material requirements.
- The compressor heating belt is preheated for more than 12 hours.
- The temperature of the equipment room is above 18 °C and has a certain heat load. If not, other heating devices are used or the unit and adjacent equipment heaters are forcibly operated to provide sufficient heat load. (For the forced operation of the unit's own heater, be sure to follow step 3 in Commissioning Procedures below).
- If the unit is in low temperature environment, the condensing pressure is increased to 21 Bar by shielding the heat exchange area of part of the condenser and limiting the amount of condensation air.

Electrical Part

- The main power input voltage is nominal voltage $\pm 15\%$. The power supply disconnect switch of the outdoor unit is closed.
- All electrical or control cables are correctly connected and the connections are tightened.
- Power cable and low-voltage control cable are arranged separately.
- The water level switch cable is connected and the pump can work normally.

5.2.2 Commissioning Procedures

1. Disconnect the corresponding circuit breakers of all components. Close the main circuit breaker and the transformer circuit breaker. Check that the control voltage is $24V_{ac} \pm 10\%$.
2. Start the unit and measure the operating current of each phase of the main fan.
3. Evacuate the system circuit.

Connect the manifold gauge to the Schrader valve at the liquid pipe ball valve and the Schrader valve behind the EEV, and evacuate the refrigeration circuit to -30 in. Hg. (The evacuation time should be more than three hours.) Maintain this condition for four hours. During this period, the pressure should not rise and the sight glass color should be normal. (To ensure the vacuum and drying effect, at least three refrigerant replacement methods should be used and the evacuation should be performed repeatedly.) If there is a solenoid valve in the system, select the vacuum mode in the manual mode, open the solenoid valve, and then evacuate the system.

4. Charge the refrigerant.

- a. Charge the unit statically (before starting up the unit): After the vacuum inspection is completed, charge the unit quickly and statically with an appropriate amount of liquid refrigerant (normally, till the pressure in the tank is balanced with the system pressure). Connect the manifold gauge to the refrigerant tank, and purge the air out of the hose of the manifold gauge. Connect the manifold gauge to the Schrader valve at the ball valve on the liquid pipe, and connect the manifold gauge to the Schrader valve behind the EEV. During this charging process, keep the refrigerant tank inverted. Stop the charging when no more refrigerant can be charged into the unit even if the amount charged hasn't reached the calculated amount. Do not start the unit immediately after the charging completes. Start the unit only after the compressor crankcase belt has been preheated for more than 12 hours. If the preheat cannot last for 12 hours, you need to use an electric dryer or other heating sources to heat the bottom part of the compressor shell for around 30 minutes, to vaporize any liquid refrigerant.



WARNING! For the CR035 model, it is forbidden to charge the refrigerant into the Schrader valve on the compressor suction pipe. Otherwise any damage to the compressor caused by this is not covered by the warranty.

NOTE: Purge the air out of the hose of the manifold gauge.

NOTE: After statically charging the unit, it is forbidden to start the unit immediately to avoid the compressor starting to run with liquid.

NOTE: For your personal health, please wear ear, earplugs and other equipment to protect your hearing after entering the computer room.

- b. Charge the unit dynamically. Put the refrigerant tank upside down and start the compressor manually (compressor output 72%, fan output 60%). After the compressor is started, charge the refrigerant (R410A) till there are no bubbles in the sight glass, the condensation degree reaches more than 3K, and the suction superheat reaches more than 7K. Observe the compressor suction pipe to ensure that the pipe and the compressor shell do not have condensation, to eliminate potential liquid strike hazards. The discharge superheat of the unit is in the range of 25 °C to 50 °C.

5.2.3 Inspection After Commissioning

Check against the following table after completing commissioning.

Table 5.1 Inspection After Commissioning

Item	Result
All output functions are automatic	
The temperature and humidity setting value and control accuracy are correct	
The other settings function correctly	

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6 Display Screen Operation

This section describes the appearance, features, control interface, and menu structure of the display screen.

6.1 Features

The micro-controller has the following features:

- Monitors and displays the operation status of the air conditioner to keep the environment within the set range.
- Configured with a 7-inch color screen, which makes user interface operation simple.
- Provides a three-level password protection to effectively prevent unauthorized operation.
- Provides self-recovery upon power failure, high voltage and low voltage protection, phase loss and anti-phase protection, etc.
- Allows users to accurately understand the main parameters and operating status of the system.
- Displays the measured temperature and humidity curves in real time.
- Displays the running time of critical components in real time.
- Provides expert-level fault diagnosis and displays the current fault information to facilitate maintenance personnel in servicing and repair.
- Stores up to 1000 historical alarm records.

6.2 Appearance

When the screen is in black screen state, tap the screen, and the service hotline will be displayed. The service hotline will disappear after 15 seconds.

Figure 6.1 Color Screen Appearance



The indicator is located under the screen. It has four colors and their indication is described in the table below.

Table 6.1 Indicator Color Description

Indicator	Color Description
Blue	Display is starting
Yellow	Unit shuts down, or the display fails to communicate with the control board
Green	Unit is running normally
Red	An alarm occurs and the buzzer keeps generating sound

6.3 Interface

6.3.1 Main Interface

After the boot is completed, the main interface is displayed, containing the menu button, date and time, unit address, display address, and unlock button. The menu button cannot be tapped because it has not been unlocked. After tapping the unlock button and inputting the correct password, the temperature and humidity setting button, curve button, unit address, display address, and switch button will be displayed. Press and hold the power on/off button for at least two seconds to toggle between the power on/off function.

In control mode, the text on the left side of the circle indicates the humidity control mode (air supply humidity control). The text on the right indicates the temperature control mode (default air supply control mode, consistent with the compressor control mode). The temperature value in the circle represents the measured temperature and humidity value (default air supply temperature) in the current mode. The humidity value represents the theoretical air supply humidity. For the two triangles on the circle, the left represents the supply air humidity set point, and the right represents the temperature set point in the current mode. Tap the toggle button 1 to switch between the graph and the list display. Tap the setting button to enter the temperature and humidity setting interface and to set the temperature and humidity.

Figure 6.2 Main Interface (Unlocked)



Table 6.2 Main Interface Description

Item	Name	Description
1	Home button	Tap this button to enter the home page and view the main data and status of the system
2	Menu button	Tap this button to display the main menu page, through which you can access each submenu
3	Settings button	Tap this button to enter the temperature and humidity setting page, where you can set system temperature and humidity
4	Curve button	Tap this button to enter the curve interface, where you can view the 0-48 hour curve of return air average temperature, remote average temperature, supply air average temperature, and supply air average humidity
5	Time display	Displays the current time
6	Unit address	Displays the unit address
7	Monitor address	Displays the monitor address
8	On and off button	When the host is in the shutdown state, tap this button for at least two seconds and the host will power on. When the host is in the running state, tap this button for at least two seconds and the host will shut down
9	Unlock button	Tap this button to enter the password-input interface and then to enter the unlocked interface. After that, you can tap the menu icon and set parameters Tap this button again to enter the unlocked interface
10	Operating status	Displays the operating status of the current unit (shutdown, operation, standby, locking, and communication interruption)
11	Toggle button 1	Tap this button to switch between graphical display mode and list display mode
12	Toggle button 2	Tap this button to switch between alarm data and sensor data
13	Control mode	Displays the setpoint of the unit and the environmental conditions of the equipment
14	Status display	Displays the running status of the current component
15	Alarm data	Displays the current alarm and the time when it occurs
*	Sensor data	Displays the sensor data of the current component

6.3.2 Control Mode

The main interface is divided into three read-only states:

- Temperature control mode and humidity control mode
- Current control mode temperature value and theoretical air supply humidity value
- Temperature and humidity set value

Figure 6.3 Control Mode

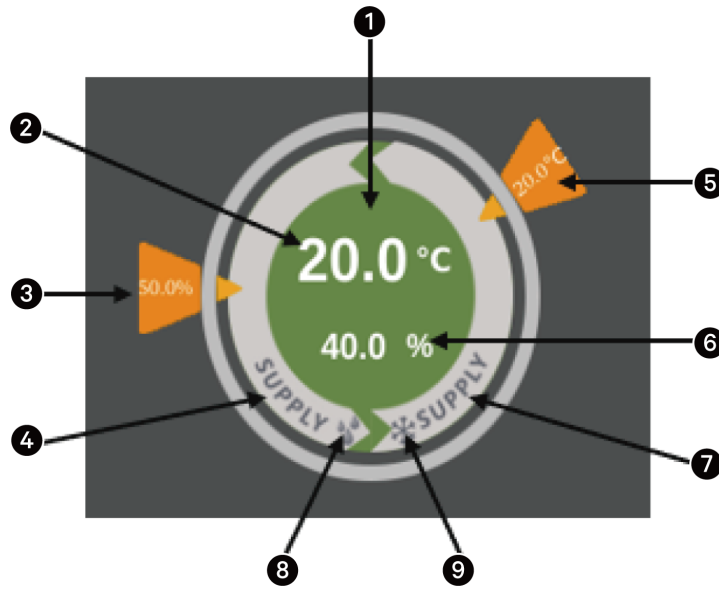


Table 6.3 Control Mode Description



Item	Description
1	The circle can be displayed in three colors: green, gray, and red
2	Measured supply air temperature value. It changes with the compressor's current control mode
3	Humidity setpoint. It changes in clockwise direction between the 30-150 angle in the polar coordinate. When the humidity setpoint is the minimum value, it is at 30 degrees in the polar coordinate; when the humidity setpoint is the maximum value, it is at 150 degrees in the polar coordinate
4	Humidity control. By default, it is supply air humidity control
5	Temperature setpoint. According to the range of temperature setpoint, it changes in counterclockwise direction between the 30-150 angle in the polar coordinate. When the temperature setpoint is the maximum value, it is at 30 degrees in the polar coordinate; when the temperature setpoint is the minimum value, it is at 150 degrees in the polar coordinate
6	Theoretical supply air humidity value
7	Current compressor control mode. By default, it is supply air temperature control
8	 represents the control state of the humidity displayed on the left
9	 represents the control state of the temperature displayed on the right

Figure 6.4 Unit Status Color



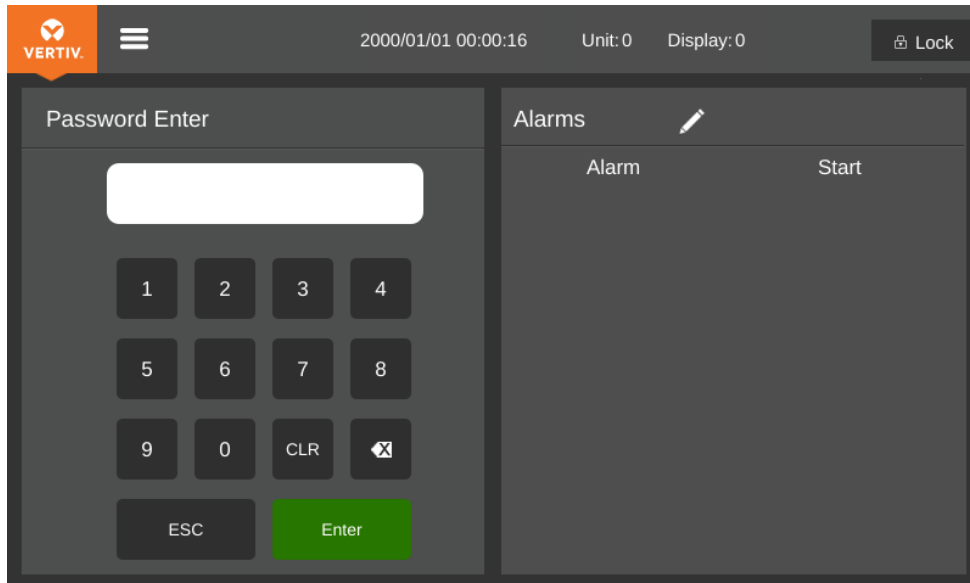
Table 6.4 Unit Status Color Description

Color	System state description
Red	The power-on status sensor data is not within the normal range or is an invalid value
Grey	The unit is in shutdown state or communication interruption state
Green	The power-on state is within the normal range

6.3.3 Password Interface

Tap the Unlock button on the main interface to display the password interface.

Figure 6.5 Password Interface



The password has three levels.

Table 6.5 Password Level

Password level	User	Initial password	Note
Level 1	Ordinary operators	1490	Browse all menu information and set only temperature and humidity setpoints. Cannot set or change other values
Level 2	Maintenance personnel	-	Browse all menu information and set all parameters except the display address
Level 3	Manufacturer technicians	-	-

If you enter the wrong password, you can only browse the homepage. Tap the ESC button to exit the password interface.

NOTE: If you do not type any password or enter the wrong password in the password interface, you can only view the parameters and data of the unlocked interface, and you cannot view and change the menu parameters.

6.4 Menu Structure

6.4.1 Main Menu

After entering the correct password, the unlocked interface is displayed. For the specific menu structure, see Appendix B Display Screen Menu Structure.

Figure 6.6 Main Menu

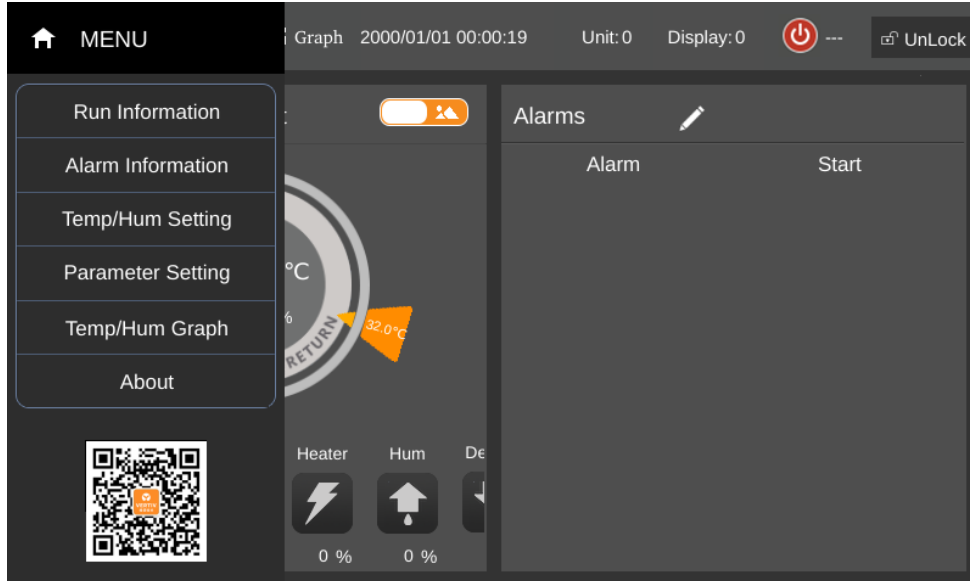


Table 6.6 Menu Description

Menu Item		Description
Home		Displays operating status, operating data, alarm data, and sensor data
Menu	Operational information	Displays temperature and humidity information, External Static Pressure (ESP) information, switch status, power information, and teamwork information
	Alarm message	Displays system current alarms, historical alarms, and compressor driver alarms
	Temperature and humidity settings	Sets the temperature and humidity values
	Parameter settings	Sets alarm parameters, alarm properties, system settings, compressor settings, internal fan settings, ESP settings, communication settings, teamwork settings, time settings, display settings, parameter recovery, password settings, and data logging settings
	Temperature and humidity curve	Displays the return air temperature curve, return air humidity curve, supply air temperature curve, and remote temperature curve
	About	Displays the controller hardware and software version number, and the software and hardware version number of the display
Settings		Displays the temperature and humidity settings under the same menu
Curve		Displays the temperature and humidity curve under the same menu

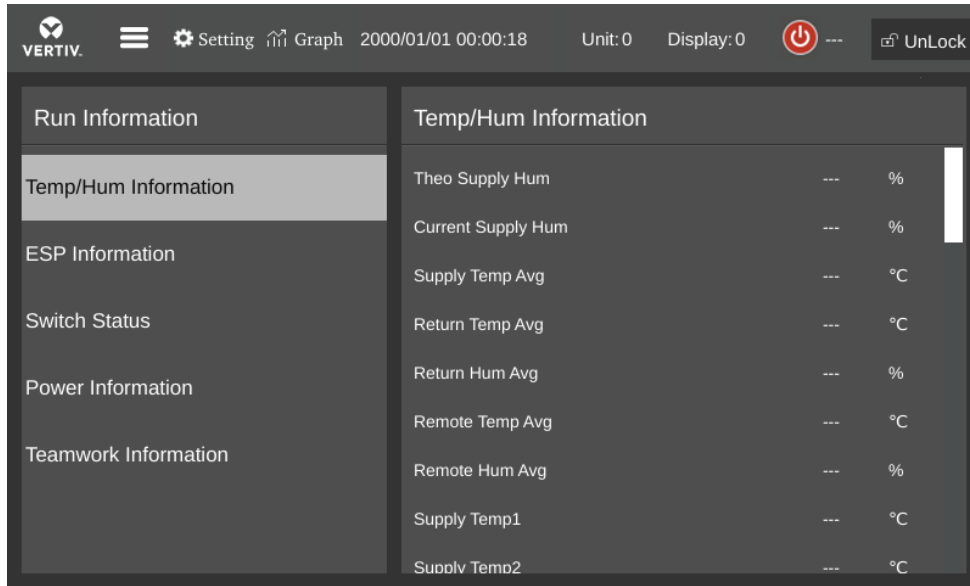
6.4.2 Operating Status

Select operation information under the main menu to view temperature and humidity information, ESP information, power supply information, and teamwork information.

Temperature and Humidity Information

You can view the temperature and humidity parameters of the unit in real time. This information includes return air temperature and humidity, supply air temperature, remote temperature and other information. Press the rightmost scroll bar to scroll up or down the query.

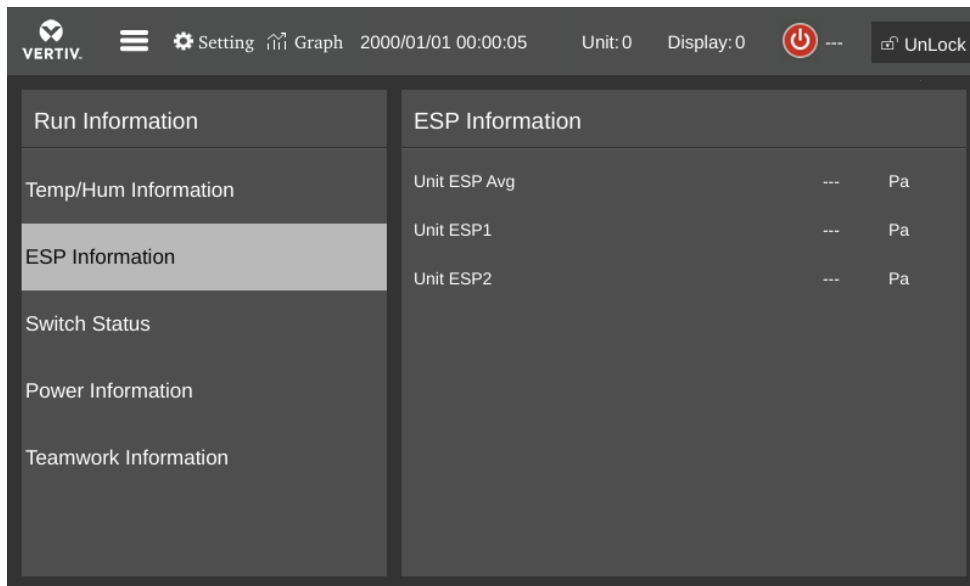
Figure 6.7 Temperature and Humidity Information



ESP Information

You can view the ESP parameters of the unit in real time (when the unit is equipped with a ESP sensor).

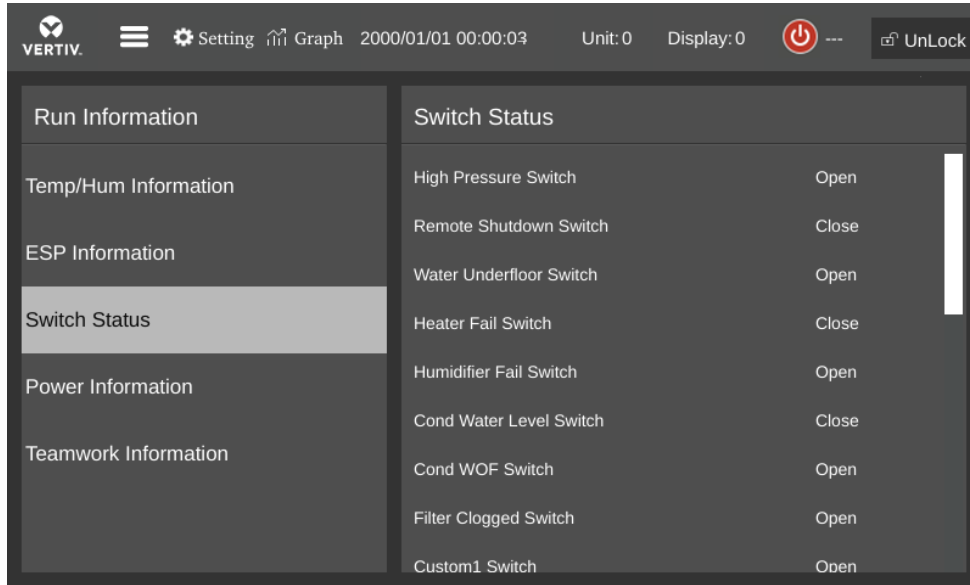
Figure 6.8 ESP Information



Switch Status

You can view the disconnection or closing status of switches such as high-voltage switches, remote shutdown switches, floor overflow switches, and electrical heating fault switches.

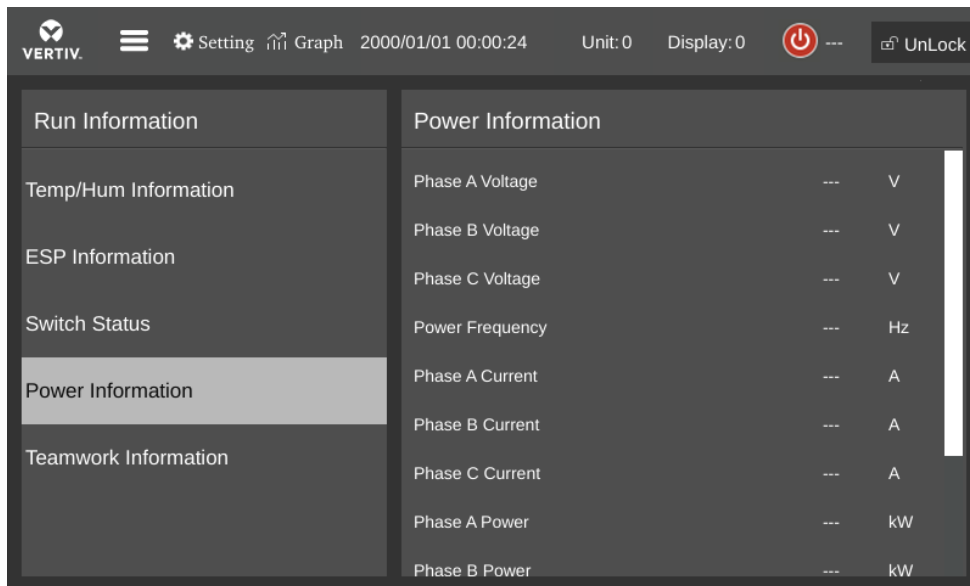
Figure 6.9 Switch Status



Power Information

You can view three-phase voltage and frequency.

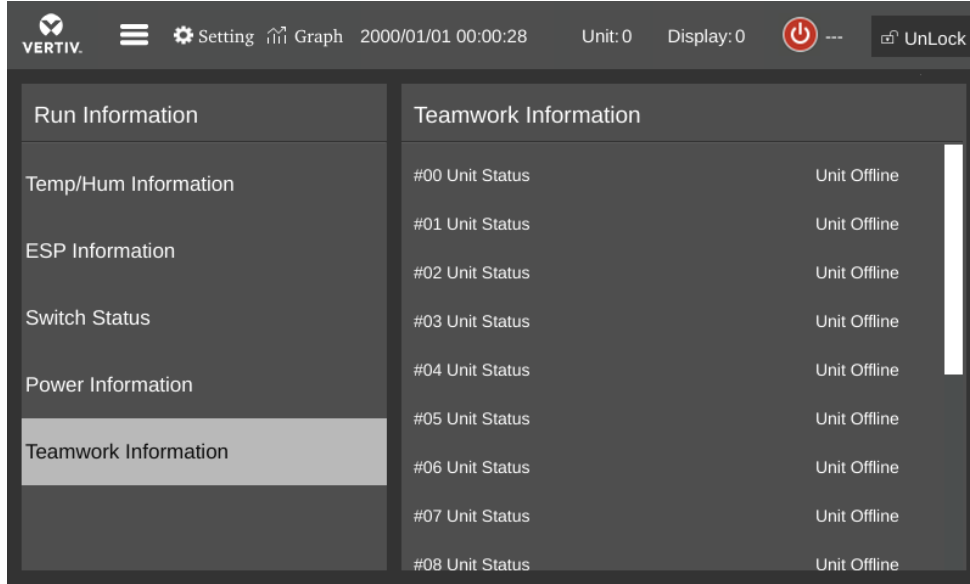
Figure 6.10 Power Information



Teamwork Information

You can view the status of the teamwork message.

Figure 6.11 Teamwork Information



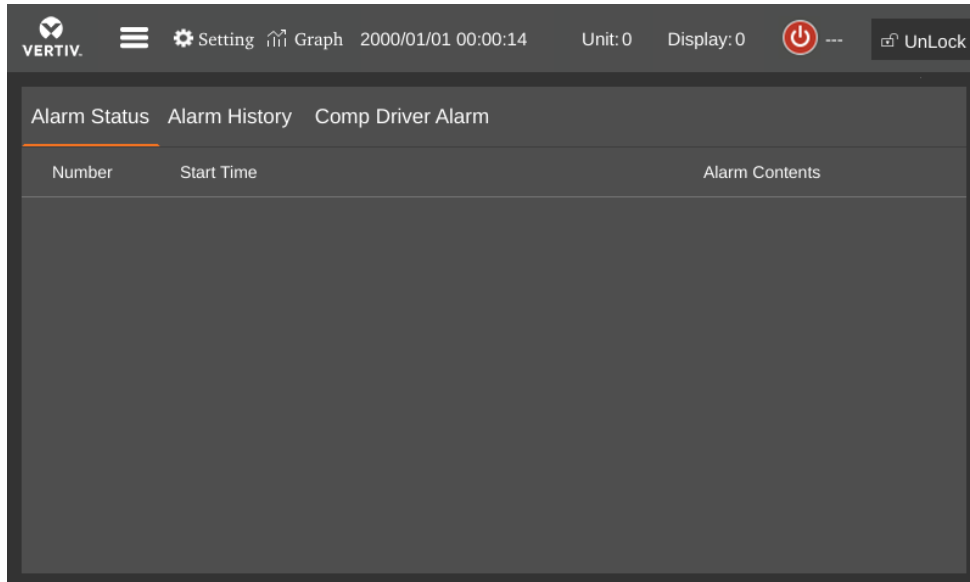
6.4.3 Alarm Information

Select alarm information under the main menu to view current alarms, historical alarms, and compressor driver alarms.

Current Alarm

You can view the current alarm status record and the specific alarm status information. The specific alarm status information includes the serial number, start date time, end date time, and alarm content.

Figure 6.12 Current Alarm



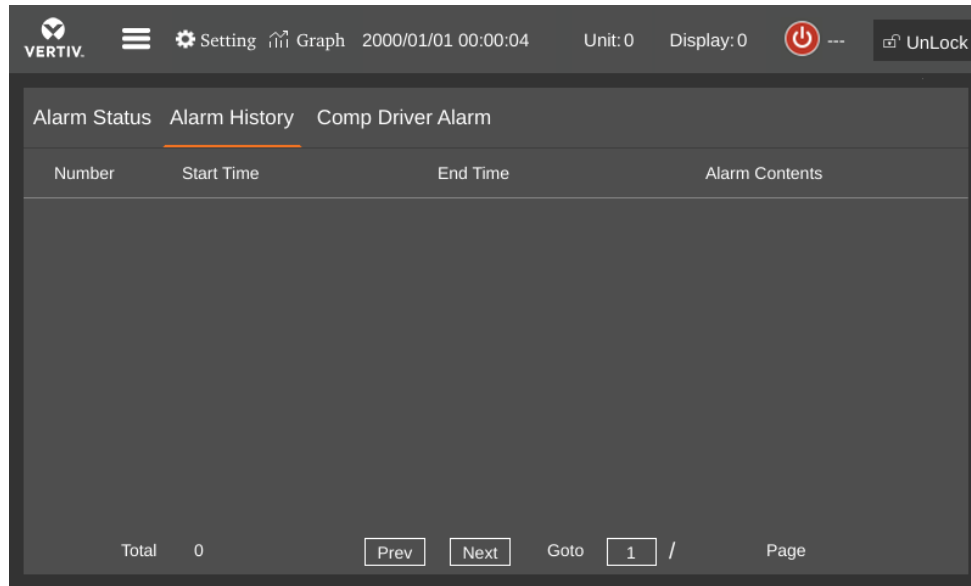
NOTE: The most recent alarm number is the smallest number. When multiple alarms occur, press the rightmost scroll bar to scroll up or down the query.

NOTE: The current alarm record is automatically cleared when the system is powered down.

Historical Alarm

You can view the historical alarm information and the specific historical alarm information. The specific historical alarm information includes the serial number, start date time, end date time, and alarm content.

Figure 6.13 Historical Alarm



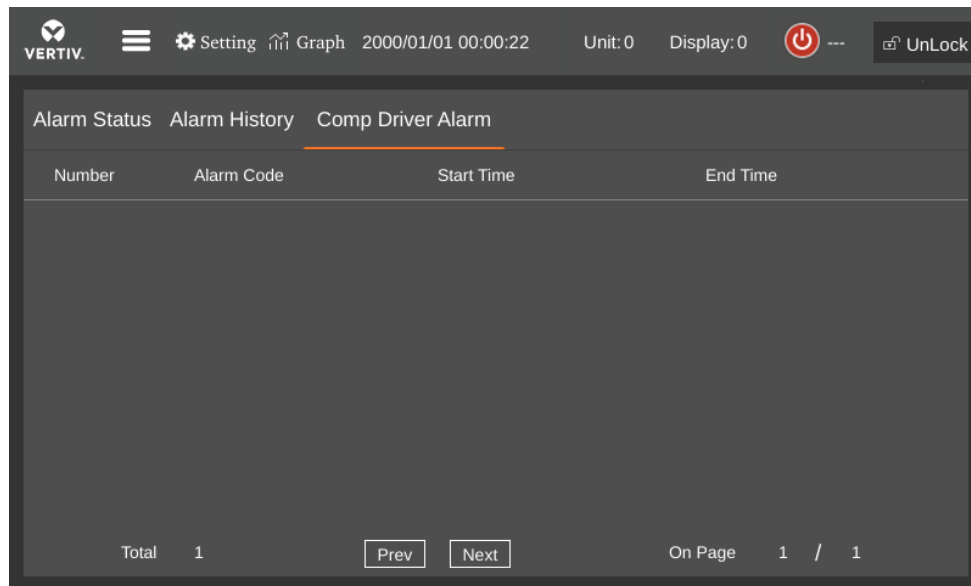
NOTE: When multiple alarms occur, press the scroll bar on the right to scroll up or down to query.

NOTE: The alarm history can be saved up to 1000, and it is not cleared when the power is disconnected.

Compressor Driver Alarm

You can view the specific code of the compressor driver alarm.

Figure 6.14 Compressor Driver Alarm



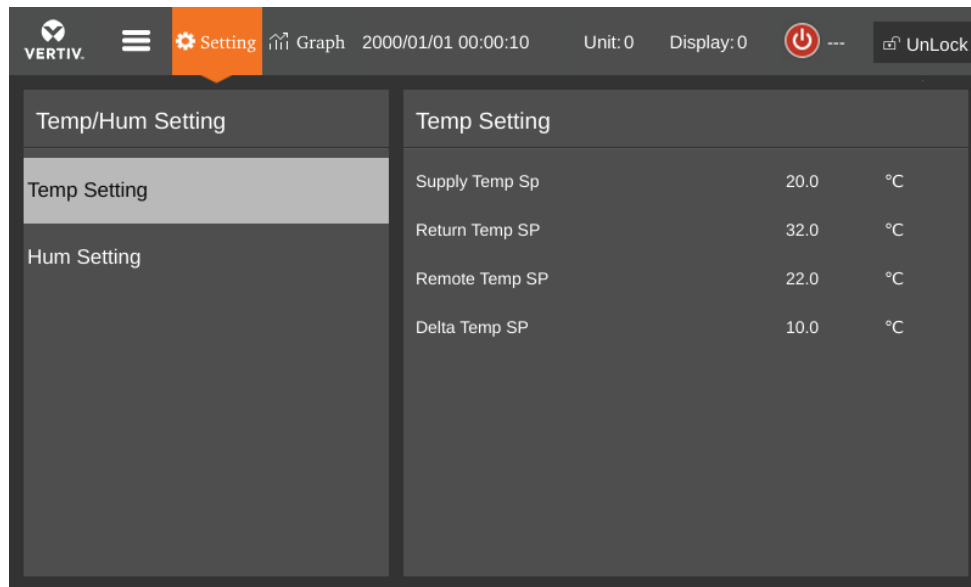
6.4.4 Temperature and Humidity Setting

Select temperature and humidity settings under the main menu to view temperature settings and humidity settings.

Temperature Setting

You can set values for return air temperature, remote temperature, supply air temperature, and temperature difference.

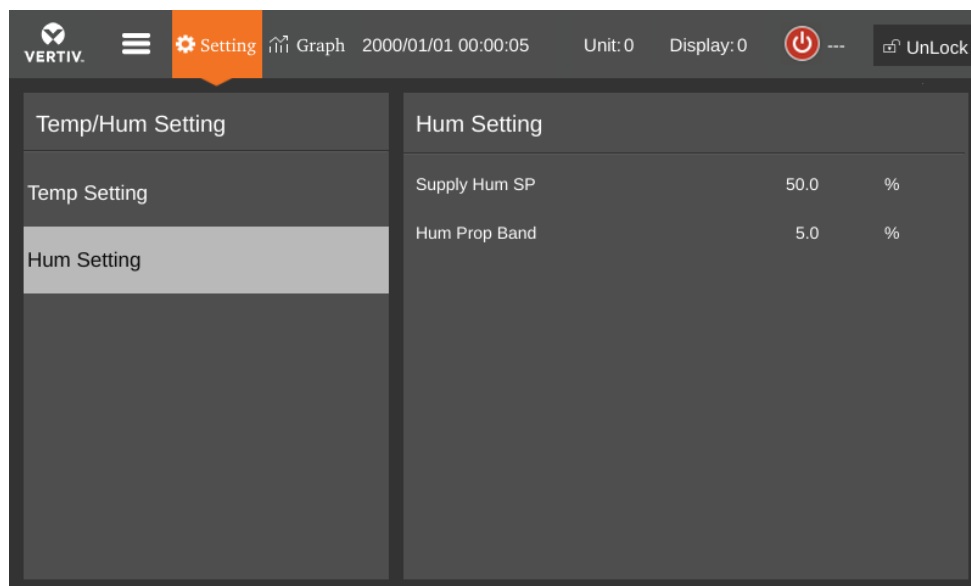
Figure 6.15 Temperature Setting



Humidity Setting

You can set the humidity value and ratio.

Figure 6.16 Humidity Setting



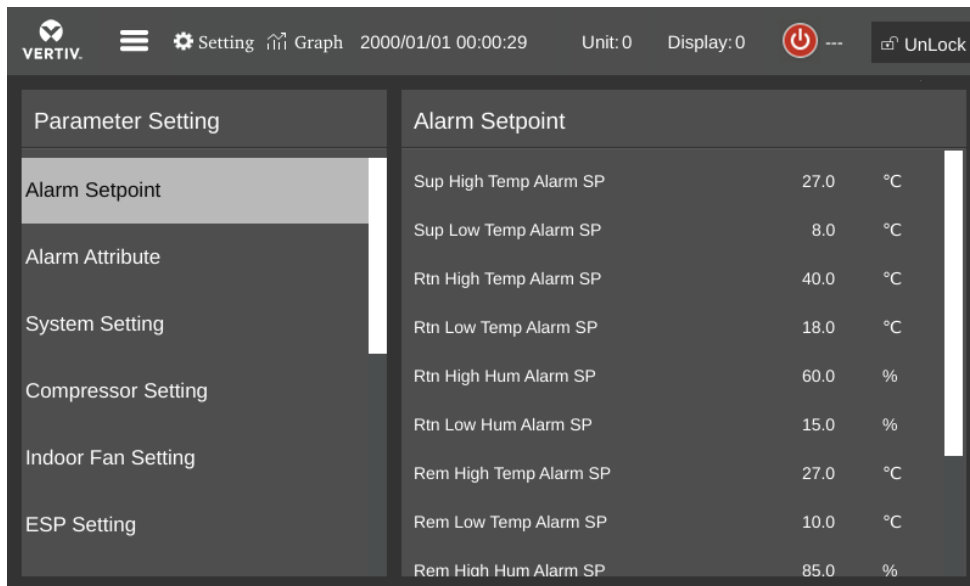
6.4.5 Parameter Setting

Select parameter settings under the main menu to view alarm parameters, alarm properties, system settings, compressor settings, indoor fan settings, ESP settings, communication settings, teamwork settings, time settings, display settings, parameter recovery, password settings, and data logging settings.

Alarm Setpoint

You can set parameters such as supply air high temperature, supply air low temperature, return air high temperature, return air low temperature, and return air high humidity.

Figure 6.17 Alarm Setpoint

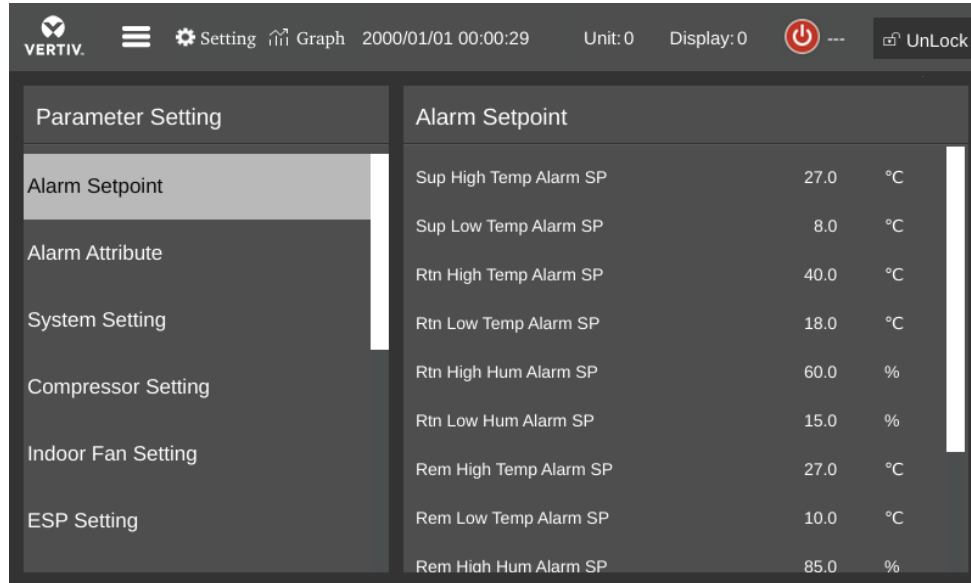


NOTE: It is not recommended to change the default values for alarm parameters. If necessary, operate under the guidance of a trained professional.

Alarm Attribute

You can set enable or disable for the properties of the alarm such as the supply air high temperature alarm, supply air low temperature alarm, return air high temperature alarm, and return air high humidity alarm.

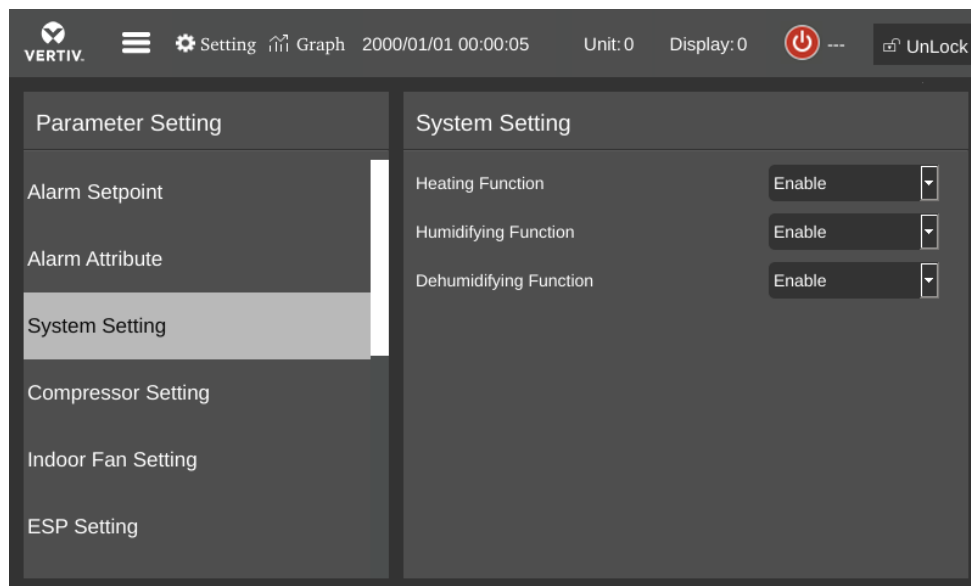
Figure 6.18 Alarm Attribute



System Setting

You can set the heating function, humidification function, and dehumidification function.

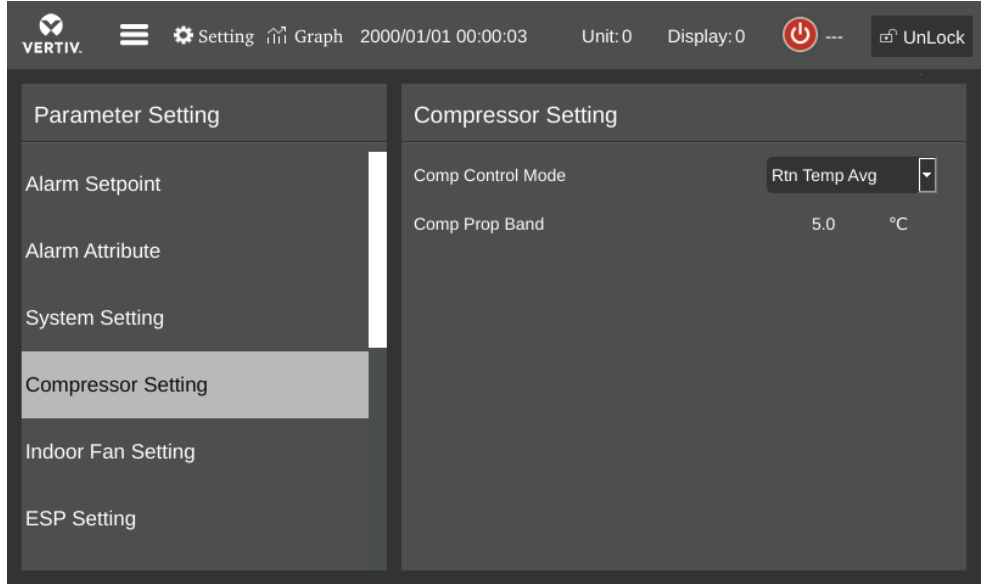
Figure 6.19 System Setting



Compressor Setting

You can set the compressor control mode and the compressor proportional band.

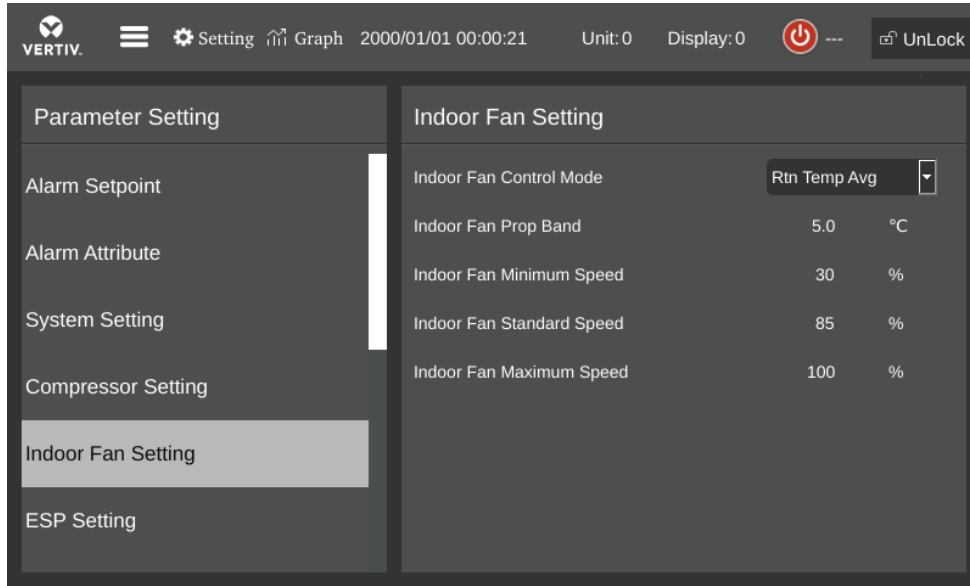
Figure 6.20 Compressor Setting



Indoor Fan Setting

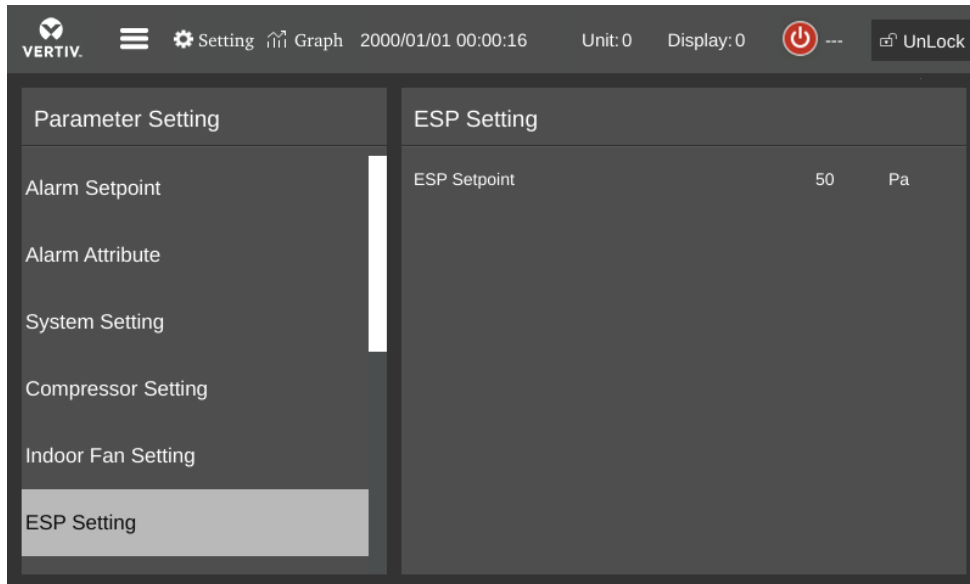
You can set the indoor fan control mode, indoor fan proportional band, the minimum speed, the maximum speed, and the rated speed of the indoor fan.

Figure 6.21 Indoor Fan Setting



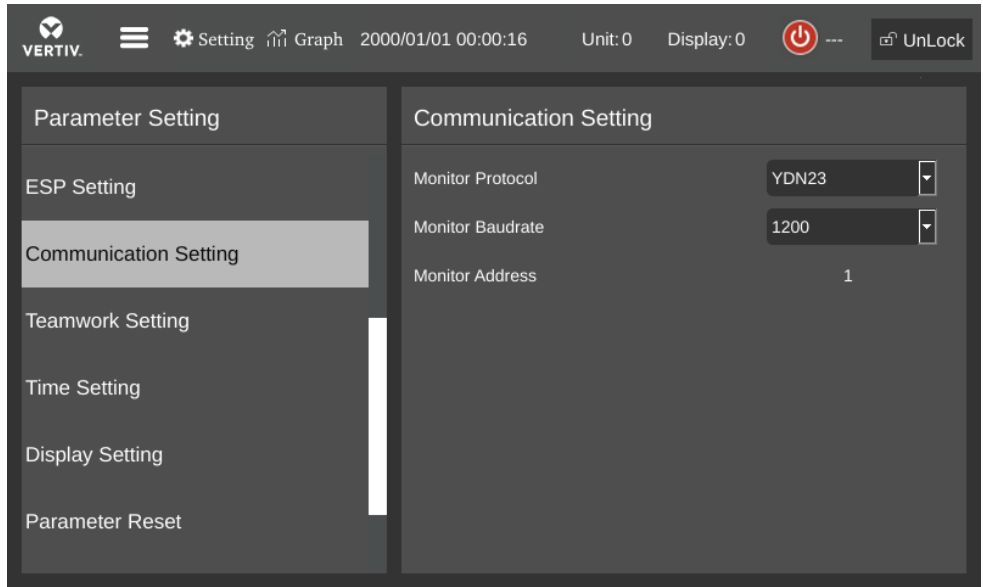
ESP Setting

Figure 6.22 ESP Setting



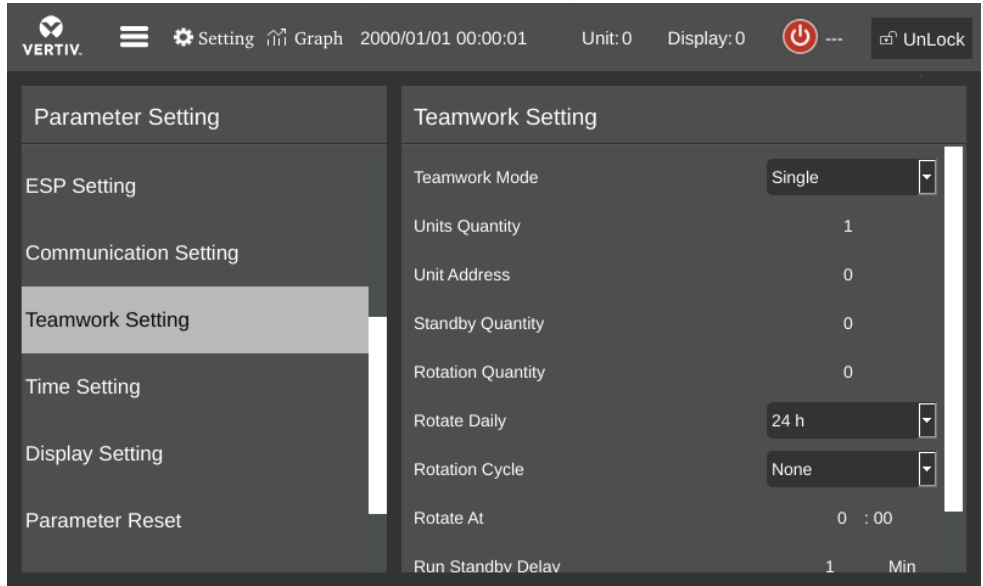
Communication Setting

Figure 6.23 Communication Setting



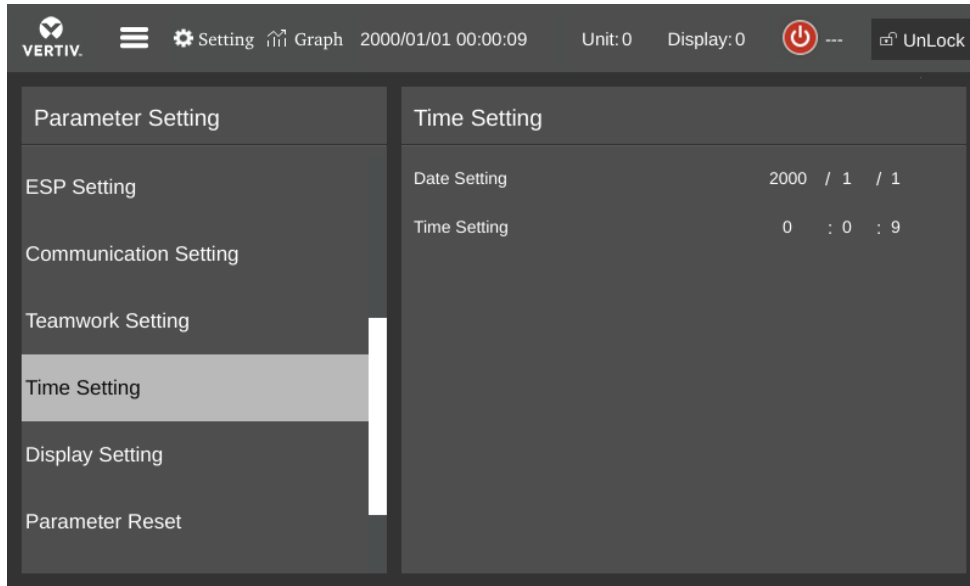
Teamwork Setting

Figure 6.24 Teamwork Setting



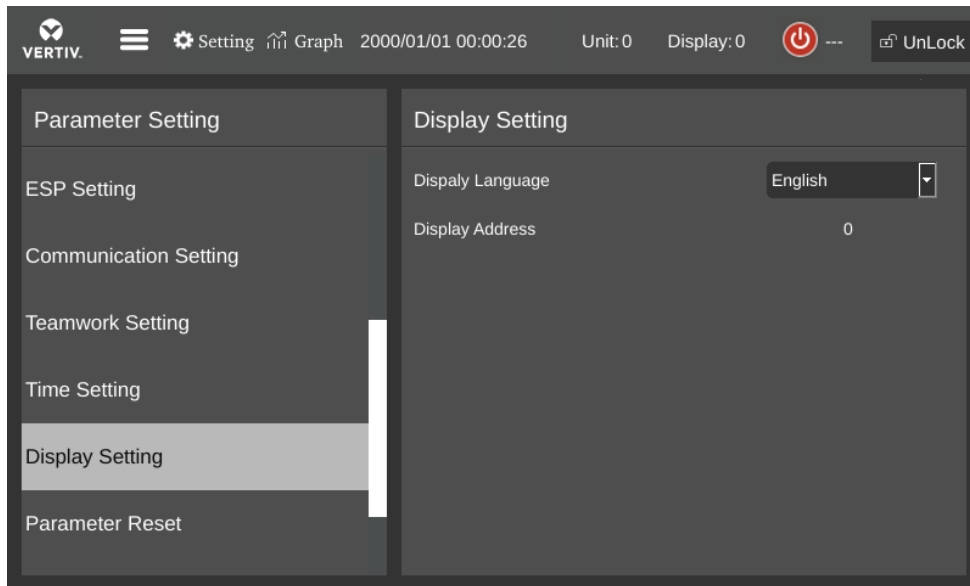
Time Setting

Figure 6.25 Time Setting



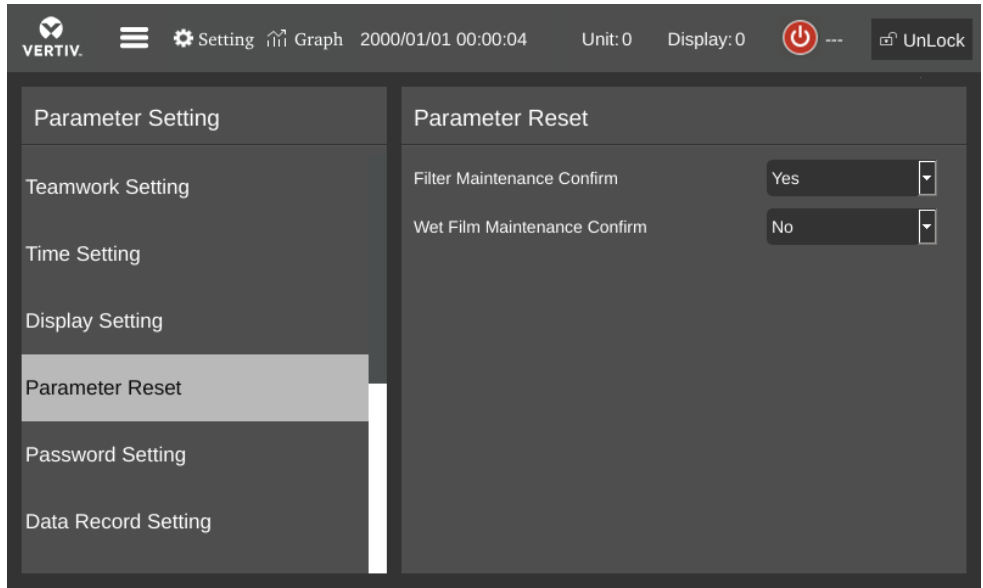
Display Settings

Figure 6.26 Display Settings



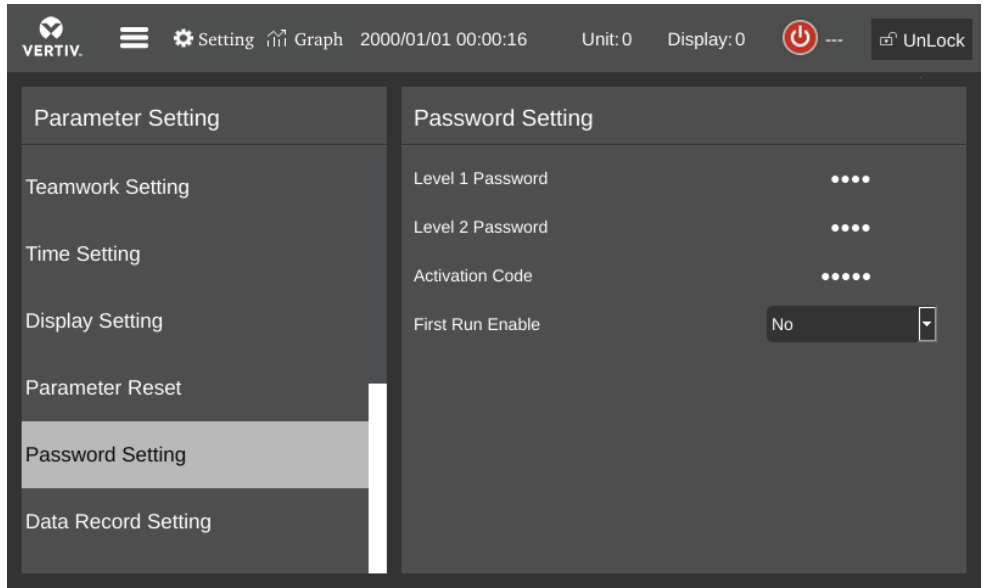
Parameter Reset

Figure 6.27 Parameter Reset



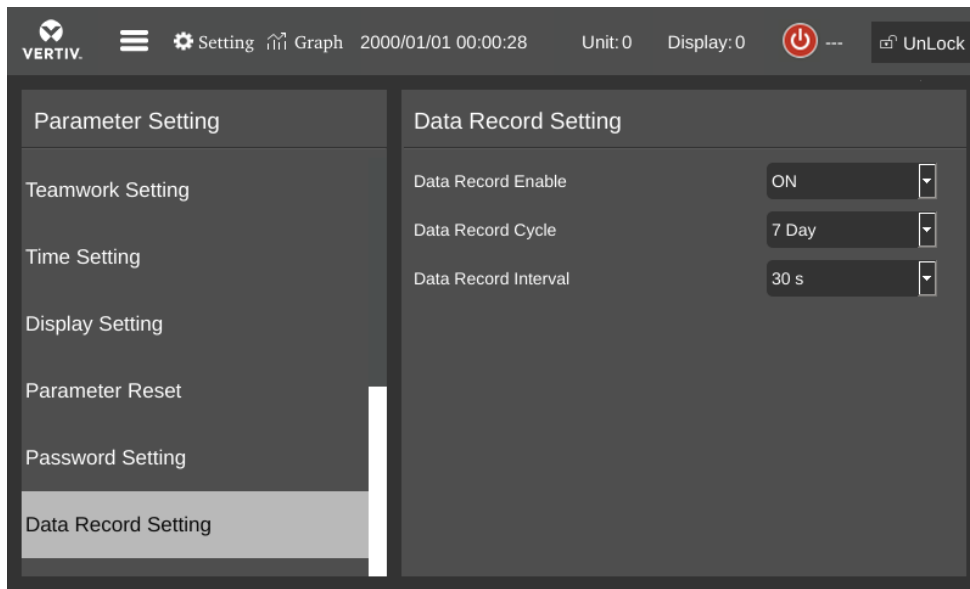
Password Setting

Figure 6.28 Password Setting



Data Record Setting

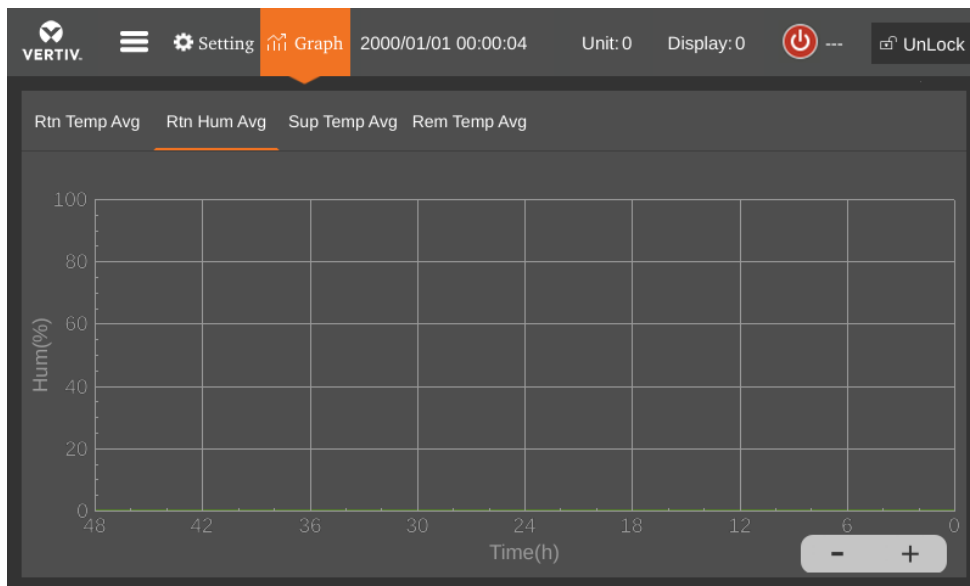
Figure 6.29 Data Record Setting



6.4.6 Temperature and Humidity Curve

Select Temperature and Humidity Curve under the main menu to view the curve of return air temperature, return air humidity, supply air temperature, and average air supply humidity of 0 to 48 hours.

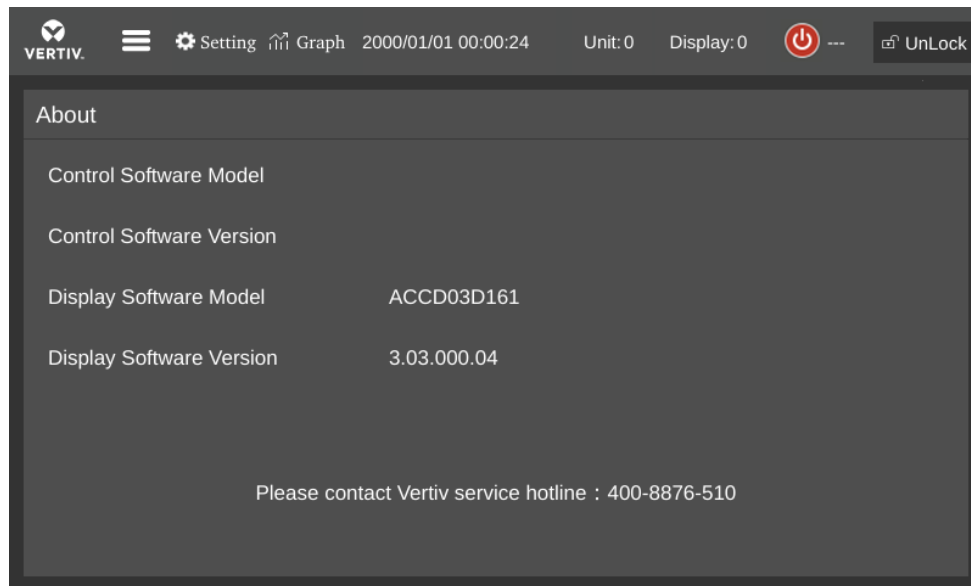
Figure 6.30 Temperature and Humidity Curve



6.4.7 Version Information

You can see the hardware and software version numbers.

Figure 6.31 Version Information



7 Maintenance

Regular system maintenance is essential to ensure product reliability and effectiveness. This section describes routine maintenance inspection, system diagnostic test, and the maintenance of filters, fan assemblies, electrode humidifiers, electric heater, refrigeration system, and drainage system.



WARNING! During the operation of the unit, there may be a fatal voltage in the equipment. When operating, all the notes and warnings on the components and in this manual must be observed; otherwise this may lead to casualties.



WARNING! Only qualified maintenance and maintenance personnel can carry out system maintenance.

7.1 Routine Maintenance Inspection (Monthly)

Check the components of the system every month, focusing on whether the system functions properly and whether the parts show signs of wear.

Table 7.1 Routine Maintenance Inspection (Monthly)

Item	Description	Result
Filter	Check the filter for damage or blockage	
	Check the filter screen clogging switch	
	Clean the filter	
Fans	Check whether the fan impeller is deformed or not	
	Check whether the bearings are worn or not	
Compressor	Check for leaks	
	Listen to the sound of the operation and observe the vibration of the operation	
Air-cooled condenser (air-cooled unit)	Check the cleanliness of the condenser fins	
	Check that the fan mounting base is secure	
	Check whether the shock absorber pad of the fan is aging or broken	
	Check that the lightning protection plate is still valid. (If there is a lightning protection plate, it is best to check once a week in the thunderstorm season)	
Refrigeration circulation system	Check that the refrigerant line is properly supported	
	Check the suction pressure	
	Check the discharge pressure	
	Check the refrigerant line	
	Check the moisture content of the system (by viewing the sight glass)	
	Check the EEV	

Table 7.1 Routine Maintenance Inspection (Monthly) (continued)

Item	Description	Result
Heating system	Check the operation of the reheating system components	
	Check for corrosion of the components	
Water pump filter	Check the water tray for foreign objects	
	Check the pump strainer	

7.2 Routine Maintenance Inspection (Semi-annually)

Table 7.2 Routine Maintenance Inspection (Semi-annually)

Item	Description	Note
Filter	Check the filter for damage or blockage	
	Check the filter screen clogging switch	
	Clean the filter	
Fans	Check whether the fan impeller is deformed or not	
	Check whether the bearings are worn or not	
	Inspect and tighten the circuit connector	
Compressor	Check for leaks	
	Listen to the sound of the operation and observe the vibration of the operation	
	Inspect and tighten the circuit connector	
Air-cooled condenser (air-cooled unit)	Check the cleanliness of the condenser fins	
	Check that the fan mounting base is secure	
	Check whether the shock absorber pad of the fan is aging or broken	
	Check that the lightning protection plate is still valid. (If there is a lightning protection plate, it is best to check once a week in the thunderstorm season)	
	Check the speed controller voltage regulation function	
	Check that the temperature switch is at the specified setpoint	
	Check that the refrigerant line is properly supported	
	Inspect and tighten the circuit connector	
Refrigeration circulation system	Check the suction pressure and suction superheat	
	Check the discharge pressure and condensation supercooling	
	Check the refrigerant line	
	Check the moisture content of the system (by viewing the sight glass)	
Heating system	Check the operation of the heating system components	
	Check for corrosion of the components	
	Inspect and tighten the circuit connector	

Table 7.2 Routine Maintenance Inspection (Semi-annually) (continued)

Item	Description	Note
Electric control system	Check the fuse and leave it open	
	Inspect and tighten the circuit connector	
	Check the control program	
	Check the contact of the contactor	
Water pump filter	Check the water pan for foreign objects	
	Check the pump filter screen	

7.3 Self-diagnostic Test

The micro-processor controller provides a diagnostic function for manually opening and closing each component in the field to self-detect the status of the system function.

7.4 Electrical Connection Check

7.4.1 Electrical System Maintenance

Visually inspect the electrical connections and handle appropriately as follows:

- The whole unit electrical insulation test: find the unqualified contact points and handle them. During the test process, attention should be paid to disconnecting the control part of the safety or air circuit breaker to avoid damage to the control board by high voltage.
- Statically detect whether the suction of each contactor is flexible and whether there is any jamming.
- Clean electrical and control components with brushes or dry compressed air.
- Check the contactor contact suction for arc pulling and burn marks. Replace the appropriate contactor in severe cases.
- Fasten each electrical connection terminal.
- Check that the coupling quick coupling is in good contact and replace the terminals if loose conditions are found.
- If the power cable is damaged, in order to avoid danger, it must be replaced by a professional from the manufacturer.

7.4.2 Control System Maintenance

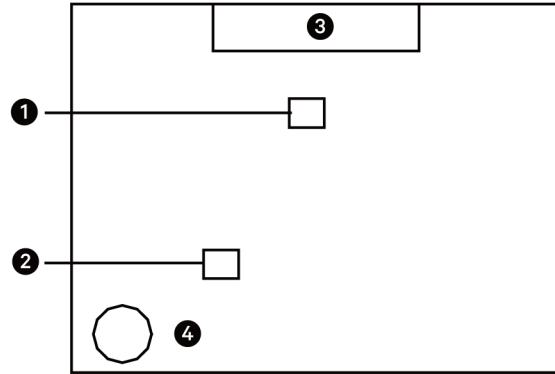
Visual inspect the control part, perform simple function test, and handle appropriately as follows:

- Check the appearance of the transformer and detect the output voltage (including indoor unit and outdoor condenser).
- Detect whether there is obvious aging on the surface of the control interface board, control board, temperature and humidity sensor board, and safety board.
- Clean the dust and dirt on the control elements and control panels of each electrical appliance with a brush and an electronic dust collector.
- Check and tighten the input and output plugs of the control interface board, including the connection between the control board and the control interface board and the connection between the control interface board and the temperature and humidity sensor board.
- Check the connection of the user terminals (70, 71, 37, 38, etc.) to the control interface board.
- Check the output connection of the control interface board to each contactor and to liquid pipe solenoid valve. Check the input connection of high voltage switches, heating over-temperature protection switches, discharge temperature sensors, and high-pressure sensors. Inspect the plug terminals of high-voltage switches and solenoid valve. If there is looseness, poor contact, or failure, replace it immediately.
- Replace electrical components such as control fuses (or air switches) and control panels that have been detected as problematic.
- Detect the specifications and aging of the control cable or power cable between the indoor unit and the condenser, and replace the cable if necessary.
- Measure and calibrate temperature and humidity sensor readings with higher levels of measurement accuracy.
- Adjust the setpoint and detect the action of each functional part according to the control logic.
- Simulate and detect the working state of the protection unit such as high and low pressure report, high and low temperature report, high water level report, and over-temperature protection.
- Check the external sensors.

7.4.3 Water Leak Detection Sensor

Install the water leak detection sensor and confirm the alarm information through the controller. The recommended installation location is shown in the figure below. Place the sensor away from the humid water trap or floor drain. Place it 2 to 2.5 meters away from the unit. Do not install it directly under the unit.

Figure 7.1 Recommended Installation Location of Water Leak Detection Sensor



Item	Description	Item	Description
1	Location of water leak detection sensor	3	Air conditioner
2	Location of water leak detection sensor	4	Floor drainage pipe



WARNING! Before tightening any assembly connection and line connection, ensure that the power supply of the control unit is turned off.



WARNING! It is forbidden to use water leak detection sensor near flammable liquid.



WARNING! It is forbidden to use the water leak detection sensor to detect flammable liquid.

7.5 Filter Maintenance

The filter has an efficiency of 30%, which meets the ASHRAE52-76 and Eurovent 4/5 standards. The dust resistance is 90% (EU4 standard). In order to ensure its effective operation, the filter maintenance alarm logic has been set up in the controller. The operating time of the fan is 2160 hours by default (the operating time can be set according to the local operating environment). If this time exceeds, the filter maintenance alarm is triggered.

Check and replace the filter according to the blockage condition. Check the filter once a month and replace as required during use. Turn off the power before replacing the filter. After replacing the filter, the fan running time should be cleared to zero.

7.6 Fan Component Maintenance

Regularly inspect the working state of the motor, the status of the fan impeller, the fixation of the fan components, and the clearance between the fan and the baffle.

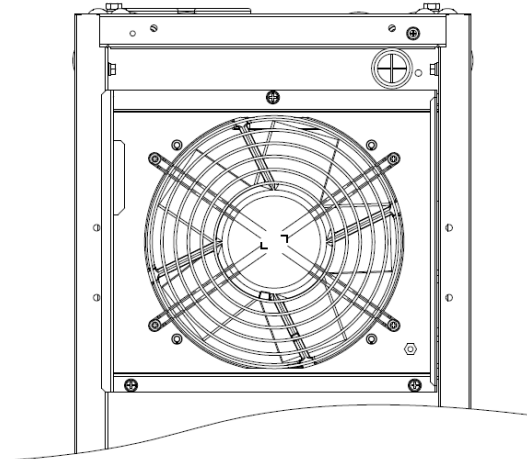
Special attention needs to be paid to whether the fan assembly and the wind guide are firmly installed and whether the fan blades may rub against nearby sheet metal when the blades rotate. Eliminate any factors that cause airflow channel blockage to avoid the harm of air volume reduction to the refrigeration system and other system components.

The fans require an input of 48 Vac main power supply. The fan speed is regulated by the 0 to 10V DC analog signal from the control board. When the fan is abnormal or does not rotate, please focus on the analog signal, the main power supply, and the filter blockage.

The steps to replace the fan are as follows:

1. Cut off the power supply of the whole unit and open the front door.
2. Remove the four screws that fix the fan mounting plate and take out the fan installation components.
3. Remove the four screws and grounding screws that fix the fan and remove them from the mounting plate.
4. Dismantle other fans in the same way.
5. Replace the fan and reinstall the fan by reversing the above steps. Please pay attention to the contact of the hot-swappable terminals during installation.

Figure 7.2 Removing the Fan



WARNING! Do not operate and maintain the fan during the operation of the fan to avoid injury.



WARNING! The outdoor EC fan speed control board can cause strong electric shock, and it is forbidden to maintain or touch it when it is connected to power.



WARNING! During the operation of the unit, it is forbidden to touch the fan mesh cover with your hand to prevent mechanical damage caused by the operation of the fan.

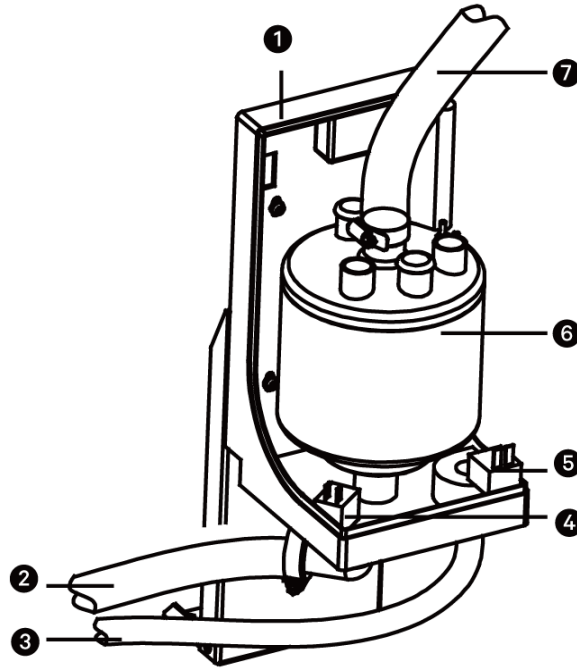
7.7 Electrode Humidifier Maintenance

If the unit is equipped with an electrode humidifier, it should be maintained regularly.

7.7.1 Instructions for Operating Electrode Humidifier

Humidifier components include: humidifier bracket (including water pressure components such as inlet solenoid valves and drainage solenoid valves), humidifier tank, humidifier control board CPY (located in a metal box opposite the humidifier), power frequency transformer, high frequency transformer, contactor, electromagnetic relay, relay socket, humidification inlet pipe, humidification drain, humidification steam pipe, etc.

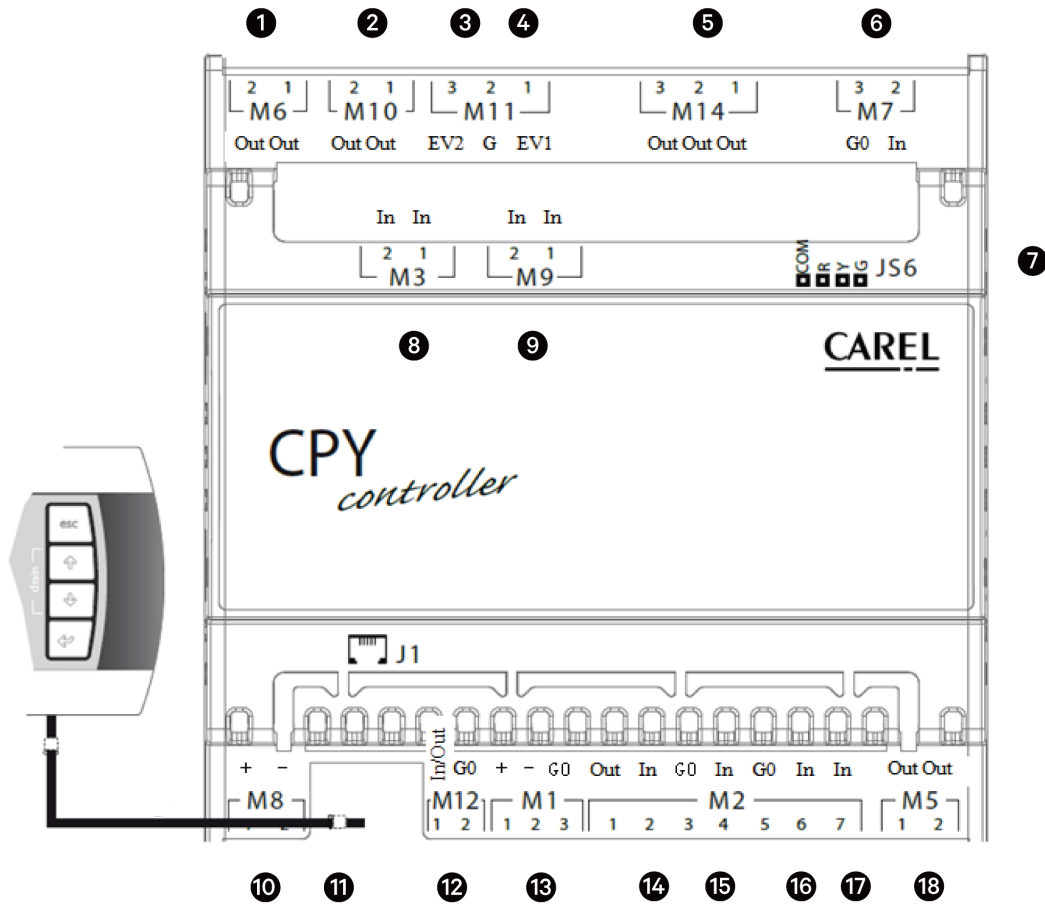
Figure 7.3 Electrode Humidifier



Item	Description	Item	Description
1	Bracket	5	Water inlet solenoid valve
2	Water outlet pipe	6	Humidifier tank
3	Water inlet pipe	7	Vapor pipe
4	Water outlet solenoid valve		

The micro-processor controller calculates whether there is a need for humidification based on the temperature and humidity value feedback from the temperature and humidity sensor. If there is a need for humidification, the humidification command is issued to the humidifier control board, and a 24V working power supply is provided at the same time. The humidifier control board starts the humidification operation. The humidification control board adopts ON/OFF working mode to control the humidifier operation according to the established procedures. The humidifier control board is located in a metal box opposite the humidifier, and its interface is shown in the figure below.

Figure 7.4 Humidifier Control Board



Item	Description	Item	Description
1	Drainage pump startup	10	24 Vac input
2	Electrode humidifier contact point	11	CPY manipulator connection
3	Water outlet solenoid valve	12	tLAN network connection
4	Water inlet solenoid valve	13	RS485
5	Auxiliary relay	14	Control signal
6	Current transformer input	15	Startup operation
7	LED remote control connection	16	Manual water drainage
8	Conductivity gauge	17	Reset timing and alarm
9	High water level sensor	18	Alarm output

7.7.2 Replacing the Humidifier

Clean the humidifier water collector on a monthly basis (the cleaning cycle varies with water quality and humidifier running time). The humidifier drainage contains scale and the long-term accumulation of scale can block the water collector and the drainage pipe.

Humidifier is a consumable component that do not require regular cleaning. If the humidifier continues to feed water, or if the input voltage of the humidifier electrode is normal, but the water cannot boil, it indicates that the humidifier has reached its service life and needs to be replaced. The replacement steps are as follows:

1. Set the humidity setting value lower than the room humidity, and turn off the humidifier.
2. Forcibly empty the humidifier by switching the normal humidification/manual drain switch to the manual drain gear.

Figure 7.5 Manual Drain Switch



3. Cut off the power supply of the whole unit.
4. Remove the humidifier electrode connection cable and the high water level probe from the tank.
5. Loosen the steam output hose clamp and remove the steam hose from the tank fitting.
6. Pull the humidifier body out of the humidifier frame, and pay attention to protecting the O-ring.



WARNING! Tanks and steam hoses can be hot! Allow some time for the humidifier to cool before replacing.

Replace the humidifier by reversing the above steps. In particular, note the following:

- Protect the O-ring between the bottom of the sealed tank and the humidifier frame.
- Ensure that there is no leakage at the steam output hose connection.
- Properly connect the power cable and tighten the crimp nut with a torque of 2 to 3 N.m.
- Reset the humidity setpoint to the initial setting.

Figure 7.6 Humidifier Water Collector



7.8 Wet Film Humidifier Maintenance

7.8.1 Instructions for Operating Wet Film Humidifier

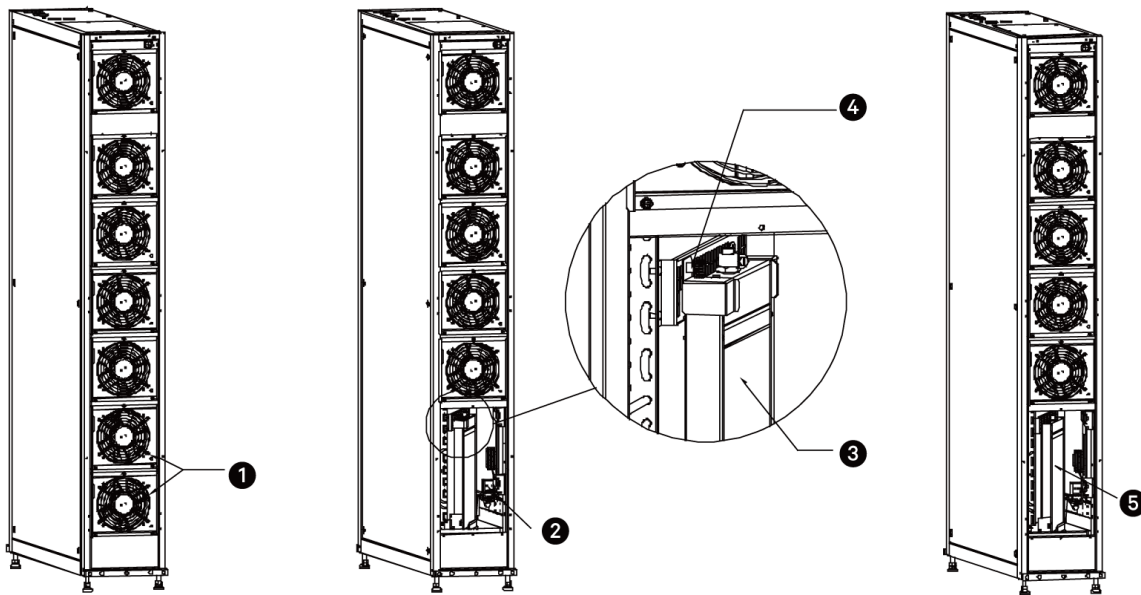
The humidifier includes: humidifier bracket, wet film assembly, humidifier inlet solenoid valve, and humidifier inlet pipe.

7.8.2 Replacing the Wet Film Humidifier

Replace the wet film humidifier on a monthly basis (the cleaning cycle varies with water quality and humidifier running time). The humidifier water supply contains scale and the scale can accumulate on the wet film surface, affecting the humidification effect. The replacement steps are as follows:

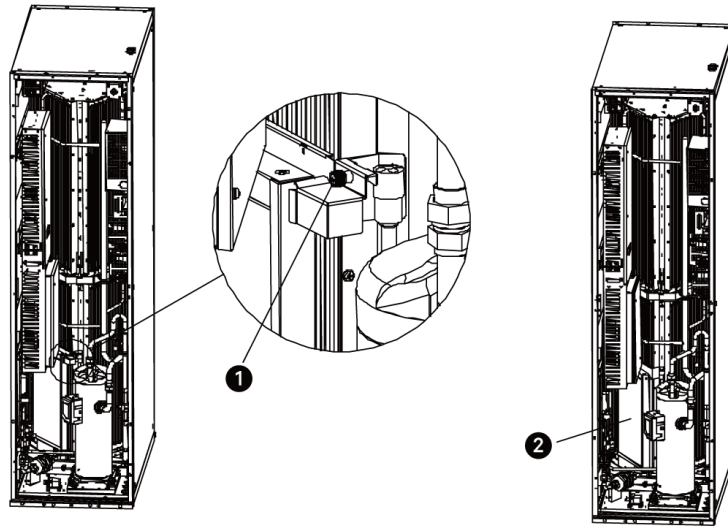
1. For CR036, replace the humidifier from the air supply side. Remove the bottom two fan installation components, and then remove the fan mounting plate. For CR066, replace the humidifier from the air return side.
2. Loosen screws to remove the wet film assembly.
3. Draw the wet film assembly outward and replace it. Reinstall the limit plate and the fan.

Figure 7.7 Replacing Wet Film Assembly (CR036)



Item	Description	Item	Description
1	Removing the bottom two fans and installation plates	4	Loosening the screw and removing the limit plate
2	Solenoid valve	5	Pulling outward the wet film assembly to remove it
3	Wet film		

Figure 7.8 Replacing Wet Film Assembly (CR066)

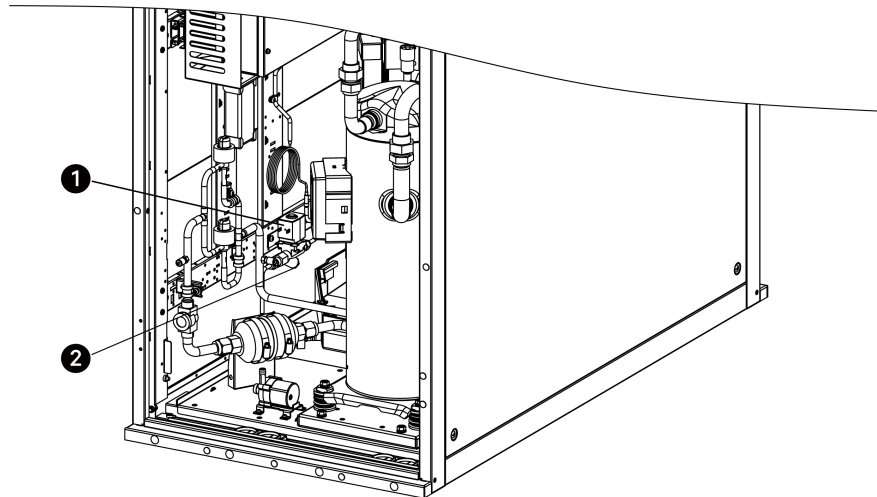


Item	Description
1	Loosening the screw and removing the limit plate
2	Pulling outward the wet film assembly to remove it

7.8.3 Maintaining Water Inlet Solenoid Valve Filter

To ensure the normal water supply of the wet film humidifier, regularly check the water inlet solenoid valve filter to ensure that there is no large scale and debris in the filter, and regularly clean or replace the filter to prevent poor drainage caused by its blockage.

Figure 7.9 Maintaining Water Inlet Solenoid Valve Filter



Item	Description
1	Water inlet solenoid valve
2	Water inlet solenoid valve filter

7.9 Electric Heater Maintenance

If an electric heater is installed, maintain it regularly. Ensure that the surface of the heater is free of dust or impurities, the heater is secured, and the wiring connections are tightly attached. Under normal conditions, the heating element is continuously heated uninterrupted. In order to ensure that the heater can operate normally, check it every six months.

When there is a heating demand but no heating effect, it is necessary to check and replace the electric heater. The steps to replace the electric heater are as follows:

1. Cut off the power supply of the whole unit and open the front door.
2. Disassemble the fan by referring to Section 7.6 Fan Component Maintenance.
3. Remove the electric heater fixing screw from the round hole of the fan mounting plate and take it out.

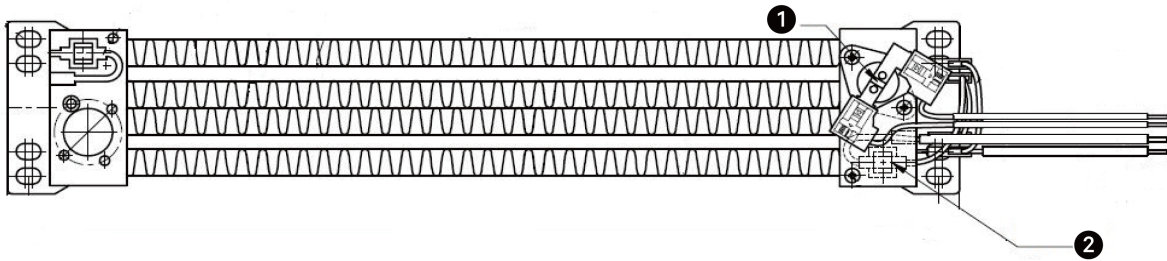
NOTE: Check the rust of electric heater, remove rust with an iron brush, or replace it according to the situation.

NOTE: When there is a heating demand but no heating effect, use the multimeter to check whether the cable connecting the thermostat is on and confirm whether the thermostat is normal.

NOTE: If the line is not turned on, it is necessary to remove the electric heater to further check whether the fuse is disconnected, whether the thermostat is damaged, and whether the PTC electric heating is damaged.

NOTE: If you need to replace the electric heater, please contact the maintenance staff of Vertiv™.

Figure 7.10 PTC Electric Heater



Item	Description
1	Temperature control device
2	Fuse

7.10 Refrigeration System Maintenance

Inspect the components of the refrigeration system monthly to see if the system is functioning properly and check for signs of wear. Check the refrigerant lines and fixing brackets every six months. Refrigerant lines must have appropriate brackets and must not be vibrating against walls, floors, or fixed frames.

Each system is equipped with a sight glass to facilitate the flow of liquid refrigerant and the water content of the system. When the water content in the system exceeds the standard, the background color of the sight glass changes from green to yellow. When there are many bubbles in the sight glass, the refrigerant charge might not be enough.

When the refrigeration system fails, check system operation parameters for causes.

7.10.1 Suction Pressure

When the suction pressure drops below the low pressure alarm setpoint, the compressor may stop. Excessively high suction pressure can also reduce the cooling effect of the refrigerant on the compressor motor, which may cause damage to the compressor. The minimum (pressure switch action setpoint) and maximum (designed-to-operate) suction pressure setpoints are shown in the table below.

Table 7.3 Suction Pressure

Model	R410A minimum pressure bar	R410A maximum pressure bar
CR025, CR036	4.5	12.4
CR035, CR045, CR066	4.5	13.4

7.10.2 Exhaust Pressure

Exhaust pressure may rise or fall due to load conditions or condenser efficiency. When the exhaust pressure reaches the pressure switch setpoint, the high-pressure switching action will cause the compressor to stop. The high-pressure switch setting value is shown in the table below.

Table 7.4 Exhaust Pressure

Model	High-voltage switch operating value, bar, R410A
CR025, CR035, CR036, CR045, CR066	39

7.10.3 EEV

The automatic adjustment of the EEV ensures that the evaporator is supplied with enough refrigerant to meet the needs of the load conditions. By measuring the superheat, it is possible to determine whether the operation of the EEV is normal. If there is too little refrigerant to supply the evaporator, the suction superheat will be very high. If too much refrigerant is supplied to the evaporator, the suction overheat will be low.

NOTE: The suction superheat has a greater impact on the life of the compressor. If the compressor runs for a long time in the case of small or no suction superheat, it may cause the compressor to produce "liquid shock" and cause damage to the compressor.

NOTE: Contact Vertiv™ for adjusting EEV. Users are not recommended to adjust the EEV by themselves.

7.10.4 Air-cooled Condenser

When air flow in the outdoor unit is obstructed, clean the condenser with compressed air or fin cleaner (weak alkaline) to remove dust debris that hinders air flow. When using compressed air to clean the fins, the blowing direction should be the reverse air flow direction. Snow should be avoided in winter around the condenser. Check the fins for rewinding or damage and perform simple repairs if necessary. Check all refrigeration lines for vibration and reinforce if necessary. Carefully inspect all refrigeration line attachments for oil traces to determine the location of the leak.

7.10.5 Compressor



WARNING! When changing the compressor, do not touch or have contact with the refrigerant and lubricating oil. If your skin is exposed to the refrigerant or lubricating oil, severe burns or frostbite may cause to the skin. Wear long-sleeved gloves when handling contaminated parts.

Maintain and inspect the compressor for abnormal operation, rather than replacing the compressor after the failure. The unit adopts DC brushless compressor. Any maintenance operation must be performed strictly in accordance with the correct procedures. Compressor motors rarely burn out due to insulation failure. If the motor burns out, this is probably caused by high temperature overheat brought by poor mechanical operation or lack of lubrication. If these problems can be detected and corrected early, most compressor failures can be avoided.

Inspecting Electrical Components

When diagnosing the compressor, check that all electrical components of the compressor are operating properly:

1. Check all fuses and circuit breakers.
2. Check the work of high voltage switch, high voltage sensor, and low voltage sensor.
3. If the compressor fails, find out whether the compressor failure is due to an electrical failure or a mechanical failure.
4. Check the relevant historical report information and historical operation records.

Mechanical Failure

The mechanical failure of the compressor cannot be judged by smelling the burning odor. Try to turn the motor, and if a mechanical fault is confirmed, the compressor must be replaced. If the motor is burned out, eliminate the factors that cause the motor to burn out and clean the system. It should be noted that the compressor motor burnout is usually caused by improper system cleaning.

Electrical Failure

Electrical failure can be judged by a pronounced pungent odor. If severe burnout occurs, the lubricating oil will turn black and acidic. In the event of electrical failure and complete burnout of the refrigeration compressor motor, clean the system to eliminate acids in the system and avoid such failures in the system in the future.

NOTE: Contact Vertiv™ for the replacement of the compressor.

NOTE: Warranty will not be guaranteed for the damage caused by improper cleaning of the compressor replacement parts.

When the compressor is completely burned out, replace the compressor and the filter drier, and check the EEV. If the EEV fails, replace it as well. Before replacement, it is mandatory to clean the system. If you do not know the cleaning method, contact Vertiv™.

Steps for replacing the compressor:

1. Cut off the power supply of the whole unit.
2. Use standard steps to recover residual refrigerant in the system.
3. Remove the damaged compressor, remove the filter drier, and clean the system according to the instructions for using the cleaning tool.
4. Install and replace the compressor and filter drier. The torque for tightening the discharge pipe threaded connector is 130 N·m, the torque for the suction pipe threaded connector is 150 N·m, and the torque for the filter drier threaded connector is 45 N·m.
5. Perform the pressurized leak detection test for the system. The leak detection pressure is about 10 bar. If there is no problem, evacuate the system.
6. Charge refrigerant to the system according to the charging requirements of the evaporator, condenser, and refrigerant pipeline. For the charging process, see Section 5.2.2 Commissioning Procedures.

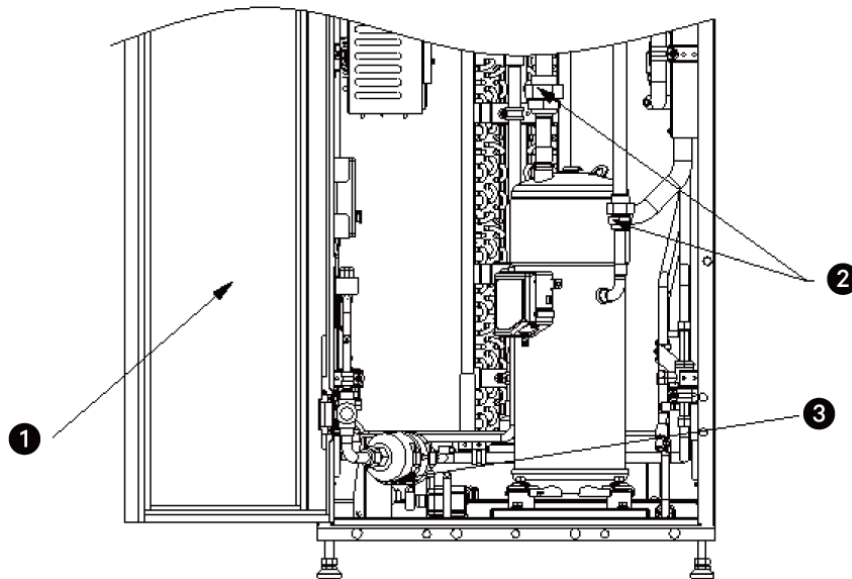
7. Turn on the power supply and run the unit. Check that the refrigeration function is operating properly. Refer to the normal refrigeration cycle suction and discharge pressure range, and dynamically replenish a certain amount of refrigerant if necessary.

NOTE: For the residual refrigerant in the system, the standard device should be used for recovery before maintenance.

NOTE: The discharge of refrigerant into the air will cause pollution to the environment. The emission of refrigerants must comply with national and local laws and regulations.

NOTE: When installing the filter drier, pay attention to the direction and make sure that the arrow points to the sight glass.

Figure 7.11 Replacing the Compressor and Filter Drier

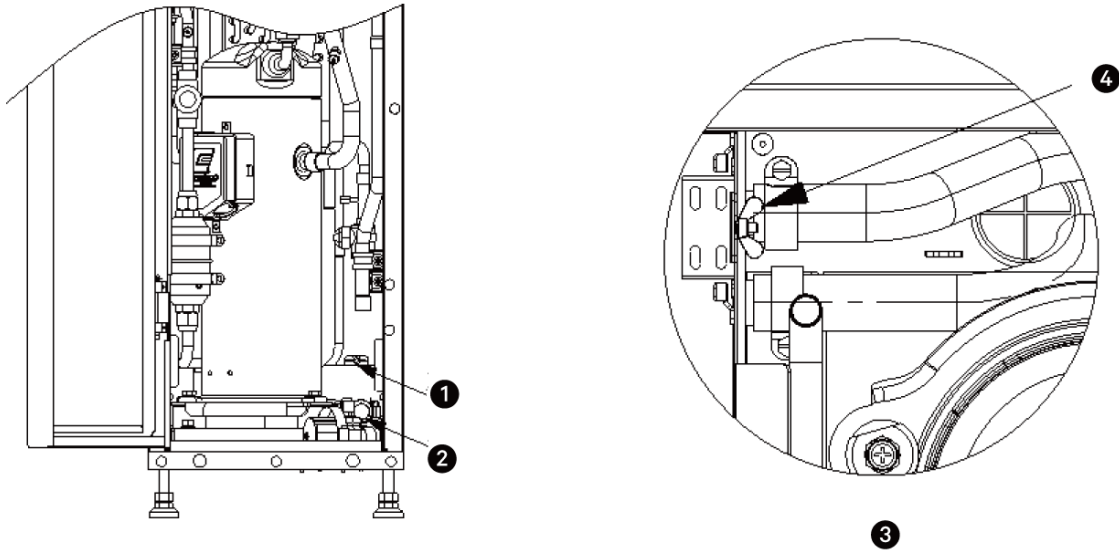


Item	Description	Item	Description
1	Rear door	3	Filter drier
2	Compressor threaded connector		

7.11 Drainage System Maintenance

Condensate drainage water pan filter: Regularly check the water pan to ensure that there is no large piece of scale, debris, and leakage. Regularly check and clean the filter screen of the water pan to prevent blockage.

Figure 7.12 Water Pan Filter Screen

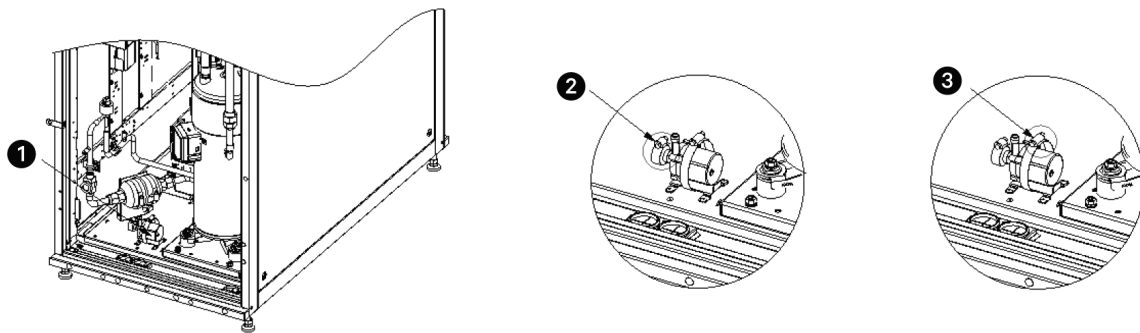


Item	Description	Item	Description
1	Water pan filter screen	3	Outlook view
2	Water pan drainage hole	4	Water pan filter screen

Steps for replacing condensate pump are as follows:

1. Cut off the power supply of the whole unit.
2. Open the rear door, unscrew the hose, and pull out the drainage pipe of the water pan.
3. Unscrew the hose that holds the pump in place.
4. Reverse the above steps and reinstall the pump.

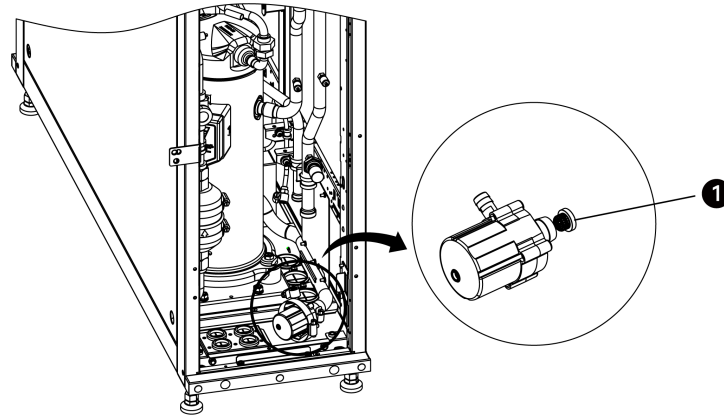
Figure 7.13 Disassembling the Condensate Pump



Item	Description	Item	Description
1	Condenser pump	3	Condensate pump hose
2	Water drainage pipe hose		

Pump filter screen: Regularly check the filter to ensure that there is no large piece of scale and debris. Regularly check and clean the filter screen of the pump to prevent blockage.

Figure 7.14 Position of Pump Filter Screen



Item	Description
1	Filter screen of pump

NOTE: Regularly check the filter screen of the water pan and pump for foreign matter blockage and clean it up.

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8 Troubleshooting

This section describes fault diagnosis and processing. Based on the content in this section, you can refer to the alarm information for fault diagnosis and handling.



WARNING! Some circuits have fatal high voltages. Only professional technicians are allowed to operate the unit. Special care must be taken when troubleshooting with live power.



WARNING! When troubleshooting with jumpers, always remember to remove the jumpers after the repair work is complete. Leftover well-connected jumpers may cross the control functions and cause damage to the device.

8.1 Fan Fault Diagnosis and Handling

Table 8.1 Fan Fault Diagnosis and Handling

Symptom	Possible cause	Check item or handling method
EC fans cannot start	The fan power supply is faulty	Check whether the fan is open and closed When the circuit breaker is in the closed state, check whether the power supply voltage of each phase is normal
	Control board failure	Check the micro-processor control board J15 and J16 to determine whether the control board is faulty
	The fan power module is faulty	Check the alarm light of the fan power supply module to determine whether there is a fault
	EC fan failure	1. Check whether the fan is not charged, the voltage is too low, etc. 2. Check whether the analog output is within the required range of 0 to 10 Vdc 3. Check whether the motor is blocked (the current is too large) 4. Check whether the motor is overheating If the problem occurs at the first three points, the motor can automatically resume operation after troubleshooting the fault point If the motor is overheated, the fan needs to be powered off. After the motor has cooled, it can be restored

8.2 Heating System Fault Diagnosis and Handling

Table 8.2 Heating System Fault Diagnosis and Handling

Symptom	Possible cause	Check item or handling method
The heating system does not operate and the contactor does not fit	There is no heating demand	Check the status of the micro-processor controller to see if there is a need for heating
	The heating system safety device is disconnected	Use a multimeter to detect the resistance across the thermostat. If the resistance is large, the safety device may be disconnected. Check whether the fuse is disconnected and the thermostat is damaged. Use the ohmic meter to detect the resistance of the heater to determine whether the electric heater is damaged
The contactor is in close contact and has no heating effect	The main heater power supply is down	Check whether the heater circuit breaker is closed When the heater contactor is under suction, check whether the contactor L1, L2 and L3 supply voltages are normal
	The heater is burned out	Cut off the power supply and use the ohmic meter to detect the resistance of the heater to determine whether the electric heater is damaged

8.3 Refrigeration System Fault Diagnosis and Handling

Table 8.3 Refrigeration System Fault Diagnosis and Handling

Symptom	Possible cause	Check item or handling method
The compressor cannot start	The power is not on (the unit is in shutdown state)	Check whether the main power supply is undervoltage, overvoltage, or phase missing
	Circuit breaker and contactor failure	Check the compressor circuit breaker, contactors, and connecting wires
	Alarm lock	Check the unit alarm record, replace the damaged device, and power it on
	The compressor coil is short-circuited and burned out	Check the motor windings and replace them immediately if defects are found
The contactor is not suctioned and the compressor is not running	Discharge overheat is low	Check the microprocessor controller status
	High voltage switching action	Detect the high voltage switch to see whether there is a high voltage alarm
	Discharge temperature alarm	Check whether there is a discharge low/high temperature alarm
	Low voltage alarm	Check if there is a low voltage alarm in the historical alarm
	Contactor failure	Check the contactor
	Compressor drive failure	Check the compressor driver
The compressor stops running or the contactor disconnects three minutes after starting	The compressor's built-in protector disconnects	Check if the compressor coil is open. If the circuit is open, wait for the coil to cool down and then automatically reset
	Refrigerant leakage. Low pressure detection is too low/abnormal	1. Check the suction pressure 2. Check the line where the low voltage sensor is located 3. Check whether the reading and actual pressure of the low pressure sensor are within the range of ± 0.3 bar

Table 8.3 Refrigeration System Fault Diagnosis and Handling (continued)

Symptom	Possible cause	Check item or handling method
High voltage protection	The condenser is dirty	Clean the condenser
	The condensing equipment is not functioning	Check condenser fan
	Refrigerant charge is excessive	Check if the cooling level is too high
Low discharge pressure	Refrigerant leakage	Find and repair the leak and add refrigerant
	The outdoor fan speed controller is faulty, and the output voltage is always a full load voltage, which does not change with the condensation pressure	If defects are found, replace the speed controller immediately
After start-up, there is no change in suction and discharge pressure	Compressor inversion or internal gas string	If there is compressor reverse operation, replace any two L lines of the compressor. If gases are mixed and cannot be recovered, replace the compressor
Low suction pressure or return liquid	Insufficient refrigerant in the system	Check for leaks. If so, repair the leak and add refrigerant
	The air filter is too dirty	Replace the air filter
	Filter driers are clogged	Replace the filter drier
	Improperly regulated overheat	Check the EEV control panel
	The EEV sensing element is defective	Replace the sensing element
	Poor airflow distribution	Check the supply air and return air system
	The condensation pressure is too low	Check the condenser
The compressor noise is too loud	Liquid is returned	See the treatment method "Low suction pressure or return liquid"
	Poor lubrication	Add lubricating oil
The compressor is running with overheat	The compression ratio is too high	Check the setting of high and low pressure protection values and check whether the condenser is dirty Check that the evaporator and condenser fan are operating properly
	The suction overheat is too high	Adjust the EEV or add the appropriate amount of refrigerant
Note: The above symptoms are judged on the premise that there is a cooling demand		

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Appendix A: Display Screen Menu Structure

Level 1 Menu	Level 2 Menu	Parameter
Run Information	Temp/Hum Information	Theo Supply Hum, Current Supply Hum, Supply Temp Avg, Supply Temp1, Supply Temp2, Supply Temp3, Supply Hum1, Supply Hum2, Supply Hum3, Return Temp Avg, Return Temp1, Return Temp2, Return Temp3, Remote Temp Avg, Remote Temp1, Remote Temp2, ..., Remote Temp10, Remote Hum Avg, Remote Hum1, Remote Hum2, ..., Remote Hum10
	ESP Information	Unit ESP Avg, Unit ESP1, Unit ESP2
	Switch Status	High Pressure Switch, Remote Shutdown Switch, Water Underfloor Switch, Heater Fail Switch, Humidifier Fail Switch, Cond Water Level Switch, Cond WOF Switch, Filter Clogged Switch, Custom1 Switch, Custom2 Switch, Dual Power Switch, Comp Output, Indoor Fan1 Output, Indoor Fan2 Output, Outdoor Fan Output, Heater Output, Humidifier Output, Cond Pump Output, LLSV Output, MBV Output, Spray Output, General Alarm Output
	Power Information	Phase A Voltage, Phase B Voltage, Phase C Voltage, Power Frequency, Phase A Current, Phase B Current, Phase C Current, Phase A Power, Phase B Power, Phase C Power, Total Power, Total Active Energy
	Teamwork Information	#00 Unit Status, #01 Unit Status, #02 Unit Status, ..., #15 Unit Status
Alarm Information	Alarm Status	
	Alarm History	
	Comp Driver Alarm	
Temp/Hum Setting	Temp Setting	Return Temp SP, Supply Temp SP, Remote Temp SP, Delta Temp SP
	Hum Setting	Supply Hum SP, Hum Prop Band

Level 1 Menu	Level 2 Menu	Parameter
Parameter Setting	Alarm Setpoint	Sup High Temp Alarm SP, Sup Low Temp Alarm SP, Rtn High Temp Alarm SP, Rtn Low Temp Alarm SP, Rtn High Hum Alarm SP, Rtn Low Hum Alarm SP, Rem High Temp Alarm SP, Rem Low Temp Alarm SP, Rem High Hum Alarm SP, Rem Low Hum Alarm SP, Filter Maintenance Cycle, Wet Film Maintenance Cycle
	Alarm Attribute	Supply High Temp Alarm, Supply Low Temp Alarm, Return High Temp Alarm, Return Low Temp Alarm, Return High Hum Alarm, Return Low Hum Alarm, Remote High Temp Alarm, Remote Low Temp Alarm, Remote High Hum Alarm, Remote Low Hum Alarm
	System Setting	Heating Function, Humidifying Function, Dehumidifying Function
	Compressor Setting	Comp Control Mode, Comp Prop Band
	Indoor Fan Setting	Indoor Fan Control Mode, Indoor Fan Prop Band, Indoor Fan Minimum Speed, Indoor Fan Standard Speed, Indoor Fan Maximum Speed
	Humidifier Setting	Humidifying Function, Humidifier Type, Wet Film First Fill Time, Wet Film Fill Time, Wet Film Fill Interval
	ESP Setting	ESP Setpoint
	Communication Setting	Monitor Protocol, Monitor Baudrate, Monitor Address
	Teamwork Setting	Teamwork Mode, Units Quantity, Unit Address, Standby Quantity, Rotation Quantity, Rotate Daily, Rotation Cycle, Rotate At, Run Standby Delay, Manual Rotate
	Time Setting	Date Setting, Time Setting
	Display Setting	Display Language, Display Address
	Parameter Reset	Wet Film Maintenance Confirm, Filter Maintenance Confirm
	Password Setting	Level 1 Password, Level 2 Password, Deployment Startup Password, Deployment Required Password
Parameter Setting	Data Record Setting	DataRecord Enable, DataRecord Cycle, DataRecord Interval
Temp/Hum Graph	Rtn Temp Avg	
	Rtn Hum Avg	
	Sup Temp Avg	
	Rem Temp Avg	
About	Control Software Model	
	Control Software Version	
	Display Software Model	
	Display Software Version	

Appendix B: Alarm

High Pressure Alarm	Smoke Alarm	Remote Hum Sensor7 Failure	Power Undervoltage
Low Pressure Alarm	Fire Alarm	Remote Hum Sensor8 Failure	Power Freq Offset
Discharge High Temp Alarm	SPD Failure	Remote Hum Sensor9 Failure	Power Phase Reverse
Discharge Low SH Alarm	Remote Shutdown Alarm	Remote Hum Sensor10 Failure	Unit Address Repeat
High Pressure Lock	Water Underfloor Alarm	Airflow Temp Sensor Failure	Primary Unit Loss
Low Pressure Lock	Custom1 Alarm	High Pressure Sensor Failure	Secondary Unit Loss
Discharge High Temp Lock	Custom2 Alarm	Dsch Temp Sensor Failure	Filter Maintenance
Discharge Low SH Lock	Supply Temp Sensor1 Failure	ESP Sensor1 Failure	Filter Clogged Alarm
HP Abnormal Alarm	Supply Temp Sensor2 Failure	ESP Sensor2 Failure	Secondary Power Feed Supply
LP Sensor Lock	Supply Temp Sensor3 Failure	Comp Driver Comm Failure	Outdoor Fan Comm Failure
Supply High Temp Alarm	Supply Hum Sensor1 Failure	Comp Driver Comm Lock	Outdoor Fan System Alarm
Supply Low Temp Alarm	Supply Hum Sensor2 Failure	Comp Driver Protect U01	Spray Comm Failure
Remote High Temp Alarm	Supply Hum Sensor3 Failure	Comp Driver Protect U02	Spray High Pressure Failure
Remote Low Temp Alarm	Return Temp Sensor1 Failure	Comp Driver Protect U03	Spray High Pressure Failure Lock
Remote High Hum Alarm	Return Temp Sensor2 Failure	Comp Driver Protect U04	Spray Low Pressure Failure
Remote Low Hum Alarm	Return Temp Sensor3 Failure	Comp Driver Protect U05	Spray Antifreeze Maintenance
Return High Temp Alarm	Return Hum Sensor1 Failure	Comp Driver Protect U06	10DI2 Comm Failure
Return Low Temp Alarm	Return Hum Sensor2 Failure	Comp Driver Protect U07	Fan11 Failure
Return High Hum Alarm	Return Hum Sensor3 Failure	Comp Driver Protect U08	Fan12 Failure
Return Low Hum Alarm	Remote Temp Sensor1 Failure	Comp Driver Protect U09	ATS Comm Failure
Loss Of Airflow Alarm	Remote Temp Sensor2 Failure	Comp Driver Protect U10	Power Meter Comm Failure
10DI1 Comm Failure	Remote Temp Sensor3 Failure	Comp Driver Protect U11	Wet Film Maintenance
Fan1 Failure	Remote Temp Sensor4 Failure	Comp Driver Protect U12	EEV Driver Device Failure
Fan2 Failure	Remote Temp Sensor5 Failure	Comp Driver Protect U13	Low Refrigerant
Fan3 Failure	Remote Temp Sensor6 Failure	Comp Driver Protect U14	
Fan4 Failure	Remote Temp Sensor7 Failure	Comp Driver Protect U15	
Fan5 Failure	Remote Temp Sensor8 Failure	Comp Driver Protect U16	
Fan6 Failure	Remote Temp Sensor9 Failure	Comp Driver Lock	
Fan7 Failure	Remote Temp Sensor10 Failure	EEV Driver Comm Failure	
Fan8 Failure	Remote Hum Sensor1 Failure	EEV Driver Parameter Error	
Fan9 Failure	Remote Hum Sensor2 Failure	Suction Temp Sensor Failure	
Fan10 Failure	Remote Hum Sensor3 Failure	LP Sensor Failure	

Humidifier Failure	Remote Hum Sensor4 Failure	Power Loss	
Cond WOF Alarm	Remote Hum Sensor5 Failure	Power Phase Loss	
Heater Failure	Remote Hum Sensor6 Failure	Power Overvoltage	

Appendix C: Driver Alarm Code

Serial Number	Compressor Driver Alarm Code	Code Description	Generation Conditions
1	E01	Hardware failure	Hardware problems detected during initialization
2	E02	Acceleration overcurrent	The instantaneous current value exceeds the overcurrent point during acceleration
3	E03	Deceleration overcurrent	The instantaneous current value exceeds the overcurrent point during deceleration
4	E04	Constant speed overcurrent	The instantaneous current value exceeds the overcurrent point at constant speed
5	E05	Acceleration overvoltage	Bus voltage exceeds 820V during acceleration
6	E06	Deceleration overvoltage	Bus voltage exceeds 820V during deceleration
7	E07	Constant speed overvoltage	Bus voltage exceeds 820V at constant speed
8	E08	Snubber Resistor Failure	Power-on snubber resistor failure
9	E09	Undervoltage fault	Bus voltage below 350V
10	E10	Inverter Overload	Inverter overload
11	E11	Motor overload (non-stop)	Motor overload
12	E12	Input Phase Loss	Input phase loss
13	E13	Output Phase Loss	Output phase loss
14	E14	IGBT overheating	IGBT temperature exceeds the overtemperature value
16	E16	Communication failure	Failure to communicate with the master
17	E17	Contactors Failure	Relay failure
18	E18	Current detection failure	Abnormal current sampling value detected during initialization
19	E19	Motor tuning failure	Motor parameter self-learning failure
21	E21	EEPROM read and write failure	EEPROM read and write failure
22	E22	Tuning parameters are abnormal	Parameters of motor parameter self-learning are abnormal
23	E23	Short to ground fault	Inverter output short to ground
24	E24	Motor phase-to-phase short circuit fault	Inverter output phase-to-phase short circuit
30	E30	Load drop fault	Load current drops to 10% of motor rated current
42	E42	Excessive speed deviation fault	The difference between the motor operating frequency and the inverter output frequency is too large

Appendix D: Maintenance Inspection List

D.1 Maintenance Inspection List (Monthly)

Date: _____		Inspector: _____	
Device model: _____		Serial number: _____	
<p>Filter</p> <ol style="list-style-type: none"> 1. Check whether the filter is broken or blocked 2. Check the filter blocking switch 3. Clean the filter 	<p>Refrigeration circulation system</p> <ol style="list-style-type: none"> 1. Check the suction pressure and suction superheat 2. Check the discharge pressure and condensation supercooling 3. Check the refrigerant line 4. Check the moisture content of the system (viewed through the sight glass) 5. Check the EEV 		
<p>Fan</p> <ol style="list-style-type: none"> 1. Check whether the fan impeller is deformed or not 2. Check whether the bearing is worn or not 	<p>Heating system</p> <ol style="list-style-type: none"> 1. Check the operation of the reheat system components 2. Check the corrosion of the components 		
<p>Compressor</p> <ol style="list-style-type: none"> 1. Check for leaks 2. Listen to the sound of the operation and observe the vibration of the operation 	<p>Humidification system</p> <ol style="list-style-type: none"> 1. Check the surface of the wet film for limescale 2. Check whether the wet film is broken 3. Check the solenoid valve for water supply 		
<p>Air-cooled condenser (if used):</p> <ol style="list-style-type: none"> 1. Cleanliness of the condenser fins 2. Check whether the installation base of the fan is firm 3. Check whether the fan shock absorber mat is aging or damaged 4. Check whether the lightning protection plate is still valid (if there is a lightning protection plate. For thunderstorm seasons it is best to check once a week) 5. Check whether the refrigerant line has appropriate support 			

Signature: _____

Note: Please make a copy of this list for record keeping.

D.2 Maintenance Inspection List (Semi-annual)

Date: _____		Inspector: _____	
Device model: _____		Serial number: _____	
<p>Filter</p> <ol style="list-style-type: none"> 1. Check whether the filter is broken or blocked 2. Check the filter blocking switch 3. Clean the filter 	<p>Refrigeration circulation system</p> <ol style="list-style-type: none"> 1. Check the suction pressure and suction superheat 2. Check the discharge pressure and condensation supercooling 3. Check the refrigerant line 4. Check the moisture content of the system (viewed through the sight glass) 5. Check the EEV 6. Check whether refrigerant needs to be added (viewed through the sight glass) 		
<p>Fan</p> <ol style="list-style-type: none"> 1. Check whether the fan impeller is deformed or not 2. Check whether the bearing is worn or not 3. Check and tighten the circuit connector 	<p>Heating system</p> <ol style="list-style-type: none"> 1. Check the operation of the reheat system components 2. Check the corrosion of the components 3. Check and tighten the circuit connector 		
<p>Compressor</p> <ol style="list-style-type: none"> 1. Check for leaks 2. Listen to the sound of the operation and observe the vibration of the operation 3. Check and tighten the circuit connector 	<p>Humidification system</p> <ol style="list-style-type: none"> 1. Check the surface of the wet film for limescale 2. Check whether the wet film is broken 3. Check the solenoid valve for water supply 		
<p>Air-cooled condenser (if used):</p> <ol style="list-style-type: none"> 1. Check the cleanliness of the condenser fins 2. Check whether the installation base of the fan is firm 3. Check whether the fan shock absorber mat is aging or damaged 4. Check whether the lightning protection plate is still valid (if there is a lightning protection plate. For thunderstorm seasons it is best to check once a week) 5. Check the speed controller voltage regulation function 6. Check whether the temperature switch is at the specified set value 7. Check whether the refrigerant line has appropriate support 8. Check and tighten the circuit connector 	<p>Electric control unit:</p> <ol style="list-style-type: none"> 1. Check the fuse and circuit breaker 2. Check and tighten the circuit connector 3. Check the control program 4. Check the contact of the contactor 		

Signature: _____

Note: Please make a copy of this list for record keeping.

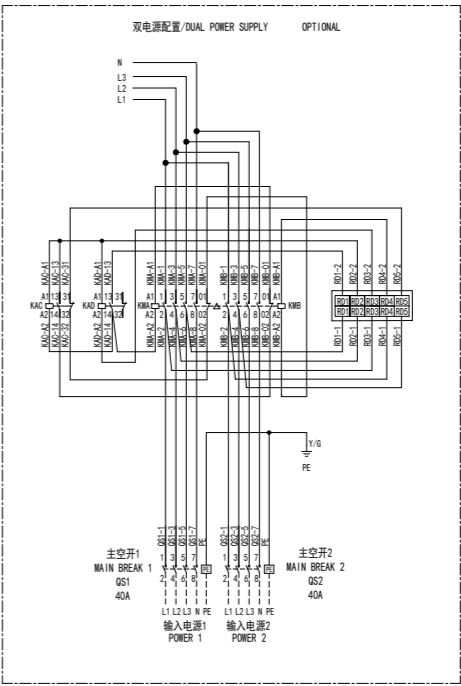
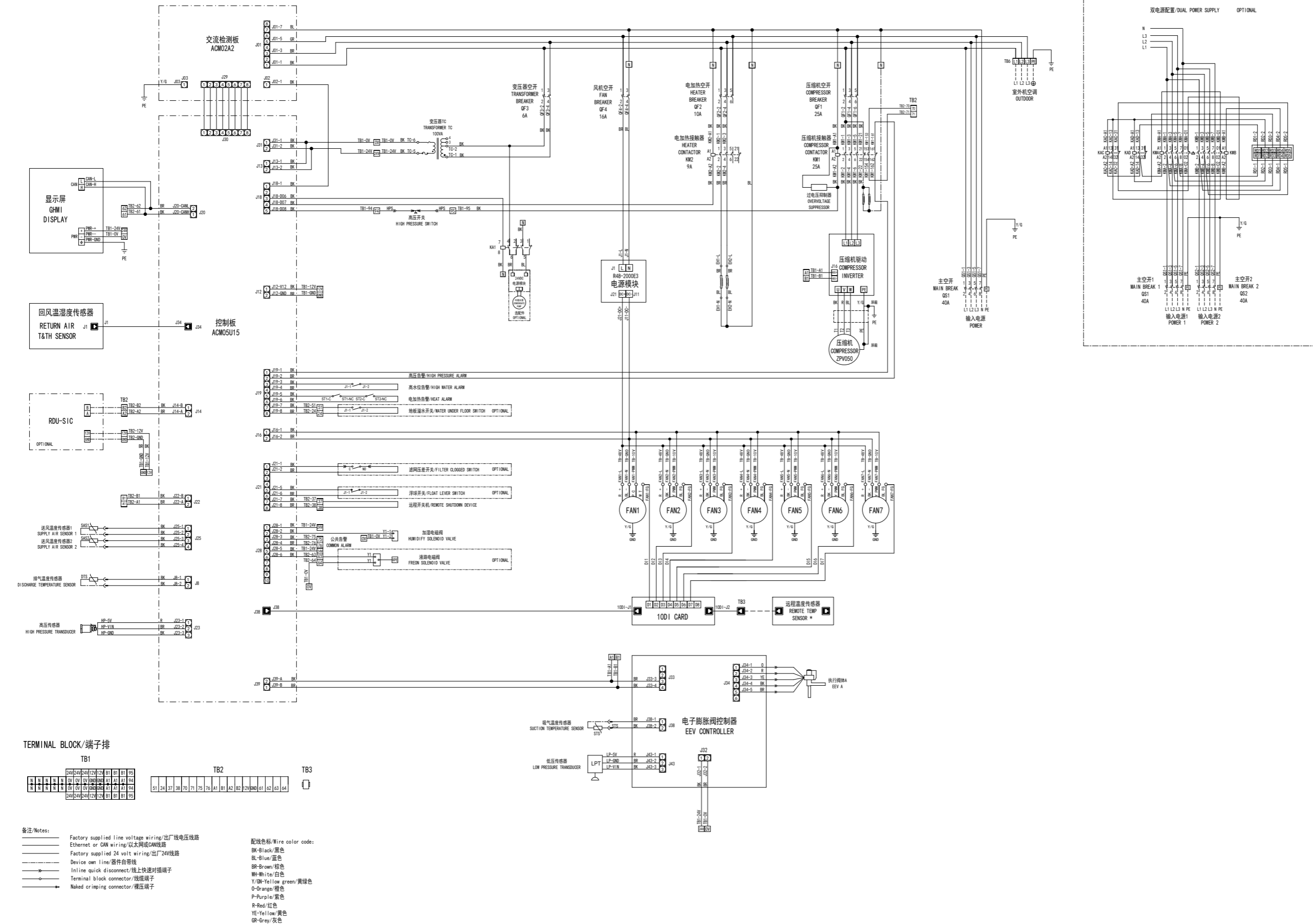
Appendix E: Hazardous Substances

Parts	Harmful substance					
	Lead or Plumbum (Pb)	Mercury or Hydrargum (Hg)	Cadmium (Cd)	Hexavalent chromium [Cr(VI)]	Polybromi- nated biphe- nyls (PBB)	Polybromi- nated diphe- nyl ethers (PBDE)
Cabinet	o	o	o	o	o	o
Cooling fitting	o	o	o	o	o	o
Fan unit	o	o	o	o	o	o
Heating unit	o	o	o	o	o	o
Electric control unit	x	o	o	o	o	o
Display screen	x	o	o	o	o	o
Heat exchanger	o	o	o	o	o	o
Copper pipe	o	o	o	o	o	o
Cable	o	o	o	o	o	o
<p>o indicates that the content of the hazardous substances in all the average quality materials of the part is within the limits specified in SJ/T-11363 - 2006</p> <p>x indicates the content of the hazardous substances in at least one of the average quality materials of the part exceeds the limits specified in SJ/T-11363 - 2006</p>						
<p>Vertiv™ is committed to the design and manufacture of environment-friendly products. It will reduce and eventually eliminate toxic and hazardous substances in the products through unremitting efforts in research. However, limited by the current technical level, the following parts still contain hazardous substance due to the lack of reliable substitute or mature solution.</p> <p>The reason that some of the above parts contain Lead or Plumbum (Pb) is as follows: diode medium and high temperature solders contain lead; resistor glass uranium contains lead (exemption); electronic ceramics contain lead (exemption)</p>						
<p>About Environmental Protection Use Period: The Environmental Protection Use Period of the product is marked on the product. Under normal working conditions and normal use of products observing relevant safety precautions, the hazardous substances in the product will not seriously affect the environment, personnel safety or property in the Environmental Protection Use Period starting from the manufacturing date</p>						
<p>Applicable product: Liebert® CRV4 series air-cooled precision air conditioners</p>						

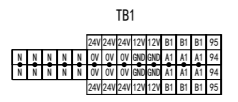
Appendix F: Circuit Diagram

- **CR025 Circuit Diagram**
- **CR035 Circuit Diagram**
- **CR045 Circuit Diagram**
- **CR036 Circuit Diagram**
- **CR066 Circuit Diagram**

CR036 Circuit Diagram



TERMINAL BLOCK/端子排



- 备注/Notes:**
- Factory supplied line voltage wiring/出厂线电压线路
 - Ethernet or CAN wiring/以太网或CAN线路
 - Factory supplied 24 volt wiring/出厂24V线路
 - Device own line/器件自带线
 - Inline quick disconnect/线上快速对插端子
 - Terminal block connector/线束端子
 - Naked crimping connector/裸压端子
- 配线色标/Wire color code:**
- BK-Black/黑色
 - BL-Blue/蓝色
 - BR-Brown/棕色
 - WH-White/白色
 - Y/GN-Yellow green/黄绿色
 - O-Orange/橙色
 - P-Purple/紫色
 - R-Red/红色
 - YE-Yellow/黄色
 - GR-Grey/灰色

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