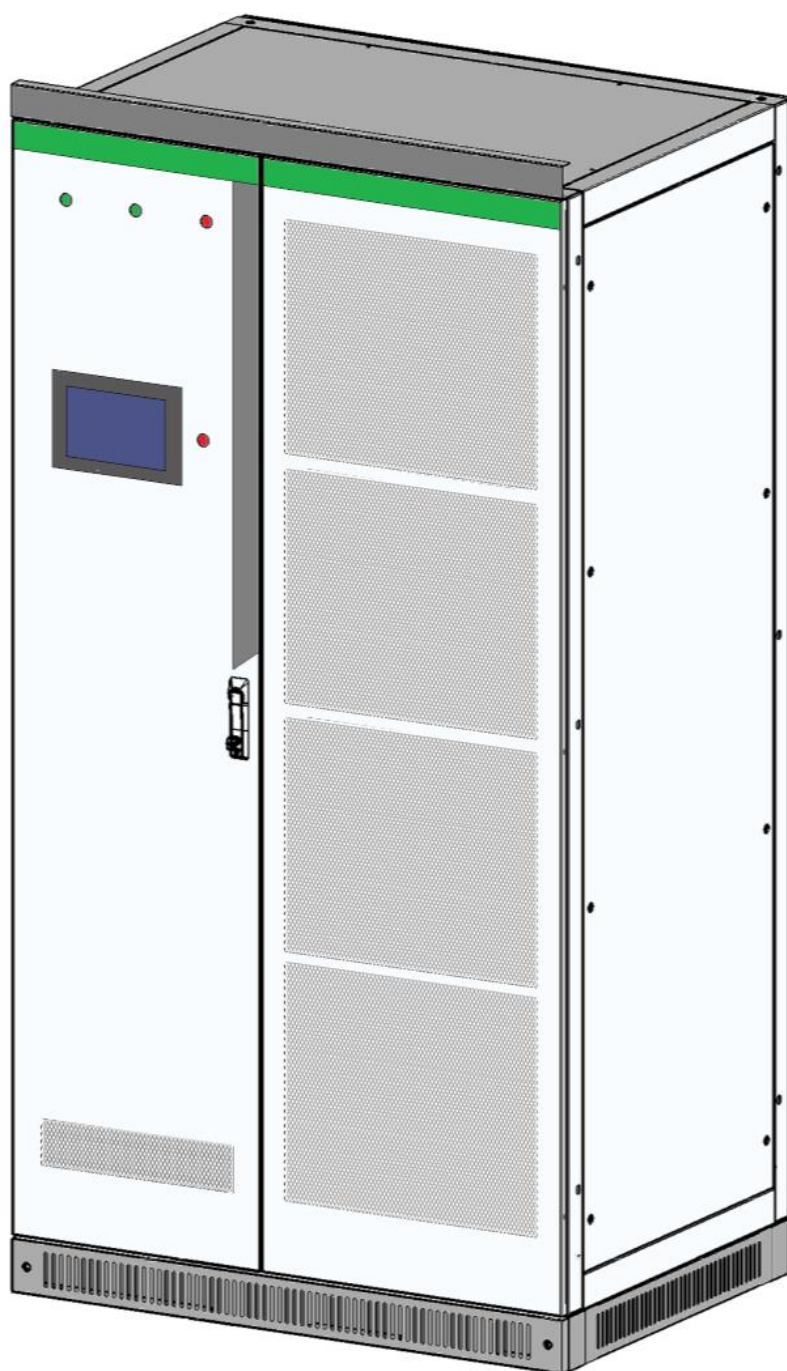


User Manual

DC-DC Converter

Sinexcel



Sinexcel
DC-DC Converter
User Manual
(PDS1-400K)

Version: V2.0

Shenzhen Sinexcel Electric Co., Ltd.

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1 Information on this Document

1.1 Validity

This document is valid for the following device models:

- PDS1-400K

Model definition

This section introduces product model definition in this operating manual, as shown in Fig. 1-1:

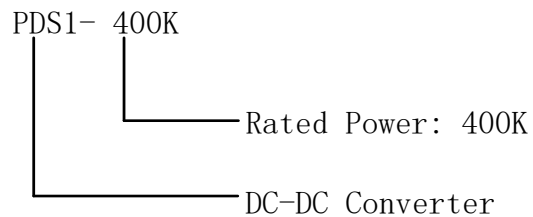


Fig.1-1 Product model definition

Check the type label for the production version of DC-DC.

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

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

Terms	Definition
DC	Direct current.
BESS	Battery energy storage system
ESS	Energy storage system.
EMS	Energy management system.
BMS	Battery management 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
 DANGER	Indicates a dangerous situation that, if not avoided, will result in death or serious injury
 WARNING	Indicates a dangerous situation that, if not avoided, will result in death or serious injury
 CAUTION	Indicates a dangerous situation that, if not avoided, may result in minor or moderate injury
 NOTICE	Indicates that if property damage is not avoided
 NOTICE	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 manual is about the installation and operation of 400KW DC-DC converter of Sinexcel. Please read this user manual carefully before installation.

The 400KW DC-DC converter must be commissioned and maintained by an engineer designated by the manufacturer or an authorized service partner. Otherwise, personal safety may be endangered and equipment failure may be caused. The equipment damage caused by this is not covered by the warranty.

The 400KW DC-DC converter cannot be used in any environment or application related to life support equipment.

This manual contains important instructions for 400KW DC-DC converter, which shall be followed when installing and maintaining 400KW DC-DC converter.



Any copper bar, contact and terminal connected to the DC copper plate inside the touch device may cause combustion or fatal electric shock!



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



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.

3 Product Introduction

3.1 System Introduction

The 400kW DC-DC converter converts the DC power of the PV module array into DC power that can charge the battery.

PDS1-400K series DC-DC converter use the single-stage topology, wide PV input range: 250-800V; voltage range for output to battery: [PV input voltage]-900V, the more detailed parameter can be seen in chapter below.

The DC-DC converter equipped with multi-string MPPT PV maximum power tracking function.

3.2 DC-DC Converter Appearance

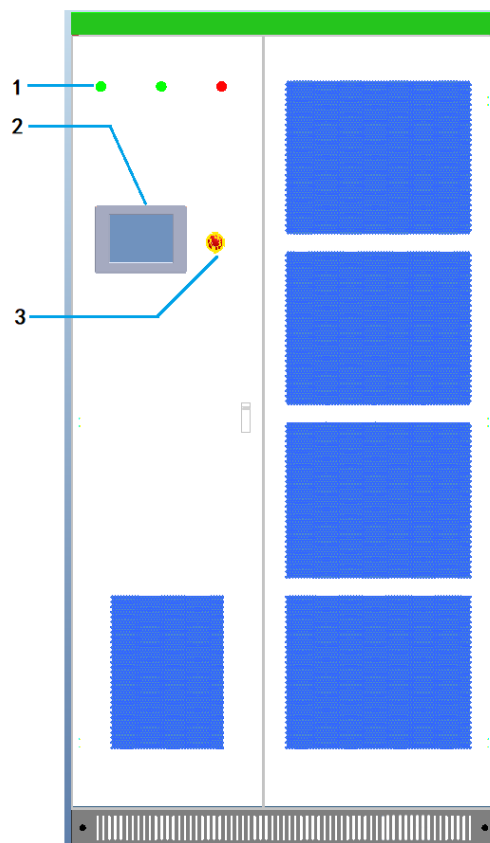


Figure3- 1: Design of the 400kW DC-DC Cabinet

Position	Designation
1	Indicator light
2	HMI(Touch Screen)
3	EPO (Emergency Power Off)

3.3 System Schematic Diagram

The 400kW DC-DC converter consists of 8 DC modules. These modules can be connected in parallel on the battery side, and each module on the PV side can work independently with multiple MPPTs. Alternatively, when the battery sides are connected in parallel, the PV sides can also be connected together in parallel in one point. When each of the battery side and the PV side are connected in parallel in each one point, the master-slave system is identified by the DIP switch dial code on the panel. One of the modules acts as a host, and the other modules act as slaves to synchronize with the host. The DC-DC converter is equipped with SPD protectors, DC circuit breakers and auxiliary power distribution units. Figure below is a topological diagram of the composition.

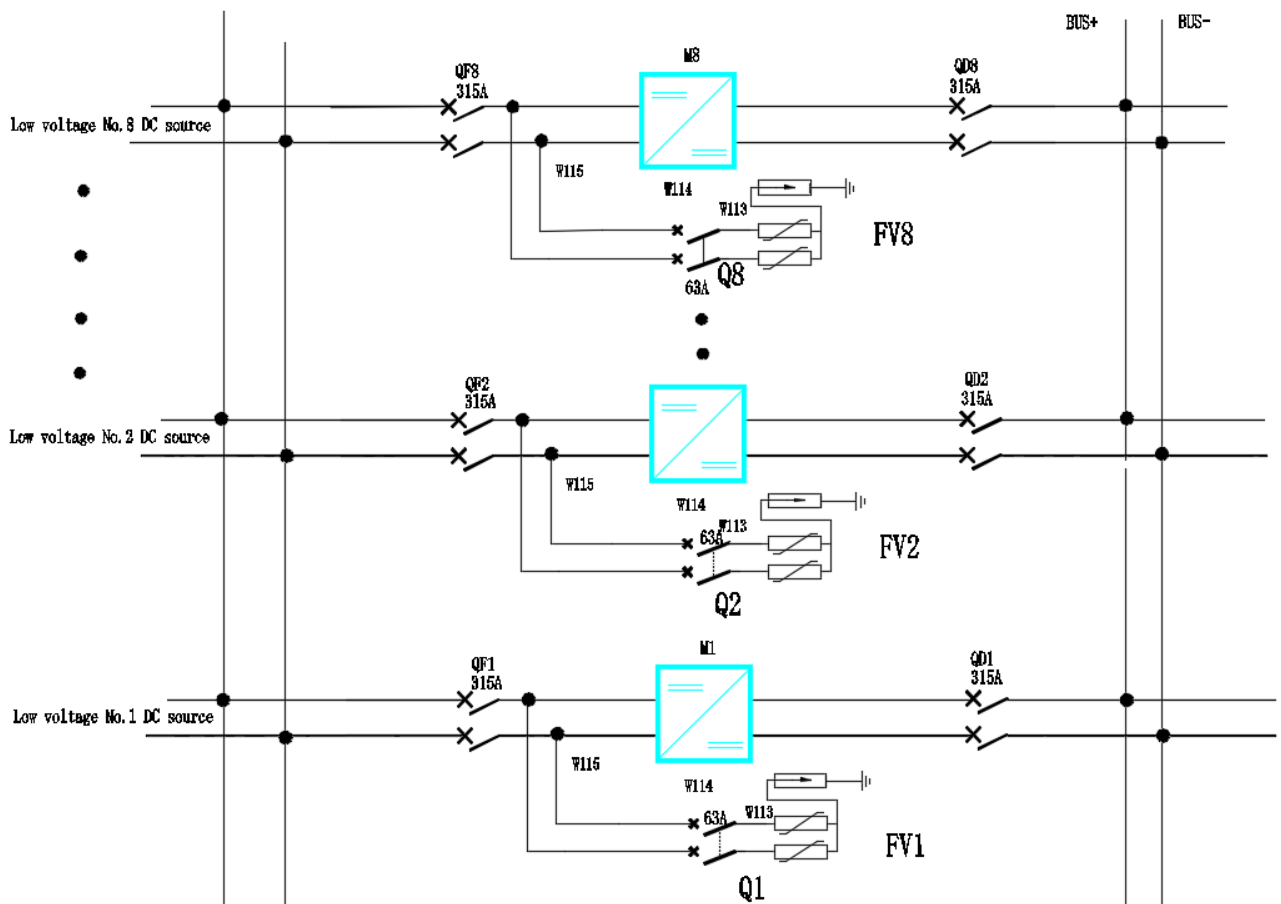


Fig. 3-2 Topological graph for DC-DC Converter

3.4 DC-DC Converter Composition

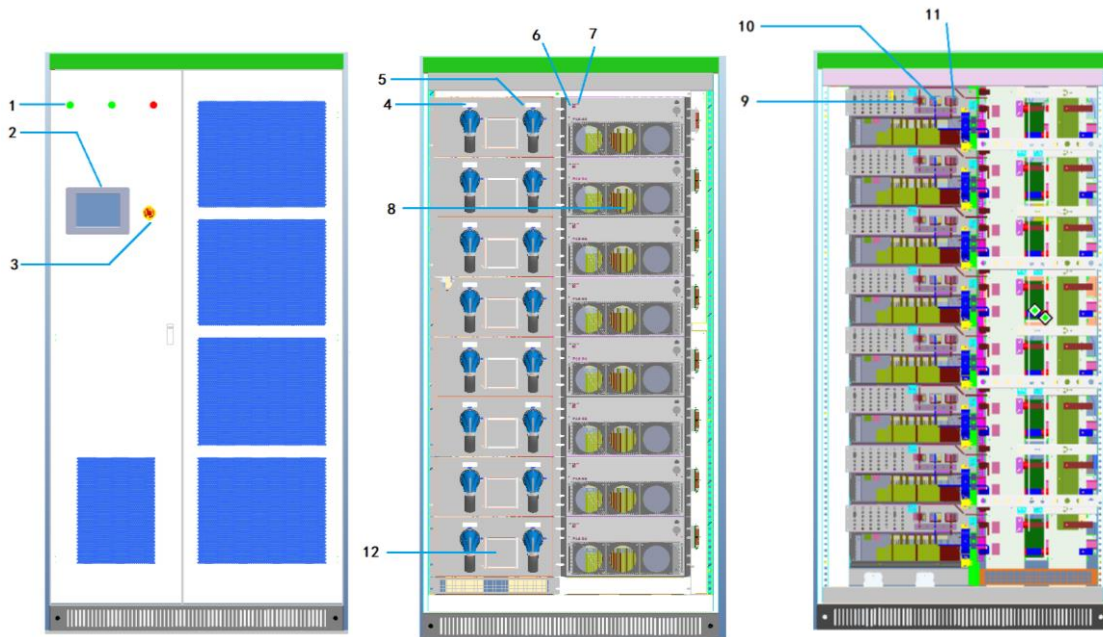


Figure3-3: Visible Components of the DC-DC

Position	Designation	Description
1	Indicator lights	The fault light is red in case of fault and off in case of normal; The operation indicator and power indicator are green
2	Touch Screen	
3	EPO (Emergency Power Off)	
4	Low voltage side switches	Load disconnecter
5	High voltage side switches	Load disconnecter
6	Module operation indicator	
7	Module fault indicator	
8	DC module (1~8 module(s))	50KW for1 set
9	Low voltage bronze medal	
10	Negative bronze medal	
11	High voltage bronze medal	
12	DC lightning arrester	DXH06-F-3DC1000R40
	Lightning protection circuit breaker	NDB2-63C63/3

3.5 Module introduction

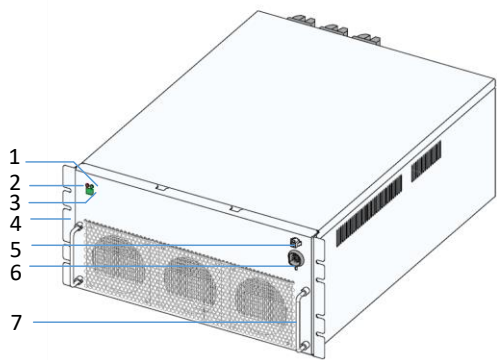


Figure 3-4 Front view for DC module

LED designation	Description	Explanation
1	Normal indicator light	Green
2	Fault indicator light	Red
3	DIP switch	Address
4	Hanger	
5	Power supply socket	
6	Communication cable socket	
7	Handle	Can't bearing too much weight

3.6 Operating Compositions

3.6.1. Battery DC Switch

The DC disconnection unit disconnects the DC-DC Converter from the batteries. The SOCOMEC series DC breaker is comply to the UL certification.



Figure 3-5: Indicators on the DC load-break switch

Position	Designation	Explanation
I	Switch position In (On)	The DC disconnection unit is closed.
O	Switch position off	The DC disconnection

Unbuckle recovery: take the switch to the off first before taking the switch to the on.

3.6.2. User Interface

The touch display is used to display instantaneous values and parameter settings. Click the touch screen with fingernail. Tapping the symbols on the touch display activates the corresponding functions. If the touch display has not been touched for 【ten】 minutes, the display is locked and the logged-in user will be logged out. By tapping the screen unlock the display again.

The touch display is divided into two areas.

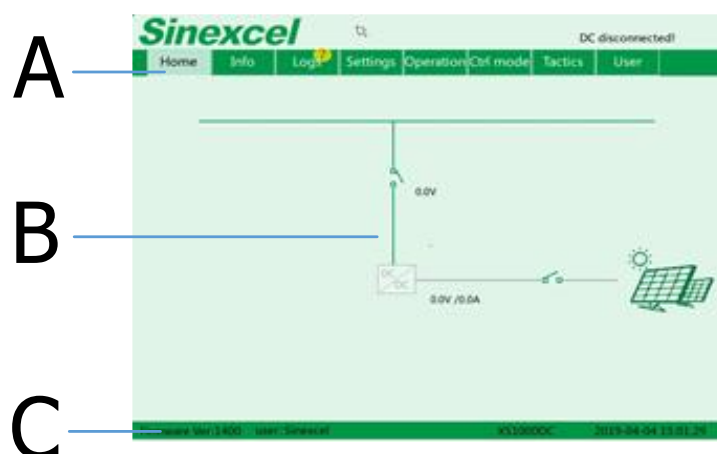


Figure 3-6 UI Design of the touch display






Position	Designation	Explanation
A	Menu	Menu can be different before/after log-in and other setting.
B	System Topology	
C	Version and time	

3.6.3 Symbols Explanation

Symbol	Designation
	DC side
	DC Module
	PV Solar
	Switch on DC or AC side open
	Switch on DC or AC side closed

3.6.4 Labels

No.	Label	Explanation
1		Label-Dot label-A phase
2		Label-Dot label-B phase
3		Label-Dot label-C phase
4		Label-Dot label-Positive electrode

5		Label-Dot label-Negative electrode
6		Label-Dot label-Neutral line
7		Label-Dot label-Grounding
8		Label-Warning label-Danger High Voltage
9		Label-Warning label-Danger large leak current

4 Technical Data

Technical parameters table (400kW)

Specification

PDS1-400K

DC parameters		
Rated power		400kW
Maximum power		560kW
DC voltage range		250~800V
DC maximum current		960A
Bus voltage range		DC voltage~900V
Bus maximum current		960A
Number of modules		8
Physical		
Cooling		Forced air cooling
Noise		70dB
Enclosure		IP20/NEMA1
Max elevation		3000m/10000feet (> 2000m/6500feet derating)
Operating temperature	ambient	-20°C to 50°C (De-rating over 45°C)
Humidity		0~95% (No condensing)
Size (W×H×D)		1100×2060×800mm
Weight		600kg
Installation		Floor standing
Other		

Peak efficiency	98%
Protection	OTP, OVP/UVP, EPO, Fan/Relay Failure, OLP
Configurable protection limits	Upper/Lower Voltage, Battery EOD voltage.
Display	Touch Screen
Communication	RS485,CAN,Ethernet
Isolation	Non-isolation
Compliant	CE LVD IEC 62109/62477, CE EMC IEC 61000 UL1741

5 Storing, lifting and transporting

5.1 Safety during Transport



WARNING

If the lifted or suspended load falls over, falls or sways, there is a risk of crushing. Vibration or careless or hasty lifting and transport can cause the product to tip over or fall. This can result in death or serious injury.

All national transport standards and regulations must be respected.

Always transport the product as close as possible to the floor.

Avoid fast or uneven movement during transport.

Always maintain a sufficient safety distance from the product during transportation.



NOTICE

Damaged frame structure of the DC-DC Converter due to uneven support surface

Placing the DC-DC Converter on an uneven surface can cause bending, which causes the DC-DC Converter door to no longer close properly. This can cause moisture and dust to seep into the DC-DC Converter.

Do not place the DC-DC Converter on an unstable, uneven surface, even for short periods of time.

The unevenness of the support surface must be less than 0.25%.

Do not use the installed kick plate to transport the DC-DC Converter.

5.2 Transporting DC-DC Converter

The modules of the DC-DC are installed in the DC-DC 400kW cabinet rack during shipping. During device transport and storage, pay attention to the caution sign on the packing case.

The selection of storing position should ensure that:

- There is no corrosive gas around it.
- There are over-wetting and high-temperature sources.

- It is not a dusty environment.
- It complies with the local firefighting requirements.



NOTICE

During rack transport and storage, stacking is not allowed. The device top cannot be placed with other articles.

The rack should be placed vertically at forward direction. Don't keep it upright placed horizontally.

6 Installation

6.1 Safety during Installation



DANGER

Risk of electric shock caused by live voltage

There is a high voltage in the live components of the product. Touching field components can result in death or seriousness electric shock damage.

Wear appropriate personal protective equipment for all work on the product.

Do not touch any live components.

Observe all warning messages in products and documents.

Obey all safety information from the battery manufacturer.



DANGER

Electric shock hazard caused by DC cable

The DC cable connected to the battery is live. Contact with live cables can cause electrocuted death or serious injury shock.

Before connecting the DC cable, make sure that the DC cable has no voltage.

Wear appropriate personal protective equipment for all work on the product.



WARNING

Danger to life due to electric shock when entering the storage system

Damage to the insulation in the storage system can result in fatal ground currents. May cause a fatal electric shock. Ensure that the insulation resistance of the storage system exceeds the minimum.

Minimum value: The insulation resistance is: 14kΩ.

The DC-DC must be installed in a closed electrical operating area.



WARNING

Fire due to failure to observe torque specifications at real-time bolt connections

Failure to comply with the specified torque reduces the current carrying capacity of the live bolt connection, thereby reducing the contact resistance increase.

This can cause the components to overheat and catch fire.

Be sure to always tighten the live bolt connection using the exact torque specified in this document.

Use only the right tools when working on the device.

Avoid repeatedly tightening the live bolt connection as this may result in unacceptably high torque.

6.2 Mechanical Installation

6.2.1 Mounting preparation

Drilling Mounting Holes is required in the Foundation. The overall dimension of the DC-DC Converter is shown in figure below.

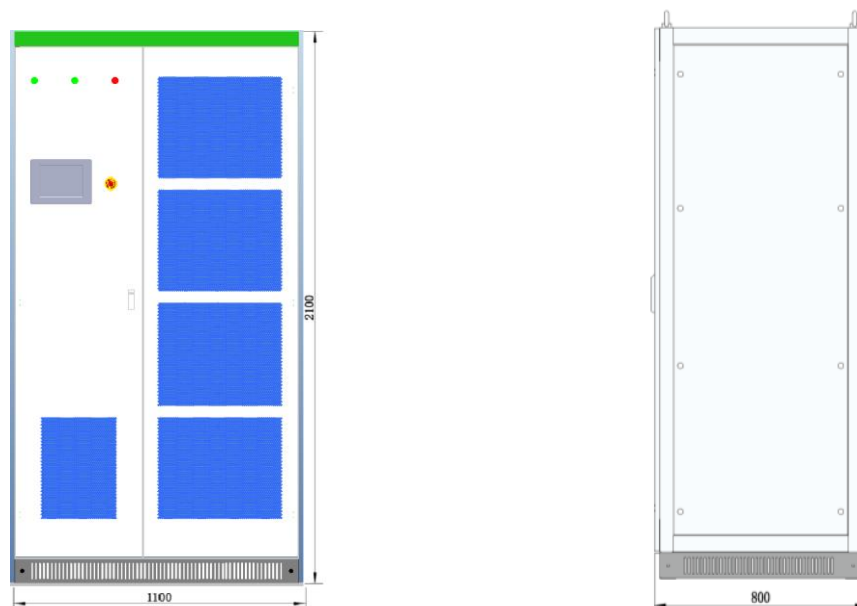


Fig. 6-1 Overall dimensions of the DC-DC Converter

The PDS1-400K cabinet, width: 1100mm, height: 2,100mm (without lifting rings); depth: 800mm.

The height of the lintel is 60mm and it can be taken down if there is no sufficient height into the room.

The PDS1-400K cabinet is without lifting rings and can't lift.

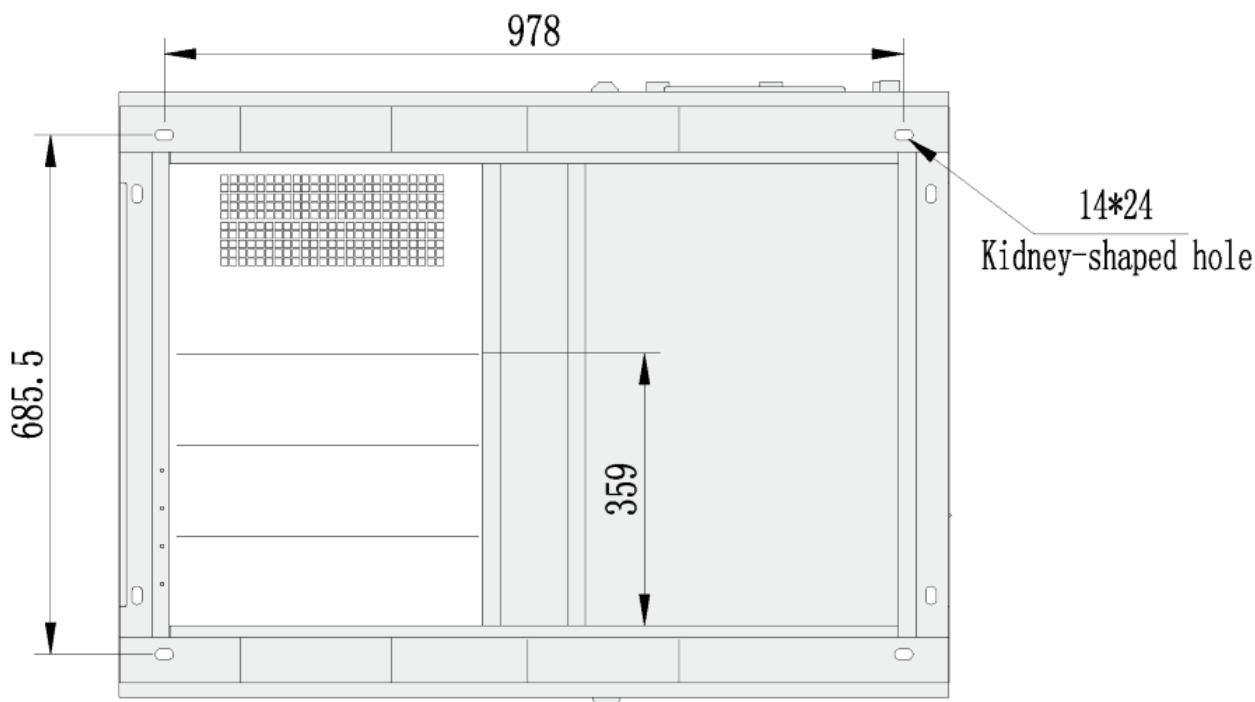


Fig. 6-2 the DC-DC Converter rack wiring hole in bottom view

There are two holes in each corner, only one hole needs to mount bolts, the other hole is used as a spare.

6.2.2 Preparation for Mounting on a Base

After the rack is removed to the installation position of BESS (battery energy storage system) with a forklift or a tool. Fine adjust the rack and remove it to the designed position, open the internal door of rack, use M10 or M12 screw to fix the rack.

When the rack needs to be fixed on the steel channel, $\Phi 14$ holes can be made in the steel channel. Fix the rack to the steel channel with screws.

When the rack is fixed to the concrete floor, make holes on the floor and fix the rack to the concrete floor with expansion screws.

6.3 Electrical Connections

6.3.1 Input requirement

PDS1-400K: The PV DC voltage of the cabinet must be within its required input range, otherwise, the PDS1-400K converter will not work. When users configure the numbers of series of photovoltaic panels, the maximum input voltage and the minimum input voltage of the module should be fully considered. For details, please consult the company's technical service personnel.

The battery system used with PDS1-400K converter should be equipped with a DC switch and the charge/discharge voltage should be between input voltage ranges. When the PDS1-400K converter is

connected to an external battery pack, make sure the DC switch is disconnected.

6.3.2 Output requirement

The PDS1-400K converter maximum current of each module can be 130A for the low voltage side.

6.3.3 Wiring mode

The wiring mode of the the PDS1-400K converter is down inlet and down outlet, the incoming and outlet wiring holes located in bottom of the cabinet. The cables put into the cable trough via the wire holes at the base. Open the back door and dismantle the dam-board to seen wiring of the cooper bars. As for wiring requirements, single cables or multiple cables with proper wire diameter should be selected. It is suggested that the current in 1mm² wire should be $\leq 3A$.

Table 6-1 PDS1-400K converter specification for cabinet wiring components

Position	Designation	Description
1	Confluence bus of battery side	BAT+, BAT-
2	Confluence bus of PV side	PV+, PV-
3	Cabinet Grounding Channels	PE-Bottom of cabinet

Open the dam-board of back door and then can see the wiring copper bar as shown below.

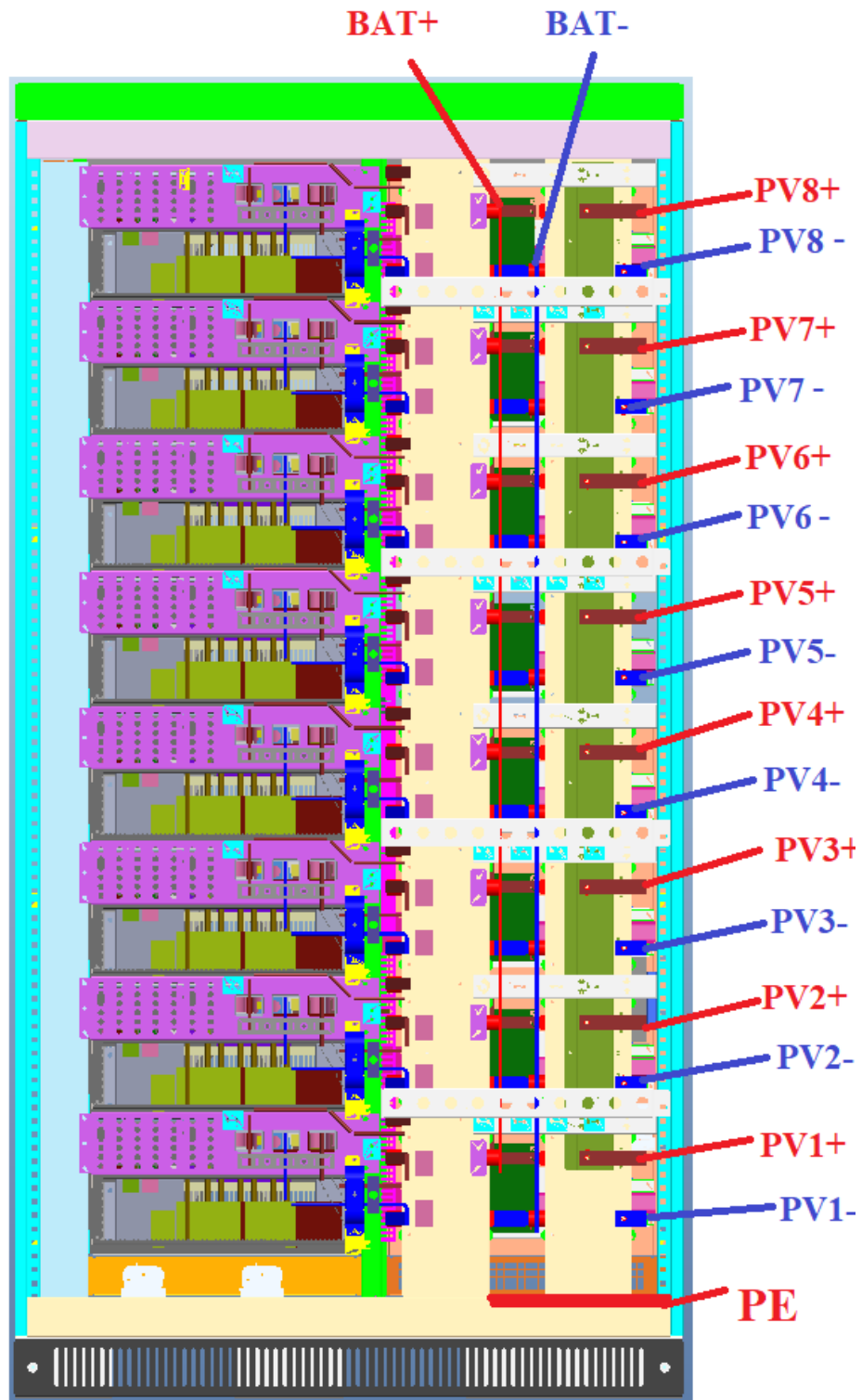


Figure 6.3 access position of PV and copper plate

In Figure 6.4, the aperture of the right photovoltaic input end is 10mm, which is connected to eight photovoltaic input ends from top to bottom. The red bronze medal is positive and the blue bronze medal is negative.

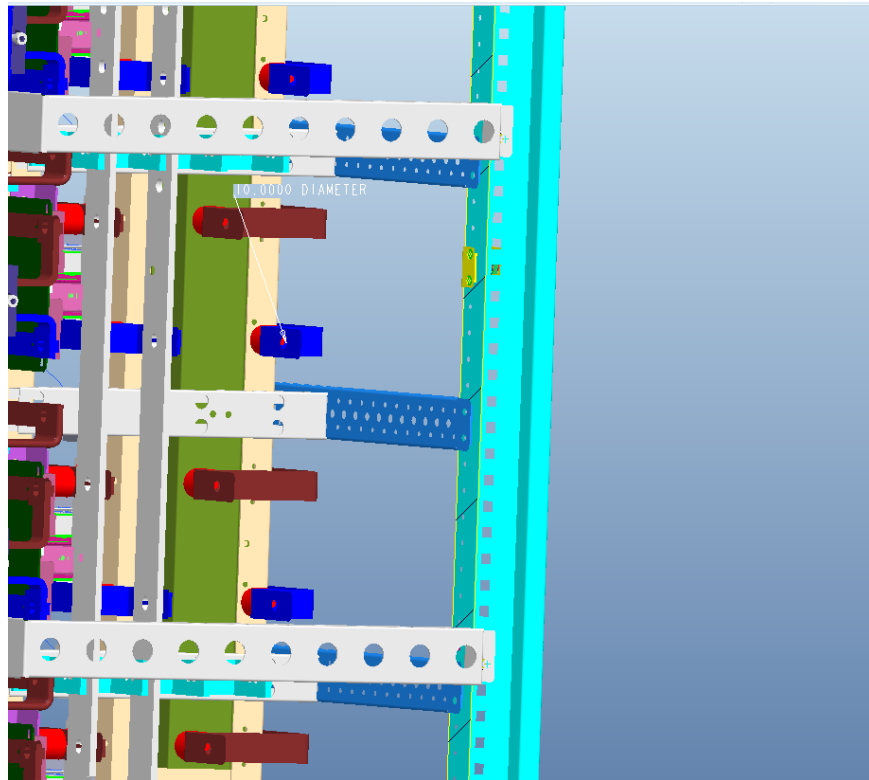


Figure 6.4 photovoltaic input terminal and copper plate size

In Figure 6.5, the aperture of the left battery output end is 12mm, the left side is positive and the right side is negative. Eight output terminals are connected in parallel and connected to the intermediate port.

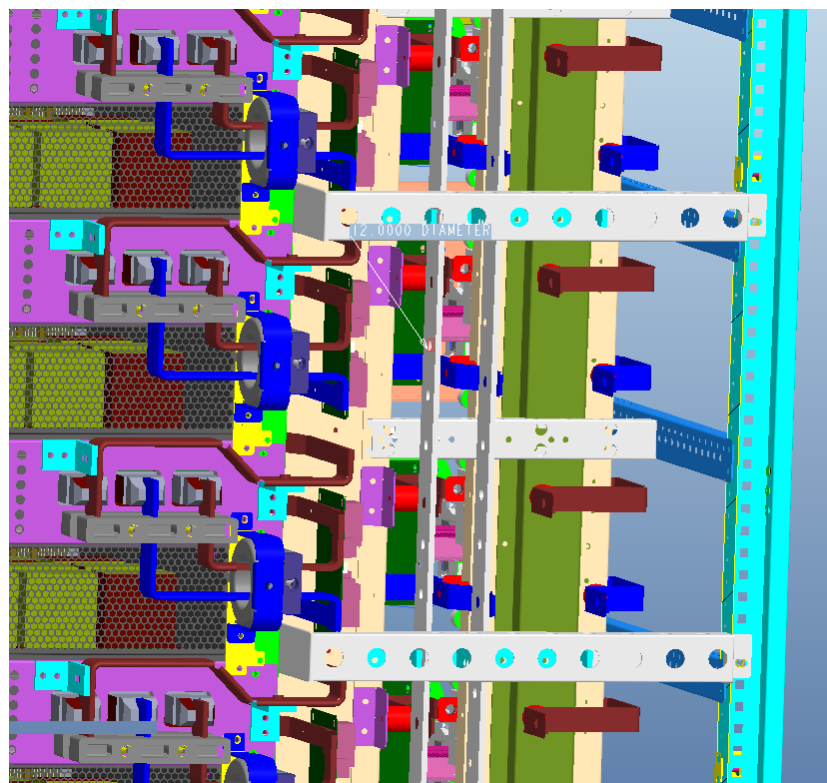


Figure 6.5 battery output terminal and copper plate size

6.3.4 System grounding

The modules in the PDS1-400K converter realize grounding connection with the rack through hangers. As for rack grounding, the rack bottom is installed with grounded cooper bars. During wiring, refer to the following table for cable diameter. The grounding resistance should be less than 4Ω.

Table 6-2 Grounding PE cable description

Rated power	Copper PE line section recommendation (mm ²)
50kW	≥16
100kW	≥25
500kW	≥75



WARNING

Rack and modules need to be grounded reliably! The grounding resistance should be less than 4Ω.

6.3.5 DC port wiring

The DC port wiring should be done before power on, the detailed DC port wiring could be seen in installation manual.



DANGER

Disconnect DC distribution switch and ensure that there is no dangerous voltage in the system during wiring.



NOTICE

The positive and negative poles of batteries cannot be connected inversely. Before wiring, a multi-mete needs to be used for measurement.

6.3.6 Wiring of terminal strips

Except power cable connection there are also auxiliary power connection, input and output of some node signals. All of them are led to the terminal strips with cluster cables in the rack.



NOTICE

All wires are connected to the wiring terminals externally from the wiring holes at the bottom of DC-DC 150KW. After wiring, fireproofing mud should be used to seal the wiring holes.

6.4 Communication interface connection

The PDS1-400K converter supports Modbus protocol, adopts RS485 and Ethernet communication interface and facilitates users to conduct background monitoring for the PDS1-400K converter and realizes remote signaling, remote metering, remote control and remote regulating of DC-DC Converter.

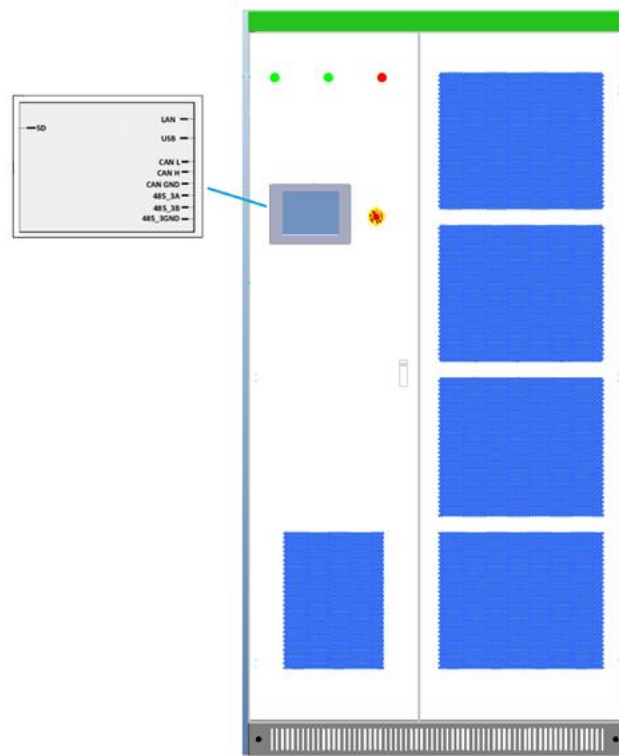


Fig. 6.6 Definition of touch screen communication ports

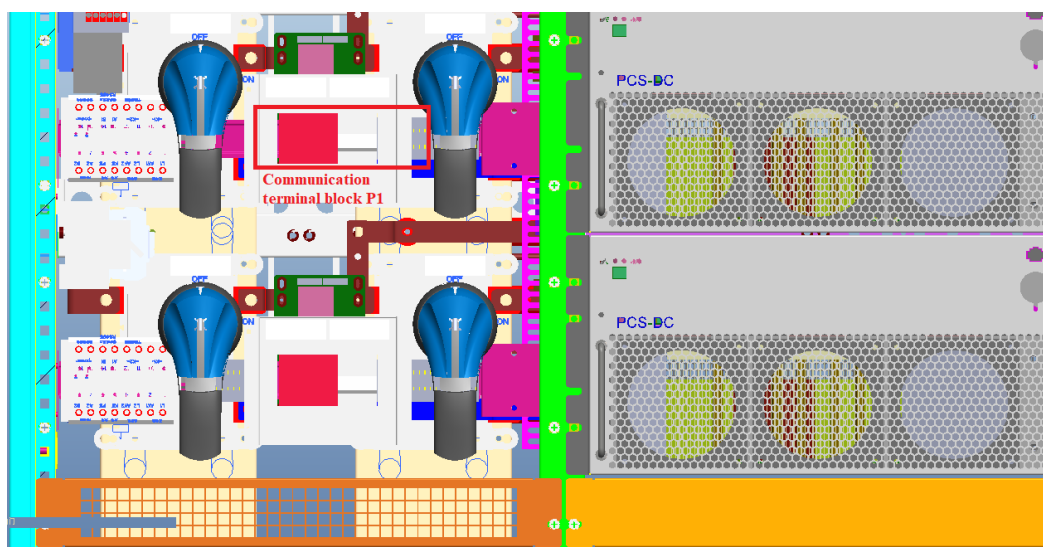


Fig. 6.7 Wring and communication interface position

7	CAN_H
8	CAN_L
9	485+
10	485-

Table 6-3 Communication interface description

Number	Description	Explanation
1	Terminal strip ports	RS485 , CAN, (AS BELLOW)
2	Touch Screen	Ethernet port Shown as 6.6 Communication interface

The LAN (Ethernet) port is used for communication. The USB port is used for system update or the logs export. The other communication ports in the back of touch screen has been wired to the wiring terminal strip ports.

Table 6-4 Communication interface with other equipment

Equipment	Wiring Method
EMS	RS485 or Ethernet (Protocol is based on MODBUS TCP/IP or MODBUS RTU compatible with SUNSPEC/MESA) Defaulted as RS485 MODEBUS RTU. Use Ethernet when the system require fast control. When the EMS need to communicate in CAN method, a CAN to Ethernet communication protocol converter is required.
BMS	RS485 or Ethernet or CAN (Protocol is based on MODBUS TCP/IP or MODBUS RTU compatible with SUNSPEC/MESA) Defaulted as CAN When the BMS need to communicate in Ethernet method, an Ethernet to CAN communication protocol converter is required.
Smart meter	Through external EMS
Air Conditioning	Through external EMS
Fire Fighting System	Through external EMS
Water Level Gauge	Through external EMS
Diesel Generators	Through external EMS

6.4.1 Connecting the EMS over RS485 or Ethernet

EMS can choose to use RS485 or Ethernet access, depending on the user's specific application, as shown in the figure below.

RS 485 Port

The front door of the storage inverter is embedded with touch screen Management Unit. User interface can be seen at its back. The position number of RS485 communication interface in the HMI (Touch Screen) is J23. It is led to terminal strip ports 9 and 10. Users can transfer serial port signal to the one which can be processed by PC via interface converter (such as RS485 transferred to RS232). The storage inverter could be set and commissioned alone via background software. It can read operation and warning information. Corresponding settings, startup and shut down operations can be conducted.

Ethernet Port

The monitoring panel integrates Ethernet port with position numbered as RJ25 that can be seen in the back of the touch screen. It supports Modbus TCP/IP protocol and has its own IP address. Ethernet connection requires a switch router, and fixed IP needs to be set. Connecting cables are twisted pair (namely network cable). The storage inverter are connected to the switch router, and the switch router is connected to remote control computer. The state of the storage inverter can be monitored and controlled in real time after setting IP address and port number in the monitoring computer.

6.4.2 Connecting a BMS over CAN

When directly connecting to the BMS, the communication port is default as CAN as shown below.

If the BMS use Ethernet communication port, a Ethernet-CAN protocol converter is needed . That Ethernet-CAN protocol converter should be bought by the user and its beyond Sinexcel's scope of supply.

The DC-DC 150KW communicates with battery management unit (BMS) to monitor battery state information, give an alarm and provide fault protection for battery according to the battery state and improve the safety of storage battery. It supports CAN communication. In particular, the position number of CAN communication interface can be seen in the back of HMI (Touch screen). It is led to terminal strip ports 7 and 8.

6.5 Check after installation

After installation of DC-DC, please inspect all aspects according to the checklist in the Installation Manual. Any failure to complete the checklist might void the warranty.

7 Function Description

7.1 Overview of the Operating Status

Refer to the following table for status of PDS1-400K converter

Table 7-1 Status of PDS1-400K converter

Status	Condition	Running mode
Powered off	PV, Battery switch disconnected	The lights on the equipment are all out.
Powered up	PV, Battery switch connected	The power on the equipment is on.
STOP	PV, Battery DC closed, equipment not running	The power green light is always on, the operation light is off, the fault light is off.
RUN	the device receives startup command	RUN green light in front door is always on, and the module green light is always on.
FUNCTION	Issue a power on command to the device	The green light of the power supply is always on and the equipment is running
Faults	Any fault information	Red light is always on, the module red light is always on or flickers, and the buzzer makes an alarm.
Shut down	The device receives shutdown command.	RUN green light flickers slowly, and the module green light flickers slowly.

7.2 Power module status

Table 7-2 DC-DC module status

light	condition	state
Power down	Disconnect bus, DC power supply	All indicators on the equipment are off
Shut down	Bus, DC power supply, device not running	Power off and no power on command, the green light flashes slowly for 0.5Hz
Open command	Power on command received when the device is in shutdown state	Green light slow flashing 1Hz Flash 2Hz during module soft start
Run	The equipment is in charge operation and discharge operation	The green light is always on
Fault	There is currently a non shutdown fault or alarm	The red light flashes slowly for 2S
	Currently, there is a shutdown alarm	The red light 1s flash

8 Operation

8.1 Safety during Operation



NOTICE

DC side operation is disturbed due to incorrect parameter settings

8.2 Power On Procedure

Power on for the first time:

- 1): Confirm the PV and BATTERY cable firmly connected according to the check list in the Installation Manual.
- 2): Measure the insulation withstand voltage according to the international or local standard. The following insulation withstand voltage should be measured
Positive pole "+" to ground "GND"; Negative pole "-" to ground "GND".
- 3): Measure the PV voltage; Battery DC voltage;
- 4): If the PV voltage, Battery DC voltage within the normal range as shown in technical specifications, then close the switch in sequence.

Power on every time:

- 1): Check whether the EPO button in reset state.
- 2): Close the switch in sequence.
Firstly close the PV switch, then close the BATTERY switch.

8.3 Setting Procedure before startup

8.3.1 Touch screen power on

After auxiliary power of the DC-DC converter is connected, THE HMI is on. At this moment, an initializing interface will appear. It shows that "The system is booting, please wait". After system booting, the interface will disappear.

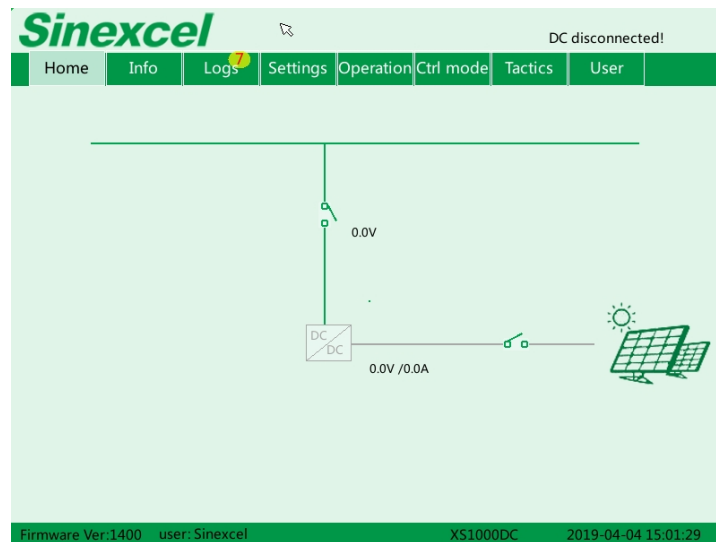


Fig. 8-1 Main Interface Sample

Detailed Menu information can be seen in Appendix. "12.1 Touch Screen Startup"

8.3.2 Log into the control Interface

1. Select **"User"**, Log into the control interface on touch screen with password.
 2. User can get the password from the authorized person/ party / agency/ etc.
- The login password 123456789 can obtain administrator authority.

8.3.3 Select Control Mode

Main menu structure can be different in different **"Ctrl Mode"**.

Configuring the control mode

1. Select **"User"**, Log into the control interface on touch screen with password.
2. Select **"Ctrl Mode"** > **"Manual Operate"**

Then the **"Settings"** is visible.

8.3.4 General Settings

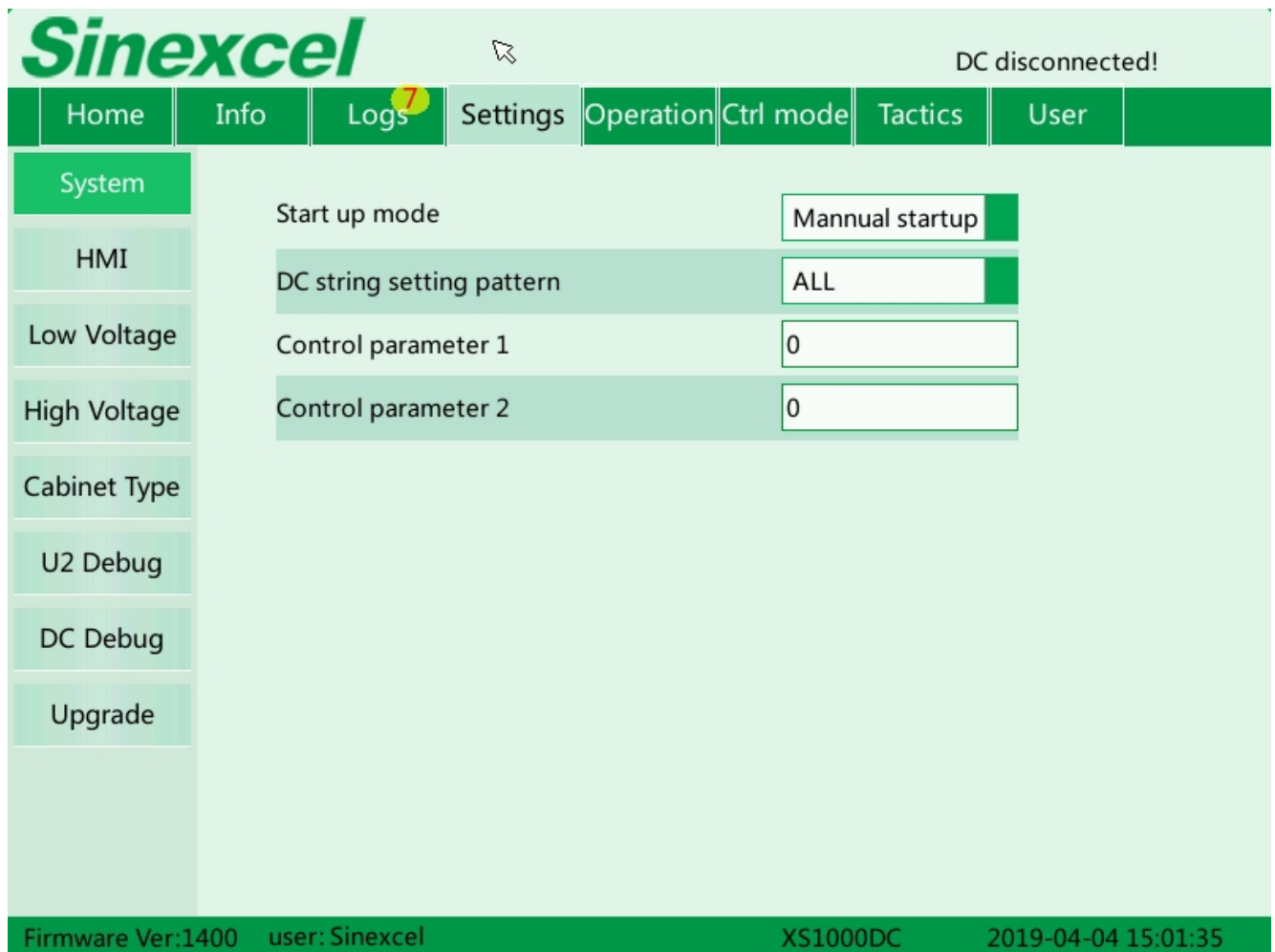


Fig. 8-2 Setting Interface Sample

There are General Setting and Advanced Setting, the commonly used setting is in the "General"
Users should set the "DC Configuration" according to the voltage and current requirement of BMS.
The detailed advanced setting can be seen in Appendix1 12.4 Parameter Setting.

8.3.5 Communication setting

Procedure:

If you do not see the settings options, do the following first:

1. Select **"User"** > Input password > **"OK"** > **"Login"**.
2. Select **"Ctrl mode"** > **"Manual Operate"**.
3. Select **"Setting"** > **"Advanced"**, **IP addresses, gateways, subnet masks, Porter rates**, etc. can be set as needed;
4. If there are multiple devices on the scene, different modbus device addresses need to be set up in order

to distinguish;

8.4 Manual Startup Procedure

Check before startup:

1. Select "User", Log into the control interface on touch screen with password.
2. Select "Ctrl Mode" > "Manual Operate"
3. Select "setting" > "System",
4. Select "Operation" > "System Startup"

The detailed menu explanation can be seen in Appendix1 12.7 Manual Startup.

8.5 Automatic Startup Procedure

1. Select "**User**", Log into the control interface on touch screen with password.
2. Select "**Ctrl Mode**" > "**Automatic Operate**"

The detailed menu explanation can be seen in **Appendix1 12.8 Automatic startup.**

8.6 Remote Startup Procedure

1. Select "**User**", Log into the control interface on touch screen with password.
2. Select "**Ctrl Mode**" > "**Remote Control**"
3. Then with other control equipment to start the DC-DC 150KW inverter remotely.

The detailed menu explanation can be seen in **Appendix1 12.9 Remote startup.**

8.7 Shutdown Procedure

During normal operation of DC-DC Converter, the following steps can be conducted if shutdown is required.

The DC-DC Converter is working in remote control mode and then with other control equipment to stop the DC-DC Converter remotely.

Manual shutdown procedure

1. "**Ctrl Mode**" > "**Manual Operate**";
2. **Select "Operation" > "System Stop"** to manually stop the DC-DC Converter.

The detailed menu explanation can be seen in **Appendix1 12.10 Shutdown procedure.**

8.8 System Power Off

When PDS1-400K CONVERTER is in "Stop" mode, can cut off the DC power and power off the system

- 1): Manually or remote control the system stop.

2): Disconnect the PV switch.

3): Disconnect the Battery DC switch.

The detailed menu explanation can be seen in **Appendix1 12.11 System Power Off**

8.9 Emergency shutdown

When the DC-DC Converter system is abnormal, press the emergency shutdown button "EPO" on the rack door and the DC-DC Converter will instantly stop running.



WARNING

To prevent personal injury, please use a multi-meter to measure the voltage at input terminal if case maintenance or opening is conducted. After ensuring that there is no mains supply, relevant operation can be conducted!

After about 15 minutes, the upper cover plate can be opened after DC BUS bar capacitance fully discharges (refer to warning label on module case surface).

9 Troubleshooting

9.1 Safety during Troubleshooting



DANGER

Danger of electric shock due to high voltage on the product

There may be high voltages on the product under fault conditions. Touching real-time components can lead to danger or death

Serious injury due to electric shock.

Observe all safety information when operating the product.

Wear appropriate personal protective equipment for all work on the product.

If you are unable to resolve the interference with this document, please contact the manufacture.

9.2 Export fault record

Insert a USB flash disk into the USB port in the back of the touch screen.

When need to send the logs to the manufacture to analyze.

1. Select **"User"**, Log into the control interface on touch screen with password.
2. Select **"Ctrl Mode"** > **"Manual Operate"**
3. Select **"logs"** > **"Export Logs"**>**"Download All Logs"**

9.3 Faults caused by improper parameter settings

Table below shows the faults that caused by improper parameter setting.

User could reset the parameter under the instruction in Appendix and then the faults can be automatically solved.



NOTICE

Alarm classification:

Fault: shutdown.

Warning: alarm but not shut down;

Alarm Clearance method:

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

Manual: After the cause of the alarm disappears, you need to manually send an alarm clear command.

Power Off: After the causes of the alarm disappear, you need to power off and restart.

Alarm Classification + Clearance Method (**abbreviate to A.C. + C.M.**):

Fault + Auto

Fault + Manual

Fault + Power Off

Warning + Auto

Warning + Power Off

Failure Name	A.C.+C.M.	Reason
DC input over voltage	Fault + Auto	DC voltage is higher than the upper voltage limit
DC input under voltage	Fault + Auto	DC voltage is lower than the lower voltage limit or DC voltage is not connected
DC bus over voltage	Fault + Auto	The voltage on the DC bus capacitor is too high during module working
DC bus under voltage	Fault + Auto	The voltage on the DC bus capacitor is too low during module operation
Parameter mismatch	Fault + Auto	1. The parameter setting of <DC parameter> is unreasonable;

Table 9-1 Faults caused by improper parameter setting

10 Maintenance

10.1 Safety during Maintenance



DANGER

There is a high voltage in the live components of the product. Touching field components can result in death or seriousness electric shock damage.

Wear appropriate personal protective equipment for all work on the product.

Do not touch any live components.

Observe all warning messages in products and documents.

Obey all safety information from the battery manufacturer.

Always disconnect the following devices from the outside before performing any work:

- internal power supply
- DC voltage of the battery
- additional external voltage, such as control signal from the control room

Make sure that the disconnected device cannot be reconnected.

After turning off the inverter, wait at least 15 minutes before turning it on to discharge the capacitor complete.

Before operating the drive, make sure that all devices are completely voltage free.

Cover or isolate any adjacent live components.



NOTICE

Property damage due to dust intrusion and moisture infiltration

Ingress of dust or moisture can damage the product and affect its function.

Perform maintenance work only when the environment is dry and free of dust.

The product is only allowed to wiring or assembly and disassembly operate when the product is turned off.

Connect the external power supply after finish installing the product.

If the installation or commissioning process is interrupted, install all dam panels, close and lock the rack.

The product must always be closed for storage.

Store the product in a dry, covered area.

10.2 Maintenance Schedule and Consumables

10.2.1 Operation environment requirements

Device operation environment must comply with the operation environment required for the device:

Allowable environment temperature: -20~55°C (power de-rating for 45 °C above)

Allowable relative humidity: 0~95% (non-condensing)

Allowable maximum elevation: 3,000m

Note: When exceeding the maximum elevation, the DC-DC will have de-rating output.

Please consult customer service center for specific de-rating coefficient.

10.2.2 Electrical and fixed connection inspection

After being put into operation, conduct regular inspection on device's electrical and fixed part connection. Such inspection is advisably conducted every three months. Record for each inspection should be made.

- Rack grounding connection;
- Module grounding connection;
- Electrical connection for DC input;
- Electrical connection for auxiliary power supply;
- Electrical connection for communication cables.
- DC switch, SPD and fan.
- Access monitored fault information.

10.2.3 Clearing and cleaning

Before the device is put into operation, the dust and sundries in its cooper bars, terminals and mesh openings should be cleaned.

After the device is put into operation, the dust in machine room should be cleaned regularly. Check whether the ventilating and air exhaust facilities in machine room are normal. They are advisably cleaned once every three months.

10.3 Maintenance Work

- Unfavorable environmental conditions shorten maintenance intervals
- Location and environmental conditions can affect maintenance intervals. Pay attention to cleaning and corrosion protection
- It may need to be more frequent, depending on the conditions at the installation site.
- If the DC power distribution parts is affected by adverse environmental conditions, it is recommended to shorten maintenance interval.
- Sinexcel recommends an optical inspection in regular periods to determine maintenance requirements

Consumables and maintenance materials

Only those consumables and maintenance materials are usually not included in standard equipment list.

Professionals or electrically qualified person listed standard tools and materials such as torque are taken for granted.

Wrench, single contact voltage tester are available for all maintenance operations.

Maintenance work under the voltage supply.

See the information in HMI

Read error messages and warnings

Check DC Switchgear

Check the fan

Maintenance under no voltage conditions

See the information in HMI

Performing a visual inspection

Cleaning the ventilation panels

Cleaning air ducts and ventilation ducts

Check internal

Check the bolt connection of the power cord.

Check label

Check latches, door stops and hinges.

Check the SPD (Surge Protecting Device)

11 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

Shenzhen Sinexcel Electri

Website: <http://sinexcel.us/> or www.sinexcel.com

Add: Building 6, Area 2, Baiwangxin High-tech Industrial Park, No. 1002, Songbai Road, Nanshan District, Shenzhen

Postcode: 518055

Hotline: +86 0755-8651-1588

12 Appendix 1 Settings on HMI (Touch Screen)

12.1 Touch Screen Startup

Operation control can be conducted via HMI (human-computer interface). This section introduces the HMI display content and settable parameters.

The **"Home"**, **"Info"**, **"Logs"**, **"User"** can always be seen before log-in with a password. The detailed menu structure can be seen as below.

12.1.1 Main Menu Structure before log-in

All these information bellow can be visible after the system booting and touch screen can be normally display.

"Home", **"Info"**, **"Logs"**, **"User"** menu can be seen in the main menu structure before login.

12.1.1.1 Home

After initializing, the home page is shown. On the main wiring diagram of system topology, system DC voltage and current, general system status can be seen.

1. Log into the PDS1-400K CONVERTER user interface
2. Select **"Home"**

12.1.1.2 Information

1. Log into the PDS1-400K CONVERTER user interface.。
2. Select **"Home"** > **"Info"**

In the Info pages, users can get the overview of the entire system operation parameters.

The branch menu **"DC Info"**, **"Status"**, **"BMS"** can be seen under the menu **"Info"**

User can see the specific information under each menu

"DC Info" shown the status of DC BUS, battery is connected to the DC BUS.

"DC Voltage (V)" **"DC Current (A)"** **"DC Power (kw)"** **"Status"** **"Warning"** **"Switch"** **"Bus Voltage (V)"** can be seen under the **"DC Info"**.

"BMS" information is different according to different BMS supplier brands

12.1.1.3 Logs

In logs page, users can review current alarm, past alarm, operation record, status record of the system, and operation curves.




Logs				Explanation
Current	No.	Warning/Fault	Occurrence Time	Dismissed Time
Past Alarm	No.	Warning/Fault	Occurrence Time	Dismissed Time
Operation	No.	Designation	Time Stamp	Operation
Status Logs	No.	Designation	Time	Status
Export	Downloading Process: Downloading All Logs			Invisible before log-in


12.1.2 Log into the control Interface

1. Select **"User"**, Log into the control interface on touch screen with password.
2. User can get the password from the authorized person/ party / agency/ etc.

The login password 123456789 can obtain administrator authority.

12.2 Main menu structure after login

Main menu			备注
Main wiring diagram	/		System topology
system information	Low voltage DC		
	High voltage DC		
	Module status		
	BMS		
Event record	Current Alarm		
	Historical alarm		
	Operation record		
	Status record		
	Download record	 NOTICE	This menu is not visible until you log in
System settings	system parameter		
	Monitoring parameters		
	Low voltage parameters		
	High voltage parameters		
	Model selection		
Operation command	Power on		 NOTICE The operation commands menu is available only when you select local remote > local manual mode
	Shut down		
	Clear fault		
Local remote	Local manual control		System settings is visible in this mode The operation command is visible in this mode The control policy is visible in this mode
	Local automatic control	 NOTICE	System settings is not visible in this mode The operation command is not visible in this mode

			The control policy is visible in this mode
	Remote control	 NOTICE	System settings is not visible in this mode The operation command is not visible in this mode Control policy is not visible in this mode
control strategy	Strategy description		
	48 segment configuration		
	Options		
Log in and log out	Please input a password		

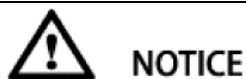
12.3 Local and remote settings

The main menu structure can be different in different "local and remote" settings.

Configure local and remote

1. Select "login and logout" and use the password to log in to the control interface on the touch screen.
2. Select local remote > local manual
3. Select local remote > local automatic
4. Select local remote > remote control

12.4 System settings



System settings can only be seen only when you select local remote > local manual mode.

When the system is in "local automatic" or "remote control" mode, "system settings" are invisible and do not need to be configured.

"System setting" menu includes "system parameters", "monitoring parameters", "low voltage parameters", "high voltage parameters" and "model selection"

12.5 Common settings

12.5.1 Language settings

Steps:

1. Select "login login login" > please enter password > "login". (log in to the user interface of DC-DC converter cabinet)
2. Select local remote > local manual.
3. Select System Settings > Advanced Settings > monitoring parameters > language > English or simplified Chinese.

4. Then a window will pop up to remind you that the system will restart. Click Yes or OK.

12.5.2 Date and time settings

Steps:

1. Select "login login" > please enter password > "OK" > "login". (log in to the user interface of DC-DC converter cabinet)
2. Select local remote > local manual.
3. Select System Settings > monitoring parameters > System Time Settings > yyyy MM DD HH mm SS
4. Then click OK to save or cancel to discard the changes.

12.5.3 Communication settings

Steps:

1. Select "login login" > please enter password > "OK" > "login". (log in to the user interface of DC-DC converter cabinet)
2. Select local remote > local manual.
3. Select System Settings > monitoring parameters > IP settings to set the IP of DC-DC converter cabinet. Enter the static IP address to be used to access the DC-DC converter cabinet.
4. Then click OK to save or cancel to discard the changes.
5. To change the gateway IP address of the network, enter the IP address in gateway.
6. To change the subnet mask of the network in the subnet mask field, enter subnet mask.
7. To change the Modbus address of the DC module, enter "MODBUS device address".
8. To change the baud rate of Modbus communication, enter "communication baud rate"

12.5.4 DC parameter setting

Steps:

1. Select "login login" > please enter password > "OK" > "login". (log in to the user interface of DC-DC converter cabinet)
2. Select local remote > local manual.
3. Select System Settings > low voltage parameters
 - 1) The upper and lower limits of MPPT refer to the voltage range during PV operation;
 - 2) PV maximum voltage refers to the opening voltage of PV;
 - 3) Sleep voltage means that when the PV voltage is lower than this set value, the DC module enters

sleep state, stops and clears all faults;

4) Wake up voltage means that when PV is higher than this setting, the module is allowed to start up;

5) It is recommended to set the wake-up voltage between the lower limit voltage of MPPT and the maximum photovoltaic voltage;

6) The sleep voltage is lower than the lower limit voltage of MPPT;

7) The maximum photovoltaic voltage setting value shall be higher than the upper limit voltage of MPPT;

8) In high voltage parameter setting: the lower limit voltage of DC high voltage side must be higher than the upper limit voltage value of MPPT.

12.6 System parameter setting

Steps:

1. Select "login login" > please enter password > "OK" > "login". (log in to the user interface of DC-DC converter cabinet)

2. Select local remote > local manual.

3. Select System Settings > system parameters

"Startup mode": the default setting is "manual startup"

"DC parameter setting mode": a function reserved for a specific model. It does not need to be set by default.

12.7 Local manual start

Check before startup

Before starting up, please check the equipment according to the following steps:

1) Check and ensure that there is no damage outside the module and the DC circuit breaker is in the "off" position.

2) Complete the installation according to the above chapters, and check whether the DC input wiring in the DC-DC converter cabinet is normal and well grounded.

3) Check whether the battery voltage is normal.



NOTICE

Select local remote > local manual operation command to be visible.

When the system is in "local remote", "local automatic" or "remote control", the "operation command" is not visible and does not need to be configured.

1. Select "login login" > please enter password > "OK" > "login". (log in to the user interface of DC-DC converter cabinet)

2. Select local remote > local manual. The action command is visible

"Total power on", "total power off" and "clear fault" are displayed in the "operation command" interface.

The system state will always be only one of the "total power on" and "total power off" modes.

"Clear fault" is used to clear faults that can be cleared manually, such as "EPO (emergency power off)".

"Clear fault" does not apply to all faults.

After setting parameters and the system meets the startup conditions, DC-DC can be started and shut down through "total startup" and "total shutdown".



NOTICE

After the system is started, check "system information" to understand the working status of the system.

12.8 Auto start

1. Select "login login" > please enter password > "OK" > "login". (log in to DC-DC user interface)

2. Select local remote > local automatic

In the local automatic startup mode, the DC-DC converter cabinet will automatically check and judge the startup conditions. If the system functions normally and meets the system setting conditions, it will start automatically. If the DC voltage is too low or too high, the DC-DC converter cabinet will give an alarm, automatically shut down and stop external power supply.

After the following conditions are met, the DC-DC converter cabinet will restart automatically and the output power will recover.

1. DC voltage is normal.
2. The operation mode is set correctly.
3. There are no other alarm faults.

If the DC-DC converter cabinet is not set with automatic start, the user can manually start the equipment through the touch panel.

12.9 Remote control start

The remote control startup step is applicable to the case that the DC-DC converter cabinet system is stopped and can be started.

The operation steps are as follows:

- 1) Close the output switch of the battery cluster and confirm that the DC port of the DC-DC converter cabinet is powered.
- 2) Close the bat DC circuit breaker. The green indicator flashes in green. After about 10 seconds, the red indicator is always red.
- 3) Set monitoring parameters and control operation mode according to the above chapters
- 4) Select local remote > remote control, and then select other control devices to remotely start the DC-DC converter cabinet.
- 5) The DC-DC converter cabinet will start the DC module. After performing step 4, return to the "main wiring diagram" on the display screen to view the system status.

12.10 Shutdown procedure

During the normal operation and power output of DC-DC converter cabinet, if it needs to be closed, the following steps can be performed.

- 1) Select local remote > remote control, and then select other control equipment to remotely stop the DC-DC converter cabinet.

Or select local remote > local manual; "Operation command > General shutdown" manually stop the DC-DC converter cabinet.

12.11 System power down

When the DC-DC converter cabinet is in the "general shutdown" mode, the DC switch can be cut off and the system power supply can be turned off:

- 1) Manual or remote control system stop.
- 2) Disconnect the battery DC switch, and then disconnect the photovoltaic DC switch.

In the above operation process, the system has stopped after step 1. The live parts of the system have stopped running, and the bus copper bar and auxiliary power supply in the system are still powered for a long time. Therefore, the relevant control system is still in standby mode. In this state, equipment setting and maintenance are not allowed.

When the system is powered down, the copper bar of the internal contactor is dead. After the internal capacitance of the module is completely discharged, relevant maintenance and setting can be carried out.

12.12 Emergency stop

When the DC-DC converter cabinet system is abnormal, press the emergency shutdown button "EPO" on the rack door, and the DC module will stop running immediately.



NOTICE

To prevent personal injury, if maintenance is carried out or the housing is opened, use a multimeter to measure the voltage at the input terminal. Ensure that relevant operations can be carried out after power is off!

After about 15 minutes, the upper cover plate can be opened after the DC bus capacitor is fully discharged (see the warning label on the surface of the module housing).
