LEOCH International Technology Limited

Integrated Lithium-ion Battery Pack for Residential Storage

User Manual

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LEOCH BATTERY

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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.
	Used as a warning of a middle or low potential hazards, if not avoided, it may cause minor or normal injury.

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

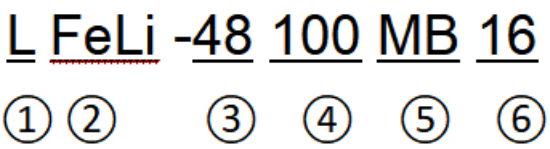
DIRECTORY

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 Trademark of Leoch: LEOCH
② The main ingredient of Lithium Ion battery is Lithium iron phosphate
③ The pressure is 48V
④ The capacity is 100Ah
⑤ M stands for Household energy storage, B stands for LCD display
⑥ 16 series of cells

1.2 Product profiles

48MB lithium iron phosphate battery is one of new energy storage products developed and produced by Leoch. It can be used to support reliable power for various types of equipment and systems. 48MB is especially suitable for application scene of high power, limited installation space, restricted load-bearing and long cycle life.

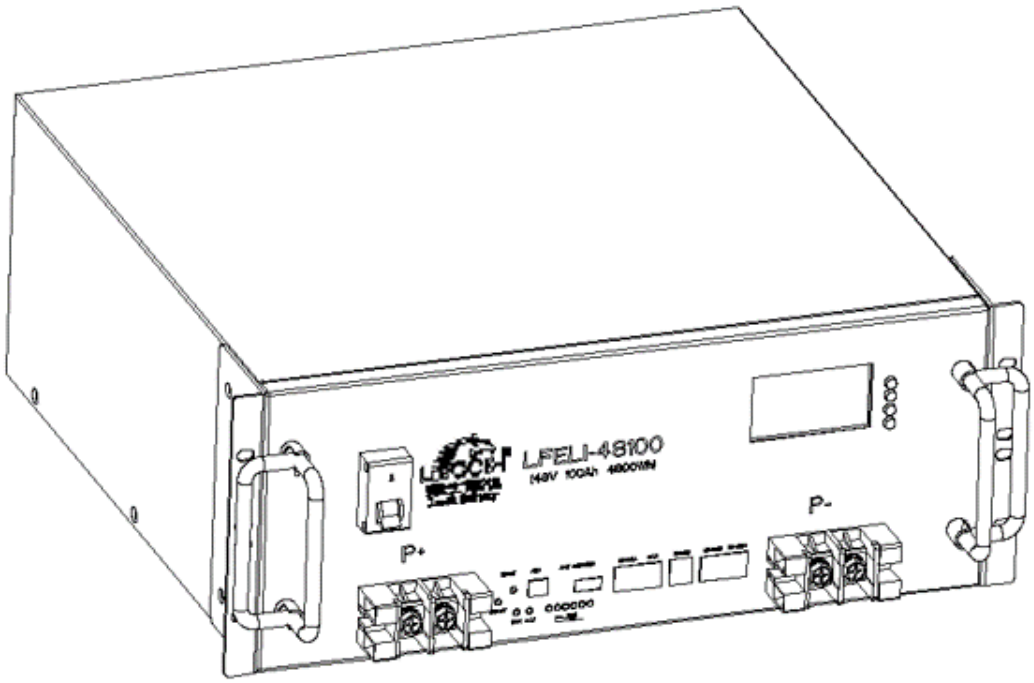
48MB has built-in BMS battery management system, which can manage and monitor cells information including voltage, current and temperature. What's more, BMS can

balance cells charging and discharging to extend cycle life. Multiple batteries can connected in parallel to expand capacity and power in parallel for larger capacity and longer power supporting duration requirements.

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

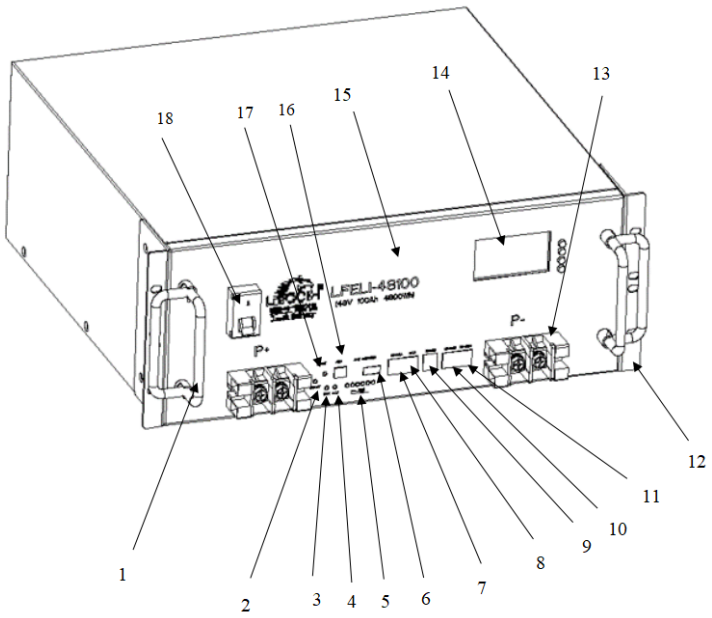


2 ILLUSTRATION

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	2 ON/OFF	3 RUN	4 ALM（alarm）	5 SOC (capacity light)	6 DRY CONTACT
7 RS485A	8 CAN	9 RS232	10 RS485B	11 RS485C	12 Hanging ear
13 Battery Output	14 Display	15 Main panel	16 ADD	17 RESET	18 Breaker

2.2 Panel description

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

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.

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

Battery Statues	Normal/Alarm/ Protection	RUN	ALM	Capacity LED				Descriptions
		🟢	🔴	🟢	🟢	🟢	🟢	
Shut Down	Dormancy	Off	Off	Off	Off	Off	Off	All Off
Standby	Normal	flash1	Off	According to electric quantity indicator				Stand by
	Alarm	flash1	flash3					The module of low pressure
Charge	Normal	Light	Off	Based on capacity (Maximum power indicator LED flash 2)				Overcharge alarm ALM Does not blink
	Alarm	Light	flash3					
	过充保护	Light	Off	Ligh t	Light	Light	Light	Stop discharging, ALM lighting
	温度、过流、失效保护	Off	Light	Off	Off	Off	Off	Stop charging, ALM lighting
Discharge	Normal	flash3	Off	Based on capacity				
	Alarm	flash3	flash3					
	Under voltage protection	Off	Off	Off	Off	Off	Off	Stop discharging, ALM lighting
	Temperature overcurrent short circuit reverse connection failure protection	Off	Light	Off	Off	Off	Off	Stop discharging, ALM lighting
Failure		Off	Light	Off	Off	Off	Off	Stop charging and discharging, ALM lighting

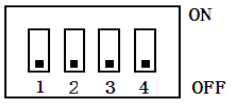
Note:The flashing instructions,flash1-light 0.25s/off 3.75 seconds;flash2-0.5 slight /0.5s off;flash3-0.5 slight /1.5s off.

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.

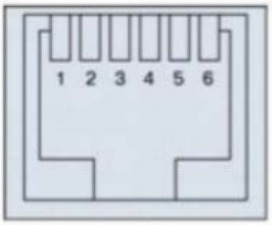
Table2-3 Band switch address code

Address Code				ADD	PACK Definition	Explanation
1	2	3	4			
OFF	OFF	OFF	OFF	0		Use Alone
ON	OFF	OFF	OFF	1	PACK	Use As Master Pack
OFF	ON	OFF	OFF	2	PACK1	Use as SlavePack1
ON	ON	OFF	OFF	3	PACK2	Use as SlavePack2
OFF	OFF	ON	OFF	4	PACK3	Use as SlavePack3
ON	OFF	ON	OFF	5	PACK4	Use as SlavePack4
OFF	ON	ON	OFF	6	PACK5	Use as SlavePack5
ON	ON	ON	OFF	7	PACK6	Use as SlavePack6
OFF	OFF	OFF	ON	8	PACK7	Use as SlavePack7
ON	OFF	OFF	ON	9	PACK8	Use as SlavePack8
OFF	ON	OFF	ON	10	PACK9	Use as SlavePack9



RS232

(RJ11 port) follow RS232 protocol, for manufacturer or professional engineer to debug or service.

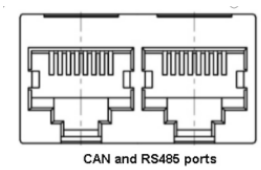


RS232 port

RS232--Use 6P6C vertical RJ11 socket	
RJ11 pin	Definition
2	NC
3	TX
4	RX
5	GND

RS485

R485 Communication Terminal: (RJ45 port) follow RS485 protocol, for output batteries information.


CAN and RS485 ports

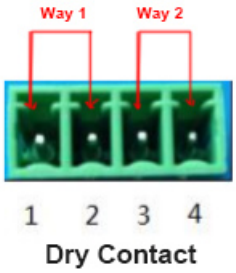
RS485--Use 8P8C vertical RJ45 socket		CAN--Use 8P8C vertical RJ45 socket	
RJ45 pin	Definition	RJ45 pin	Definition
1、8	RS485-B1	9、10、11、14、 16	NC
2、7	RS485-A1	12	CANL
3、6	GND	13	CANH
4、5	NC	15	GND

CAN

CAN Communication Terminal:(RJ45port) follow CAN protocol,for output batteries information.

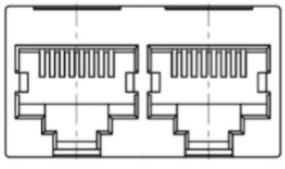
Dry Contact Terminal

Dry Contact Terminal:provided 2 ways input and 2 ways output dry contact signal.



Parallel communication

BMS can be connected in parallel through 485. When wiring, the CORRESPONDING A and B of each 485 interface should be connected respectively. In parallel communication, the slave machine can be collected by the host and uploaded to the inverter or upper computer.


Parallel communication interface

RS485--Use 8P8C vertical RJ45 socket		RS485--Use 8P8C vertical RJ45 socket	
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

RESET

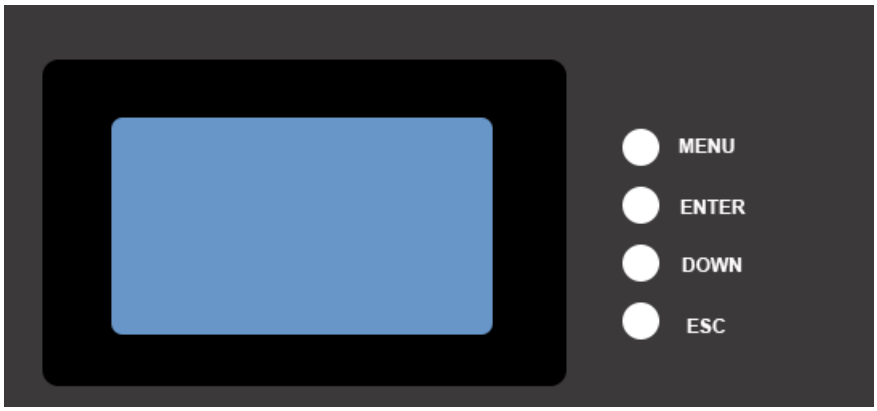
Press RESET key for 5 seconds, then start the device, press the RESET key for 5 seconds again, then shut down the device. When the system is running, should there be an exception, use this button to reset the system (press / release) to ensure the stability of the system.

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.

Figure2-3 LCD Display



The commonly used button function

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

Table2-4 Button function description

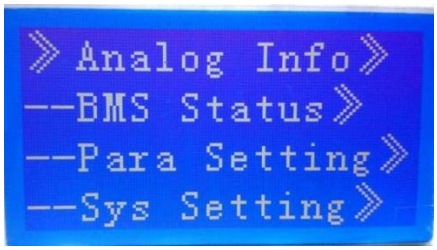
MENU	Main menu
ENTER	Confirm, enter

DOWN	Page down
ESC	Return, launch

Operation procedures

1) Press MENU 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 DOWN , Enter the Menu screen, when the arrow points to the corresponding bar, press Enter ENTER to confirm.

4) Go back on the menu bar, click ESC .

2.4 The working principle

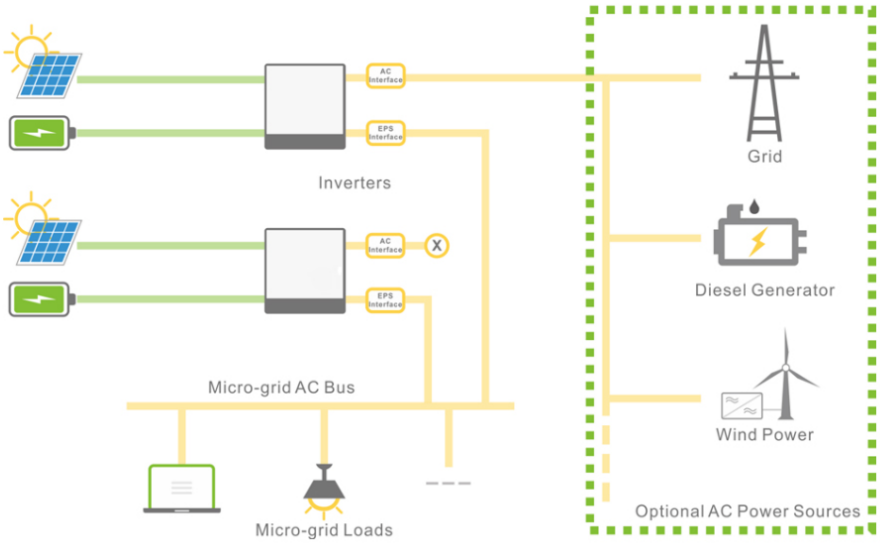
Lithium battery pack is equipped with charging and discharging management module and monitoring module.

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

A single module has a 48V (100~200) Ah, with a large capacity, can be used in accordance with user requirements arbitrary combination. As shown in figure 2-6.

Figure2-4 the working principle diagram



2.5 The product features

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

- The whole module is non-toxic, non-polluting and environmentally friendly;
- The system can automatically manage charge and discharge state and balance current and voltage of each cell;
- Flexible configuration, multiple battery modules can be in parallel for expanding capacity and power
- Adopted self-cooling mode rapidly reduced system entire noise;
- The module has less self-discharge, up to 6 months without charging on shelf ; no memory effect, excellent performance of shallow charge and discharge;
- Working temperature range is from -20℃ to 60℃, (Charging 0~60℃; discharging -20~60℃) with excellent discharge performance and cycle life;
- Small size and light weight, standard of 19-inch embedded designed module is comfortable for installation and maintenance;

INTRO

1) Telemetry: voltage, current, temperature, SOC, SOH (optional), etc.
2) tele-signalling 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..

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 in Leoch at first. 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

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.

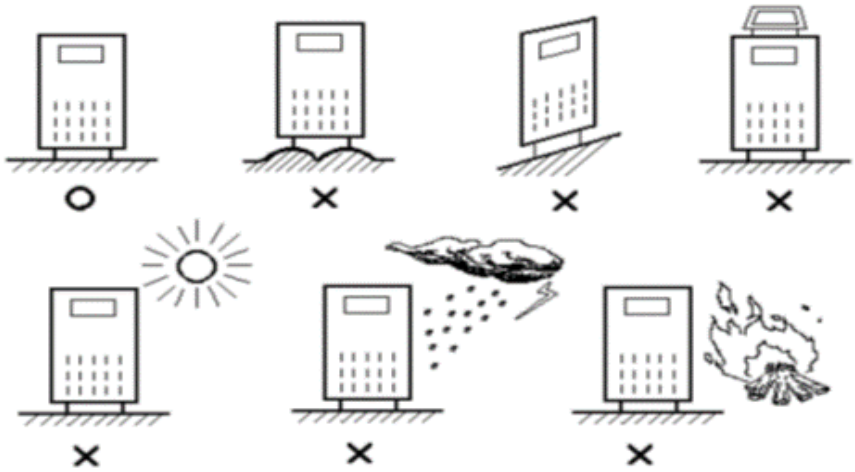
4) Installation requirements

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

Put the lithium battery on 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%.


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 inany 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 Leoch should be contacted immediately.

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 3-1~3-4 the field technician will increase or decrease the amount according to the construction.

Table3-1 General purpose tools

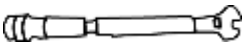
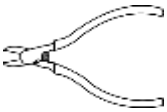
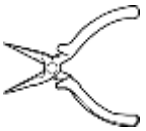
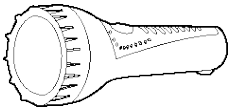
The appearance of the tools, parameters, and names			
Adjustable wrenches	Phillips screwdriver	Slotted screwdriver	Socket wrench
			
Torque wrench	Open-end wrenches	Double offset ring spanner	Diagonal cutting pliers
			
Wire cutters	Needlenosed pliers	Marking pen	Working gloves
			
Ladder (2m)	Flashlight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

Table3-2 Tools for delivery and unpacking

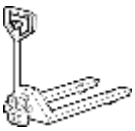
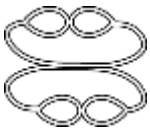
The appearance of the tools, parameters, and names			
Manual forklifts	Electric forklift	Sling（weight≥ 400kg）	Leverage （weight≥400kg）
			

Table3-3 Electrical installation tools

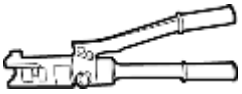
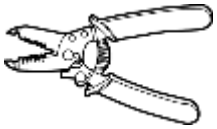
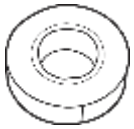
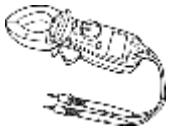
The appearance of the tools, parameters, and names			
Insulated gloves	Power cable crimping plier	Wire stripping pliers	Electrical tape
			

Table3-4 Measuring Tools

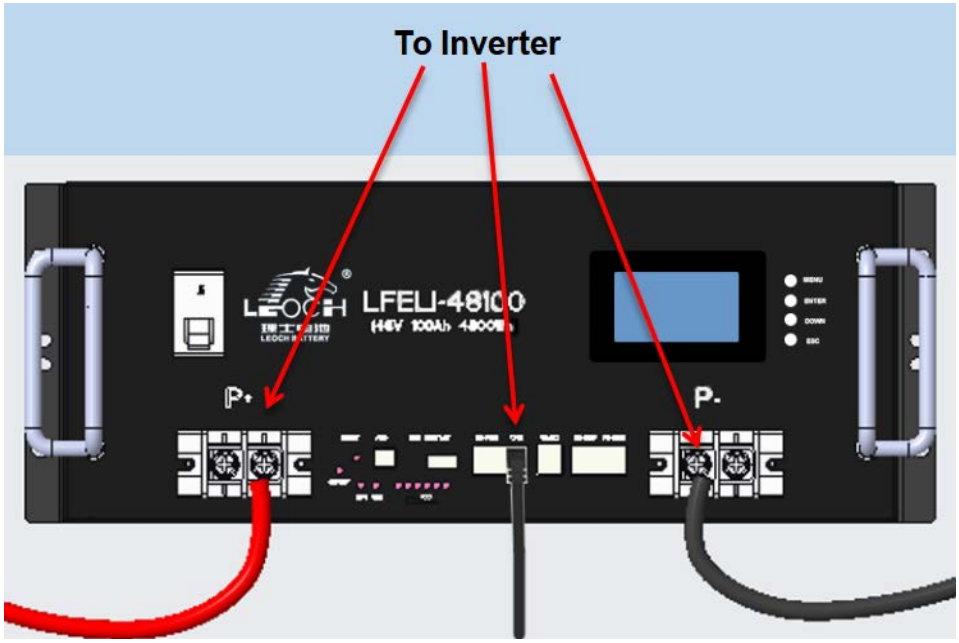
The appearance of the tools, parameters, and names			
Clamp the flow table			-
			-

3.3 Installation and wiring

3.3.1 Single installation

Single installation as shown in figure 3-2.

Figure3-2 single installation diagram

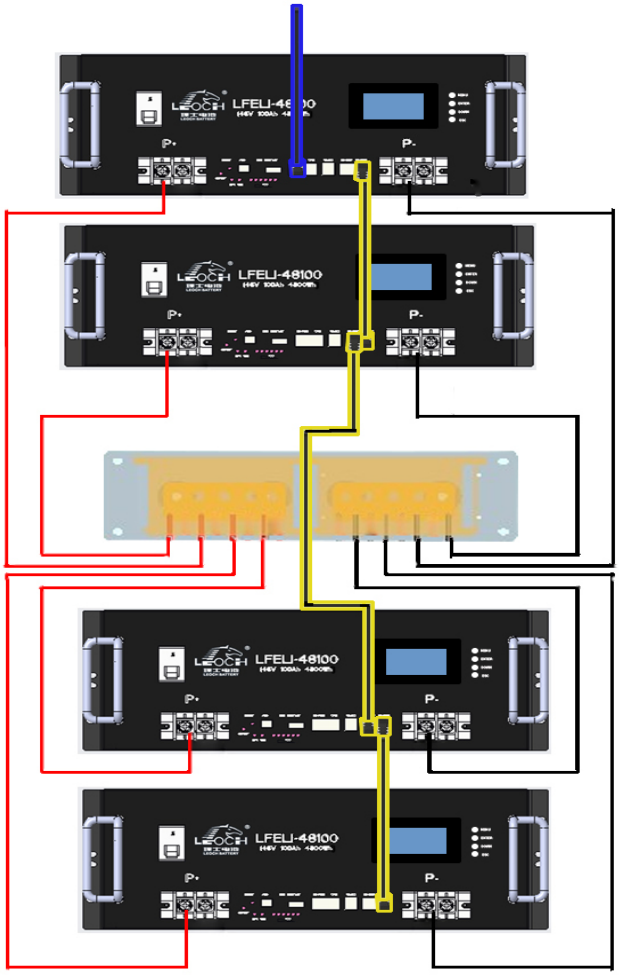


3.3.2 Multiple sets of parallel installation

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.

For parallel sets of batteries no more than 8 groups, as shown in figure 3-3.The red line is connected to the positive pole, the black cable is connected to the negative pole, the blue cable is connected to the CAN communication, and the yellow cable is connected to the parallel battery.

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 ensure the work, start the power supply module first, then load.

Installation steps are shown below:

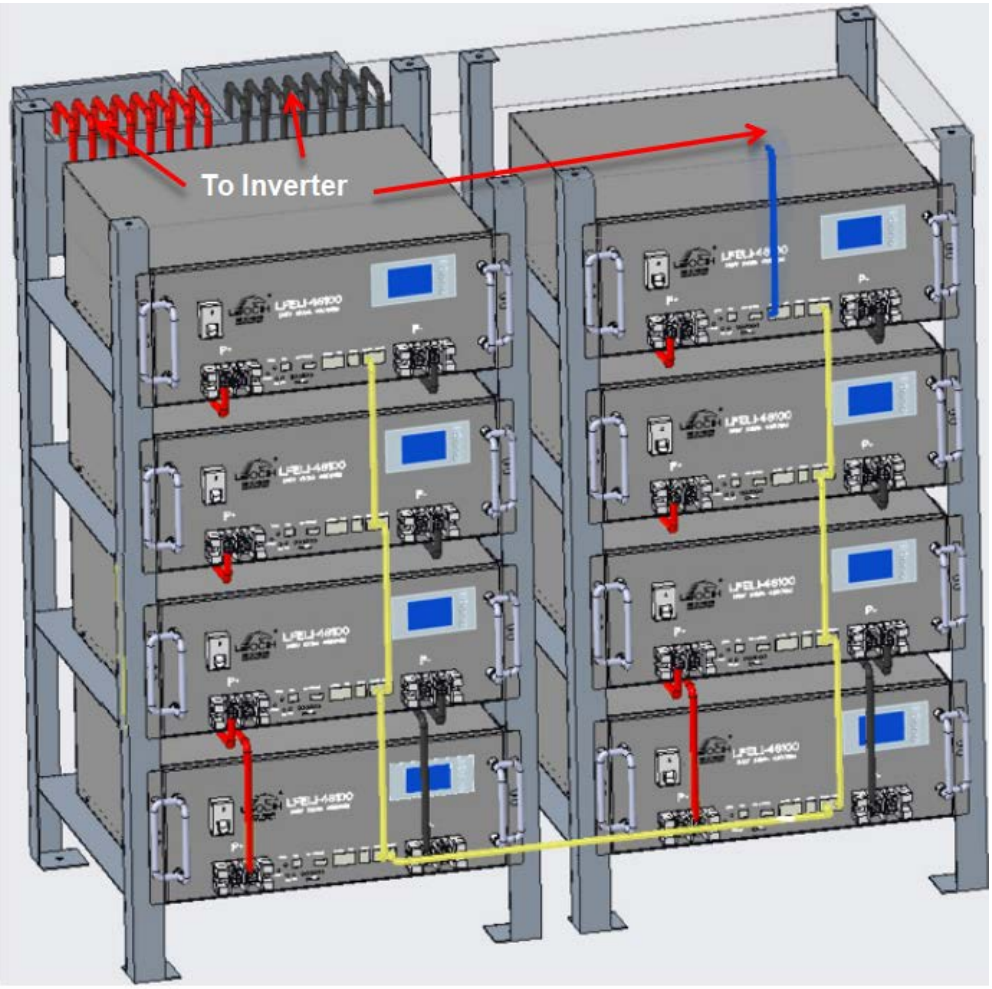
1) Preparation before installing: insulation metal mounting tool (such as a cross screwdriver, wrench), insulation tape and customized wiring cables.

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.

Eight LFeLi-48100MB16 in parallel as shown in figure 3-4.The red cable is connected to the positive pole, the black cable is connected to the negative pole, the blue cable is connected to the CAN communication, and the yellow cable is connected to the parallel battery.

Figure3-4 Eight parallels of customized wiring cable diagram



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 verif ication 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, Terminal	Visual inspection	● Insulation cracks, aging ● Exfoliated, corrosion of the terminals	● Replace the cable ● Replace the terminal block

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 photograph 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. ● 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 by every 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 Trouble shooting steps

① **Problem determination based on:**

1) Whether the battery can turn on or not;
2) If battery is turned on, check the red light is off, flashing or lighting;
3) If the red light is off, check whether the battery can charge/discharge or not.

② **Preliminary determination steps:**

1) Battery cannot turn on, switch on the lights are all no lighting or flashing.

If the battery external switch is ON, the RUN light is flashing, and the external power supply voltage is 48V or more, the battery still unable to turn on, please contact Leoch.

2) The battery can be turned on, but red light is lighting, and cannot charge or discharge. If the red light is lighting, that means system is abnormal, please check values as following:

a) Temperature: Above 50℃ or under -10℃, the battery could not work.

Solution: to move battery to the normal operating temperature range between -10□ and 50□

b) Current: If current is greater than 100A, battery protection will turn on.

Solution: Check whether current is too large or not, if it is, to change the settings on power supply side.

c) High Voltage: If charging voltage above 54V, battery protection will turn on.

Solution: Check whether voltage is too high or not, if it is, to change the settings on power supply side.

d) Low Voltage: When the battery discharges to 44.5V or less, battery protection will turn on. Solution: Charge the battery for some time, the red light turn off

Excluding the four points above, if the faulty is still cannot be located, turn off battery and repair.

c. The battery cannot be charged or discharged

1) Cannot be charged:

Disconnect the power cables, measure voltage on power side, if the voltage is 53~54V, restart the battery, connect the power cable and try again, if still not work, turn off battery and contact Leoch.

2) Unable to discharge:

Disconnect the power cables and measure voltage on battery side, if it is under 44.5V, please charge the battery; if voltage is above 48V and still cannot discharge, turn off battery and contact Leoch

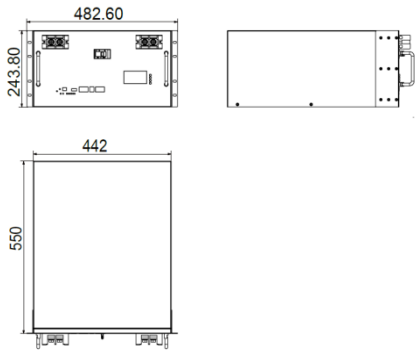
5 SPECIFICATIONS

5.1 Technical specifications

Lithium batteries with 48V MB series of modules, the main physical dimensions for a single module is shown in table 5-1, technical indicators for a single module is shown in table 5-2.

Table 5-1 The main physical dimensions for a single module

Dimensions(mm) of 48200MB



Dimensions(mm) of 48100MB

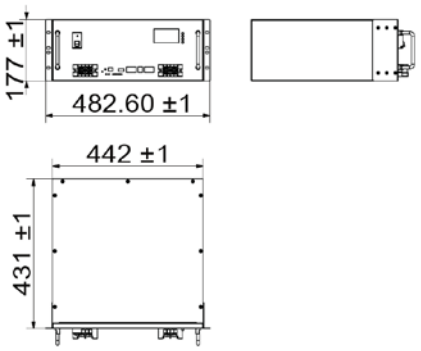


Table 5-2 technical indicators for a single module

Item	Specification		
Model	LFeLi-48100MB15	LFeLi-48100MB16	LFeLi-48200MB16
Rated Capacity (5HR)	100 Ah	100 Ah	200 Ah
Nominal Voltage	48 V	51.2 V	51.2 V
Discharge Ending Voltage	40.5V	43.2 V	43.2 V
Charging Limited Voltage	54 V	57.6 V	57.6 V
Max. Charging Current	100 A	100 A	150 A
Max. Continue Discharging Current	100 A	100 A	150 A
Weight	Approx. 43 Kg	Approx. 43 Kg	Approx. 85 Kg
Display	With display screen	With display screen	With display screen
Protocol	CANBUS	CANBUS/ MODBUS	CANBUS/ MODBUS
Parallel Connection	Parallel connection is optional (up to 15P).		
Dimensions (W*D*H) mm (inches)	442 (17.40") * 431 (16.97") * 177 (6.99")	442 (17.40") * 431 (16.97") * 177 (6.99")	442 (17.40") * 550 (21.65") * 244 (9.61")
Cell	3.2V 100Ah	3.2V 100Ah	3.2V 50Ah
Design life	More than 20 years		
Cycle Life	More than 3500 cycles at 100% DOD.		
IP Class	Ip31		
Outer Package Material	Black bake lacquer steel case (battery rack or cabinet is optional)		
Operating Temperature	Charging: 0 to +60℃ Discharging: -20 to +60℃ Storage: -20 to +60℃		

5.2 The main performance index of the battery

For lithium battery of 48V series module, the electrical performance as shown in table 5-3.

Table 5-3 Multiple group parallel discharge technology parameters

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

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.

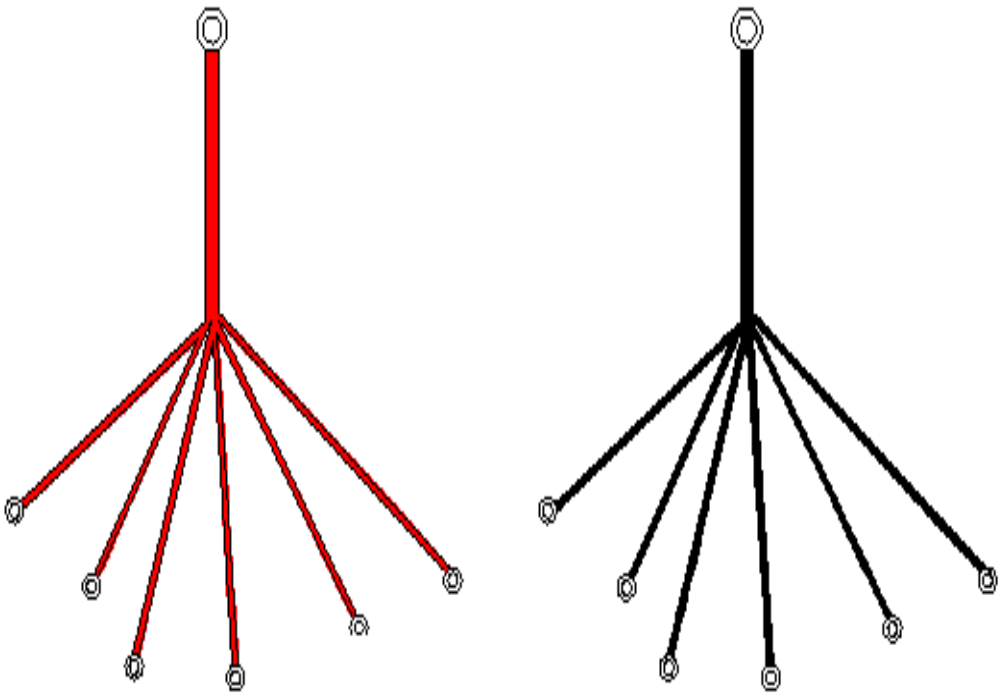
7 APPENDIX

7.1 Connection cable

If groups (4~10) of parallel sets of lithium batteries are not supplied by Leoch battery racks, 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 customised 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.

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

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