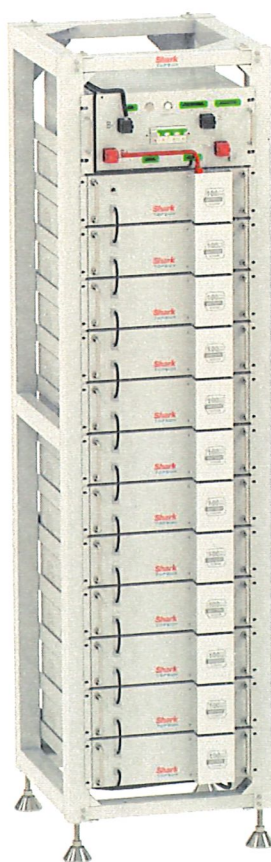




User Manual

High voltage energy storage battery



02.08.01.1812

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2024.12.9

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Version: V1.1

Attention:

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limitation of liability:

the manufacturer of the equipment

Equipment manufacturers are not directly responsible for damage to the battery system or for loss of property damage to the battery system or loss of property caused by the following circumstances:

- Without the authorisation of the equipment manufacturer, the battery system has been modified or replaced.
- None of the technicians of equipment manufacturers change or delete the serial number of the battery system.
- The design and installation of systems consisting of equipment does not comply with standards, safety and protection
- Regulations and other relevant requirements.
- Damage to equipment caused by failure to comply with the requirements of the power system manual.
- Damage to equipment caused by improper use or misuse of battery system.
- Damage to equipment caused by insufficient ventilation of the battery system.
- Battery system maintenance procedures did not meet acceptable standards.
- Damage to equipment caused by force majeure, such as earthquakes, storms, lightning, surges, fires, etc.

Preface

Overview

This document describes product introduction, component introduction, system maintenance and related technical indicators of lithium-ion batteries.

maintenance and related technical indicators of lithium-ion batteries.

The images contained in this document are for reference only, while the specific structure is subject to the actual object.








Intended Audience

This document is intended for:

Only applicable to professionals who are familiar with local regulations, standards, and electrical systems, have received professional training, and are familiar with the relevant knowledge of this produc.

Symbol Description

The symbols may appear in this document, and they represent the following meanings.

Symbol	Description
	Warning! Failure to follow the warning signs in this manual may result in personal injury
	High voltage electricity will be generated during equipment operation, and avoid touching during operation
	The equipment should be placed in the correct place and recycled in accordance with local environmental regulations.
	The equipment cannot be treated as garbage disposal. Please dispose of the equipment in accordance with local laws and regulations, or send it back to the equipment manufacturer.
	CE certification mark
	Protective grounding sign, used to indicate the connection position of the protective grounding wire.
	Please refer to the operating instructions

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Safety instructions



DANGER

- ◆ The battery will generate a high voltage during operation. Before operating the equipment of the plant, turn off the power supply to avoid hazards and carefully follow all precautions and safety signals given on the equipment in this manual.
- ◆ Only professional personnel are allowed to operate the battery system. Professional personnel should be familiar with local regulations, standards, and electrical systems, have received professional training, and be familiar with the relevant knowledge of this product.
- ◆ If the battery or control box has obvious defects, damage, or missing, do not use it.
- ◆ Do not disassemble or modify any part of the battery or control box without official authorization from the equipment manufacturer.
- ◆ Battery damage may result in leakage of conductive electrolyte. If the electrolyte leaks, do not come into contact with the leaked electrolyte or volatile gas, and immediately contact the after-sales service center for assistance.



WARNING

If you accidentally come into contact with leaked substances, please perform the following actions:

- ◆ Inhalation of leaked substances: Evacuate from the contaminated area and seek medical assistance immediately.
- ◆ Eye contact: Rinse with water for at least 15 minutes and seek medical assistance immediately.
- ◆ Skin contact: Thoroughly wash the contact area with soap and water, and seek medical assistance immediately.
- ◆ Ingestion: Induce vomiting and seek medical assistance immediately.
- ◆ If you need to replace or add batteries, please contact the after-sales service center.



CAUTION

Transportation:

- Ensure that the battery system is not damaged during transportation and storage.
- When lifting the battery, be careful and consider its weight.
- Gloves are required when handling batteries.
- Do not hit, pull, drag or step on the device, and do not put unrelated items into any part of the battery module.
- Transportation must be carried out by trained professionals and the operations during the process must be recorded.
- Ensure that the equipment is placed firmly and not tilted, as tilting the equipment may cause damage to the equipment and personal injury.

- Please ensure that there are carbon dioxide, Novac1230, or FM-200 fire extinguishers near the equipment.
- When extinguishing a fire, please use a recommended material fire extinguisher, and do not use water or ABC dry powder fire extinguishers for extinguishing the fire; Firefighters must wear protective clothing and self-contained breathing apparatus.
- When the ambient temperature exceeds 150 °C, there is a risk of explosion in the battery.
- When installing and maintaining heavy equipment, please use appropriate tools and take protective measures. Improper operation can cause personal injury.
- When performing high-voltage operations, please use special insulation tools.
- The use of cables in high-temperature environments may cause aging and damage to the insulation layer, and the distance between the cable and the periphery of the heating device or heat source area should be at least 30mm.
- Similar cables should be tied together, and different types of cables should be laid at least 30mm apart. It is prohibited to wrap or cross lay each other.

Abuse of Operation

The following abuse of operation should be avoided.

Abuse of Operation	Protection Description
Reverse connection	If the battery power cables are reversely connected, the battery will not start and stays in hibernation mode. If you forcibly press the MANUAL ON/OFF button or the activation terminal to activate the battery, a protection alarm will be reported and the ALM indicator is on.
External short circuit	If the battery loop is short-circuited, the battery protection will be triggered and the battery cannot be charged or discharged. Long-time frequent short circuiting can result in cell or board faults, which may cause risks such as fire.
Series connection	The battery cannot be connected in series. If the batteries are connected in series forcibly, its protection will be triggered. Operations outside the protection range will result in board or battery damage and battery protection failure, which may cause risks such as fire.

Gas Composition

The battery is an enclosed battery system and will not release any gases under normal operations. If the battery is severely misused, for example, in case of being burned or thunderstruck, the battery may be damaged, resulting in electrolyte leakage. Because the electrolyte is of organic carbonate nature, it may produce CO₂, CO, and N₂ after being burned.

1 Product Introduction

1.1 Product Description

This article mainly elaborates on the product introduction, application cases, installation, debugging, maintenance, and technical parameters of rack mounted energy storage batteries.

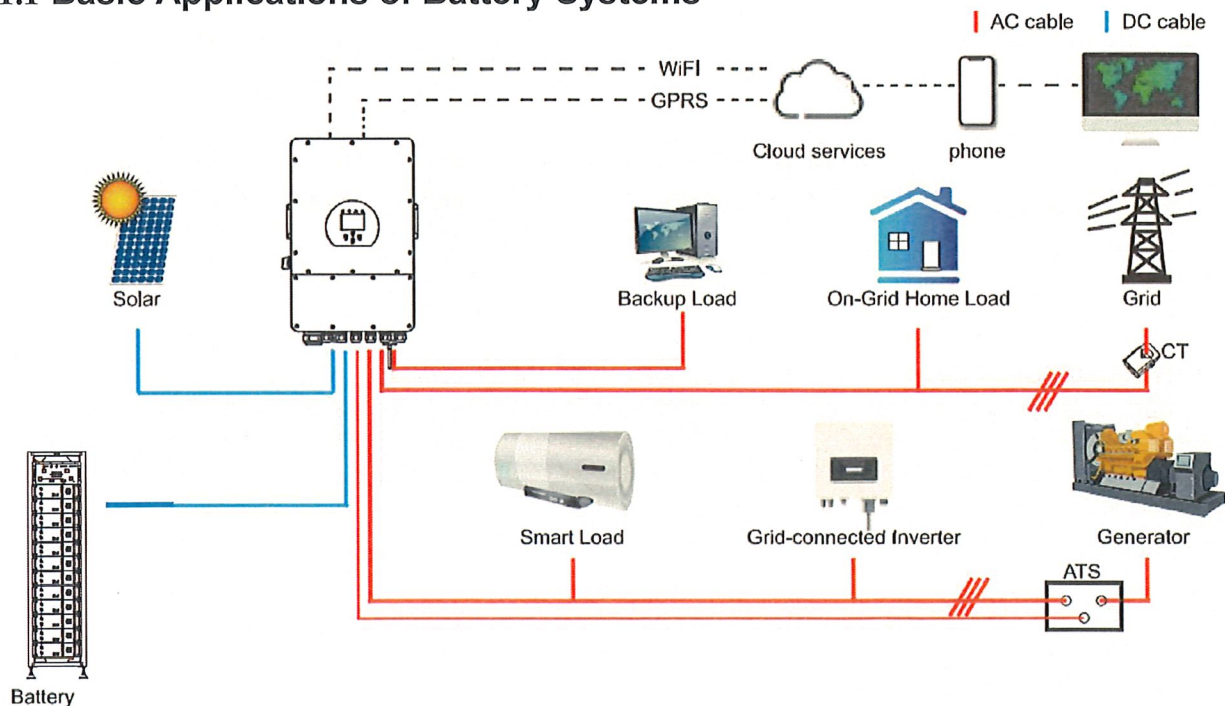
Energy storage batteries are mainly composed of PDU main control boxes and slave batteries

HERO RACK product specifications are as follows

Model	System energy (kWh)	Composition
HERO RACK	20	RACK-512100*4+PDU 750V100A*1
	25	RACK-512100*5+PDU 750V100A*1
	30	RACK-512100*6+PDU 750V100A*1
	35	RACK-512100*7+PDU 750V100A*1
	40	RACK-512100*8+PDU 750V100A*1
	45	RACK-512100*9+PDU 750V100A*1
	50	RACK-512100*10+PDU 750V100A*1
	55	RACK-512100*11+PDU 750V100A*1
	60	RACK-512100*12+PDU 750V100A*1

Note: This energy storage battery cluster can have up to 5 clusters connected in parallel on the DC side

1.1.1 Basic Applications of Battery Systems



1.2 Correct use of energy storage batteries

- ◆ The battery energy storage system can only be installed and operated in an enclosed space. The working environment temperature range of HERO RACK is -20°C~55°C, and the maximum humidity is 85%. The battery module shall not be exposed to the sun or placed directly beside the heat source.
- ◆ The battery module shall not be exposed to a corrosive environment.
- ◆ When installing the battery energy storage system, ensure that it stands on a sufficiently dry and flat surface with sufficient bearing capacity. Without the manufacturer's written approval, the installation site's altitude shall not be higher than 2,000 meters. The output power of the battery decreases with the altitude.
- ◆ The battery energy storage system must be installed in a fireproof room. This room must have no fire source and must be equipped with an independent fire alarm device, which complies with local applicable regulations and standards. According to local applicable regulations and standards, the room must be separated by the T60 fire door. Similar fire-proof requirements apply to other openings in the room (such as windows).

Do not use this energy storage battery system in the following situations:

- Applied to medical devices
- Applied to UPS system
- Mobile use on land or in the air

2 Installation

2.1 Storage environment

If the device is not installed and used immediately, please verify that the storage environment meets the following conditions:

- The equipment should be packaged in a packaging box and sealed with desiccant placed inside.
- If the installation is not carried out within 3 days after opening, it is recommended to store the equipment in the packaging box.
- Storage SOC: 25%~50% SOC, charging and discharging cycles are required every 3 months of storage.
- Storage temperature range: Store at -20 °C~45 °C for no more than 1 month; Store at 0-35 °C for no more than 1 year.
- Humidity range: 0-95% without condensation. The battery interface cannot be installed when there is moisture condensation.
- The equipment should be stored in a cool place, avoiding direct sunlight.

- Equipment storage should be kept away from flammable, explosive, and corrosive materials.
- Equipment must not be exposed to rain.

2.2 Pre-installation

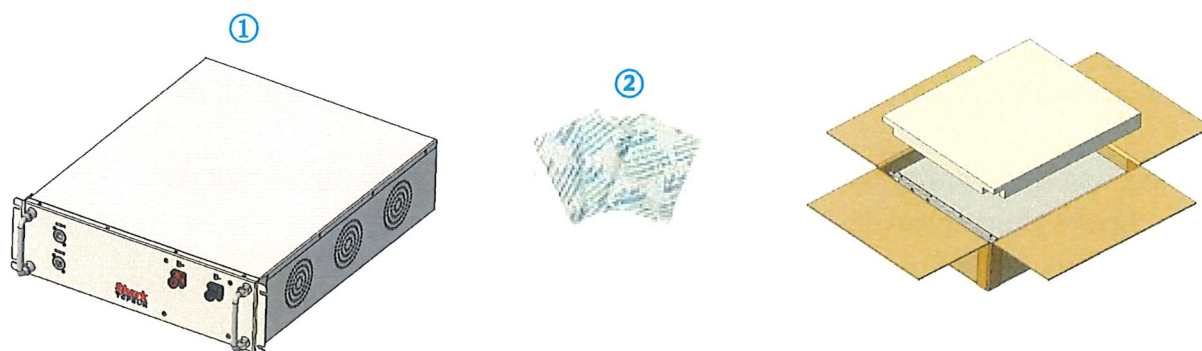
2.2.1 Unpacking & Package List

Unpacking

After receiving the entire energy storage battery pack, please check to ensure that the packaging and all components are not lost or damaged. If there are any damaged or lost parts, please contact your dealer directly for support

Single battery pack packaging

Open the package, please check the packing list shown as below.

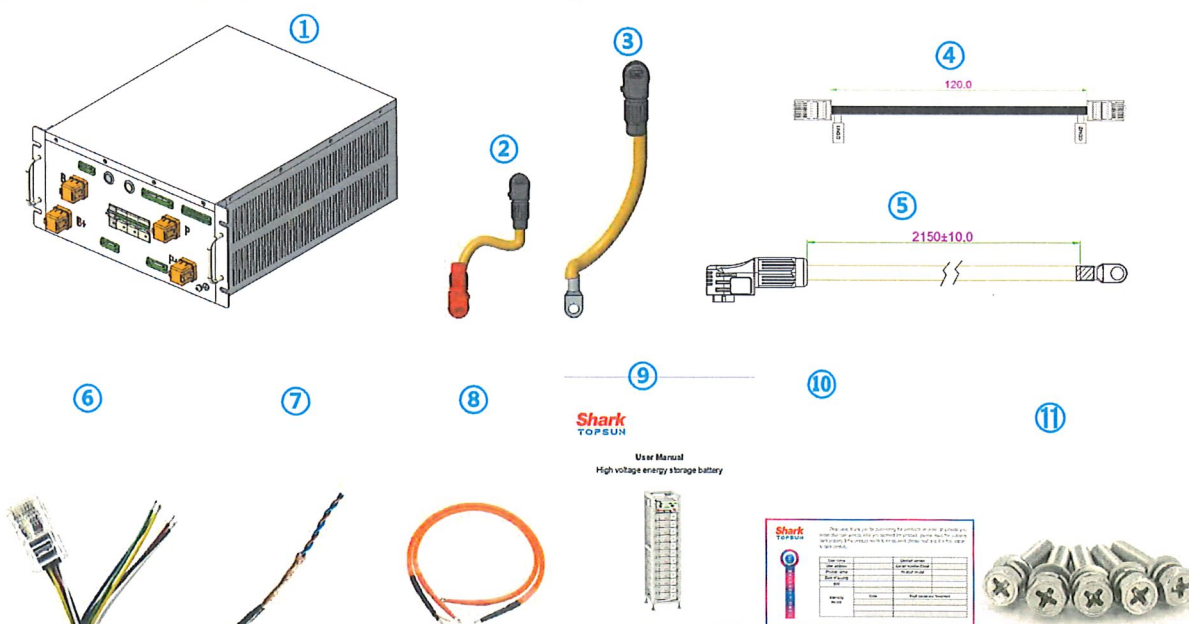


NO.	Qty	Items
1	1	STS-HVJ512100LFP

NO.	Qty	Items
2	1	desiccant

High voltage box packaging list

Open the package, please check the packing list shown as below.

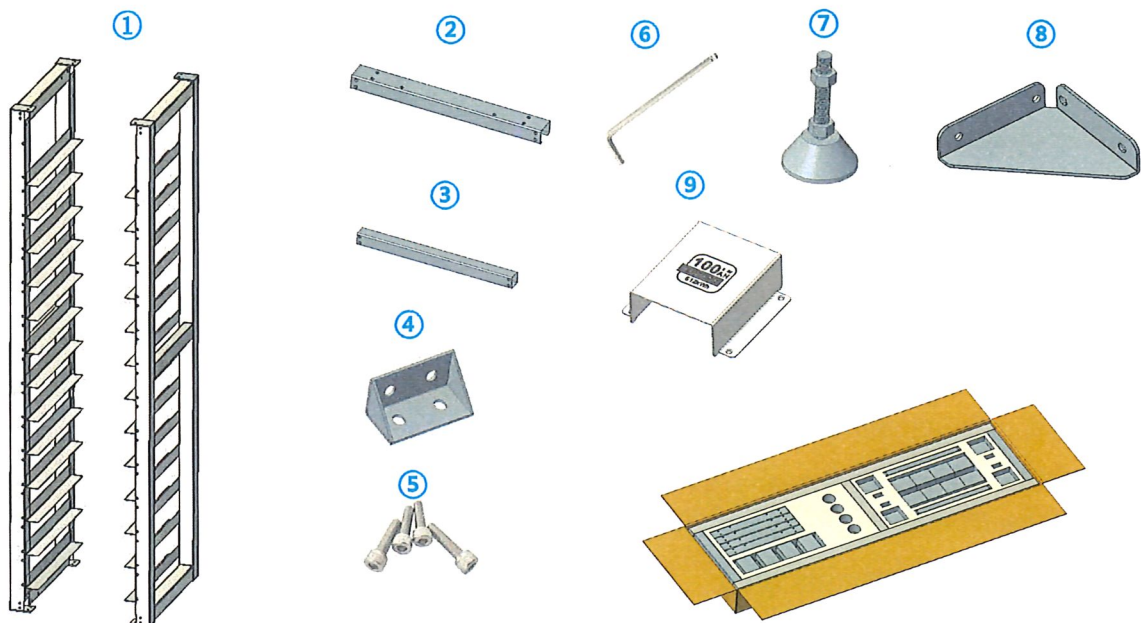




NO.	Qty	Items	NO.	Qty	Items
1	1	PDU 750V100A	2	11	110mm power cord of battery module
3	1	The negative power cord of the high-voltage control box	4	11	Battery communication network cable
5	1	positive power cord of high-voltage control box	6	1	High voltage box and PCS communication network cable
7	1/3 M	Parallel communication line for battery clusters	8	1	Battery cluster positive and negative output lines
9	1	instructions	10	1	warranty card
11	52	M6X20 combination screw	12	1	desiccant

Packaging List of Removable Rack Parts

Open the package, please check the packing list shown as below.



NO.	Qty	Items	NO.	Qty	Items
1	1	Side beam	2	4	Fixed crossbeam 1
3	2	Fixed crossbeam 2	4	4	Strengthening reinforcement components1

5	64	M6 hexagon socket screw	6	1	hexagonal wrench
7	4	D80 load-bearing foot brace	8	8	Strengthening reinforcement components ²
9	12	Protective cover			

2.2.2 Installation and usage tools

2.2.2.1 Tools



Screwdriver



Socket wrench



Pliers



Measuring ruler



Multimeter



tester



Pinze



insulation tape

2.2.2.2 Pre installation instructions

- The battery system must be installed on a safe surface that can withstand the size and weight of the battery.
- The battery system works best in an environment with temperatures between 20 and 40.
- The battery system is installed indoors Avoid installation in an environment directly exposed to drafts.
- Avoid installation on high temperature heat sources or low temperature cold sources.
- Avoid installation in areas with extreme variations in ambient temperature.
- Avoid installation in environments with strong interference.
- Avoid installation in areas where children can touch.
- Avoid installation in areas subject to water.

Note: The total weight of the energy storage battery storage system is approximately 700kg. Ensure that the installation site has sufficient load-bearing capacity

2.2.2.3 Install a detachable rack

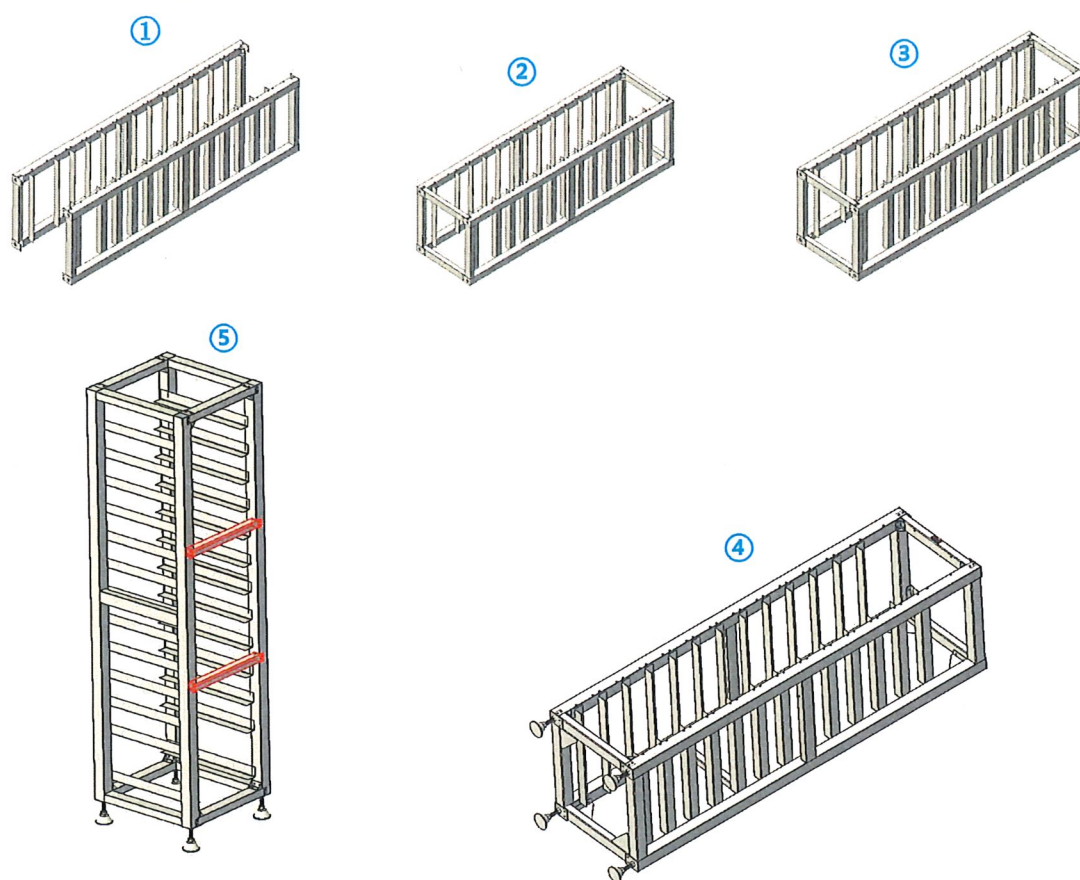
1) Take two side beams and place the screw holes facing upwards, ensuring that the hole positions are consistent. Then take the fixed crossbeam 1 and align it with the side beam device to assemble it into a rectangular frame. Use an Allen wrench to secure it with M6 hex screws.

2) After fixing the combination of the side beam and the fixed crossbeam 1, align the 4PCS

reinforcement 1 and 8PCS reinforcement 2 with the connection between the side beam and the fixed crossbeam 1. Then take the hexagon socket screw, tighten the screw with a hexagon socket wrench, and stabilize the steel reinforcement

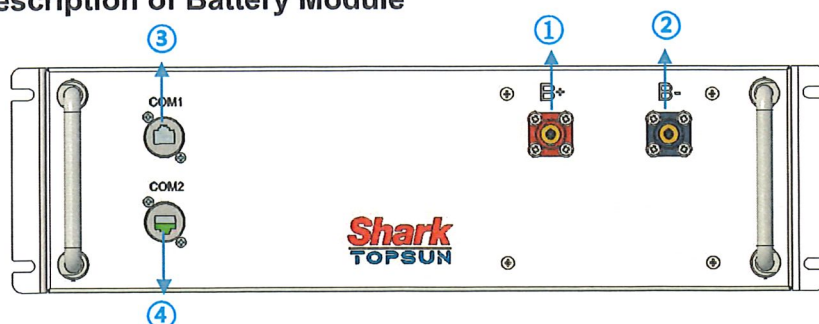
3)After the reinforcement reinforcement is fixed, take the 4PCS-D80 load-bearing foot support and align it with the bottom installation hole of the side beam, and lock it tightly. Note that the locking position of the foot support needs to be the same, otherwise the rack will be unbalanced when it is erected

4)After the foot support device is in place, stand the frame upright, take 2PCS to fix the crossbeam 2 to the back of the frame, align the device, take M6 hexagon socket screws, and use an hexagon socket wrench to fix the screws to the installation position of the fixed crossbeam 2, completing the installation of the frame



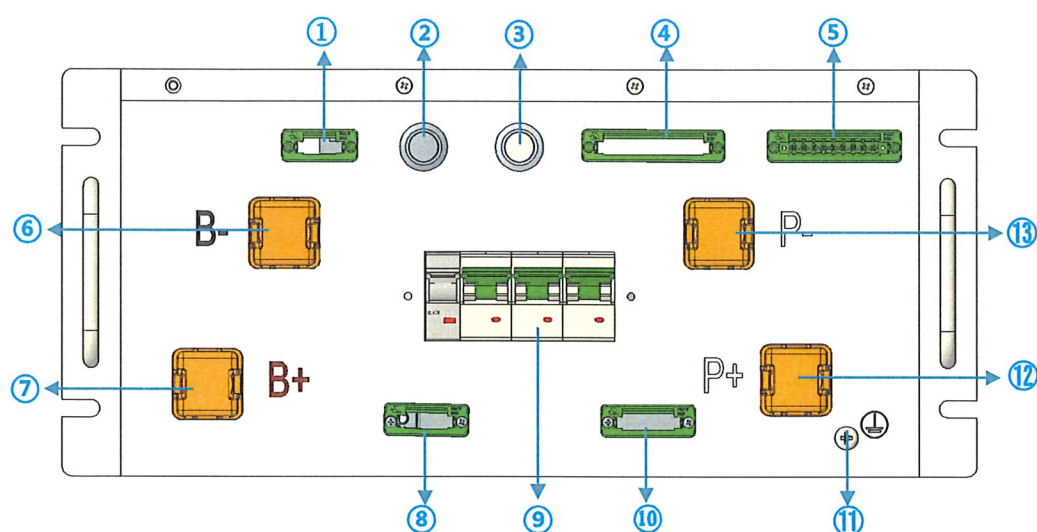
2.2.3 Product Overview


Description of Battery Module



NO.	Name	Description
1	B+	Battery module positive pole (orange)
2	B-	Battery module negative pole (black)
3	COM1	Battery data transmission access communication port
4	COM2	Battery data transmission communication port

High voltage box description



NO.	Name	Description
1	COM1(3P)	High voltage box AC power supply port
2	AC power switch	Start button when AC power is supplied to the high-voltage box
3	Power indicator light	Display the current status of the battery storage unit
4	COM2 (10P)	Connect PCS communication and external device communication ports
5	COM3 (8P)	Dry contact access point and 24V power supply
6	B-	Connect the negative terminal of the battery family
7	B+	Connect the positive end of the battery family with an M8 bolt interface
8	COM4 (4P)	Debugging communication port of upper computer
9	ON/OFF	Battery cluster start disconnect switch
10	COM5 (5P)	Communication port between cluster battery and control box
11		Battery cluster grounding port
12	P+	Connect PCS positive port
13	P-	Connect PCS negative port

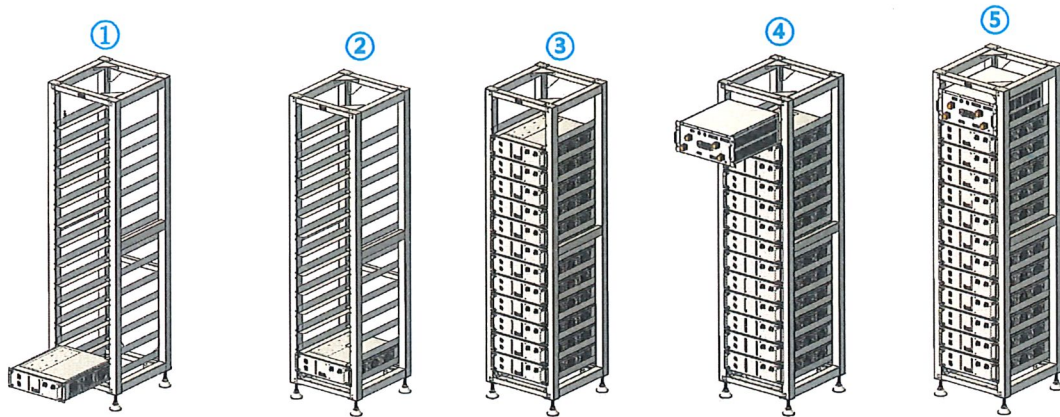
2.2.4 Rack mounted battery pack and high-voltage box

1) Place the installed detachable rack in the desired position, first remove the battery pack from the packaging box, insert it into the installation position of the battery on the rack, and install it until the hanging ears of the battery pack are aligned with the screw holes on the rack. Install the battery pack from bottom to top in sequence

2) After installing the battery pack on the rack, take the M6 cross combination screw, use

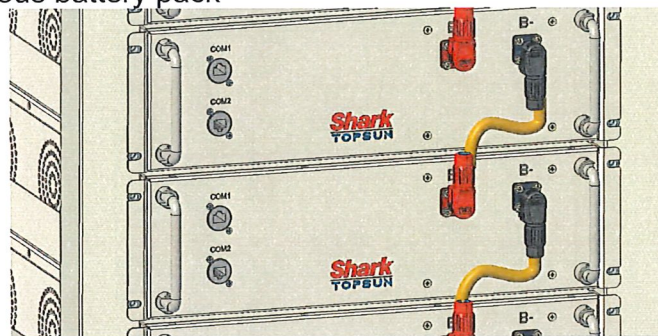
a screwdriver and socket wrench to lock and fix the screw at the connection position between the battery pack and the rack, and tighten the lock

3) Remove the high-voltage box from the packaging cardboard box, align it with the installation position of the rack, and install it until the hanging ear contacts the rack in place. Take the M6 cross combination screw, use a screwdriver and socket wrench to fix the screw to the connection fixing hole between the high-voltage box and the rack, and lock it tightly

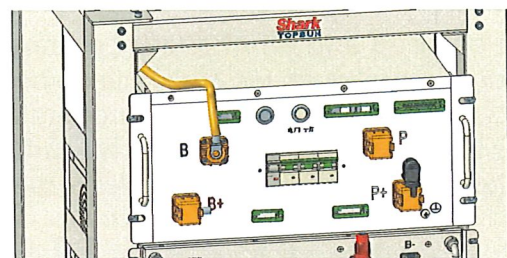
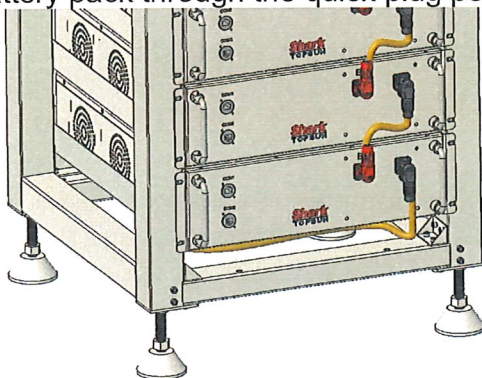


2.2.5 Electrical Connection

1) Take the series connection power line from the high-voltage cardboard box, insert the positive end into the positive port of the lowest battery pack, and insert the negative end into the negative port of the previous battery pack

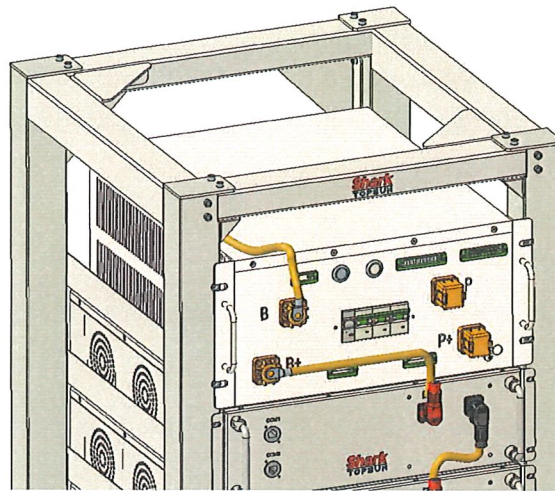


2) Connect the battery packs in series with power lines, and then connect the battery pack to the negative power line of the high-voltage box. One end should be locked to the B-connection port on the high-voltage box, and the other end should be inserted into the negative port of the first battery pack through the quick plug port

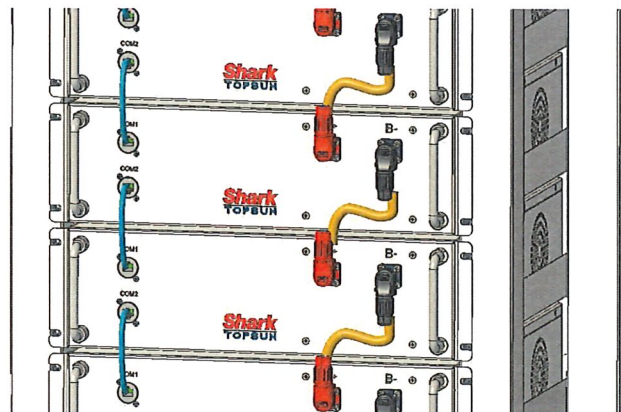


3) Connect the positive power line between the battery pack and the high-voltage box, with one end locked to the B+connection port on the high-voltage box, and the other end inserted through

the top of the rack into the positive port of the top battery pack



4) Take out the battery and battery communication network cable from the packaging box. Starting from the first group of batteries, connect one end of the network cable to the COM1 network port of the first group of batteries, and the other end of the network cable to the COM2 network port of the next group of batteries. Connect the communication network ports in series in sequence

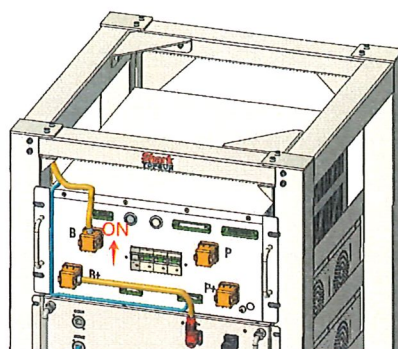


5) Take out the communication network cable between the battery and the high-voltage box from the packaging cardboard box. One end of the communication cable is connected to the COM2 network port of the first group of batteries through an RJ45 port, and the other end is connected to the COM5 port of the high-voltage box through a 5P port

Note: This installation is for electrical connection within the battery cluster, and additional instructions will be provided for the connection with PCS

2.2.6 Power on and off of energy storage batteries

The ON/OFF switch on the high-voltage box is the control switch for the entire battery cluster. If the battery cluster needs to be used for operation, turn the ON/OFF gear on the high-voltage box to the ON position, and the indicator light will turn green. After 1 minute, you will hear the sound of the relay closing, indicating that the battery cluster can work

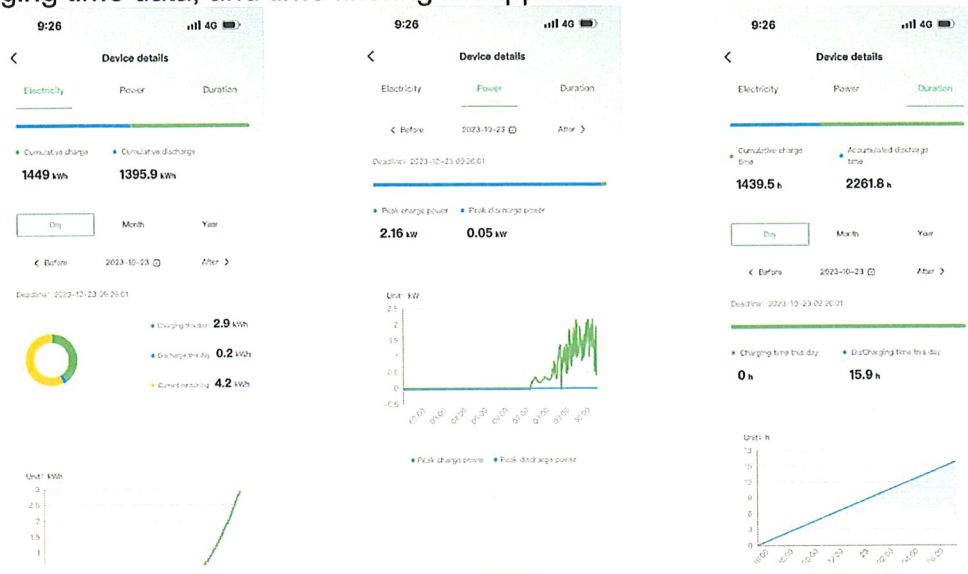


2.2.7 Performance parameter table of battery cluster

Item	RACK-20	RACK-45	RACK-50	RACK-55	RACK-60
The energy of the battery system	20KWh		45KWh	50KWh	55KWh	60KWh
Nominal voltage	204.8V		460.8V	512V	563.2V	614.4V
Nominal capacity	100Ah		100Ah	100Ah	100Ah	100Ah
Battery cell chemistry	LiFePO4		LiFePO4	LiFePO4	LiFePO4	LiFePO4
Charge-discharge rate (Max)	1C		1C	1C	1C	1C
Maximum charging/discharging current	100A		100A	100A	100A	100A
Working voltage(V)	185.6~233.6		417.6~525.6	464~584	510.4~642.4	556.8~700.8
Working temperature	Charge: 0~45℃/Discharge:-10~55℃					
Humidity	5% - 85% (RH)					
The altitude of the installation site	≤ 2000 m					
Dimensions (W x D x H)	By specifications		574*600*2200mm			
Warranty period	10 years					
The total weight (12 battery modules, 1 rack)	700Kg					
Weight of each battery module	50Kg					
Case protection grade	IP20					
Certification	Un38.3/CE/IEC62619					

2.2.8 Regarding WiFi functionality

The PDU of this project has WiFi function, and after establishing the corresponding WiFi, the corresponding data can be queried on the APP. On the APP interface, the current device's data details can be displayed, including battery, charging and discharging power, charging and discharging time data, and time filtering is supported.



3 Transportation and storage

3.1 Transportation Requirements

The product can be transported directly to the site and transported by land and water. The packaging box must be sturdy during transportation, conform to national regulations in force and printed with anti-collision, anti-moisture and other marks, and must be printed with anti-collision, moisture-proof and other marks. Disposal of electric batteries must be strictly in accordance with local laws and regulations. Protect the packaging containing the product from rain, snow, falling water, falling mechanical objects, falling into water, mechanical shocks, overturning or tipping.

3.2 Storage requirements

3.2.1 Security of storage

- 1) Lithium batteries should be placed according to the instructions on Do not turn them upside down or put them sideways.
- 2) Packing boxes of lithic batteries must be stacked according to the stacking criterion requirements of the outer packaging.
- 3) I The storage environment requirements are as follows:
Ambient temperature: 0-35°C; Recommended storage temperature: 20-30° Humidity: ≤85%, dry, clean, well ventilated, away from corrosive and organic substances (including gases), in a place without direct contact with sunlight
- 4) Keep away from sources of strong infrared radiation, organic solvents and corrosive gases and keep away from sources of fire.

Table 3-1 Storage Requirements

Actual preservation temperature	Storage time	Comments
$-20^{\circ}\text{C} \leq T \leq 45^{\circ}\text{C}$	1 month	Do not reach the charging time: Use the battery as much as possible. Reach the charging time: Recharge the battery. The total storage life should not exceed the warranty period
$-20^{\circ}\text{C} \leq T \leq 35^{\circ}\text{C}$	6 months	

4 Environmental protection

4.1 Recycling



This mark indicates that the battery cannot be separated from other waste. To prevent hazardous waste disposal from damaging the environment and human health, please follow the local waste recycling classification to promote the sustainable use of physical resources.



To recycle spent batteries, please follow local regulations and recycling system or contact the manufacturer or seller of the product and the competent authority for waste management.

Regarding after-sales service:

Please contact the after-sales service hotline or fax provided by our company

Thanks!