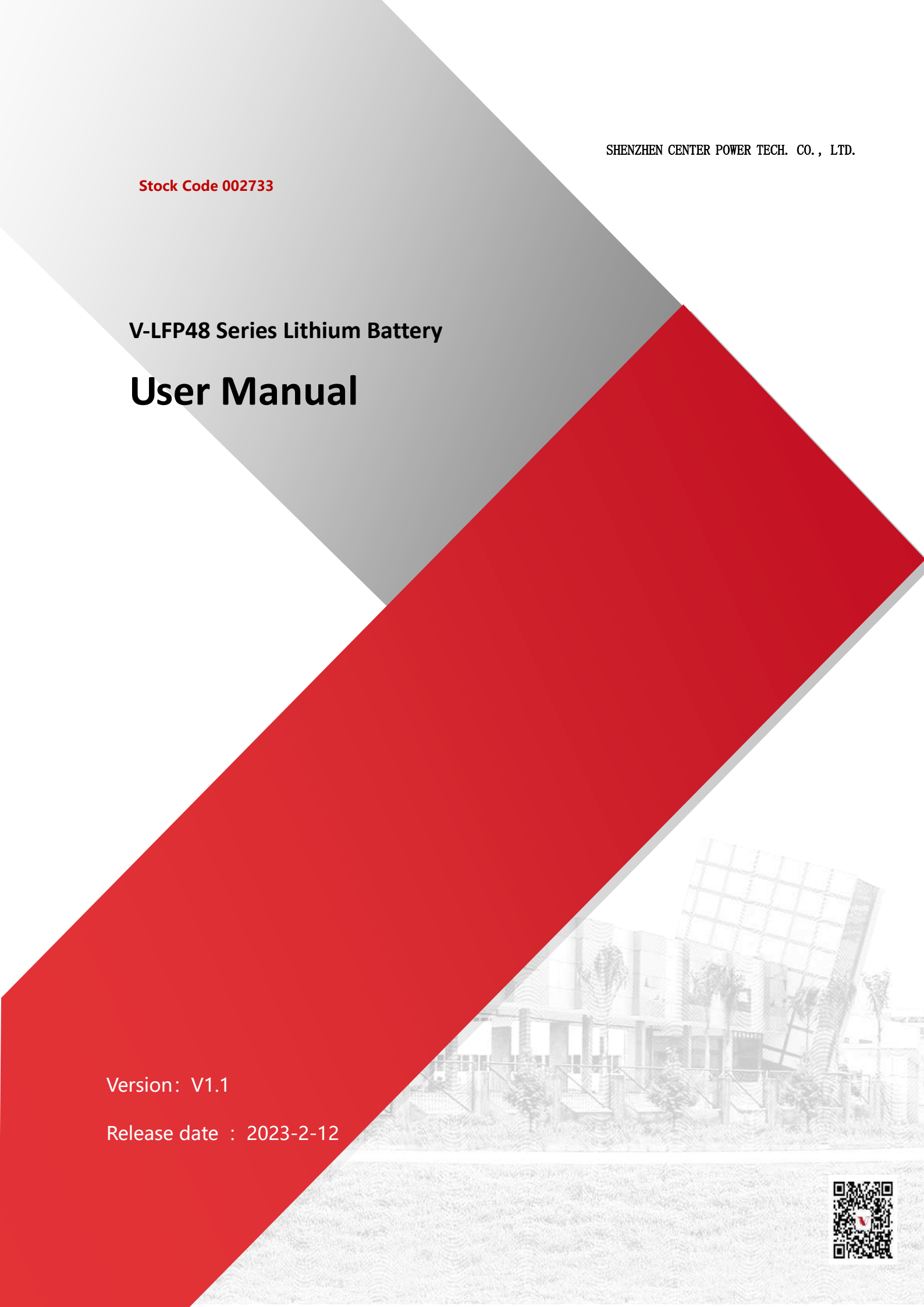
SHENZHEN CENTER POWER TECH. CO., LTD.

Stock Code 002733

V-LFP48 Series Lithium Battery

User Manual



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Preface

Overview

This document describes the lithium iron phosphate battery for energy storage module. It is referred to as lithium battery for short.

It mainly describes the product overview, application scenario, working principle, basic structure, operation parameters, operation, installation and maintenance.

The pictures in this paper are for reference only, and the specific structure is subject to the real object.

Readers

This document is mainly applicable to the following readers:

- Maintenance engineer
- Sales Engineer
- Technical support engineer

Attention

Due to product version upgrade or other reasons, the contents of this document will be updated from time to time. Unless otherwise agreed, this document is only used as a guide. All statements, information and suggestions in this document do not constitute any express or implied warranty.

Disclaimer: This manual is as comprehensive and detailed as possible on the basis of existing data, but the company reserves the final right to data, parameters and other information. No further notice!

Contents

1 Safety precautions

The installation, operation and maintenance of V-LFP48 series lithium battery system can only be carried out by trained and qualified professionals. Before installation and use, please carefully read the safety precautions and relevant operating procedures of this product, otherwise personal injury or product damage may occur. The precautions mentioned in this manual are those under normal conditions. If you find any special use environment or conditions, please contact VISION's technical personnel for solution.

SAFETY SYMBOLS

Symbol	Definiton
	Important safety information will follow.
	DO NOT dispose of battery in a fire.
	Recycle or dispose of Lithium batteries in accordance with local Laws/regulations.
	DO NOT dispose of battery in the trash.

Safety instructions

Please read and comply with the following conditions of installation and use of the battery, incorrect installation using the battery may cause personal injury or damage to the product.

1.DO NOT throw the battery into water. Store batteries in a cool and dry environment when not in use.

2.DO NOT put the battery into fire or heat the battery, so as to avoid explosion or other dangerous events.

3.When charge the battery， please choose specialized charging equipment, and follow the correct procedures, do not use unqualified chargers.

4.DO NOT reverse positive and negative terminals, do not connect the battery directly to AC power , avoid battery short circuit.

5.DO NOT using batteries from different manufacturers or different kinds, types together ,and do not mixed use old batteries and new batteries.

6.DO NOT use the battery when it become hot, bulges, deforms or leaks.

7.DO NOT puncture the battery by nail or other sharp objects; Do not throw, stamp on, impact or hit the battery.

8.DO NOT open or try to repair the battery when it is defective. Warranty invalid if the battery repaired or disassembled.

9.Batteries are half charged before shipment, Don't use the battery if it's hot, bulge, or smell abnormal and so on, and report to VISION after-sale dept. immediately.

10.If you need storage the battery for a long time, please charge and discharge the battery every three months to ensure the best performance, and the best state of charge for storage is between 50%~60%.

11.Please use the battery in the temperature range which defined in the manual.

12.The state of charge of batteries is 50% before shipment, please charge the battery before use or test.

2 Product introduction

2.1 Product overview

V-LFP48 series lithium battery is an external battery system that provides standby power for - 48V equipment. When 220V mains power supply is normal, the rectifier power supply module works normally to supply power to the equipment and charge the battery ; When the mains power is cut off, the rectifier power module stops power supply, and then the battery provides uninterrupted power supply to the equipment to ensure the normal operation of the equipment; When the mains power is switched on again, the rectifier power module will restore power to the communication equipment and charge the battery .

The lithium battery BMS can monitor the status of temperature, current, voltage, etc., and provide protection functions such as overvoltage, undervoltage, overcurrent, short circuit, high and low temperature. At the same time, the lithium battery operation status and alarm information are reported through the communication interface RS485/dry contact.

Table 2-1: Nominal voltage and capacity of battery

Model	Nominal voltage	Capacity
V-LFP48100	48V	100Ah
V-LFP48150	48V	150Ah
V-LFP48200	48V	200Ah

Characteristic:

- Intelligent charge and discharge management, SOC, SOH calculation based on intelligent learning;
- High precision voltage, current, temperature detection;
- Over voltage, under voltage, over current, high and low temperature, short circuit protection function;
- Four remote functions: telemetry, remote message, remote control, remote adjustment;
- With intelligent software anti-theft function *, with sound and light alarm function;
- Easy maintenance: integrated BMS design, support a variety of ways to activate, forced power off function, with maintenance mode;
- Intelligent operation and maintenance: the whole network energy storage visible tube, support for remote upgrade*;
- Intelligent design: gyroscope *, GPS anti-theft *, heating film *, (fire extinguisher) built-in fire module * and other extension function interface;
- Maintenance-free: the battery module can be maintenance-free in the process of use, save customers battery operation and maintenance testing costs, reduce the station replacement frequency;
- Long life: the life of lithium battery is 2~3 times that of lead-acid battery. At the same time, it can realize real-time online monitoring of battery health and storage capacity, intelligent management, and improve the reliability of backup power of the site

Note: The function marked with asterisk is optional and needs to be selected to support the corresponding function

2.2 System architecture

The connection diagram of V-LFP48 series lithium iron phosphate battery system is shown in Figure 2.2 below.

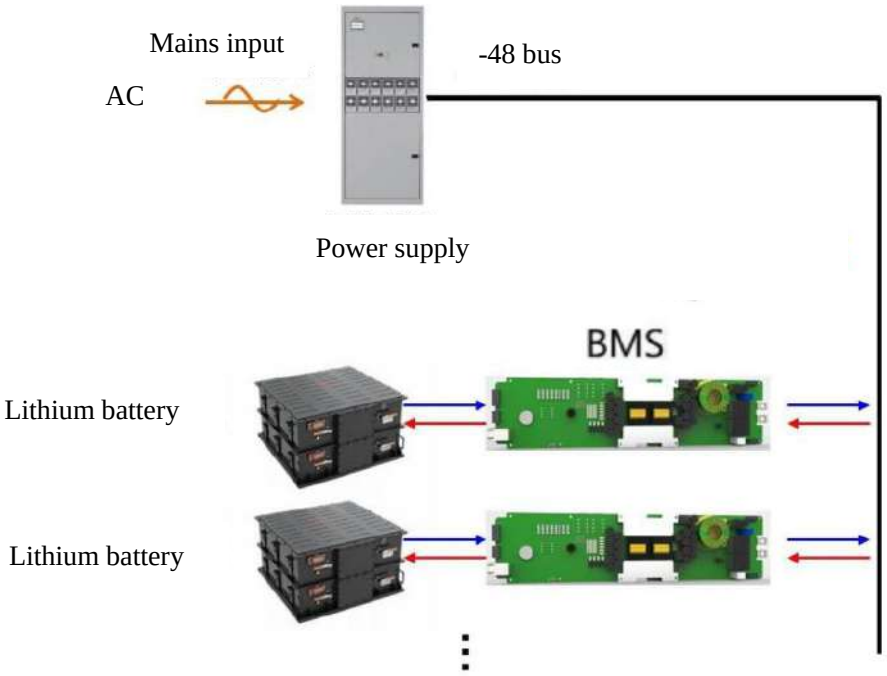
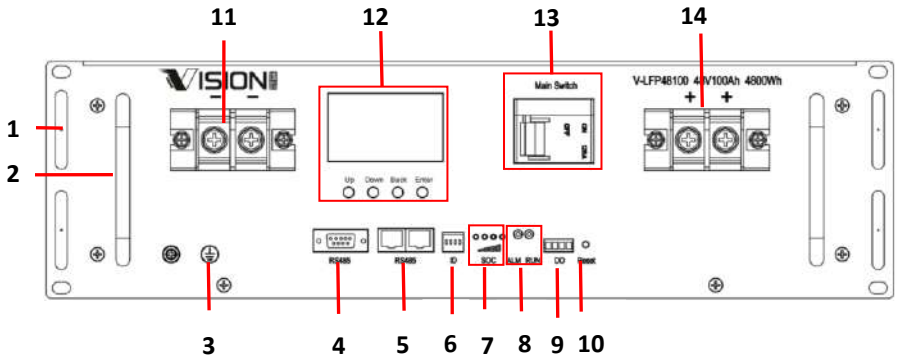


Figure 2.2： Working principle of the battery system

2.3 Control panel introduction

The V-LFP48 series lithium battery system uses the same control panel structure.

Figure 2.3： Control panel of V-LFP48100 series products



Note: VISION lithium battery products have several models, and the one shown above can be selected according to the customer's requirements. It supports the selection of LCD display, circuit breaker, gyroscope, GPS anti-theft, heating film, fire extinguisher (fire module), and other expansion functions. The above is only shown, and the details are subject to the actual object. No further notice of changes or alterations.

Table 2.3 :Ports on the control panel

NO	Name	Function
1	Hanging ear	The system module is fixed and recommended to be installed on a 19-inch rack
2	Case handle	Convenient handling, moving and installation
3	Protective	/

	grounding		
4	RS485	Communication interface	
5	RS485	Communication interface	
6	ID Dip	This parameter is used to set the address information of battery . When multiple battery use the same monitoring software or are connected in parallel, this parameter is used to distinguish different battery	
7	SOC status light	Battery capacity status indicator	
8	ALM	Alarm indicator light, alarm indication when the system is abnormal	
	RUN	Operation indicator light, LED indication during normal operation (green)	
9	DO	The alarm output dry contact	
10	Reset	Reset button	
11	-	Power port, negative port	
12	LCD	UP	Previous line
		DOWN	Next line
		Back	Return to the previous menu
		Enter	Enter
13	Main Switch	125A Circuit breaker, short circuit and overload protection	
14	+	Power port, positive port	

2.4 LED light definition

LED sequence: 4 green capacity indicators are arranged in a row; 2 working status LED indicators, green running indicator, red alarm indicator, sorted by row.

Table 2.4: LED indicator status

Battery status	Normal/Alarm/protection	RUN	ALM	Capacity indication LCD				description
		●	●	●	●	●	●	
Shutdown/sleep		Off	Off	Off	Off	Off	Off	All Off
Standby	Normal	On	Off	According to power indicator (Each LED represents 25%SOC)				
Charge	Normal	On	Off					
	Alarm	Short flash	Off					
	Overvoltage protection	On	Off					
	Temperature protection	Off	On					
	Over current to current limit	Short flash	Off					Current limiting off

Discharge	Normal	Long flash	Off		
	Alarm	Long flash	flash3		
	Low pressure protection	Off	On		60s Enter sleep
	Over temperature and over current protection	Off	On		
	Discharge overcurrent alarm	Long flash	Off		

Description: LED long blink: once every 2.4 seconds; The LED short blinking period is about once every 1.2 seconds

The corresponding relationship between SOC light display and capacity:

Capacity	Capacity indicator LED			
	●	●	●	●
	LED1	LED2	LED3	LED4
[0, 25%)	On	Off	Off	Off
[25%,50%)	On	On	Off	Off
[50%,75%)	On	On	On	Off
[75%,100%]	On	On	On	On
Conditions of LED light on: When standby.If the voltage of cell is higher than the sleep voltage or during charging and discharging, the capacity indicator is steady on in proportion to the capacity				

2.5 RS485 communication interface

The communication circuit of this system is one RS485, through which BMS communicates with the upper computer. The baud rate is set to 9600 by default. Two RJ45 sockets are used for the RS485 port

Table 2.5 ： Definition of RJ45 socket pins

Signal definition	DB9	RJ45*2（Two of the same）
RS485 A+(T/R+)	PIN-1	PIN-1
RS485 B-(T/R-)	PIN-2	PIN-3
Isolated power supply V-	PIN-5	PIN-2、6
undefined	other	other

2.6 Technical specification

Table 2.6 ： Technical specification

Item	V-LFP48100	V-LFP48150	V-LFP48200
Size (W*D*H)	442mm×480mm×134.5mm	442mm×540mm×190mm	442mm×550mm×222mm
Weight	45.0 ±0.3Kg	58.0 ±0.3Kg	75.0 ±2Kg
Nominal voltage	48V DC	48V DC	48V DC
Nominal capacity(25℃,0.5C)	100AH	150AH	200AH
Recommended charging voltage	53.5V~54V	53.5V~54V	53.5V~54V
Maximum charging current	100A/100A@25℃	100A/100A@25℃	100A/100A@25℃
Maximum charging and discharging power	4800W	4800W	4800W
Operating	Charging operating temperature: 0℃~60℃,		

temperature	discharge operating temperature: -20℃~60℃		
Relative humidity	5%~95%	5%~95%	5%~95%
Atmospheric pressure 强	61kPa~113kPa	61kPa~113kPa	61kPa~113kPa
Installation mode	19 inch bracket mount		
Maintenance mode	Front maintenance	Front maintenance	Front maintenance
altitude	0~4000 m (2000 m to 4000 m, every 200 m rise, the maximum operating temperature drops 1℃)		
IP Protection class	IP20	IP20	IP20
SOC accuracy	≤±5%，according to YD/T2344.1- 2011		
Other requirements	Indoor scene: ● No conductive dust and corrosive gas, no explosion risk ● Dust, corrosive substances, pests, mold and other indicators shall comply with ETSI EN 300 019-1-3 (V2.3.2 or later) Class 3.1 Outdoor scene: ● No conductive dust and corrosive gas, no explosion risk ● Dust, corrosive substances, pests, mold and other indicators shall comply with ETSI EN 300 019-1-4 (V2.2.1) Class 4.1		

3 BATTERY MANAGEMENT SYSTEM （BMS）

3.1 Voltage protection

Discharge low voltage protection

When the battery is discharged, when the voltage of cell is lower than the low voltage protection value of the system or the battery voltage is lower than the protection voltage value , the over-discharge protection is started, and the battery stops external power

supply. When the overall voltage of the battery and the voltage of all cells are recovered above the value of the over-discharge recovery voltage, the over-discharge protection status is released. The protection parameters are shown in **Table 3**.

Charging overvoltage protection

When any cell is higher than the overvoltage protection value of the system or the battery voltage is higher than the protection value, the overdischarge protection is started and the battery stops charging. When the overall voltage of the battery and the voltage of all individual cells are restored to the value above the overvoltage recovery voltage, the overvoltage protection state is removed. The protection parameters are shown in **Table 3.**

3.2 Current protection function

Charge overcurrent protection

When the battery is being charged, the system stops charging when the charging current is higher than the protection value. Remove the protection after removing the charger. Refer to the overcurrent parameters in **Table 3** for protection parameters.

Discharge overcurrent protection

When the battery is discharged, the system stops charging when the discharge current is greater than the protection value. The protection is removed after the load is removed. For details about the protection parameters, see **Table 3**.

Short circuit protection

When the discharge current of a battery is much higher than the normal operating current, the battery string is protected by short circuit by default, and stops supplying power to the battery string. For details about the protection parameters, see **Table 3**.

3.2 Temperature protection function

Cell temperature protection

When charging, the temperature sensor detects the surface temperature of the cell, when the battery temperature is higher than 70℃ or lower than 0℃, start the charging temperature protection, stop the battery charging; When the battery temperature is higher than 75 ° C or lower than -20 ° C, the discharge temperature protection is enabled and the battery stops discharging. **Table 3** lists the temperature protection parameters.

3.3 Battery equalization

Intelligent battery equalization

BMS perform battery balancing in resistor bypass mode. The battery balancing function is enabled when the voltage of a battery cell in the protection plate reaches 3.4V and the voltage of the battery cell is higher than 40mV of the lowest battery cell. Balance type: passive balance. Balance current: 80mA±10mA(voltage of single cell 3.40V)

Table 3：Protection function parameters

NO	Type	Protection function	Protection parameter value	Delay time	Contact conditions (restore the relationship between conditions 1 and 2 as or below)
1	Charge	Single cell overvoltage alarm	3.70V alarm（Can be set）		
		Single cell overvoltage protection	3.80V protection（Can be set）	1-2S	1. Discharge current > 1.0A or 2. The voltage of a single cell drops to 3.6V and the voltage of the battery drops to 54.0V
		Battery overvoltage alarm	56.0V（Can be set）		1. Discharge current > 1.0A or 2. The voltage of a single cell drops to 3.6V and the voltage of the battery drops to 54.0V

		Battery overvoltage protection	57.0V protection（Can be set）	1-2S	1. Discharge current > 1.0A or 2. The voltage of a single cell drops to 3.6V and the voltage of the battery drops to 54.0V
		Charging protection current 1	>102A 且<112A（Can be set）	20S	Transfer current limiting charging mode
		Charging protection current 2	≥112A（Can be set）	2-3S	
2	Discharge	Single cell over-discharge alarm	2.8V（Can be set）		
		Single cell over-discharge protection	2.5V Protection（Can be set）	1-2S	1. Charging current >1.0A or 2. The voltage of each cell is > 3V and the voltage of battery rises to 46V
		Battery over-discharge alarm	43.2V（Can be set）		
		Battery over-discharge protection	42V（Can be set）	1-2S	1. Charging current >1.0A or 2. The voltage of each cell is > 3V and the voltage of battery rises to 46.5V
		Discharge alarm current	102A（Can be set）		
		Discharge protection current 1	＞102A & ＜122A（Can be set）	30S	1. Charging current > 1.0 A or 2. The protection is automatically removed after 60 seconds
		Discharge protection current 2	≥122A（Can be set）	2-3S	1. Charging current > 1.0 A or 2. The protection is automatically removed after 60 seconds
		Short circuit protection	Short-circuit load（≥0.1R）（Can be set）		1. Charging current > 1.0 A or 2. Delayed recovery
3	Cell temperature	Charging high and low temperature alarm	≤-3℃，≥65℃（Can be set）		
		High and low temperature	≤-5℃，≥70℃（Can be set）		The charging temperature is higher than 0℃ and lower

		protection for charging			than 60℃
		Discharge high and low temperature alarm	≤-20℃， ≥70℃（Can be set）		
		Discharge high and low temperature protection	≤-25℃，≥75℃（Can be set）		The discharge temperature is higher than -15℃ and lower than 65℃
4	PCB temperature	PCB high temperature alarm	≥90℃（Can be set）		
		PCB high temperature protection	≥95℃（Can be set）		＜80℃
5	Ambient temperature	High and low ambient temperature alarm	≤-15℃， ≥65℃		
		High and low temperature protection of ambient temperature	≤-20℃， ≥70℃		The temperature is higher than -10 ° C and lower than 60 ° C
6	SOC	SOC low capacity alarm	≤5％		＞5％

4 Installation and commissioning

4.1 Installation preparation

Rules Of Safe

The installation, operation and maintenance of V-LFP48 series lithium iron phosphate battery system must be performed by trained and qualified professional personnel. Before installation and use, please carefully read the product safety precautions and related operating rules. Strictly abide by the following safety rules and local safety regulations,

otherwise may cause personal injury or damage to the product.

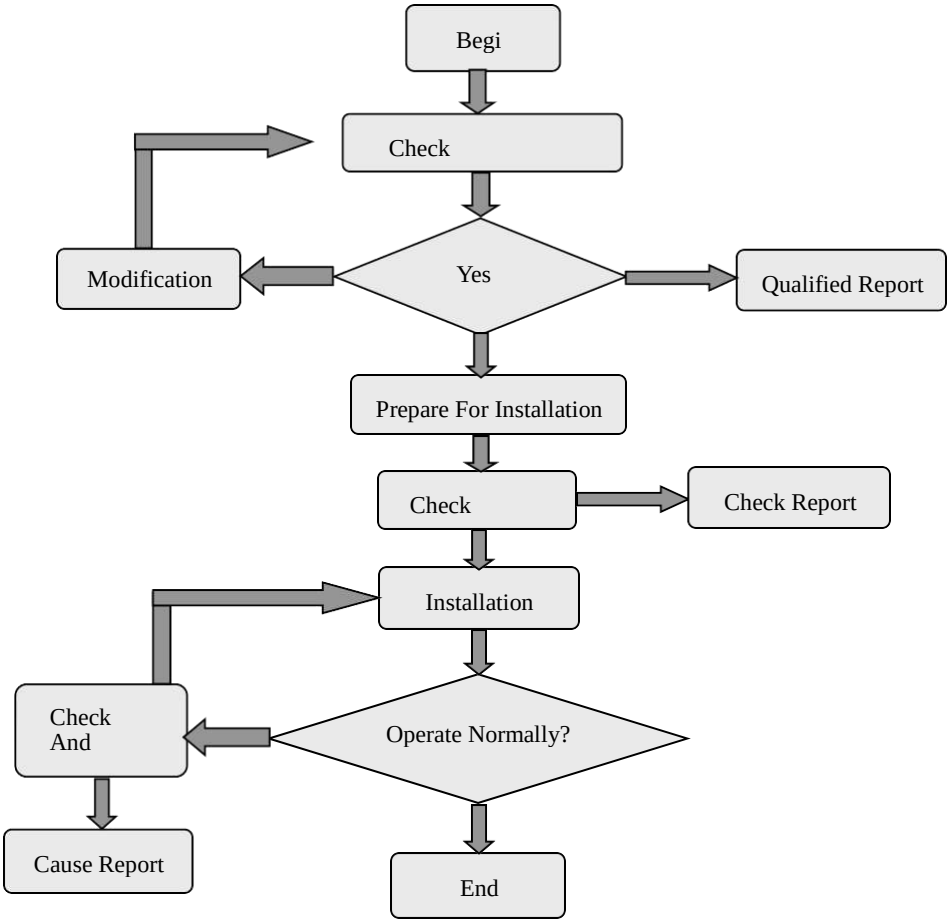
1.Make sure that the Telecom equipment to be connected with the battery system is in good condition and free from defects;

2.Before installation, make sure that the power supply system is under shut down state, while the battery system is also under shut down state;

3.All the electricity cables must have corresponding grade of insulation, Please ensure that no exposed cables;

4.Make sure that the battery and power system are reliable grounding.

Figure 4.1: Process Of Installation



4.1.1 Requirement Of Installation Environment

The requirement of installation environment is shown in **table 4.1.1.**

Table 4.1.1： Requirement Of Environment

Type	description
Working Temperature	Charging operating temperature: 0℃~60℃， Discharge operating temperature: -20℃~60℃ Recommended operating temperature：0℃~45℃
Storage Temperature	-20℃ ~+45℃，Recommended storage temperature：25℃
Relative Humidity	45%~85%，Recommend as 45%~60%
Atmospheric Pressure	86kPa~106kPa
Site Requirements	No conductive dust, no corrosive gases, no explosion hazards, no jolts. Keep away from heat and open flames

4.1.2 Tools and Materials

● Insulation tools should be used. The following table is for reference only

● Power terminal installation must be periodically checked whether it is tightened, whether there is rust, corrosion or other foreign matter, if there should be wiped clean, tighten the bolt, battery bolt virtual connection will lead to connection voltage drop is too large, or even a large amount of heat will burn the battery when the current is large

Table 4.1.2: Tool list

Tool name	
1. User manual	7 .Diagonal cutting pliers
2. Screwdriver (flat and cross)	8. Multimeter
3. Wrench	9. Tongs meter
4. Needle-nose pliers	10. Insulating tape
5. Wire stripper	11. Anti-static bracelet
6. Wire clamp	12. Cable tie

4.1.3 Site Survey

Equipment inspection

1. Check the properties of the device directly connected to the battery to enable the user device,

switch power supply, or other power supply devices.

2. Check the DC port position and output voltage of the device, and check whether the floating charging voltage and equalizing charging voltage are within the specified range.

3. Check whether the maximum output current of the DC device port matches the selected battery.

4. Check the maximum working current of the battery powered device and ensure that the current is smaller than the maximum discharge current of the product in use.

Ground Check

Check and confirm the electrical grounding position of power system room.

4.1.4 Battery inspection and acceptance

1. After the battery arrives at the installation site, check whether the battery package is in good condition.

2. After unpacking, check whether the materials are complete and intact according to the packing list. If there is any damage, please fill in the acceptance form truthfully;

3. Handle the objects gently when taking them out to avoid damaging the surface of the objects and affecting the appearance.

4.2 Installation and construction

4.2.1 Matters needing attention in construction

Construction should pay attention to the following matters:

1. Installation space and bearing capacity of supports. Ensure that the battery has sufficient mounting controls and that the battery mounting bracket or cabinet is strong enough to withstand the battery's gravity.

2. Cable specifications. Ensure that the power cable used can meet the maximum current requirements of the equipment operation.

3. Engineering layout. Ensure that the layout of power supplies and batteries is reasonable during the entire construction process.

4. Cable layout. Ensure that the wiring is reasonable and orderly; And consider moisture-proof, anti-corrosion.

5. Wear an anti-static bracelet during the entire construction process.

6. There should be at least two people operating the construction site.

 Note: Ensure site security before installation.

4.2.2 Installation procedure

Table 4.2.2 describes how to install the battery.

Table 4.2.2： Installation steps

NO	Name	Name
1	Turn off power supply	The system should be powered off, to ensure that there is no electric in installation process
2	Mechanical installation	1. Mounting lugs installation
		2. Battery fixed installation
3	Electrical	1. Grounding cable
		2. Power cable installation
		3. Connecting equipment installation

	installation	4. Communication cable installation

Step 1. Interruption Of Power Supply

● Before installation, please ensure the battery is powered off., at the same time, shutdown the equipment which need to connect to the battery.

Step 2. Mechanical installation

1.Mounting lugs installation. Equipment packaging with the chassis mounting lugs, before the installation of equipment, fix the mounting lugs on both sides of the battery box, ensure that the installation strong.

2.Battery installation. Battery module preference mounted in the rack 19 inch (or cabinet), when installed, portable handle arranged in parallel on the frame (or cabinet) supporting plate, push rack (or cabinet), ensure the mounting lugs and frame (or cabinet) edge fixing hole tightly, and then using a screwdriver with screw for fixation screwed into the rack to the mounting holes, to ensure that the battery pack mounted solid.

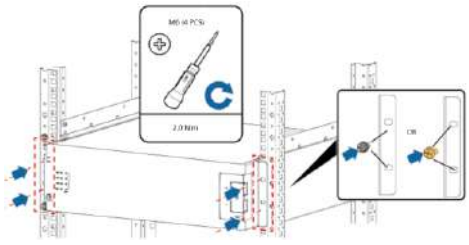
Notice:

● The weight of V-LFP48100 is about 40kg. Please check the bearing capacity of the rack tray before installation.

● The depth of V-LFP48100 is 480mm. Ensure that the rack depth meets the requirements before installation.

● Lithium batteries can be installed in 19 inches with guide rails and trays. Check whether the bearing capacity of the guide rails meets requirements. This section uses the guide rails as an example.

Figure 4.2.2: Mechanical installation diagram of the equipment

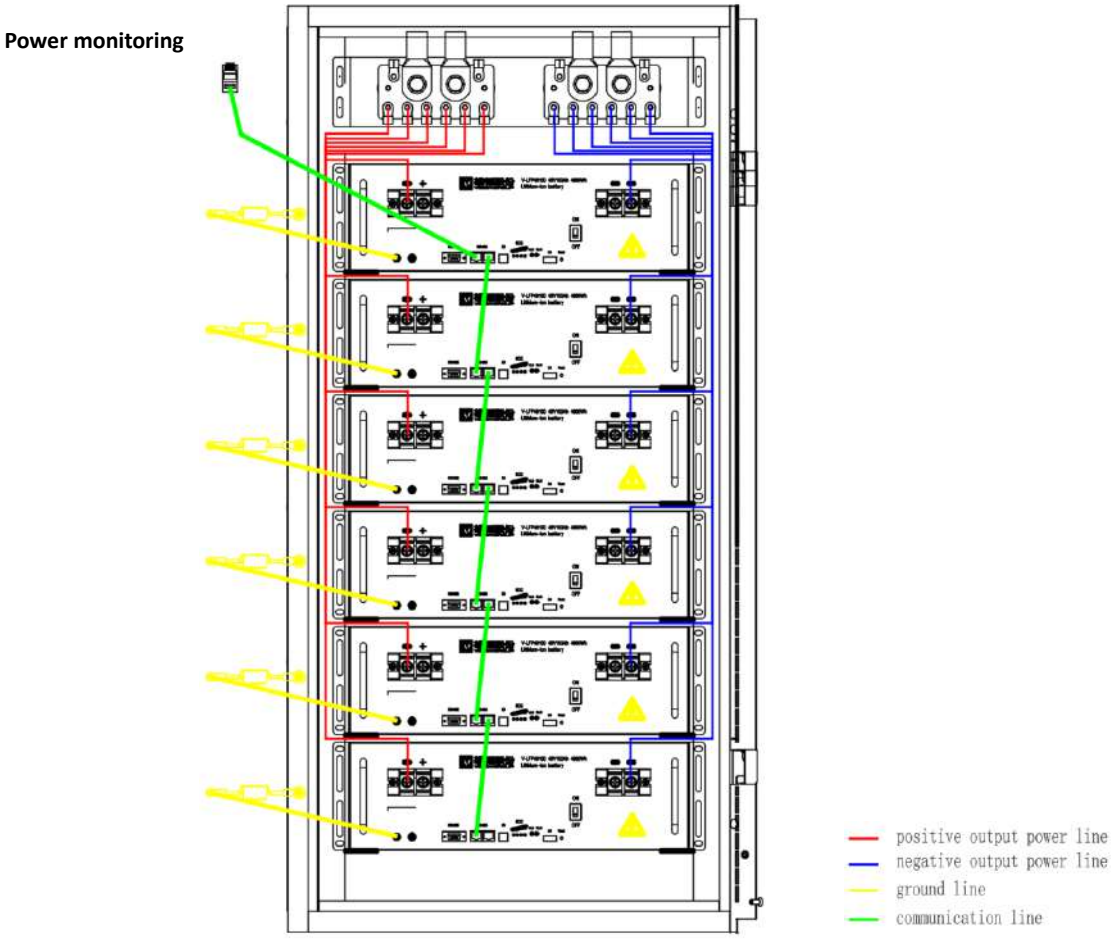


Step 3. Electrical installation

1. Connect ground cables. Screw one end of the ground cable to the ground hole at the rear of the chassis, and connect the other end to the ground copper bar of the rack or cabinet. Make sure the connection is secure. For the connection mode, refer to the yellow section in Figure 4.2.2 Device Connection Diagram below.

2. Install power cables. If a single battery is used, connect its wiring terminals to the terminals of the device or the switching power supply. If multiple batteries are connected in parallel, connect each battery to the copper bar of the cabinet (or rack) by using a power cable. For the connection mode, refer to the red and blue sections in Figure 4.2.2 Device Connection Diagram below.

Figure 4.2.2: Schematic diagram of device connection



1. Connect the device and install it. When installing the connecting device, determine the

position of the positive and negative terminals of the system. Connect the positive terminal with the red connection wire and the negative terminal with the blue connection wire to ensure that the connection is not wrong.

Note: If there is any problem during installation, please contact VISION in time to avoid damaging the equipment or causing safety accidents.

2. Install communication cables. When the battery is used individually, the communication port "RS485 communication interface" is connected to the communication port of the switching power supply. If multiple batteries are connected in parallel, battery communication is cascaded. Use a network cable to cascade the RS485 communication port. For the connection method, see the green connection in Figure 4.2.2 Device Connection Diagram.

Step 4. Power-on commissioning

After completing the above steps, long press the ON/OFF key on the control panel to power on the system one by one, and then power on the entire system to complete the installation.

Note: If the battery cannot start normally or the ALM light on the control panel is on, please disconnect the power cable, check and restart it. If the problem persists, please contact VISION in time to avoid device damage or safety accidents.

5 Transportation, storage, use and maintenance

5.1 Transportation and storage

Transportation

According to the provisions of the product can be used in general means of conveyance, but should avoid throwing, rain fall, strong radiation and corrosion erosion. during transportation, please prevent the collision and strong vibration.

Storage

Storage device in the indoor storage, the ambient air temperature is 0 ℃ to + 30℃, the average monthly relative humidity of not more than 90%, the ambient air without corrosive and flammable and explosive gas; storage warehouse should be ventilated, free of alkaline, acidic substances and other corrosive gases, without a strong mechanical vibration, shock, and without strong electromagnetic field and direct sunlight. Capacity was maintained at 50% to 60% stores, and charging the battery every 6 months.

5.2 Description and handling of alarms

When the ALM lights, battery has been alarmed or protected, please check fault reasons and take corresponding measures. Table 5.1 below is the main alarm condition.

Table 5.2： The main alarm

State	Type	Indicator	Disposal
Charging	Over voltage protection	ALM Light on	Stop charge, check module voltage and charger
	Over current protection	ALM Light on	Stop charge, check the settings and limitation
	Temperature protection	ALM Light on	Stop charge, wait for the temp recovery
Discharging	Low voltage protection	ALM Light on	Stop discharge, turn to charging mode
	Over current protection	ALM Light on	Stop discharge, check if there is an over load
	Temperature protection	ALM Light on	Stop discharge, wait for the temp recovery

5.3 Common faults and solutions

Common faults and solutions are shown in table 5.3.

Table 5.3： Common faults and solutions

NO	Fault phenomenon	Analysis	Solution
1	LED "RUN" does not light after START	Battery management system not awaken	Press the reset button to reset the system, then reboot the system
2	No DC output	Low voltage protection	Charge the battery and try again
3	Power supply time is too short	Battery capacity lack or not full power	Maintenance or replacement
4	The battery won't be fully charged	Power system DC output voltage falls below the minimum charge voltage	Adjust the DC output voltage of the device to the appropriate charging voltage of the battery
5	ALM LED always lights	Power line connection short circuit	Disconnect the power supply, check the line, and troubleshoot the fault
6	The battery output voltage is unstable and fluctuates greatly	Battery management system do not operate normally	Press the reset button to reset the system, then reboot the system
7	Communication lost or data fault	Communication settings fail	Check the communication settings and correct it

Note: If you have some special technical problems which not mentioned above, please

contact VISION technical staff.

Legal statement：

雄 韬 股 份

VISION GROUP

Shenzhen Center Power Tech. Co.,Ltd.