DUNEXT

PowerRack 0.5C Series

User Manual

V_1.0 Date 2024/12/04

Notice

This manual contains important safety instructions, installation, electrical connections, commissioning, maintenance, and troubleshooting of the equipment.

Save the manual!

This manual must be stored carefully and be available at all times.

Copyright Declaration

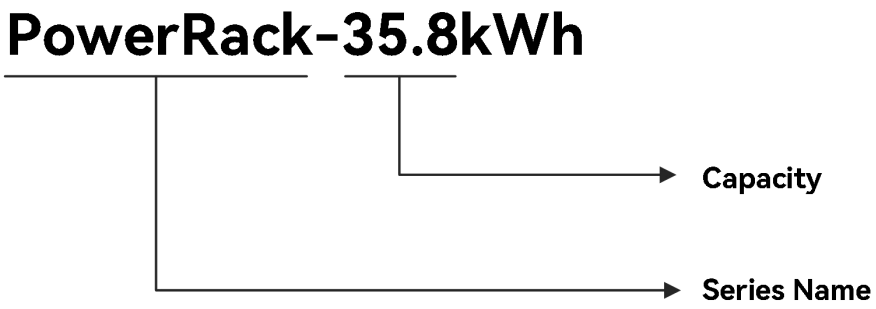
Content

About This Manual

Overview

Please read the product manual carefully before installation, operation, or maintenance of the PowerRack 0.5C Series . This manual contains important safety instructions and installation instructions that must be followed during installation and maintenance of the equipment.

Designation explanation of the PowerRack 0.5C Series:



No.	Meaning	Description
1	Series Name	PowerRack: In-door Rack-mounted Energy Storage System
2	Rated Power	35.8: Capacity is 35.8kWh 51.2: Capacity is 51.2kWh 56.32: Capacity is 56.32kWh

Intended Audience

This manual is intended for technical professionals for installation, commissioning and maintenance of the product. The technical personnel has to be familiar with the product, local standards, and electric systems.

Symbol Conventions

The following types of safety instructions and general information appear in this document as described below:

Symbol	Description
 DANGER!	'Danger' indicates a hazard with a high level of risk that, if not avoided, will result in death or serious injury.
 WARNING!	'Warning' indicates a hazard with a medium level of risk that, if not avoided, will result in death or serious injury.
 CAUTION!	'Caution' indicates a hazard with a low level of risk that, if not avoided, could result in minor or moderate injury.
NOTICE NOTICE!	'Notice' indicates a situation that, if not avoided, could result in equipment or property damage.
 NOTE!	'Note' provides tips that are valuable for the optimal operation of the product.

Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

Issue 01 (2024-09-11)

This issue is used for first application.

1 Safety Information

1.1 Safety Precautions

WARNING!

- Please do not put the battery into water or fire, in case of explosion or any other situation that might endanger your life.
- Please connect wires properly while installation, do not reverse connect.
- To avoid short circuit, please do not connect positive and negative poles with conductor on the same device.
- Please avoid any form of damage to battery, especially stab, hit, trample or strike.
- Please shut off the power completely when removing the device or reconnecting wires during the daily use or it could cause the danger of electric shock.
- Please use dry powder extinguisher to put out the flame when encountering a fire hazard, liquid extinguisher could result in the risk of explosion.
- For your safety, please do not arbitrarily dismantle any component in any circumstances. The maintenance must be implemented by authorized technical personnel or our company's technical support. Device breakdown due to unauthorized operation will not be covered under warranty.

CAUTION!

- The products have been strictly checked before shipment. Please contact us if you find any abnormal phenomena such as device outer case bulging.
- In order to ensure safety and normal use of the product, the equipment should be grounded properly before use.
- To assure the product normal operation, please make sure parameters among the relevant device are compatible and matched.
- Please do not mixed-use batteries from different manufacturers, different types and models, as well as old and new together.
- Ambient and storage method could impact the product life span, please comply with the operation environment instruction to ensure device works in proper condition.
- For long-term storage, the battery should be fully recharged once every 10 months.
- Please charge the battery in 18 hours after it fully discharged or over-discharging protection mode is activated.
- Formula of theoretical standby time: T=C/I (T is standby time, C is battery capacity, I is total current of all loads).

2 Product Description

2.1 Brief Introduction

PowerPack-5.12HV lithium iron phosphate battery system is a high voltage battery system unit, customers can choose a certain number of PowerPack-5.12HV according to their needs, by connecting series to form a PowerRack 0.5C Series, to meet the user's long-term power supply needs. The product is especially suitable for application scene of high power, limited installation space, long power backup time and long service life.

2.2 Product Properties

PowerPack-5.12HV energy storage product's positive electrode materials are lithium iron phosphate, battery cells are managed effectively by BMS with better performance, the system's features as below:

- Comply with European ROHS, Certified SGS, employ non-toxic, non-pollution environment-friendly battery.
- Anode materials are lithium iron phosphate (LiFePO4), safer with longer life span.
- Carries battery management system with better performance, possesses protection function like over-discharge, over-charge, over-current, abnormal temperature.
- Self-management on charging and discharging, Single core balancing function.
- Intelligent design configures integrated inspection module.
- Flexible configurations allow parallel of multi battery for longer standby time.
- Self-ventilation with lower system noise.

- Less battery self-discharge, then recharging period can be up to 10 months during the storage.
- No memory effect so that battery can be charged and discharged shallowly.
- With wide range of temperature for working environment, -10℃~ +55℃, circulation span and discharging performance are well under high temperature.
- Less volume, lighter weight.

2.3 Product Identity Definition

Battery Energy Storage System nameplate

Figure 2-1 Nameplate of PowerRack

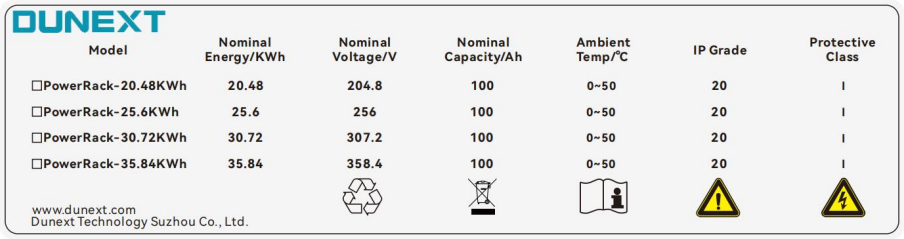


Figure 2-2 Nameplate of PowerRack

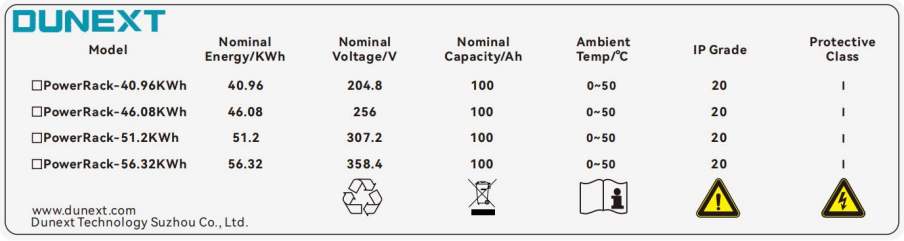


Figure 2-3 Nameplate of BDU-200

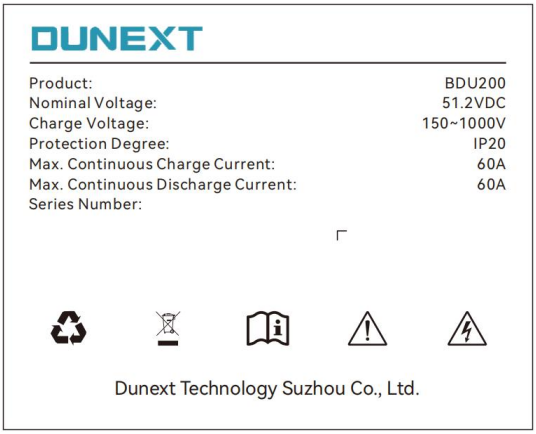
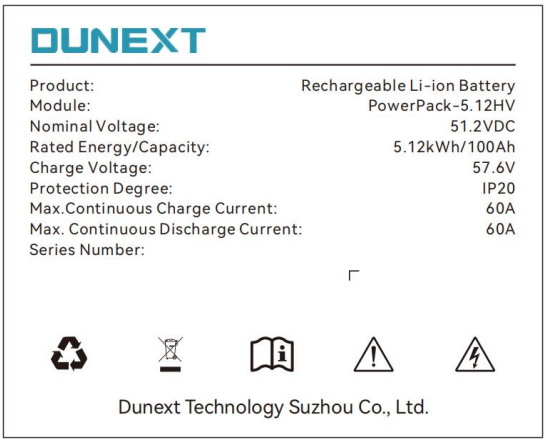


Figure 2-4 Nameplate of PowerPack-5.12HV



2.4 Explanation of Symbols

	Battery voltage is higher than safe voltage, direct contact with electric shock hazard.
	Be careful with your actions and be aware of the dangers.
	Read the user manual before using.

	The scrapped battery cannot be put into the garbage can and must be professionally recycled.
	After the battery life is terminated, the battery can continue to be used after it recycled by the professional recycling organization and do not discard it at will.
	Dangerous goods warning label on the side of the battery module

2.5 System Performance Parameter

Table 2-1 The parameter of PowerRack system-1

Item	PowerRack-20.48kWh	PowerRack-25.6kWh	PowerRack-30.72kWh	PowerRack-35.8kWh
Module Type	LFP	LFP	LFP	LFP
Nominal Voltage (V)	204.8V	256V	307.2V	358.4V
Work Voltage Range (V)	179.2~230.4	224~288	268.8~345.6	313.6~403.2
Module configuration	4 Series	5 Series	6 Series	7 Series
Nominal Energy (kWh)	20.48	25.6	30.72	35.84
Nominal Power (kW)	12.288	15.36	18.432	21.504
Max Power (kW)	20.48	25.6	30.72	35.84
Recommend Charging Current (A)	50	50	50	50
Recommend Discharge Current (A)	50	50	50	50
Max Discharging Current (A)	100	100	100	100
Peak Discharging Current [1min,25°C] (A)	125	125	125	125
Dimension(W*D*H) (mm)	601*610*1422	601*610*1422	601*610*1422	601*610*1422

Weight (kg)	237	290.5	344	397.5
Battery Module Name	PowerPack-5.12 HV	PowerPack-5.12 HV	PowerPack-5.12 HV	PowerPack-5.12 HV
Battery Module Quantity (pcs)	4	5	6	7

Table 2-2 The parameter of PowerRack system-2

Item	**PowerRack-40.96kWh**	**PowerRack-46.08kWh**	**PowerRack-51.2kWh**	**PowerRack-56.32kWh**
Module Type	LFP	LFP	LFP	LFP
Nominal Voltage (V)	409.6V	460.8V	512V	563.2V
Work Voltage Range (V)	358.4~460.8	403.2~518.4	448~576	492.8~633.6
Module configuration	8 Series	9 Series	10 Series	11 Series
Nominal Energy (kWh)	40.96	46.08	51.2	56.32
Nominal Power (kW)	24.576	27.648	30.72	33.792
Max Power (kW)	40.96	46.08	51.2	56.32
Recommend Charging Current (A)	50	50	50	50
Recommend Discharge Current (A)	50	50	50	50
Max Discharging Current (A)	100	100	100	100
Peak Discharging Current [1min,25℃] (A)	125	125	125	125
Dimension (W*D*H)(mm)	601*610*2062	601*610*2062	601*610*2062	601*610*2062
Weight (kg)	486	539.5	593	646.5
Battery Module Name	PowerPack-5.12 HV	PowerPack-5.12 HV	PowerPack-5.12 HV	PowerPack-5.12 HV
Battery Module Quantity (pcs)	8	9	10	11

Figure 2-5 PowerRack-56.32kWh

2.6 Battery Module

Table 2-3 Product parameter

Module Name	PowerPack-5.12HV
Cell Technology	Li-ion(LFP)
Battery Module Capacity (kWh)	5.12
Battery Module Voltage (Vdc)	51.2
Battery Module Capacity (Ah)	100
Battery Module Charge Voltage (Vdc)	57.6
Battery Module Charge Current [Normal] (A)	50
Battery Module Discharge Current [Normal] (A)	50
Max Discharging Current(A)	100
Peak Discharging Current[1min,25℃](A)	125
Dimension(W*D*H, mm)	481*535*140
Communication	CAN/RS485
Pollution Degree (PD)	I
IP Grade	IP20
Weight(kg)	43.5

2.7 Interface Definition

This section elaborates the interface functions of the front interface of the device.

Figure 2-6 The sketch of interface

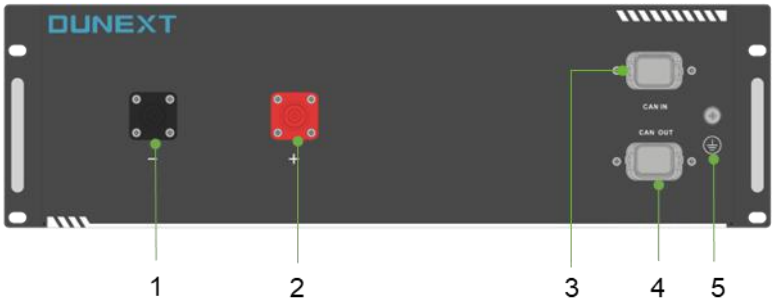


Table 2-4 Interface Definition

Item	Name	Definition
1	Negative socket	Battery output or Serial anode cable
2	Positive socket	Battery output or Serial anode cable
3	CAN IN	Quick plug communication port, connect to former module or BDU
4	CAN OUT	Quick plug communication port, connect to next module
5	Grounding	⏚ Shell ground connection

The interface of BDU-200

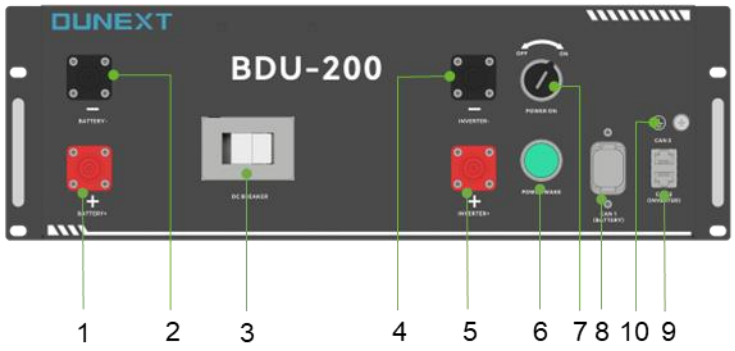


Table 2-5 Interface Definition

Position	Name	Description

1	Positive socket	Battery input cable
2	Negative socket	Battery input cable
3	DC Breaker	The master switch of the battery system，you must switch on it before switching on power on&power wake switch; Short circuit protection.
4	Negative socket	Battery output cable
5	Positive socket	Battery output cable
6	Power Wake Button	Long press this button to start the battery system
7	Power On switch	Turn on the switch to power the BMS system
8	CAN 1	Quick plug communication port between battery module and BDU
9	CAN 2	RJ45 communication port between the battery system and inverter
10	Grounding	Shell ground connection

Figure 2-7 CAN interface definition

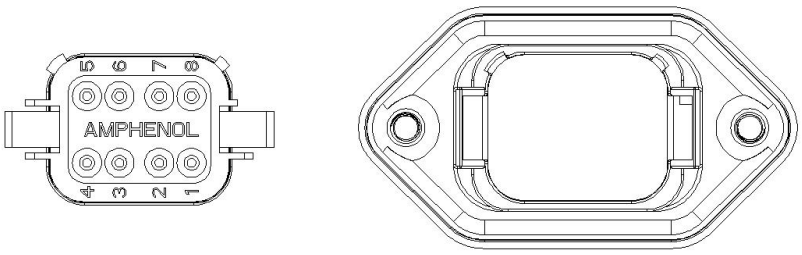


Table 2-6 BDU-200 CAN1 & Battery CANPin Definition

Foot position	Color	Definition
PIN1	Red	24V+
PIN2	Black	24V-
PIN3	White	SCANACC
PIN4	Blue	SWAKE
PIN5	Yellow	SCANH
PIN6	Green	SCANL
PIN7	Reserved	Reserved
PIN8	Reserved	Reserved

Figure 2-8 CAN interface definition

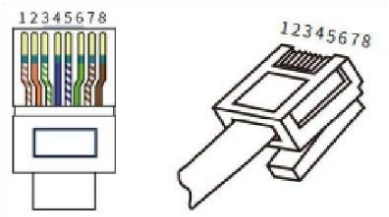


Table 2-7 BDU-200 CAN2 Pin Definition

Foot position	Color	Definition
PIN1	Orange/white	Reserve
PIN2	Orange	XGND
PIN3	Green/white	Reserve
PIN4	Blue	CANH
PIN5	Blue/white	CANL
PIN6	Green	CANIN
PIN7	Brown/white	CANOUT
PIN8	Brown	Reserve

2.8 Battery Management System (BMS)

Voltage Protection

Low Voltage Protection in Discharging:

When any battery cell voltage or total voltage is lower than the rated protection value during discharging, the over-discharging protection is activated. Then battery system stops supplying power to the outside. When the voltage of each cell back to rated return range, the protection is over.

Over Voltage Protection in Charging:

Battery will stops charging when total voltage or any battery cell voltage reaches the rated protection value during charging stage. When total voltage or all cell back to rated range, the protection is over.

Current Protection

Over Current Protection in Charging:

When the charge current is higher than the protection value, the system stops charging. Protection is released after rated time delaying or charging current released.

Over Current Protection in Discharging:

When the discharge current is higher than the protection value, the system stops discharging. Protection is released after rated time delaying or discharging current released.

Temperature Protection

Under/Over temperature protection in charging:

When battery's temperature is beyond range of 0℃ ~+55℃ during charging, temperature protection is activated, device stops charging.

The protection is over when temperature back to rated working range.

Low/Over temperature protection in discharging:

When battery's temperature is beyond range of -10℃ ~+55℃ during discharging, temperature protection is activated, device stops supplying power to the outside.

The protection is over when temperature back to rated working range.

 **CAUTION!**	Battery' s maximum discharging current should be more than load' s maximum working current.

3 Installation

3.1 Preparation for Installation

3.1.1 Safety Requirement

This system can only be installed by personnel who have been trained in the power supply system and have sufficient knowledge of the power system.

The safety regulations and local safety regulations listed below should always be followed during the installation.

All circuits connected to this power system with an external voltage of less than 48V must meet the SELV requirements defined in the IEC60950 standard.

If operating within the power system cabinet, make sure the power system is not charged. Battery devices should also be switched off.

Distribution cable wiring should be reasonable and has the protective measures to avoid touching these cables while operating power equipment.

when installing the battery system, must wear the protective items below:

The insulated gloves, safety goggles, safety shoes.

Figure 3-1 Protective tools

3.1.2 Environmental Requirements

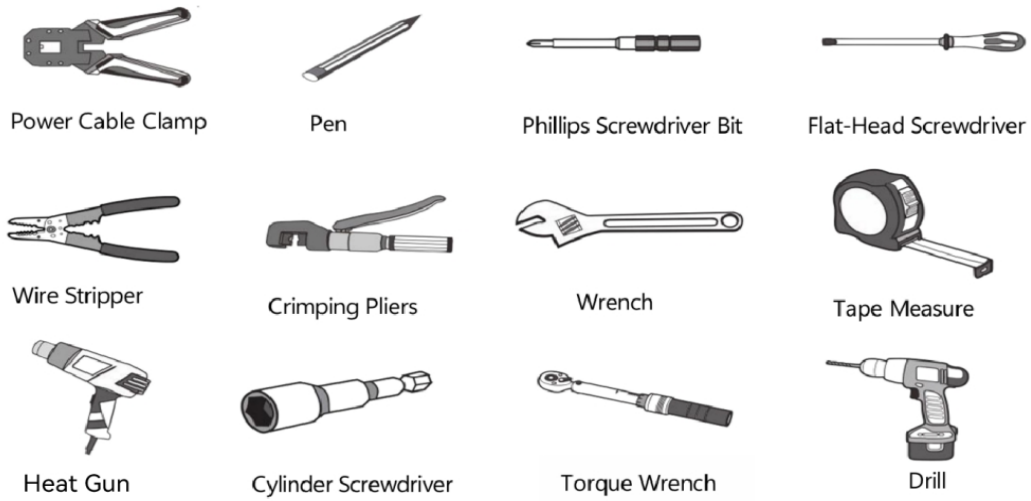
- Working temperature: -10℃ ~ +55℃
- Charging temperature range is 0℃ ~+55℃
- Discharging temperature range is -10℃ ~+55℃
- Storage temperature: 5℃~ +45℃
- Relative humidity: 5% ~ 85%RH
- Elevation: no more than 4000m
- Operating environment: Indoor installation, sites avoid the sun and no wind, no conductive dust and corrosive gas.

And the following conditions are met

- Installation location should be away from the sea to avoid brine and high humidity environment.
- The ground for product arrangement shall be flat and level.
- There is no flammable explosive materials near to the installation site.
- The optimal ambient temperature is 5℃ ~ 45℃
- Keep away from dust and messy zones.
- The installation site must be equipped with fire-extinguisher system for safety purpose.

3.1.3 Tools Needed

Figure 3-2 Installation Tools



3.1.4 Technical Preparation

Electrical interface check

- Devices that can be connected directly to the battery can be user equipment, power supplies, or other power supplies.
- Confirm whether the user's PV power generation equipment, power supply or other power supply equipment has a DC output interface, and measure whether the DC power output voltage meets the voltage range requirements in Table 2-1 and Table2-2.
- Confirm that the maximum discharge current capability of the DC power interface of the user's photovoltaic power generation equipment, power supply or other power supply equipment should be higher than the maximum charging current of the products used in Table 2-1and Table2-2.
- Verify that the maximum operating current of the battery-powered user equipment (inverter DC input) should be less than the maximum discharge current of the products used in Table 2-1andTable2-2.

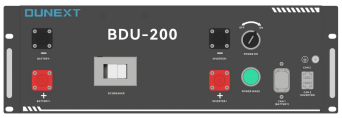
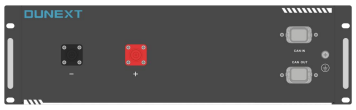
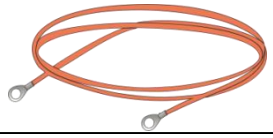
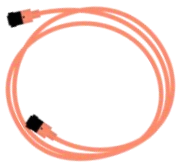
The security check

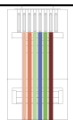
- Firefighting equipment should be provided near the product, such as portable dry powder fire extinguisher.
- Automatic fire fighting system shall be provided for the case where necessary.
- No flammable, explosive and other dangerous materials are placed beside the battery.

3.2 Unpacking Inspection

- When the equipment arrives at the installation site, loading and unloading should be carried out according to the rules and regulations, to prevent from being exposed to sun and rain.
- Before unpacking, the total number of packages shall be indicated according to the shipping list attached to each package, and the case shall be checked for good condition.
- In the process of unpacking, handle with care and protect the surface coating of the object.
- Open the package, the installation personnel should read the technical documents, verify the list, according to the configuration table and packing list, ensure objects are complete and intact, if the internal packing is damaged, should be examined and recorded in detail.

Table 3-1 Packing list of PowerRack-56.32kWh

Item	Specification	Quantity	
BDU-200	51V/100Ah 480×535×133mm	1	
Battery-PowerPack-5.12HV	480×410×155mm	11	
Power cable-positive	Red /35mm²/L3000mm	1	
Power cable-negative	Black /35mm²/L3000mm	1	
Serial cable	Orange /35mm²/L215mm	10	
Module cable-positive	Orange /35mm²/L215mm	1	
Module cable-negative	Orange /35mm²/L2200mm	1	
Communication parallel cable	Quick plug communication port	11	
Communication cable-to inverter	Black /L3000mm /Double RJ45 plug	1	
OT terminal	OT4-6	2	

User Manual	PowerRack 0.5C Series User manual	1	
Screw	Combination screws M6*14	48	
CAN resistor	120Ω	1	

3.2.1 Engineering Coordination

Attention should be paid to the following items before construction:

- Power line specification.
- The power line specification shall meet the requirements of maximum discharge current for each product.
- Mounting space and bearing capacity.
- Make sure that the battery has enough room to install, and that the battery rack and bracket have enough load capacity.
- Wiring.
- Make sure the power line and ground wire are reasonable. Not easy to short-circuit, water and corrosion.

3.3 Equipment Installation

Table 3-2 Packing list of PowerRack 0.5C Series

Step1 Mechanical installation
1. Battery placement position determination 2. Battery module installation 3. BDU installation
Step2 Electrical installation
1. Ground cable installation 2. Battery module serial cable installation 3. Connect the module cable-positive from the battery "+" to the BDU "+" 4. Connect the module cable-negative from the battery "-" to the BDU "-" 5. Connect the CAN 1 of the BDU with the CAN IN of the battery module with the communication parallel cable, then connect the CAN OUT of the previous battery module with the CAN IN of the next battery module in turn.
Step3 Battery system self-test
1. Turn the BDU 'DC Breaker' ON/OFF switch to the "ON" state 2. Turn the 'Power ON' ON/OFF switch to the "ON" state 3. Press 'POWER WAKE' button 10S to wake up battery 4. Check the system output voltage and 'POWER WAKE' led status 5. Shut down the system
Step4 Connecting inverter
1. Connect total positive & total negative cable of the battery system to the inverter 2. Connect the communication cable from the master CAN 2 to the inverter 3. Close the DC breaker 4. Turn on the 'Power ON' switch , wake up system by 'POWER WAKE' button 5. Turn on the inverter and check the communication between inverter and battery system

3.3.1 Installation Preparation

1. Make sure the environment is meeting all technical requirements: "Environmental requirements"
2. Prepare equipment and tools for installation.
3. Confirm that the DC breaker is in the OFF state to ensure that it is no live operation.

3.3.2 Mechanical Installation

Installation method:

1. Place the PowerPack-5.12HV unit on the rack bracket as shown in the figure and push the device into the rack at the installation position. (The rack structure in the figure is for reference only)

2. Secure the PowerPack-5.12HV unit to the rack with a nut through the mounting holes top on the hanging ears of the PowerPack-5.12HV unit.

3. Insert the second one PowerPack-5.12HV in to the rack.

4. Stack the required number of battery and BDU as described above, and use 4 screws to fix the battery and BDU on the front bracket.

3.3.3 Electrical Installation

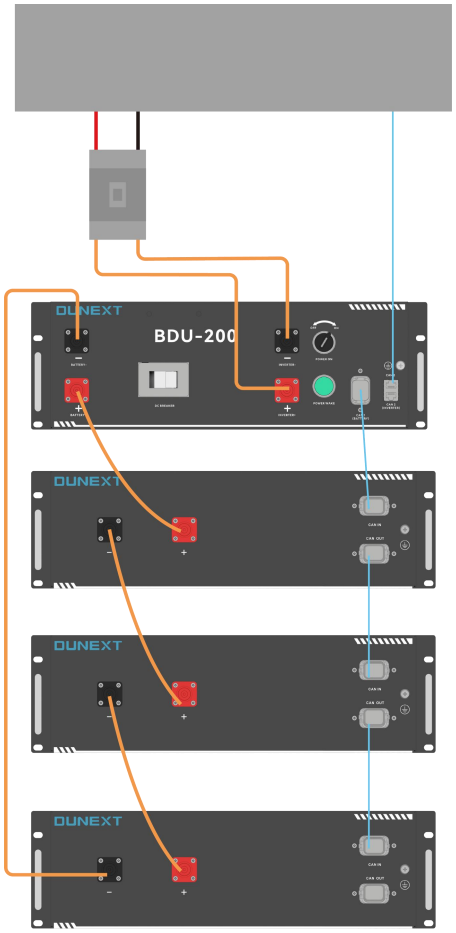
Power cable installation

Before connecting the power cables, use multimeter to measure cable continuity, short circuit, confirm positive and negative, and accurately mark the cable labels.

Measuring methods:

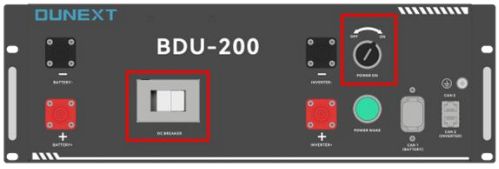
- Power cable check: select the buzzer mode of multimeter and detect the both ends of the same color cable. If the buzzer calls, it means the cable is in good condition.
- Short circuit judgment: choose multimeter resistor file, probe the same end of positive and negative pole, if the resistor shows infinity, means that the cable is available.
- After visual testing of power line connection, the positive and negative poles of the battery shall be connected respectively to the positive and negative poles of the opposite terminal.

It is better to add a circuit breaker between the inverter and the battery system.

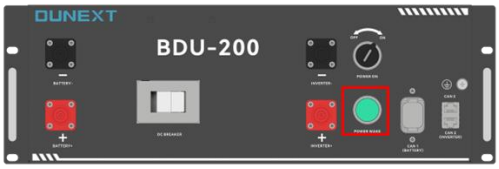


3.3.4 Battery System Self-test

- Switch the DC BREAKER of BDU to the "ON" state
- Switch on the "POWER ON" switch



- Press the "POWER WAKE" button for about 10S. The system start-up.

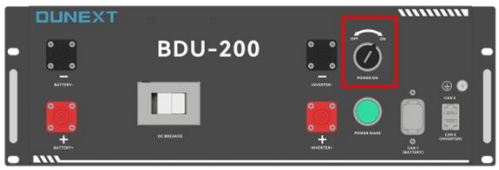


- Use a multimeter to measure the output voltage on the positive and negative ports of the BDU. Confirm the voltage is within the normal range
- The output voltage should conform to the voltage range in the table "Table 2-1/2 The parameter of PowerRack 0.5C Series". Otherwise, the system will be not working properly.

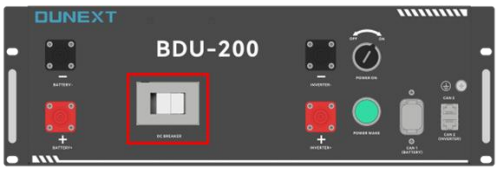
DANGER!	The voltage of the battery is too high, please pay attention to do self-protection during the measurement.

Shut down the system

1. Switch off the "POWER ON" switch.



2. Switch the BDU "DC BREAKER" to the "OFF" state.

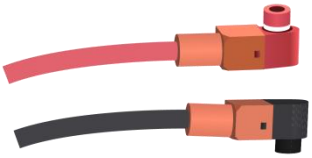


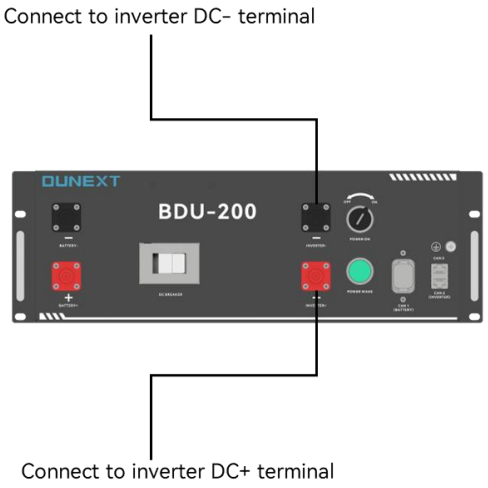
CAUTION!	A external DC Breaker that operates both positive and negative conductors simultaneously between the BDU and inverter on the power cable is recommended. After waking up the BDU and ensure that the BDU is pre-charged, you can turn on it.

3.3.5 Connecting Inverter

DANGER!	Please confirm that the battery system is in the off state before connecting. It may cause electric shock to personnel and damage to the inverter if connect the battery directly without power off. Connect the positive and negative connectors with the positive and negative power lines together. Both ends must have connectors, and the connector on the inverter side is provided by the inverter. If that 2m power cable is not long enough, please find another power cable of the same specification, the length cannot be longer than 3m.

- Connect External Power Cable to the inverter;





- Connect the INVERTER-CAN communication cable to the inverter RJ45 CAN port.

Symbol	Description
 WARNING!	Double check all the power cables and communication cable. Make sure the voltage of the Inverter is in the same level with the battery system. Switch on the inverter, to make sure all the power equipment can work normally.

4 Maintenance

4.1 Trouble Shooting

DANGER!	The PowerRack 0.5C Series battery system is a high voltage DC system, operated by professional and authorized person only. Before check the failure, must check all the cables connection. Switches are right or not (refer to section Battery "system self-test"), and if the battery system can be woken up normally.

Table 4-1 Trouble shooting guide

NO.	Problem	Possible Reason	Solution
1	The battery has no voltage output, and "POWER ON"/ "POWER WAKE" Light is off.	The DC breaker of the BDU didn't be turned on	Turn on the DC breaker of BDU
2		The "POWER ON" switch of the BDU box was not switched on	Switch on the "POWER ON" button
3		Battery is in sleep state.	Long press the "POWER WAKE" button for about 10S
4		Battery gets into over-discharged protection	Charge the battery to relieve the protection state
5	The battery has no voltage output, but "POWER ON"/	The relay in BDU is faulty	Replace a new BDU directly

	"POWER WAKE" are on		
6	When the battery is connected to the inverter, the DC breaker trips automatically	The circuit between the battery and the inverter has a short circuit point	Check whether there is a short circuit in the circuit between the battery and the inverter; Check if the inverter is faulty
7	Communication failure between battery and inverter	The wrong battery model type is selected on the inverter	Select correct battery model type on the inverter

4.2 Replacement of Main Component

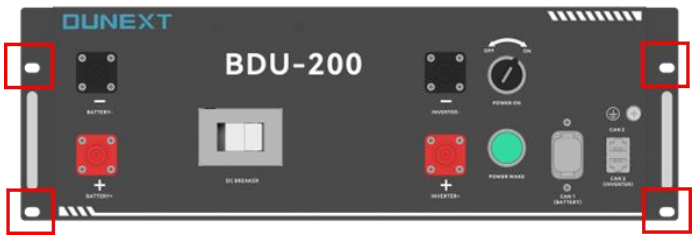
DANGER!	The PowerRack 0.5C Series battery system is a high voltage DC system, only can be operated by professional and authorized person. The maintenance of battery only can be operated by professional and authorized person. You need turn off the battery system firstly when you do some maintenance items.

Replacement of Battery Controller (BDU-200)

Turn off the whole battery system. Ensure the Negative terminal and Positive terminal have no power.

Remove the four screws on the BDU-200 and remove the BDU-200 from the system.

Change a new BDU-200. Then fix four screws.



Voltage Inspection:

[Periodical Maintenance] Check the voltage of battery system through the monitor software. Check whether the system voltage is normal or not. For example: Check Single cell's voltage is out of rated range or not.

Voltage Inspection:

[Periodical Maintenance] Check the SOC of battery system through the monitor software. Check the SOC of battery string is normal or not.

Cables Inspection:

[Periodical Maintenance]Visual inspect all the cables of battery system. Check the cables have broken, aging, getting loose or not.

Balancing:

[Periodical Maintenance] The battery system will become unbalanced if have not be charged fully for a long time. Solution: Preform the balancing maintenance (fully charged)every 10 month. Generally, this maintenance progress needs to be completed when external devices such as the monitor software and battery and inverter are in good communication.

Output Relay Inspection:

[Periodical Maintenance] Under low load condition (low current), control the output relay OFF and ON to hear the relay has click voice, that's mean this relay can off and on normally.

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