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# Integrated Lithium-ion Battery Pack for Telecom

# User Manual

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# FOREWORD

## Overview

This manual describes the installation, history recording and parameter settings etc.

Please keep the manual in safety for more information.

## Readers

This document provides technical details regarding the tools and infrastructure used by the following users:

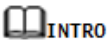
- Sales engineer
- Technical support engineer
- Installation engineer
- Application engineer
- Maintenance engineer

## Symbol convention

The following symbols may appear in this article, and they are represented as follows:

| Symbol | Indication |
|---|---|
|   | Used as warning in an emergency, if not avoided, it will result in death or serious personal injury. |
|  warning | Used as a warning of a middle or low potential hazards, if not avoided, it may cause minor or normal injury. |


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| | |
|---|---|
|  caution | Used as a warning of potential dangers, if ignore this information, it may result in equipment broken, data lost, equipment performance decrease and other unpredictable result. |
|  | represents the supplement information of main text to emphasize or replenish. |


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# DIRECTORY

**FOREWORD** ..... ii

**DIRECTORY** ..... iv

**1 OVERVIEW** ..... 6

1.1 Product specification ..... 6

1.2 Product profiles ..... 6

1.3 Product structure ..... 7

**2 ILLUSTRATION** ..... 8

2.1 Explanation of the structure ..... 8

2.2 Panel description ..... 8

2.3 Menu operation instructions ..... 12

2.4 The working principle ..... 13

2.5 The product features ..... 14

**3 INSTALLATION GUIDE** ..... 16

3.1 Installation precaution notes ..... 16

3.2 Installation preparation ..... 18

3.2.1 Unpacking and inspection ..... 18

3.2.2 Installation tools ..... 19

3.3 Installation and wiring ..... 20

3.3.1 Single installation ..... 20

3.3.2 Multiple sets of parallel installation ..... 20

**4 MAINTENANCE** ..... 23

4.1 Electrical maintenance ..... 23


All Right Reserved

4.2 Battery maintenance ..... 24
4.3 Treatment for malfunctions ..... 24
**5 SPECIFICATIONS ..... 29**
5.1 Technical specifications ..... 29
5.2 The main performance index of the battery ..... 32
**6 ENVIRONMENT PROTECTION ..... 33**
6.1 Environmental Label ..... 33
6.2 Recycle ..... 33
**7 APPENDIX ..... 34**
7.1 Connection cable ..... 34
7.2 Current collection copper ..... 36

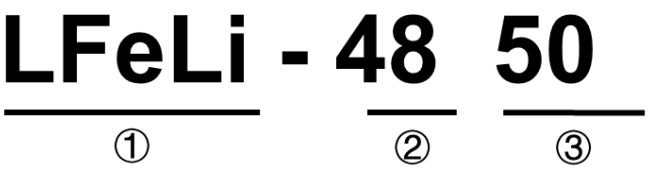

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# 1 OVERVIEW

## 1.1 Product specification

The model of integrated lithium Ion battery (hereafter referred to as lithium battery or PACK) for Telecom is shown in figure 1-1.

Figure1-1 The explanation of the product specification




① The main ingredient of Lithium Ion battery is Lithium iron phosphate
② The pressure is 48V
③ The capacity is 50Ah

## 1.2 Product profiles

The lithium battery group adopts the international advanced lithium iron phosphate battery application technology and BMS control technology. Due to it's a long lifecycle, small size, light weight, stable performance, safety and environmental protection, as well as a strong ability to adapt, it can be used in harsh outdoor environments.

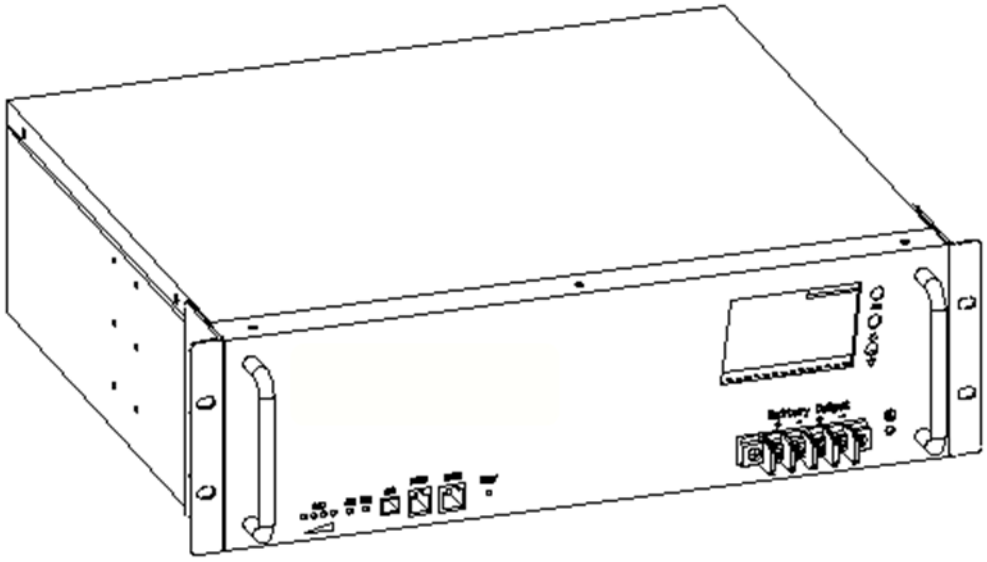
The system integrates advanced battery manage system (BMS), including charge and discharge management, thermal management, communication management, balance management, data management, and realize remote centralized monitoring, remote management and maintenance of the battery. It has outstanding advantages in specific occasions, as a backup power supply is widely used in the remote access network equipment, exchange, mobile communication equipment, transmission equipment, satellite and microwave communication equipment and communication.


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# 1.3 Product structure

The appearance of the lithium battery pack is shown in figure 1-2, for interface description; please refer to the 2.2 panel description".

Figure1-2 Product picture



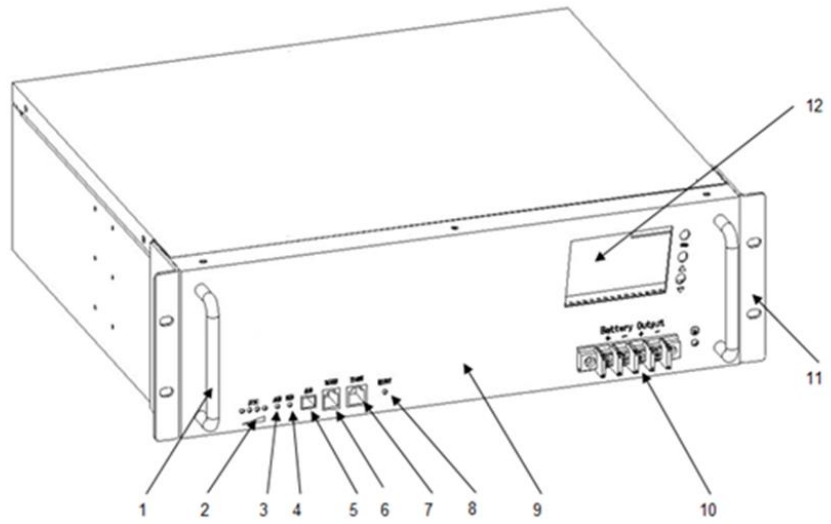

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# 2 ILLUSTRATION

## 2.1 Explanation of the structure

The structure of Lithium Ion battery pack as shown in figure 2-1.

Figure2-1 Product structure




| | | | |
|---|---|---|---|
| 1 Handle | 2SOC (capacity light) | 3ALM（alarm） | 4RUN |
| 5ADD | 6RS232 | 7RS485 | 8RESET |
| 9 Main panel | 10Battery Output | 11 Hanging ear | 12Display |

## 2.2 Panel description

The panel of the module of the lithium battery pack, as shown in figure 2-2.


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Figure2-2 Module panel description



## Battery Output

Using 4 pin terminal pins, the front of the terminal from left to right is defined as battery+, Battery-, Battery+, battery-, which is connected with the power transmission line for charging and discharging.

## SOC

The meaning of SOC indication light is shown in table 2-1

Table2-1 The relationship between the capacity of the battery and the light

| ● | ● | ● | ● | Capacity |
|---|---|---|---|---|
| ¤ | ¤ | ¤ | ¤ | 75%-100% |
| ¤ | ¤ | ¤ | ○ | 50%-75% |
| ¤ | ¤ | ○ | ○ | 25%-50% |
| ¤ | ○ | ○ | ○ | 0%-25% |

INTRO ¤indicates ON，○indicates OFF。

## ALM

When the battery is at fault, "ALM" light is red.

## RUN

During charging, the "RUN" light will be flashing.

"RUN" and "ALM" can display the battery status, as shown in table 2-2.


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Table2-2 The explanation of "RUN" and "ALM"

| Function | Mark | Color | Flashing frequency | Indication |
|---|---|---|---|---|
| Running | RUN | Green | No light | Not working |
| | | | Slow Flash(about 3 secs) | Standby state |
| | | | Fast flash | Working state |
| Alarm | ALM | Red | No light | Normal |
| | | | stable lighting | Alarm |

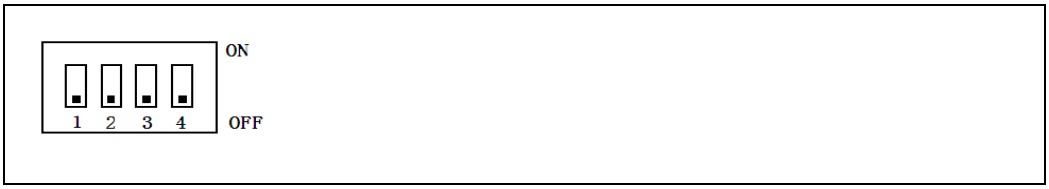
# ADD

In parallel, band switch using four dip switch to address set cell system. The explanation of its dial switch as shown in table 2-3.

Table2-3 Band switch address code

| Address Code | | | | ADD | PACK Definition |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | | |
| OFF | OFF | OFF | OFF | 0 | PACK 0 |
| ON | OFF | OFF | OFF | 1 | PACK1 |
| OFF | ON | OFF | OFF | 2 | PACK2 |
| ON | ON | OFF | OFF | 3 | PACK3 |
| OFF | OFF | ON | OFF | 4 | PACK4 |
| ON | OFF | ON | OFF | 5 | PACK5 |
| OFF | ON | ON | OFF | 6 | PACK6 |
| ON | ON | ON | OFF | 7 | PACK7 |
| OFF | OFF | OFF | ON | 8 | PACK8 |
| ON | OFF | OFF | ON | 9 | PACK9 |
| OFF | ON | OFF | ON | 10 | PACK10 |
| ON | ON | OFF | ON | 11 | PACK11 |
| OFF | OFF | ON | ON | 12 | PACK12 |
| ON | OFF | ON | ON | 13 | PACK13 |
| OFF | ON | ON | ON | 14 | PACK14 |
| ON | ON | ON | ON | 15 | PACK15 |


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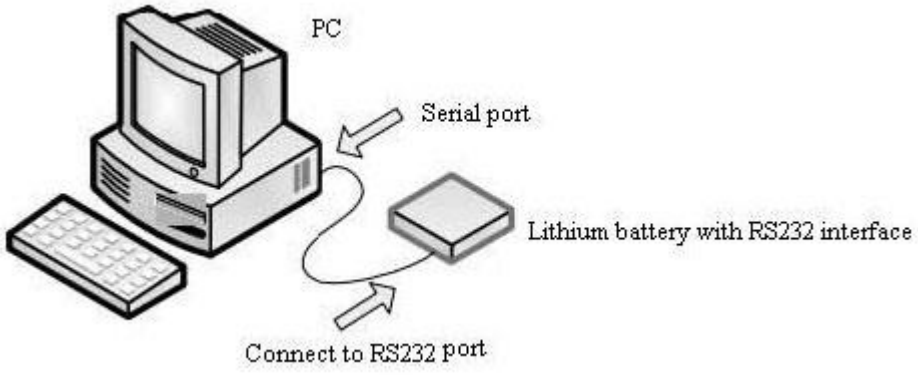



# RS232

The system uses RS-232 series load data for Telecom, transferring data including: system parameters, system status and alarm information.

Telecom RS-232 generally uses 1200bps. Connected with a high-end computer, only when the dip switch is set to Pack (Master Pack) mode, the RS-232 Telecom module is effective. Connection as shown in figure 2-3.

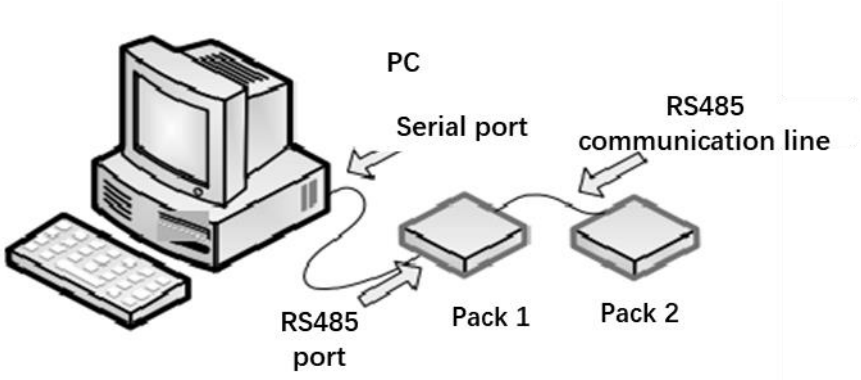
Figure2-3 RS-232 connection schematic diagram




# RS485

When the system is in parallel mode, it can use the RS-485 serial Telecom for data transfer. Connection as shown in figure 2-4.

Figure2-4 RS-485 connection schematic diagram





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## RESET

Press RST key for 3 seconds, then start the device, press the RST key for 3 seconds again, then shut down the device. When the system is running, should there be an exception, use this button to reset the system (press / release) to ensure the stability of the system.

# 2.3 Menu operation instructions

The LCD display interface is user-friendly, as shown in figure 2-5. It provides 320 * 240 dot matrix graphic display. The LCD is able to display the alarm information in real time, and provides the historical warning records for the user to query, and provide a reliable basis for fault diagnosis.

Users can easily browse the battery parameters through the LCD interface, and obtain timely access to information on the current state of the battery. The interface displays a total of 5 menu keys, the functions described as follows.

Figure2-5 LCD Display




## The commonly used button function

The display function of the button as shown in table 2-4.

Table2-4 Button function description

| | |
|---|---|
|   | Main menu |
|   | Confirm, enter |
|  | Page up |


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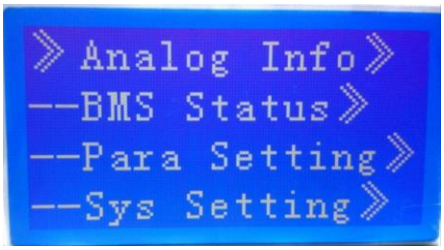
| | |
|---|---|
|  | Page down |
|  | Return, launch |

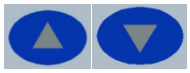
## Operation procedures

1) Press  once, the LCD display screen light up, then the welcome interface will be shown.




2) Followed by the prompt and then click once to enter the main menu bar.




3) Scroll page up and page down , Enter the Menu screen, when the arrow  points to the corresponding bar, press Enter  to confirm.

4) Go back on the menu bar, click .

# 2.4 The working principle

Lithium battery pack is equipped with charging and discharging management module and monitoring module.

Charge and discharge management module protects battery charge and discharge functioning, prevents overcharging, discharge over-current, the charging process by the adapter charger to the DC input form, the discharge process is completed by connecting the load discharge.

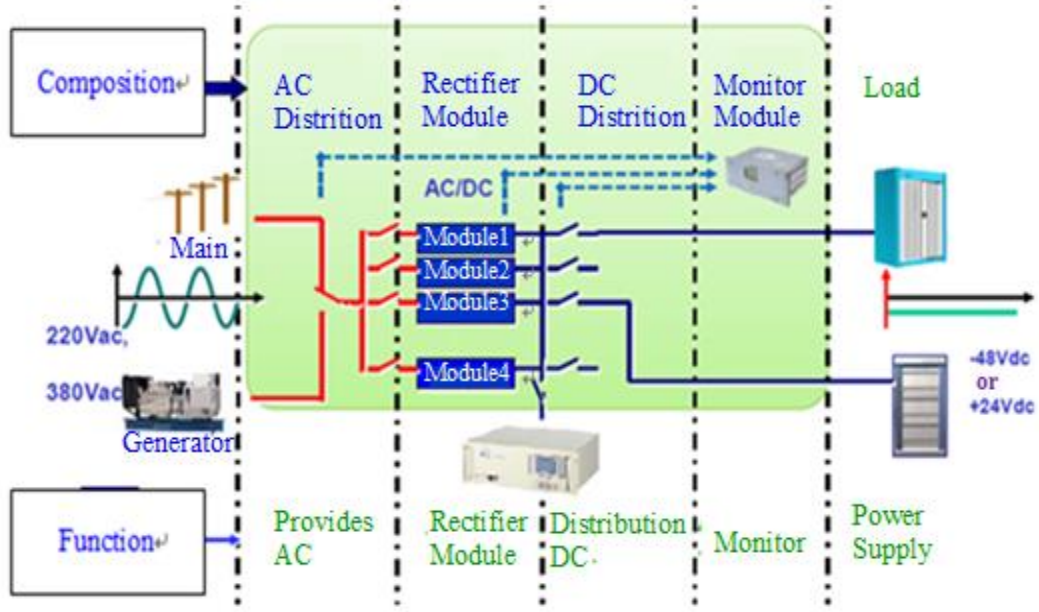
The monitoring module has the balance function and power, temperature and SOC. The monitoring module transmits the real-time information collected in the operation of the product through the Telecom protocol network to the monitoring platform, and


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the user can observe the operation status of the battery in each group through the display screen.

A single module has a 48V (10~100) Ah, with a large capacity, can be used in accordance with user requirements arbitrary combination. As shown in figure 2-6.

Figure2-6 theworking principle diagram




# 2.5 The product features

Integrated lithium battery pack for Telecom has the following remarkable characteristics:

- The lithium iron phosphate as cathode material has a long lifecycle, its safety is extremely good.
- The operating temperature range is: （-20~+60）℃.
- It has strong charge discharge capacity, charge and discharge rate can support 1.0C.
- It can support multiple batteries for expansion.
- During storage and transport, L can enter the sleep mode, in order to reduce the loss of capacity.
- The Port design is convenient; all wire harness connected to the plug, convenient connection.
- It is light weight, small size, easy to install and maintain, meets the requirements of the standard cabinet, is able to be wall mounted, or mounted on a pole.
- Battery status parameters is the system for real-time monitoring of current and voltage, temperature, alarm and protection function.


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- The function of "four remote" (telemetry, remote signaling, remote regulating and remote control), can be connected by computer with remote control center.
- It is environmentally-friendly.

INTRO

1) Telemetry: voltage, current, temperature, SOC, SOH (optional), etc.
2) tele-signaling state of charge and discharge, overcharge / overcurrent, under voltage overcurrent alarm / alarm, environment / battery /PCBA/ battery temperature alarm, low environmental temperature alarm, battery capacity is too low, the battery temperature / voltage / current sensor failure alarm, battery failure alarm (just not cut off the monomer pressure high limit alarm) (optional), battery failure alarm (optional).
3) Remote control: charge / discharge (optional), alarm sound off, intelligent intermittent charging mode, current limiting charging mode.
4) Optional: Battery charge / discharge management parameters and the output parameters of the switching power supply system..


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# 3 INSTALLATION GUIDE

## 3.1 Installation precaution notes

### Comply with local laws and regulations

When operating the equipment, make certain to comply with local laws and regulations.

### Personnel requirements

Technicians who are responsible for installation and maintenance are required to undertake strict training. Master the correct methods for operation and safety, only then the installation, operation and maintenance can be carried out.

In order to maximize the efficiency of the equipment, to obtain best possible operating results, and ensure maximum lifespan, please pay careful attention to the correct installation and usage requirements.

### Personal safety

- Insulated tools and gloves should be used and worn at all times – During the installation process, watches, bracelets, rings and other metal products should be removed.
- Avoid any fall or collision during the installation process.
- Do not remove the battery components. The maintenance of the battery should be carried out by a professional engineer.
- Should be operated and supervised by engineer who have experience and can take preventive measures for potential hazards of battery.

### Field and environment

- Site requirements

1) Cleanliness


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Lithium battery packs cannot be placed in or near garbage disposals, or accidentally dropped or placed in smaller disposal units, as their interaction with metals is likely to cause short circuits and endanger the system and personal safety.

2) Fire protection

The room is prohibited to store flammable, explosive and other dangerous goods, and it should be equipped with effective fire equipment (such as CO2 fire extinguishers).

3) Ventilation and heat dissipation

In order to facilitate the operation and maintenance of equipment for the heat, the equipment should be left around (50~30) cm around at least, left about 50cm for the upper space. The space should be equipped with exhaust fan, to maintain good indoor ventilation.

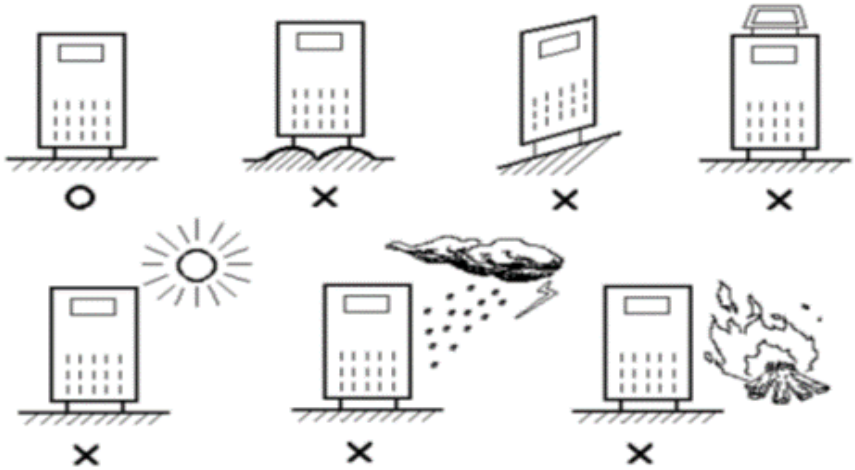
4) Installation requirements

Installation should be carried out as shown in figure 3-1 in order to avoid possible risks.

Put the lithium batteryon the ground (to avoid tilt, uneven ground).

Avoid placing in the sunlight, rain or wet surfaces.

Figure3-1 Requirements for installation scenarios



- Environmental requirements

Ambient temperature: ( -10~+40) ℃.

Relative humidity level: 0%RH~95%RH, no condensation.

Cooling method: air cooler.

Height above sea level: match to the standard requirement of GB3859.2-93.

Verticality: no vibration and the vertical inclination does not exceed 5º.

Pollution level: Level ii.

Recommended operating temperature : (20~25) ℃, humidity level control within 50%.


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caution

- Do not install in the working environment with metal conduction type dust.
- Do not put anything containing corrosive gases.
- Do not put anything in the dust concentrated areas.
- Do not place any items on the top of lithium-ion battery pack. People could not sit on the battery.

## Power check

Before installation, please confirm that the load capability of inlet wire meets the requirements of the new equipment. Check to see if the power supply corresponds to the equipment nameplate of the voltage and frequency and if the current capacity has decreased due to the aging of the wire.

If in doubt, please check with your local power supply Consultation Department.

- Ground wire

  Earthing terminal is ready; zero voltage required in the room cannot exceed 5V.
- DC output voltage and load capacity

  Lithium-ion battery pack of rated DC output 48V.

  DC output power


caution

- When installing the lithium-ion battery pack, the user should check the lithium-ion battery pack in advance to make sure that the contacts and connectors are safely in place to avoid an open circuit or short circuit fault.
- During installation, do not connect the lithium batteries polarity in reverse or in a ny way incorrectly, to avoid causing a short circuit.
- Please do not connect the terminals with no security or insulation protection, so as to avoid the risk of electric shock.

# 3.2 Installation preparation

## 3.2.1 Unpacking and inspection

Lithium batteries and accessories use packaging of cardboard boxes or wooden boxes. When unpacking, be careful when dismantling. Inspect the device and accessories according to the package list, to ensure it's complete and make certain nothing was damaged during shipping.

Before clearing the packaging, make sure that all parts are included. If equipment or accessories are damaged in transit, or incomplete or incompatible, the equipment, accessories and order contracts should be recorded and local branches or offices of our company should be contacted immediately.


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The site needs to be tidied and inspected once again to make sure the audit documents are in order for the audit. Before inspection, the site should be clean.

## 3.2.2 Installation tools

Potential commonly used tools as shown in table 3-1~3-4the field technician will increase or decrease the amount according to the construction.

Table3-1 General purpose tools

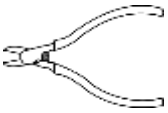
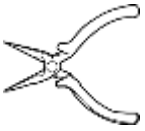
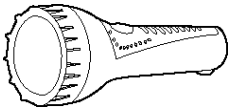
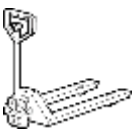
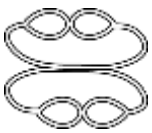
| The appearance of the tools, parameters, and names | | | |
|---|---|---|---|
| Adjustable wrenches | Phillips screwdriver | Slotted screwdriver | Socket wrench |
|  |  |  |  |
| Torque wrench | Open-end wrenches | Double offset ring spanner | Diagonal cutting pliers |
|  |  |  |  |
| Wire cutters | Needle nosed pliers | Marking pen | Working gloves |
|  |  |  |  |
| Ladder (2m) | Flashlight | Tape measure | Impact drill |
|  |  |  |  |

Table3-2 Tools for delivery and unpacking

| The appearance of the tools, parameters, and names | | | |
|---|---|---|---|
| Manual forklifts | Electric forklift | Sling（weight≥ 400kg） | Leverage （weight≥400kg） |
|  |  |  |  |


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Table3-3 Electrical installation tools

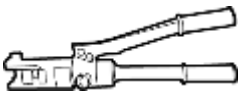
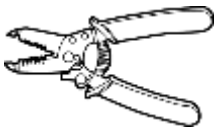
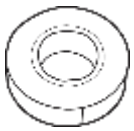
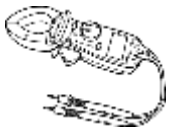
| The appearance of the tools, parameters, and names | | | |
|---|---|---|---|
| Insulated gloves | Power cable crimping plier | Wire stripping pliers | Electrical tape |
|  |  |  |  |

Table3-4 Measuring Tools

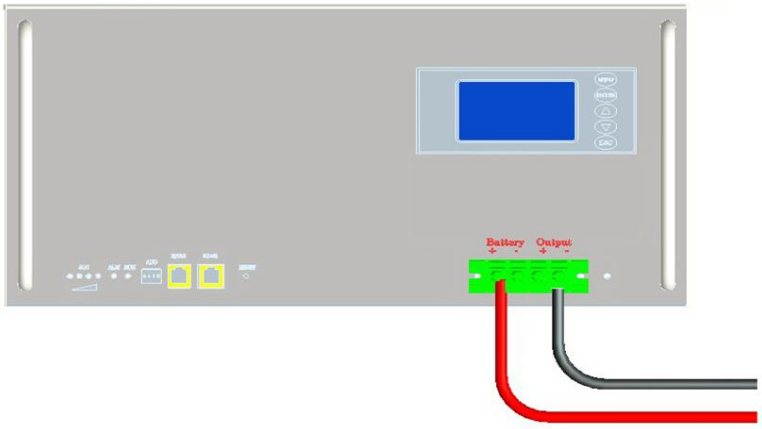
| The appearance of the tools, parameters, and names | | | |
|---|---|---|---|
| Clamp the flow table | | | - |
|  | | | - |

# 3.3 Installation and wiring

## 3.3.1 Single installation

Single installation as shown in figure 3-2.

Figure3-2 single installation diagram



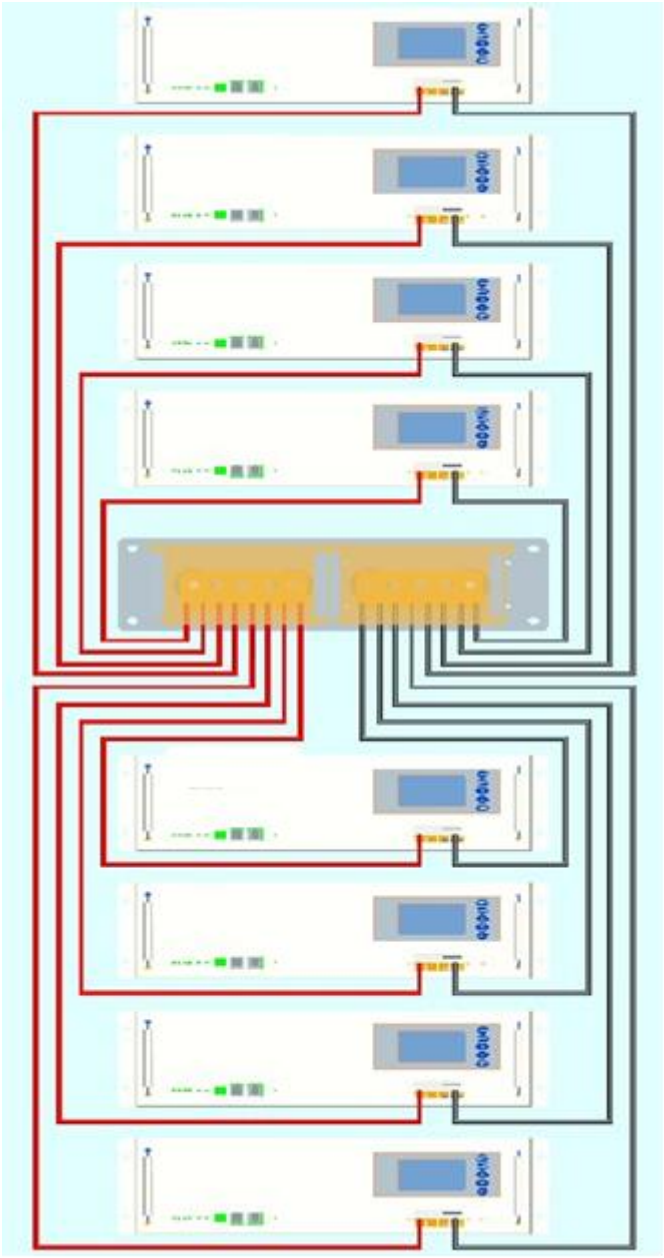

## 3.3.2 Multiple sets of parallel installation

Lithium batteries of 48V (10~100) Ah, with a variety of capacity modules, can be carried out according to the requirements for the parallel sets of batteries.


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For parallel sets of batteries no more than 8 groups, as shown in figure 3-3.

Figure3-3 Sketch map of parallel Installation



INTRO

1) Before the parallel installation, setting the battery to the limited charging mode is very important. For detailed operations, please refer to Integrated Lithium-ion Battery Pack PC Software User Manual, and it will be provided with this manual.
2) Capacity load (namely in line with the voltage-hysteresis current load), to ensur e the work, start the power supply module first, then load.


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### 3.3.3 Switch power supply parameter setting

After installation, test whether there is a short-circuit phenomenon, if not, you can directly on the electricity.

Switch power supply module parameters should be set according to the following table:

Table3-5 Switch power supply parameter setting

| Item | Parameters （16 cells） | Parameters （15 cells） |
|---|---|---|
| Uniform charge voltage | 56.00V ~ 57.60V | 52.50V ~ 54.00V |

After the parameter is set up, it can be used normally, when the power outage, the product is no delay to the communication equipment to provide back-up power supply support.

INTRO

1）Before the parallel installation, setting the battery to the limited charging mode is very important. For detailed operations, please refer to Integrated Lithium-ion Battery Pack PC Software User Manual, and it will be provided with this manual.

2）Capacity load (namely in line with the voltage-hysteresis current load), to ensure the work, start the power supply module first, then load.


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# 4 MAINTENANCE

In order to ensure the lithium-ion battery pack achieves the longest life cycle, the maintenance technician should carry out regular inspections and maintenance care.

The maintenance records should be complete and routine, so that subsequent v erification of management parameters of the battery pack can be tracked.

## 4.1 Electrical maintenance

Maintenance of the electrical parts may refer to table 4-1.

Table4-1 Table of contents for maintenance

| Items | The checking Points | Methods | Repair conditions | Repair solution |
|---|---|---|---|---|
| Electrical | Check if the Output of the voltage is normal | Multimeter | Battery voltage out of range set | See the Following troubleshooting section |
| Fault inspection | Check if lights are normal | Visual inspection | Alarm | |
| Cable | Insulation, T erminal | Visual inspection | ● Insulation cracks, aging<br>● Exfoliated, corrosion of the terminals | ● Replace the cable<br>● Replace the terminal block |


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# 4.2 Battery maintenance

Table4-2 Contents of battery maintenance

| Frequency | Items | Solutions |
|---|---|---|
| Monthly | Operating environment | Stay away from heat source and avoid direct sunlight. |
| | Visual inspection | If there is any breakage, leakage or deformation, Isolate the problematic battery pack, take a photo graph and replace the battery. |
| Quarterly | Visual inspection | Use cotton cloth to clean the appearance. Be careful during cleaning because the voltage is high. |
| | Connection status | ● Check each terminal, check the bolt, if it's loose, and tighten it again.<br>● Check the reason if the cable temperature exceeds 40℃. |
| Every 6 months | Measure and record the voltage | ● At the final stage of charging, record the voltage; make sure the positive and negative voltage of the battery are the same. Otherwise, should check and repair the corresponding connection cable.<br>● Collect the discharging data at least once every six months for the first year.<br>● In the second year, capacity is determined byevery three months. Through the RS232 interface to view history, which shows frequent overcharge of a battery in the alarm message, indicating that the batteries have reached the charging and discharging protection point. This may result in time for preparing electricity is not enough and suggest changing the battery immediately. |

INTRO

1) Charge and discharge status at the final stage can through capacity light to display. Please refer to 2.2 for the definition of capacity lights.

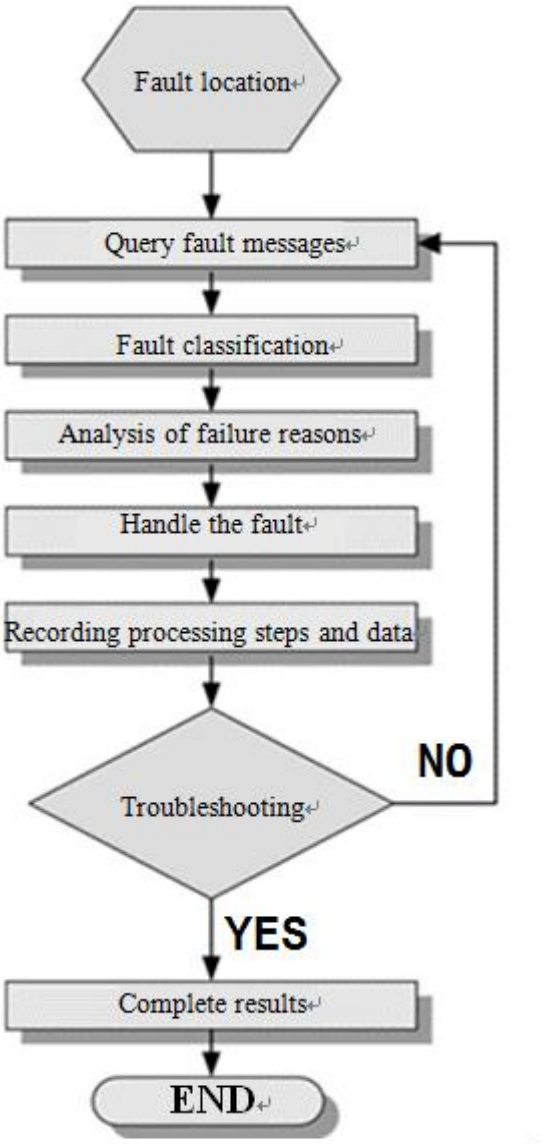
# 4.3 Treatment for malfunctions

## Solutions

Follow figure4-1 to process the malfunction.


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Figure4-1 Table of Battery maintenance




**Step 1** Check the LED lights to determine which part may fail.

**Step 2** Check the information about failure in the monitor module.

**Step 3**Classify the information (DC, AC, modules, batteries, control, etc.).

**Step 4** Find the problem according the information.

**Step 5**Debuging the failure.

**Step 6**Record the data while processing.

**Step 7** Confirm all malfunction removed.

**Step 8** Fill the report.

**Step 9**Repeat these steps if any more malfunction.


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# Faulty reasons and handling methods

Table 4-3 lists of most frequently failures and solutions.

Table4-3 Checklist

| Failure modes | Possible reasons | Solutions |
|---|---|---|
| Overvoltage | ● DC over-voltage alarm set Unreasonable.<br>● In manual control mode, the power supply voltage is set too high.<br>● Rectifier module failure. | ● Check if the DC over-voltage alarm point (default value is 58.5V) is reasonable. If it is unreasonable, adjust according to the actual situation.<br>● Check whether the manual control increases the system voltage. If yes, confirm the cause and return to the normal value when the operation is completed.<br>● Pull out the rectifier module one by one to check whether the alarm disappears. If the alarm still exists, insert the rectifier module into the home position. If the alarm disappears, replace the module. |
| Under voltage | ● No AC power.<br>● Monitoring module DC under voltage alarm point set unreasonable.<br>● System configuration is unreasonable.<br>● In manual control mode, the power supply voltage is set too low.<br>● Check whether the exchange of power outage and restore AC power supply. | ● Check the DC under voltage alarm point (default value is 45V). If it is not reasonable, adjust it according to the actual situation.<br>● Check that the power system current value is greater than the current power system capacity and, if so, increase capacity configuration or reduce the power system load.<br>● Check whether the manual control to reduce the system voltage, if so, should confirm the reason, to be restored to normal after the completion of the action.<br>● Check whether the rectifier module is faulty and the system capacity does not meet the load demand. If yes, replace the rectifier module. |
| Charge overcurrent | ● Module communication interruption.<br>● Loose contact for monitor module.<br>● Monitoring failures. | ● If there is a commutation module communication interruption alarm, if yes, plug and unplug the commutation module of communication interruption to confirm whether the alarm is cleared. If the alarm continues, replace the rectifier module.<br>● Reinstall the monitoring module, if still alarm, replace the module. |


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| Failure modes | Possible reasons | Solutions |
|---|---|---|
| Ambient temperature is too high | ● Temperature alarm parameter setting is unreasonable.<br>● The temperature control system of the cabinet where the temperature sensor is located is faulty.<br>● The temperature sensor is faulty. | ● Check if the ambient temperature alarm value (default 50 ℃) is reasonable. If not, adjust it according to the actual situation.<br>● Check whether the temperature control system of the cabinet is faulty. If so, handle the fault of the temperature control system. When the temperature in the system cabinet returns to the normal range, the alarm will be cleared automatically.<br>● Check the temperature sensor is faulty, if so, replace the temperature sensor. |
| Ambient temperature is too low | ● Low temperature alarm parameter setting isunreasonable.<br>● Temperature sensor system cabinet where the temperature control system failure.<br>● The temperature sensor is faulty. | ● Check if the ambient temperature alarm value (default 0℃) is reasonable. If not, adjust it according to the actual situation.<br>● Check the system cabinet temperature control system is faulty, if it is, then deal with temperature control system failure. After the temperature in the system cabinet returns to the normal range, the alarm will be cleared automatically.<br>● Check that the ambient temperature sensor is faulty and, if so, replace the ambient temperature sensor. |
| Battery temperature is too high | ● The battery temperature is too high alarm point set unreasonable.<br>● Battery compartment cooling system failure.<br>● The temperature sensor is faulty. | ● Check the battery temperature is too high alarm value (default 53 ℃) is reasonable, if unreasonable, according to the actual situation adjustment.<br>● Check the battery compartment temperature control system is faulty, and if so, then deal with temperature control system failure. When the battery temperature returns to normal, the alarm will be cleared automatically.<br>● Check the temperature sensor is faulty, and if so, replace the temperature sensor. |


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| Failure modes | Possible reasons | Solutions |
|---|---|---|
| Battery temperature is too low | ● Battery temperature is too low alarm set unreasonable.<br>● Battery compartment heating system failure.<br>● The temperature sensor is faulty. | ● Check if the battery temperature is too low (default: 0 ℃). If it is not reasonable, adjust the battery temperature according to the actual situation.<br>● Check the battery compartment temperature control system is faulty, and if so, then deal with temperature control system failure. When the battery temperature returns to normal, the alarm will be cleared automatically.<br>● Check the temperature sensor is faulty, and if so, replace the temperature sensor. |

INTRO

1) Only when the power system is configuredwith a battery temperature sensorther e should be a temperature alarm.


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# 5 SPECIFICATIONS

## 5.1 Technical specifications

Lithium batteries with 48V series of modules, the main technical indicators for a single module is shown in table 5-1, 5-2, when performing multiple sets of parallel battery, the charge and discharge parameters (parallel example LFeLi-4850 (16 cell)) are shown in table 5-3, table 5-4.

Table5-1 Technical data of single module charging

| Model | Voltage(V) 16cell/15cell | Capacity (Ah) | Limited charging voltage(V) 16cell/15cell | Charging current (A) | |
|---|---|---|---|---|---|
| | | | | Standard value | Largest value |
| LFeLi-4810 | 51.2/48 | 10 | 57.6/54 | 2 | 10 |
| LFeLi-4820 | 51.2/48 | 20 | 57.6/54 | 4 | 20 |
| LFeLi-4830 | 51.2/48 | 30 | 57.6/54 | 6 | 25 |
| LFeLi-4840 | 51.2/48 | 40 | 57.6/54 | 8 | 25 |
| LFeLi-4850 | 51.2/48 | 50 | 57.6/54 | 10 | 50 |
| LFeLi-4860 | 51.2/48 | 60 | 57.6/54 | 12 | 50 |
| LFeLi-4870 | 51.2/48 | 70 | 57.6/54 | 14 | 50 |
| LFeLi-4875 | 51.2/48 | 75 | 57.6/54 | 15 | 50 |
| LFeLi-4880 | 51.2/48 | 80 | 57.6/54 | 16 | 50 |
| LFeLi-48100 | 51.2/48 | 100 | 57.6/54 | 20 | 50 |
| LFeLi-48150 | 51.2/48 | 150 | 57.6/54 | 20 | 100 |
| LFeLi-48200 | 51.2/48 | 200 | 57.6/54 | 20 | 100 |


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INTRO

1) Rated capacity <30Ah, don't have display by default.
2) Rated capacity ≥ 30Ah, suffix A model don't have display suffix have display.
3) In parallel (≥30Ah), the recommended maximum charging current is 10A/module.
4) Suggest charge voltage: 3.6V/cell
5) Subject to revisions without prior notice.

Table5-2 A single module technology parameter

| Model | Voltages (V) 16cell/15cell | Capacity (Ah) | Limited discharge voltage(V) 16cell/15cell | Discharging current (A) | |
|---|---|---|---|---|---|
| | | | | Standard value | Biggest value |
| LFeLi-4810 | 51.2/48 | 10 | 43.2/40.5 | 2 | 10 |
| LFeLi-4820 | 51.2/48 | 20 | 43.2/40.5 | 4 | 20 |
| LFeLi-4830 | 51.2/48 | 30 | 43.2/40.5 | 6 | 25 |
| LFeLi-4840 | 51.2/48 | 40 | 43.2/40.5 | 8 | 25 |
| LFeLi-4850 | 51.2/48 | 50 | 43.2/40.5 | 10 | 50 |
| LFeLi-4860 | 51.2/48 | 60 | 43.2/40.5 | 12 | 50 |
| LFeLi-4870 | 51.2/48 | 70 | 43.2/40.5 | 14 | 50 |
| LFeLi-4875 | 51.2/48 | 75 | 43.2/40.5 | 15 | 50 |
| LFeLi-4880 | 51.2/48 | 80 | 43.2/40.5 | 16 | 50 |
| LFeLi-48100 | 51.2/48 | 100 | 43.2/40.5 | 20 | 50 |
| LFeLi-48150 | 51.2/48 | 150 | 43.2/40.5 | 20 | 100 |
| LFeLi-48200 | 51.2/48 | 200 | 43.2/40.5 | 20 | 100 |

INTRO

1) Rate capacity of <30Ah, do not have display by default.
   Rated capacity ≥ 30Ah, don't have display for suffix A, suffix B have display.
2) Suggest the end of discharge voltage: 2.7V/cell.
3) Subject to revisions without prior notice.


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Table5-3 Multi group of parallel charging parameters

| Voltage (V) | Capacity (Ah) | Limited charging voltage(V) | | | Recommend current (A) | Notes |
|---|---|---|---|---|---|---|
| | | smallest value | typical value | biggest value | | |
| 48 | 100 | 53.5 | 54.4 | 57.6 | 20 | 2 parallels |
| 48 | 150 | 53.5 | 54.4 | 57.6 | 30 | 3 parallels |
| 48 | 200 | 53.5 | 54.4 | 57.6 | 40 | 4 parallels |
| 48 | 250 | 53.5 | 54.4 | 57.6 | 50 | 5 parallels |
| 48 | 300 | 53.5 | 54.4 | 57.6 | 60 | 6 parallels |
| 48 | 350 | 53.5 | 54.4 | 57.6 | 70 | 7 parallels |
| 48 | 400 | 53.5 | 54.4 | 57.6 | 80 | 8 parallels |
| 48 | 450 | 53.5 | 54.4 | 57.6 | 90 | 9 parallels |
| 48 | 500 | 53.5 | 54.4 | 57.6 | 100 | 10 parallels |

Table5-4 Multi group of parallel discharging parameters

| Voltage (V) | Capacity (Ah) | Limited discharge voltage(V) | | | Recommend current (A) | Notes |
|---|---|---|---|---|---|---|
| | | The smallest value | The classical value | The biggest value | | |
| 48 | 100 | 43.2 | 44.8 | 46.4 | 30 | 2 parallels |
| 48 | 150 | 43.2 | 44.8 | 46.4 | 45 | 3 parallels |
| 48 | 200 | 43.2 | 44.8 | 46.4 | 60 | 4 parallels |
| 48 | 250 | 43.2 | 44.8 | 46.4 | 75 | 5 parallels |
| 48 | 300 | 43.2 | 44.8 | 46.4 | 90 | 6 parallels |
| 48 | 350 | 43.2 | 44.8 | 46.4 | 105 | 7 parallels |
| 48 | 400 | 43.2 | 44.8 | 46.4 | 120 | 8 parallels |
| 48 | 450 | 43.2 | 44.8 | 46.4 | 135 | 9 parallels |
| 48 | 500 | 43.2 | 44.8 | 46.4 | 150 | 10 parallels |


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# 5.2 The main performance index of the battery

For lithium battery of 48V series module, the electrical performance as shown in table 5-5.

Table5-5 Electrical performance

| Items for test | Testing methods | Requirements |
|---|---|---|
| 0.1C discharge performance | Standard battery charge, 1h within 1h with 0.1C discharge current to 43.2V, Record the discharge time. | Discharge time ≥ 600min |
| 0.5C discharge performance | Standard battery pack, 1h within 0.5C discharge current to 43.2V, record the discharge time. | Discharge time≥ 115min |
| High temperature performance | After the battery pack is charged in the standard (60 ± 2) ℃ high temperature box for 4 hours and then discharged to 43.2V at 0.1C, record the discharge time. | Discharge time≥ 600min |
| Low temperature performance(-10 ℃) | After charging, the battery pack is put in the low temperature box of(-10 ± 2) ℃ for 6 hours, then discharged to 43.2V at 0.2C at this temperature, record the discharging time. | Discharge time≥ 180min |
| Low temperature performance (-20 ℃) | After charging, the battery pack is allowed to stand for 6 hours at (-20 ± 2) ℃, then discharged to 43.2V at 0.2C at this temperature. Record discharge time. | Discharge time≥ 120min |


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# 6 ENVIRONMENT PROTECTION

## 6.1 Environmental Label

The product described in this manual does not contain toxic and hazardous substances or elements. It is a green product. It can be recycled after being discarded and should not be discarded at will. The environmental label shown in Table 6-1.

Table6-1 Environmental label

| Specification | Mark |
|---|---|
| 48V |  |

## 6.2 Recycle



This mark indicates that the product can not be classified with other waste. In order to prevent potentially hazardous substances from hazardous waste disposal hazards to the environment and human health, please refer to the classification of waste recycling in order to promote the sustainable use of material resources.



In order to recycle the used equipment, please use the recycling system or contact the manufacturer or seller of the product or the local authority to manage the waste products.


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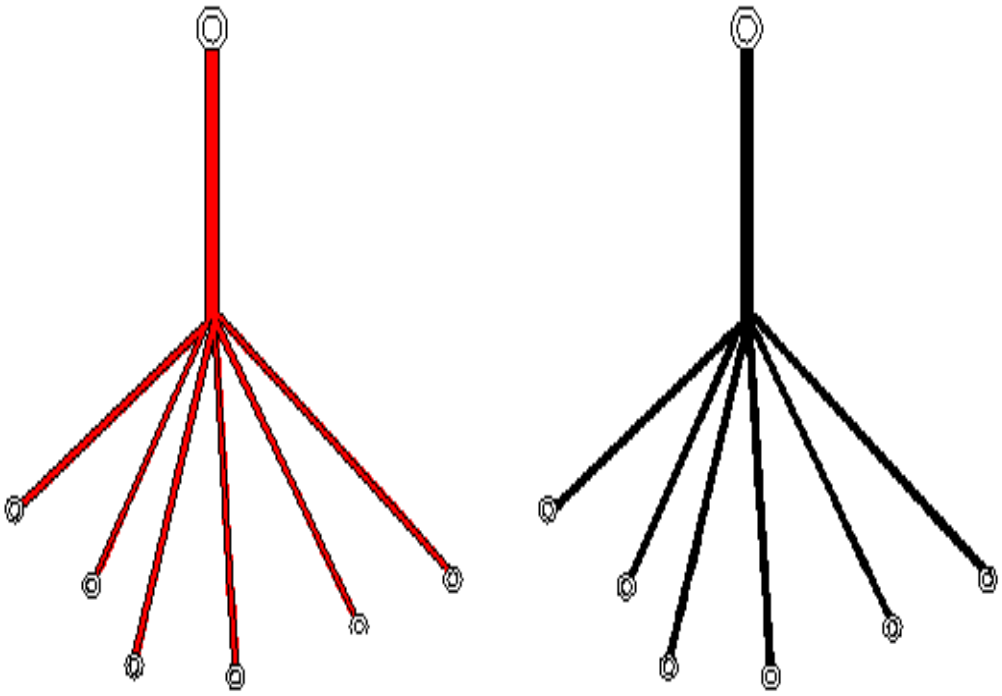
# 7 APPENDIX

## 7.1 Connection cable

If groups (4~10) of parallel sets of lithium batteries are not supplied by our company, you can choose the customized wiring cables to replace. Relevant technical requirements are the feeder cable number and the number of parallel battery pack is consistent, and the specifications of each extension cable (length, diameter, and material) are the same.

For example, a customized six parallel wiring cable diagram as shown in figure7-1.

Figure7-1 Customized wiring cable diagram



According to the customer requirements, selecting the appropriate connector, cables, extension cable specifications, refer to relevant cable specifications given in table 7-1.


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Table7-1 Corresponds to AWG line number table

| AWG | Diameter | | cross-sectional area （$mm^2$） | Resistance （Ω/km） | Rated current （A） | Maximum current （A） |
|---|---|---|---|---|---|---|
| | mm | inches | | | | |
| 0000 | 11.68 | 0.4600 | 107.22 | 0.17 | 423.2 | 482.6 |
| 000 | 10.40 | 0.4096 | 85.01 | 0.21 | 335.5 | 382.6 |
| 00 | 9.27 | 0.3648 | 67.43 | 0.26 | 266.2 | 303.5 |
| 0 | 8.25 | 0.3249 | 53.49 | 0.33 | 211.1 | 240.7 |
| 1 | 7.35 | 0.2893 | 42.41 | 0.42 | 167.4 | 190.9 |
| 2 | 6.54 | 0.2576 | 33.62 | 0.53 | 132.7 | 151.3 |
| 3 | 5.83 | 0.2294 | 26.67 | 0.66 | 105.2 | 120.0 |
| 4 | 5.19 | 0.2043 | 21.15 | 0.84 | 83.5 | 95.2 |
| 5 | 4.62 | 0.1819 | 16.77 | 1.06 | 66.2 | 75.5 |
| 6 | 4.11 | 0.1620 | 13.30 | 1.33 | 52.5 | 59.9 |
| 7 | 3.67 | 0.1443 | 10.55 | 1.68 | 41.6 | 47.5 |
| 8 | 3.26 | 0.1285 | 8.37 | 2.11 | 33.0 | 37.7 |
| 9 | 2.91 | 0.1144 | 6.63 | 2.67 | 26.2 | 29.8 |
| 10 | 2.59 | 0.1019 | 5.26 | 3.36 | 20.8 | 23.7 |
| 11 | 2.30 | 0.0907 | 4.17 | 4.24 | 16.5 | 18.8 |
| 12 | 2.05 | 0.0808 | 3.332 | 5.31 | 13.1 | 14.9 |
| 13 | 1.82 | 0.0720 | 2.627 | 6.69 | 10.4 | 11.8 |
| 14 | 1.63 | 0.0641 | 2.075 | 8.45 | 8.2 | 9.4 |

Installation steps are shown below:

1) Preparation before installing: insulation metal mounting tool (such as a cross screwdriver, wrench), insulation tape and customized wiring cables.

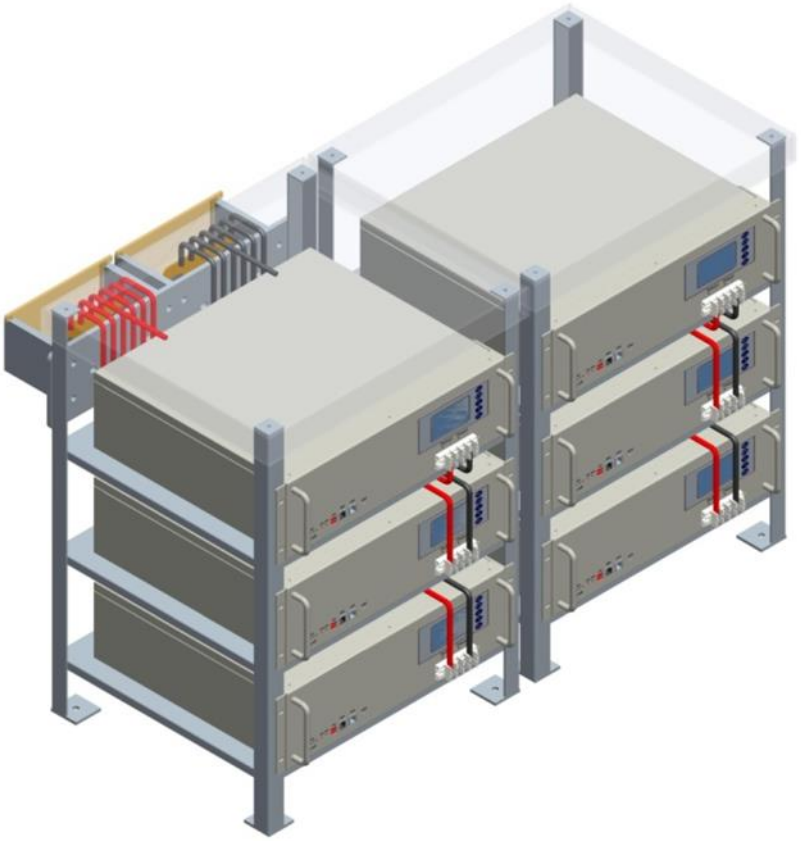
2) Lithium-ion battery pack should be installed in a suitable location.

3) Connect each connector in turn with each of the output end of the lithium-ion battery pack. First, connect all lithium-ion battery packs with to the positive terminals (“+”), and then all the negative terminals of lithium-ion battery packs.

Six LFeLi-4850 in parallel as shown in figure 7-2.


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Figure7-2 Six parallel of customized wiring cable diagram



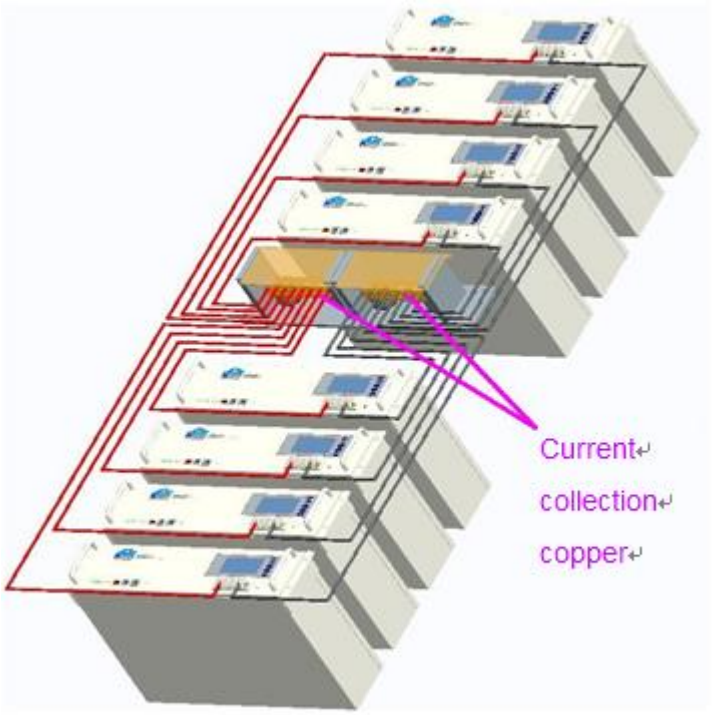
# 7.2 Current collection copper

If groups of (4~10) is in parallel, you can choose to use Current collection copper by our company.

Eight sets of parallel connection Schematic of LFeLi-4850 is shown in figure 7-3.

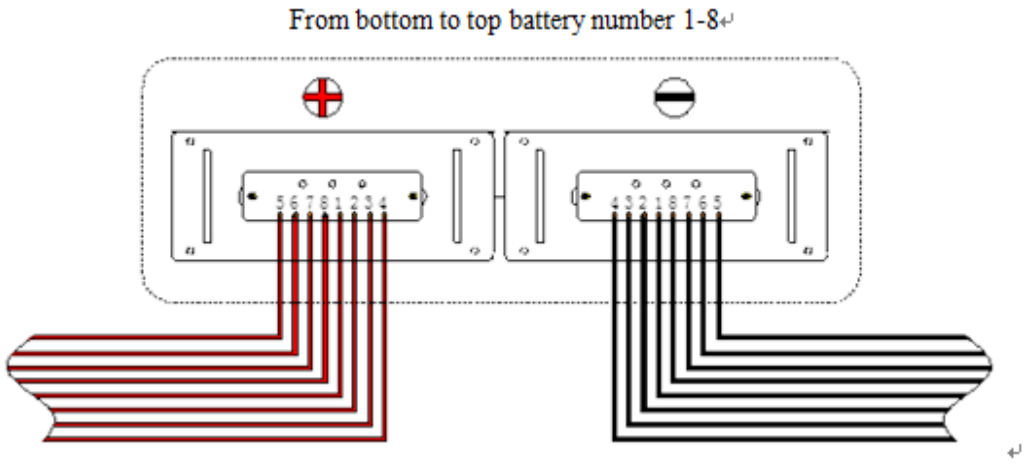

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Figure7-3 Sketch map of eight parallel




Wiring cable diagram is shown in figure 7-4.

Figure7-4 Wiring cable diagram of current collection copper




INTRO

1) The figure indicates the position of the corresponding number for the battery terminal position.


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