

# SP500HCG2 Off-grid Integrated Photovoltaic and Storage System Product User Manual



Version: V1.3

Date: March 08,2026

## catalogue

1. Regarding this manual .....	1
1.1 Introduction .....	1
1.2 Applicable Products .....	1
1.3 Manual Instructions .....	1
1.4 Label Description .....	2
2. Safety Guidelines .....	4
2.1 Personnel Requirements .....	4
2.2 Safety Warning Operation .....	4
2.3 Electrical Safety Precautions .....	5
2.3.1 Electrical Safety .....	5
2.3.2 Static Electricity Protection .....	5
2.4 Environmental Space Requirements .....	5
2.4.1 Requirements for evacuation routes .....	5
2.4.2 Humidity Protection .....	5
2.5 Live Testing Specifications .....	6
2.5.1 Live Measurement .....	6
2.5.2 Use of Measurement Equipment .....	6
2.6 Touchscreen Parameter Settings .....	6
2.7 Maintenance or Repair Specifications .....	7
2.8 Product Disposal .....	7
2.9 Other Notes .....	7
3. Product Introduction .....	9
3.1 Introduction to SP500HCG2 .....	9
3.2 Product Design .....	10
3.2.1 Product Appearance .....	10
3.2.2 Product Dimensions .....	10
3.2.2 Bottom View .....	11
3.2.3 Front and Rear Views .....	12
3.3 External Devices .....	12

3.4 Product Features .....	12
3.5 Technical Parameters Table .....	13
4. Product Installation Guide .....	15
4.1 Pre-installation Notes .....	15
4.2 Installation Process .....	15
4.3 Installation Preparation .....	15
4.3.1 Packaging Inspection .....	15
4.3.2 Delivery List Inspection .....	15
4.3.3 Installation Tools and Parts .....	16
4.3.4 Installation Environment Requirements .....	16
4.4 Machine Transportation .....	17
4.4.1 Transportation Instructions .....	17
4.4.2 Forklift Transportation .....	17
4.5 Positioning and Fixation .....	18
4.5.1 Spatial Requirements .....	18
4.5.2 Fixed .....	19
5. Electrical Installation Guide .....	21
5.1 Cable Requirements .....	21
5.2 Terminal Block .....	22
5.3 Cabling Specifications .....	23
5.4 Fixing and Protection of Connection Cables .....	23
5.4.1 Fixing of Cables .....	23
5.4.2 Cable Protection .....	24
5.5 External Cable Installation Steps .....	24
5.5.1 The cabinet door opens .....	24
5.5.2 Remove the cover plate .....	25
5.5.3 DC Side Wiring .....	25
5.5.4 AC Side Wiring .....	26
5.5.5 Communication Cable Wiring .....	27
5.5.6 System Grounding .....	29

5.5.7 Installation Completed .....	30
6. Trial Operation .....	30
6.1 Pre-start Check .....	30
6.2 Power-on Operation Procedure .....	32
6.3 Power Off Procedure .....	38
6.4 Use of Maintenance Bypass .....	38
7. Maintenance and Fault Diagnosis .....	40
7.1 Description .....	40
7.2 Precautions .....	40

# 1. Regarding this manual

## 1.1 Introduction

Dear customer, thank you very much for using the integrated solar-storage and off-grid system developed by Sino Soar Hybrid (Shenzhen) Technology Co.,Ltd. We sincerely hope this product meets your needs and look forward to receiving your valuable feedback on its performance and features, which will enable us to continue improving it.

## 1.2 Applicable Products

This manual applies to the following models of integrated off-grid photovoltaic-storage systems:

- SP500HCG2

In this manual, unless otherwise specified, references to "integrated photovoltaic-storage system" and "integrated system" refer exclusively to this product.

## 1.3 Manual Instructions




- This manual is the dedicated instruction guide for the integrated photovoltaic-storage system series provided by Sino Soar Hybrid (Shenzhen) Technology Co.,Ltd. It provides detailed information about the product, installation procedures, and other relevant content. Before installing, commissioning, or operating the equipment, users must thoroughly read all instructions in this manual and familiarize themselves with the applicable safety symbols.

- Readers should possess a certain foundation in electrical theory, electrical wiring, and specialized mechanical knowledge. Before installing this product, please read this manual carefully and ensure that relevant personnel can access it conveniently for use.

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## 1.4 Label Description




To use this manual more effectively, the following symbols are used to highlight important information. Please read the symbols and their explanations carefully.

 danger	
●	This indicates a situation with a high potential risk that, if not avoided, could result in death or serious injury.
 warn	
●	Indicates a moderate potential hazard that, if not avoided, may result in death or serious injury.
 take care	
●	Indicates a low potential hazard that, if not avoided, may result in moderate or minor injuries to personnel.

pay attention to

- The emphasis and supplementation of the content may also provide techniques or tips for optimizing product usage, helping you solve a specific problem or save time.

Always pay close attention to the hazardous warning signs on the equipment, which include:

标识符	标识说明
	此标识表示机体内部含有高压，触摸可能会导致电击危险。
	此符号表示此处温度高于人体可接受范围，请勿任意接触以避免人员伤害。
	此符号表示此处为保护接地（PE）端，需要牢固接地以保证操作人员安全。

## 2. Safety Guidelines

### 2.1 Personnel Requirements

- Only professional electricians or personnel with relevant qualifications are authorized to perform all operations on this product.
- Operators must have a thorough understanding of the structure and operating principles of the entire integrated photovoltaic-storage system.
- Operators must be thoroughly familiar with this manual, titled "Installation Manual for Off-grid Integrated Photovoltaic-Storage System."
- Operators must be thoroughly familiar with the relevant standards of the country/region where the project is located.



- It is strictly prohibited to perform maintenance or repair operations while the equipment is energized!
- During equipment maintenance or repair, at least two personnel must be present on-site. After the equipment has been safely disconnected, wait for 15 minutes until the integrated photovoltaic-storage system completes its discharge before performing maintenance or repair operations.

### 2.2 Safety Warning Operation

When installing, performing daily maintenance, or conducting repairs on integrated photovoltaic-storage systems, please adhere to the following guidelines to prevent accidents caused by unauthorized personnel approaching and performing improper operations:

- Install clear markings at the front and rear switches of the integrated photovoltaic-storage system to prevent accidental switch activation.
- Install warning signs or safety warning tapes near the operational area.
- After completing maintenance or inspection operations, remove the cabinet door key and store it securely.

## 2.3 Electrical Safety Precautions

### 2.3.1 Electrical Safety



- The product contains a potentially fatal high voltage inside!
- Do not touch any terminals or conductors connected to the power grid circuit.
- Pay attention to all instructions or safety guidelines regarding grid connection, and comply with the warning labels on the product.
- Adhere to the safety precautions listed in this manual and other relevant documents for this equipment.



- Damaged equipment or system failures may cause electric shock or fire!
- Perform a preliminary visual inspection of the equipment before operation to check for damage or other potential hazards.
- Check whether other external devices or circuit connections are safe.
- The device must be in a safe state before operating.

### 2.3.2 Static Electricity Protection

pay attention to

- 静电-sensitive components on the negative circuit board or elsewhere may be damaged due to improper handling or contact by the operator.
- operators should avoid unnecessary contact with circuit boards.
- Operators must comply with electrostatic protection regulations, such as wearing anti-static wristbands.

## 2.4 Environmental Space Requirements

### 2.4.1 Requirements for evacuation routes

To ensure that staff can evacuate the site promptly in the event of an accident, please comply with the following:

- Do not place flammable or explosive items around the integrated solar-storage system.
- It is strictly prohibited to pile debris in evacuation routes or occupy them in any manner.

### 2.4.2 Humidity Protection

Do not use the integrated photovoltaic-storage system in environments with excessive humidity beyond the specified limits!

pay attention to

- An integrated photovoltaic-storage system is highly susceptible to damage in humid environments!
- Do not open the cabinet door when the air humidity exceeds 95%.
- Avoid opening the cabinet door to perform maintenance or inspection operations on the integrated light storage unit during rainy or humid weather conditions.

## 2.5 Live Testing Specifications

### 2.5.1 Live Measurement

 danger

- The device operates at high voltage; accidental contact may result in fatal electric shock. Therefore, the following precautions must be observed during live measurements:
- Take protective measures (e.g., wear insulating gloves and shoes).
- At least two personnel must be present on-site to ensure personal safety.

### 2.5.2 Use of Measurement Equipment

When performing electrical connections and trial operations on integrated photovoltaic-storage systems, appropriate electrical measurement equipment must be used to ensure that all electrical parameters meet the required specifications.

Inappropriate parameter settings may impair the proper functioning of the integrated photovoltaic-storage system!

Only authorized professionals may configure the parameters of the integrated photovoltaic-storage system.

 warn

- High-quality measuring equipment with appropriate range and operating conditions that fully meet the site requirements should be selected.
- Ensure that the measurement equipment is properly connected and used in accordance with specifications to avoid hazards such as electric arcs.

## 2.6 Touchscreen Parameter Settings

The parameters in the touchscreen are closely related to the operation of the integrated photovoltaic-storage system. Any modifications or adjustments to these parameters must be preceded by a reliable analysis and evaluation of both the system and the integrated photovoltaic-storage unit's operational status.



- Inappropriate parameter settings may impair the proper functioning of the integrated photovoltaic-storage system!
- Only authorized professionals may configure the parameters of the integrated photovoltaic-storage system.

## 2.7 Maintenance or Repair Specifications

The following points should be noted when performing maintenance or repair operations on equipment:

- Install maintenance signs and ensure the integrated solar-storage system is not accidentally powered on again.
- After shutting down the integrated photovoltaic-storage system and disconnecting both AC and DC power supplies, wait at least 15 minutes before opening the front door to perform maintenance or inspection operations on the system.
- Use a multimeter to check the interior of the integrated light-storage unit and confirm that the discharge has completed.
- Ensure the equipment is properly grounded.
- Live parts must be insulated and covered with insulating materials.
- Throughout the entire maintenance and inspection process, ensure that the evacuation routes remain completely unobstructed.

## 2.8 Product Disposal

- When an integrated light-storage unit needs to be discarded, it should not be treated as regular waste.
- Please contact a locally authorized professional recycling agency.

## 2.9 Other Notes

The actual operational summary shall implement the following protective or emergency measures based on on-site requirements:

- During equipment maintenance, repair, or other operations, personnel shall implement appropriate protective measures as required, such as wearing noise-resistant earplugs, insulating shoes, and insulating gloves.

- Integrated solar-storage systems are typically installed in locations far from urban areas; therefore, appropriate emergency rescue facilities should be prepared as needed to ensure immediate response when required.

- Implement all necessary auxiliary measures to ensure the safety of personnel and equipment.

pay attention to

- All operations of the integrated photovoltaic-storage system must comply with the relevant standards of the respective country or region.

### 3. Product Introduction

#### 3.1 Introduction to SP500HCG2

The system integrates PCS, MPPT, EMS, PCM, an off-grid switching device, AC/DC power distribution units, generator control, and lightning protection devices. It supports the integration of diesel generators, photovoltaic systems, and batteries. Primarily used in photovoltaic-storage-diesel microgrids and diesel-backup power systems for mining applications, it enables operation of multiple parallel units.

Application scenarios: optical reserve microgrids, backup power sources, emergency power supplies, diesel energy storage systems, construction sites, oilfield extraction, and field operations.

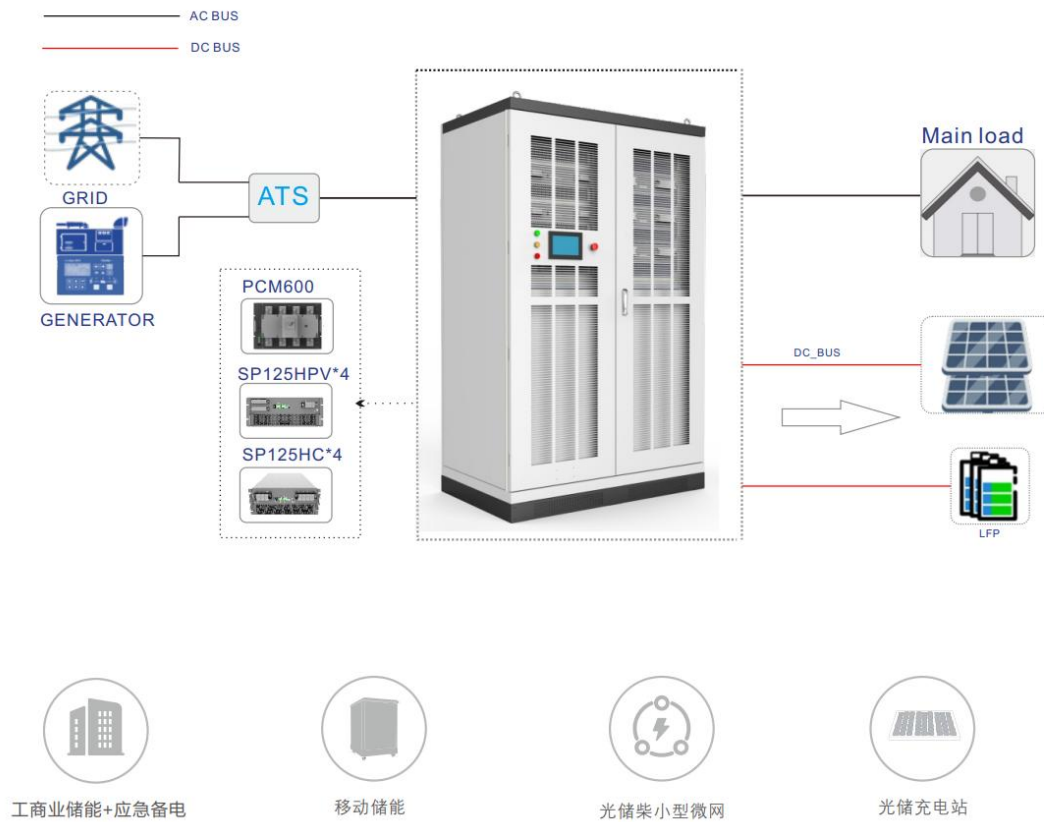


Figure 3-1 Schematic diagram of internal components and applications of the integrated photovoltaic-storage system

## 3.2 Product Design

### 3.2.1 Product Appearance



Figure 3-2 Product Appearance

### 3.2.2 Product Dimensions

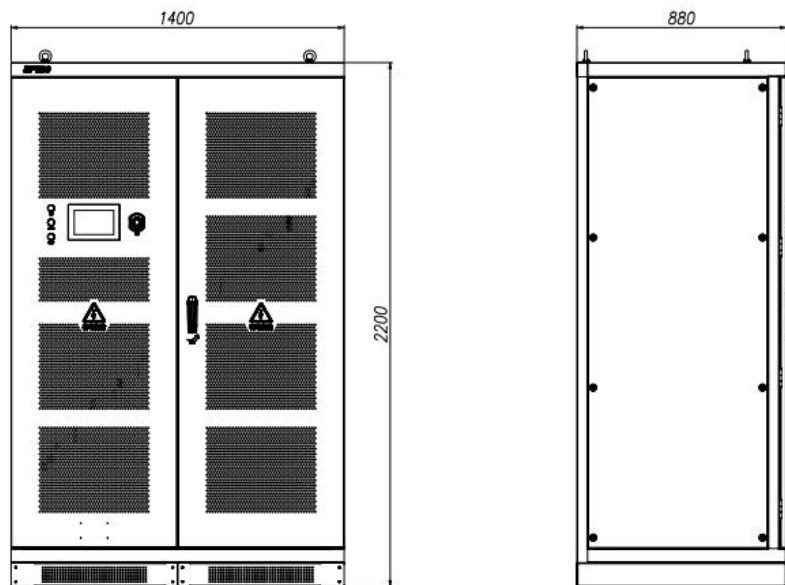


Figure 3-3 Product Dimensions

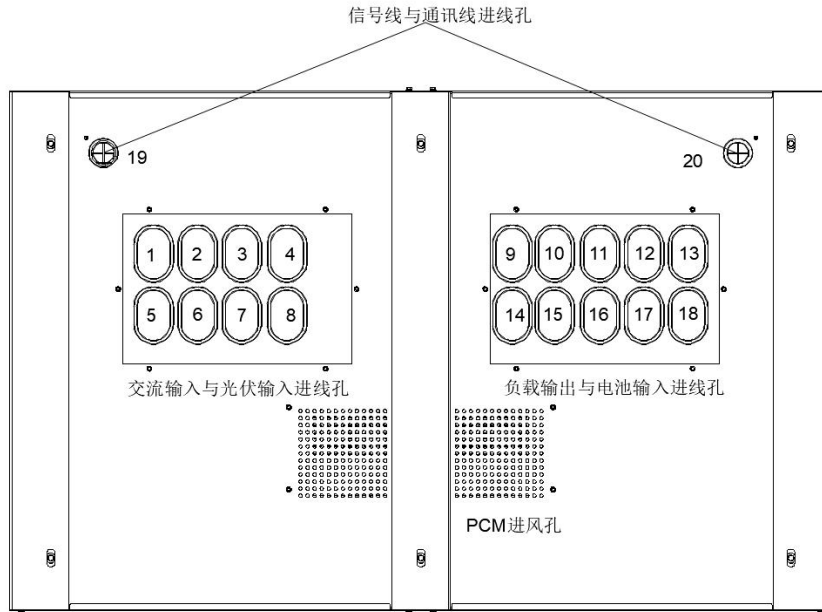
wide (Width)	Height	deep (Depth)
1400mm	2200mm	880mm

Table 3-1 Product Appearance Dimensions

### 3.2.2 Bottom View

The integrated solar-storage unit features a base at its bottom, as shown in Figure 3-2. The cable connection port extends into the unit from the bottom.

The hole on the bottom left serves as the photovoltaic and grid power inlet, while the hole on the bottom right serves as the battery and load power inlet. A signal cable inlet is also reserved at the lower left front, with the dimensions of the mounting holes for the all-in-one unit marked, as shown in Figure 3-4.



Bottom view of Figure 3-4

Index Number	External cable	Index Number	External cable	Index Number	External cable
1	GRID-L1	8	PV4	15	BAT1
2	GRID-L2	9	LOAD-N	16	BAT2
3	GRID-L3	10	LOAD-L1	17	BAT3
4	GRID-N	11	LOAD-L2	18	BAT4
5	PV1	12	LOAD-L3	19	Signal/Communication Cable
6	PV2	13	Reserve	20	Signal/Communication Cable
7	PV3	14	earth wire		

Table 3-2 Cabinet Bottom External Cable Passage Hole Diagram

The wire holes are for reference only and may be adjusted according to the actual on-site assembly conditions.

### 3.2.3 Front and Rear Views

The air required by the integrated solar-storage unit is drawn in through the OB holes in the front door panel, while the heated air is expelled through the rear air outlet after passing through the MPPT and PCS, as shown in Figure 3-4.

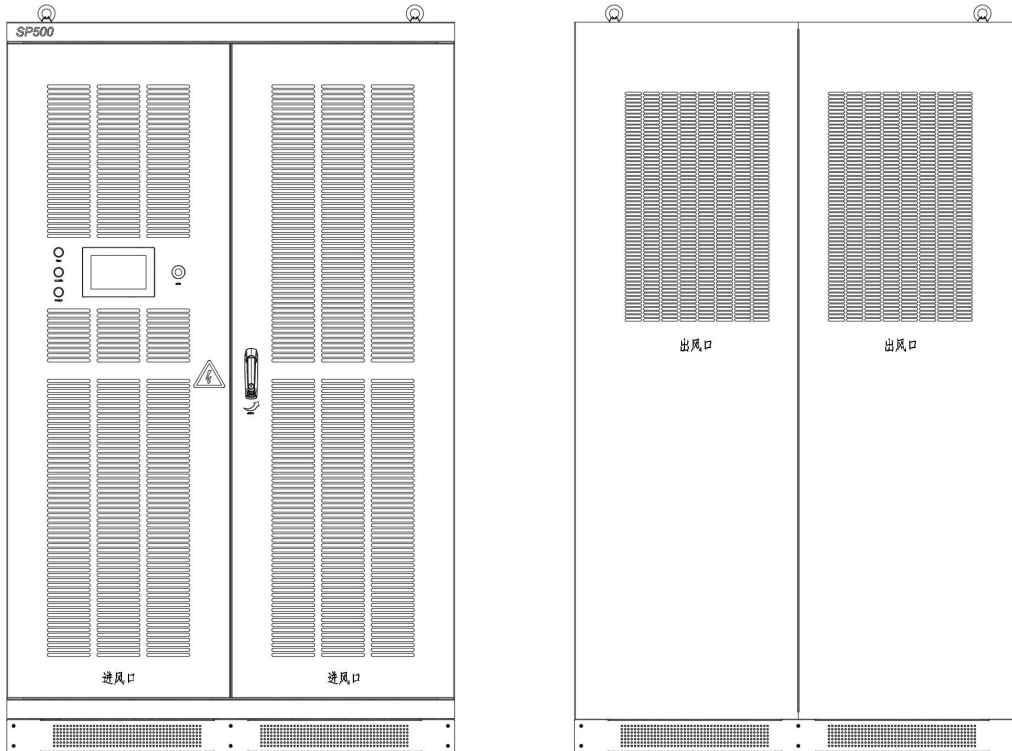


Figure 3-4 Front and rear views

### 3.3 External Devices

The external components of the integrated solar-storage system mainly include:

- LED pilot lamp
- Indicates the operating status of the all-in-one machine: "RUN", "ALARM", or "FAULT".
- LED touch screen

Display various information of the all-in-one device, including charge and discharge levels, operating modes, etc.

- Emergency shutdown button

When an emergency shutdown is required, this button allows for immediate shutdown.

### 3.4 Product Features

- And the off-grid rapid switching takes 10 ms.
- Multi-channel DC coupling achieves a charging efficiency exceeding 99.3%.
- The oil engine operates in hybrid mode, forming a networked system.
- It features built-in anti-backflow protection, self-generated power for self-consumption, and peak shaving and valley filling capabilities.

- Supports multiple devices connected in parallel.
- All-in-one design enables rapid deployment and simple on-site debugging, featuring plug-and-play functionality.

### 3.5 Technical Parameters Table

model	SP500HCG2
Battery Parameters	
Maximum battery voltage	950V
Minimum battery voltage	680V
Rated battery voltage range	680V-900V
Maximum battery current	200A*4
PV parameter	
Photovoltaic power	120KW*4
Maximum PV voltage	900V
Minimum PV voltage	200V
Rated MPPT voltage range	600V-900V
Maximum input current	200A*4
AC side (grid-connected)	
power rating	500kVA
rated current	724A
Rated grid voltage	400V/230V
Grid voltage range	-20%~15%
Grid imbalance	125%
Grid frequency range	50Hz/47Hz~52Hz(60Hz/57Hz~62Hz)
current harmonics	<3% (above 30% load)
power factor	-1~1
AC side (off-grid)	
output rating	500kVA
maximum output	550kVA
rated output current	724A

maximum output current	796.4A
rated voltage	400V/230V
Output voltage harmonics	<2% (resistive load)
degree of unbalancedness	100%
frequency range	50/60Hz
Output overload (current)	Ie*1.1<Iload≤Ie*1.25      100s
Ie: Rated output current	Ie*1.25<Iload      300ms
	Ie*1.25<Iload      300ms
system parameter	
And the off-grid switching time	Active: 0 ms; Passive: <10 ms
Number of cabinets	3 units
EMS function	SOC balancing, peak shaving and valley filling, self-generation and self-consumption, surplus electricity fed into the grid, cloud platform, anti-backflow protection, oil-electric hybrid system
isolation transformer	None (Supports transformer startup)
Bypass function	800A
levels of protection	IP20
size	W*H*D=1400*2200*880mm
weight	≈850kg
temperature range	-30~60°C (performance reduced at 45°C)
Humidity range	10-95%
cooling-down method	forced air cooling
height	4000 m (use at reduced rate for distances above 2000 m)

Table 3-3 Technical Parameters

**Note: In case of any changes to product dimensions and specifications, please refer to the company's latest information. No separate notice will be provided.**

## 4. Product Installation Guide

### 4.1 Pre-installation Notes

- When installing an integrated solar-photovoltaic and storage system, at least two qualified personnel must operate simultaneously, and all electrical installations must comply with local electrical installation standards.
- During installation, avoid touching any other parts inside the chassis except the terminal blocks.
- Safety signs indicating "Construction in Progress – Do Not Close Switch" must be installed at all upstream switches.

### 4.2 Installation Process

The installation procedure for the integrated solar-storage system is as follows:

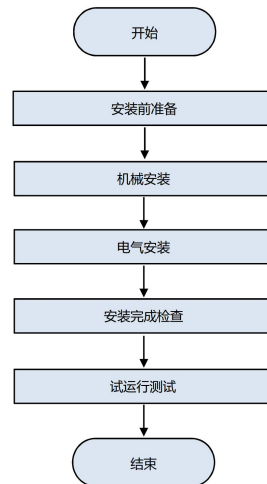


Figure 4-1 Installation Flowchart

### 4.3 Installation Preparation

#### 4.3.1 Packaging Inspection

Before installation, inspect the equipment for any damage. If transportation-related damage is detected, contact the transportation company or Zhongteng Microgrid (Shenzhen) Technology Co., Ltd., and provide photos of the damaged areas.

#### 4.3.2 Delivery List Inspection

According to the packing list inside the packaging box, verify that all delivered accessories are complete and intact:

name	quantity
Integrated Solar and Storage System	1 unit
key	2 pairs
memory card	1 copy

certificate	1 copy
Electrical Circuit Diagram	1 copy
Product User Manual	1 copy
Factory Inspection Report	1 copy

Table 4-1 Delivery List

#### 4.3.3 Installation Tools and Parts

The tools and parts required for installing an all-in-one unit are as follows:

tool	quantity
Forklift or crane	1 vehicle
Stripping pliers	1 piece
Wiring clamp	1 piece
bolt driver	1 set
Sleeve	1 set
inner hexagon spanner	1 set
multimeter	1
nut bolt	Several

Table 4-2 Tool List

#### 4.3.4 Installation Environment Requirements

Before installing the integrated solar-storage system, confirm that the environment meets the following requirements:

project	ask
temperature	-30 to 60°C (use at reduced capacity above 45 °C)
humidity	<95% (no condensation)
height	4000 m (use at reduced rate for distances above 2000 m)

Table 4-3 Environmental Requirements

The SP500HCG2 cabinet has an IP20 protection rating, making it suitable for installation in clean indoor environments; outdoor installation is prohibited.

## 4.4 Machine Transportation

### 4.4.1 Transportation Instructions

- To ensure optimal protection for the integrated photovoltaic-storage system, transportation should preferably be conducted in packaged conditions whenever possible.
- When using forklifts or cranes for transportation, pay attention to the weight of the integrated machine, ensure the transport equipment has sufficient load-bearing capacity, and arrange support or lifting points appropriately.
- The outer packaging of the all-in-one machine displays detailed product specifications and transportation requirements. Transport the device strictly in accordance with the instructions indicated on the packaging, as illustrated below:


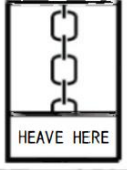



图标	示意
	重心标识
	起吊标识
	正面朝上，禁止光储一体机横放、倾斜或倒置
	小心轻放，避免运输环境中过于激烈的碰撞摩擦对光储一体机造成损坏
	注意防潮，避免光储一体机遭受雨淋或受潮

Figure 4-2 Packaging Label Description

### 4.4.2 Forklift Transportation

- When transporting without packaging, the front and rear panels must be removed before transportation.

- During transportation, the center of gravity of the container must be located between the two forks of the forklift.
- Forklifts are prohibited from long-distance transportation or use on inclined roads.
- Handle the aircraft gently during takeoff and landing to avoid impact or vibration.
- The large size of the integrated time and storage transport device may obstruct the operator's view; please arrange additional personnel.



Figure 4-3 Transport with packaging



Figure 4-4 Transport without packaging

Figure 4-3 Transport with packaging      Figure 4-4 Transport without packaging

## 4.5 Positioning and Fixation

### 4.5.1 Spatial Requirements

- Install indoors in a well-ventilated area free from excessive humidity, heat sources, and corrosive gases.
- Avoid direct sunlight exposure or rain exposure.
- Ensure proper grounding of the ground wire in the distribution room, with a grounding resistance of less than  $4 \Omega$  in dry environments.
- The installation surface of the integrated solar-storage system must have sufficient load-bearing capacity.
- Avoid storing with flammable or explosive materials; ensure compliance with fire safety requirements. The recommended space dimensions are shown in Figure 4-8:

- When installing an integrated solar-storage system, adequate distance must be maintained between the system and walls or other equipment to ensure sufficient space for the narrowest maintenance access, emergency evacuation routes, and ventilation requirements.
- This section specifies the minimum spatial requirements for the normal operation of the integrated solar-storage system. If site conditions permit, it is recommended to adopt a larger spacing to ensure reliable and efficient system performance.

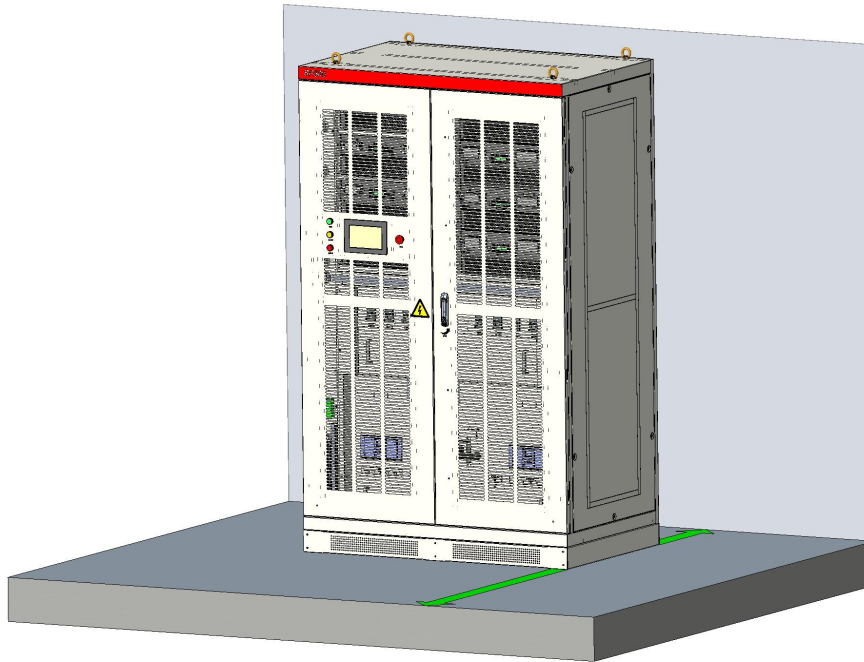


Figure 4-5 Recommended installation space

The installation area of the integrated solar-storage system must maintain a minimum clearance of  $\geq 900$  mm in front and  $\geq 200$  mm at the rear to facilitate installation, heat dissipation, and maintenance.

The specific requirements for the narrowest maintenance channel and escape routes should also refer to the applicable standards of the country/region where the project is located.

#### 4.5.2 Fixed

Before installation, remove the outer packaging of the integrated photovoltaic-storage system. When removing the packaging, ensure that at least two staff members perform the operation simultaneously.

- Select appropriate tools to transport the integrated photovoltaic-storage system to the

installation site, then align it with the bottom mounting holes as shown in Figure 4-6 (bottom view) and the system's installation dimensions.

- Secure the integrated optical storage unit to the steel trough or foundation using the M12 bolt through the central hole in the base.
- After installing the base of the integrated solar-storage unit, mount the front and rear panels onto the unit to complete its fixed installation.

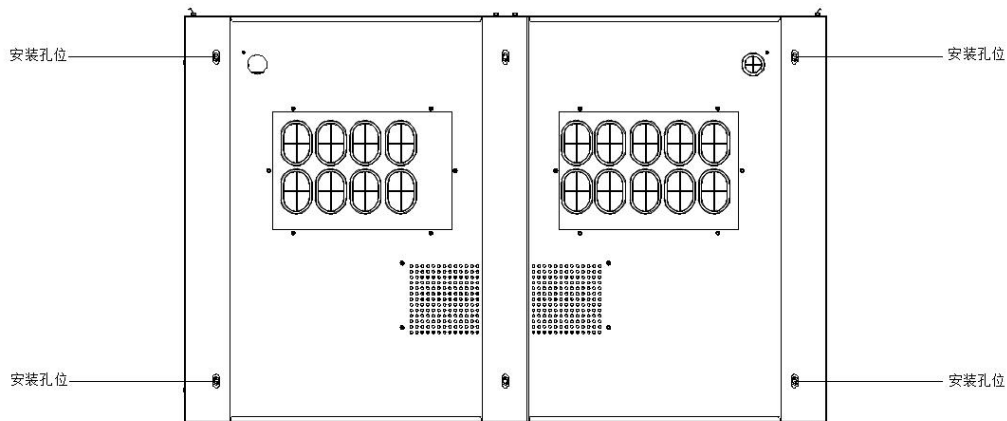


Figure 4-6 Bottom View

## 5. Electrical Installation Guide

### 5.1 Cable Requirements

According to the capacity requirements for a single integrated photovoltaic-storage system, the current flowing through a 1 mm<sup>2</sup> conductor should not exceed 5 A. Connection cables on the same side must use conductors of identical specifications. Zhongteng Microgrid (Shenzhen) Company provides reference specifications for various interface cables. Users may refer to the table below for cable design recommendations. Cable design must comply with the guidelines in this section and local wiring regulations, while also considering environmental conditions.

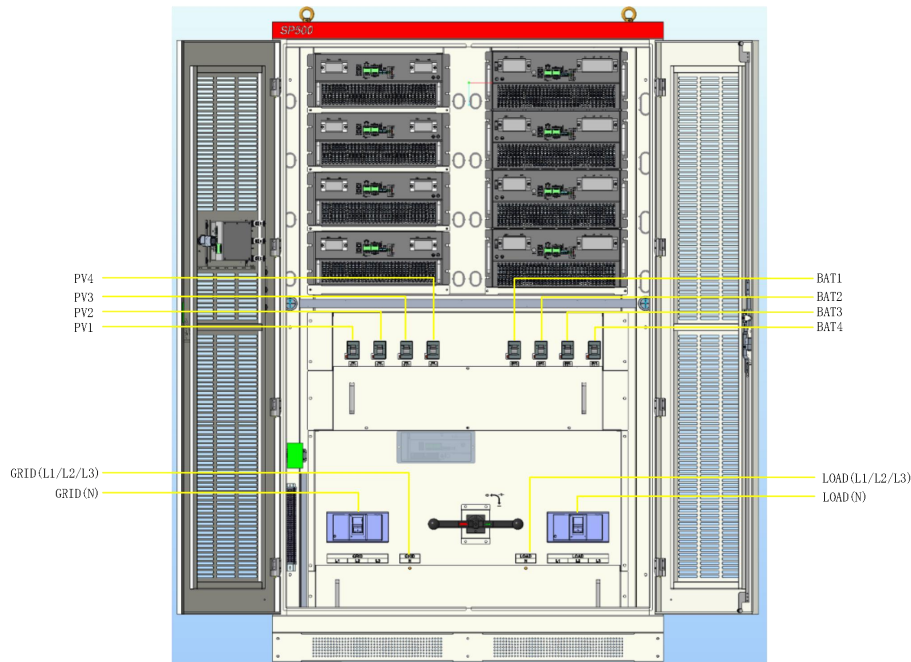



Figure 5-1 Schematic diagram of the wiring ports

name	function	remarks
PV1~PV4	MPPTPV Input Circuit Breaker	OT terminal (SC50-10); recommended cable size: 50 mm <sup>2</sup>
BAT1~BAT4	PCS battery input circuit breaker	OT terminal (SC50-10); recommended cable size: 50 mm <sup>2</sup>
GRID(L1\L2\L3\N)	PCS AC input circuit breaker	OT terminal (OT240-12); recommended: 240 mm <sup>2</sup> × 2 cables

LOAD(L1\L2\L3\N)	PCS AC output circuit breaker	OT terminal (OT240-12); recommended: 240 mm <sup>2</sup> × 2 cables
PE	Grounding busbar	OT terminal (SC16-6); recommended cable size: 16 mm <sup>2</sup>

Table 5-1 Recommended Cable and Terminal Specifications for Integrated Solar-Storage Systems

 warn

- This device does not come with external cables. The recommended cable list above is not included with the integrated cabinet. Users should provide their own cables according to their specific requirements.

Note: To prevent damage to cables from sheet metal components, the bottom cable protection ring must not be removed, as this avoids mechanical damage to the cables or radio frequency interference to surrounding equipment.

## 5.2 Terminal Block

Installation diagram of terminals and fixing screws used for power cable wiring in integrated solar-storage systems:

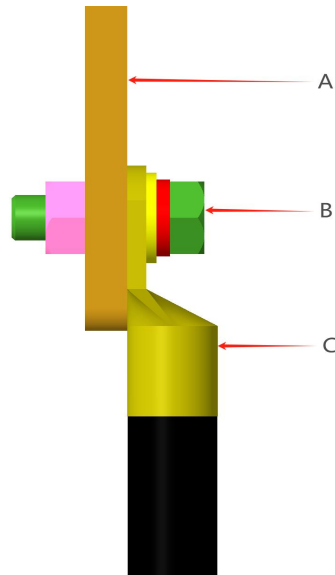


Figure 5-2 Schematic diagram of power terminal wiring

order number	name
--------------	------

A	Copper plate
B	nut bolt
C	terminal

Table 5-2 Power Terminal Names

## 5.3 Cabling Specifications

When laying cables, communication cables and power cables must be installed separately. DC circuits and AC circuits should also be installed separately, with a minimum distance of 300 mm between different cables. When control cables must pass through power cables, the angle between the two types of cables must remain at 90°.

The recommended minimum spatial distance between parallel shielded data cables and power cables, along with their corresponding on-site configurations.

Parallel line length (m)	Minimum distance (m)
200	0.3
300	0.5
500	1.2

Table 5-3 Spacing between communication lines and power cable wiring

For communication cables, shielded twisted-pair cables are recommended. The shielding layer should be grounded at one end for optimal shielding performance.

## 5.4 Fixing and Protection of Connection Cables

### 5.4.1 Fixing of Cables

To prevent the copper terminals from loosening under stress—leading to poor contact, increased contact resistance causing overheating or even fire—the screws securing the terminal blocks must meet the torque requirements specified in Table 5-5.

Screw size	M4	M5	M6	M8	M10	M12
torsion (N·m)	2	3.2	7	16	34	46

Table 5-4 Screw Dimensions and Required Torque

## 5.4.2 Cable Protection

Cable protection covers both communication cables and power cables, with the following protective measures:

- Protection of communication cables: Due to their thin diameter, communication cables are prone to breaking under tension or detaching from terminal blocks during installation. It is recommended to complete the power circuit connections first before proceeding with cable routing. Where cable trays are unavailable, use tie straps for secure fixation. Additionally, cables should be routed away from heat-generating components and areas with strong electric fields.
- Protection of power cables: During installation and connection, avoid scratching or damaging the cable insulation, as this may cause short circuits; power cables must also be securely secured.

## 5.5 External Cable Installation Steps

### 5.5.1 The cabinet door opens

- Remove the front and rear panels at the bottom of the all-in-one unit (as indicated in Figure 4-7), then open the front door panel.
- Insert the cabinet key, rotate it 90°, press the button below the door lock to release the handle, then rotate the handle counterclockwise (as indicated by the screw-printed rotation pattern on the cabinet) to open the front door panels on both sides of the cabinet. See Figure 5-3:



Figure 5-3 Cabinet Door Lock

### 5.5.2 Remove the cover plate

Remove the cover plate fixing screws shown in Figure 5-6 (marked with a red circle). The center of the cover plate 2 houses the PCM600 external extension handle. To remove the cover plate, loosen the fixing screws on the handle (marked with a yellow circle) and the cover plate fixing screws.

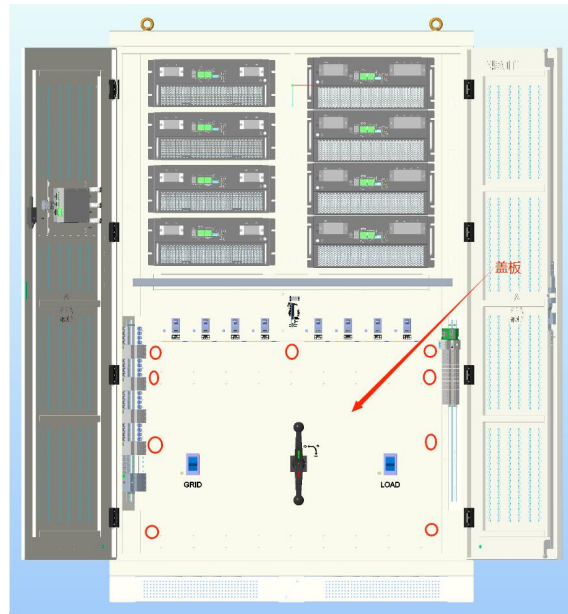


Figure 5-4 Interior of the Cabinet

### 5.5.3 DC Side Wiring

Step 1: Use a multimeter to verify that all terminals of the integrated solar-storage system are powered off.

Step 2: Check whether the external cables have proper labeling.

Step 3: After confirming the correct polarity of the cables, connect the positive and negative terminals of the battery pack to the "BAT+" and "BAT-" terminals (DC circuit breaker), and connect the photovoltaic "+" and "-" terminals to the "PV+" and "PV-" terminals (DC circuit breaker).

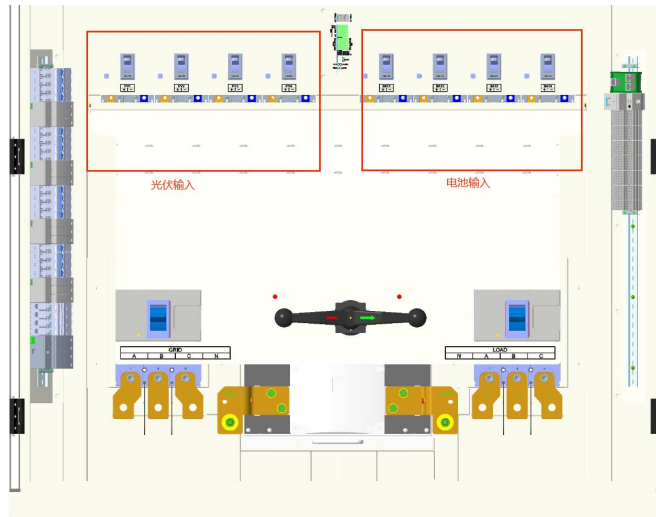


Figure 5-5 DC wiring switch

**! danger**

- To avoid injury from direct contact with equipment, wiring must be performed when the equipment is not energized.
- The DC switch must be in the open state.
- Use the square and table to measure the non-powered copper busbar on the DC side.

**! warn**

- DC input voltage limit. Ensure the DC input voltage does not exceed 950 VDC!
- Any DC input voltage exceeding this limit may damage the integrated photovoltaic-storage system.
- The equipment damage and loss incurred under such circumstances are not covered by the warranty.

### 5.5.4 AC Side Wiring

Step 1: Use a multimeter to verify that all terminals of the integrated solar-storage system are powered off.

Step 2: Verify that the external cables are properly labeled and correctly marked with phase sequence. The three-phase AC output cables (A, B, C, N) should be fitted with yellow, green, red, and blue insulating sleeves respectively to distinguish the phase sequence.

Step 3: Connect all grid components to the "GRID" terminals and all load components to the "LOAD" terminals, as shown in Figure 5-6. The corresponding cable connections are listed in Tables 5-5 and 5-6.

L1	Connect to Grid Option A
L2	Connect to Grid Option B
L3	Connect to Grid Option C
N	Connect to the grid with N items

AC	Under load L1
Output	Under load L2
	Under load L3
	Load N

Table 5-6 Load Connection Correspondence

Table 5-5 Grid Connection Correspondence

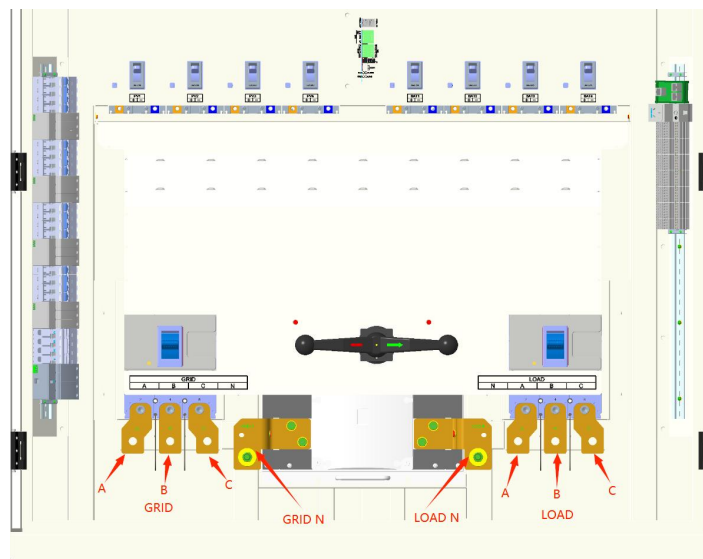


Figure 5-6 Schematic diagram of AC-side wiring ports

### 5.5.5 Communication Cable Wiring

#### External communication cable wiring:

Step 1: The device base includes reserved external communication cables for the customer.

Connect the cables correctly to the terminal ports at the bottom of the device.

Step 2: To ensure proper wiring, connect all EMS communication cables to the terminal block.

The customer connects the cables through the terminal block, as shown in Figure 5-7: Terminal Block.

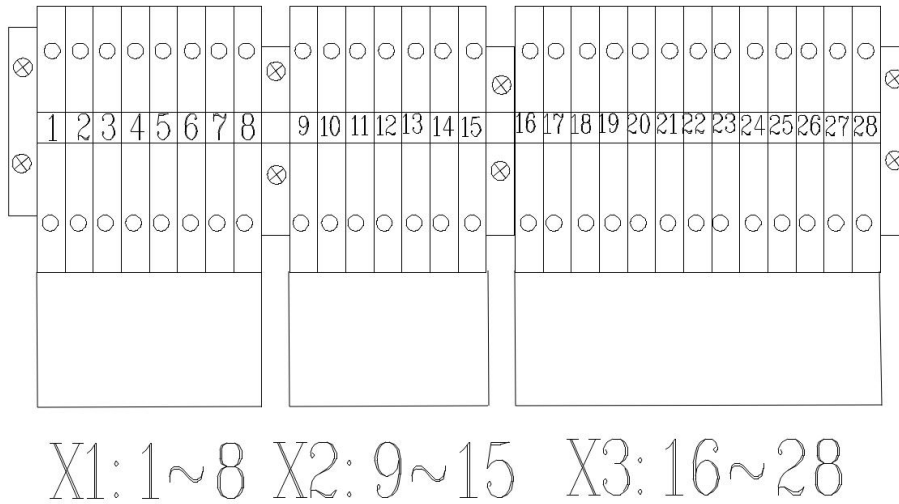


Figure 5-7 Terminal Strip

Communication cable wiring can be fine-tuned using technical protocols, with connections defined according to the terminal block specifications. The interface definition table is as follows:

Terminal strip name	Terminal sorting number	Default Function
X1	1	Meter RS485: A
	2	Electric meter RS485: B
	3	Air Conditioning RS485: A
	4	Air Conditioning RS485: B
	5	BMS CAN:H
	6	BMS CAN:L
	7	BMS RS485:A
	8	BMS RS485:B
X2	9	Input dry contact 1 (reserved)
	10	Input dry contact 2 (reserved)
	11	Input dry contact 3 (reserved)

	12	Input dry contact 4 (reserved)
	13	Input dry contact 5 (reserved)
	14	Input dry contact 6 (reserved)
	15	Input dry contact common terminal
X3	16	Output dry contact 1 (reserved)
	17	Output dry contact 1GND
	18	Output dry contact 2 (reserved)
	19	Output dry contact 1GND
	20	Output dry contact 3 (reserved)
	21	Output dry contact 1GND
	22	Output dry contact 4 (reserved)
	23	Output dry contact 1GND
	24	Output dry contact 5 (reserved)
	25	Output dry contact 1GND
	26	Output dry contact 6 (reserved)
	27	Output dry contact 1GND
	28	Reserve

Table 5-7 Terminal Strip Function Definition

### 5.5.6 System Grounding

The grounding busbar within the integrated solar-storage system must be reliably connected using a grounding cable. The grounding busbar is already securely connected to the system's enclosure inside the cabinet; during connection, it must be linked to the equipotential bonding device at the installation site or electrical control room, with a resistance not exceeding 4 Ω. The grounding

cable must have a cross-sectional area of no less than 16 mm<sup>2</sup>. The location of the grounding busbar is indicated in Figure 5-8, and the cable outlet holes are specified in Table 3-4.

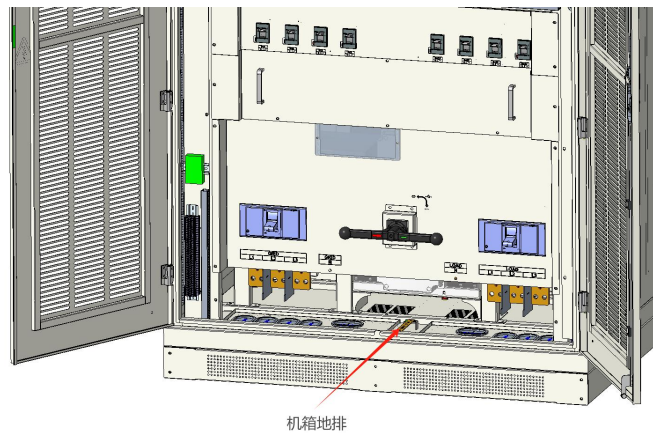


Figure 5-8 Grounding busbar

## 5.5.7 Installation Completed

After completing all mechanical and electrical installations, the removed front and rear panels must be reinstalled on the integrated photovoltaic-storage system. Only after confirming that everything is properly installed should power-on operations be permitted.

## 6. Trial Operation

### 6.1 Pre-start Check



- Prior to the trial operation, conduct a thorough inspection of the equipment installation, paying special attention to verifying that the DC and AC voltages meet the PCS requirements, as well as confirming correct polarity and phase sequence.
- Check whether all connections comply with the relevant standard specifications and ensure the system is properly grounded. The grounding resistance is critical to the overall system safety and must meet the required specifications before the initial trial operation.
- Before the trial run, ensure that both the AC switch and DC switch are in the open position.

Step 1: Check the PCS

A series of inspections must be performed on the PCS before power-on:

Check whether the PCS installation and wiring have been completed in accordance with Chapter 5.

Ensure that both AC and DC circuit breakers are in the open position.

Step 2: Check the AC side voltage

Check whether the three-phase connection of the PCS matches the correct phase sequence of the power grid.

Check whether both the phase voltage and line voltage fall within the predetermined range, and record the voltage values.

If possible, measure the Total Harmonic Distortion (THD) and examine the curve. If the distortion is severe, the PCS may fail to operate.

Step 3: Check the DC side voltage

The DC side should connect the battery pack to the inverter, ensuring the correct polarity of each battery pack's input.

The photovoltaic side should connect the PV input to the MPPT, ensuring correct polarity for each PV input group.

The maximum voltage of the battery shall not exceed 950 V.

The maximum voltage for photovoltaic systems shall not exceed 900 V.

If the voltage deviation exceeds%, it may be caused by factors such as load fluctuations at the site, cable damage, or loose cables.

Step 4: Check Other Content

After completing the aforementioned pre-startup checks, carefully verify the following items to ensure accuracy.

All connections shall be made in accordance with the contents of Chapter 5 of this manual.

The protective cover inside the device is securely installed.

The emergency shutdown button is in the released position.

The circuit breakers on both the AC and DC sides are open, i.e., in the "OFF" position.

Use a multimeter to check whether the AC and DC side voltages meet the PCS startup requirements and ensure there is no risk of overvoltage.

The cabinet door is closed, and the key has been removed and entrusted to a designated person for

safekeeping.

For PCS units with prolonged downtime, a thorough and meticulous inspection of the equipment must be conducted prior to startup to ensure all components are in proper working order.

The machine may only be started after all indicators meet the requirements.

## 6.2 Power-on Operation Procedure

After all requirements in Chapter 6.1 are met, the PCS can be powered on.

Step 1: Ensure that the wiring on both the DC and AC sides is correct.

Step 2: Close the AC input surge protection switch and the PV input surge protection switch, then close QF3, QF8, QF9, QF10, and QF1.

Step 3: Close the circuit breakers on both the AC and DC sides; the screen will then light up.

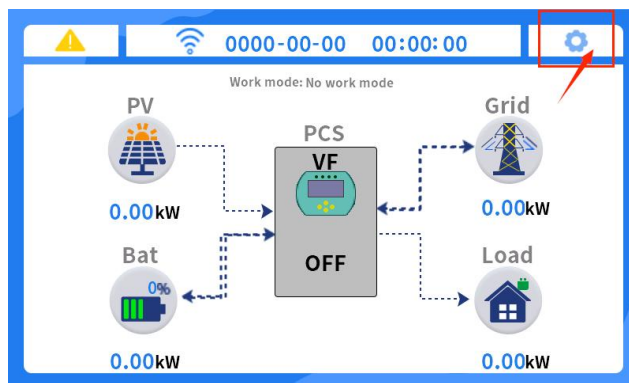
Step 4: After completing the above steps, close the cabinet door. Use the touchscreen to configure the number of PCS units, select the BMS protocol, set the operating mode, and configure application settings. Then click the Screen Settings button, select Basic Settings, and click Power On. The PCSRUN indicator will switch from flashing to continuously lit, indicating successful startup. The EMS operation steps are shown in the figure below:

Number of PCS types:

Click the Screen Settings button → Select Advanced Features → Enter the password "11" →

Go to Converter/System Configuration → Set the number of converters to 4 and the type to SP125H+STS+MPPT/DCDC

Step 1: Click Screen Settings



Step 2: Click Advanced Features and enter the password "11"



Step 3: Click on Converter/System Configuration



Step 4: Set the number of converters to 4, and the type to SP125H+STS+MPPT/DCDC

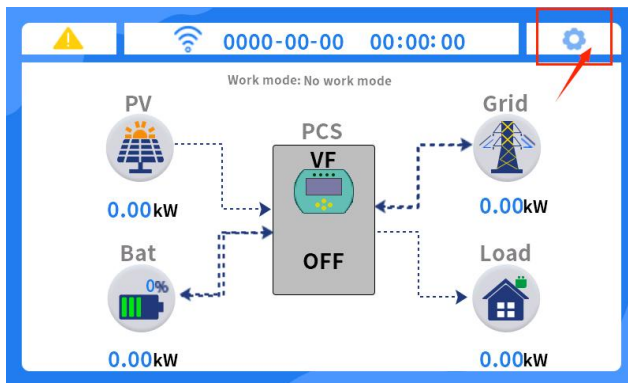


Set BMS protocol:

Click the Screen Settings button → Select Battery Settings → Scroll up and down to find

Battery Configuration → Choose the protocol based on your actual battery specifications → Set the battery cluster count to 4 and battery management to 1 cluster per management unit

Step 1: Click Screen Settings



Step 2: Click Battery Settings



Step 3: Flip the page up and down to find the battery configuration



Step 4: Select the protocol based on the actual battery protocol



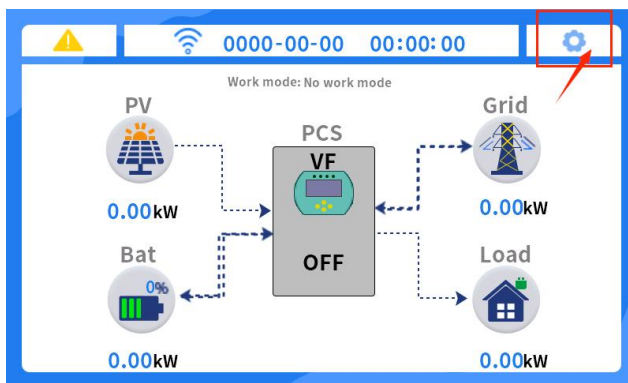
Step 5: Set the battery cluster count to 4 and the battery management to 1 cluster per management unit.



Set work mode:

Click the Screen Settings button → Select System Operating Mode → Choose the operating mode based on your application requirements

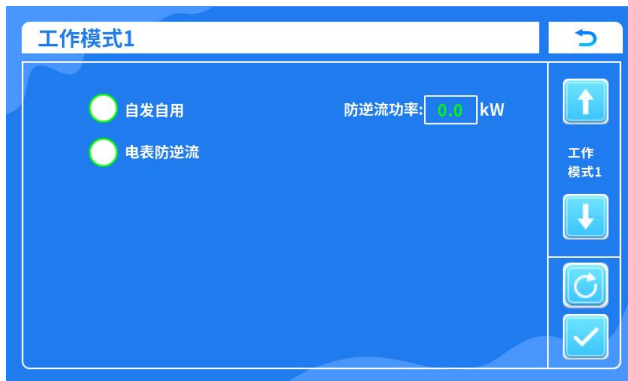
Step 1: Click Screen Settings



Step 2: Click System Operating Mode



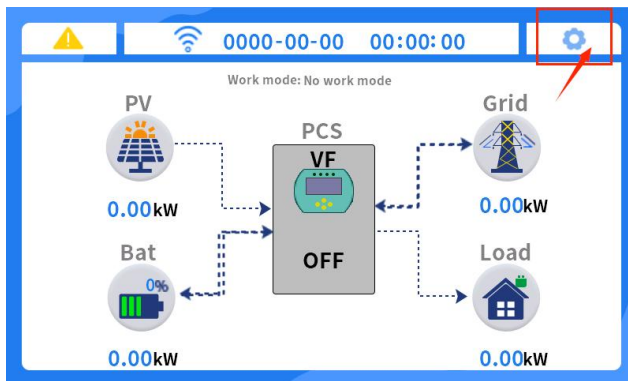
Step 3: Select the working mode based on application requirements



Set PCS to turn on:

Click the Screen Settings button → Click Basic Settings → Click ON to power on

Step 1: Click Screen Settings



Step 2: Click Basic Settings



Step 3: Click ON to power on



## 6.3 Power Off Procedure


### 6.2.1 Power off under normal conditions

During routine maintenance or inspection, follow the following procedure to perform the shutdown operation:

Step 1: Through the power-on/off menu on the touchscreen, click "OFF" to shut down; the PCSRUN indicator will then change from continuously lit to slow flashing.

Step 2: Disconnect the AC-side GRID switch to set it to the "OFF" position. At this point, the PCM indicator light turns off, and the PCS icon on the screen changes from grid-connected to off-grid.

Step 3: Disconnect the PCS DC-side switch to set it to the "OFF" position. Wait until the bus capacitor has fully discharged, the touchscreen turns off, and the PCS indicator light goes out, completing the shutdown process.

 warn

- When the machine is operating normally, it is strictly prohibited to directly disconnect the circuit breaker to avoid arc damage that could compromise its functionality.
- In severe cases, it may also damage the energy storage converter.


### 6.2.1 Power shutdown during faults or crises

In cases of critical situations or malfunctions, follow the following procedure:

Step 1: Press the emergency shutdown button "EPO".

Step 2: Disconnect the DC-side circuit breaker or load switch from the AC-side circuit breaker.

Step 3: After confirming that the hazard or fault has been resolved and operation is required, reset the EPO button.

 warn

- The emergency shutdown button is intended solely for use during machine failures or critical emergencies. For normal shutdown operations under normal conditions, the shutdown command should be executed via the button on the touchscreen panel.
- In a crisis, immediately press the emergency shutdown button to ensure a rapid response.

## 6.4 Use of Maintenance Bypass

The maintenance bypass ensures uninterrupted power supply to the load during PCS maintenance or failure (provided the grid or diesel generator remains powered). Upon closing the bypass, the diesel generator or grid is connected to the load.

When a maintenance bypass is not required:

When the system is operating normally, the PCS requires no maintenance and is fault-free, with the bypass switch in the open position, as shown in Figure 6-1:

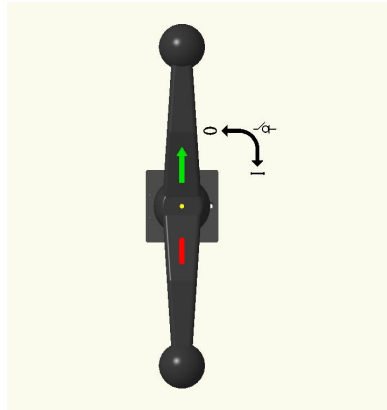


Figure 6-1 Maintenance bypass disconnected

When a maintenance bypass is required:

Step 1: Turn off the PCS/MPPT;

Step 2: Disconnect the photovoltaic switch and the DC switch;

Step 3: Ensure that the power grid or generator is powered;

Step 4: Rotate the bypass switch to the right, as shown in Figure 6-2:

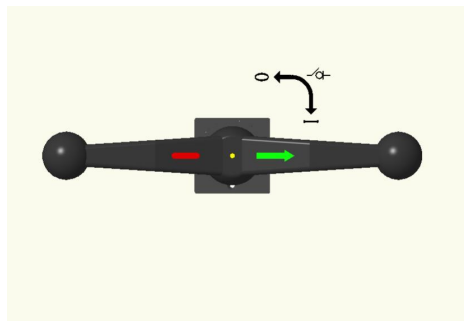


Figure 6-2 Closure of Maintenance Bypass

**⚠ danger**

- In off-grid mode, when the PCS is powered on and operating normally, the bypass switch must not be opened to prevent short-circuit faults.
- In severe cases, it may also cause PCS damage.

## 7. Maintenance and Fault Diagnosis

### 7.1 Description

Due to factors such as ambient temperature, humidity, dust, and vibration, the internal components of the system undergo aging, which can impair their performance or even cause operational failures. Therefore, routine and periodic maintenance of the integrated cabinet and its internal equipment is essential to ensure proper functioning and extended service life. All measures and methods that help maintain the integrated cabinet and its internal components in optimal working condition fall within the scope of maintenance activities.

If a malfunction occurs and the issue cannot be resolved using this manual, please contact our company and provide the following information.

To provide you with better service:

- Photo of the fault site.
- Device model and serial number.
- Information including components connected to the system, configuration of energy storage batteries, and grid parameters.
- Communication connection scheme for hybrid inverters.
- Failure information and brief description.

### 7.2 Precautions

#### 7.2.1 General Safety Principles

When performing maintenance or inspection operations on integrated cabinets, please strictly adhere to the following five safety principles to ensure operator safety:

- Disconnect all external connections of the integrated cabinet, as well as the connection to the internal power supply of the device.
- Ensure the integrated cabinet is not accidentally powered on again.
- Use a multimeter to ensure the interior of the integrated cabinet is completely de-energized.
- Ensure the integrated cabinet and its internal equipment are properly grounded.
- When operating near potentially live components, cover them with insulating fabric.



- Only qualified and authorized personnel may perform maintenance and other operations on the integrated cabinet.
- During maintenance, do not leave metal parts such as screws or washers inside the integrated cabinet to avoid damaging the internal equipment!
- Even if only the circuit breaker is disconnected, the cable terminals inside the integrated cabinet remain energized!
- Before opening the cabinet door and commencing formal maintenance work, disconnect all circuit breakers before and after the equipment.
- After shutting down the PCS, wait at least 15 minutes and use a multimeter to confirm that there is no voltage on the internal copper plates before proceeding.

Sino Soar Hybrid (Shenzhen) Technology Co.,Ltd.  
Address: 10th Floor, Building 3, Huidongsheng Industrial Park, No. 1028 Guangqiao  
Avenue, Yutang Subdistrict, Guangming District, Shenzhen  
Postal code: 518100  
Website: <https://www.vgridpower.com>  
Tel: 0755-23202574