

# PDS1-750K-H DC converter



Manual

*Energy Freedom*  
Driven By **Sinexcel®**

**Sinexcel**

**PDS1-750K-H DC converter**

**User Manual**

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Shenzhen Sinexcel Electric Co., Ltd.

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# 1 Overview

## 1.1 Applicable models

This document applies to the following device models;

- PDS1-750K-H series

### Model Definition

This section introduces product model definition in this user manual, as shown in Fig 1.1:

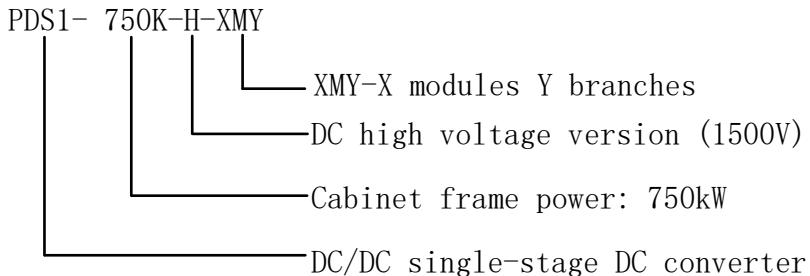


Fig 1.1 Product model definition

For example:

PWS1-750K-H: Indicates 750kW bidirectional DC converter high voltage 1500V model.

Check the equipment nameplate to determine the model.

The illustrations in this document have been reduced to be necessary and may differ from the real product.

The PDS1-750K-H energy storage converter is a series of converters; the rated converter capacity is 750kW, and the number of modules fully loaded is 8 modules.

Table 1 PDS1-750K-H cabinet backward compatible series list

serial number	model	illustrate
1	PDS1-750K-H-XM1	Single branch model, the number of modules X can choose 8/7/6/5/4/3/2/1
2	PDS1-750K-H-XM2	2 branch models, the number of modules X can choose 8/4
3	PDS1-750K-H-XM4	4 branch models, the number of modules X can choose 8/6/4/2

## 1.2 Target Group

The tasks described in this document can only be performed by professionals or other qualified persons. Qualified persons must have the following skills:

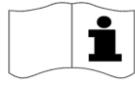
- Understand how the product works and how to operate the product
- Understand how the battery works and how to operate the battery
- Training on how to deal with the hazards and risks associated with installing and using electrical equipment installation
- Installation and commissioning of electrical equipment and installations
- Understand all applicable standards and directives
- Understand and follow this manual and all safety information

### 1.3 Nomenclature Terms and abbreviations

名称	定义
DC	Direct current
BUS	Bus side
BESS	Battery energy storage system
ESS	Energy storage system.
EMS	Energy management system.
BMS	Battery management system.
PCS	Power conversion system.
SLD	Single line diagram
SOH	State of health (of battery), expressed in percentage.
SCR	Silicon controlled rectifier
DOD	Depth of discharge, the rest battery capacity, expressed in percentage.
EOD	End of discharging.
SOC	State of charge (of battery).
UI	User Interface
EPO	Emergency Power Off
SPD	Surge Protecting Device

## 2 Safety Precautions

### 2.1 Symbols

Symbol	Explanation
	<b>DANGER</b> Indicates a dangerous situation that, if not avoided, will result in death or serious injury
	<b>WARNING</b> Indicates a dangerous situation that, if not avoided, will result in death or serious injury
	<b>CAUTION</b> Indicates a dangerous situation that, if not avoided, may result in minor or moderate injury
	<b>NOTICE</b> Indicates that if property damage is not avoided
	Draw attention to important information, best practices and tips NOTE is used to address information that is not related to personal injury, equipment damage, and environmental degradation.

### 2.2 Important Safety instructions

This user's manual is about installation and operation of Sinexcel PDS1 series 750kW Bi-directional DC converter.

Before installation, please read this user's manual carefully.

The PDS1 must be commissioned and maintained by the engineers designated by the manufacturer or the authorized service partner. Otherwise, it might endanger personal safety and result in device fault. Any damage against the device caused thereby shall not be within the warranty scope.

The PDS1 cannot be used for any circumstance or application related to life support device.

This manual contains important instruction for Models of PDS1 series that shall be followed during installation and maintenance of the PDS1.



### **DANGER**

Any contact with copper bar, contactor and terminal inside the device or connected with the loop of utility grid might result in burning or fatal electric shock.

Don't touch any terminal and conductor connected with the loop of utility grid.



## **WARNING**

There might be an electric shock risk inside the device!

Any operation related to this device will be conducted by professionals.

Pay attention to the safety precautions listed in safety instruction and installation documents.

Pay attention to the safety precautions listed in operating and installation manual and other documents.

---



## **WARNING**

Large leakage current

Before connecting input power supply, please ensure that the grounding is reliable.

The device must be grounded complying with the local electric codes.

---



## **WARNING**

When storage battery is connected to PCS, there may be DC voltage at input port. Please pay attention to it during operation or check the battery system user manual

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## **WARNING**

Don't touch electric parts within 15 minutes after power outage!

There is dangerous energy in capacitance storage. Don't touch device terminal, contactor and cooper bar and other electric parts within 15 minutes after disconnecting all device power supplies.

---



## **NOTICE**

All maintenance and preservation inside the device require using tools and shall be conducted by trained person.

The components behind the protective cover plate and dam board which are opened by tools cannot be maintained by users.

Please read this user's manual before operation.

---

## **2.3 Additional Information**

Links to additional information can be found at <http://sinexcel.us/> or [www.sinexcel.com](http://www.sinexcel.com).

## 3 Product Introduction

### 3.1 System Introduction

Bidirectional DC converter is usually a conversion device between photovoltaic and battery, photovoltaic power generation can charge the battery. It can also be a conversion device between the battery and the DC bus, the battery can be discharged to the DC bus, and the DC bus can charge the battery.

Using DCDC single-stage topology, The voltage input range on both sides is wide: 500-1500V, and there is no distinction between high and low voltage, and the voltage ranges on both sides can overlap.

### 3.2 Bidirectional DC Converter Appearance

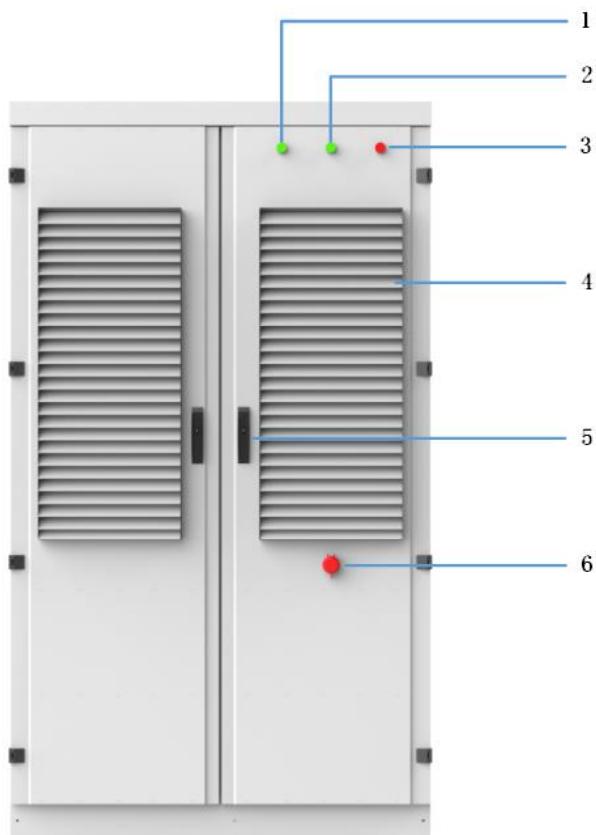


Fig 3.1 Appearance of bidirectional DC converter

Location	describe
1	Power (POWER) indicator
2	Running (RUN) indicator
3	FAULT indicator
4	Air intake shutters
5	Door lock
6	Emergency stop knob

### 3.3 System schematic

PDS1-750K-H bidirectional DC converter consists of 8 DC/DC converter modules, These modules identify master and slave systems through DIP switch dial codes on the panel. One of the modules is used as the master, and the other modules are used as slaves to synchronize with the master. The equipment is equipped with SPD protectors, high and low voltage side switches and auxiliary power distribution units. Fig 3.2 is the topology of the system.

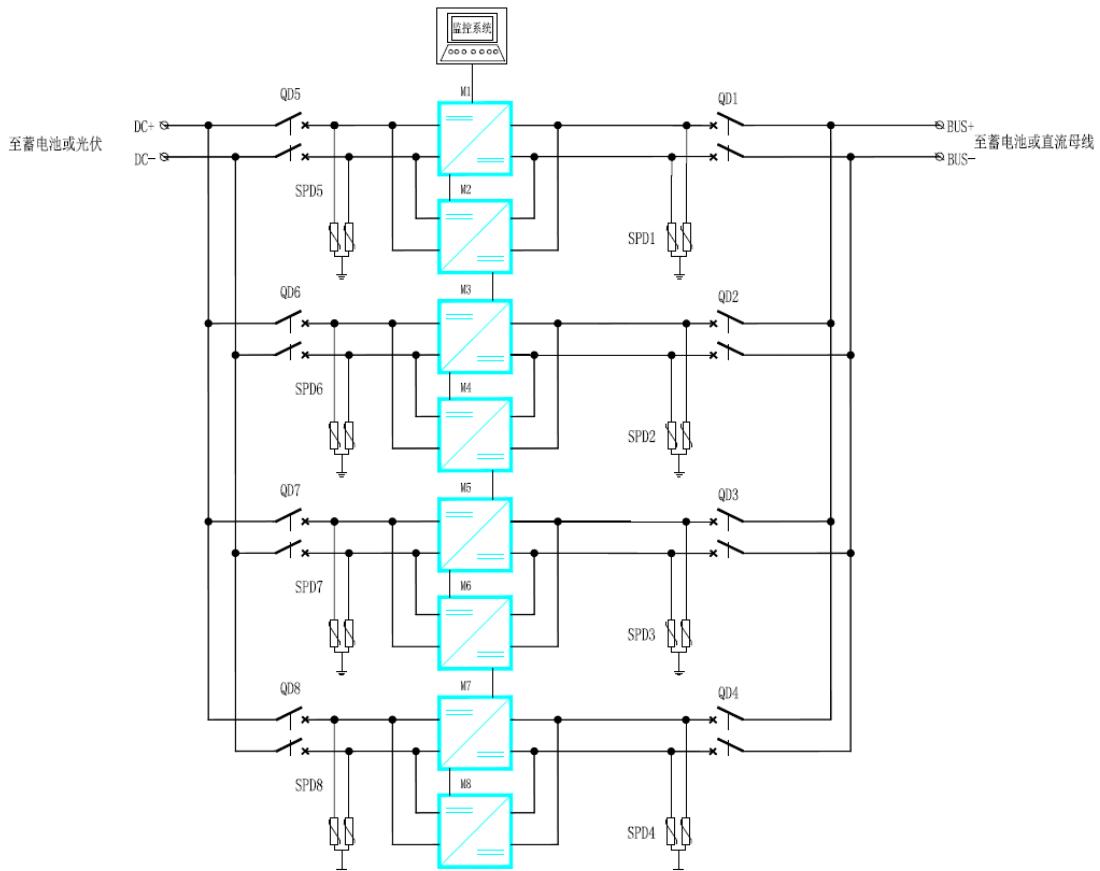


Fig 3.2 Schematic diagram of bidirectional DC converter system

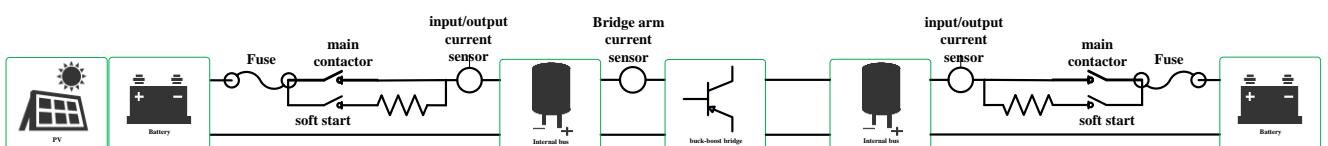


Fig 3.3 Schematic diagram of bidirectional DC converter circuit system



#### NOTICE

PDS1-750K-H consists of 8 DC modules, the DC side can be used as 1/2/4 branch, and the BUS side is 1 branch.

### 3.4 Module introduction



Fig 3.4 Front View of DC Module

Position	Description	Description
1	Rear power plug-in terminals	white - high pressure
2	Multi-function indicator port	Communication, dial code, indicator light
3	hanging ears	Module fixing ears
4	handle	not load bearing

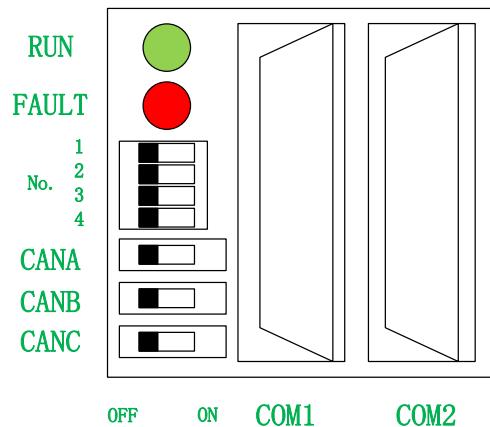


Fig 3.5 Schematic diagram of the multi-function indicating terminals of the DC module

silk screen	describe	directions
RUN	Running lights	green
FAULT	Fault indicator	red
No.	phone number dial	The phone number dialing is binary dialing
CANA B C	CAN communication matching resistance dial	Improve signal quality
COM1 2	Module communication port	communication
OFF ON	Dial status direction indication	Left dial is OFF, right dial is ON



Figure 3.6 Schematic diagram of the control box

serial number	name	directions
1	Multifunctional Communication Panel	Ethernet port, parallel, USB, EPO button
2	Multifunctional dry contact panel	Including 485, CAN and dry contacts
3	Module communication port	Module communication terminal
4	hanging ears	fixed module
5	handle	not load bearing

### 3.5 Dimensions and Weight

The dimensions of the PDS1-750K-H DC converter are shown in Figure 3.7. The net weight of the product is about 845kg, and the specific weight is based on the actual standard.



Fig 3.7 Dimensions of PDS1-750K-H

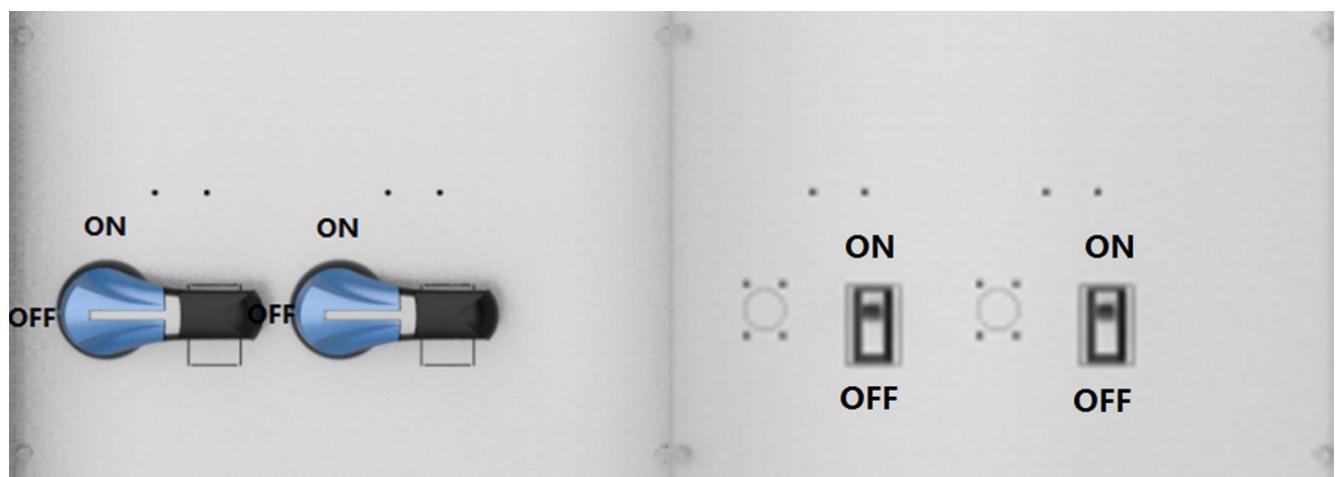
### 3.6 Heat dissipation and fire protection

The PDS1-750K-H DC converter is an IP54 outdoor unit. It adopts the structure design of front air and rear air outlet. The outdoor air enters through the air intake window at the front of the DC converter, and the hot air is discharged through the exhaust port on the back of the converter. The fire protection design adopts a device filled with clean fire extinguishing agent to surround the top of the whole machine. When the surface of the device encounters heat, it blasts to form a natural nozzle, and the fire extinguishing agent is released to achieve the effect of suppressing the fire. The ventilation design is shown in the left picture of Fig 3.8, fire protection design As shown in Fig 3.8 on the right.



Fig 3.8 PDS1-750K-H DC converter ventilation and fire protection design

### 3.7 Switch status



Left - disconnector version		Right picture - circuit breaker version
Location	name	illustrate
ON	ON position	Isolation switch (rotate clockwise) - handle longitudinally - handle up
OFF	OFF position	Isolation switch (turn counterclockwise) - handle horizontally (toggle down) - handle down

## 4 Specifications

Technical Data Sheet

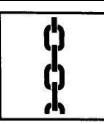
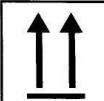
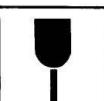
model	PDS1-750K-H
DC	
rated power	750kW
Max power	825kW
DC side voltage range	500~1500V
Number of DC side	1/2/4
DC side max current	825/413/207A
BUS side voltage range	500~1500V
Number of BUS side	1
BUS side max current	825A
number of modules	8
System	
Max conversion efficiency	98.6%
Dimensions (W×H×D)	1200×2100×970 mm
weight	845kg
noise	<85dB
Protection class	IP54
allowable ambient temperature	-40~55 °C (Derating over 45 °C)
cooling method	Forced air cooling
allowable relative humidity	0~95% (no condensation)
allowable altitude	3000m (Derating over 3000m)
Communication	
Communication Interface	RS 485, Ethernet, CAN
Communication protocol	ModbusTCP/RTU
BMS access	support

## 5 Storing、 lifting and transporting

### 5.1 Transport and storage

In order to ensure that the energy storage converter is in a better protective state during transportation, please choose to transport with packaging as much as possible, and transport according to the indications of various signs on the packaging. The illustrations of the packaging signs are shown in Table 5-1:

Table 5-1 Description of packaging label

Icon	Describe
	Center of gravity mark, indicating the center of gravity of the energy storage converter.
	Lifting mark, indicating the position of the chain or rope when lifting the energy storage converter.
	The upward mark indicates the placement method when carrying and placing the energy storage converter. It is strictly forbidden to put it upside down, horizontally or tilted.
	Handle the logo with care, and avoid violent friction or collision during transportation and placement.
	During transportation and storage, the energy storage converter should be protected from rain or moisture.



#### NOTICE

Since the center of gravity is not the mechanical center of the energy storage converter, please pay attention to the center of gravity mark on the packaging box during transportation.



#### NOTICE

Regardless of whether the converter is packaged or not, it is strictly forbidden to tilt an angle greater than 5° during the movement. Due to its large size and weight, an excessively large inclination angle may cause the equipment to fall upside down, causing casualties or equipment damage.

Please avoid physical shocks to the equipment during the movement, such as suddenly lowering or lifting.



#### NOTICE

Please avoid transporting the energy storage converter under rain or bad weather conditions. If it is unavoidable, please take necessary protective measures.

If the on-site installation is not carried out immediately after the completion of the delivery and acceptance work, the energy storage converter with outer packaging should be stored in a ventilated, dry, and clean indoor environment. At the same time, you should also pay attention to the following aspects:

- Restore the package to the state at the time of receipt, and the desiccant in the package must be retained.
- The storage floor is flat and sufficient to carry the weight of the energy storage converter with the outer packaging.
- When storing the equipment, you need to pay attention to ventilation and moisture prevention, and it is strictly forbidden to store water in the storage environment.
- The storage environment temperature is required to be -40°C~+55°C, and the relative humidity of the storage environment is required to be 0~95%, without condensation.
- Take care to deal with the harsh surrounding environment, such as sudden cold, sudden heat, collision, etc., to avoid damage to the equipment.
- Regular inspections, at least once a week. Check if the packaging is intact to avoid insect bites. If the outer packaging is damaged, it should be replaced immediately.
- If the storage time is more than half a year, the package should be opened for inspection, and the desiccant should be replaced and repackaged.



## NOTICE

The energy storage converter is a whole device, and it must not be disassembled during transportation or storage. Equipment failures caused by modifications not authorized by Sinexcel are not covered by the warranty.

---



## NOTICE

When the equipment is transported and stored, it is strictly forbidden to stack, and no other items are allowed to be stacked on the top of the equipment.

---



## NOTICE

When the equipment is transported and stored, it should be ensured that the environment in which it is located is free of corrosive gas, no high-temperature heat source, not excessively dusty, and meets the fire protection requirements. Storage without packaging is strictly prohibited.

---

## 5.2 Transfer

It is recommended to use a forklift to move the entire box body in a short distance without removing the shipping box. When moving, pay attention to the center of gravity mark and lifting mark position on the box, and ensure that the transportation tool has sufficient carrying capacity. Lifting is strictly prohibited.

Moving the energy storage converter without a packaging box is usually used near the installation location of the equipment. It is recommended to use a forklift for operation. When using a forklift, the bottom baffle of the energy storage converter needs to be removed first.

### 1) Forklift movement (preferred)

Using a forklift to transport the energy storage converter is a standard way of movement. The center of gravity of the converter should fall between the two forks of the forklift and be pre-inserted to ensure that it will not tilt after being lifted. As shown in Figure 1-1, the length of forklift forks shall not be less than 1.2m.

In the process of using a forklift to fork, lower and move the energy storage converter, it is necessary to ensure that it is slow and stable, and the energy storage converter must be placed on a firm and level ground.

In the entire process of using a forklift to operate, it is necessary to strictly abide by the forklift safety operation specifications. Due to the large volume of the energy storage converter, it may obstruct the driver's sight, so assistance should be provided for cooperation.



Fig 5-1 Schematic diagram of forklift

#### 1) Pallet truck movement

The use of a pallet truck to move the energy storage converter is only suitable for conditions where the transportation route is relatively stable. During transportation, the center of gravity of the converter should fall between the two forks of the forklift and be pre-inserted to ensure that it will not tilt after being lifted. As shown in Figure 3-2, the length of the forklift forks shall not be less than 1.2m, the inner distance between the two fork arms of the pallet truck shall not be less than 0.2m, the outer distance shall not be greater than 0.8m, and the load-bearing capacity of the pallet truck must be  $\geq 1500\text{kg}$ .

In the process of using a forklift to fork, lower and move the energy storage converter, it is necessary to ensure that it is slow and stable, and the energy storage converter must be placed on a firm and level ground.

In the entire process of using a forklift to operate, the relevant safety operation regulations must be strictly observed. Due to the large size of the energy storage converter, it may obstruct the operator's view, so assistance should be provided for cooperation.

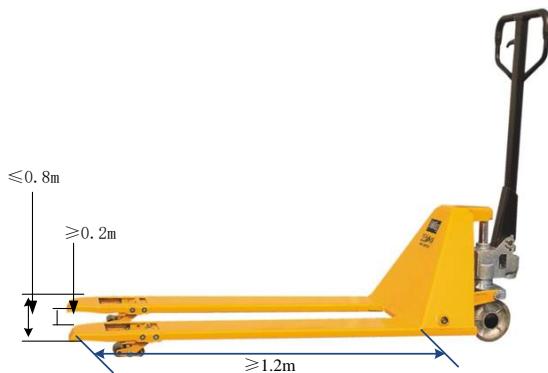


Fig 5-2 Schematic diagram of pallet truck



#### NOTICE

Before moving with a forklift or pallet truck, the bottom baffle of the energy storage converter must be removed, otherwise the bottom baffle will be damaged.



## NOTICE

No matter which way you choose to move the energy storage inverter, you must ensure:

- Must always pay attention to the position of the center of gravity.
- Must be considered the volume and weight at all times.
- Must be ensured the safety of operators at all times.

Take necessary auxiliary measures to ensure that the equipment is transported to the installation site in good condition.

---

### 5.3 Out of the box inspection

#### 5.3.1 Unpacking

After the DC converter is transported to the vicinity of the installation site, the transport box needs to be removed. The removal steps are as follows:

- ① Remove the top panel of the box.
- ② Remove the wooden side panel of the packing box.
- ③ Remove the shielding material from the packing box.
- ④ Remove the anchor parts that fix the DC converter on the transport wooden bracket.



## NOTICE

After removing the anchor parts between the DC converter and the transport wooden bracket, it is strictly forbidden to transport the DC converter through the wooden bracket.

---

#### 5.3.2 Test

Before leaving the factory, the DC converter has been checked by the staff of Shenghong Electric and packed firmly. Nonetheless, the following items need to be checked after the DC converter shipping packaging has been removed:

Check whether the quantity of each item on the packing list is consistent with the actual item;

Check whether the nameplate data of the product is consistent with the order contract, such as product model, rated capacity, voltage level, etc.;

Check whether the factory documents and accessories are complete;

Check whether the appearance of the DC converter is consistent with the description in this manual;

Check the DC converter for deformation, peeling paint and loose parts.

The packing list of the PDS1-750K-H DC converter is shown in Table 5-2.

Table 5-2 Packing list

serial number	name	quantity
1	PDS1-750K-H-DC converter (including cabinet door key and related accessories)	1 set
2	PDS1-750K-H User Manual	1 serving
3	Equipment wiring diagram	1 serving
4	Product certification	1 serving
5	Inspection Report	1 serving
6	Warranty Card	1 serving



## NOTICE

Installation and debugging can only be carried out on the DC converter that has been inspected correctly and is complete without damage. During the inspection process, if any problem is found, please contact the transporter or Shenghong Electric in time.

## 6 Device installation

### 6.1 installation requirements

#### 6.1.1 Basic requirements

The protection level of the PDS1-750K-H DC converter is IP54, which can be installed outdoors, but cannot be placed in a high-humidity environment for a long time. Due to the noise generated during operation, the energy storage inverter should be installed in a location far away from residential areas, and the installation location should not contain corrosive and flammable gases.

In order to ensure the safe and efficient operation of the DC converter, when choosing an installation environment, be sure to observe the following:

- The DC converter must be installed on a suitable concrete support with refractory surface. The air outlet at the bottom of the converter must be no less than 0.5m above the ground and not blocked.
- The installation ground should be dry and flat, without water accumulation, and the ground level should not shake, and can fully bear the weight of the DC converter.
- The ambient temperature range of the installation site is: -40°C~+55°C; the relative humidity range is: 0~95%, non-condensing.
- DC converter grounding resistance <4Ω.
- The installation location should ensure that it is easy to observe the LED indicators and operate the LCD touch screen.
- If the machine is placed directly outdoors, it is recommended to take necessary shading measures for the machine to avoid the temperature of the machine rising due to direct sunlight and causing the machine to run at a reduced rate.

#### 6.1.2 Outdoor requirements

The converter can operate within the ambient temperature of -40°C~55°C;

When the ambient temperature is higher than 45°C, the machine will run with derating. When the ambient temperature is lower than -20°C, the machine needs to be warmed up and then run with high power.

The solar radiation intensity should be less than or equal to 1200W/m<sup>2</sup>. It is recommended to take necessary shading measures for the converter installed outdoors.

### 6.1.3 Foundation Support Requirements

The DC converter needs to be installed on the concrete foundation or the structure supported by the steel channel with the surface of the flame retardant material. It must be ensured that the foundation is flat, solid, safe and reliable, and has sufficient bearing capacity. It is strictly forbidden to install it on the foundation with depressions or slopes on the surface.

When constructing the foundation, the cable trench should be preset according to the overall design of the power station and the cable entry and exit positions at the bottom of the DC converter.

The foundation needs to be pre-drilled, and the size of the opening must be exactly the same as the positioning hole of the DC converter base, so that the DC converter can be firmly connected to the foundation.

As shown in Fig 6-1, the base of the DC converter is equipped with six 14mm\*25mm positioning waist holes. It is recommended to use grade 8.8 M12\*50 bolts to fasten the base of the inverter and the foundation.

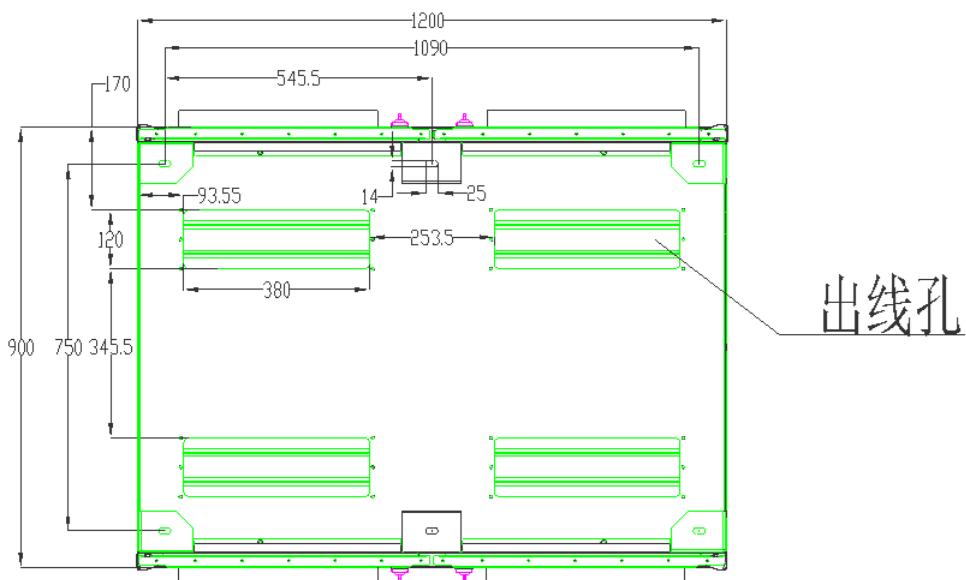


Fig 6-1 Bottom view of DC converter

### 6.1.4 Space requirements

As shown in Fig 6-2, when installing the DC converter, a sufficient distance must be kept from walls and other equipment to meet the requirements of the narrowest maintenance channel, evacuation route, and ventilation. The requirements in this section are the minimum space requirements for the DC converter during normal operation. If the site conditions permit, it is recommended to select a larger spacing to ensure the reliable and efficient operation of the DC converter.

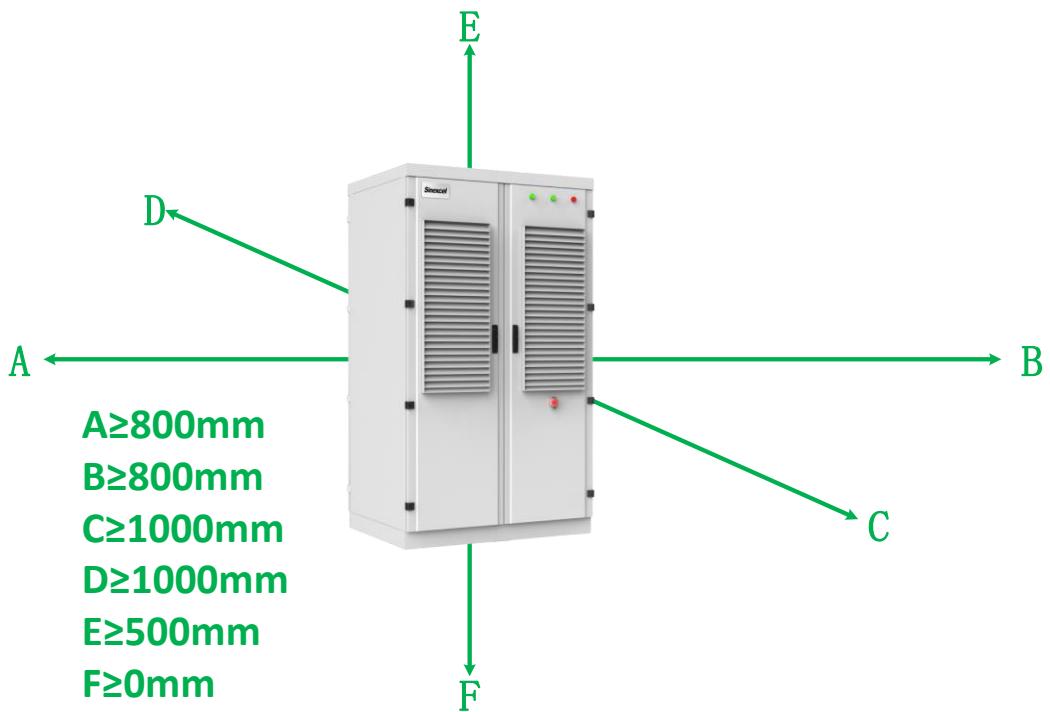


Fig 6-2 DC converter space requirements

### 6.1.5 Ventilation Requirements

The inverter will generate a lot of heat during operation. If the temperature is too high, it will directly affect the electrical performance of the equipment and even damage the equipment. Therefore, when planning the installation environment of the inverter, the ventilation and heat dissipation requirements of the equipment should be fully considered to ensure the normal and efficient operation of the equipment.



#### NOTICE

The fan outlet of the PDS1-750K-H DC converter is located at the bottom of the device. The location where the DC converter is installed should ensure that there is enough air duct space before and after the converter according to the requirements of 3-4, otherwise it will seriously affect the operation and performance of the DC converter.

In order to ensure the reliable and efficient operation of the DC converter, please regularly clean the grids, filters and filter cottons of the air inlet and air outlet of the equipment, and regularly check whether the fan of the equipment module is normal.

In order to meet the ventilation requirements of the DC converter, its installation environment must meet the following requirements:

- 1) The DC converter should not be installed in places with poor ventilation and low airflow.
- 2) There should be sufficient fresh air supply at the air inlet.
- 3) The air quality must be guaranteed. If the content of suspended matter such as sand and dust in the air is too large, the air purity can be improved by installing filters at the air supply grille.
- 4) The ventilation system of the DC converter must be independent of the ventilation systems of other equipment and not affect each other.

If a cooling air duct needs to be installed, the air duct should be designed by a professional in advance to avoid the phenomenon of reverse wind in the DC converter cabinet. At the same time, each joint must be sealed to prevent air leakage, and the upper limit of temperature resistance of the selected sealing material is at least 90 °C. After the cooling air duct is installed, check the inside of the DC converter to prevent screws, gaskets and other debris from falling into the cabinet during installation.

## 6.2 On-site installation

### 6.2.1 Trunking design

The DC converter is wired in and out of the bottom. To facilitate installation and maintenance, it is recommended that the cables connected to the outside be routed from the cable trench. A concrete cable trench should be preset in the DC converter room, or a rigid bracket should be installed on the ground of the machine room to raise the installation surface, and cables should be laid in the overhead. If the cable trench is preset, it can be fixed with anchor screws or channel steel. If a steel bracket is used, the equipment can be directly installed and fixed on the bracket.

The cable ground communication is usually designed and constructed by the construction party according to relevant standards, and the weight and space occupied of the required cables are fully considered.

The cross section of the trench is shown in Fig 6-3. Users can determine the number of cable supports according to their needs. To facilitate installation and maintenance, the bus circuit and battery circuits should be laid separately.

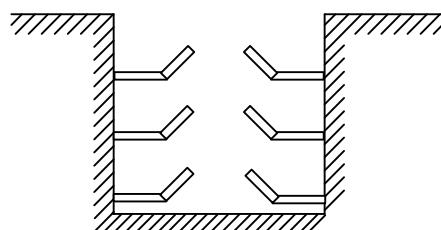


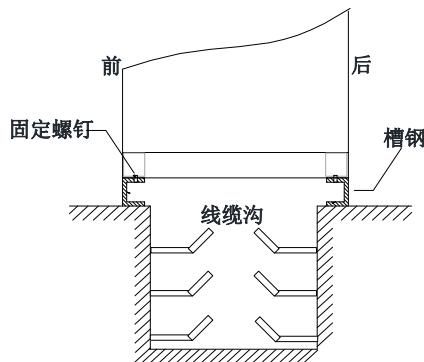
Fig 6-3 Sectional view of trench

## 6.2.2 Fixed DC Converter

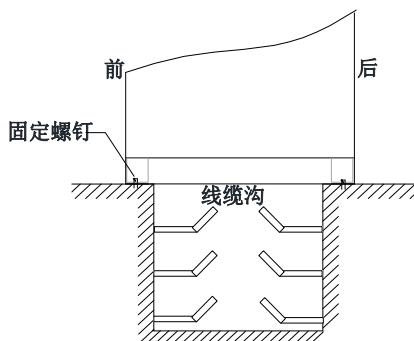
If the DC converter is finally fixed on the channel steel, before the equipment is finally fixed, it is necessary to ensure that the laying of the cable trench and the opening of the channel steel meet the requirements for the bottom size and fixing holes in Section 6.1.3 of the DC converter. If the DC converter is finally fixed on the concrete floor, it is necessary to drill holes on the ground and use expansion screws to fix the DC converter firmly. The fixing method of the DC converter is shown in Fig 6-4.

The fixing of the DC converter needs to be completed according to the following steps:

- 1) Select a suitable tool to transport the DC converter to the installation location and align the installation holes.
- 2) Use M12\*50 bolts to fix the DC converter on the channel steel or foundation through the waist hole of the base.
- 3) Install the DC converter base baffle to complete the fixed installation of the DC converter.



(a) Schematic diagram of the converter fixed to the channel steel



(b) Schematic diagram of the converter fixed on the ground

Fig 6-4 Fixing method of DC converter

## 6.3 Electrical connections

### 6.3.1 General Safety

---



#### DANGER

Danger of electric shock!

Before installation, make sure that the installation cables and equipment are not powered.

The internal capacitor of the DC converter is a dangerous energy storage device. Do not place inflammable and explosive materials near the DC converter.

---



#### WARNING

All electrical connections must comply with the electrical connection standards of the country where the project is located.

The DC converter can be connected to DC only after it has been approved by the local power supply company and installed by professional technicians.

---



#### WARNING

Only professional electricians or qualified personnel should make electrical connections to this product.

Please strictly follow the wiring identification inside the device to perform wiring operations.

---

During the entire process of electrical connection of the DC converter, as well as subsequent maintenance and inspection operations, the following safety rules need to be observed:

- Disconnect all external connections of the DC converter.
- Make sure that the DC converter cannot be accidentally re-powered on.
- Use a multimeter to make sure that the DC converter is completely de-energized.
- Make necessary ground and short-circuit connections.
- Use insulating cloth to cover the parts that may be live near the operation part.

### 6.3.2 Installation tool

The following tools need to be prepared before installation:

- Torque wrench
- Screwdriver

- Wire strippers
- Terminal crimping machine
- Hot air gun (or hot air blower)
- Multimeter

### 6.3.3 Wiring Parts

The fixing screws and other parts used for the wiring of the power cable of the DC converter have been packaged in a unified packaging bag when the device is delivered. Please connect the cables in strict accordance with the screw tightening rules.



#### NOTICE

When connecting cables, make sure that the connectors are tight.

Insufficient connections or oxidation of the contact surfaces can cause localized heat build-up, which may lead to fires.



#### NOTICE

When wiring the power line, it is necessary to select a copper wire of appropriate size, and use a copper terminal to fix it tightly before connecting it to the wiring copper bar.

### 6.3.4 Preparation before wiring

- 1) Open the front door and rear door of the DC converter

The user needs to open the front door and rear door of the DC converter before wiring.

Door keys are required to open and close the door. After installation, please pull out the cabinet door key for safekeeping.

- 2) Remove the protective cover

In order to improve safety, a protective net cover is installed inside the DC converter, and the protective net cover covering the part of the wiring port needs to be removed during electrical installation.

- 3) Open the cable entry hole

The overall DC converter adopts the structure design of bottom incoming and bottom outgoing lines. The bottom of the converter is reserved for the user to enter the hole, and the external connection lines are connected

from the bottom of the machine. In order to prevent foreign objects from entering and leaving the machine during transportation, the delivered equipment has a wire inlet baffle at the bottom, and the wire inlet baffle needs to be removed before wiring.

### 6.3.5 Cable Requirements

The cable selection requirements are as follows:

- The selected cable must have sufficient current carrying capacity. The current-carrying capacity of a conductor is related to factors such as environmental conditions, type of conductor insulation, laying method, wire material, and cross-sectional area.
- The diameter of all cables must be selected according to the maximum current on either side of the DC converter, and there must be a margin.
- The connection wires on the same side should be of the same specification and type.
- Please use flame retardant cables.

Table 6-1 lists the recommended diameters of connecting cables.

Table 6-1 Recommended specifications of connecting cables

cable	Wire diameter requirements	Mounting Bolt Specifications
Battery side DC+	4 channels, each channel is 95mm <sup>2</sup> ; other types of cables can also be selected, but the total diameter should not be less than 380mm <sup>2</sup> .	M8*30
battery side DC-	4 channels, each channel is 95mm <sup>2</sup> ; other types of cables can also be selected, but the total diameter should not be less than 380mm <sup>2</sup> .	M8*30
Bus side DC+	4 channels, each channel is 95mm <sup>2</sup> ; other types of cables can also be selected, but the total diameter should not be less than 380mm <sup>2</sup> .	M8*30
Bus side DC-	4 channels, each channel is 95mm <sup>2</sup> ; other types of cables can also be selected, but the total diameter should not be less than 380mm <sup>2</sup> .	M8*30
ground wire	1 channel, 50mm <sup>2</sup>	M8*12
communication line	2*0.75mm <sup>2</sup> , it is recommended to use shielded wire	-



#### NOTICE

It is strictly forbidden to overload the cable, and the current distributed on the 1mm<sup>2</sup> cable is strictly prohibited to exceed 3A.

### 6.3.6 Wiring Precautions

---



#### NOTICE

Insulation and integrity checks of all connecting cables are required prior to all electrical wiring.  
It is strictly forbidden to use cables with poor insulation, partially exposed or otherwise damaged cables.

---



#### NOTICE

Before wiring, make sure the polarity of the cables on either side is correct.  
During the wiring process, do not pull the cable hard to avoid damaging its insulation performance.  
All cables should have a certain amount of bending space.  
Take necessary auxiliary measures to reduce the stress on cables.  
The length of the screw should be selected appropriately. Too long a screw may affect the insulation performance of the equipment.  
During installation, some heat-shrinkable sleeves should be prevented from being clamped between the copper nose and the copper bar, otherwise it may cause poor contact and even damage the equipment.

---



#### NOTICE

Incorrect wiring method may cause fire and burning, please pay attention to the connection sequence of wiring components.  
When connecting, make sure that the connectors are tight. Inadequate connections or oxidation of the contact surfaces can cause localized heat build-up, which may result in a fire.

---



#### NOTICE

After all electrical connections are completed, the wiring should be checked comprehensively, and the gap of the inlet should be sealed with fireproof mud after confirmation.  
to prevent small animals from entering.

---

### 6.3.7 Overview of the wiring area

The input and output terminals of the DC converter are all located at the bottom of the cabinet, and the communication ports are located at the top of the cabinet. The wiring terminals are arranged as shown in the figure.  
Please connect according to the signs.

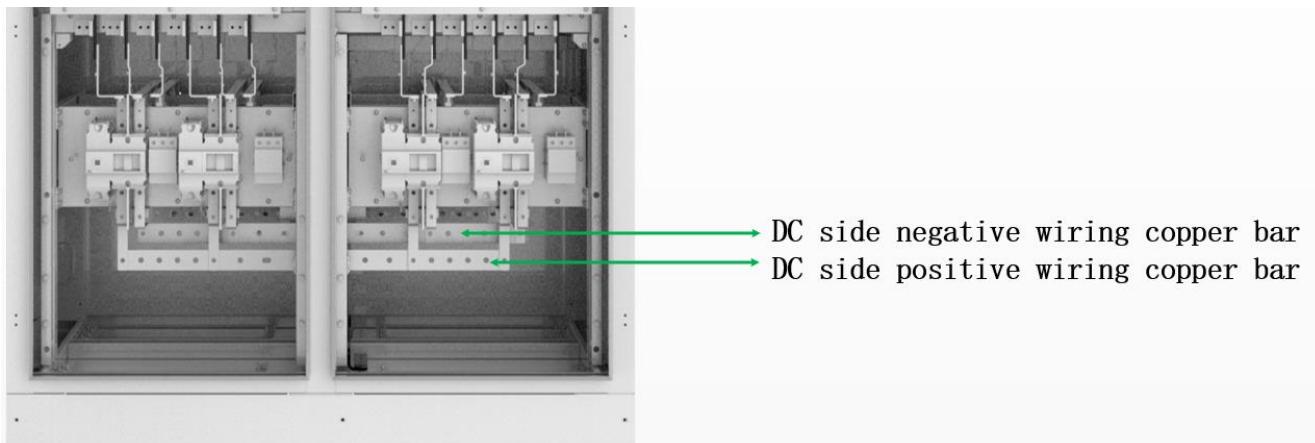


Fig 6-5 Schematic diagram of the battery side terminals (front of the device)

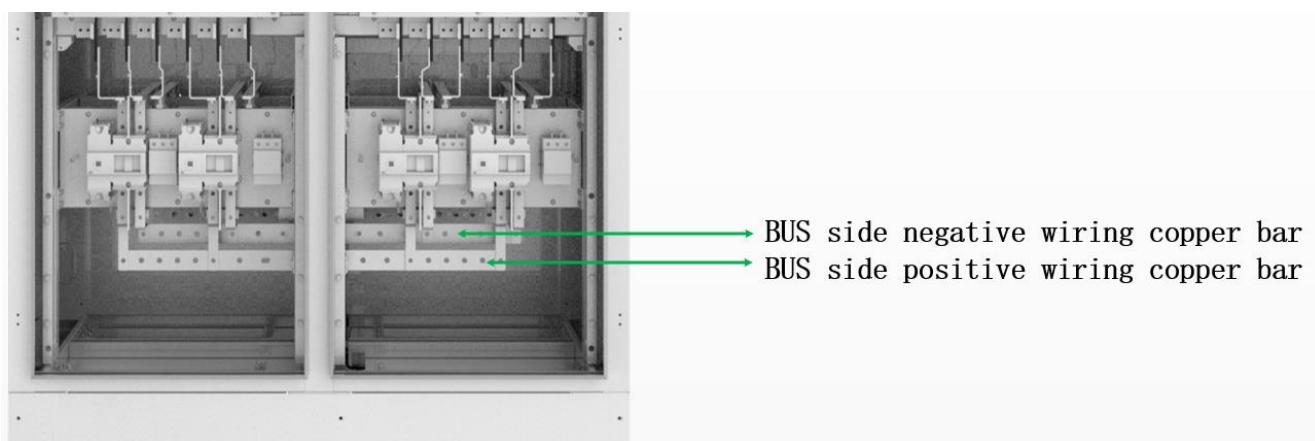


Fig 6-6 Schematic diagram of the wiring terminal on the bus side (the back of the device)

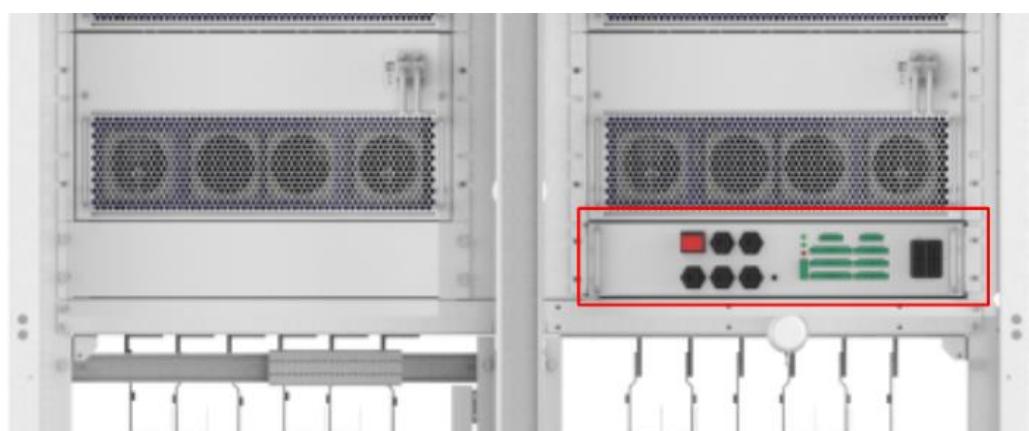


Fig 6-7 Communication port wiring diagram (control box panel)

### 6.3.8 Power line wiring

Before wiring either side, the following checks should be made:

- Measure the open-circuit voltage of the battery/bus group to ensure that the open-circuit voltage is within the normal DC voltage range of the DC converter.
- Check the positive and negative poles of the cables, and make sure that they are marked.



#### NOTICE

It is strictly forbidden for the open circuit voltage of the bus group to exceed the maximum DC input voltage of the DC converter. Excessive open circuit voltage will cause damage to the DC converter.

The positive and negative poles of the battery pack are connected to the positive and negative copper bars of the DC converter correspondingly, and cannot be reversed.

The steps for connecting cables on either side are as follows:

- ① Confirm that the battery or busbar of the front stage of the DC converter is disconnected.
- ② Confirm that the DC isolating switch or DC circuit breaker of the DC converter is in the OFF state.
- ③ Strip off the insulation at the end of the cable. The length of the exposed cable should be about 5mm longer than the depth of the copper nose hole.
- ④ Use a terminal crimping machine or crimping pliers to crimp the copper lugs.
- ⑤ Choose a heat shrink sleeve that matches the size of the cable, and use a hot hair dryer to shrink the heat shrink sleeve.
- ⑥ Select the appropriate size bolts and use a wrench to tighten the "DC+" and "DC-" cables on each side separately.

In order to prevent poor contact caused by loose copper nose, or increase the contact resistance and cause local overheating or even fire, ensure that the torque requirements shown in Table 6-2 are met when tightening the screws:

Table 6-2 Comparison table of screw size and torque

Screw size	M6	M8	M10	M12	M16
Torque(N.m)	7~8	17~20	34~40	60~70	119~140

### 6.3.9 Ground connection

---



#### NOTICE

The grounding cable must be well grounded, otherwise:

- In the event of a malfunction, there may be a fatal click hazard to the operator.
- May cause equipment damage when struck by lightning.
- May cause the device to fail to operate normally.

---

Before leaving the factory, the shell of the DC converter and the components that need to be grounded in the cabinet have been reliably connected to the grounding copper bar at the bottom of the machine. When making a grounding connection, a grounding cable of at least 50mm<sup>2</sup> is required to connect the PE grounding copper bar to the installation site or the equipment room. The equipotential bonding device is reliably connected, and then connected to the earth or the ground network through the equipotential bonding device, and the grounding resistance shall not be greater than 4Ω.

After the cable connection is complete, the gap around the bottom of the converter should be sealed with fireproof grout. Tighten the waterproof terminals of communication cables, etc., and plug the unused waterproof terminals with suitable plugs to meet the requirements of waterproof and dustproof.

### 6.3.10 Installation Checklist

After all the DC converters are installed, at least two staff members are required to conduct a comprehensive inspection of the installation according to the items listed in Table 3-5. Records should be made during the inspection process. Once items that do not meet the requirements are found, they should be rectified immediately.

Table 6-3 Checklist

Mechanical installation project inspection	
<input type="checkbox"/>	There is no deformation or damage to the DC converter
<input type="checkbox"/>	The bottom of the DC converter is fixed and the support is stable and reliable
<input type="checkbox"/>	Sufficient space around the DC converter
<input type="checkbox"/>	The temperature, humidity and ventilation conditions of the environment where the DC converter is located meet the requirements
<input type="checkbox"/>	Smooth cooling air circulation
<input type="checkbox"/>	Complete and reliable cabinet sealing protection
Electrical installation inspection	
<input type="checkbox"/>	The grounding of the DC converter is complete and firm
<input type="checkbox"/>	The DC voltage matches the voltage on either side of the DC converter
<input type="checkbox"/>	Cables are marked correctly and clearly
<input type="checkbox"/>	The insulating protective cover is complete and reliable, and the hazard warning labels are clear and firm
Other checks	
<input type="checkbox"/>	All useless conductive parts are fastened with insulating cable ties
<input type="checkbox"/>	No tools, parts, iron filings or other foreign objects left inside the cabinet
<input type="checkbox"/>	No condensing moisture or icing inside the cabinet

## 7 Product runs

### 7.1 Check before running

Before the first operation or after completing maintenance and overhaul, the installation of the equipment should be thoroughly checked again.

---



#### **WARNING**

All operations during operation must be performed by professional electrical personnel, and any individual shall not operate without authorization.

---

#### 7.1.1 Check cable connections

- Check whether all connecting cables are damaged or cracked, and ensure that all connecting cables are in good condition.
- Double check whether all cables are connected correctly according to the system wiring diagram.
- Make sure all cables are securely connected.
- Make sure that the PE grounding copper bar of the DC converter is connected to the equipotential bonding point in the equipment room and is well grounded, and the grounding resistance should not exceed  $4\Omega$ .

#### 7.2.2 Check the DC converter

- Make sure that the main circuit DC isolating switch/circuit breaker is off.
- Make sure that the emergency stop knob has been released and can work normally.
- Check and ensure that the DC converter and various electrical switches and buttons of the front and rear stages are flexible in operation and meet the requirements of the specification.
- Measure whether the open circuit voltage of each energy storage battery meets the requirements, and record it accurately.
- Make sure the positive and negative polarities are correct.
- Use an ohmmeter with a megohm range to measure the resistance of the cable between the battery pack junction box and the machine, and record it accurately.

---



#### **WARNING**

Make sure that the measuring device is used correctly, otherwise there is a danger of clicking.

---



## **WARNING**

The voltage on either side shall not exceed the maximum DC voltage allowed by the energy storage inverter, Excessive DC voltage can damage equipment or even cause safety accidents.

---

### **7.2.3 Check battery/bus side voltage**

- Accurately measure the voltage on either side, and the measured value should not exceed the allowable DC voltage range on the battery/bus side of the DC converter.

## **7.2 Start and stop**

### **7.2.1 Start**

After the above pre-operation inspections are all satisfied, close all circuit breakers/isolating switches, close the DC converter cabinet door, pull out the cabinet door key and hand it over to a special person for safekeeping, and then start the DC converter operation. . The operation steps are:

- ① Close the battery cabinet output switch. The DC port of the device is powered on, the green "power indicator" is always on, and the power supply of the device is normal.
- ② Set DC parameters. After the DC converter is powered on, it is necessary to confirm that the DC parameters comply with the field application, such as upper and lower voltage limits, charge and discharge current limits, please change through the LCD touch screen or monitor the connection through the web page.
- ③ The DC converter starts work according to the dispatch instruction.

The power-on mode of the DC converter is "Auto". After the DC is powered on, it will automatically and continuously monitor whether the voltage and other parameters of each side meet the operating requirements. If the parameters of each side meet the conditions, the converter will automatically start up and run according to the scheduling instructions.

## 7.2.2 Stop

Stop is usually divided into two situations: shutdown during normal maintenance or overhaul and shutdown during emergency.

To stop during normal maintenance or overhaul, follow the steps below:

- ① Control the shutdown of the DC converter through the "stop" operation command on the LCD touch screen.
- ② Disconnect the battery cabinet output switch
- ③ Disconnect the bus side distribution circuit breaker.

---



### WARNING

Dangerous energy is stored in the internal capacitor of the DC converter. Maintenance or overhaul is strictly prohibited within 30 minutes after the shutdown operation is completed.

---



### NOTICE

When the equipment is in normal operation, it is strictly forbidden to manually disconnect the DC isolation switch.

In order to avoid the risk of arc damage to the isolating switch, it may also cause equipment damage in severe cases.

---

To shut down in an emergency, follow the steps below:

- ① Press the emergency stop button.
- ② Disconnect the battery cabinet output switch.
- ③ Disconnect the bus side distribution circuit breaker.

---



### NOTICE

The emergency stop knob is only for emergency use, and the normal shutdown should be done through the "shutdown" operation command on the LCD touch screen.

In case of emergency, be sure to directly press the emergency stop knob to ensure rapid shutdown.

---

## 7.3 Operating mode

### 7.3.1 Main function

PDS1-750K-H DC converter has the following functions:

- Local manual

The DC converter is operated by local monitoring or webpage monitoring for on-off, charging and discharging, and is scheduled locally.

- Local automatic

The DC converter is subject to local monitoring or the automatic operation DC and operation strategy set by the webpage monitoring to perform on-off, charging and discharging operation, and is scheduled by the local strategy.

- Remote control

The DC converter accepts remote scheduling commands. At this time, there will be no scheduling and operation authority locally. You need to log in to change the control mode.

- PV access mode

The DC converter performs MPPT maximum power tracking to maximize photoelectric conversion.

- Super capacitor access mode

The DC converter supports access to supercapacitors for power scheduling of charging and discharging of supercapacitors.

- Battery access mode

The DC converter supports the connection of lithium batteries and lead-acid batteries for battery charging and discharging power scheduling.

- DC bus access mode

The DC converter supports the DC bus for charging and discharging power scheduling for DC-coupled applications.

### 7.3.2 Introduction to work status

The PDS1-750K-H DC converter has several states such as "initial stop", "stop", "run", "fault" and "emergency shutdown".

- Initial stop

In this state, the system performs a self-check, and when the self-check is passed, the converter transfers from the initial shutdown mode to the shutdown mode.

- Stop

When the DC converter does not accept any operation command or dispatch, the system is in a shutdown state.

In the shutdown mode, the converter accepts the operation instructions and scheduling of the LCD touch screen or the host computer. When the operating conditions are met, the equipment will be transferred from the shutdown to the running mode.

During operation, if a "shutdown" command is received, the DC converter will turn from running to shutdown.

- Run

The run mode is divided into charging and discharging.

- Fault

The PDS1-750K-H DC converter has a comprehensive fault detection function. The fault types can be divided into two categories: "stop fault" and "non-stop fault". When a "stop fault" occurs, the system enters the shutdown state; when a "non-stop fault" occurs When "stop fault", the LCD touch screen sends out alarm information, but does not stop the running state.

- Emergency shutdown

Press the emergency stop button in a critical moment, the equipment enters the emergency stop state, and when it needs to enter the running state again, the emergency stop knob must be unscrewed.

## 7.4 Protective function

serial number	protected name	serial number	Protected name
1	Overvoltage and undervoltage protection	6	Emergency stop protection
2	Overcurrent and overload protection	7	Repeated start and stop protection
3	reverse polarity protection	8	Module current abnormal protection
4	Short circuit protection	9	Power input over and under voltage protection
5	Communication fault protection	10	Power output over-voltage protection

Note: Short-circuiting the device during power-on operation may cause damage to the internal components of the device.

When the above fault occurs, the energy storage device will enter the protection shutdown. When the fault is restored, according to the type of fault, it is divided into automatic reset, manual operation reset (fault clear command), and power-off reset.

## 8 LCD touch screen operation guide

### 8.1 LCD touch screen function and menu introduction

The LCD touch screen is located on the front of the door of the DC converter. Users can issue various operation commands through the LCD touch screen to easily browse various operation-related parameters and working states, and obtain the current working conditions and alarm information of the DC converter in time. The LCD can also display the version information of system control software and internal monitoring software.

After the LCD touch screen works, if the user does not perform any click operation on the LCD touch screen within 5 minutes (default value, which can be modified), the LCD touch screen backlight will turn off. When the user performs any click operation, the backlight lights up and the main page is displayed at the same time.

In order to facilitate the user's understanding of the LCD touch screen function menu, the menu logic distribution table is as follows.

Table 8-1 Logic distribution of LCD touch screen function menu

	first level sub menu	Secondary submenu
Home page	running information	DC information
		module status
		BMS information
		current alert
		Historical alarms
	record	Status record
		Operation record
		Curve record
		record export
		control commands
Home page	control scheduling	scheduling command
		Model settings
		system settings
		Monitoring settings
		DC setting
		operating mode
		run strategy
		Optional accessories
		local information
		Log in

In order to facilitate the user's operation of the touch screen, a large number of pictures of liquid crystal cross-sections are arranged in this chapter. The parameter values and other specific details in the pictures are for illustrative purposes only, and the specific display content depends on the working conditions.



## NOTICE

The LCD touch screen contains a large number of parameters related to the operation of the DC converter.

All settings such as parameter modification must be completed by designated professionals. For parameters whose meaning is unclear, do not modify them without authorization.

## 8.2 Main page introduction

### 8.2.1 Start page

When the DC converter is powered on, the LCD touch screen will automatically start up, and the startup page will be displayed at the same time.

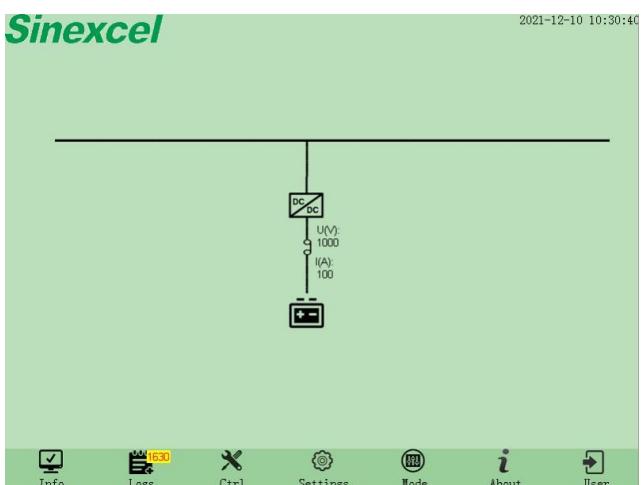


start page

This page is displayed every time the power is turned on.

After the start-up process is over, the LCD touch screen displays the main page.

### 8.2.2 Home page



home page

Display the main schematic diagram of energy scheduling,

And display the system working status and parameters such as voltage and current information.

Displays first level submenu options.

## 8.3 Operation information menu introductio

Click the running information menu on the main page to enter the secondary menu display interface of running information. When the secondary menu interface has multiple pages, only the home page is displayed in this section, and the contents of other pages are fully listed in the description section.

DC Info		
	DC String	1
	DC Voltage(V)	1000
Status	DC Current(A)	100
	DC Power(kW)	100
BMS Info	Bus Voltage(V)	0.0
	Bus Current(A)	0.0
	Bus Power(kW)	0.0
	Status	Run
	Warning	No Warning
	Switch	ON

### DC Information Secondary Submenu

Display equipment DC voltage, DC current, DC power, bus voltage, running status, alarm status and MCB status.

DC Info		
	DC Module	Version
	1	B9135
	2	Abc
	3	Abc
Status	4	Abc
	5	Abc
BMS Info	6	Abc
	7	Abc
	8	Abc
	9	Abc
	10	Abc
	11	Abc
	12	Abc
	U2	B1023

### Module Information Secondary Submenu

Displays the CPU version and communication/operation status of each module

DC Info	BMS String	1	2
	Total Voltage(V)	123	123
	Total Current(A)	123	123
Status	SOC	123	123
	SOH	123	123
BMS Info	Max. charge current(A)	123	123
	Max. discharge current(A)	123	123
	Full Status	123	123
	EOD Status	123	123
	Forced Charging Status	123	123
	Fault Status	123	123

#### BMS Information Secondary Submenu

Display battery-related voltage, SOC, current, and status information.

## 8.4 Introducing the Event Log Menu

Click the event record menu on the main page to enter the secondary menu display interface of the event record.

When the secondary menu interface has multiple pages, only the home page is displayed in this section, and the contents of other pages are fully listed in the description section.

No.	Warning/Fault	Occurrence Time
1	DC #1 DC input overvoltage	2021-12-10 10:37:35
2		
3		
4		
5		
6		
7		
8		
9		
10		

#### Secondary submenu of current alarm

Displays various alarm information existing in the current situation.

2021-12-10 10:42:20

No.	Warning/Fault	Occurrence Time	Dismissed Time
1	DC #1 DC input overvoltage	2021-12-10 10:37:35	2021-12-10 10:38:35
2			
3			
4			
5			
6			
7			
8			
9			
10			

◀ 167/999 ▶

### Historical alarm secondary submenu

show that has appeared,

However, various alarm information has been cleared in the current situation.

2021-12-10 10:49:49

No.	Designation	Status	Time
1	U2 Alarm status	0->1	2021-12-10 10:37:35
2			
3			
4			
5			
6			
7			
8			
9			
10			

◀ 167/999 ▶

### Status Record Secondary Submenu

Displays the state change log of the DC converter.

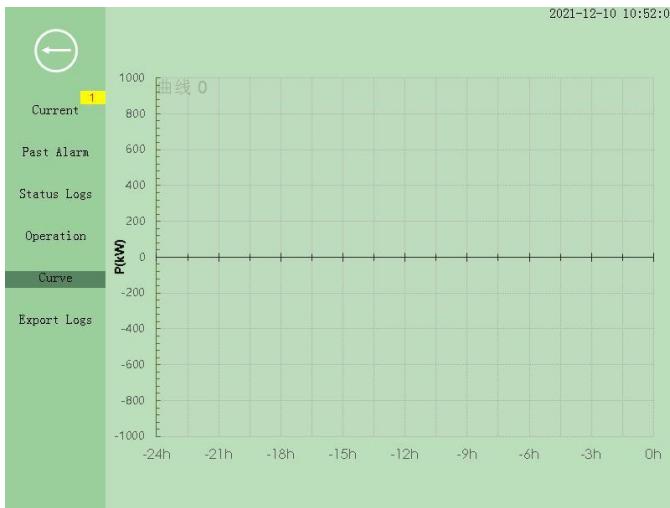
2021-12-10 10:48:53

No.	Designation	Operation	Time
1	DC #1 Starting up	0-->1	2021-12-10 10:42:35
2			
3			
4			
5			
6			
7			
8			
9			
10			

◀ 167/999 ▶

### Operation record secondary submenu

Displays the command record issued to the DC converter.



#### Curve record secondary submenu

You can choose to display DC voltage, DC current, DC power and temperature curves.



#### Record Export Secondary Submenu

Provide download history alarms, download operation records, download fault records and download status records, historical data or all records to mobile storage.

## 8.5 Control scheduling menu introduction

Click the control scheduling menu on the main page, and the operation password input box will pop up first. The operation password is provided by the on-site maintenance engineer.



#### Operation password input interface

After the user enters the correct operation password, the access control scheduling, system settings, operating mode and login for secondary sub-menu settings, The initial password for login is 080808, It can be modified on the "Login--Change Password" page.

After the user enters the correct operation password, it will enter the secondary submenu of control scheduling



#### Control Command Secondary Submenu

It can control the startup, shutdown and fault reset functions of the DC converter (note that the fault reset function should not be used arbitrarily).



#### Schedule Command Secondary Submenu

The user can set the energy scheduling mode, constant power regulation, and constant current regulation of the DC converter.

Energy dispatching: DC branch dispatching and DC general dispatching can be selected

DC control mode, DC power regulation, and DC current regulation can be set.

## 8.6 System settings menu introduction

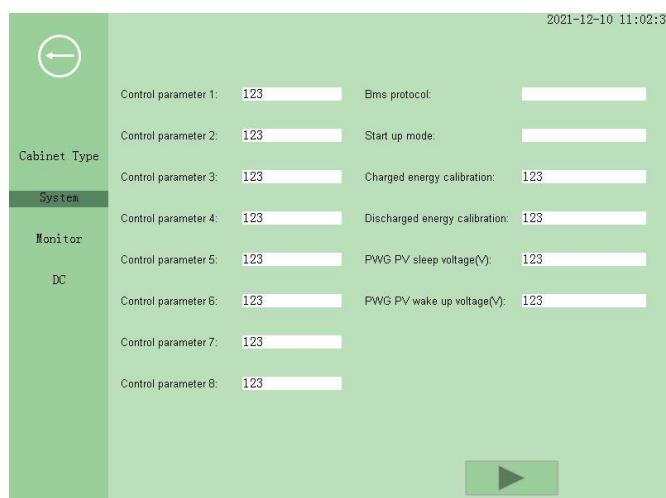
Click the system setting menu on the main page, and the operation password input box will pop up first, please refer to 5.5 for related login operations.

After the user enters the correct operation password, the user will enter the secondary submenu of system settings.



### Model Settings Secondary Submenu

Users can check the model, working mode, Soft start mode, etc.



2021-12-10 11:03:20

Cabinet Type	Ethernet 1 IP:	192.168.255.228	Ethernet 2 IP:	192.168.255.228
	Ethernet 1 Mask:	192.168.255.228	Ethernet 2 Mask:	192.168.255.228
	Ethernet 1 Gateway:	995.968.555.558	Ethernet 2 Gateway:	192.168.255.228
	System	Ethernet 1 Server IP:	995.968.555.558	Ethernet 2 Server IP:
Monitor	Modbus addr:	123	Language:	English
	Baud:	115200	Set backlight delay(min):	123
	RTU remote timeout(s):	123	BMS timeout(s):	123
	TCP remote timeout(s):	123	Please enter SN:	asfasdfsf2165875538



**Monitoring settings secondary submenu**  
 Users can set the IP, subnet mask, network management, Server IP, communication baud rate, language, Backlight time and factory reset, etc.

2021-12-10 11:07:55

Cabinet Type	Realtime clock	Backlight
	Modify ETH1 MAC	Modify ETH2 MAC
	Reset Settings	Upgrade monitor
	Save	Clear Logs
		

2021-12-10 11:06:25

Cabinet Type	DC string setting pattern:	<input checked="" type="checkbox"/>		
	String	1		
	Total battery capacity:	123	Number of batteries in series:	123
	MPPT lower voltage threshold(V):	123	Maximum charge current(A):	123
System	End of discharge voltage(V):	123	Maximum discharge current(A):	123
	Topping charge voltage(V):	123	End-of-charge current(A):	123
	Float charge voltage(V):	123	Maximum precharge current(A):	123
	Precharge voltage(V):	123	Topping to float charge Curr(A):	123
Monitor	Bus over-volt region boundary(V):	123	Bus operating voltage lower threshold(V):	123
	Bus under-volt region boundary(V):	123	Bus side battery charging current limit(A):	123
	Bus operating voltage upper threshold(V):	123		

**DC Settings Secondary Submenu**  
 The user can set the DC upper/lower limit voltage of the converter, Discharge termination voltage, maximum charging current, Maximum discharge current and charge cut-off current.

## 8.7 Operation Mode Menu Introduction

Click the operation mode menu on the main page, and the operation password input box will pop up first. After the user enters the correct operation password, it will enter the secondary submenu of the operation mode.



#### Operation Mode Secondary Submenu

The user can set the operation mode of the DC converter: local control, local automatic and remote control.

## 8.8 Operation strategy menu introduction

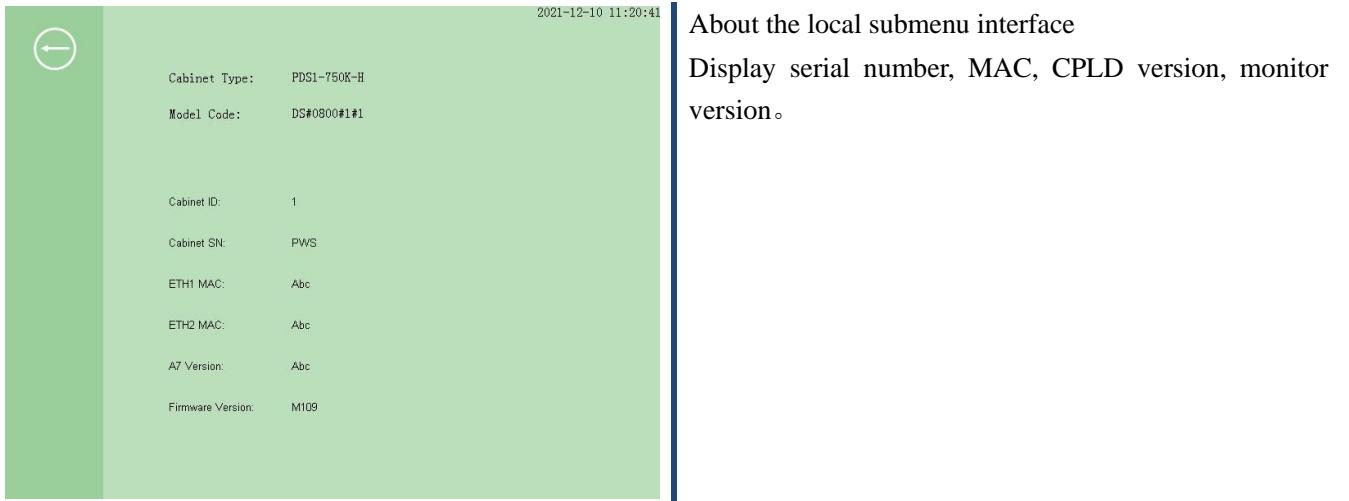


#### Run Strategy Secondary Submenu

The user can set the charging and discharging status and the corresponding charging and discharging power at different times of the day.

## 8.9 About this machine's menu introduction

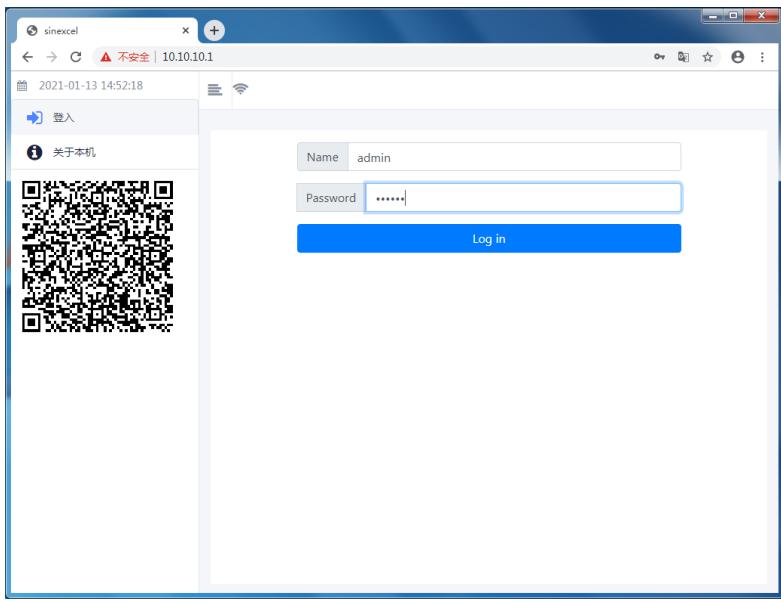
On the main page, click the About This Machine menu to enter the About This Machine menu interface.



## 9 Introduction to Web Monitoring

### 9.1 WIFI webpage background function and menu introduction

In addition to the human-computer interaction mode of the LCD touch screen, the DC converter also has a WIFI web page background interaction mode, which is convenient for users to view data and perform related operations. Users can use mobile phones, tablets, laptops and other devices with WIFI and web browser functions, through manual link (default WIFI name: DC converter serial number, default password: 080808) or scan the code of the DC converter body Connect the QR code on the DC converter to the WIFI hotspot of the DC converter, then open the web browser, enter the IP address of the DC converter in the address bar: 10.10.10.1, and enter the login interface of the back-end of the DC converter webpage, as shown in the following figure:



Web page background landing page

The login user name is: admin, and the initial password is 080808, which can be modified on the "Login--Change Password" page.

After entering the correct user name and password, the user can enter the background of the web page, conveniently issue various operation commands, browse various operation-related parameters and working status, obtain the current working condition and alarm information of the DC converter in time, and display the system control software. and the version information of the internal monitoring software.

The web page background function menu is basically similar to the LCD touch screen.

### 9.2 Network monitoring initial state description

The monitoring interface of the machine is sampled from the web version monitoring system, which can be directly connected through a network cable or connected to a local area network to achieve remote monitoring and control; it can also be connected to the WIFI hotspot of the machine at a short distance for mobile phone or tablet connection to achieve monitoring and control.

System network port communication address default state:

LAN 1: 192.168.1.10

LAN 2: 172.16.1.10

WIFI default state:

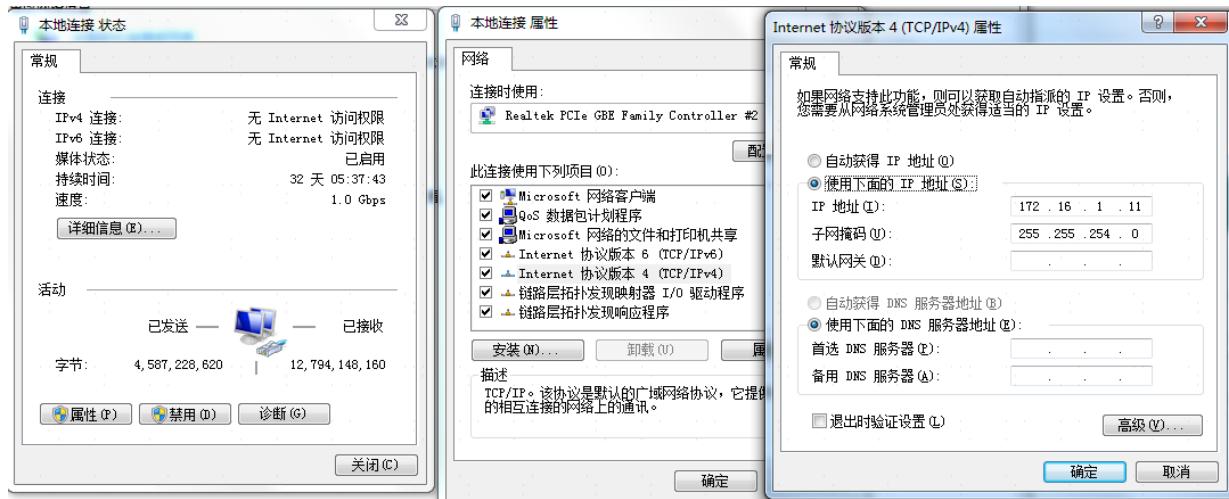
Name: The product serial number (nameplate)

Address: 10.10.10.1

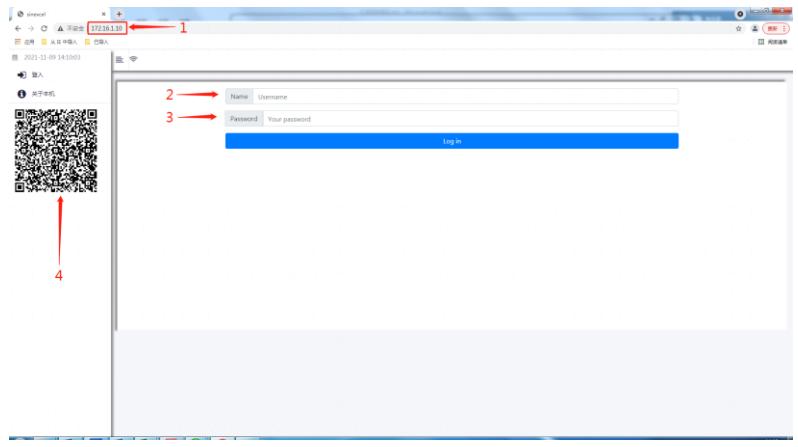
### 9.3 LAN port LAN connection:

Take the use of control box LAN2 as an example:

a. The PC is directly connected to the LAN port of the control box, and the PC port is configured with IPv4 manual settings, so that the PC and the control box are in the same network segment:



b. The browser enters the web monitoring panel

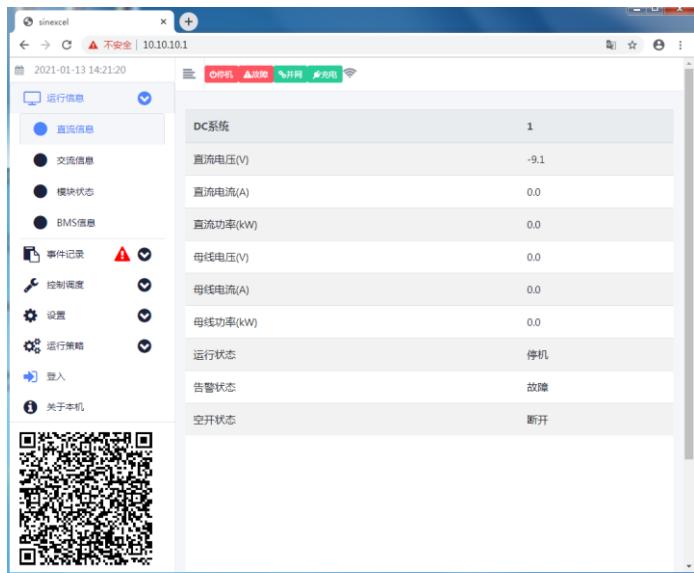


1. Use your browser to type the device IP address at the link;
2. Type user;
3. Type 080808
- (4. QR code for local information)

Find the monitoring settings in the settings item, you can set the IP address to the IP in the LAN network segment that the current device can access, be careful not to conflict with the existing IP; the current web page communication will be lost after typing, and the control box can transfer the network cable to the LAN, the computer can access the local area network for remote connection, and the connection method is step b (note: enter the newly set IP).

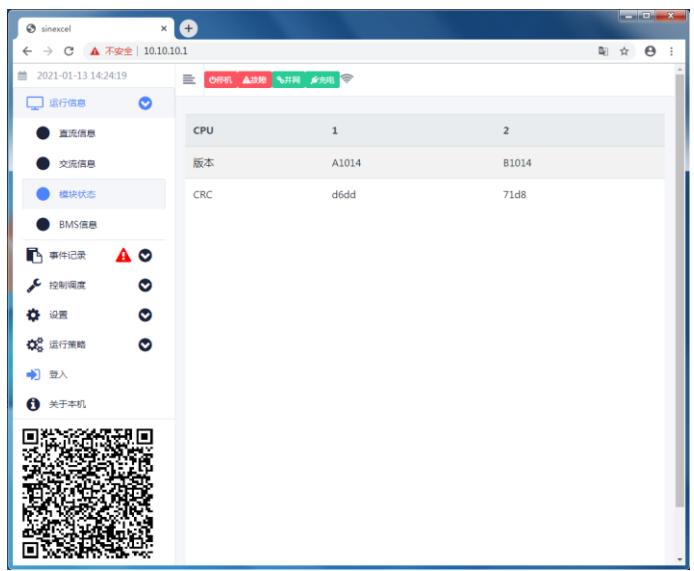
## 9.4 Operation information menu introduction

After the user enters the correct username and password to enter the background of the web page, click on the running information to enter the secondary menu display interface of the running information. When the secondary menu interface has multiple pages, only the home page is displayed in this section, and the contents of other pages are fully listed in the description section.



### DC Information Secondary Submenu

Display equipment DC voltage, DC current, DC power, bus voltage, running status, alarm status and MCB status.



### Module Information Secondary Submenu

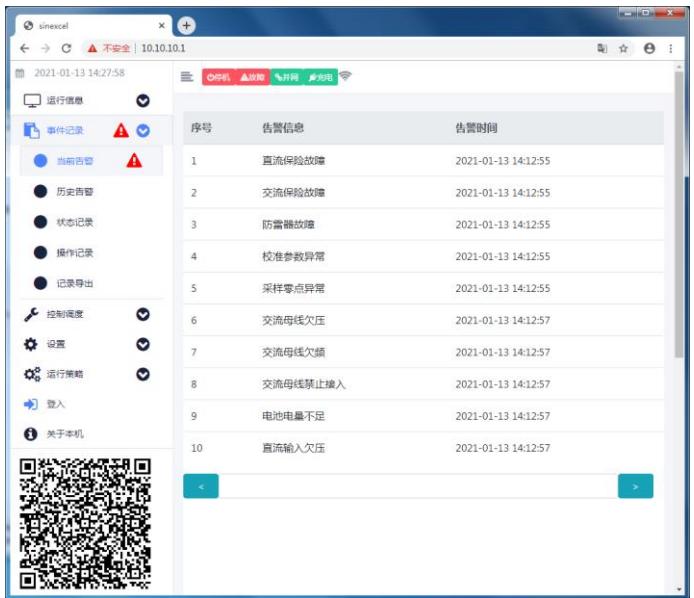
Display CPU software version information and CRC check code



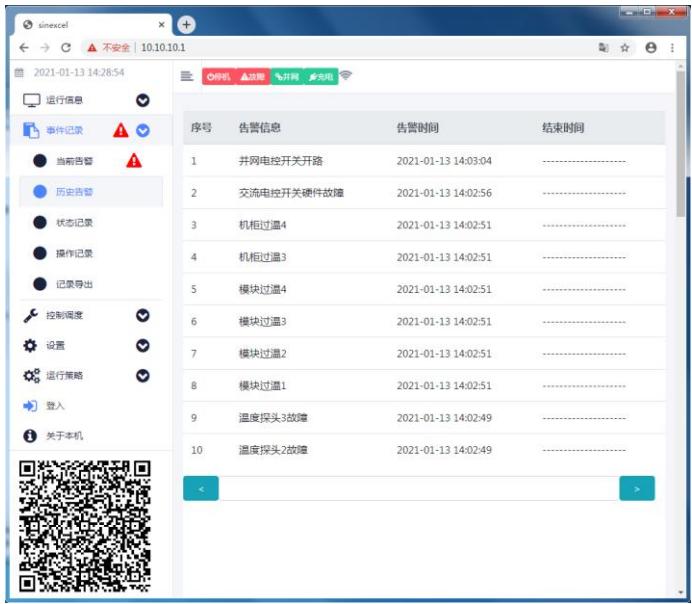
**BMS Information Secondary Submenu**  
Display battery related voltage, current, SOC and charge and discharge status information, etc.

## 9.5 Introducing the Event Log Menu

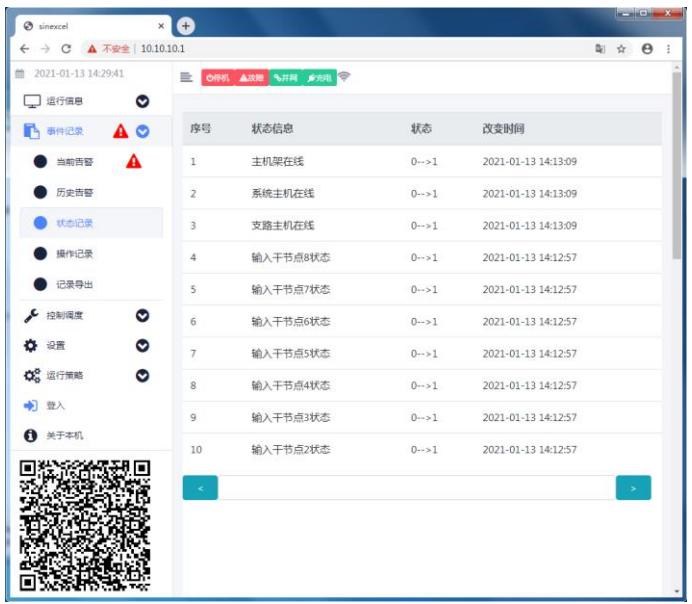
Click the event record menu to enter the event record secondary menu display interface. When the secondary menu interface has multiple pages, only the home page is displayed in this section, and the contents of other pages are fully listed in the description section.



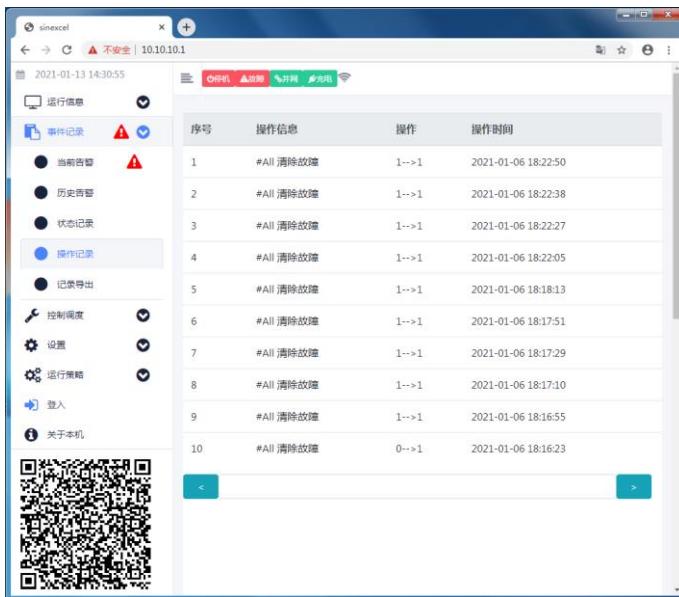
**Secondary submenu of current alarm**  
Displays various alarm information existing in the current situation.



Historical alarm secondary submenu  
show that has appeared,  
However, various alarm information has been cleared  
in the current situation.

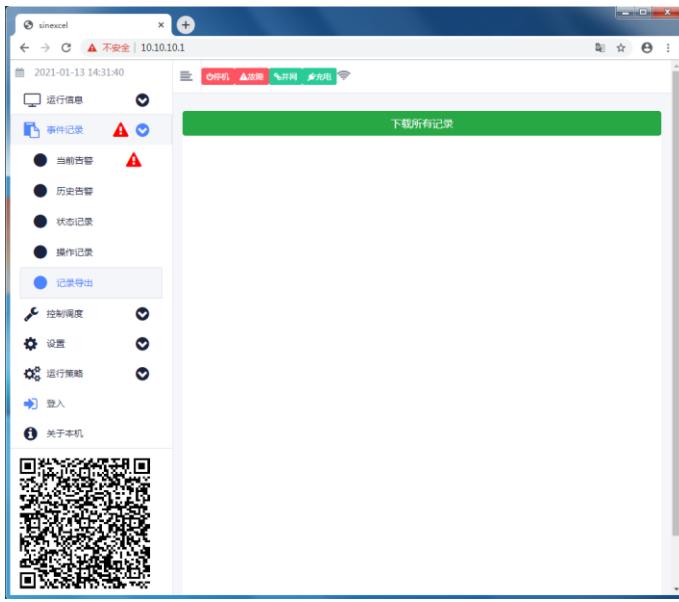


Status Record Secondary Submenu  
Displays the state change log of the DC converter.



#### Operation record secondary submenu

Displays the command record issued to the DC converter.

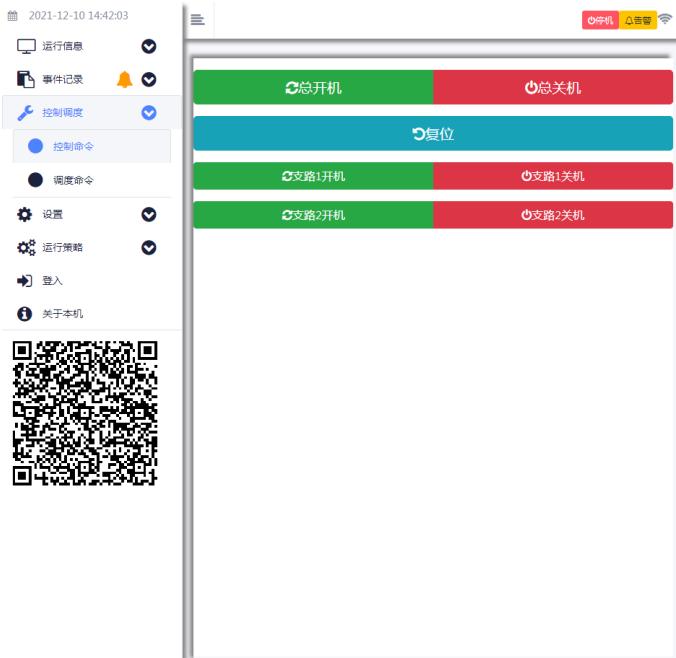


#### Record Export Secondary Submenu

Provides download of all recorded files to the local browser download directory.

## 9.6 Control scheduling menu introduction

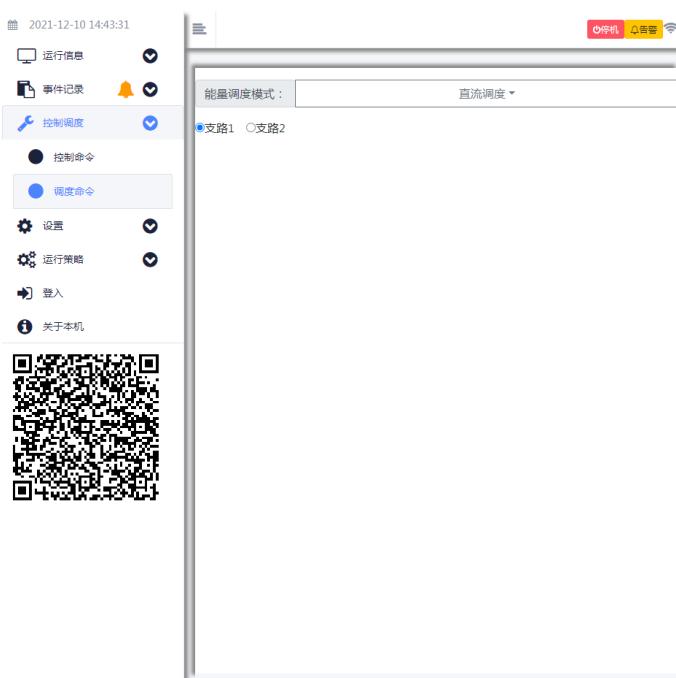
Click the control scheduling menu to enter the secondary submenu of control scheduling, including control command settings and scheduling command settings.



### Control Command Secondary Submenu

It can control the startup, shutdown, and fault reset function

(Note that the fault reset function should not be used arbitrarily).



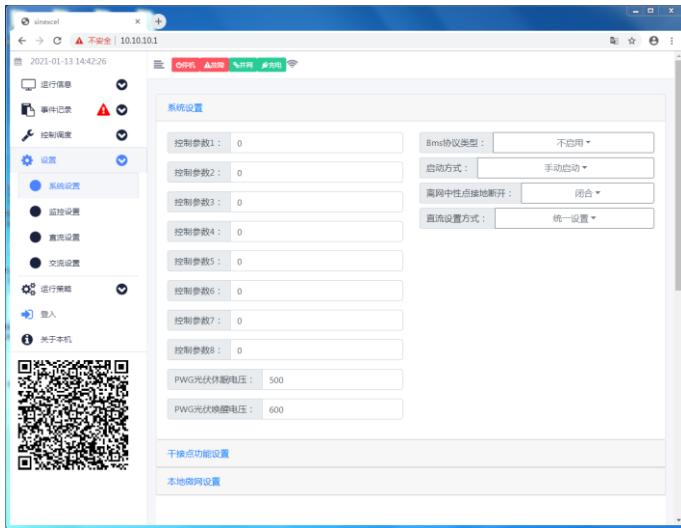
### Schedule Command Secondary Submenu

The user can set the energy scheduling mode of the DC converter;

DC dispatch, DC total dispatch, constant current or constant power mode

### 9.6.1 Introduction to the settings menu

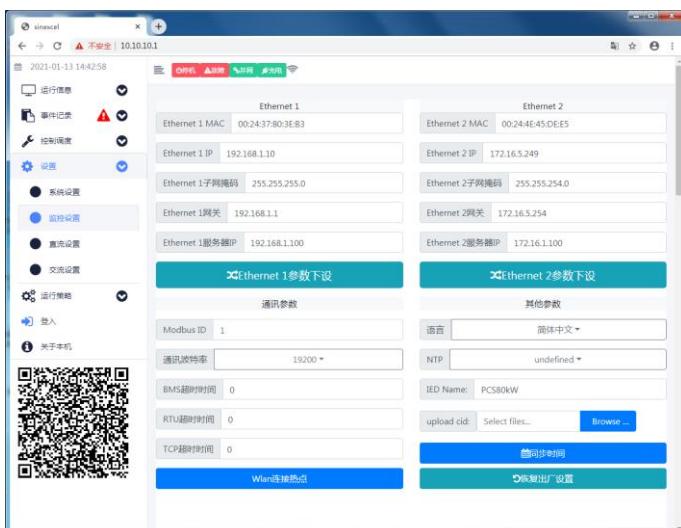
Clicking the system setting menu will enter the secondary submenu of system setting, including system setting, monitoring setting and DC setting.



#### System Settings Secondary Submenu

This interface is a custom interface,

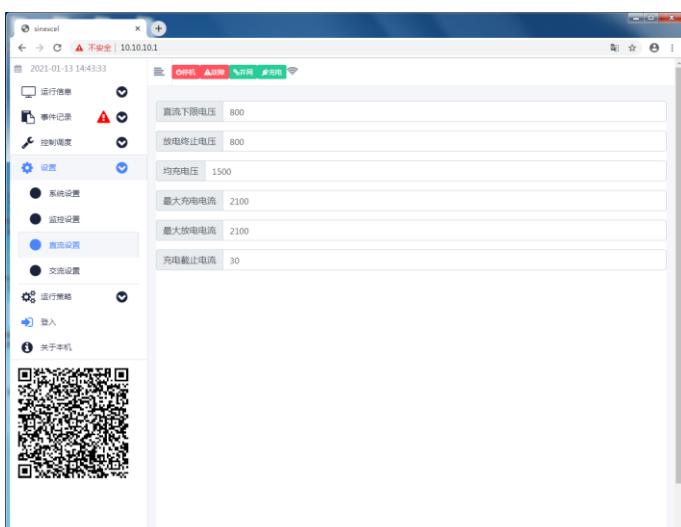
If necessary, please contact our engineers for relevant sub-settings



#### Monitoring settings secondary submenu

Users can set the IP, subnet mask, network management,

Server IP, communication baud rate, language and factory reset.



#### DC Settings Secondary Submenu

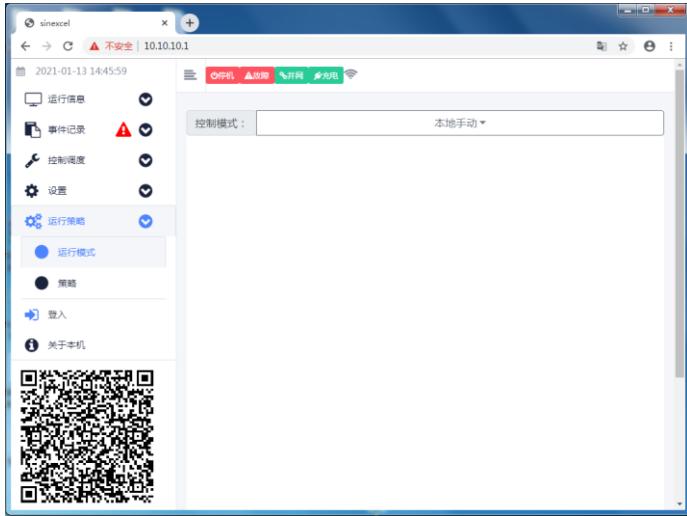
The user can set the DC lower limit voltage,

Discharge termination voltage, maximum charging current,

Maximum discharge current and charge cut-off current.

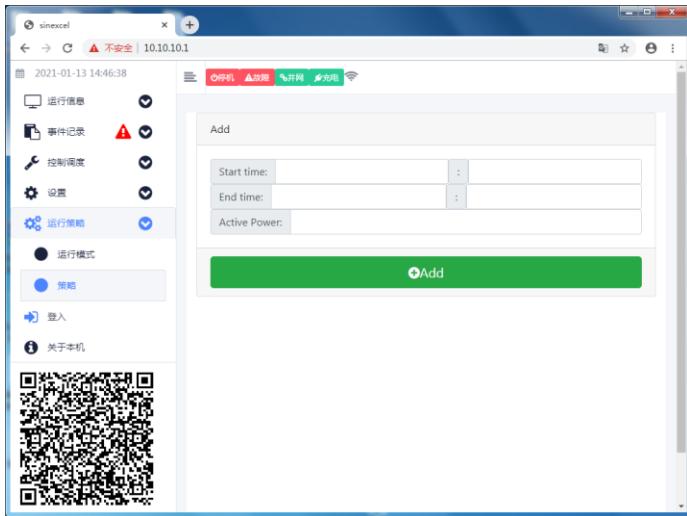
## 9.6.2 Operation strategy menu introduction

Click the Run Mode menu to enter the second level submenu of Run Mode, including Run Mode and Strategy.



### Operation Mode Secondary Submenu

The user can set the operation mode of the DC converter: local control, local automatic and remote control.

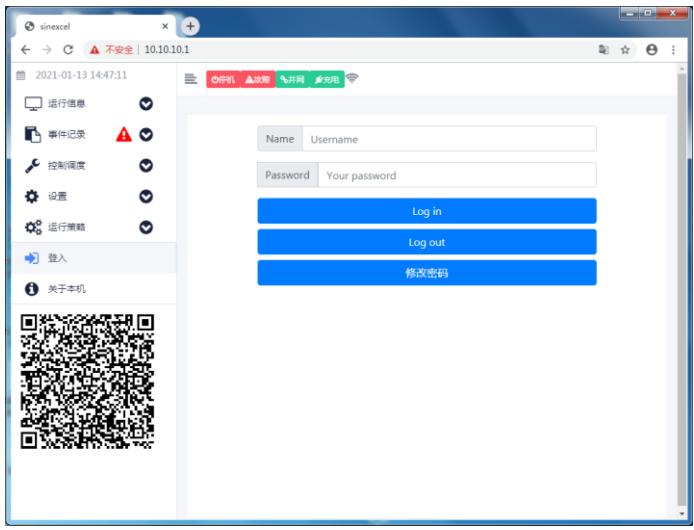


### Run Strategy Secondary Submenu

The user can set the charging and discharging status and the corresponding charging and discharging power at different times of the day.

## 9.7 Login menu introduction

Click the login menu to enter the login menu interface.

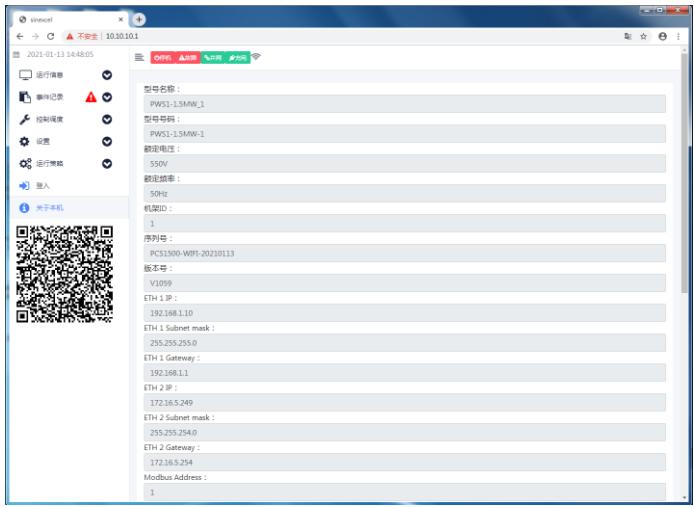


User interface after successful login

Users can log in, log out and modify passwords with more advanced permissions on this interface.

## 9.8 About this machine's menu introduction

Click the About This Machine menu to enter the About This Machine menu interface.



About the local submenu interface

Display model, serial number, rack ID, MAC address, monitoring software version, etc.

## 10 Troubleshooting

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### WARNING

Only qualified technicians should perform the operations described in this chapter.

"Meeting the requirements" means that the operator has previously participated in professional training on various operations of equipment troubleshooting.

Only perform troubleshooting as described in this manual.

When operating, follow all safe operating practices.

---

If you still cannot solve the problem or still have questions with the help of this manual, please contact Shenghong Electric. In order to provide you with better and faster service, we usually need the following information:

- DC converter model
- DC converter serial number
- Manufacturers and models of components connected to the DC converter, as well as information on the configuration of energy storage batteries
- Communication connection scheme of DC converter
- Fault information and brief description
- Photos of the fault site (if site conditions permit)

### 10.1 Preliminary investigation

When the DC converter fails to work as expected or the charge and discharge capacity changes abnormally, please pay attention to the following items before consulting the maintenance personnel of our company:

- Whether the open-circuit voltage of the energy storage battery meets the requirements of the DC converter
- Is the emergency stop knob pressed?
- Whether the DC is connected correctly and powered on
- Whether the communication cable is loose

## 10.2 LED indicator shows troubleshooting method

Please refer to the following table for device status description:

Table 10-1 DC-DC converter cabinet status

State	Condition	Operating status
Power-off	Disconnect BUS, DC power supply	The lights on the device are all off
Power-on	Close BUS, DC power supply	The power light on the device is on
Stop	BUS, DC DC power supply, the device is not running	The power yellow light is always on, the running light is off, and the fault light is off
Run	The device is in charging and discharging operation	The power yellow light is always on, and the running light is always on
Start	Issue a boot command to the device	The power yellow light is always on, and the device running light is on
Fault	There is currently an alarm or failure	The fault red light is always on, and the warning red light is flashing
Shutdown	Send a shutdown command to the device	Running light goes out

Note: The control box indicator and cabinet indicator have the same logic, refer to the above table.

Table 10-2 DC-DC module status

State	Condition	Indicator light
Power-off	Disconnect BUS, DC power supply	The lights on the device are all off
Stop	BUS, DC DC power supply, the device is not running	The green light flashes slowly at 0.5Hz when it is powered off and there is no power-on command
Stop	Device is off	Green light flashes slowly at 1Hz
power-on command received		Fast flashing at 2Hz during module soft-start
Run	The device is in charge operation and discharge operation state	Green light is always on
Fault	There is currently a non-shutdown fault or an alarm occurs	Red light flashes slowly for 1s
	The current shutdown alarm occurs	Red light flashes quickly for 1s
	There is currently a shutdown failure	Steady red light

表 10-3 故障处理方法

LED status	Approach
The POWER indicator does not light up	<p>It means that neither side of the two ends of the DC converter is supplied with power.</p> <ol style="list-style-type: none"> <li>1) Check whether the DC and battery power supply and connections are normal.</li> <li>2) Check whether the isolation switch and circuit breaker of DC power are normally closed.</li> <li>3) If the indicator light is still not on, please contact our company's after-sales service personnel.</li> </ol>

RUN indicator does not light up	Indicates that the DC converter is not running
	<ol style="list-style-type: none"> <li>1) Check whether the DC wiring is correct, use a multimeter to measure the DC input voltage, and ensure that the voltage value exceeds the starting voltage of the DC converter.</li> <li>2) Ensure that the DC power supply and various parameters meet the operating requirements of the DC converter.</li> <li>3) If the indicator light is still not on, please contact our company's after-sales service personnel.</li> </ol>
The FAULT indicator is always on	<p>It means that the DC converter is faulty and the fault has not been rectified.</p> <ol style="list-style-type: none"> <li>1) Please check the detailed fault information on the LCD screen or web monitoring, and take corresponding troubleshooting measures.</li> <li>2) If the indicator light stays on, please contact our after-sales service personnel.</li> </ol>

### 10.3 Common faults and solutions

<b>fault name</b>	<b>Alarm classification</b>	<b>reason</b>	<b>Check</b>
<b>DC input over/under voltage</b>	<b>A.A</b>	<p>DC side voltage &gt; DC side maximum voltage setting</p> <p>DC side voltage &lt; DC side minimum voltage setting</p>	<ol style="list-style-type: none"> <li>1. Correctly configure DC side parameters according to the operation instructions.</li> <li>2. The DC side should be connected to a voltage that meets the requirements.</li> </ol>
<b>DC bus over/under voltage</b>	<b>A.A</b>	<p>DC BUS side voltage &gt; BUS side maximum voltage setting</p> <p>DC BUS side voltage &lt; BUS side minimum voltage setting</p>	<ol style="list-style-type: none"> <li>1. Correctly configure the BUS side voltage parameters according to the operation instructions.</li> <li>2. The BUS side should be connected to a voltage that meets the requirements.</li> </ol>
<b>DC reverse</b>	<b>A.M</b>	The port voltage on the DC side or the BUS side is a negative voltage	<ol style="list-style-type: none"> <li>1. Check whether the positive and negative connections of the DC side or BUS side ports are reversed.</li> <li>2. After denying the positive and negative connection of the DC and BUS ports, check whether the voltage sampling of the DC side or the BUS side port is abnormal.</li> </ol>
<b>emergency shutdown (EPO)</b>	<b>A.M</b>	<ol style="list-style-type: none"> <li>1. The PCS emergency stop button is pressed;</li> <li>2. The emergency stop dry contact on the control box panel is open.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check whether the EPO button on the PDS front door panel is pressed.</li> <li>2. The emergency stop dry contact of the control box panel is open, and check whether the contact is poor.</li> </ol>
<b>low battery</b>	<b>F.M</b>	It is only applicable to the BUS side connected to the DC bus, the module operation mode is discharge or charge mode, and the discharge current is large	<ol style="list-style-type: none"> <li>1. The battery is empty, and the discharge current is still large.</li> </ol>
<b>DSP parameter setting Mismatch</b>	<b>W.A</b>	Conflict of voltage settings on DC side or Bus side	Check whether the DC side voltage parameter settings conflict: DC lower limit voltage, discharge termination voltage, equalization voltage, maximum voltage, float

			voltage, PV wake-up voltage, DC output voltage
			Check whether the BUS side voltage parameter settings conflict: bus side overvoltage protection setting, bus side undervoltage protection setting, bus side voltage operation upper limit, bus side voltage operation lower limit
<b>Monitoring parameter settings Mismatch</b>	<b>W.A</b>	The parameters under monitoring are beyond the scope of the protocol	1. Check whether CANA communication is disturbed 2. Exclude software logic errors
<b>Frequent startup</b>	<b>F.A</b>	Within 15 minutes, the number of PDS starts and stops exceeds the limit	1. Investigate the reason why the entire system is currently turned on and off repeatedly
<b>Module overcurrent fault 1</b>	<b>A.A</b>	DC side current exceeds allowable value	1. Reduce the load and operating power to eliminate the alarm.
<b>Module overcurrent fault 2</b>	<b>A.A</b>	BUS side current exceeds allowable value	1. Reduce the load and operating power to eliminate the alarm.
<b>Module overcurrent fault 3</b>	<b>A.A</b>	Internal main inductor current exceeds allowable value	1. Reduce the load and operating power to eliminate the alarm.
<b>DC overload timeout</b>	<b>F.A</b>	Module power exceeds allowable value	1. Reduce the load and operating power to eliminate the alarm.
<b>Ambient temperature is too high</b>	<b>W.A</b>	The ambient temperature of the air inlet is too high, and the PCS runs with derating	1. Check whether the air inlet and outlet of the equipment are blocked? Whether the heat dissipation of the device is good. 2. Whether there is a heat source near the temperature sensor that causes the temperature to be too high.
<b>Auxiliary control board communication failure</b>	<b>F.A</b>	The communication between the module and the control box is abnormal	1. Check whether the communication terminal is loose
<b>EMS communication connection timed out</b>	<b>A.A</b>	The communication between the EMS and the device is interrupted in remote mode	1. In the monitoring parameters, check whether the 485 communication timeout and TCP communication timeout are configured correctly. 2. Check whether the communication connection between EMS and PDS is tight. 3. Check the logic of EMS to see if the time to access the device regularly exceeds
<b>BMS shutdown failure</b>	<b>A.A</b>	1. The communication between BMS and PCS is interrupted; 2. The BMS is directly connected to the PDS, and the BMS generates other related alarms that cause the PDS to shut down.	1. Check the related alarms about BMS tripping in <BMS> of the UI, and check the cause of the BMS alarm. 2. In the monitoring parameters, check whether the BMS communication protocol and BMS communication timeout configuration are correct. 3. The communication line between the BMS and the PDS is interrupted, or the BMS is not connected.
<b>Heavy number</b>	<b>F.P</b>	1. Due to the duplicate ID, the alarm may not be	1. Reconfigure the ID, and perform binary dialing on

<b>failure</b>	displayed	the module panel No.
	2. Modules with duplicate IDs are offline	
<b>BMS failure</b>	<b>A.A</b>	When a single-channel BMS dry node is connected, the BMS dry contact is open Check the connection problem of the BMS dry node.



## NOTICE

Alarm classification:

Fault - Hardware shutdown failure.

Alarm - shutdown alarm.

Warning - Alert but not shut down.

Alarm clearing method:

Auto - After the cause of the alarm disappears, the alarm is automatically cleared.

Manual - After the cause of the alarm disappears, send the reset command to clear the alarm.

PowerOff - After the cause of the alarm disappears, the alarm will be cleared after power off and restart.

The following simplifies to:

Fault shutdown + automatic	F.A
Fault shutdown + manual	F.M
Fault shutdown + power failure	F.P
Alarm shutdown + automatic	A.A
Warning + Auto	W.A
Warning + Manual	W.M

## 10.4 Other faults

- The machine is noisy during operation

Possible causes: abnormal operation of the DC converter; abnormal operation of the inductor; failure of the cooling fan.

Solution: Check whether the power is within the normal range, measure whether the DC current and voltage waveform are normal, the waveform oscillation will generate a lot of noise, and the inductor will generate a lot of heat; repair or replace the cooling fan.

- The LCD touch screen cannot be activated or difficult to click

Possible reasons: The communication between the LCD touch screen and the DSP board is faulty, the power supply of the touch screen is faulty, and the converter is not grounded.

Solution: Check the connection between the touch screen and the communication cable of the control box, and check the ground connection of the converter.

- The host computer cannot communicate

Ethernet communication method

1. Check whether the IP address, subnet mask and gateway are set correctly.
2. Check whether the communication cable is a straight-through cable and whether it is well connected.

## 11 Maintain

Due to the influence of ambient temperature, humidity, dust and vibration, the components inside the DC converter will age and wear out, which will lead to potential failures inside the DC converter. Therefore, it is necessary to carry out daily and regular maintenance on the DC converter to ensure its normal operation and service life.

### 11.1 Safety Precautions



#### WARNING

Only qualified and authorized personnel should perform operations such as maintenance on the DC converter.

During maintenance work, do not leave metal parts such as screws and washers in the DC converter, otherwise the equipment may be damaged.



#### WARNING

Before starting the formal maintenance, not only disconnect the battery isolation switch, but also disconnect the battery cabinet switch and the power distribution switch on the bus side.

If only the DC isolation switch is disconnected, the DC cable connection copper bar at the bottom of the DC converter is still live.



#### WARNING

After disconnecting the DC disconnect/breaker, wait at least 30 minutes before performing maintenance operations on it.



#### WARNING

Please refer to the precautions in Section 6.3 when electrical connections are involved in the maintenance process.

\

### 11.2 Maintenance work and cycles

Table 11-1 lists the recommended routine maintenance cycles and work contents.

Table 11-1 Maintenance Worksheet

Check the content	Inspection Method	maintenance cycle
Save software data	<ul style="list-style-type: none"><li>● Read data in LCD touch screen software</li><li>● Save running data, parameters and logs to related files</li><li>● Check the parameter settings</li></ul>	1 time a month

System operating status and environment	<ul style="list-style-type: none"> <li>Observe whether the DC converter is damaged or deformed</li> <li>Listen to whether there is any abnormal sound in the operation of the DC converter</li> <li>When the system is running, check whether the variables are abnormal</li> <li>Check whether the main components are normal</li> <li>Use a thermal imager to check whether the system heating is normal</li> <li>Check whether the incoming and outgoing air is normal</li> <li>Check whether the humidity and dust in the operating environment of the equipment meet the requirements, and whether all air inlet filters function normally.</li> </ul> <p>Notice! Inlet and outlet ventilation must be checked</p>	1 time in 6 months
System cleaning	<ul style="list-style-type: none"> <li>Check the cleanliness of circuit boards and components</li> <li>Check the radiator temperature and dust. If necessary, use compressed air and turn on the fan to clean the module</li> <li>Replacing the air filter</li> </ul>	Once every 6 to 12 months (depending on the dust content of the operating environment)
Power circuit connection	<ul style="list-style-type: none"> <li>Check whether the power cable connection is loose</li> <li>Check whether the power cables and control cables are damaged, especially whether the skin in contact with the metal surface has any signs of cuts</li> <li>Check whether the insulating wrapping tape of the power cable terminal is detached</li> </ul>	6 months after the first commissioning, then once every 6 to 12 months
Terminal, cable connection	<ul style="list-style-type: none"> <li>Check whether the screws of the control terminals are loose</li> <li>Check whether the main circuit terminals are in poor contact and whether there are signs of overheating at the screw positions</li> <li>Check whether the color of the wiring copper bars or screws changes.</li> <li>Visually check the connections of equipment terminals and the distribution of cables</li> </ul>	1 time in 12 months
Cooling fan maintenance and replacement	<ul style="list-style-type: none"> <li>Check the fan blades for cracks</li> <li>Listen for abnormal vibration sound when the fan is running</li> <li>If the fan is abnormal, please replace it in time</li> </ul>	1 time in 12 months
Disconnect Switch/Circuit Breaker maintain	<ul style="list-style-type: none"> <li>Routine inspection of all metal components for corrosion</li> <li>Annual inspection of isolating switch (auxiliary switch and micro switch) to ensure good mechanical operation</li> <li>Check operating parameters (especially voltage and insulation)</li> </ul>	Once every 6 to 12 months
Security function	<ul style="list-style-type: none"> <li>Check the emergency stop knob and the stop function of the LCD touch screen</li> <li>Simulate shutdown and check shutdown signal communication</li> <li>Check the warning signs of the body and other equipment signs. If they are blurred or damaged, please replace them in time.</li> </ul>	Once every 6 to 12 months
Software maintenance	<ul style="list-style-type: none"> <li>Optimization software</li> <li>Check the parameter settings</li> </ul>	Once every 6 to 12 months



## NOTICE

The vast majority of maintenance work requires removing the protective grille inside the machine before it can be performed. After all maintenance work is complete, be sure to restore all removed maintenance grilles to their original condition and ensure that all screws are securely in place.



## WARNING

It is necessary to regularly check whether the fan of the cabinet module is running normally, and observe whether there is a friction noise during operation. If there is, it may be caused by the entry of dust, and the dust needs to be removed after the DC converter is stopped.

Due to the dangerous energy stored in the DC bus capacitors, it is necessary to wait at least 30 minutes after the DC converter is completely powered off. Before removing dust, please measure with a multimeter to confirm that the inside of the machine has been completely discharged to prevent electric shock.

### 11.3 Check and replace dust cotton

Specific steps are as follows:

- ① Read the user manual carefully and pay special attention to safety precautions.
- ② Check the dustproof cotton as shown in Figure 8-1. If it needs to be replaced, toggle the quick release port. Note that the green side of the dustproof cotton should face outward.
- ③ After replacing the dustproof cotton, please tighten the relevant fixing screws and restore them to the original state.

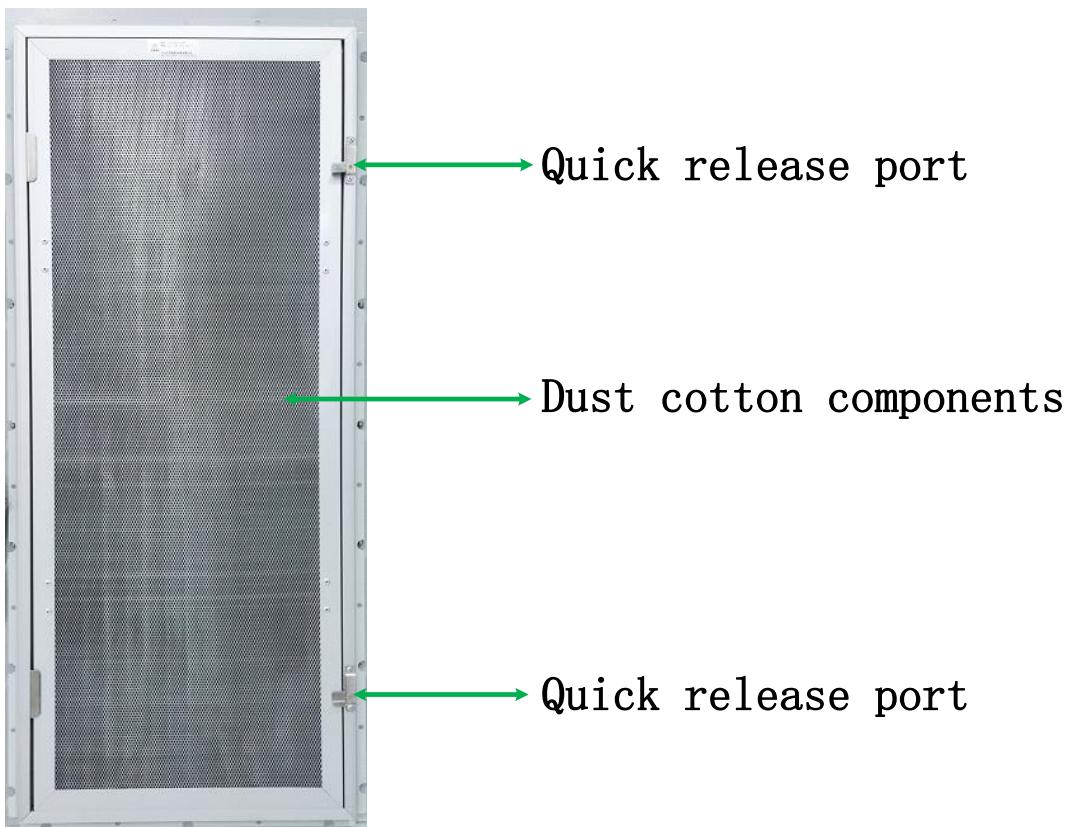


Fig 11-1 Schematic diagram of the location of the dustproof cotton

## 11.4 Replace electrical and electronic components

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### NOTICE

When replacing the electronic and electrical components in the DC converter, be sure to replace the components of the same manufacturer and the same model. The model of the component can generally be obtained through the identification of the product itself. If you cannot know it, please contact Shenghong Electric.

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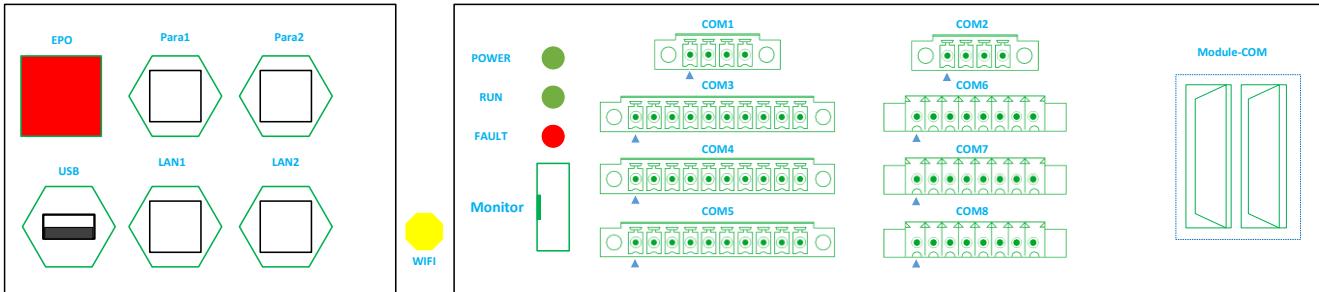
### NOTICE

If it is necessary to replace products of other manufacturers or different models of the same manufacturer, it must be analyzed and confirmed by Shenghong Electric in advance. Otherwise, Shenghong Electric shall not be liable for any personal injury or property damage that may be caused thereby.

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## 12 Appendix

### 12.1 Customer dry contact and communication port description



#### Terminal schematic:

1. EPO is the emergency stop button;
2. Para1 is the parallel network port 1, and Para2 is the parallel network port 2;
3. USB is the interface for USB software update and record download;
4. LAN1 is network port communication 1, and LAN2 is network port communication 2;
5. WiFi interface is WiFi antenna, AP mode;
6. POWER power indicator, RUN running indicator, FAULT fault indicator;
7. Monitor monitors reserved ports and door panel indicators and EPO interfaces;
8. COM1&COM2 are 485 and CAN communication ports;
9. COM3-COM8 are dry contact interfaces;
10. Module-COM is the module communication port.

▲ Indicates pin 1 of the terminal

COM1-1 485A4	COM3-1 EXT_OUT1	COM4-1 Dry_OUT1_DRV	COM5-1 Dry_IN1_DRV
COM1-2 485B4	COM3-2 GND_SELV	COM4-2 GND_SELV_IO	COM5-2 GND_SELV_IO
COM1-3 485A5	COM3-3 EXT_OUT2	COM4-3 Dry_OUT2_DRV	COM5-3 NC
COM1-4 485B5	COM3-4 GND_SELV	COM4-4 GND_SELV_IO	COM5-4 NC
COM2-1 485A6	COM3-5 NC_DRY_OUT5	COM4-5 Dry_OUT3_DRV	COM5-5 NC
COM2-2 485B6	COM3-6 DO_DRY_OUT5	COM4-6 GND_SELV_IO	COM5-6 NC
COM2-3 CAN H2	COM3-7 NO_DRY_OUT5	COM4-7 Dry_OUT4_DRV	COM5-7 MON_EXT_IN5
COM2-4 CAN L2	COM3-8 NC_DRY_OUT6	COM4-8 GND_SELV_IO	COM5-8 GND_SELV
	COM3-9 DO_DRY_OUT6	COM4-9 Dry_IN2_DRV	COM5-9 MON_EXT_IN6
	COM3-10 NO_DRY_OUT6	COM4-10 GND_SELV_IO	COM5-10 GND_SELV
COM6-1 BMS_FAULT1	COM7-1 BMS_FAULT5	COM8-1 PV_Switch_State	
COM6-2 GND_SELV_IO	COM7-2 GND_SELV_IO	COM8-2 GND_SELV_IO	
COM6-3 BMS_FAULT2	COM7-3 BMS_FAULT6	COM8-3 PV_SPD	
COM6-4 GND_SELV_IO	COM7-4 GND_SELV_IO	COM8-4 GND_SELV_IO	
COM6-5 BMS_FAULT3	COM7-5 BMS_FAULT7	COM8-5 Reserve_State1	
COM6-6 GND_SELV_IO	COM7-6 GND_SELV_IO	COM8-6 GND_SELV_IO	
COM6-7 BMS_FAULT4	COM7-7 BMS_FAULT8	COM8-7 Reserve_State2	
COM6-8 GND_SELV_IO	COM7-8 GND_SELV_IO	COM8-8 GND_SELV	

The above are all external communication ports included in the whole machine, which can be used flexibly. The specific application details are subject to the technical agreement.

## 12.2 Quality assurance

For products that fail during the warranty period, Shenzhen Shenghong Electric Co., Ltd. (hereinafter referred to as the company) will repair or replace new products free of charge.

### ● Evidence

During the warranty period, the company requires customers to present the invoice and date of purchase of the product. At the same time, the trademark on the product should be clearly visible, otherwise it has the right to not give quality assurance

### ● Conditions

Replaced substandard products will be handled by our company.

The customer should reserve a reasonable time for the company to repair the faulty product.

### ● Liability waiver

In the following cases, the company has the right not to carry out quality assurance:

- 1) The whole machine and parts have exceeded the free warranty period.
- 2) Shipping damage.
- 3) Improper installation, modification or use.
- 4) Operation in very harsh environments beyond those described in this manual.
- 5) Equipment failure or damage caused by installation, repair, modification or disassembly by non-company service personnel.
- 6) Equipment failure or damage caused by the use of non-standard or non-Shenghong parts or software.
- 7) Any installation and use beyond those specified in the relevant international standards.

8) Damage caused by abnormal natural environment.

If the product fails due to the above situation, the customer requests maintenance service. After the company's service department determines, the paid maintenance service can be stopped.

In order to continuously improve customer satisfaction, the company's products and user manuals are in continuous improvement and upgrading. If there is a difference between the user manual in your hand and the product, there may be a version reason, please refer to the specific product. If you still have questions, please contact our company.

## 13 Contact

If you have technical problems with our products, please contact the service hotline. Please provide the following information to help you with the necessary assistance:

- Equipment model
- serial number
- Battery Type and number
- Communication type
- Firmware version
- Error number and error message

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