Next Generation Critical Cooling
for Room and Row

Liebert PEX

Efficiency And Reliability For High Availability Cooling

Condenser Technical Manual

EMERSON
Network Power

Liebert.PEX Condenser

Technical Manual

Version	V1.0
Revision date	May 27, 2010
BOM	31020761

Emerson Network Power provides customers with technical support. Users may contact the nearest Emerson local sales office or service center.

Emerson Network Power Co., Ltd.

Address: No.1 Kefa Rd., Science & Industry Park, Nanshan District 518057, Shenzhen China

Homepage: www.emersonnetworkpower.com.cn

E-mail: support@emersonnetwork.com.cn

Contents

Chapter 1 Overview

The Liebert range of Air Cooled Condensers offer many unique benefits including low profile design, antirust aluminum cabinets, anticorrosive fins, low sound levels and efficient, reliable operation over a wide range of ambient conditions. To maximize performance and reduce downtime, the installation and commissioning of each unit must be carefully carried out.

This manual provides a guide to unit installation and commissioning. It should be read carefully before installation or commissioning commences. If an equipment defect is found, or if a malfunction occurs, it should be reported to your local sales office or distributor immediately.

Note: This manual refers only to standard production units. Units manufactured to a non-standard specification will generally be supplied with supplementary notes and drawings. Field alterations and/or external equipment alterations or connections are not covered by the Liebert product warranty.

This chapter gives a brief introduction to the classification & models, model description and appearance of the Liebert.PEX condenser (condenser for short).

1.1 Classification And Models

The condenser is classified into single circuit and dual circuit in 17 models. See Table 1-1 for details.

Table 1-1 Models

Type	Model
Single circuit	LSF12, LSF18, LSF24, LSF32, LSF38, LSF42, LSF52, LSF62, LSF72, LSF76, LSF85
Dual circuit	LDF42, LDF52, LDF62, LDF72, LDF76, LDF85

1.2 Model Description

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

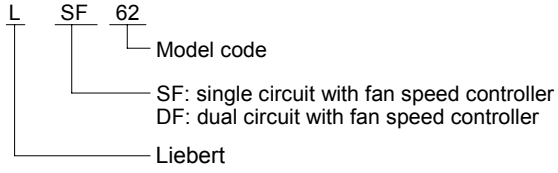
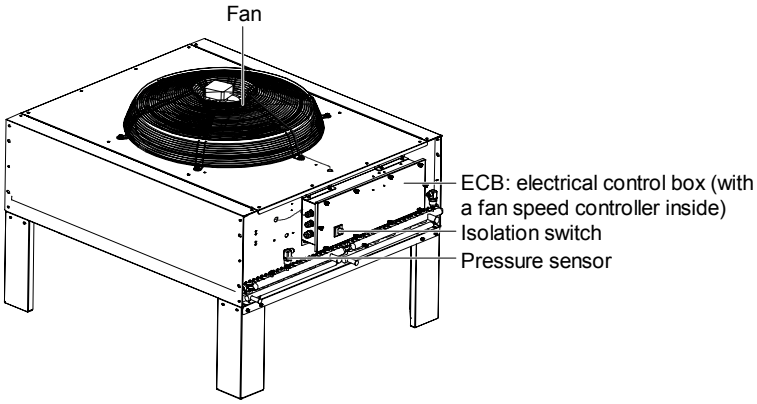


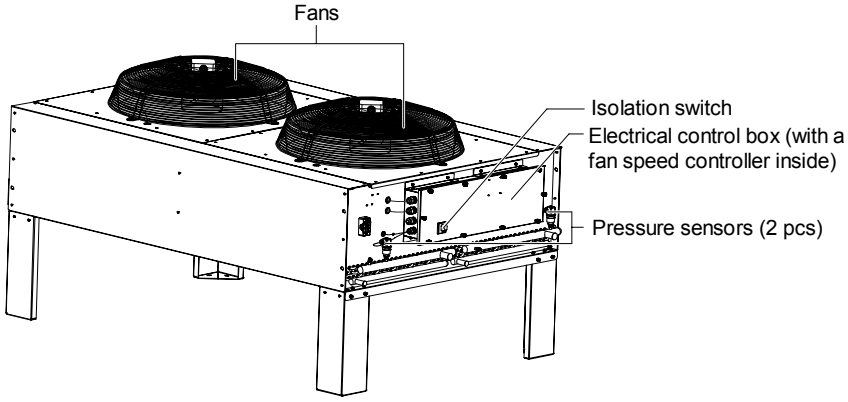
Figure 1-1 Model description

1.3 Appearance

The condenser consists of the heat exchanger, fan, fan speed controller and pressure sensor. The heat exchanger is inside the condenser and other components are shown in Figure 1-2. Note that the side copper pipes may be deformed by collision, resulting in system leakage. So you must use a correct method to move the condenser. For detailed moving method, refer to *Chapter 2 Installation* in *Liebert.PEX Condenser User Manual* and *Appendix 2 Circuit Diagram* in this manual.



Single fan, single circuit condenser



Double fans, dual circuit condenser

Figure 1-2 Condenser

Chapter 2 Technical Parameters

This chapter details the environmental parameters, mechanical parameters and performance parameters of the condenser.

2.1 Environmental Parameters

2.1.1 Parameters Of Storage Environment

See Table 2-1 for parameters of storage environment.

Table 2-1 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. Note that the performance needs to be re-calibrated after the 6 months storage time

2.1.2 Parameters Of Operating Environment

See Table 2-2 for parameters of operating environment.

Table 2-2 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 ~ +20m. Installation mode: horizontal airflow or vertical airflow
Ambient temperature	Outdoor: -20°C ~ +45°C. Low temperature kits are required if the temperature is -35°C ~ -20°C
Ambient relative humidity	Outdoor: 5%RH ~ 95%RH
Operation power	400V ± 10%, 50Hz
Altitude	≤ 1000m. Derating is required if the altitude exceeds 1000m
Protection level	Electrical control box: IP55; unit: IP20
Note*: The value is positive if the condenser is installed higher than the indoor unit; otherwise the value is negative	

Note

When the equivalent distance between the indoor unit and the condenser exceeds 30m, see *5.1 Refrigerant Tubing System* in *Liebert.PEX Series Air Conditioner Technical Manual* for detailed requirements for the pipe equivalent length.

2.1.3 Signal Cable

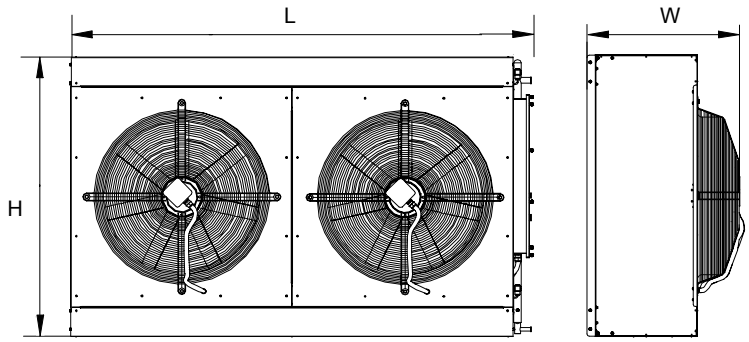
It is recommended to use the 20AWG (0.52mm^2) cable for the condenser startup/stop signal cable.

For cables connection, see *Appendix 2 Circuit Diagram*.

2.2 Mechanical Parameters

2.2.1 Mechanical Parameters Of Condenser

The dimensions of the condenser with vertical placement are shown in Figure 2-1 and the mechanical parameters are listed in Table 2-3.



Front view *Side view*

Figure 2-1 Dimension figure (double fans)

Table 2-3 Mechanical parameters

Model	Weight (kg)	Dimensions (mm)			Liquid pipe diameter (mm)	Discharge pipe diameter (mm)
		L	H	W		
LSF12	80	924	990	599	16	22
LSF18	80	924	990	599	16	22
LSF24	105	1374	990	689	16	22
LSF32	110	1374	990	689	16	22
LSF38	120	1374	990	695	16	22
LSF42	130	1574	1273	695	16	22
LSF52	140	1574	1273	695	22	28
LSF62	150	1874	1273	689	22	28
LSF72	150	1874	1273	689	22	28
LSF76	220	2374	1273	695	22	28
LSF85	230	2374	1273	695	22	28
LDF42	130	1574	1273	695	16	22
LDF52	140	1574	1273	695	16	22
LDF62	160	2074	1273	689	22	28
LDF72	160	2074	1273	689	22	28
LDF76	220	2374	1273	695	22	28
LDF85	230	2374	1273	695	22	28

2.2.2 Parameters Of Mounting Base

The condenser can be installed horizontally or vertically.

Mounting base for horizontal installation

The mounting base for horizontal installation is shown in Figure 2-2 and the mounting base dimensions of each model are listed in Table 2-4.

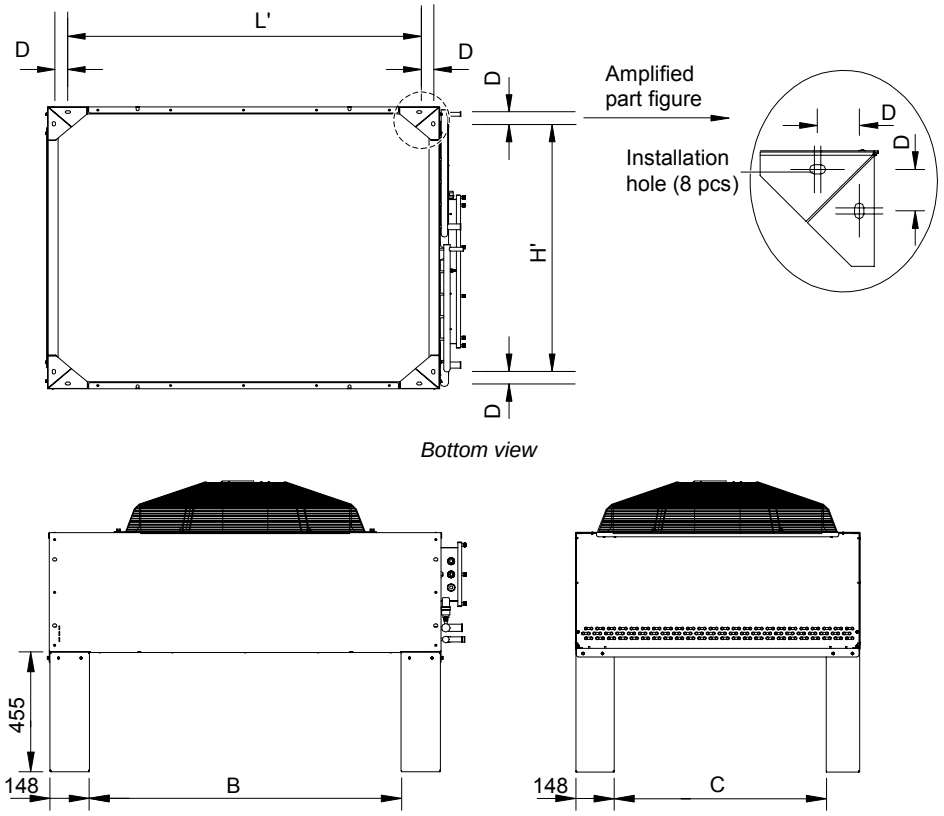


Figure 2-2 Mounting base dimensions for horizontal installation (unit: mm)

Table 2-4 Mounting base dimensions for horizontal installation (unit: mm)

Model	Dimension (L' × H' × D)	B	C		Model	Dimension (L' × H' × D)	B	C
LSF12	676 × 837 × 53	530	691		LSF76	2126 × 1120 × 53	1980	974
LSF18	676 × 837 × 53	530	691		LSF85	2126 × 1120 × 53	1980	974
LSF24	1126 × 837 × 53	980	691		LDF42	1326 × 1120 × 53	1180	974
LSF32	1126 × 837 × 53	980	691		LDF52	1326 × 1120 × 53	1180	974
LSF38	1126 × 837 × 53	980	691		LDF62	1826 × 1120 × 53	1680	974
LSF42	1326 × 1120 × 53	1180	974		LDF72	1826 × 1120 × 53	1680	974
LSF52	1326 × 1120 × 53	1180	974		LDF76	2126 × 1120 × 53	1980	974
LSF62	1626 × 1120 × 53	1480	974		LDF85	2126 × 1120 × 53	1980	974
LSF72	1626 × 1120 × 53	1480	974					

Note

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

Mounting base for vertical installation

The mounting base for vertical installation is shown in Figure 2-3, and the dimensions of each model are listed in Table 2-5.

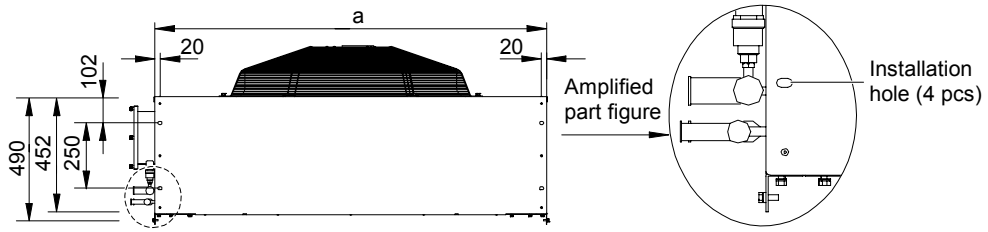


Figure 2-3 Mounting base dimensions for vertical installation (top view) (unit: mm)

Table 2-5 Mounting base dimensions for vertical installation (unit: mm)

Model	Dimension 'a'
LSF12, LSF18	830
LSF24, LSF32, LSF38	1280
LSF42, LDF42, LSF52, LDF52	1480
LSF62, LSF72	1780
LDF62, LDF72	1980
LSF76, LDF76, LSF85, LDF85	2280

Note

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

2. When one condenser needs to be installed on another one, the upper condenser must be installed on a rack and cushion pads should be used between the condenser and the rack for damping. It is prohibited to stack two condensers and bolt them together directly.

2.3 Performance Parameters

The performance parameters of the condenser include fan design parameters, heat exchanging capacity, sound pressure level (SPL) parameters and configuration parameters.

2.3.1 Fan Design Parameters

The fan design parameters of the condenser are listed in Table 2-6.

Table 2-6 Fan design parameters

Model	Fan No.	Diameter (mm)	Rated airflow (m^3/h)	Rated rotation speed (rpm)	Rated current (A)	Rated power (kW)
LSF12	1	500	5450	1066	0.79	0.49
LSF18	1	500	7800	1374	1.45	0.79
LSF24	1	710	13600	900	1.65	0.88
LSF32	1	710	8150	690	1.05	0.62
LSF38	1	800	15800	650	2.4	1.05
LSF42	1	800	15800	650	2.4	1.05
LSF52	1	800	14000	650	2.4	1.05
LSF62	2	710	25600	900	3.3	1.76
LSF72	2	710	25600	900	3.3	1.76
LSF76	2	800	31600	650	4.8	2.1
LSF85	2	800	28000	650	4.8	2.1
LDF42	1	800	15800	650	2.4	1.05
LDF52	1	800	14000	650	2.4	1.05
LDF62	2	710	25600	900	3.3	1.76
LDF72	2	710	25600	900	3.3	1.76
LDF76	2	800	31600	650	4.8	2.1
LDF85	2	800	28000	650	4.8	2.1

Note

1. The rated airflow, rated rotation speed, rated current and rated power are the parameters of the fan operating at 400V, which is provided by the factory.

2. The power supply of the condenser, as determined by the rated current in Table 2-6, is provided by yourself on site.

2.3.2 Heat Exchanging Capacity

The heat exchanging capacities (unit: kW) of each model are listed in Table 2-7 and Table 2-8.

Table 2-7 Heat exchanging capacities (R22)

Model	TD* (°C)				
	10	12	15	18	20
LSF12	8.1	10.6	14.3	17.9	20.3
LSF18	8.8	12.2	16.7	20.9	23.5
LSF24	15.3	19.8	26.3	32.3	35.9
LSF32	18.0	23.1	30.5	36.6	41.0
LSF38	24.9	31.8	41.5	50.7	56.6
LSF42	28.6	36.2	47.6	58.1	64.7
LSF52	35.3	44.8	58.9	71.9	80.1
LSF62	43.1	54.6	71.8	87.6	97.6
LSF72	45.3	58.1	77.5	96.0	106.1
LSF76	51.7	67.2	90.5	112.7	127.1
LSF85	57.8	75.3	99.0	123.1	138.3
LDF42	30.0	38.0	50.0	61.0	68.0
LDF52	34.2	43.3	57.0	69.5	77.5
LDF62	45.5	57.6	75.8	92.5	103.1
LDF72	49.1	62.6	81.7	98.8	110.3
LDF76	51.6	67.5	90.3	112.4	126.8
LDF85	57.9	74.8	99.5	122.9	138.3
Note*: TD = condensing temperature – ambient temperature					

Table 2-8 Heat exchanging capacities (R407C)

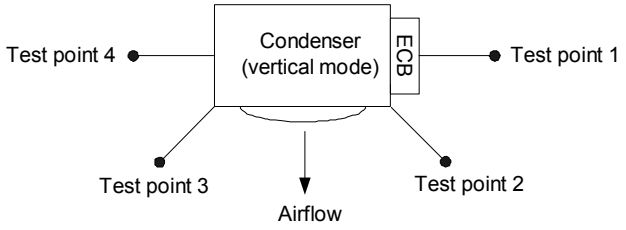
Model	TD* (°C)				
	10	12	15	18	20
LSF12	N/A	8.5	11.9	16.1	18.6
LSF18	N/A	8.7	14.1	18.9	21.8
LSF24	11.6	14.4	22.8	29.1	33.6
LSF32	14.2	18.6	27.8	35.1	39.8
LSF38	19.2	25.1	37.6	48.2	54.8
LSF42	21.7	28.5	42.5	54.4	62.1
LSF52	26.7	35.1	52.4	67.1	76.5
LSF62	32.8	43.1	64.4	82.4	94.0
LSF72	34.9	45.8	68.4	87.6	99.9
LSF76	39.8	52.3	78.0	99.8	113.9
LSF85	45.9	60.3	90.0	115.2	131.4
LDF42	22.6	29.7	44.4	56.8	64.8
LDF52	27.7	36.4	54.4	69.6	79.4
LDF62	35.2	46.2	69.0	88.3	100.7
LDF72	37.2	49.5	73.4	93.4	106.6
LDF76	39.2	51.0	77.0	103.5	119.3
LDF85	44.7	58.1	89.1	116.3	133.7
Note*: TD = condensing temperature – ambient temperature					

2.3.3 SPL Parameters

Place the condenser vertically, and test the SPL of the outdoor fan following SPL test method. The fan test voltage is the output voltage of the fan speed controller in the working condition of SPL test. See Table 2-9 for the working condition of SPL test and Figure 2-4 & Figure 2-5 for the placing modes of the condenser used to test SPL. The SPL parameters of all models are listed in Table 2-10.

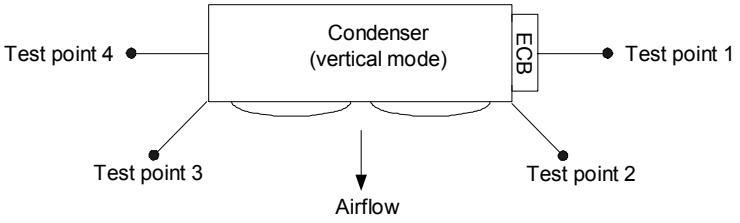
Table 2-9 Working condition of SPL test (unit: °C)

Internal cycle air condition		External cycle air condition	
Dry bulb temperature	Wet bulb temperature	Dry bulb temperature	Wet bulb temperature
23	17	35	-



Horizontal difference: the difference between the test point and the unit shell is 1m
Vertical difference: the vertical difference from the earth is 1/2 (the unit height +1m)

Figure 2-4 Single fan SPL test figure with vertical placement



Horizontal difference: the difference between the test point and the unit shell is 1m
Vertical difference: the vertical difference from the earth is 1/2 (the unit height +1m)

Figure 2-5 Double fans SPL test figure with vertical placement

Table 2-10 SPL parameters (unit: dB (A))

Model	Full load SPL
LSF12	≤ 65
LSF18	≤ 71
LSF24	≤ 66
LSF32	≤ 64
LSF38	≤ 68
LSF42	≤ 68
LSF52	≤ 68
LSF62	≤ 68
LSF72	≤ 68
LSF76	≤71
LSF85	≤ 71
LDF42	≤ 68
LDF52	≤ 68
LDF62	≤ 68
LDF72	≤ 68
LDF76	≤ 71
LDF85	≤ 71

2.3.4 Configuration Parameters

The condenser uses the fan speed controller to control the fan full load supply voltage according to the designed load, decreasing the SPL of the fan while meeting the designed load. The default 'full load supply voltage V_{max}' percentages in factory of all models are listed in Table 2-11.

Table 2-11 'Full load supply voltage V_{max}' percentages in factory

Model	V_{max} percentage in factory (%)
LSF12, LSF18, LSF32, LSF72, LDF52, LDF72	100
LSF52, LDF42	89
LSF76, LSF85, LDF76, LDF85	81
LSF38, LSF42, LSF62, LDF62	73
LSF24	65

Chapter 3 Fan Speed Controller

This chapter details the fan speed controller, including control logic, wiring terminal, human-machine interface (HMI), HMI operation, protection function and alarm function.

3.1 Control Logic

The control logic of the fan speed controller is shown in Figure 3-1.

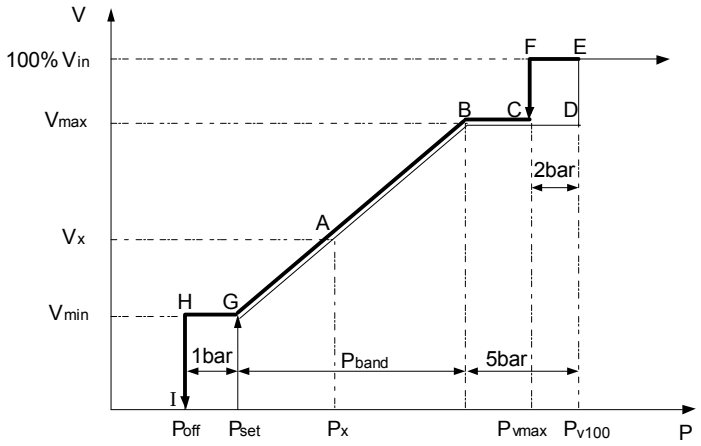


Figure 3-1 Control logic figure

The control logic is described as follows:

- Startup control: If the startup condensing pressure is within the setting range ($P_{set,}$ P_{set} + P_{band}), the fan speed controller will output V_x; if the startup condensing pressure exceeds the setting range ($P_{set,}$ P_{set} + P_{band}), the fan speed controller will output V_{max}.
- Operation control: The control logic during operation follows A -> B -> C -> D -> E -> F -> C -> B -> A -> G -> H -> I. The point A is the corresponding point of the condensing pressure from B to G.
- Shutdown control: When the condensing pressure is less than P_{off} (= P_{set} - 1), the fan speed controller stops supplying power to the fan.
- Max. voltage output control: When the condensing pressure rises above P_{v100} (= P_{set} + P_{band} + 5), the fan speed controller supplies 100% input voltage V_{in} to fan; when the condensing pressure falls down to P_{vmax} (= P_{v100} - 2), the fan speed controller supplies the max. setting voltage V_{max} to the fan.

Note

1. The lifting pressure process follows the control logic of thin line: G -> A -> B -> C -> D -> E and the releasing pressure process follows the control logic of thick line: E -> F -> C -> B -> A -> G -> H -> I. The difference between the two processes is the return difference: P_{v100} - P_{vmax} = 2bar and P_{set} - P_{off} = 1bar.

2. P_{v100} - (P_{set} + P_{band}) = 5bar.

The names, default values and setting ranges of the configuration parameters in the control logic are listed in Table 3-1.

Table 3-1 Configuration parameters

SN	Name	Default	Setting range
1	Startup pressure P_{set}	13bar	11bar ~ 15bar
2	Pressure control range P_{band}	5bar	4bar ~ 6bar
3	Min. setting voltage V_{min}	30%	30% ~ 50%
4	Max. setting voltage V_{max}	See Table 2-11	60% ~ 100%
5	Fan number	1	1 ~ 2
6	Pressure sensor type	2: current type	1: voltage type 2: current type

Note

1. The configured fan number must be the same as the number of the actual fans. Otherwise, a false alarm will appear.

2. The configured type of the pressure sensor must be the same as the actual type. Otherwise, the pressure will not be measured accurately, and the deviation will be increased during the control process.

3.2 Wiring Terminal

The wiring terminals are located on the fan speed controller board. Their distributions are shown in Figure 3-2 and the definitions are listed in Table 3-2. Refer to *Appendix 2 Circuit Diagram* for connections.

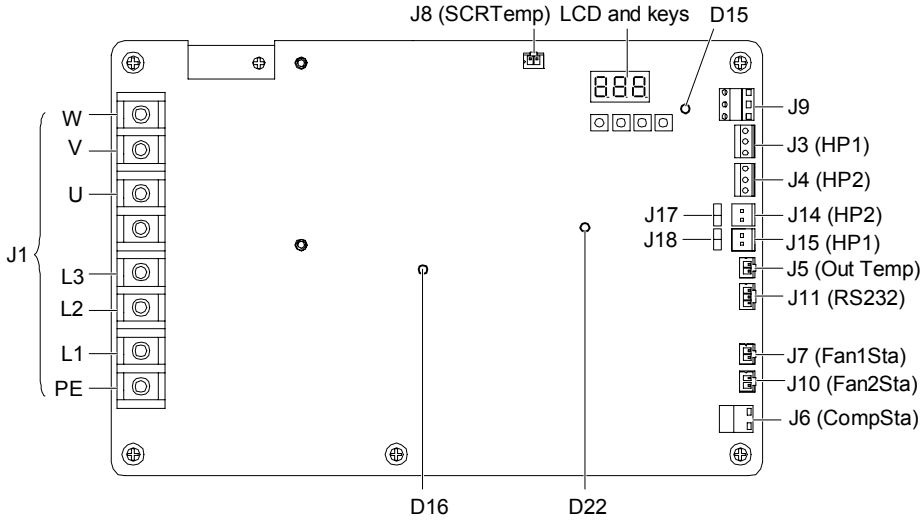


Figure 3-2 Layout of wiring terminals

Table 3-2 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 terminals U, V, W: three-phase AC output terminals, connected with the power supply terminals of the fan The middle terminal pin without logo is reserved
J9	Passive dry contactor relay output (for the power switch of fan power contactor)	Pin 1: normally closed terminal of relay, reserved Pin 2: common terminal of relay, used for AC input Pin 3: normally open terminal of relay, used for AC output
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	
J17, J18	Jumpers (used for current pressure sensor configuration)	Current pressure sensor: install jumper caps on J17 and J18 Voltage pressure sensor: keep J17 and J18 in open status
J5 (Out Temp)	Input terminal of ambient temperature sensor (spare)	Pin 1: input terminal of temperature signal Pin 2: referrence ground of temperature signal
J11 (RS232)	Serial communication interface (used for maintenance)	Pin 1: communication ground Pin 2: reception terminal of communication Pin 3: transmission terminal of communication
J7 (Fan1Sta)	Detecting terminal of fan 1 over temperature state	Pin 1: output terminal of 19V AC signal Pin 2: return terminal of 19V AC signal
J10 (Fan2Sta)	Detecting terminal of fan 2 over temperature state	
J6 (CompSta)	Detecting terminal of compressor state	
Note : J8 (SCRTemp) in Figure 3-2 is a reserved device interface on fan speed controller board. Do not use it		

Note

1. If the phase sequence of the three-phase AC inputs (L1, L2 and L3) is incorrect, the fan speed controller will generate a phase loss alarm A00 and cannot supply the AC output.

2. If the phase sequence of the three-phase AC outputs (U, V and W) is incorrect, the fan will rotate in the reverse direction.

3. If the upper temperature detecting terminals of the fan 1 & 2 (J7, J10), and the detecting terminal of the compressor (J6) are not connected with cables, you can short them with short cables to make sure that the fan speed controller can operate normally. If the terminals are disconnected, the fan speed controller cannot supply the AC output.

3.3 HMI

The fan speed controller operation and setup is provided through indicators, RS232 serial port, keys and LED.

Indicator

The fan speed controller board provides three indicators (see Figure 3-2). See Table 3-3 for their functions.

Table 3-3 Indicator functions

Silk print	Definition	Color	State	Function
D16	Power indicator	Green	On	CPU circuit of the fan speed controller board is powered with 5V power supply
			Off	Fan speed controller board is faulty
D22	Run indicator	Green	On or off	Fan speed controller board is faulty
			Blinking at 1Hz (slowly)	The system is running normally without alarm
			Blinking at 5Hz (quickly)	An alarm is registered or the compressor is in stop state
D15	Power switch control indicator of AC contactor	Red	On	The control switch which supplies the AC contactor with the driving power is closed
			Off	The control switch which supplies the AC contactor with the driving power is open

RS232 serial port

The RS232 serial port (see J11 in Figure 3-2) is a port to connect the background computer using factory-defined protocol. It is used for factory commissioning and maintenance.

Keys and LED

The keys and LED, which can realize the functions in Table 3-4, provide the HMIs for service personnel. For the operations of the keys and LED HMI, refer to *3.4 Operation Description Of HMI*.

Table 3-4 Function descriptions of keys and LED

NO.	Function	Description
1	Query the acquisition data in real time	The acquisition data include condensing pressure, ambient temperature, silicon controlled rectifier (SCR) temperature, output percentage
2	Query the current alarm data in real time	The current alarm data include phase loss alarm, SCR over temperature, fan 1 over temperature, fan 2 over temperature, pressure sensor failure, EEPROM read fault, SCR temperature sensor failure and abnormal frequency
3	Query the historical alarm data in real time	The last saved 100 historical alarms can be queried
4	Change the configuration parameters in real time	The configuration parameters include setup pressure P_{set}, pressure control band P_{band}, minimum voltage V_{min}, maximum voltage V_{max}, fan number, pressure sensor type; or resume the above parameters to the default values (see C99 in Figure 3-9)

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

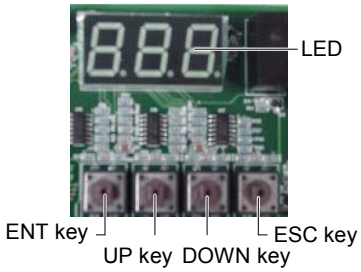


Figure 3-3 Keys and LED

3.4 Operation Description Of HMI

Initial interface

When the fan speed controller is powered on initially, the LED will alternately display 'F01' (the max. pressure logo) and the larger of condensing pressure 1 and condensing pressure 2. The key functions on the initial interface are listed in Table 3-5. The display order is shown in Figure 3-4 (the '16.1' is only an example, and the actual value is determined by the sampling result).

Table 3-5 Key function of initail interface

Key	Function
ESC	Enter the main menu interface

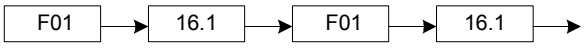


Figure 3-4 Display order of the initial interface

Note

The pressure value will be displayed as '88.8' on the LED if:

1. The pressure sensor is not installed.

2. The jumper caps of the J17 and J18 terminals (see Figure 3-2) used to configure the current pressure sensor are not installed correctly.

3. The pressure sensor has failed.

Main menu interface

The main menu interfaces include the analog main menu interface 'F--', current alarm main menu interface 'A--', historical alarm main menu interface 'H--' and configuration main menu interface 'C--'. The key functions of the main menu interfaces are listed in Table 3-6. The switching operation processes and orders are shown in Figure 3-5.

Table 3-6 Key functions of main menu interface

Key	Function
UP, DOWN	Switch between the main menu interfaces
ENT	Enter the submenu interface

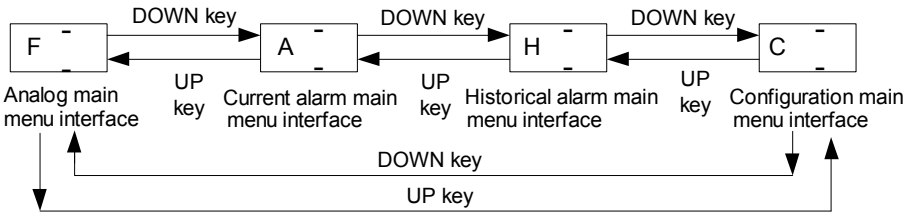


Figure 3-5 Switch figure of main menu interfaces

Analog main menu interface

The key functions of the analog main menu interface are listed in Table 3-7. The switching operation processes and orders are shown in Figure 3-6.

Table 3-7 Key functions of analog main menu interface

Key	Function
UP, DOWN	Switch between ID
ESC	Return to the analog main menu interface F--

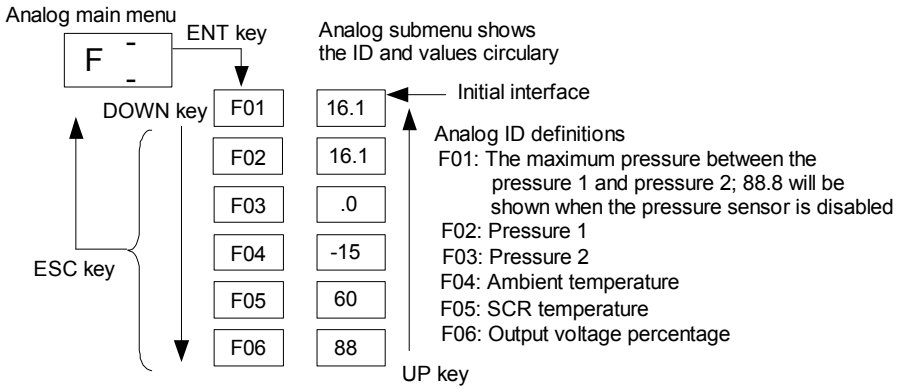


Figure 3-6 Switch figure of analog main menu interface

Current alarm main menu interface

The key functions of the current alarm main menu interface are listed in Table 3-8. The switching operation processes and orders are shown in Figure 3-7.

Table 3-8 Key functions of the current alarm main interface

Key	Function
UP, DOWN	Switch between ID
ESC	Return to the analog main menu interface F--

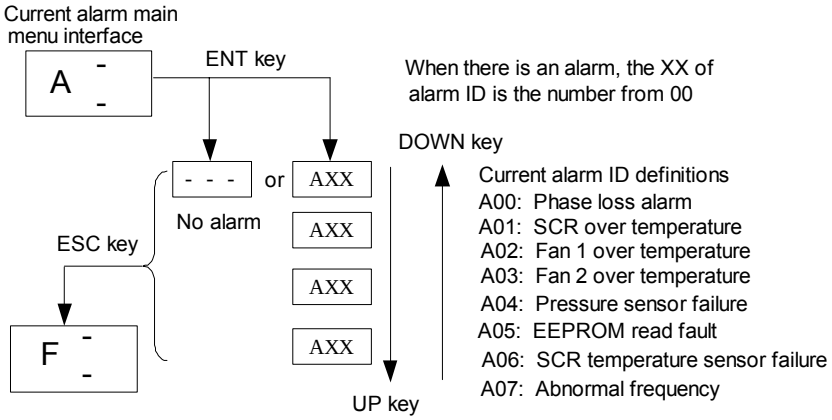


Figure 3-7 Switch figure of current alarm main interface

Note

The alarm generating conditions and troubleshooting are listed in Table 4-2.

Historical alarm main menu interface

The key functions of the historical alarm main menu interface are listed in Table 3-9. The switching operation processes and orders are shown in Figure 3-8.

Table 3-9 Key functions of historical alarm main menu interface

Key	Function
UP, DOWN	Switch between ID
ESC	Return to the analog main menu interface F--

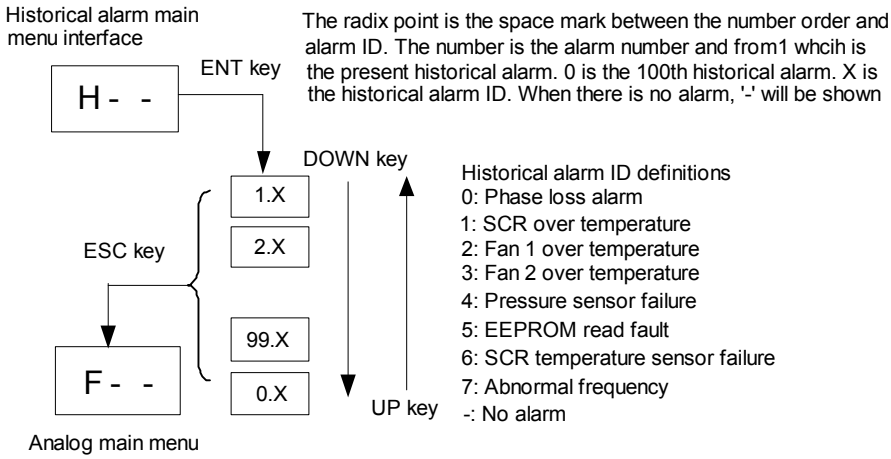


Figure 3-8 Switch figure of historical alarm main menu interface

Configuration main menu interface

Note

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

The key functions of the configuration main menu interface are listed in Table 3-10. The switching operation processes and orders are shown in Figure 3-9.

Table 3-10 Key functions of configuration main menu interface

Key	Function
UP, DOWN	1. Switch between ID 2. Change the ID value
ENT	1. Enter the changing interface of ID value 2. Confirm the changed ID value
ESC	1. Return to the configuration main menu interface C-- 2. Return to the configuration value change submenu interface from the configuration ID selected submenu interface 3. Return to the configuration value change submenu interface from the prompt interface '888' of successful change

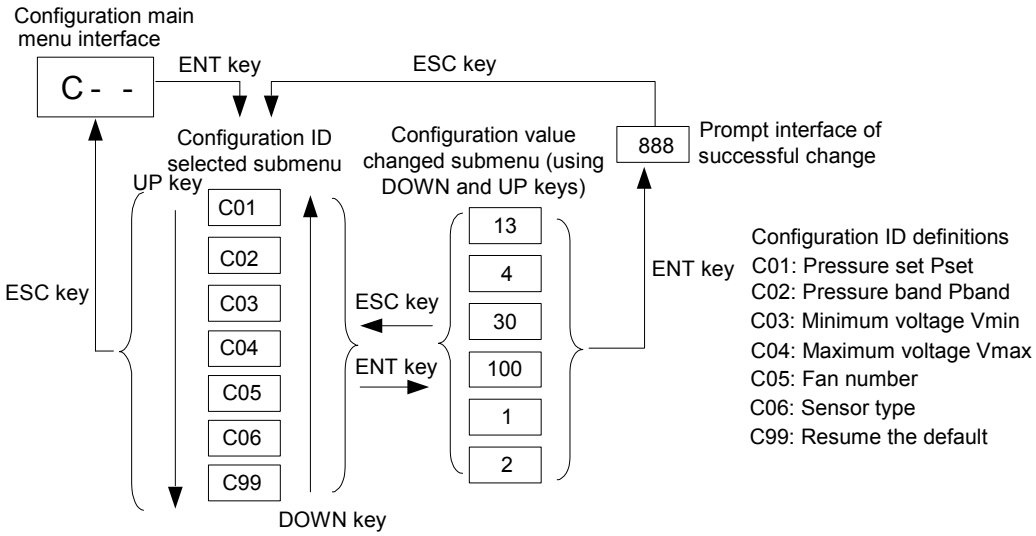


Figure 3-9 Switch figure of configuration data main menu interface

3.5 Protection Function

The fan speed controller can provide a corresponding protection function according to the acquired information. The detailed protection functions are as follows:

- Compressor operation synchronization protection

When the compressor operates normally, the fan speed controller can provide an output control according to the measured condensing pressure. Otherwise, the fan power will be stopped.

- Fan power protection 1

Before starting the fan power output, if the AC abnormal frequency alarm (the normal range of AC frequency is 45Hz ~ 65Hz) is detected, the fan power output will be stopped until the AC frequency resumes normal.

- Fan power protection 2

If a fault such as fan over temperature, phase loss alarm or SCR over temperature occurs during single fan configuration, the fan power output will be stopped until the fault is removed. When the temperature rises up to 100°C, the SCR will cut off the fan power; when the temperature drops down to 70°C, the fan power will be restored.

- Fan power protection 3

When a single fan is configured, if the interval between two consecutive over temperature alarms of fan 1 is less than 24 hours, the power of fan contactor coil will be cut off and the fan power output will be stopped. After the maintenance personnel remove the faults and restart the fan speed controller, the fan re-works.

When two fans are configured, if the interval between two consecutive over temperature alarms of both fan 1 and fan 2 is less than 24 hours, the power of fan contactor coil will be cut off and the fan power output will be stopped. After the maintenance personnel remove the faults and restart the fan speed controller, the fans re-work.

3.6 Alarm Protection

The fan speed controller can handle the corresponding alarms according to the acquired alarm information. The detailed alarms include:

1. Phase loss alarm
2. SCR over temperature
3. Fan 1 over temperature
4. Fan 2 over temperature
5. Pressure sensor failure
6. EEPROM read fault
7. SCR temperature sensor failure
8. Abnormal frequency

See Table 4-2 for alarm generating conditions and troubleshooting.

Chapter 4 Maintenance And Troubleshooting

This chapter gives an introduction to the maintenance and troubleshooting of the condenser. You should check the condenser regularly to ensure reliable operation and system performance. When the unit is in operation, the isolation switch outside the electrical control box is turned on. There is hazardous high voltage inside the electrical control box, thus non-staff operation is strictly prohibited.

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 near any refrigeration pipes, and make sure that the pipes do not leak.

Heat exchanger

1. Clean the fins of the heat exchanger regularly.

2. Clean the fins of the heat exchanger with compressed air or fin detergent (weakly alkaline) if the condenser airflow is blocked. When the compressed air is used, blow the fins in reverse airflow direction. Chemical reagent cleaning is strictly prohibited.

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

4. Avoid snow accumulation around the condenser in winter.

Fan

Check that the fan runs normally and check it for problems such as abnormal noise, vibration and bearing failure. If the fan should be replaced, refer to Table 4-1 for selecting the fan models.

Table 4-1 Fan model parameters

Model	Fan model	Fan number	Wiring type of fan motor
LSF12*	FE050-VDK.4I.V7	1	Y
LSF18	FE050-VDK.4I.V7	1	Δ
LSF24	FE071-SDK.6F.V7	1	Δ
LSF32*	FE071-SDK.6F.V7	1	Y
LSF62, LSF72, LDF62, LDF72	FE071-SDK.6F.V7	2	Δ
LSF38, LSF42, LSF52, LDF42, LDF52	FE080-ADK.6N.V7	1	Δ
LSF76, LSF85, LDF76, LDF85	FE080-ADK.6N.V7	2	Δ
Note*: When the fans of models LSF12 and LSF32 are replaced, you should change the wiring of the fan motor from delta wiring type Δ to star wiring type Y			

Fan speed controller

Check that the fan speed controller board operates normally. If not, replace it. The board is installed inside the electrical control box. Refer to Figure 4-2 for assembling. Rotate the isolation switch to ‘OFF’, and then remove the cover plate of the electrical control box, as shown in Figure 4-1.

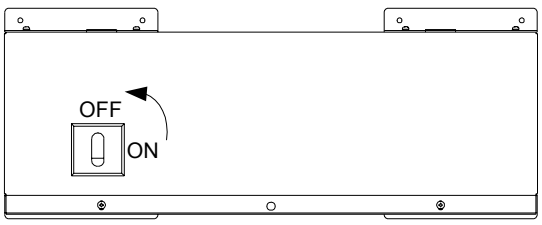


Figure 4-1 Fan speed controller board

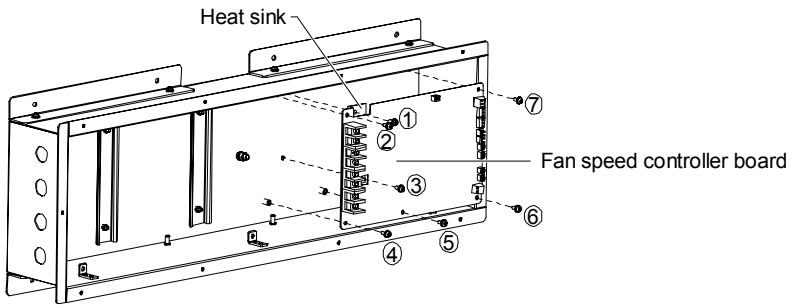


Figure 4-2 Removing the fan speed controller board

Note

1. ~ in Figure 4-2 are seven bolts (M4 × 10). The bolt and bolt are used to fix the heat sink, others are used to fix the fan speed controller board.

2. Except for the seven bolts in Figure 4-2, other bolts are prohibited to remove.

3. While installing the fan speed controller board, bolt and bolt , used to fix the heat sink, must be fastened firstly. The heat sink must cling to the back plate of the electrical control box. After installing the heat sink, use other five bolts to fix the fan speed controller board.

Pressure sensor

If the standard configuration pressure sensor fails, follow the instructions below to select the type and install the sensor.

- Selecting pressure sensor type

To ensure the measurement precision of the condensing pressure, the pressure sensor should be selected as follows:

1. The type of the pressure sensor should match the fan speed controller.

2. The configured pressure sensor type (see Figure 3-9) must be the same as the actual type.

3. The current type pressure sensor must meet 4mA ~ 20mA corresponding to 0 ~ 30bar; the voltage type pressure sensor must meet 0.5V ~ 4.5V corresponding to 0 ~ 34bar.

4. Except for the type configuration, all parameters of the pressure sensor should be amended by factory prior to use.

- Installing pressure sensor

The condenser is configured with current type pressure sensor in factory. If the pressure sensor should be replaced, the current type pressure sensor is recommended. If the voltage pressure sensor has to be used because of special condition, refer to the following steps:

1. Remove the current type pressure sensors on J14 and J15 terminals (see Figure 3-2) and the jumper caps of the current type pressure sensors on J17 and J18 terminals (see Figure 3-2).

2. Connect the voltage type pressure sensor to J3 and J4 terminals (see Figure 3-2). For the type configuration of pressure sensor, refer to *Configuration main menu interface* in *3.4 Operation Description Of HMI.*

4.2 Troubleshooting

The troubleshooting of the condenser is listed in Table 4-2.

For alarm query, refer to *Current alarm main menu* interface in *3.4 Operation Description Of HMI*.

Table 4-2 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 input connection is reversed	Check the input wire order
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and then compare the results of two boards
A01	SCR 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 then compare the results 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 is faulty or disconnected	Check the wiring of AC contactor; detect the auxiliary contact state of AC contactor
		The fan speed controller board has a hardware fault (the detecting circuit or SCR power supplying circuit is faulty)	Replace the fan speed controller board and then compare the results of two boards
A04	Pressure sensor failure	The pressure sensor is not installed or its terminal connection is poor	Check the wiring of pressure sensor
		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 failure	Replace the pressure sensor and compare the results of two sensors
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and then compare the results of two boards
A05	EEPROM read fault	The fan speed controller board has a hardware fault	Replace the fan speed controller board and then compare the results of two boards
A06	SCR temperature sensor failure	The SCR temperature sensor is not installed or its terminal connection is poor	Check the wiring of SCR temperature sensors (J8 SCRTemp, see Figure 3-1 for its position)
		SCR temperature sensor failure	Replace the SCR temperature sensor and compare the results of two sensors
		The fan speed controller board has a hardware fault	Replace the fan speed controller board and then compare the results of two boards
A07	Abnormal frequency	The voltage frequency of power supply is wrong	Replace the fan speed controller board and then compare the results of two boards
		The fan speed controller board has a hardware fault	

Appendix 1 Condenser Matching Table

1. R22 Matching Table

See Table 1 for the matching relationships of single circuit condensers for PEX Small Frame.

Table 1 Matching table of single circuit condensers

Model of indoor unit	Matching condensers at different temperatures		
	30°C	35°C	40°C
P1010	LSF12	LSF12	LSF12
P1015	LSF18	LSF18	LSF18
P2020	LSF24	LSF24	LSF24
P2025	LSF32	LSF32	LSF32

See Table 2 for the matching relationships of single circuit condensers for PEX Large Frame.

Table 2 Matching table of single circuit condensers

Model of indoor unit	Matching condensers at different temperatures		
	30°C	35°C	40°C
P1020	LSF24	LSF24	LSF32
P1025	LSF32	LSF32	LSF32
P1030	LSF38	LSF38	LSF42
P1035	LSF42	LSF42	LSF52
P2035	LSF42	LSF42	LSF52
P2045	LSF52	LSF52	LSF62
P2055	LSF62	LSF62	LSF62
P2040	LSF24 × 2	LSF24 × 2	LSF32 × 2
P2050	LSF32 × 2	LSF32 × 2	LSF32 × 2
P2060	LSF38 × 2	LSF38 × 2	LSF42 × 2
P2070	LSF42 × 2	LSF42 × 2	LSF52 × 2
P3070	LSF42 × 2	LSF42 × 2	LSF52 × 2
P3080	LSF52 × 2	LSF52 × 2	LSF52 × 2
P3090	LSF52 × 2	LSF52 × 2	LSF62 × 2
P3100	LSF62 × 2	LSF62 × 2	LSF62 × 2

See Table 3 for the matching relationships of dual circuit condensers for PEX Large Frame.

Table 3 Matching table of dual circuit condensers

Model of indoor unit	Matching condensers at different temperatures		
	30°C	35°C	40°C
P2040	LDF42	LDF42	LDF52
P2050	LDF52	LDF52	LDF62
P2060	LDF62	LDF62	LDF72
P2070	LDF76	LDF76	LDF85
P3070	LDF76	LDF76	LDF85
P3080	-	-	-
P3090	-	-	-
P3100	-	-	-

2. R407C Matching Table

See Table 4 for the matching relationships of single circuit condensers for PEX Small Frame.

Table 4 Matching table of single circuit condensers

Model of indoor unit	Matching condensers at different temperatures		
	30°C	35°C	40°C
P1010	LSF12	LSF12	LSF18
P1015	LSF18	LSF18	LSF24
P2020	LSF24	LSF24	LSF32
P2025	LSF32	LSF32	LSF38

See Table 5 for the matching relationships of single circuit condensers for PEX Large Frame.

Table 5 Matching table of single circuit condensers

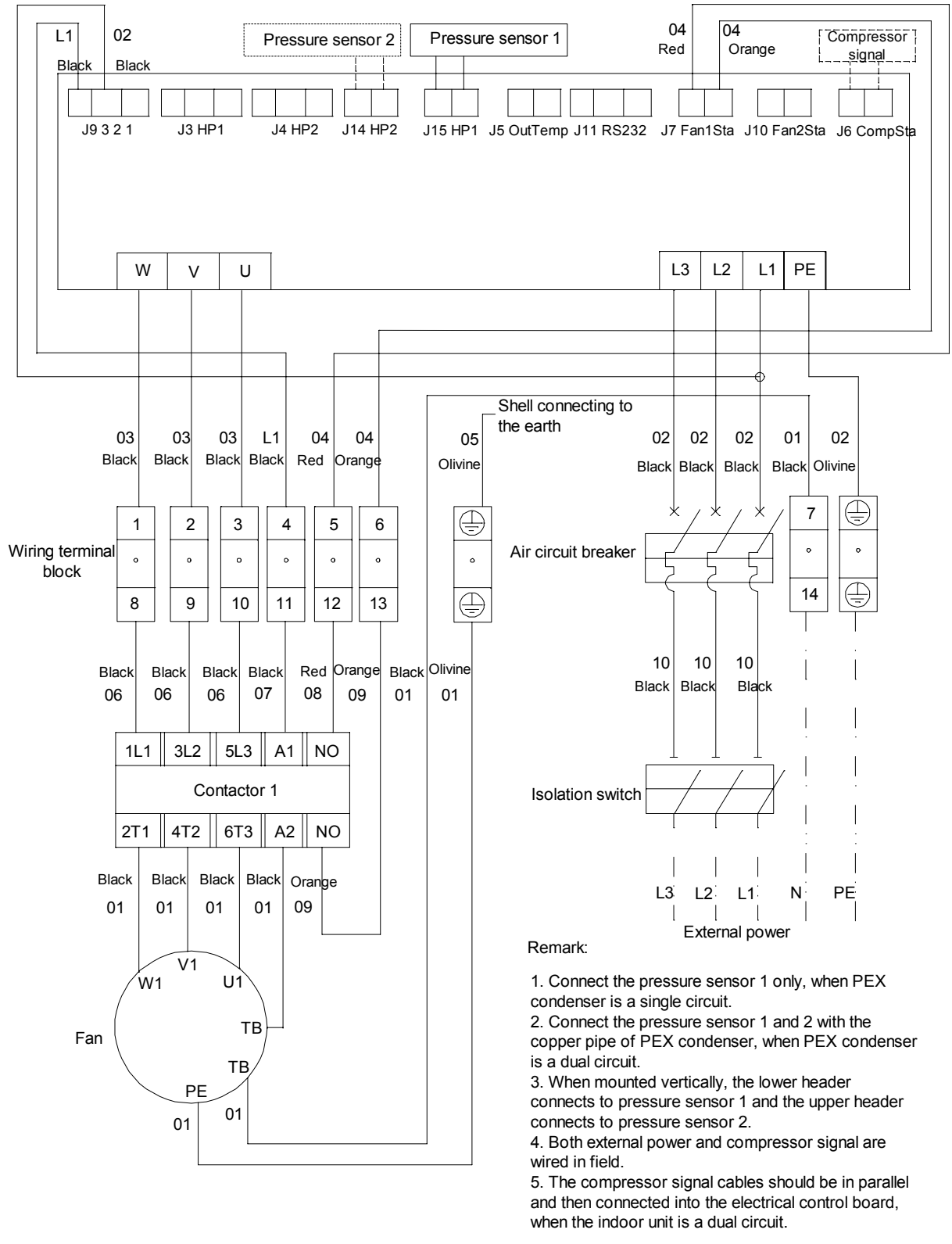
Model of indoor unit	Matching condensers at different temperatures		
	30°C	35°C	40°C
P1020	LSF32	LSF32	LSF38
P1025	LSF32	LSF38	LSF38
P1030	LSF38	LSF42	LSF52
P1035	LSF42	LSF52	LSF62
P2035	LSF42	LSF52	LSF62
P2045	LSF62	LSF62	LSF76
P2055	LSF62	LSF72	LSF85
P2040	LSF32 × 2	LSF32 × 2	LSF38 × 2
P2050	LSF32 × 2	LSF38 × 2	LSF38 × 2
P2060	LSF38 × 2	LSF42 × 2	LSF52 × 2
P2070	LSF42 × 2	LSF52 × 2	LSF62 × 2
P3070	LSF42 × 2	LSF52 × 2	LSF62 × 2
P3080	LSF52 × 2	LSF52 × 2	LSF62 × 2
P3090	LSF62 × 2	LSF62 × 2	LSF76 × 2
P3100	LSF62 × 2	LSF72 × 2	LSF85 × 2

See Table 6 for the matching relationships of dual circuit condensers for PEX Large Frame.

Table 6 Matching table of dual circuit condensers

Model of indoor unit	Matching condensers at different temperatures		
	35°C	35°C	40°C
P2040	LDF52	LDF52	LDF62
P2050	LDF52	LDF62	LDF72
P2060	LDF76	LDF76	-
P2070	LDF85	-	-
P3070	LDF85		
P3080	-	-	-
P3090	-	-	-
P3100	-	-	-

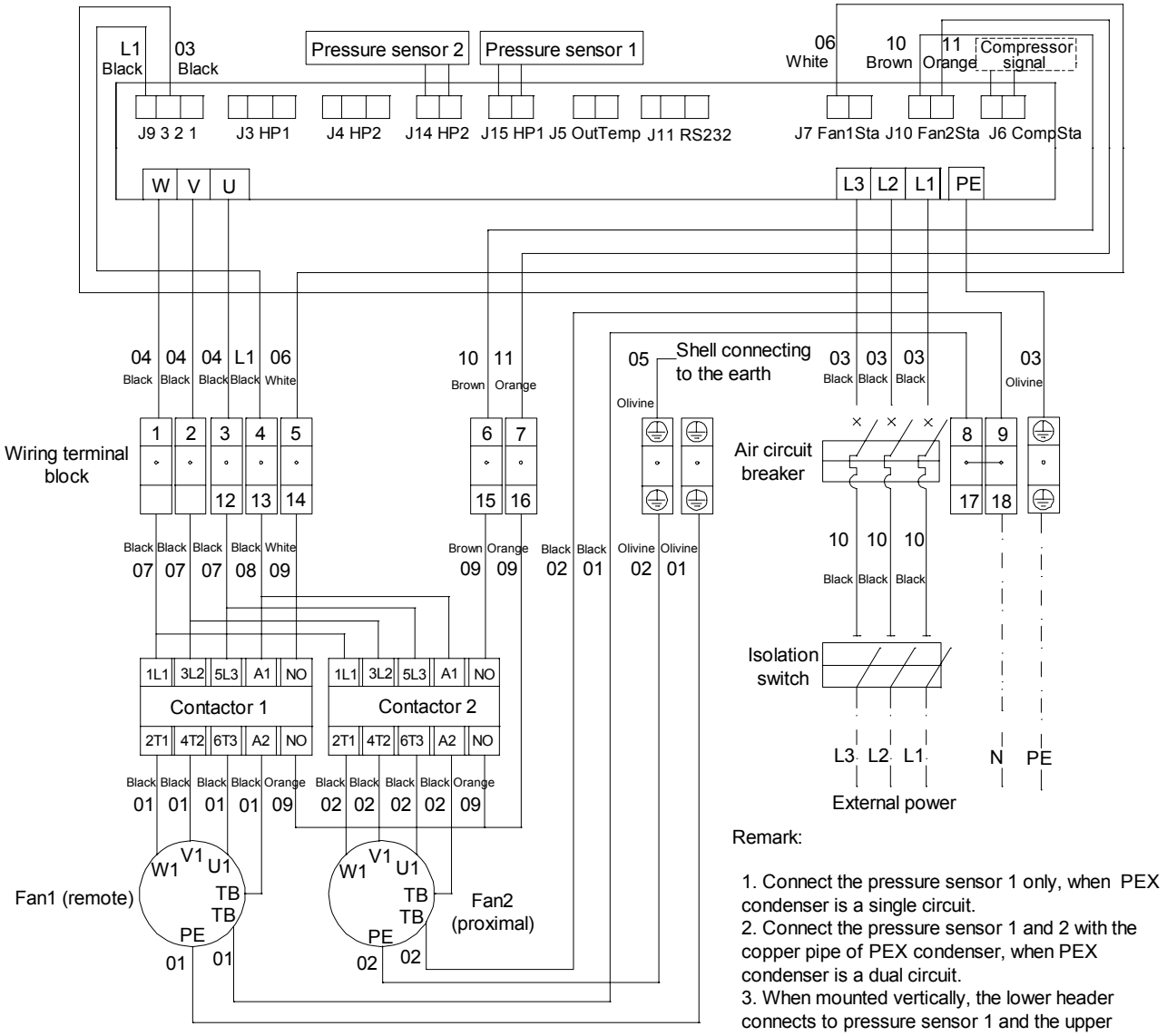
Appendix 2 Circuit Diagram



Remark:

1. Connect the pressure sensor 1 only, when PEX condenser is a single circuit.
2. Connect the pressure sensor 1 and 2 with the copper pipe of PEX condenser, when PEX condenser is a dual circuit.
3. When mounted vertically, the lower header connects to pressure sensor 1 and the upper header connects to pressure sensor 2.
4. Both external power and compressor signal are wired in field.
5. The compressor signal cables should be in parallel and then connected into the electrical control board, when the indoor unit is a dual circuit.

Figure 1 Circuit diagram of the condenser with single fan



Remark:

1. Connect the pressure sensor 1 only, when PEX condenser is a single circuit.
2. Connect the pressure sensor 1 and 2 with the copper pipe of PEX condenser, when PEX condenser is a dual circuit.
3. When mounted vertically, the lower header connects to pressure sensor 1 and the upper header connects to pressure sensor 2.
4. Both external power and compressor signal are wired in field.
5. The compressor signal cables should be in parallel and then connected into the electrical control board, when the indoor unit is a dual circuit.

Figure 2 Circuit diagram of the condenser with double fans

Appendix 3 Lifting Figure

See Figure 3 for lifting the condenser package (taking the condenser with double fans for example).

Note

When lifting the package, fix the cable by leading it through the slots 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 within and resulting in system leakage.

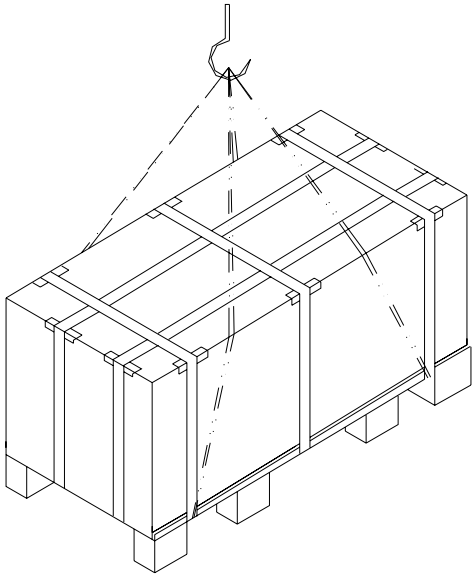


Figure 3 Lifting figure

Emerson Network Power Asia

Australia
T: 1800-065345
F: 61-2-97438737

China
T: 86-755-860-10808
F: 86-755-860-10245

India
T: 91-22-67208000
F: 91-22-25828358

Indonesia
T: 62-21-2513003
F: 62-21-2510622

Japan
T: 81-3-54038594
F: 81-3-54032924

Korea
T: 82-2-34831500
F: 82-2-5927883

Malaysia
T: 603-78845000
F: 603-78845188

New Zealand
T: 64-3-3392060
F: 64-3-3392063

Pakistan
T: 92-42-36622526 to 28
F: 92-42-36622530

Philippines
T: 63-2-6203600
F: 63-2-6203693

Singapore
T: 65-64672211
F: 65-64670130

Thailand
T: 66-2-6178260
F: 66-2-6178277 / 78

Vietnam
T: 84-4-37628908
F: 84-4-37628909

Marketing.AP@Emerson.com

Emerson Network Power.
The global leader in enabling *Business-Critical Continuity*™.

- AC Power
- Connectivity
- DC Power
- Embedded Computing
- Embedded Power
- Infrastructure Management & Monitoring
- Outside Plant
- Power Switching & Controls
- Precision Cooling
- Racks & Integrated Cabinets
- Services
- Surge Protection

EmersonNetworkPower.com

AP11ENT-PEXCondenserV1-TDM