LMF1000-20Bxx(-Q) Series Power Supply Application Notes

Suitable for industrial and medical applications

Content

1. Overview

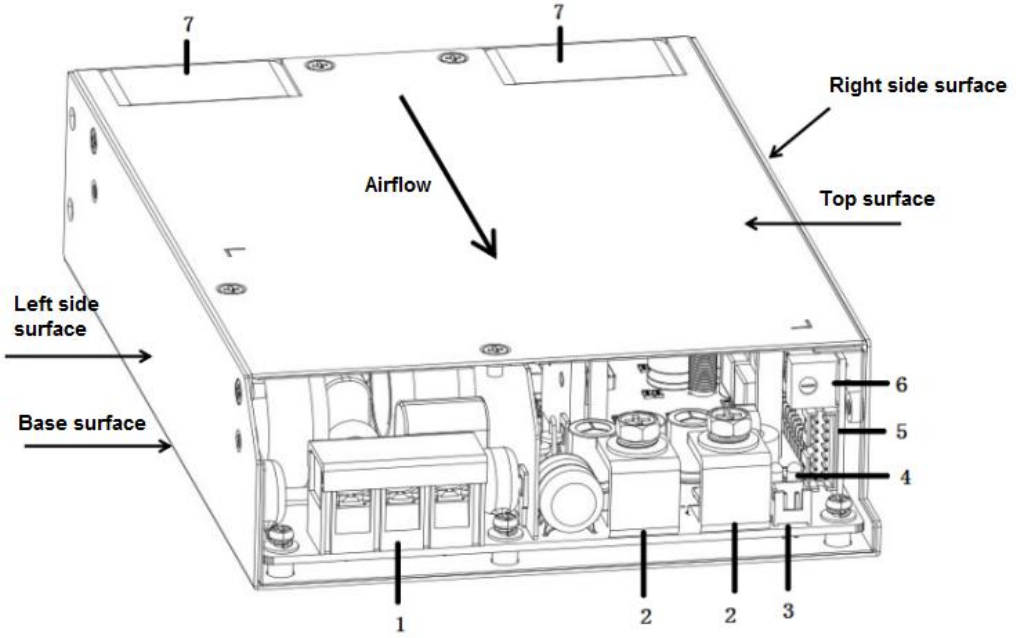


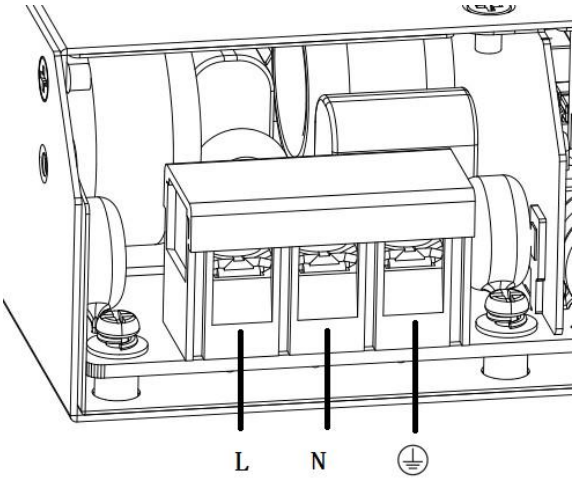
Fig. 1: Appearance information of LMF1000-20Bxx

Composition structure description

1. AC/DC input terminal (J1)
2. DC output terminal (J2, J3)
3. Auxiliary road output terminal (CN1)
4. Green and red status display LED lights
5. Signal connection Press the terminal (CN2)
6. Output voltage regulation knob
7. Fans

1.1 AC/DC input terminal block (J1)

J1 is the input terminal adopts a standard 3-pin fence welding terminal with upper cover, and the center spacing of the pins is 10mm.

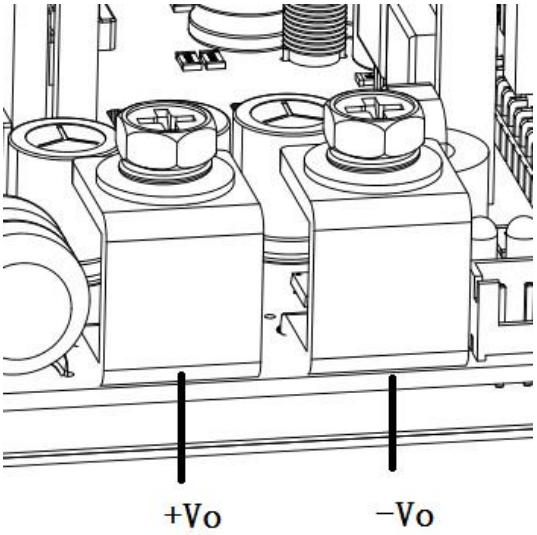


Pin	Features
L	Line (Phase)
N	Neutral
⏚	Ground/Earth

Wire size: 12-18 AWG
Torque: 1.8Nm

1.2 Main DC output terminal (J2)

J2 is the output terminal adopts two standard screw lock type metal terminals with a 2 Pin spacing of 18mm.

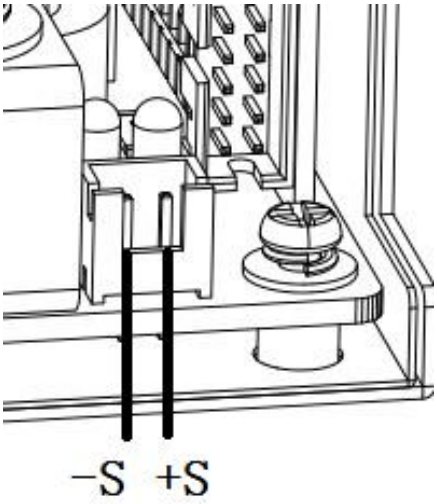


Pin	Features
+Vo	Main Output -
-Vo	Main Output +

Wire size: 4 - 12 AWG
Torque: 2.3Nm

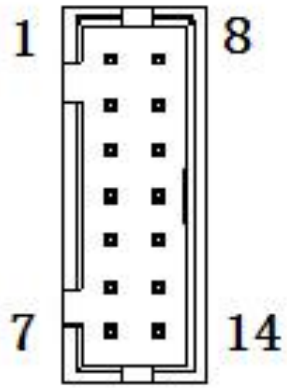
1.3 Auxiliary DC Output Terminal (CN1)

The auxiliary DC Output terminals adopt standard 2.5mm pitch terminals.



Pin	Function
-S	Auxiliary DC Output -
+S	Auxiliary DC Output +

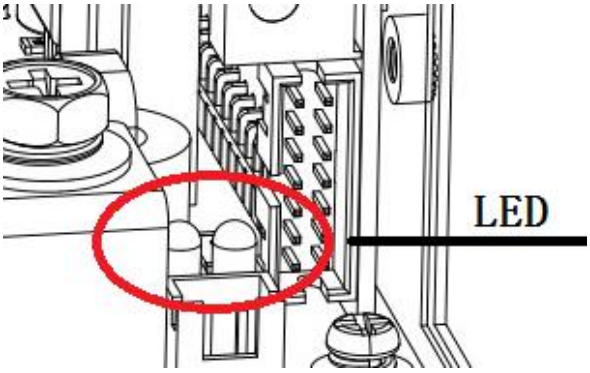
1.4 Signal port (CN2)



Pin	Label	Features
1	VS+	Remote compensation positive end
2	CURRENT SHARE	Current sharing bus
3	DC_OK	DC_OK Signal
4	SCL	I2C communication line
5	SDA	I2C communication line
6	PS_ON	Remote Control signal
7	GND	Signal terminal reference ground
8	VS-	Remote compensation negative terminal
9	ADDRESS0	ADDRESS code 0
10	ADDRESS1	ADDRESS code 1
11	ADDRESS2	ADDRESS code 2
12	RXD	Serial communication
13	TXD	Serial communication
14	GND	Signal terminal reference ground

Note: The reference ground of all pins on the signal terminal is pin7 and pin8.

1.5 Green and red status display LED lights

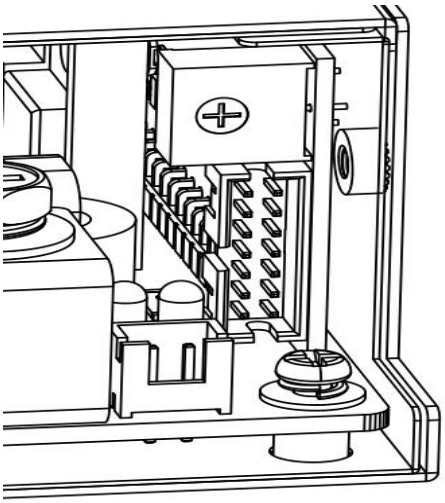


Two kinds of LED lights indicate difference working states of the power supply :

Green LED	Red LED	Status
ON	OFF	Normal work
OFF	ON	Main or auxiliary road alarm
OFF	OFF	No AC input

1.6 Output voltage adjustment knob

Turn counterclockwise to increase output voltage



Model	Rated Ouput Voltage	Adjustable Range Of Output Voltage
LMF1000-20B12	12V	12 -14.4V
LMF1000-20B24	24V	24 - 28.8V
LMF1000-20B48	48V	48 - 56V

2. Function Manual

2.1 Input Requirements

The AC input voltage and DC input voltage must be at the specified voltage (refer to the number table), and the power supply may not work properly or even malfunction. The internal L line and N line of the power module have been connected in series with a 250V 20A fuse. For better protection of the module, it is recommended that customers use a circuit breaker not greater then 20A. (Non-mandatory requirements)

2.2 Output Requirements

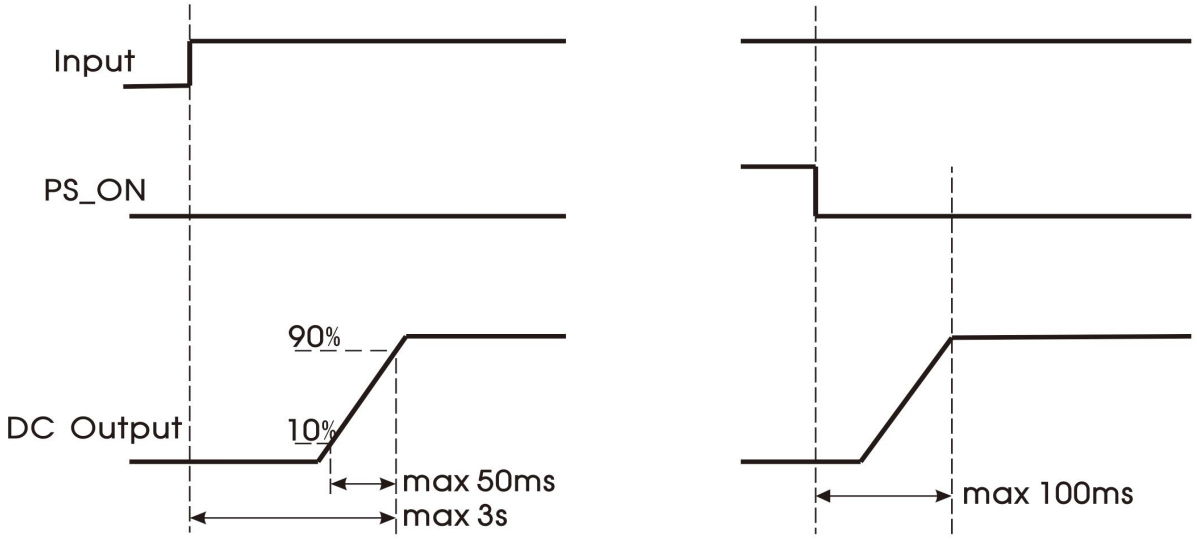
Main Output

At any voltage value, the maximum output current and power must not exceed the rated/specified value. The output current must not exceed the maximum output current value.

Auxiliary output

The auxiliary circuit supports a maximum current of 2A.

2.3 Start-up timing



Item	Operating Conditions		Min.	Typ.	Max.	Unit
Power-down Hold Time	Room temperature, full load	115VAC	--	12	--	ms
		230VAC	--	12	--	
Start Delay Time	230VAC, full load		--	--	3	s
Output Rise Time	Output Voltage From 10%-90%		--	--	50	ms

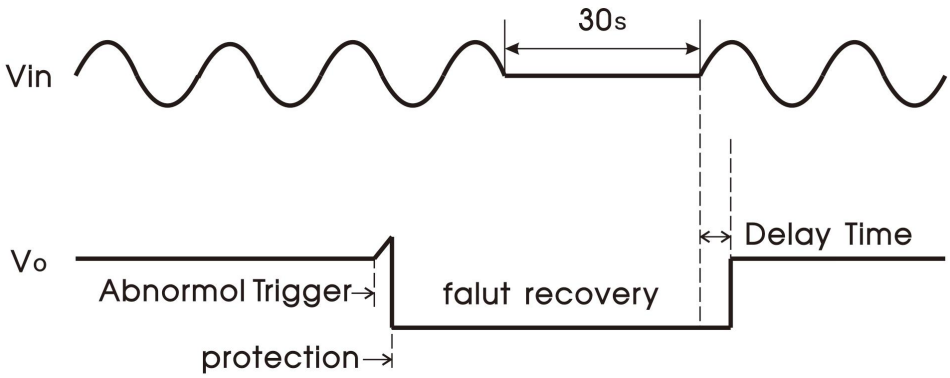
2.4 Fan Speed Control

The fan speed is determined by the ambient temperature output power, and linearly adjusts, when the ambient temperature is dry 45℃ and the output is loaded, the fan reaches 100% speed. In order to improve the feasibility of the power supply block, in the no-load state and the ambient temperature is higher than -5℃, the fan maintains a minimum speed of 10%, and the ambient temperature is lower than -5℃, the fan will stop rotating.

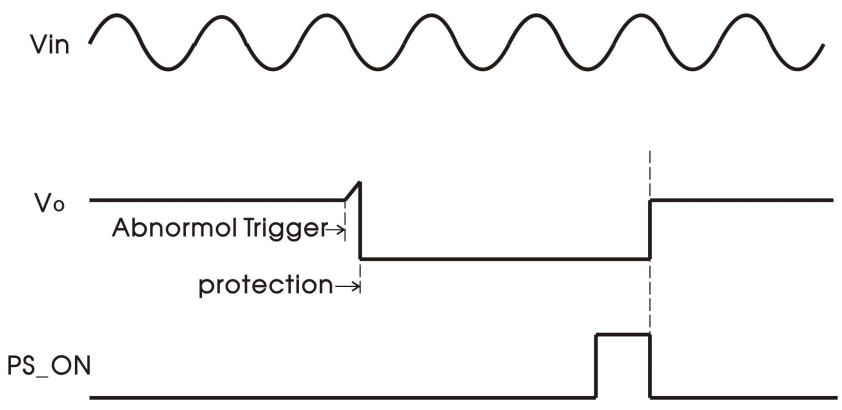
2.5 Output over-voltage protection (OVP)

Main Output

The over-voltage protection function is to close the main circuit output when the output voltage reaches the protection voltage value. After the main circuit over-voltage protection occurs, the main circuit output of the building block is disconnected, and the auxiliary circuit output is not affected. The input power supply needs to be disconnected for at least 30S to resume main output.



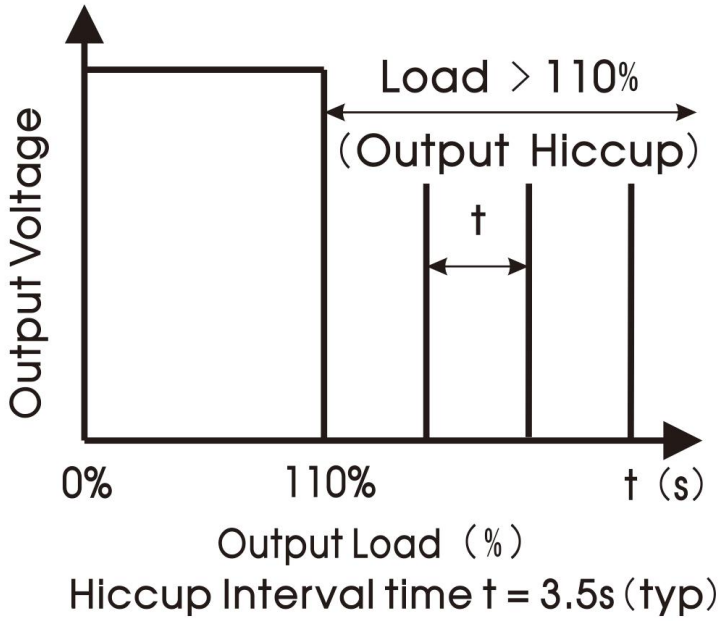
In addition, it can be quickly restarted by the PS_ON signal:



Secondary output

When the auxiliary circuit reaches 7Vdc (maximum value), the auxiliary circuit output is in the playing state, and the circuit has no output until the paving output returns to normal after the elimination of the fault.

2.6 Output over-current protection (OCP)



Hiccup Interval time t = 3.5s (typ)

Main output

When the output current exceeds 110%(minimum), the DC output is turned off. The OCP protection function is to use snoring mode. After the over-current state is eliminated, the main path output is automatically recovered, and the auxiliary output will not be affected.

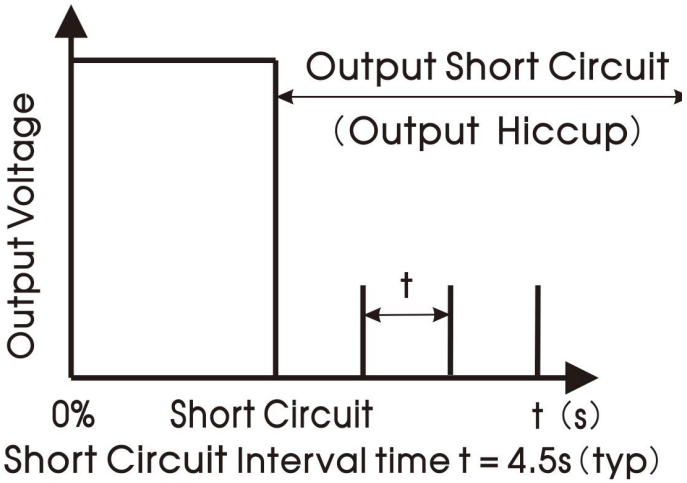
The main output has an OCP delay function, and the main output is turned off after the output current reaches 120% (typical value) of the rated load current for 300ms. After the main circuit is programmed to reach 150% (typical value) of rated load current 15ms, turn off the main circuit output.

When the output current of the auxiliary circuit exceeds 120% (typical value) of the rated current, the main circuit output will be closed. After the auxiliary circuit over-current condition is eliminated, the main circuit will automatically return to the output.

2.7 Output short circuit protection (SCP)

When the output is short-circuited, the power output is in hiccup mode normal, and the lubrication interval is 4.5S, after the short-circuit is eliminated, the power block automatically return to normal, the auxiliary output is not affected.

When the road output a short circuit, the main road has no output.



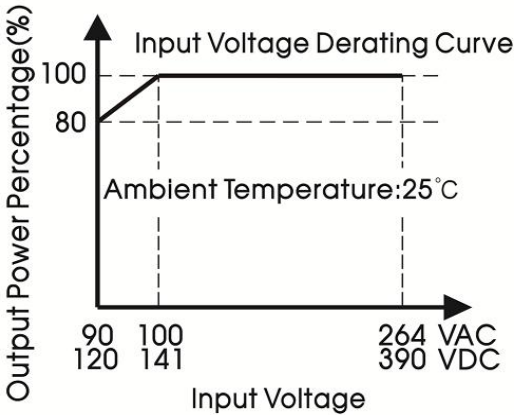
2.8 Over temperature protection (OTP)

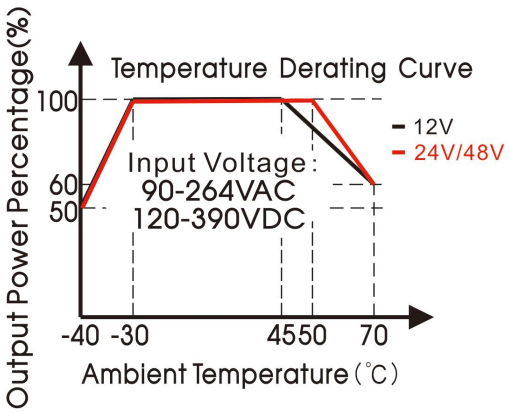
When the ambient temperature of the power supply exceeds the rated temperature for a period of time, the power supply will be turned off and the power supply will resume normal operation after the ambient temperature drops to the set value.

2.9 Output power derating

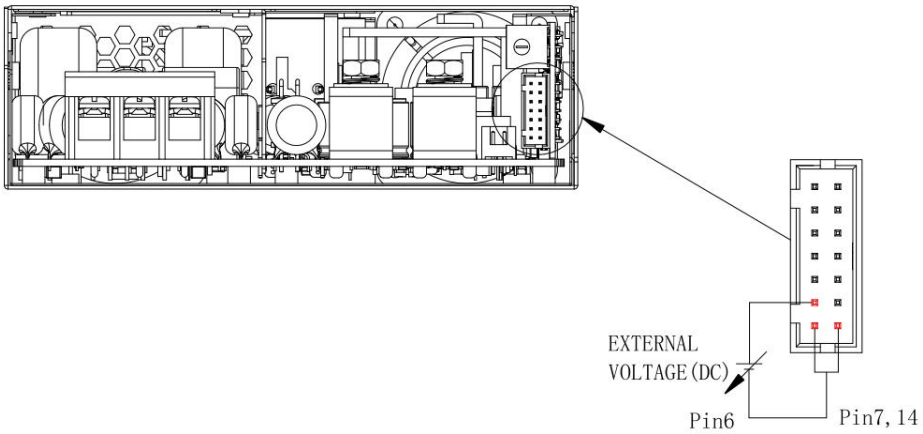
When the input voltage is greater than 100VAC (or 141VDC), only need to derate according to the temperature derating curve.

When the input voltage is lower than 100VAC (or 141VDC), the output power will be derated according to the following input voltage derating curve after temperature derating.





2.10 Remote control switch machine



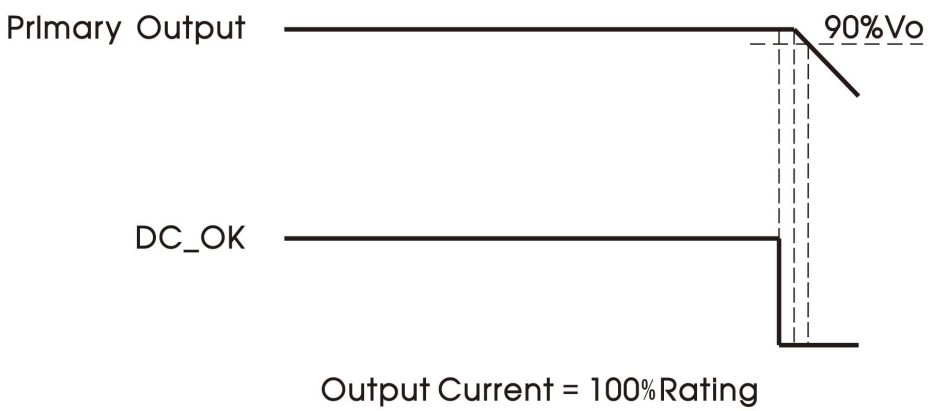
PS_ON (Pin6) and GND (Pin7or Pin14)	Output status
0 - 0.5V	ON
2 - 5V	OFF

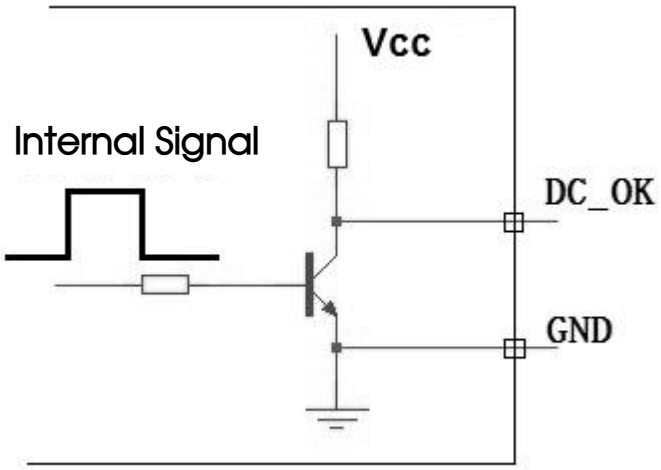
If the input of the power block has been connected to the power supply, the PS_ON signal pin can be used to control the on and off of its main output, the PS_ON signal does not affect the output voltage of the auxiliary circuit. Notes: PS_ON input positive resistance 5.1K inside the module.

2.11 DC_OK Signal

The DC_OK signal is used to monitor whether the power supply is working normally, and the signal is at Pin3 of the signal terminal CN2.

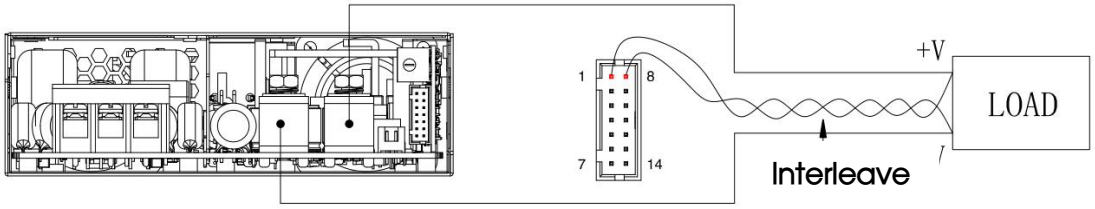
Note: When the DC_OK signal is connected to the external circuit, the impedance of the external external circuit (i.e. between Pin3 and Pin7 or Pin14 of CN2) is not less than 10kΩ.





DC_OK (Pin3) and GND (Pin7or Pin14)	Output state
2.5 - 5V	ON
0 - 0.5V	OFF

2.12 Remote compensation



Note: VS+ and VS- cannot be short-circuited or reversely connected, incense will damage the power supply block.

Pin 1 and pin 8 of the signal terminal CN2 can compensate the voltage drop on the output cable.

The remote compensation circuit can compensate up to 200mV cable voltage drop. This voltage includes the sum of the cable drop connected to the output positive terminal and the output negative terminal.

If you need to use the near-end compensation function, the signal pin needs to be connected with the load end with a twisted pair, otherwise the power module will be damaged.

2.13 Parallel operation

2.13.1 Redundancy

The power building has determined that it can be connected in parallel to achieve redundancy, thereby improving system reliability. The maximum power of the redundant system needs to be designed for reduction to ensure that the redundant system can meet the rated load requirements when a power module fails, at present, the general storage method is the N+1 method to construct a redundant system, that is N+1 power supply wells, supporting the maximum load current N*Iomax.

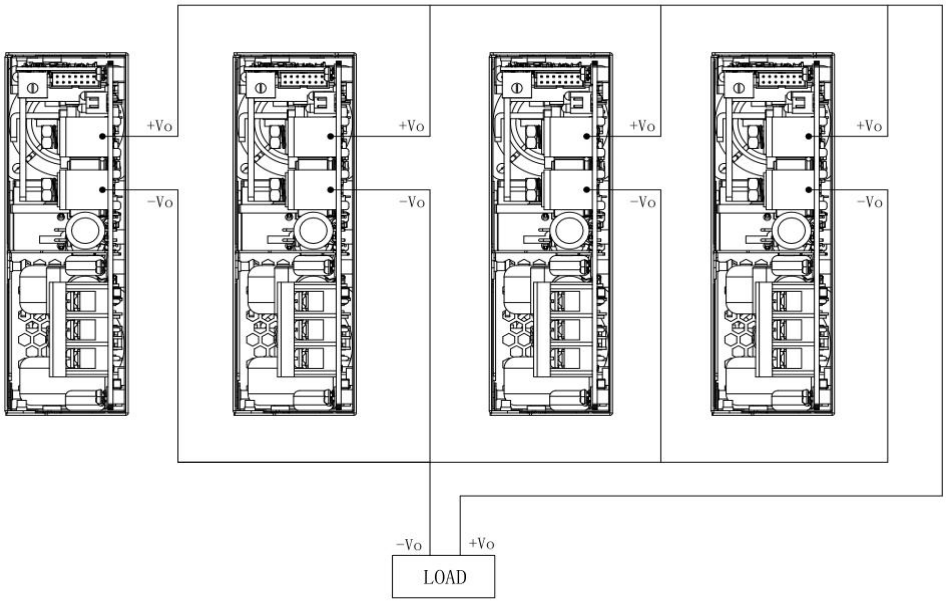
The power block supports 3+1 redundant work.

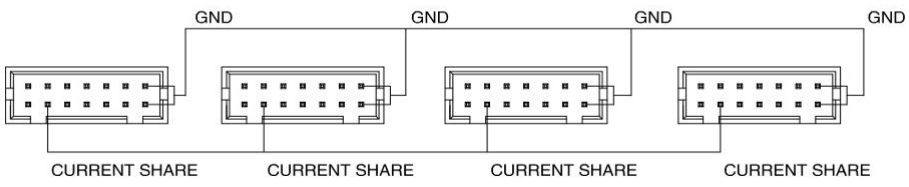
The ORing circuit is used inside the power building block, and when any power building block in parallel fails, it will not affect the operation of other power modules.

When used in parallel, the maximum load current cannot exceed the maximum output current of a single power supply module, otherwise the whole parallel power supply module will not start normally.

2.13.2 Current sharing

When using in parallel, the number of parallel modules cannot exceed 4.





When the power building block are working in parallel, there is an active current sharing circuit inside to ensure the current between each module is balanced.

The active current sharing circuit adopts an automatic master-slave current sharing method, and each power module has a sharing bus signal(CURRENT SHARE BUS). All power supplies of all power floors must be connected together while working in parallel. The average bus signal is located in the pin 2 of CN2.

The output voltage of each power supply block will affect the current sharing accuracy. The output voltage of the power module is rated voltage ±50mV. In practical applications, if the output voltage value needs to be adjusted, the output voltage of all parallel power supply blocks needs to be adjusted to the same voltage. The recommended voltage is: the target voltage value is ±50mV.

After the output load of each power module is greater than 50% of the rated load, the current sharing accuracy should be ±5%. the current sharing calculation formula is:

$$\text{Current sharing accuracy}=\frac{Io\max - Io\min}{Io\max}*100\%$$

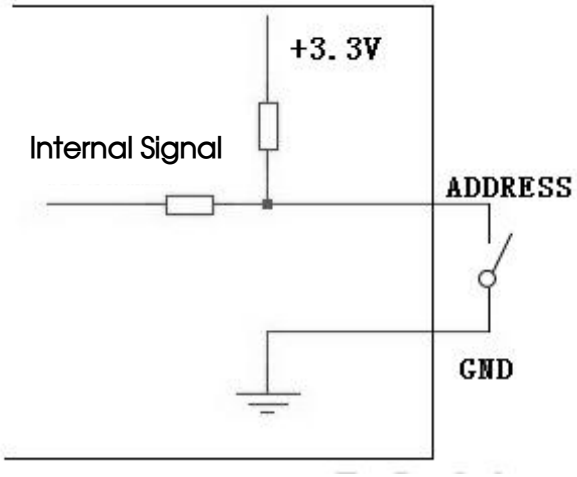
Iomax: the largest output current value in power building block.

Iomin: the smallest output current value in power building block.

2.14 I2C communication address

In the parallel system, if you need to identify the information of the power module, you need to set the I2C communication address for each parallel ton source school block, and through I2C and the host computer for data exchange. The setting of the communication address is determined by the 9, 10 and 11 pins of the signal terminal CN2, when these three pins are shorted with the pin7 or 14 of CN2, it is low level (L, voltage range: 0-1.31V), while it is high level (H, voltage range: 1.99V-3.3V) when these three pins are disconnected from Pin7 or Pin14. The specific address number is shown in the table below:

ADDRESS 2	ADDRESS 1	ADDRESS 0	Address number
L	L	L	0
L	L	H	1
L	H	L	2
L	H	H	3
H	L	L	4
H	L	H	5
H	H	L	6
H	H	H	7



The internal pull-up resistance of the power building block is 10kΩ, and the external resistance can be matched according to the actual application to meet the high and low voltage range.

3. Installation requirements

3.1 Safety introduction

Warning

Risk of electric shock
During high voltage operating

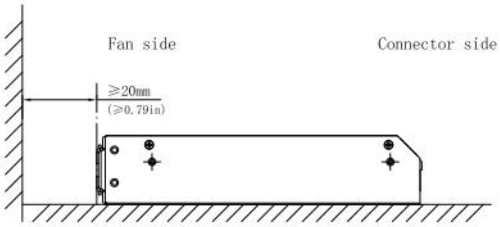
- The power supply module is disconnected from the input DC or the AC power and placed for at least one minute before starting to operate it.
- When installing the input wire to the power module, please connect the ground terminal first, and then connect the L line and the N line.
- When removing the input wire, please remove the L wire and the N wire first, and then remove the ground wire.
- Ensure that no objects fall into the power supply module during disassembly and assembly.
- Pay attention to high temperature
- After the power module is working in a high temperature environment, wait for its shell to cool down before operating.
- This product needs to be installed by professionals and needs to be used with other equipment.

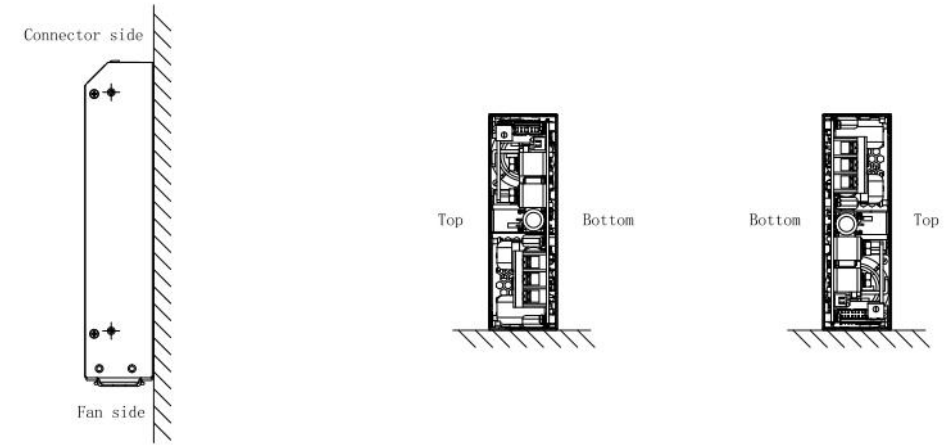
3.2 Safety requirements

When installing, pay attention to the primary side and the protective ground, the creep distance and the electrical clearance of the primary side and the secondary side refer to EN60601-1.

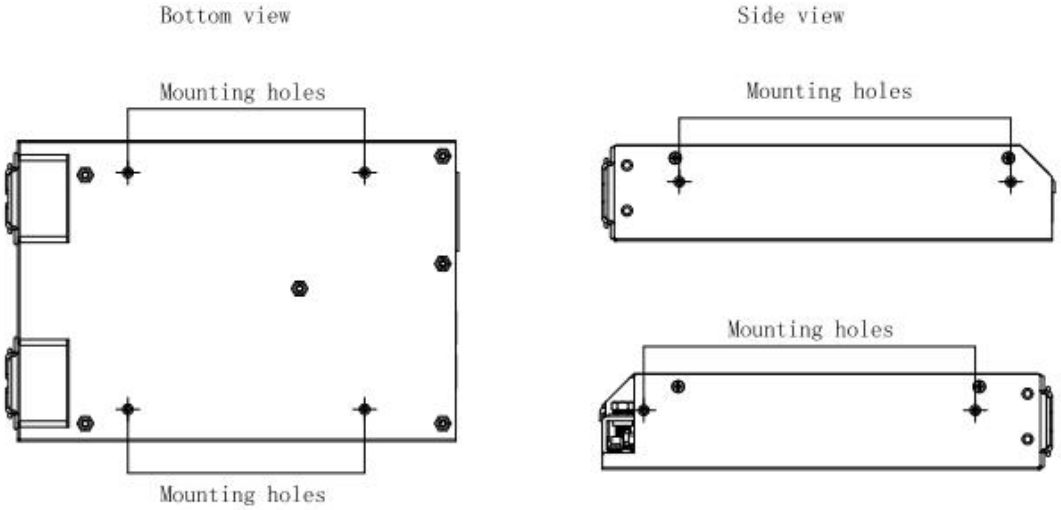
3.3 Installation method

Standard mounting orientation:





Position of mounting holes:



Note: The fan panel cannot be blocked by other objects, and a distance of at least 20mm must be maintained, otherwise it will affect the heat dissipation and performance of the power module.

4. PMBUS

Series LMF1000-20Bxx power modules support standard PMBUS protocol, manage and monitor power modules through I2C bus.

Command Code	Command Name	Access Type	Data Bytes	Data Format	Description
0x9A	PMB_MFR_MODEL	Block Read	32	ASCII	Product model
0x9B	PMB_MFR_REVISION	Block Read	32	ASCII	Software version
0x9D	PMB_MFR_DATE	Block Read	32	ASCII	Software date
0x9C	PMB_MFR_LOCATION	Block Read	32	ASCII	Production place
0x9E	PMB_MFR_SERIAL	Block Read	32	ASCII	Product series
0x8B	PMB_READ_VOUT	Read Word	2	Liner	Main circuit output voltage (10mV)
0x8C	PMB_READ_IOUT	Read Word	2	Liner	Main output current (10mV)
0x96	PMB_READ_POUT	Read Word	2	Liner	Main output power (10mV)
0xC4	PMB_MFR_AUX_VOUT	Read Word	2	Liner	Auxiliary output voltage (10mV)
0xC5	PMB_MFR_AUX_IOUT	Read Word	2	Liner	Auxiliary output current (10mV)
0xC7	PMB_MFR_FAULT_BIT	Read Word	2	HEX	Fault status word

Describe Of Fault Status Through PMB_MFR_FAULT_BIT	
Bit segment	Describe
BIT: 0	0: Fan 1 normal 1: Fan 1 fault
BIT: 1	0: Fan 2 normal 1: Fan 2 fault
BIT: 2	0: Auxiliary output is normal 1: The output of auxiliary circuit is fault
BIT: 3	0: No over-voltage in main circuit 1: Over-voltage in the main circuit
BIT: 4	0: No under-voltage in main circuit 1: Under-voltage in the main circuit
BIT: 5	0: No primary over-current on the main circuit 1: Primary over-current in the main circuit
BIT: 6	0: No secondary over-current on the main circuit 1: Secondary over-current in the main circuit
BIT: 7	0: No primary overload on the main circuit 1: Overload in the main circuit
BIT: 8	0: No secondary overload on the main circuit 1: Secondary overload in the main circuit
BIT: 9	0: No three-level overload on the main circuit 1: Three-stage overload in the main circuit
BIT: 10	0: Normal temperature 1: Over-tempetature and overload
BIT: 11	0: No short circuit in the main circuit 1: Short circuit in the main circuit
BIT: 12	0: No hardware over-voltage on the main circuit 1: Hardware over-voltage in the main circuit
BIT: 13	0: No hardware under-voltage on the main circuit 1: Hardware under-voltage in the main circuit
BIT: 14	0: Pre-charge is normal 1: Precharge of the front stage is fault
BIT: 15	0: PFC soft start is normal 1: PFC soft start fault

For more details, please consult the MORNSUN FAE.