

RV12100

USER MANUAL

Battery Module
12.8V/100Ah

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Statement of Law

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Please note that the product can be modified without prior notice.

Revision History

Revision NO.	Revision Date	Revision Reason
1.0	2021.12.20	First Published

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 don't connect positive and negative poles with conductor (wires for instance).

Please do not stab, hit, trample or strike the battery in any other way.

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 secondary disaster.

For your safety, please do not arbitrarily dismantle any component in any circumstances unless a specialist or an authorized one from our company, device breakdown due to improper operation will not be covered under warranty.



CAUTION

We have strict inspection to ensure the quality when products are shipped out, however, please contact us if case bulging or another abnormal phenomenon.

For your safety, device shall be ground connected properly before normal use.

To assure the proper use please make sure parameters among the relevant device are compatible.

Please do not mixed-use batteries from different manufacturers, different types and models, as well as old and new together.

The battery can only be used in parallel. Do not use in series. There is a risk of battery damage when used in series.

Ambient and storage method could impact the life span and product reliability, please consider the operation environment abundantly to make sure device works in proper condition.

For long-term storage, the battery should be recharged once every 6 months, and the amount of electric charge shall exceed 80% of the rated capacity.

Please charge the battery in 18 hours after it discharges fully and starts over-discharging protection.

Formula of theoretical standby time: $T=C/I$ (T is standby time, C is battery capacity, I is total current of all loads).

Preface

Manual description

The RV12100 lithium iron phosphate battery energy storage system can provide energy storage solutions for photovoltaic power generation users through parallel combination. During the day, the excess power of photovoltaic power generation can be stored in the battery. At night or when needed, the stored electrical energy can be used to supply power to the electrical equipment, which can improve the efficiency of photovoltaic power generation, peak load shifting, and emergency power backup.

This user manual details the basic structure, parameters, basic procedures and methods of installation and operation and maintenance of the equipment.

1 Introduction

Brief Introduction

RV12100 lithium iron phosphate battery system is a standard battery system unit, customers can choose a certain number of RV12100 according to their needs, by connecting parallel to form a larger capacity battery pack, to meet the user's long-term power supply needs.(It is forbidden to use in series)

Product Properties

RV12100 energy storage product's anode 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;
- Flexible configurations allow parallel of multi battery for longer supply time;
- Self-ventilation with lower system noise;
- Less battery self-discharge, then recharging period can be up to 6 months during the storage; No memory effect so that battery can be charged and discharged shallowly;
- With wide range of temperature for working environment, -20°C ~ +55 °C, circulation span and discharging performance are well under high temperature;
- Less volume, lighter weight.

Product identity definition

	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

Nameplate Label



Module :	LFP Lithium Ion Battery
Type :	RV12100
Capacity/Voltage :	12.8V/100Ah
Total Storing Energy :	1.28kWh
Charge Voltage :	14V~14.4V
Max. Discharge Power :	1.28kW
Series Number :	┌
Manufacture Date :	



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Figure 1-1 nameplate of RV12100

2 Product Specification

Size and Weight

Table 2-1 RV12100 Spec&Size

Product	Nominal Voltage	Nominal Capacity	Dimension	Weight
RV12100	DC12.8V	100Ah	306mm*185mm*183mm	14kg

Performance Parameter

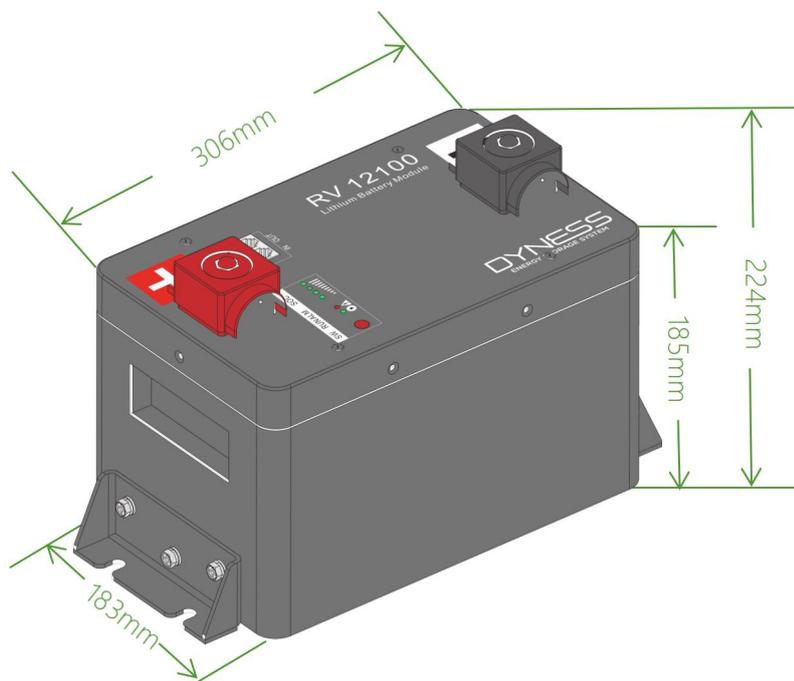


Table 2-2 RV12100 performance parameter

Nominal Voltage	12.8V
Work Voltage Range	11.4~14.4V
Nominal Capacity	100Ah
Nominal Energy	1.28kWh
Nominal Power	0.64KW
Max Power	1.28KW
Rated Charging Current	50A
Rated Discharging Current	50A

Interface Definition

RV12100 product panel interface configuration and function.

This section details the interface functions of the front panel of the device.

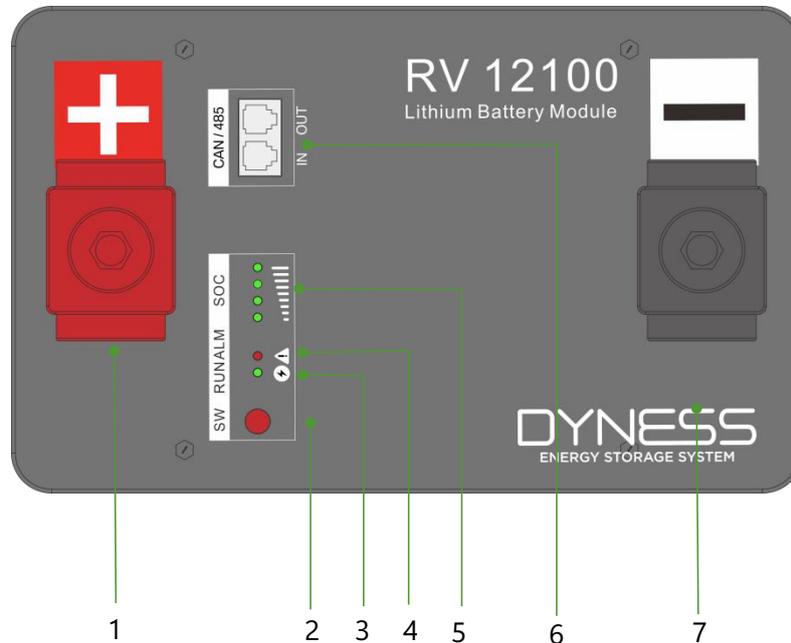


Figure 2-1 RV12100 The sketch of interface

Table 2-3 Interface Definition

Item	Name	Definition
1	Positive socket	Battery output or parallel anode line
2	SW (battery wake/sleep Switch)	long pressing SW for 3s to enable the battery for switch-on or dormant state
3	RUN	Green light, flashing when standby, always on when discharge, flash when charging
4	ALM	Red lights, flash when warning, always on when Protection. When the condition of triggering protection is removed, the battery can recover automatically
5	SOC	Green light, showing battery capacity
6	CAN/485	Communication Port Communication (factory default CAN communication)
7	Negative socket	Battery output or parallel cathode line

CAN/485 Interface definition

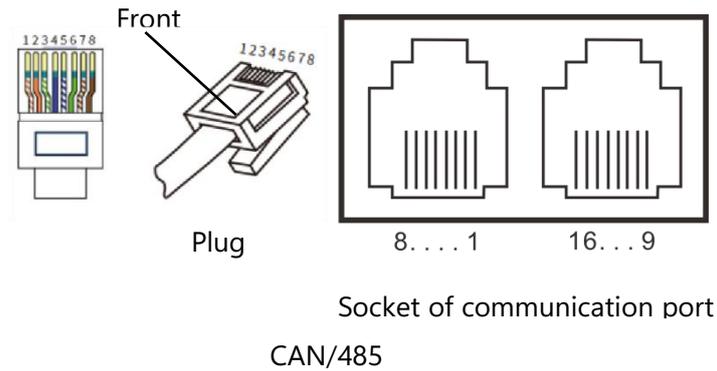


Figure 2-2 CAN/485 Interface definition

Table 2-4 Pin Definition

PIN	Color	Definition
PIN1	Orange/White	Reserve
PIN2	Orange	Reserve
PIN3	Green/White	CANL
PIN4	Blue	CANH
PIN5	Blue/White	XGND
PIN6	Green	XGND
PIN7	Brown/White	Reserve
PIN8	Brown	Reserve
PIN9	Orange/White	Reserve
PIN10	Orange	Reserve
PIN11	Green/White	CANL
PIN12	Blue	CANH
PIN13	Blue/White	XGND
PIN14	Green	XGND
PIN15	Brown/White	485B
PIN16	Brown	485A

Table 2-5 SOC/ALM/RUN Light instructions

Battery State	SOC	LED1	LED2	LED3	LED4	RUN
Shut down		off	off	off	off	off
Standby	$75\% \leq \text{SOC} \leq 100\%$	on	on	on	on	flash
	$50\% \leq \text{SOC} < 75\%$	on	on	on	off	flash
	$25\% \leq \text{SOC} < 50\%$	on	on	off	off	flash
	$0\% < \text{SOC} < 25\%$	on	off	off	off	flash

Charging	SOC=0%	off	off	off	off	flash
	$75\% \leq \text{SOC} \leq 100\%$	on	on	on	flash	flash
	$50\% \leq \text{SOC} < 75\%$	on	on	flash	off	flash
	$25\% \leq \text{SOC} < 50\%$	on	flash	off	off	flash
	$0\% \leq \text{SOC} < 25\%$	flash	off	off	off	flash
Discharging	$75\% \leq \text{SOC} \leq 100\%$	on	on	on	on	on
	$50\% \leq \text{SOC} < 75\%$	on	on	on	off	on
	$25\% \leq \text{SOC} < 50\%$	on	on	off	off	on
	$0\% < \text{SOC} < 25\%$	on	off	off	off	on
	SOC=0%	off	off	off	off	on

On: means green light always on

Flash: means green light flashing

flash: on 0.5S , off 0.5S

Battery Management System (BMS)

Voltage Protection

Discharging Low Voltage Protection:

When any battery cell voltage is lower than the protection value during discharging, the over-discharging protection starts, and the ALM light always on. Then battery system stops supplying power to the outside. When the voltage of each cell recovers to rated return range, the protection is over.

Charging Over Voltage Protection:

When total voltage or any battery cell voltage reaches the protection value during charging, battery stops charging. When total voltage and all the cell voltage recover to rated return range, the protection is over.

Temperature Protection

Less/Over temperature protection in charging:

When battery's temperature is beyond range of $0^{\circ}\text{C} \sim +55^{\circ}\text{C}$ during charging, temperature protection starts, device stops charging. The protection is over when it recovers to rated return range.

Less/Over temperature protection in discharging:

When battery's temperature is beyond range of $-20^{\circ}\text{C} \sim +55^{\circ}\text{C}$ during discharging, temperature protection starts, device stops supplying power to the outside.

The protection is over when it recovers to rated return range.

Other Protection

Short Circuit Protection:

The battery does not allow external short circuit, which will damage the BMS.

**CAUTION**

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

3 Installation and Configuration

Ready for installation

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 12V must meet the SELV requirements defined in the IEC60950 standard.
- If operating within the power system cabinet, make sure the power system is not running. 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.
- The following protective items must be worn when installing the battery system:



Isolation gloves



Safety goggles



Safety shoes

Figure 3-1 Safety Gear

Environmental requirements

- Working temperature: $-20^{\circ}\text{C} \sim +55^{\circ}\text{C}$
- Charging temperature range is $0^{\circ}\text{C} \sim +55^{\circ}\text{C}$
- Discharging temperature range is $-20^{\circ}\text{C} \sim +55^{\circ}\text{C}$
- Storage temperature: $-10^{\circ}\text{C} \sim +35^{\circ}\text{C}$
- The storage time must be less than 3 months in $35 \sim 40^{\circ}\text{C}$
- Relative humidity: $5\% \sim 85\% \text{ RH}$
- 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 is flat and level; There is no

flammable explosive near to the installation places;The optimal ambient temperature is 15~30°C.

- Keep away from dust and messy zones.

Tools and data

Tools and meters that may be used are shown in Figure 3-2:



Figure 3-2 Installation Tools

Technical preparation

Electrical interface check

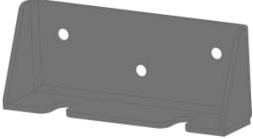
- Devices that can be connected directly to the battery can be user equipment, power supplies, or other power supplies. Confirm whether the user's PV power generation equipment, power supply or other power supply equipment has a DC output interface, and measure whether the DC power output voltage meets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

The security check

- No flammable, explosive and other dangerous articles are placed beside the battery. Firefighting equipment should be provided near the equipment, such as portable dry powder fire extinguisher. If necessary, an automatic fire fighting system should be equipped.

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. Packing list is as follows:

Item	Specification	QTY	Figure
RV12100 module	12V100Ah 306mm*185mm*183mm	1	
Module fixing bracket	L-shaped bracket	2	
Bolt	M6×16 External hexagon internal cross three combination bolt	1	
User Manual	User manual	1	
Parallel cable-positive	Red /25mm ² /L250mm	1	
Parallel cable-negative	Black /25mm ² /L250mm	1	

Engineering coordination

- Attention should be paid to the following items before construction:

Power cable specification The power cable specification shall meet the requirements of maximum discharge current for each product;

Mounting space and bearing capacity; Make sure that the battery has enough space 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, wading and corrosion.

Equipment installation

Table 3-1 Installation steps

Step1	Installation preparation
	1. Confirm that the light on the front panel of RV12100 unit is off to ensure no live operation
Step2	Mechanical installation
	1. Battery placement position determination 2. Confirm the direction of battery module installation 3. Installation of the bottom fixing bracket of the battery
Step3	Electrical installation
	1. Remove the battery terminal protective cover 2. Battery module parallel positive cable installation 3. Battery module parallel negative cable installation 4. Installation of total positive and negative cable of battery module
Step4	Battery system self-test
	1. Press the SW switch 2. Check the system output voltage 3. Shut down the system
Step5	Inverter connecting
	1. Install the total positive and negative cables of the battery system to the MCB

Installation preparation

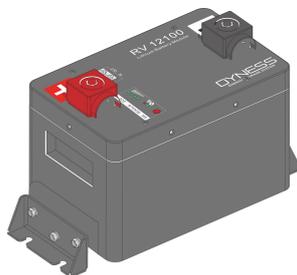
1. Prepare equipment and tools for installation;
2. Check the RV12100 unit , ensure no live operation.

Mechanical installation

Mechanical installation

Mechanical installation

1. Firstly fix the L-shaped bracket to the bottom of the battery module, the fixed bolt is the matching bolt M6*14, the tightening torque is controlled at 9-12NM, the schematic diagram is as follows:



2. After installation, as shown in the figure below, the left and right side brackets are fixed in the same way:



3. Fix the L-shaped bracket to the structure or other structure in the installation scene that needs to be fixed.

Electrical installation

Before connecting the power cable and ground wire, it is recommended to use a multimeter to measure the continuity of the cable, whether it is short-circuited, and confirm the positive and negative.

Measuring methods:

- Cable continuity: select the multimeter buzzer file, use a probe to measure both ends of the same color cable, if the buzzer sounds, the cable is available.
- Short circuit judgment: select the multimeter resistance file, use the probe to measure the positive and negative poles of the same end, if the resistance shows infinity, it means the cable is available.
- Positive and negative poles: After the power cable is connected visually, the positive and negative poles of the battery should be connected to the positive and negative poles of the opposite device respectively.

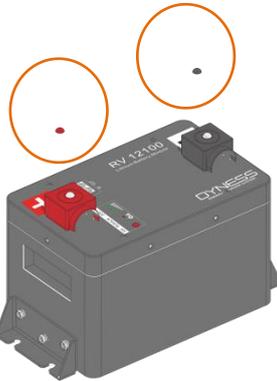
Selection requirements for MCB:

Voltage: $U > 24V$

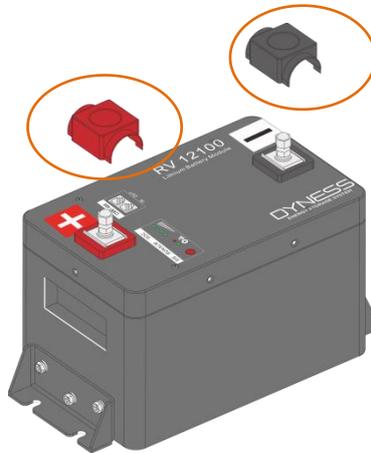
Current: $I = \text{Inverter power} / 10V$

Schematic diagram of the wiring operation of the positive and negative terminals of the module

1. Unscrew the plastic nut on the plastic protective cover on the top of the terminal



2. Remove the plastic protective cover of the terminal.

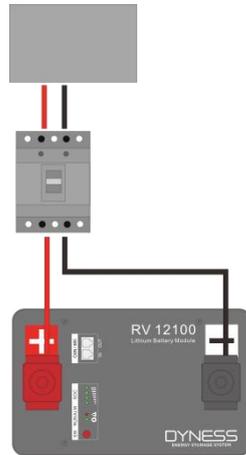


3. Remove the nut and washer on the terminal, and connect it with the parallel cable or the total positive and total negative cable, torque 10-12NM. After the cable connection is done, reinstall the plastic protective cover.

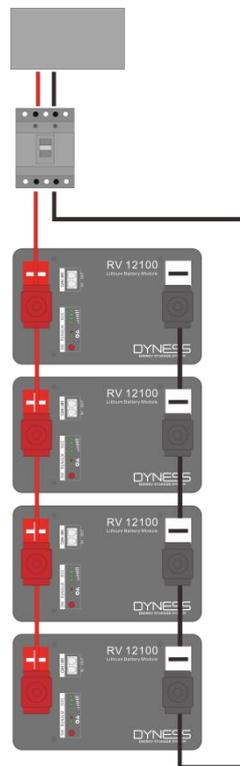


Wiring diagram for single module use

The battery power cable is connected to the MCB according to the following figure.



Wiring diagram for parallel use of modules

**WARNING**

The battery can only be used in parallel. Do not use in series. There is a risk of battery damage when used in series.

4 Use, maintenance and troubleshooting

Instructions for use and operation of the battery system

After completing the electrical installation, follow the steps below to turn on the battery system;

1. Refer to the wiring instructions of "Wiring diagram for single module use" or "Wiring diagram for parallel use of modules", do the preparation work before the battery pack is turned on, and then press the SW button , the RUN light is on after the self-test. SOC indicator is on.



CAUTION

After pressing the SW button, if you find that the battery status indicator on the front panel is continuously red, please refer to "Alarm Description" to deal with it. If the fault cannot be eliminated, please contact the dealer in time.

2. Use a multimeter to measure whether the voltages on the DC breaker connected to battery are more than 11.4V, and check whether the voltage polarity is consistent with the inverter input polarity; if the DC breaker side connected to battery has output voltage and is more than 11.4V, the battery has started working normally;
3. After confirming that the battery output voltage and polarity are correct, turn on the inverter; Turn on the DC breaker.
4. Check whether the indicator lights (communication indicator light and battery connection status indicator light) on the inverter are normal; if they are normal, the connection between the battery and the inverter is completed. If the indicator is abnormal, please refer to the inverter manual to find the reason or contact the dealer.

Table 4-1 Battery and inverter power matching table

Hybrid inverter	Off-grid inverter		RV12100
EPS(backup side)ACoutput power	ACoutput power	Min.parallel amount	System energy(kWh)
≤1.2kW		2	2.4
≤2.4 kW		4	4.8
≤3.6 kW		6	7.2
≤4.8 kW		8	9.6
≤6.0 kW		10	12.0

Equipment requirements	Charge	The battery's long-term continuous charging current should be $\leq 0.5C$; If the battery capacity is empty, please charge it within 48 hours after the battery is empty.
	Discharge	The long-term continuous discharge current of the battery should be $\leq 0.5C$ It is recommended Max.depth of discharge(DOD)of battery doesn't more than 90%.

Alarm description and processing

When the protection action or fault occurs in the system, the alarm signal will be given through the working status indicator on the front panel of the RV12100. You can query the specific alarm categories through battery monitor.

If the fault such as charging over-current, under-voltage protection, high-temp protection and other abnormalities which affects the output, please deal with it according to Table 4-2.

Table 4-1 Main alarm and Protection

State	Alarm category	Alarm indication	Processing
Charging state	Over-current	ALM light on	Stop charging and find out the cause of the trouble
	High temp	ALM light on	Stop charging
Discharging state	over-current	ALM light on	Stop discharging and find out the cause of the trouble
	High temp	ALM light on	Stop discharging
	Total voltage undervoltage	ALM light on	Charging
	Cell voltage undervoltage	ALM light on	Charging
Standby state	Short circuit protection	ALM light on	Check the circuit connected to the output of the battery, and check the power ratio between the battery and the inverter (some inverters have a large inrush current at the moment of startup, and there is a probability of triggering BMS short-circuit protection)
	Undervoltage seriously	ALM light on	Use battery monitor to check whether the cell voltage is lower

than 2V ,and if it is lower than 2V.
The battery pack is prohibited from recharging.

Analysis and treatment of common faults

Analysis and treatment of common faults in the Table 4-3:

Table 4-3 Analysis and treatment of common faults

No	Fault	Analysis	Solution
1	The indicator does not respond after the power on	SW switch is broken	Replace the PCB
2	Red light on,and no DC output	Abnormal battery data status	Use battery monitor to read battery information
3	The DC power supply time is too short	Battery capacity become less	Storage battery replacement or add more modules
4	Battery can't be fully charged	Low charge voltage	Set the charge voltage to14.4V
5	The power cable side sparks at the moment of power on, and the red light is on	Power connection short-circuit	Turn off the battery, check the cause of the short circuit

If you have any technical help or question, please contact the seller in time



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