YUNT
云天数能

User Manual

Mercury Series DC-DC Converter

Ver 02.02

Contents

About This Manual

This manual describes the Mercury Series bi-directional DC-DC converter in terms of its product information, installation, operation and maintenance. More information is available from YUNT's official website or sales channels.

Scope of Application

This manual mainly targets the following equipment:

- Mercury DC-DC converter module product, bi-directional DC-DC converter

Intended Readers

- End users
- Installation engineers
- Maintenance engineers

Manual Usage

Please read the manual carefully before using the product, and keep it in an accessible place.

The manual content will be continuously updated and corrected, but there may be discrepancies or errors compared to the actual product. The purchased product shall prevail. The latest manual version is available from the YUNT's official website or sales channels.

Revision History

Version	Revision Content	Date
01.00	First release	2023-09
01.01	1. Updated the content related to the front panel indicator and communication interface; 2. Added the product operation derating curve.	2023-12
01.02	1. Added the RJ45 interface definition description. 2. Added the description of bidirectional bypass working mode.	2024-01
01.03	1. Optimized the electrical diagram description.	2024-03
01.04	1. Added the terminal wiring description. 2. Added 50kW model parameters. 3. Optimized product specifications. 4. Added the DIO wiring example diagram. 5. Updated the drawing number and description. 6. Separated the technical specifications of the MPPT module and DC-DC module.	2024-07
01.05	1. Defined the signal interface default functions, and optimized the wiring description. 2. Added the MPPT module MC4 terminal crimping description in section 4.2. 3. Added 4.5 system-level communication wiring description.	2024-09
01.06	1. Added MPPT module power wiring precautions. 2. Updated the document title.	2024-10
01.07	1. Optimized the cable preparation and wiring guide. 2. Optimized some specifications.	2024-11
02.00	Major version update: split DC-DC and MPPT.	2025-01
02.01	1. Added system configuration application precautions.	2025-02
02.02	1. Optimized block diagram description and precautions; 2. Optimized system duct configurations; 3. Added quality assurance description.	2025-05

Safety Precautions

Safety Statement

- Please read and comply with the safety precautions in this manual when installing, operating and maintaining the product.
- To ensure personal and equipment safety, please follow all safety precautions indicated on the product and described in the manual when installing, operating, and maintaining the product.
- The “Caution,” “Warning,“ and “Danger“ notices in the manual do not represent all the safety precautions that must be observed; they serve only as supplements to all safety instructions.
- This product should be used under the environment meeting design specifications; otherwise, malfunctions may occur. Functional abnormalities or component damage caused by failure to comply with related regulations are not covered by the product quality guarantee.
- Our company shall assume no legal responsibility for personal injury or property loss caused by improper product operation.

Safety Level Definition

indicates that failure to follow the instructions may result in minor bodily injury or equipment damage.

indicates that serious bodily injury or damage to critical equipment may result if instructions are not followed.

indicates that failure to follow the instructions may result in death or serious bodily injury.

Safety Warning Sign Settings

When installing, operating, performing routine maintenance, or servicing the DC-DC converter, clear warning signs should be placed near the converter's front and rear switches to prevent unauthorized personnel from approaching and accidentally operating or causing accidents. Please follow these guidelines:

- Place clear signage at the front and rear switches of the DC converter to prevent accidents caused by accidental switching on.
- Erect warning signs or safety warning tapes near the operation area.
- After completing maintenance or repair operations, always check that the DC-DC converter's front and rear switches are in the off position and that there is no power.

Safety Precautions

Unpacking Inspection

- Do not install the product if product or accessory damage, rust, or signs of prior use are found upon unpacking.
- If internal water ingress, missing parts, or damaged components are found upon unpacking, do not install the product!
- Check the packing list carefully; if the product name does not match, do not install the product.

- Before unpacking, inspect the outer packaging for damage, water ingress, dampness, deformation, etc.
- Upon unpacking, check the device and accessories for damage, rust, or dents.

- After unpacking, carefully compare the packing list to verify the quantity of devices and accessories, and completeness of documentation.

Installation and Wiring

Danger

- Non-professionals are strictly prohibited from installing, wiring, maintaining, inspecting, or replacing parts of the equipment.
- Before wiring installation, disconnect all power sources of the equipment. Ensure that the DC-DC converter is disconnected from power, and measure the voltage on both sides of the DC relay to ensure it is within safe voltage levels to prevent electric shock.
- Ensure proper grounding of the equipment to avoid electric shock hazards.

Warning

- Before installation, carefully read the product user manual and safety precautions.
- Before installation, ensure the mechanical strength of the installation location can support the equipment weight to avoid mechanical hazards.
- It is strictly prohibited to disassemble or modify the internal components of the DC-DC converter. Prevent screws from accidentally falling causing electric shock hazards.
- Use the torque values specified in the manual for terminal screw tightening. Insufficient or excessive torque may cause overheating, damage, or fire hazards.
- After wiring, check all wiring to ensure input/output and phase sequence are correct and normal.

Power On and Operations

Danger

- Before powering on, confirm the product is properly installed, wiring is secure, and external devices allow startup.
- Non-professionals are strictly prohibited from operating the product to avoid injury or death risks.
- It is forbidden to open the door of the product cabinet or the protective cover of the product, touch any terminals of the product, or disassemble any device or parts of the product under power or running condition; otherwise, there is a risk of electric shock.

Warning

- After wiring and parameter setting, conduct trial operation to ensure the machine operates safely; otherwise, injuries or equipment damage may occur.
- Before powering on, ensure the rated voltage of the product matches the power supply voltage. Incorrect power voltage usage may cause fire hazards.
- During operation, do not touch the equipment enclosure or fans to prevent unnecessary personal injury.

After Power Off

Danger

- Immediately disconnect the DC-DC converter's front and rear switches to ensure power is off before inspecting the unit.
- Wait 20 minutes or use discharge equipment to consume residual voltage, ensuring no internal voltage before touching internal components.

1 Product Information

1.1 Model Description

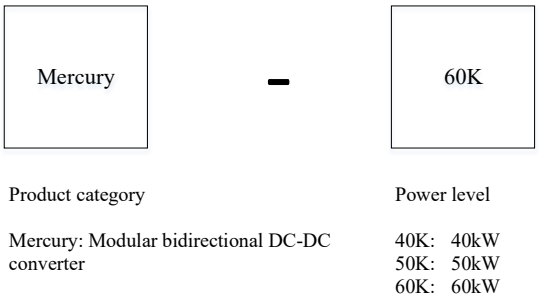


Figure 1 Model description

1.2 DC-DC Converter Application System

The DC-DC converter is primarily used for energy conversion between low-voltage DC (relative to the converter's high-voltage side) and high-voltage DC (relative to the converter's low-voltage side). It can be used with systems such as battery DC-DC systems, PV power generation systems, PCS application systems, and charging station systems, and can be widely applied in industries such as industrial storage, photovoltaic (PV) power generation, battery manufacturing, and microgrids.

Battery + converter + PCS application scenario:

The scenario includes the use with the PCS. The battery is a mobile DC-DC battery, which exhibits a low voltage and needs to be broadened to the DC voltage range of the power converter; it can be used with the PCS with a single machine power level between 40kWh and 120kWh; voltage expansion for reuse of cascade batteries.

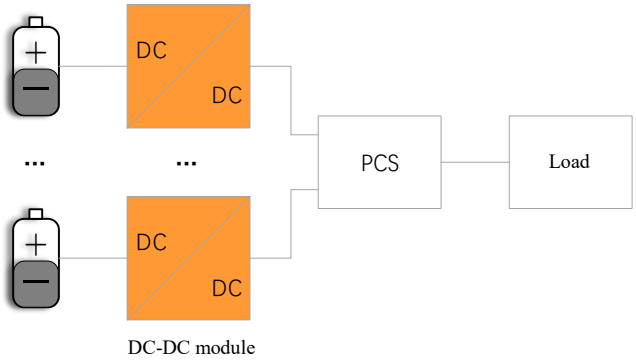


Figure 2 DC-DC module application scenario

1.3 Converter Principle

The converter adopts a 4-way non-isolated bi-directional DC-DC parallel structure, controlled to satisfy synchronous parallel or interleaved parallel operating modes.

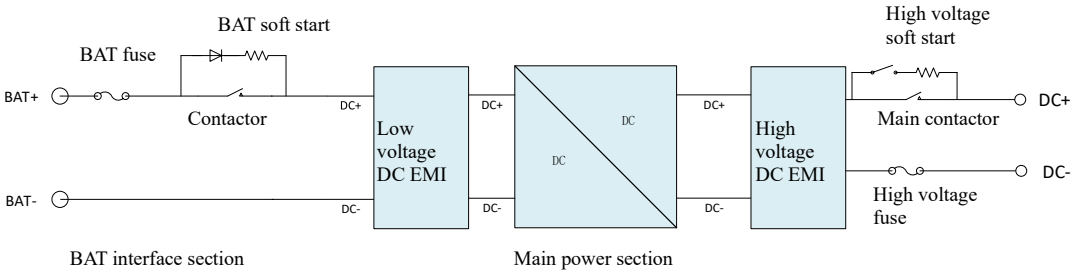


Figure 3 Converter circuits

1.4 Components

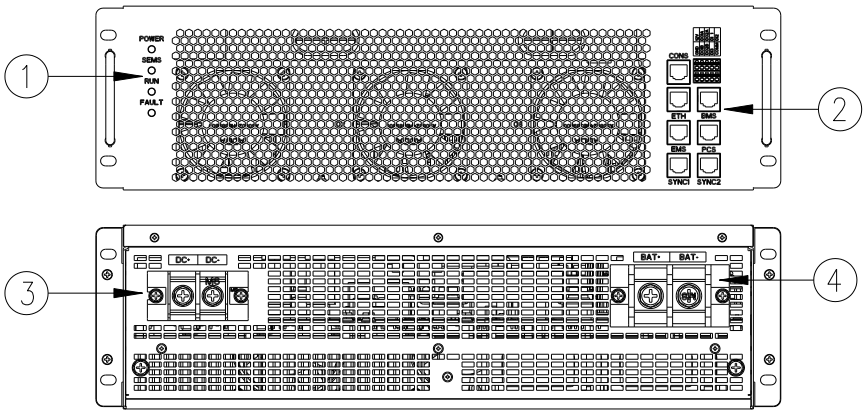


Figure 4 DC-DC module components

Table 1 DC-DC module component description

No.	Description
1	Indicators
2	Communication interface
3	High-voltage DC wiring terminal
4	Low-voltage DC wiring terminal

1.5 Product Dimensions

The converter adopts a standard 3U size structure, as shown in the following figure.

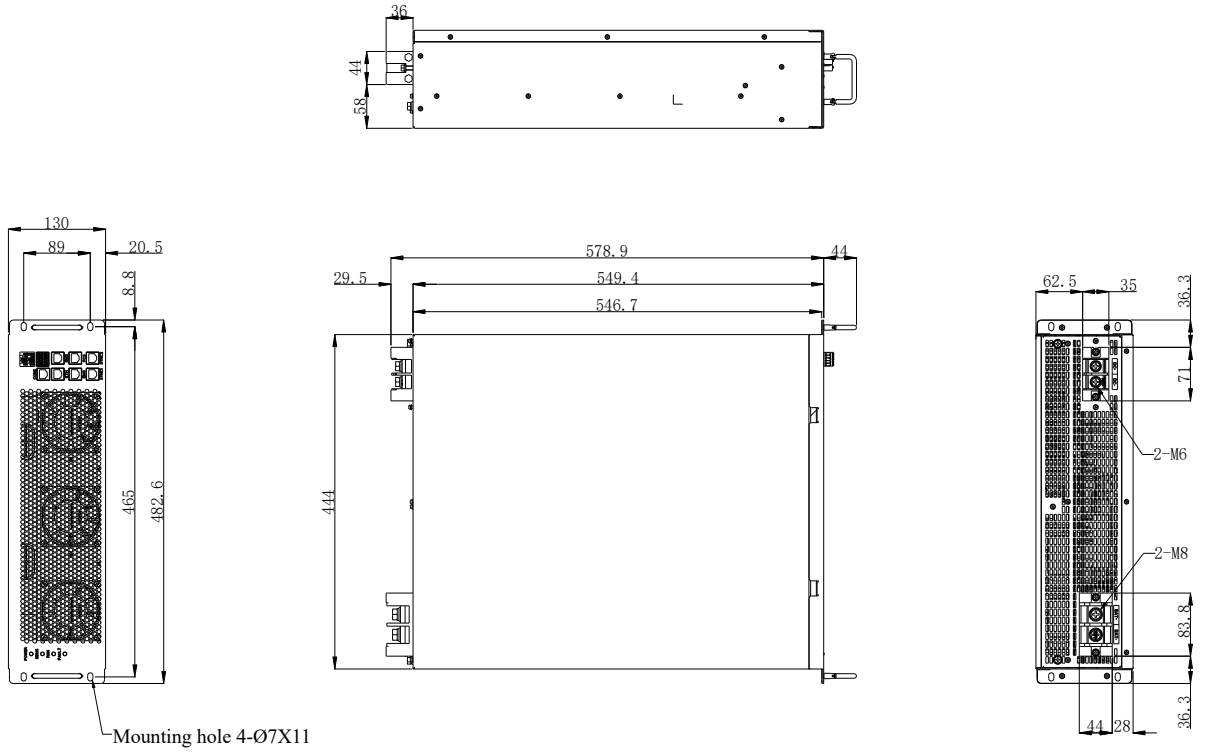


Figure 5 DC-DC module interface dimensions

1.6 Indicators on the Panel

There are indicators on the front panel of the converter, as shown in the following figure.

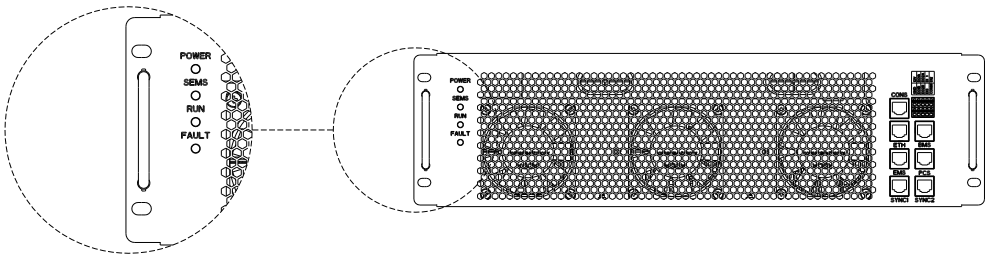


Figure 6 Indicators on the Panel

Table 2 Indicator definitions

Indicator	Status	Description
POWER (green)	Steady on	The converter has connections for low-voltage side battery, PV, or high-voltage side power input.
	Off	The converter system is not powered.
SEMS (green)	Steady on	Normal communication
	Off	Communication fault
RUN (green)	Steady on	The converter is in operating state.
	Off	The converter is in non-operating state.

FAULT (red indicator)	Steady on	The converter has generated an alarm, but can continue to operate.
	Flashing	Converter fault, shutdown status
	Off	The converter is free of faults or alarms.

1.7 Technical Specifications

Table 3 Technical specifications

Model	Mercury-40K	Mercury-50K	Mercury-60K
Low-Voltage DC Side			
Rated power	40kW	50kW	60kW
Rated current	120A	150A	180A
Rated voltage	350V	350V	350V
Maximum voltage	1,000 V	1,000 V	1,000 V
Voltage range	150-1000 V	150-1000 V	150-1000 V
Minimum voltage at full power	340V	340V	340V
Voltage requirements for the low-voltage side in step-down mode.	150V ≤ low-voltage side voltage ≤ (high-voltage side voltage - 30V), maximum 1000V		
Low-voltage side start-up voltage	150V	150V	150V
High-Voltage DC Side			
Rated power	40kW	50kW	60kW
Rated current	67A	83A	100A
Rated voltage	600V	600V	600V
Maximum voltage	1,000 V	1,000 V	1,000 V
Voltage range	350-1000 V	350-1000 V	350-1000 V
Full power voltage range	600-950 V	600-950 V	600-950 V
High-voltage side voltage requirements in step-up mode	1000V ≥ high-voltage side voltage ≥ (low-voltage side voltage +30V), minimum 350V		
High-voltage side start-up voltage	350V	350V	350V
Protection Features			
Reverse connection protection	Yes		
Fuse protection	Yes		
Overcurrent protection	Yes		
Overvoltage/undervoltage protection	Yes		
Overheat protection	Yes		
Low-voltage side short-circuit protection	Yes		
Over-voltage level	Type II		
Basic operating modes	Bi-directional constant power, bi-directional constant current, bi-directional constant voltage		
Forward and reverse switching time	Full-load switching time 30ms		
System Parameters			
Topology structure	Non-isolated		
Protection level	IP20		
Operating temperature	-30°C to +60°C (> 45°C derated)		
Humidity	< 95% (non-condensing)		
Maximum operating altitude	4,000m (derating when > 3,000m)		
Maximum efficiency	＞99％		
Cooling method	Intelligent forced air cooling		
Communication mode	RS485/CAN/Ethernet		
Display	LED		

Maximum parallel operation number	8
Mechanical Parameters	
Weight	25kg
Dimensions (H*W*D)	444mm*130mm*550mm (excluding terminals)
Installation method	Cabinet-style fixed installation (left and right mounting ears)
Standards	
Safety specifications	IEC62477-1
EMC	IEC 61000-6-2, IEC 61000-6-4

1.8 Operating Curves

Input voltage derating curve:

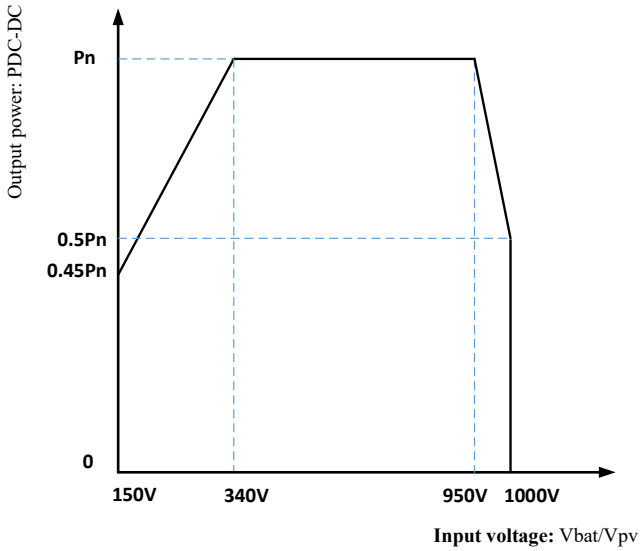


Figure 7 Input voltage-power derating curve

Output voltage derating curve:

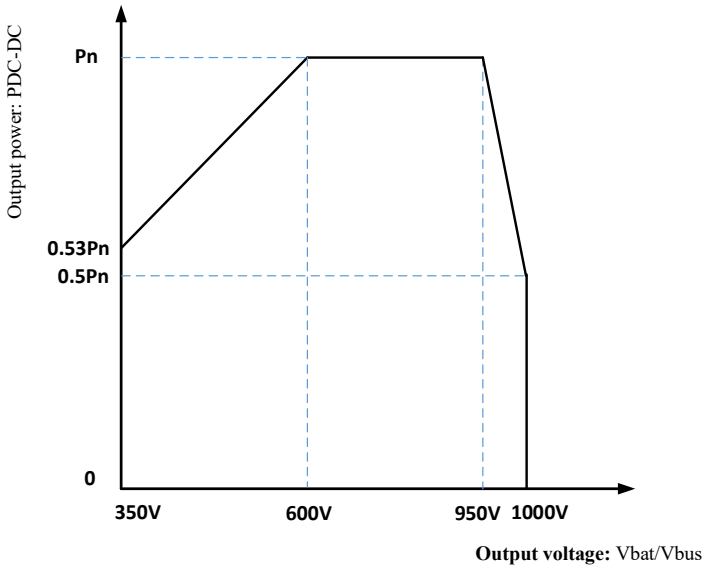


Figure 8 Output voltage-power derating curve

Ambient temperature derating curve:

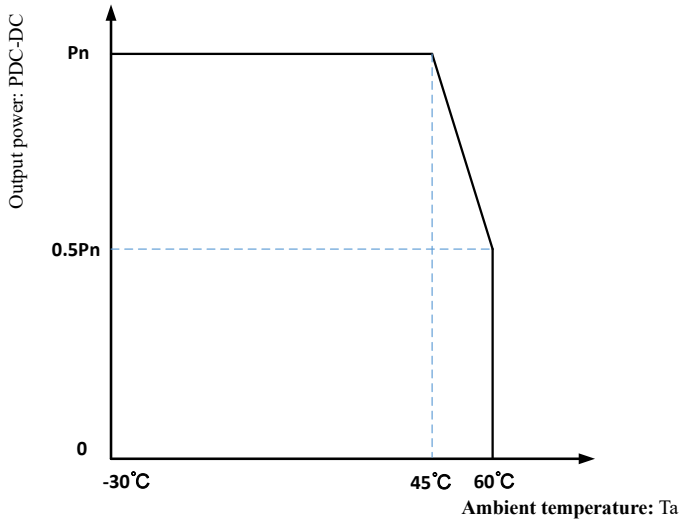
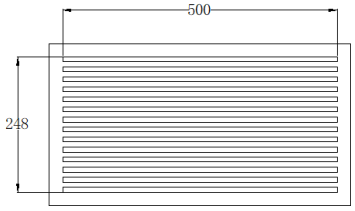


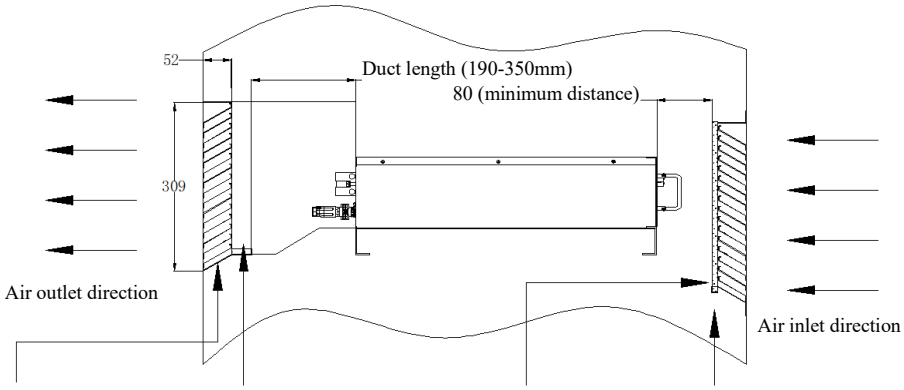
Figure 9 Ambient temperature-power derating curve

1.9 Fan Configuration of the Module Integrated System

The maximum air volume of a single DC-DC converter module is v=285CFM (8.1M^3/min). After the module is integrated into the system, the system cooling ventilation fan configuration satisfies the air volume of V=(1.5~2)*n*v, where n represents the number of DC-DC converter modules configured in the system.



Inlet and outlet louver size



Recommendations:
1. Use the outlet louver style
2. With 10-mesh insect-proof steel mesh

Recommendations:
1. Fan installation cover

Filter cotton
(40-50ppi density – polyurethane mesh foam – flame retardant)

Recommendations:
1. Use the inlet louver style
2. With 10-mesh insect-proof steel mesh

Side view of the DC/DC module inside the cabinet

Unit: mm

2 Unpacking and Handling

2.1 Unpacking

2.1.1 Precautions

Attention

- Converter packaging must not be removed during storage; remove only before installation.
- Upon receipt from transport company, carefully and thoroughly inspect the product.
- Check each item against the delivery note. Immediately notify the transport company if any items are missing or damaged.

2.1.2 Unpacking

Steps for unpacking:

1. Remove all ties, and open the carton.
2. Remove all packing fillers.
3. Take out the module, and remove packaging film and accessories.
4. Inspect and ensure no damage signs.

Dispose or recycle packaging according to local regulations.

2.1.3 Unpacking Inspection

After unpacking, the following must be inspected:

Table 4 Unpacking inspection items

No.	Check Item	Completion
1	No damage, scratches, dents on appearance.	□
2	All ordered items are complete.	□
3	Nameplate information matches the ordered product model.	□
4	Warning labels are intact, with no damage, scratches, or blurring.	□

2.2 Storage Precautions

Place the device in a ventilated, clean and dry space, and keep the temperature between -40°C and +60°C. The ambient temperature change should be less than 1°C/min. When the module is stored for a long period, it must be covered or appropriate measures must be taken to ensure the module is protected from contamination and environmental effects. For temporary and long-term storage after purchase, the following points should be noted:

Attention

- During storage, try to pack the product into the original packaging box.
- The equipment must not be left for extended periods in humid, high-temperature, or direct sunlight conditions.
- Long-term storage may lead to the degradation of electrolytic capacitors. Ensure the converter is powered on at least once within a year for at least 5 hours, and the input voltage should be slowly increased to the rated value using a voltage regulator.

2.3 Handling Precautions

- At least 2 people are required to handle the module. After holding the converter handle, move it to the appropriate position.
- During handling, keep the converter's vertical movement as low as possible.
- Avoid large amplitude shaking; ensure smooth handling of the equipment.
- Handle gently during lifting and lowering to avoid impact or vibration. Ensure the product is not stepped on.
- When moving, ensure the ground is level and free of sharp objects.

3 Mechanical Installation

3.1 Installation Environment Requirements

Table 5 Installation environment requirements

Item	Environmental Requirements
Installation site requirements:	This product is designed for cabinet installation and must be installed in the final system.
Pollution class	2. No conductive dust
Altitude	4000m (derating if above 3000m)
Temperature	-30°C to +60°C (derated above +45°C)
Humidity	0%-95% RH (non-condensing)

3.2 Installation Space Requirements

1. If there is a partition on the back of the converter's installation position, the partition must have an opening for the module's through-terminal (screw-fixed terminals and MC4 terminals), as shown in the following figure.

2. Ensure there is sufficient space for the power cable inside the cabinet.

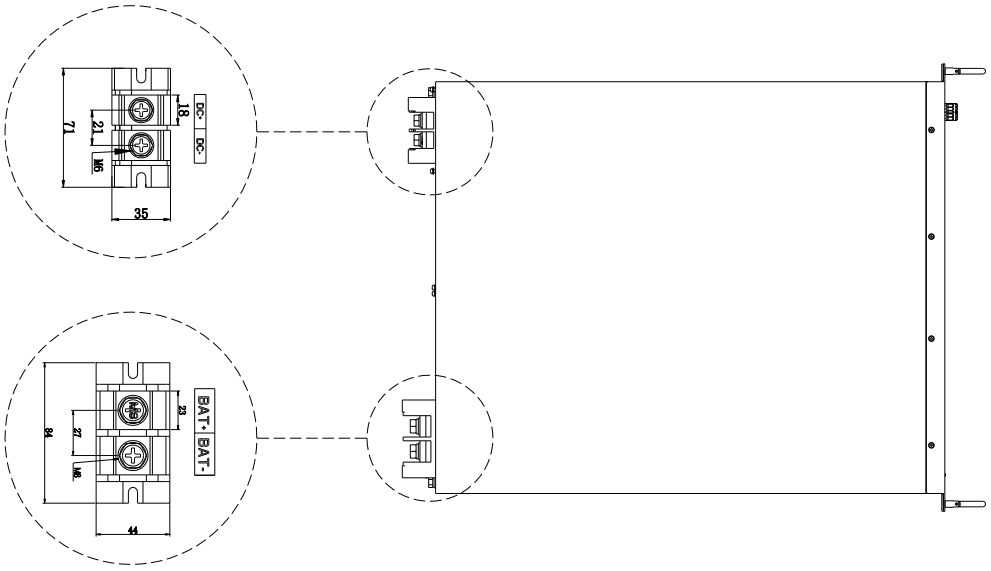


Figure 10 DC-DC module through-terminals

3.3 Installation Tool Requirements

Table 7 Installation tool requirements

Tool	How to Use
Fixed sleeve and wrench	A set of M8 & M6 sockets; the maximum torque must be greater than 45N·m
Screwdriver	Two Phillips screwdrivers (for M6 and M4 screws)
Automatic stripping machine	Strip the outer sheath of the cable
Steel tape measure	Measure the wire length
Crimping tool	Crimp the wire core to the cold-press terminal head.

3.4 Cable Preparation

Table 7 Cable specifications

Wiring Location	Voltage and Current	Terminal Specifications	Recommended Cable (Minimum)
DC+/DC-	1000V/90A	M6 OT through-terminal	13.5mm^2
BAT+/ BAT-	1000V/180A	M8 OT through-terminal	33.6mm^2
PE	-	M6 OT through-terminal	13.5mm^2
10-pin signal terminals	12V/1A	Pin spring terminal crimping terminal	0.5~1mm^2
SYNC1/SYNC2/CONS/BMS/EMS/PCS	-	RJ45 connector	Category 5e or Category 6 cable
ETH	-	RJ45 connector	Category 6e or Category 6 cable

3.5 Installing the Converter

Converter installation steps:

1. Grasp the handle of the converter with both hands, support the converter with both hands, and insert it into the corresponding position of the cabinet;
2. Gently push the converter completely into the slot;
3. Tighten the four fixing screws on the converter's front panel to secure it in the cabinet, with an installation torque of 6 N·m.
4. Follow the left-to-right or top-to-bottom sequence to install the converter into the cabinet.

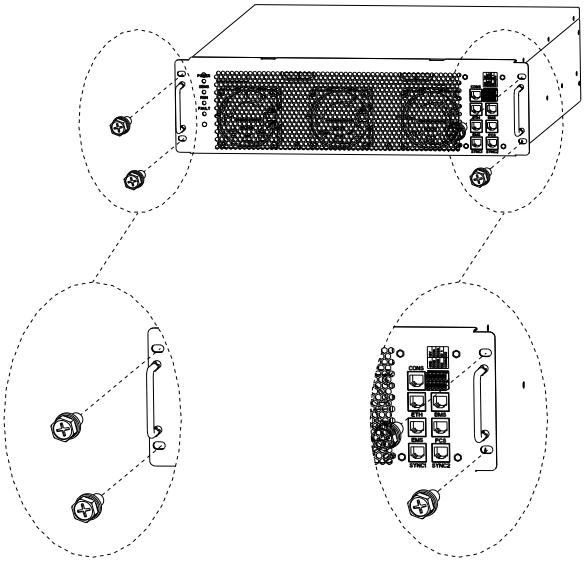


Figure 11 Installation

4 Electrical Installation

4.1 Wiring Check

For the safety of personnel, necessary safety measures must be in place when performing electrical installation on this product. The following procedures must be strictly followed during electrical installation:

- All power supplies connected to the converter must be disconnected to ensure the equipment is in an unpowered state.
- Warning signs must be left at the disconnection points to prevent re-powering during installation.
- If operating after de-energizing, wait 10 minutes or use relevant equipment to dissipate energy and ensure the converter is in an unpowered state before performing operations.
- Only qualified professionals can install the converter. Installation must strictly follow the instructions in the user manual.
- Installation personnel must comply with the electrical operation regulations of their country or region.
- Necessary grounding connections must be made.

4.2 Notes for Wiring

Danger

- Before installation, disconnect all switches from the external front-end equipment and ensure that all external cables and the converter's internal wiring are in an unpowered state.
- After the converter is powered off, wait 20 minutes naturally or use a discharge device to ensure the converter's internal components are in an unpowered state before continuing with operations.
- Live installation is prohibited.

4.3 Power Terminal Wiring

The module's backend has power terminals, as shown in the following figure.

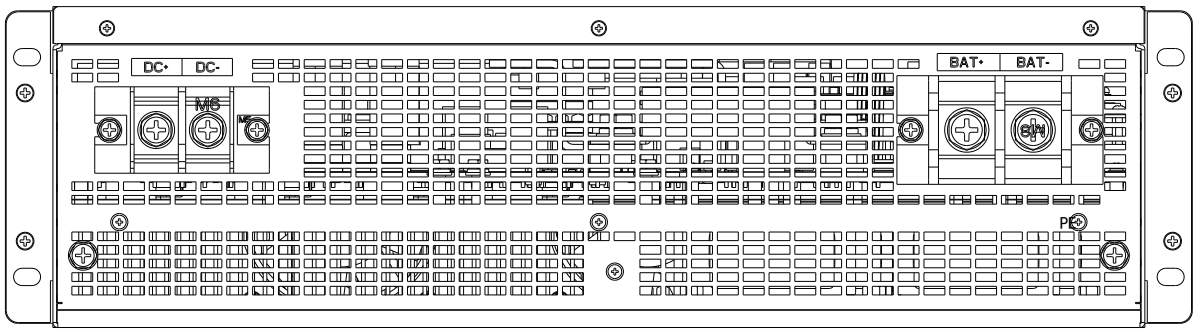


Figure 12 DC-DC module power terminal

Table 8 Power terminal definitions

Name	Function	Wiring Description
DC+	High-voltage positive terminal	Wiring needs to be done inside the cabinet, wire length < 3m
DC-	High-voltage negative terminal	Wiring needs to be done inside the cabinet, wire length < 3m
BAT+	Battery positive	
BAT-	Battery negative	
PE	Protective earth	

Attention

- DC-DC module connection to other voltage sources, ensure BAT port connects to the low-voltage side and DC port connects to the high-voltage side.

4.4 Signal Terminal Wiring

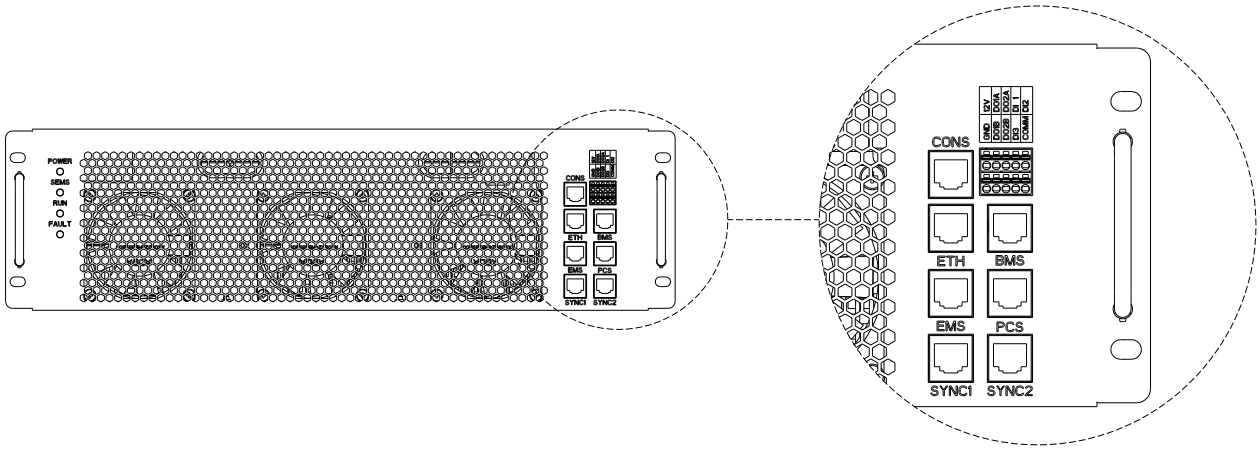


Figure 13 Signal terminals

Table 9 10pin signal terminal definitions

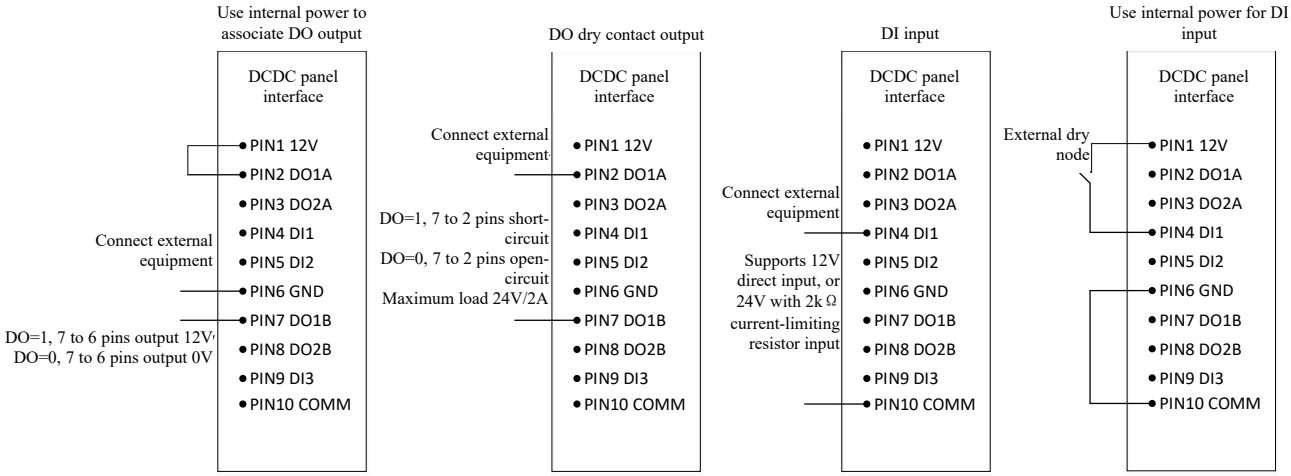
PIN	Signal Name	Purpose	Remarks
1	12V	Output 12V SELV power supply	Supports 12V & 0.5A output
2	DO1A	DO1A interface	Normally open dry contact DO output, forming a signal interface with DO1B
3	DO2A	DO2A interface	Normally open dry contact DO output, forming a signal interface with DO2B
4	DI1	DI1 input	Supports 12V & 0.3A input Default function: emergency stop
5	DI2	DI2 input	Supports 12V & 0.3A input
6	GND	Output 12V SELV power ground	
7	DO1B	DO1B interface	
8	DO2B	DO2B interface	

9	DI3	DI3 input	Supports 12V & 0.3A input
10	COMM	DI public port	DI1-DI3 common input interface

Table 10 RJ45 signal terminal definitions

Interface	Function	Description	Interface Definition
CONS	Debug interface	Connect to Smart Assistant	
ETH	Ethernet communication interface	Ethernet	
BMS	BMS communication interface	Supports RS485/CAN	Pin1_TX+: RS485A Pin2_TX-: RS485B Pin3_RX+: CANH Pin6_RX-: CANL
EMS	EMS communication interface	Support 485	Pin4_NC1: RS485A Pin5_NC2: RS485B
PCS	PCS communication interface	Support 485	Pin7_NC3: RS485A Pin8_NC4: RS485B
SYNC1	Multi-unit parallel synchronization signal	Daisy chain networking	
SYNC2	Multi-unit parallel synchronization signal		

Note 1: DIO wiring example diagram



Note: The standard RJ45 interface is defined as follows

Standard RJ45 plug definition:

Pin1_TX+: white orange

Pin2_TX-: orange

Pin3_RX+: white green

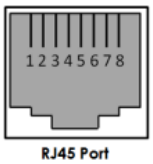
Pin4_NC1: blue

Pin5_NC2: white blue

Pin 6_RX-: Green

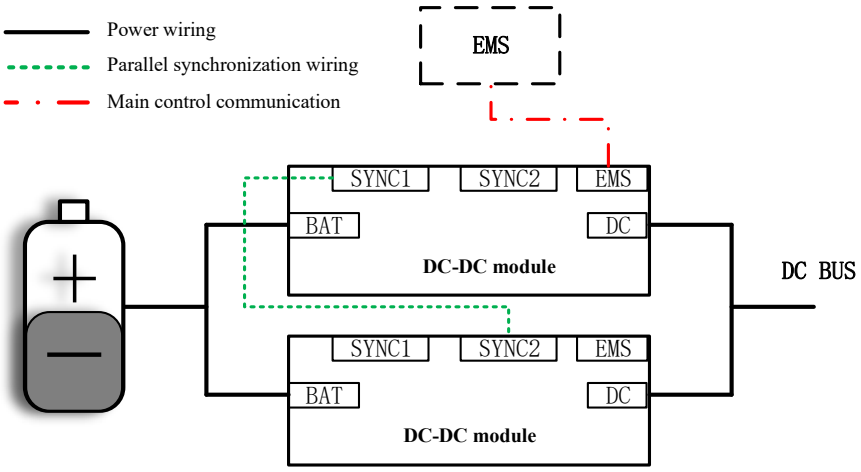
Pin7_NC3: white brown

Pin8_NC4: brown

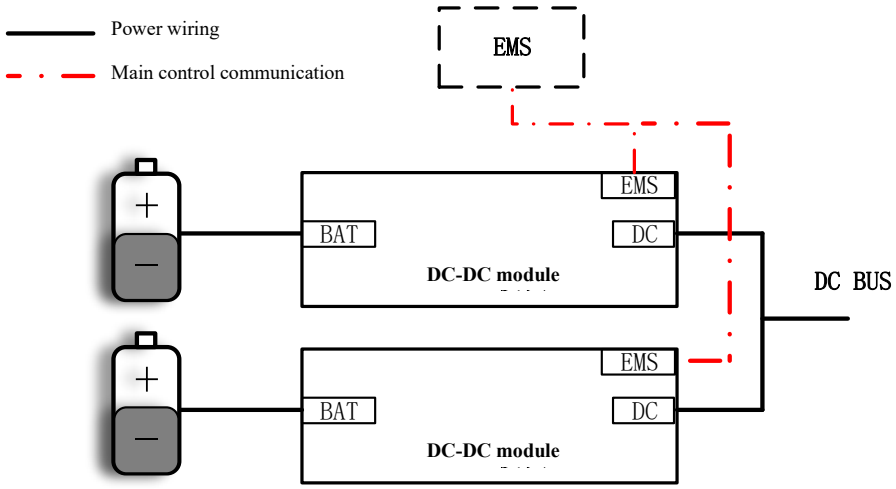


4.5 General System Communication Wiring Description

1. DC-DC module multi-machine parallel system reference wiring



2. DC-DC module multi-battery cluster system reference wiring



5 First Power-On and Operation

5.1 Power-On

Before power-on, check the external power supply is normal; after confirmation, proceed as follows:

1. Disconnect the converter's input power source. Disconnect the battery high-voltage box switch from the battery input machine.
2. Check the converter input/output power wiring, signal wiring, and communication wiring.
3. Turn on the converter's input DC power supply.
4. The converter has no faults and can be turned on by sending the "power on" command via EMS or smart assistant.

Notes:

- The converter must be powered on following the above startup procedure, or it may result in damage or improper operation.
- After powering on, the converter defaults to the shutdown status. When the low-voltage side input power is on, the converter's bus is energized, so caution is needed to prevent personal safety accidents.

5.2 Power-Off

5.2.1 Normal Shutdown

Normal shutdown steps for the converter:

1. Send the "shutdown" command via EMS or the smart assistant.
2. The converter automatically disconnects the internal high-voltage side switch.
3. The fan continues to run for 5 minutes to cool the converter.
4. Disconnect the external power switch of the converter.

Notes:

- After shutdown, wait 10 minutes before touching the converter.
- Place warning signs at disconnected switches to prevent accidental re-energizing.

5.2.2 Emergency Shutdown (Requires External Configuration)

In case of emergency, follow these steps to operate the converter:

1. Manually press the emergency stop button directly.
2. Disconnect the external power switch of the converter.

Notes:

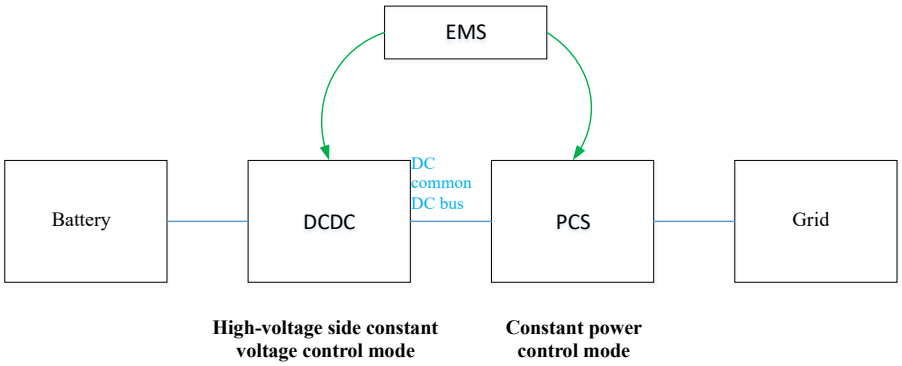
- Under normal circumstances, shutdown is carried out by sending a command via EMS.
- In emergencies, use emergency stop to ensure rapid response and protect equipment and personnel safety.
- After shutdown, wait 10 minutes before touching the DC-DC converter.
- Place warning signs at disconnected switches to prevent accidental re-energizing.

5.3 Application Precautions

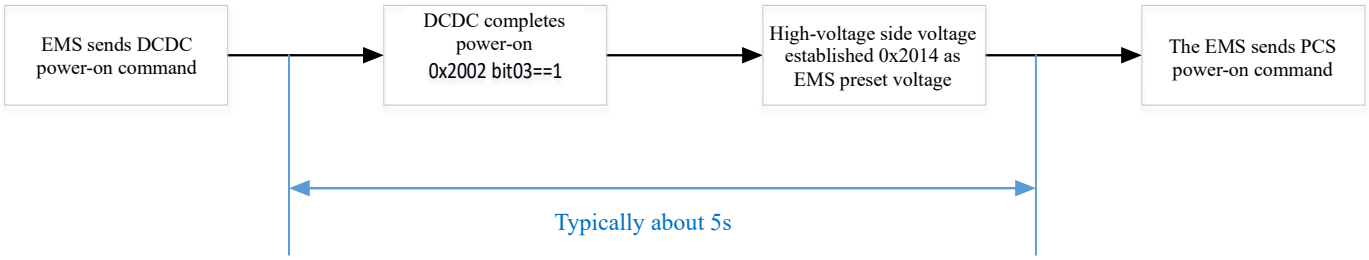
5.3.1 EMS Control Timing for the DC-DC+PCS Energy Storage System

1. Application mode ①

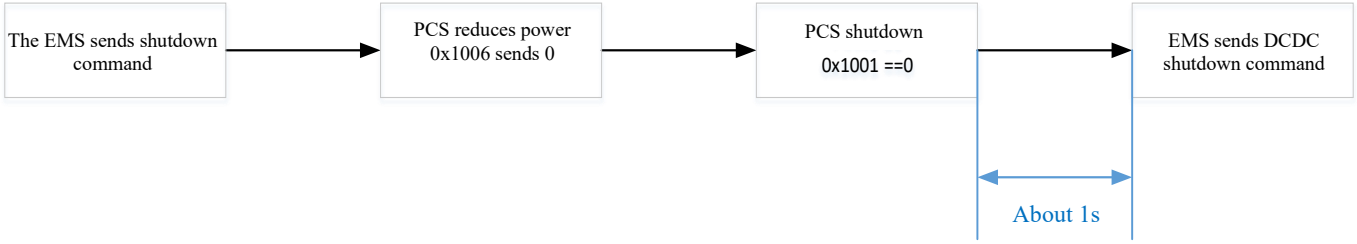
The DC-DC controls the DC common bus voltage, while the PCS controls the power.



Startup timing:

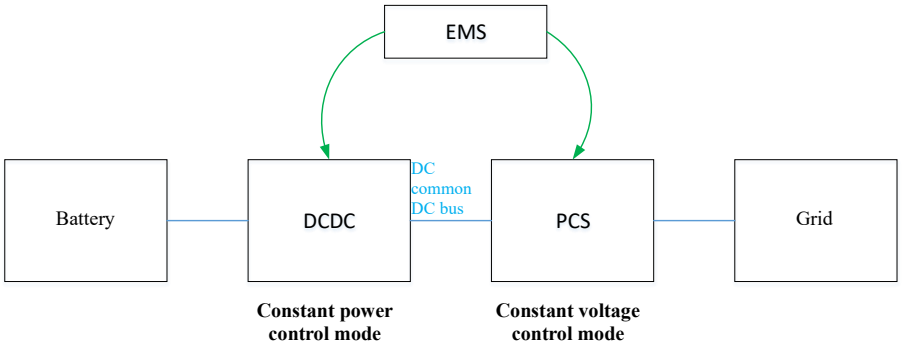


Shutdown timing:

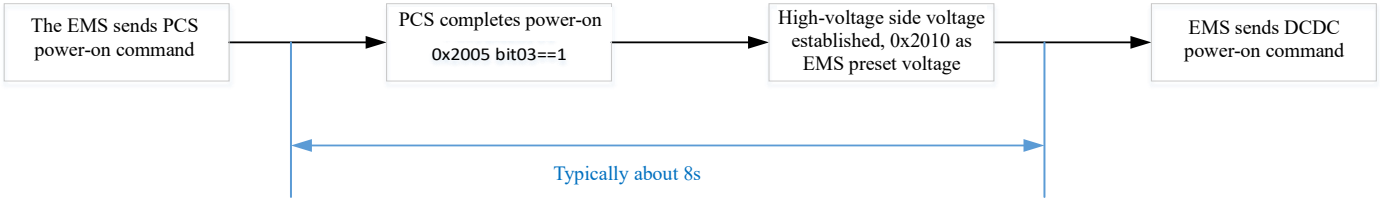


2. Application mode ②

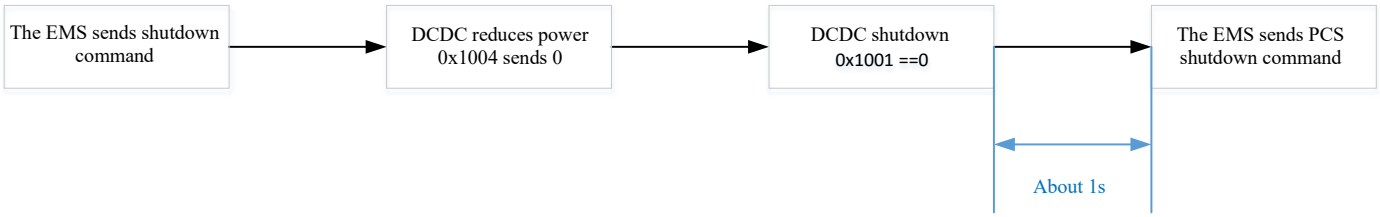
The DC-DC controls the power, while the PCS controls the DC common bus voltage.



Startup timing:



Shutdown timing:



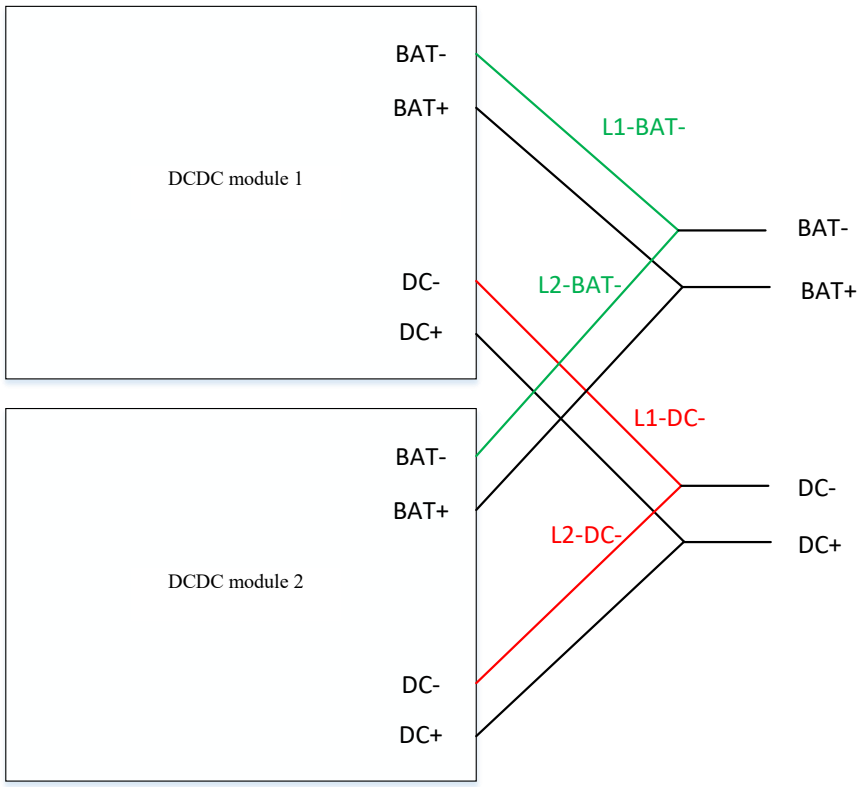
5.3.2 Ethernet Communication Interface and Communication Cable Precautions

The Ethernet communication interface is a panel ETH interface. The physical interface is RJ45, the communication type is Ethernet, and the cable requirement is Cat 6/Cat 6a (matching the same type of crystal head). For details, see section 4.4.

5.3.3 DC-DC Parallel External Cable Precautions

When the inputs and outputs of multiple DC-DC modules are connected together for parallel use, to prevent current imbalance due to negative current exchange after parallel connection, try to make the input ports BAT- cable lengths equal for different modules, and also make the output ports DC- cable lengths equal.

In the following figure, the length of L1-BAT- cable is equal to that of L2-BAT-, and the length of L1-DC- cable is equal to that of L2-DC-.



6 Maintenance and Troubleshooting

6.1 Routine Maintenance

Each time on-site maintenance is performed, a functional check of the converter should be done, mainly including:

1. Check the connecting cables;
2. Check the working status of the converter;
3. Check the operating mode switching of the converter
4. Check the indicator display status of the converter.

6.2 Fault List

The Mercury series converter has complete fault protection features. Once a fault occurs, it automatically shuts down, and the user can read the relevant fault information via EMS.

Users can perform preliminary self-checks of faults using the prompt information in the table below, observe fault phenomena, analyze causes, and attempt solutions. Note: During self-check faults, do not open the converter. If faults persist, please contact your sales channel or YUNT.

Fault reset methods are classified into automatic reset and manual reset:

- Automatic reset fault: After this type of fault occurs, the converter automatically resets after a certain period. If the fault condition is eliminated, the fault state is exited. If the fault condition still exists, the fault is reported again.
- Manual reset fault: After this type of fault occurs, once the fault condition is cleared, a manual reset is required via EMS to exit the fault state.

Table 11 Major faults

No.	Fault Name	Reset Method	Possible cause	Solution
1	Low-voltage side reverse connection fault	Automatic reset	Low-voltage side PV interface or battery interface positive and negative reversed	Update the wiring to the correct method
2	High-voltage side reverse connection fault	Automatic reset	High-voltage side interface positive and negative reversed	Update the wiring to the correct method
3	Low-voltage side over-voltage fault	Automatic reset	Low-voltage side voltage exceeding 1010V	Configure the correct input power source.
4	High-voltage side over-voltage fault	Automatic reset	High-voltage side voltage exceeding 1010V	Configure the correct input power source.
5	Low-voltage side under-voltage fault	Automatic reset	Low-voltage side voltage below 150V	Configure the correct input power source.
6	High-voltage side under-voltage fault	Automatic reset	Low-voltage side voltage exceeding 350V	Configure the correct input power source.
7	Low-voltage side over-	Automatic	Any single current of the low-voltage	Please contact manufacturer

	current fault	reset	side is too high	
8	High-voltage side over-current fault	Automatic reset	High-voltage side current too high	Please contact manufacturer
9	Low-voltage side short-circuit fault	Reset it manually.	Low-voltage side as output, hardware over-current fault triggered	Please contact manufacturer
10	Power module over-temperature	Automatic reset	Radiator temperature too high	Check if the cooling fan is damaged.
11	Low-voltage side voltage imbalance	Automatic reset	Low-voltage side parallel operation with poor voltage consistency among 4 routes	Please contact manufacturer
12	Low-voltage side current imbalance	Automatic reset	Low-voltage side parallel operation with poor current consistency among 4 routes	Please contact manufacturer
13	Grounding fault	Reset it manually.	System grounding impedance abnormal	Please contact manufacturer
14	Fan fault	Automatic reset	Cooling fan damaged	Please contact manufacturer

6.3 Quality Assurance

Precautions:

- Products should avoid dust and moisture penetration to prevent damage or impact on product functionality.
- Maintenance should be performed when the power is fully turned off, discharged, and with no electrical current.
- After installation, protective measures should be taken to prevent direct contact with live parts.
- Products should be used strictly within the proper operating parameters specified in the user manual to avoid abnormal equipment performance.
- After operation, periodically check the product's ventilation conditions and clean dust from the operating environment.
- Avoid operating the product in environments with corrosive gases or pollutants.

Liability exemption:

The quality guarantee does not apply in the following cases:

- Damage caused by impact or improper operation during transportation, handling, or installation.
- Incorrect installation or modification.
- Exceeding the usage conditions specified in the product manual, such as overvoltage, overcurrent, incorrect input sources, abnormal external load devices, high or low temperature, and corrosive environments.
- Abnormal equipment caused by disassembly, repair, modification, or research by non-company personnel.
- Damage caused by changing the product's default protection parameters or operating and configuring the product using non-company software.
- Damage caused by abnormal natural environments.

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