Liebert® DM

Precision Air Conditioning

User Manual

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Purpose of the Document

This document applies to the series of precision air conditioners and cooling solutions which maintain optimal environmental control of technological ecosystems at minimal operating costs. This document gives an overview of the specifications, installation, commissioning, and maintenance procedures with troubleshooting from the user perspective. The figures used in this document are for reference only.

Please read this manual carefully before installing, maintaining, and troubleshooting.

Vertiv™ Liebert® DM precision CRAC is a professional device, only professionals are permitted to access the unit and is kept in a place where access is restricted to common people.

Styling used in this Guide

The styles used in the manual will be defined as mentioned in the following table:

Situation	Description
Warning/Danger/Caution 	• *The Warning/Danger/Caution note indicates a hazardous or potentially harmful situation that can result in death or injury. It also indicates instructions that need to be adhered to, failing which may result in danger and safety issues thereby having an adverse effect on the reliability of the device and security. Even for practices not related to physical injury, to avoid equipment damage, performance degradation, or interruption in service, follow the warning instruction, carefully.*
Note 	• *The Note section indicates additional and useful information. It also calls attention to best practices and industry-best protocols that are standardized and help make maximum utilization of the resources at hand. Helpful information related to the product also comes under the Note heading, helping the users with the definitions, concepts, and terminologies used in the manual.*

Version History

Product Name	AC BOM No.	EC BOM No.	Relese Date	Revision No.
DME07	01306112 & 13	01306114 & 15	13/09/2021	V2
DME12	01306122 & 23	01306124 & 25	13/09/2021	V2
DME17	01303763 to 65	--	13/09/2021	V2
DME22	01304682 & 83; 01304690 to 92; 01304701	--	13/09/2021	V1
DME27	--	F0128444 & 45	13/09/2021	V1

Product Name	BOM No.	Relese Date	Revision No.
DMC07	01306127	13/09/2021	V2
DMC12	01306129	13/09/2021	V2
DMC17	01303769	13/09/2021	V2
DMC22	01304698	13/09/2021	V1
DMC27	F0128702	13/09/2021	V1

Safety Precautions and Measures

The important safety precautions and measures that should be followed during the installation and maintenance are described in the following sections.

Read the manual prior to installation and operation of the unit. Only qualified personnel should move, install, or service this equipment.

Before working on the equipment, the user reads and considers all precautions, compliance and safety measures. The unit control must be used exclusively for the purpose which it is intended for; the manufacturer takes no liability for incorrect use or a modification to the unit control.

Adhere to all the Warnings and Cautionary measures included in the manual.

Please read this manual carefully before installing, maintaining and troubleshooting; especially the Warning/Danger/Caution information in the User Guide. Apart from the User Guide, also pay attention to the warning labels on the unit and its components.

This manual is retained for the entire service life of the unit. The user must read all the precautions, danger, warnings, and cautionary measures mentioned in the manual prior to carrying out any operations on the unit. Each unit is equipped with an electric insulation which allows the users to work in safe conditions. The main switch is positioned on the electrical panel cover; to access it, open the right door. Before any maintenance operation, switch off the unit with this electrical insulation device to eliminate risks such as electrical shocks, burns, automatic restarting, moving parts, and remote control. The panel key, supplied along with the unit, must be kept by the personnel responsible for the maintenance. The protective covers can be removed after the electric power has been cut off by opening the main switch.

In the following sections, notice the various cautionary measures and warnings that need to be read carefully prior to installing or operating the system.

Disconnect the local and remote power supplies prior to working with the unit.

Prior to the installation process, read all the instructions, verify if all the parts are in place, and check the nameplate to ensure the voltage matches the available utility power for the unit.

The controller doesn't isolate power from the unit even in the Off mode, and some internal components still require and receive power during the Off mode.

If the unit door is open while the fans are operating, the airflow may result in abrupt slamming of the door resulting in injury. Another aspect is the presence of small objects in the fans bay that can result in object ejection during the fan start-up and there is a probable risk of being hit by these objects resulting in grievous injury and causing equipment damage.

The unit contains fluids and gases under high pressure. Therefore, the pressure should be relieved before working with the piping.

Various components such as compressors, refrigerant discharge lines, and humidifiers are extremely hot during the unit operation. Therefore, allow sufficient time for the unit to cool down before working with the unit. Handle the unit with extreme caution and wear safety gears such as protective gloves, safety shoes, and arm protection while working with the hot compressors, discharge lines, and reheats.

There is a risk of water leaking that can damage both the equipment and the building. Effective water drain connection and facilities should be available. Installation should be precise. Implementation of the application and service practices should be appropriate and fault-free. Failure to comply with these norms will result in water leakage from the unit. Water leakage can lead to massive damage and loss of critical equipment in the hosting ecosystem. Therefore, care should be taken to ensure that the unit is not located directly above any equipment that could sustain damage due to water and excessive moisture. Use of a leak detection system for the unit and system supply lines are recommended by Vertiv Co.

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Chapter 1: Overview

This chapter introduces the model description, product introduction, basic parameters, main components, optional components, and ambient requirements of Vertiv™ Liebert® DM air conditioner (hereafter Liebert® DM).

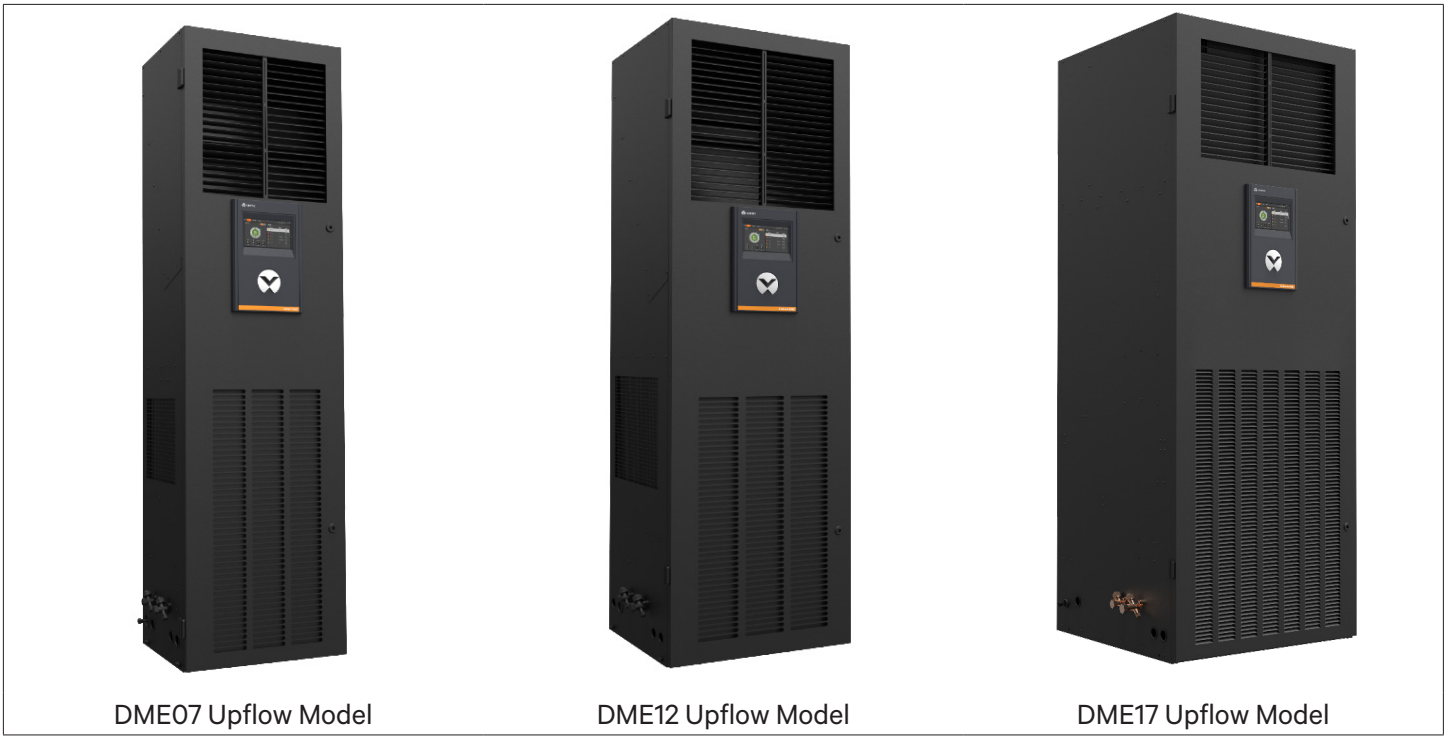
1.1. Product Introduction

The Liebert DM AC is a small precise environment control system, specially designed for cooling the electrical equipment room/ small IT room. It is applicable to environment control in equipment room, computer room and similar eco-system. Featuring high reliability, it can maintain a favorable environment for precision equipment such as sensitive equipments, industrial processing equipments, communication equipments, and computers.

The Liebert DM AC has a micro-processing controller that can automatically switch over to the required function (cooling or heating, dehumidifying or humidifying), based on the advance programmed algorithm, setpoints and room ambient conditions. The cooling kit is provided as standard that can precisely control the ambient temperature. An electrical heater and the humidifier are provided as options to precisely control the ambient humidity. If the AC unit is only available for cooling, the optional components are not needed. Each Liebert DM unit consists of an indoor unit and the outdoor unit, these units must be installed on the seperate floors or rooms.

1.1.1. Indoor unit

Liebert DM series air conditioner with 07 kW/12 kW/17 kW/22 kW/27 kW cooling capacity used in 400 V (±10%) three-phase power supply distribution.



DME07 Upflow Model | DME12 Upflow Model | DME17 Upflow Model

Figure 1-1 Liebert DM Indoor Unit (07 kW, 12 kW, and 17 kW)

DME22/27 Upflow Model DME22/27 Downflow Model

Figure 1-2 Liebert® DM Indoor Unit (22 kW and 27 kW)

1.1.2. Outdoor unit

The outdoor unit is an air-cooled type.

DMC07WA1 DMC12WA1 DMC17WA1

Figure 1-3 Liebert® DM Outdoor Unit (07 kW, 12 kW and 17 kW)

DMC22/27MA1

Figure 1-4 Liebert® DM Outdoor Unit (22 kW and 27 kW)

A water-cooled condenser option is available on request, contact Vertiv representative for more details.

1.2. Model Description

The Liebert® DM air conditioner series is fully-defined by eleven digits, as represented in Table 1-1.

Table 1-1 Liebert DM Model Nomenclature

1	2	3	4	5	6	7	8	9	10	11
D	M	E	0	7	M	C	S	U	A	1

Digit 1,2 Product Model	
DM	***DataMate***
Digit 3 Unit	
E	***Indoor Unit***
C	Outdoor Unit
Digit 4,5 Cooling Capacity kW	
0-9	***Nominal Cooling Capacity - kW***
Digit 6 Power Supply	
M	***400 V, 3 Ph, 50 Hz***
W	230 V, 1 Ph, 50 Hz
Digit 7 Cooling System	
C	***Cooling Only***
0	Cooling and Heating
H	Cooling and Heating and Humidifying
Digit 8 Fan	
S	***Forward Centrifugal Fan AC Type***
0	Backward Centrifugal Fan AC Type
1	EC Fan
Digit 9 Air Discharge	
U	***Upflow***
F	Downflow
Digit 10 Client Code	
A	***For Asia Pacific Customer***
Digit 11 Version	
1-9	***Design Version***

The standard components are represented in ***'Bold Italic'*** font in Table 1-1.

- *The specification options represented in nomenclature such as Cooling system, Fan and Air discharge are only applicable to the Indoor unit.*
- *Power supply of 400 V, 3 Ph, 60 Hz is available on request, contact vertiv representative for details.*
- *There is no Cooling Only option for 07 kW and 12 kW models.*

1.3. Basic Performance Parameters

The basic performance parameters of the Liebert® DM air conditioner are shown in Table 1-2.

Table 1-2 Basic Performance Parameters

Model	Nominal Cooling Capacity (kW)	Power (kW)	Heating Power[1] (kW)	Humidification Capacity[2] (kg/h)
DME07M**UA1 (upflow)	7.5	2.5	3.0	1.5
DME12M**UA1 (upflow)	12.5	4.3	3.0	1.5
DME17M*0UA1 (upflow)	17.0	5.7	5.5	3.0
DME22M*0UA1 (upflow)	22.0	7.0	6.0	3.0
DME22M*0FA1 (downflow)	22.0	7.4	6.0	3.0
DME27M*1UA1 (upflow)	28.1	8.9	6.0	3.0
DME27M*1FA1 (downflow)	28.1	9.3	6.0	3.0

1. *The heating power values are only applicable for models with the electrical heating option.*
2. *The humidification capacity values are only applicable for models with humidification option.*

Due to the continuous upgrade of the unit, the technical parameters are subject to change without prior notice, therefore for the details of performance parameters refer to respective nameplate of the unit.

1.4. Main Components

1.4.1. Indoor Unit

The indoor unit consists of evaporator, compressor, fan, micro-processing controller, thermal expansion valve, filter dryer, sight glass, strainer, electrical heater (optional), humidifier (optional), and surge protective devices (SPD optional). For optional component details, refer to Section 1.5.

- Evaporator

The unit is equipped with with a high-efficiency finned-tube heat exchanger along with a distributor, which is designed and verified according to the individual model to ensure that the refrigerant is distributed evenly in each circuit, thereby improving the effectiveness of the evaporator.

- Compressor

The Liebert DM unit consists of a compressor with high efficiency ratio. It has features such as low vibration, low noise and high reliability, refer Figure 1-5 for better understanding.

Figure 1-5 Scroll Compressor

- Centrifugal Fan

A highly efficient and reliable centrifugal fan is provided in Vertiv™ Liebert® DM unit, that can handle large airflow. It also has features such as long throw, direct driven, and easily maintainable.

Figure 1-6 Centrifugal Fan

- Microprocessor

Figure 1-7 Microprocessor Controller Screen

Vertiv™ Liebert® DM air conditioning unit is configured with 7-inch HMI color screen. The user-friendly interface operation is simple. The multi-level password protection feature can effectively prevent unauthorized operation. It also provides self recovery on power failure; high & low voltage protection functions and phase loss protection. 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.

- Thermal Expansion Valve (TXV)

The Liebert® DM unit has an external equalizer type mechanical Thermal Expansion Valve (TXV) which accurately regulates the refrigerant flow into the evaporator.

Figure 1-8 Thermal Expansion Valve (TXV)

- Filter Dryer

Moisture can adversely affect the operations and service life of a system in the refrigeration life-cycle. In order to rectify this condition, the unit is equipped with a filter dryer that can filter out, hold, and prevent the moisture particles from circulating through the system.

Figure 1-9 Filter Dryer

- Sight Glass (Only for 22 kW and 27 kW)

The sight glass is an utility used for observing the refrigerant state; specifically, the moisture content of the system. If the moisture content exceeds the levels of defined standards, then there is a color change in sight glass, indicating the presence of moisture content in the refrigerant.

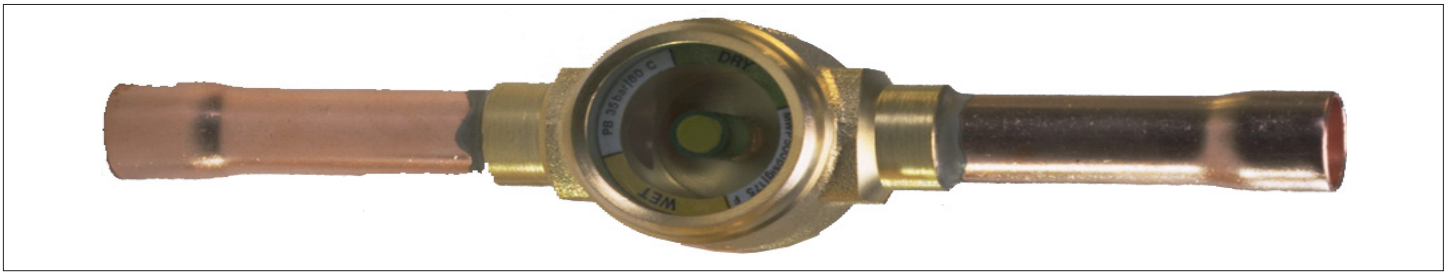


Figure 1-10 Sight Glass

- Air Filter

The Liebert® DM unit is equipped with a nylon air filter rated for 90% filtration efficiency at 10-micron particle size. The air filter has features such as compact structure, reusable, and easy maintenance.

A standard G4 filter option is available on request, contact Vertiv representative for more details.

1.4.2. Outdoor Unit

Vertiv™ Liebert® DM outdoor unit consists of condenser coil, fan, and fan speed controller.

- Condenser Coil

The unit is equipped with an uniquely designed finned-tube heat exchanger (condenser) with wavy fin on the surface, which facilitate high heat transfer rate. The condenser also has anti-dust feature over its surface thereby enables easy cleaning and maintenance of the outdoor unit.

- Fan

The fan has axial flow blades with low noise and a high performance 3 Ph induction motor which can be customized to operate on a wide voltage range with high reliability.

Figure 1-11 Axial Flow Blade

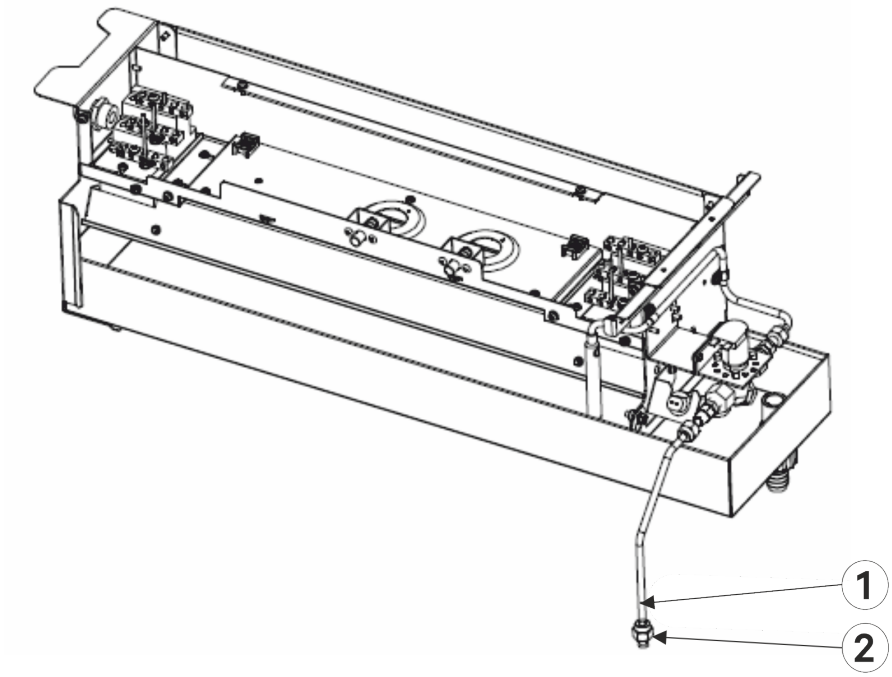
- Fan Speed Controller (Only for 22 kW and 27 kW)

The Liebert DM unit is equipped with a fan speed controller that is used to control the fan speed according to the requirements of the air conditioner condenser based on the condenser pressure and input conditions. The fan speed controller is installed in the outdoor unit, and used to control the speed of the outdoor unit fan.

1.5. Optional Components

1.5.1. Infrared Humidifier

The humidifier can add pure water vapor (up to 3 kg/hour) into the room to control the humidity within levels required by equipment or computer room. The humidifier consists of an infrared lamp, a water injection valve, a humidifying water pan, a temperature protection device, and a water level alarm device.



No.	Description	No.	Description
1	Inlet pipe	2	Outlet joint

Figure 1-12 Infrared Humidifier

- *The humidifier is installed and tested in the factory.*
- *The Liebert® DM can control the ambient humidity only if a humidifier is installed.*

1.5.2. Electrical Heating

Vertiv™ Liebert® DM series uses a ceramic heater with Positive Temperature Co-efficient (PTC) which is highly reliable and safe. A temperature sensor is provided on the surface of the heater that signals to cut off the power of the heater when the surface temperature is too high. When the surface temperature decreases back to the normal temperature, the temperature sensor signals the heater to start automatically.

Optional two-stage electrical heating can be provided according to customers' requirement, which helps maintaining a more precision control of the ambient temperature.

Figure 1-13 Electrical Heater

1.5.3. Communication Protocol

The Liebert DM air-cooled unit is equipped with standard Modbus RTU for monitoring.

1.5.4. Monitoring

The RDU-SIC card or Unity card is used in the Liebert DM series.

- Using the Web browser to monitor your equipment and the environment through the Web server function provided by the RDU-SIC card.
- Using the Network Management System (NMS) to monitor customers' intelligent equipment and the environment through the SNMP agent function provided by the RDU-SIC card.
- Using the equipment room management software (RDU-Manager) to monitor customers' intelligent equipment and the environment through the TCP/IP port provided by RDU-SIC card.
- Using the centralized management software (Nform) to monitor customers' intelligent equipment through the Vertiv Server function provided by the RDU-SIC card.
- An industry-standard modbus communication protocol that allows the system to communicate with the host computer and receive the control instructions from the host software through a unity communication card.

1.5.5. Energy-saving Card

Vertiv™ Liebert® DM can monitor the maximum room temperature with the energy-saving card. The card is located outside the unit cabinet such that it can accurately measure high heat load and temperature of the unit. Up to four cards can be configured in the unit.
When the '**Sleep Mode**' is set to **'ENAB'** and only indoor fan is running, and if all the energy-saving cards sense the temperature of the unit is lower than the '**Sleep Mode**' setpoint temperature then the unit turns off the indoor fan and enters into the Sleep Mode to save energy.

1.5.6. Power SPD

The power SPD is used for surge over-voltage protection in second level (C-level) single-phase (or three-phase) AC power supply. It provides status indication and alarm function of the unit.

The humidifier, electrical heater and power SPD should be installed in factory.

1.5.7. Floor Leak Detection Sensor

Liebert® DM series can be supplied with an optional single floor leak detector (a point leak sensor); when the 'Floor Leak Detector sensor' detects water under floor, it sends a signal to the controller and then controller triggers the alarm.

1.5.8. Installation Accessories

The Liebert DM 07 kW, 12 kW and 17 kW units can be supplied with installation accessories according to user's requirements. See Table 1-3 for details.

Table 1-3 Installation Accessories (Liebert DM 07 kW, 12 kW and 17 kW)

Name		Specifications	Remark
07 kW	Discharge pipe	1/2"" (12.7 mm) copper pipe	5.0 m optional
	Liquid pipe	3/8"" (9.52 mm) copper pipe	5.0 m optional
12 kW / 17 kW	Discharge pipe	5/8"" (16 mm) copper pipe	5.0 m optional
	Liquid pipe	1/2"" (12.7 mm) copper pipe	5.0 m optional
Outdoor unit power supply cable		(3*0.75 mm^2)	8.0 m optional
Indoor unit power supply cable		(5*4 mm^2)	7.0 m optional

The Liebert DM 22 kW and 27 kW units can be supplied with installation accessories according to user's requirements. See Table 1-4 for details.

Table 1-4 Installation Accessories (Liebert DM 22 kW and 27 kW)

Name	Specifications	Remark
Discharge pipe	3/4" (19 mm) copper pipe	7.5 m optional
Liquid pipe	5/8" (16 mm) copper pipe	7.5 m optional
Outdoor unit power supply cable	16 AWG (1.5 mm^2)	9.0 m optional
Outdoor unit signal cable	20 AWG (0.5 mm^2)	9.0 m optional
Indoor unit power supply cable	10 AWG (6 mm^2)	9.0 m optional

1.6. Environmental Conditions Requirements

1.6.1. Operating Environment Requirements

The operating environment requirements for Liebert® DM are given in Table 1-5.

Table 1-5 Operating Environment Requirements

Item	Requirements
Installation position	The maximum equivalent horizontal distance between indoor and outdoor units[1]: 50 m; Vertical distance ΔH[2]: -5 m ≤ ΔH ≤ 20 m
Installation orientation and mounting base requirement	Indoor unit: vertical mode only; Floor stand for upflow unit ≥ 150 mm; Floor stand for downflow unit ≥ 450 mm; Outdoor unit: 07 kW/12 kW/17 kW—Only vertical mode" 22 kW/27 kW—horizontal or vertical mode
Ambient temperature	Indoor: 18 °C to 32 °C; Outdoor: -15 °C to +45 °C(standard model) / -34 °C to +45 °C (low-temperature components model) [3]
Ambient humidity	Indoor: 30% RH to 80% RH
Protection level	Outdoor unit: IPX4
Altitude	< 1000 m, derating is required when location altitude is above 1000 m
Operation voltage range	400 V, 3 Ph, 50 Hz (±3%)

1. *For the equivalent lengths of components, refer to 2.6.*
2. *The value of* ΔH *is positive, if the outdoor unit is installed above the indoor unit;* ΔH *is negative, if the indoor unit is installed above the outdoor unit.*
3. *In case of any non-standard design application for example, if outdoor environment temperature is below -15 °C, then consult Vertiv representative.*
4. *If you need to operate the service valve (outdoor) below -20 °C ambient temperature, then consult Vertiv representative for guidance.*
5. The power supply of 380 V to 415 V, 3 Ph, 60 Hz option is available on request, contact Vertiv representative for details.

1.6.2. Storage Environment Requirements

The storage environment requirements for Liebert® DM are given in Table 1-6.

Table 1-6 Storage Environment Requirements

Item	Requirements
Storage environment	Clean indoor without dust
Ambient humidity	5% RH to 95% RH
Ambient temperature	-25 °C to +55 °C (transport environment 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.

1.7. Refrigerant Charging Requirement

The unit has a specifically designed air conditioning system that requires a specified quantity of refrigerant (R410A) to perform continuously at the most optimum efficiency. For the details on the quantity of refrigerant to be charged into the system, refer 2.8 for more detail on refrigerant charging requirement.

Do not use sub-standard quality inferior refrigerant as it may cause extensive damage to the system. Vertiv does not undertake any responsibility for all the related consequences that are resulted from using a low quality inferior refrigerant.

Chapter 2: Mechanical Installation

This chapter describes the mechanical installation of the Vertiv™ Liebert® DM, including unpacking & inspection, installation notes, system installation arrangement, installing indoor and outdoor units, piping, removing transportation fasteners, adding refrigerant for long pipe system, and inspection items.

2.1. Unpacking and Inspection

Move the unit to the location near to the final installation site and then unpack the packaging.

Check that the fittings are complete and the components are intact against the packing list. If any parts are found missing or damaged, report immediately to the local office of the carrier and Vertiv representative. Do not accept a damaged unit

The air conditioning unit is factory charged with 0.2 MPa (2 bar) of nitrogen. If the unit has no pressure after unpacking inspection, then consult Vertiv representative.

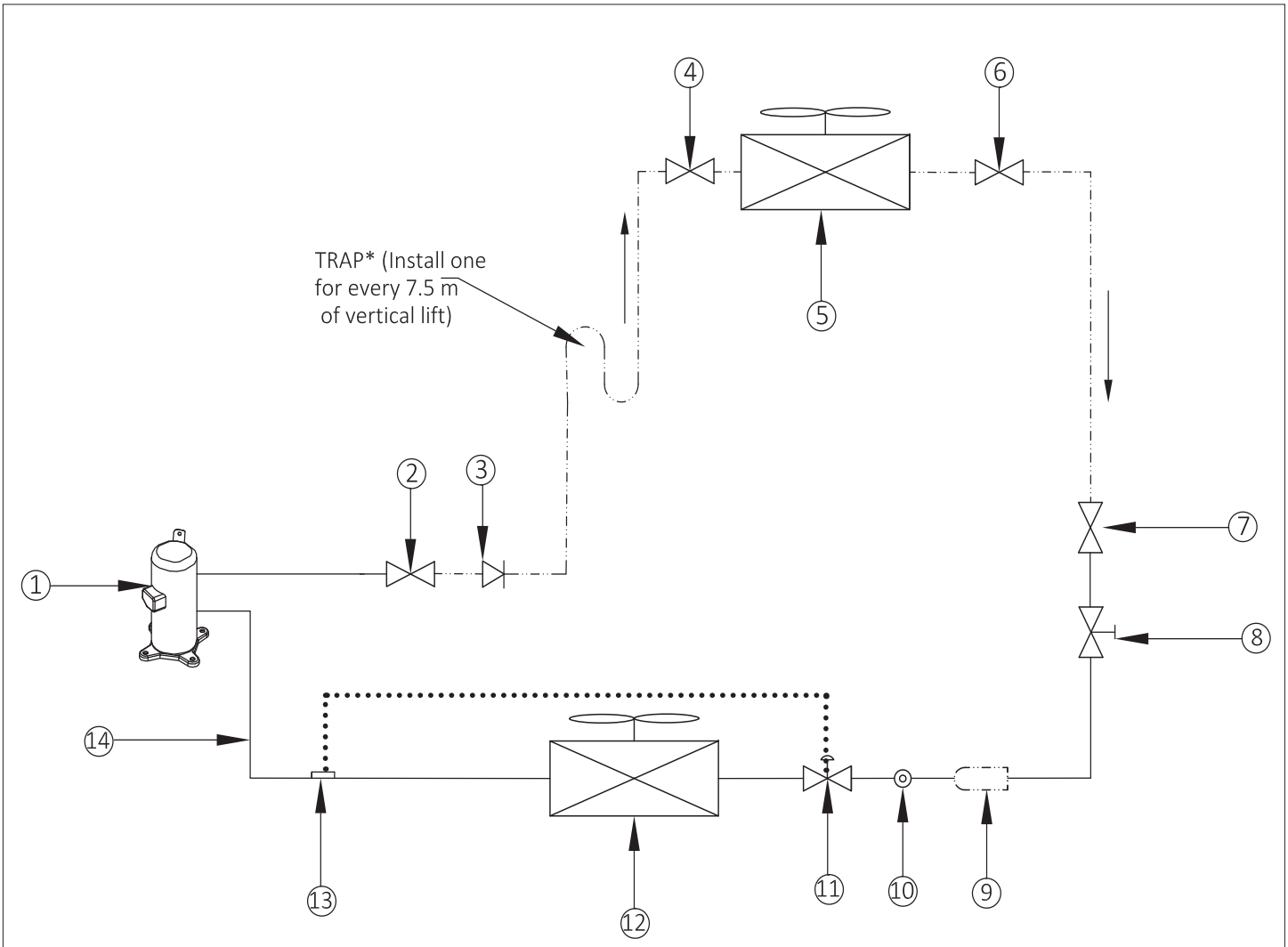
2.2. Installation Notes

- The Liebert DM adopts raised floor installation; adequate installation space for the indoor unit must be provided. The air-cooled indoor unit must be installed on the floor of equipment room or computer room and the outdoor unit must be installed outside of equipment/computer room or on the floor of other rooms.
- Vertiv recommends that the site preparation is defined as per the requirements. However, if these requirements are not met, Vertiv recommends that rectifications should be made on the site in order to comply with the specified requirements and conditions.
- However, if the rectifications or modifications are not implemented, then Vertiv does not guarantee the accuracy and precision of the temperature and humidity provided by the unit.
- The Liebert DM air-cooled air conditioner is charged in the factory with 0.2 MPa (2 bar) nitrogen for shipping; before installation release the internal nitrogen of the unit.
- The installers must strictly follow the design drawings for installation and reserve the space for maintenance. The manufacturer's engineering dimension drawings can serve as a reference.

2.3. System Installation Arrangement

2.3.1. System Arrangement during Installation

The refrigerant piping is required to connect the indoor and the outdoor units of the air-cooled system. The system arrangement diagram of the refrigeration system is shown in Figure 2-1.



No.	Description	No.	Description
1	Scroll Compressor	8+	Solenoid valve
2	Ball valve	9	Filter dryer
3+	Check valve	10#	Sight glass
4	Ball valve	11	Thermal Expansion Valve (TXV)
5	Condenser coil	12	Evaporator coil
6	Ball valve	13	Suction Temperature Sensor
7	Ball valve	14	Suction line

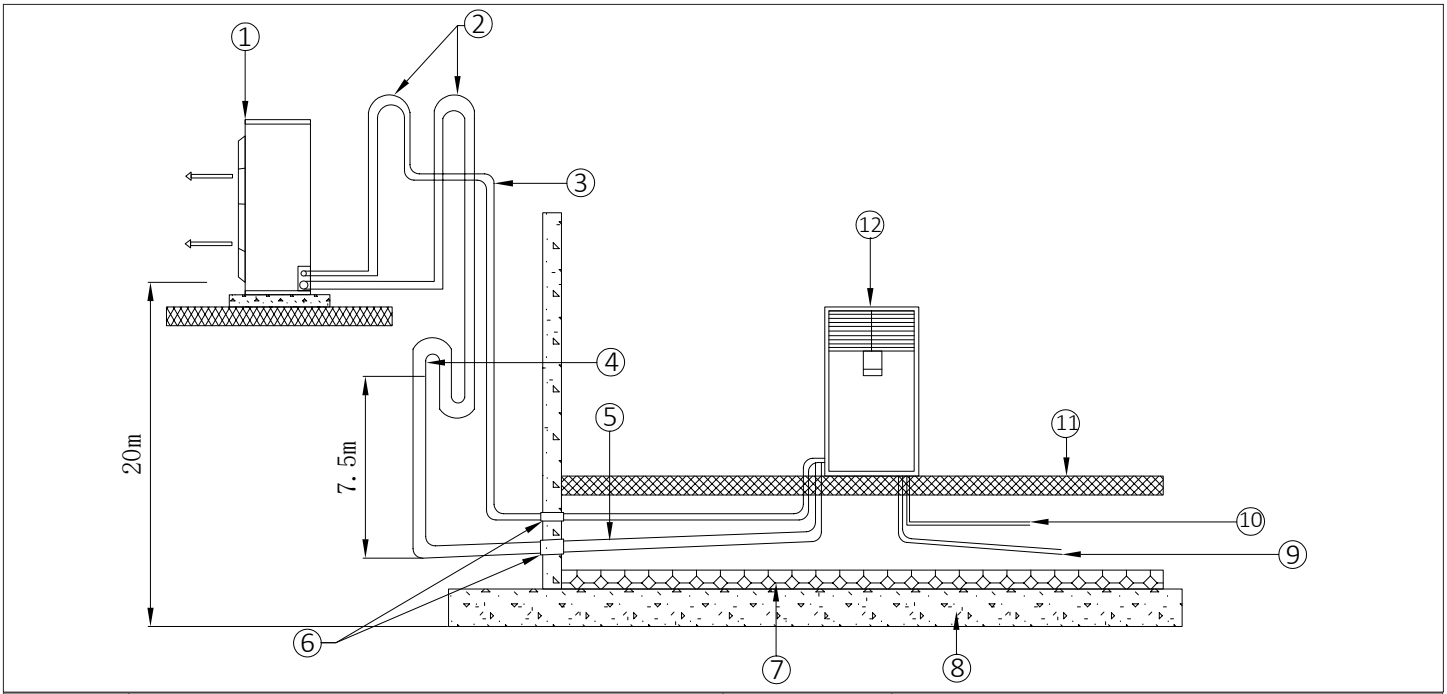
Figure 2-1 System Arrangement Diagram

The following points should be considered before checking out the overall layout diagram:

- ————————*: Factory piping*
- - - - - - - - - - - -*: Field piping (by technical personnel)*
- ••••••••••••••*: Represents the link between Suction Temperature Sensor and Thermal Expansion Valve (TXV).*
- *The single system is used as an example.*
- *Components (marked with *) are not supplied by Vertiv but are recommended for the proper circuit operation and maintenance.*
- *Components (marked with #) is only available for Vertiv™ Liebert® DM 22 kW and DM 27 kW units; and the Liebert DM 07 kW, DM 12 kW, and DM 17 kW Units are not equipped with sight glass.*
- *Additional components (marked with +) are required when the equivalent length exceeds 30 m.*

2.3.2. System Installation Mode

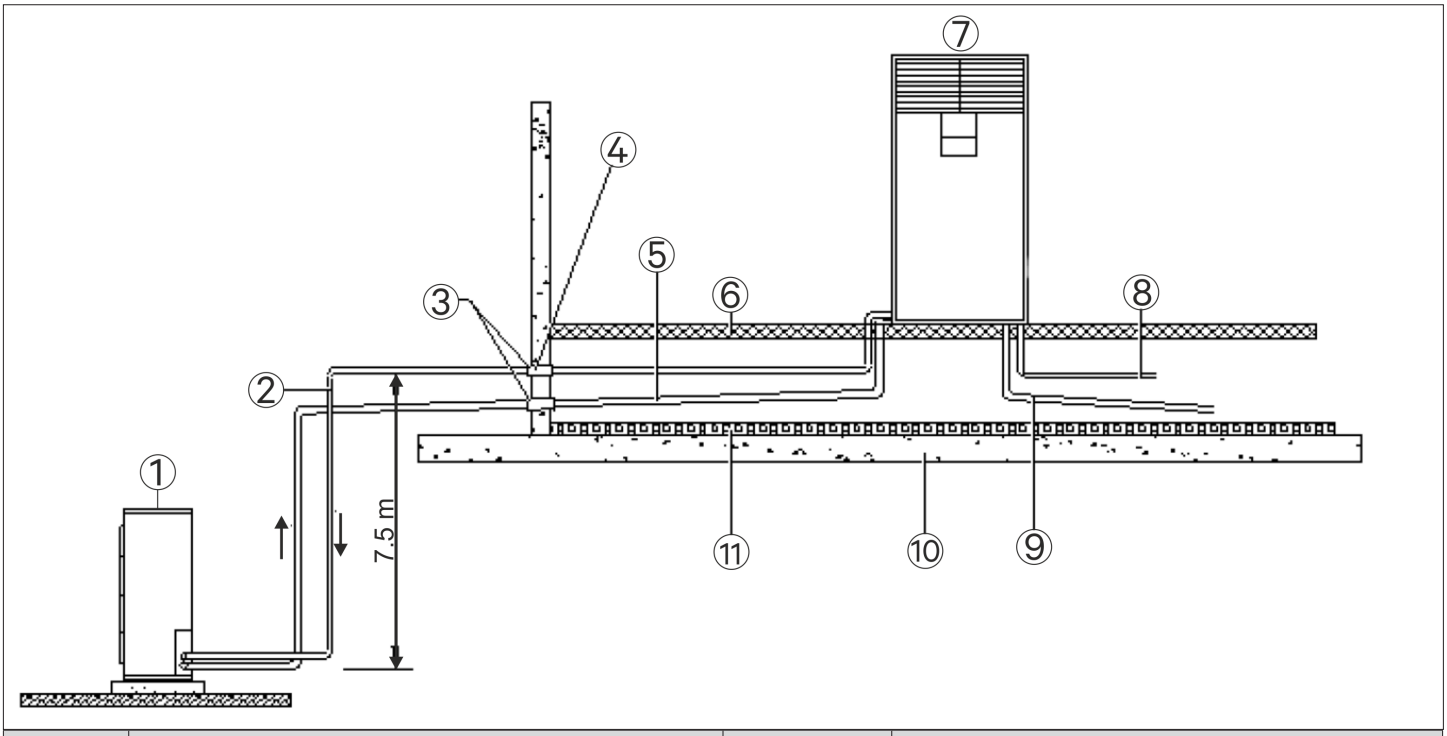
Ensure that the Liebert DM 07 kW/12 kW /17 kW indoor and outdoor units must be installed vertically, and the indoor unit of Liebert DM 22 kW/27 kW must be installed vertically, while the outdoor unit of Liebert DM 22 kW/27 kW can be installed horizontally or vertically. The system installation schematic diagram explains the process of installation of the outdoor unit.



No.	Description	No.	Description
1	Outdoor Unit	7	Heat insulation material
2	Back bend (must be higher than the highest copper pipe of the condenser)	8	Floor
3	Liquid line (avoid exposure to direct sunlight)	9	Condensate water drain pipe (to outdoor, slope 1:200)
4	Trap	10	Humidifier water supply pipe (to water tap)
5	Discharge pipe (slope 1:200)	11	Isolation floor
6	Sealed	12	Indoor Unit

Figure 2-2 Condenser is Placed Higher than the Compressor during Installation

If the outdoor unit is installed higher than the indoor unit (see Figure 2-2), a back-bend should be fitted to the discharge line and liquid line of the outdoor unit, so as to prevent the liquid refrigerant from flowing back when the outdoor unit stops. The top end of the inverted back-bend should be installed higher than the ultimate level of the copper pipe of the outdoor unit. However, if the outdoor unit is installed lower than the indoor unit, then there is no need of modification.



No.	Description	No.	Description
1	Outdoor unit	7	Indoor unit
2	Liquid Pipe (not be exposed to Sun)	8	Humidifier water supply pipe (to water tap)
3	Sealed	9	Condensation water drain pipe (to outdoors)
4	Protection tube	10	Floor
5	Discharge pipe (Slope 1:200)	11	Insulation material
6	Isolation floor		

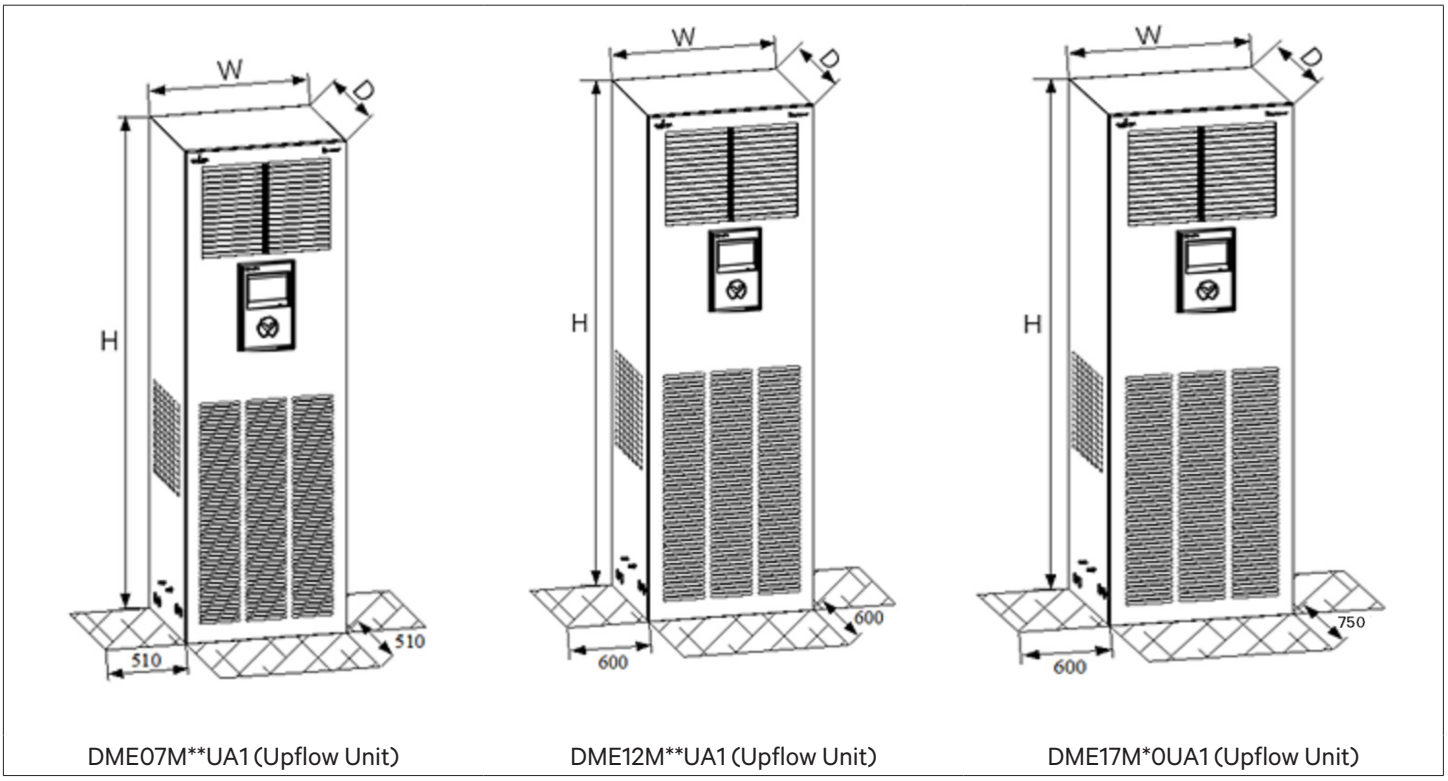
Figure 2-3 The Condenser is Placed Lower than the Compressor during Installation

The illustration in Figure 2-2 depicts the schematic diagram of system installation when the outdoor unit is installed at a higher level than the indoor unit and Figure 2-3, when the outdoor unit is installed at a lower level than the indoor unit.

2.4. Mechanical Installation

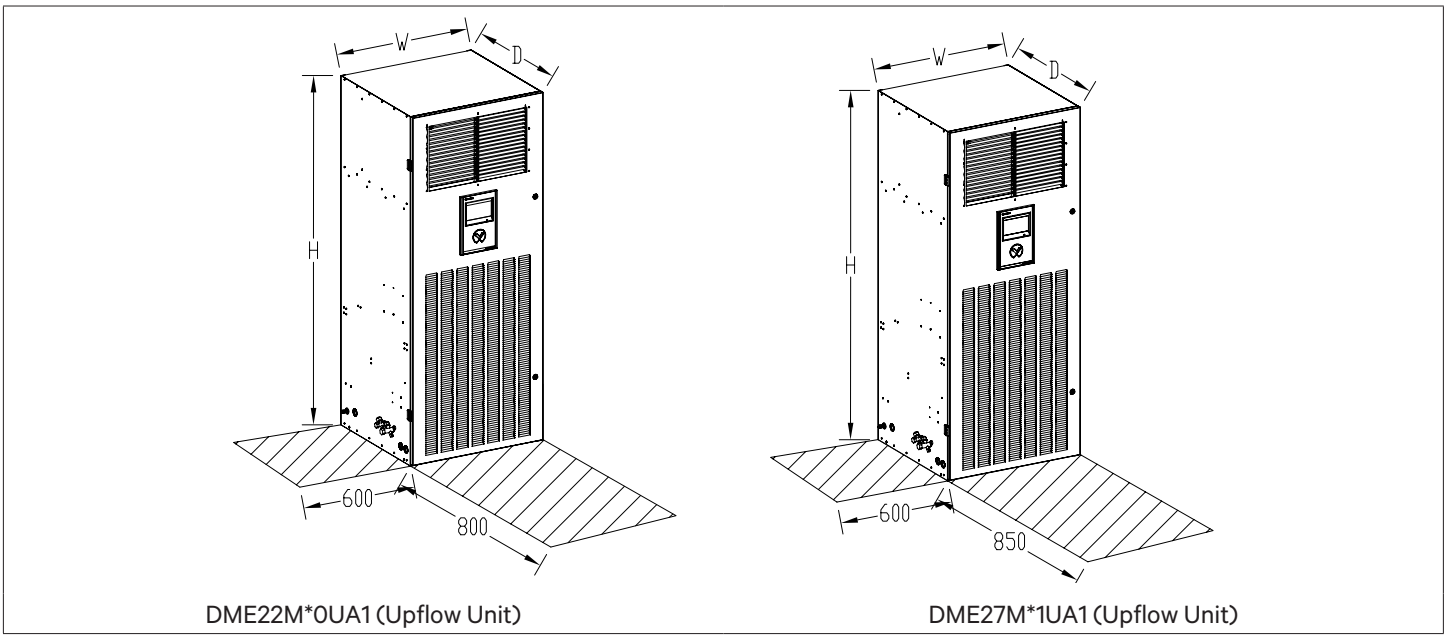
2.4.1. Dimension and Weight of the Indoor Unit (Product Dimension)

The dimensions and operational weight of the indoor units are represented in Figure 2-4 , Figure 2-5 & Figure 2-6 and Table 2-1 respectively.



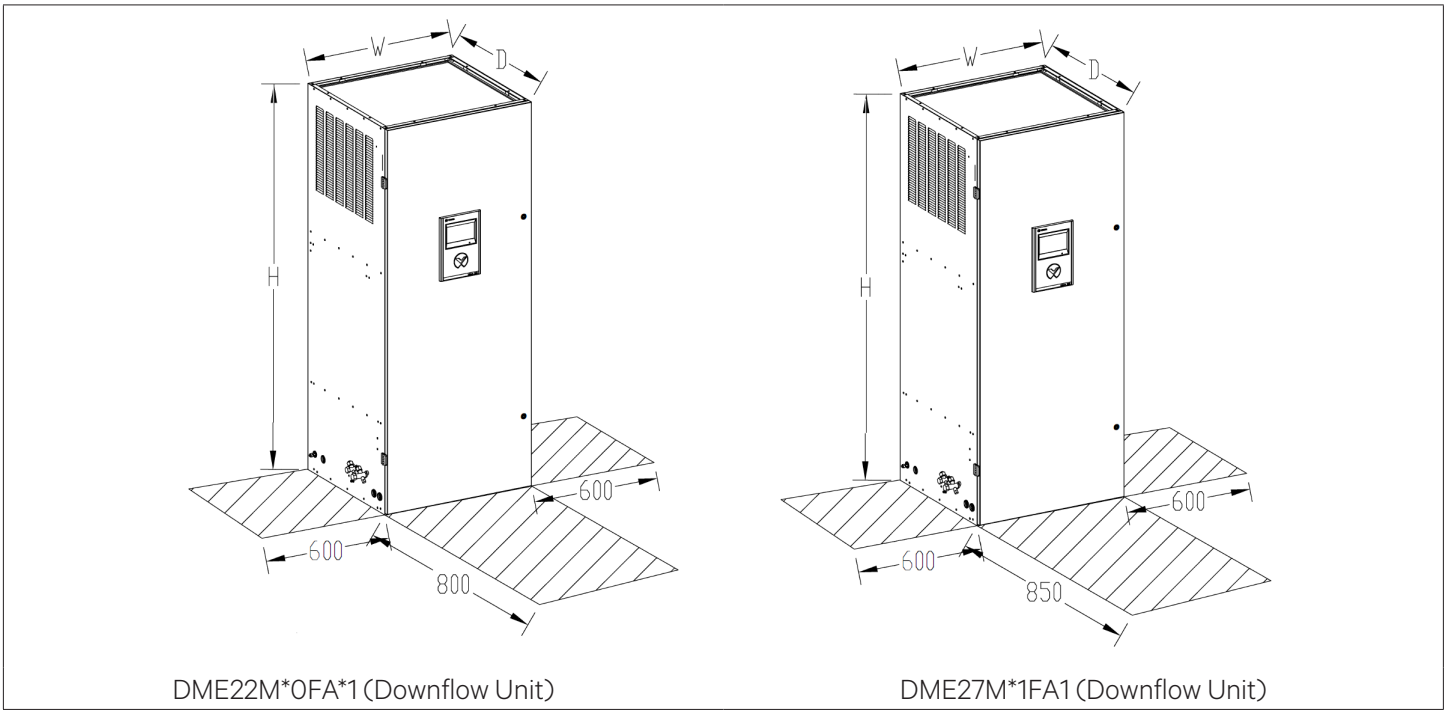
DME07M**UA1 (Upflow Unit) DME12M**UA1 (Upflow Unit) DME17M*0UA1 (Upflow Unit)

Figure 2-4 Vertiv™ Liebert® DM Indoor Unit (07 kW, 12 kW and 17 kW)



DME22M*0UA1 (Upflow Unit) DME27M*1UA1 (Upflow Unit)

Figure 2-5 Vertiv™ Liebert® DM Upflow Indoor Unit (22 kW and 27 kW)



DME22M*0FA*1 (Downflow Unit)

DME27M*1FA1 (Downflow Unit)

Figure 2-6 Vertiv™ Liebert® DM Downflow Indoor Unit (22 kW and 27 kW)

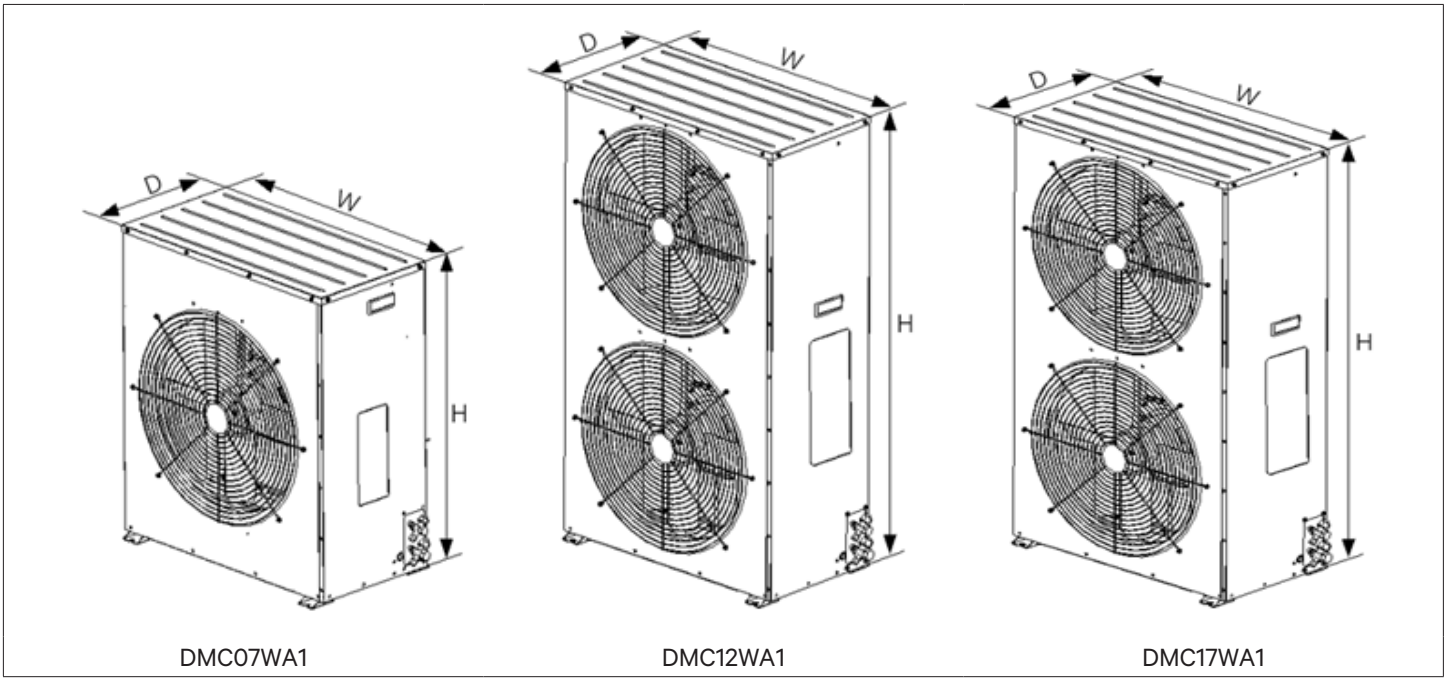
Table 2-1 Mechanical Parameters of Indoor Unit

Model	Dimensions (W × D × H)		Operational Weight (kg)
	mm	inch	
DME07M**UA1	510x385x1850	20.08x15.16x72.83	85
DME12M**UA1	600x500x1975	23.62x19.69x77.76	125
DME17M*0UA1	750x650x1975	29.53x25.59x77.76’	230
DME22M*0UA1	800x765x1975	31.5x30.1x77.8	253
DME22M*0FA1	800x765x1975	31.5x30.1x77.8	284
DME27M*1UA1	850x835x1975	33.5x32.9x77.8	283
DME27M*1FA1	850x835x1975	33.5x32.9x77.8	280

- *The maintenance space required for the upflow and downflow indoor units are shown in Figure 2-4, Figure 2-5 and Figure 2-6 respectively.*
- *The unit equipped with a heater should be kept at least 150 mm away from the combustible substance. While testing the unit, maintain the external static pressure below 100 Pa before the air volume becomes too low and the heater becomes too hot.*

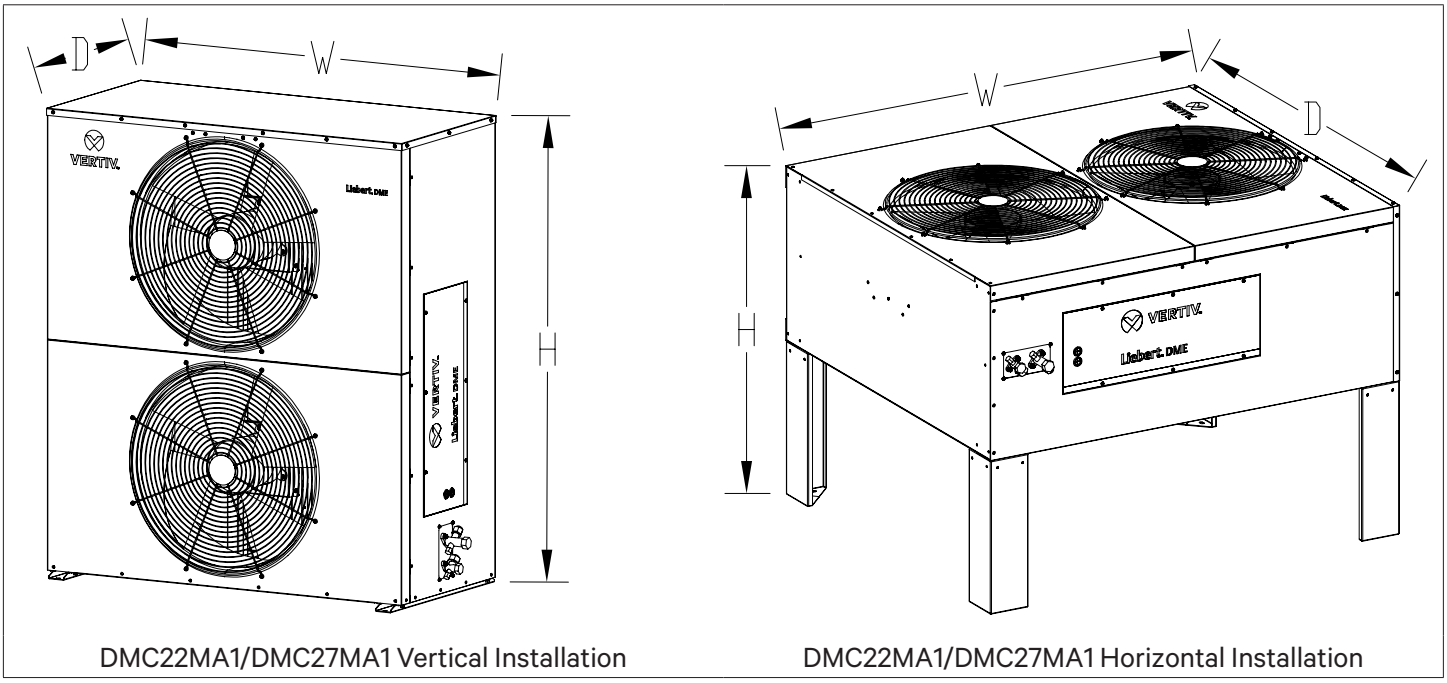
2.4.2. Dimension and Weight of the Outdoor Unit

The mechanical parameters of the outdoor unit are shown in Figure 2-7, Figure 2-8, and Table 2-2.



DMC07WA1 DMC12WA1 DMC17WA1

Figure 2-7 Dimension of Standard Outdoor Unit (07 kW, 12 kW and 17 kW)



DMC22MA1/DMC27MA1 Vertical Installation DMC22MA1/DMC27MA1 Horizontal Installation

Figure 2-8 Dimension of Standard Outdoor Unit (22 kW and 27 kW)

Table 2-2 Mechanical Parameters of Outdoor Unit

Model	Dimensions (W × D × H)		Operational Weight (kg)
	mm	inch	
DMC07WA1 (Vertical installation)	787×352×829	30.98x13.86x32.64	40
DMC12WA1 (Vertical installation)	787×352×1240	30.98x13.86x48.82	61
DMC17WA1(Vertical installation)	950×400×1245	37.40x15.75x49.02	85
DMC22MA1 (Vertical installation)	1133×520×1323	44.6x20.5x52.1	104
DMC22MA1 (Horizontal installation)	1305×1133×974	51.4x44.6x38.3	104
DMC27MA1 (Vertical installation)	1293×520×1491	50.9x20.5x58.7	120
DMC27MA1 (Horizontal installation)	1473×1293×974	57.9x50.9x38.3	120

- *The indoor unit parameters do not include the size of shut off service angle valve.*
- *The horizontal installation parameters of the outdoor unit do not include the dimensions of brackets, shut off service angle valves, protective nets, and support-leg.*
- *The vertical installation parameters of the outdoor unit do not include the dimensions of brackets, shut off service angle valves, protective nets, and support-leg.*
- *The external dimensions are for reference only; if the application requirements are other than the standard dimension, contact Vertiv representative.*
- *The operational weight of the unit includes the heater and the infrared humidifier, and does not include the refrigerant charge inside the unit.*

2.5. Installing Indoor Unit

2.5.1. Equipment Room Requirements

The equipment room must be prepared before installation to ensure a smooth operating flow and to achieve the expected results. The data center must meet the standards to be properly ventilated and heated. The design specifications for the air conditioners must be ideal and should correspond to energy-efficient design standards.

Following are the requirements to maintain a favorable room environment prior to the installation.

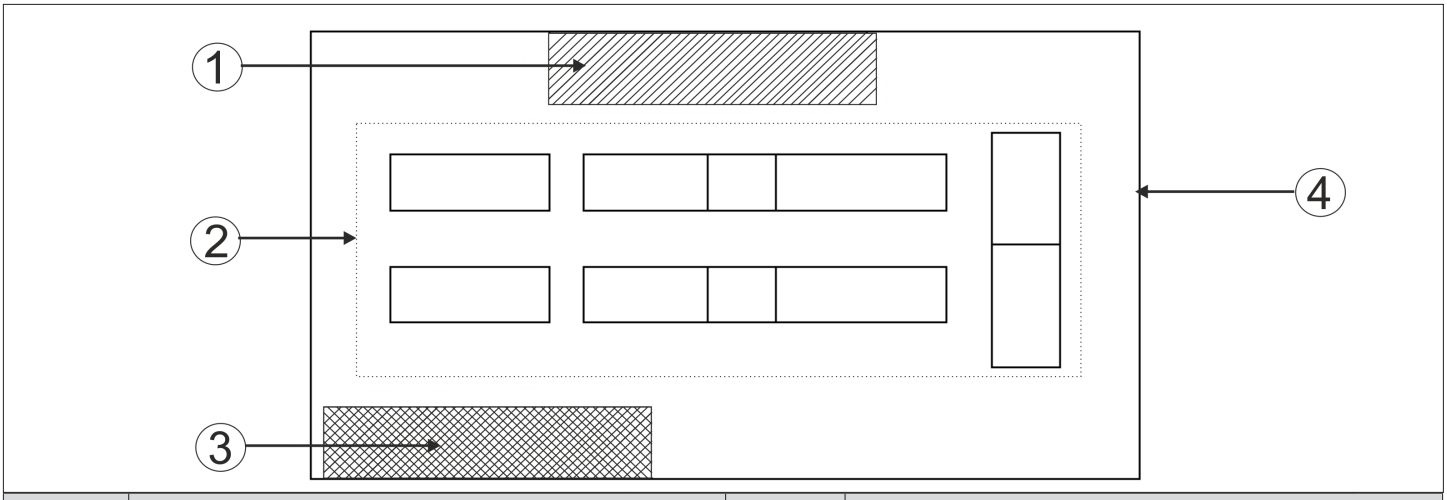
The equipment room should have suitable and effective heat insulation.

- The equipment room should have a sealed and damp-proof layer. Polyethylene film should be used for the damp proof layer of the ceiling and walls. Alternatively, a moisture-proof paint can be used to simulate the same effect as that of Polyethylene. It is important to ensure that the coating on the concrete wall and floor are damp-proof.
- Outdoor air significantly increases the load of heating, cooling, humidification and dehumidification. Therefore, all the doors and windows must be closed. Gaps and seams must be very narrow to prevent the outdoor air from entering the equipment room. It is an industry best practice to keep the infiltration of the outdoor air below 5% of the total indoor airflow. Apply appropriate thermal insulation and antifreeze measures for outdoor water pipes to avoid poor drainage and insufficient water supply caused by freezing.

- *Vertiv recommends that the site preparation is defined as per the requirements. However, if these requirements are not met, Vertiv recommends that rectifications to be made on the site in order to comply with the specified requirements and conditions.*
- *However, if the rectifications or modifications are not implemented, then Vertiv does not guarantee the accuracy and precision of the temperature and humidity provided by the unit.*

2.5.2. Installation Space Requirements

Adequate installation space for the indoor unit must be provided. The indoor unit of the air-cooled product must be installed on the floor of equipment room or computer room and the outdoor unit must be installed at outside of data center, open to external ambient. Figure 2-9 indicates the installation location of the indoor unit.



No.	Description		No.	Description	
1	Recommended location for unit installation		3	*Not recommended location for unit installation	
2	IT Equipments		4	Layout of the room	

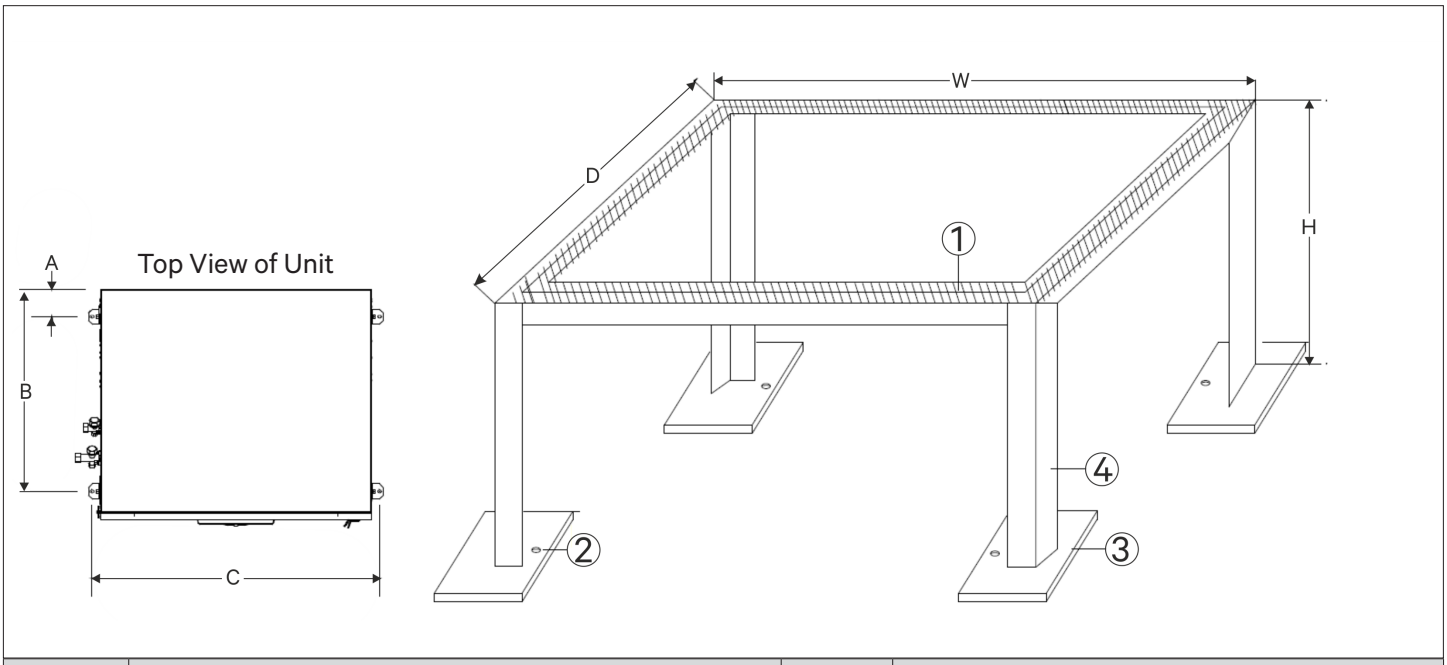
Figure 2-9 Installation Location of the Indoor Unit

- *Do not use the indoor unit in the open and severe outdoor environment.*
- **Avoid locating the indoor unit in concave or narrow areas, which can obstruct the airflow, shorten the cooling cycle and result in air return short cycle and air noise.*
- *Avoid locating multiple indoor units close to each other that can result in short cycle of air and creating load imbalance. The minimum distance between adjacent units is 600 mm.*
- *Do not install the unit within the vicinity of any other precision cooling equipment to avoid the leakage of condensed water produced due to imbalance load condition.*
- *Do not install other devices (such as smoke detector) over the indoor cabinet.*

- *The Liebert® DM can generate condensate water. Water leakage can cause damage to other precision equipment nearby. Do not install the units in the vicinity of any precision equipment. The installation site must have the facility of drainage piping.*

2.5.3. Installation Procedure

1. The floor stand has to be prepared by the installation team according to the dimensions, weight, and height of the unit. To ensure the rigidness of the structure, size the floor stand according to Figure 2-10 and Table 2-3.
2. According to the position of the fixing hole of the indoor unit, the sheet metal is welded and fixed on both sides of the beam of the floor stand.
3. Place a layer of waffle pad or anti-vibration with 8 mm to 10 mm thickness on the top side of the floor stand, and on the bottom of the steel plate respectively to avoid transmission of vibration during operation of the unit, as shown in Figure 2-10.
4. Next, place the indoor unit on the floor stand and fix it with nuts, spring washers, flat washers and bolts (M10).
5. For the upflow unit, swing the grilles up or down to adjust the airflow direction of the indoor unit. The adjustment angle is 45°, as shown in Figure 2-11.

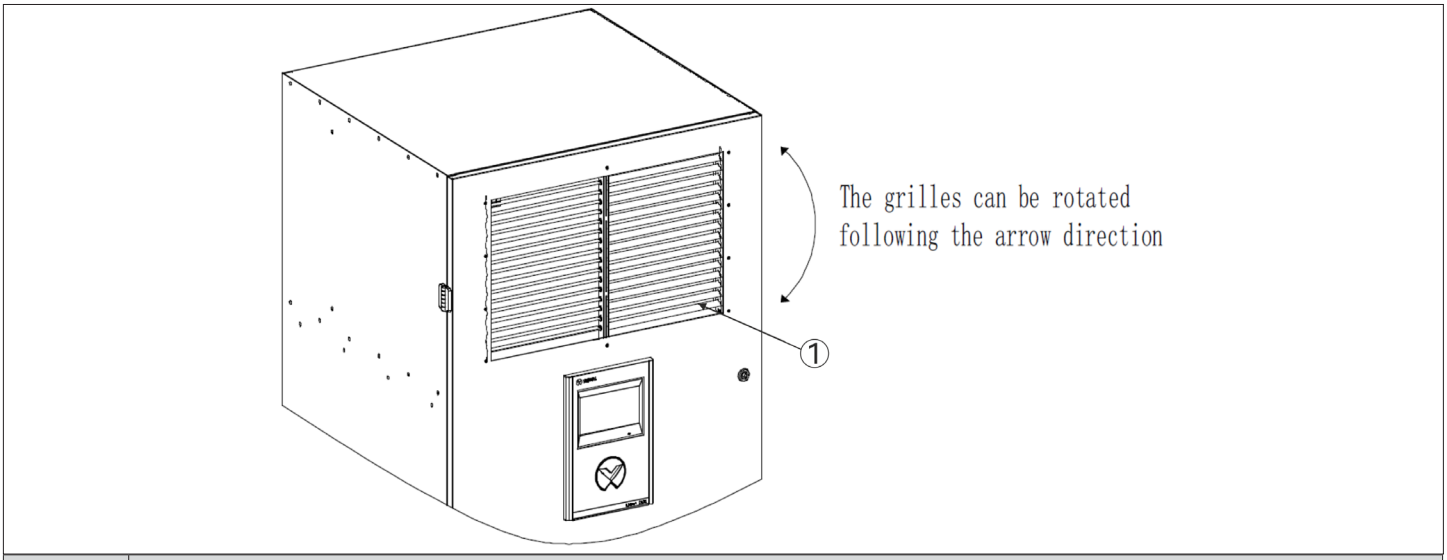


No.	Description	No.	Description
1	Waffle pad or anti-vibration (8mm to 10 mm thickness)	3	Steel plate (60x60x4)
2	Fixing hole for expansion bolt (M6x50)	4	Angle iron (30x30x3) or square tube (25x25x3)

Figure 2-10 Indoor Unit Mounting Hole Position and Base Size (unit: mm)

Table 2-3 Indoor Unit Mounting Hole Position and Base Size

Model	A (mm)	B (mm)	C (mm)	W (mm)	D (mm)	H (mm)
DME07M**UA1	55	276	560	510	385	≥150
DME12M**UA1	38	403	650	600	500	≥150
DME17M*0UA1	75	500	800	750	650	≥150
DME22M*0UA1	90	670	850	800	765	≥150
DME22M*0FA1						≥450
DME27M*1UA1	90	740	900	850	835	≥150
DME27M*1FA1						≥450



No.	Description
1	Grille

Figure 2-11 Changing Airflow Direction

2.6. Installing Outdoor Unit

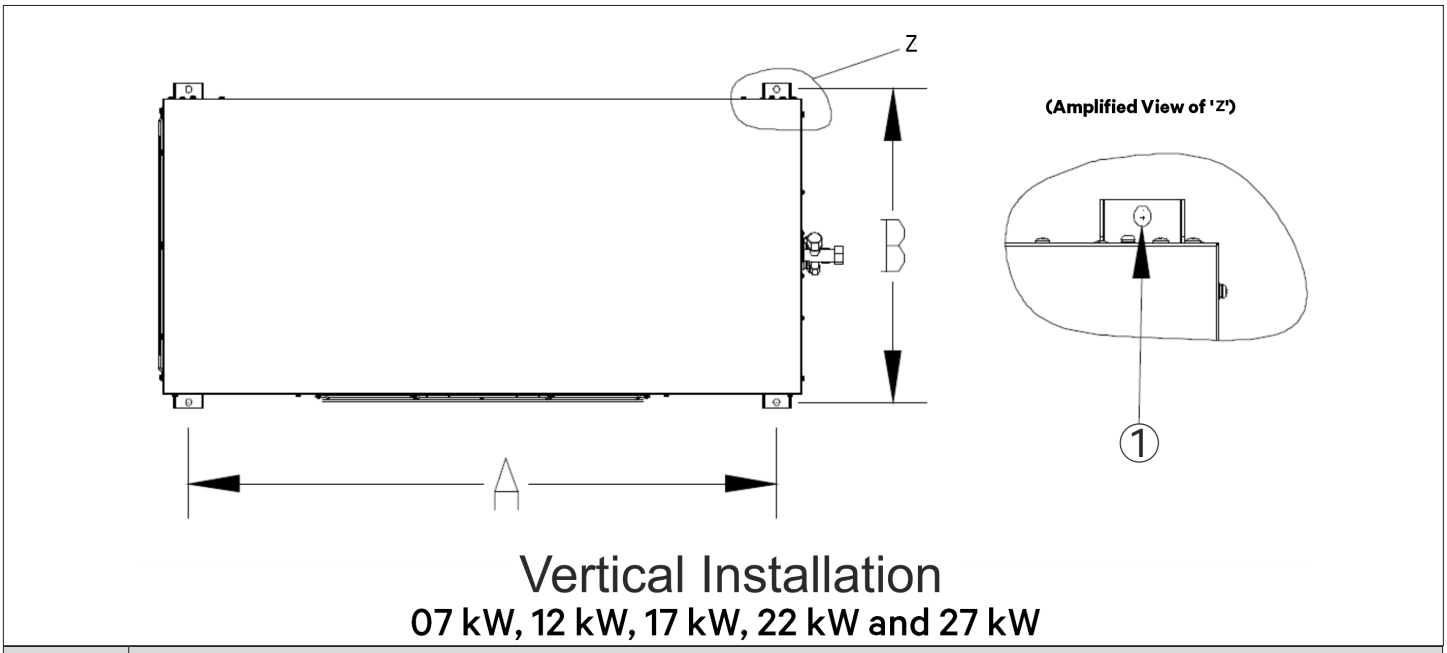
2.6.1. Installation Notes

- Install the outdoor unit for better security and maintenance accessibility. Do not install it on ground-level sites where public can access it easily.
- The outdoor unit should be installed away from the residential area. Do not locate it directly in the environment that requires low noise.
- To ensure the cooling performance of the unit, install the outdoor unit in the outdoor with sufficient airflow. Do not install where dust or snow can obstruct the condensing coil.
- **Ensure that there are no steam around the unit, waste heat, and so on. Keep a clearance of more than 450 mm between the outdoor unit and the wall or obstruct or adjacent devices.**
- Prepare a strong solid base capable of supporting the outdoor unit weight (see Table 2-2). The base should be at least 50 mm higher than the installation floor and 50 mm more than the dimensions of the outdoor unit base, as shown in Figure 2-14.

2.6.2. Installation Procedure

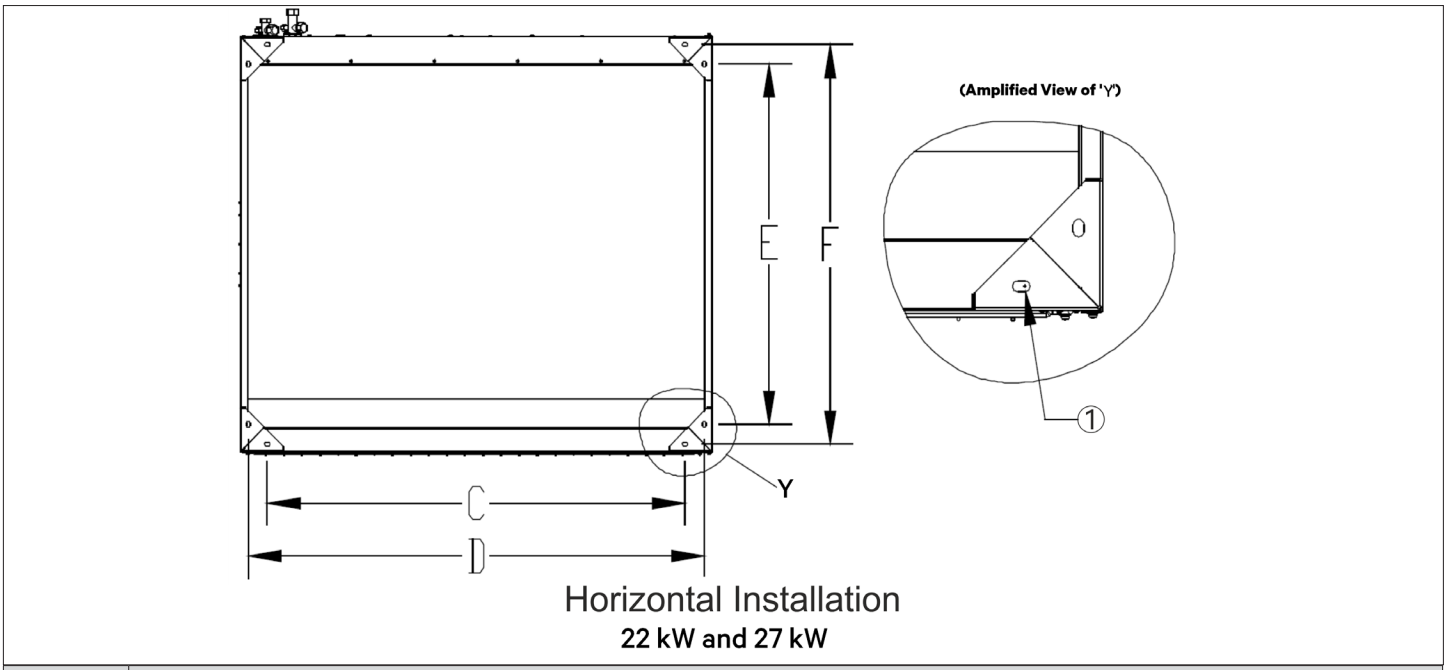
1. Place the outdoor unit on the base.

2. Fix the outdoor unit onto the base with expansion bolts, refer Figure 2-12 and Figure 2-13 for the vertical and horizontal installations of the outdoor unit respectively. The hole dimension of the base for vertical and horizontal installations are given Table 2-4



No.	Description
1	Slot hole (4-10x12)

Figure 2-12 Hole Dimension of Outdoor Unit Base (Vertical Installation)



No.	Description
1	Slot hole (8-10x16)

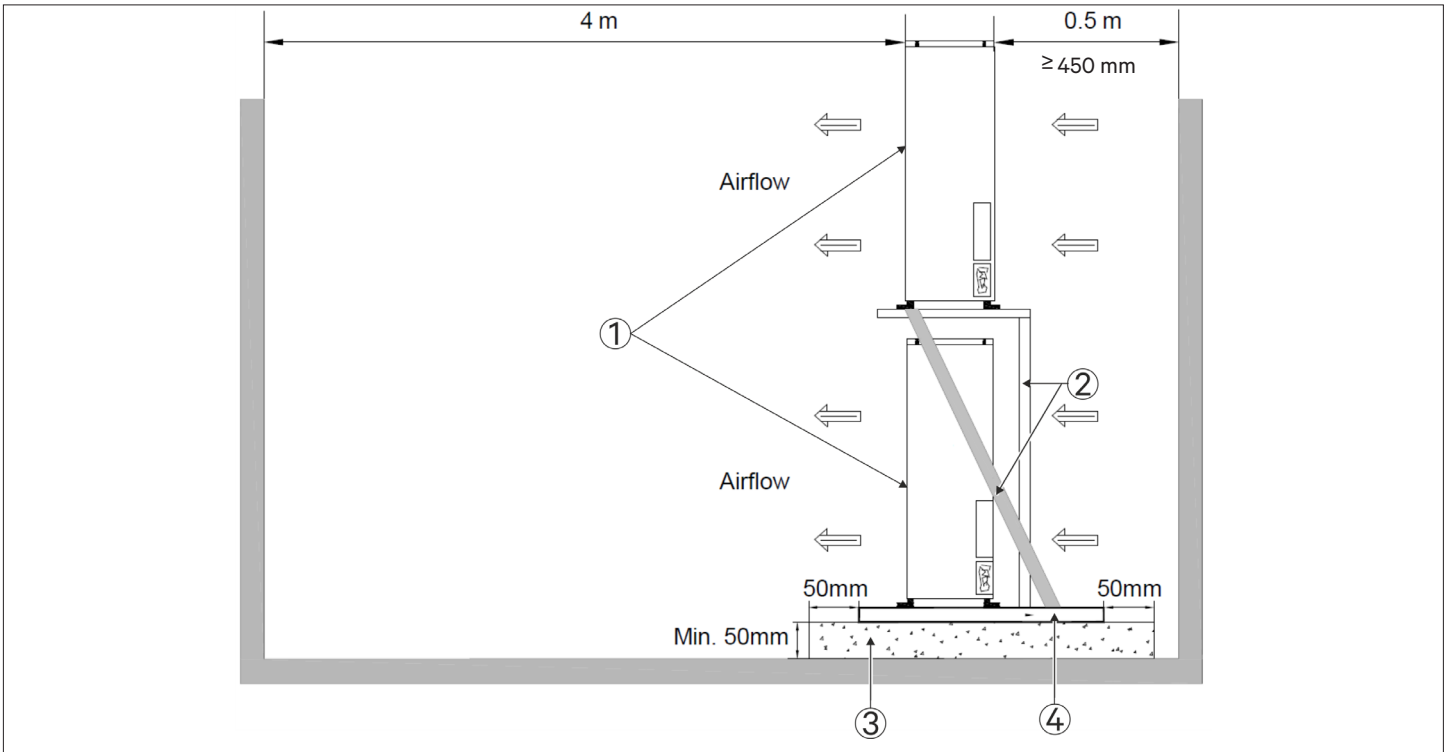
Figure 2-13 Hole Dimension of Outdoor Unit Base (Horizontal Installation)

For horizontal installation, first fix the support-legs of the base frame to the installation floor, then install the outdoor unit on the base frame.

Table 2-4 Outdoor Unit Mounting Hole Size

Installation Mode	Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)
Vertical installation	DMC07	680	374	/	/	/	/
	DMC12	680	374	/	/	/	/
	DMC17	867	424	/	/	/	/
	DMC22	1043	550	/	/	/	/
	DMC27	1203	550	/	/	/	/
Horizontal installation	DMC22	/	/	1154	1260	980	1086
	DMC27	/	/	1322	1428	1140	1246

Figure 2-14 shows the vertical installation of the multiple outdoor units one above the other.



No.	Description	No.	Description
1	Outdoor unit	3	Base
2	Bracket	4	Outdoor unit base

Figure 2-14 Vertical Installation of Multiple Outdoor Units with One above the Other

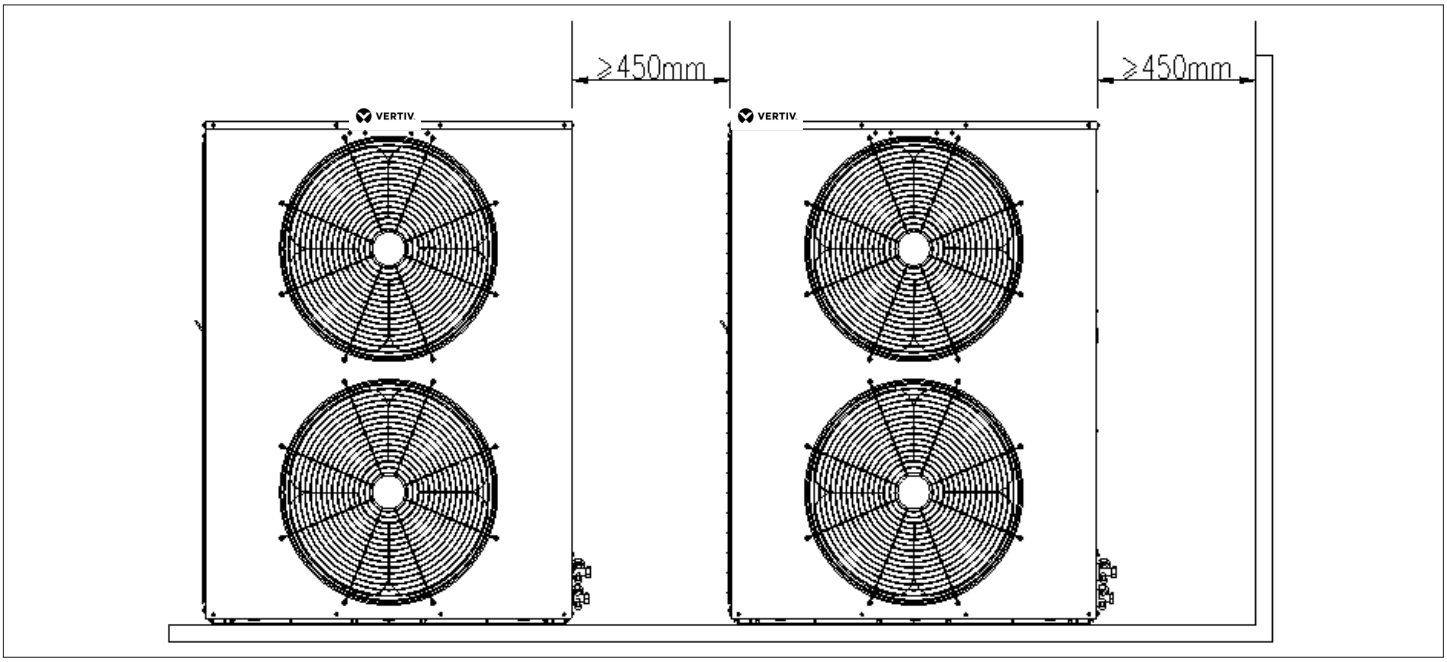
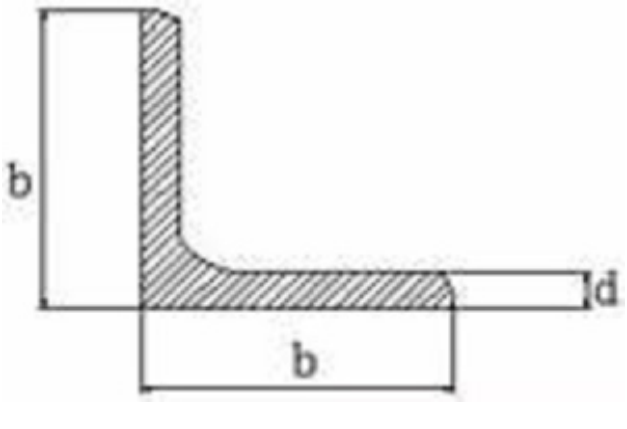
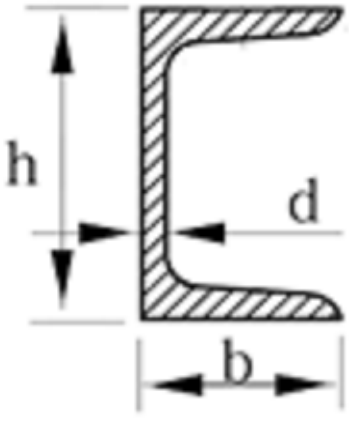


Figure 2-15 Horizontal Installation of Multiple Outdoor Units

- *Use 5# angle iron for bracket, when two units are installed with one above the other, refer Figure 2-16.*
- *Use 6.5# channel steel for bracket, when three units are installed with one above the other, refer Figure 2-16.*
- *In vertical installation arrangement, ensure to maintain minimum vertical distance of 450 mm between two outdoor units.*



5# angle b*b*d(mm): 50*50*5



6.5# h*b*d(mm): 65*40*4.3

Figure 2-16 Angle and Channel for Brackets

Figure 2-17 shows the horizontal installation of the multiple outdoor units (only for 22 kW and 27 kW).

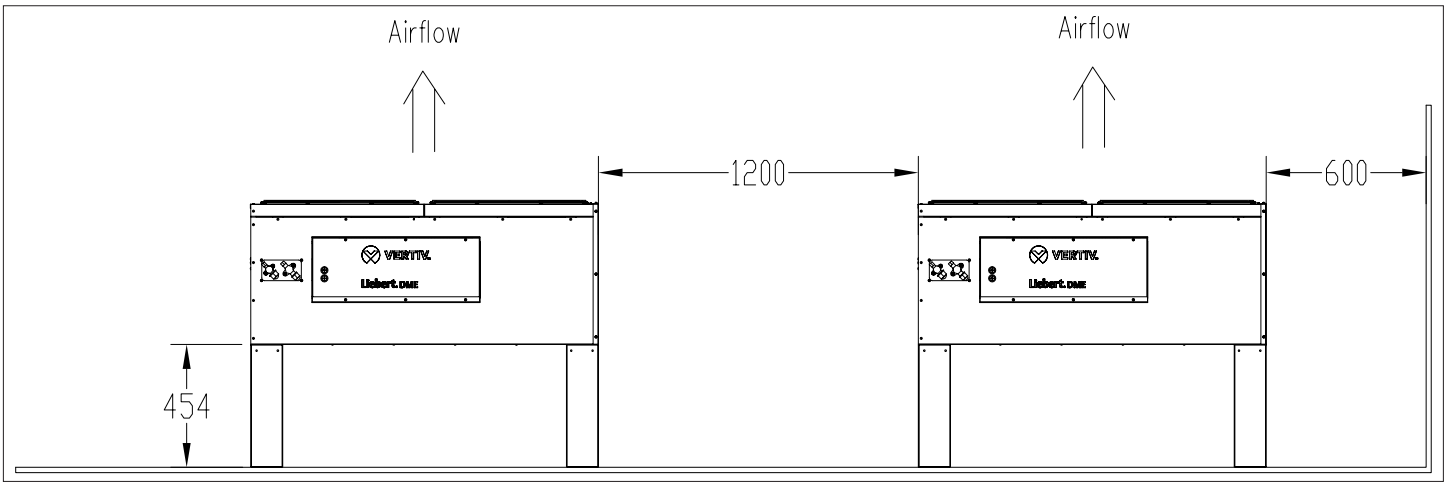


Figure 2-17 Horizontal Installation of Multiple Outdoor Units

2.6.3. Refrigeration Piping Connection General Principles

1. Copper pipes with flare nut are used to connect the indoor and the outdoor units. If the pipe length exceeds the standard pipe length given in Table 2-5 and straight copper pipe is used, then each joint of the piping must be brazed properly. Set flow to the copper piping with nitrogen gas during the brazing process to prevent it from oxidation.
2. The selection, placement and fixation of piping, evacuation of the system and refrigerant charging are required to operate according to industry standards.
3. The parameters such as pipeline pressure drop, compressor return oil, noise reduction, and vibration should be considered in the design and construction process.
4. If the equivalent length exceeds 30 m, or the vertical height difference between the indoor and the outdoor units exceeds the values given in Table 2-6, consult Vertiv representative for technical support in installation design phase.
5. The equivalent lengths of the components are shown in Table 2-7. Consult Vertiv representative to confirm the suitability as per the site conditions.

Table 2-5 Standard Copper Piping Size

Model	Pipe Length	Discharge Pipe OD		Liquid Pipe OD	
	m	inch	mm	inch	mm
DME07M**UA1	5.0	1/2	12.7	3/8	9.5
DME12M**UA1	5.0	5/8	16	1/2	12.7
DME17M*0UA1	5.0	5/8	16	1/2	12.7
DME22M*0*A1	7.5	3/4	19	5/8	16.0
DME27M*0*A1	7.5	3/4	19	5/8	16.0

Table 2-6 Vertical Distance between the Indoor and the Outdoor Units

Relative Position	Distance
Outdoor unit installed higher than indoor unit	Maximum: 20 m
Outdoor unit installed lower than indoor unit	Maximum: 5 m

Table 2-7 Equivalent Length of Each Local Component

Liquid Pipe OD (inch)	Equivalent Length (m)		
	90° Elbow	45° Elbow	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	0.30	0.18	0.76
7/8	0.44	0.24	1.10
1-1/8	0.56	0.30	1.40

2.6.4. Quick Thread Connector Installation Notes

Refer the following procedure when connecting the quick thread connector

1. Remove the dust-proof caps.
2. Clean the coupling seats and threaded surface of the connector with a clean cloth carefully.
3. Lubricate the male thread with lubricant oil.
4. Thread the coupling halves together by hand to ensure that the threads mate properly.
5. Tighten the coupling body's hexagon nut and union valve until a definite resistance is felt.
6. Use a marking pen to draw a line* lengthwise from the coupling union nut to the bulkhead.
7. Tighten the nuts and apply additional quarter turn with two wrenches.

- **Misalignment of the lines shows how much the coupling has been tightened.*
- *Care must be taken while performing this operation to avoid any damage to the connector threading.*
- *Two wrenches must be used to cooperate with each other during connection, because one wrench can damage the coupling copper lines easily.*

The recommended torque values are listed in Table 2-8.

Table 2-8 Recommended Torque Value

Coupling Size inch	Torque Value (N.m)
5/8	7 to 8
3/4, 7/8	25 to 32

2.6.5. Piping Connection Requirements

Refer to Figure 2-2 and Figure 2-3; the required piping connections are as follows:

- Refrigerant piping between the indoor and the outdoor units (discharge and liquid piping).
- Drain piping connections of the indoor unit.

In case of Humidifier is configured with the unit: The water supply piping to the humidifier connection is required.

Prior to start-up, ensure that all piping connections have been completed and there is no leakage in the system.

2.6.6. Connecting Refrigerant Piping

- The copper pipes from the factory are available in length of 7.5 m (see Table 2-5). Refer Table 2-9 and Table 2-10 for the pipe sizes. In case of longer pipe is required contact Vertiv representative.
- Select the appropriate dimension (Pipe diameter & Wall thickness) of refrigerant liquid pipes connecting the outdoor unit to ensure that the pressure drop of the refrigerant liquid through the pipe during unit operation does not exceed 40 kPa (5 psi to 6psi).
- The pipe should be installed and removed with care so that they will not get damaged. Use tube benders and make all bends before connecting refrigerant piping of the indoor and the outdoor units.
- If brazing is required, all refrigerant piping should be connected with silver-brazed joints. The copper pipe is filled with nitrogen gas during the brazing process to prevent oxidation of the copper piping.
- Prior to use, check piping supports, leakage testing, dehydration of refrigerant pipes and evacuation. Use vibration isolating support to isolate the refrigeration piping from the building.
- Use a soft and flexible material to pack around the piping to protect them when sealing openings in walls and to reduce vibration transmission.
- When installing the outdoor unit 7.5 m higher than the indoor unit, the trap should be installed on the discharge pipe (Oil trap). This trap will retain lubricant oil in the off cycle of the compressor. When the compressor starts, oil in the trap will be carried up the vertical riser and return to the compressor immediately.

Table 2-9 Recommended Size of the Pipeline

Model	DME07				DME12			
Pipe Length (m)	D		L		D		L	
	mm	inch	mm	inch	mm	inch	mm	inch
10	12.7	1/2	9.5	3/8	16.0	5/8	12.7	1/2
20	12.7	1/2	9.5	3/8	16.0	5/8	12.7	1/2
30*	12.7	1/2	9.5	3/8	16.0	5/8	12.7	1/2
40*	12.7	1/2	9.5	3/8	16.0	5/8	12.7	1/2
50*	12.7	1/2	9.5	3/8	16.0	5/8	12.7	1/2

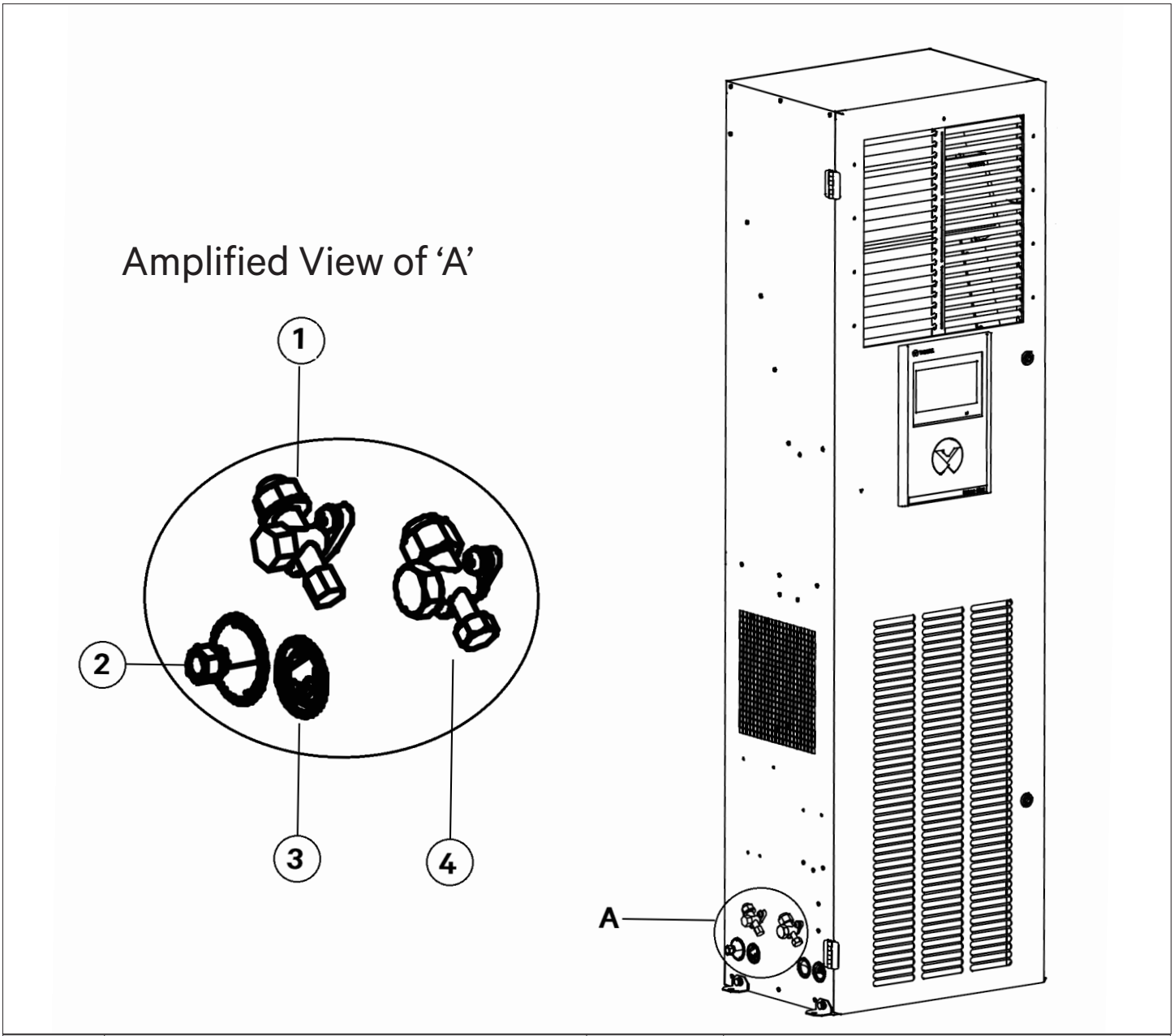
Table 2-10 Recommended Size of the Pipeline

Model	DME17				DME 22				DME27			
Pipe Length (m)	D		L		D		L		D		L	
	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
10	16.0	5/8	12.7	1/2	19.0	3/4	16.0	5/8	19.0	3/4	16.0	5/8
20	19.0	3/4	12.7	1/2	19.0	3/4	16.0	5/8	19.0	3/4	16.0	5/8
30	19.0	3/4	16.0	5/8	19.0	3/4	16.0	5/8	19.0	3/4	16.0	5/8
40*	19.0	3/4	16.0	5/8	19.0	3/4	16.0	5/8	22.0	7/8	16.0	5/8
50*	22.0	7/8	16.0	5/8	22.0	7/8	16.0	5/8	22.0	7/8	19.0	3/4

- *The pipe lengths marked with "*" require a Long piping kit to be added in their equivalent length.*
- *D: Discharge line, L.: Liquid pipe.*
- *If the pipe length exceeds 50 m, please consult Vertiv local representative for details.*
- *Copper pipe with outer diameter of 9.5 mm, then wall thickness requirement ≥0.8 mm.*
- *Copper pipe with outer diameter of 12.7 mm, then wall thickness requirement ≥1 mm.*
- *Copper pipe with outer diameter of 16.0 mm, wall thickness requirement ≥1 mm.*
- *Copper pipe with outer diameter of 19/22 mm, wall thickness requirement ≥1.2 mm.*
- *Copper pipe with outer diameter of 25.0 mm and above, wall thickness requirement ≥1.5 mm.*

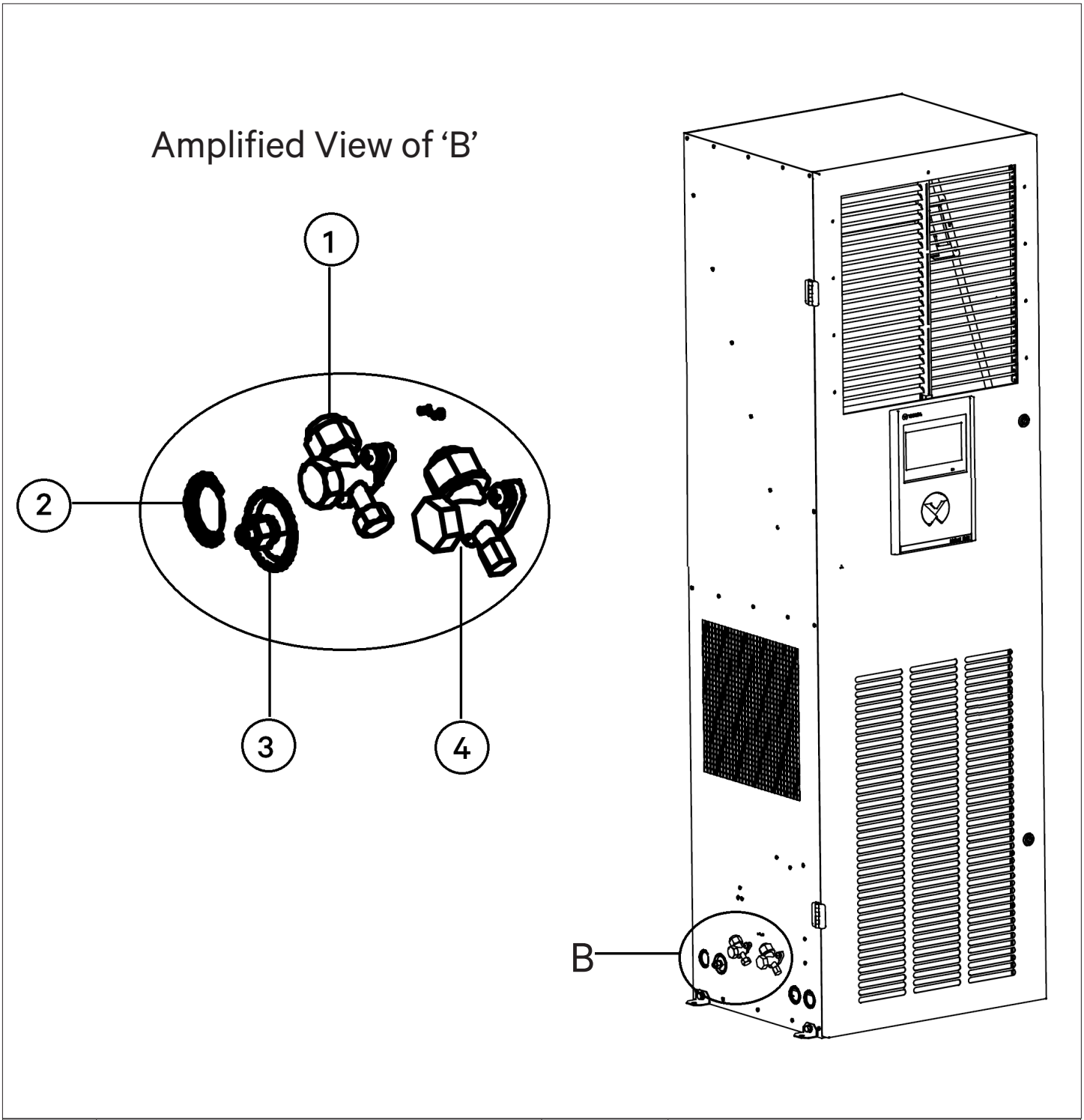
2.6.7. Pipe Connector Position

Figure 2-18 to Figure 2-22 show the pipe connector cutout locations of the indoor unit for upflow and downflow models respectively.



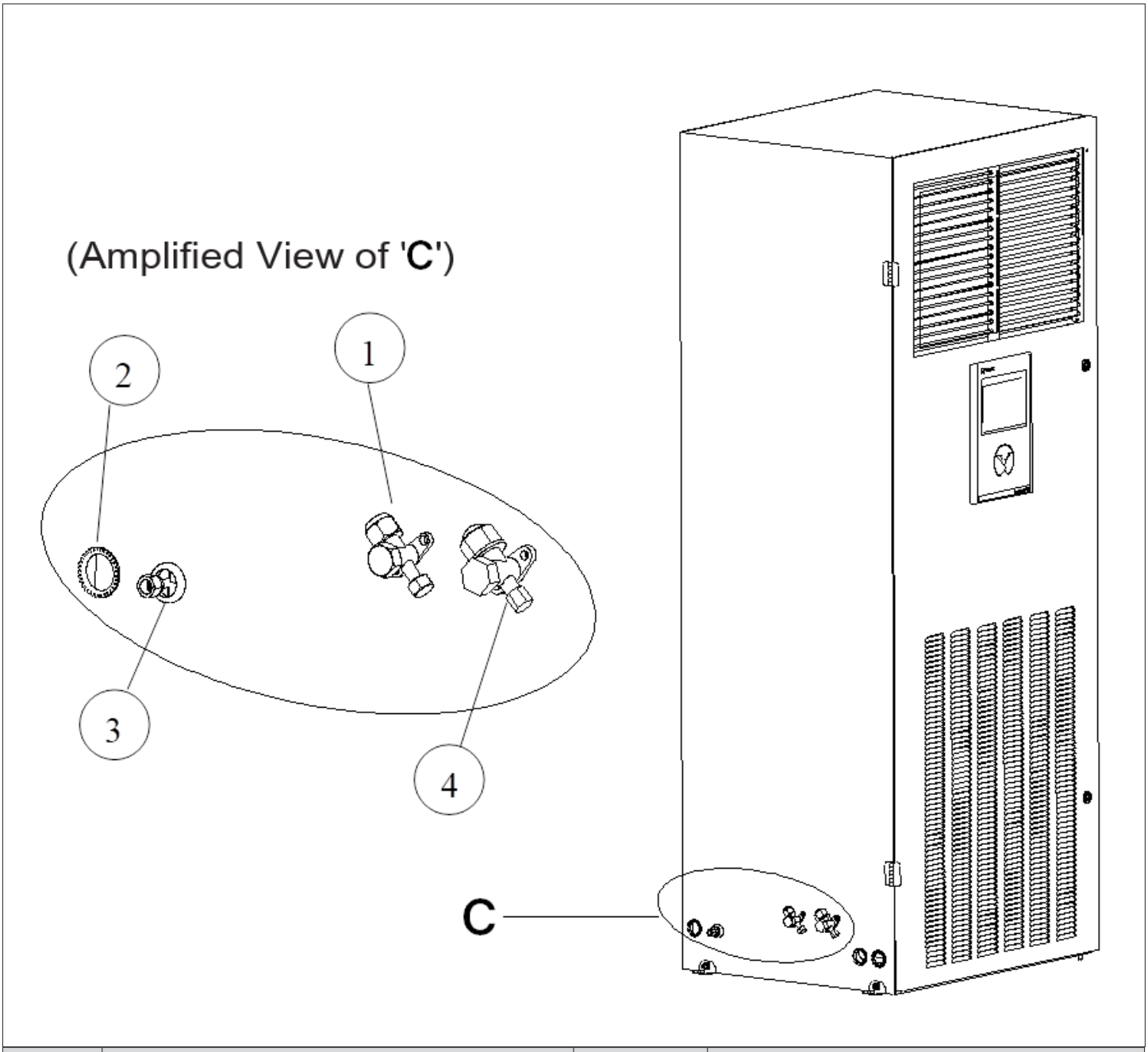
No.	Description	No.	Description
1	Liquid pipe (Straight pipe 3/8"-9.52mm Connector 5/8"-18UNF thread)	3	Condensate water drain pipe (OD 22 mm)
2	Humidifier water supply pipe 1/4" copper nut 1/4"-1/2" Connector thread	4	Discharge pipe (Straight pipe 1/2"-12.7 mm Connector 3/4"-16UNF thread)

Figure 2-18 Pipeline Connector Interface (DME07)



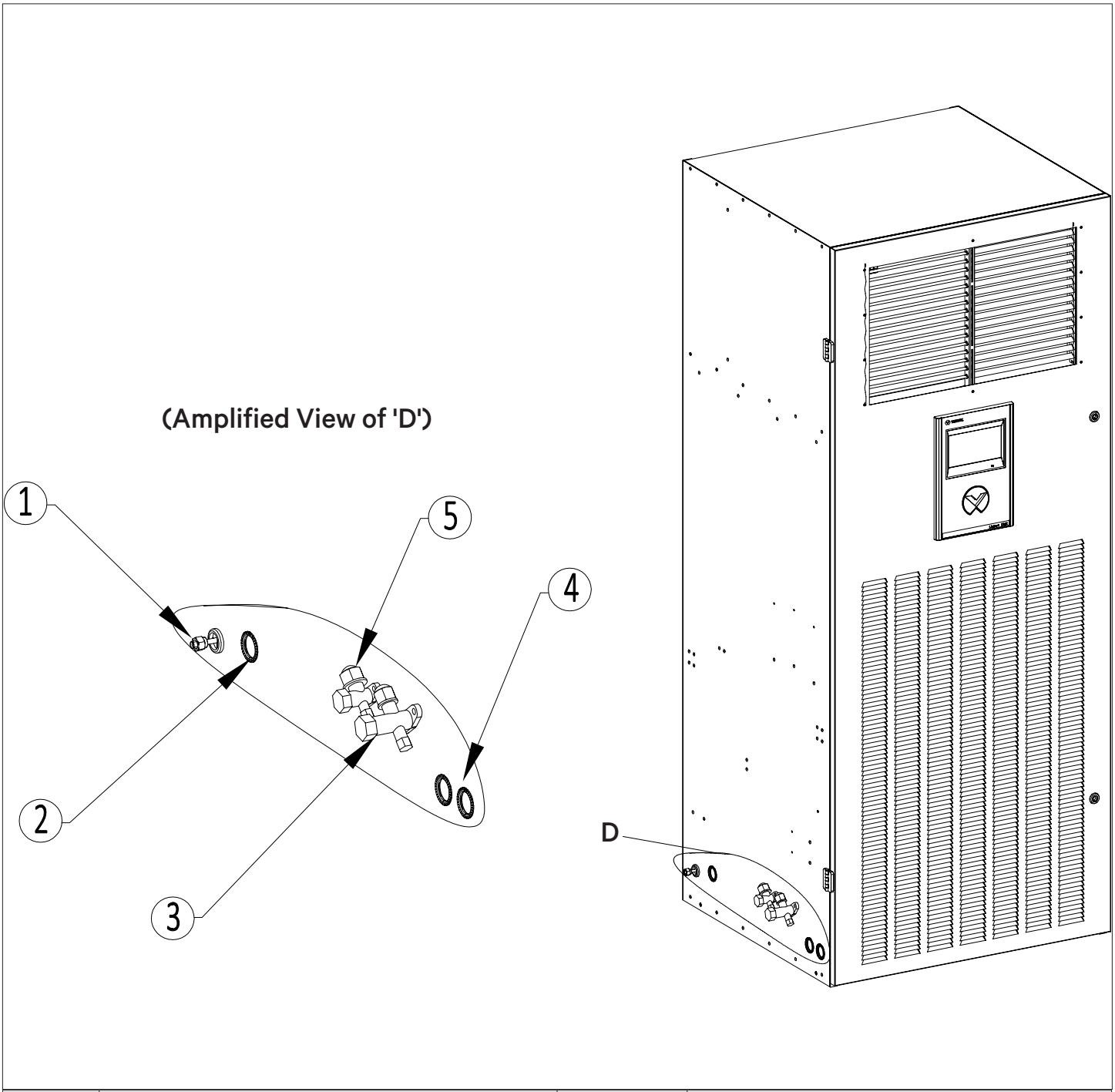
No.	Description	No.	Description
1	Liquid pipe (Straight pipe 1/2”-12.7 mm Connector 3/4”-16UNF thread)	3	Condensate water drain pipe (OD 22 mm)
2	Humidifier water supply pipe 1/4” copper nut 1/4”-1/2” Connector thread	4	Discharge pipe (Straight pipe 5/8”-16 mm Connector 7/8”-14UNF thread)

Figure 2-19 Pipeline Connector Interface (DME12)



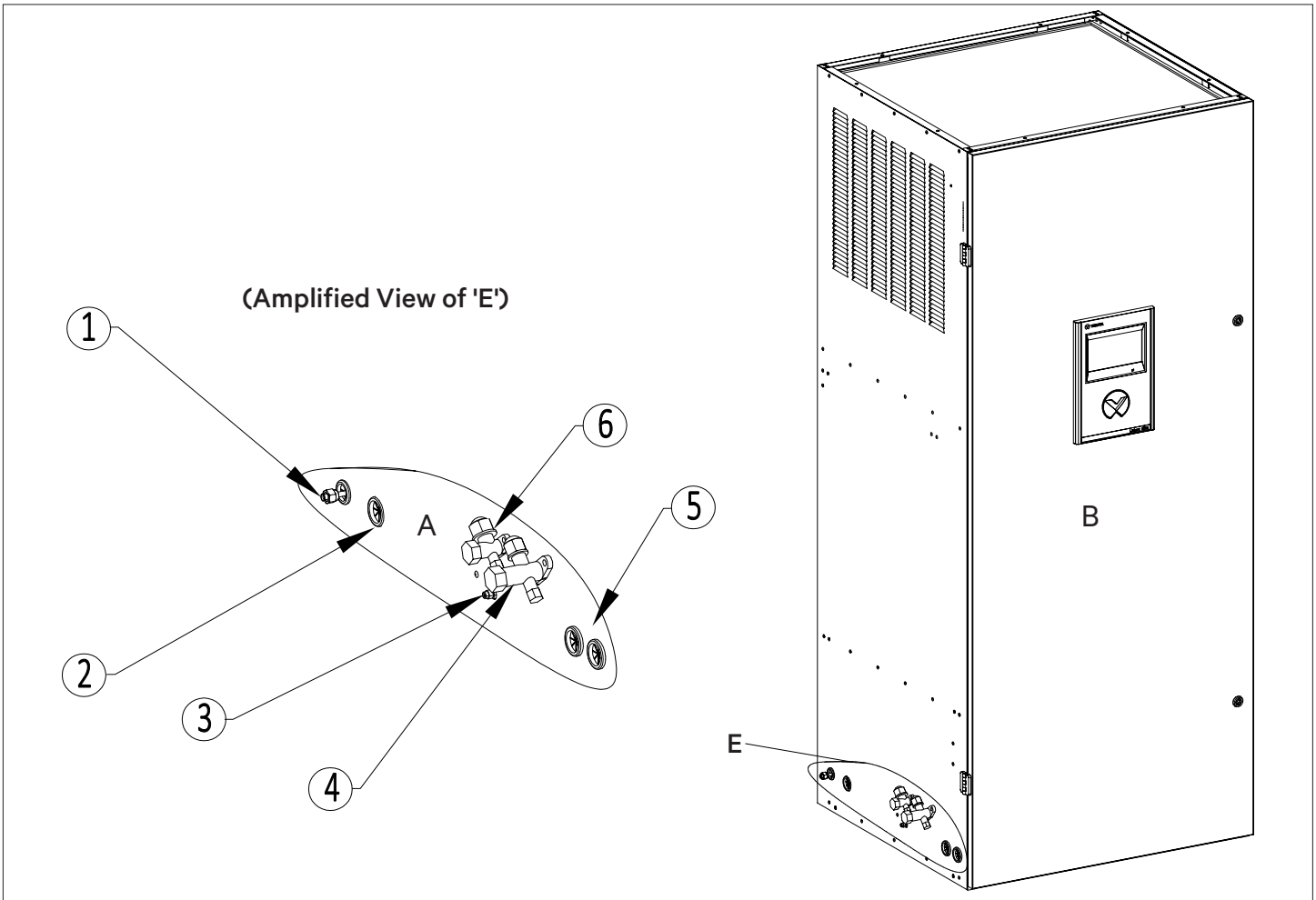
No.	Description	No.	Description
1	Liquid pipe (Straight pipe 1/2”-12.7 mm Connector 3/4”-16UNF thread)	3	Humidifier water supply pipe 1/4” copper nut 1/4”-1/2” Connector thread
2	Condensate water drain pipe (OD 22 mm)	4	Discharge pipe (Straight pipe 5/8”-16 mm Connector 7/8”-14UNF thread)

Figure 2-20 Pipeline Connector Interface (DME17)



No.	Description	No.	Description
1	Humidifier inlet pipe (1/4" BSP, 1/2" BSP Male)	4	Cable hole (ID 29 mm)
2	Condensate drain pipe (OD 22 mm)	5	Liquid line shut off service angle valve (5/8"-16 mm straight pipe, 7/8"- 14 UNF Connector thread)
3	Discharge line shut off service angle valve (3/4"-19 mm straight pipe, 1-1/16"- 14 UNF Connector thread)		

Figure 2-21 Pipeline Connector Interface (DME22 and DME27 Upflow Unit)



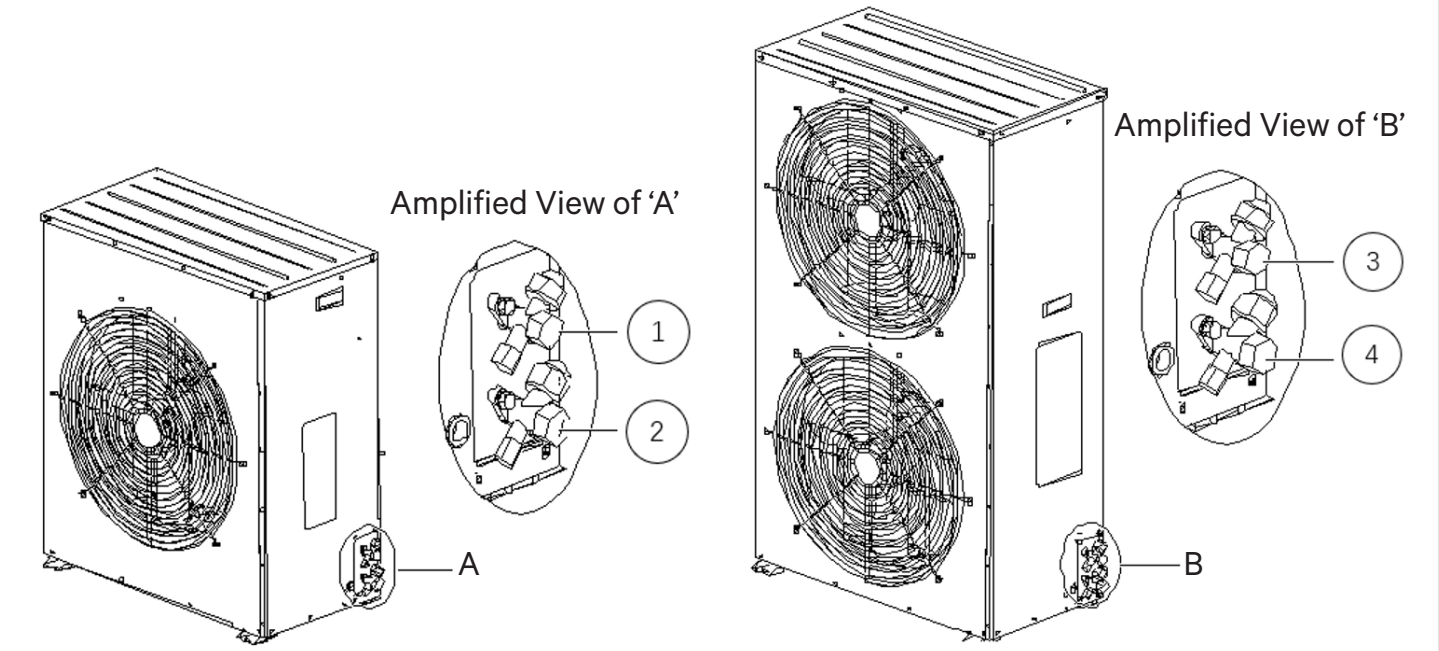
No.	Description	No.	Description
1	Humidifier inlet pipe (1/4" BSP, 1/2" BSP Male)	4	Discharge line shut off service angle valve (3/4"-19 mm straight pipe, 1-1/16"- 14 UNF Connector thread)
2	Condensate drain pipe (OD 22 mm)	5	Cable hole (ID 29 mm)
3	Schrader Valve	6	Liquid line shut off service angle valve (5/8"-16 mm straight pipe, 7/8"- 14 UNF Connector thread)

Figure 2-22 Pipeline Connector Interface (DME22 and DME27 Downflow Unit)

- Connecting discharge pipe

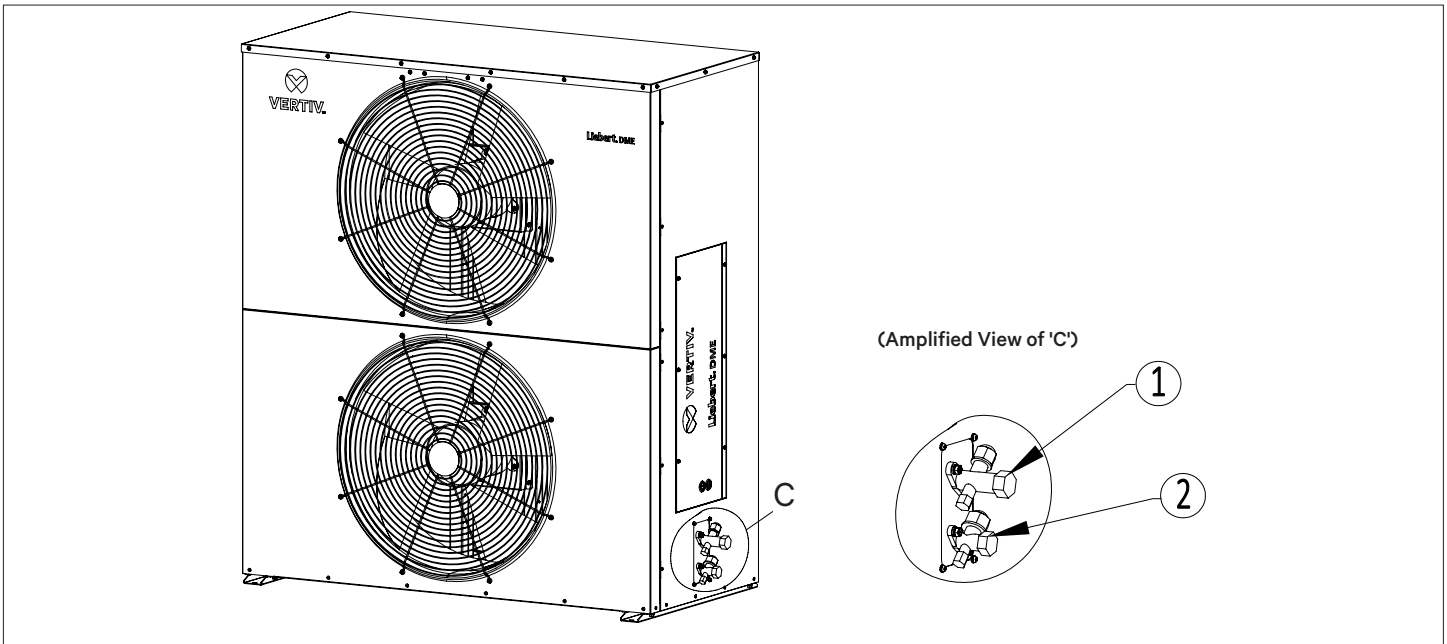
Connect one end of the discharge pipe to the discharge line shut off service angle valve of the indoor unit shown in Figure 2-18 to Figure 2-22, and the other end to the discharge line shut off service angle valve of the outdoor unit shown in Figure 2-23 to Figure 2-25.

Horizontal sections of the discharge pipe should be sloped down from the compressor with a slope of at least 1:200 (5 mm down for each 1 m run). The discharge pipes should be insulated where they are routed in the conditioned space (including under a raised floor).



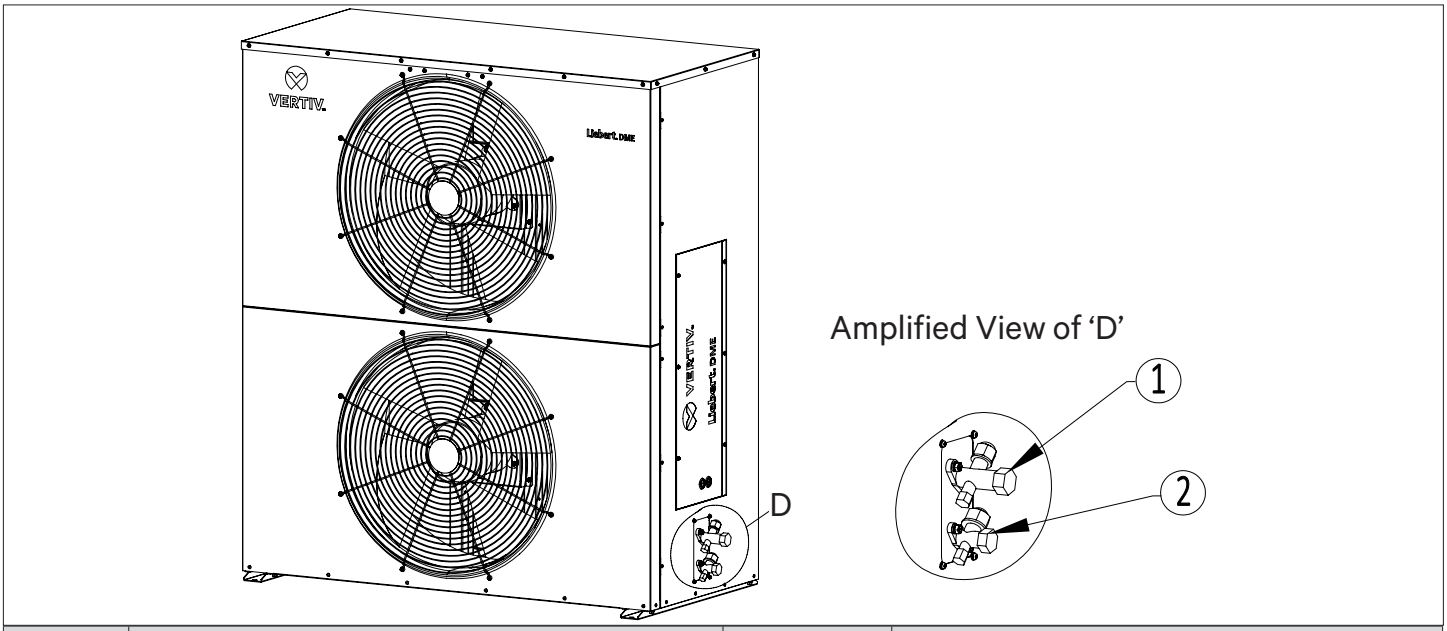
No.	Description	No.	Description
1	Discharge pipe (Straight pipe 1/2"-12.7 mm Connector 3/4"-16UNF thread)	3	Discharge pipe (Straight pipe 5/8"-16 mm Connector 7/8"-14UNF thread)
2	Liquid pipe (Straight pipe 3/8"-9.52 mm Connector 5/8"-18UNF thread)	4	Liquid pipe (Straight pipe 1/2"-12.7 mm Connector 3/4"-16UNF thread)

Figure 2-23 Refrigerant Pipe Connectors of Outdoor Unit (Left: DMC07; Right: DMC12)



No.	Description	No.	Description
1	Discharge line shut off service angle valve (5/8"-16 mm straight pipe, 7/8"- 14 UNF Connector thread)	2	Liquid line shut off service angle valve (1/2"-12.7 mm straight pipe, (3/4"-16UNF Connector thread)

Figure 2-24 Refrigerant Pipe Connectors of Outdoor Unit (DMC17)



No.	Description	No.	Description
1	Discharge line shut off service angle valve (3/4"-19 mm straight pipe, 1-1/16"- 14 UNF Connector thread)	2	Liquid line shut off service angle valve (5/8"-16 mm straight pipe, (7/8"- 14 UNF Connector thread)

Figure 2-25 Refrigerant Pipe Connectors of Outdoor Unit (DMC22 and DMC27)

- Connecting liquid pipe

Connect one end of the liquid pipe to the liquid line shut off angle valve of the indoor unit shown in Figure 2-18 to Figure 2-22, and the other end to the liquid line shut off angle valve of the outdoor unit shown in Figure 2-23 to Figure 2-25.

2.6.8. Connecting Drain Piping Of Indoor Unit

1. The indoor unit is provided with a copper condensate drain piping with 22 mm outer diameter to connect to the outdoor drain pipe using the hose barb connector.
2. Connect one end of the drain pipe to the connector of condensate water drain pipe shown in Figure 2-18 to Figure 2-22.

Ensure, drain pipe must not be placed in position with freezing temperature (≤0 ºC). The drain pipe should be the full size of the drain pipe connector.

- *The drain pipe of the indoor unit equipped with a humidifier must be able to endure the 90 ºC water temperature.*
- *Use galvanized steel pipe, aluminum-plastic composite pipe with hot water type or PP-R polypropylene plastic pipe with hot water type as the drain pipe*

2.6.9. Humidifier and Water Supply Piping Connection (If Applicable)

A shut-off valve should be installed on this piping for maintenance. The humidifier water supply piping needs to be connected to the interface reserved on the unit, as shown in Figure 2-18 to Figure 2-22. The unit has a copper pipe with an outer diameter of 6.35 mm and a 1/4" copper nut and a 1/4" x 1/2" conversion copper threaded connector at the end of the copper pipe.

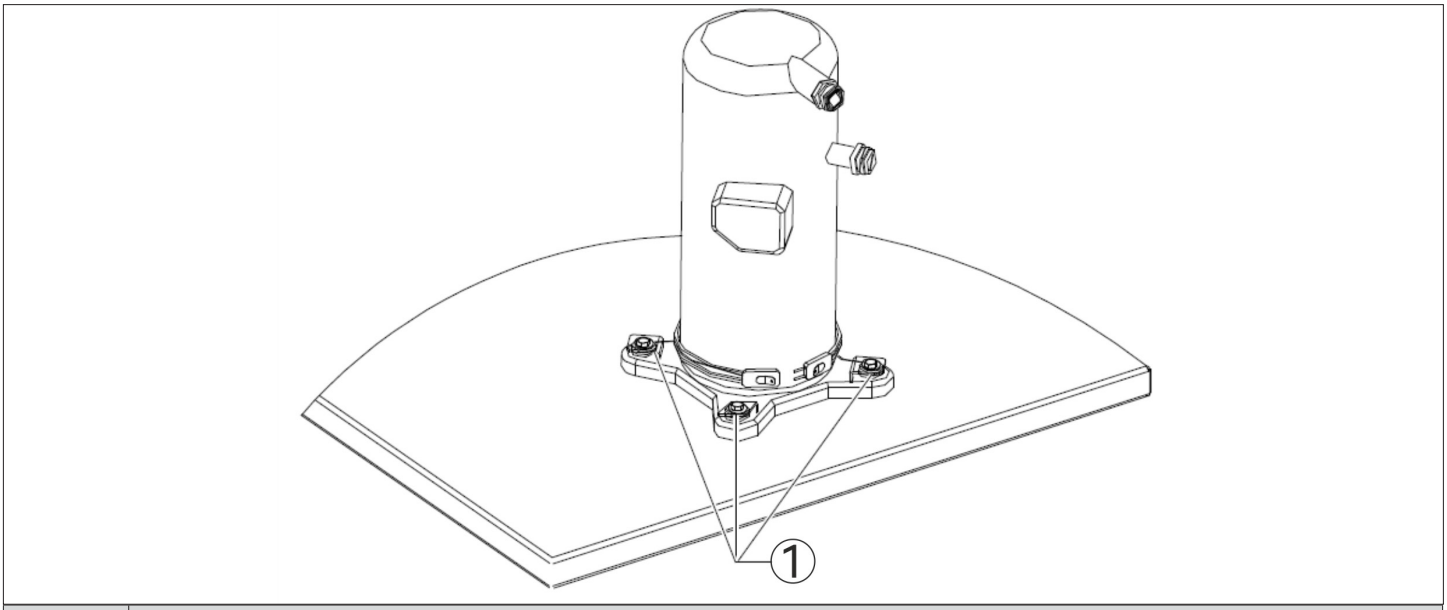
- *Where the main line pressure may exceed 700 kPa (the main line pressure range should be 100 kPa to 700 kPa), a pressure reducer should be installed.*
- *Where the main pipeline pressure is lower than 100 kPa, there should be a water-collecting tank and a water pump system should be installed.*
- *Some models may contain components, where local regulations need to be considered.*

2.7. Removing Transport Fasteners and Shock Absorbers

The fasteners and vibration absorbers are mounted on the unit to protect partial components from getting damaged and distorted due to bumping, impact, and resonance. Removal of these fasteners and absorbers is necessary before installation and commissioning the unit.

- Remove the transport fastening sheet metal of the compressor

In order to absorb the vibration of the compressor operation and reduce the vibration noise, a vibration isolator is installed on the compressor foot. However, this damping technology does not suppress compressor shaking well during transportation, which may cause loose connections or wear of components. In order to eliminate this possible problem while transporting, the "U" type sheet metal for transportation fixing plate is installed on the three fixed feet of the compressor, as shown in Figure 2-26.



No.	Description
1	Fixing plates (3 pcs)

Figure 2-26 Fastening Sheet Metal for Compressor

- *Remove the "U" type fixing plates after installation, and then restore the bolts and washers in reverse sequence of the assembly process.*
- *The fastening torque of the bolts is (12±1) Nm.*

2.8. Charging Refrigerant

- Leak Test and System Vacuuming

1. Open the Thermal expansion valves for evacuation then connect refrigerant gauges to the suction valves and to the discharge line of Schrader valves.
2. Open the service valves and place a 150 psig (1034 kPa) of dry Nitrogen with a tracer of refrigerant. After that check system for leaks with a suitable leak detector.
3. After four hours, check the pressure readings and, if they have not changed, break vacuum with dry Nitrogen, and vacuum the system second and third time with 250 microns or less. Recheck the pressure after two hours.

- *For the downflow unit, a tube with a Schrader valve is extended from the compressor suction line to the side of the unit for ease of service access. Refer* Figure 2-18 to Figure 2-22.
- *If the unit is equipped with an optional low temperature kit, the nitrogen in the liquid storage tank should be released before the unit is vacuumed.*

2.8.1. Base Charging of Refrigerant

After vacuum inspection, immediately charge the cooling system with proper amount of liquid refrigerant (generally charge until the pressure in the tank is balanced with the system pressure).

1. Connect the high and low composite pressure gauge to the refrigerant cylinder, and ensure that the connection hose is vacuumed.
2. Connect the high and low pressure composite pressure gauge to the Schrader valve interfaces at the liquid pipe angle valve and the compressor suction pipe Schrader valve interface, and keep the refrigerant cylinder up-side-down during the static charging process.
3. When the amount of the refrigerant reaches the calculated charging amount, the static charging should be stopped.
4. Do not turn on the unit immediately after static charging.
5. Prior to turning on the unit, ensure to preheat the compressor crankcase by heating belt for more than 12hours, if the preheating time is insufficient, use an air drier or other safe heating source to heat the housing of the compressor for about 30minutes so as to evaporate any liquid refrigerant.

The recommended standard refrigerant amount (kg) of the unit is shown in Table 2-11.

Table 2-11 Recommended Base Refrigerant Charge Quantity (R410A)

Unit Model	DME07 (Upflow) +DMC07	DME12 (Upflow) +DMC12	DME17 (Upflow) +DMC17	DME22 (Upflow) +DMC22	DME22 (Downflow) +DMC22	DME27 (Upflow) +DMC27	DME27 (Downflow) +DMC27
Base charge (kg) - Standard pipe length within 10 m	2.5	3.2	5.2	8.1	7.5	9.4	9.0

- *Ensure that the refrigerant charging into the refrigeration system is in a liquid state.*
- *After the refrigerant charging is completed, do not turn on the unit immediately to avoid any damage to the compressor with liquid.*
- *After the mechanical installation, electrical installation, and pre-commissioning inspection of the unit is completed, the unit is turned on and the unit system is dynamically charged with liquid refrigerant.*
- *For your personal health, please wear earmuffs or earplugs and other equipment to protect your hearing after entering the computer room.*
- *If the unit is equipped with low-temperature components, the cooling capacity will be subjected to the actual site of the project. Turn on the unit and charge the unit system with refrigerant until there is no air bubbles in the sight glass, the system supercooling degree reaches 6 K and the suction superheat degree reaches 8 K.*
- *Check the compressor suction line to ensure that the piping and compressor housing are free of condensation to prevent liquid flood back issues.*

2.8.2. Adding Refrigerant For Long Piping System

Under the condition of the standard pipe length (within 10 m), the Liebert® DM series air conditioner can be charged with reference to the recommended refrigerant charging amount. If the connecting pipe between the indoor and the outdoor units is longer than 10 m in actual installation, then add refrigerant to the system in order to ensure the normal system operation according to the following formula:

Adding refrigerant amount (kg) = Adding refrigerant amount per meter of liquid pipe (kg/m) × Total length of extended liquid pipe (m).

Refer Table 2-12 for the adding refrigerant amount per meter of liquid pipe.

Total length of extended liquid pipe (m) = Total length of liquid pipe - 5 m (for 07 kW/12 kW/17 kW)

Total length of extended liquid pipe (m) = Total length of liquid pipe - 7.5 m (for 22 kW/27 kW)

Table 2-12 Amount of Refrigerant per Unit Length of Liquid Pipe (Unit: kg/m)

Liquid Pipe OD inch (mm)	Adding Refrigerant Amount per Meter (kg/m)
3/8 (9.53)	0.050
1/2 (12.7)	0.107
5/8 (16.0)	0.174
3/4 (19.0)	0.245
7/8 (22.2)	0.321
1-1/8 (28.6)	0.431

2.8.3. Long Connecting Pipe System with Lubricant Oil (RL32-3MAF)

The lubricant oil should be added during the installation. The lubricant oil used in the Liebert® DM air conditioner is given in Table 2-13.

- *A certain type of POE lubricant that is directly supplied by Vertiv must be used, otherwise the compressor may be damaged. When charging the refrigeration system with oil, consult Vertiv representative for more details on adding the lubricant oil.*
- *Adding inferior lubricant oil and incorrect type of lubricant oil will damage the compressor, so the quality problems caused are not covered by the warranty.*

- *Do not use inferior quality refrigerant.*
- *For any consequences resulting from inferior quality refrigerant, Vertiv does not assume warranty responsibility. Select the type of lubricant oil in accordance with the compressor manufacturer's recommendation.*

Table 2-13 Amount of Lubricant Oil (RL32-3MAF)

Liquid Pipe Diameter (mm)	Within 10 (m)	>10 (m)
9.5	Do not add lubricant oil	Amount of additional lubricant oil (ml) = Adding refrigerant amount (kg) x 22.6
12.7		
16.0		
19.0		
22.0		
25.0		

2.9. Installation Inspection

Following are the particulars in the checklist (refer Table 2-14) that need to be verified and confirmed to ensure that the mechanical installation is implemented successfully.

Table 2-14 Installation Inspection Checklist

Particulars	Results
Leave enough space around the unit for maintenance.	
The equipment is installed vertically, and the installation fasteners have been fixed.	
The pipes between the indoor and outdoor units have been connected, and the ball valves of the indoor and outdoor units have been opened completely.	
Condensate pump is installed (if required).	
The drain pipe has been connected.	
The water supply pipe for the Infrared humidifier has been connected.	
All pipe joints tightened.	
Fasteners for transportation have been removed.	
Irrelevant things (such as transportation material, structure material, and tools) inside or around the unit have been cleared after the unit is installed.	
The airflow distribution system has been installed in each room (e.g. raised floor/ grill, duct, etc.).	
The upflow unit must have plenum or have air duct connection, and the fan and heater shall not be accessible after installation (if applicable).	

Chapter 3: Electrical Installation

In this chapter, the electrical installation of the Vertiv™ Liebert® DM unit is explained in-depth to help users with the various activities, which include work introduction and installation notes, connecting power cables of the indoor and outdoor units, connecting the control cables, connecting energy-saving card, and the installation inspection.

- *Liebert DM is a range of sophisticated units used in industrial, commercial, or other professional ecosystem. It is not tailored for the general public. Its total rated power is greater than 1 kW and complies to the IEC61000-3-12 standard. It is necessary to provide an interface between the user's power supply and the grid with a short-circuit ratio greater than or equal to 350.*
- *The user needs to obtain permission from the utility power department to ensure that the air conditioning unit connection to the power supply with the short-circuit ratio is greater than or equal to 250.*

3.1. Task Introduction

3.1.1. Cables to Connect On-site

1. Power cable of the indoor unit: 3P5W (3 × L + N + PE)
2. Power cable of the outdoor unit for 07 kW, 12 kW and 17 kW: 1P3W (L+N+PE)
3. Power cable of the outdoor unit for 22 kW and 27 kW: standard model: 3P4W (3 x L + PE)
4. Control signal cables of outdoor unit (only for 22 kW and 27 kW)
5. Control signal cables of unit (if relevant function/component is configured)
6. Unit monitoring and control cable (if remote control is applicable)
7. Energy-saving card cable (if applicable)

3.2. Installation Notes

All power and control cabling and ground connections must be in accordance with the national and local electrician regulations. The power cables should not be lighter than the ordinary PVC sheathed cord GB5023.1 (idt IEC60277) line 53.

1. The connections of all the power cables, control cables, and ground cables should be in compliance with the local and national electrical regulations.
2. Observe the unit name-plate for the full load current. The cables sizes must meet the conditions as specified in the local cabling protocols and rules.
3. Mains power supply requirement: 3P5W, 380 Vac to 415 Vac (AP customer), 50Hz, 3×L + N + PE.
4. The power cable connection, if damaged, it has to be replaced immediately to eliminate the dangers. The replacement procedure must be carried out by an authorized professional or experienced service personnel.
5. The electrical installation and maintenance must be carried out by some authorized personnel or a trained engineer well-versed with the inner workings of the electrical connection (for example, a service engineer from the manufacturer's side).
6. Prior to the cabling, a voltmeter must be used to measure the power supply voltage and ensure that the power supply has been switched off.
7. The front end of the unit needs to be equipped with a power-disconnection device to ensure safe operation.
8. Use screws, guide rails or other modes to fix the device firmly during the installation process to avoid movement or shaking during the start-up or operation mode.

3.3. Indoor Unit Power Cable Connection

Refer the following procedure to connect the power supply cables of the unit:

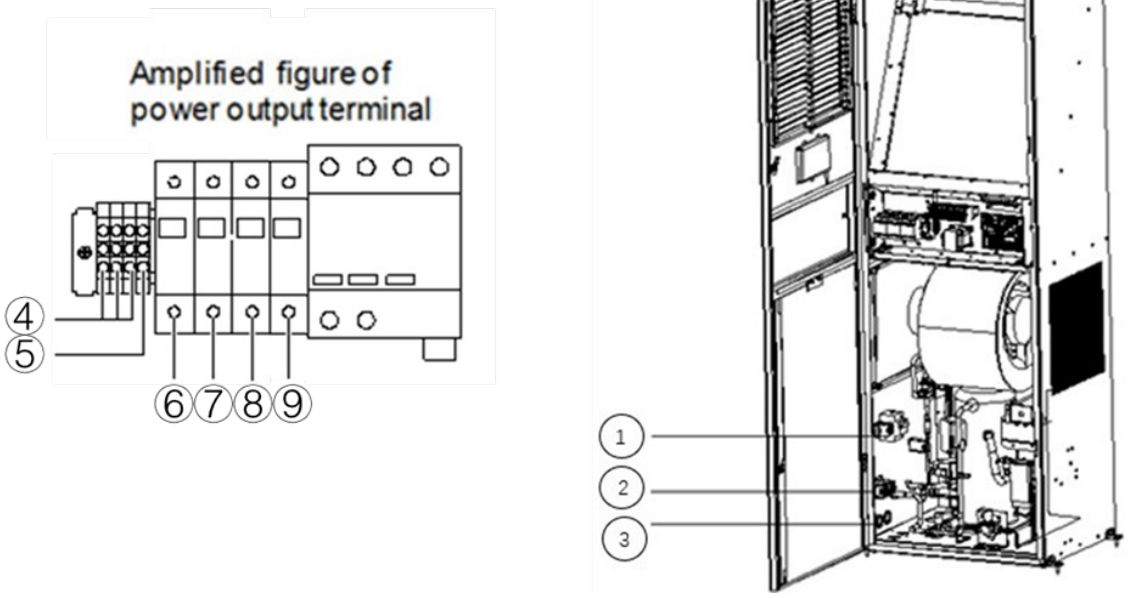
1. The recommended diameter of the power supply cable for DM07 kW/12 kW/17 kW indoor unit is not less than 12 AWG (4 mm^2). Use the attached wrench to rotate the indoor door lock.
2. The recommended power supply cable diameter for DM22/27 kW indoor unit is not less than 10 AWG (6 mm^2). Use the attached wrench to rotate the indoor door lock.
3. Open the front door to access the power input terminal of the DM22/27 kW indoor unit, which is located at the left side panel.
4. Route the power cable through the panel wire hole, and connect it to the indoor unit power input terminal.
5. Then fix the power cable with the cable clamp, as shown in Figure 3-1, and connect the other end to the AC power supply outside the air conditioner system.

The Full Load Current (FLA) of the indoor unit is given in Table 3-1.

Table 3-1 Full Load Current of the Indoor Unit (unit: Ampere 'A')

Model	Standard Model with Electrical Heater and Humidifier (A)
DM07	15.2
DM12	21.5
DM17	28.0
DM22	35.9
DM27	36.5

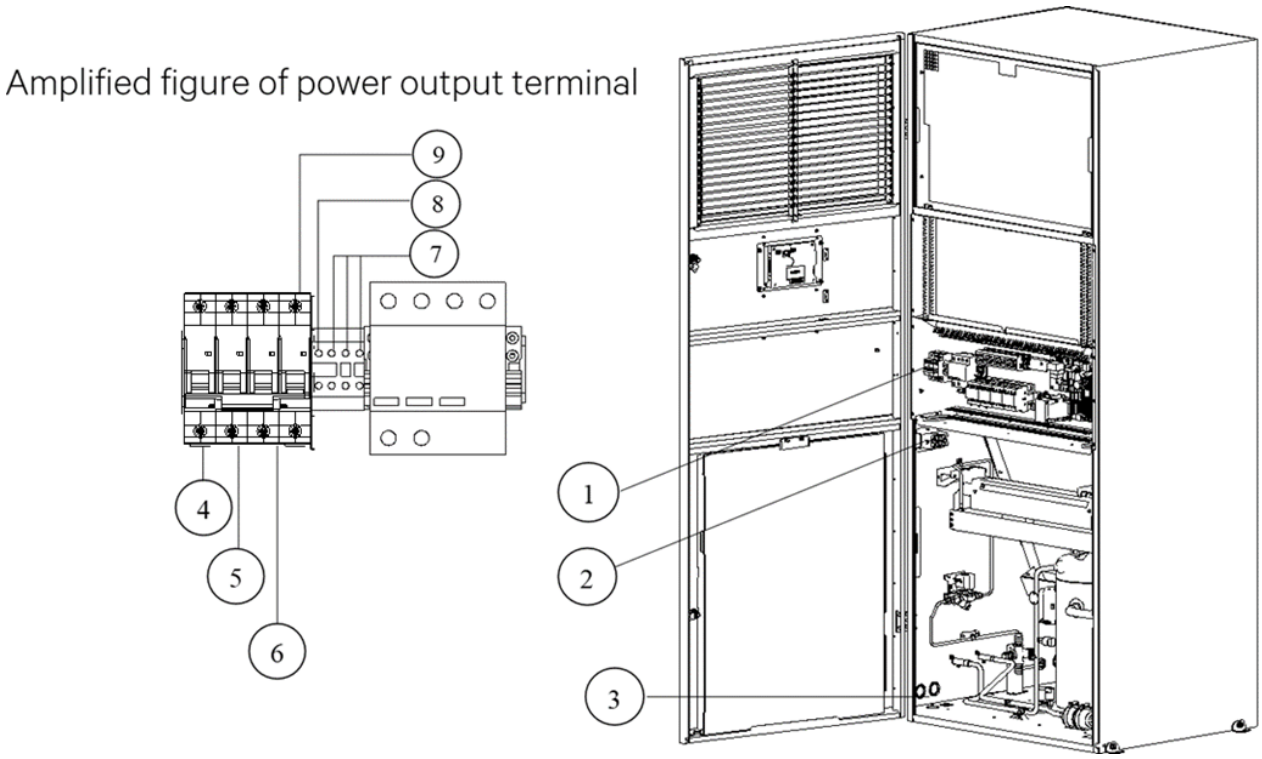
Electrical heater and humidifier are the optional components, which can be available on request, contact Vertiv representative for more details.



Enlarge view of Power Input Terminal for DM 07 kW/12 kW

No.	Description	No.	Description
1	Power output terminal	6	A line terminal
2	Cable clamp	7	B line terminal
3	Cable hole	8	C line terminal
4	Outdoor terminal	9	N line terminal
5	PE terminal		

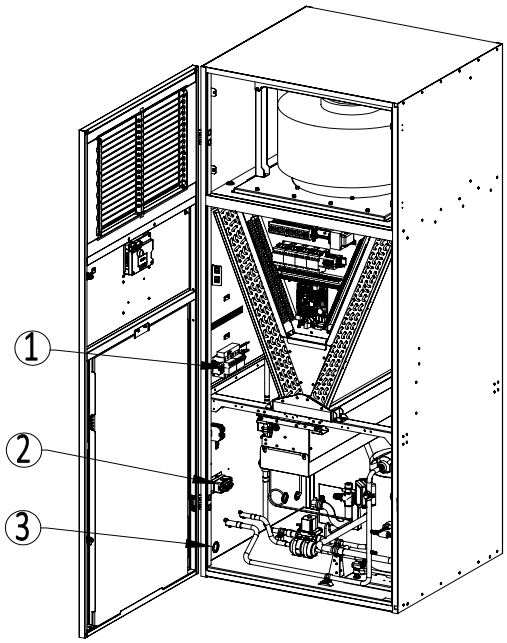
Figure 3-1 Power Connection of Indoor Unit (7 kW and 12 kW)



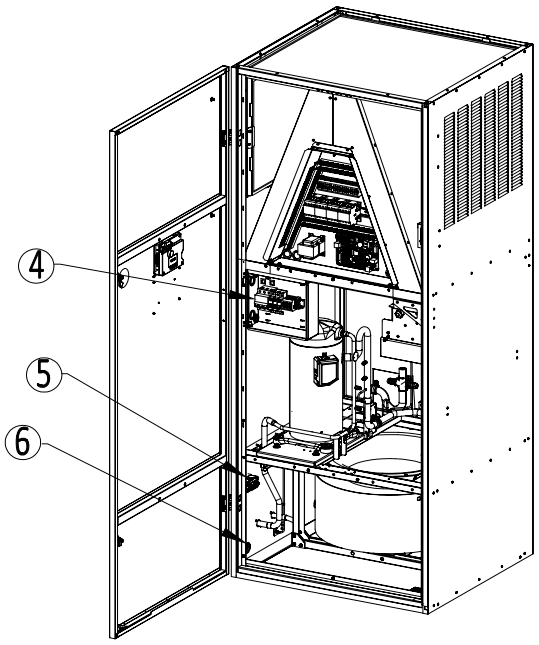
Enlarge view of Power Input Terminal for DM 17 kW

No.	Description	No.	Description
1	Power output terminal	6	C line terminal
2	Cable clamp	7	Outdoor terminal
3	Cable hole	8	PE line terminal
4	A line terminal	9	N line terminal
5	B line terminal		

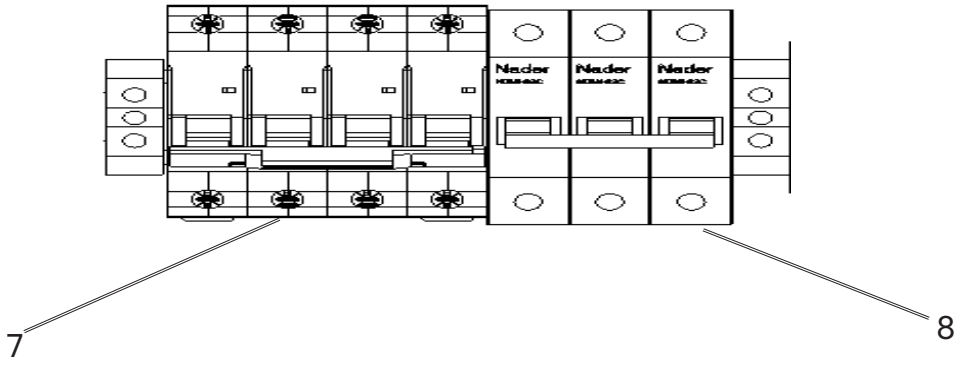
Figure 3-2 Power Connection of Indoor Unit (17 kW)



Upflow Unit



Downflow Unit



Enlarge view of Power Input Terminal for DM 22 kW/27 kW

No.	Description	No.	Description
1	Power input terminal	5	Cable clamp
2	Cable clamp	6	Cable hole
3	Cable hole	7	Indoor unit switch
4	Power input terminal	8	Outdoor unit switch

Figure 3-3 Indoor Unit Power Cabling Diagram (22 kW/ 27 kW)

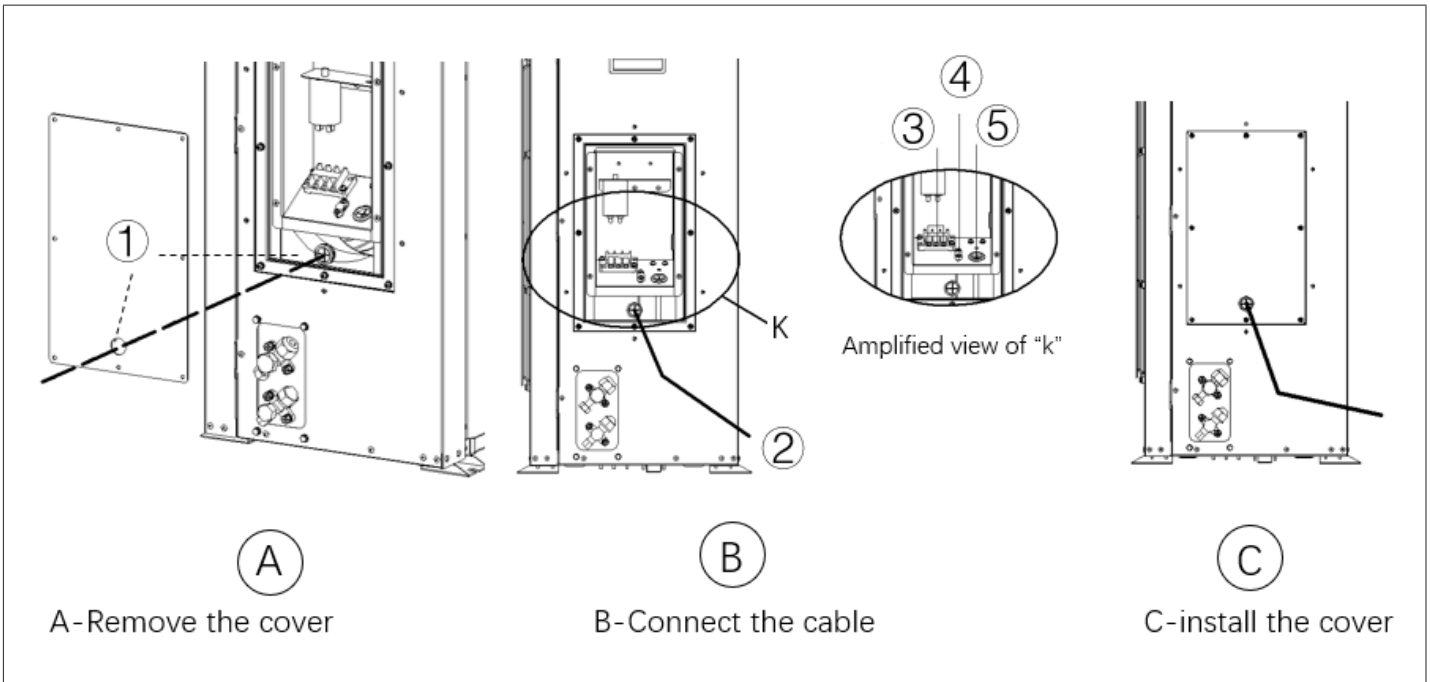
Cut off the power supply to the unit prior to the maintenance, because the unit contains high voltage.

- *Use copper cables only and ensure that all cables are firmly connected.*
- *Ensure that the power supply voltage is as per the voltage specified on the unit name-plate.*
- *Install a MCB switch before the power supply input of the indoor unit to easily isolate the unit for maintenance. Connect the power cable to the MCB switch and then to the unit.*
- *A RCCB should be installed before the indoor unit power supply input.*

3.4. Connecting Power Cable of Outdoor Unit

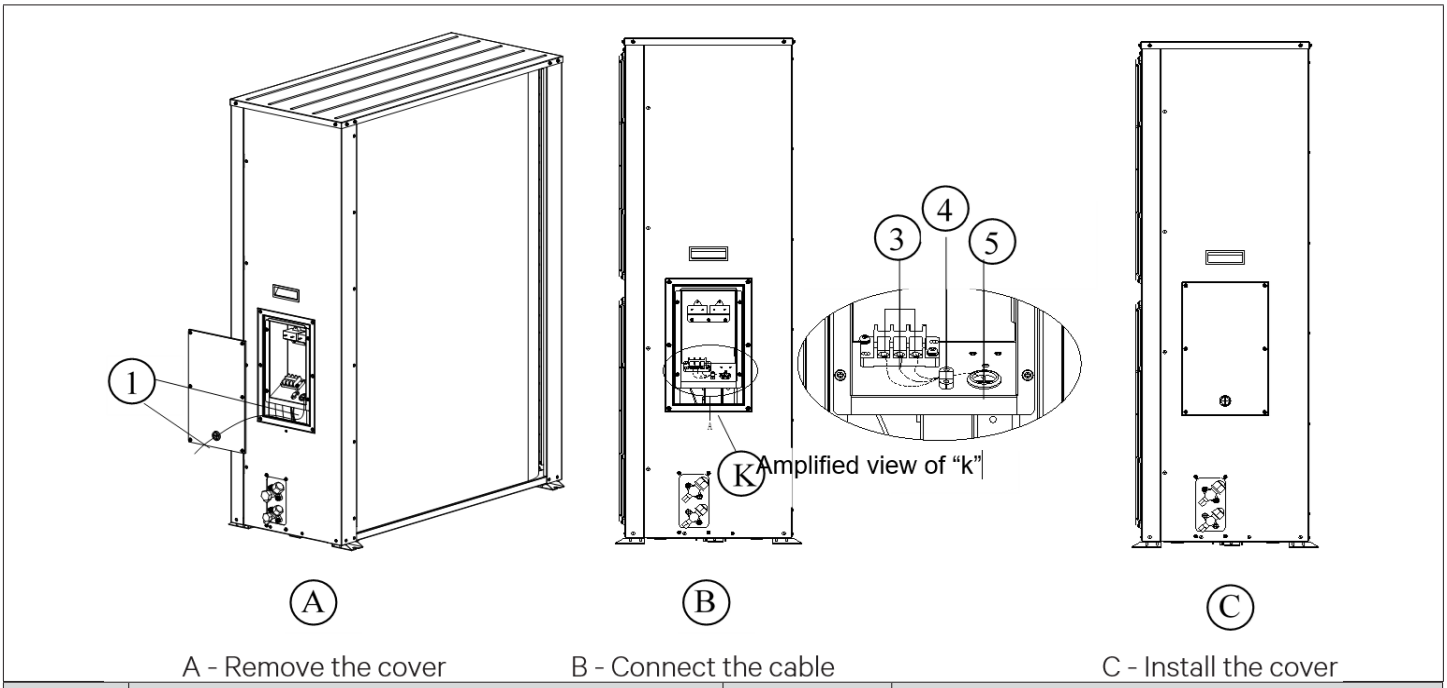
Refer the following procedure to connect the power supply cables of the unit:

1. 07 kW/12 kW/17 kW standard engaged with an outdoor unit fan control cable is 8 m. If you need a longer cable, contact Veritv for more details or purchase it yourself. The recommended power supply cable diameter for DM 07 kW/12 kW/17 kW outdoor unit must not be less than 18 AWG (0.75 mm^2).
2. The recommended diameter of the power supply cable for DM 22 kW/27 kW outdoor unit must not be less than 16 AWG (1.5 mm^2).
3. Connect one end of the outdoor unit power cable to the power output terminals of the indoor unit, as shown in Figure 3-1, Figure 3-2 and Figure 3-3, and the other ends to the power connection terminals of the outdoor unit shown in Figure 3-4, Figure 3-5, and Figure 3-6.



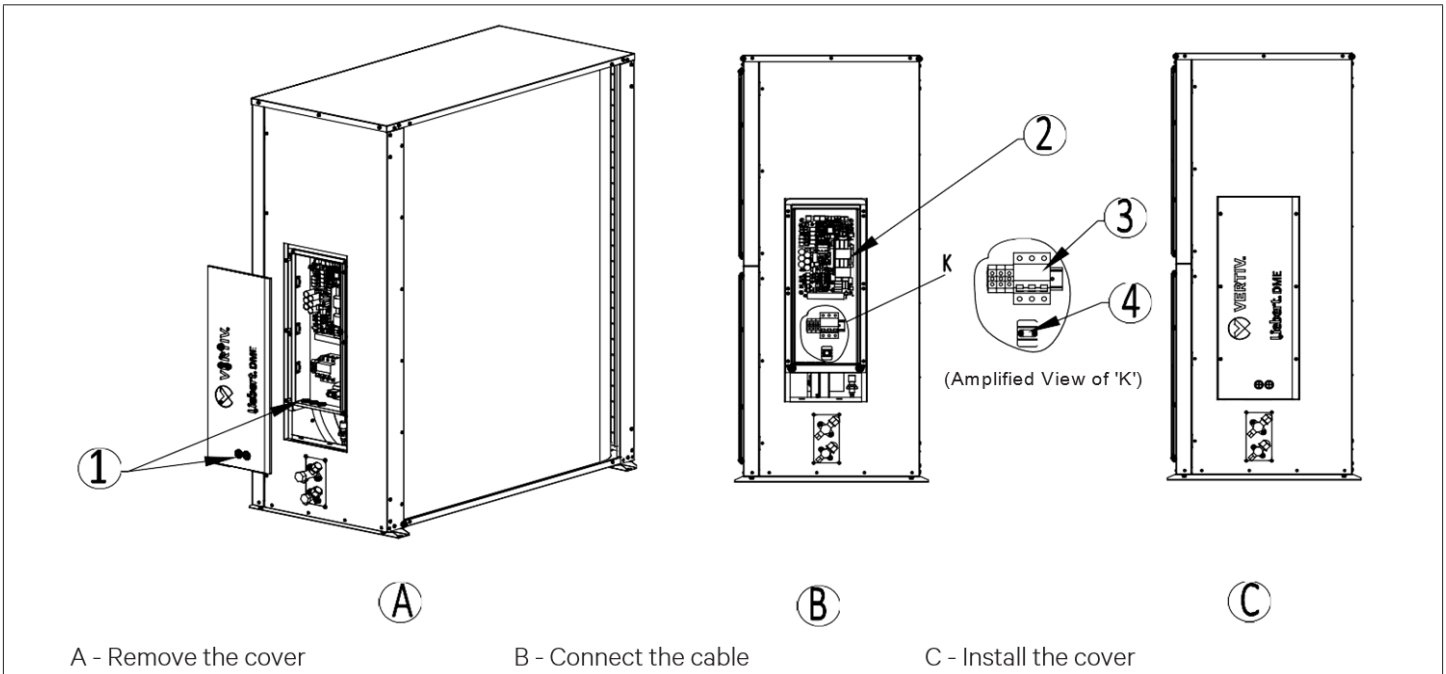
No.	Description	No.	Description
1	Cable hole in cover	4	Wire clamp
2	Cable hole	5	Cable hole in unit
3	Power input terminal		

Figure 3-4 Power Connection of Outdoor Unit (07 kW/12 kW)



No.	Description	No.	Description
1	Cable hole in cover	4	Wire clamp
2	Cable hole	5	Cable hole in unit
3	Power input terminal		

Figure 3-5 Power Connection of Outdoor Unit (17 kW)



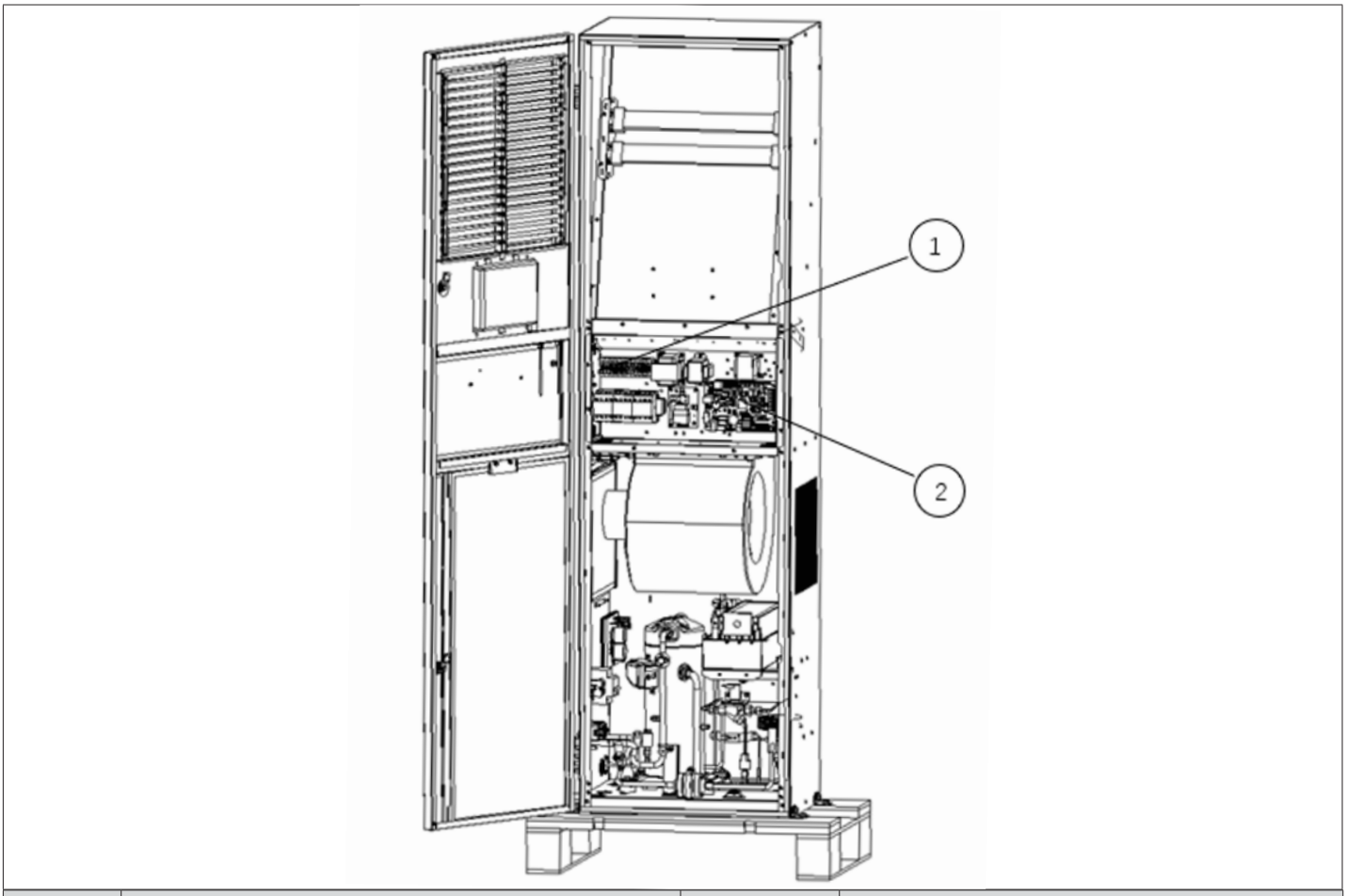
No.	Description	No.	Description
1	Cable hole	3	Power input terminal
2	Fan speed controller	4	Cable clip

Figure 3-6 Power Connection of Outdoor Unit (22 kW/27 kW)

3.5. Control Cable Connections

3.5.1. Connecting Control Terminal

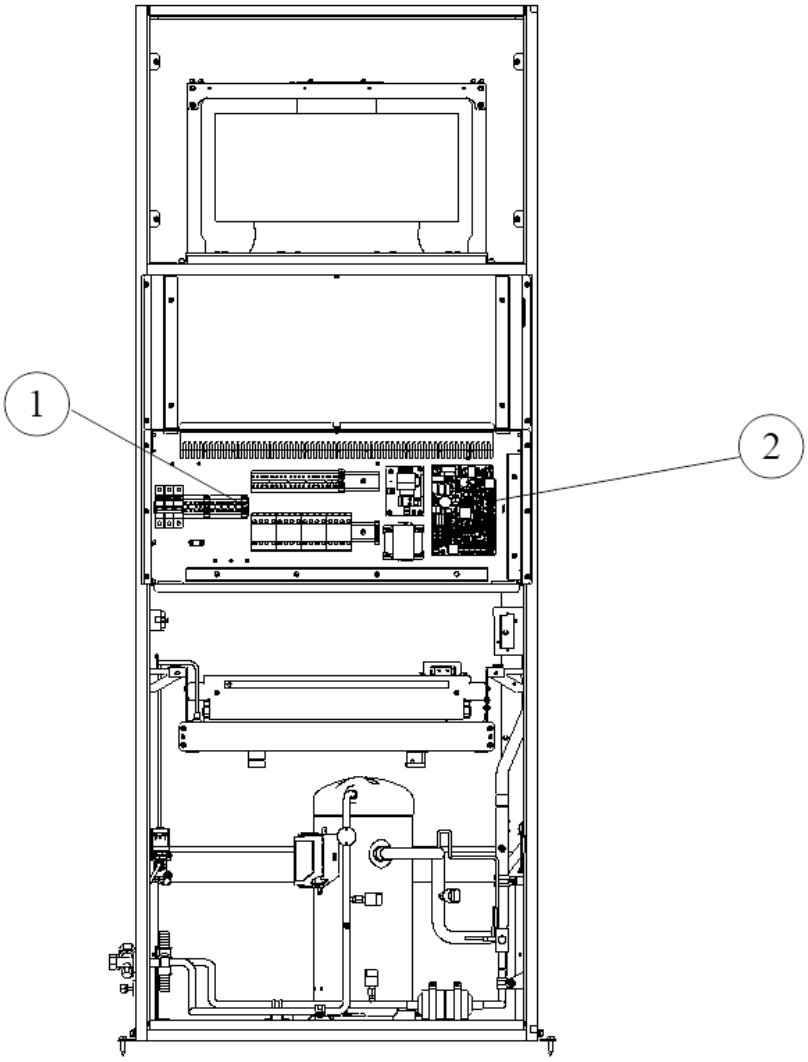
The control terminals are located on the Printed Circuit Board (PCB) and terminal block of the electrical control box, as shown in Figure 3-7, Figure 3-8, and Figure 3-9.



No.	Description	No.	Description
1	Control terminal on the terminal block	2	Control terminal on the PCB

Figure 3-7 Power Connection of Outdoor Unit (07 kW/12 kW)

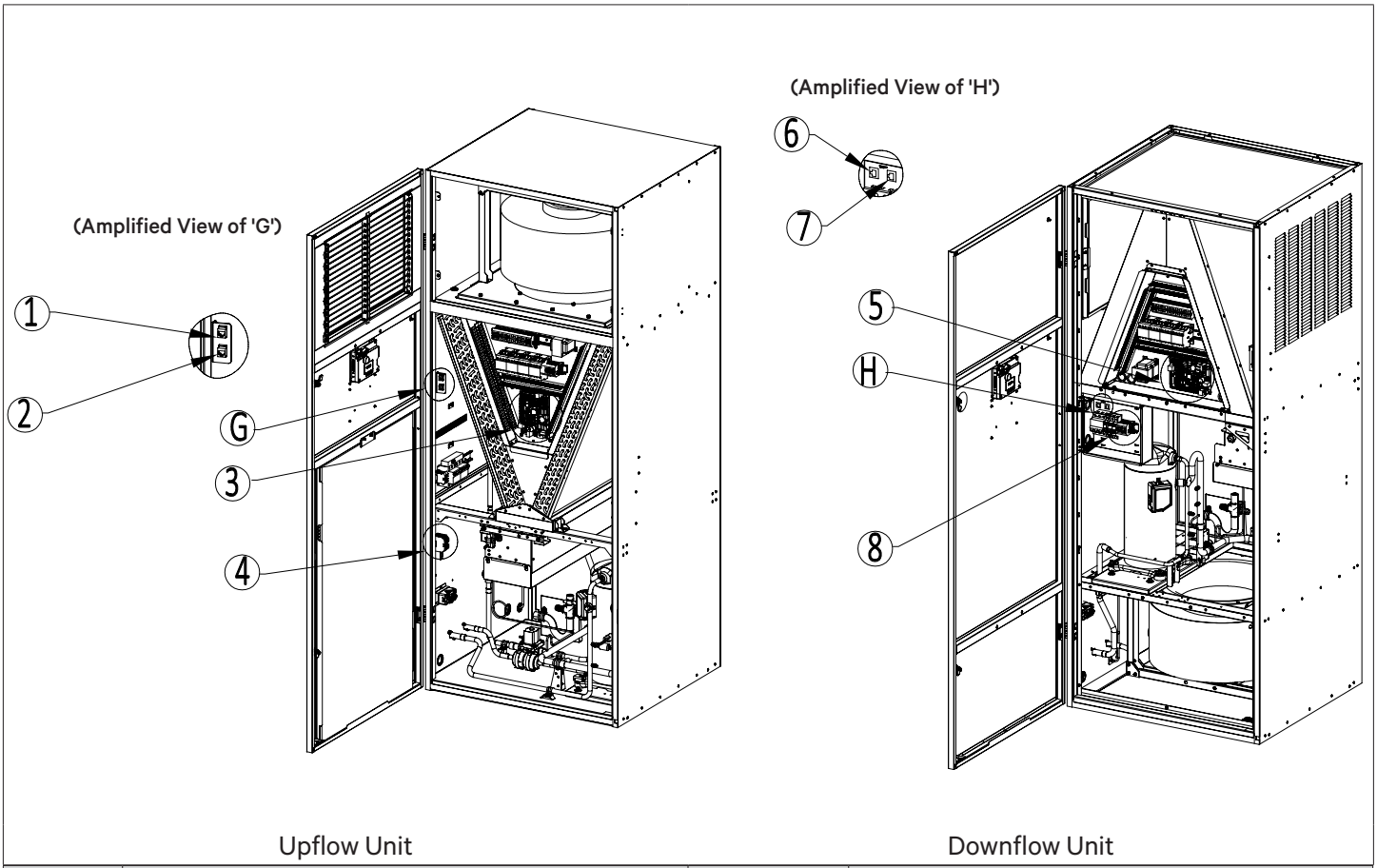
DM 07 kW/12 kW (the interface of the energy-saving card and the RDU-A/SIC cable are fixed in the electrical control box.



No.	Description	No.	Description
1	Control terminal on the terminal block	2	Control terminal on the PCB

Figure 3-8 Power Connection of Outdoor Unit (17 kW)

DM 17 kW (the interface of the energy-saving card and the RDU-A/SIC cable are fixed in the electrical control box.

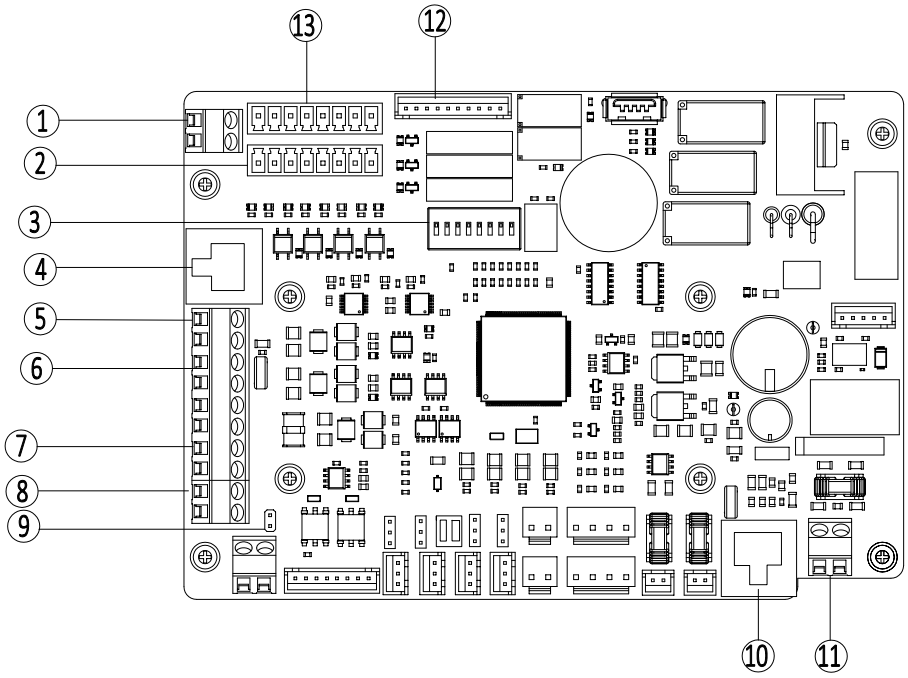


Upflow Unit Downflow Unit

No.	Description	No.	Description
1	Energy-saving card	5	Control terminal
2	RDU-A/SIC	6	Energy-saving card
3	Control terminal on the PCB	7	RDU-A/SIC
4	Control terminal on the terminal block	8	Control terminal on the terminal block

Figure 3-9 Control Terminal Position (22 kW/27 kW)

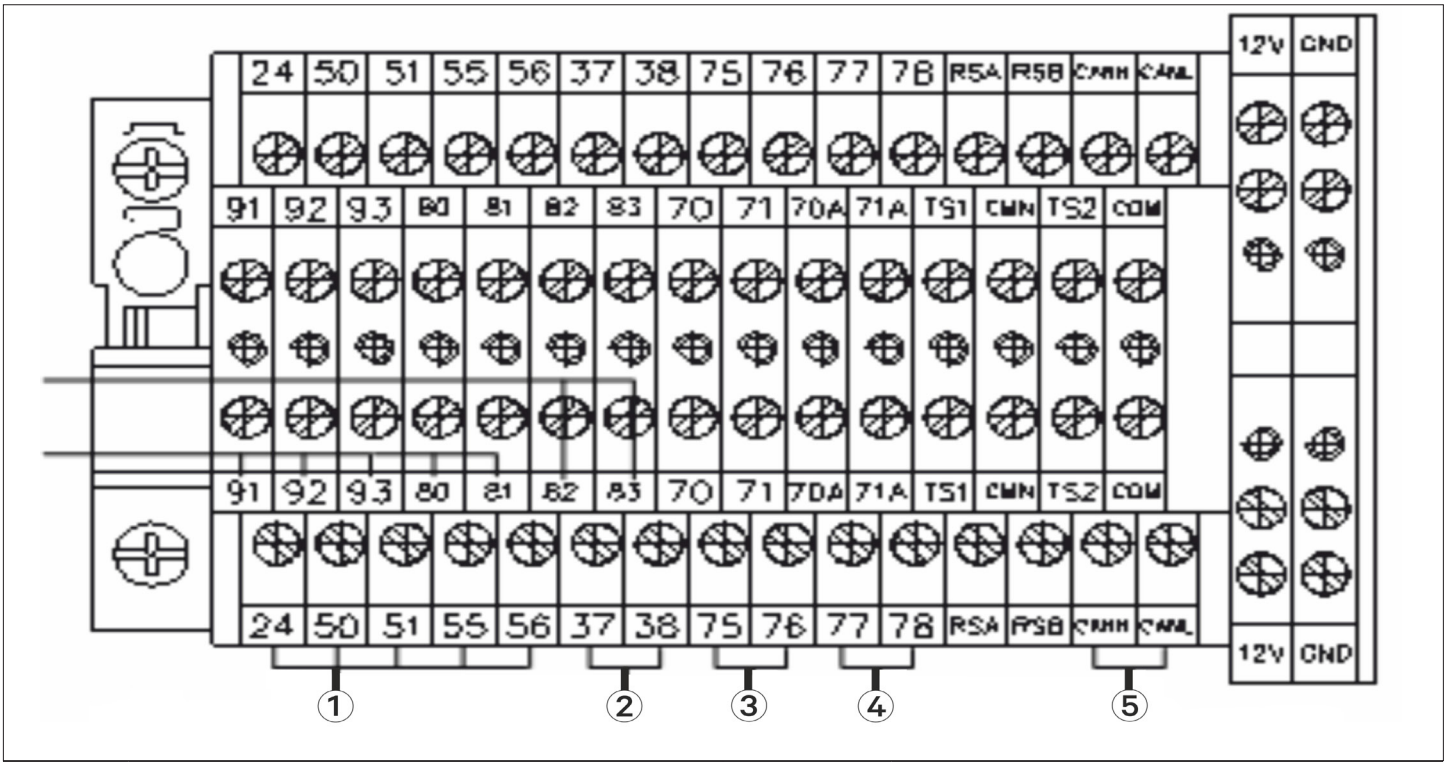
The control terminal arrangement is shown in Figure 3-10.



No.	Description	No.	Description
1	J31 DI input power	8	J20 teamwork control
2	J21 input of high pressure switch and so on	9	J27 teamwork control jumper
3	SW3 teamwork control DIP switch address	10	J34 temperature and humidity detection board
4	J38 Energy-saving Card	11	J13 single broad power input
5	J39 display data cable	12	J28 output of electrical heater and so on
6	J12 SIC power	13	J19 input of remote On/Off and so on
7	J14 monitoring		

Figure 3-10 Control Terminal Arrangement on PCB

The control terminals on the terminal block are shown in Figure 3-11. The upper part of the terminal block is connected to the unit, and the lower part is the user control signal line interface.



No.	Description	No.	Description
1	Customized alarm terminal/ water under floor sensor	4	RS-485 interface
2	37/38 are short connection remove this short wire at remote shutdown	5	CANH/CANL terminal
3	External general alarm		

Figure 3-11 Terminal Block Control Terminal Diagram

The connection personnel must take anti-static measures before connecting the control cables

- SPD (custom 1 terminal)

If the power SPD is configured in the unit, the PIN1 and PIN2 of the customer 1 terminal J19 have been connected with its alarm signal in factory and alarm is set to be normally closed (NC).

- Remote On/Off (custom 2 terminal)

The remote On/Off terminal (07 kW/12 kW J19 pin5 pin6, 17 kW/22 kW/27 kW pin37 pin38) can be used to remotely control the unit ON/OFF status and to stop the unit operation upon special moment. If the inputs of remote On/Off terminals are shorted and the unit power supply is switched On, then unit outputs are normal.

- Overflow detection (custom 3 terminal)

If the unit is equipped with an overflow detection board, connect the overflow detection board in the accessory to the control terminals (07 kW/12 kW main control board J21-7, J21-8, 17 kW/22 kW/27 kW control terminal TB-51 and TB-24 before starting-up). The overflow detection board should have the metal contacts facing down and placed on the bottom plate below the evaporator tray.

If the terminal is open, the unit will stop giving outputs. The terminals have been shorted before delivery.

If the control cables need to be connected at site, remove the short cables and connect the outer controller to the remote On/Off terminals respectively.

- *The customer terminal (control terminal) can connect with any alarm signal except for the system.*
- *Any outer alarm signal with NO dry contact can be connected with customer terminal. After the outer alarm signal is connected, user should set the corresponding customer alarm information in micro-processing controller.*
- *If no alarm signal is connected, the input state of the customer terminal is the same as that of setting. If an outer alarm is generated, the input state is different from the setting.*
- *The system will generate an audible alarm and LCD screen on micro-processing controller will display the corresponding alarm information. If a computer using Vertiv host monitoring software is connected, the alarm will be displayed on it too.*

- General alarm terminal

The general alarm relay, connected with (pin 19 and pin 20 (07 kW/12 kW), pin 75 and pin 76 (17 kW/22 kW/27 kW)) (see Figure 3-11) of the terminal block, has a set of NO dry contact, and it can also be set to NC through software. When a major alarm is generated, the contact is closed. This can be used to send a remote alarm, sending signals to the Building Management System (BMS) or dialing the paging system automatically.

- Teamwork control terminal

The Liebert® DM air conditioners support the teamwork control function of up to 4 units. If user needs to use the teamwork control function, then connect the main control boards J20-1 and J20-2 between the units in series for 07/12kW shown in Figure 3-12 and connect the teamwork control terminals 73 and 74 between the units in series for 17/22/27kW shown in Figure 3-13. After the teamwork control unit is cabled, as given in Table 3-2, set the teamwork control unit DIP switch on the printed circuit board (see Figure 3-10) to complete the address setting.

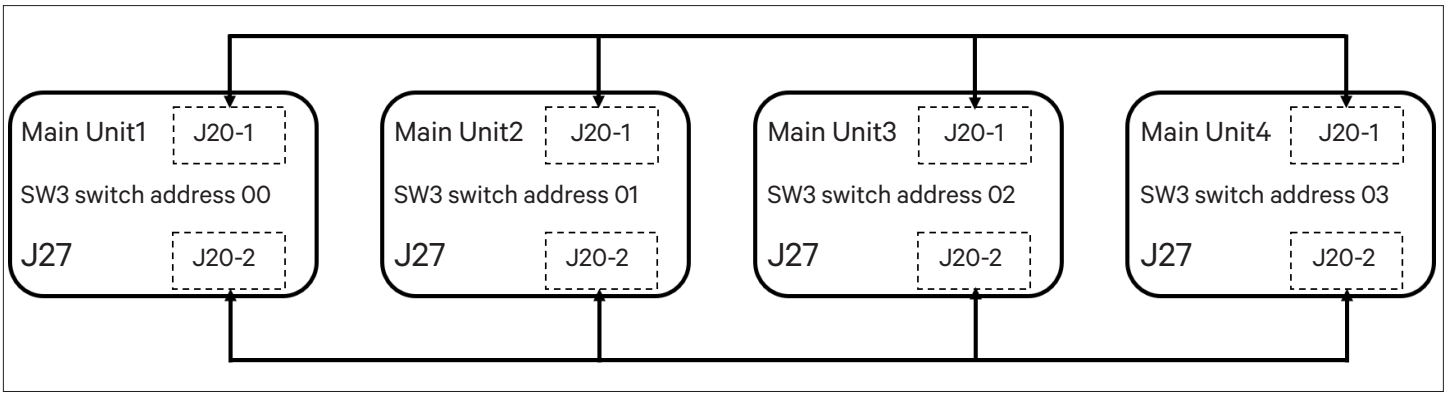


Figure 3-12 Connection Diagram of Teamwork Control Terminal (07/12 kW)

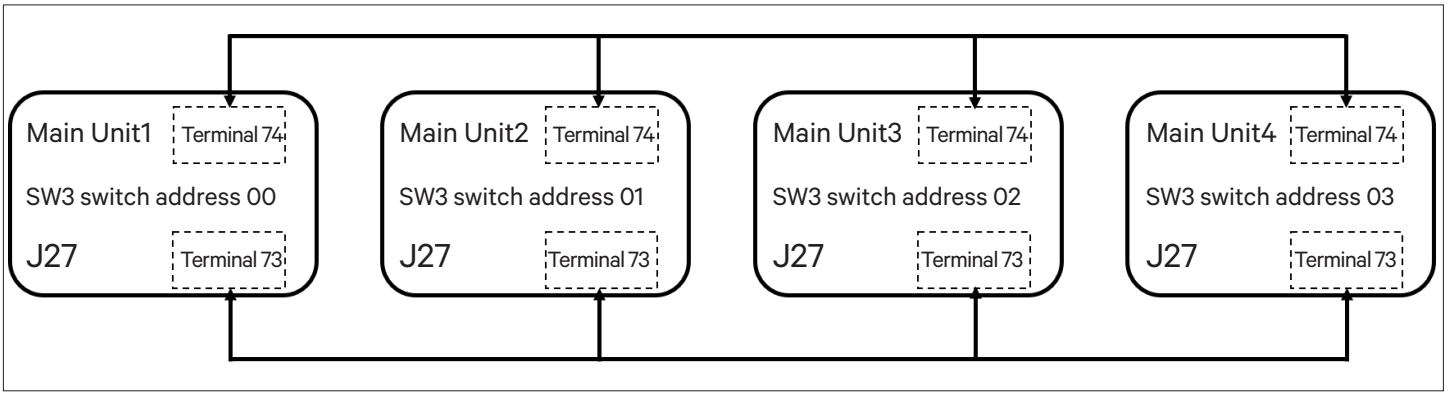


Figure 3-13 Connection Diagram of Teamwork Control Terminal (17/22/27 kW)

1. *The first and last teamwork control units need to keep the J27 group control jumper cap on the printed board (the main unit 1 and the main unit 4 as shown in Figure 3-12). The middle teamwork control unit needs to remove the J27 teamwork control jumper cap (as shown in the Figure 3-12 that shows main unit 2, main unit 3).*
2. *The specific locations of the J27 teamwork control jumper and the SW3 teamwork control DIP switch address are shown in Figure 3-10. The specific positions of the teamwork control terminals 73 and 74 are shown in Figure 3-11.*
3. *If the teamwork control wiring is incorrect and the DIP switch address is incorrect, the group control function will not function properly.*

Table 3-2 Teamwork Control Unit SW3 DIP Switch Address Setting

Unit	1	2	3	4	5	6	7	8	ID No.	
Main Unit 1	0	0	0	0	0	0	0	0	00	ON — “0” Default ID: 00
Main Unit 2	1	0	0	0	0	0	0	0	01	
Main Unit 3	0	1	0	0	0	0	0	0	02	
Main Unit 4	1	1	0	0	0	0	0	0	03	

3.5.2. The Outdoor Unit Signal Cable Connection (for 22 kW/27 kW)

Refer the following procedure to connect the signal cables of the unit:

1. The signal cable diameter of the outdoor unit must not be less than 20 AWG (0.5 mm^2).
2. Connect one end of the outdoor unit signal cable to the control terminals 70 and 71 on the indoor unit terminal block shown in Figure 3-11, and the other end to the J6 on the outdoor fan speed controller shown in Figure 6-1.
3. The dry contact leads to the terminals 70A and 71A.

If the outdoor unit signal cable is not connected properly, the outdoor fan cannot operate normally.

3.5.3. Connecting the Monitoring Interface Cable

The RS485 monitoring interface of the Liebert® DM indoor unit is located on the J14 terminal on the printed circuit board as shown in Figure 3-10. The monitoring interface is shown in Figure 3-9. The twisted-pair communication cable is used to connect to the host computer.

Multiple Liebert DM air conditioners can be simultaneously monitored through the Vertiv RDU-A/SIC monitoring. Figure 3-14 shows the networking of the two Liebert DM units monitored through the Vertiv RDU-A/SIC monitoring.

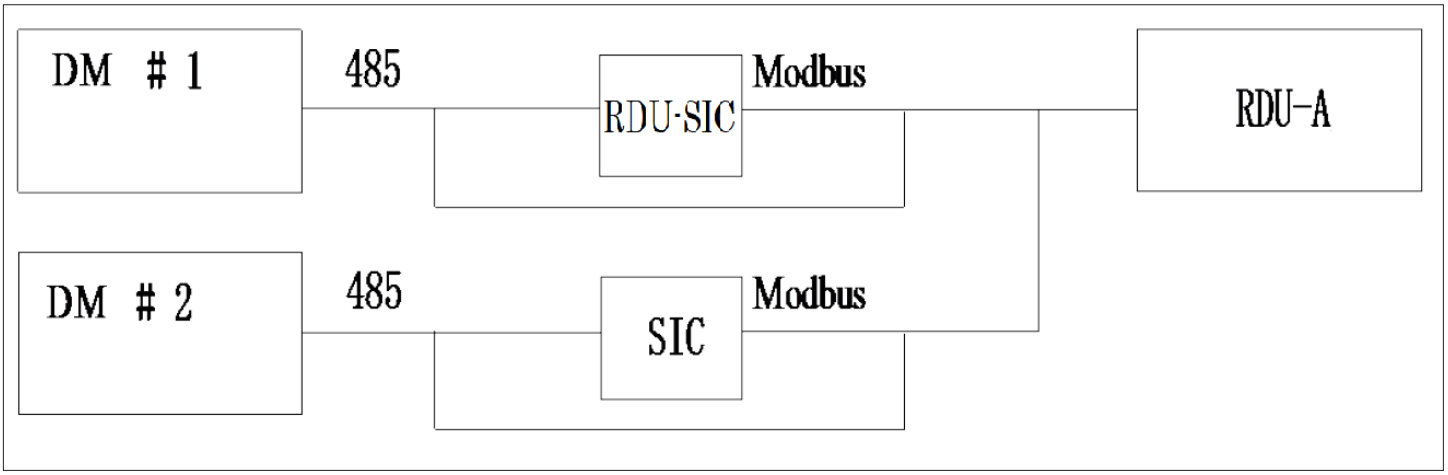
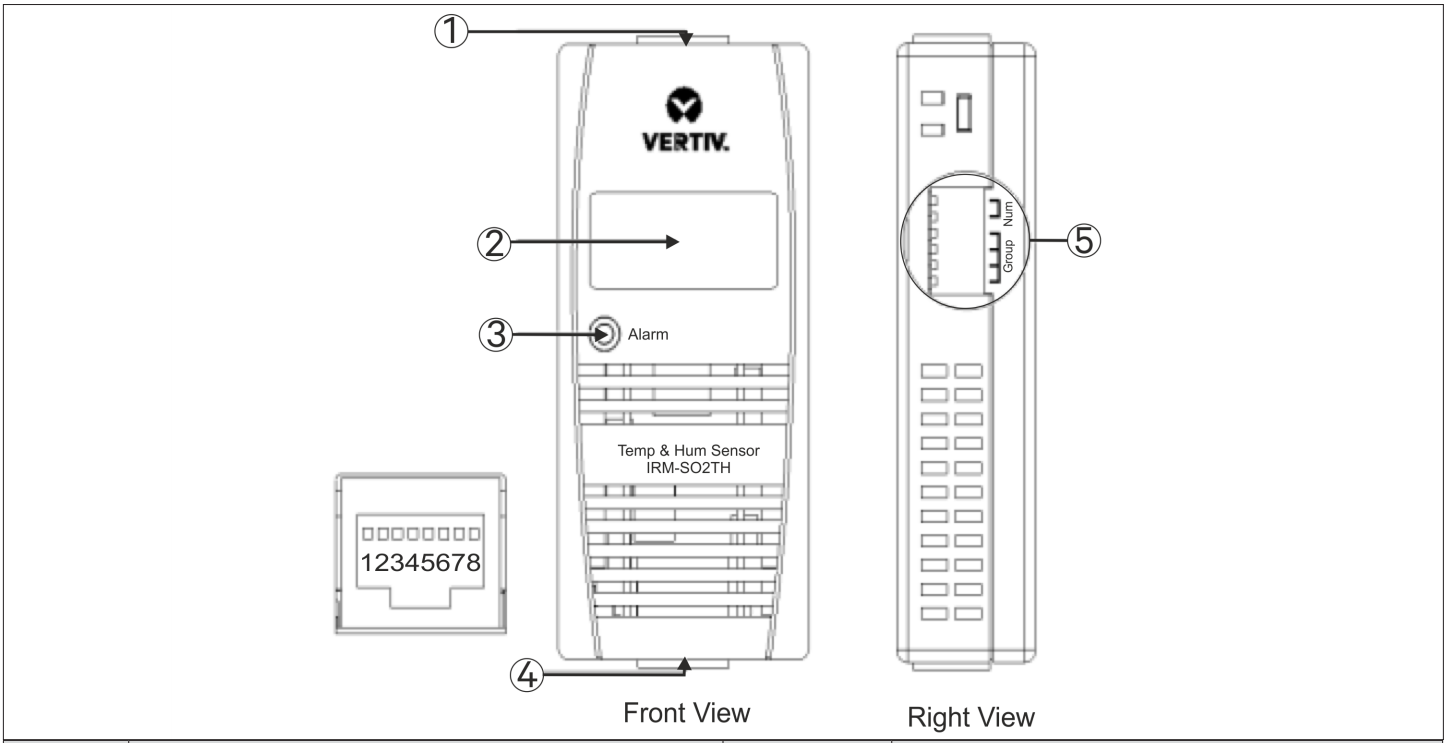


Figure 3-14 Monitoring the Networking of Two Liebert DM Units

3.5.4. Energy-Saving Card Connection

If the unit is equipped with an energy-saving card, connect the energy-saving card to the unit. Up to 4 energy-saving cards can be configured in each unit. The energy-saving card is shown in Figure 3-15.



No.	Description	No.	Description
1	RJ45 port	4	RJ45 port
2	LCD display panel	5	DIP switch
3	Alarm indicator		

Figure 3-15 Energy-saving Card

3.6. Notes on Installing and Using the Energy-saving Card

1. It is recommended to configure the energy-saving card on the cabinet with a heavy thermal load to obtain the most accurate temperature value. Each energy-saving card monitors the air temperature entering each cabinet and the temperature value is used to control the unit operation.
2. The standard position of the energy-saving card is placed 1.5m high from the ground. Each energy-saving card can be attached to the cabinet using the attached magnet.
3. The energy-saving card needs to use the standard straight-through cable. The connector at one end of the network cable is plugged into the J38 energy-saving card interface on the unit's printed circuit board, refer Figure 3-10.
4. The other end of the cable is routed from the top of the unit and connected to the J45 interface of the first sensor, then from the other end of the first sensor to the second sensor J45 interface, and so on, forming a link as shown in Figure 3-16.

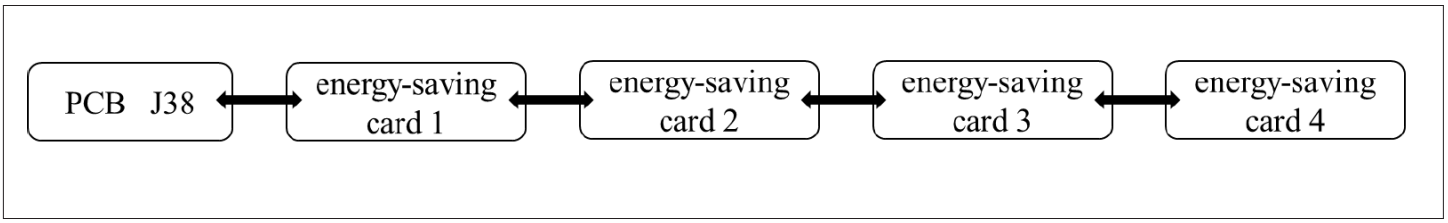


Figure 3-16 Connection of Energy-saving Card

5. After the energy-saving card is installed, refer Table 3-3 to set the energy-saving card DIP switch to complete the address setting.

Table 3-3 Energy-saving Card IRM-S02TH DIP Switch Address Setting

Energy-saving Card	1	2	3	4	5	6	ID No.	
Energy-saving card 1	0	0	0	1	0	0	10	ON — "1" OFF — "0"
Energy-saving card 2	0	0	0	1	0	1	11	
Energy-saving card 3	0	0	0	1	1	0	12	
Energy-saving card 4	0	0	0	1	1	1	13	

6. Through the microprocessing controller:
   i. Enter the third-level password to access the operation and maintenance menu-option function.
   ii. Set the energy-saving card type to 1, check whether the energy-saving card quantity setting value is consistent with the actual quantity.
   iii. Set the sleep temperature, and check if the temperature display of each energy-saving card is normal.

The sleep mode can be activated only when the number of energy-saving cards is not zero. Only the Liebert DM unit with more than one energy-saving card can enter sleep mode. For the system with the main and backup units, the main and backup units cannot share the energy-saving card.

3.7. Electrical Installation Inspection

After the system electrical installation is completed, the following requirements should be met.

Table 3-4 Electrical Inspection Checklist

Particulars	Results
The system electrical loop has no open-circuit or short-circuit exists in the electrical connection.	
The power supply voltage meets the rated voltage on the name-plate of the unit.	
Confirm if the power cables and ground cables are connected to the breaker switches, indoor unit, and outdoor unit correctly as per the norms.	
The ratings of the MCBs and fuses are correct.	
The control cables are configured and subsequently fixed properly.	
All the cables and connector connections, including the fixing blocks are firm and appropriately fixed.	

After confirming the preceding points, user can replace the electrical plate and start start-up inspection & functional testing.

Chapter 4: Start-up Commissioning

This chapter introduces the start-up inspection and function testing of the Liebert® DM air conditioning units.

4.1. Start-Up Inspection

Before commissioning the unit, inspect the status of components of the unit. Refer Table 4-1 for the list of inspection requirements.

Table 4-1 Component Inspection Checklist before Commissioning

Components	Inspection Requirements
Panel	• Check if there is any damage to the top, bottom, side, front & rear panels of the unit. • Check if the panels are well insulated and clean.
Filter	• Check if there is any damage to the filter, and clogging. • Check if the filter is reliably fixed.
Power supply	• Measure and record the voltage before the system is powered on. • Check if the power cables are firmly connected.
Outdoor unit	• Check if the outdoor unit is installed properly, the piping are rigidly supported and pipings are sloped down properly. • Check the trap is installed at an appropriate location.
Fan	• Check if there is any obstacle at inlet and outlet areas of the fan.
Humidifier (if applicable)	• Check if the water supply pipe and drain pipe are firmly connected. • Check if the water level sensor is functioning correctly.
Electrical Heater (if applicable)	• Check if the heating components are secured reliably.
Power SPD (if applicable)	• Check if the power SPD module is secured reliably.
Microprocessing Controller	• Check if the connection cables are firmly connected.

After inspecting and confirming the above particulates, go ahead with commissioning procedure.

Prior to powering on the indoor unit, ensure that the outdoor unit power and signal cables are connected and the outdoor unit MCB is closed.

The inspection requirements after starting-up are listed in Table 4-2.

Table 4-2 Component Inspection after Starting-up

Components	Inspection Requirements
Fan	• Check if the rotation direction of the blades is correct. • Check and record the rated full load current and actual current of the fan motor.
Electrical Heater (if applicable)	• Record the electrical heater current.
Outdoor fan	• Check if the rotation direction of the blades is correct. • Check and record the rated full load current and actual current of the fan motor.
Refrigerant charge amount	• Check after the compressor is turned On, if the refrigerant (R410A) is dynamically charged until there is no air bubble in sight glass. The condensation and sub-cooling temperature reaches 3 K or more, while the suction superheat temperature reaches 7 K or more. • Observe the compressor suction line to ensure that the piping and compressor housing are free of condensation to avoid potential damages caused by liquid presence. • Check if the unit exhaust superheat is in the range of 25 °C to 50 °C.
Others	• Record user setpoint values, return air temperature, suction pressure, exhaust pressure, compressor current, and outlet air temperature.

- *During the dynamic charging of the air conditioning unit, the liquid refrigerant should be slowly charged into the system from the compressor air return piping to prevent the compressor from being exposed to liquid that can impact hazard on the system.*
- *The refrigerant should not be overcharged. The recommended amount of refrigerant (kg) is represented in Table 2-12.*

4.2. Function Testing

The lethal voltage may be present in the unit which can be fatal, therefore cut off the power supply prior to functional testing. All notes, warnings, and cautions marked on the unit as well as the ones mentioned in the manual must be considered, otherwise, it may lead to injury and fatality.

Only qualified service and maintenance personnel can perform system operation and maintenance.

4.2.1. Cooling

Adjust the temperature setpoint to 5 °C (10 °F) lower than the indoor temperature. Then the control system triggers the cooling demand signal and the compressor starts to work. After at least 3 minutes of cooling, adjust the temperature setpoint to 5 °C (10 °F) higher than the indoor temperature. If the compressor stops working, it means that the cooling function is normal. Refer 5.4.3 (Temp/Hum) for better understanding.

Restore the temperature setpoint to the default or the original value after the test.

4.2.2. Heating

Adjust the temperature setpoint to 5 °C (10 °F) higher than the indoor temperature. Then the control system triggers the heating demand signal and the heater starts to work. Adjust the temperature setpoint to 5°C (10°F) lower than the indoor temperature. If the heater stops working, it means that the heating function is normal. Refer 5.4.3 (Temp/Hum) for better understanding.

Restore the temperature setpoint to the default or the original value after the test.

4.2.3. Humidifying

Adjust the humidity setpoint to 10% higher than the indoor relative humidity. Then the control system triggers the humidifying demand signal and the humidifier starts to work. Adjust the humidity setpoint to 10% lower than the indoor relative humidity. If the humidifier stops working, it means that the humidifying function is normal. Refer 5.4.3 (Temp/Hum) for better understanding.

Restore the humidity setpoint to the default or the original value after the test.

4.2.4. Dehumidifying

Adjust the humidity setpoint to 10% lower than the indoor relative humidity. Then the control system triggers the dehumidification demand. Note that during the testing process, if the indoor temperature is 3 ºC higher than the temperature setpoint, the system may enter in 'Forced Cooling Mode' and the dehumidification demand will not be responded. Refer 5.4.3 (Temp/Hum) for better understanding.

Restore the humidity setpoint to the default or the original value after the test.

Chapter 5: Microprocessor Controller

This chapter gives a detailed description on feature, appearance, LCD screen, control buttons, control interface and menu structure of Vertiv™ Liebert® DM Series.

5.1. Features

The micro-processing controller features as follows:

1. Adopt menu operation. It can monitor and display the operation status of precision cooling AC unit to keep the environment within the setting range.
2. Adopt a 7-inch HMI color screen, the user interface, which is easy-to-use.
3. Provide 3-level password protection to prevent unauthorized operation effectively.
4. Provide the functions, including self-recovery upon power failure, high-voltage & low-voltage protection, phase loss protection and automatic phase-sequence switching upon anti-phase.
5. The running status and setting parameters of the part can be displayed in real time.
6. The graphical representation of return air temperature and humidity can be displayed in real time.
7. Accurately know the running time of important components through menu operation.
8. The expert-level fault diagnose system can automatically display the current fault information of the unit to facilitate easy maintenance.
9. Store up to 999 PCS historical alarm records.
10. Configured with a serial RS485 communications protocol for monitoring purpose, it meets all securities norms.

5.2. Appearance

The micro-processing controller panel is shown in Figure 5-1.

Figure 5-1 Appearance of Color Screen

There are 4 types of indicators in the lower right corner of the color screen. The color and function descriptions of each case are as follows according to Table 5-1.

Table 5-1 Indicator Function Table

Indicator	Function Description
Blue	The screen is starting.
Yellow	The screen fails to communicate on the control panel or the system is shut down.
Green	The system is running normally.
Red	The system has an alarm and the buzzer sounds.

5.3. Control Interface

5.3.1. Color Screen Main Interface

After the start-up is completed, enter the main interface. The top part of the color screen displays the menu, first page, time, date and unlock button options. User cannot enter the menus as the menu option is locked. Click the unlock button and enter the correct password. The top part of the screen will display temperature / humidity setting option, graph option and On/Off option as shown in Figure 5-2. User can switch On/Off by pressing the On/Off button for at least 3 seconds.

As shown in the left half of Figure 5-2, the text on the left side of the arc indicates the humidity control mode (default is return air humidity control), and the text on the right arc indicates the temperature control mode (default is return air temperature control). The temperature value in the circle indicates the measured value of the return air temperature and humidity. Two triangles on the circumference of the circle - the left side indicates the return air humidity setpoint and the right side indicates the return air temperature set point. Click toggle button 1 to switch between graphics and list display. Click the Settings button to enter the temperature and humidity settings interface to set the temperature and humidity.

As shown in the right half of Figure 5-2, the sensor data or alarm data is displayed. Click the toggle button 2 to switch between the sensor data and the alarm data.

The unit provides the alarm self-diagnosis function. Click the alarm data to display the possible causes and treatment measures of the listed alarms.

No.	Description	No.	Description
1	Home button	8	Toggle button 2
2	Operating status	9	Unlock button
3	Toggle button 1	10	On/Off button
4	Control mode	11	Date and Time display
5	Status display	12	Graph button
6	Alarm diagnosis	13	Setting button
7	Real-time data	14	Menu button

Figure 5-2 Display Screen Interface - Unlocked

The function of each touch key on the interface is described in Table 5-2.

Table 5-2 Menu Description

Touch key	Description of Functions
Menu button	Click this button to display the main menu page to enter each sub-menu.
Home button	Click this button to display the homepage to view the main data and status of the system.
Settings button	Click this button to enter the temperature and humidity setting page, in which user can set the temperature and humidity settings of the system.
Graph button	Click this button to enter the graph interface to view the return air temperature graph and the return air humidity graph.
Date and Time display	Show current date and time.

Touch key	Description of Functions
On/off button	The main unit is in the shutdown state. Click this button for at least 3s, the main unit will be powered On; the main unit is in running state, click this button for at least 3s, the main unit will shut down.
Unlock button	Click the unlock button to enter the correct password to enter the unlock interface, user can open the menu icon to set the parameters; click the unlock button to enter the unlocked interface.
Operating status	Display the current operating status of the unit (shutdown, operation, standby, lock, communication interruption).
Toggle button 1	Click this button to switch between graphic display mode and list display mode.
Toggle button 2	Click this button to switch between sensor data and alarm data.
Control mode	Display the current set value of the unit and the required environmental conditions of the equipment room. The following describes the main interface control mode.
Status Display	Display the running status of the current part.
Sensor data	Display current part sensor data.
Alarm data	Display current alarm data.
Alarm diagnosis	The unit provides the alarm self-diagnosis function. Click the alarm data to display the possible causes and treatment measures.

1.1.1 Main Interface Control Mode

Figure 5-3 shows the main interface which is divided into temperature control mode, humidity control mode, current control mode, current return air temperature and humidity measured value, and temperature and humidity set value.

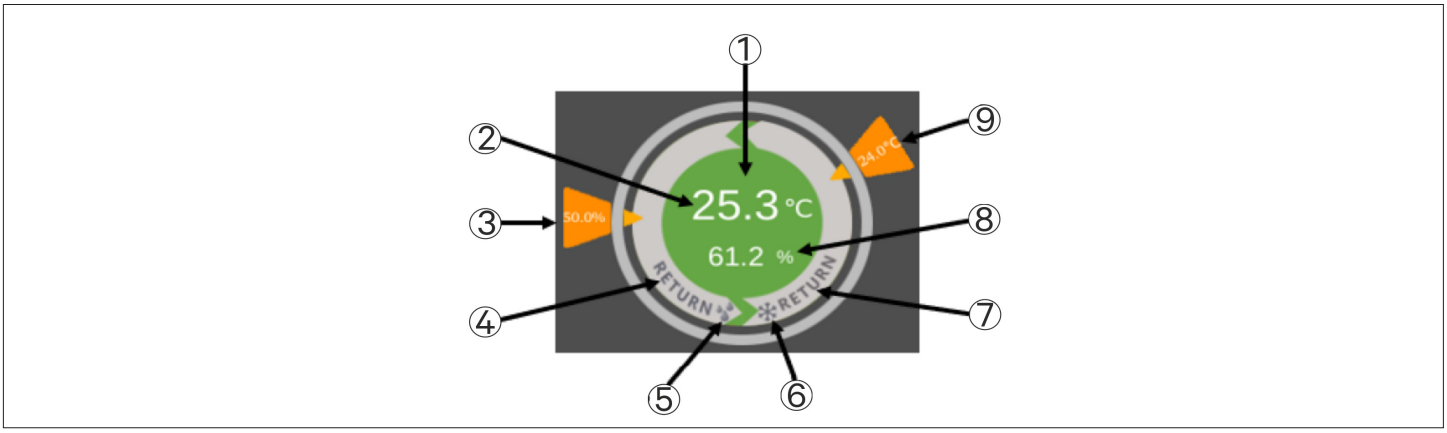


Figure 5-3 Control Mode Diagram

Table 5-3 describes different control modes of the display.

Table 5-3 Control Mode Diagram Description

No.	Description
1	The color in the circle is red, gray and green. See Table 5-4 for details.
2	Measured current return air temperature value
3	Humidity setting value, according to the range of humidity setting value, clockwise rotation changes between 30° to 150° of polar coordinate angles. If the humidity setting value is minimum value, the humidity setting value is 30° in polar coordinates. When the humidity setting value is the maximum value, the humidity setting value is 150° in polar coordinates.
4	Humidity control, default is return air humidity control, display RETURN.
5	indicates humidity.
6	indicates temperature.
7	Temperature control, default is return air temperature control, display RETURN.
8	Measured current return air humidity value.
9	The temperature setting value, according to the range of the temperature setting value, counterclockwise rotation changes between the 30° to 150° of polar coordinate angles , if the temperature setting value is the maximum value, the temperature setting value is at the polar coordinate 30°. When the temperature setting value is the minimum value, the temperature setting value is 150° in polar coordinates.

There are three types of unit status colors in main interface, as shown in Figure 5-4 below:

Figure 5-4 Unit Status Colors

Table 5-4 Description of Unit Status Colors

Status	Description of System Status
Red	The power-on status sensor data is not in the normal range or is invalid.
Gray	Power- off state
Green	The power-on status is within the normal range

5.3.2. Password Screen

Press the Unlock button on the Normal screen, and the Password screen will appear, as shown in Figure 5-5.

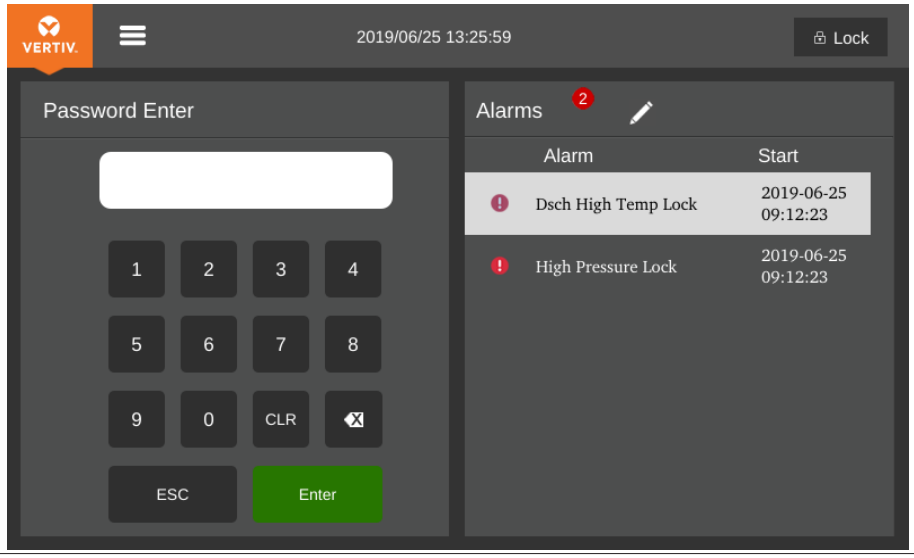


Figure 5-5 Password Screen

Three levels of passwords are provided for accessing the menus. The detailed descriptions are listed in Table 5-5.

Table 5-5 Password Level

Password Level	User	Initial Password	Remark
Level 1	General operator	0001	User can browse all the menu information except the operation and maintenance menu. User can set all parameters except the parameters under the operation and maintenance menu
Level 2	Maintenance personnel	/	Browse all menu information. Set all parameters
Level 3	Factory technician	/	/

On entering a wrong password, user can only able to see main screen. In this case, user can press the ESC button to enter the Password screen again.

If user does not enter any password or enter wrong password, user can only view the menu settings but cannot change any parameters.

5.4. Menu Structure

5.4.1. Main Menu

Enter the password in the Password screen and press Enter, and the Main Menu screen will appear, as shown in Figure 5-6. Some menu items are settable and others are not. For detailed setting procedures, refer 5.4.5 for Parameter Settings.

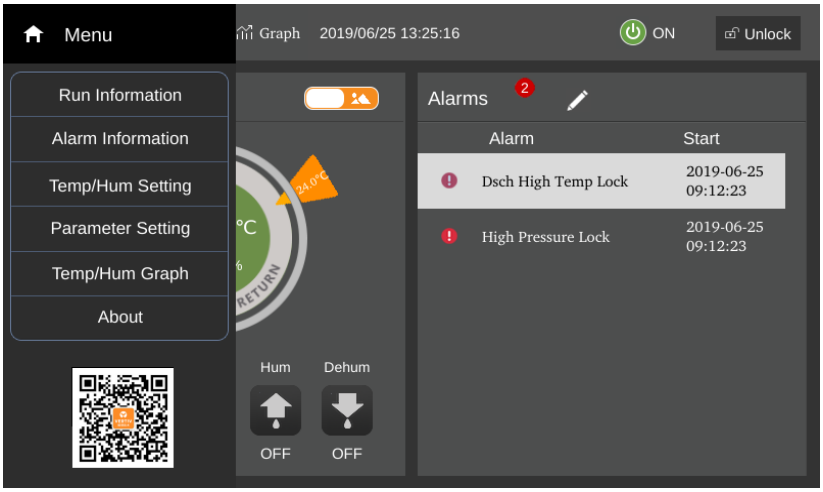


Figure 5-6 Main Menu Screen

The items in the Main Menu screen are described in Table 5-6.

Table 5-6 Main Menu Description

Menu Item	Descriptions
Run information	View digital value information, temperature and humidity information, DIP switch information, and power information.
Alarm information	View active and historical alarms of the system.
Temperature and humidity setting	Set temperature and humidity values.
Parameter setting	Set teamwork control settings, alarm parameters, alarm properties, communication settings, time settings, display settings, password settings.
Temperature and humidity graph	View return air temperature graph, return air humidity graph.
About	View the controller software and hardware version number, the software and hardware version number of the display screen.

5.4.2. Run Information

Select **Run Information** from the main menu to access the interface as shown in Figure 5-7, including digital value information, temperature and humidity information, DIP switch information, and power information.

- Switch information

The Switch information menu displays the digital value status of the device in real time, as shown in Figure 5-7.

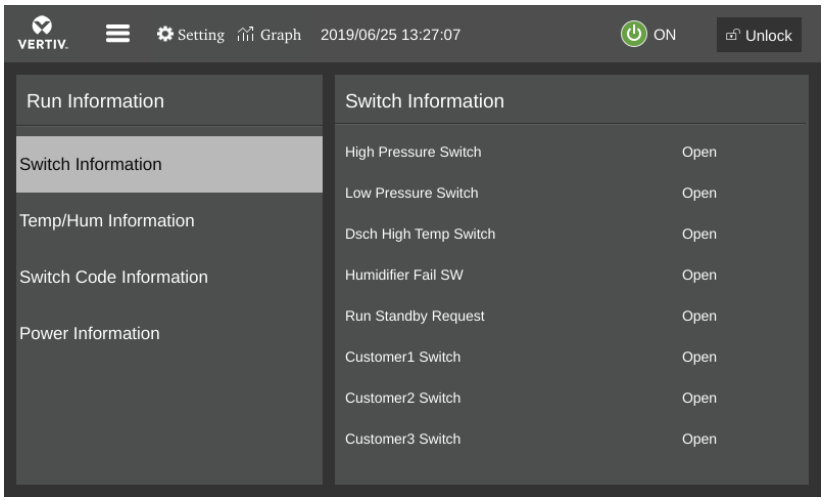


Figure 5-7 Run/Switch Information

- Temperature and humidity information

The temperature and humidity information menu displays the return air temperature and humidity information of the device in real time, as shown in Figure 5-8.

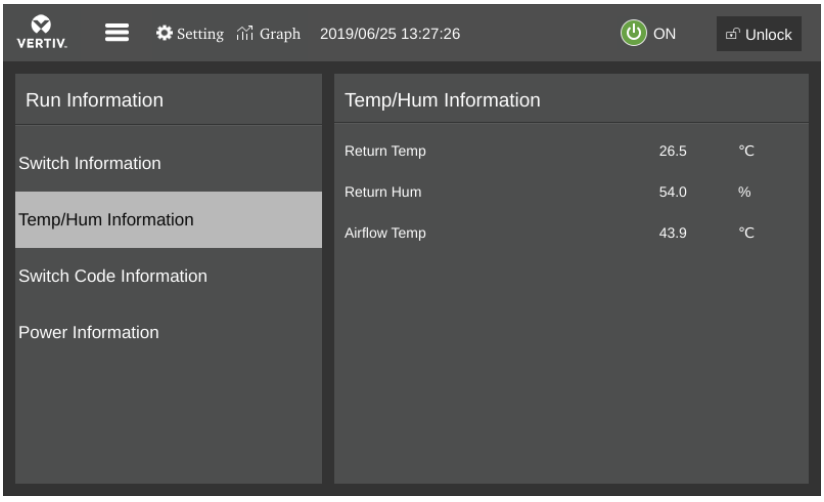


Figure 5-8 Temperature and Humidity Information

- DIP Switch Information

The **DIP Switch Information** menu displays the DIP switch value, as shown in Figure 5-9.

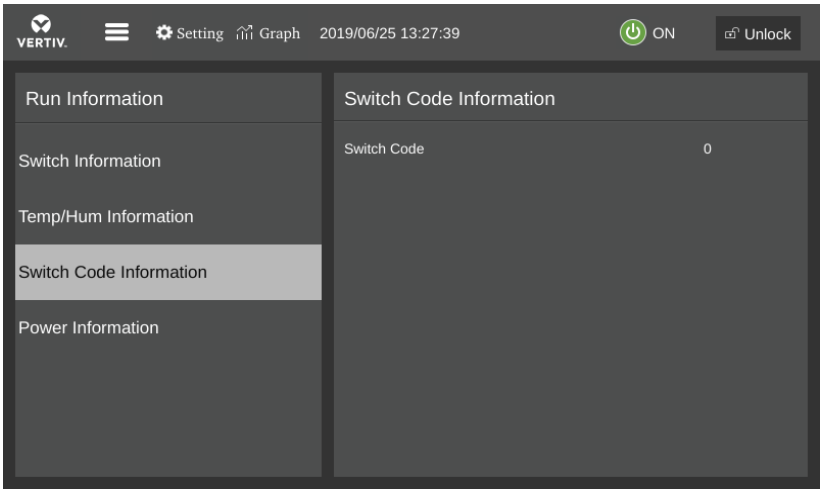


Figure 5-9 DIP Switch Information

- Power Information

The **Power information** menu displays the three-phase voltage and frequency as shown in Figure 5-10.

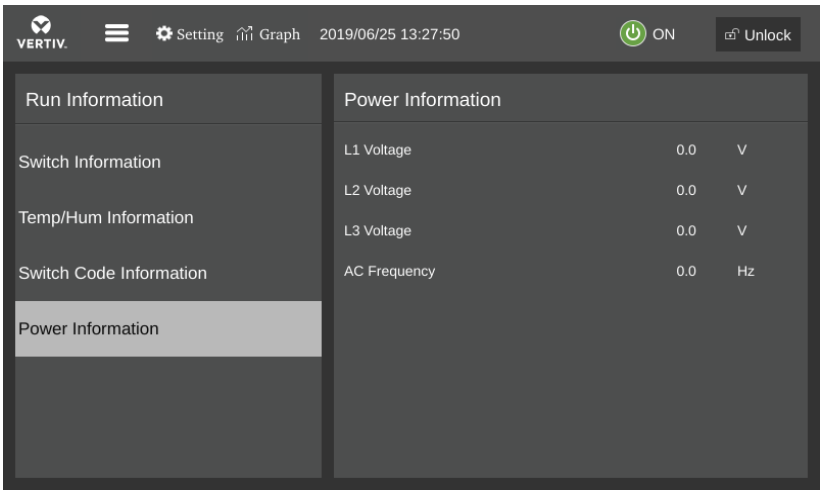


Figure 5-10 Power Information

5.4.3. Temp/Hum Setting

Select the **Temperature and Humidity setting** in the main menu to access the interface as shown in Figure 5-11, including temperature settings and humidity settings. Under this menu, the user can set the value of the return air temperature and humidity, temperature and humidity ratio band.

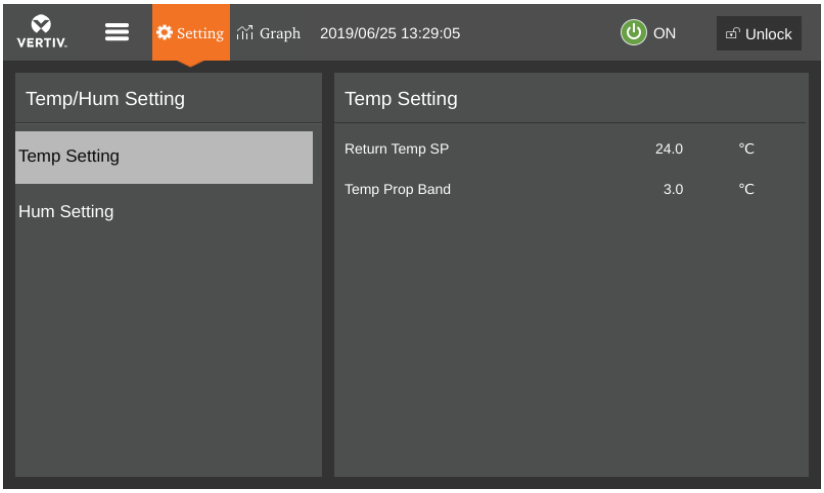


Figure 5-11 Temperature and Humidity Settings

5.4.4. Alarm Information

Select **Alarm Information** from the main menu to access the interface as shown in Figure 5-12. It includes active and historical alarms.

- Active Alarm

The **Active Alarm** menu is used to monitor the current alarm status record of the unit and prompt specific alarm status information. The specific alarm status information includes sequence number, start date and time and alarm content, as shown in Figure 5-12.

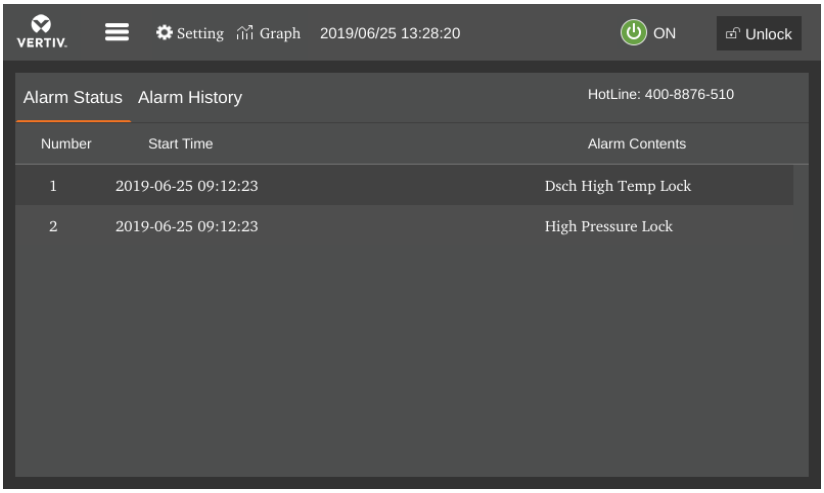


Figure 5-12 Active Alarm Menu

1. *The latest alarm number is the smallest number. When multiple alarms occur, press the scroll bar on the far right to scroll up or down.*
2. *The alarm status record is automatically cleared when the system is powered Off.*
3. *The unit provides the alarm self-diagnosis function. Click the alarm data to display the possible causes and treatment measures.*

- Alarm History

The **Alarm History** menu is used to view the historical alarm record of the unit, including alarm no., alarm start time and alarm end time, and the alarm contents, as shown in Figure 5-13.

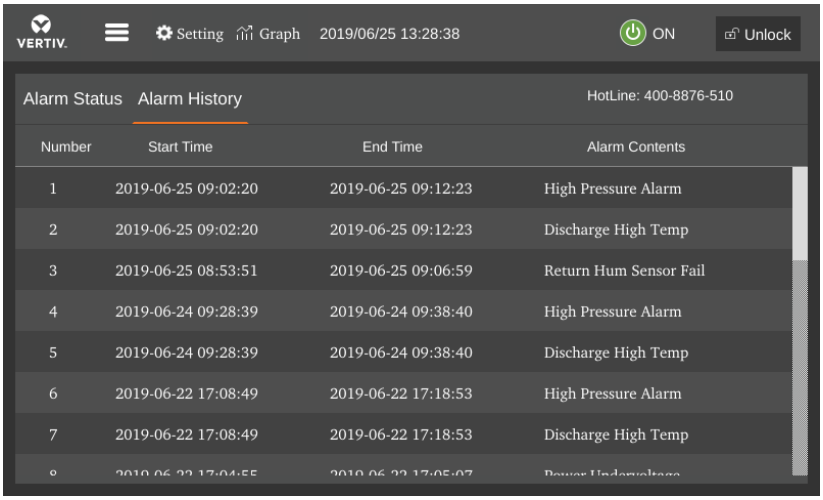


Figure 5-13 Historical Alarm Menu

- *Press the Up or Down button to scroll through the historical alarm records if more than one alarm is activated.*
- *Up to 999 historical alarm records can be stored. They will not be cleared upon system power-off.*

5.4.5. Parameter Settings

Select **Parameter Settings** from the main menu to enter the interface as shown in Figure 5-14, including teamwork control settings, alarm parameters, alarm properties, communication settings, time settings, password settings and display settings.

- Teamwork Settings

The **Teamwork Setting** menu interface is shown in Figure 5-14.

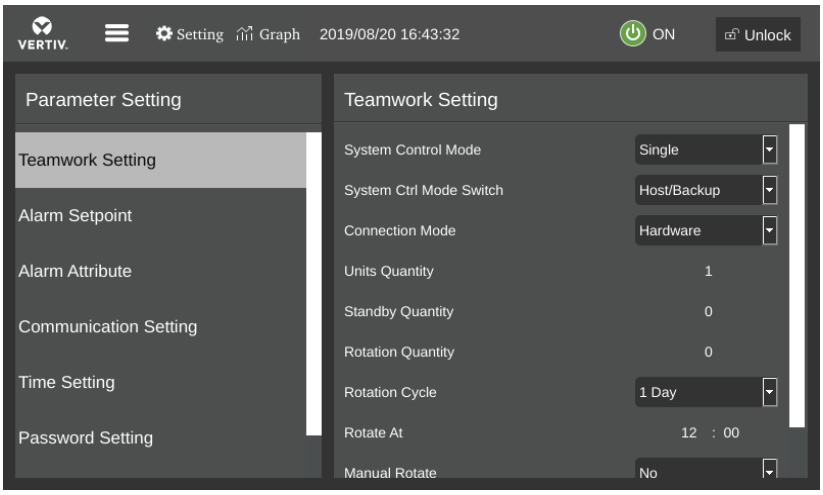


Figure 5-14 Teamwork Control Settings

- *If user need to use the teamwork control function, then complete the teamwork control terminal cabling according to the Section 3.5.*

- Alarm Setpoint

Figure 5-15 shows the **Alarm Setpoint** menu interface. The temperature and humidity alarm value can be set in the alarm parameter menu.

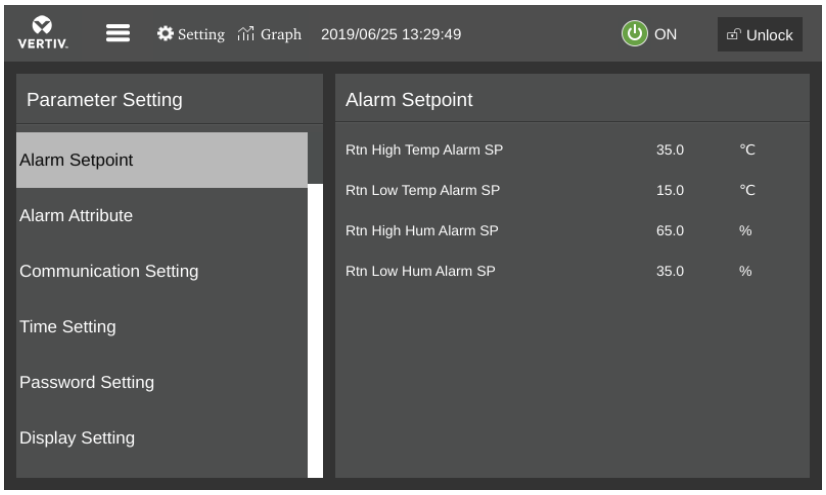


Figure 5-15 Alarm Setpoint

- Alarm Attribute

Figure 5-16 shows the **Alarm Attribute** menu interface.

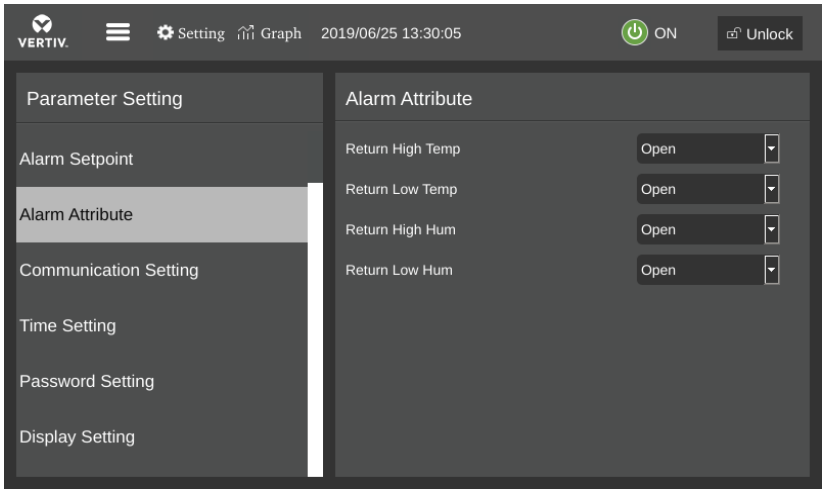


Figure 5-16 Alarm Attribute

- *The alarm settings are saved for permanent memory. It is not recommended to change the default value of the alarm setpoint and turn off the alarm properties. The alarm output logic is shown in Table 5-7. If it is necessary, please operate under the guidance of a trained professional.*

Table 5-7 Alarm Output Logic

Set Value	Alarm History	Alarm Status record	Alarm Sound	Alarm Prompt
Enabled	Yes	Yes	Yes	Yes
Ceases	Yes	Yes	No	No
Disabled	No	No	No	No

- Communication Setting

The **Communication Setting** menu interface is shown in Figure 5-17.

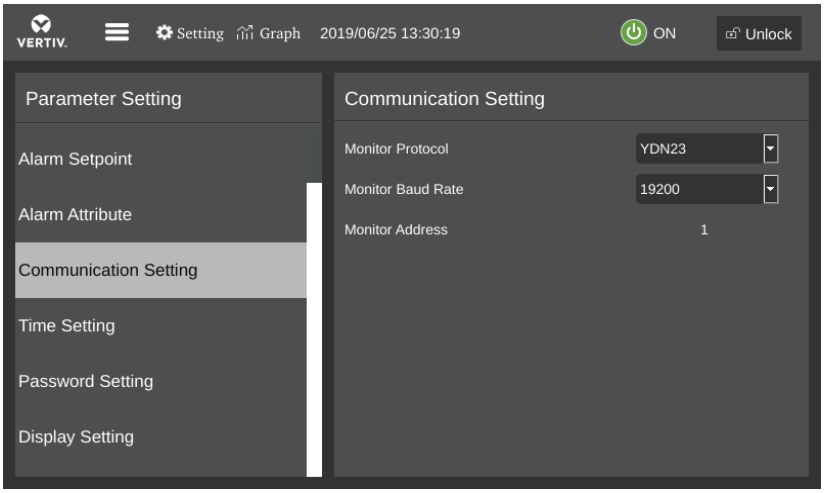


Figure 5-17 Communication Setting

- Time setting

The **Time Setting** menu interface is shown in Figure 5-18. The time settings menu enables to set in the time and date of the unit.

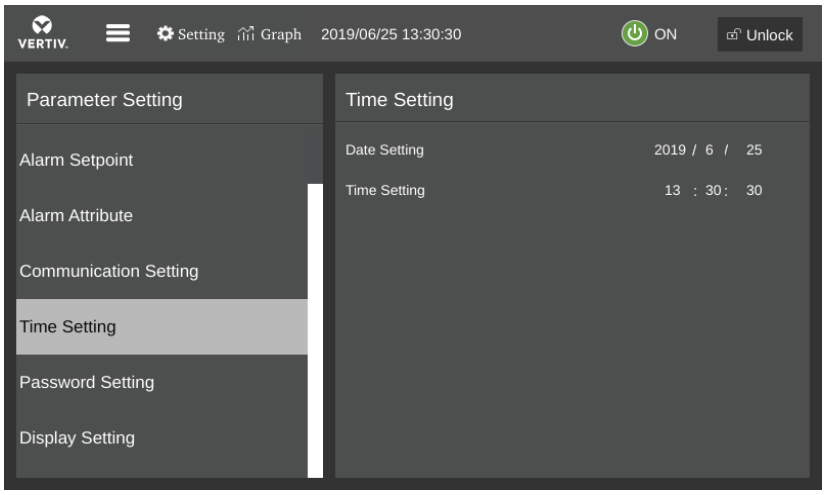


Figure 5-18 Time Setting

- Password Setting

The **Password Setting** menu interface is shown in Figure 5-19. Change the password settings for permanent memory saving.

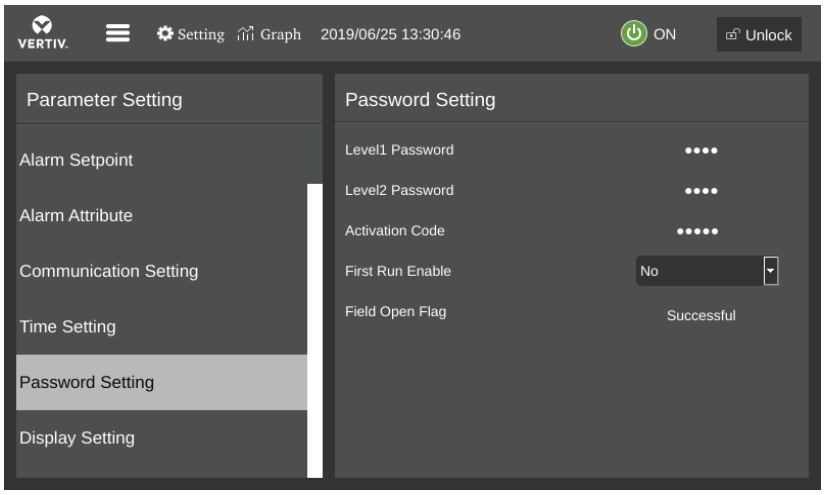


Figure 5-19 Password Setting

- Display Setting

The **Display Setting** menu interface is shown in Figure 5-20. The display language (Chinese or English) can be selected in the display setting menu.

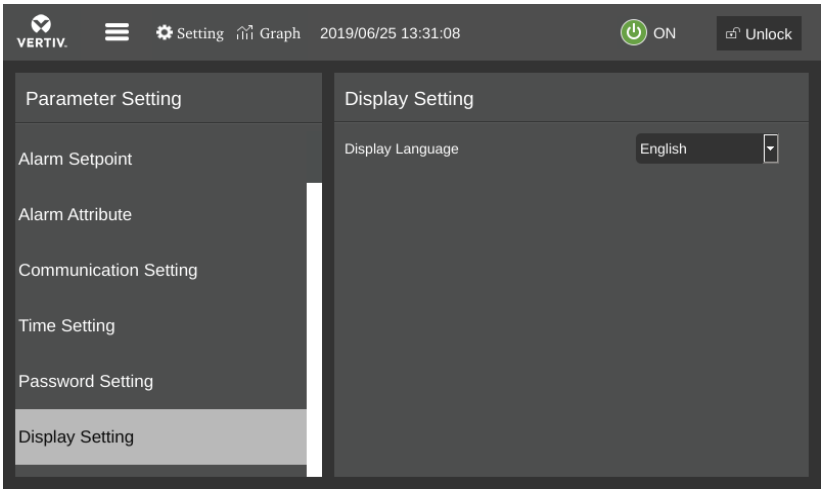


Figure 5-20 Display Setting

5.4.6. Temperature and Humidity Graph

In the main menu, select the **Temperature and Humidity Graphs** to access the interface as shown in Figure 5-21. The user can view the graph of return air temperature and return air humidity 0 to 48 Hour under this menu.

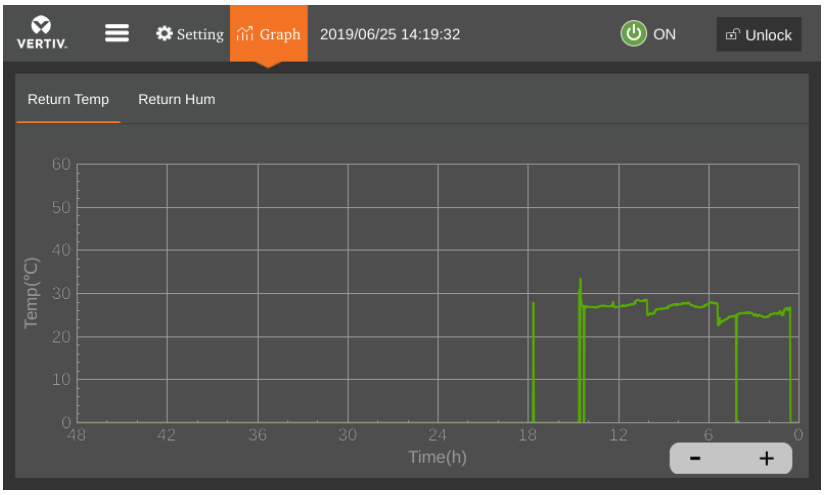


Figure 5-21 Temperature and Humidity Graphs

5.4.7. About

In the main menu, choose **About** to access the version information and device abnormality help interfaces as shown in Figure 5-22.

- Version Information

The **Version Information menu** interface is shown in Figure 5-22. The software and hardware version number can be queried in the version information menu.

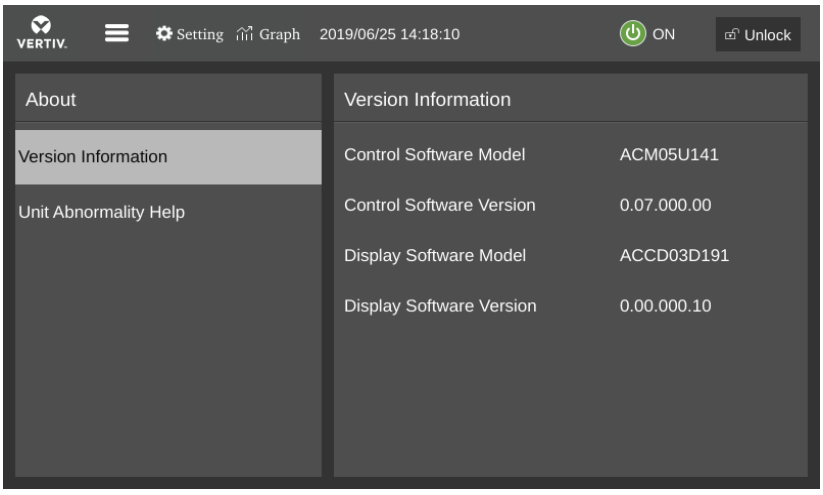


Figure 5-22 Version Information

- Unit Abnormality Help

Figure 5-23 shows the unit exception abnormality menu interface. In the **Unit Abnormality Help** menu, user can query the unit fault cause analysis and solutions.

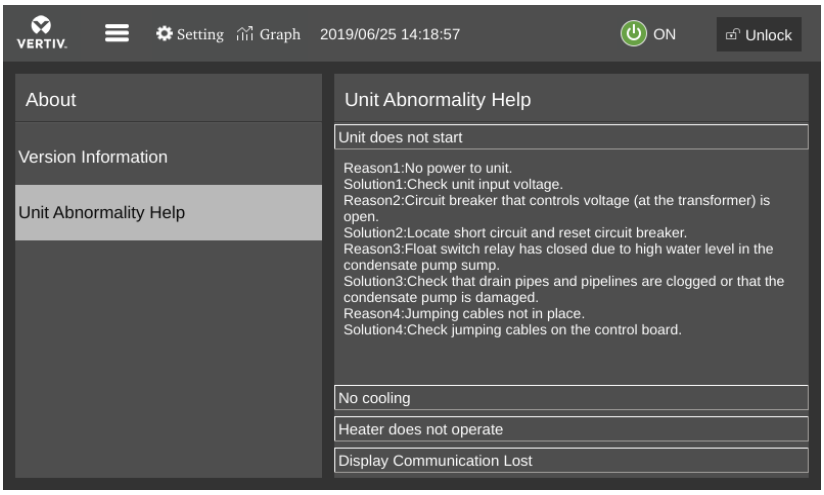


Figure 5-23 Device Abnormality Help

Chapter 6: Outdoor Fan Speed Controller (Only for 22 kW/27 kW)

This chapter briefly introduces the use of the fan speed controller from an end-user perspective. The detail includes the definition of the cabling terminals of the fan speed controller and the introduction of the human-machine interface & operation instructions. The content of this chapter helps in the maintenance of the unit.

- *The number of fan configured in the unit must be same as the actual number of fans. Otherwise, false alarms may occur. For details, refer Section 6.3.2.*
- *Only qualified service and maintenance personnel can perform system operation and maintenance.*

6.1. Cabling of the Terminals

The cabling terminals are located on the fan speed controller board, refer Figure 3-2. The distribution is shown in Figure 6-1, and refer Table 6-1 for details. For the specific wiring method of the wiring terminal, please refer to Appendix 2 Outdoor unit circuit diagram.

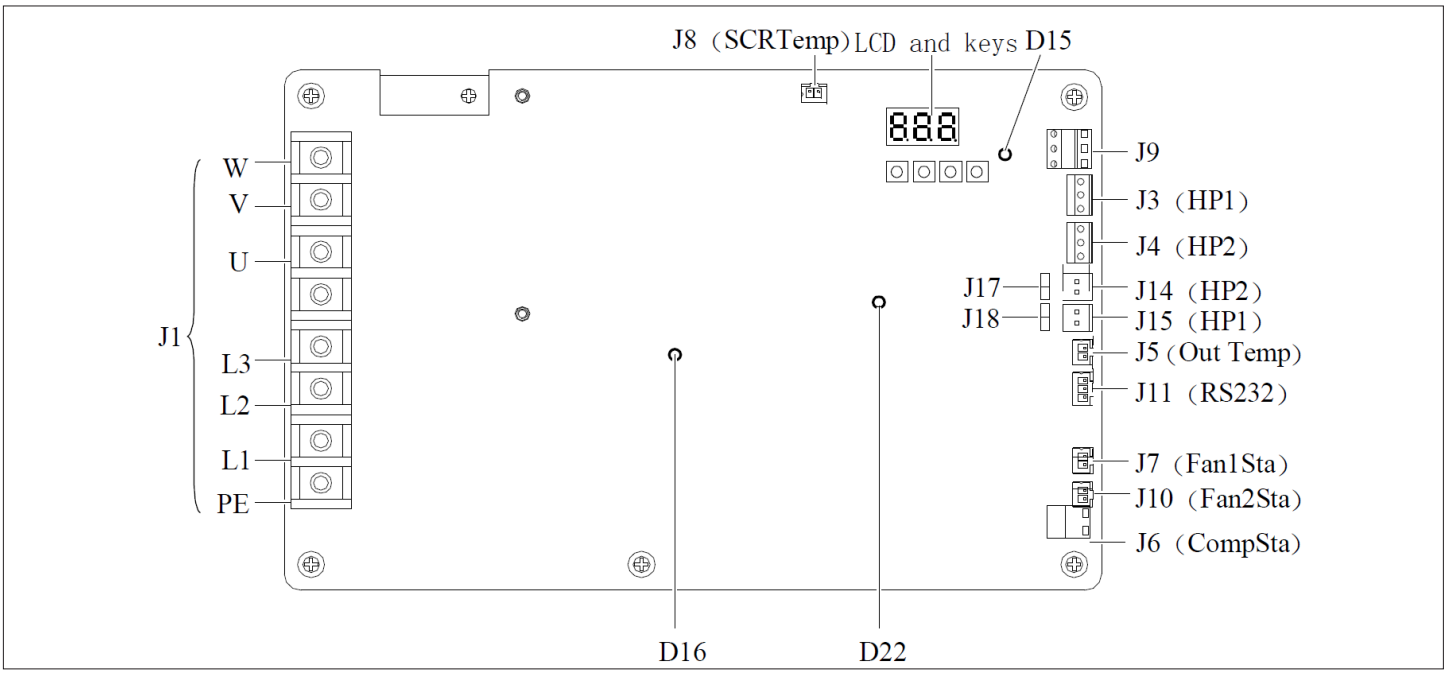


Figure 6-1 Distribution of Terminals

The description of each speed controller board terminal is given in Table 6-1

Table 6-1 Description of Terminals

Terminal/Terminals	Description	Pin Definition
J1	AC input and output terminal	• PE: Protected Earth. • L1, L2, L3: Three-phase AC input. • U, V, W: Three-phase AC output, connected to the fan power supply terminal. • The intermediate terminal pins without identification are reserved.
J3 (HP1)	Voltage type pressure sensor 1 connection terminal	• Pin 1: 5 V positive power supply terminal. • Pin 2: pressure voltage signal 0.5 V to 4.5 V input. • Pin 3: 5 V voltage negative terminal.
J4 (HP2)	Voltage type pressure sensor 2 connection terminal (backup)	
J15 (HP1)	Current type pressure sensor 1 connection terminal	• Pin 1: 12 V positive power supply terminal. • Pin 2: 4 mA to 20 mA input for pressure and current signals.
J14(HP2)	Current type pressure sensor 2 connection terminal (backup)	
J17, J18	Short circuit jumper for current type pressure sensor	• This type of short-circuit jumper must be installed with a jumper cap when using a current-type pressure sensor. • The short circuit jumper must be kept open when using a voltage type pressure sensor.
J5 (Out Temp)	Ambient temperature sensor input terminal (backup)	• Pin 1: Temperature signal input. • Pin 2: Signal reference ground.
J11 (RS232)	Serial communication interface (used during maintenance)	• Pin 1: Communication ground. • Pin 2: Communication receiving end. • Pin 3: Communication sender.
J7 (Fan1Sta)	Fan 1 over temperature detection terminal	• Pin 1: 19 V AC signal output. • Pin 2: 19 V AC signal return.
J10 (Fan2Sta)	Fan 2 over temperature detection terminal	
J6 (CompSta)	Compressor status detection terminal	

J8 (SCRTemp) in Figure 6-1 is the unit interface on the fan speed controller board, not open to users.

6.2. Human-Machine Interface

The fan speed controller realizes the human-machine interface function through the indicators, RS232 serial communication interface, buttons and digital tube.

- Indicators

There are three indicators on the fan speed controller board as shown in Figure 6-1 and refer Table 6-2 for the indicator function.

Table 6-2 Indicator Function of Speed Controller Board

Terminal	Description	Color	Status	Function
D16	Power indicator	Green	On	CPU circuit has 5 V power supply.
			Off	Fan speed controller board failure.
D22	Run indicator	Green	On or Off	Fan speed controller board failure.
			1 Hz flashing (slow flash)	No alarm, normal operation.
			5 Hz flashing (fast flash)	There is an alarm or the compressor is stopped.

- RS232 serial communication port

The RS232 serial communication interface provides an interface to the monitoring computer using a factory-defined protocol, mainly used for factory commissioning and maintenance.

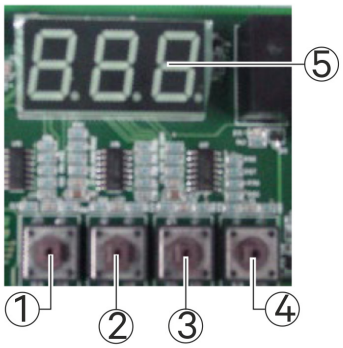
- Button and digital tube

The buttons and the digital tube provide a human-machine interface for on-site maintenance, and can realize the functions as described in Table 6-3. Refer Section 6.3 for the Human-Machine Interface operation instructions of buttons and digital tube.

Table 6-3 Button and Digital Tube Function Description

No.	Function	Description
1	Real-time query of collected data	Queryable data includes condensing pressure, ambient temperature, SCR temperature, and output percentage.
2	Real-time query of active alarm data	Queryable active alarm data includes input phase loss alarm, SCR over temperature, Fan 1 over temperature, Fan 2 over temperature, pressure sensor failure, EEPROM read failure, SCR temperature sensor failure and frequency anomaly.
3	Real-time query of historical alarm data	Can query the most recently saved 100 historical alarms.
4	Modify configuration parameters in real time	The modifiable configuration data includes start-up pressure, minimum voltage, pressure control range, maximum voltage, number of fans, pressure sensor type, or restore the above parameters to default values.

The buttons and the digital tube are located in the upper right corner of the fan speed controller board as shown in Figure 6-1, and its appearance is shown in Figure 6-2.



No.	Description	No.	Description
1	ENT key	4	ESC Key
2	UP key	5	LED
3	Down key		

Figure 6-2 Buttons and the Digital Tube

6.3. Human-Machine Interface Operation Instructions

6.3.1. Power-on Initial Interface

When the fan speed controller starts to power on, it displays the maximum value of "F01", condensing pressure 1 and condensing pressure 2, where "F01" indicates the maximum pressure. When the pressure sensor is not configured, the short circuit jumper cap of the current type pressure sensor is not jumped or the pressure sensor fails, the digital tube displays the pressure value as "88.8". The display sequence is shown in Figure 6-3 ("16.1" in the figure is an example data, and the specific value depends on the sampling result).

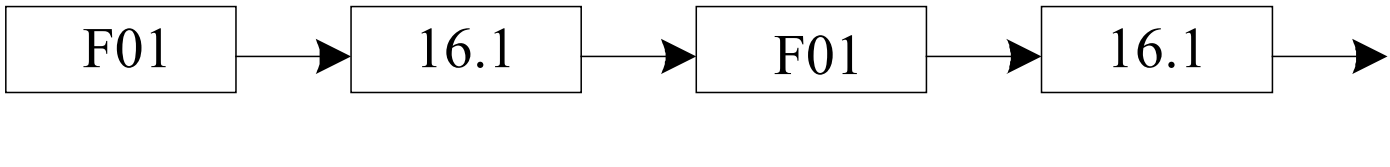
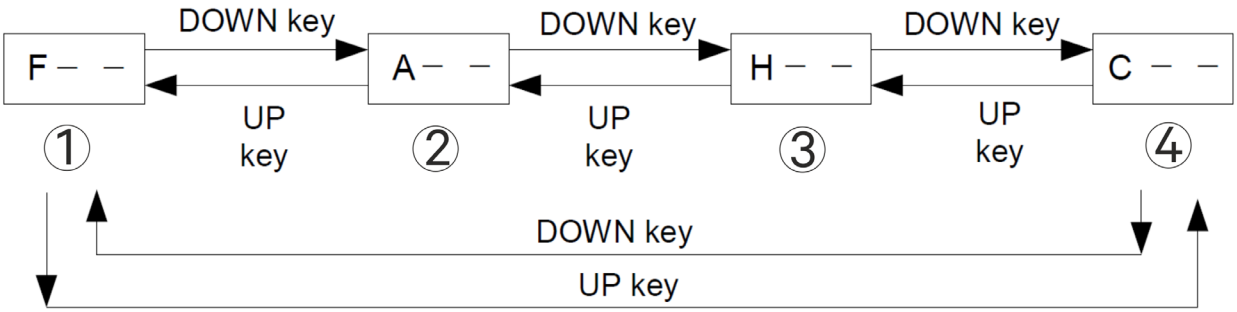


Figure 6-3 Power-on Initial Interface

6.3.2. Main Menu Interface

In the power-on initial interface, press the ESC key, the digital tube display will enter the main menu interface. The main menu interface includes the analog main menu interface, the active alarm value main menu interface, the historical alarm value main menu interface, and the configuration value main menu interface.
In the main menu interface, use the UP and DOWN keys to switch to different main menu interfaces, and press the ENT key to enter the lower submenu display interface of the current main menu. The main menu switching operation process and sequence are shown in Figure 6-4:



No.	Description	No.	Description
1	Analog main menu interface	3	Historical alarm main menu interface
2	Current alarm main interface	4	Configuration main menu interface

Figure 6-4 Main Menu Interface

- Analog main menu interface

When the current main menu is the analog main menu identifier “F--”, press the ENT key to enter the analog value menu interface. The switching operation process and sequence of analog value menu are shown in Figure 6-5:

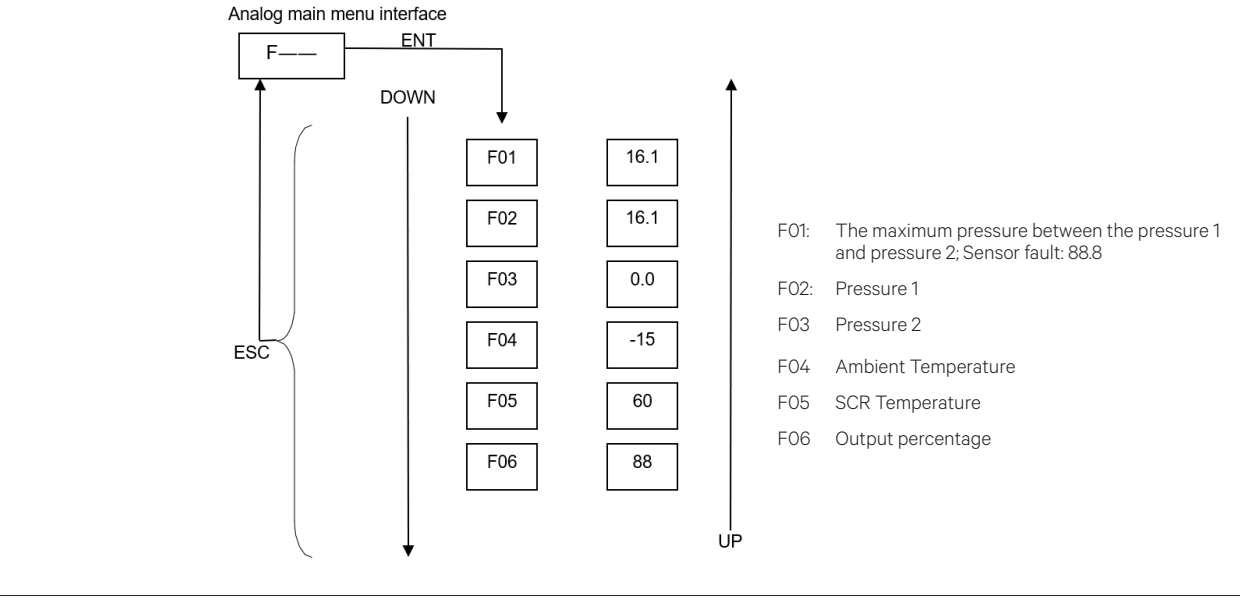


Figure 6-5 Analog Main Menu Interface

- Active alarm value main menu interface

When the current main menu is the active alarm value main menu identifier “A--”, press the ENT key to enter the active alarm value menu interface. The switching operation process and sequence of active alarm value menu are shown in Figure 6-6. Refer Table 8-2 for the conditions and troubleshooting of alarm generation.

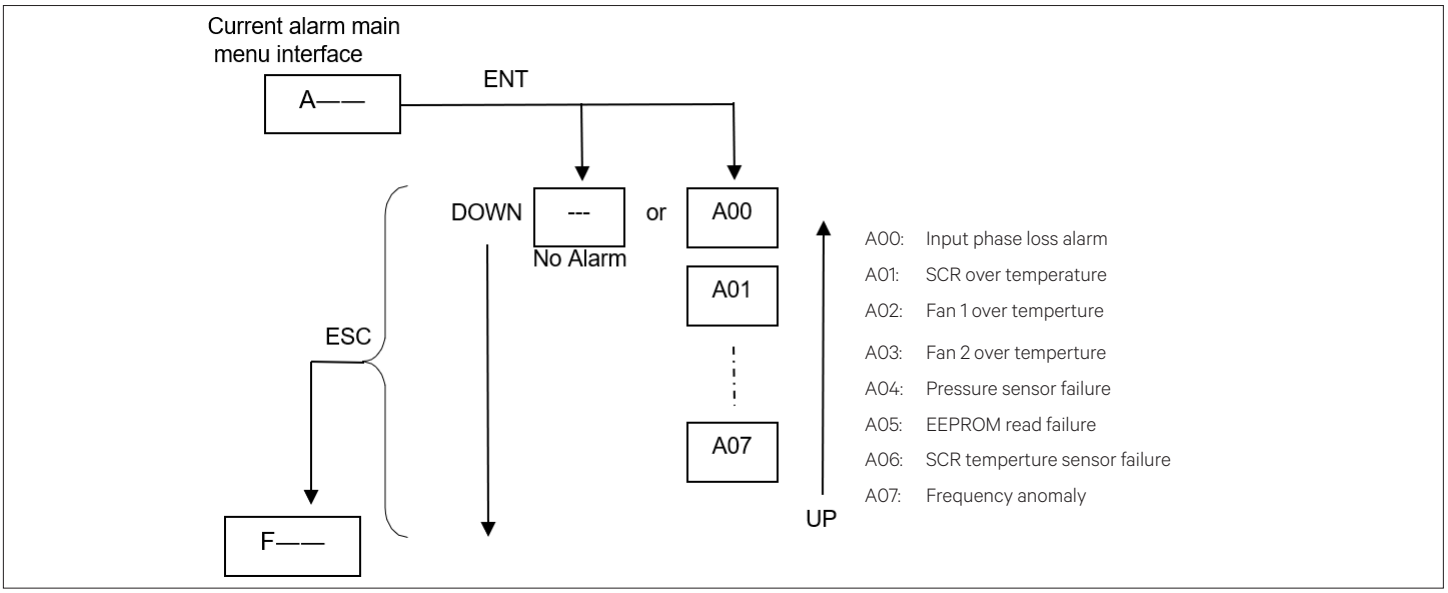


Figure 6-6 Active Alarm Value Main Menu

- Historical alarm value main menu interface

When the current main menu is the historical alarm value main menu identifier “H--”, press the ENT key to enter the historical alarm value menu interface. The switching operation process and sequence of historical alarm value menu are shown in Figure 6-7.

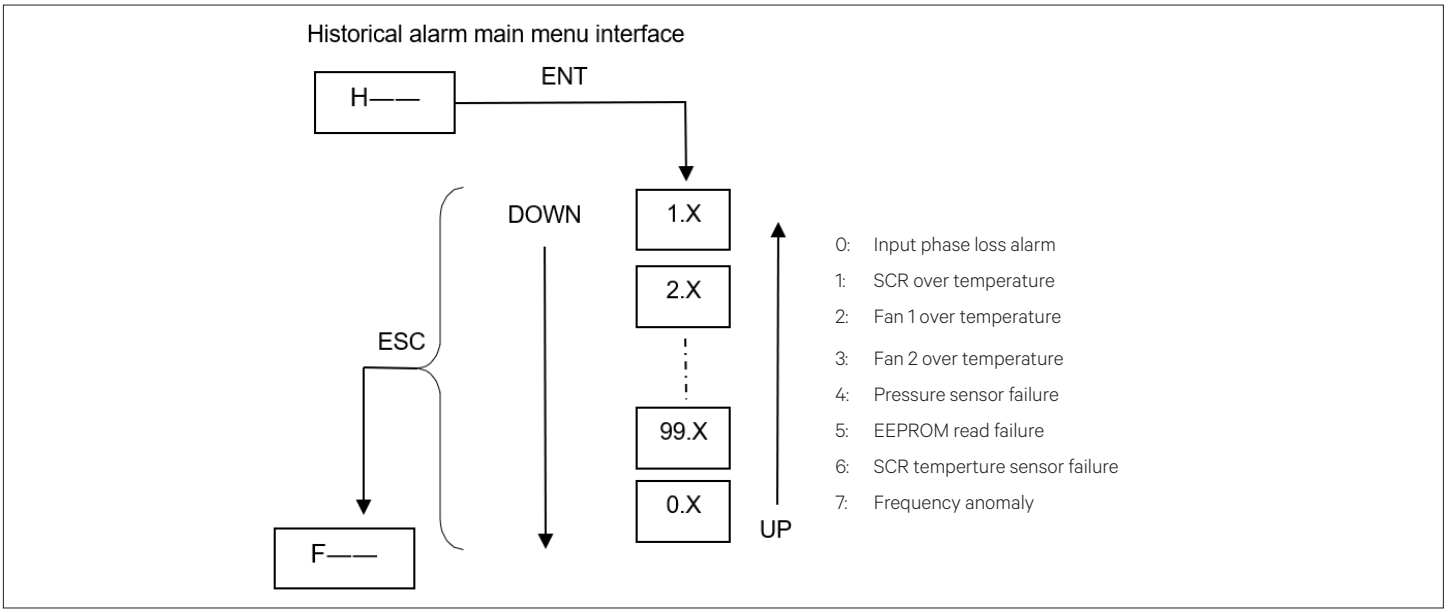


Figure 6-7 Historical Alarm Value Main Menu

- Configuration value main menu interface

The configuration parameter has been set at the factory, and only qualified service and maintenance personnel are suppose to perform the system operation and maintenance.

When the current main menu is the configuration value main menu identifier “C--”, press the ENT key to enter the configuration value menu page. The process and sequence of menu switching operation of configuration value are as shown in Figure 6-8.

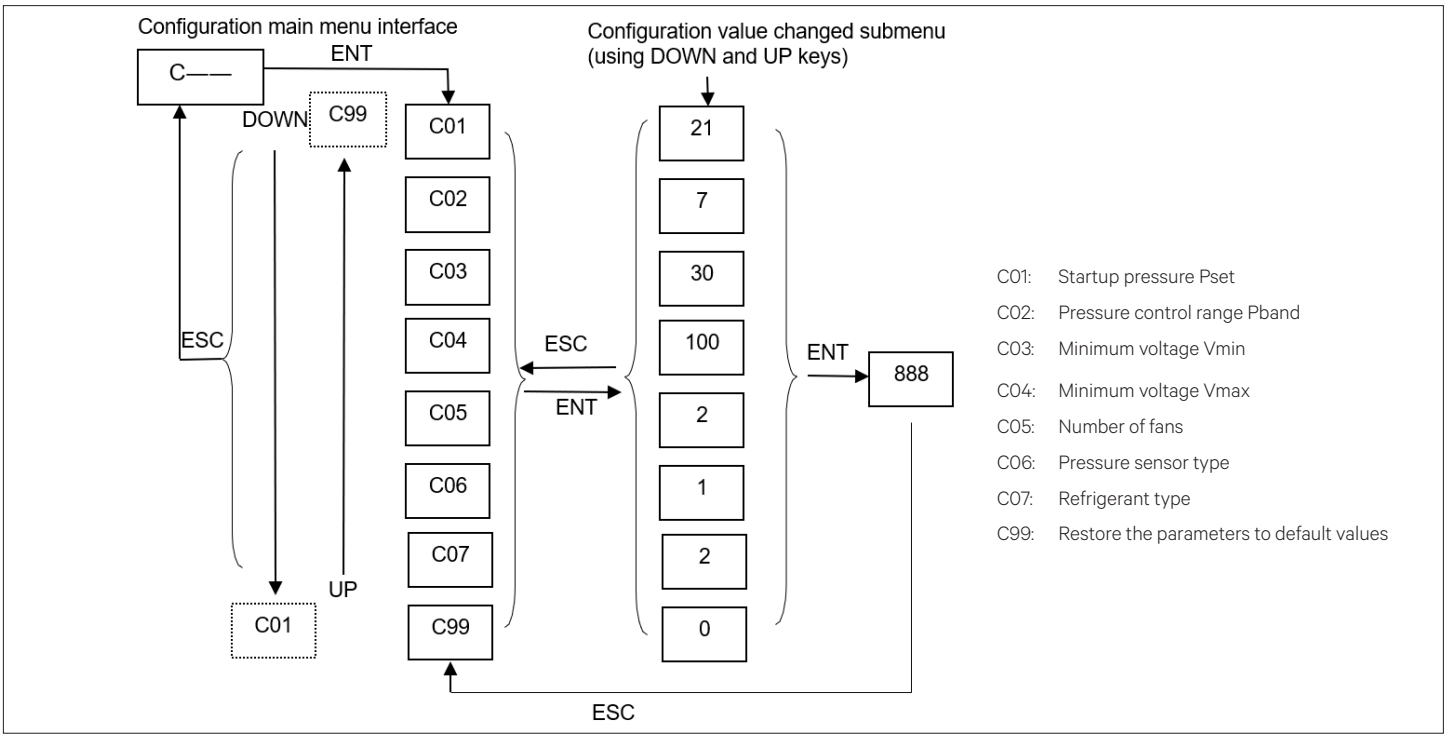


Figure 6-8 Configuration Value Main Menu

Chapter 7: System Operation and Maintenance

This chapter explains the system maintenance of the Liebert® DM units, including electrical inspection, indoor unit maintenance, outdoor unit maintenance and maintenance inspection checklist.

- *Switch off the circuit breaker and cut-off the unit power supply before maintenance unless the power is necessary for commissioning the unit.*
- *Prior to operation and maintenance, the lethal voltage may be present in the unit which can be fatal. All notes, warnings, and cautions marked on the unit as well as the ones mentioned in the manual must be considered, otherwise, it may lead to injury and fatality.*

7.1. Electrical Inspection

Visually inspect the control board, power detection board, outdoor fan speed controller board, display panel, temperature and humidity sensor, infrared humidification leak detection board on a semi-annual basis for any loose electrical connection and circuit corrosion.

The micro-processing controller has six circuit boards, which jointly complete the system fault diagnosis process.

Inspect the boards one by one according to the procedures below:

1. Conduct overall electrical insulation test: Find out the unqualified contacts and handle them carefully.
2. Statically check and test the contactors before powering on and ensure that contactors can act freely without any obstructions.
3. Clean the electrical and control components with a brush or compressed dry air.
4. Check the end of contactors for arcs or signs of burning. Replace the contactors if necessary.
5. Fasten all the electrical connection terminals.
6. Check if the temperature of all MCBs and contactor terminals become higher.

- *All circuit boards are not hot-pluggable. Big instant current will be produced when the board is plugged or unplugged with powering on and it may lead to unrepairable damage to the circuit.*
- *All control boards can only be maintained after the micro-processing controller is powered off.*

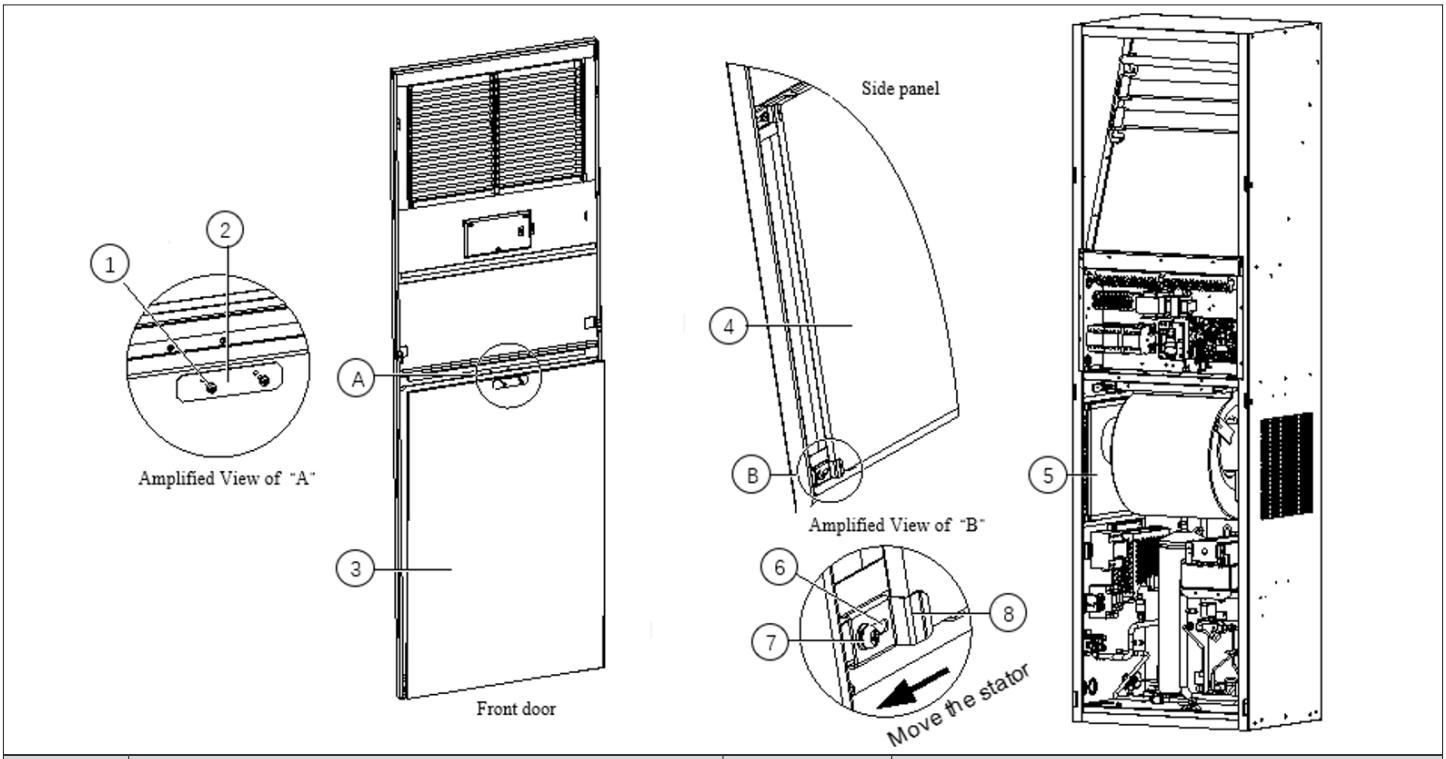
7.2. Indoor Unit Maintenance

7.2.1. Filter

The filter is a consumable part. Its replacement interval is directly related to the seal and cleanliness status of the equipment room. In order to maintain efficient operation, the filter should be checked monthly and be replaced or washed if it is damaged or clogged.

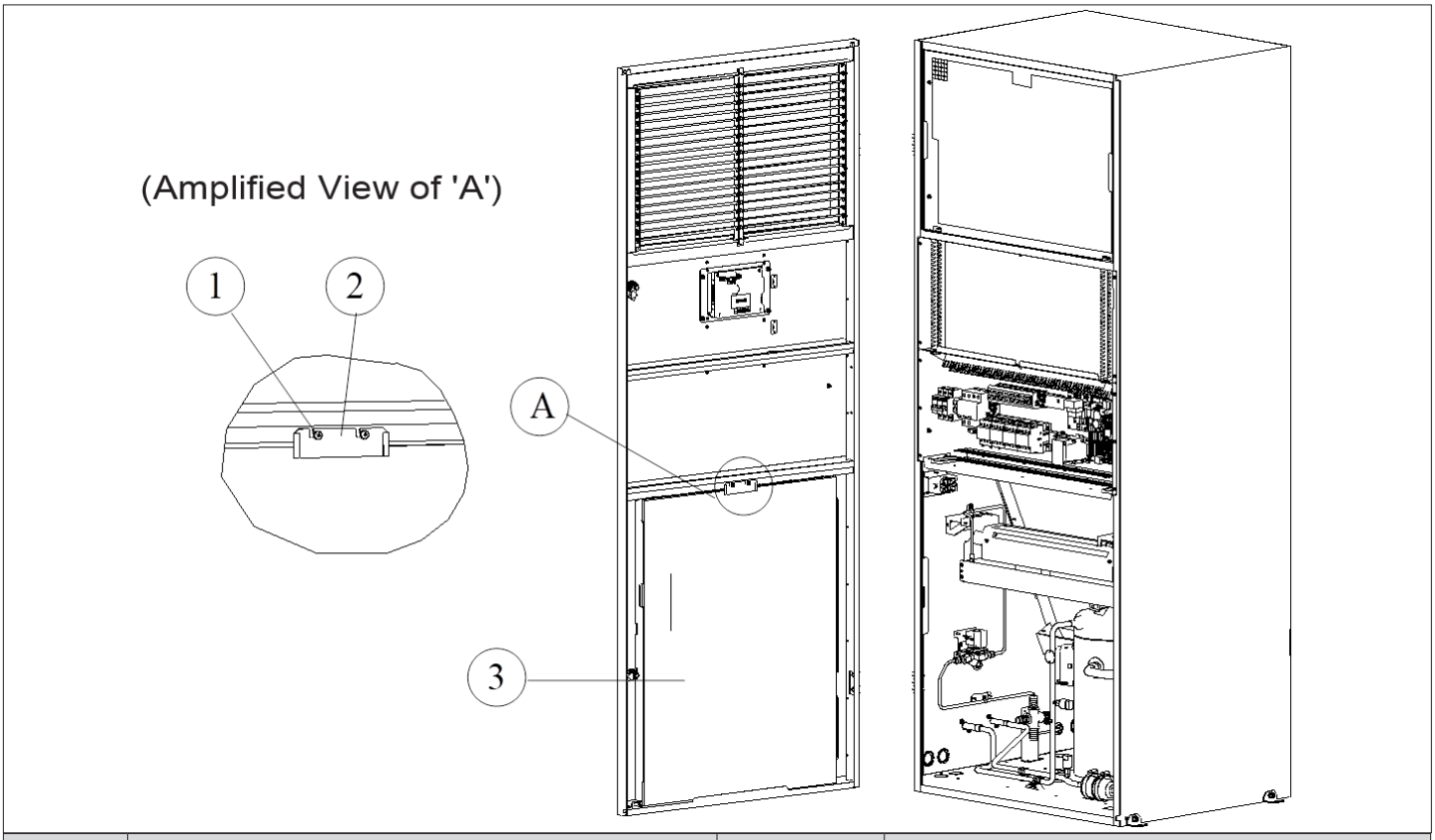
- Filter location

Loosen the fixing screws on the filter holder and take out the filter, as shown in Figure 7-1, Figure 7-2, and Figure 7-3.



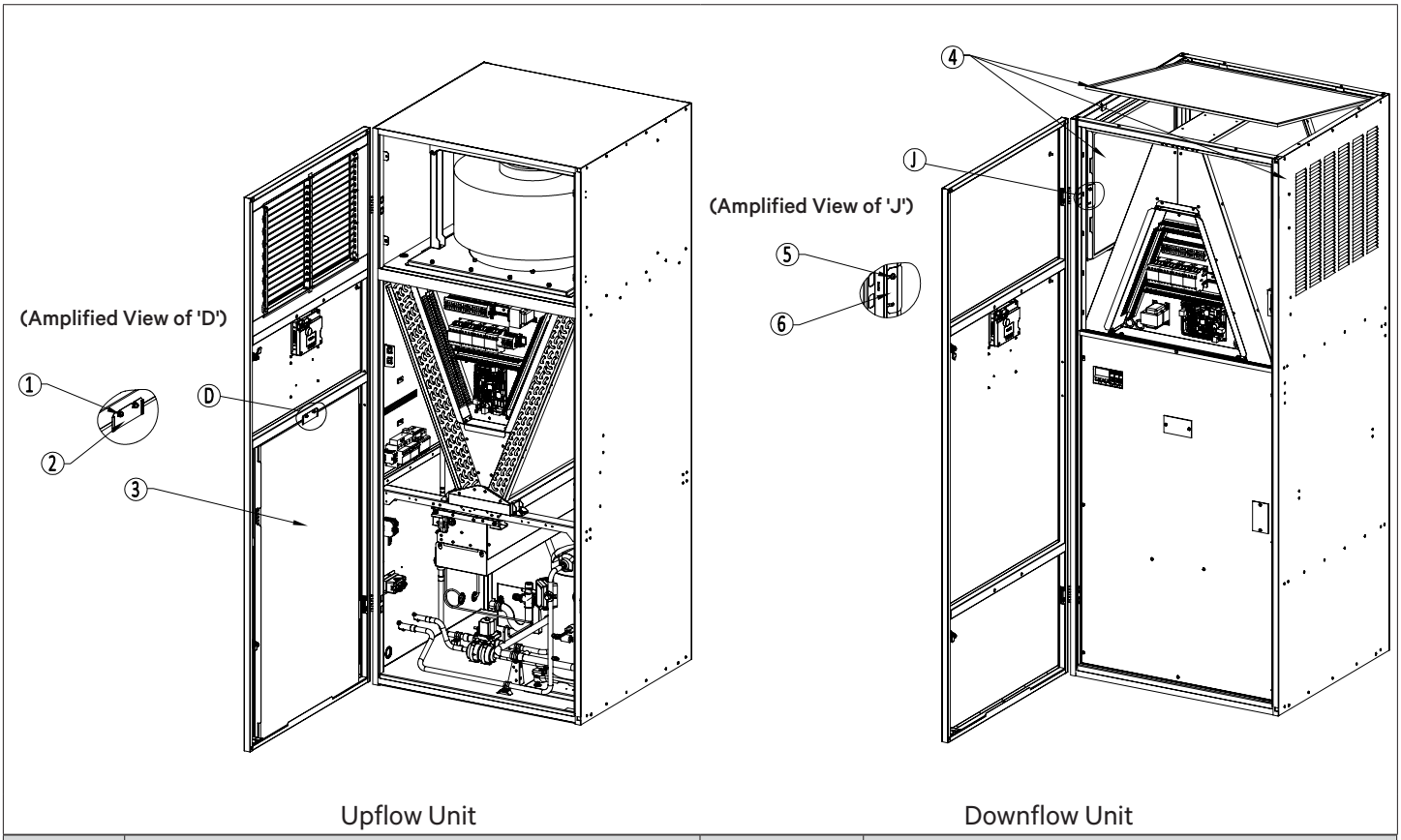
No.	Description	No.	Description
1	Fixing screw (2pcs)	5	Side panel
2	Stator	6	Guide rail
3	Filter (front)	7	Fixing screw (2pcs)
4	Filter (left & right)	8	Stator (2pcs)

Figure 7-1 Fliter Location (07 kW/12 kW)



No.	Description	No.	Description
1	Fixing screw (2pcs)	3	Filter (front)
2	Stator		

Figure 7-2 Filter Location (17 kW)



Upflow Unit Downflow Unit

No.	Description	No.	Description
1	Filter Screw	4	Filter (top, left, right)
2	Stator	5	Fixing Screw (2pcs)
3	Filter (2pcs)	6	Stator

Figure 7-3 Filter Location (22 kW/27 kW)

7.2.2. Fan

The monthly inspection particulars of the fan kit include: motor operation status, impeller status, fan kit fixation and clearance between fan and impeller. Inspect the motor bearings and impeller monthly; and replace it if any damaged found in impeller. Check that the impeller is tightly mounted on the rotor of the motor and does not obstruct against its neighboring metal components during rotation. Since the fan kit operates 24 hours every day continuously, any unusual airflow obstruction must be cleared in time to avoid damage to the cooling system. This unusual airflow obstruction can also affect other system components due to reduction in air volume.

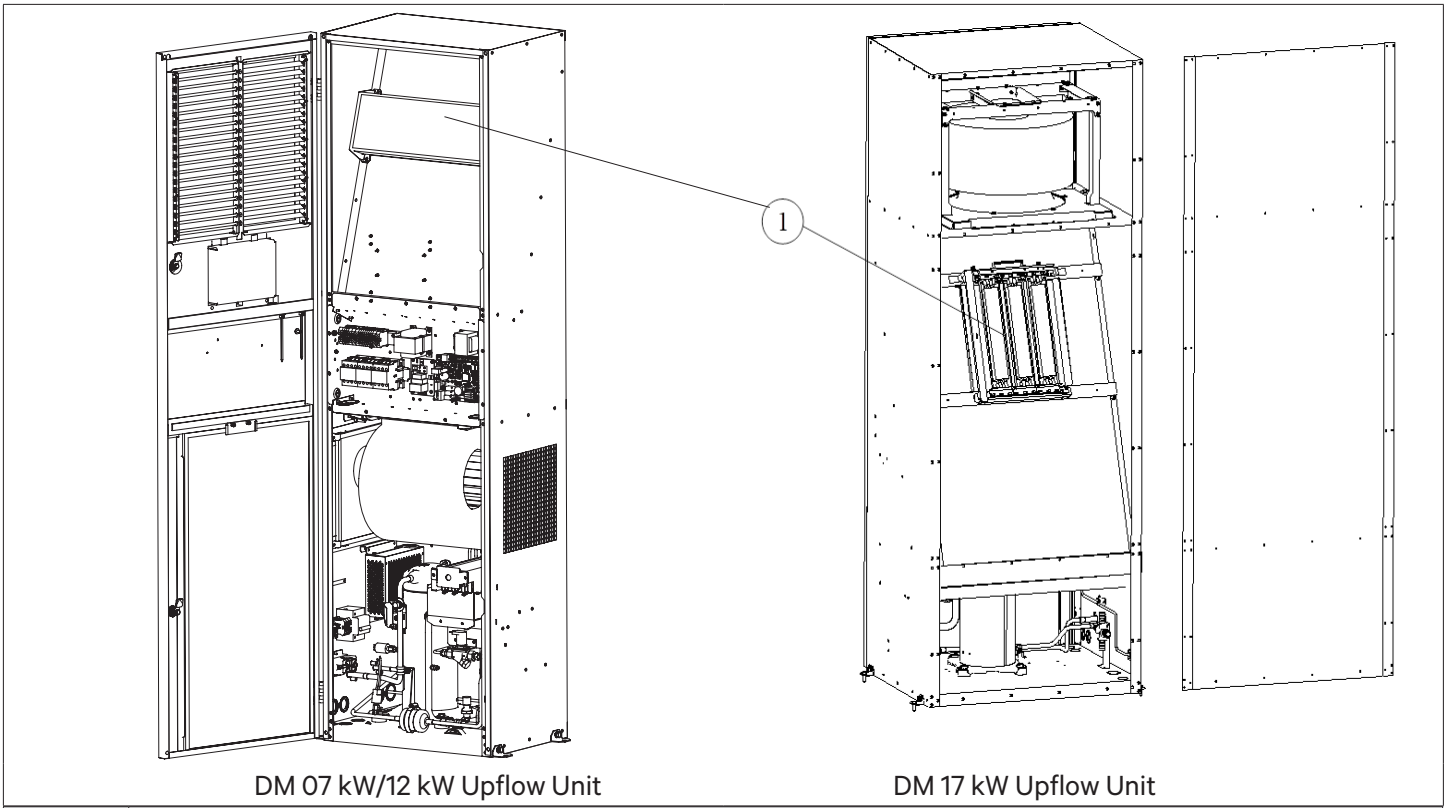
7.2.3. Drain Pipe

Inspect water pan periodically for normal operation of the drain pipe. Ensure that no foreign matter or leakage exists in the drain pipe.

7.2.4. Electrical Heater

If the optional electrical heater is used, it should be maintained periodically. Ensure that no dust or foreign matter deposits on its surface; the heater is fixed reliably and the cable connection is firm. The heating elements will heat continuously in normal operation conditions, hence inspect the heater in every six months for its normal operation. Figure 7-4 and Figure 7-5 show the location of the electrical heater; if the heater needs to be replaced, please contact the Vertiv representative for maintenance support.

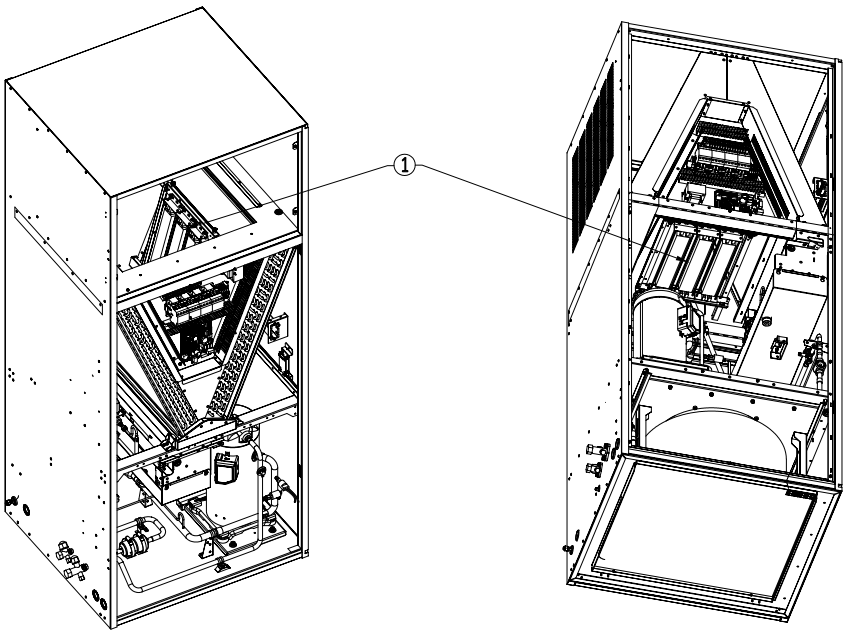
The electrical heater cable must be routed through the thimble socket, then connected to the heater.



DM 07 kW/12 kW Upflow Unit DM 17 kW Upflow Unit

No.	Description
1	Location of Electrical Heater

Figure 7-4 Location of Electrical Heater (07 kW, 12 kW, and 17 kW)



DM 22 kW/27 kW Upflow Unit DM 22 kW/27 kW Downflow Unit

No.	Description
1	Electrical Heater

Figure 7-5 Location of Electrical Heater (22 kW and 27 kW)

7.2.5. Infrared Humidifier

During the normal operation of the infrared humidifier, mineral particles will be concentrated on the infrared humidifier water pan. These deposits must be removed periodically to ensure efficient operation of the infrared humidifier. Due to the different water sources, the cleaning time should be determined by each local region. It is recommended to check monthly (cleaning if necessary). The automatic flushing function of the infrared humidifier itself extends the time interval between cleanings, but regular inspections and maintenance are still essential.

Following are the cleaning steps:

1. Disconnect the infrared lamp power supply plug-in cable.
2. Drain the water in the infrared humidifier water pan and disconnect the drain pipe.
3. Remove the humidifier water pan fixing screw, tilt the rear end of the water pan upwards, loosen the rear side hook of the water pan, then carefully remove the water pan, and do not touch the lamp.
4. Use a hard brush to remove the deposit from the infrared humidifier water pan.
5. Reverse the process to restore the humidifier water pan.

Before exercising the corresponding operation, ensure that the power supply has been switched off. Ensure that the water in the water pan is close to room temperature before draining it to avoid personal injury.

- *The bottom of the humidifier is equipped with a manual reset over-temperature switch. When the infrared humidifier has a dry burning phenomenon, the over-temperature switch is disconnected, and the infrared humidification lamp power supply is cut off.*
- *After the abnormality of the unit is completed, if it requires to be reset, press the reset switch as shown in Figure 7-6 by the dotted box.*

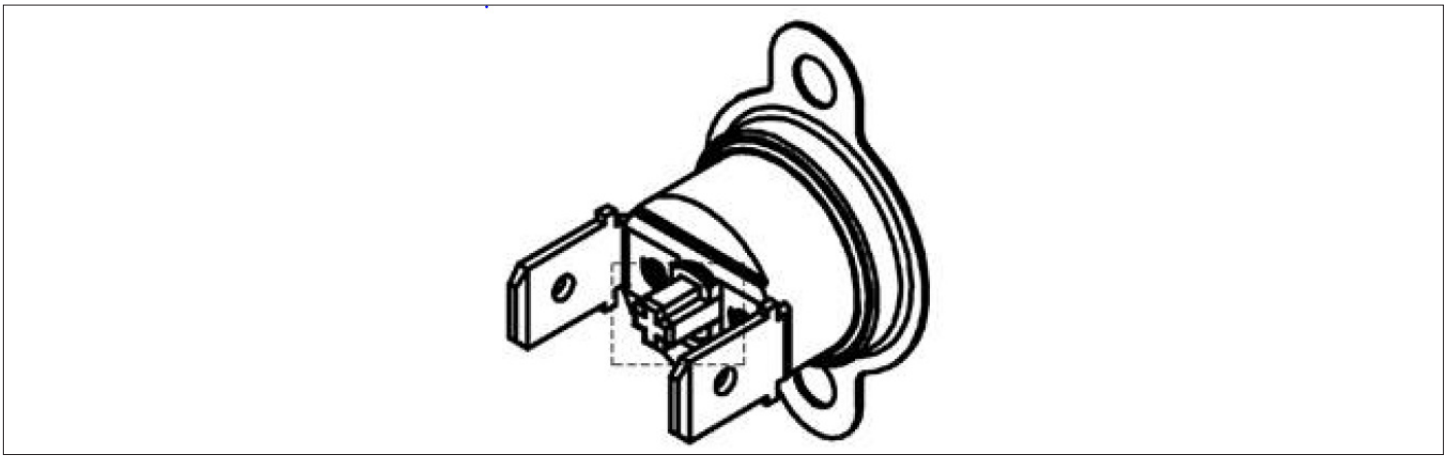
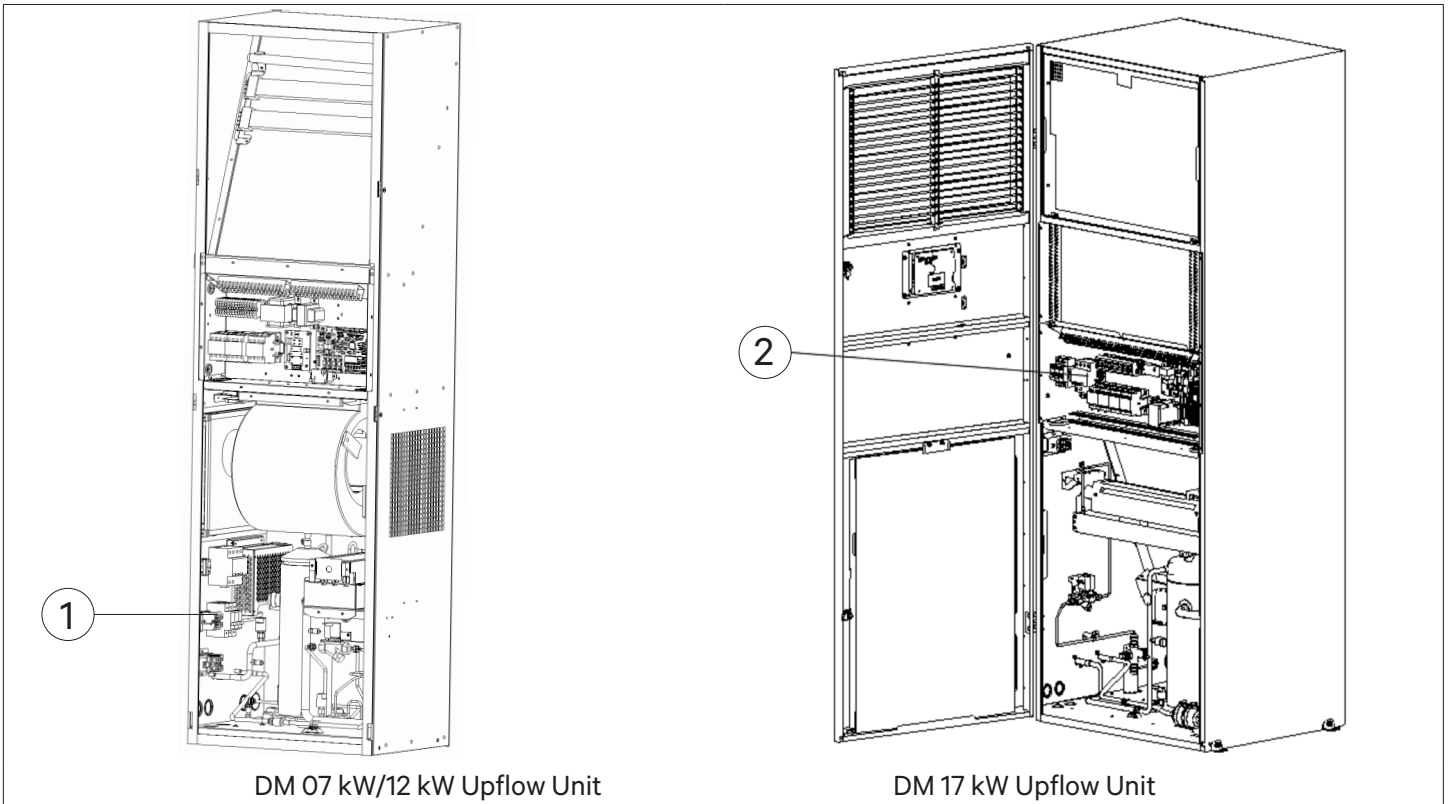


Figure 7-6 Over-temperature Switch

7.2.6. Power SPD (Optional)

Figure 7-7 and Figure 7-8 shows the location of the power SPD.

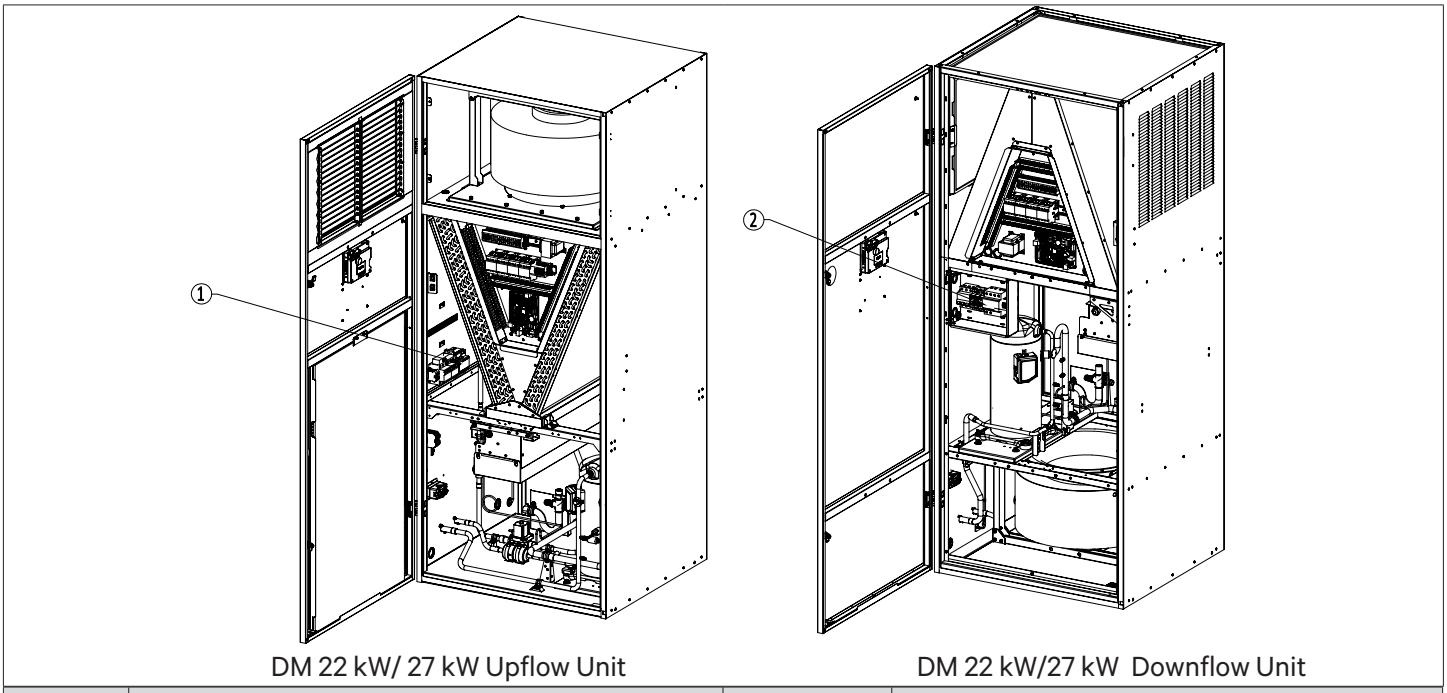


DM 07 kW/12 kW Upflow Unit

DM 17 kW Upflow Unit

No.	Description	No.	Description
1	Power SPD	2	Power SPD

Figure 7-7 Power SPD Location (07 kW, 12 kW, and 17 kW)



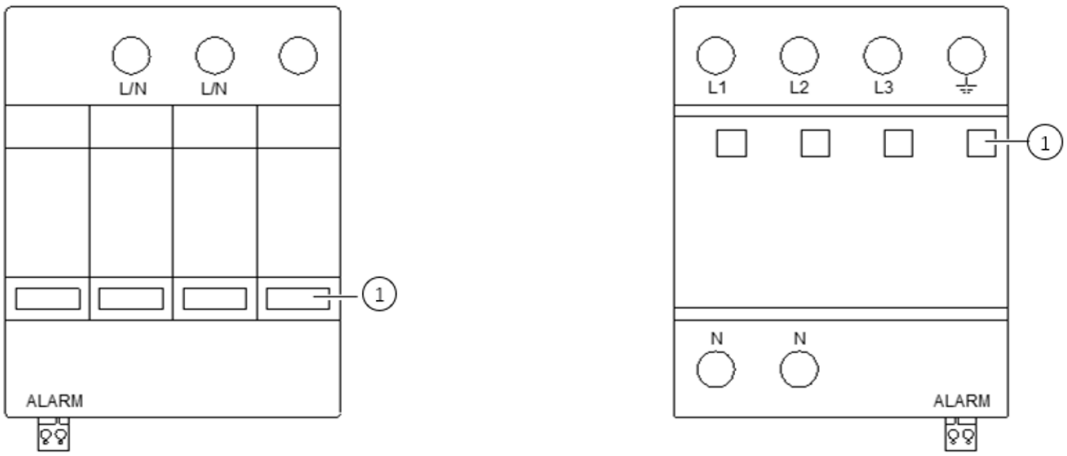
DM 22 kW/ 27 kW Upflow Unit

DM 22 kW/27 kW Downflow Unit

No.	Description	No.	Description
1	Power SPD	2	Power SPD

Figure 7-8 Power SPD Location (22 kW and 27 kW)

There are four status indicators on the power SPD, as shown in Figure 7-9. The status indicator is green during normal operation, and turns red when the SPD fails.



1-ph power SPD

3-ph power SPD

No.	Description
1	Status Indicator (4 PCS)

Figure 7-9 Location of Status Indicators of Power SPD

The power SPD does not need special maintenance. It needs regular check for non-loosening and normal status indication. If any one of the following phenomena appears, the power SPD has failed and it needs to be replaced immediately:

1. Any indicator of the power SPD turns red.
2. The customer alarm 2 is registered, refer 3.5.1 Connecting Control Terminal in SPD (custom 2 terminal).

7.2.7. Thermal Expansion Valve (TXV)

The thermal expansion valve keeps the evaporator supplied with enough refrigerant to satisfy load conditions. Its proper operation can be determined by measuring the superheat level. The correct superheat setting is 5.6 °C to 8.3 °C (10 °F to 15 °F).

7.2.8. High-Pressure Switch and Low-Pressure Switch

The discharge and suction pressures will vary greatly with the unit load and ambient conditions, refer Table 7-1 for details of normal operation. When the discharge pressure rises to the high-pressure setpoint, the high-pressure switch gets activated and the control system shuts down the compressor after ensuring that an abnormal input signal of the high-pressure switch is triggered.

When the suction pressure is lower than the low-pressure setting, the low-pressure switch gets activated and the control system shuts down the cooling system after confirmation.

Table 7-1 Typical Discharge Pressure and Suction Pressure

Items	psig	MPa
Low pressure	100 to 159	0.7 to 1.1
Low-pressure setting	53	0.4
Low-pressure recovery point	80	0.6
High pressure	284 to 526	2.0 to 3.7
High-pressure setting	583	4.1
High-pressure recovery point	469	3.3

7.2.9. Compressor

The compressor fault is generally classified into two types:

1. Motor failure (such as winding burnout, insulation failure, short-circuit between coils and so on).
2. Mechanical failure (such as compressing failure, relief valve fault, therm-o-disc fault and so on).

If the sufficient operating pressure is not established, it is an indication of the compressor has failed. It can be confirmed - if the suction pressure and discharge pressure are balanced, and the motor does not rotate reversely.

The controller of the unit has a powerful alarm and protection functions to ensure safe operation of the compressor. The maintenance personnel should record the high pressure and the low pressure, and find out the cause of an alarm protection during periodical maintenance and inspection.

Avoid touching or contacting the residual gas and oils in compressor with exposed skin. Wear long rubber gloves to handle contaminated components.

Check the following particulars before replacing the compressor:

1. Check that all fuses and circuit breakers are normal.
2. Check the working status of the high and low pressure switches.
3. Check the relative historical alarm information.
4. Check the compressor operation record.
5. Check the motor electrical characteristic.

System contains refrigerant. Recover refrigerant using standard recovery equipment before maintenance.

Refer the following procedure to remove and replace the failed compressor:

1. Cut off the power supply.
2. Attach suction and discharge gauges to compressor access fitting.
3. Recover the residual refrigerant by using standard recovery procedures.
4. Remove the failed compressor.
5. Follow manufacturer's instructions to clean out piping kit.
6. Install replaced compressor and make all connections, perform pressurization and leakage tests of the system at approximately 150 psig (1034 kPa).
7. Evacuate the system twice to 1500 microns and the third time to 500 microns. Break the vacuum each time with clean and dry refrigerant to 2 psig (13.8 kPa).
8. Charge the system with refrigerant based on the requirements of the evaporator, condenser and piping.
9. Apply power and operate the AC unit. To check for proper operation, make sure the circulation suction pressure and discharge pressure are in normal operation ranges. Add some refrigerant if necessary.

Release of refrigerant to the atmosphere is harmful to the environment. Refrigerant must be recycled in accordance with state and local regulations.

7.3. Outdoor Unit Maintenance

7.3.1. Refrigeration System

The components of the refrigerant system should be inspected monthly to find out any abnormal operation phenomenon. Refrigerant piping must be properly fixed and not allowed to vibrate against wall, floor or the unit frame. Inspect all refrigerant piping every six months for signs of wear.

7.3.2. Air-Cooled Condenser

- When the airflow through the outdoor unit is restricted or blocked, use compressed air or fin cleaner (alkalescence) to clean the dust and debris off the condenser that reduce the airflow.
- The compressed air should be blown at the reversed airflow direction. In winter, do not let snow to accumulate around the side or underneath the condenser.
- Check for bent or damaged fins and simply repair them if necessary.
- Check all refrigerant pipes and capillaries for vibration and support them if necessary.
- Carefully inspect all refrigerant piping for signs of oil leakage, determine the leakage position and fix them immediately.

7.4. Monthly Routine Maintenance

Check the components of the system monthly, focusing on whether the system function is normal and whether the parts are showing signs of wear. Refer Table 7-2 for monthly routine maintenance inspection items.

To ensure proper operation of the equipment, routine maintenance checks must be performed on a regular basis.

Table 7-2 Routine Maintenance Checklist (Monthly)

Component	Inspection Particulars	Remark
Filter	Check for clogging or damage.	
	Check the filter clogging switch.	
	Clean the filter.	
Infrared humidifier (if applicable)	Check the drain piping of the water pan for blockage.	
	Check the humidifier quartz tube.	
	Check if the mineral deposited on the water pan.	
Indoor unit fan	Impellers free of debris and distortion, and move freely.	
Compressor	Check for any signs of oil leaks.	
	Listen to running sounds and observe operation vibrations.	
Power SPD (if applicable)	Check for indicator color.	
Drain system	Check and clean out unit drain piping; humidifier and water pan; condensate pump and building drain piping.	
Refrigerant system	Check if refrigerant piping is reliably supported.	
	Check system circulation and moisture content (observed through sight glass).	
	Check Thermal Expansion Valve (TXV) is firmly connected.	

7.5. Routine Maintenance and Inspection (Semi-annually)

Refer Table 7-3 for the semi-annual routine maintenance and inspection items.

Table 7-3 Routine Maintenance Checklist (Semi-annually)

Components	Inspection Particular	Remark
Compressor	Check for any signs of oil leaks.	
	Listen to running sounds and observe operation vibrations.	
Refrigeration cycle system	Check suction pressure, exhaust pressure and suction superheat are as per setpoints.	
	Check if the evaporator is functioning normally.	
	Check system circulation and moisture content (observed through sight).	
	Check whether there is an obvious temperature difference before and after drying the filter.	
	Check Thermal Expansion Valve (TXV) is firmly connected.	
	Check the refrigerant piping. The refrigerant line must have a suitable bracket and must not be placed against the wall, floor or fixed frame.	
Air-cooled condenser	Check if the condenser coil is clogged, clean immediately if it is blocked.	
	Check if the motor is firmly mounted.	
	Check if there is any distortions in impeller rotation, also check bearings if they are in good condition.	
	Check if the refrigerant piping are properly supported.	
Electrical board	Check all electrical connections are firmly tightened.	
	Check the surface of the circuit board for signs of corrosion.	
Electrical heater	Check heating element for signs of corrosion or burning.	

Chapter 8: Troubleshooting

Troubleshooting is to be performed by trained and qualified service personnel. However, the checklists have been provided for reference.

- *Certain circuits carry lethal voltages. Only professional technicians are allowed to maintain the unit. Extreme care and caution is required while troubleshooting the unit online.*
- *If jumpers are used for troubleshooting, remember to remove the jumpers after the troubleshoot. If not removed, the connected jumpers may bypass certain control functions and increase the risk to the unit.*

Table 8-1 represents the troubleshooting of the indoor unit of Liebert® DM units.

Table 8-1 Troubleshooting of the Indoor Unit

Symptom	Possible Cause	User Needs to Check Particulars or Processing Method
The unit does not start	No power supply to the unit	Check unit input voltage.
	Circuit breaker of controller voltage is open (at transformer)	Locate short circuit and reset circuit breaker.
	Float switch relay has closed due to high water level in the condensate pump sump	Check if the drain piping and pipelines are clogged or whether the condensate pump is damaged.
	Jumper cables are not in place	Check the state of the jumper cables on the control board.
No cooling	Compressor contactor not pulling in	Check for 220 Vdc ± 44 Vdc of coil. If the voltage is right, check if the contactor is connected properly.
	High compressor discharge pressure	See if there is “High pressure alarm” and follow the maintenance descriptions.
	Plugged filter	Check if filter is clogged or damaged, if it is then clean or replace the filter accordingly.
	Low refrigerant charge	Use suction and discharge pressure gauge to check if pressure is as per requirement. Also, see if there are any evidents of bubbles exist in the sight glass.

Symptom	Possible Cause	User Needs to Check Particulars or Processing Method
Heater does not function	Heat function disabled in Select Options menu	Set the Heat optional function.
	No heat demand output from the control system	Adjust temperature setpoint and sensitivity within the required range.
	Heating element is burned out	Turn off the power supply. Check the element resistance with a multimeter.
Display abnormal	Static discharge	Disconnect the system power supply and then restart.
	Loose connection between keypad and control board	Check the connections are firmly fixed after powering off, the unit and then restart the unit.
No display, control buttons do not respond and unit operates normally	Disconnection between keypad and control board	Check if the connections between keypad and control board are firmly connected.
The screen display is normal, the button does not respond, the device is running normally	The display board setting is faulty	Contact Vertiv representative for maintenance support or engineering assistance.
No display, control buttons do not respond and unit has no output	Low power supply voltage	Check for power supply voltage.
	Communication between control board and control board interrupted	Check if the connections between control board and control board are firmly connected.
High pressure alarm	Insufficient airflow across condenser	Remove debris from coil and airflow inlet and check the fan speed function of the control board.
	Condenser fan is not operating	Check that the connections of the control board to the outdoor unit terminals are firmly connected. Check that the condensate pressure sensor works normally.
	High pressure switch failure	Check the connection of the high-pressure switch and the on-off condition when the power is turned off. If necessary, replace it with the high-pressure switch of the same specification.

Symptom	Possible Cause	User Needs to Check Particulars or Processing Method
Low pressure alarm	Refrigerant leakage	Check for leaking point and fix it immediately and then re-charge the system with adequate amount of refrigerant.
	Outdoor ambient temperature is too low	Contact Vertiv representative for maintenance support or engineering assistance.
	Outdoor unit fan running at full speed upon low outdoor ambient temperature	Check if the outdoor unit cabling is correct; and check whether the condensate pressure sensor works normally.
High temperature alarm	High temperature setpoint is unreasonable	Reset the setpoint.
	Room load exceeding unit design ability	Check for room sealing or make capacity expansion.
Low temperature alarm	Low temperature setpoint is unreasonable	Reset the setpoint.
	Electrical heater operating current is unreasonable	Check if the electrical heater operation is normal.
High humidity alarm	High humidity setpoint is unreasonable	Reset the setpoint.
	Vapor barrier is not done in the room	Check for the vapor barrier.
Low humidity alarm	Humidifier does not work	Check if the water supply is normal. Contact Vertiv representative for maintenance support or engineering assistance.
	Setpoint is unreasonable	Reset the setpoint.

Symptom	Possible Cause	User Needs to Check Particulars or Processing Method
Air exhaust temperature alarm	Simultaneously with high voltage alarms	Refer and follow the inspection and repair procedure for the high pressure alarm.
	Other failure	Contact Vertiv representative for maintenance support or engineering assistance.
Floor overflow warning	The humidifier water injection solenoid valve is faulty and cannot be closed. The water level is too high and there is water overflowing	Replace the humidifier water injection solenoid valve.
	Condensate water pipe is not properly draining	Check the opening of the condensate drain for blockages, if identified then clear it immediately and improve drainage facility.
SPD alarm	SPD failure	Replace the SPD switch.
Remote shutdown	Remote control shutdown	Adjust remote control parameters.
Infrared humidifier high water level alarm	Condensate water pipe is not draining properly	Check the opening of the condensate drain for blockages, if identified then clear it immediately and improve drainage facility.
	Water injection solenoid valve failure	See if there is a floor overflow alarm, if identified follow the procedure to clear the alarm.
Airflow loss alarm	Return air volume is small	Remove the obstruction at the return air outlet of the unit, clean the return air filter or contact Vertiv representative for maintenance support or engineering assistance.
Return air temperature sensor fault alarm	Return air temperature and humidity sensor failure	Replace the return air temperature and humidity sensor.
Return air humidity sensor fault alarm		
Airflow loss sensor failure alarm		

Symptom	Possible Cause	User Needs to Check Particulars or Processing Method
Pressure sensor failure	Pressure sensor failure	Check if the condensing pressure sensor cabling is firmly connected or contact Vertiv representative for maintenance support or engineering assistance.
Energy-saving card failure	The number of normal online energy-saving cards is less than the number of preset energy-saving cards.	The number of energy-saving cards must be greater than or equal to the set number.
	Energy-saving card DIP switching address is incorrect	Contact Vertiv representative for maintenance support or engineering assistance.
	More than one energy-saving card measures temperature and humidity beyond the measurement range	Contact Vertiv representative for maintenance support or engineering assistance.
Power loss alarm	The unit is in operation and the power is lost and then restored	Check if the power input line is in good condition.
Power supply over-voltage alarm	Power supply voltage deviates from set value	Check if the power input line voltage is in good condition.
Power supply under-voltage alarm	Power supply voltage deviates from set value	Check if the power input line voltage is in good condition.
Power supply frequency offset	Power supply frequency deviates from set value	Check if the power input line frequency is in good condition.
Power supply phase loss alarm	Power supply phase loss	Check if the power input line cabling are in good condition.
Power supply reverse phase rotation alarm	Power supply reverse phase rotation	Check if the power input line cabling are in good condition.
Warranty expiry alarm	The product usage time reaches the “warranty period”	Contact Vertiv representative for maintenance support or engineering assistance.

The outdoor unit fault diagnosis and treatment measures are shown in Table 8-2.

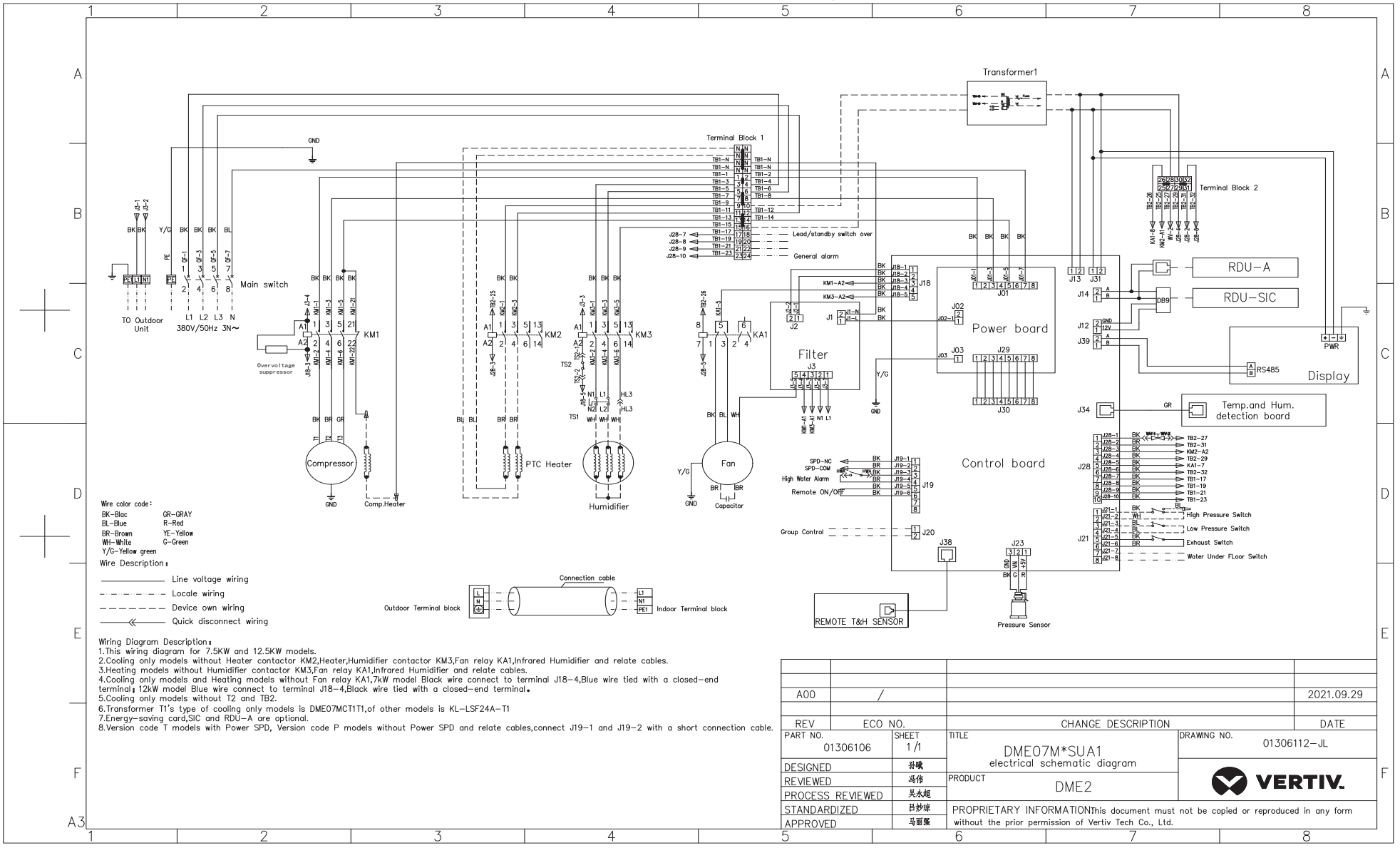
Table 8-2 Outdoor Unit Fault Diagnosis and Treatment

Alarm ID	Alarm Name	Possible Cause	User Needs to Check Particulars or Processing Method
A00	Phase loss alarm	One-phase or two-phase loss of three-phase voltage	Measuring whether the three-phase live line voltage is correct.
		Input reverse connection	Check input line sequence.
		Fan speed controller board hardware failure	Compare after replacing the fan speed controller board.
A01	SCR over temperature	Fan stalling and other faults	Check if the fan is functioning properly.
		Fan speed controller board hardware failure	Compare after replacing the fan speed controller board.
A02 A03	Fan 1 is over temperature, Fan 2 is over temperature	Fan stalling and other faults	Check if the fan is functioning properly.
		Fan speed controller board hardware failure (detect circuit failure or SCR power supply circuit failure)	Compare after replacing the fan speed controller board.
A04	Pressure sensor failure	The pressure sensor is not installed or the terminal is not connected properly	Check the pressure sensor cabling.
		Current type pressure sensor short-circuit terminals J17 and J18 are not mounted with short-circuited jumper caps	Mount short-circuited jumper caps when configuring the current type pressure sensor.
		Pressure sensor failure	Compare after replacing the pressure sensor.
		Fan speed controller board hardware failure	Compare after replacing the fan speed controller board.

Alarm ID	Alarm Name	Possible Cause	User Needs to Check Particulars or Processing Method
A05	EEPROM read failure	Fan speed controller board hardware failure	Compare after replacing the fan speed controller board.
A06	SCR temperature sensor failure	The SCR temperature sensor is not installed or the terminal is not properly connected	Check the cabling of the SCR temperature sensor (J8 (SCRTemp), J8 (SCRTemp) terminal position is shown in Figure 6-1).
		SCR temperature sensor failure	Compare after replacing the SCR temperature sensor.
		Fan speed controller board hardware failure	Compare after replacing the fan speed controller board.
A07	Frequency abnormal	Grid voltage frequency error, Fan speed controller board hardware failure	Compare after replacing the fan speed controller board.

Appendix I: Circuit Diagram of Indoor Unit

DME07MHSUP1 Circuit Diagram



Wire color code:

BK-Blac	GR-GRAY
BL-Blue	R-Red
BR-Brown	YE-Yellow
WH-White	G-Green
Y/G-Yellow green	

Wire Description:

- Line voltage wiring
- Locale wiring
- Device own wiring
- Quick disconnect wiring

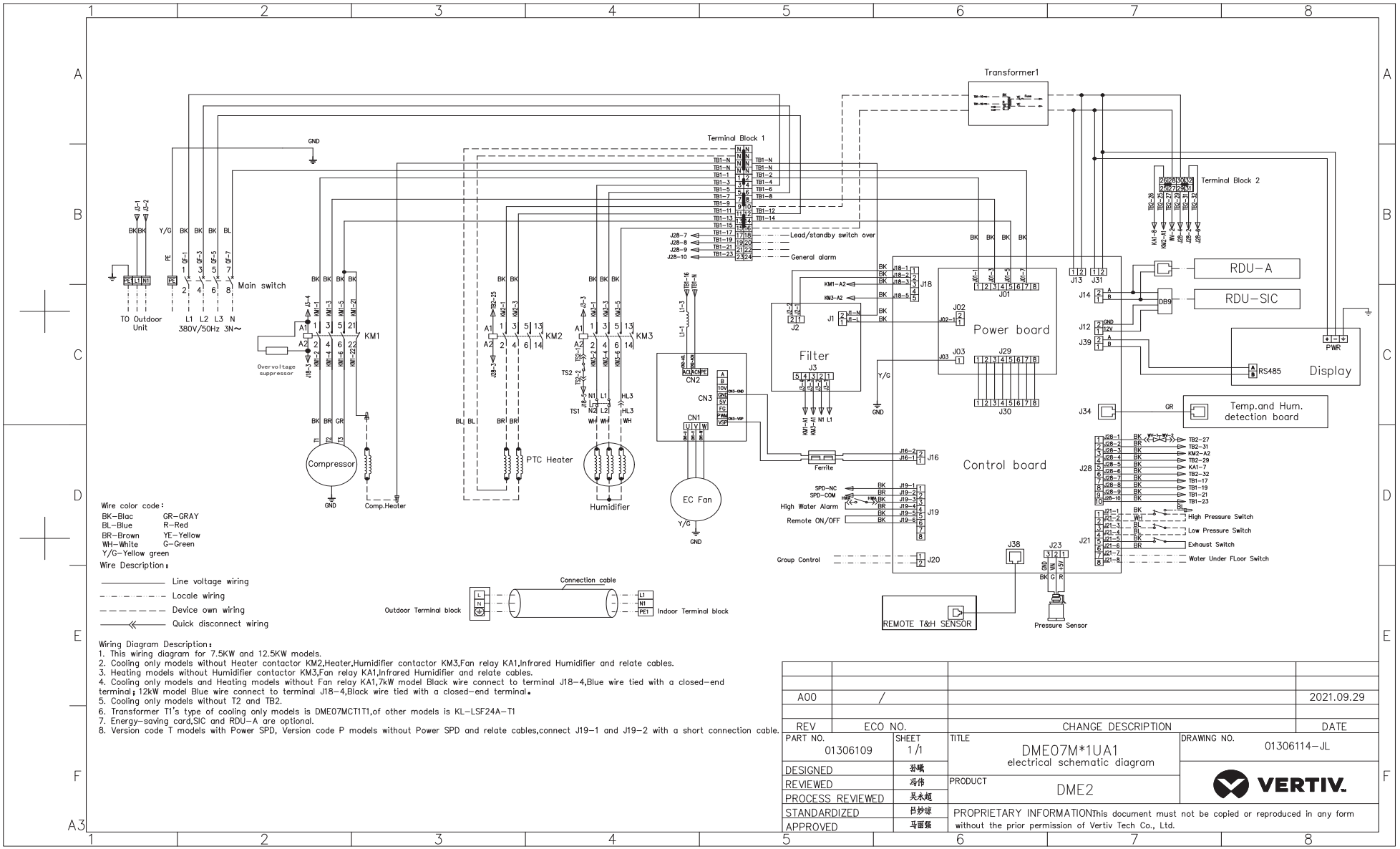
Wiring Diagram Description:

1. This wiring diagram for 7.5KW and 12.5KW models.
2. Cooling only models without Heater contactor KM2,Heater,Humidifier contactor KM3,Fan relay KA1,Infrared Humidifier and relate cables.
3. Heating models without Humidifier contactor KM3,Fan relay KA1,Infrared Humidifier and relate cables.
4. Cooling only models and Heating models without Fan relay KA1,7kW model Black wire connect to terminal J18-4,Blue wire tied with a closed-end terminal; 12kW model Blue wire connect to terminal J18-4,Black wire tied with a closed-end terminal.
5. Cooling only models without T2 and TB2.
6. Transformer T1's type of cooling only models is DME07MCT1T1,of other models is KL-LSF24A-T1
7. Energy-saving card,SIC and RDU-A are optional.
8. Version code T models with Power SPD, Version code P models without Power SPD and relate cables,connect J19-1 and J19-2 with a short connection cable.

REV	ECO NO.	CHANGE DESCRIPTION	DATE
A00	/		2021.09.29

PART NO. 01306106	SHEET 1/1	TITLE DME07M*SUA1 electrical schematic diagram	DRAWING NO. 01306112-JL
DESIGNED	孙曦		
REVIEWED	冯伟	PRODUCT DME2	VERTIV.
PROCESS REVIEWED	吴永超		
STANDARDIZED	吕妙琼	PROPRIETARY INFORMATION This document must not be copied or reproduced in any form without the prior permission of Vertiv Tech Co., Ltd.	
APPROVED	马丽强		

DME07MH1UP1 Circuit Diagram



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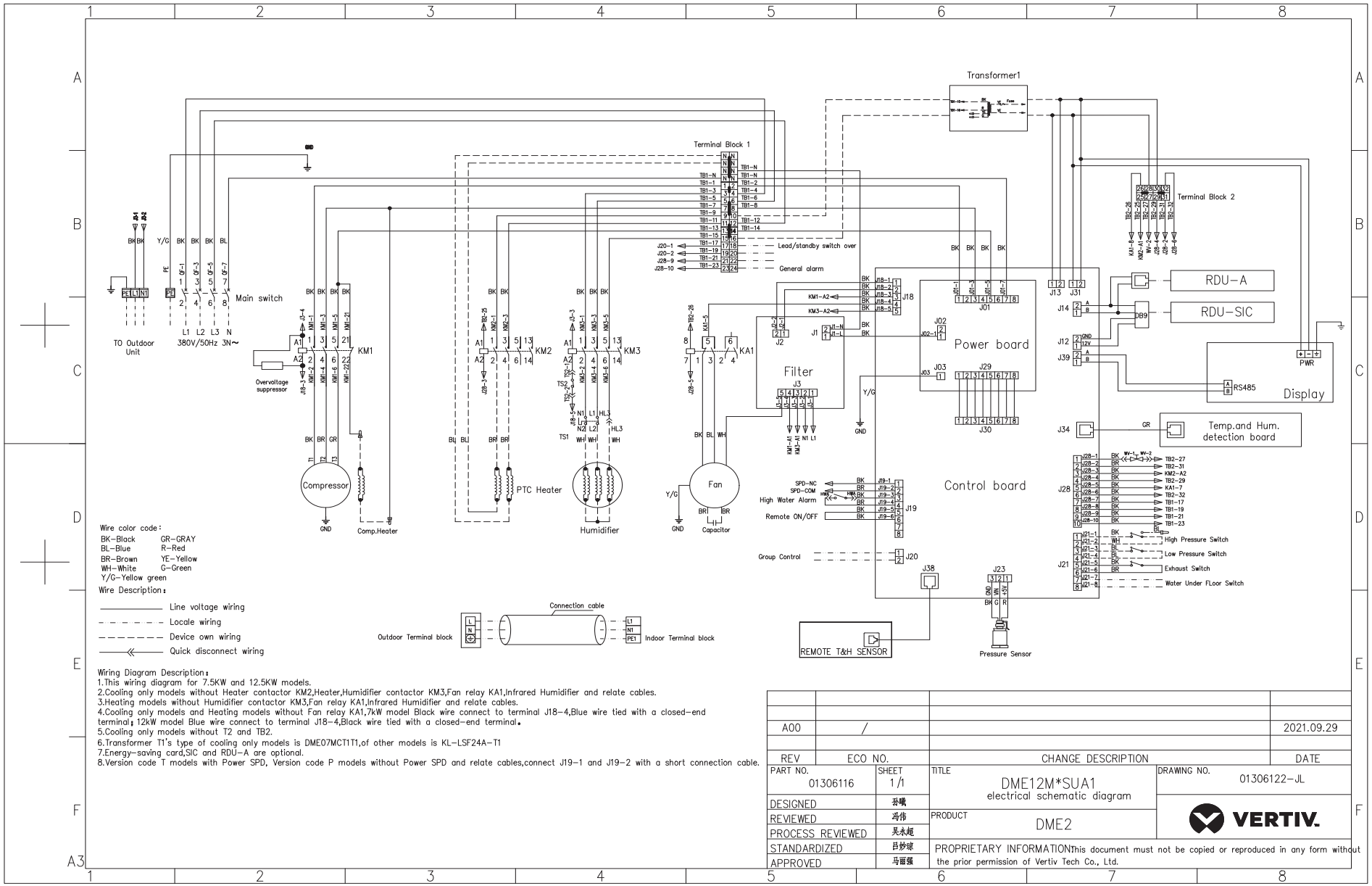
REV	ECO NO.	CHANGE DESCRIPTION	DATE
A00	/		2021.09.29

PART NO. 01306109	SHEET 1/1	TITLE DME07M*1UA1 electrical schematic diagram	DRAWING NO. 01306114-JL
DESIGNED	孙曦	PRODUCT DME2	VERTIV.
REVIEWED	冯伟		
PROCESS REVIEWED	吴永超		
STANDARDIZED	吕妙琼	PROPRIETARY INFORMATIONThis document must not be copied or reproduced in any form without the prior permission of Vertiv Tech Co., Ltd.	
APPROVED	马丽强		

DME12MHSUP1 Circuit Diagram



Wire color code:

BK–Black	GR–GRAY
BL–Blue	R–Red
BR–Brown	YE–Yellow
WH–White	G–Green
Y/G–Yellow green	

Wire Description:

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- Locale wiring
- Device own wiring
- Quick disconnect wiring

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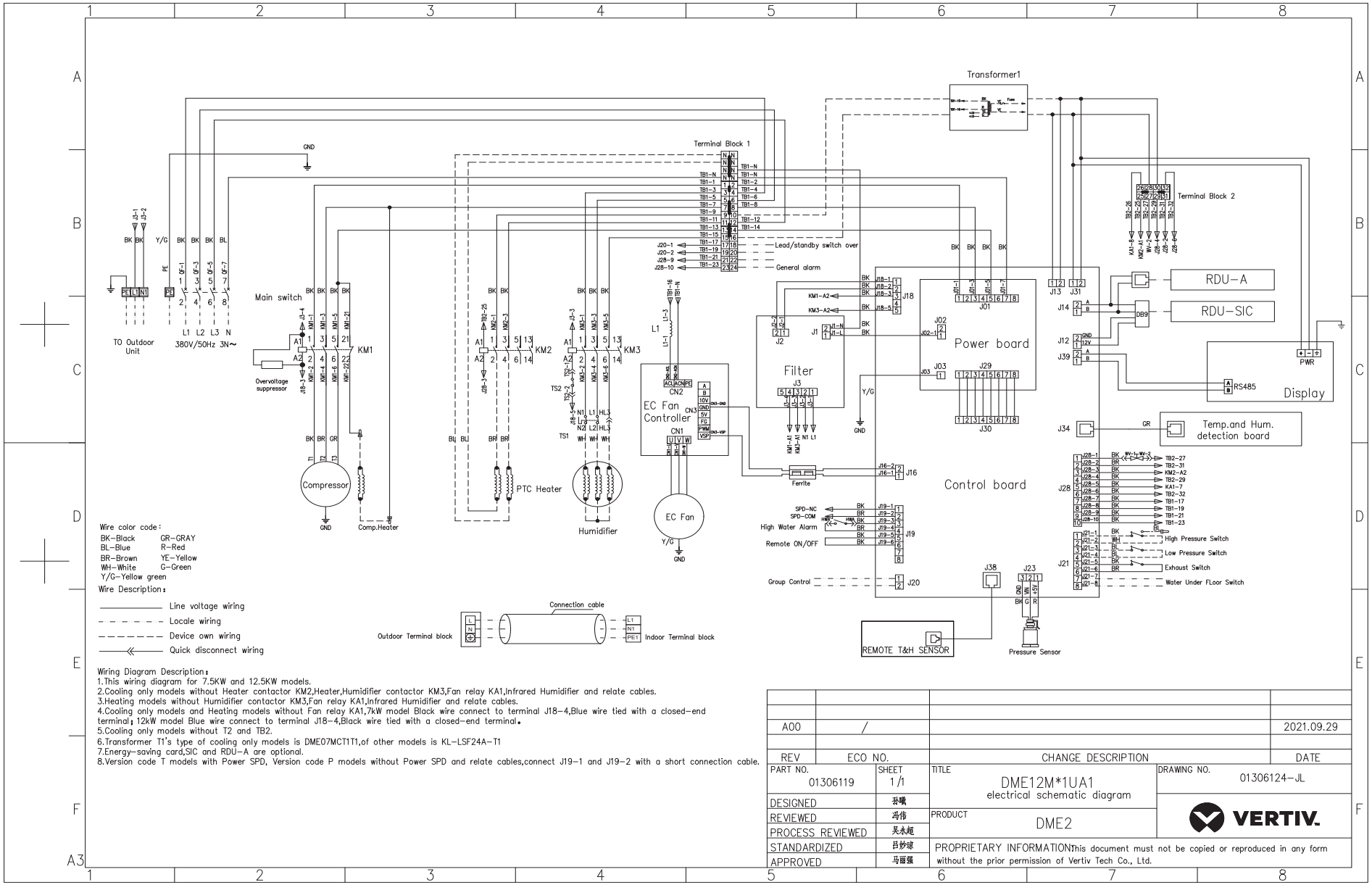
REV	ECO NO.	CHANGE DESCRIPTION	DATE
A00	/		2021.09.29

PART NO. 01306116	SHEET 1/1	TITLE DME12M*SUA1 electrical schematic diagram	DRAWING NO. 01306122–JL
DESIGNED	孙曦		
REVIEWED	冯伟	PRODUCT DME2	VERTIV.
PROCESS REVIEWED	吴永超		
STANDARDIZED	吕妙琼	PROPRIETARY INFORMATIONThis document must not be copied or reproduced in any form without the prior permission of Vertiv Tech Co., Ltd.	
APPROVED	马丽强		

DME12MH1UP1 Circuit Diagram



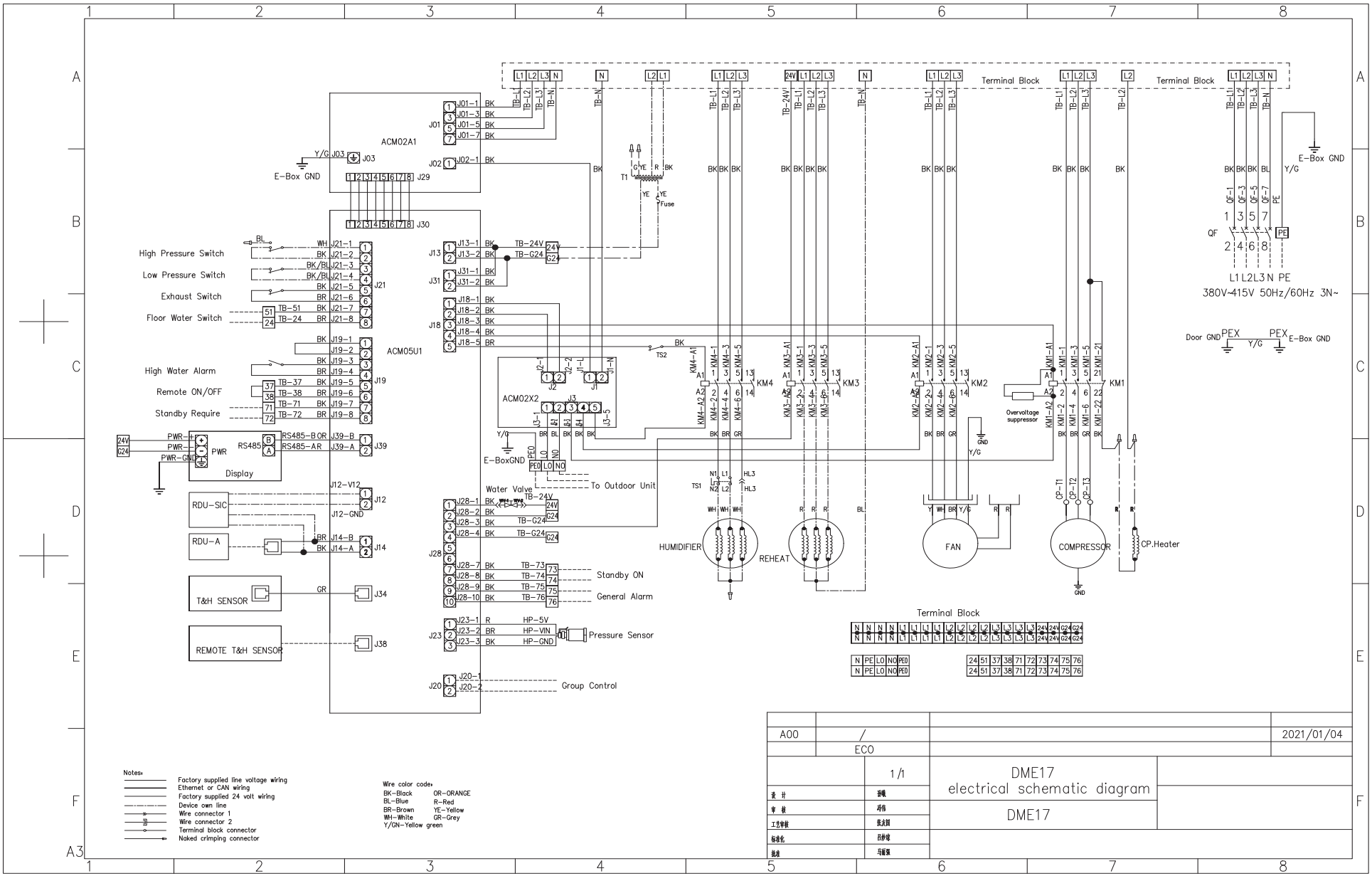
Wiring Diagram Description:

1. This wiring diagram for 7.5KW and 12.5KW models.
2. Cooling only models without Heater contactor KM2,Heater,Humidifier contactor KM3,Fan relay KA1,Infrared Humidifier and relate cables.
3. Heating models without Humidifier contactor KM3,Fan relay KA1,Infrared Humidifier and relate cables.
4. Cooling only models and Heating models without Fan relay KA1,7kW model Black wire connect to terminal J18-4,Blue wire tied with a closed-end terminal; 12kW model Blue wire connect to terminal J18-4,Black wire tied with a closed-end terminal.
5. Cooling only models without T2 and TB2.
6. Transformer T1's type of cooling only models is DME07MCT1T1,of other models is KL-LSF24A-T1
7. Energy-saving card,SIC and RDU-A are optional.
8. Version code T models with Power SPD, Version code P models without Power SPD and relate cables,connect J19-1 and J19-2 with a short connection cable.

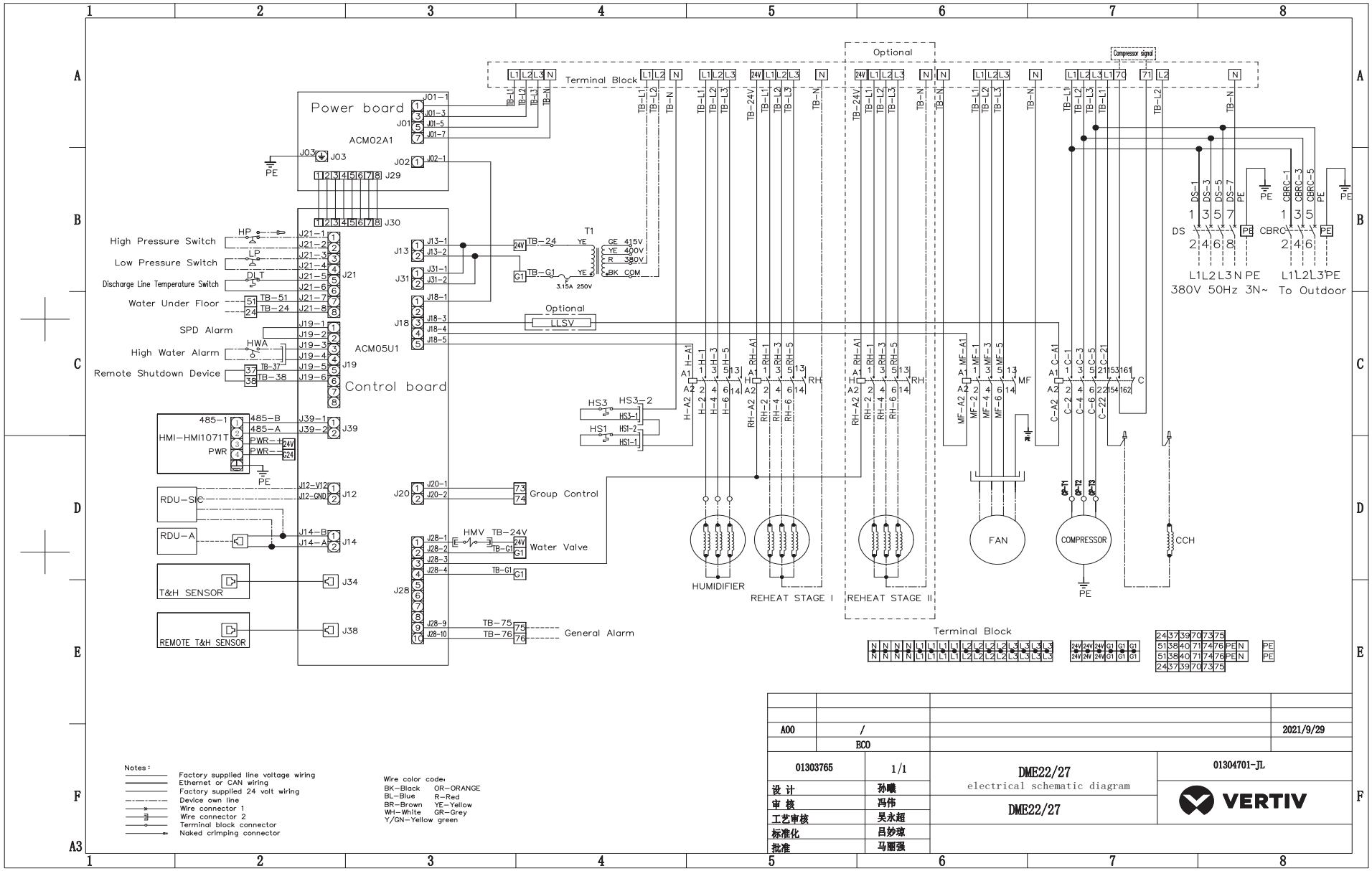
REV	ECO NO.	CHANGE DESCRIPTION	DATE
A00	/		2021.09.29

PART NO. 01306119	SHEET 1/1	TITLE DME12M*1UA1 electrical schematic diagram	DRAWING NO. 01306124-JL
DESIGNED	孙曦		
REVIEWED	冯伟	PRODUCT DME2	VERTIV.
PROCESS REVIEWED	吴永超		
STANDARDIZED	吕妙琼	PROPRIETARY INFORMATIONThis document must not be copied or reproduced in any form without the prior permission of Vertiv Tech Co., Ltd.	
APPROVED	马丽强		

DME 17 kW Circuit Diagram

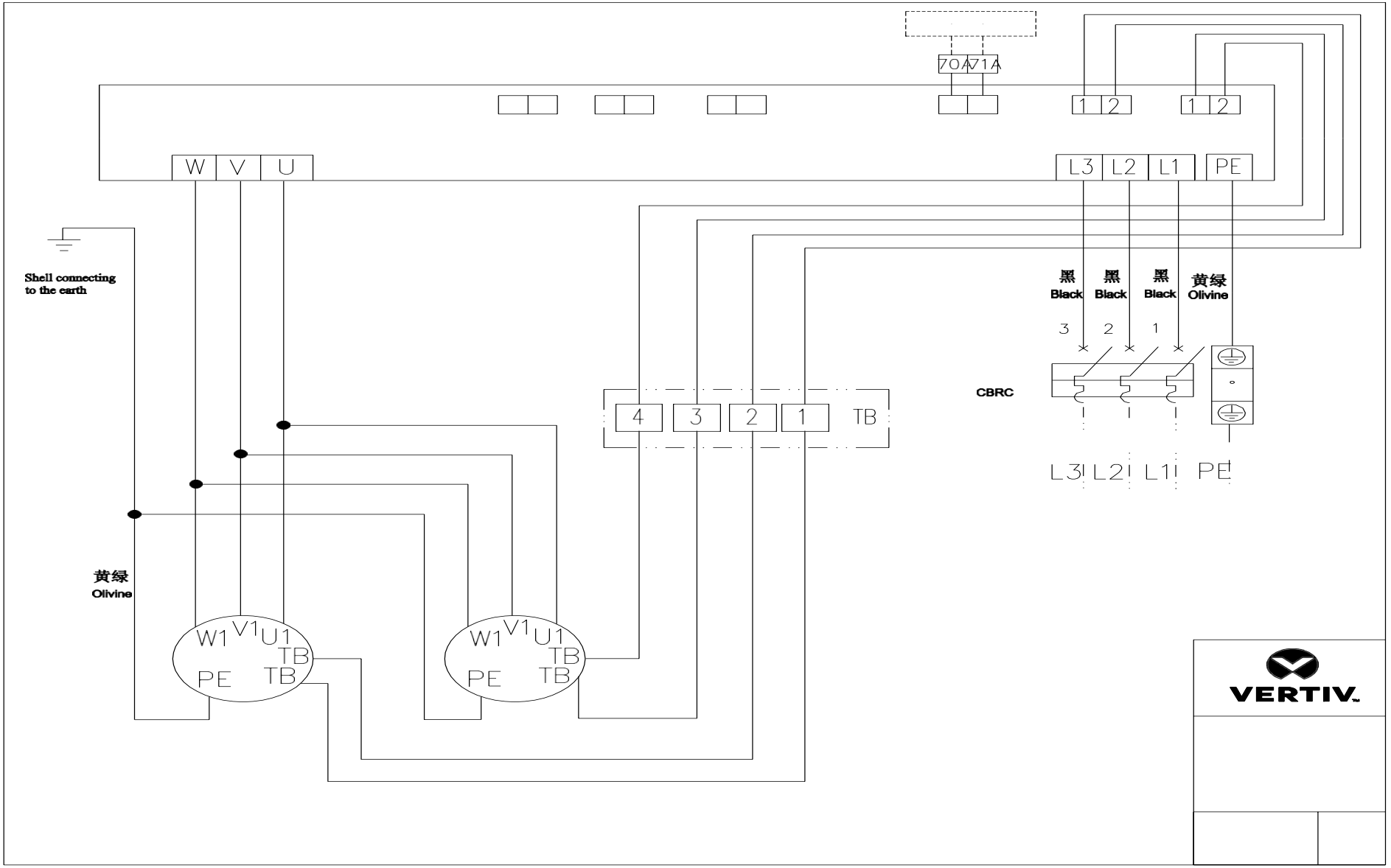


DME 22 kW/27 kW Circuit Diagram

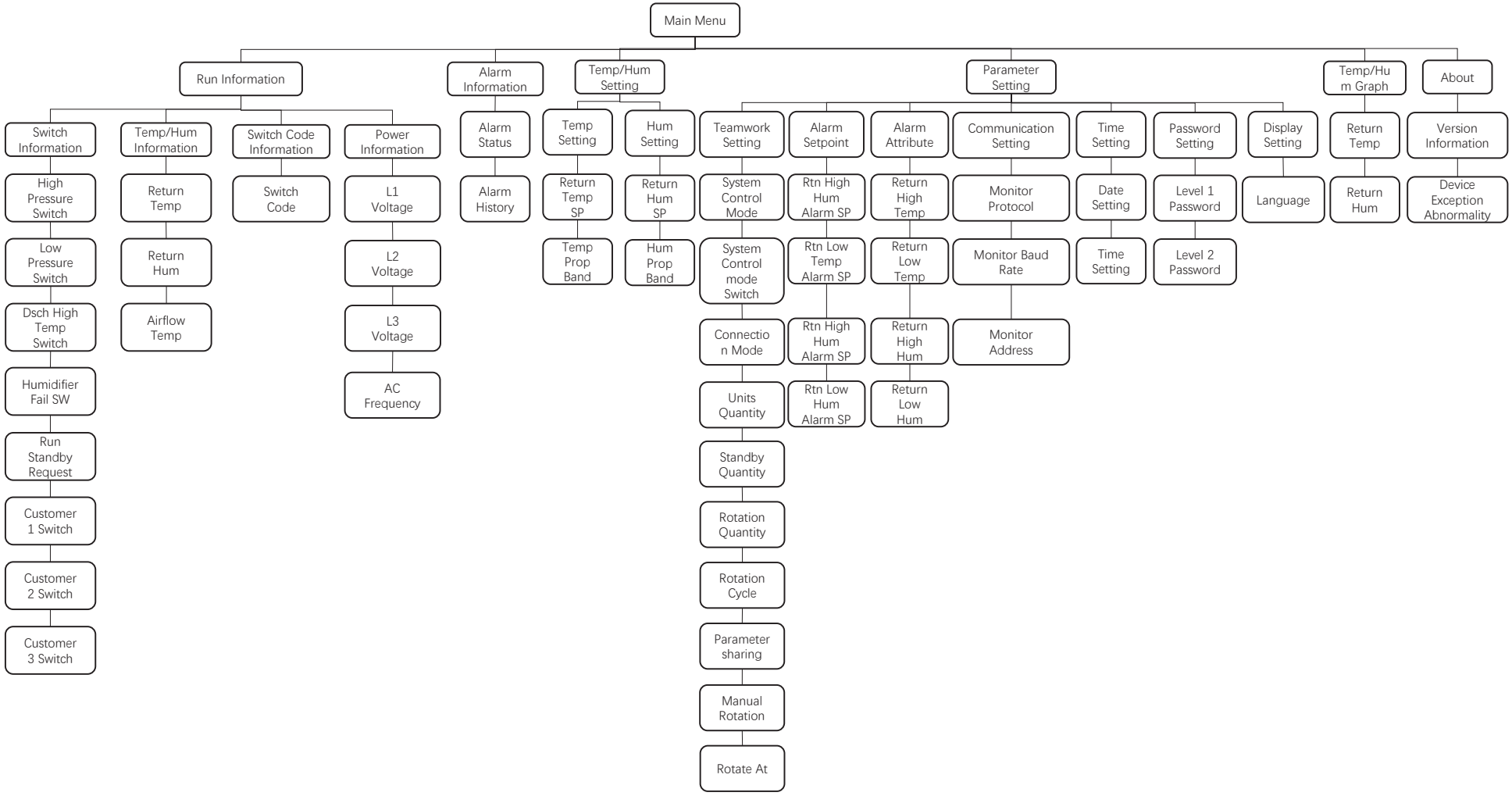


Appendix II: Circuit Diagram of Outdoor Unit

DMC 22 kW & 27 kW Circuit Diagram



Appendix III: Menu Structure of Controller



Appendix IV: Parameter Setting Tables

Level 1	Level 2	Parameter	Default	Setting Range
Temperature and humidity settings	Temperature setting	Temperature setting ºC	24	15 ºC to 35 ºC
		Temp. proportional band K	3	1 K to 5 K
	Humidity setting	Humidity setting %	50	20% to 80%
		Hum. proportional band %	5	1% to 10%
Parameter settings	Teamwork control settings	System control mode	0	0: Single unit; 1: Main unit; 2: Standby
		Control mode switching	0	0: Main /standby; 1: Rotation; 2: Intelligent rotation
		Teamwork control connection	0	0: Hardware connection; 1: CAN connection
		Number of units	1	1 to 4
		Number of standby units	0	0 to m (m=number of units-1)
		Number of rotations	0	0 to n (n=minimum (number of running units or number of standby units))
		Rotating cycle (days)	0	1-7
		Rotating time	12:00	0: 00 to 23: 00
		Manual rotation	0	0: No; 1: Yes
		Parameter sharing	0	0: No; 1: Yes

Level 1	Level 2	Parameter	Default	Setting Range
Parameter settings	Alarm parameters	High temperature alarm value ℃	35 ℃	25 ℃ to 50 ℃
		Low temperature alarm value ℃	15 ℃	5 ℃ to 20 ℃
		High humidity alarm value%	65%	65% to 90%
		Low humidity alarm value%	35%	10% to 35%
	Alarm properties	High temperature alarm	2	0: Disabled; 1: Ceased; 2: Enabled
		Low temperature alarm	2	0: Disabled; 1: Ceased; 2: Enabled
		High humidity alarm	2	0: Disabled; 1: Ceased; 2: Enabled
		Low humidity alarm	2	0: Disabled; 1: Ceased; 2: Enabled
	Communication settings	Monitoring protocol	0	0: YDN23; 1: MODBUS-O; 2: MODBUS-N
		Monitoring baud rate bps	5	0: Reserved; 1: 1200; 2: 2400; 3: 4800; 4: 9600; 5: 19200
		Monitoring address	1	1-254
	Time setting	Date setting	/	/
		Time setting	/	/
	Password setting	Primary password	0001	/
		Secondary password	/	/
	Display setting	Display language	Chinese	0: Chinese; 1: English
Operation and maintenance	Optional function	Electrical heating quantity	0	0-1
		Humidifier type	0	0: None; 1: electrode humidification; 2: infrared humidification
		Customer 1 configuration	2	0: None; 1: Floor overflow 2: SPD; 3: Remote power on/off; 4: Electrical heating failure; 5: Air loss switch
		Customer 2 configuration	3	0: None; 1: Floor overflow 2: SPD; 3: Remote power on/off; 4: Electrical heating failure; 5: Air loss switch
		Customer 3 configuration	1	0: None; 1: Floor overflow 2: SPD; 3: Remote power on/off; 4: Electrical heating failure; 5: Air loss switch
		Customer 1 polarity	1	0: NC 1: NO
		Customer 2 polarity	0	0: NC 1: NO

Level 1	Level 2	Parameter	Default	Setting Range
Operation and maintenance	Optional function	Customer 3 polarity	0	0: NC 1: NO
		Analog input 1 configuration	0	0: None; 1: Condensing pressure 1; 2: Condensing pressure 2
		Analog input 1 type	0	0: Voltage type; 1: Current type
		ECO mode	0	0: Disabled; 1: Enabled
		ECO mode start	22:00	0:00-23:00
		ECO mode end	7:00	5:00-10:00
		ECO mode proportional band	2	0-10
		Energy saving card type	1	0-1
		Energy saving card quantity	0	0-4
		Sleep Temp.°C	27 °C	15 °C to 40 °C
		Energy saving card 1 Temp.°C	0	-40 °C to 100 °C
		Energy saving card 2 Temp.°C	0	-40 °C to 100 °C
		Energy saving card 3 Temp.°C	0	-40 °C to 100 °C
		Energy saving card 4 Temp.°C	0	-40 °C to 100 °C

Appendix V: Routine Maintenance Inspection Items (Monthly)

Date: _____ Prepared By: _____

Model: _____ Serial Number: _____

Routine Maintenance Inspection Items Checklist (Monthly)

Component	Inspection Particulars	Remark
Filter	Check for clogging or damage	
	Check the filter clogging switch	
	Clean the filter	
Infrared humidifier (if applicable)	Check the drain piping of the water pan for blockage	
	Check the humidifier quartz tube	
	Check if the mineral deposited on the water pan	
Indoor unit fan	Impellers free of debris and distortion, and move freely	
Compressor	Check for any signs of oil leaks	
	Listen to running sounds and observe operation vibrations	
Power SPD (if applicable)	Check for indicator color	
Drain system	Check and clean out unit drain piping; humidifier and water pan; condensate pump and building drain piping.	
Refrigerant system	Check if refrigerant piping is reliably supported	
	Check system circulation and moisture content (observed through sight glass)	
	Check Thermal Expansion Valve (TXV) is firmly connected	

Signature_____

Note: Please copy this table for record keeping purposes.

Appendix VI: Routine Maintenance Inspection Items (Semi-annually)

Date: _____ Prepared by: _____

Model: _____ Serial number: _____

Routine Maintenance Inspection Items Checklist (Semi-annually)

Components	Inspection Particular	Remark
Compressor	Check for any signs of oil leaks	
	Listen to running sounds and observe operation vibrations	
Refrigeration cycle system	Check suction pressure, exhaust pressure and suction superheat are as per setpoints	
	Check if the evaporator is functioning normally	
	Check system circulation and moisture content (observed through sight)	
	Check whether there is an obvious temperature difference before and after drying the filter	
	Check Thermal Expansion Valve (TXV) is firmly connected	
	Check the refrigerant piping. The refrigerant line must have a suitable bracket and must not be placed against the wall, floor or fixed frame.	
Air-cooled condenser	Check if the condenser coil is clogged, clean immediately if it is blocked.	
	Check if the motor is firmly mounted	
	Check if there is any distortions in impeller rotation, also check bearings if they are in good condition	
	Check if the refrigerant piping are properly supported	
Electrical board	Check all electrical connections are firmly tightened	
	Check the surface of the circuit board for signs of corrosion	
Electrical heater	Check heating element for signs of corrosion or burning	

Signature_____

Note: Please copy this table for record keeping purposes.

Appendix VII: Table Names and Content of Harmful Substances in Products

Harmful Substances in the Products (Indoor Unit)

Part Name	Harmful Substance					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexvalent Chromium (Cr (VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Cabinets	○	○	○	○	○	○
Refrigeration accessories	○	○	○	○	○	○
Fan unit	○	○	○	○	○	○
ECU	○	○	○	○	○	○
Display screen	×	○	○	○	○	○
PCBA	×	○	○	○	○	○
Heat exchanger	○	○	○	○	○	○
Copper pipes	○	○	○	○	○	○
Cables	○	○	○	○	○	○

This form has been prepared in accordance with the provisions of SJ/T 11364.
○: Indicates that the content of this toxic or hazardous substance in all homogeneous materials of this part is below the limit requirement specified in SJ/T-11363-2006;
×: Indicates that the content of the toxic or hazardous substance in at least one of the homogeneous materials of the part exceeds the limit requirement specified in SJ/T11363-2006.

Reasons for lead contained in the above parts:
Vertiv is committed to the design and manufacture of environment-friendly products. We will continue to reduce and eliminate toxic and hazardous substances in our products through continuous research. The following part or applications contain toxic or hazardous substances that are limited to the current state of the art and cannot be reliably replaced or have no mature solutions.

Description of the environment protection use period:
The environment protection use period of this product (identified on the product body) refers to a period from the date of production, in which the toxic or hazardous substances contained in this product does not seriously affect the environment, person and property under normal use conditions, and compliance with the safety precautions of this product.

Scope: Liebert® DM series of Precision Air Conditioning Indoor Unit

Harmful Substances in the Products (Outdoor Unit)

Part Name	Harmful Substance					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexvalent Chromium (Cr (VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Cabinets	○	○	○	○	○	○
Refrigeration accessories	○	○	○	○	○	○
Fan unit	○	○	○	○	○	○
ECU	○	○	○	○	○	○
PCBA	×	○	○	○	○	○
Heat exchanger	○	○	○	○	○	○
Copper pipes	○	○	○	○	○	○
Cables	○	○	○	○	○	○

This form has been prepared in accordance with the provisions of SJ/T 11364.
○: Indicates that the content of this toxic or hazardous substance in all homogeneous materials of this part is below the limit requirement specified in SJ/T-11363-2006;
×: Indicates that the content of the toxic or hazardous substance in at least one of the homogeneous materials of the part exceeds the limit requirement specified in SJ/T11363-2006.

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Scope: Liebert® DM series of Precision Air Conditioning Outdoor Unit

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