PMA SERIES USER MANUAL

PMA0050 PMA0060 PMA0080B PMA0080F PMA0105B PMA0105F

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VER: V2.10

CONTENT

1 About the manual

1.1 Preface

- This manual serves as the exclusive instruction guide for the PMA series modular energy storage converter provided by Shenzhen Megarevo Technology Co., Ltd. It includes detailed product information, installation instructions, operational guidelines, maintenance procedures, and troubleshooting tips. Before installation and setup, users are supposed to thoroughly read all information in this manual and familiarize themselves with the relevant safety symbols.
- Readers are expected to possess a foundational understanding of electrical theory, electrical wiring, and professional mechanical knowledge. Before installation, please read this manual carefully and ensure that the relevant personnel can easily access and use manual.
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1.2 Identifier explanation

In order to ensure the safety of users and their property while using this product, as well as to facilitate its proper use, relevant information is provided in the manual, with appropriate identifiers highlighted for clarity. This manual outlines the identifiers presented in the table below, each serving distinct purposes. Various identifiers can be used in combination.

Table 1-1 Identifier explanation

Identifier	Identifier Explanation
	Warning: Warning identifier to pay attention to.
	Hazard: Risk of electric shock, which can result in personal injury.
	Hazard: High risk. Special attention.

Identifier	Identifier Explanation
CE	CE certification.
	European recycling WEEE.
	Reference manual for details.
	Warning mark, which needs to be noticed.
	Risk of burning, which can result in personal injury.
	Risk of electric shock, which can result in personal injury.
 	The energy stored in capacitors presents a risk of electric shock. Maintenance should only be performed after all power supplies have been turned off for at least 5 minutes.

2 Safety instructions

2.1 General safety instructions

- Only professional electricians or qualified personnel are permitted to perform operations on this product.
- Strictly follow the instructions in the manual when installing the converter, otherwise it may lead to equipment damage or safety risks for the operators.


WARNING

- Operators should be thoroughly familiar with this manual *PMA series energy storage converter user manual.*
- Operators should be thoroughly familiar with and perform operations based on the relevant standards in the country or region where the project is located.
- Power conversion systems should be installed in restricted access areas, which are accessible only to qualified electrical professionals and individuals with proper authorization.

2.2 Electrical safety

- Ensure the converter is grounded well and complies with the local electrical code, otherwise it may lead to safety risks for the operators.
- There is a lethal high voltage between the positive and negative poles of the battery connected to the converter. Without protective measures or confirming voltage on the converter's DC port, please avoid direct contact with its ports and terminals that have a direct electrical connection to avoid personal injury. Please set up a clear warning sign and implement protective measures if necessary!


HAZARD

- There is a dangerous voltage inside the converter during its operation! Do not remove the internal cover of the converter without authorization or permission, as this may cause equipment damage or personal injury!
- Before starting any operations, please wait at least 5 minutes after the converter has been completely powered down due to energy storage components inside it.

2.3 Maintenance or overhaul regulation

The following should be observed when performing maintenance or overhaul operations on the equipment:


HAZARD

- Set up the maintenance sign and ensure that the converter will not be accidentally re-powered.
- Using a multimeter to measure inside the energy storage converter and ensure that the discharge is complete.
- Ensure the equipment grounded well.


HAZARD

- The electric components must be covered with insulating materials.
- Please wait at least 5 minutes after the converter has been completely powered down and disconnect both AC and DC power sources before starting any maintenance or overhaul operations.
- Ensure that the escape ways are completely unblocked during maintenance and overhaul.

- This manual cannot take into account all possible situations during operating, maintenance and overhaul. If you encounter a situation that is not addressed in the manual occurs, please contact Shenzhen Megarevo Technology Co., Ltd.

3 Product introduction

3.1 Introduction of the converter

3.1.1 Product model

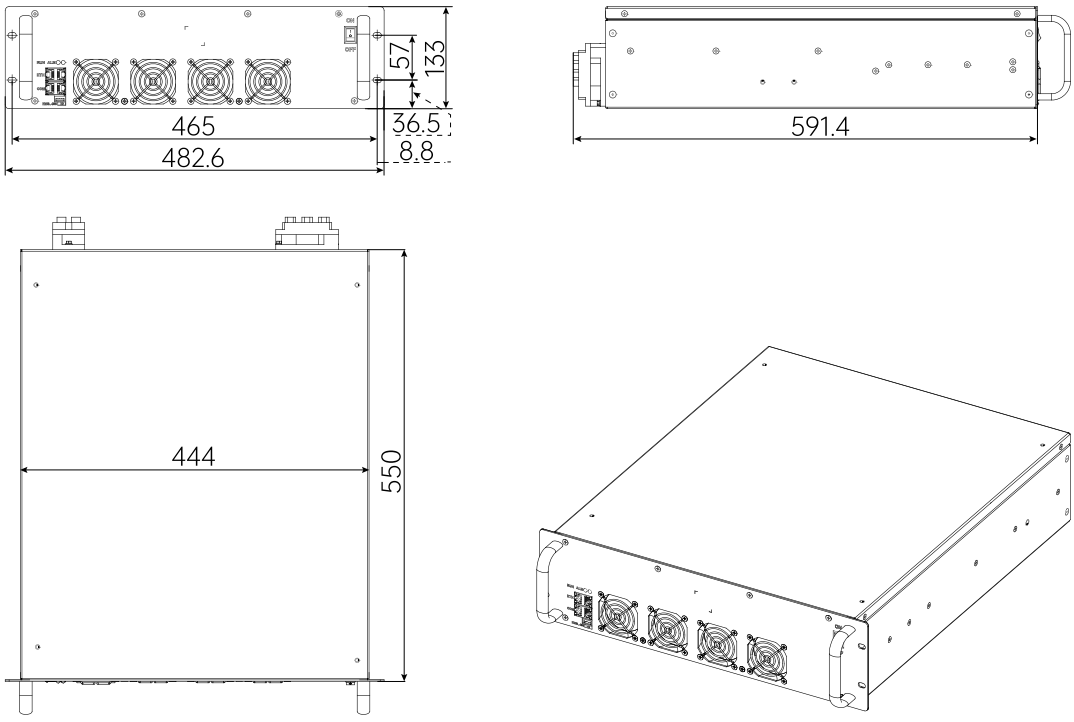
PM A 0050 □-□-□

- PM: Power module.
- A: DC/AC single-stage convert.
- 50: 50kW; 60: 62.5kW; 80: 80kW; 105: 105kW; 125: 125kW.
- B: Back wiring (Power ports are located at the rear of the model); F: Front wiring.
- □ : Standard model; E: Integrated with energy management system.
- □ : Standard model; H: Integrated with high-voltage battery cabinet.

3.1.2 50KW, 62.5KW module size

PMA0050/PMA0060 in a three-view format is presented in the following picture: (unit: mm).

Figure 3-1 PMA0050/PMA0060 converter three-view



3.1.3 80KW, 105KW module size

PMA0080B/PMA0105B, PMA0080F/PMA0105F in a three-view format is presented in the following picture: (unit: mm).

Figure 3-2 PMA0080B/PMA0150B converter three-view

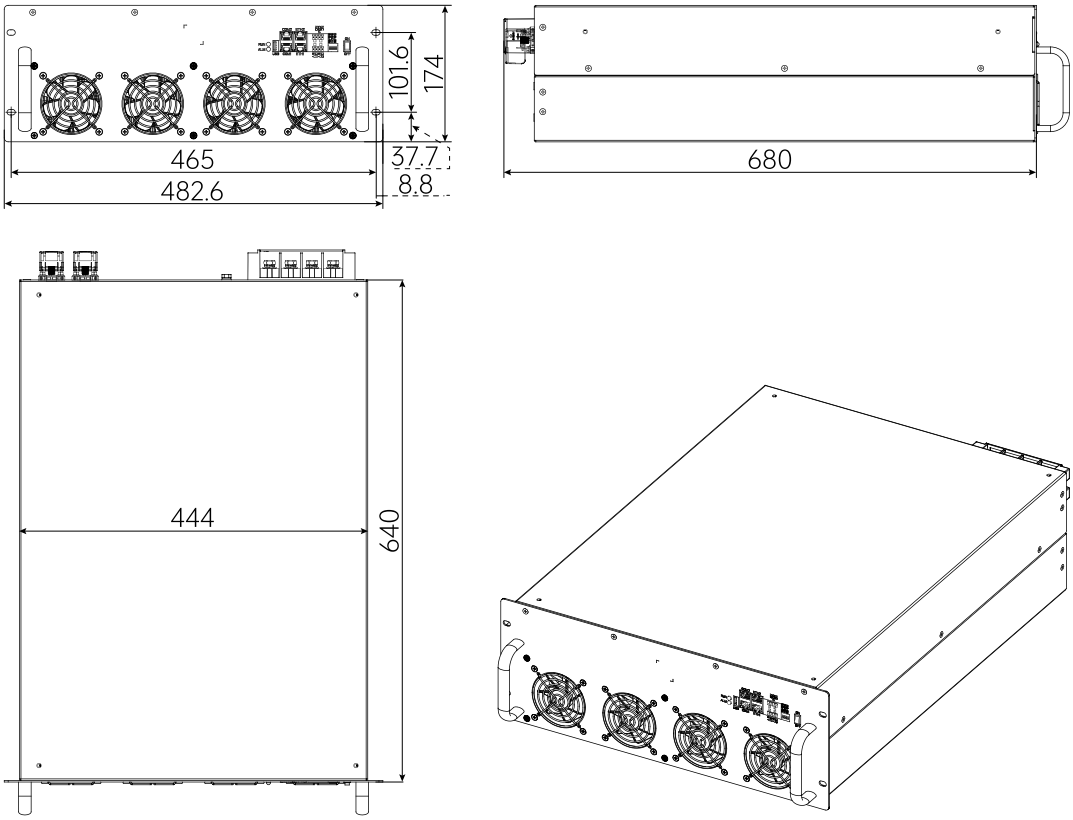
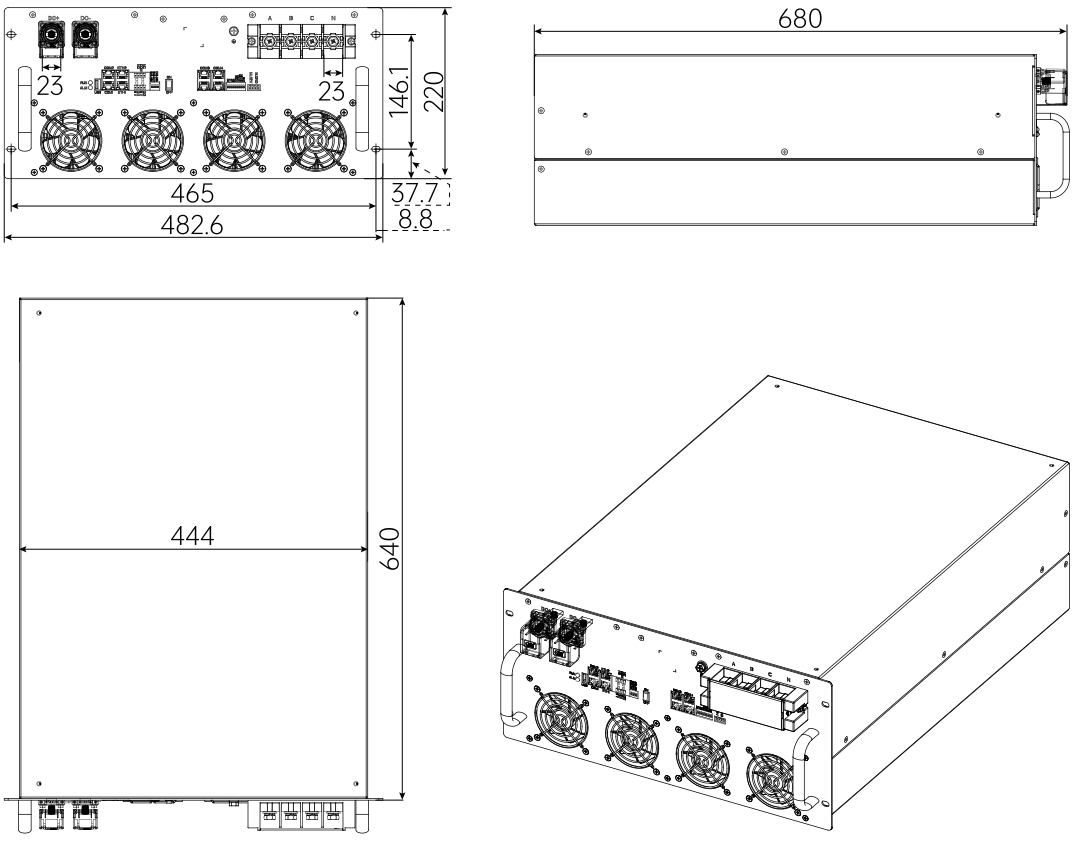


Figure 3-3 PMA0080F/PMA0150F converter three-view



3.1.4 PCS module appearance

Figure 3-4 PMA0050/PMA0060 converter appearance

Figure 3-5 PMA0080B/PMA0150B converter (back wiring type) appearance

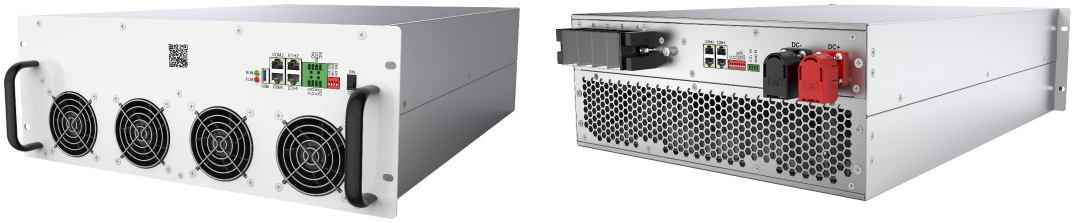


Figure 3-6 PMA0080F/PMA0150F converter (front wiring type) appearance

Num.	Name
1	LED Indicators (RUN, ALM)
2	Handle
3	4P AC port (A, B, C, N)
4	Positive battery port (DC+)
5	Negative battery port (DC-)
6	PCS communication port area
7	PCS parallel port area

3.1.5 Product features

- Adopt three-level topology and supports a wide charge/discharge voltage range when multiple units operate paralleled.
- Adopt mid-point balancing technology and support adjusting DC components and low-frequency pulsating currents on the bypass bus, leading to a longer lifespan of the battery and improved imbalance and non-linear adaptability.
- Support local on-site recording of power fault waves and storing waveforms 100ms before and after the fault is triggered. With 32 recording channels, it allows for the continuous storage of multiple groups of recorded data.
- Compatible with various types of batteries including lithium-ion, lead-acid, and DC bus systems.
- Equipped with SPD, ISO GFCI monitoring functions, and multiple safety protections linked with smart electrical protection.
- Adopts standard rack-mount module design, which facilitates flexible configuration, simplifies maintenance, and allows for convenient expansion.

3.1.6 Product topology

Figure 3-7 PCS main circuit topology - (a) 3W+PE

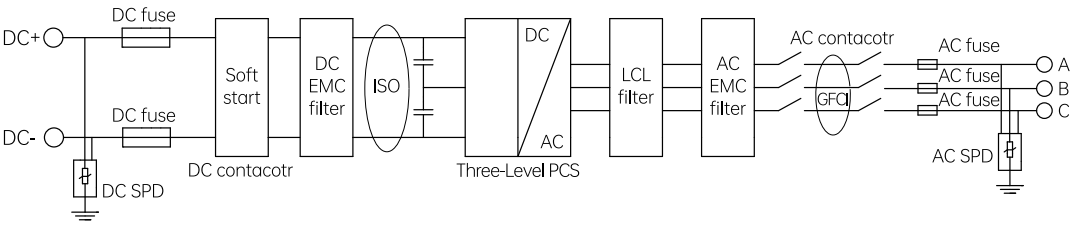
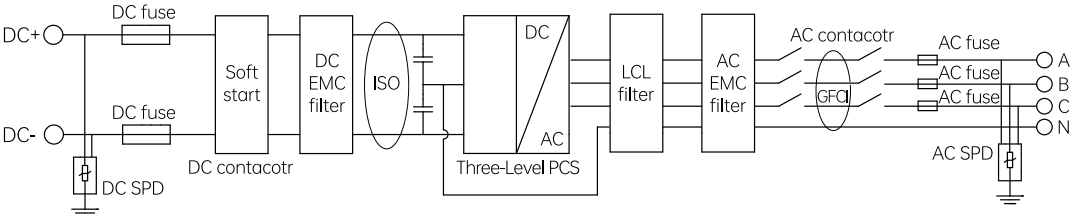


Figure 3-8 PCS main circuit topology - (b) 3W+N+PE



3.2 Work mode description

3.2.1 On-grid mode

Every model of the PMA series energy storage converter supports on-grid operations. In on-grid mode, the energy storage converter could perform charge or discharge function.

- 1. Charge mode: Constant voltage, constant current, constant power.
- 2. Discharge mode: Constant voltage, constant current, constant power.
- 3. Standby mode: inactive but ready to accept startup commands at any time.

3.2.2 Off-grid mode

Every model of the PMA series energy storage converter supports off-grid operations. These settings can be configured through the master computer or the monitor screen of the converter. When set to this mode, the converter supplies AC power with constant voltage and frequency to the load.

When battery storage system works off-grid, there are some limitations on the application scenarios:

- In the case that the AC outputs of the multiple converter modules are paralleled, please contact Shenzhen Megarevo Technology Co., Ltd.
- Resistance-type loads power < power conversion system (PCS) rated power.
- RCD (resistor,capacitor,diode) type loads power < 60% of the converter module apparent power. If RCD (resistor,capacitor,diode) type loads exited, please contact Shenzhen Megarevo Technology Co., Ltd for the converter capacity.
- For motor loads equipped with variable frequency drives (VFDs), the load power < 60% of a single power conversion system (PCS) module.
- For motor loads without variable frequency drives (VFDs), please contact Shenzhen Megarevo Technology Co., Ltd for the power conversion system (PCS) capacity.

The size of the motor-type loads carried by the converter should be determined based on the actual loads in application after contact with Megarevo's engineers.

* **Note: For now, the PMA series converter does not support auto switching between on-grid and off-grid. After powering off the converter, you can manually switch it using the master computer or the monitor screen.**

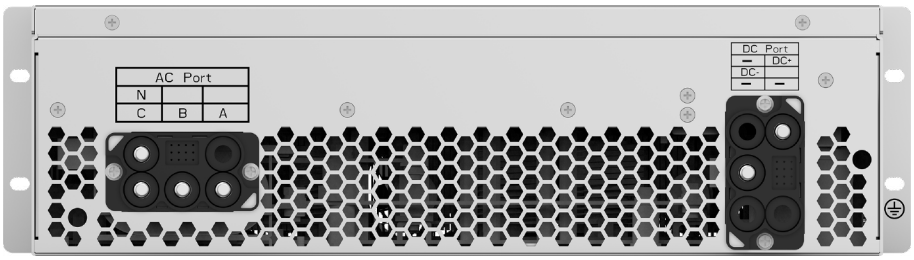
3.3 Port description

3.3.1 50KW, 62.5KW power port description

- PMA0050/PMA0060 converter power ports are at the back of the module with specification shown on Figure 3-9.
- DC Power Port: Connect the positive and negative terminals of the DC source to the accompanying DC terminal block DL17Z-5 on the right side of the module. The module's DC port, arranged from top to bottom, consists of DC+ and DC-.

- AC Power Port: Connect the grid's three phases, labeled A, B, and C, to the corresponding AC terminal block DL17Z-5 located on the left side of the module. The module's AC port, arranged from right to left, consists of phases A, B, and C, with the upper port of phase C serving as the neutral (N) line connection.

Figure 3-9 PMA0050/PMA0060 converter DC port



- 1. The phase sequence of the grid must be connected according to the phase sequence on the AC side of the module.
- 2. For a single module system: The A, B, C phase of the grid should be connected to the module with N phase (neutral line) port left unconnected.
- 3. For a multi-module system:

  When batteries are jointly connected, the N phase cables of each module should be combined without connecting to the grid's N phase.

  When batteries are separately connected to the models, the N lines between modules should be left unconnected without connecting to the grid's N line.

3.3.2 50KW, 62.5KW signal port description

- PMA0050/PMA0060 converter signal ports are at the front of the module. The signal ports consist of READY switch, indicators, USB, COM port and EMS_485 communication DIP switch with specification shown on Figure 3-10.

Figure 3-10 PMA0050/PMA0060 converter signal port

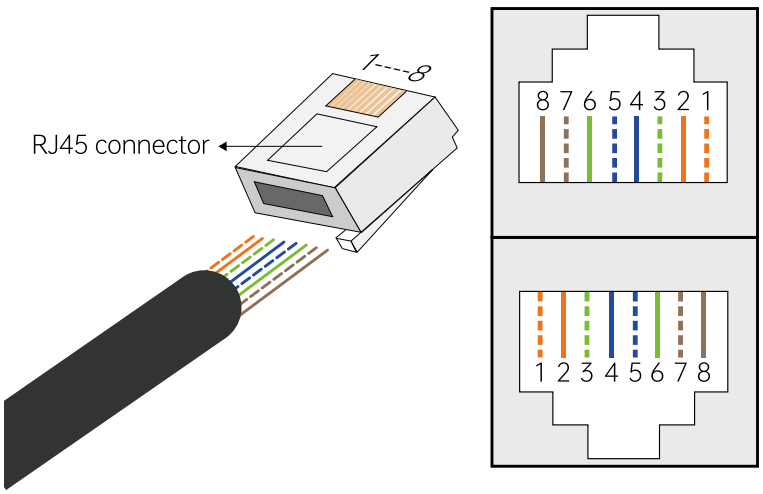
READY switch		
Num.	Label	Function Description
1	ON	Confirm position: Modules are correctly connected to the cabinets.
2	OFF	Initial position: Modules have not been connected to the cabinets.

Indicators			
Num.	LED	State	Description
1	RUN (Grean)	Keep on	Module operates normally.
		Flashing	Module standbys or startup.
2	ALM (Red)	Keep on	Module failure alarm.
Note: If both the red and green LEDs are keep on, the module is undergoing software upgrading.			

EMS_485 communication DIP switch	
Label	Description
EMS_485	EMS_485 communication matching resistance DIP switch.

- The COM port consists of RJ45 dual network connector. The COM port also serves the EMS communication port for external communicates. When multiple modules operates in parallel, the COM ports of each module should be connected to the COM ports of another module using parallel communication cables. The definitions of each pin are as follows (the definitions for the two COM ports are the same):

Figure 3-11 Communication port - COM port usage description



COM (COM1/COM2) port pin definition		
Pin	Label	Description
1	BMS_CANH	BMS_CANH
2	BMS_CANL	BMS_CANL
3	BAT_FAULT	Battery failure signal
4	BMS_485A	BMS_485A
5	BMS_485B	BMS_485B
6	GND_COM	Signal ground
7	EMS_485A	EMS_485A
8	EMS_485B	EMS_485B

* **Note: When communicating with the master computer, please use a TIA/EIA-568-B standard network line and connect its pin 7 (brown and white) and pin 8 (brown) to the T/R+ and T/R- ports of the USB-to-RS-485 serial port converter. During communication, the network port side should connect to the converter's signal port (COM1/COM2) and the USB side should connect to the computer.**

Definition of each pin on the ETH port		
Pin	Label	Description
1	NET_TX+	Transmit End+
2	NET_TX-	Transmit End-
3	NET_RX+	Receive End+
4	PE	Signal grounding
5	PE	Signal grounding
6	NET_RX-	Receive End-
7	PE	Signal grounding
8	PE	Signal grounding

3.3.3 80KW, 105KW power port description

(1) Back wiring type

- PMA0080B/PMA0105B converter power ports are at the back of the module with specification shown on Figure 3-12.
- DC Power Port: Use M6 screw for fixing the cables when connecting. The module's DC port, arranged from right to left, consists of DC+ and DC-.
- AC Power Port: Use M8 screw for fixing the cables when connecting. The module's AC port, arranged from right to left, consists of phases A, B, C and N.

Figure 3-12 PMA0080B/PMA0105B converter power port

(2) Front wiring type

- PMA0080F/PMA0105F converter (front wiring) power ports are at the front of the module with specifications shown on Figure 3-13.
- DC Power Port: Use M6 screw for fixing the cables when connecting. The module's DC port, arranged from right to left, consists of DC- and DC+.
- AC Power Port: Use M8 screw for fixing the cables when connecting. The module's AC port, arranged from right to left, consists of phases N, C, B and A.

Figure 3-13 PMA0080F/PMA0105F converter power port

- 1. The phase sequence of the grid must be connected according to the phase sequence on the AC side of the module.
- 2. For a single module system: The A, B, C phase of the grid should be connected to the module with N phase (neutral line) port left unconnected.
- 3. For a multi-module system:

  When batteries are jointly connected, the N phase cables of each module should be combined without connecting to the grid's N phase.

  When batteries are separately connected to the models, the N lines between modules should be left unconnected without connecting to the grid's N line.

3.3.4 80KW, 105KW signal port description

(1) Back wiring type

- PMA0080B/PMA0105B converter signal ports are at the front of the module. The signal ports consist of indicators, USB, COM ports, communication DIP switch and READY switch with specification shown on Figure 3-14.

The definitions for the READY switch, status indicator lights, USB, and COM ports are consistent with those of the PMA0050/PMA0060. Please refer to section 3.3.2 for specifics.

Figure 3-14 PMA0080B/PMA0105B converter signal interface

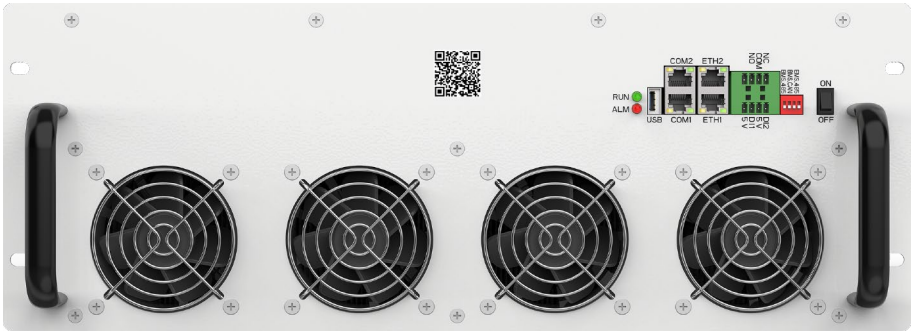
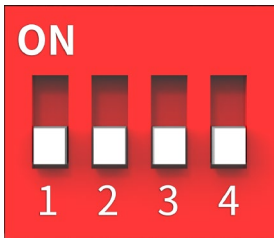


Figure 3-15 DIP switch



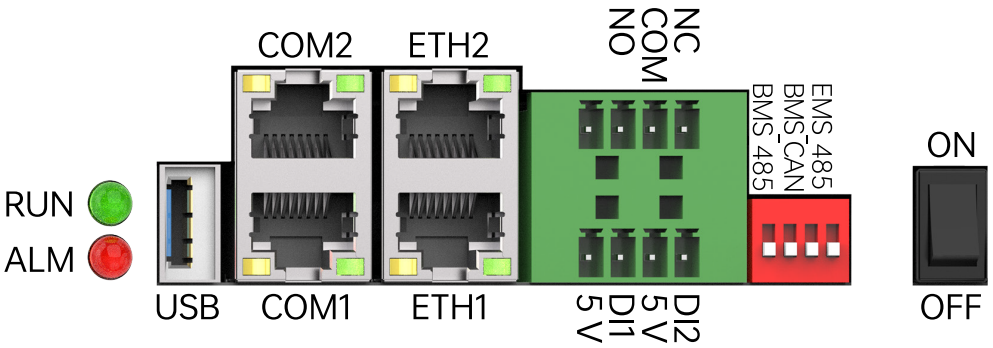
- Each key on the DIP switch has two pins on its backside. Dial towards the "ON" for open and the opposite direction for closed.

DIP switch		
Pin	**Label**	**Description**
1	BMS_485	EMS_485 matching resistance dial
2	BMS_CAN	BMS_CAN matching resistance dial
3	EMS_485	EMS_485 matching resistance dial
4	Reserve	Reserve

(2) Front wiring type

- PMA0080F/PMA0105F converter communication ports are at the front of the module. Their composition and functions of each component are consistent with the back wiring type. For details, please refer to section 3.3.4 - (1).

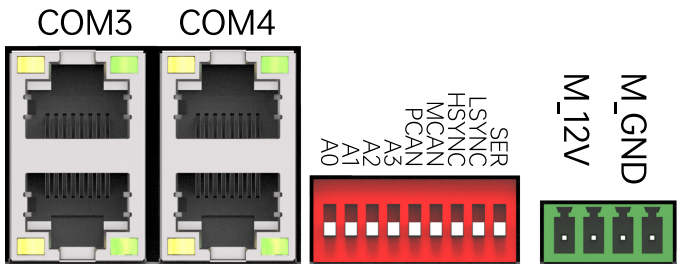
Figure 3-16 PMA0080F/PMA0105F converter signal port



3.3.5 Parallel port description

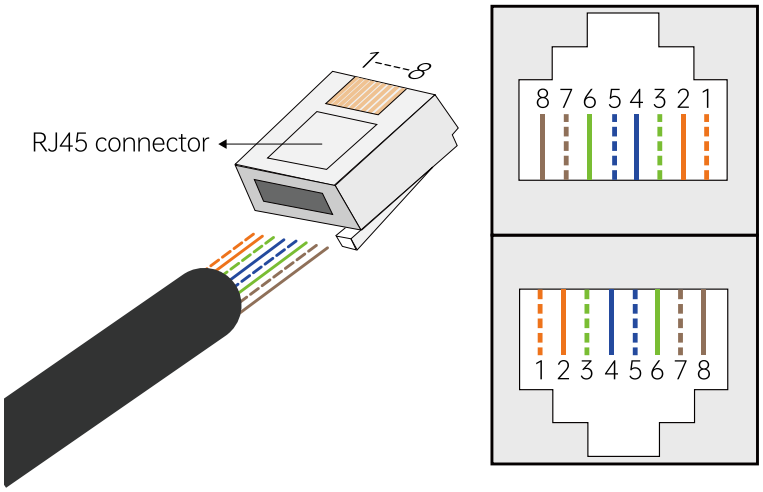
- PMA0080B/PMA0105B converter parallel ports are at the back of the module. PMA0080F/PMA0105F converter parallel ports are at the front of the module. The parallel port of the two types of modules is consisted of 2 RJ45 dual network connectors (COM3, COM4), DIP switch and monitor power ports, with specification shown on Figure 3-17.

Figure 3-17 80KW, 105KW parallel port



(1) Parallel communication port

Figure 3-18 Dual network connector



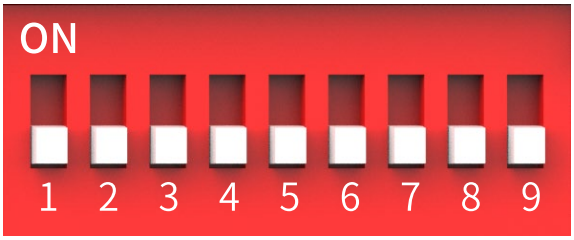
- The definitions of the two network ports in the same dual network connector are consistent. Their wiring method adheres to the TIA/EIA-568-B standard. The definition of each pin is shown below:

COM3 dual network port terminal			
Pin	**Label**	**Description**	**Color**
1	POWER_CAN_H	Parallel Communication_H	Orange and white
2	POWER _CAN_L	Parallel Communication_L	Orange
3	COM_GND	COM_GND	Green and white
4	EPO+	Emergency power outage_H	Blue
5	EPO-	Emergency power outage_L	Blue and white
6	COM_GND	COM_GND	Green
7	MONITOR_CAN_H	MONITOR Communication_H	Brown and white
8	MONITOR_CAN_L	MONITOR Communication_L	Brown

* **Note: when you communicate using the monitor screen, please use network line adheres to the TIA/EIA568B standard and connect its pin 7 (brown and white) to the CAN1/H port and pin 8 (brown) to the CAN1/L port of the monitor. For communication, the cable should be connected to the COM3 parallel port of the converter with its the network port and to the monitor screen on the other end.**

COM4 dual network port terminal		
Pin	Label	Description
1	Carrier_sync_H	High-Frequency synchronization H
2	Carrier_sync_L	High-Frequency synchronization L
3	COM_GND	COM_GND
4	Sync_H	Low-Frequency synchronization H
5	Sync_L	Low-Frequency synchronization L
6	COM_GND	COM_GND
7	SER_H	Low-Frequency Discrete H
8	SER_L	Low-Frequency Discrete L

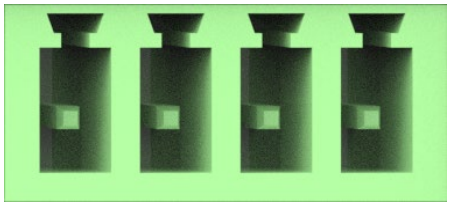
Figure 3-19 9pin DIP switch



- The definition of each pin on the DIP switch is shown below:

DIP switch BMS EMS communication port		
Pin	Label	Description
1	A0	Parallel address dial bit0
2	A1	Parallel address dial bit1
3	A2	Parallel address dial bit2
4	A3	Parallel address dial bit2
5	PCAN	Parallel PCAN matching resistance DIP switch
6	MCAN	Parallel MCAN matching resistance DIP switch
7	HSYNC	Parallel HSYNC matching resistance DIP switch
8	LSYNC	Parallel LSYNC matching resistance DIP switch
9	SER	Parallel SER matching resistance DIP switch

Figure 3-20 Monitor power port



- Definition of each pin on the monitor power port is shown below:

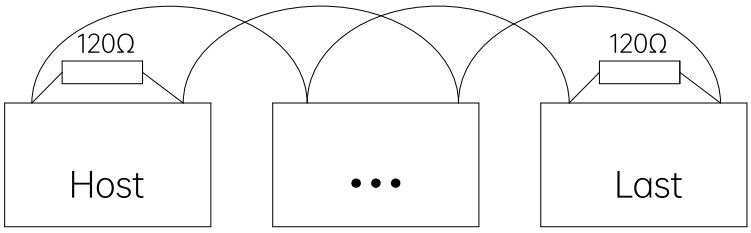
Monitor power port		
Pin	Label	Description
1	M_12V	monitor_12V
2	M_GND	monitor_GND
3	M_12V	monitor_12V
4	M_GND	monitor_GND

(2) Parallel procedure

1. Monitor control

When more than 2 modules run in parallel, the paralleling steps are shown below.

- Step1: connect the COM3 and COM4 from the master module to each module using network line in daisy chain connection. (That is: the COM3 of module 1 connects to the COM3 of module 2. The COM3 of module 2 connects to the COM3 of module 3. The COM4 of module 1 connects to the COM4 of module 2. The COM4 of module 2 connects to the COM4 of module 3. And similarly for other connections.



- Step2: (For specifications, please refer to Figure 3-19.) The first four positions (1, 2, 3, 4) of the DIP switch are address bits. Please set the address according to Table 3-1. For the master module, please set the MCAN (pin 6) matching resistor switch to ON. For the terminal module, set the PCAN and MCAN (pins 5 and 6) matching resistor switches to ON. Additionally, if the DC sides are connected to batteries in parallel, set the HSYNC, LSYNC, and SER (pins 7, 8, 9) matching resistor switches to ON for the master and terminal modules. If the batteries on the DC side are connected separately, set these switches to OFF.

Table 3-1 Parallel address code

Parallel address code				
module code	bit0	Bit1	Bit2	Bit3
1	1	0	0	0
2	0	1	0	0
3	1	1	0	0
4	0	0	1	0
5	1	0	1	0
6	0	1	1	0

* **Note: 4 address bit, using 8421 BCD code, allow for up to 14 module to parallel with 0000 (module0) and 1111 (module15) excluded.**

- Step3: Connect the monitor power port in daisy chain connection starting from the master module. Connect the monitor screen to the master module with network line included in delivery and finish the parallel communication wiring.

2. Master computer control

When 2 modules run in parallel, the paralleling steps are shown below:

- Step1: Connect the COM2 port in daisy chain connection starting from the master module using network line. (That is: the COM2 of module 1 connects to the COM1 of module 2. The COM2 of module 2 connects to the COM1 of module 3. And similarly for other connections) Additionally, if the DC sides are connected to batteries in parallel, Connect the COM3 and COM4 ports in daisy chain connection starting from the master module. And no such procedure is needed if the batteries on the DC side are connected separately.
- Step2: (Refer to Figure 3-19.) The first four positions (1, 2, 3, 4) of the DIP switch are address bits. Please set the address according to Table 3-1. For the master module, please set the PCAN (pin 5) matching resistor switch to ON. Additionally, if the DC sides are connected to batteries in parallel, set the HSYNC, LSYNC, and SER (pins 7, 8, 9) matching resistor switches to ON for the master and terminal modules. If the batteries on the DC side are connected separately, set these switches to OFF.
- Step3: (For specifications, please refer to Figure 3-15.) Set the EMS_485 resistance matching switch (pin 3) on the DIP switch on all modules to ON.
- Step4: Connect the upper computer to the master module using a USB-to-RS-485 serial port converter and finish the parallel communication wiring.

- After completing the parallel procedures, please refer to section 5 for power on/off procedures.

4 Mechanical and electrical installation

- Without disconnecting the switch on the battery side, there is high DC voltage at the PCS DC port which poses safety risks for the operators!
- The insulation of the power cables must be kept intact, with no damage or scratches. Otherwise, it may lead to short circuits and fires!
- Before connecting the PCS, please check and confirm that all the connecting cables are free of hazardous voltages. Additionally, a clear warning sign must be placed near the external power distribution switches to prevent others from accidentally operating them, which leads to safety risks for the operators!
- The converter must be grounded well and comply with the local electrical code, otherwise it may lead to safety risks for the operators!

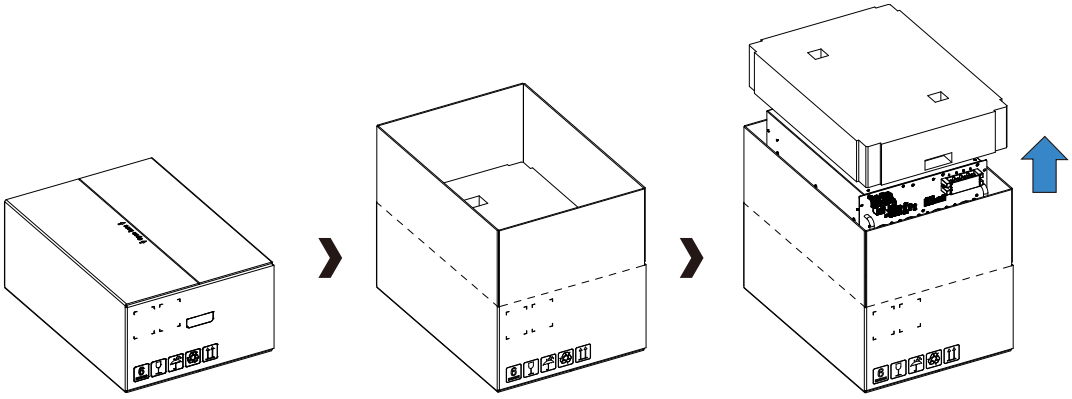
- Before installation, please inspect the module for any damage. If you discover any transportation damage, please contact the shipping company or Shenzhen MagneTek Technology Co., Ltd., and provide photos of the damaged areas.
- Check all included components on the packing list inside the box to ensure they are complete and intact.
- The converter should be stored within a temperature range of -40℃ to 70℃ and a relative humidity range of 0% to 100%, without condensation.

4.1 Transportation and mounting

4.1.1 Transportation and unpacking

- Before transportation, confirm that the PCS packaging is complete and undamaged! If the packaging is damaged, stop all subsequent operations! Contact Shenzhen Megarevo Technology Co.,LTD or the freight carrier.
- The manual transportation of the PCS must be performed by at least two qualified personnel. When unpacking and moving the PCS, maintain balance to prevent the PCS from falling, which could result in injury to personnel or damage to the PCS enclosure and internal components, as well as squeezing or scratching the operators.
- Follow the steps in Figure 4-1 to unpack the module. Place the PCS on a flat surface with cushioning material such as foam or cardboard at the bottom to prevent it from tipping over and causing damage.

Figure 4-1 PCS unpacking steps instruction



4.1.2 Mounting

- The PCS supports horizontal and vertical mounting. Ensure that air duct inlet and air duct outlet are unobstructed to maintain clear airflow.
- For horizontal mounting: Recommend reserving at least 200mm of space in front of the module (fan side) and at least 800mm of space behind the module (wiring terminal side).
- For vertical mounting: Recommend reserving at least 800mm of space below the module (fan side) and 200mm of space above the module (wiring terminal side).

4.1.3 Air duct requirement for single module

Air duct requirement for single PMA module				
Model	PMA0050	PMA0060	PMA0080	PMA0105
Ventilation quantity	≥ 189 CFM	≥ 236 CFM	≥ 303 CFM	≥ 398 CFM
Effective air inlet area	≥ 0.0405m²	≥ 0.0405m²	≥ 0.054m²	≥ 0.054m²

4.1.4 Installation environment requirements

- The PCS should be installed indoors.
- The PCS should be installed in areas with good ventilation to prevent poor heat dissipation, which could affect its performance.
- The PCS generates high temperatures on its surface during operation. Please install it in a location that is not easily accessible and keep it away from children and vulnerable individuals.
- Do not place flammable and explosive materials around the PCS.

- The mounting frame or wall on which the PCS is installed must have fire-resistant properties.
- It is strictly forbidden to pile up sundries in the escape way or occupy the escape way in any form.

4.2 Installation preparation

4.2.1 Packaging inspection

Table 4-1 Delivery checklist

Item	Quantity	Description
Converter	1	All PMA series module
Certificate	1	All PMA series module
Warranty card	1	All PMA series module
Product user manual	1	All PMA series module
Factory inspection report	1	All PMA series module
DC terminal block	1	50kW/62.5kW
AC terminal block	1	50kW/62.5kW
Guide Pin	2	50kW/62.5kW
M6*14 screw	2	80kW/105kW

Table 4-2 Optional accessories list

Item	Quantity	Description
monitor	1	All PMA series module
Monitor cable set for single module	1	All PMA series module

4.2.2 Installation tools and parts

- The tools and parts needed to install the converter are as follows:

Table 4-3 Tool list

Tool	Number
Screwdriver	1
Socket wrench	1
Multimeter	1
Screws, nuts and washers	Some

4.3 Electrical installation guidance

4.3.1 Short-circuit protection device requirements

- To ensure reliable cutoff from the battery side and grid during emergencies, please choose suitable breakers for the PCS. The recommended specifications of breaker are shown in Table 4-4.

Table 4-4 Recommended specifications of breaker

Model capacity	DC output breaker	AC output breaker
50kW	1000Vdc/200A	400Vac/200A
62.5kW	1000Vdc/200A	400Vac/200A
80kW	1000Vdc/300A	400Vac/250A
105kW	1000Vdc/300A	400Vac/250A

4.3.2 Cable requirement

- The external cables of PCS include DC input cables, AC output cables, communication cables and grounding cables. The recommended specifications of the cables are shown in Table 4-5.

Table 4-5 Recommended specifications of cables

Model capacity	AC output (Per phase)	N-phase cable (one PCS)	N-phase cable (Paralleled)	Grounding cable	Positive/negative DC input (Per pole)
50kW	≥ 35mm²×3	/	≥ 35mm²	≥ 16mm²	≥ 50mm²
62.5kW	≥ 50mm²×3	/	≥ 50mm²	≥ 25mm²	≥ 50mm²
80kW	≥ 70mm²×3	/	≥ 70mm²	≥ 35mm²	≥ 70mm²
105kW	≥ 70mm²×3	/	≥ 70mm²	≥ 35mm²	≥ 70mm²

- The cable sizes provided in this table are for reference only. Please choose the cables based on their actual environmental temperature, installation method, heat dissipation conditions, etc.

4.3.3 Wiring requirement instruction

(1) DC wiring procedures

For the DC wiring corresponding relations between the battery and the PMA series converter, please refer to Section 3.3.

For the allowable voltage range of the battery, please refer to the technical parameters table in appendix1. When wiring, follow the cable size recommendations in Table 4-5. The specific steps are as follows:

- Step1: Use multimeter to verify that all the output wiring terminals of the battery have been powered off.
- Step2: Identify and label the positive and negative poles of the cable.
- Step3: Connect the positive and negative poles of the battery pack to the DC terminal block.
- Step4: Connect and secure the wired DC terminal block to the converter.

- Inspect the material of the external terminal connection points. If copper and aluminum materials are being connected, use a dedicated copper-aluminum connector. Do not connect them directly!

(2) AC wiring procedures

For the AC wiring corresponding relations between the battery and the PMA series converter, please refer to Section 3.3.

All models of PMA series have grid connected with specific steps list as follows:

- Step1: Use multimeter to verify that all the output terminal of grid have been powered off.
- Step2: Identify and label the phase sequence. The three-phase AC output cables A, B, and C should be fitted with yellow, green, and red insulating sleeves, respectively, to distinguish the phase sequence.
- Step3: Connect the ABC (UVW) three-phase power from the grid to the AC power inlet.
- Step4: Connect the wired AC power inlet to the converter.

(3) Grounding the system

The enclosure of the PMA series converter should be securely connected to grounding cables. The size of the grounding cables should be chosen according to Table 4-5. The grounding position is beside the AC wiring terminal. The specific steps are as follows:

- Step1: Secure the grounding cable to the connector.
- Step2: Loosen the grounding point screw, and secure the grounding cable to the converter enclosure using the screw.

Figure 4-2 50kW, 62.5kW model grounding

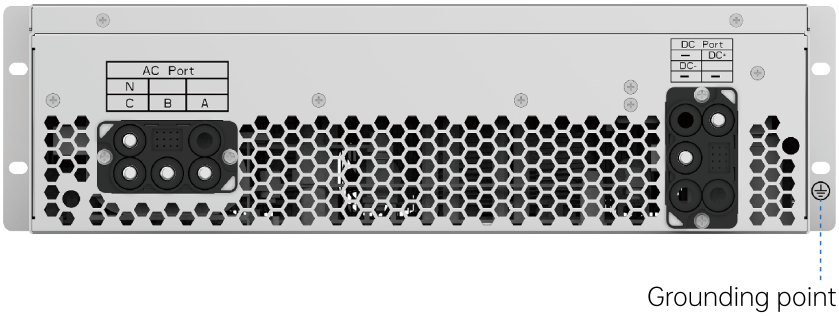
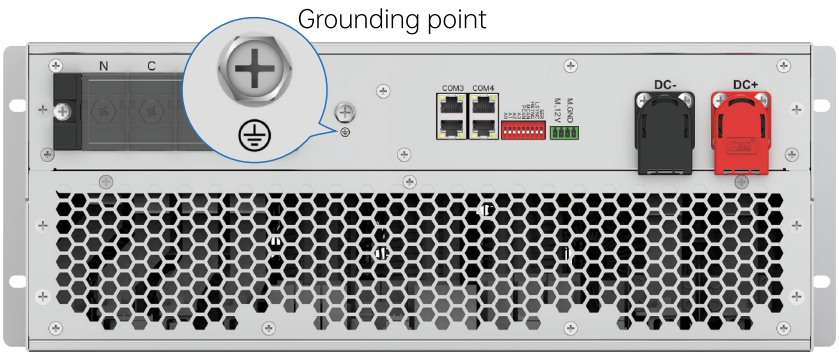
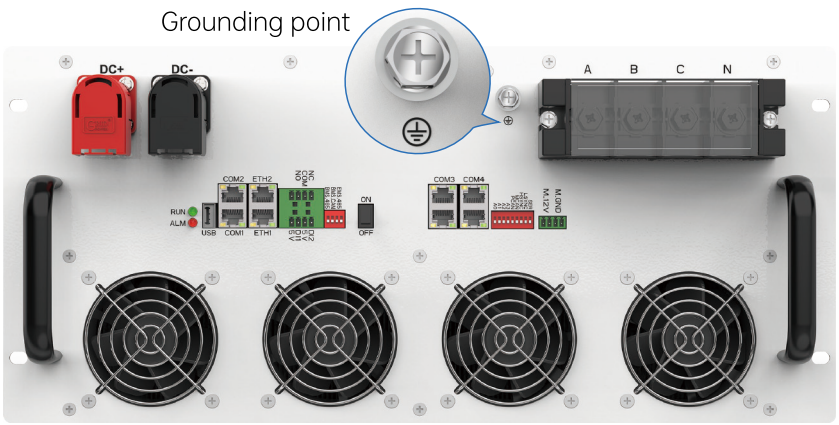


Figure 4-3 80kW, 105kW model grounding





5 Converter procedures

HAZARD

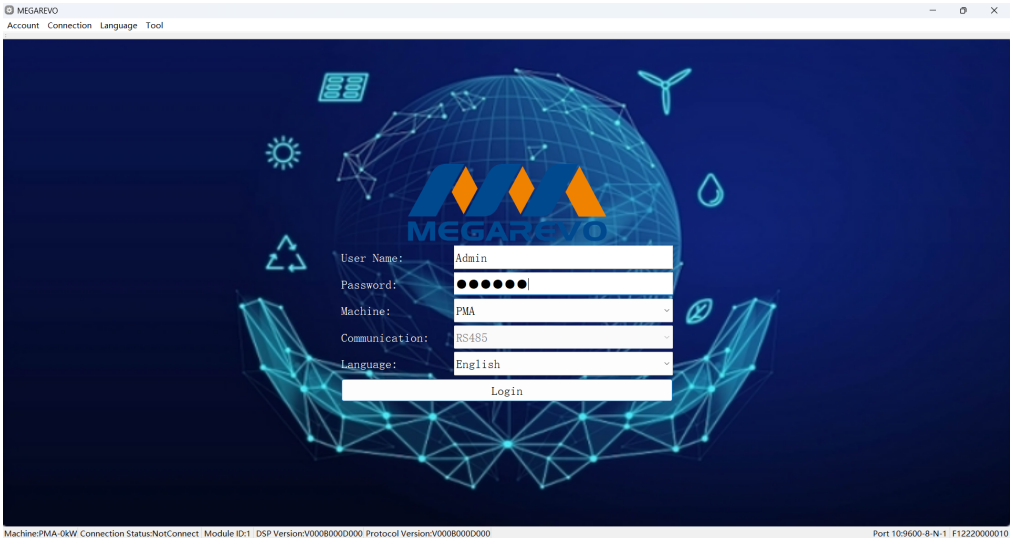
- Non-professional personnel must not open the PCS cover due to high voltage danger!
- There is dangerous voltage inside the PCS during its operation. Please follow the instructions in this manual!
- Only professional electricians or qualified personnel are allowed to carry out all operations on this product!
- Users should determine whether to install a leakage current protection device based on the actual situation.

5.1 Startup procedure

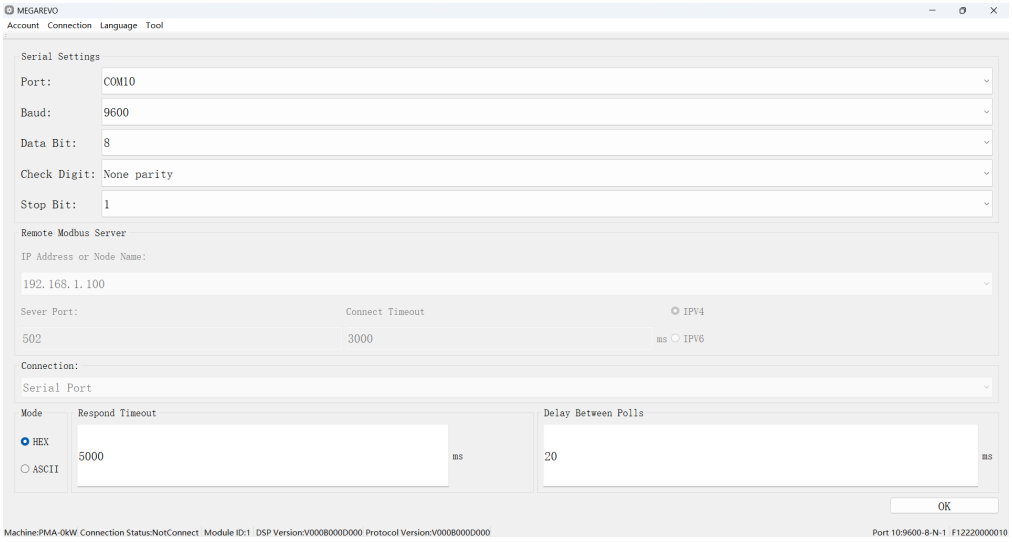
(1) Master computer control

- Step1: Check the DC and AC power cables as well as grounding cables. The DC voltage should be within the connected range.
- Step2: Connect the converter to the computer using a USB-to-RS-485 serial port converter, with specifications shown in section 3.3.2.
- Step3: Close the AC breaker and the DC breaker outside the module.
- Step4: Complete the above steps and then login to PMA.exe. Initial account: Admin, Password: 123456 (You can choose the language in the login interface: Chinese/ English).

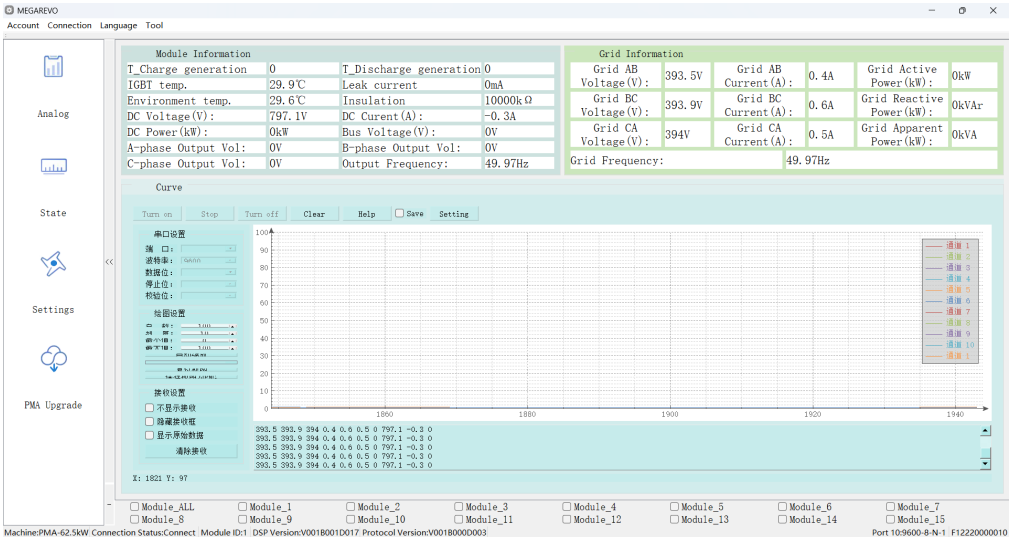
Login:



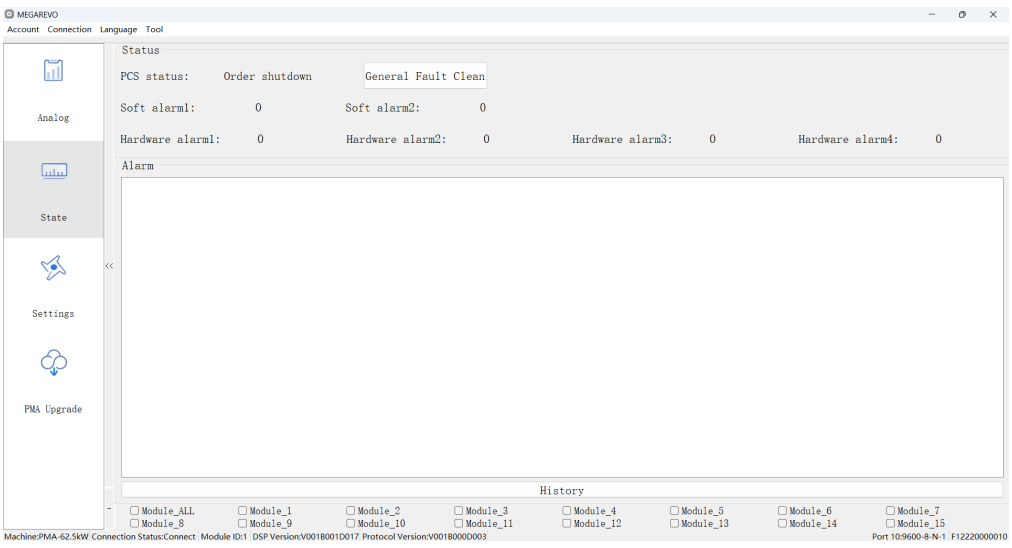
Enter this page and select the connected interface. Set the bit rate to 9600 and click "OK".



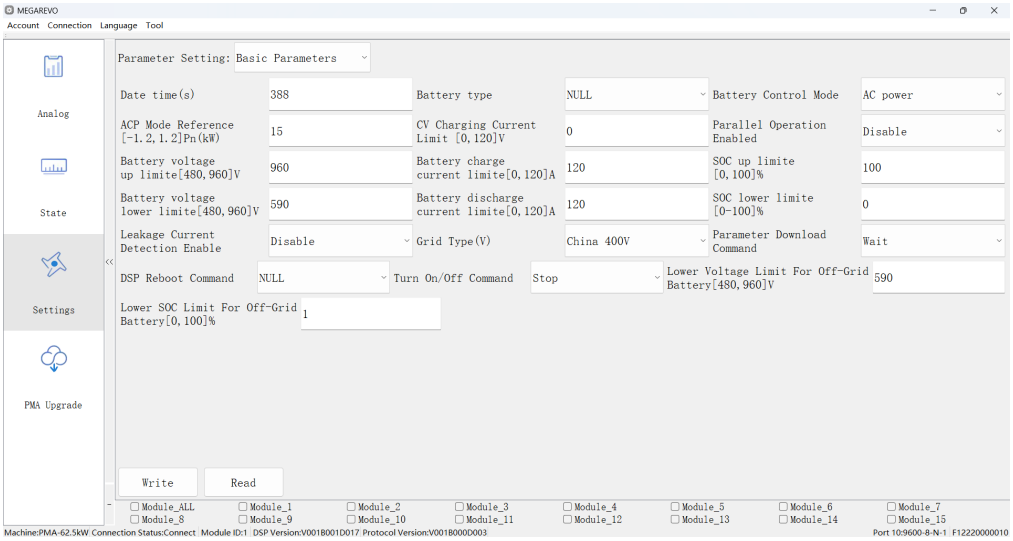
In the 'Analog' page, you can check the converter's operating status and data.



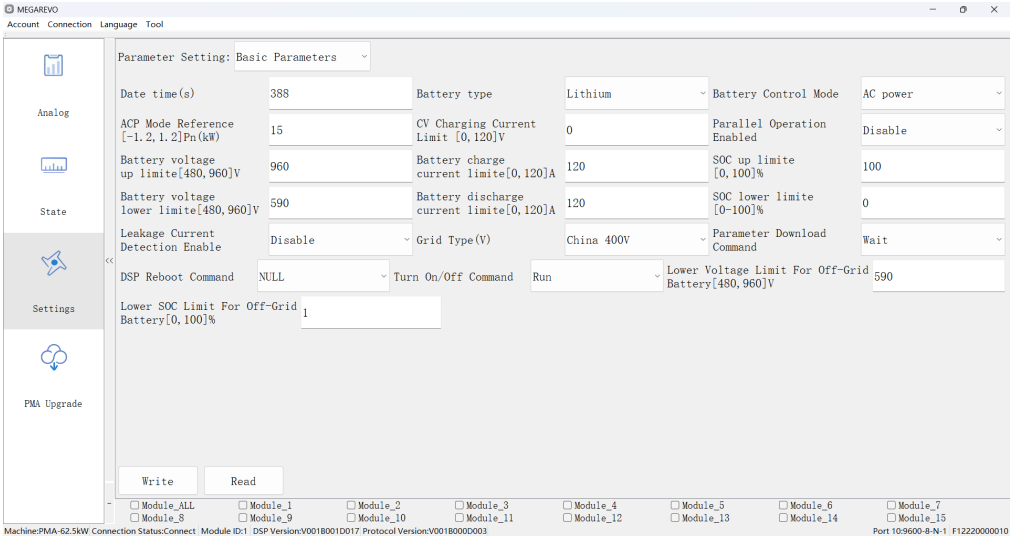
In the 'State' page, you can check the converter's failure alarms.



In the 'Setting' page, you can choose in which mode the converter operates or the control depth. The parameter settings can be changed after clicking 'Read' and are recorded after clicking 'Write'.



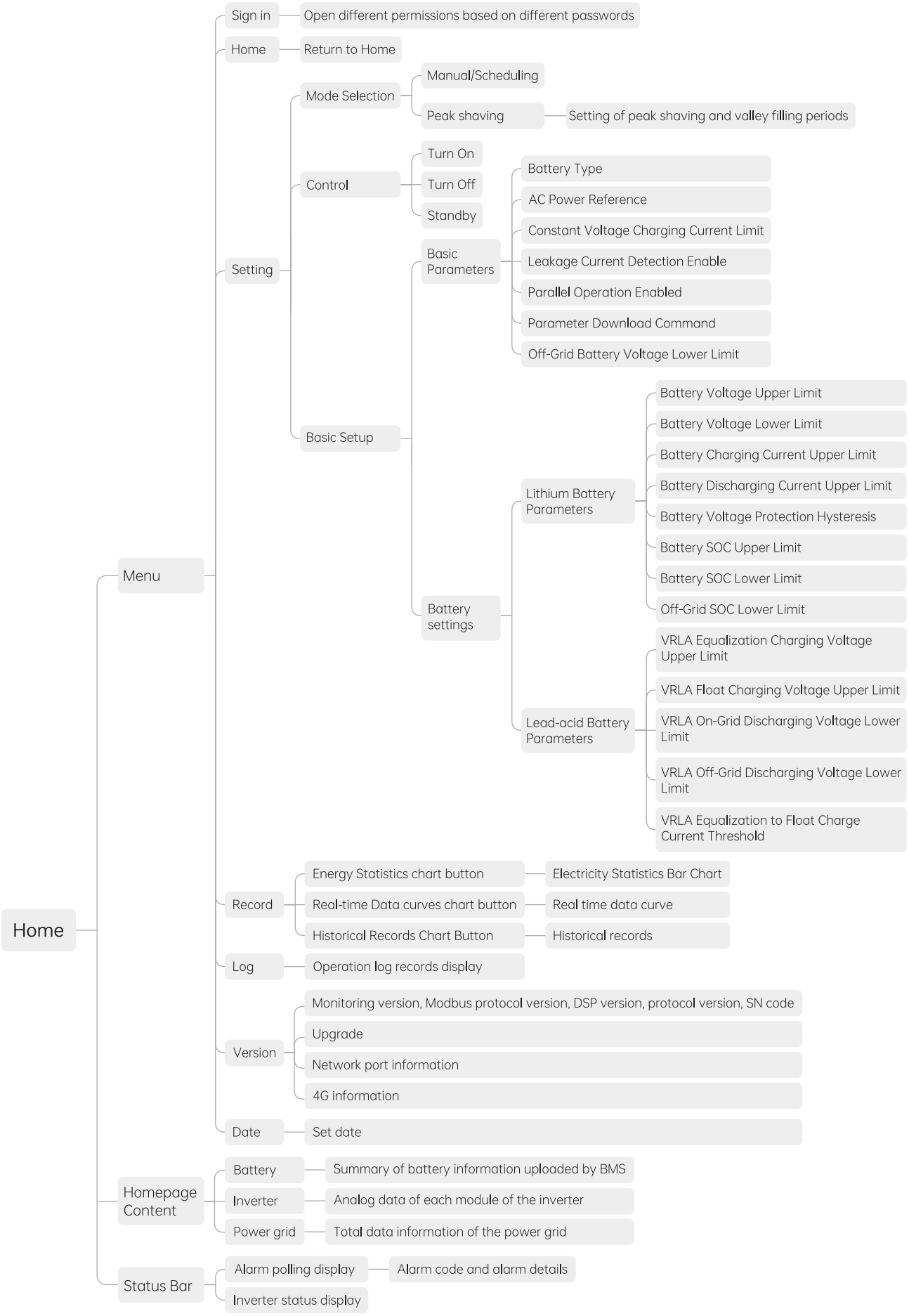
Step5: If the converter has not generated any fault alarms, please navigate to the 'Settings' page to configure the operating mode and parameters. After completion select 'Turn On/Off Command' to 'Run' and click 'Write' to start the converter.



Step6: After the converter starts normally, you can set 'ACP Mode Reference' to control its power with '+'as discharging and '-' as charging. Please refer to appendix 1 for the settable power range (unit: kW) of all the models.

(2) Monitor screen control

- The monitor screen system consists of three parts: the menu, the homepage content and the status bar. Please refer to the following contents for the details.


Home
Menu
Sign in
Open different permissions based on different passwords
Home
Return to Home
Setting
Mode Selection
Manual/Scheduling
Peak shaving
Setting of peak shaving and valley filling periods
Control
Turn On
Turn Off
Standby
Basic Setup
Basic Parameters
Battery Type
AC Power Reference
Constant Voltage Charging Current Limit
Leakage Current Detection Enable
Parallel Operation Enabled
Parameter Download Command
Off-Grid Battery Voltage Lower Limit
Battery settings
Lithium Battery Parameters
Battery Voltage Upper Limit
Battery Voltage Lower Limit
Battery Charging Current Upper Limit
Battery Discharging Current Upper Limit
Battery Voltage Protection Hysteresis
Battery SOC Upper Limit
Battery SOC Lower Limit
Off-Grid SOC Lower Limit
Lead-acid Battery Parameters
VRLA Equalization Charging Voltage Upper Limit
VRLA Float Charging Voltage Upper Limit
VRLA On-Grid Discharging Voltage Lower Limit
VRLA Off-Grid Discharging Voltage Lower Limit
VRLA Equalization to Float Charge Current Threshold
Record
Energy Statistics chart button
Electricity Statistics Bar Chart
Real-time Data curves chart button
Real time data curve
Historical Records Chart Button
Historical records
Log
Operation log records display
Version
Monitoring version, Modbus protocol version, DSP version, protocol version, SN code
Upgrade
Network port information
4G information
Date
Set date
Homepage Content
Battery
Summary of battery information uploaded by BMS
Inverter
Analog data of each module of the inverter
Power grid
Total data information of the power grid
Status Bar
Alarm polling display
Alarm code and alarm details
Inverter status display

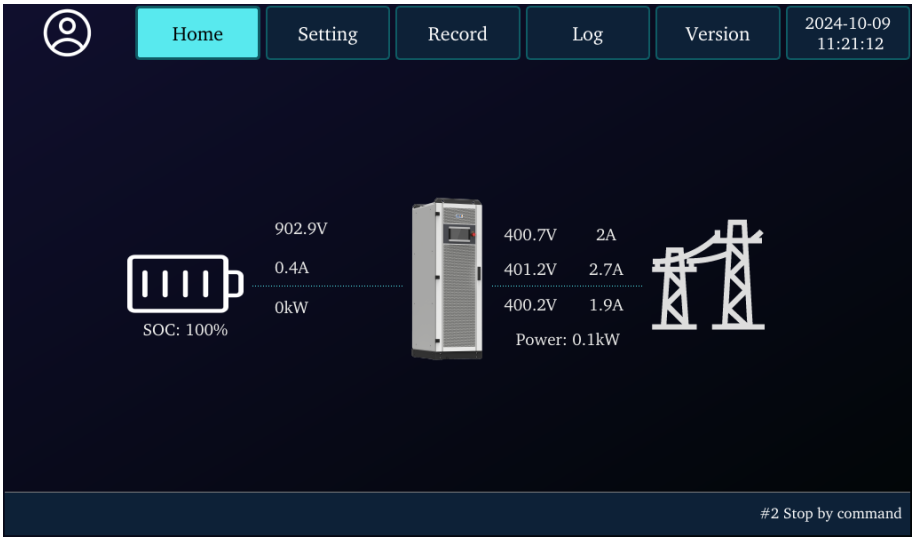
Starting up steps are shown as follow:

Step1: Check the DC and AC power cables and verify the DC input voltage is within the allowing range.

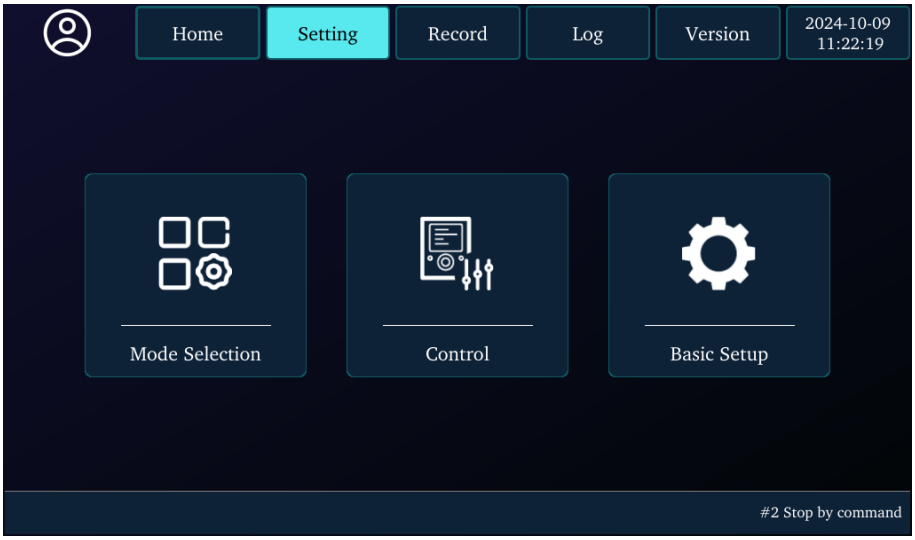
Step2: Connect the converter to the monitor screen using the network cables and power cables in the delivery list. For the configuration, please refer to section 3.3.5.

Step3: Close the AC breakers and the DC breakers.

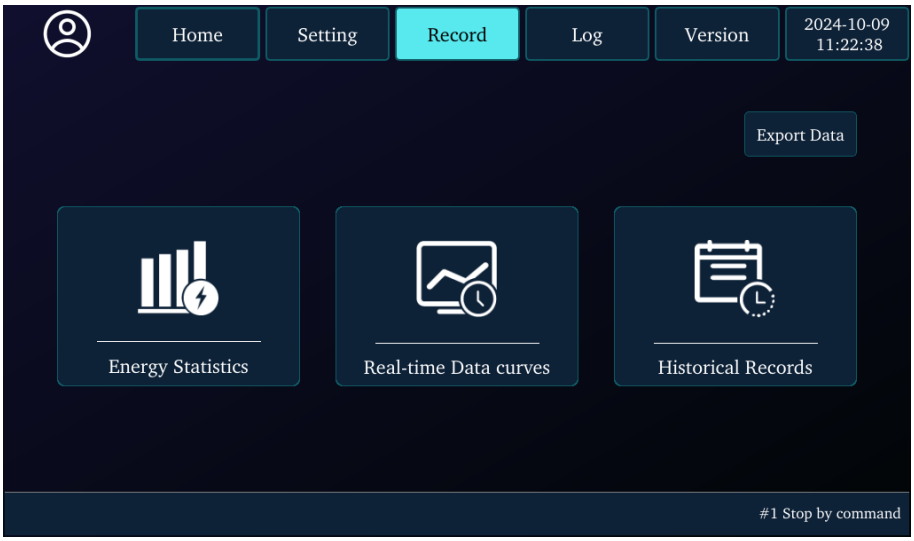
Step4: Complete the steps above and enter the controlling main page in the monitor screen. Login in the left upper corner of the screen. Account: User. Password: 123456. In the 'Home' page, you can check the operating status and parameters of the converter.



In the 'Setting' page, you can start or shut down the converter and set its parameters.



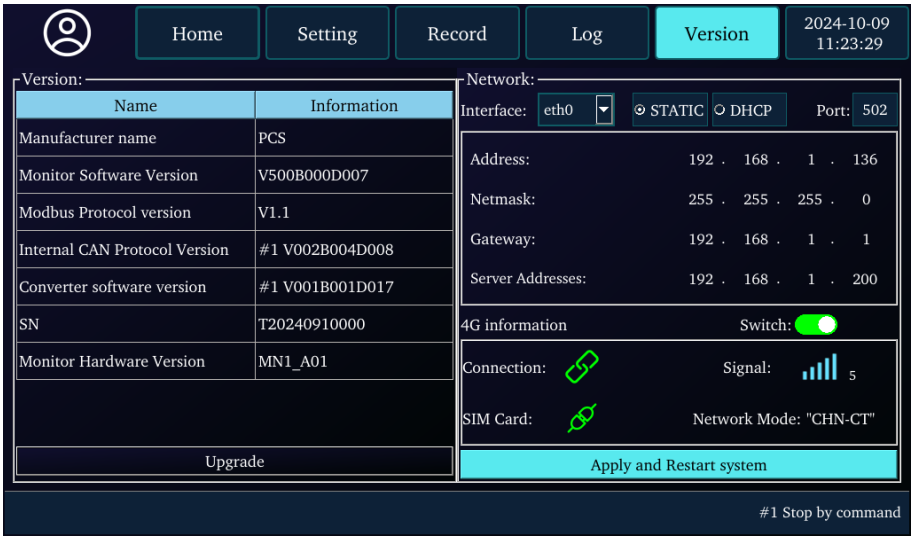
In 'Record' page, you can check the energy using/generating situations.



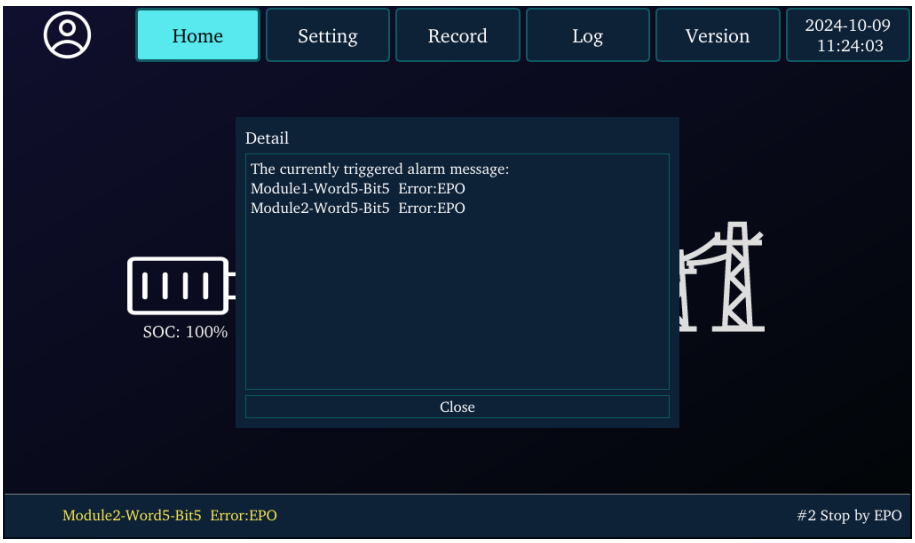
In the 'Log' page, you can check the operating logs of the converter.

	Modify Type	Modify Time	Event
1	Local	2024-10-09 11:15:01	语言: 中文 -> 英文
2	Local	2024-10-09 11:09:37	EMS通信方式: CAN -> NULL
3	Local	2024-10-09 11:09:26	EMS通信方式: NULL -> CAN
4	Local	2024-10-09 11:01:36	电池SOC上限(%): 90 -> 0
5	Local	2024-10-09 10:53:31	Language: English -> Chinese
6	Local	2024-10-09 10:52:39	BMS Communication Type: CAN -> NULL
7	Local	2024-10-09 10:52:26	Battery Type: Lithium-ion Battery -> Null
8	Local	2024-10-08 19:33:36	语言: 中文 -> 英文
9	Local	2024-10-08 17:57:42	故障清除: 0 -> 1
10	Local	2024-10-08 16:09:30	BMS通信方式: NULL -> CAN
11	Cloud Platform	2024-10-08 15:52:42	时区: UTC+4 -> UTC+8
12	Cloud Platform	2024-10-08 15:52:19	时区: UTC+2 -> UTC+4
13	Local	2024-10-08 15:52:09	电池类型: 铅酸电池 -> 锂电池
14	Cloud Platform	2024-10-08 15:49:38	VRLA均充转浮充电流(A): 100 -> 60

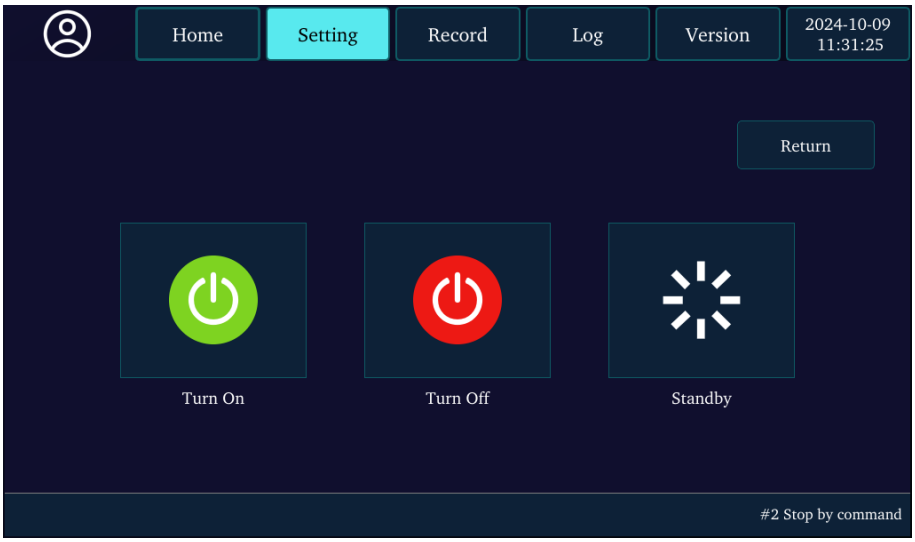
In the 'Version' page, you can check the software version of the converter using.



Click the left lower corner to check the alarms information of the converter.



Step5: If the converter has no fault alarms generated, the user can set its parameters according to application. After completion select 'Setting' → 'Turn On' to start the converter.



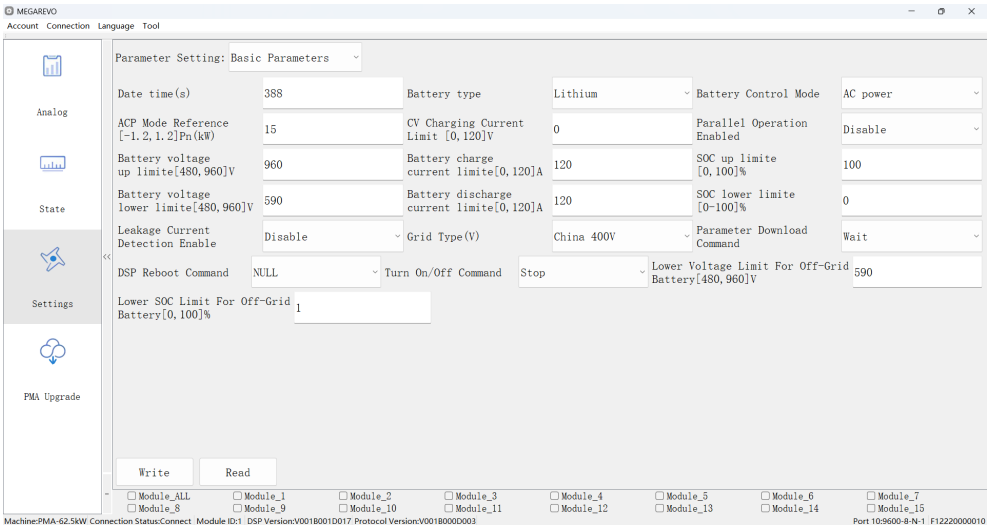
Step6: If the converter operates normally, navigate to the 'Setting' → 'Basic Setting', you can set 'AC Power Reference' to control its power with '+' as discharging and '-' as charging. Please refer to appendix 1 for the settable power range (unit: kW) of all the models.

5.2 Shutdown procedure

(1) Upper computer control

During the daily maintenance or overhaul, please perform the shutdown operations following the steps below:

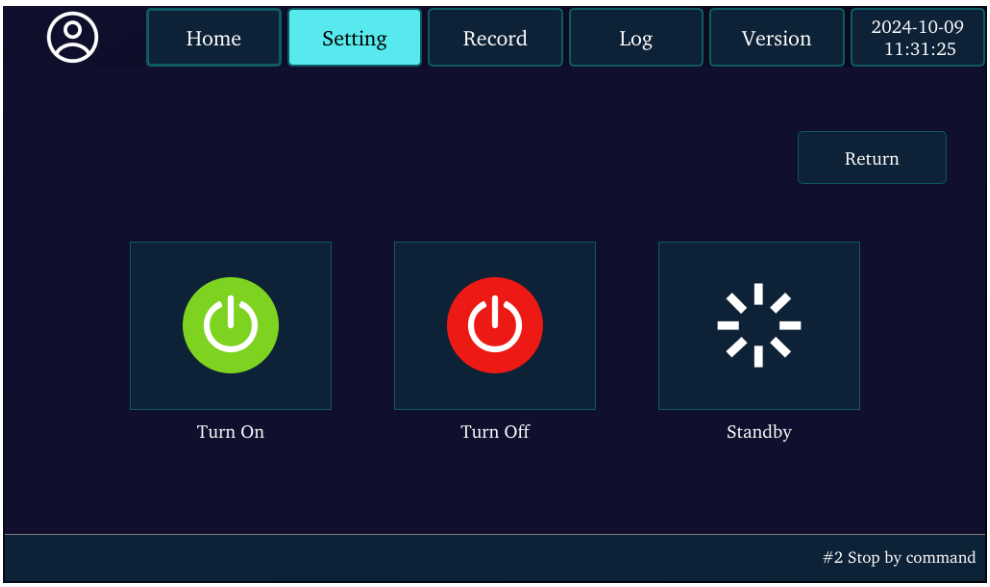
- Step1: Set the 'Turn On/Off Command' to 'Stop' in the PMA.exe to shut down the converter.



- Step2: Cut off the AC breakers and DC breakers.
- Step3: The indicators turn off when the converter has shut down.

(2) Monitor screen control

- Step1: Navigate to the 'Setting' page in the monitor screen and click the 'Turn Off' to shut down the converter.



- Step2: Cut off the AC breakers and DC breakers.
- Step3: The indicators turn off when the converter has shut down.

6 Alarms and fault handling

- Non-professional personnel must not perform fault handling or troubleshooting!
- When addressing PCS issues, please follow the relevant procedures in this manual!

6.1 Fault handling

- When abnormalities are detected in the grid, battery, or PCS status, the PCS will intelligently diagnose the issue, display the malfunction on the backend and record them in the historical alarm log during its operation. Table 6-1 lists common alarm information and fault handling advice.

6.2 General safety rules

- Disconnect all external connections of the converter and the internal power supply of the equipment.
- Ensure that the converter is not accidentally re-energized.
- Use a multimeter to ensure that the inverter is completely de-energized.
- Ensure that the converter is well grounded.
- The operating areas is close to the parts that may be electrified. It needs to be covered with insulation material.

Table 6-1 Alarm failure handling methods

Fault type	Handling method
Output overcurrent	Contact the customer service center.
DC bus overcurrent	Contact the customer service center.
Environment over temperature	Shut down, check whether the air duct is free.
IGBT over temperature	Contact the customer service center.
Over-limit leakage current	Shut down and check whether the grounding connection is abnormal.
Battery reverse connection	Shut down and check power cables at DC side.
Grid overvoltage/undervoltage	Wait for the module to perform a self-check to clear the alarm and contact the customer service center if it cannot be cleared.

Fault type	Handling method
Grid voltage reverse sequence	Shut down and check the three-phase wiring.
Grid over-frequency/ underfrequency	Wait for the module to perform a self-check to clear the alarm and contact the customer service center if it cannot be cleared.
Isolation island protection	Wait for the module to perform a self-check to clear the alarm and contact the customer service center if it cannot be cleared.
DC relay failure	Contact the customer service center.
AC relay failure	Contact the customer service center.
Lightning arrester failure	Contact the customer service center.
Output instantaneous overcurrent	Contact the customer service center.
Battery overvoltage/ undervoltage	Shut down, check the DC voltage and the configuration of battery.
DC bus instantaneous overcurrent	Contact the customer service center.
DC bus overvoltage/ undervoltage/imbalance voltage	Contact the customer service center.
Module fan failure	Shut down and check whether the fan is damaged.
EMS communication failure	Shut down and check the module and communication wiring.

Appendix 1: Technical parameters

Table 6-2 Appendix 1: Technical parameters (PMA0050/PMA0060)

Parameters for DC side

Model	PMA0050	PMA0060
Max.DC continuous power (kW)	55	69
Operating DC voltage range (Vdc)	590~950Vdc(3W+PE)/650~950Vdc(3W+N+PE)	
Full load DC voltage range (Vdc)	600~900Vdc(3W+PE)/680~900Vdc(3W+N+PE)	
Max.DC current (A)	±100	±125
Max.DC continuous current (A)	±92	±115

Model	PMA0050	PMA0060
Stabilized voltage precision	±1%	
Stabilized current precision	±2%(of rated power)	

Parameters for AC side (On-Grid)

Model	PMA0050	PMA0060
Rated active power (kW)	50	62.5
Max.apparent power (kVA)	60	75
Max.continuous apparent power (kVA)	55	69
AC grid connection type	3W+PE or 3W+N+PE	
Rated AC voltage (Vac)	400/230	
Rated AC current (A)	72	90
Max.AC current (A)	86	110
Max.continuous AC current (A)	79	99
Total harmonic distortion	THDi < 3%(of rated power)	
Grid voltage range (Vac)	400±15%(According to local standards)	
Grid frequency range (Hz)	50±2/60±2	
Adjustable power factor range	-1~ +1	

Parameters for AC side(Off-Grid)

Model	PMA0050	PMA0060
Rated output active power (kW)	50	62.5
Max.output apparent power (kVA)	60	75
Max.output continuous apparent power (kVA)	55	69
Max.AC current (A)	86	110
Max.AC continuous current (A)	79	99
Rated output voltage (Vac)	L-N:220/230/240Vac;L-L:380/400/415Vac	

Model	PMA0050	PMA0060
Rated frequency (Hz)	50/60	
Output voltage precision	±1%	
Output frequency precision (Hz)	50/60±0.2%	
Total harmonic distortion	THDu<3%(of linear balance load)	
Output voltage imbalance	±1%;120 ±1° (of linear balance load)	
Load unbalance	100% Three-phase unbalanced	
Overload capacity	≤ 110%:continuous;110%~ ≤ 120%:2min; > 120%:200ms	

Communication parameters

Model	PMA0050	PMA0060
Human-computer interaction	10.1" Touch screen/ Local web/Upper computer (Optional)	
Communication interface	Ethernet/RS485/CAN	
Communication with BMS	RS485/CAN (Optional)	
Communication with EMS	RS485/Ethernet (Optional)	

Protection parameters

Model	PMA0050	PMA0060
Protection class	Class I	
DC surge arrester	Type II	
AC surge arrester	Type II	
DC shorted protection	Fuses+DC contactor	
AC shorted protection	Current control	
Residual current monitoring unit	Integrated	
Insulation resistor detection	Integrated	
AC relay automatic checking	Integrated	

General parameters

Model	PMA0050	PMA0060
Max. efficiency	98.50%	
Transfer time between charge and discharge (ms)	< 20	
Relative humidity	< 95% (NO condensation)	
Operating temperature range (℃)	-30~+60(> 45 derating)	
Storage temperature range (℃)	-40~+70	
Max.operating altitude (m)	5000(> 3000 derating)	
Noise emission (dB)	< 70	
Pollution degree	External PD3;Internal PD2	
Over voltage category	DC Type II / ACType III	
Protection degree	IP20 (Power compartment) IP5X (control compartment)	
Cooling method	Intelligent forced air-cooling	
DC connector	Quick connector (Support hot plug)	
AC connector	Quick connector (Support hot plug)	
Installation style	Rack-Mounted (Vertical/Horizontal)	
Dimensions (W*D*H) (mm)	483(Without mounting ears 444)*550*133 19"3U	
Weight (KG)	35 (Without packaging)	
	38 (With packaging)	

Standards compliance

Model	PMA0050	PMA0060
Grid connection standard	EN50549-1,EN50549-10, GB/T34120,GB/T34133	
Safty standard	EN62477-1,EN62109-1,EN62109-2	

Appendix 2: Technical parameters

Table 6-3 Appendix 2: Technical parameters (PMA0080B/PMA0080F/PMA0105B/PMA0105F)

Model	PMA0050	PMA0060
EMC standard	EN IEC61000-6-2,EN IEC61000-6-4	

Parameters for DC side

Model	PMA0080B	PMA0080F	PMA0105B	PMA0105F
Max.DC continuous power (kW)	88		115	
Operating DC voltage range (Vdc)	590~950Vdc(3W+PE)/650~950Vdc(3W+N+PE)			
Full load DC voltage range (Vdc)	600~900Vdc(3W+PE)/680~900Vdc(3W+N+PE)			
Max.DC current (A)	±160		±200	
Max.DC continuous current (A)	±146		±190	
Stabilized voltage precision	±1%			
Stabilized current precision	±2%(of rated power)			

Parameters for AC side (On-Grid)

Model	PMA0080B	PMA0080F	PMA0105B	PMA0105F
Rated active power (kW)	80		105	
Max.apparent power (kVA)	96		126	
Max.continuous apparent power (kVA)	88		115	
AC grid connection type	3W+PE or 3W+N+PE			
Rated AC voltage (Vac)	400/230			
Rated AC current (A)	115		150	
Max.AC current (A)	138		180	
Max.continuous AC current (A)	126		165	
Total harmonic distortion	THDi < 3%(of rated power)			
Grid voltage range (Vac)	400Vac±15%(According to local dtandards)			
Grid frequency range (Hz)	50±2/60±2			

Model	PMA0080B	PMA0080F	PMA0105B	PMA0105F
Adjustable power factor range	-1~ +1			

Parameters for AC side(Off-Grid)

Model	PMA0080B	PMA0080F	PMA0105B	PMA0105F
Rated output active power (kW)	80		105	
Max.output apparent power (kVA)	96		126	
Max.output continuous apparent power (kVA)	88		115	
Max.AC current (A)	138		180	
Max.AC continuous current (A)	126		165	
Rated output voltage (Vac)	L-N:220/230/240Vac;L-L:380/400/415Vac			
Rated frequency (Hz)	50/60			
Output voltage precision	±1%			
Output frequency precision (Hz)	50/60 ±0.2%			
Total harmonic distortion	THDu<3%(of linear balance load)			
Output voltage imbalance	±1%;120 ±1° (of linear balance load)			
Load unbalance	100% Three-phase unbalanced			
Overload capacity	≤ 110%:continuous;110%~ ≤ 120%:2min; > 120%:200ms			

Communication parameters

Model	PMA0080B	PMA0080F	PMA0105B	PMA0105F
Human-computer interaction	10.1" Touch screen/ Local web/Upper computer(Optional)			
Communication interface	Ethernet/RS485/CAN			
Communication with BMS	RS485/CAN(Optional)			
Communication with EMS	RS485/Ethernet(Optional)			

Protection parameters

Model	PMA0080B	PMA0080F	PMA0105B	PMA0105F
Protection class	Class I			
DC surge arrester	Type II			
AC surge arrester	Type II			
DC shorted protection	Fuses+DC contactor			
AC shorted protection	Current control			
Residual current monitoring unit	Integrated			
Insulation resistor detection	Integrated			
AC relay automatic checking	Integrated			

General parameters

Model	PMA0080B	PMA0080F	PMA0105B	PMA0105F
Max. efficiency	98.50%			
Transfer time between charge and discharge (ms)	< 20			
Relative humidity	< 95% (NO condensation)			
Operating temperature range (℃)	-30~+60 (> 45 derating)			
Storage temperature range (℃)	-40~+70			
Max.operating altitude (m)	5000 (> 3000 derating)			
Noise emission (dB)	< 70			
Pollution degree	DC type II / AC type III			
Over voltage category	External PD3;Internal PD2			
Protection degree	IP20			
Cooling method	Intelligent forced air-cooling			
DC connector	OT/DT Terminal(Permanently connected)			
AC connector	OT/DT Terminal(Permanently connected)			
Installation style	Rack-Mounted (vertical/horizontal)			

Model	PMA0080B	PMA0080F	PMA0105B	PMA0105F
Dimensions (W*D*H) (mm)	483 (Without mounting ears 444) * 680 * 174 (Back maintained) 19"4U	483 (Without mounting ears 444) * 680 * 220 (Front maintained) 19"5U	483 (Without mounting ears 444) * 680 * 174 (Back maintained) 19"4U	483 (Without mounting ears 444) * 680 * 220 (Front maintained) 19"5U
Weight (KG)	48 (Without packaging)			
	50 (With packaging)			

Standards compliance

Model	PMA0080B	PMA0080F	PMA0105B	PMA0105F
Grid connection standard	EN50549-1,EN50549-10, GB/T34120,GB/T34133			
Safty standard	EN62477-1,EN62109-1,EN62109-2			
EMC standard	EN IEC61000-6-2,EN IEC61000-6-4			

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