



48V Lithium iron phosphate battery system for Telecom

Operation Manual

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Shuangdeng Group Co., Ltd



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About this document

Role of this document

This document introduces the introduction, panel function, working principle and parameters, installation, use, maintenance, packaging, transportation and storage of lithium iron phosphate battery system for communication.

The pictures provided in this document are for reference only.

Target readers

- Service engineer
- Sales engineer
- Technical support engineer

Symbol Description

Symbol	Illustration
 Danger	It indicates an emergency hazardous situation that, if not avoided, may result in serious injury or death.
 Warn	It warning indicates a potentially hazardous situation that, if not avoided, could result in serious injury or death.
 Caution	It indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.
 Attention	It indicates a potentially hazardous situation that, if not avoided, may result in equipment damage, data loss, performance degradation or other accidents. "Attention" is used to mark behaviors unrelated to personal injury.
 Note	It indicate attention to important information, best practices and tips. "Note" is used to mark information irrelevant to personal injury, equipment damage and environmental degradation.

1 Introduction

1.1 Smarmy

Lithium iron phosphate battery system for Telecom is a high-tech product developed by Shuangdeng Group Co., Ltd. It is widely used in access network equipment, remote exchange office, mobile communication equipment, transmission equipment, satellite ground station, microwave communication equipment and other communication fields as back-up power supply because of its characteristics of integration, miniaturization, light-weight, intelligent centralized monitoring, battery maintenance and management, unattended, standardized cabinet installation, energy conservation and environmental protection.

1.2 Appearance and specification

Figure 1-1 Appearance of SDA10 series products

Note: The picture is for reference only, and the specific object shall prevail



Table 1 Specifications and Models of 48V Series Products

Specification and model	Voltage (V)	Capacity (Ah)	Overall dimensions (mm) (wide × deep × high)
SDA10-4850	48	50	442×400×133 (3U)
SDA10-48100	48	100	442×420×133 (3U)
			442×400×176 (4U)
			442×450×176 (4U)
SDA10-48150	48	150	442×500×177 (4U)
			442×540×191 (4.3U)
			442×420×265(6U)
SDA10-48200	48	200	442×505×222(5U)
			442×480×245(5.5U)
			442×440×310 (7U)



Note: 1. The dimension deviation is ± 2mm. The dimensions in the table are the dimensions

of the box, excluding lugs, handles and cabinets;

2. The above product models and sizes are only some products. Please refer to the official Shuangdeng website for the latest specifications and information.

1.3 Product characteristics

- The positive electrode is lithium iron phosphate (LiFePO₄) material: good safety performance, long cycle life, and superior rate discharge performance;
- BMS has powerful functions: current, voltage, temperature and other protection functions, and makes the battery system communicate well with the host;
- The monitoring unit automatically measures: charging and discharging current, charging and discharging voltage, surface temperature of cell and ambient temperature;
- Secondary power-off function: alarm when the voltage is lower than the alarm value, and automatically power-off when the voltage is too low to protect the battery;
- The system has good electromagnetic compatibility;
- Centralized computer monitoring: it has four remote functions (telemetry, teleindication, telecontrol and teleadjusting), computer management, and can communicate with the remote central monitoring center;;
- The power control technology is effectively combined with the computer, which can monitor and control various parameters and states in real time;
- Built in natural cooling: the noise of the system is extremely low.

1.4 Product advantages

- It can work without changing the charging and discharging mode of the original communication DC switching power supply system;
- The new back-up power supply system, which was first produced in batch and widely used in the telecom field in China, has been applied in the market for the longest time with the largest number and good market response;
- The solution based on integrated backup power supply of lithium iron battery, BMS, DC switching power module (or UPS system) meets the new requirements of telecom operators for distributed power system;
- High volume specific energy and weight specific energy, no special requirements for space and bearing during installation;
- Flexible configuration: multiple iron lithium battery modules can be connected in parallel to form a large capacity telecommunication iron lithium battery system.

1.5 Production environment requirements

- ☒ Ambient temperature: - 20~+60 °C,
Recommended: +15~+35 °C
- ☒ Storage temperature: - 40~+55 °C,
Recommended: +15~+35 °C
- ☒ Relative humidity: 5% ~ 85% RH
- ☒ Altitude: no more than 4000m
- ☒ No conductive dust and corrosive gas

1.6 Product certification

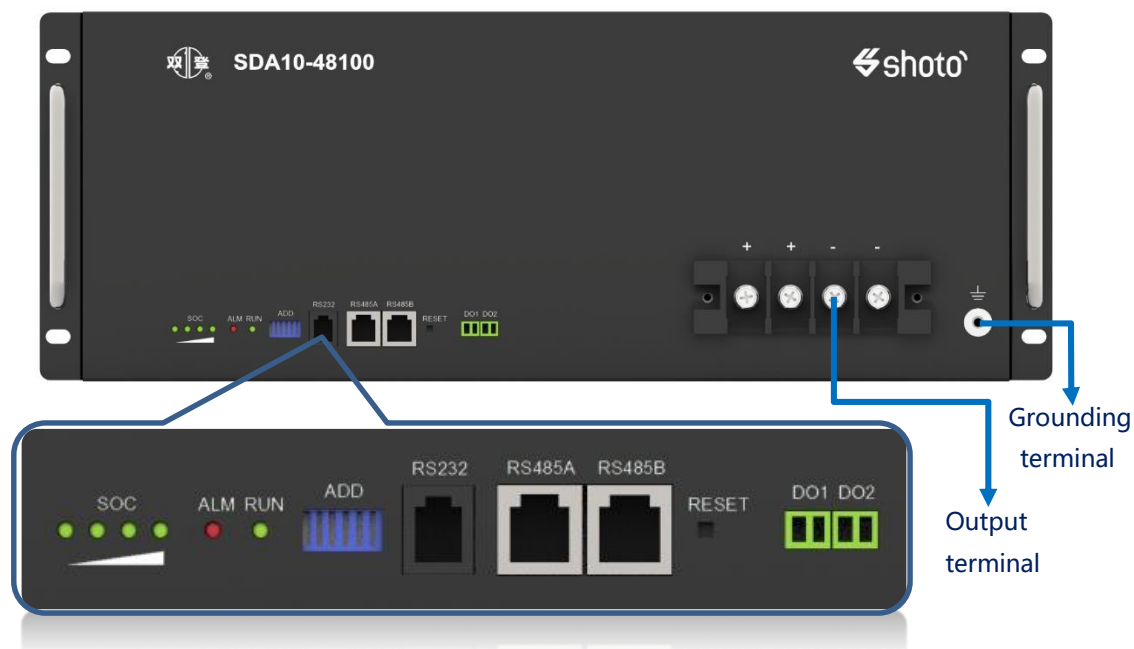


1.7 Environmental requirements

- ☒ Meet  certification requirements
- ☒ Free of cadmium, hydride, fluoride and asbestos
- ☒ Does not emit organic compound
- ☒ Recyclable packaging

2 Panel functions

Fig. 2-1 Panel Diagram



2.1 LED indicator

Table 2-1 Description of LED Indicator

system state	running state	SOC	RUN	ALM	statement
		● ● ● ●	●	●	
cutoff	dormant	all lights off			
standby	normal	according to battery indicator	flash 1	off	standby state
	alarm	according to battery indicator	flash 3	flash 3	ALM and RUN lights flash3 synchronously
charge	normal	according to battery indicator	lamp keeping on	off	Maximum LED flash 2
	overvoltage alarm	according to battery indicator	lamp keeping on	off	Maximum LED flash 2
	overcurrent alarm	according to battery indicator	lamp keeping on	flash 3	Maximum LED flash 2
	overvoltage protection	lamp keeping on	lamp keeping on	off	RUN light: it is always on when the switching power supply is online, and it is in normal standby mode when the switching power supply is offline.
	overcurrent protection (No current limiting function)	all lights off	off	lamp keeping on	protection status, after standby and sleep, all lights are off.

system state	running state	SOC	RUN	ALM	statement
					
	current limiting charging	according to battery indicator	lamp keeping on	off	Maximum LED flash ₂
discharge	normal	according to battery indicator	flash ₃	off	
	alarm	according to battery indicator	flash ₃	flash ₃	
	over current, short circuit, reverse connection and other protection	off	off	always bright	stop charging and discharging, no action after 24h, forced sleep
	undervoltage protection	All lights off			stop discharging
temperature	normal	Normal indication according to status			
	charging alarm	according to battery indicator	lamp keeping on	flash ₃	Maximum LED flash ₂
	discharging alarm	according to battery indicator	flash ₃	flash ₃	
	protection	off	off	always bright	Stop charging/discharging, forced sleep after 24h of no action
Anti theft (communication anti-theft and gyroscope anti-theft)	successful deployment	lamp keeping on	lamp keeping on	always bright	All lamps will turn to normal operation state after 5s
	standby after anti theft locking	Maximum SOC light always bright	off	always bright	
	charging after anti theft locking	according to battery indicator	lamp keeping on	off	Maximum LED flash ₂
failure alarm	MOS failure, differential pressure failure, NTC failure, AFE failure, etc	All lights flash ₂	flash ₂	flash ₂	



Note: RUN=running light (green), ALM=alarm indicator (red), SOC=capacity indicator (green).

Each pilot light represents 25% of the capacity, and lights up from left to right according to the capacity.

flash ₁ = On 0.25S/off 3.75S cycle ; flash ₂ = On 0.5S/off 0.5S cycle; flash ₃ = On 0.5S/off 1.5S cycle.

2.2 Dial switch

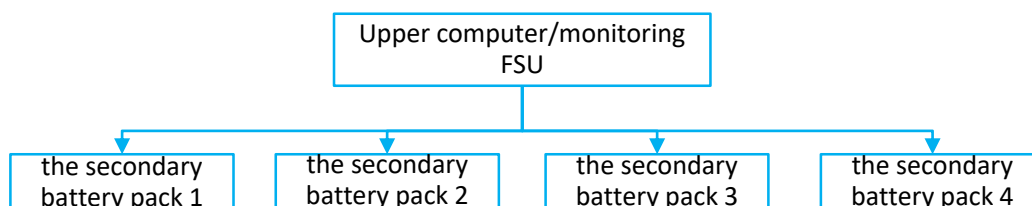
The six digit address dial switch is numbered from 0 to 15. The factory default location is 000000 (i.e. number "0"). When the number of battery packs in the cascade system is greater than 15, the address code of the battery pack shall be set through the software program.

2.3 Communication interface

Each battery module is equipped with two RS485 cascade communication interfaces and one RS232 uplink communication interface. When the battery packs are cascaded, those with a communication address of 000001 are called the primary battery pack, and those with other communication addresses are called the secondary battery pack. The slave battery pack

communicates with the main battery pack through the RS485 communication interface, and the main battery pack communicates with the upper computer through the RS232 communication interface to upload the data, status and information of all battery packs in the cascade system for remote centralized monitoring and management.

Figure 2-2 Schematic diagram of cascade and upper connection



2.3.1 Cascade communication interface

RS485 puts to use two 8P8C straight type PCB welding telephone sockets (round pins), and has the functions of uplink connection and cascade connection communication. The two RS485 ports are independent serial ports, that is, they are physically a serial port. The pins are defined as follows:

Table 2-2 RS485 Interface Definition

Pin	Definition description
1	RS485-B
2	RS485-A

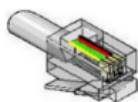
2.3.2 Uplink communication interface

RS232 uplink communication interface adopts 6P4C straight PCB welding telephone socket (round needle), and the default baud rate is 9600bps. The pin definition is shown in Table 2-3:

Table 2-3 Definition of RS232 Interface

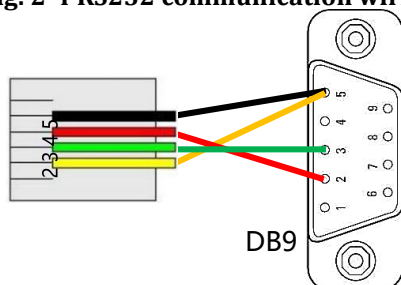
RJ11 Pin	Definition description	DB9 Pin	Definition description
2	ground	5	ground
3	TX	3	RX
4	RX	2	TX
5	ground	5	ground

Fig. 2-3 Schematic Diagram of RJ11 Crystal Head



RJ11 Crystal Head

Fig. 2-4 RS232 communication wiring diagram



2.4 Reset key

When the system runs abnormally, you can use the "RESET" key to reset the system to ensure the stability of the system operation.

Table 2-4 Definition of On/Off and Reset Keys

Function	Original state	Operation	Function
Start up / power-up	Dormancy	Long press 3S	After the BMS is started and the LED indicator lights flash in turn, it turns to the normal working state.
Shutdown /Sleep	Standby	Long press 3S	The BMS is dormant. After the LED indicators flash in turn, the BMS goes to sleep
Reset	/working	Long press 6S	The BMS is reset, and the internal data is restored to the factory state (historical records are retained)

2.5 Dry contact

DO1, DO2, when BMS has alarm or protection signal, send switch signal through corresponding port.

Table 2-5 Definition of dry contact interface

Dry contact	Definition	State	
dry contact 1	BMS is powered off or fails to start	Exception: disconnected	Normal: closed
dry contact 2	BMS failure (charging MOS, discharging MOS, NTC damaged) The electric cell fails (the voltage of the electric cell is too low and the pressure difference is too large)		



Note: When the BMS is in sleep, the dry contact is disconnected.

2.6 Output terminal

Table 2-6 Wiring Configuration of Output Terminal

Battery model	Battery capacity	Requirements for wire diameter	Screw model
48V50Ah	50Ah	$\geq 10\text{mm}^2$	M6/M8
48V100Ah	100Ah	$\geq 16\text{mm}^2$	M8
> 100Ah	--	$\geq 16\text{mm}^2$	M8

2.7 Grounding terminal

The grounding terminal is used to ground the battery chassis through cables. When the equipment has abnormal faults, the grounding wire can be well grounded through the grounding terminal to protect the equipment

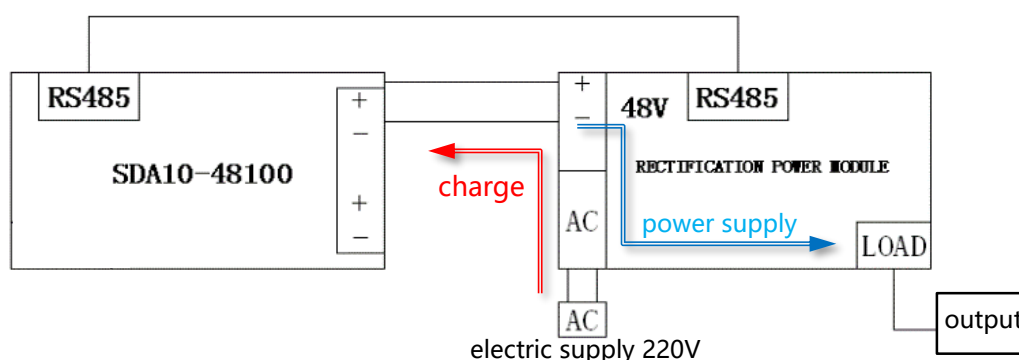
3 Working principle and parameters

3.1 Working principle

The 220V mains power input is processed by the rectifier power module, and the output is 48V. When the power grid is normal, the rectifier power module provides the power required by the system and charges the battery system at the same time. When the power grid is cut off, the battery system provides electric energy to ensure the normal operation of the DC power supply system and realize uninterrupted power supply.

The power supply has the secondary power-off function. When the battery voltage is too low, the power supply cuts off the battery power supply to protect the battery life.

Figure 3-1 Schematic Diagram of System Operation



3.2 Charging parameters

Table 3-1 Charging Parameters

Specification and model	Charging voltage (DCV)			Charging current (A)
	Min	Typical	Max	
48V100Ah(15S)	53.2	55.0	56.4	Charging current $\leq 1C_3$
48V100Ah(16S)	56.4	57.6	60.4	

3.3 Discharging parameters

Table 3-2 Discharge parameters of some series of products

Specification and model	Discharging voltage (DCV)			Discharging current (A)	
	Min	Typical	Max	Typical	Max
48V100Ah (15S)	40	48.0	53.0	$0.2C_3$	$1C_3$
48V100Ah (16S)	41.6	51.0	55.0	$0.2C_3$	$1C_3$

3.4 Protection functions and parameters

Table 3-3 Various protection functions and parameters of battery system

Protection items		Default	
		15S system	16S system
Protection and recovery of system total voltage too high	Alarm value	54.00V	57.00V
	Alarm recovery value	52.50V	56.00V
	Protection value	57.00V	57.75V
	Protection recovery value	50.1V	53.5V
Protection and recovery of system total voltage too low	Alarm value	42V	42V
	Alarm recovery value	43.2V	43.2V
	Protection value	40V	40V
	Protection recovery value	Charge recovery, total voltage > 43.2V	
Short circuit protection	Protection value	Protection and alarm	
Single low voltage protection and recovery	Alarm value	2.5V	
	Alarm recovery value	3.0V	
	Protection value	2.0V	
	Protection recovery value	Charge recovery, cell voltage > 2.7V	
Single high voltage protection and recovery	Alarm value	3.7V	
	Alarm recovery value	3.65V	
	Protection value	3.85V	
	Protection recovery value	Discharge recovery, cell voltage < 3.34V	
Charging overcurrent protection (no charging current limiting)	Alarm value	1.05C ₃ A	
	Alarm recovery value	1.0C ₃ A	
	Protection value	1.1C ₃ A	
	Protection recovery value	Discharge or manual reset	
Discharge overcurrent protection	Alarm value	1.05C ₃ A	
	Alarm recovery value	1.0C ₃ A	
	Protection value	1.1C ₃ A	
	Protection recovery value	Charge or manual reset	
High temperature protection and recovery of cell	Charging high temperature protection value	65℃	
	Charging high temperature recovery value	60℃	

Protection items		Default	
		15S system	16S system
	Discharge high temperature protection value	70°C	
	Discharge high temperature recovery value	65°C	
Low temperature protection and recovery of cell	Low temperature protection value for charging	-10°C	
	Low temperature recovery value of charging	-5°C	
	Discharge low temperature protection value	-25°C	
	Discharge recovery recovery value	-20°C	
Environmental temperature protection and recovery	High alarm value of ambient temperature	65°C	
	Low alarm value of ambient temperature	-20°C	
	High protection value of ambient temperature	70°C	
	High recovery value of ambient temperature	65°C	
	Low protection value of ambient temperature	-25°C	
	Low recovery value of ambient temperature	-20°C	



Note: The above table is the default parameter. The specific setting parameters of some models may vary according to the actual needs of customers. Please refer to the actual product parameters.

4 Installation, use and maintenance

4.1 System installation

Lithium battery for telecommunication can be composed of 48V series product specifications and models in parallel as shown in [Table 1-1](#). The installation methods include 19 "standard cabinet embedded installation, rack type installation and cabinet type installation.

Fig. 4-1 Installation steps of non-standard rack

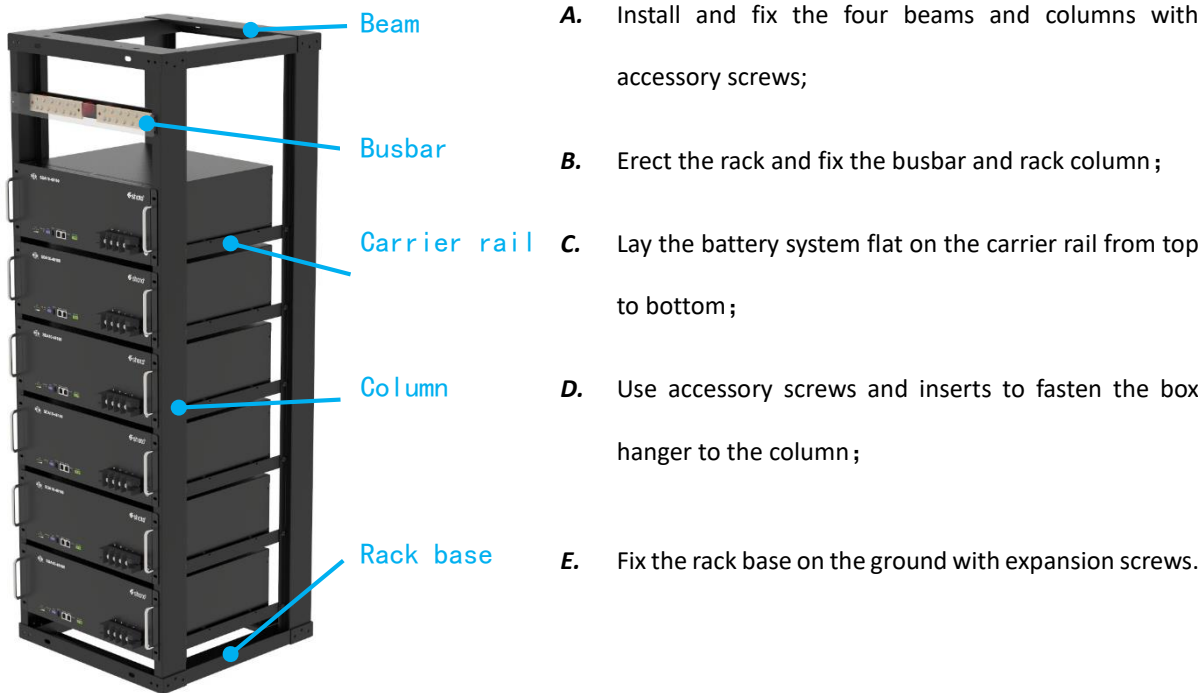
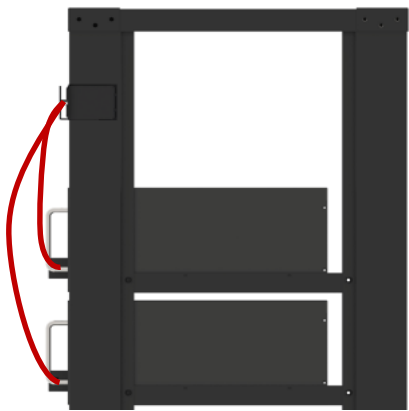
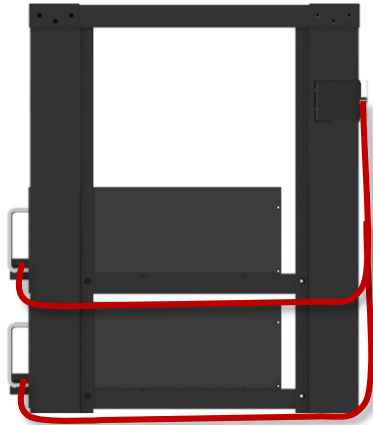


Fig. 4-2 Two busbar installation and routing modes



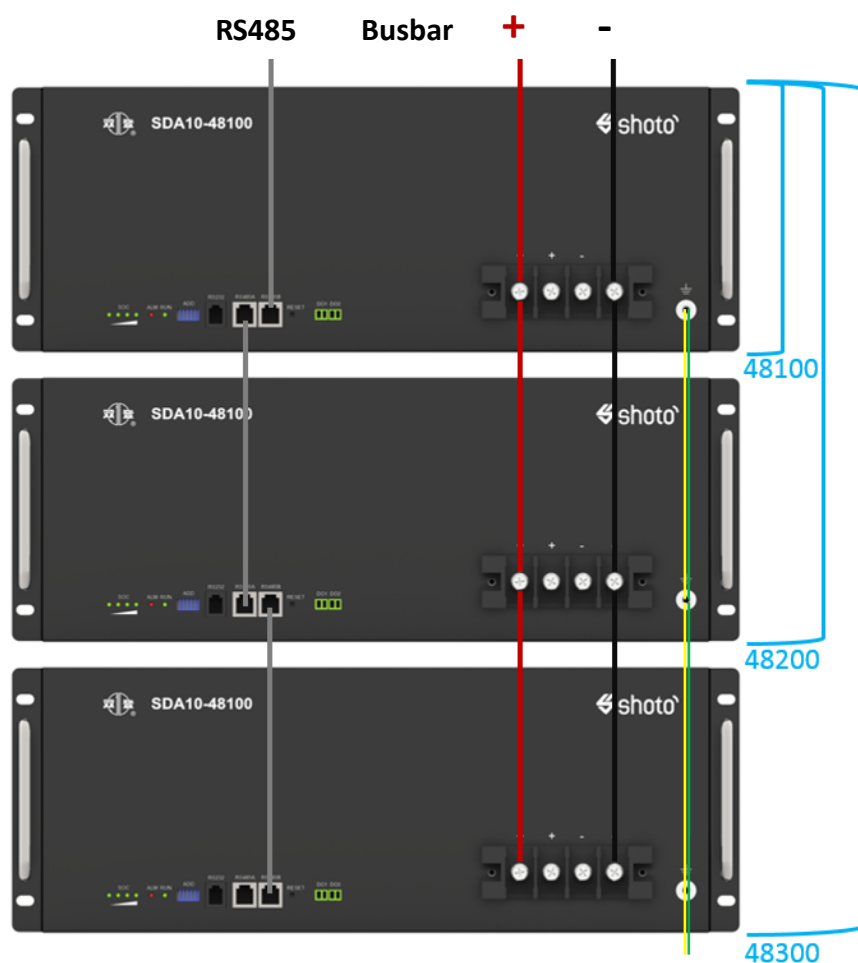
**In the same direction as the panel
(easy to load and unload)**



Reverse to panel (more secure)

Battery module rack wiring:

- A.** Place each battery module on the supporting rail, and fix the lug of each battery module on the column with M6 combination screw;
- B.** Use yellow green flexible cable of more than 4mm^2 at the chassis panel grounding terminal to ensure good grounding;
- C.** The 10mm^2 above red cable is used to connect the positive terminal of the battery module and the positive terminal of the bus bar in parallel, the 10mm^2 above black cables connect the negative terminal of the battery module and the negative terminal of the busbar in parallel;
- D.** Lead out the main positive line and the main negative line from the busbar and connect them to the positive and negative terminals of the switching power supply or equipment.

Fig. 4-3 Parallel connection steps of battery module

4.2 System power on

After the system is installed, it is generally in standby mode. When necessary, the equipment can be put into normal operation by simply powering on

4.2.1 System activation

During storage and transportation, or after 24 hours without external power supply and load, the battery system has been in a dormant state. After the allowable charging voltage is applied, the battery system is activated and enters the normal operation state. It can be charged, discharged, or entered the standby state.

Note: When the battery system is in the sleep state, the DC switching power supply used with the battery system must have its anti-reverse connection protection function cancelled, so that the battery system can be activated with 48V voltage after AC recovery.

4.2.2 System standby

After the system standby system is activated, if the external power supply and load are removed, the battery system will actively enter the standby mode. In this state, the power loss is extremely low. The RUN light on the panel flashes, indicating that the battery system is in standby mode. After 24 hours, the battery system will automatically enter the sleep state. In this state, the power loss will be lower. If all the pilot lamps on the panel are off, the battery system is in sleep state.

4.3 Alarm illustration and handling

In case of system failure, alarm signal will be given depending on the type, and all failures will have audible and visual alarm and text prompt. In case of alarm, the red alarm light on the monitoring unit lights up and sends alarm information to the remote monitoring center. At this time, the maintainers should immediately check the corresponding equipment according to the alarm information prompted by the monitoring unit, determine the fault type and location, and take corresponding countermeasures.

4.3.1 Alarms affecting system output

If there are faults in the system that affect the output abnormally, such as single battery voltage overvoltage, charging overcurrent, undervoltage protection, temperature protection, etc., please handle according to Table 4-1.

Table 4-1 Alarm handling and countermeasures

State	Alarm amount	ALM light	Handle
Charging state	Charging overcurrent	Always bright	Stop charging and find out the cause of the fault
	Charging temperature protection	Always bright	Stop charging
	Reverse connection protection	Always bright	Stop charging and find out the cause of the fault
Discharging state	Discharge overcurrent protection, short circuit protection	Always bright	Stop discharging and find out the cause of the fault
	Discharge temperature protection	Always bright	Stop discharging
	Total voltage undervoltage protection	Off	Charge
	Cell voltage undervoltage protection	Off	Charge

4.3.2 Alarms that do not affect system output

If there is a low total voltage alarm or low cell voltage, the battery system will also generate a corresponding alarm signal. The phenomena and countermeasures are shown in Table 4-2. The maintenance personnel shall check the equipment according to the prompt information, determine the fault type and location, and take corresponding countermeasures to ensure that the system is in the best working state, prevent the fault from expanding, so as not to affect the system output.

Table 4-2 Alarm not protected

Alarm amount	FET action	ALM light	countermeasure
Low voltage alarm of total voltage	None	Flashing	Stop discharging
Low voltage alarm of cell voltage	None	Flashing	Stop discharging

4.4 Communication failure

- Whether there is error in the parallel connection line, or whether there is open circuit in the connection line;
- The network cable plug shall be connected continuously from the first one. If there is no space in the middle, the plug after connecting the last battery can be suspended;
- The dial switch must be in place and cannot be stuck in the middle position;

4、Winding RS485A/RS485B into twisted pairs can enhance the anti-interference performance of communication lines.

4.5 Protection failure

Table 4-3 Protection Fault Types

Fault type	Phenomenon	Failure causes/Solutions
Overvoltage protection	The cell is overvoltage and the total voltage is low.	Check the voltage of the cell.
Current protection	Low current and current protection.	Check the system status indication and check whether the connection line is normal.
Other faults	Protection alarm without charging or discharging.	Check the specific voltage, temperature and other parameters and system status indication to determine the cause of the fault.

4.6 Handling of special cases

4.6.1 Power failure

AC power failure is the most common situation in system operation. When the power failure is not long, DC power supply is provided by the lithium battery pack in the system. If the reason for the power failure is unknown or the time is too long, pay attention to the power supply time of the system.

4.6.2 Disaster accident

Including telecommunication equipment failures caused by lightning, flooding, earthquake, fire and other disasters. The prevention and control of disasters that may seriously affect the telecommunication security shall be given priority to. Telecommunication bureaus and stations shall have countermeasures against the above disasters, corresponding human and material resources, emergency management regulations and major accident repair procedures.

4.7 Normalized maintenance

After the installation and commissioning of the system project is completed, if the mains power is not connected or the system is not opened, be sure to disconnect the air switch of the lithium battery pack. It is necessary to connect the mains power as soon as possible and supplement the battery power to avoid the battery pack being in a state of power loss for a long time and leading to battery failure.

4.8 Emergency treatment measures for serious safety accidents

4.8.1 Battery bulging

Possible causes	Emergency measures	Further measures
1、 The battery is overcharged or discharged; 2、 Application scenarios do not match, abuse or end of life occurs.	Stop charging and discharging the battery immediately and cut off the power supply.	1、 Take out the battery and place it in an outdoor open area ; 2、 Replace the battery pack, check the ventilation system, fan and other ventilation systems and use conditions, avoid direct sunlight, and create a relatively ideal use environment as far as possible ; 3、 Keep away from people and valuables.

4.8.2 Smoke or burning of battery

Possible causes	Emergency measures	Further measures
1、 Short circuit inside or outside the electric core ; 2、 Battery overcharged ; 3、 Serious external causes such as collision and extrusion ; 4、 Other external reasons.	1、 Cut off the power immediately ; 2、 Evacuate people nearby ; 3、 Organize professionals to extinguish the fire or call 119.	1、 Fire fighting measures shall be taken according to the fire situation ; 2、 If the smoke or fire is small, professionals should wear protective equipment and use fire extinguishers to calm the fire. Since lithium batteries will re burn, if they do not cool down, it is very important to use a lot of water to cool the batteries. It is important to water the batteries until they are completely extinguished to avoid explosion ; 3、 Call 119 directly when the fire is serious and ask for support from the superior fire department ; 4、 After the battery is completely extinguished, take it out and place it in an open area away from people ; 5、 Check the damage of other equipment and resume communication as soon as possible.

5 Package, transportation and storage

5.1 Package

The system shall be packaged as a whole to ensure that the product is free from any harmful gas, chemical pollution, static electricity, moisture and mechanical damage during handling, transportation and storage. The packing box has been marked with: product name, specification and model, production date, quantity and batch number.

5.2 Transportation

It is suitable for road transportation, waterway transportation and air transportation. In the process of loading and unloading, the battery shall be handled with care to prevent falling, rolling and heavy pressure. Canopy and sunscreen shall be provided during transportation to avoid direct rain and snow and mechanical impact.

The battery pack shall be packed with insulating and shockproof materials and labeled with fragile words to avoid damage to the battery pack due to turbulence on the way.

The battery pack must be handled with care during transportation and loading and unloading. Do not throw it at will to avoid collision. Do not press heavy objects on the battery pack during transportation to avoid damage to the battery pack caused by crushing.

5.3 Storage

It shall be stored in a dry warehouse without exposure to the sun and rain. No harmful gas, flammable and explosive products and corrosive chemicals are allowed in the warehouse. Mechanical impact, heavy pressure and strong magnetic field shall be avoided. Direct sunlight shall be avoided. The distance from the warehouse to the heat source shall not be less than 2m. The packing box shall be padded at least 20cm from the ground and at least 50cm from the wall, window or air inlet.



Note

Under the above specified conditions, products with a storage period of more than 3 months shall be recharged once. Products with a storage period of more than 6 months must be subject to capacity verification test. Products with a storage period of more than 1 year must be re inspected and can only be used after being qualified.

6 Safety

- **This battery system is only used as a backup power supply for the telecommunication base station, and it is strictly prohibited to use it for other purposes without permission.**
- Please read the instructions carefully before installation, commissioning and use.
- It is strictly forbidden to immerse the battery in water or rain. When it is not in use, it should be stored in a cool and dry environment.
- It is prohibited to use or put the battery beside the high temperature source.
- It is prohibited to throw the battery into the fire or heater.
- Be sure to use the battery system according to the charging and discharging parameters specified in this manual. Unless otherwise specified, it is recommended that the charging and discharging current of the battery pack and battery system be set to $0.5C_3$.
- ⚠ It is prohibited to directly connect the battery to the power socket.
- It is prohibited to disassemble the battery and components.
- It is prohibited to knock, throw or step on the battery.
- Even if the mains power is cut off, the output terminal of the battery system still has voltage output. Pay attention to avoid electric shock or short circuit.
- In areas with harsh external environment, the battery must be provided with effective protective measures, such as good grounding, sunshade, rain proof cabinet, dust screen, etc., to avoid damage to the battery system caused by lightning, rain, snow, high temperature, and dust, which will affect the service life.
- For use in high temperature areas, the battery must be matched with a cabinet with corresponding heat dissipation equipment (heat exchanger/air conditioner).
- For use in low temperature areas, the battery must be matched with a cabinet with corresponding heating equipment (heating module/air conditioner).
- For use in coastal areas, the battery must be equipped with a cabinet with corresponding salt spray protection capacity.