marvel® Tech

ML350-51.2-W06

User Manual

Declaration

1.The Manual covers the detailed specification of lithium iron phosphate battery pack; please read the instructions carefully before operation and comply with relevant industrial safety regulations. We accept no responsibility for damages arising from improper operation or any operation in violation of provisions as stipulated herein.

2. The document is subject to change by virtue of product version update or other reasons without prior notice. Unless otherwise agreed herein, the document is only used as the guideline, and no presentations or suggestions may constitute any express warranty.

Safety Instruction

Please read the safety instructions before operating the equipment. The safety precautionary measures as mentioned herein are only used as the supplement to all safety precautions, without representing all safety precautions to be complied with. Please comply with local safety rules and regulations when installing, operating and maintaining the equipment. Only trained professionals are allowed to install, operate and maintain the equipment,and marvel Group assumes no responsibility for losses arising from violating the general safety operation requirement or violating the safety standard for equipment design, production and use. Installation and maintenance personnel must have the technical ability of operation in high voltage and AC power supply. Do not wear any conductive object such as watch, chain bracelet, bracelet and ring when installing, operating and maintaining the equipment, and keep the equipment away from moisture.

Danger！ High Voltage

The high voltage power supply offers the equipment power; direct contact or indirect contact through wet object with high-voltage power supply may cause fatal danger.

Using a special tool:

Working in high voltage and AC power, make sure to use a special tool instead of individual tools.

Static-free:

Static electricity would damage veneer on the electrostatic sensitive components; before touching the plug-in, circuit board or chips, make sure to use correct electrostatic prevention measures.

Disconnect the power supply in operation:

When operating the power supply, you must first cut off power supply, live operation is prohibited.

Disconnect the power supply in operation:

Power system provides DC regulated power supply. DC short circuit could cause fatal damage to the equipment.

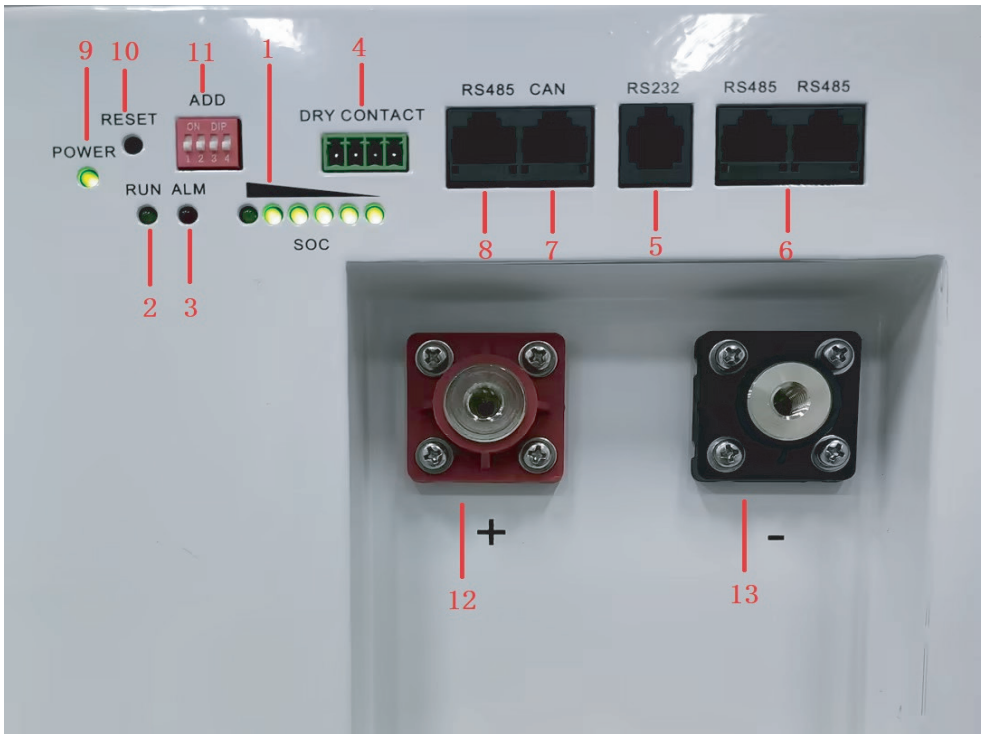
Content

1. Product Introduction

The lithium iron phosphate battery pack consists of a lithium module and a battery management system. High-performance battery management system (BMS), which have functions such as overcharging, over-discharging, over-current, over-temperature, under-temperature short-circuits protection and 20A current limitation, as well as RS232 and RS485 communication ports, could communicate with computers, read parameters of battery pack and monitor status of battery pack in real time.

The product, characterized by integration, miniaturization, light weight, no need of operator on duty, easy use and maintenance, energy conservation, environmental protection, etc., has been widely used. As a backup power supply for indoor and outdoor telecommunication base stations, ETC, UPS, intelligent transportation backup power supply, mobile communication and other fields.

The diagram of the product's front panel is shown as below:



1) SOC LED: 6 green LED lights to display thecurrent power of lithium battery pack.
2) Running light: green, always on when the product is running.
3) Warning light: Red LED light, normally off,normally on in case of fault.

4) Dry contact

5) RS 232 interface: upper communication port, RS232 communication mode when uploading data, data content includes system parameters, system status and alarm information. Generally, 9600bps is adopted.

6) RS485 RS485 interface (dual): levelconnection signal interface, RS485 communication mode is adopted when products are cascaded.

7) CAN interface: communicate with inverter.

8) RS485 interface: communicate with inverter.

9) Power light: green always on,battery power on.

10) Reset switch: when the product is in abnormal or dormant state, the reset button can be used to restart and wake up the product to ensure the stable operation of the system.

11) Address switch: used to set the address distributionwhen the product is used in parallel.

12) Positive terminal

13) negative terminal

All functions are introduced as follows:

(1) Instruction on indicator when charging battery

- 6 capacity indicators (CAPACITY) will display according to current battery capacity;
- The run indicator (RUN) will flash every other 1S.
- When 6 capacity indicators of battery are normally on and RUN light is off, the battery is fully charged.

(2) Instruction on indicator when discharging battery

- RUN indicator is normally on.
- 6 capacity indicators (CAPACITY) will display according to the residual capacity of battery when discharging.

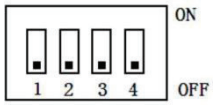
- When discharging to the protection voltage, the battery goes into the protection status and all indicators of battery are off.

(3) Battery alarm

In case of battery fault, ALM light shows red and battery fault alarm gives warning.

(4) ADS dial

The dial switch is located on the right of guard plate socket, with the shape as follows:



	#1	#2	#3	#4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

The dial switch is used to control the address of protection panel. The dial control is a way to control address by binary system; as shown in the above diagram, 1 shows the least significant bit and 4 shows the most significant bit. When dialing to the upper side, each bit means 1; when dialing to the lower side, each bit means 0.

(5) RS232 Monitoring Port

RS232 serial communication is adopted to upload data of battery system; RS232 serial port could realize centralized background monitoring on the battery system, and transmit the battery system working status, alarm information, etc. to the remote monitoring center so as to realize remote monitoring.

(6) RS485 Communication Port

RS485 cascade connection communication port. During system cascade connection, RS485 communication way is adopted for the internal Pack system after RS485 serial communication cascade connection is adopted for data transmission, and the master system acquires Slave Pack data through

Master Pack. Please refer to the specification sheet for the PIN definition of RS485.

(7) Current breaker

Control the battery on & off. When the battery is suffering from short circuit or high current surge, the current breaker will turn off to effectively protect the battery pack.

(8) RST key

RST: represents resetting; in case of system exceptions, the RST key could be used to reset and recover the system to the normal operation.

- When BMS is in a dormant state, press RST for 3S then loosen it, the protection panel will be activated, LED indicators will be lighted up for 0.5S for "RUN" in turn.
- When BMS is in an activated state, press RST for 3S then loosen it, the protection panel will be dormant, LED indicators will be lighted up for 0.5S from the minimum electricity volume light in turn.
- When BMS is in an activated state, press RST for 6S then loosen it, the protection panel will be reset, all LED indicators will be simultaneously lighted up for 1.5S.

(9) Sleep and wake up

Sleep

When any one of the following conditions is met, the system enters a low-power mode:

1) Single or overall over-discharge protection has not been released within 30 seconds.

2) Release the button after pressing the button for 3 seconds.

3) The lowest cell voltage is lower than the sleep voltage, and the duration reaches the sleep delay time (at the same time, no communication, no protection, no balance, and no current are met).

4) The standby time is more than 24 hours (no communication, no charging and discharging, no mains).

5) Forcibly shut down through the host computer software.

Before entering sleep, make sure that there is no charger connected, otherwise it will not be able to enter low power consumption mode.

Wake up

When the system is in low-power mode and meets any of the following conditions, the system will exit the low-power mode and enter the normal operation mode:

1) When the charger is connected, the output voltage of the charger must be greater than 48V.

2) Press the button for 3S, then release the button.

3) Connect the communication line and turn on the host computer software (because of the over-discharge protection and enter the dormant state, this method cannot wake up the protection board).

Remarks: After single or overall over-discharge protection, it enters low-power consumption mode,

wakes up every 4 hours and turns on the charge and discharge MOS. If it can be charged, it will exit the rest.

Sleep state enters normal charging; if it fails to be charged after 10 consecutive automatic wakeups, it will no longer wake up automatically.

When the system is defined as the end of charging, the recovery voltage is not reached after 2 days/48h of standby (standby time setting value), and it is forced to resume charging until the end of recharging.

2. Technical Parameters

2.1 Specification Parameters of Battery Pack

Nominal Voltage	51.2V
Nominal capacity	350Ah
Structural dimension of battery pack W×D×H(mm)	880*450*260mm
Weight	Around 126±1Kg
Discharging cut-off voltage	46.4
Charging voltage	56
Monitoring communication	RS232、double RS485 CAN communication port
Maximum continuous discharging current	200A
Maximum continuous charging current	200A
Internal Resistance	≤8mΩ
Installation Method	Floor mount, Portal frame mount
Working Environment	Charge：0~50℃， Discharge：-20℃～ + 65℃；Humidity：10～85%； Altitude：≤3600m
Protection Function	Overcharging, over-discharging, short-circuit, overload and over-temperature

2.2 Indicator Instruction

2.2.1 Capacity Indicator

Capacity Status	LED Capacity Indicator											
	Discharging						Charging					
	●	●	●	●	●	●	●	●	●	●	●	●
	LED1	LED2	LED3	LED4	LED5	LED6	LED1	LED2	LED3	LED4	LED5	LED6
0~16.6%	Light on	Light off	Light off	Light off	Light off	Light off	Flash2	Light off	Light off	Light off	Light off	Light off
16.6~33.2%	Light on	Light on	Light off	Light off	Light off	Light off	Light on	Flash2	Light off	Light off	Light off	Light off
33.2~49.8%	Light on	Light on	Light on	Light off	Light off	Light off	Light on	Light on	Flash2	Light off	Light off	Light off
49.8~66.4%	Light on	Light on	Light on	Light on	Light off	Light off	Light on	Light on	Light on	Flash2	Light off	Light off
66.4~83.0%	Light on	Light on	Light on	Light on	Light on	Light off	Light on	Light on	Light on	Light on	Flash2	Light off
83.0~100%	Light on	Light on	Light on	Light on	Light on	Light on	Light on	Light on	Light on	Light on	Light on	Flash2
The condition of light-on: the monomer voltage is higher than dormant voltage under storage; when charging and discharging, the capacity indicator light is always on based on the capacity percentage.												

2.2.2 State Indicator

Battery pack State	Protection/Alarm/Normal	ON/OFF	RUN	ALM	Electricity Volume Indication LED						Remarks
		●	●	●	●	●	●	●	●	●	
Power off /Dormant	dormant	Light off	Light off	off	off	off	off	off	off	off	Completely destroyed
Standby	Normal	on	Flash 1	Off	According to electricity volume indication						stand by
	Alarm	on		Flash3							Module low pressure
Charging	Normal	on	Normally on	Off	According to electricity volume indication(Power indicates the maximum LED flash 2)						Maximum power LED flashes (flash 2), and ALM does not flash during overcharging alarm
	Alarm	on		Flash3							
	Protection	on	Off	on	On	On	On	On	On	On	If no market power is available, the indicator light turns to the standby state
	Temperature, overcurrent, and failure protection	On	Off	On	Off	Off	Off	Off	Off	Off	Stop charging
Discharging	Normal	On	Flash3	Off	According to electricity volume						

	Alarm	On		Flash3	indication						
	Protection	On	Off	Off	Off	Off	Off	Off	Off	Off	Stop discharge
	Temperature, overcurrent, short circuit, reverse connection, failure protection	On	Off	On	Off	Off	Off	Off	Off	Off	Stop discharge
Failure		Off	Off	On	Off	Off	Off	Off	Off	Off	Stop charging and discharge

2.2.3 LED Flashing Instruction

Flashing Ways	On	Off
Flash 1	0.25S	3.75S
Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S

Remark: Make or prohibit LED indicator alarms by host computer, and the factory default is to make it alarm.

2.3 Installation Guide

2.3.1 Installation

Open the packaging case, take out battery and accessory hangers, and install the hangers to the battery pack.

2.3.2 Grounding connection

Connect the battery touchdown point and equipment cabinet ground connection place , so as to guarantee the connection to be tightened.

2.3.3 Battery pack in Parallel

Connect the positive pole of battery pack to the positive pole bus-bar with 16 square red cable, and connect the negative pole of battery pack to the negative pole bas-bar with 16 square black cable.

If there are several packs of battery in parallel, ensure that positive poles of each battery pack are connected and that negative poles of each battery pack are connected.

2.3.4 Start-up System

After completing the battery installation, ensure the battery to be in the close state; and the

battery may be charged or discharged only after the system is started up.

2.3.5 Communication Port Connection

Connect RS232 or RS485 communication port to client’ s computer or remote monitoring equipment with the line of communication.

2.4 Discharging

(1) Inset load to discharge the battery normally.

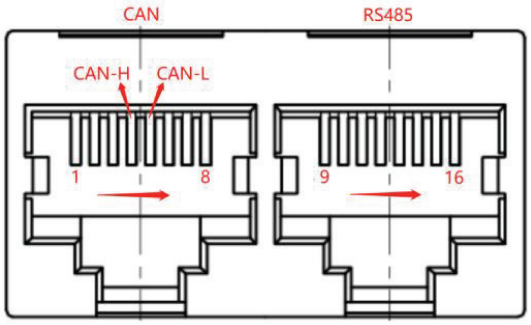
(2) Battery’s maximum discharging current is 200A.

(3) Battery’s minimum discharging cut-off voltage is 43.2V.

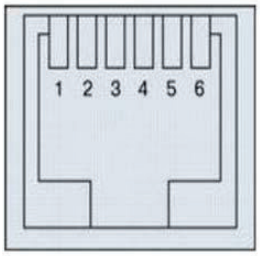
2.5 Monitoring and Communication

It is equipped with RS232 interface communicating with upper computer and RS485 interface performing communication cascade among battery pack.

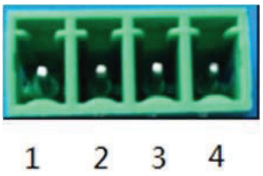
2.5.1 Communication interface definition



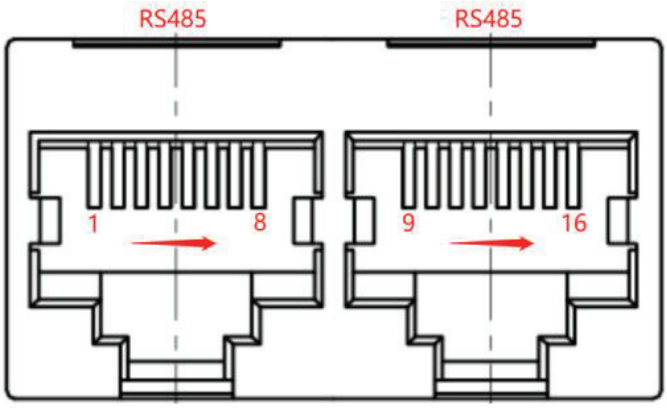
CAN AND RS485



RS232



DO OUPUT



Parallel communication port

RS232 6P6C RJ11	
RJ11 PIN	Definition
2	NC
3	TX
4	RX
5	GND

RS485 8P8C RJ45		CAN 8P8C RJ45	
RJ45 PIN	Definition	RJ45 PIN	Definition
9、16	RS485-B1	1、3、6、7、8	NC
10、15	RS485-A1	4	CANL
11、14	GND	5	CANL
12、13	NC	2	GND

CAN AND RS485

RS485 8P8C RJ45		RS485 8P8C RJ45	
RJ45 PIN	Definition	RJ45 PIN	Definition
1、8	RS485-B	9、16	RS485-B
2、7	RS485-A	10、15	RS485-A
3、6	GND	11、14	GND
4、5	NC	12、13	NC

Parallel communication port

2.5.2 Monitoring Targets

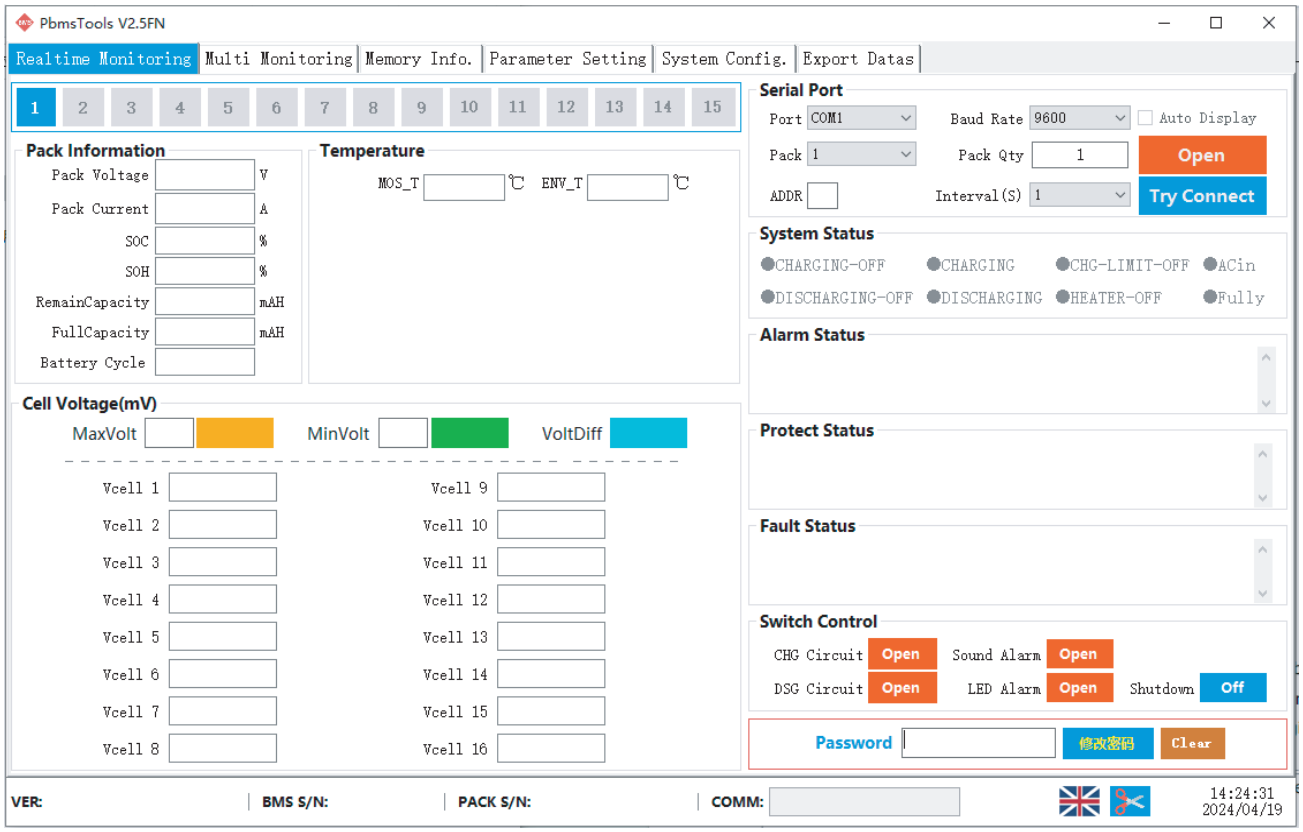
Telemetry: Voltage, current, temperature, SOC, SOH (optional), etc.

Tele-command: Charging and discharging state, overcharge/over-current alarm, ambient/battery pack/PCBA/high battery temperature alarm, low ambient temperature alarm, low battery pack capacity alarm, battery pack temperature/voltage/invalid current sensor alarm, invalid battery alarm (optional-only alarm without cutting off when monomer voltage difference is too high and exceeds the limit), invalid battery pack alarm (optional);

Tele-control: Charge/discharge (optional), turning off the alarm voice, smart charging by interval, current limiting charging method;

Tele-adjusting (optional): charge/discharge administrative parameters of battery pack, etc. which shall match the output parameters of switch power system.

2.5.3 Monitoring Page



3. Precautions

3.1 Installation Precautions

(1) Unpack prior to installation to check the quantity of the parts and battery appearance;

(2) Handle the battery gently during handling and placement to prevent it from dropping or being impacted. The battery shall not be thrown or striken to avoid damaging the battery or resulting in potential safety hazard;

(3) Do not put any metal and any article made of the metal conductive material together with the battery or assemble it into the battery box;

(4) Install the hanger and handle and measure the battery voltage with a multi-meter.

(5) Check the anode and cathode of the battery prior to wiring; and do not connect reversely the anode and cathode terminals;

(6) Wear protective gloves during battery connection. When using such metal tools as torque wrench, please perform insulating packaging for them and the two ends of the metal tools such as torque wrench shall not contact the positive and negative terminals of the battery at the same time to avoid battery short-circuit;

(7) Before the battery is connected with the peripheral equipment, make the equipment be

in a disconnected state, check whether the connecting polarity of the battery and total voltage are correct, connect the battery anode with the equipment anode and battery cathode with the equipment cathode and fix the connecting line,

(8) Install it according to the selected installation mode:

a) Installation of standard cabinet (rack): Install the matching hanger for the battery pack and fix them in the standard cabinet and add tray protection for the battery box.

b) Installation of wall-mounted box: Prior to installation, please ensure that the wall complies with the wall-mounted requirements; install the special wall-mounted box of the lithium battery and fix the battery pack in the wall-mounted box in a hanger manner according to the location in the design plan;

c) Installation of integrated indoor and outdoor cabinets (boxes): Install them according to the installation specification for the customized integrated cabinet (box).

(9) Installation method diagram:

3.2 Operation Precautions

(1) Do not unpack battery box without permission;

(2) Do not let any sharp part of tool touch the battery box surface and scratch or damage the battery box;

(3) Do not change the parameter setting in battery management system;

(4) Do not sprinkle any fluid or powder on the product;

3.3 Maintenance Precautions

Our lithium iron phosphate battery pack, characterized by low self-discharge rate, floating charge resistance and long using life, is free from maintenance. Its fully smart battery management system (BMS) replaces human detection process, automatically monitoring the voltage of each monomer battery of the battery pack and the overall voltage and overall current of battery pack, performing equilibrium on each monomer battery during charging and discharging process to avoid overcharging and over-discharging. The automatic detection and protection functions of battery management system greatly lower the malfunction rate of battery pack and prolong its service life, and drastically reduce the usage cost of the communication industry. A simple maintenance and inspection of lithium iron battery can be performed during post installation and service period. Maintenance intervals can be extended since it is maintenance-free. For instance, charge it every 3 months.

- Battery shall be maintained by professional technicians; and others are prohibited from changing battery parameters without permission;
- Check whether polar columns or connecting lines of lithium iron phosphate are loose, damaged, distorted or eroded, check whether battery shell is damaged or distorted; and remove the accumulated dust in the air-vent;
- Observe the status of RUN indicator of battery pack, which is in green in normal status. When only one last capacity indicator remains flashing, it indicates that the capacity is low and the battery is discharging all the remaining power and shutting the output.
- Pull out the charging cable when the battery is left idle for long time.
- When it malfunctions, the red ALM light of battery pack flashes and send out warnings. In this case, please check whether the battery is connected in right manner or over-current exists; then press the reset button to see whether the malfunction is resolved after resetting. If not, please contact the manufacturer. Do not open the battery pack box without permission.
- When multiple battery packs are applied in parallel and one of those malfunctions and needs

to be replaced, please ensure the voltage difference between the battery voltage of the alternative battery pack and that of other parallel battery pack is less than 2V; otherwise the large voltage difference will lead the high-voltage battery pack to charge the high current of the lower one, on which the protection for charging over-current is activated, finally causing charging disability.

3.4 FAQs and Troubleshooting

3.4.1 Under-voltage Alarm

Phenomenon: ALM indicator flashes, and RUNindicator goes off.

Cause analysis:

(1) Load current has exceeded the protection value of battery discharging.

(2) Battery protection board malfunctions.

Troubleshooting: protection board will be locked in over-current state when it enters into such state; and it is activated until charger is connected with the charging input end.

3.4.2 Over-current Discharging Protection

Phenomenon: ALM indicator flashes, and RUN indicator goes off.

Cause analysis:

(1) Load current has exceeded the protection value of battery discharging.

(2) Battery protection board malfunctions.

Troubleshooting: protection board will be locked in over-current state when it enters into such state; and it is activated until charger is connected with the charging input end.

3.4.3 Temperature Protection

Phenomenon: ALM indicator flashes, and RUN indicator goes off.

Cause analysis: the ambient temperature is too high or too low

Troubleshooting: when the temperature of NTC end returns to normal value, the protection board recovers from temperature protection state and the red ALM light goes off.

3.4.4 No Voltage Output from Battery

Phenomenon: Electricity capacity indicator goes off, and the inspected voltage of the terminals of the battery is 0V.

Cause analysis: The battery is not activated or the battery management system is abnormal.

Troubleshooting: Activate the battery or press the "RST" bottom on the battery board to

reset the battery when it is in active state. If there is still no voltage output, please contact the technicians of the manufacturer for troubleshooting.

4. Packaging, Transportation and Storage

4.1 Packaging

Pack the lithium iron phosphate battery pack in whole package to ensure no noxious gas, chemical contamination, static electricity, moisture and mechanical damage during handling, transportation and storage.

4.2 Transportation

Pay attentions to the following when handling batteries:

(1) Handle the battery gently and avoid violent vibration of the device;

(2) Do not invert, roll, throw or strike the battery to avoid damaging the appearance;

(3) Do not expose batteries to the sun and rain and not to directly flood the batteries in whole;

(4) Prohibit from short circuit of both terminals.

4.3 Storage

(1) The external terminal of battery pack is in insulating protection state;

(2) Batteries stored shall be connected with master computer software every 3 months to check the battery pack state:

a. If average monomer voltage is ≤3.0V, the battery pack is needed to charge with 0.13C for 1.5hour (charge 15% capacity), then store for next 3 months;

b. If battery pack alarms after it is switched on, firstly make sure the alarm reason is not for battery pack, nor BMS breakdown, then check item a;

c. If the battery cannot be switched on, please check item a and item b after making trouble shooting process.

d. Make sure the battery pack is switched off when it is stored.

(3) Batteries shall be stored in dry, clean, ventilating environment without corrosive gas, and away from fire and the exposure of sun;

(4) Do not store or place batteries in the place where ambient temperature is higher than 60℃ for a long period, otherwise it will cause hypo-function or shortened usage life.

4.4 Ambient Conditions

(1) Temperature

Working temperature range: -20℃~65℃（Discharge）/0℃~55℃（Charge）;

Storage and transportation temperature range: -10℃~50℃;

Under -20℃~25℃， it can be stored for 12 months; -20℃~40℃, 3 months;

-20℃~50℃, 7 days

(2) Humidity

Relative storage and transportation humidity range: ≤85%;

Relative working humidity range: ≤85%;

(3) Atmosphere pressure

Atmosphere pressure range: 70KPa ~106KPa.

5.Accessories

NO.	Accessories	Rem
1	485 communication line×1	100cm