Liebert® Air Cooled Condenser

USER MANUAL

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Purpose of the Document

This document applies to the Liebert LSF Air Cooled Condenser used in precision air conditioners and cooling solutions which maintain an optimal environmental control for technological ecosystems at minimal operating costs. This document gives an overview of the technical specifications and parameters. The figures used in this document are for reference only.

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, the content under the Warning heading is used for precautions which need to be taken which, otherwise, could result in equipment damage, performance degradation, or interruption in service.*
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

BOM	Revision	Change
31012725	V1.3	--

TABLE OF CONTENTS

Chapter 1 Overview

This chapter introduces the classification and models, model description, main components and technical parameters of the Liebert condenser (condenser for short).

1.1 Classification And Models

The condenser is classified into two types: single circuit and dual circuit. The single circuit has a set of discharge/liquid pipe to match the single refrigeration system of indoor unit. The dual circuit has two sets of discharge/liquid pipes to match the two separate refrigeration systems of indoor unit.

The condenser is available in 17 models. The classification and models are listed in Table 1-1.

Table 1-1 Condenser models

R22/R407C refrigeration	Single circuit	LSF24-T	LSF32-T	LSF38-T	LSF42-T	LSF52-T	LSF62-T	LSF70-T	LSF76-T	LSF85-T
	Dual circuit	LDF42-T	LDF52-T	LDF62-T	LDF70-T	LDF76-T	LDF85-T			
R410A refrigeration	Single circuit	LSF24-R3	LSF32-R3	LSF38-R3	LSF42-R3	LSF52-R3	LSF62-R3	LSF70-R3	LSF76-R3	LSF85-R3
	Dual circuit	LDF42-R3	LDF52-R3	LDF62-R3	LDF70-R3	LDF76-R3	LDF85-R3			

1.2 Model Description

Taking LSF62 for example, the model description of the condenser is shown in Figure 1-1.

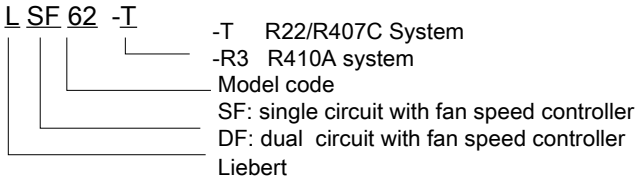

Figure 1-1 Model description

1.3 Main Components

The main components of the condenser include the heat exchanger, fan, fan speed controller and pressure sensor. The heat exchanger is inside the condenser, and the appearance and position of other components are shown in Figure 1-2 and Figure 1-3.

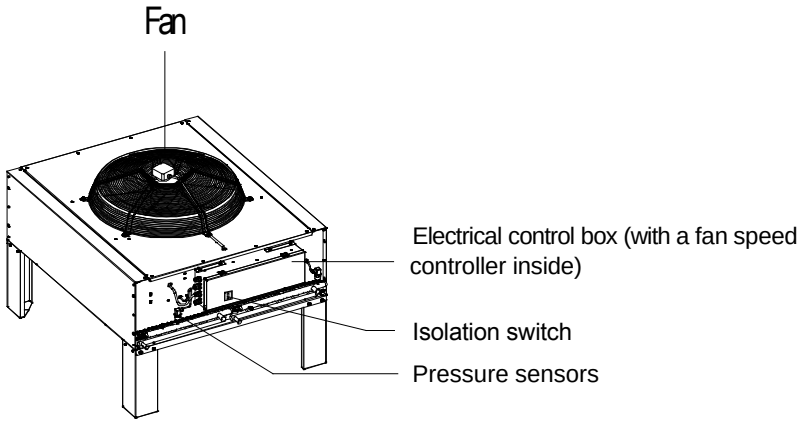

Figure 1-2 Condenser (single fan, single circuit)

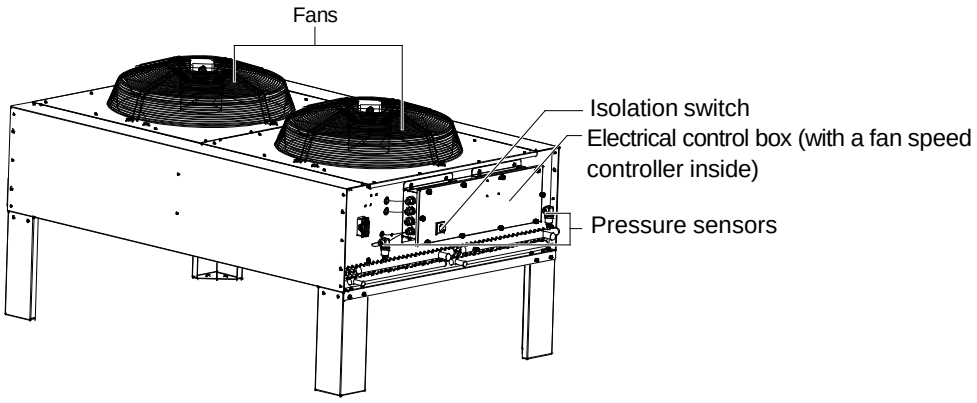

Figure 1-3 Condenser (double fans, dual circuit)

1.4 Technical Parameters

1.4.1 Mechanical Parameters

The condenser structure is shown in Figure 1-4. The mechanical parameters of each model are listed in Table 1-2.

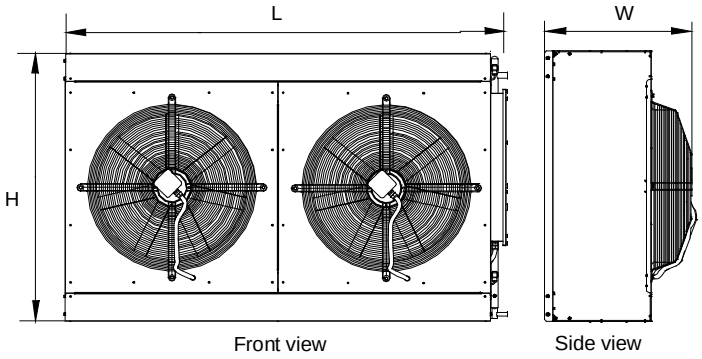

Figure 1-4 Structure (double fans) (unit: mm)

Table 1-2 Mechanical parameters

Model	Weight (kg)	Fan diameter (mm)	Fan number	Dimension (mm)		
				L	H	W
LSF24	105	710	1	1384	990	689
LSF32	110	710	1	1384	990	689
LSF38	120	800	1	1384	990	695
LSF42	130	800	1	1584	1273	695
LSF52	140	800	1	1584	1273	695
LSF62	150	710	2	1884	1273	689
LSF70	150	710	2	1884	1273	689
LSF76	220	800	2	2384	1273	695
LSF85	230	800	2	2384	1273	695
LDF42	130	800	1	1584	1273	695
LDF52	140	800	1	1584	1273	695
LDF62	160	710	2	2084	1273	689
LDF70	160	710	2	2084	1273	689
LDF76	220	800	2	2384	1273	695
LDF85	230	800	2	2384	1273	695

1.4.2 Mounting Base Dimensions

➢ **Mounting base dimensions for horizontal installation**

The mounting base figure for horizontal installation is shown in Figure 1-5, and the specific mounting base dimensions of each model are listed in Table 1-3.

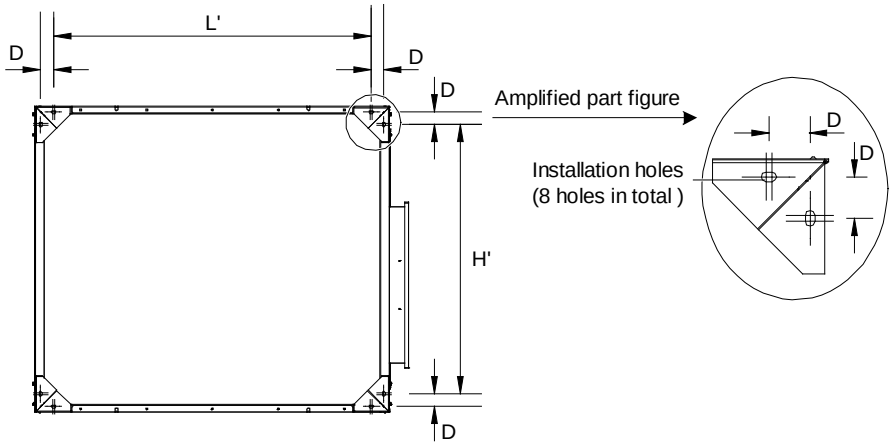

Figure 1-5 Mounting base figure for horizontal installation (unit: mm)

Table 1-3 Mounting base dimensions for horizontal installation (unit: mm)

Model	Dimension (L' × H' × D)	Model	Dimension (L' × H' × D)
LSF24	1126 × 837 × 53	LSF85	2126 × 1120 × 53
LSF32	1126 × 837 × 53	LDF42	1326 × 1120 × 53
LSF38	1126 × 837 × 53	LDF52	1326 × 1120 × 53
LSF42	1326 × 1120 × 53	LDF62	1826 × 1120 × 53
LSF52	1326 × 1120 × 53	LDF70	1826 × 1120 × 53
LSF62	1626 × 1120 × 53	LDF76	2126 × 1120 × 53
LSF70	1626 × 1120 × 53	LDF85	2126 × 1120 × 53
LSF76	2126 x 1120 x 53		

The installation holes are long and flat holes. It is recommended to use M10 × 20 bolts to fix the mounting base.

➢ **Mounting base dimensions for vertical installation**

The mounting base figure for vertical installation is shown in Figure 1-6, and the specific mounting base dimensions of each model are listed in Table 1-4.

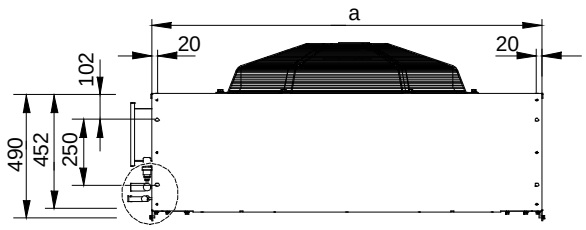

Figure 1-6 Mounting base figure for vertical installation (top view) (unit: mm)

Table 1-4 Mounting base dimensions for vertical installation (unit: mm)

Model	Dimension 'a'
LSF24, LDF32, LSF38	1280
LSF42, LDF42, LSF52, LDF52	1480
LSF62, LSF70	1780
LDF62, LDF70	1980
LSF76, LDF76, LSF85, LDF85	2280

1. The installation holes are long and flat holes. It is recommended to use M10 × 20 bolts to fix the mounting base.

2. The upper condenser must be installed on a rack during vertical installation, and the cushion pads should be installed between the condenser and the rack for reducing vibration. It is prohibited to stack two condensers through bolt connection.

1.4.3 Parameters of Operating Environment

Refer to Table 1-5 for parameters of operating environment.

Table 1-5 Parameters of operating environment

Item	Requirement
Installation position	The standard equivalent distance between the indoor unit and the condenser is 30m. Vertical difference* ΔH: -5m ≤ ΔH ≤ 20m. Installation mode: horizontal or vertical mode
Ambient temperature	Outdoor temperature: -20°C ~ +45°C. Low temperature accessories are required if the temperature is between -35°C and -20°C
Ambient relative humidity	Outdoor humidity: 5%RH ~ 95%RH
Operation power	400V ± 10%, 50/60Hz
Altitude	≤ 1000m. Derating is required if the altitude exceeds 1000m
Protection level	Electrical control box: IP55; unit: IP20; fan motor: IP54
Note*: Condenser fins have a corrosion resistant coating designed to provide maximum life expectancy for the heat exchanger and protect the aluminium fins from harsh environments. The high performance coating has been tested for 2000 hours exposure to a 5% neutral salt spray test in accordance with ASTMB117 without impact to the coating	

When the equivalent distance between the indoor unit and the condenser exceeds 30m, refer Refrigerant Tubing System in Liebert LSF Air Conditioner Technical Manual for the requirement of the line equivalent length.

1.4.4 Parameters Of Storage Environment

Refer to Table 1-6 for parameters of storage environment.

Table 1-6 Parameters of storage environment

Item	Requirement
Storage environment	Clean indoor environment with good ventilation and no dust
Ambient temperature	-40°C ~ +70°C
Ambient relative humidity	5%RH ~ 85%RH
Storage time	The total storage time should not exceed 6 months. Otherwise, the performance needs to be re-calibrated

Chapter 2 Installation

This chapter introduces the moving, unpacking, inspection, installation notes, space requirements and installation procedures.

2.1 Moving, Unpacking And Inspection

➢ **Moving**

It is recommended to use the mechanical transport equipment such as a forklift or a crane when unloading and transferring the condenser closest to the installation site.

When a forklift is used, insert the tines of the forklift shown in Figure 2-1 (taking the single fan condenser for example).

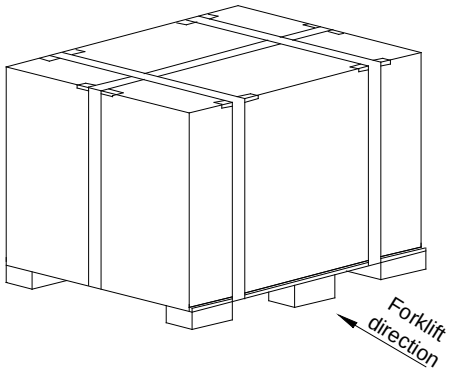

Figure 2-1 Forklift direction

When a crane is used, refer to Figure 2-2 to lift the package (taking the double fans condenser for example).

When lifting the package, fix the cable by leading it through the slots located at the bottom of the pallet. Otherwise, the cable may slide during the lifting process, and the package may fall to the ground, damaging the pipes inside and resulting in system leakage.

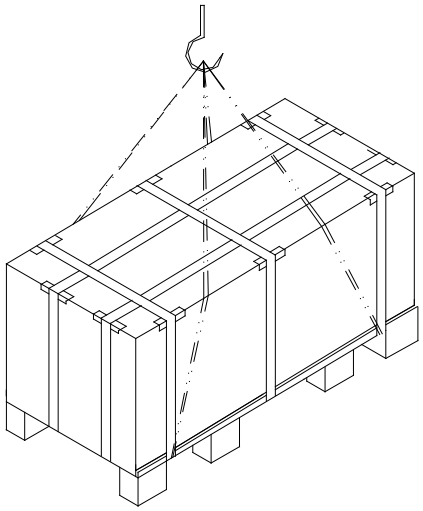

Figure 2-2 Crane lifting

- **Unpacking**

Remove the timber frame package and foam of the condenser but reserve the protection cardboard of fins. The protection cardboard of fins and the cushion pad of U tube located at the end of the condenser should be removed after the condenser is in its installation position.

1. If the condenser is to be placed horizontally, you should complete the installation of legs while the condenser is located vertically.

2. When moving the condenser by hand, to avoid distortion and system leakage, do not touch the copper pipes.

- **Inspection**

After the product arrival, you should check the accessories against the packing list. If any parts are found missing or damaged, please report to the carrier immediately. If any covert damage is found, please report to the carrier and the distributor immediately.

2.2 Installation Notes

The installation notes of the condenser are as follows:

1. To ensure the heat dissipation capacity, install the condenser in the place with smooth airflow. Do not install it where the coil of the condenser may be obstructed by dust or snow. Ensure that there is no steam or waste heat around.

2. If possible, the horizontal installation is recommended to reduce the noise.

3. The condenser should be installed away from the residential areas (≥ 15m).

4. Be careful not to damage the waterproof layer and observe the local regulations when the condenser is installed on the roof of the building.

5. Position the condenser higher than the indoor unit to ensure normal oil return.

6. Follow the installation arrows on the condenser for correct installation direction.

2.3 Space Requirements

1. A 4000mm clearance is required around the condenser air outlet.

2. 600mm service spaces are required on the four sides of the condenser.

The condenser needs sufficient installation and service space around the installation place. The specific space requirements are shown in Figure 2-3 and Figure 2-4.

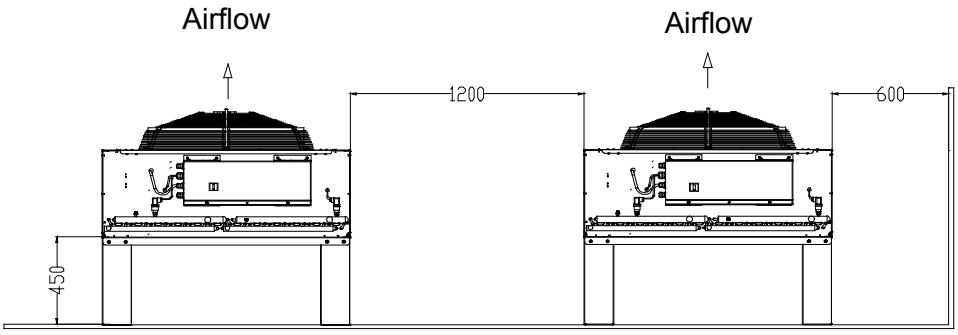

Figure 2-3 Horizontal installation space requirement (unit: mm)

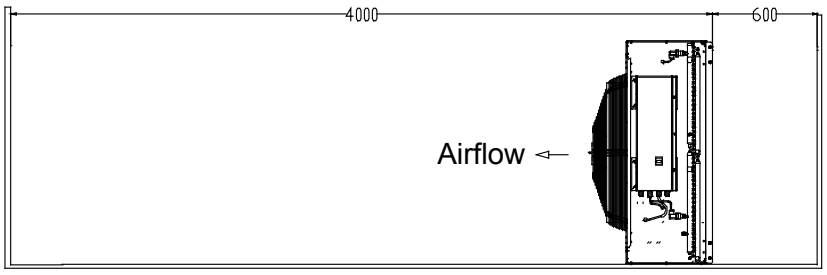

Figure 2-4 Vertical installation space requirement (unit: mm)

2.4 Installation Procedures

Before commencing installation hot works, release all nitrogen holding charges from the indoor and outdoor units.

- **Installing pipelines**

1. Protect copper pipes from heat sources. Isolate copper pipes from structures or other obstacles using rigid supports. Avoid dust, water vapor and irrelevant objects from entering copper pipes.

2. Use a good quality, silver-based solder for all brazed connections. Use refrigeration grade copper pipes and fittings throughout the installation. Purge all pipes with nitrogen during brazing to prevent oxidation.

1. Identify the pipe sizes

Refer to Installing Unit Pipes in Liebert LSF Air Conditioner User Manual for pipe sizes.

2. Identify the condenser installation height

Refer to Installing Unit Pipes in Liebert LSF Air Conditioner User Manual for installation height.

3. Install the pipes

Install the pipes according to local and national codes and standards.

- **Connecting external power (external power supply of the condenser)**

1. Identify the cable specifications

Select the power supply cables and start/stop signal cables of the condenser according to site conditions, such as the distance between the indoor unit and the condenser.

Table 2-1 Operation current of fan under 400V voltage

Condenser Model	FLA (A)
LSF24	1.65
LSF32	1.05
LSF38, LSF42, LSF52, LDF42, LDF52	2.4
LSF62, LSF70, LDF62, LDF70	3.3
LSF76, LSF85, LDF76, LDF85	4.8

1. It is recommended to use the 20AWG (0.52mm2) cable as the condenser start/stop signal cable.

2. The (outdoor) air cooled condenser requires a three-phase, neutral and earth power supply. The indoor unit is the recommended point of connection for this electrical service and includes a three-pole circuit breaker rated at 16 amps.

3. The cables should not contact hot objects, such as the copper pipe and water pipe without insulation, to avoid damaging the insulation layers.

4. The cables should be connected in accordance with the local regulations.

2. Connect the cables

Refer Figure 2-5, Figure 2-6 and Circuit Diagram for the connections of external power cables.

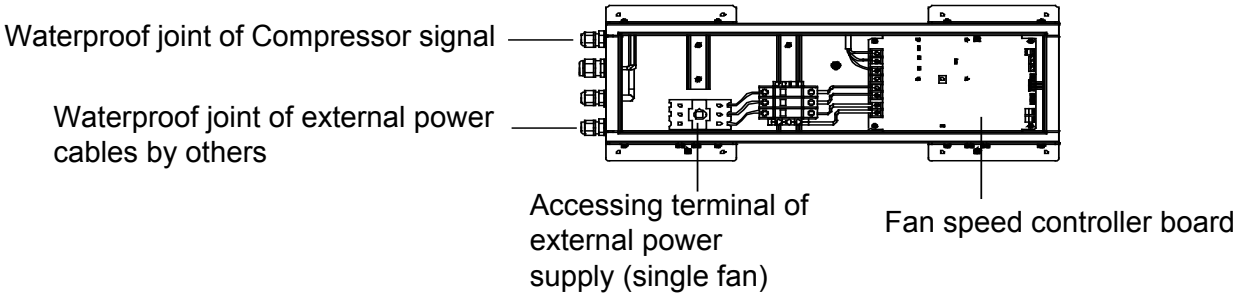

Figure 2-5 Connection figure of single fan external power cables (taking LDF42 for example)

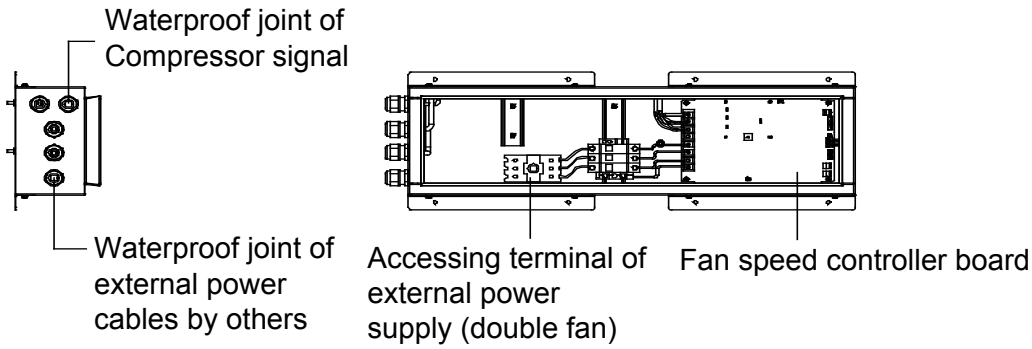

Figure 2-6 Connection figure of double fans external power cables (taking LDF62 for example)

1. The external power cables enter the electrical control box through the waterproof joint of external power cable whose inner diameter is Φ10mm.

2. The compressor signal cables enter the electrical control box through the waterproof joint of external power cable whose inner diameter is Φ6mm.

3. After connecting the external power cables, apply waterproof sealant treatment to ensure the good waterproof performance of electrical control box.

4. The phase sequence of three-phase AC input (L1, L2, L3) must be correct. Otherwise, the fan speed controller will generate the phase loss alarm, and there will be no AC output.

5. For dual circuit condenser (such as LDF42, LDF52, LDF62, LDF70, LDF76 and LDF85), the four condenser start/stop signal cables should be paralleled at the terminal block of indoor unit before connection; for single circuit condenser, the two condenser start/stop signal cables can be connected directly.

- **Charging refrigerant and adding cooling oil**

Refer to Installing Unit Pipes in Liebert LSF Air Conditioner User Manual for charging refrigerant and adding cooling oil.

Chapter 3 Application of Fan Speed Controller

This chapter introduces the use of the fan speed controller, which includes the definitions of wiring terminals, introduction of human-machine interface (HMI) and operation of HMI. This chapter is mainly provided for the factory maintenance personnel. It is recommended that users should not operate the fan speed controller unless necessary.

The configured fan number must be the same as the number of the actual fans, or else a false alarm will be generated. Refer to Configuration data main menu interface in 3.3.2 Main Menu Interface for detailed settings.

3.1 Wiring Terminals

The wiring terminals are located on the fan speed controller board (Refer Figure 2-5 and Figure 2-6). Their distribution is shown in Figure 3-1 and the definitions are listed in Table 3-1. Refer to Circuit Diagram for detailed connections.

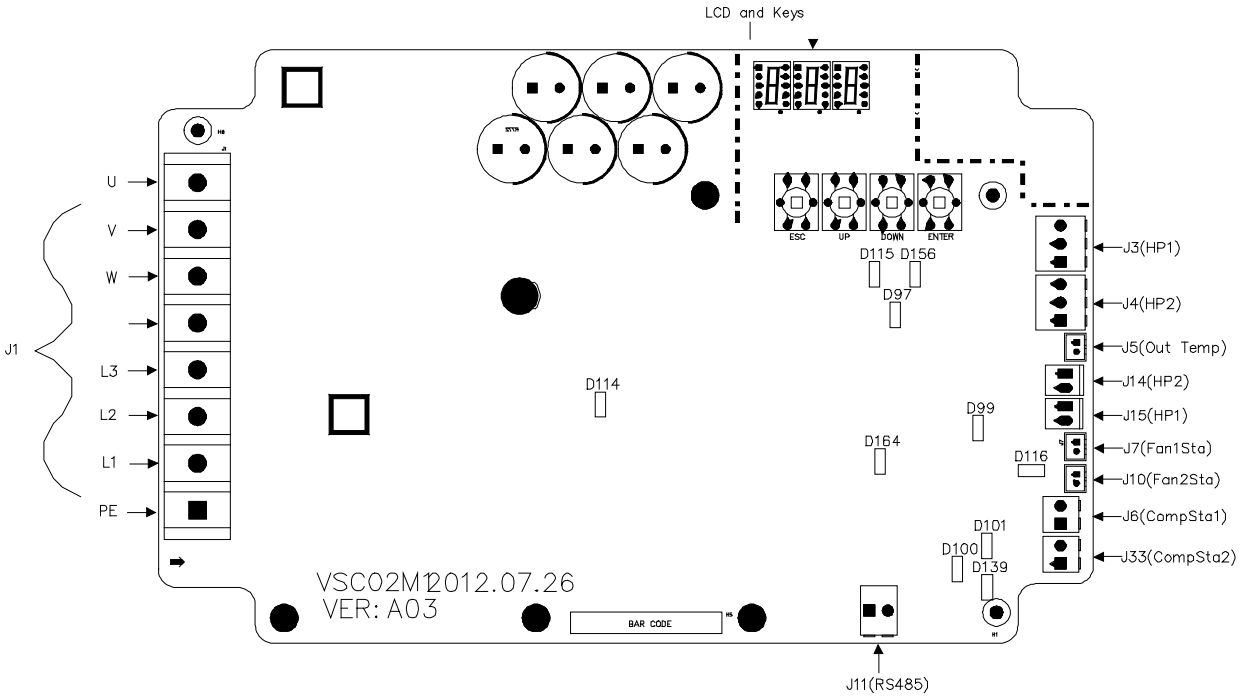

Figure 3-1 Layout of wiring terminals

Table 3-1 Definitions of wiring terminals

Silk print	Definition	Definition of pins
J1	AC I/O terminal	PE: protection earth L1, L2, L3: three-phase AC input U, V, W: three-phase AC output, which connects with the power supply terminals The middle terminal pin without logo is reserved
J3 (HP1)	Input terminal of voltage pressure sensor 1 (spare)	Pin 1: positive terminal of 5V power Pin 2: input terminal of 0.5V ~ 4.5V pressure voltage signal Pin 3: negative terminal of 5V power
J4 (HP2)	Input terminal of voltage pressure sensor 2 (spare)	
J15 (HP1)	Input terminal of current pressure sensor 1	Pin 1: positive terminal of 12V power Pin 2: input terminal of 4mA ~ 20mA pressure current signal
J14 (HP2)	Input terminal of current pressure sensor 2	
J5 (Out Temp)	Input terminal of ambient temperature sensor (spare)	Pin 1: input terminal of temperature signal Pin 2: signal ground
J11 (RS485)	Serial communication interface (used for maintenance)	Pin 1: RS485+ Pin 2: RS485-
J7 (Fan1Sta)	Detecting terminal of fan 1 over temperaturestate	Pin 1: output terminal of 19Vac signal Pin 2: return terminal of 19Vac signal
J10 (Fan2Sta)	Detecting terminal of fan 2 over temperature state	
J6 (CompSta1)	Detecting terminal of compressor1 state	Pin 1: output terminal of 19Vac signal Pin 2: return terminal of 19Vac signal
J33 (CompSta2)	Detecting terminal of compressor2 state	

3.2 HMI

The fan speed controller operation and setup is provided through indicators, RS485 serial communication port, keys and LCD.

➢ Indicators

There are ten indicators (Refer Figure 3-1) on the fan speed controller board. Refer Table 3-2 for the functions of indicators.

Table 3-2 Functions of indicators

Silk print	Definition	Color	State	Function
D97	+5V Power indicator	Yellow	On	The CPU circuit of fan speed controller board is supplied with 5V power
			Off	The fan speed controller board is faulty
D115	+12V Power indicator	Yellow	On	The fan speed controller board is supplied with +12V power
			Off	The fan speed controller board is faulty
D116	+24V Power indicator	Yellow	On	The fan speed controller board is supplied with +24V power
			Off	The fan speed controller board is faulty
D139	VCOM Power indicator	Yellow	On	The fan speed controller board is supplied with VCOM power
			Off	The fan speed controller board is faulty
D156	-5V Power indicator	Yellow	On	The fan speed controller board is supplied with -5V power
			Off	The fan speed controller board is faulty
D114	VCC_BOT Power indicator	Yellow	On	The fan speed controller board is supplied with VCC_BOT power
			Off	The fan speed controller board is faulty
D99	Run indicator	Green	On or off	The fan speed controller board is faulty
			Blinking at 2Hz (slowly)	The fan is not running
			Blinking at 5Hz (quickly)	The fan is running
D164	Alarm indicator	Red	On	Fan speed controller detects an alarm(alarms)
			Off	No alarm
D100	RS485 sending indicator	Green	On	RS485 is sending data
			Off	No data sending
D101	RS485 receiving indicator	Green	On	RS485 is receiving data
			Off	No data receiving

- **RS485 serial communication port**

The RS485 serial communication port is a port to connect the computer using factory-defined protocol. It is used for factory commissioning and maintenance.

- **Keys and LCD**

The keys and LCD, which can realize the functions in Table 3-3, provide the HMIs for maintenance personnel. Refer to 3.3 Operation Description of HMI for operation of keys and LCD HMI.

Table 3-3 Function descriptions of keys and LCD

NO.	Function	Description
1	Query the acquisition data in real time	The acquisition data include condensing pressure, ambient temperature, output percentage, the state of fan enable singal and the state of alarm
2	Query the current alarm data in real time	The current alarm data include phase loss alarm, PIM over temperature, fan 1 over temperature, fan 2 over temperature, fan 1 over temperature locked, fan 2 over temperature locked, pressure sensor failure, EEPROM read fault alarm, hardware over current and bus over voltage
3	Query the historical alarm data in real time	The latest saved 100 historical alarms can be queried
4	Modify the configured parameters in real time	The configured parameters include running pressure, pressure controlling range, minimum output frequency, maximum output frequency, fan number and pressure sensor type, refrigerant type, jump frequency 1, jump frequency 1 range, jump frequency 2, jump frequency 2 range, jump frequency 3, jump frequency 3 range, the curve of frequency control, manual mode, manual mode output frequency; or resume the default values

The keys and LCD are on the upper right corner of the fan speed controller board, as shown in Figure 3-1. Their appearance is shown in Figure 3-2.

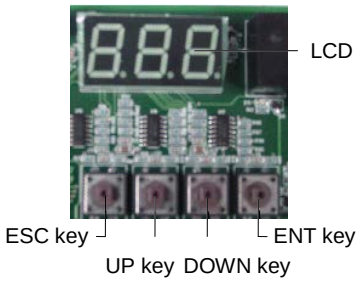

Figure 3-2 Keys and LCD

3.3 Operation Description Of HMI

3.3.1 Initial Interface

The LCD will alternately display 'F00' (the maximum pressure logo) and the larger of condensing pressure 1 and condensing pressure 2 when the fan speed controller is powered on initially.

The display order is shown in Figure 3-3 (the '16.1' is only an example, and the actual value is determined by the sampling result).

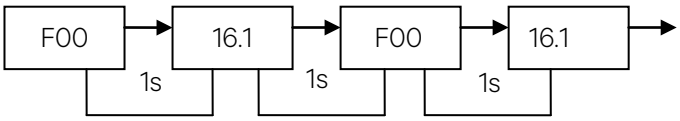

Figure 3-3 Display order of the initial interface

3.3.2 Main Menu Interface

Press the ESC key on the initial interface, and the main menu interface will appear on the LCD. The main menu interfaces include the analog main menu interface, current alarm main menu interface, historical alarm main menu interface and configuration main menu interface. Press the UP key and DOWN key to select a different main menu interface, and press the ENT key to enter the submenu of the current main menu on the main interface. The switching operation processes and orders of the main menus are shown in Figure 3-4.

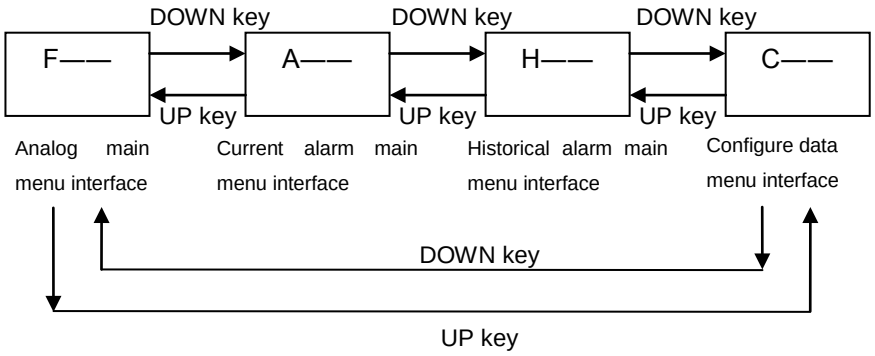

Figure 3-4 Switching operation processes and orders of the main menus

Analog main menu interface

Press the ENT key to enter the analog submenu interface when the current main menu interface shows 'F--' (the symbol of analog main menu). The switching operation processes and orders of the analog submenu are shown in Figure 3-5, and the analog main menu ID significances are shown in Table 3-4,

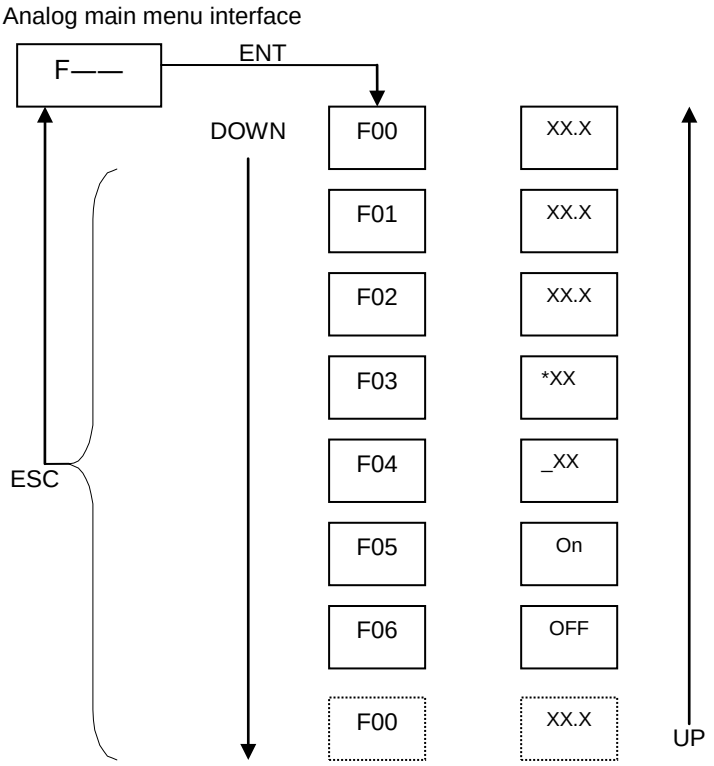

Figure 3-5 Switching operation processes and orders of the analog submenu

Table 3-4 Analog main menu ID significances

Sub Menu ID	Significance	Display	Remarks
F00	The maximum pressure between the pressure 1 and pressure 2	0～44.2Bar	Condensing pressure
		888	Sensor fault
F01	Pressure 1	0～44.2Bar	Condensing pressure
		888	Sensor fault
F02	Pressure 2	0～44.2Bar	Condensing pressure
		888	Sensor fault
F03	Ambient temperature	-41℃～106℃	-41℃：The temperature sensor is not connected
			106℃：Temperature sensor short
			-40℃～105℃：Ambient temperature
F04	Output percentage	0～100	Rated frequency 50/60Hz
F05	State of enable signal	0	ON
		1	OFF
F06	State of alarm	0	ON
		1	OFF

Current alarm main menu interface

Press the ENT key to enter the current alarm submenu interface when the current main menu interface shows 'A--' (the symbol of current alarm main menu). The switching operation processes and orders of the current alarm submenu are shown in Figure 3-6, and the Current alarm main menu ID significances are shown in Table 3-5.

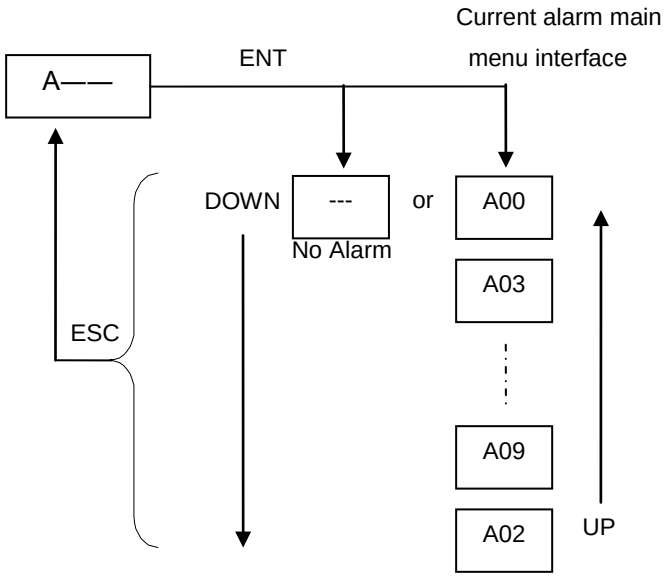

Figure 3-6 Switching operation processes and orders of the current alarm submenu

Table 3-5 Current alarm main menu ID significances

Alarm name	Alarm number ID
phase loss alarm	00
PIM over temperature	01
fan 1 over temperature	02
fan 2 over temperature	03
fan 1 over temperature locked	04
fan 2 over temperature locked	05
pressure sensor failure	06
EEPROM read fault alarm	07
hardware over current	08
bus over voltage	09

Historical alarm main menu interface

Press the ENT key to enter the historical alarm submenu interface when the current main menu interface shows 'H--' (the symbol of historical main menu). The switching operation processes and orders of the historical main menu are shown in Figure 3-7.

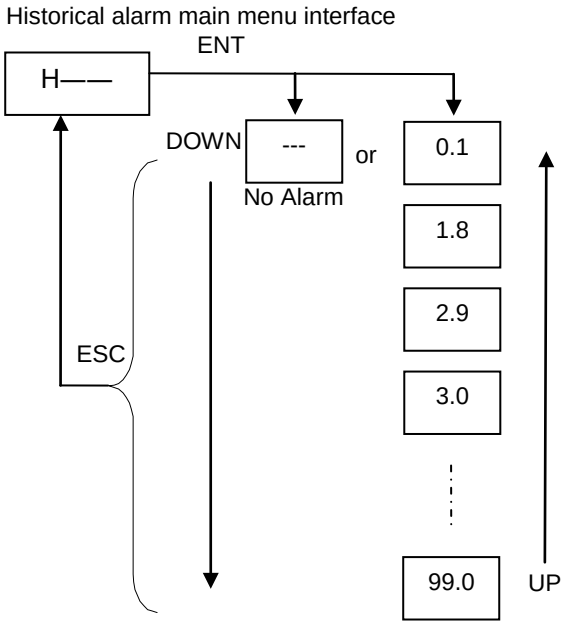

Figure 3-7 Switching operation processes and orders of the historical main menu

Configuration data main menu interface

The configuration data main menu interface is designed only for maintenance personnel to set parameters, others are prohibited to operate it.

Press the ENT key to enter the configuration data submenu interface when the current main menu interface shows 'C--' (the symbol of configuration data main menu). The switching operation processes and orders of the configuration data main menu are shown in Figure 3-8. and the configuration main menu interface ID significances are shown in Table 3-6.

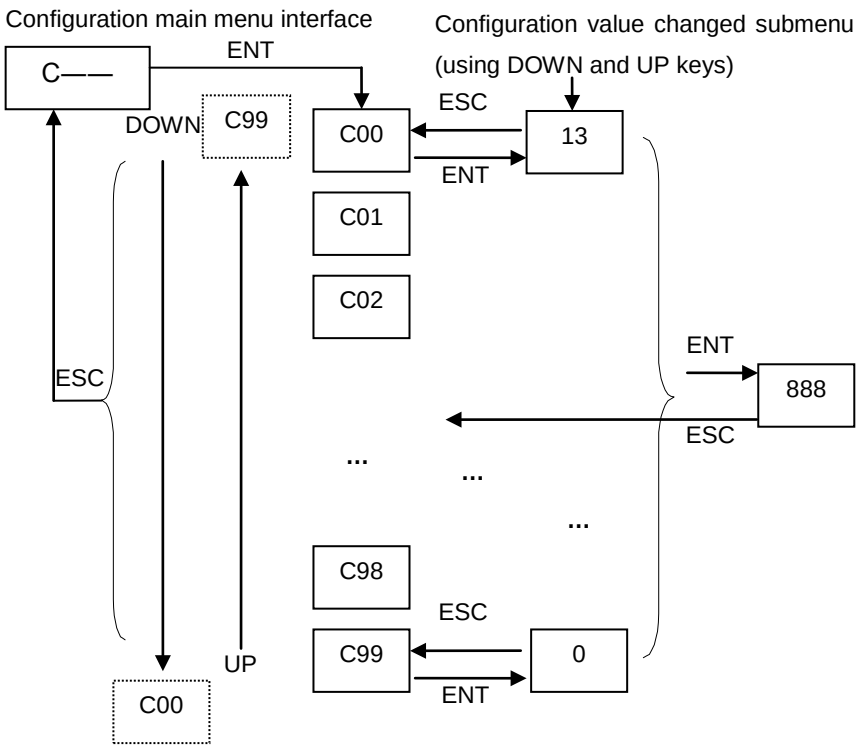

Figure 3-8 Switching operation processes and orders of the configuration data main menu

The configured parameters include running pressure, pressure controlling range, minimum output frequency, maximum output frequency, fan number and pressure sensor type, refrigerant type, jump frequency 1, jump frequency 1 range, jump frequency 2, jump frequency 2 range, jump frequency 2, jump frequency 2 range, the curve of frequency control, manual mode, manual mode output frequency; or resume the default values.

Table 3-6

Sub menu ID	Significance	Default value	Range	Remarks
C00	Running pressure Pset	13/13/21	11～15/11～15/19～23	Read and write
C01	Pressure controlling range Pband	5/5/7	4～6/4～6/6～7	Read and write
C02	Minimum output frequency fMin	10%fp	10%fp～50%fp	Read and write
C03	Maximum output frequency fMax	fp	51%fp～100%fp	Read and write
C04	Fan number	1	1～2	Read and write
C05	Pressure sensor type	2 or 1	1：voltage type；2：current type；	Read and write
C06	Refrigerant type	1	1：R22；2：R407C；3：R410A	Read and write
C07	Jump frequency 1（% fp）	0	0～100	Read and write
C08	Jump frequency 1 range	0.0	0.0Hz～0.5Hz	Read and write
C09	Jump frequency 2（% fp）	0	0～100	Read and write
C10	Jump frequency 2 range	0.0	0.0Hz～0.5Hz	Read and write
C11	Jump frequency 3（% fp）	0	0～100	Read and write
C12	Jump frequency 3 range	0.0	0.0Hz～0.5Hz	Read and write
C13	Curve of frequency control,	0	0：V/F；1：V/F2	Read and write
C14	Manual mode	0	0：OFF；1：ON	Read and write
C15	Manual mode output frequency	0	0%fp～100%fp	Read and write
C16	Software version	100	100～999	Read only
C17	Year of manufacture	11	0～99	Read only
C18	Month of manufacture	02	1～12	Read only
C19	Day of manufacture	28	1～31	Read only
C98	Clear alarm history	0	0～1（Clear alarm history）	Read and write
C99	Resume the default values	0	0～1（Resume the default values）	Read and write

Chapter 4 Maintenance and Troubleshooting

This chapter introduces the maintenance and troubleshooting of the condenser. Users should check the condenser regularly and solve the problems in time.

1. The maintenance of the condenser must be done by technicians.

2. Except for the commissioning items that must be carried out with power-on, during maintenance, the power of the indoor unit and the air switch of the condenser must be cut off.

4.1 Maintenance

- **Refrigeration system**

1. Check that the refrigeration pipes are firmly fixed. The refrigeration pipes shall not shake with the vibration of wall, earth or equipment frame. Otherwise, reinforce the refrigeration pipes with fastening objects.

2. Check that there is no oil on the accessories of all refrigeration pipes, and make sure that the pipes do not leak.

- **Heat exchanger**

1. Clean the fin of the heat exchanger regularly.

2. Clean the fin of the heat exchanger with compressed air or fin detergent (weakly alkaline) if the condenser airflow is blocked. Inverse airflow is good when the compressed air is used.

3. Check for damaged fins and maintain them in time.

4. Avoid snow accumulation around the condenser in winter.

- **Fan**

Check that the fan runs normally. Check it for problems such as abnormal noise, vibration and bearing failure.

- **Fan speed controller**

Check that the fan speed controller board operates normally. If not, replace it as illustrated in the following paragraph.

Note that the positions of the bolt installation holes on the fan speed controller could be different on the actual product.

The fan speed controller is inside the electrical control box (Refer Figure 1-2 and Figure 1-3). Rotate the isolation switch to 'OFF', and then remove the cover plate of the electrical control box, as shown in Figure 4-1. Remove the cover plate of the electrical control box before removing the fan speed controller board. Except for the seven bolts in Figure 4-2, other bolts are prohibited to remove. The bolt 1 and bolt 2, which are used to fix the heat sink on the fan speed controller board, must be fastened firstly. The heat sink must cling to the floor of the electrical control box. After installing the heat sink, use other five bolts to fix the fan speed controller board.

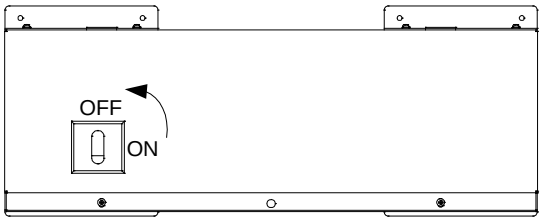

Figure 4-1 Fan speed controller board

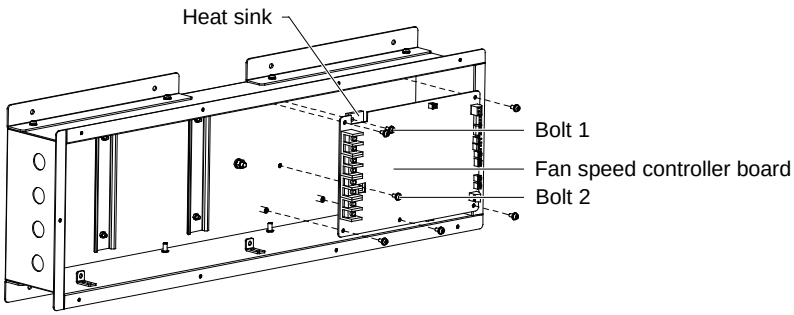

Figure 4-2 Removing the fan speed controller board

4.2 Troubleshooting

Refer Table 4-1 for alarm troubleshooting.

Table 4-1 Table of alarm troubleshooting

Alarm number ID	Alarm name	Cause	Troubleshooting
A00	Phase loss alarm	One phase or two phases of three-phase voltage are lost	Check that the three-phase voltage is correct
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and compare the result of two boards
A01	PIM over temperature	The fan cannot run normally	Check that the fan runs normally
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and compare the result of two boards
A02 A03	Fan 1 over temperature, Fan 2 over temperature	The fan cannot run normally	Check that the fan runs normally
		The AC contactor supplying power for fan has fault or its wire cuts off	Check the wiring of AC contactor; detect the auxiliary contact state of AC contactor
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and compare the result of two boards
A04 A05	Fan 1 over Temperature locked, Fan 2 over Temperature locked	The fan cannot run normally	Check that the fan runs normally
		The AC contactor supplying power for fan has fault or its wire cuts off	Check the wiring of AC contactor; detect the auxiliary contact state of AC contactor
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and compare the result of two boards
A06	Pressure sensor	The pressure sensor is not installed or its terminal connection is poor	Check the wiring of pressure sensor

Alarm number ID	Alarm name	Cause	Troubleshooting
	failure	Jumper caps are not used to short terminals J17 and J18 of current pressure sensor	Install the jumper cap when the current pressure sensor is configured
		Pressure sensor failed	Replace the pressure sensor and compare the result of two boards
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and compare the result of two boards
A07	EEPROM read fault	The fan speed controller board has a hardware fault	Replace the fan speed controller board and compare the result of two boards
A08	Hardware over current	The fan cannot run normally	Check that the fan runs normally
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and compare the result of two boards
A09	Bus over voltage	The power supply voltage is abnormal	Check the power supply
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and compare the result of two boards

Appendix Circuit Diagram

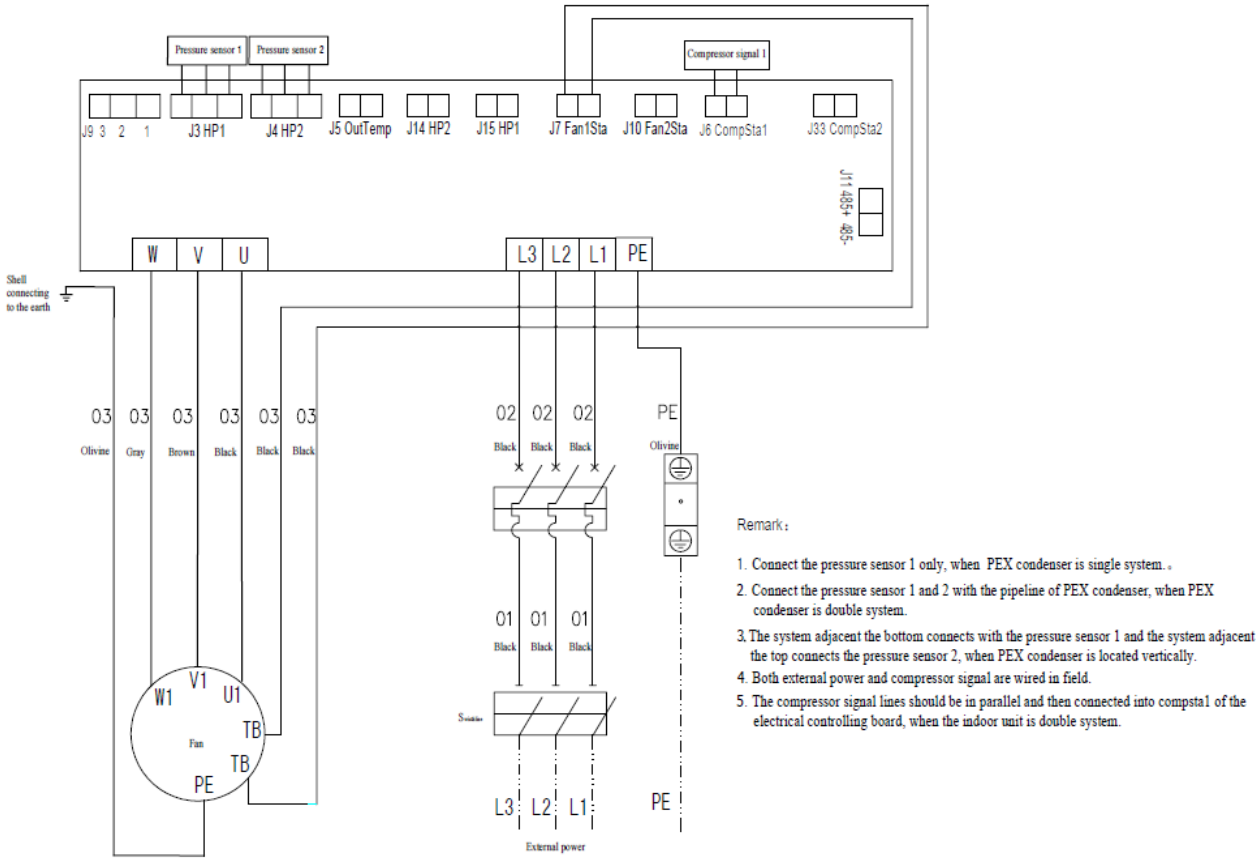

Figure 1 Circuit diagram of the condenser with single fan

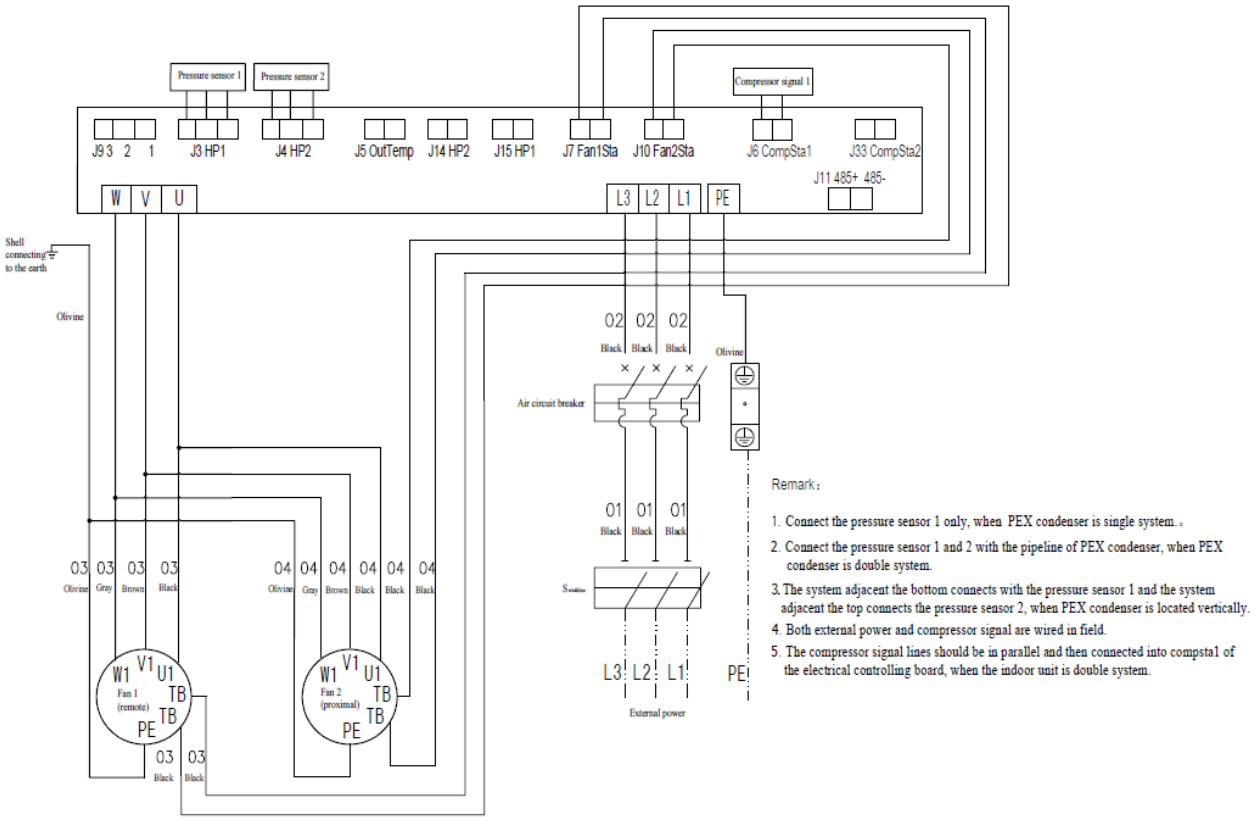

Figure 2 Circuit diagram of the condenser with double fans