

***Sinexcel***

**PDS1-45k/ PDS1-60k**  
**DC-DC Converter User Manual**

**Ver 1.00**

# User's Manual

## Sinexcel Electric PDS1 DC-Boost Converter

Data Version V1.0

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Applicable to PDS1-45k, PDS1-60k

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Ltd. provides a full range of technical support for customers, users can contact the nearest office or customer service center of Sinexcel Electric Co.

Sinexcel Electric Co.

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Sinexcel Electric Co.

Company website: [www.sinexcel.com](http://www.sinexcel.com)

Address: Block 6, Block 2, Nanshan Baiwangxin Hi-Tech Industrial Park, No.1002 Songbai Road, Nanshan District, Shenzhen, China

Postcode: 518055

Customer Service Hotline: 0755-8651-1588

Company Fax: 0755-8651-3100

E-mail: [service@sinexcel.com](mailto:service@sinexcel.com)



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# Chapter 1 Overview

## 1.1 Model Definition

Model Definition.

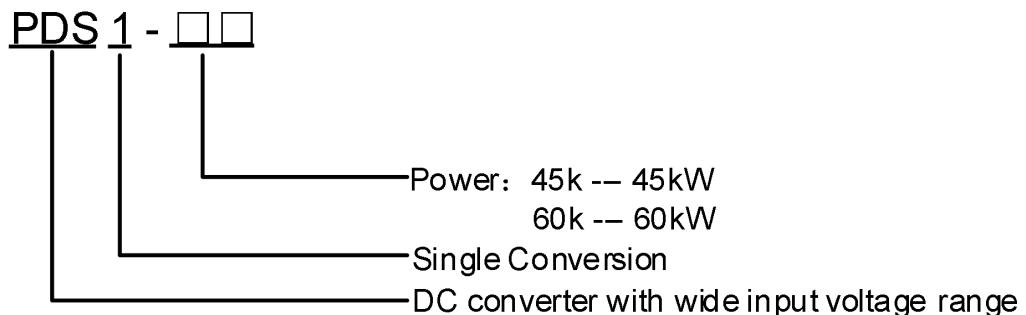


Figure 1-1 Product model definition

SN Definition

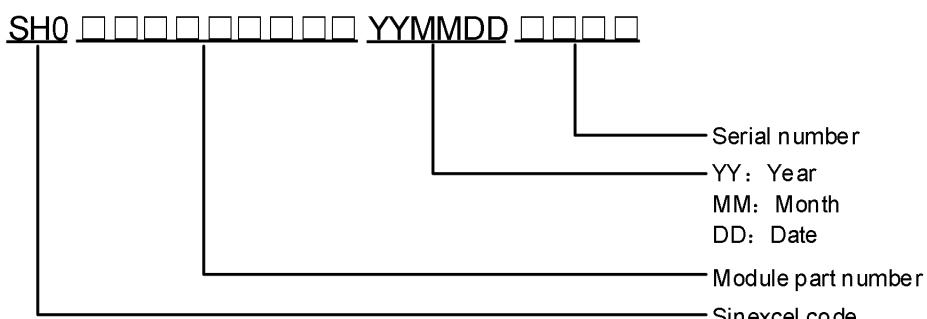


Figure 1-2 Model serial number definition

## 1.2 Explanation of Symbols

This manual covers the installation and use of the Shenghong Electric PDS1-45k/PDS1-60k DC-DC Boost Converter.

To ensure the user's personal and property safety or efficient use of this product, please read this manual carefully before installation and use.

### 1.2.1 Manual Tip Identifiers

The following is a list of identifiers used in this manual. Please read carefully and understand the meaning of each identifier.

 DANGER	This symbol indicates that there is a danger during operation and that failure to comply with such warnings may directly result in serious injury or death.
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	<b>WARNING</b>	This symbol indicates that there are potential hazards during operation and failure to comply with such warnings may result in personal injury or death.
---	----------------	--

	<b>CAUTION</b>	This symbol indicates that there is a potential hazard during operation and that failure to comply with such warnings may result in damage to the equipment.
---	----------------	--

	"Instructions" are additional information in the manual that emphasize and supplement the content, and may also provide tips or tricks to optimize the use of the product and help you solve some of the problems in your application efficiently.
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### 1.2.2 Transformer Tip Identifiers

The following is a list of identifiers used on DC-DC boost converters. Please read carefully and understand what each identifier represents.

 5min	This symbol indicates that after the converter is disconnected from the PV panel and the energy storage converter, it is necessary to wait for 5 minutes before touching the internal conductive devices.
	This symbol indicates that the surface of the machine is hot during operation, so do not touch the surface of the machine!
	Please read the product manual carefully before performing any operation on the converter.
	Danger of electricity! Only professional and qualified personnel should install and electrically operate this equipment.

### 1.3 Safety instructions

The PDS1-45K/PDS1-60K DC-DC boost converter is designed and tested in strict accordance with the relevant international safety standards. The installation, commissioning, operation and maintenance processes must comply with the safety practices for electrical and electronic equipment. Improper use or misuse may endanger the personal safety of the operator or third parties, as well as damage the converter or other property. To avoid this, the following safety precautions must be strictly observed during operation and maintenance, which are described in detail in the respective sections.

 <b>WARNING</b>	<p>All installation, commissioning and maintenance operations must be performed by qualified personnel. Professional technicians must meet the following conditions.</p> <ul style="list-style-type: none"> <li>■ An engineer appointed by the manufacturer or its agent.</li> <li>■ Have received professional training.</li> <li>■ A complete reading of this manual and familiarity with safety matters in the operation of electrical and electronic equipment.</li> <li>■ Familiar with the relevant safety codes for electrical systems.</li> </ul>
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Professional technicians meeting the above requirements may perform the following tasks.

- (1) Installation of the converter.
- (2) Construction of PV-storage systems according to customer requirements.
- (3) Commissioning of the PV-energy storage system.
- (4) Operation, commissioning and maintenance of the PV-energy system.

 <b>CAUTION</b>	<p>Risk of injury if the equipment is operated incorrectly!</p> <ul style="list-style-type: none"> <li>■ The instructions in the manual must always be followed when moving and placing the converter.</li> <li>■ Improper handling of the equipment may lead to electric shocks, burns, contusions, etc.</li> <li>■ Damage to the equipment caused by any private modification and dismantling of the system (or equipment) operation without permission is not covered by the warranty.</li> </ul>
--	--

### 1.3.1 Safety instructions in mechanical installation

 <b>DANGER</b>	<p>Always ensure that the converter is free of any electrical connections before installing the converter.</p>
 <b>CAUTION</b>	<p>Poor ventilation of the installation environment will affect the system performance!</p> <p>Good ventilation needs to be ensured during the operation of the equipment. It is important to keep the unit upright and the air ducts smooth, with no strong drafts blocking the air flow near the air outlets, to ensure adequate cooling inside the unit.</p>

### 1.3.2 Safety instructions in the electrical connection

 <b>DANGER</b>	<p>Do not touch the metal terminals of the PV panels without adequate protection.</p>
 <b>CAUTION</b>	<p>The cables used in the photovoltaic-storage system must be firmly connected, well insulated, and of proper gauge.</p>
 <b>CAUTION</b>	<p>All electrical installations must meet national/regional electrical standards. Permission must be obtained from the electricity authority of the country/region in which it is located in order to operate on the grid.</p> <p>Before connecting to the input power source, be sure to ground the system reliably and comply with local electrical standards.</p>

### 1.3.3 Safety instructions during operation of the equipment

 <b>DANGER</b>	<p>Any touching of the copper strip, contacts, terminals, etc. inside the equipment connected to the photovoltaic panels and the energy storage converter circuit may cause a fatal burn or electric shock!</p> <ul style="list-style-type: none"> <li>■ Do not touch the terminals and conductors connected to the photovoltaic panels and energy storage converter circuits.</li> <li>■ Pay attention to any instructions and safety documentation regarding the connection to the PV panel and the energy storage converter.</li> </ul>
 <b>WARNING</b>	<p>There is a risk of electric shock inside the device! Do not open the converter housing while the converter is in operation or under power.</p> <ul style="list-style-type: none"> <li>■ A complete and closed cabinet enclosure protects the operator's personal property.</li> <li>■ Any operation of this equipment needs to be performed or directed by qualified personnel.</li> <li>■ Please pay attention to the safety precautions listed in the user manual and other documents.</li> </ul> <p>Do not disconnect the input side when the output side of the converter is under load. If disconnection is necessary, perform a shutdown operation first. Disconnect the input only after disconnecting the output side disconnect switch of the converter and confirming that no voltage is present.</p>

 <b>CAUTION</b>	<p>It is strictly forbidden to block the air duct with foreign objects while the converter is in operation.</p>
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### 1.3.4 Safety instructions for repair and replacement

 <b>DANGER</b>	<p>Improper maintenance operations on the equipment may lead to injury or equipment damage. Before performing any operation, the user must strictly follow the following steps.</p> <ul style="list-style-type: none"> <li>■ Disconnect all external connection switches and confirm with a multimeter that there is no voltage at the converter ports.</li> <li>■ Wait for at least 5 minutes until the internal energy storage components are discharged, during which time it is strictly forbidden to touch the charged parts of the equipment terminals, contacts, copper row, etc. with human body or any conductor.</li> <li>■ Please carry out maintenance operations with an escort after complete power supply to prevent any unexpected situation.</li> </ul>
 <b>CAUTION</b>	<p>Do not allow unrelated personnel to enter the maintenance site!</p> <p>Temporary warning signs must be posted or barriers erected to prevent unrelated persons from entering the electrical connection or maintenance area when performing electrical connection and maintenance work.</p>
 <b>CAUTION</b>	<p>Restart the converter only after removing faults that affect the safety performance of the converter.</p> <p>the converter may only be re-powered after a complete power down of 1 minute.</p> <p>The converter does not contain service parts inside, so if you need any repair service, please contact our after-sales service.</p>
 <b>CAUTION</b>	<p>Do not replace the internal components of the converter without permission. We will not be responsible for any warranty or joint and several liability for any damage caused by this.</p>
 <b>CAUTION</b>	<p>Contact or improper handling of printed circuit boards or other electrostatic sensitive components can cause damage to the device.</p> <p>Avoid unnecessary contact with the circuit board.</p> <p>Observe electrostatic protection codes and wear anti-static bracelets.</p>

### 1.3.5 Miscellaneous

 <b>WARNING</b>	<p>All safety markings, warning labels, and nameplates on the transducer.</p> <ul style="list-style-type: none"> <li>■ must be clearly visible.</li> </ul>
--	--

	<ul style="list-style-type: none"><li>■ They must not be removed or covered.</li></ul>
--	--

## 1.4 Caution

### 1.4.1 Personnel requirements

The transducer must be commissioned and maintained by an engineer appointed by the manufacturer or its agent. Failure to do so may endanger personal safety and cause equipment failure, and any resulting damage to the equipment is not covered by the warranty.

### 1.4.2 Scope of use of the equipment

Converters are for commercial/industrial use only and may not be used as any energy saving equipment associated with life support equipment.

### 1.4.3 Enclosure marking

The chassis marking contains important information for safe operation of the converter and must not be torn or damaged.

Make sure the chassis marking is legible and replace it immediately if it becomes damaged or obscured.

### 1.4.4 Instructions

To make it easier for the user to read this manual, a large number of pictures are included. The pictures are only for illustration purpose, please refer to the actual product for detailed display.

## Chapter 2 Introduction of optical storage system

## 2.1 System Application

As shown in Figure 2-1, the photovoltaic storage system built by DC-DC booster converter includes battery (group), energy storage converter, intelligent power distribution unit, EMS and BMS, and PV module. The PV modules are connected to the DC-DC boost converter to realize the PV boost, and the MPPT control is performed in real time according to the PV string energy state. After the boost, the DC bus of the storage converter is connected through the bus side, and the discharge power of the storage converter is dispatched through RS485 communication with EMS to realize the effective power transmission; the DC side of the storage converter is connected to the battery pack, and the AC side is connected to the industrial load or grid connection through the intelligent power distribution unit, and the energy management between the three is performed through EMS to realize the energy dispatch of the photovoltaic storage system.

### 2.1.1 System structure diagram

The structure diagram of the optical storage system is as follows. The energy storage converter pushes the data to the EMS, DC-DC boost converter or other upper computer system in real time.

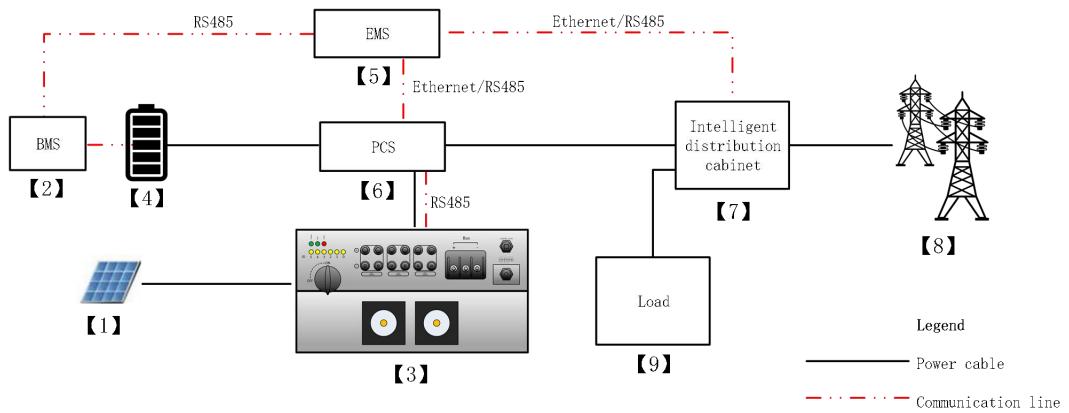


Figure 2-1 Energy storage system structure diagram

(1) PV module	(2) BMS battery management system	(3)DC-DC booster converter
(4) Battery pack	(5) EMS energy management system	(6) Energy storage converters
(7) Intelligent power distribution unit	(8) Grid	(9) Household and industrial loads

## 2.2 Dimension

The outline dimensions of PDS1-45K/PDS1-60K module models are shown in Figure 2-2.

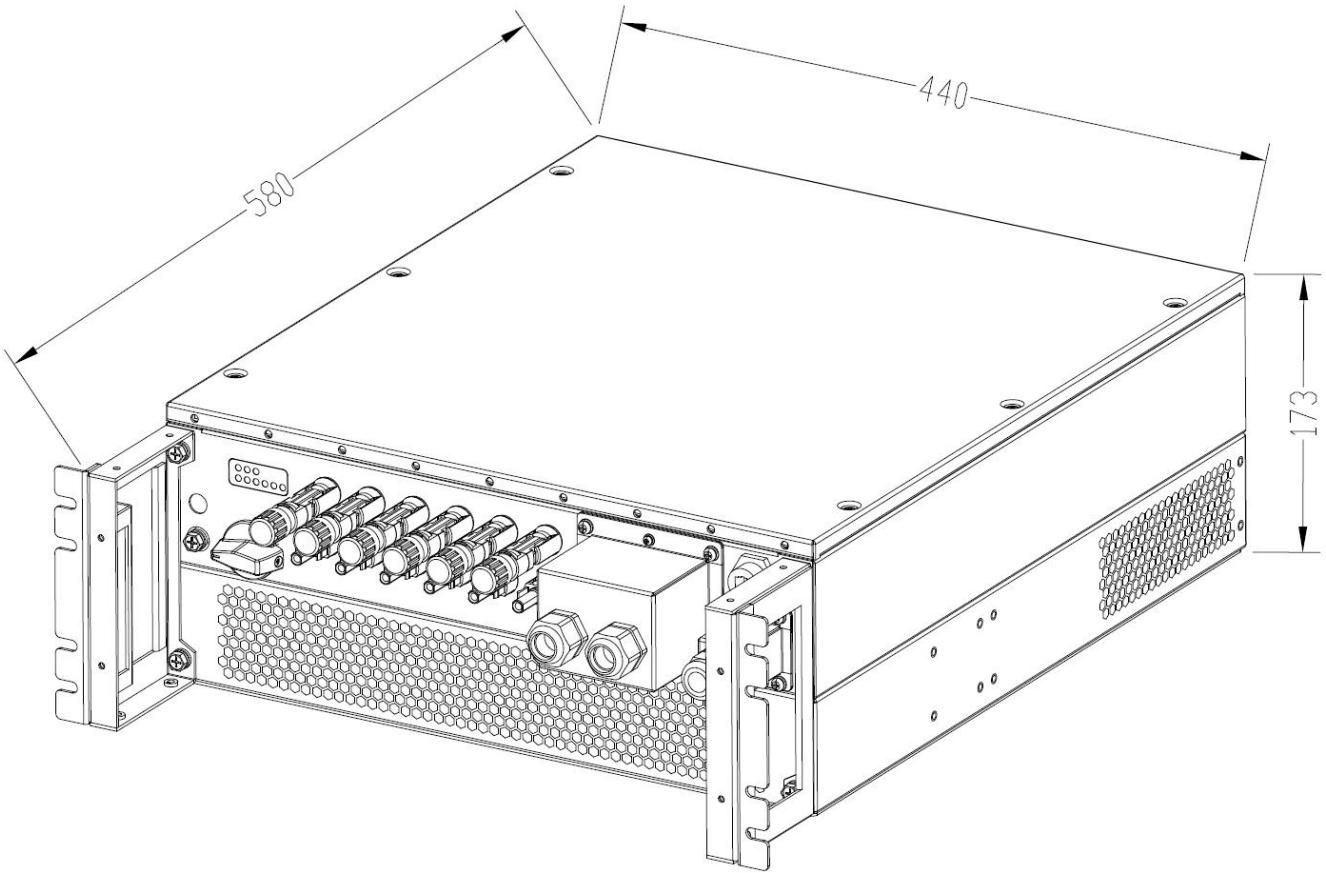


Figure2-2 PDS1-45K/PDS1-60K module external dimension diagram (unit: mm)

## 2.3 Appearance display diagram

The appearance of the PDS1-45K/PDS1-60K module panel is shown in Figure 2-3.

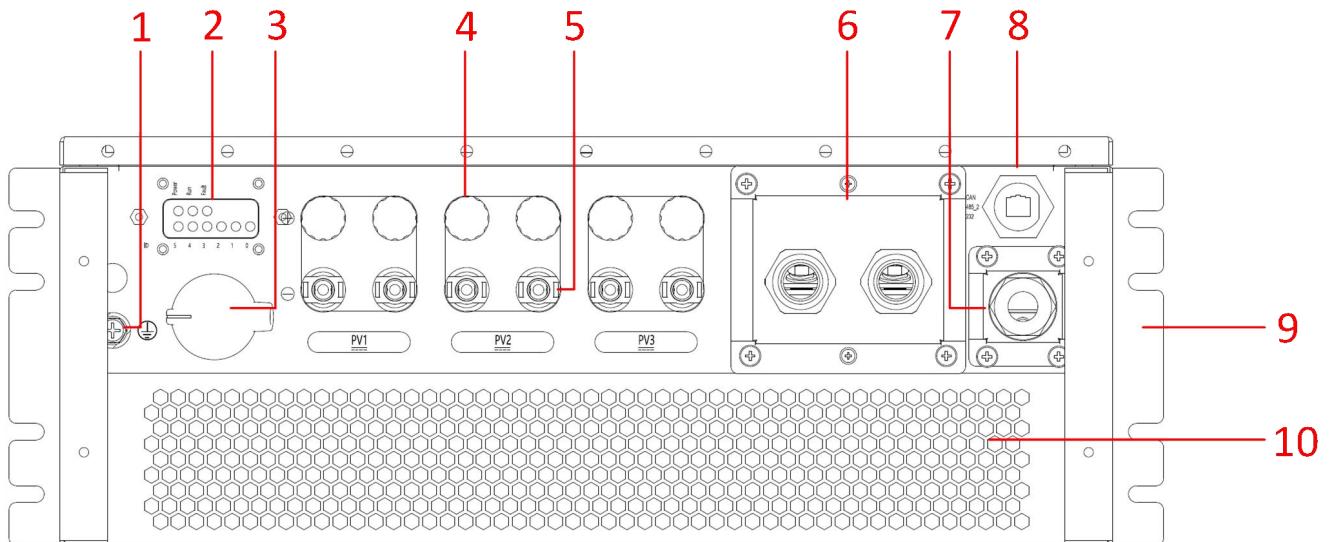


Figure2-3 PDS1-45K/PDS1-60K module model panel appearance diagram

Table 2-1 Port introduction table

SN	Name	Description
1	Ground terminal	Grounding protection wire fixed point
2	Indicator light	To indicate the working status and ID of the module
3	PV input switch	To turn on/off the photovoltaic input (To avoid power device life attenuation because of the impact current, do not turn on the switch when the photovoltaic voltage is higher than 100V.)
4	PV positive input port	MC4 terminal*6 To connect positive power cables to the photovoltaic module
5	PV negative input port	MC4 terminal*6 To connect negative power cables to the photovoltaic module
6	DC output port	To connect power cables to the PCS system
7	Signal interface	External communication interface
8	Reserve signal interface	Not supported at present
9	Handle	Extraction and install module, not for load-bearing
10	Vent	Fan cover and air duct vents

## 2.4 Technical Parameters

The technical parameters of DC-DC boost converter are shown in the following table.

Table 2-2 Technical parameters table

Technical specifications	PDS1-45k	PDS1-60k
<b>Photovoltaic side</b>		
Rated allowable power	45kW	60kW
Maximum input voltage <sup>1</sup>	1100V	1100V
Rated input voltage	600V	600V
Starting Voltage	250V	250V

MPPT voltage range <sup>2</sup>	200~830V	200~1000V
Full Load MPPT Voltage Range	430V~750V	575~900V
Number of MPPTs	3	3
Number of MPPT input strings per circuit	2	2
Maximum input current	35A/35A/35A	35A/35A/35A
<b>DC bus side</b>		
Rated allowable power	45kW	60kW
Operating voltage range	700V~830V	600~1000V
Rated Voltage	700V	700V
Rated Current	65A	86A
Maximum working current	65A	86A
<b>Efficiency</b>		
Peak efficiency	>99%	>99%
<b>Basic parameters</b>		
Module size (width, height and depth)	440*175*580mm	440*175*580mm
Net weight	22kg	22kg
Heat dissipation method	Air-cooled	Air-cooled
Working temperature / humidity	-20 ~ +60°C	-20 ~ +60°C
Protection grade	IP66	IP66
Noise	≤70dB	≤70dB
Altitude	4000m (derating greater than 3000m)	4000m (derating greater than 3000m)
Working environment pollution level	II	II
<b>Protection</b>		
Photovoltaic reverse connection protection	Yes	Yes
Insulation impedance detection	Yes	Yes
Photovoltaic side switch	Yes	Yes
Temperature protection	Yes	Yes
Nighttime PID repair <sup>3</sup>	Yes <sup>3</sup>	Yes <sup>3</sup>
Photovoltaic input surge protection	DC level 2 lightning protection	DC Class 2 lightning protection
Fan/contactor failure	Yes	Yes
Leakage current protection	Yes	Yes
<b>Terminal Type</b>		
DC Busbar Terminal Type	OT terminals	OT terminals

Photovoltaic terminal type	MC4 terminal	MC4 terminal
<b>Display/Communication</b>		
Display	LED	
Communication	RS485/CAN(reserve)/RS232(reserve)	
<b>Certification</b>		
Safety certification	IEC62109,UL1741	
EMC	EN61000 series	

Notes.

1. *The maximum input voltage is the maximum voltage that the PV input side of the converter can withstand. Input voltage exceeding this voltage may damage the converter.*
2. *If the input voltage is not in the working voltage range, the inverter will not work properly.*
3. *This function is related to the power distribution system, the default is not enabled; customers can set the enable or disable, and the compensation direction according to their needs.*

## 2.5 Technical description

### 2.5.1 Principle Description

The DC-DC boost converter will decide whether to connect to the energy storage system according to the strength of the PV module, when the PV module energy is weak, the DC-DC boost converter will disconnect from the energy storage system due to the PV input undervoltage, and other components of the energy storage system will realize energy deployment; when the PV module energy is strong, it will reach the starting voltage of the DC-DC boost converter, and the PV open circuit voltage is within the MPPT operation range. At this time, the DC-DC booster converter is normally connected to the energy storage system, and the DC-DC booster converter can start working to raise the DC bus voltage to the normal operating range of the energy storage converter, and MPPT control is performed according to the energy strength of the PV module at this time. It can realize the conversion from wide input range to low output range.

### 2.5.2 Function Description

The functions of the PDS1-45K/PDS1-60K can be basically summarized as follows.

PV power boost control: The DC-DC boost converter can be connected to the bus side of the DC of the energy storage converter to realize PV access through MPPT boost, which can transmit PV power to the battery for charging and also send PV power to the grid.

Data storage: DC-DC boost converter stores operation information, operation records, fault records and other information.

Communication function.

- The standard RS485 interface can be connected to the energy storage converter for remote control, remote upgrade and other functions.
- Standard RS485, CAN interface, etc. can be used to connect with other devices (reserved, function not yet open).

Protection functions.

- Overcurrent protection
- Overload protection
- PV short-circuit protection
- PV reverse connection protection
- Bus bar reverse connection protection
- Environmental over-temperature protection
- Power module over-temperature protection
- Earth leakage current monitoring
- Insulation impedance detection and protection
- Photovoltaic voltage monitoring
- Busbar voltage monitoring
- Fan fault protection
- Communication timeout protection
- Bus bar electric switch fault protection

### 2.5.3 Derating

Derating of the converter is done to avoid overloading of the converter or to suppress potential faults.

The converter may be derated under the following operating conditions.

- Excessive internal temperature (both ambient and module temperature)
- Low photovoltaic voltage
- Remote power scheduling

#### **Over-temperature derating**

High ambient temperature and poor air duct will cause the converter to derate. Over-temperature derating regulation is as follows.

- When the power device temperature reaches the upper limit, the converter will actively reduce the input and output power until the power device temperature returns to the normal range, and then the converter will gradually increase to the set value.
- When the ambient temperature inside the machine exceeds the upper limit, the converter will automatically stop and power off to protect the safety of the machine itself.



The lower limit of over-temperature derating is about 70% of the rated power. If the derating reaches the lower limit and still does not improve the temperature, the converter will automatically shut down.

## PV under-voltage derating

If the PV voltage does not reach the lower limit point of the full-load MPPT operation range, the DC-DC boost converter cannot output the rated power at this time, and the PV output current is limited to the specified range by derating.

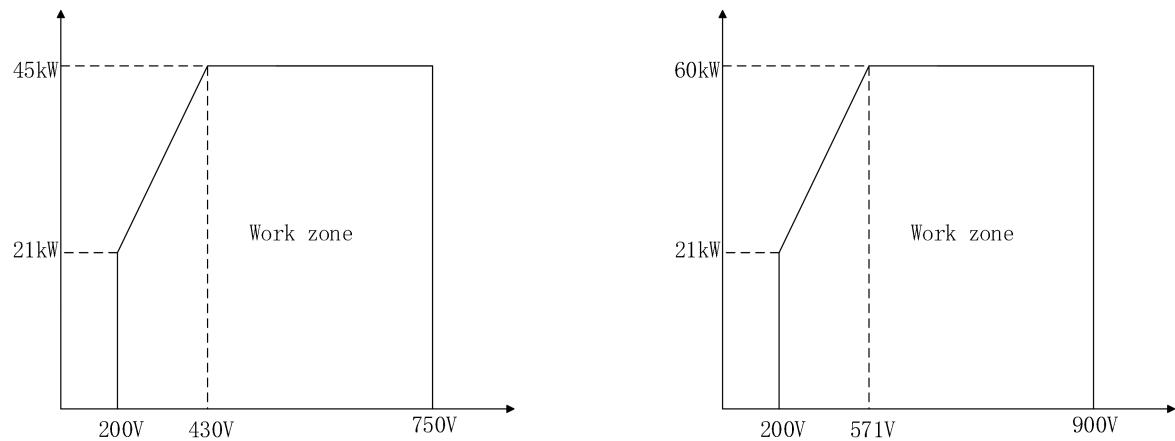


Figure 2-4 PDS1-45K/PDS1-60K PV undervoltage derating diagram

## Chapter 3 Equipment transportation, storage and installation

### 3.1 Transportation and Storage

When transporting and storing the converter cabinet, please pay attention to the marking on the packing box. The following requirements should be met during transportation and storage.

- Do not remove the outer packaging of the DC-DC boost converter.
- No corrosive gases in the surrounding area.
- Storage temperature maintained at -40 °C ~65 °C and relative humidity maintained at 0%RH~95%RH.
- Non-dusty environment.
- Up to 5 layers of stacking.
- Regular inspection is required during storage. If insects and rodents are found, the packaging material should be replaced in time.
- Comply with fire protection requirements.
- After long-term storage, the converter needs to be inspected and tested by professionals before it can be put into use.

### 3.2 Installation flow

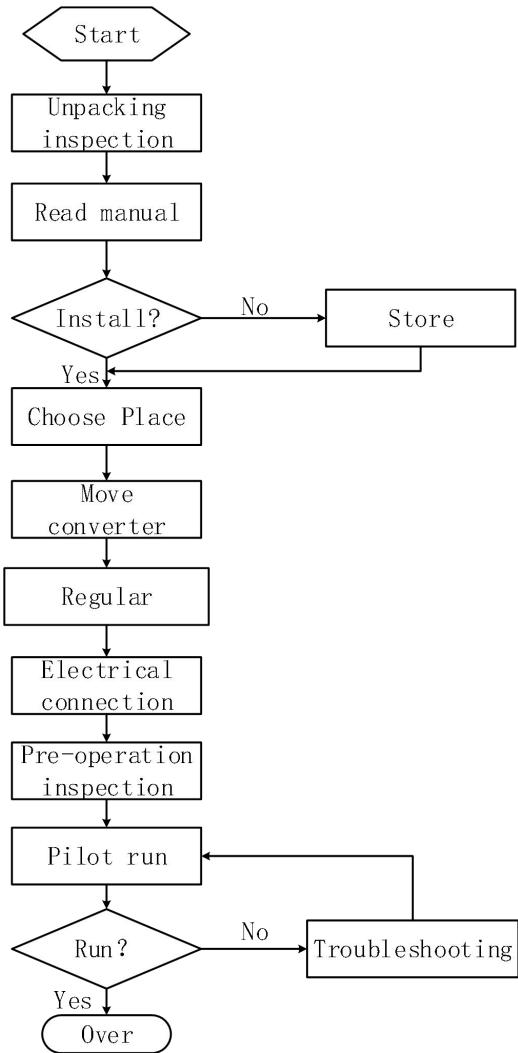


Figure 3-1 Equipment installation logic flow chart

### 3.3 Unpacking and inspection

Each cabinet needs to undergo strict factory inspection and testing before shipment, and in order to prevent damage during transportation, it is necessary to carry out unpacking inspection before the energy storage device is ready for installation.

- Check whether the quantity of each item in the packing list is consistent with the physical object.
- Check whether the product nameplate data and the ordering contract are consistent, such as the product model, rated capacity, voltage level, etc..
- Checking whether the factory documents and accessories are complete.
- Whether the DC converter is deformed and paint is lost.

### 3.4 Converter identification and preparation

Before installing the converter, please identify the converter type and the corresponding parameters.

There is a nameplate on the side of the converter, which contains the model information, important technical parameters and certification mark of the converter. Please also prepare the corresponding operation tools in advance so that the energy storage machine can be installed smoothly.

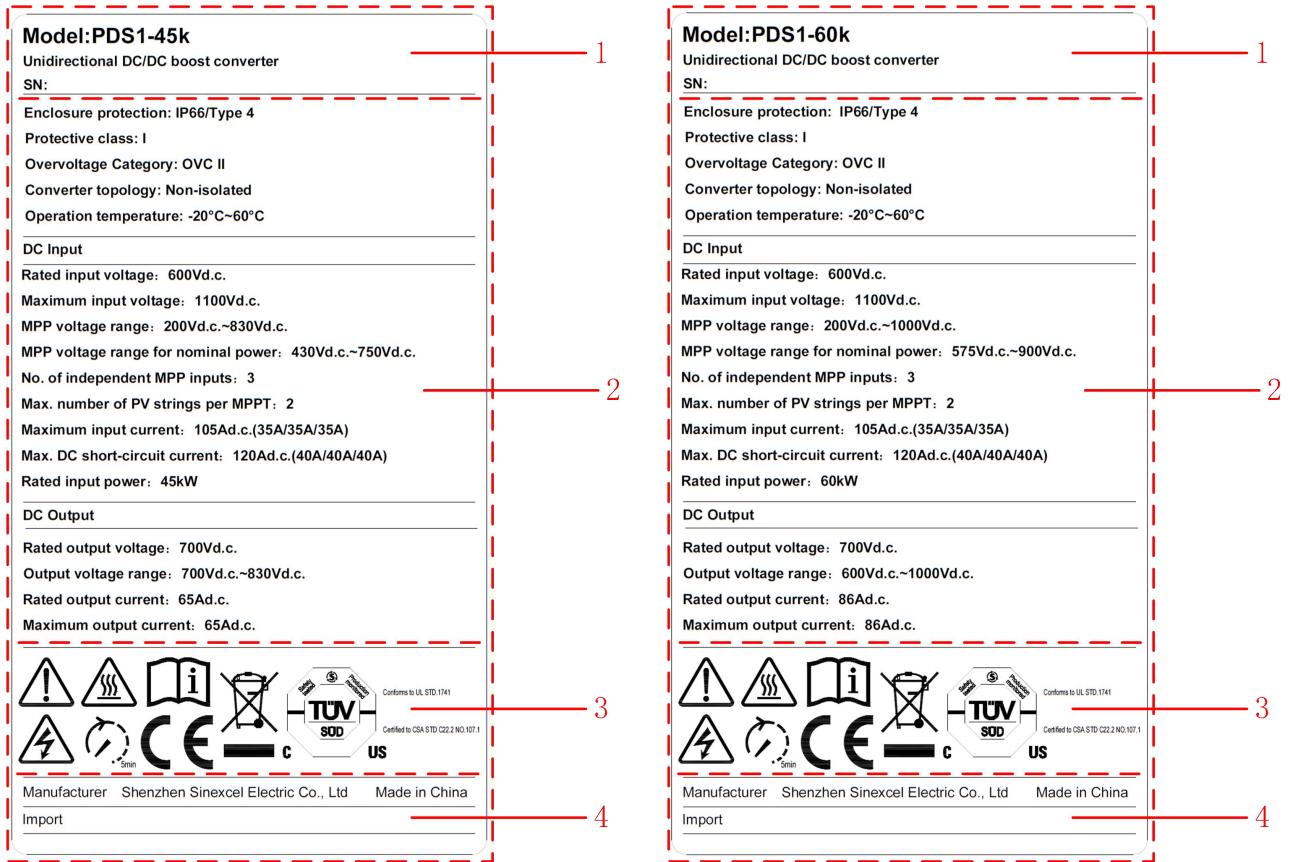


Figure 3-2 Example of nameplate

*\*Picture is for reference only, please refer to the actual product*

(1) Product model and serial number

(2) Technical parameters of the converter

(3) Caution warning mark and certification mark

(4) Manufacturer's name

### 3.5 Installation requirements

#### 3.5.1 Environmental requirements

- Can be installed indoors or outdoors, supports plug-in frame and wall mounting (with wall mounting option), not side-to-side installation.
- Clean installation environment, avoiding large amounts of dust in the air.
- Installed in a well-ventilated environment to ensure good heat dissipation.
- Avoid blocking the air inlet and outlet to ensure smooth air ducts.
- The ambient temperature should be guaranteed to be -25~60 °C to ensure the best operating condition of the converter, too high or too low temperature will affect the normal use of the converter.

### 3.5.2 Carrier requirements

- The converter installation carrier must have fireproof performance.
- Do not install the converter on flammable building materials.
- Please ensure that the mounting surface is strong and meets the load-bearing requirements for the installation of the converter.

## 3.6 Electrical Connection

### 3.6.1 Recommended System Configuration

In order to use this converter in a safer and regulated manner, the recommended configuration of the energy storage system is shown below.

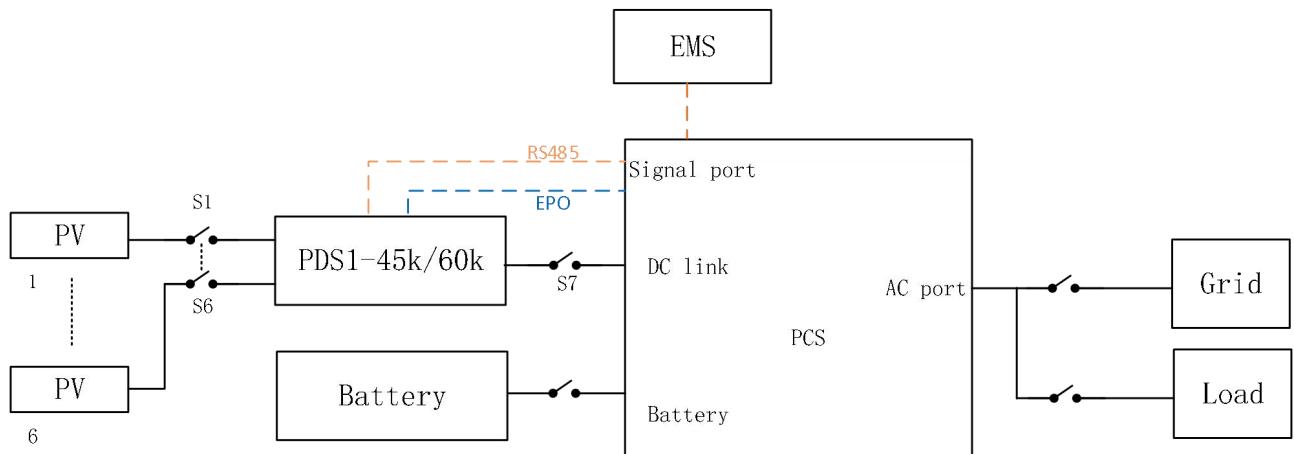


Figure 3-3 Recommended Configuration

Recommended parameters for S1~S7 are as follows:

	PDS1-45k		PDS1-60k	
	S1~S6	S7	S1~S6	S7
Rating insulated voltage	$\geq 1000V$		$\geq 1250V$	
Rating operation voltage	$\geq 900Vdc$		$\geq 1100Vdc$	
Rating operation current	$\geq 32A$	$\geq 100A$	$\geq 32A$	$\geq 125A$

 <b>WARNING</b>	<p>Ensure that the installation cables and equipment are not charged before installation.</p> <p>Ensure that the PV string output open circuit voltage is within the operating range of the DC converter during installation, otherwise the converter will not work properly.</p>
 <b>WARNING</b>	<p>All electrical connections must comply with the electrical connection standards of the country/region where the project is located. Only qualified professionals should perform wiring work, and please follow the wiring symbols of the equipment strictly for wiring operations.</p>

### 3.6.2 Terminal Introduction

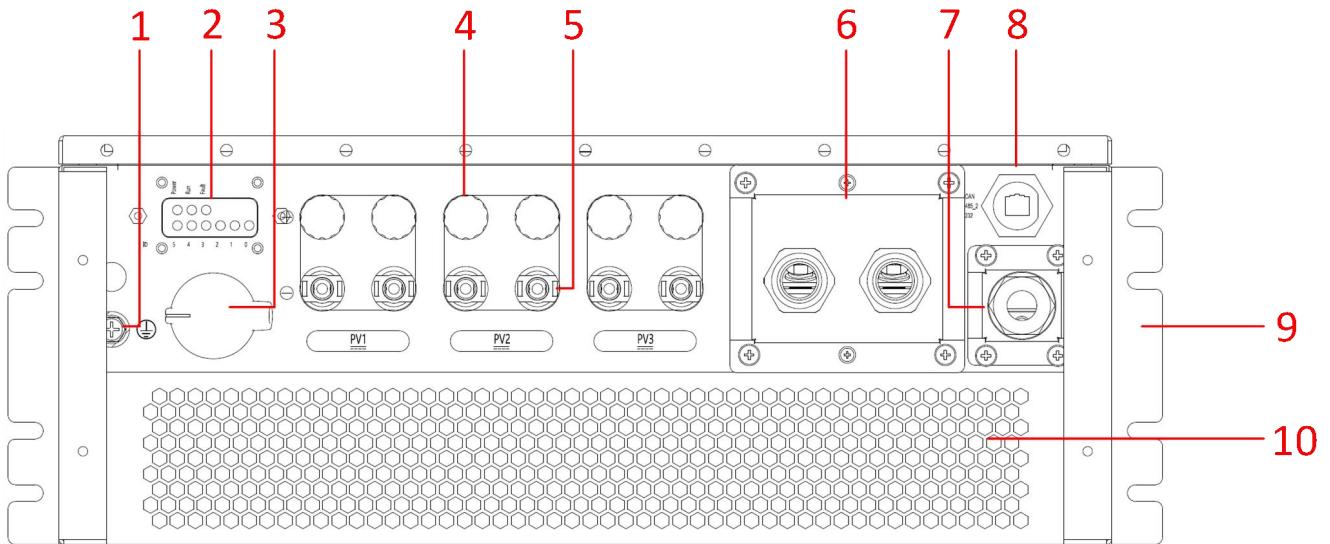


Figure 3-4 Terminal diagram of modular machine model

Table 3-1 Port introduction table

SN	Name	Description
1	Ground terminal	Grounding protection wire fixed point
2	Indicator light	To indicate the working status and ID of the module
3	PV input switch	To turn on/off the photovoltaic input (To avoid power device life attenuation because of the impact current, do not turn on the switch when the photovoltaic voltage is higher than 100V.)
4	PV positive input port	MC4 terminal*6 To connect positive power cables to the photovoltaic module
5	PV negative input port	MC4 terminal*6 To connect negative power cables to the photovoltaic module
6	DC output port	To connect power cables to the PCS system

7	Signal interface	External communication interface
8	Reserve signal interface	Not supported at present
9	Handle	Extraction and install module, not for load-bearing
10	Vent	Fan cover and air duct vents

Preparation tools.

- Torque wrench
- Screwdriver
- Wire stripping pliers
- Terminal Crimping Machine
- Multimeter
- Hot air gun (or hot out of the fan), heat shrinkable tubing

### 3.6.3 System grounding

Through the protection ground, the converter is connected to the grounding row to achieve the purpose of grounding protection.

Cable and terminal specifications.

- Grounding cable: recommended to use cross-sectional area  $\geq 10\text{mm}^2$ (7AWG) outdoor copper core cable.
- OT terminal: M6.

 <b>CAUTION</b>	<p>Good grounding is good for resisting surge voltage shocks and improving EMI performance, so grounding wire is required before AC, DC, and communication cables are connected.</p> <p>It is recommended that the converter be grounded near the end. For multiple PDS1-45K/PDS1-60K parallel systems, it is necessary to connect the grounding points of all converters to each other to ensure the ground wire is connected equipotentially.</p>
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Step 1: Strip the insulation of the grounding cable to a suitable length with wire strippers.

Step 2: Thread the stripped insulation core into the conductor crimp area of the OT terminal and crimp it with a hydraulic clamp.

Step3: Select heat-shrinkable tubing that matches the size of the cable and use a heat blower to shrink the tubing.

Step 4: Place the terminal on the ground bolt and tighten.

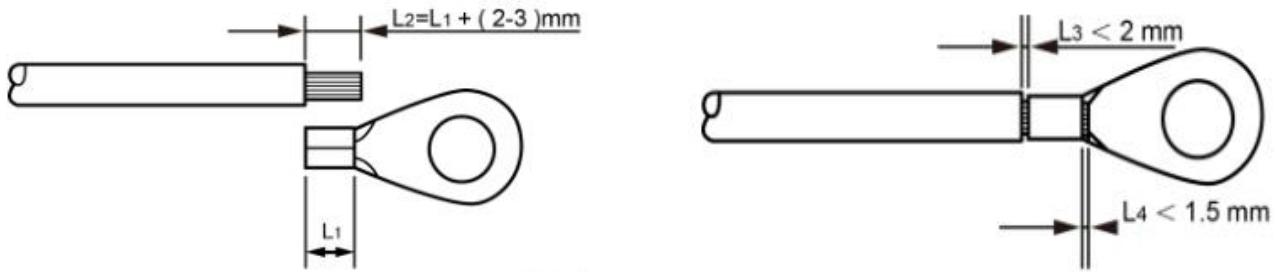


Figure 3-5 Wire Stripping Diagram

### 3.6.4 DC output side wiring

Cable and terminal specifications.

- DC output side cable: Outdoor copper core cable (red/black) with across-sectional area of  $21\text{mm}^2$ (4AWG) -  $25\text{mm}^2$ (3AWG) is recommended.
- OT terminal: SC25-6

Step 1 : Measure the voltage of the bus bar port of the energy storage converter with a multimeter to ensure that it is within the normal operating bus voltage range of the converter.

Step 2 : Make sure the external switch is disconnected and measure between the positive and negative input terminals with a multimeter to make sure there is no voltage before wiring operation.

Step 3 : Strip the cable to the appropriate length with wire strippers and crimp the corresponding terminals suitable for access to the converter and switch.

Step 4 : Select heat-shrinkable sleeving that matches the size of the cable, keeping the length of the heat-shrinkable sleeving at least 60 mm, and use a hot air blower to shrink the heat-shrinkable sleeving.

Step 5 : Remove the protective cover on the DC output side, connect to the BUS+ and BUS- of the converter output terminals respectively, and lock the protective cover.

Step 6 : Connect the positive cable (DC+) to the positive terminal of the external switch and make sure that the positive terminal is connected to the positive terminal of the busbar of the energy storage converter.

Step 7 : connect the negative cable (DC-) to the negative terminal of the external switch and make sure that the negative terminal is connected to the negative terminal of the bus bar of the energy storage converter.

 <b>DANGER</b>	<p>Disconnect the distribution switch connected to the converter before wiring to ensure that no dangerous voltages are present in the system at the time of wiring.</p>
 <b>WARNING</b>	<p>Before making all electrical connections, check the insulation and integrity of all cables.</p> <p>Do not use poorly insulated, partially exposed or otherwise damaged cables.</p> <p>Inadequate connection may cause local heat accumulation and may lead to fire and</p>

	combustion.
 <b>CAUTION</b>	<p>Make sure that the polarity of either side of the cable is correct before wiring.</p> <p>Do not pull the cable hard during the connection process to avoid damaging the terminals and the cable insulation.</p> <p>When connecting cables, ensure that there is a certain amount of bending space, and add the necessary auxiliary measures to reduce the stress on the cable.</p>

### 3.6.5 Photovoltaic input side wiring

Step 1 : Measure the PV panel output voltage with a multimeter to confirm that the PV open-circuit voltage at the output of either string does not exceed the operating limit of the PV side of the converter.

Step 2 : Ensure that the external switch is disconnected and measure with a multimeter between the positive and negative input terminals to confirm that there is no voltage before wiring operations.

Step 3 : Take out the MC4 PV terminals (one male and one female) in the accessories, and the round metal crimp terminals for cable connection, the terminals are shown in Figure 3-6. Cable with across-sectional area of 4mm<sup>2</sup>(11AWG) - 6mm<sup>2</sup>(10AWG) is recommended.

Step 4 : After the cable is made, please insert the cable into the PV input terminal on the converter panel correctly and make sure the connection is tight.



Figure 3-6 MC4 terminal connector

- (1) Wire end socket: for fixing the round metal terminal.
- (2) Connection snap: for connecting and fixing with the board end terminal.
- (3) Cable fixing knob: tightening knob after cable access, used to fix the cable and waterproof.
- (4) Contact terminal: used for connection of metal parts of the cable.

(5) Crimp terminal: use in this position to crimp the cable to ensure that the two metal crimp surface crimp the cable.

*\* terminal wiring, you should first contact terminal crimp cable, remove the cable fixing knob, and then inserted into the line end socket, hear the snap sound that the inserted contact terminal has been fixed, the connection is complete screw the cable fixing knob.*

 DANGER	Disconnect the power distribution switch connected to the converter before wiring to ensure that there is no dangerous voltage in the system when wiring.
 WARNING	<p>Before making all electrical connections, check the insulation and integrity of all connecting cables.</p> <p>Do not use poorly insulated, partially exposed or otherwise damaged cables.</p> <p>Inadequate connections may cause localized heat build-up, which may lead to fire and combustion.</p>
 WARNING	The open circuit voltage of the PV port must not be higher than the maximum input voltage of the PV side of the converter.
 WARNING	Make sure that the PV positive and negative terminals are connected to the positive and negative terminals of the converter, do not reverse the connection, and do not interconnect the positive and negative cables between the strings.
 WARNING	In order to prevent poor contact of PV terminals, it is strictly forbidden to use PV terminals that are not used with this product to connect with this product, and the terminals should be connected with the terminals to ensure close contact and should not be easily pulled out.
 CAUTION	<p>Please make sure the polarity of either side of the cable is correct before wiring.</p> <p>Do not pull the cable during the connection process to avoid damage to the terminals and cable insulation.</p> <p>When connecting cables, ensure that there is a certain amount of bending space, and add the necessary auxiliary measures to reduce the stress on the cable.</p>
 CAUTION	The cable should be made to fit into the terminal block in accordance with the steps, otherwise it may lead to failure.

### 3.6.6 Connecting the communication cable

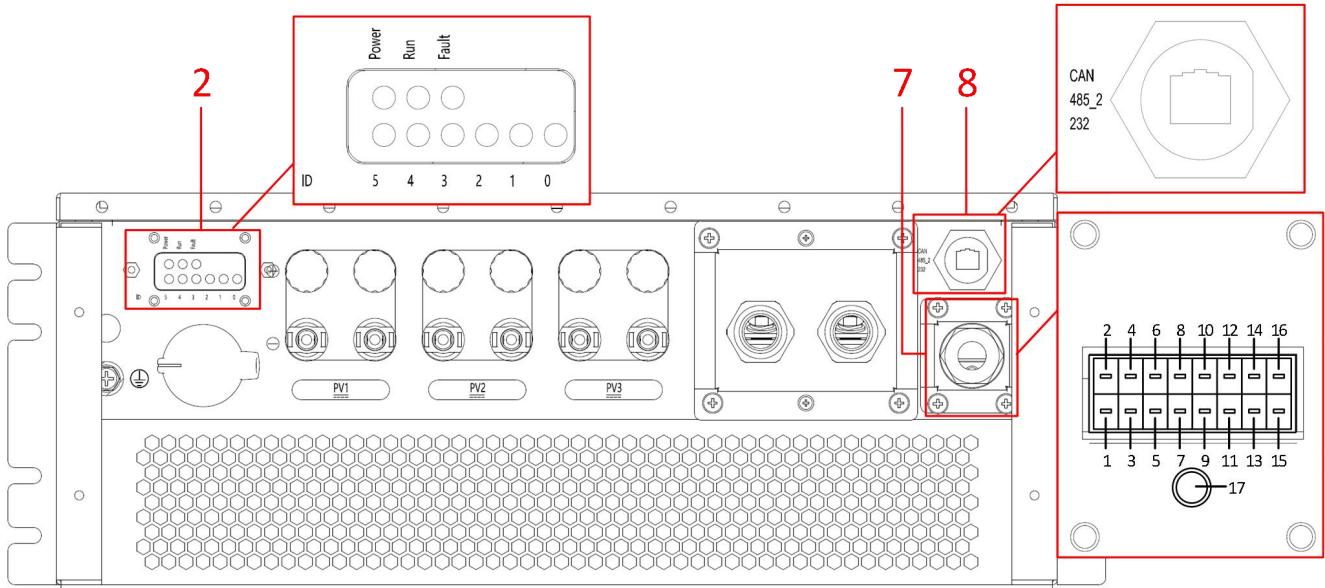


Figure 3-7 Communication panel and display panel

Table 3-2 Technical parameter table

SN	Pin definition	Description
2	Indicator light	<p>Power: Module power indicator</p> <p>Run: Module run indicator</p> <p>Fault: Module fault indicator</p> <p>ID0-ID5: Module six-digit ID code, used to indicate the module serial number</p>
7	<p>Signal interface.</p> <p>1/3: 485B_1(PCS)</p> <p>2/4: 485A_1PCS)</p> <p>5/6: R_485_1(PCS)</p> <p>7/8: R_485_2(Reserve)</p> <p>9/10: R_CAN(Reserve)</p> <p>11/13: GND</p> <p>12/14: Dry in</p> <p>15: GND_ios</p> <p>16: Dry out_ios</p> <p>17: PE</p>	<p>1/2/3/4: RS485_1 differential signal, Connect to PCS or EMS.</p> <p>5/6: 120 ohms matching resistor access signal for 485_1(PCS); Short the Pin5 and Pin6 to enable it.</p> <p>7/8: 120 ohms matching resistor access signal for 485_2(Reserve); Short the Pin7 and Pin8 to enable it.</p> <p>9/10: 120 ohms matching resistor access signal for CAN(Reserve); Short the Pin9 and Pin10 to enable it.</p> <p>11/13: GND of Dry in signal.</p> <p>12/14: EPO dry contact input signal; Connect to EMS or PCS or others.</p> <p>15/16: DO OC output(Reserve).</p>

		17: Grounding screw holes of RS485 communication cable shielding layer.
8	Reserve signal interface 1: CAN_H(Reserve) 2: CAN_L(Reserve) 4: 485A_2(Reserve) 5: 485B_2(Reserve) 3: RS232_T(Reserve) 7: RS232_R(Reserve) 6/8: GND	1/2: CAN differential signal(Reserve, not supported at present). 4/5: RS485_2 differential signal(Reserve, not supported at present). 3/7: RS232 differential signal(Reserve, not supported at present). 6/8: GND of RS232_T and RS232_R.

### (1) ID code description

The six-digit ID code on the panel is used to indicate the current module number, which is displayed in binary format, ID0 is the lowest binary bit, ID5 is the highest binary bit, the light is on for "1", the light is off for "0", i.e. "ID000000" means the number is "0", "ID000001" means the number is "1", "ID000010" means the number is "2", "IDXXXXXX" and so on.

### (2) Communication port connection

The PDS1-45K/PDS1-60K DC converter can be directly connected to the EMS through RS485 communication, so that the EMS monitoring interface or display terminal can query the status information of the PDS1-45K/PDS1-60K, and perform parameter setting, power control and software upgrade. It can also be directly connected to the energy storage converter device through RS485 communication. In this case, it is necessary to add the PV MPPT (DC converter) accessory option in the monitoring background interface of the energy storage converter device, and then display the system information and parameter setting and software upgrade in the corresponding interface.

EPO (emergency stop) function, Pin12 (Dry in) and Pin11 (GND) of Signal terminal 7 can be used as EPO interface. The EPO function can be enabled or disabled by checking the communication protocol and setting the content of the corresponding address register to 1 or 0. When the EPO function is enabled, Pin12 (Dry in) and Pin11 (GND) of Signal terminal 7 must be connected to the normally closed emergency stop switch or the corresponding output dry contact of PCS/EMS, otherwise the DC-DC booster converter will report an EPO fault and shut down.

Pin16 (Dry out\_iso) and Pin15 (GND\_iso) of Signal terminal 7 are the dry contacts of the OC output, which are not defined yet and can be configured according to customer requirements.

A pluggable signal terminal is provided in the random accessory, and the terminal description is shown in Figure 3-8. When wiring, you need to use a small screwdriver to press the Spring button on the terminal first, and then insert the cable into the corresponding wiring hole, as shown in Figure 3-9. Recommended wire diameter of 24AWG-16AWG, including RS485 communication line need to recommend the use of

twisted pair cable with shielding layer, shielding layer crimped appropriate OT terminal and connected to the signal line shield wiring, OT terminal wiring instructions refer to Figure 3-5 shows.

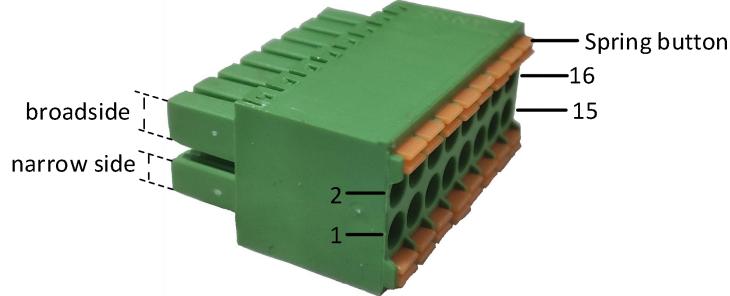


Figure 3-8 pluggable terminal pins

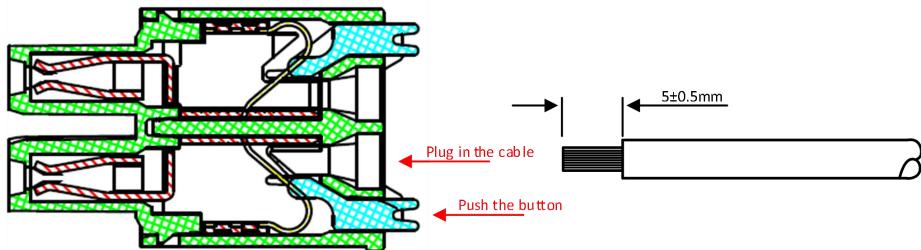


Figure 3-9 signal cable wiring instructions

 WARNING	All communication cables are for professional commissioning or installation use only.
 CAUTION	Communication cable with shielding twisted pair, shielding layer should be connected to the communication line grounding point, the distance is recommended less than 10m, to reduce the interference of the line on the communication.

### (3) Reserved communication port connection

PDS1-45K/PDS1-60K can also use the reserved way to communicate, get the energy storage converter information and energy scheduling instructions, and complete the automatic discharge control of the energy storage system. The interface is connected using RJ45 port, and the RJ45crystal header pins are defined as shown in Figure 3-10.

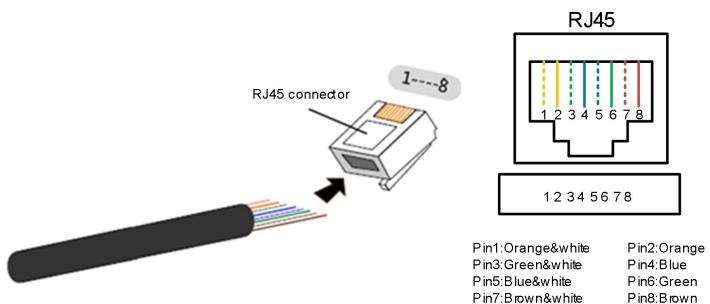


Figure 3-10 RJ45 terminal pinout definition

Cable production steps.

Step1 : the stripped insulation layer of the network cable through the cable guard cap in order to line up and inserted into the RJ45 crystal head.

Step2 : Use crimping pliers to compress the crystal head and mark it accordingly to complete the DC converter communication cable production.

Step3 : Confirm whether the definition of the RJ45 connector of the energy storage converter or EMS is consistent with the converter, if not, the corresponding changes need to be made when crimping the cable.

Step4 : Insert the finished cable into the RJ45 port of the DC converter panel and the corresponding port of the access device.

 WARNING	The communication cable made is a custom cable, so it cannot be used with ordinary network cable, otherwise it cannot communicate normally.
 WARNING	All communication cables should be used by professionals only for debugging or installation.

### 3.6.7 Single module application system connection

For single PDS1-45K/PDS1-60K application, the system wiring can be referred to Figure 3-11 and Figure 3-12. If the EPO function is not enabled, Pin12 (Dry in) and Pin11 (GND) of Signal terminal 7 do not need to be wired.

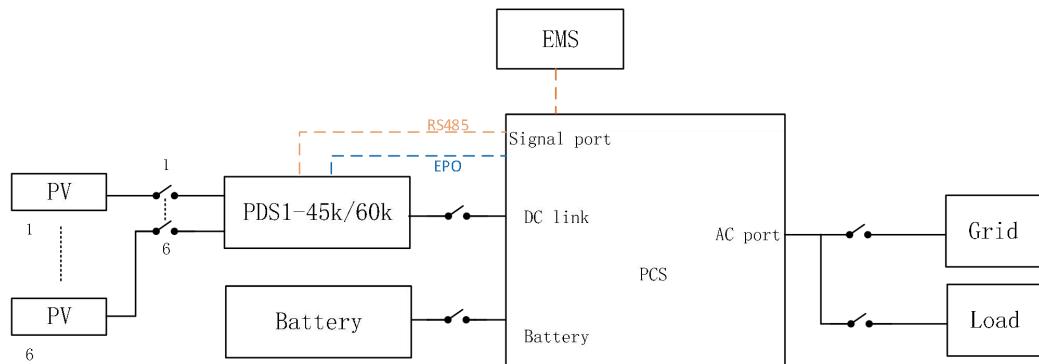


Figure 3-11 Single module application system connection diagram

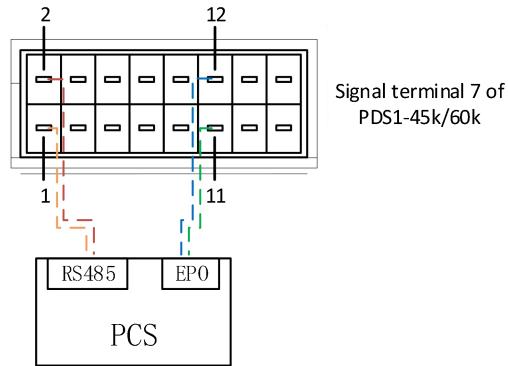


Figure 3-12 Single module application communication line connection diagram

### 3.6.8 Multi-module application system connection

#### (1) Multi-module single branch application

For multiple PDS1-45K/PDS1-60K single-branch application, the system wiring can be referred to Figure 3-13 and Figure 3-14, where the number of PDS1-45k/60k and PCS depends on the actual demand of the site. If the EPO function is not enabled, Pin12/14 (Dry in) and Pin11/13 (GND) of Signal terminal 7 do not need to be wired.

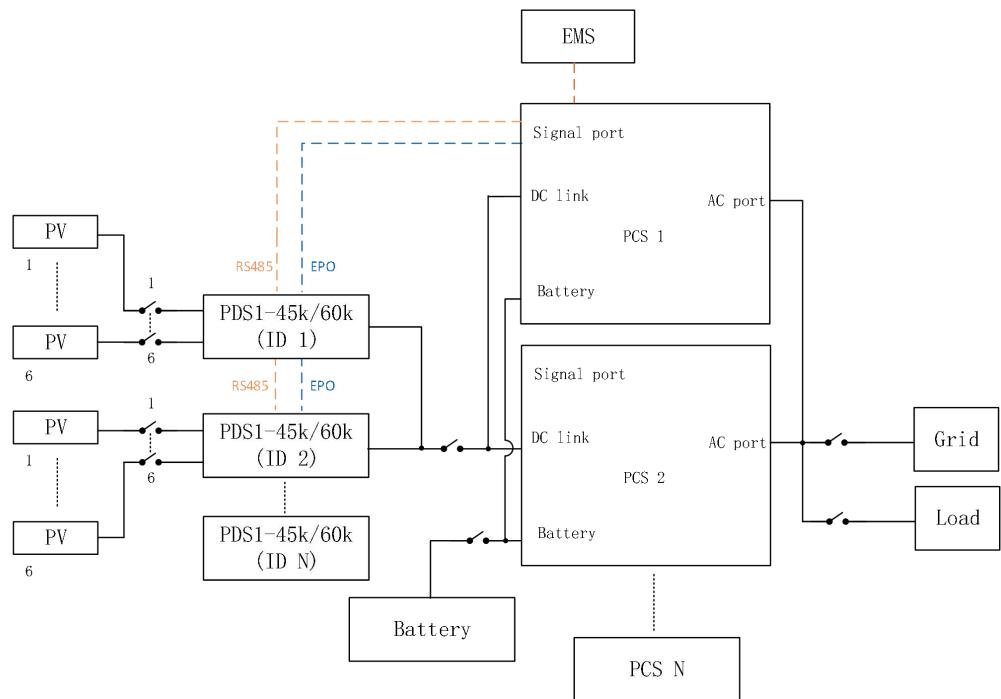


Figure 3-13 Connection diagram of multi-module single-branch application system

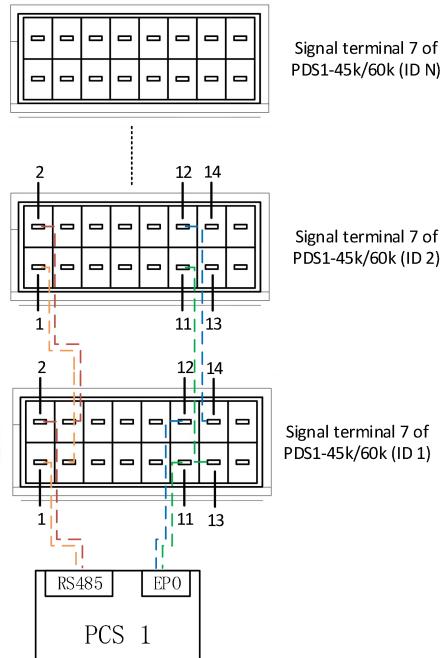


Figure 3-14 Multi-module single-branch application communication line connection diagram

## (2) Multi-module multi-branch application

For multiple PDS1-45K/PDS1-60K multi-branch application, the system wiring can be referred to Figure 3-15 and Figure 3-16, where the number of PDS1-45k/60k and PCS depends on the actual demand of the site. If the EPO function is not enabled, Pin12/14 (Dry in) and Pin11/13 (GND) of Signal terminal 7 do not need to be wired.

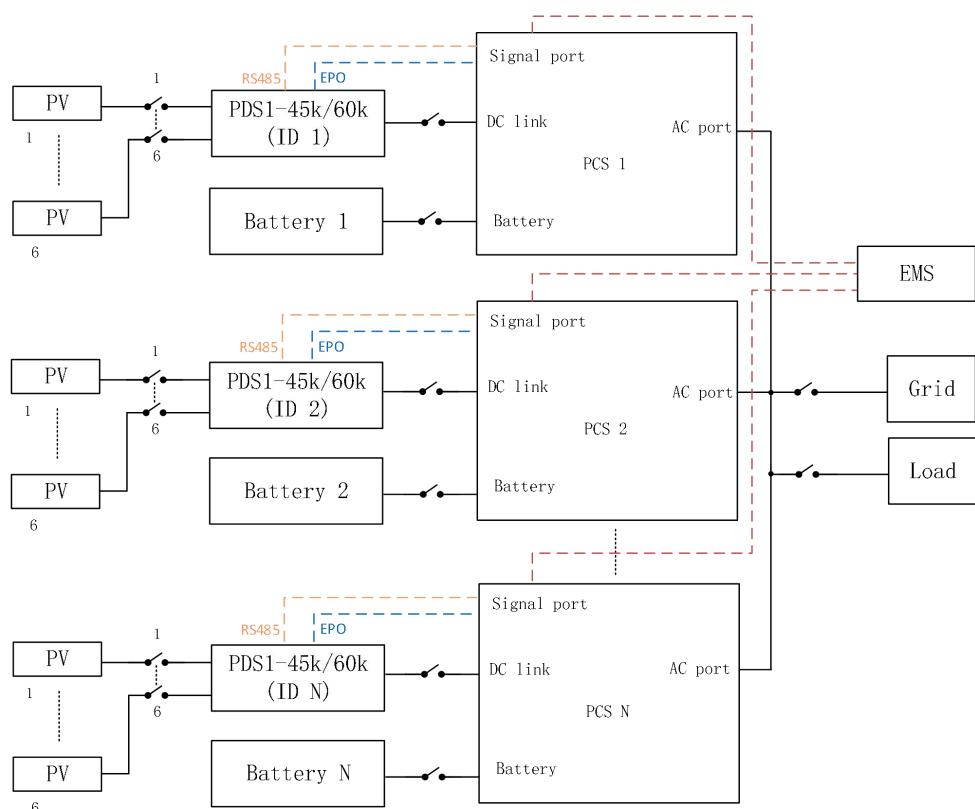


Figure 3-15 Multi-module multi-branch application system connection diagram

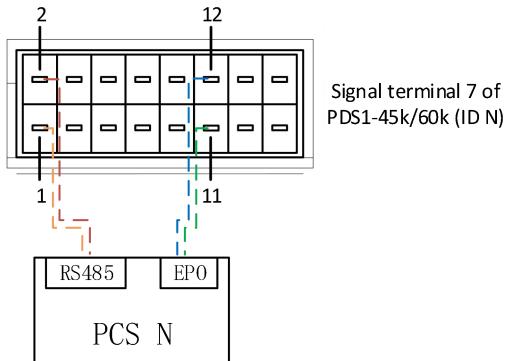


Figure 3-16 Multi-module multi-branch application communication line connection diagram

### 3.7 Post-installation inspection

#### 3.7.1 Equipment installation check

After the installation of DC-DC boost converter is completed, post-installation inspection is required.

- 1) The reasonable location of the equipment placement and installation to meet the load-bearing requirements.
- 2) The temperature, humidity and ventilation of the environment in which the equipment is located meet the requirements.
- 3) The transformer shell is invisible and damaged.
- 4) Power line connection polarity correct, good contact, ground and ground network connected well, and require the construction unit to test the grounding resistance value.
- 5) Compare the main wiring diagram from the factory with the actual wiring at the site to understand whether it is different and to determine whether the difference will affect the safe operation of the PV energy storage system.
- 6) Confirm that the communication lines have all been properly connected.

#### 3.7.2 Electrical and communication check

- 1) Measure the voltage of each PV branch circuit to ensure that the voltage value is within the operating range of the converter and make relevant records, and prohibit access to the equipment when the voltage is too high.
- 2) Power up each branch and observe whether the POWER indicator and fault indicator are always on, and check whether the displayed voltage value is consistent with the multimeter measurement value with the help of the background; if it is consistent, it means that the connection is correct, otherwise it is necessary to disconnect the PV side switch and re-check the PV side wiring.
- 3) Disconnect the external switch on the PV side of the branch after the branch is checked normally, and repeat the operation of step 2 for another branch; confirm that all branches are connected normally.
- 4) Measuring the bus-side external port voltage, confirming that it is within the normal range, and recording the value.

5) Close the bus-side external switch with the PV side powered on, and check through the background whether the bus-side voltage value displayed is consistent with the actual value; if it is consistent, it means the connection is correct; otherwise, all external switches of the machine need to be disconnected and the bus-side external wiring needs to be checked freshly.



The electrical wiring inspection link needs to be completed by qualified professionals.

After closing the switch, the system has been charged with high voltage, and it is strictly forbidden to touch any parts inside the converter.

## Chapter 4 Control and parameter setting process

This section introduces the PV energy storage system composed of PDS1-45k and our PWS2-30P series energy storage converter as an example, the control method and the displayed monitoring interface are only for example reference, the control method and interface display of PV energy storage system composed of PDS1-60k and third party energy storage converter should be based on the actual design of third party energy storage converter.

## 4.1 Web connection

### 1. Use Ethernet connection.

First, please open the browser on the desktop (Google / Firefox is recommended), then enter the IP of the energy storage converter PWS2-30P in the URL bar of the browser (the default IP is 192.168.1.10), after entering the interface shown in Figure 4-1 below; wait for the login page to load successfully and enter the user name and password, the default user name is admin and the default password is 20072020. Then click "Log in" to enter the background operation interface of PWS2-30P.

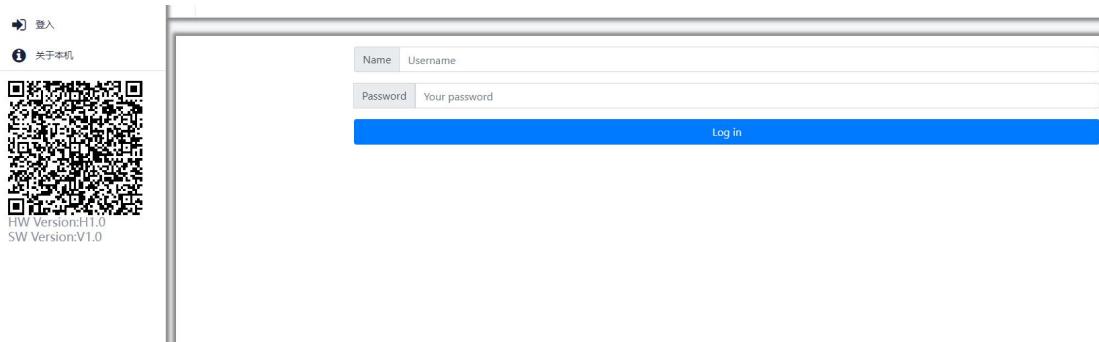


Figure 4-1 Ethernet Login Interface

 CAUTION	<ol style="list-style-type: none"><li>1. The initial password for admin user login is 20072020.</li><li>2. For the first time, please use the initial password and change it as soon as possible, and remember the password after changing it to ensure account security. Not changing the password may lead to password leakage, and the loss of the password will result in the user not being able to access the device, and the resulting loss needs to be borne by the user.</li></ol>
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### 2. Use WIFI connection (take Apple phone as an example).

First, please open the wireless area network on the phone settings, search the network to find the PWS2-30P device corresponding to the serial number, enter the initial WIFI password "12345678" and connect to this network, as shown in Figure 4-2; then open the browser on the phone, enter the PWS2-30P in the URL bar IP address (or enter the default address of 10.10.10.1), the login interface will appear as shown in Figure 4-3; finally, enter "admin" in the "Name" input box and "Password" in the "Password" input box. "Password" input box, enter the initial password "20072020", and click "Log in" to enter the background operation interface of PWS2-30P, as shown in Figure 4-4.



Figure 4-2 WiFi connection

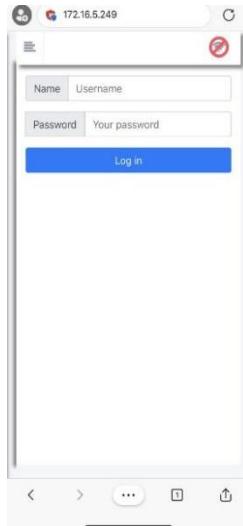


Figure 4-3 Mobile phone login interface

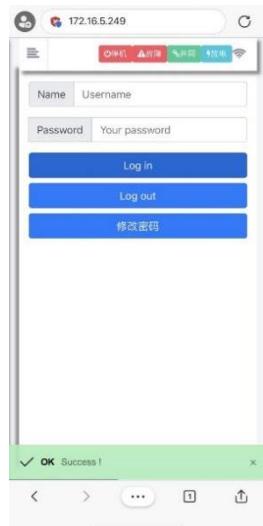


Figure 4-4 Mobile phone operation interface

 CAUTION	<ol style="list-style-type: none"><li>1. The initial password for admin user login is 20072020.</li><li>2. For the first time to power on, please use the initial password and change the password as soon as possible. After changing the password, please keep the password in mind to ensure the account security. Not changing the password may lead to password leakage, and the loss of password will lead to the user not being able to access the device, and the resulting loss needs to be borne by the user.</li></ol>
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## 4.2 Multi-module multi-monitoring application settings

In the application of multiple modules corresponding to multiple energy storage converter monitoring, you need to connect the monitoring backend of each energy storage converter and set up each PDS1-45k/PDS1-60k individually according to the following steps 4.2.1-4.2.6.

### 4.2.1 Step 1

In the "Operation Policy" - "Options" menu, set the option to PV DCDC to enable the PDS1-45k/PDS1-60k module. Set the number of PVs to 1 and set the parameters in the PV number 1 screen as shown in Figure 4-5.

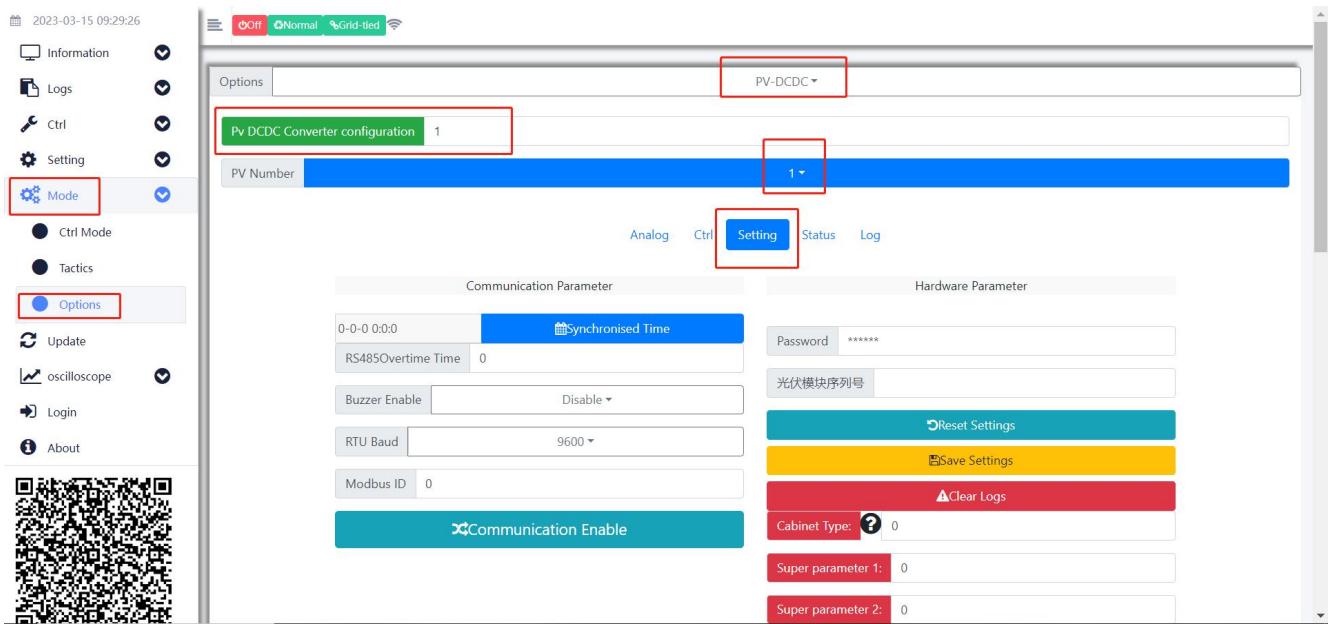


Figure 4-5 PDS1-45k/PDS1-60k parameter setting

#### 4.2.2 Step 2

If the model is 60k, enter the "Set Amount" menu and set the "Model Setting" option to 1, if the model is 45k, set the "Model Setting" option to 0. To change the model, you need to restart the PV; click "Restart PV" in the "Control Amount" column.

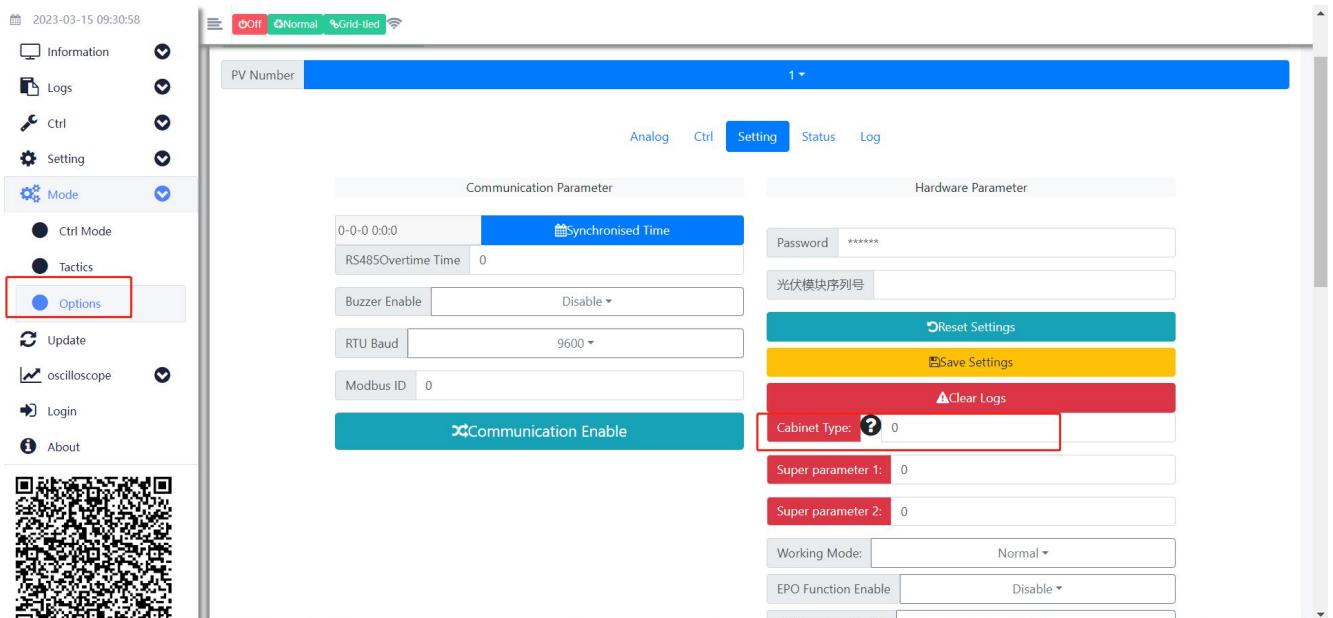


Figure 4-6 Model setting

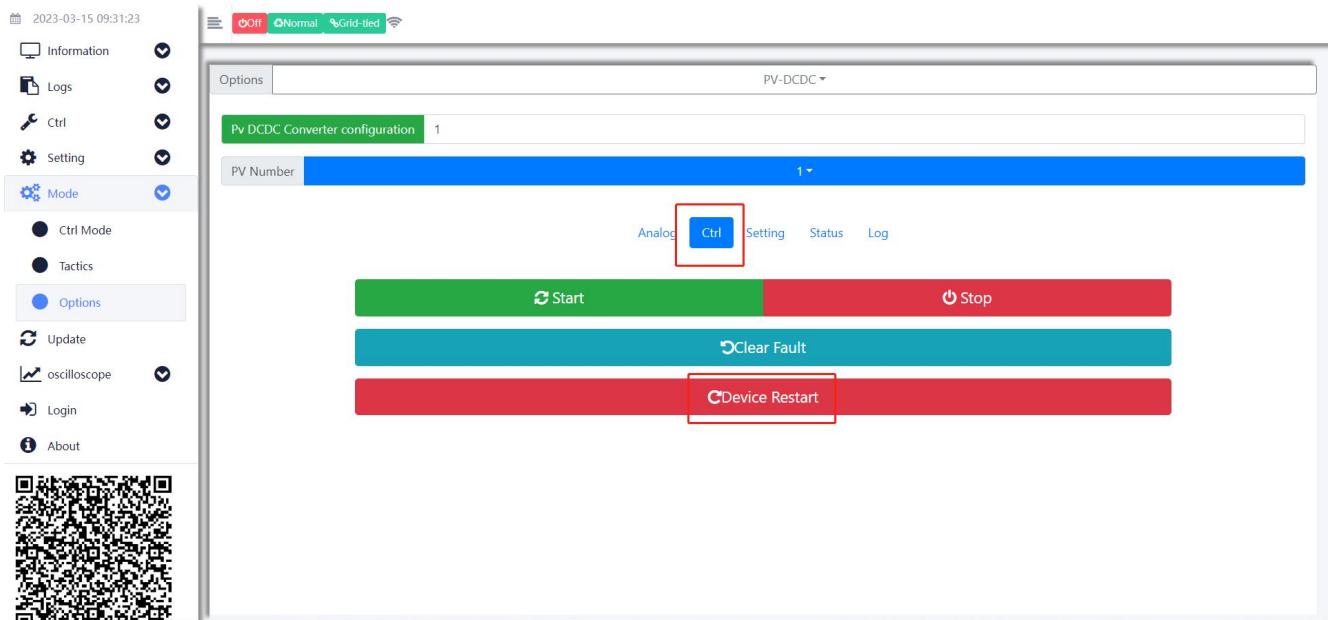


Figure 4-7 Device Reboot

#### 4.2.3 Step 3

Set "PV1 PV wakeup voltage", "PV2 PV wakeup voltage" and "PV3 PV wakeup voltage" according to the actual wakeup voltage of 1, 2 and 3 PVs respectively.

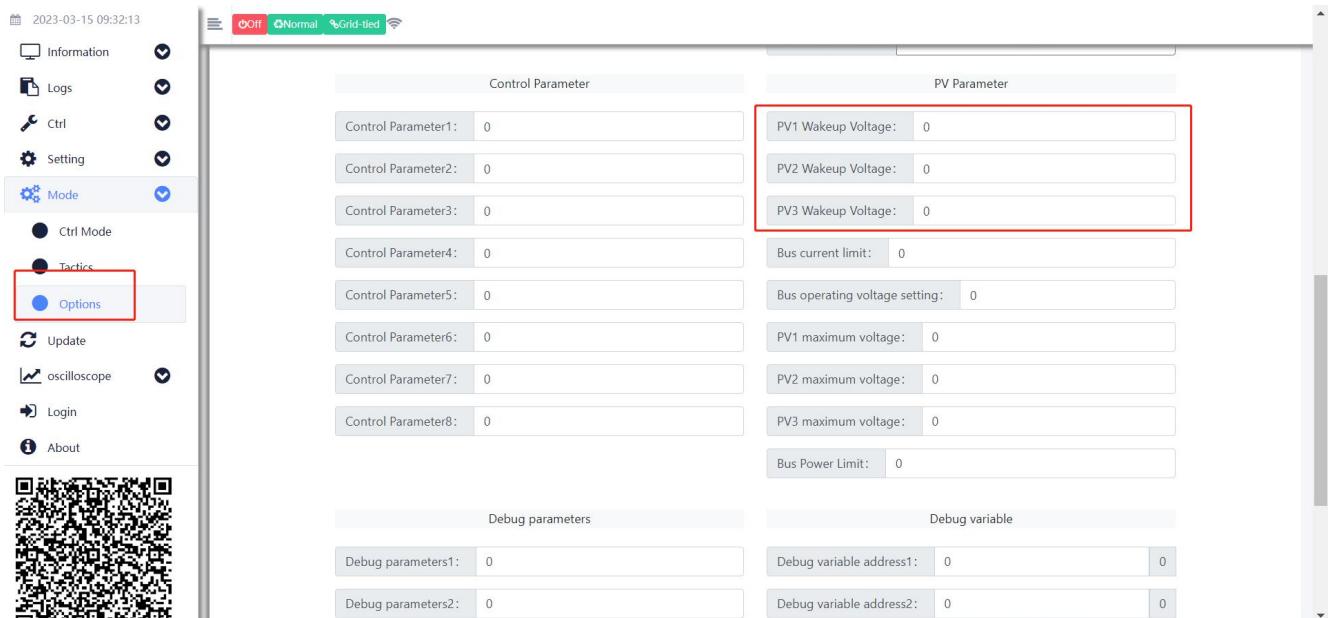


Figure 4-8 Wake-up voltage setting

#### 4.2.4 Step 4

Set the "PV1 PV maximum voltage", "PV2 PV maximum voltage" and "PV3 PV maximum voltage" according to the actual opening voltage of 1, 2 and 3 PVs respectively.

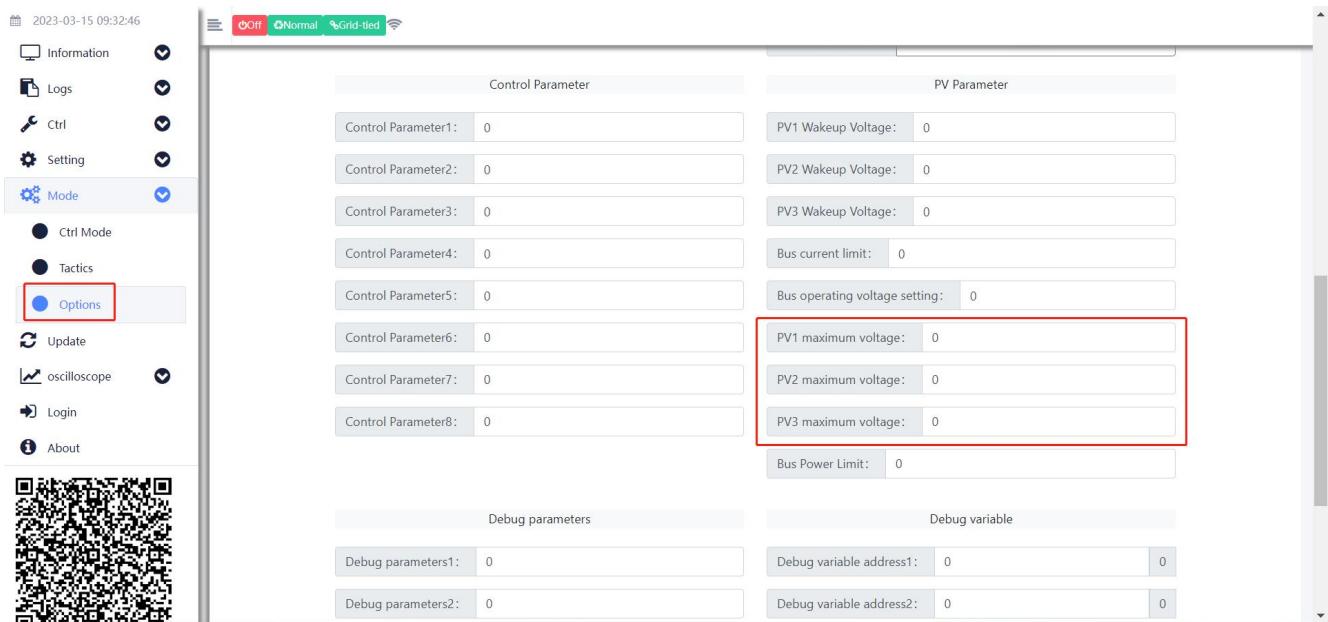


Figure 4-9 Maximum voltage setting

#### 4.2.5 Step 5

The "Bus operating voltage setting" in the "Setting amount" option is set to the actual bus voltage value of the PDS1-45k/PDS1-60k bus side (i.e. the bus voltage of the energy storage converter), and the "Bus operating voltage setting" is at least 30 % higher than the maximum values of "PV1 PV maximum voltage", "PV2 PV maximum voltage" and "PV3 PV maximum voltage". is at least 30V higher than the maximum value of the three settings. According to the actual maximum current flowing on the busbar side, set the "Bus Current Limit" in the "Setting Amount" menu.

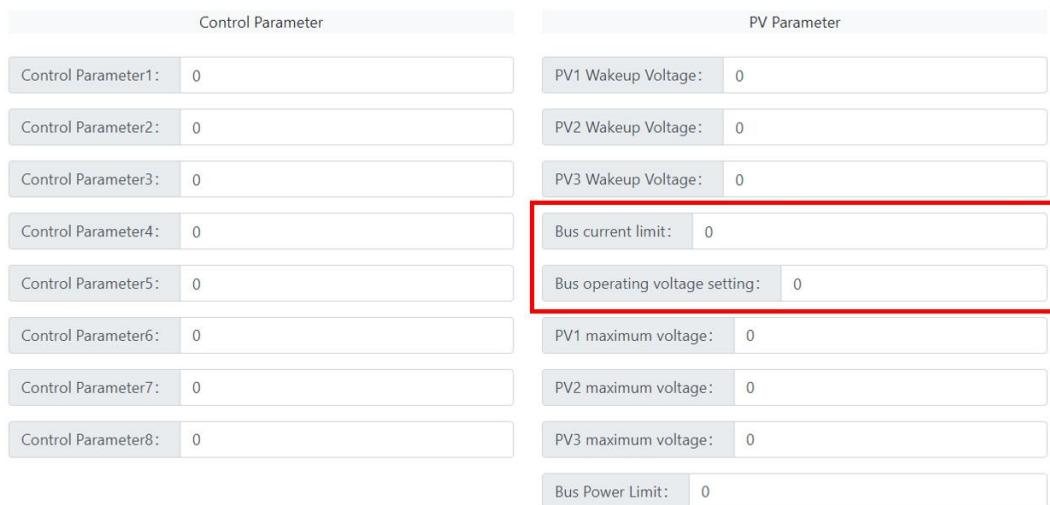


Figure 4-10 Bus bar parameter setting

#### 4.2.6 Step 6

If you need to use the PDS1-45k/PDS1-60k EPO input dry contact, set "EPO function enable" in the "Setting quantity" column to enable the dry contact EPO protection function.

If you need to use the night PID repair function, set the "PID Enable" item in the "Setting Amount" column to enable the night PID repair function.

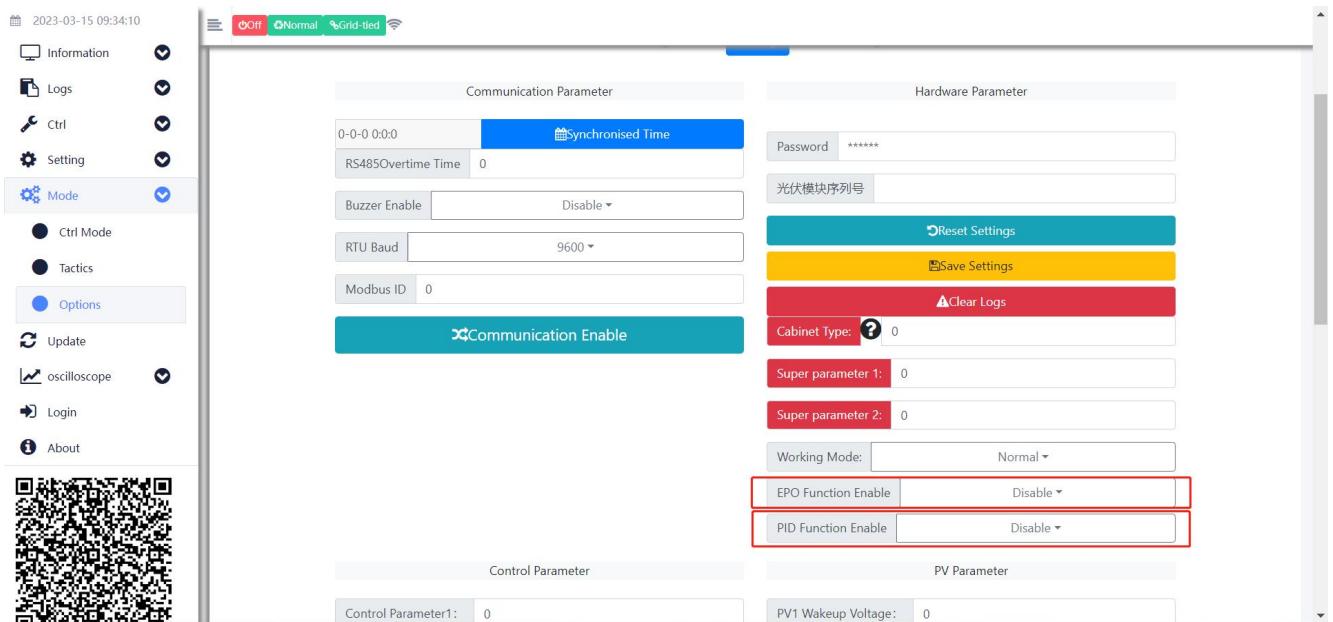


Figure 4-11 Optional Function Settings

## 4.3 Single monitoring application setting

### 4.3.1 Step 1

In the "Operation Policy" - "Options" menu, set the option to PV DCDC. Set the number of PVs to the actual number of PVs, for example, if there are 3 PDS1-45k/PDS1-60k DC-DC booster converter modules connected to the system, the number of PVs is set to 3.

In single-branch, single-monitoring applications, the 485 communication lines of all PDS1-45k/PDS1-60k DC-DC boost converters are connected in the monitoring 485 interface of the same storage converter (host), and the factory default Modbus ID of each DC-DC boost converter is 1. In order to avoid the conflict of Modbus IDs of DC-DC boost converters Before setting parameters, you need to assign Modbus ID to each DC-DC booster converter separately, and the order of configuration is from high to low, for example, if the number of PV is set to 3, the order of configuring Modbus ID is 3 - 2 - 1. The steps are as follows.

First, connect the 485 communication line of DC-DC booster converter #3 to the 485 interface of the energy storage converter monitoring. At this time, make sure that the 485 communication lines of DC-DC booster converter #1 and DC-DC booster converter #2 are disconnected from the 485 communication of the energy storage converter (host). Since the factory default Modbus ID of the DC-DC booster converter is 1, the initial configuration of the Modbus ID for DC-DC booster converter #3 needs to be configured in the interface with the "PV number" of 1, as shown in Figure 4-12.

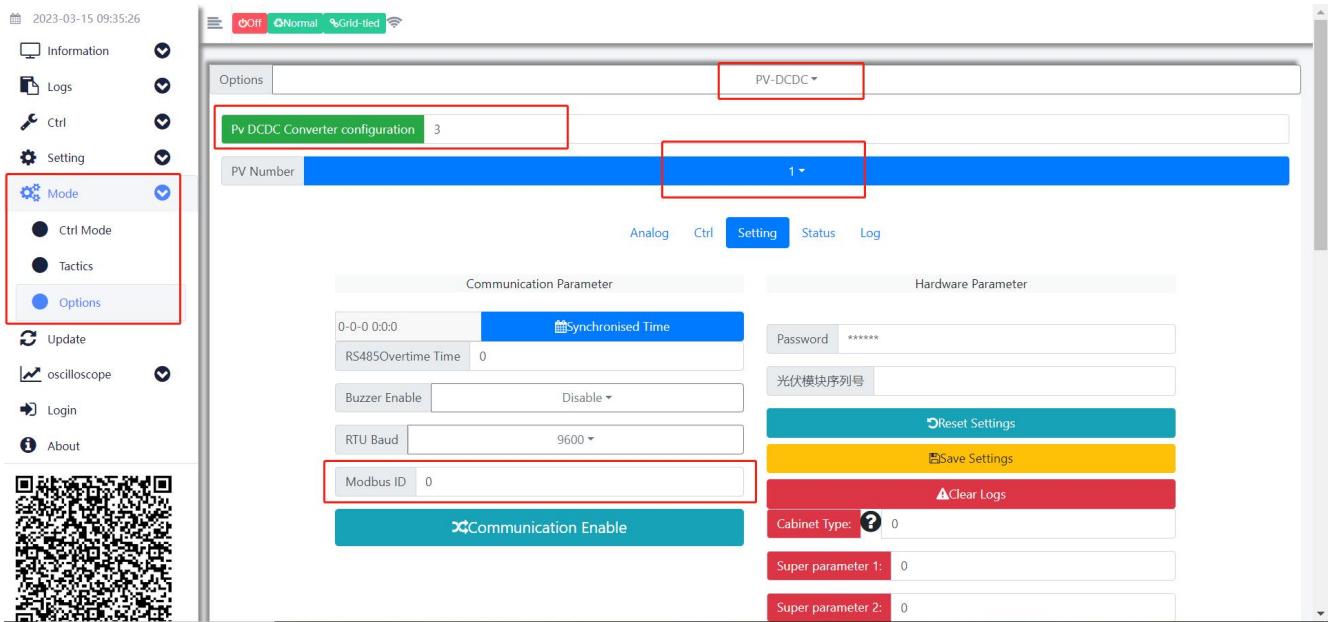


Figure 4-12 Single monitoring application ID setting interface

Set the Modbus ID of DC-DC Boost Converter #3 to 3, as shown in Figure 4-13.

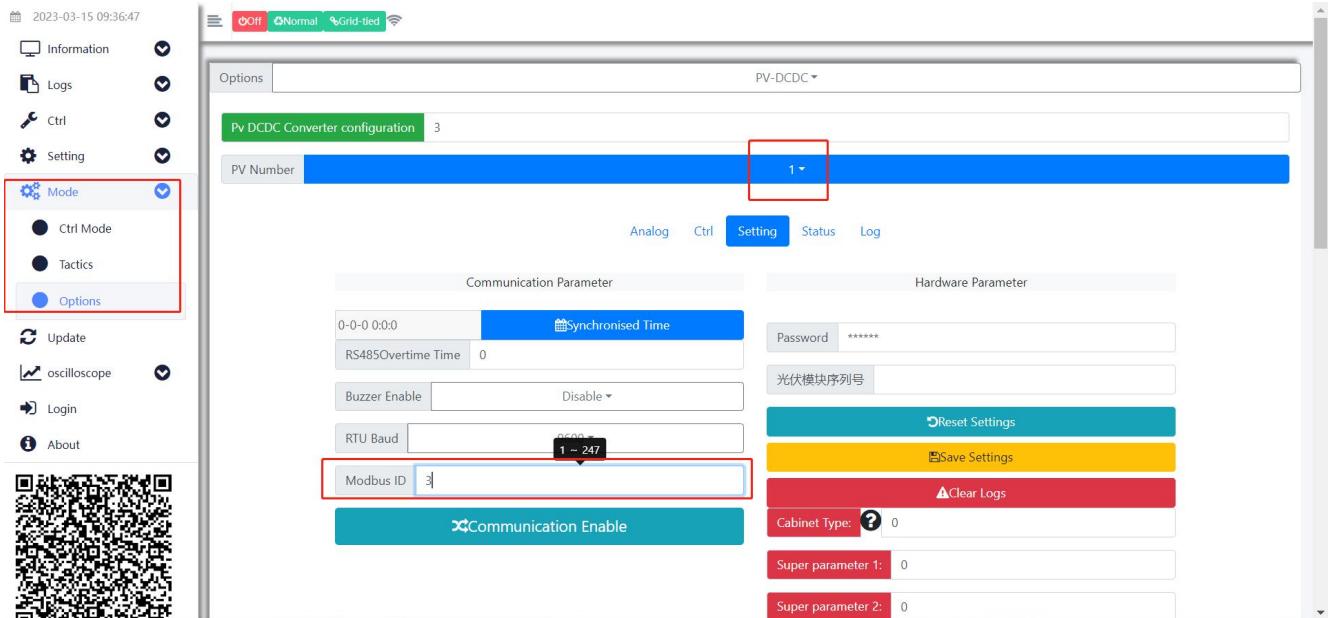


Figure 4-13 Single monitor application ID setting interface

After setting the Modbus ID of DC-DC Boost Converter #3 to 3, you need to set the parameters of DC-DC Boost Converter #3 in the interface of "PV No. 3", as shown in Figure 4-14.

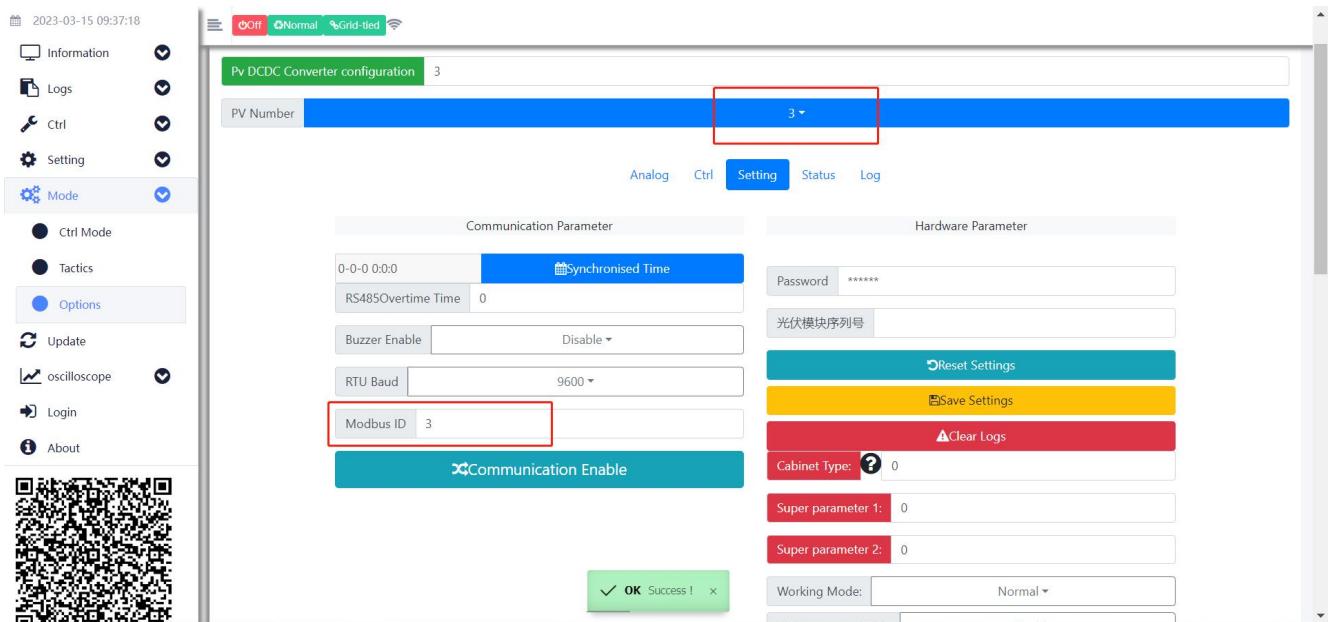


Figure 4-14 Single monitoring application ID setting interface

#### 4.3.2 Step 2

If it is PDS1-60k model, enter the "Setting Amount" column and set the "Model Setting" option to 1, if it is PDS1-45k model, set the "Model Setting" option to 0. The model change requires restarting the DC-DC booster converter device; click "Restart PV" in the "Control Amount" column.

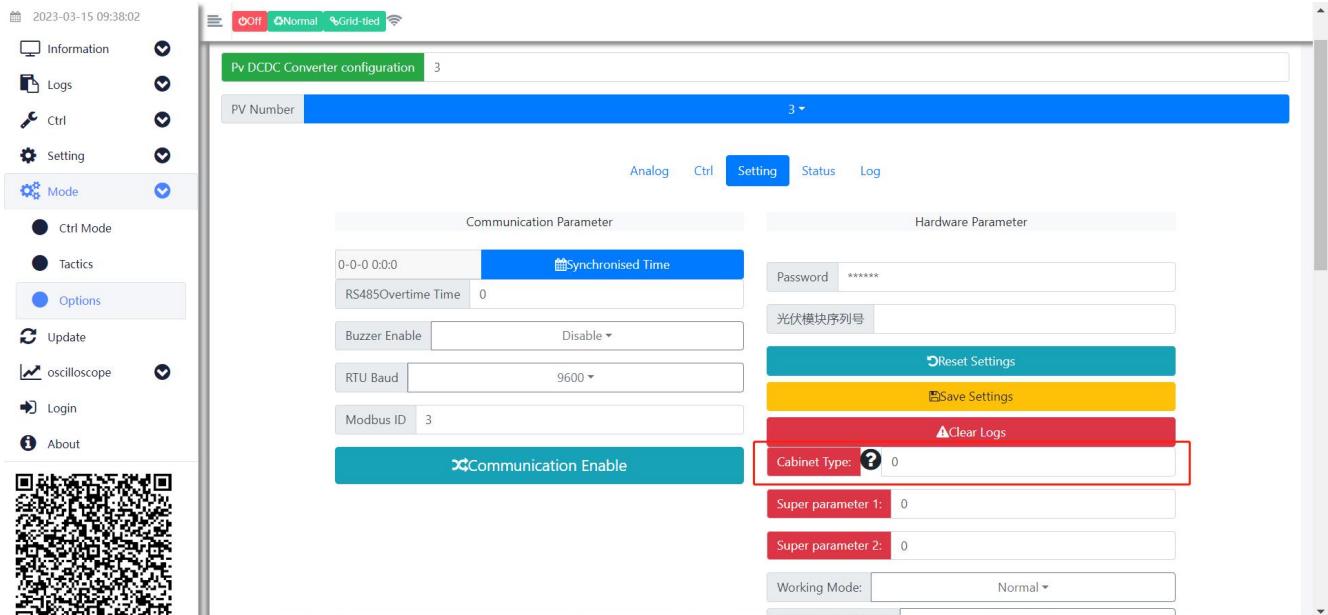


Figure 4-15 Model setting

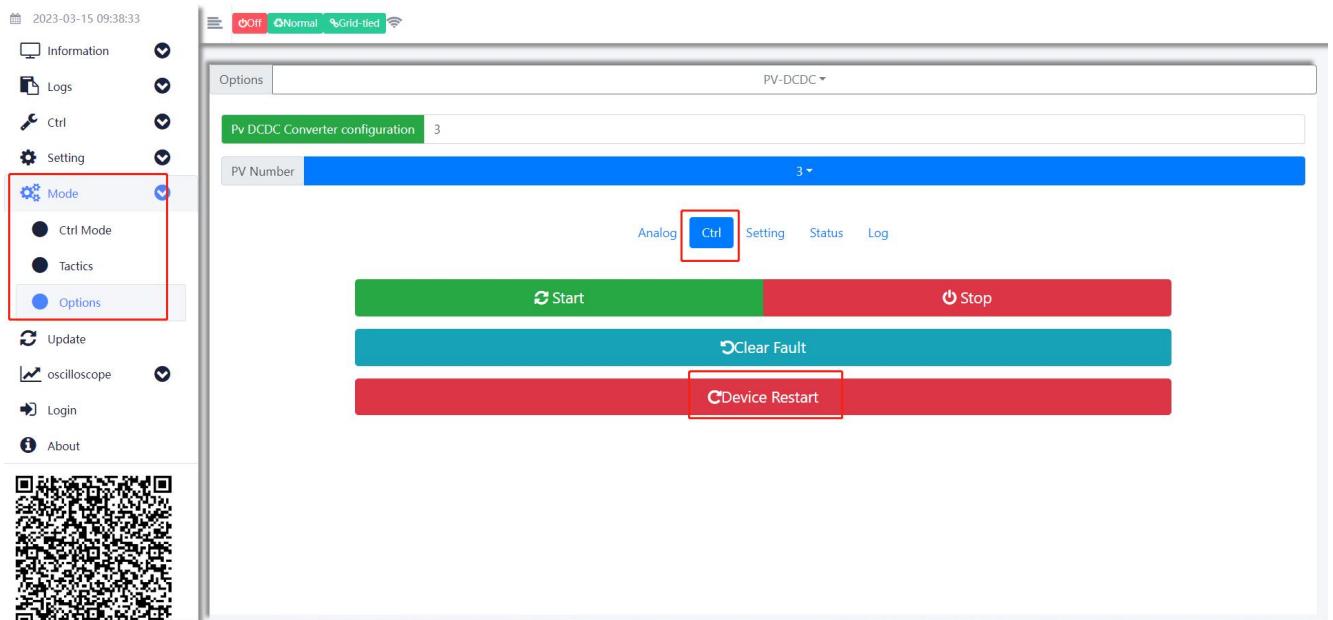


Figure 4-16 Restart the device

#### 4.3.3 Step 3

Set "PV1 PV wake-up voltage", "PV2 PV wake-up voltage" and "PV3 PV most wake-up voltage" according to the actual wake-up voltages of 1, 2 and 3 PVs of DC-DC booster converter No.3 respectively.

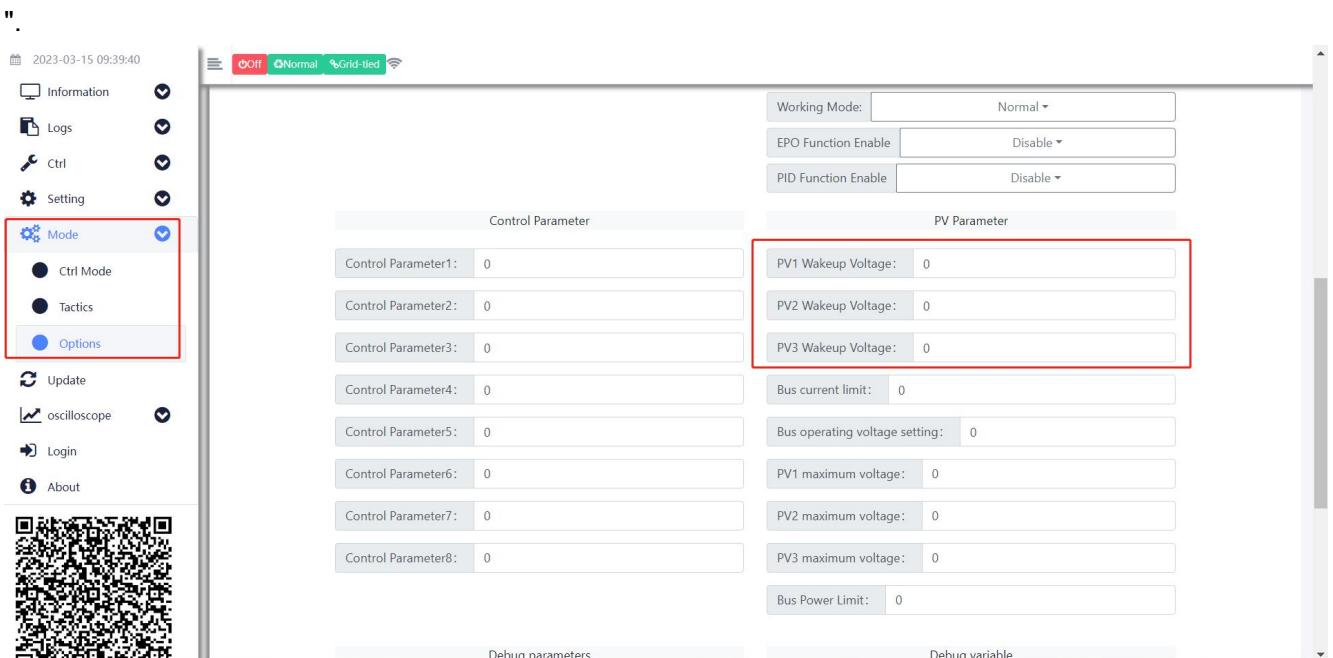


Figure 4-17 Wake-up voltage setting

#### 4.3.4 Step 4

Set "PV1 PV max voltage", "PV2 PV max voltage" and "PV3 PV max voltage" according to the actual open voltage of 1, 2 and 3 PVs respectively.

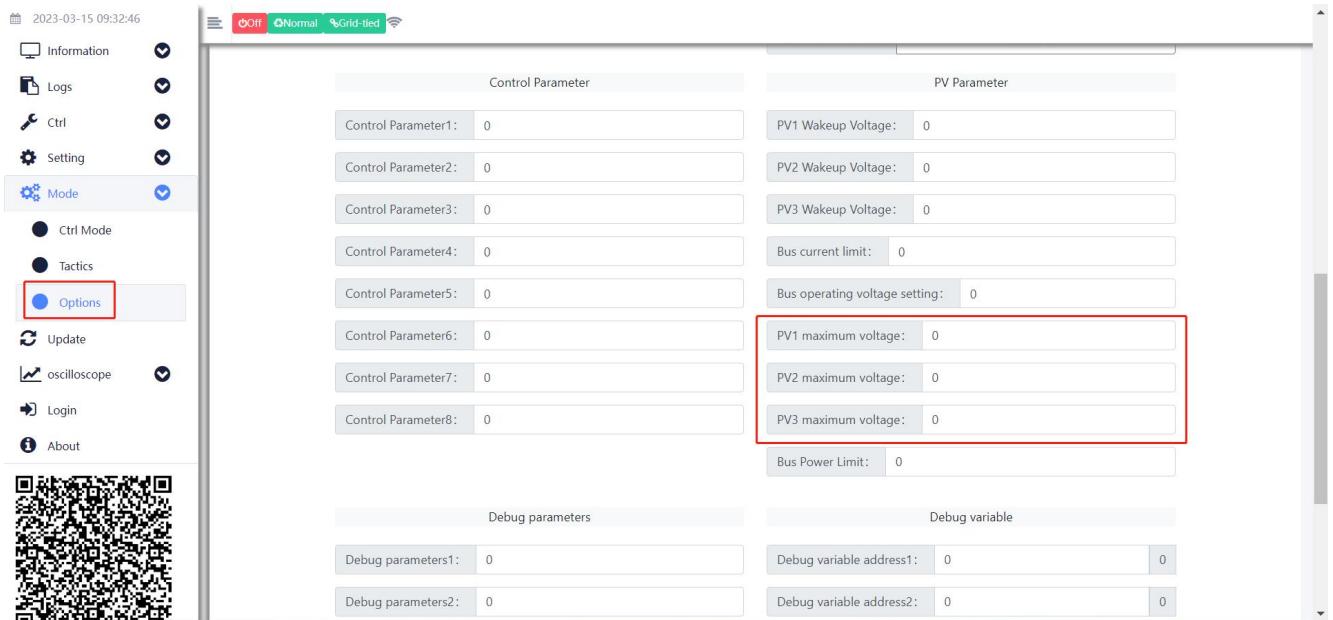


Figure 4-18 Maximum voltage setting

#### 4.3.5 Step 5

The "Bus operating voltage setting" in the "Setting quantity" menu is set to the actual bus voltage value of the PDS1-45k/PDS1-60k bus side (i.e. the bus voltage of the energy storage converter), and the "Bus operating voltage setting" is at least 30 % higher than the maximum values of "PV1 PV maximum voltage", "PV2 PV maximum voltage" and "PV3 PV maximum voltage". is at least 30V higher than the maximum value of the three settings. Based on the maximum current value that can flow on the busbar side, set the "Busbar Current Limit" in the "Setting Amount" menu.

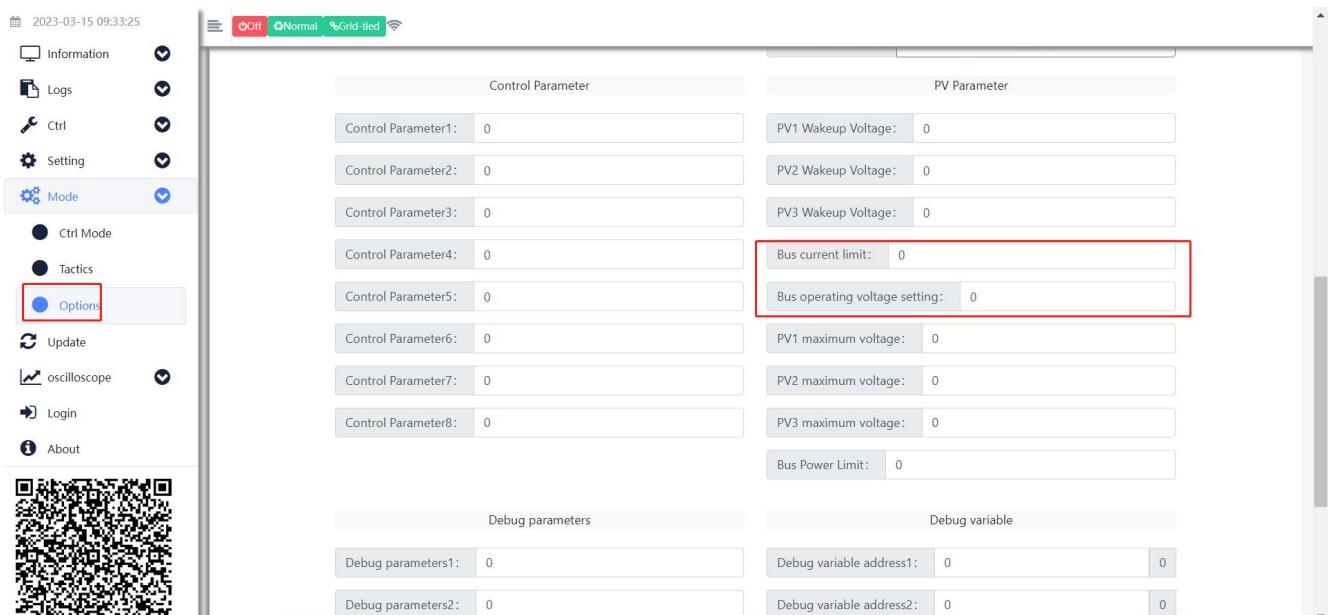


Figure 4-19 Bus bar parameter setting

#### 4.3.6 Step 6

If you need to use the PDS1-45k/PDS1-60k EPO input dry contact, set "EPO function enable" in the "Setting quantity" column to enable the dry contact EPO protection function.

If you need to use the night PID repair function, set the "PID Enable" item in the "Setting Amount" column to enable the night PID repair function.

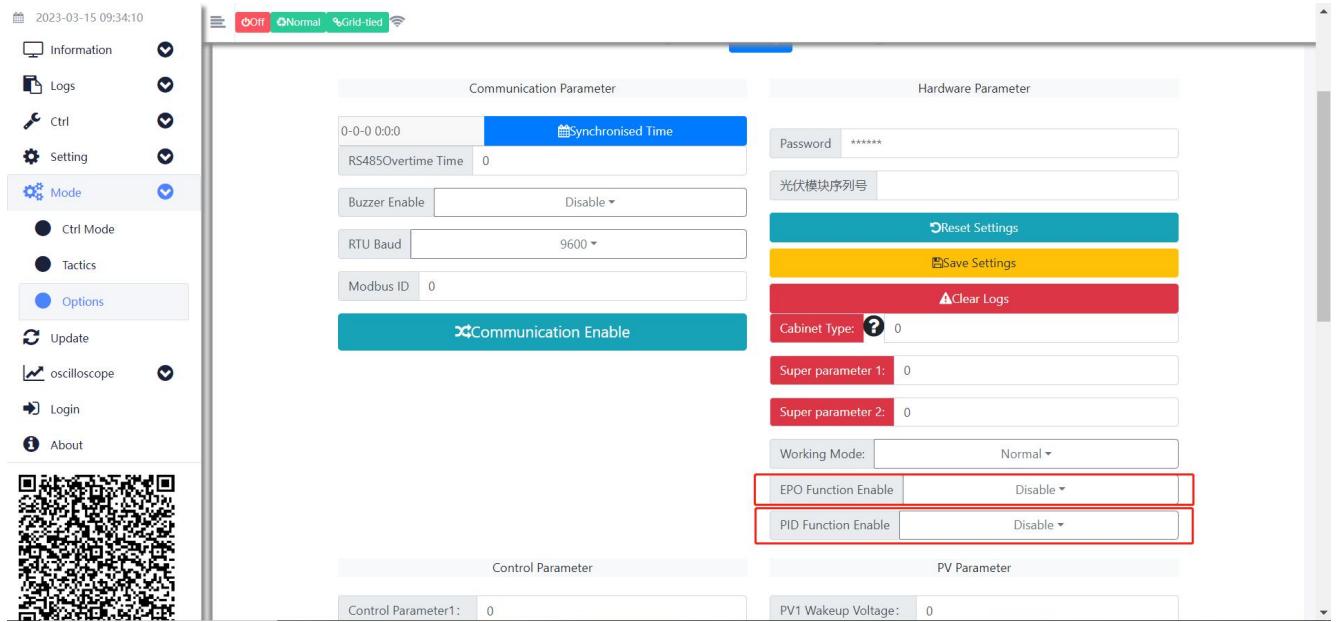


Figure 4-20 Optional Function Setting

#### 4.3.7 Step 7

According to steps 4.3.1-4.3.6, use the same method to configure the Modbus ID and set the parameters for DC-DC boost converter #2 and DC-DC boost converter #1 modules.

### 4.4 Startup and Shutdown

The PDS1-45k/PDS1-60k DC-DC booster converter must be installed and properly commissioned by the engineer, and the external power switch must be closed before the power-on procedure can be performed.

#### 4.4.1 Check before power on

Before power on, the equipment should be inspected as follows.

- 1) Visually check that there is no sign of damage on the outside of the module, and make sure that all internal and external circuit breakers or disconnect switches are "OFF".
- 2) Check whether the input and output wiring of the converter is normal and whether the grounding is good according to the inspection items in Chapter 4 after the installation is completed.
- 3) Check whether the PV voltage and bus voltage are normal.

#### 4.4.2 Power-on steps

- 1) Make sure the external input circuit breaker (switch between PV panel and PDS1-45k/PDS1-60k input side) and external output circuit breaker (switch between energy storage converter bus and PDS1-45k/PDS1-60k output side) are in "OFF" state, and the system closes the PDS1-45k/PDS1-60k output side. 45k/PDS1-60k module panel PV input switch.
- 2) Ensure that the PV panel input voltage is below 100V, close the external circuit breaker on the

input side to access the PV, and when the PV panel voltage rises to 200V, the power indicator on the PDS1-45k/PDS1-60k panel is illuminated.

- 3) Connecting PCS using Ethernet/WIFI and logging into the PV control interface as in section 4.1.
- 4) When using Ethernet connection, please open a browser on the desktop (Google/Firefox is recommended), then enter the default IP address of the machine in the URL field of the browser, and finally, enter "admin", "Password" into the "Name" input box, "Password" input box, enter the initial password "20072020", click "Log in" to enter the machine. The "Current Alarm" in the "Event Record" will show PV #01 DC bus undervoltage, "PV #2 DC bus undervoltage", "PV #3 DC bus undervoltage", "PV #4 DC bus undervoltage", "PV #5 DC bus undervoltage" and "PV #6 DC bus undervoltage". "PV #3 DC bus undervoltage", etc.
- 5) According to the single-monitoring or multi-monitoring scenario, choose to configure the DC-DC boost converter by referring to section 4.2 and 4.3 parameter setting process.
- 6) After parameter setting, ensure that the bus voltage of the energy storage converter is within the normal working range of PDS1-45k/PDS1-60k DC-DC booster converter, close the external circuit breaker on the output side, then the information such as DC bus undervoltage alarm shown in the "current alarm" will be automatically eliminated and enter the current alarm-free state. At the same time, the red fault indicator goes out.
- 7) If there is no alarm on the interface, the converter will automatically turn on and run when the shutdown command is invalid (i.e. the shutdown command has not been clicked after power-on). If the shutdown command is invalid, "Operation strategy" - "Option", click "PV power on" in the "Control quantity" menu. "Set the power-on command.

 CAUTIO N	<ol style="list-style-type: none"><li>1. The initial password for admin user login is 20072020.</li><li>2. The first time you power on, please use the initial password, and change the password as soon as possible, after changing the password, please remember the password to ensure account security. Not changing the password may lead to password leakage, and the loss of the password will lead to the user not being able to access the device, and the resulting loss needs to be borne by the user.</li></ol>
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#### 4.4.3 Steps to shut down the device

- (1) Click "Run Policy"- "Options" on the left side of the webpage, and click "PVShutdown" in the "Control" menu. "Set the shutdown command, and the converter will stop running.
- 2) Confirm whether the converter is in normal shutdown state.
- 3) Disconnect the external circuit breaker on the busbar output side.
- 4) Disconnect the external circuit breaker on the PV input side.
- 5) Disconnect the PV input switch on the PDS1-45k/PDS1-60k panel.

**WARNING**

The upper cover can only be opened after the electrical circuit connected to the converter has been disconnected for about 5 minutes and the DC bus capacitor inside the module has been discharged.

To prevent personal injury, if you want to do maintenance or open the chassis after power down, please use a multimeter to measure the voltage at the terminals first to ensure that all internal parts of the machine are not charged before carrying out relevant operations!

## Chapter 5 Maintenance and repair

### 5.1 Working environment and operating condition inspection

Does the working environment of the equipment meet the requirements of the equipment.

- Allowed ambient temperature in -25~+60°C
- Allowable relative humidity: 0~95% (non-condensing)

When the external climate or operating environment changes, it is still necessary to ensure that the machine operates within the allowable humidity and temperature range, if problems arise, the equipment installation environment needs to be rectified.

- Check whether the operation status information display is normal and the analog quantity display is normal when running
- Read the monitoring alarm information, fault records and operation records, etc. in the relevant documents

### 5.2 Electrical and fixed parts connection check

After the equipment is put into operation, the electrical and fixed parts connection of the equipment should be checked regularly, recommended once every three months, and records should be made after each check.

- Check whether the power cable connection screws of the converter are loose.
- Checking whether the PV side terminal connection is loose.
- Visually inspecting whether there is color change at the equipment wiring screws and whether the cables are deformed and melted, and scanning with a thermal imager if necessary.
- Whether the communication cables or terminals are deformed by force.
- rust and corrosion inspection of the external DC switch metal parts to ensure their mechanical operation is good.
- Check whether the cooling fan is working normally and whether there is any abnormal sound during operation, and replace it in time if there is any abnormality.

### 5.3 Cleaning and cleaning

Before the equipment is put into operation, clean the dust and debris at the terminals and mesh.

After the equipment is put into operation, the dust and debris around the equipment should be cleaned regularly, and the ventilation and exhaust facilities of the equipment should be checked to see if they are normal, and it is recommended to clean them once every three months.

After the equipment is put into operation, the dust on the converter fan and the insect-proof net of the

air inlet and outlet should be cleaned regularly, recommended once every three months.

 WARNING	The dust accumulation on the fan inlet will lead to poor air ducts and over-temperature shutdown of the converter, which will seriously affect the normal operation of the converter, so it must be cleaned regularly.
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## Chapter 6 APPENDIX

### **Appendix I:Quality assurance and after-sales service**

#### 1) Quality Assurance

Ltd. (hereinafter referred to as the Company) will repair or replace the product with a new one free of charge if the product fails during the warranty period.

#### 2) Faulty products processing

After the replacement of substandard products handled by the Company, the user should properly store the faulty products; for products that need to be repaired, the user should be given sufficient and reasonable time, please understand the inconvenience caused to your use.

#### 3) The Company has the right not to carry out quality assurance after the following circumstances.

- Transportation damage.
- Operation under extremely harsh conditions other than the environmental conditions specified in this manual.
- Improper installation, modification or use.
- Unauthorized disassembly and assembly of machine or system components, etc..
- Exceeding the warranty period.
- Damage caused by unexpected events or natural disasters, etc.

Product failure caused by the above circumstances, the customer requests for repair service. After the determination of our customer service department, we can provide paid maintenance services.

## Installation records

## QuestionFeedback