LEOCH International Technology Limited

LFP SERIES LITHIUM IRON PHOSPHATE Battery

User Manual

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LEOCH BATTERY

FORWARD

Overview

This manual describes product introduction, installation, use, maintenance, etc. Please read this manual before installing the battery and follow the instructions carefully during installation. If there is any confusion, please get in touch with LEOCH immediately for advice and clarification.

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

Manual Lost

If you lose the manual, please contact the LEOCH customer service center for the electronic files.

Symbol convention

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

Symbol	Indication
	Used as a warning in an emergency, if not avoided, it will result in death or serious personal injury.
	Used as a warning of middle or low potential hazards, if not avoided, it may cause minor or normal injury.
	Used as a warning of potential dangers, if this information, it may result in equipment broken, data lost, equipment performance decrease, and other unpredictable result.

 INTRO	Represents the supplement information of the main text to emphasize or replenish.

i. It is important and necessary to read the user manual carefully (in the accessories) before installing or using the battery. Failure to do so or to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, or death, or can damage the battery, potentially rendering it inoperable.
ii. If the battery is stored for a long time, it is required to charge it every six months, and the SOC should be no less than 80%.
iii. The battery must be recharged within 12 hours after full discharge. Do not install in an environment outside of the operation temperature or humidity range listed in the manual.
iv. Do not expose the cable outside.
v. Do not connect the power terminal reversely.
vi. All the battery terminals must be disconnected for maintenance.
vii. Please contact the supplier within 24 hours if there is something abnormal.
viii. Do not use cleaning solvents to clean the battery.
ix. Do not expose the battery to flammable or harsh chemicals or vapors.
x. Do not paint any part of the battery, including internal or external components.
xi. Do not connect the battery with PV solar wiring directly.
xii. Any foreign object is prohibited from being inserted into any part of the battery.

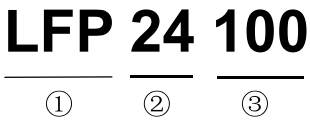
DIRECTORY

1 OVERVIEW

1.1 Product specification

The model of the integrated LITHIUM IRON PHOSPHATE Battery lithium-ion battery is shown in Figure 1-1.

Figure 1-1 The explanation of the product specification



① means Lithium-iron phosphate battery.

② means the rated voltage is 25.6V.

③ means the rated capacity is 100Ah.

1.2 Product profiles

Lithium iron phosphate battery named LiFePO4 Battery (referred to as the lithium battery, LiFePO4) as anode, aluminum foil as the battery cathode collector; carbon (graphite) battery consisting of copper foil for the battery cathode collector; intermediate polymer diaphragm, which separates the anode and the cathode of lithium-ion, but by Li+ but, not through the electronic e-. The inner part of the battery is provided with an organic electrolyte solution. During the charging and discharging process of Li-ion, the lithium-ion is in a state of movement from the positive electrode to the negative electrode.

The lithium battery group adopts the international advanced lithium iron phosphate battery application technology and BMS control technology. Due to its long lifecycle, small size, lightweight, 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 an advanced battery management system (BMS), including charge/discharge management, thermal management, communication management, balancing management, and data management, and is widely used in consumer, small power, solar energy storage, communication, and other applications.

1.3 Product picture

The appearance of the lithium battery pack is shown in Figure 1-2.

Figure 1-2 Product picture

2 ILLUSTRATION

2.1 Explanation of the structure

The structure of the Lithium-Ion battery pack is shown in Figure 2-1.

Figure 2-1 Product structure

1 Handle	2 Cover	3 Case
4 Label	5 Terminal	6 Polarity marking

2.2 Product Features

The integrated lithium-ion battery has the following remarkable features

- High energy density 100Wh/kg and 1200Wh/L.
- The operating temperature range is: (-20 ~ +60)℃.
- Capacity is greater than 95% of rated capacity when discharging with 1C current.
- Fast charge it will just take 2.25 hours to 100% of the capacity with 0.5C current.

- Long cycle life 5000 times under 80%DOD(25℃).
- Excellent safety performance LiFePO4 is very stable and will not explode or fire for overcharge, high temperature, or short circuit.
- BMS system: specially designed for 24V battery, with the function of preventing overcharge, over-discharge, over-current, and so on.

3 INSTALLATION GUIDE

3.1 Installation precaution notes

Comply with local laws and regulations

- When operating the equipment, 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.
- To maximize the efficiency of the equipment, obtain the 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 installation, 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 an engineer who has experience and can take preventive measures for potential hazards of battery.

Field and environment

- Site requirements

a) Cleanliness

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.

b) Fire protection

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

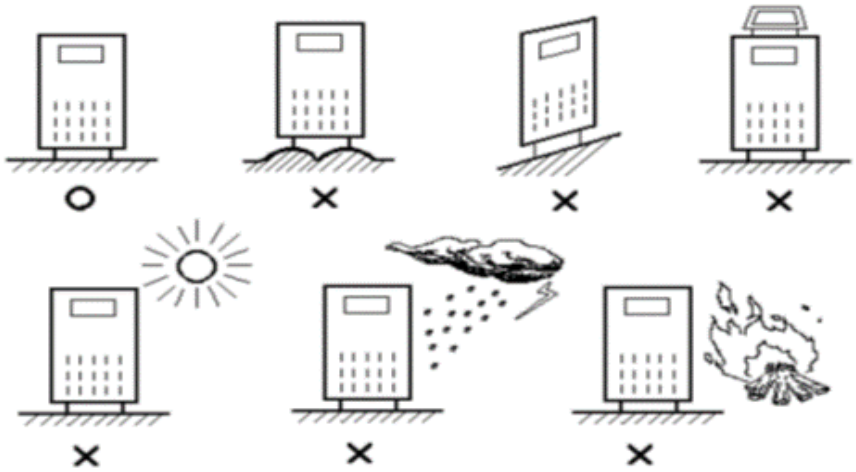
c) Ventilation and heat dissipation

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

d) Installation requirements

Installation should be carried out as shown in Figure 3-1 to avoid possible risks.
Put the lithium battery on the ground (to avoid tilt and uneven ground).
Avoid placing in the sunlight, rain, or wet surfaces.

Figure 3-1 Requirements for installation scenarios



- Environmental requirements

a) Ambient temperature: (-20 ~ +60) ℃.
b) Relative humidity level: 0%RH~95%RH, no condensation.
c) Cooling method: Nature cooling.
d) Height above sea level: matches the standard requirement of GB/T 20626.1.
e) Verticality: no vibration and the vertical inclination does not exceed 5º.
f) Pollution level: Level ii.
g) Recommended operating temperature : (20~30) ℃, humidity level control within 50%.


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 the lithium-ion battery pack. People could not sit on the battery.

3.2 Installation Preparation

3.2.1) Installation and operating environment

- Installation location

The batteries should be installed in a dry and clean environment to ensure system and personal safety.

Flammable, explosive, and similar dangerous materials or devices are prohibited in the same room. The installation room should be equipped with fire suppression equipment.

Always keep in mind the structural load of the building and any other structural weight and force limitations.

- Environment

Operation Temperature range: charge (0~45)℃, discharge (-10~55)℃, storage (-20℃~60)℃, (20~30)℃ is recommended.

Relative humidity: (0% ~95%)RH, non-condensing.

Avoid heat and direct sunlight, and avoid high humidity (with condensation) environments.

3.2.2) Unpacking and inspection

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

3.2.3) Installation tools

- It is recommended to wear the following safety gear when dealing with the battery pack.

Safety gloves　Safety goggles　Safety shoes

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

Table 3-1 General purpose tool

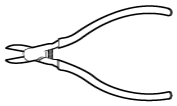
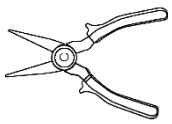
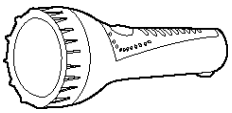
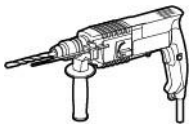
The appearance of the tools, parameters, and names			
Adjustable wrenches	Phillips screwdriver	Slotted screwdriver	Socket wrench
			
Torque wrench	Open-end wrenches	Double offset ring spanner	Diagonal cutting pliers
			
Wire cutters	Needle nosed pliers	Marking pen	Working gloves
			
Ladder (2m)	Flashlight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

Table 3-2 Tools for delivery and unpacking

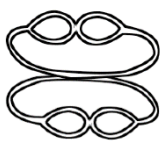
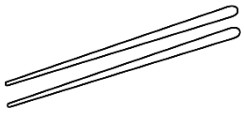
The appearance of the tools, parameters, and names			
Manual forklifts	Electric forklift	Sling（weight≥ 400kg）	Leverage （weight≥400kg）
			

Table 3-3 Electrical installation tools

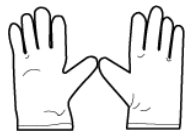
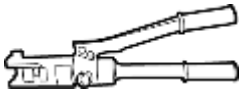
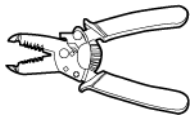
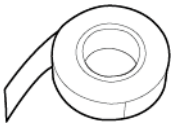
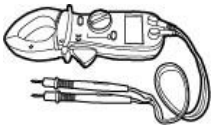
The appearance of the tools, parameters, and names			
Insulated gloves	Power cable crimping plier	Wire stripping pliers	Electrical tape
			

Table 3-4 Measuring Tools

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

3.3 Installation

3.3.1) Single installation

Single installation as shown in Figure 3-1.

Figure 3-1 Single installation diagram

Terminal	Recommended torque value
M5	4±0.5N*M
M6	5.5±0.5N*M
M8	8±0.5N*M

3.3.2) Multiple sets in series or parallel installation(If applicable to product)

Before using the product in series or parallel, consult the manufacturer on whether the product can be connected in series or parallel.

If the LFP series lithium-ion batteries can be connected in series or parallel.

For connecting in series, as shown in Figure 3-2, and for connecting in parallel, as shown in Figure 3-3.

Figure 3-2 Connect in series

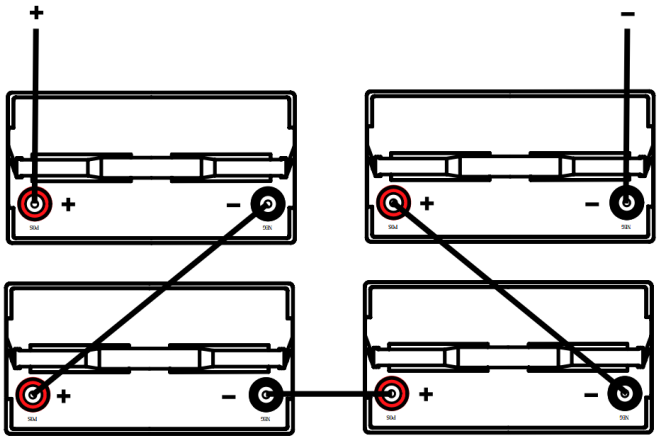
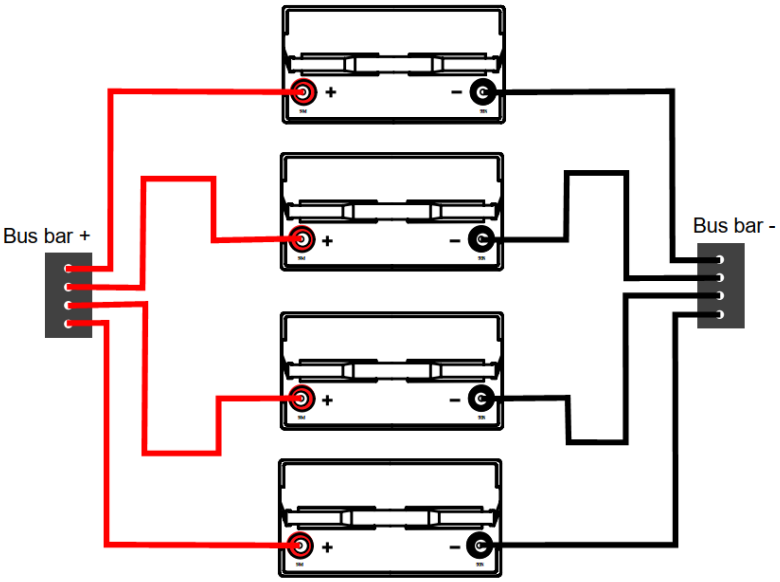


Figure 3-3 Connect in parallel



3.3.3) Charge and Discharge Parameters

The recommended charging and discharging parameter settings for single products are as follows:

Model	LFP 12V series	LFP 24V series
Nominal Voltage/V	12.8	25.6
Working Voltage/V	10-14.6	20-29.2
Max. Charge Voltage/V	14.6	29.2
Max. Continuous Charge Current/A	1C	1C

Recom. Continuous Charge Current/A	0.2~0.5C	0.2~0.5C
Standard Discharge Current/A	0.5C	0.5C
Max. Continuous Discharge Current/A	1C	1C
Lower Limit Voltage/V	10	20
Note: C is the nominal capacity of the battery.		

4 TRANSPORTATION AND STORAGE

Transportation requirement

Battery via UN38.3 (UN38.3: Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria) and SN/T 0370.2-2009 "Inspection Procedures for Packaging of Dangerous Goods for Export Part 2 Performance Inspection" certification (This product belongs to Class 9 dangerous goods)

The battery meets the transportation requirements of cars and ships. The transport box must be firm, and the outside of the box should comply with the provisions of the national standard and should be marked "handle with care" and "moisture-proof". Direct rain snow and mechanical impact should be avoided during transportation.

Storage

1. When storing batteries, place them according to the labels on the packing case. Do not place them upside down or on the side.

2. When packing cases are stacked, they shall comply with the packing requirements.

3. The storage environment requirements are as follows:

- Ambient temperature -20 ° C to 60 ° C. The recommended storage temperature is 0 ° C to 40 ° C.
- Relative humidity ≤95%.
- Storage battery should be at 40% ~ 80% SOC.
- A dry, ventilated, and clean place.
- Avoid contact with corrosive substances or organic solvents (including gas).
- Avoid direct sunlight.
- The distance from the heat source (such as the heating device) must be at least 2m.

The warehouse manager should count the battery storage every month, and the batteries that are stored beyond the expiration date must be replenished in time.

- A dry, ventilated, and clean place.
- Avoid contact with corrosive substances or organic solvents (including gas).
- Avoid direct sunlight.
- Recharge the battery during long-term storage for self-discharge. Recharge program as follows table:

Storage temperature	Recharge interval	Recharge procedure for the single battery
＜30°C	Every 6 months	1) Discharge with current 0.2C(A) to 0% SOC 2) Charge with current 0.2C(A) per battery for 2~4 hours
30°C-45°C	Every 3 months	
＞45°C	Every 1 months	

5 BLUETOOTH FUNCTION

Please check with the manufacturer in advance to see if the product you are purchasing comes with Bluetooth function.

5.1 System characteristics

- The phone may need to be within 20m of the product to search for the product's Bluetooth signal.
- Alarm prompt: alarm fault view, alarm prompt automatic elimination after fault release.
- Bluetooth: When the user opens the software, if the user does not turn on the Bluetooth function, then automatically prompt to turn on the phone Bluetooth, unplug or sleep automatically disconnect the Bluetooth connection.

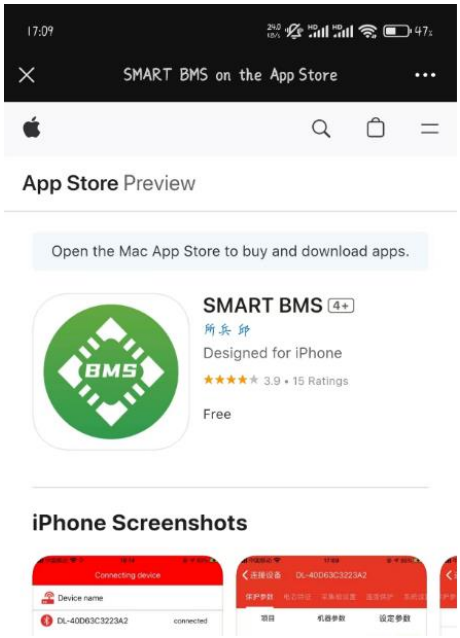
5.2 Operating instructions

- Step 1: download and install on your mobile desktop (take IOS as an example).

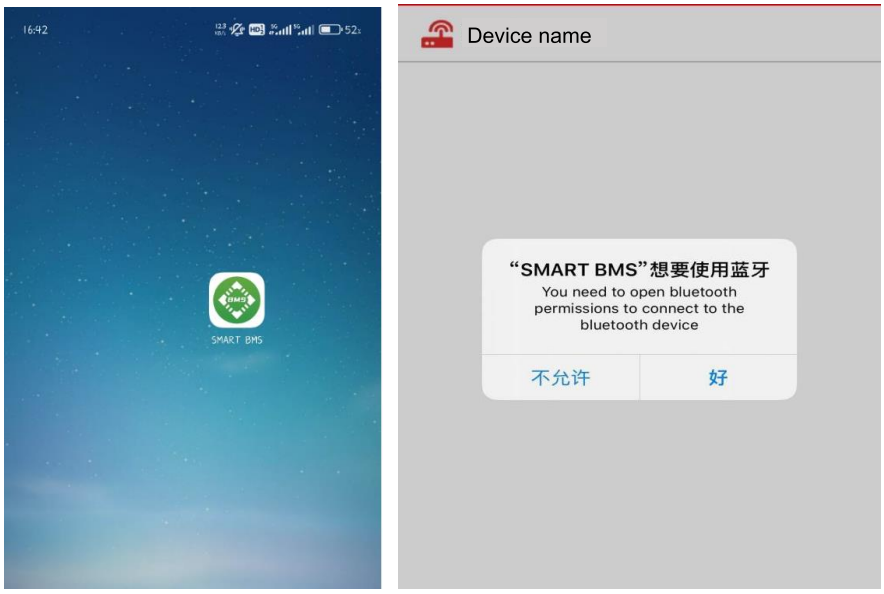
Or click on the following link in your mobile browser to download the APP.

Android system: http://yunbms.cn/resources/download/smartBMS.apk

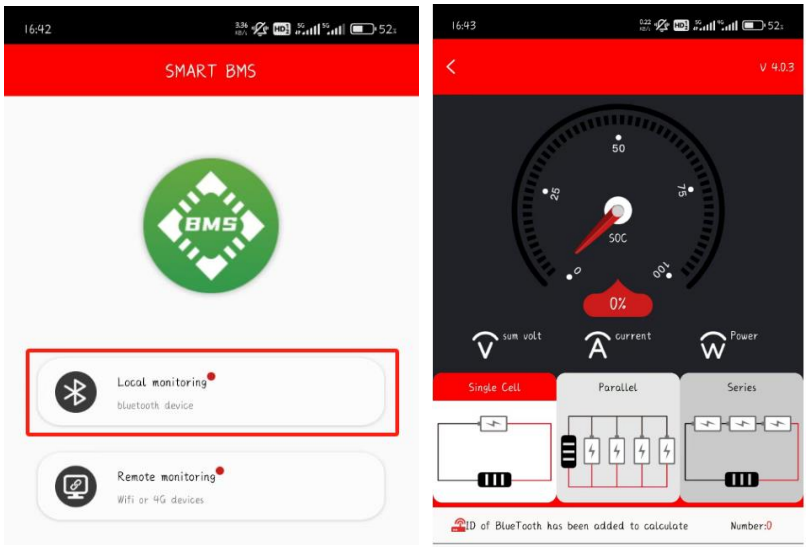
IOS system: https://apps.apple.com/cn/app/smart-bms/id1519968339?l=en



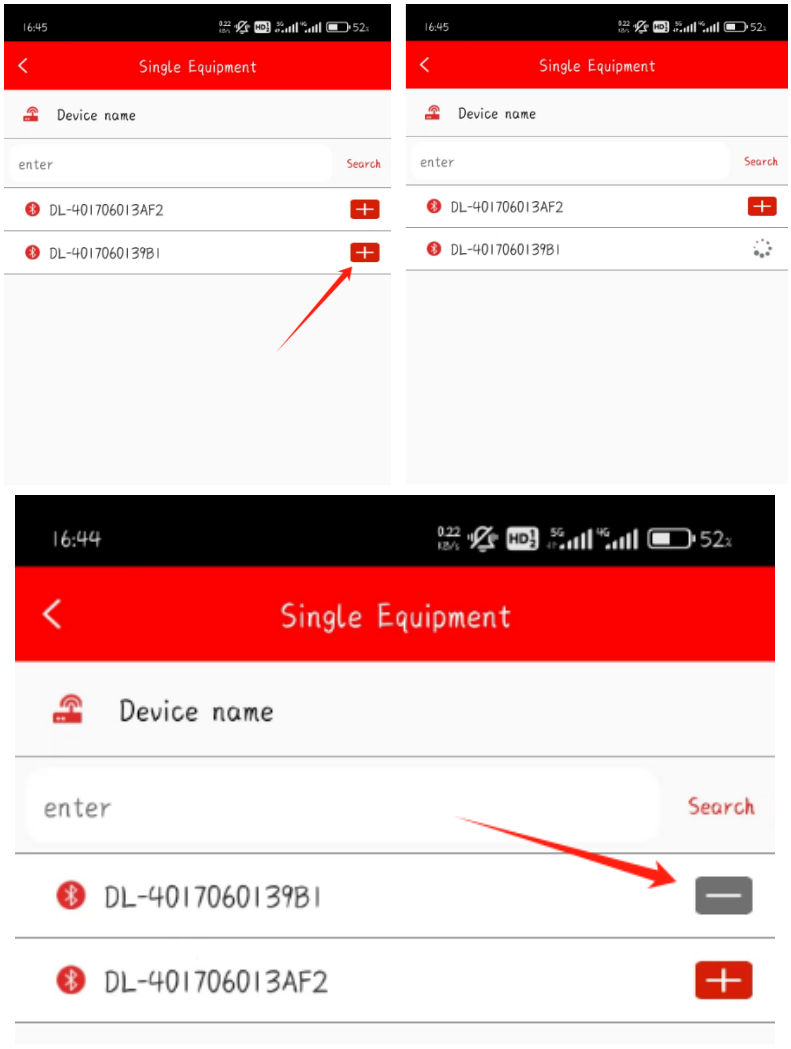
- Step 2: Install and open the "SMART BMS" APP and make sure this APP can use Bluetooth on your mobile phone.



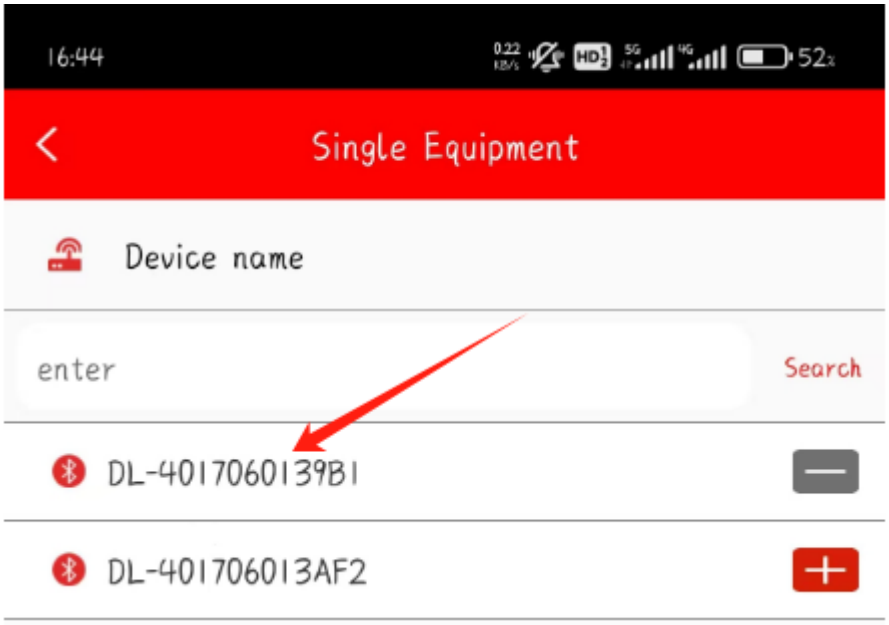
- Step 3: Click on “Local monitoring” and show below interface.



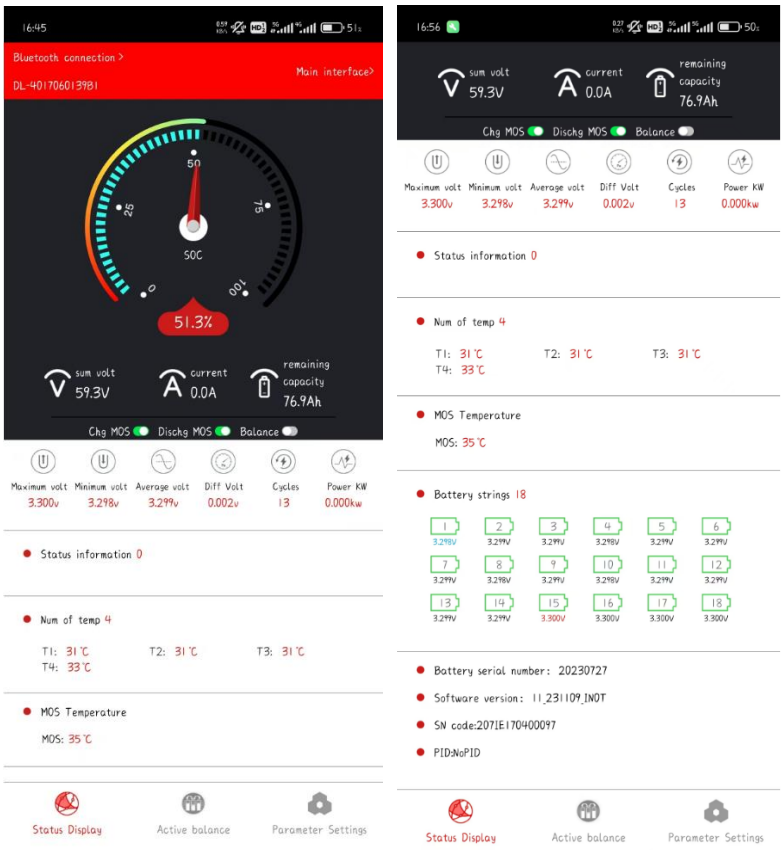
- Step 4: Click on “Single Cell” and try to search devices around, click on “+” to connect the battery, and when shown “—”, that means that you have connected the device successfully.



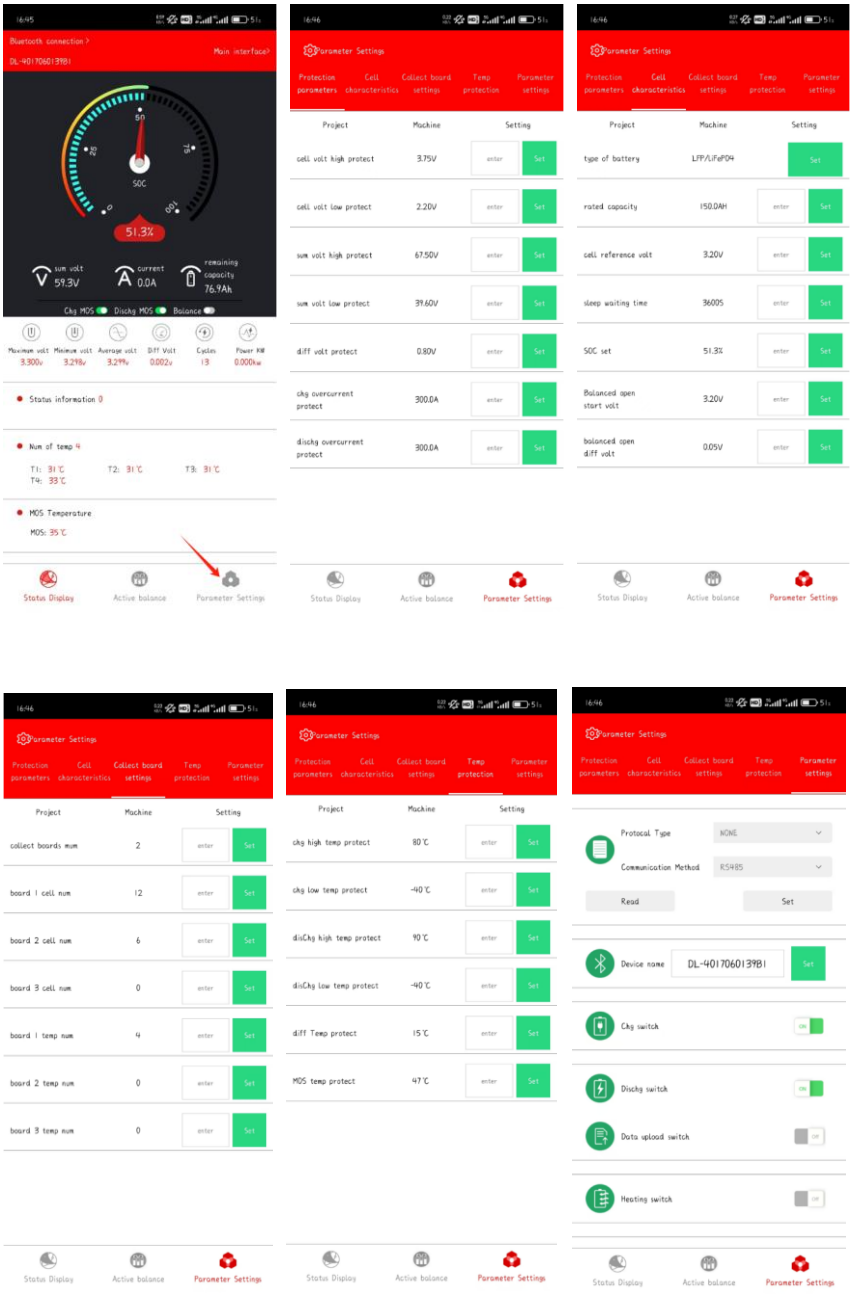
- Step 5: Click on the device which you want to check.



- Step 6: Click on the device address that you want to check and you can see the below interface of “Status Display”, that are battery’s basic information.

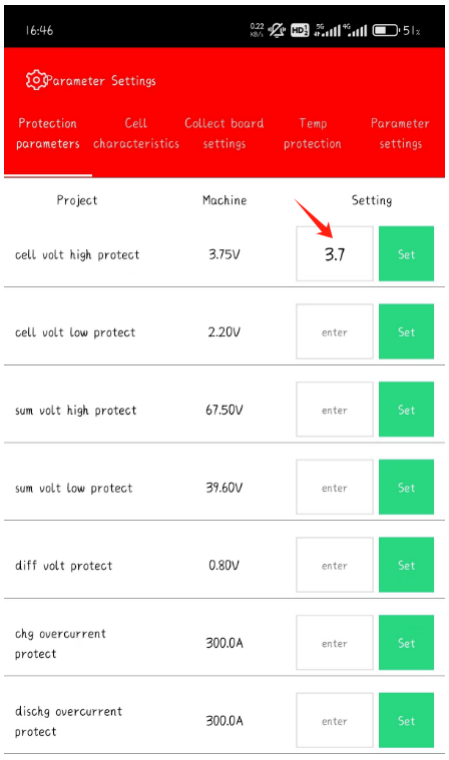


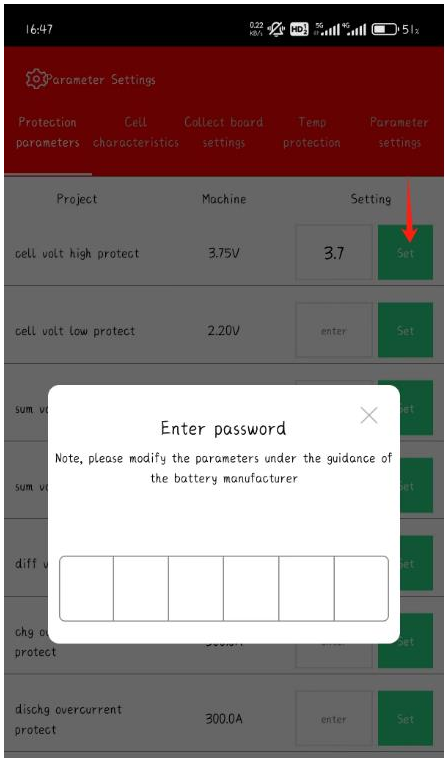
- Step 7: Click on “Parameter Settings” to check more settings.

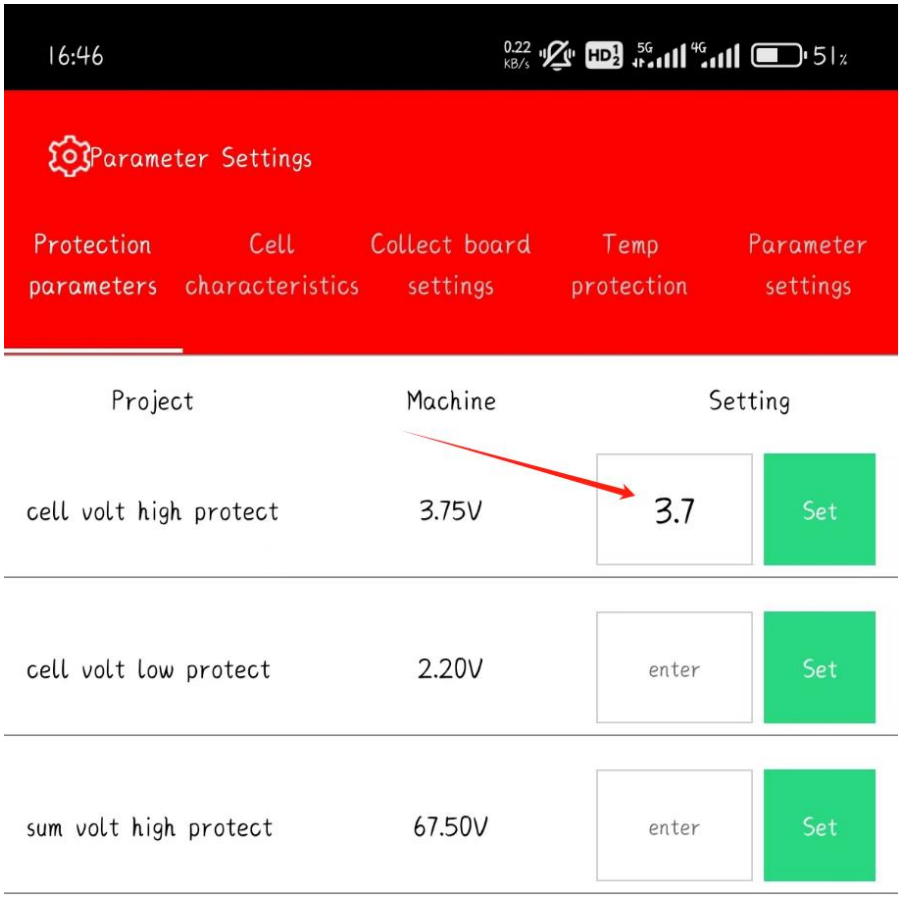


5.3 Modifying parameter settings

- Enter the value you want to change in the “Setting” field.
- Click “Set” at the end of the dialog box to confirm the modification, and then enter your password to complete the modification.


16:46
Parameter Settings
Protection parameters
Cell characteristics
Collect board settings
Temp protection
Parameter settings
Project
Machine
Setting
cell volt high protect
3.75V
3.7
Set
cell volt low protect
2.20V
enter
Set
sum volt high protect
67.50V
enter
Set
sum volt low protect
39.60V
enter
Set
diff volt protect
0.80V
enter
Set
chg overcurrent protect
300.0A
enter
Set
dischg overcurrent protect
300.0A
enter
Set


16:47
Parameter Settings
Protection parameters
Cell characteristics
Collect board settings
Temp protection
Parameter settings
Project
Machine
Setting
cell volt high protect
3.75V
3.7
Set
cell volt low protect
2.20V
enter
Set
Enter password
Note, please modify the parameters under the guidance of the battery manufacturer
dischg overcurrent protect
300.0A
enter
Set


16:46
0.22 KB/s
Parameter Settings
Protection parameters
Cell characteristics
Collect board settings
Temp protection
Parameter settings
Project
Machine
Setting
cell volt high protect
3.75V
3.7
Set
cell volt low protect
2.20V
enter
Set
sum volt high protect
67.50V
enter
Set

6 MAINTENANCE

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 verification of management parameters of the battery pack can be tracked.

6.1 Electrical maintenance

Maintenance of the electrical parts may refer to Table 6-1.

Table 6-1 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 the lights are normal	Visual inspection	Alarm	
Cable	Insulation, Ter minal	Visual inspection	• Insulation cracks, aging • Exfoliated, corrosion of the terminals	• Replace the cable • Replace the cable terminal

6.2 Battery maintenance

Maintenance of the battery may refer to Table 6-2

Table 6-2 Battery maintenance

Frequency	Items	Solutions
Monthly	Operating environment	Stay away from heat sources and avoid direct sunlight.
	Visual inspection	If there is any breakage, leakage, or deformation, Isolate the problematic battery pack, take a photograph, and replace the battery.
Quarterly	Visual inspection	Use a 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. • 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. • Collect the discharging data at least once every six months for the first year. • In the second year, capacity is determined every six months.

7 ENVIRONMENT PROTECTION

7.1 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 is shown in Table 7-1.

Table 7-1 Environment protection marking

Model	Sign
LFP series	

7.2 Recycle

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

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.

Trademark Statement

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