



LFM420M Series

Application Note V12 March 2025

420W AC-DC Power Supply with PFC LFM420M Series APPLICATION NOTE



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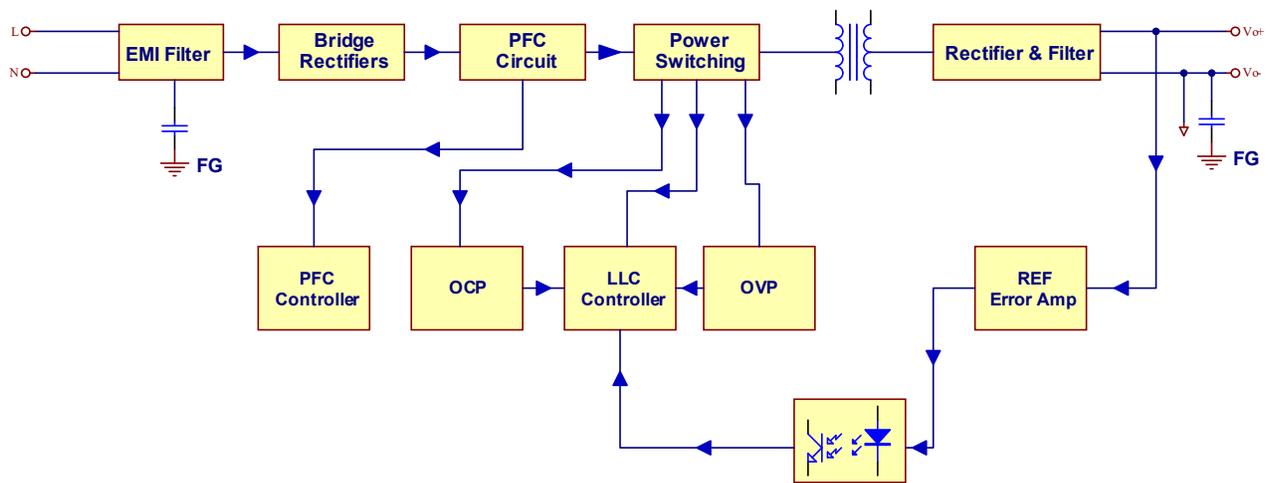
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1. Introduction

This application note describes the features and functions of Cincon's LFM420M series power module. These are highly efficient, reliable, compact, high-power density, single output AC/DC power modules. The module is fully protected against short circuit and over-voltage conditions. Cincon's world class automated manufacturing methods, together with an extensive testing and qualification program, ensure that the LFM420M series power module is extremely reliable.

2. Electrical Block Diagram





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3. Main Features and Functions

3.1 Operating Temperature Range

The highly efficient design of Cincon's LFM420M series power modules has resulted in their ability to operate within ambient temperature environments from -40°C to 80°C. Due consideration must be given to the de-rating curves when ascertaining the maximum power that can be drawn from the module. The maximum power which can be drawn is influenced by a number of factors, such as:

- Input voltage range
- Permissible output load (per derating curve)
- Effective heat sinks

3.2 Output Protection (Over Current/Constant Current/Over Voltage Protection)

The power modules provide full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit will operate normally once the fault condition is removed. The output voltage will decrease when the output current is above its constant current point. When the output current is continue increase the power module will go to hiccup mode if the output voltage is lower than its set output voltage.

When the overvoltage protection is activated, the machine latch. It is necessary to wait for about one minute after turning off the input voltage.

4. Applications

4.1 Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown in Figure 1. When testing the Cincon's LFM420M series under any transient conditions, please ensure that the transient response of the source is sufficient to power the equipment under test. We can calculate the

- Efficiency
- Load regulation and line regulation

The value of efficiency is defined as:

$$\eta = \frac{V_o \times I_o}{V_{in} \times I_{in}} \times 100\%$$

Where:

- V_o is output voltage,
- I_o is output current,
- V_{in} is input voltage,
- I_{in} is input current

The value of load regulation is defined as:

$$Load\ reg. = \frac{V_1 - V_2}{V_2} \times 100\%$$

Where:

- V_1 is the output voltage at full load
- V_2 is the output voltage at 10% load

The value of line regulation is defined as:

$$Line\ reg. = \frac{V_{HL} - V_{LL}}{V_{LL}} \times 100\%$$

Where:

- V_{HL} is the output voltage of maximum input voltage at full load.
- V_{LL} is the output voltage of minimum input voltage at full load.

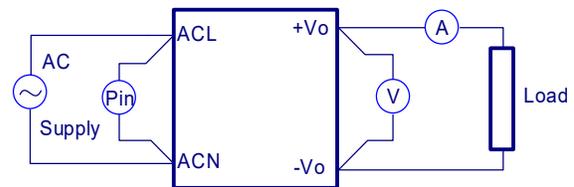


Figure 1. LFM420M Series Test Setup

4.2 Output Ripple and Noise Measurement

The test set-up for noise and ripple measurements is shown in Figure 2. Measured method:

Add a $C_2=0.1\mu F$ ceramic capacitor and a $C_1=10\mu F$ electrolytic capacitor to output at 20 MHz Band Width.

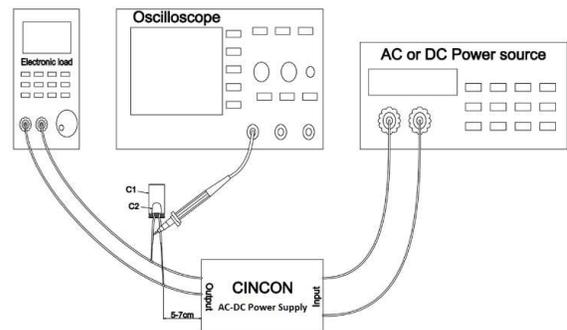


Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

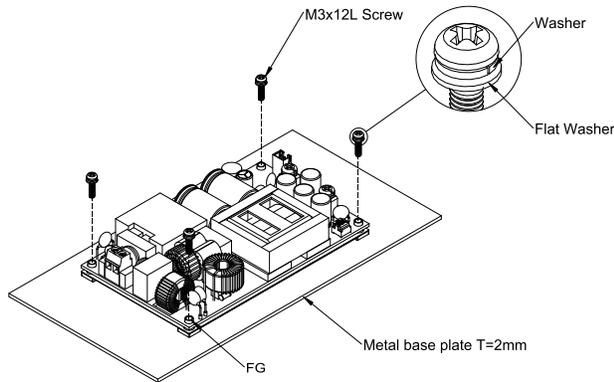


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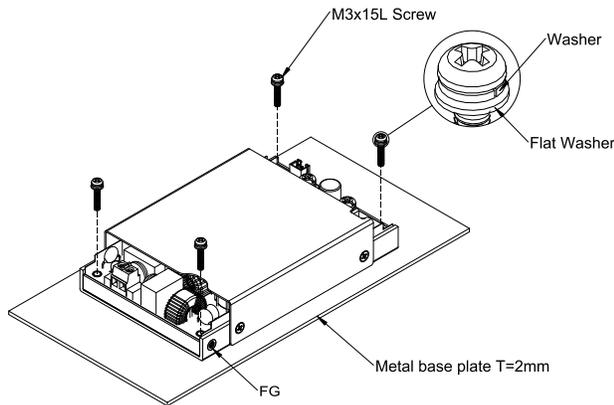
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4.3 Installation Instruction

The LFM420M series provide the baseplate cooling for customer to increasing heat dissipation. Please refer to the following figure for installation.



LFM420MXXXB Installation Diagram

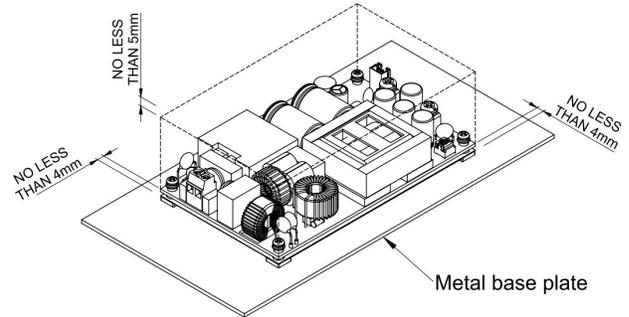


LFM420MXXXC Installation Diagram

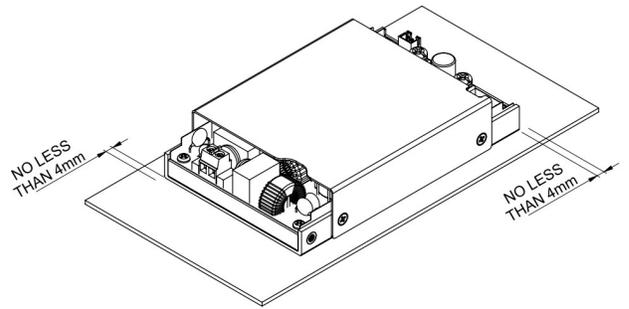
Note:

M3 screw head and washer diameter shall not exceed 5.5mm. For example, if the baseplate thickness is 2mm, the suggested M3 screw length is 12mm for LFM420MXXXB and 15mm for LFM420MXXXC. The required screw length depends on the baseplate thickness. M3 torque is 4 kgf-cm max.

Please allow 4mm side clearance from the components and all side of the PCB. Allow 5mm clearance above the highest parts on the PCB. Be especially careful to allow 5mm between the solder side of the PCB and the mounting surface. If the clearances are not sufficient the specifications for isolation and withstand will not be valid.

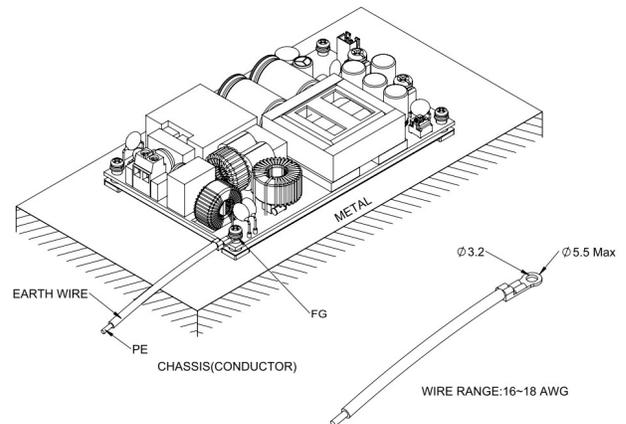


LFM420MXXXB Installation Diagram



LFM420MXXXC Installation Diagram

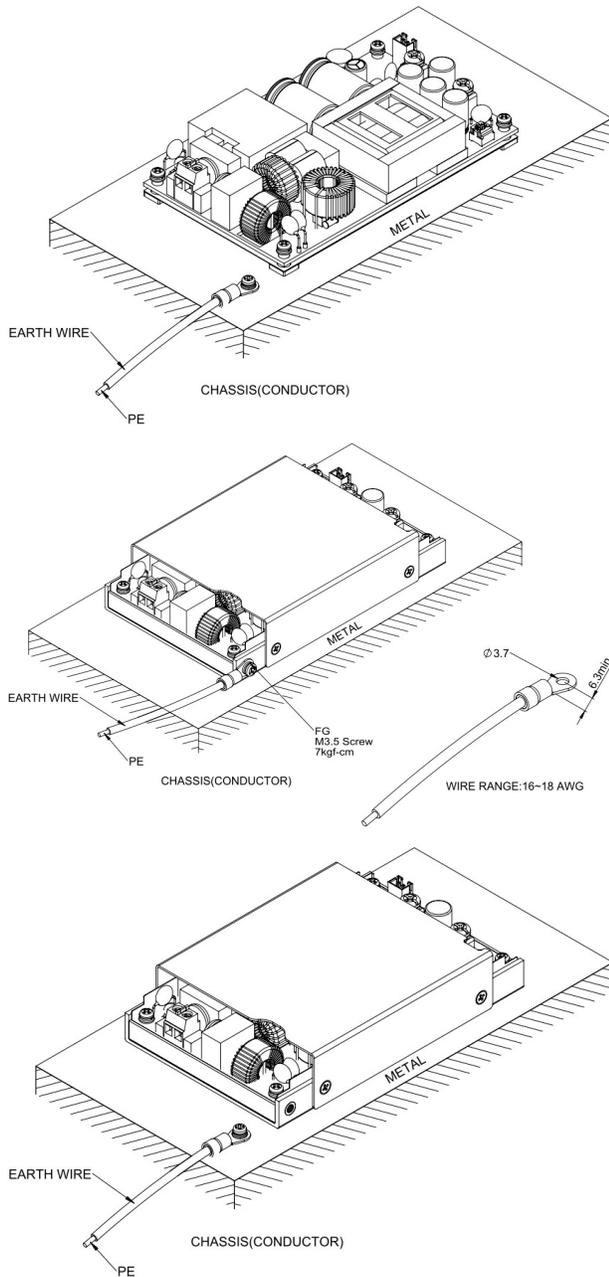
FG should be connected to the earth (ground) terminal of the apparatus. If not the conducted noise and output noise will increase.





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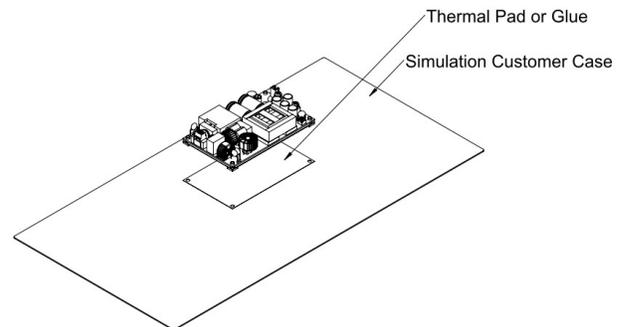
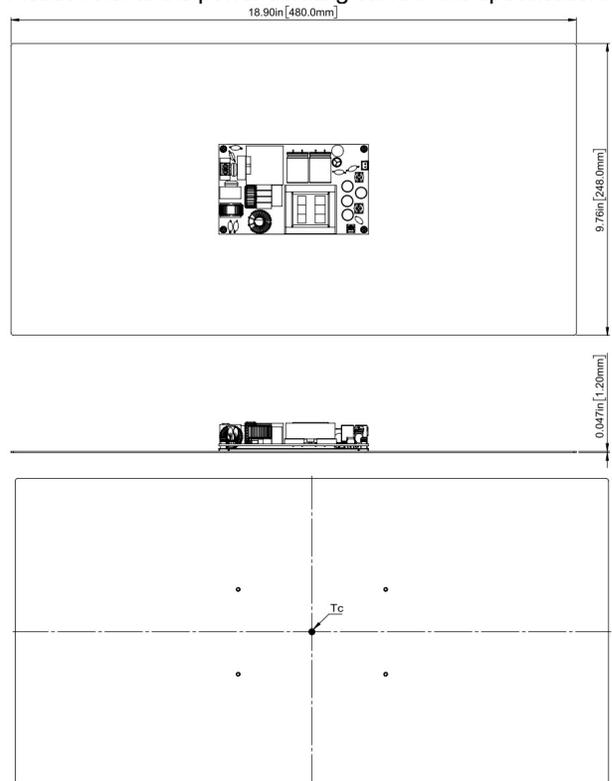


4.4 External Baseplate Cooling

The LFM420M series provide the baseplate cooling for customer to increasing heat dissipation. For example, adding a 480mmx248mmx1.2mm heatsink at the bottom of LFM420M, between the heatsink and LFM420M with thermal grease better than 1.6 W/m.K or thermal pad (PMP-P-400) to help heating ability. If customer choose the other heatsinks make sure T_c point of LFM420M under 85°C.

Please refer to the following figure for installation. When the LFM420M series uses an external baseplate cooling solution, it can be used at 350W.

Please refer to the power derating curve in the specification.

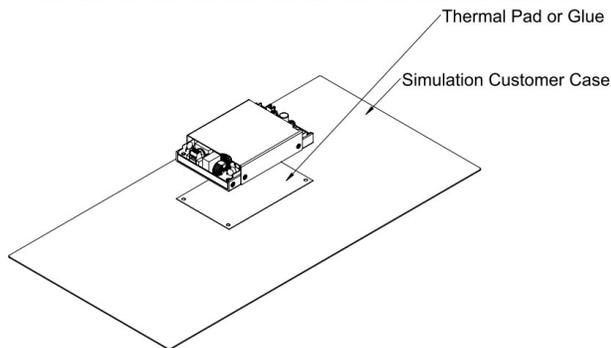
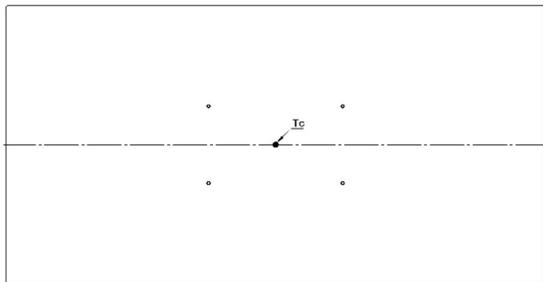
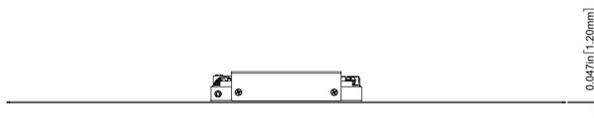
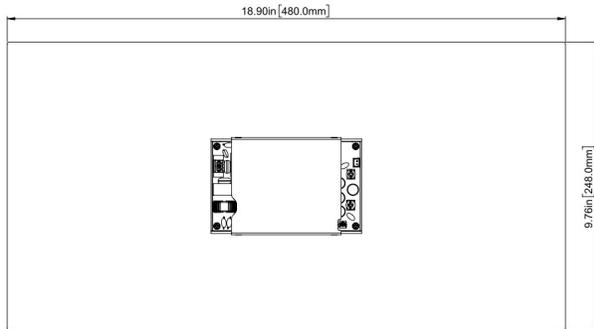


Thermal Pad: PMP-P-400 (P/N:G61236RC404)



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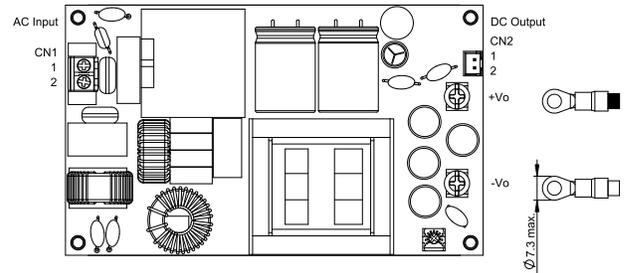


Thermal Pad: PMP-P-400 (P/N:G61236RC404)

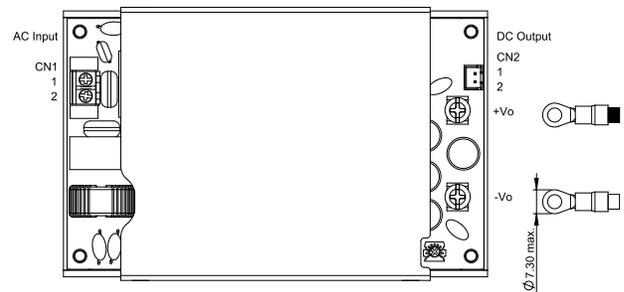
4.5 EMI Test

The LFM420M series Conductive EMI meets EN55011, FCC Part 18 Class B when test condition is Class I.

4.6 Mating Connectors



LFM420MXXXB Installation Diagram



LFM420MXXXC Installation Diagram

AC Input Connector(CN1):ECE ETB22

Pin	Function	Mating Wire Range
1	ACL	14~18 AWG
2	ACN	

DC Output Connector:KANG YANG PCB-58M4

Function	The screw locked torque
+Vo	M4 7kgf-cm
-Vo	

DC Output Connector(CN2):TKP 8822-02-NHB or equivalent

Pin	Function	Mating Housing	Terminal
1	Rs+	JST XHP-2 or equivalent	JST
2	Rs-		SXH-001T-P0.6N or equivalent



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4.7 Output Remote Sensing

The LFM420M series converter has the capability to remotely sense both lines of its output. This feature moves the effective output voltage regulation point from the output of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of the LFM420M series in order to compensate for voltage drops in distribution and maintain a regulated voltage at the point of load. The remote-sense voltage range is:

$$[(+V_{out}) - (-V_{out})] - [(Rs+) - (Rs-)] \leq 0.5V$$

A Remote Sensing is provided in CN2. This is shown in the schematic as below. Remote sense and constant current functions cannot be used at the same time.



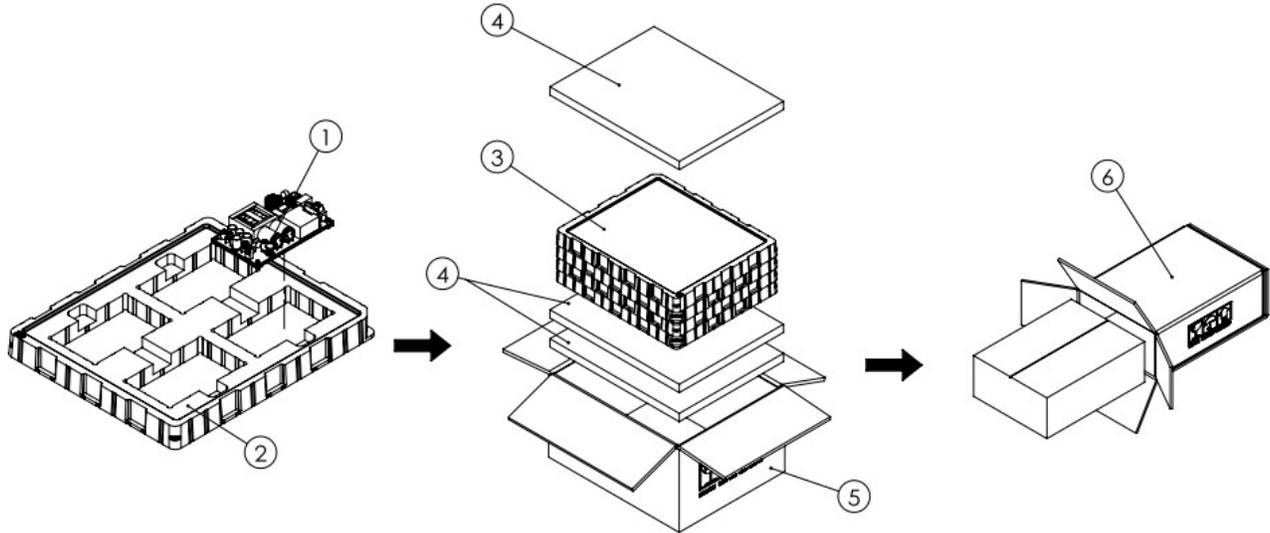


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5. Packing Information

The packing information for LFM420MXXXB series is showing as follows:



ITEM	PART NO.	NAME	OUTSIDE DIM(mm)	PCS
1	-	LFM420MXXXB Product	127x76.2x25.4	16
2	G64G20136	Antistatic Plastic blister	338.4x283.4x32	4
3	G64G20138	Antistatic Plastic blister	340x285x32.6	4
4	G64301087	Antistatic Foma	360x290x20	3
5	G64211308	No.114 Inner Cardboard Box	364x294x200	1
6	G64114293	No.114 Cardboard Box	400x320x225	1

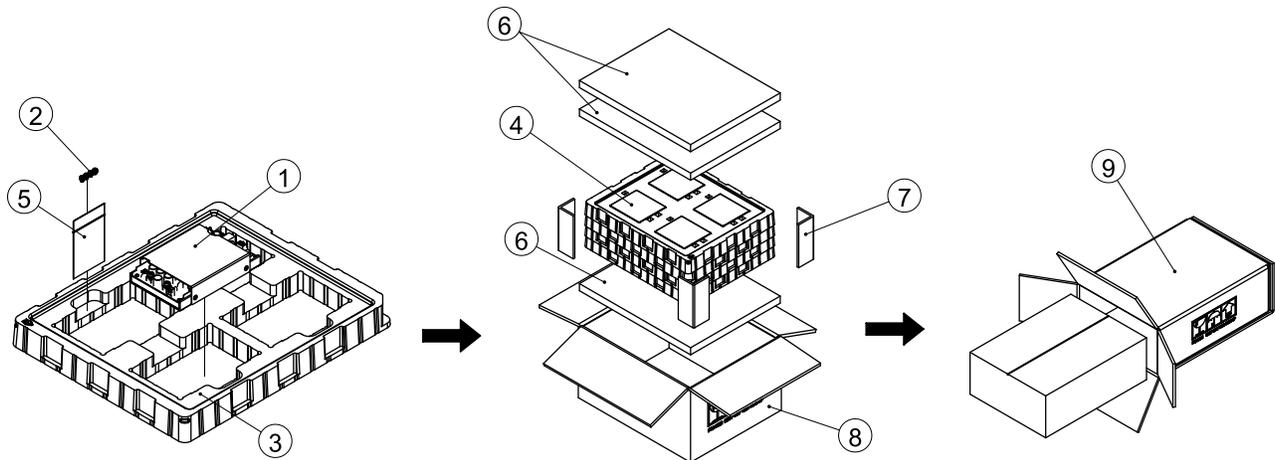
Each Box Packaging 16 PCS Products
Gross weight Ref. 7.5 Kg



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The packing information for LFM420MXXXC series is showing as follows:



ITEM	PART NO.	NAME	OUTSIDE DIM(mm)	PCS
1	-	LFM420MXXXC Product	129.4x83.5x25.4	16
2	G75V2200000	Screw	M3.5x0.6	16
3	G64G20169	Antistatic Plastic blister	338.4x283.4x34.2	4
4	G64G20153	Antistatic Plastic blister	340x285x35	4
5	GT4101	Zipper Bag	70x50x0.04	4
6	G64301087	Antistatic Foma	360x290x20	3
7	GDGT13903	Paper Angle Bead	120x50x50	4
8	G64211308	No.114 Inner Cardboard Box	364x294x200	1
9	G64114293	No.114 Cardboard Box	400x320x225	1

Each Box Packaging 16 PCS Products
Gross weight Ref. 9.8 Kg

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