

# **PowerLine - 5**

## **Wall Mounted LFP Energy Storage Battery System**

### **OPERATING INSTRUCTION**



**BSL NEW ENERGY TECHNOLOGY CO., LTD**

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## **NOTICE**

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# 1 Summary

The integrated LFP battery pack PowerLine - 5 is a household energy storage battery system developed by BSL NEW ENERGY TECHNOLOGY CO.LTD, which is characterized by ultra-thin, light weight, self maintenance and management, convenience, energy efficiency and environmental protection, and maximum support for 16 groups of parallel use; It is suitable for mainstream inverters in the market, and is suitable for wall mounted installation in families, and can be used in household, industrial and commercial energy storage and many other fields.

## 1.1 Main Characteristics

① The positive pole of the battery is made of lithium ferrous phosphate (LiFePO<sub>4</sub>) material, with good safety performance and long cycle life

② Battery management adopts high-performance BMS battery management system, with functions such as over discharge, overcharge, over current, short circuit, high and low temperature protection, and the calculation of the capacity is more accurate because of the advanced SOC algorithm.

③ It has the function of elf management of charge- discharge and real-time reporting of information ,so that the back-end monitoring unit can timely and accurately reflect the battery information

④ With charging current limiting function. When the value of the charging current is larger than the over current protection , it will automatically start to limit the current charging.

⑤ With the function of automatic wake-up, the battery automatically activates when the base station is powered on again, without manual startup.

⑥ With remote measurement, remote control, remote signaling and remote adjustment functions, which can totally realize remote monitoring.

⑦ Its configuration is flexible,and multiple modules can be used in parallel, so the system whose standby time can be extended.

⑧ Self cooling and no noise.

⑨ With better battery compatibility, more suitable for home power backup.

⑩ It can add heating, fire fighting and other modules As required.

## 1.2 Operating Environment

### (1) the Environmental Requirement of Usage

While you are using the battery, you should be in the environment where is no corrosive, explosive, insulating damaging gas and conductive dust, and keep away from high heat source.

### (2) Range of Ambient Temperature, Humidity and Atmospheric difference

Range of charging temperature: 0°C ~ 65°C;

Range of discharging temperature: -20°C ~ 65°C;

Range of storage temperature: -20°C ~ 65°C;

Range of relative humidity: ≤90% (45°C±2°C) ;

Range of storage humidity: ≤95% (45°C±2°C) ;

Range of atmospheric pressure: 70 ~ 106kPa

### 1.3 Main Technical Specification

Table1-1 Main Technical Specification

Item	Specification	Remarks
Nominal Capacity	100Ah	
Nominal Voltage	51.2V	
Limited Charge Voltage	58.4V	
Cut-off Discharge Voltage	42.4V	
Maximum Charge Current	100A	
Recommended Continuous Charging Current	50A	
Maximum Continuous Discharge Current	100A	
Dimensions (W * H * D)	670*540*90mm	
Installation Method	Wall Mounted	

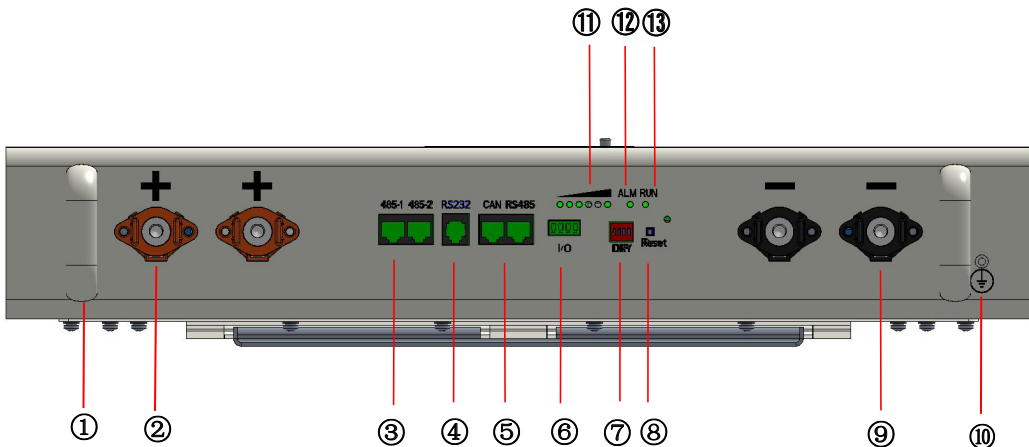
## 2 Description of Product

### 2.1 Appearance



Figure 2-1 Sketch map of appearance

## 2.2 The Sketch Map and Introduction of The Panel



### Introduction of The Panel

① Handle	② Positive	③ RS485	④ RS232
⑤ CAN/485 of inverter	⑥ Dry contact	⑦ Dial switch	⑧ Reset
⑨ Negative	⑩ GND	⑪ SOC	⑫ Warning
⑬ Run			

### 2.2.1 +, - Output Terminal

The output terminals are wiring terminals, which are respectively located on the left and right sides of the battery pack panel, representing the input and output ports of the positive and negative poles of the battery pack. Rated over-current 100A, charging and discharging can be carried out after connecting with external power transmission line (inverter).

### 2.2.2 RESET

“RESET” The bit reset button adopts the self recovery switch, which is used for system activation, switch on and reset, etc

Table1 RESET Definition and operation method

Item	Function	Definition
1	Start up/Activate	When the BMS is in the dormancy state, press the RESET button continuously for 1s, the BMS will be activated, and the LED indicator lights will flash in turn, and then it will turn to the normal working state.
2	Start off/Stand by	When the BMS is in standby or working state, press the RESET button continuously for 3s, the BMS will sleep, and the LED indicator lights will flash in turn, then the BMS will turn to the sleep state.
3	Reset	When the BMS is in standby or working state, press the RESET button continuously for 6s, the BMS will reset, and the internal data will be restored to the factory settings (historical storage records will be retained)

### 2.2.3 RS485 Communication

It has two RS485 interfaces. The two interfaces form an independent serial port, which is a serial port physically. The definition of the interface is shown in Figure 2-3. By setting different dialing addresses for multiple battery packs, it can realize cascade communication, as shown in Figure 2-4.

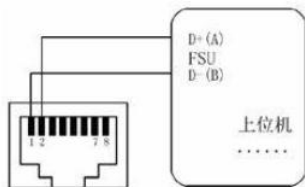


Figure 2-3 RS485 Definition of communication interface

RS485 Pin definition	
Pin	Signal
1、8	RS485-B
2、7	RS485-A
3、6	GND
4、5	NC

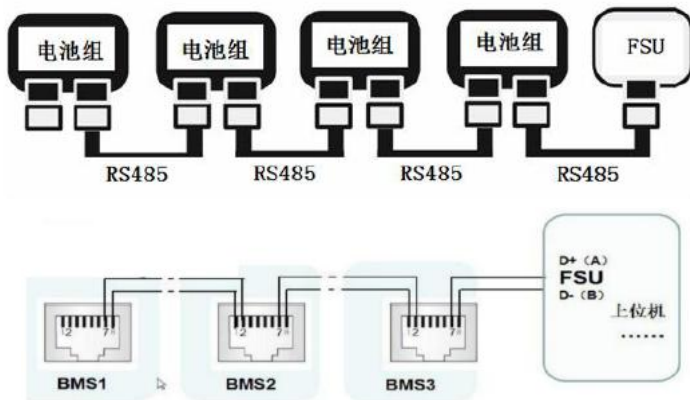


Figure 2-4 Cascade Communication

### 2.2.4 Dialing Address

The dialing adopts BCD code format, the dial up is ON and the dial down is OFF. Four bits are used as the address settings. The dial 1 is low, Dial 4 is high, as shown in Figure 2-5.

When it is in the stand-alone operation mode, all dial addresses are OFF; In the multi machine cascading mode, it is necessary to configure different parameters for the dial address of each PACK (NOTICE: if there are multiple machine parallel connected and address settings of them are the same, communication will not be available).

If you need to connect communication, input the code system of the master or slave machine to be communicated in the software operation interface of the BMS upper computer. The system address is set from 0 to 15, and the dial switch is assigned from left to right as shown in Table 2-1.



Figure 2-5Dial address

Table2-1 Correspondence between the address number of the battery pack and the position of the dialing switch

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

### 2.2.5 RUN Operation, alarm and capacity indicators

It has four SOC indicator LED , one operation LED and one alarm LED, and LED indications under different operating conditions are shown in Table 2-2, 2-3 and 2-4 below

Table2-2 LED Flashing mode

Flashing mode	Duration of lighting	Duration of lighting off
Flesh 1	0.25S	3.75S
Flesh 2	0.5S	0.5S
Flesh 3	0.5S	1.5S



Table2-3 Description of LED status indication

Status	Normal/ Alarm/Pr otection	ON/ OFF	RUN	ALM	Power indicator LED						Description	
		●	●	●	●	●	●	●	●	●		
Power-off	Dormant	off	off	off	off	off	off	off	off	off	off	off
Standby	Normal	on	Flesh1	off	Indicating according quantity of electricity						Stand State	
	Alarm	on	Flesh1	Flesh3							Under voltage	
Charging	Normal	on	on	odd	Indicating according quantity of electricity(Maximum indication: LED Flesh2)						Maximum indication LED Flesh ( Flesh2 ) , ALM does not flash in case of overcharge alarm	
	Alarm	on	on	Flesh3								
	Overcharge protection	on	on	off	on	on	on	on	on	on	on	If there is no AC power, the indicator turns to standby state
	Temperature, over current and failure protection	on	off	on	off	off	off	off	off	off	off	Stop charging
Discharging	Normal	on	Flesh3	off	Indicating according quantity of electricity							
	Alarm	on	Flesh3	Flesh3								
	Under voltage protection	on	of	off	off	off	off	off	off	off	off	Stop discharging
	Temperature, over current, short circuit, reverse connection, failure protection	on	off	on	off	off	off	off	off	off	off	Stop discharging
Invalid		off	off	on	off	off	off	off	off	off	off	Stop charging and discharging

Table2-4 Description of capacity indication

Status		Charging					Discharging				
Indication of capacity		L5●	L4●	L3●	L2●	L1●	L5●	L4●	L3●	L2●	L1●
Capacity (%)	0 ~ 20%	off	off	off	off	閃2	off	off	off	off	on
	20 ~ 40%	off	off	off	閃2	on	off	off	off	on	on
	40 ~ 60%	off	off	閃2	on	on	off	off	on	on	on
	60 ~ 80%	off	閃2	on	on	on	off	on	on	on	on
	80 ~ 100%	閃2	on	on	on	on	on	on	on	on	on
RUN LED●		on					Flesh(Flesh 3)				

### 3 Operating Principle of The System

The working principle of the system is as shown in the figure below. The 220V mains power input is processed by the rectifier module, then the 48V voltage will be output. Under the normal condition of the electric grid, the rectifier module provides the power required by the system, while charging the battery system; In case of electricity failure in the electric grid, the battery system will provide energy to ensure the normal operation of the DC load system and realize continuous power supply. When the battery is discharged but the mains power is still not restored, the battery will automatically cut off the output to protect its own .

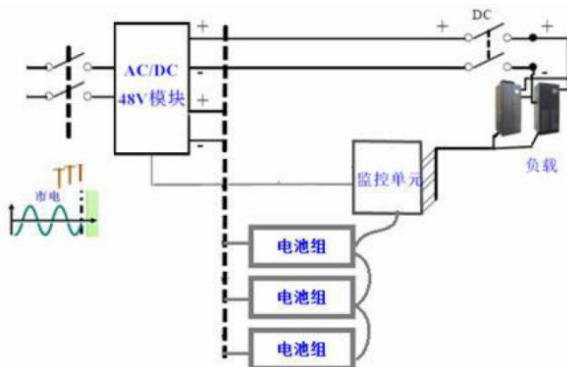


Figure 3-1 Operating Principle of The System

### 4 Installation Guide

#### 4.1 Installation Precautions

- ( 1 ) When you are installing the product, you should observing the local regulations and codes.
- ( 2 ) Personnel requirements: the personnel responsible for installation and maintenance must receive training ,only they master the correct operation methods and safety precautions can they go on duty for installation, operation and maintenance.
- ( 3 ) Personal safety:
  - a、 Insulated tools and gloves shall be used during installation, and all conductors containing metal materials should be strictly prohibited from contacting the battery pack.
  - b、 Avoid falling and collision of battery pack during installation.
  - c、 Except for the maintenance engineers who have received professional training, it is prohibited to remove the battery components for battery maintenance.
- ( 4 ) Site and environment :
  - a、 Cleaning:Keep the area around the battery pack clean.

- b、Fire prevention: It is prohibited to store flammable, explosive and other dangerous goods in the room, meanwhile effective fire-fighting equipment should be provided.
- c、 Ventilation and heat dissipation: in order to facilitate product operation, maintenance and heat dissipation, a space of 30~50 cm shall be reserved around the equipment at least.
- d、 Installation requirements:The battery pack shall be placed flat on the ground to avoid tilting or uneven ground, and shall not be placed in the sun, rain or wet places.
- e、 Environment requirement:Temperature: - 20 ~ 60 °C;Relative humidity: 0% ~ 95%,non-condensing; verticality of the ground: no vibration and the vertical inclination shall not exceed 5 °.

(5) Check the switching power supply. Before installation, please confirm whether the load capacity of the grid incoming line can meet the requirements of the new equipment, whether the switching power supply meets the voltage and frequency on the equipment nameplate, and whether the current carrying capacity decreases due to the aging of the wires. If in doubt, please consult with the local power supply department.

#### 4.2 Installation preparation:

(1) Open the pack and check the product and its parts, all of their packages are cartons.When unpacking, carefully disassemble and check the packing list, and timely check whether the equipment and accessories are complete or damaged during transportation.Before throwing away the packing materials, make sure that all accessories have been found. If the equipment or accessories are damaged during transportation, or the equipment and accessories do not conform to the order contract, they should be recorded in time and immediately contacted. When cleaning the site, recheck again, determine the acceptance data and prepare for acceptance.

##### (2) Preparation of installation tools

Table4-1 List of tools for installation (recommended tools, provided by the customer)

No.	Tool	Specification	Remark
1	Electric screwdriver	/	Insert with M6/M8
2	Wrench	Torque wrench	Test
3	Wrench	M10	Positive and negative pole wires, terminals
4	Sleeve	M6	Positive and negative pole wires, terminals
5	cross screwdriver	/	Lock the lid lock
6	Diagonal pliers	/	Cut tie
7	Electrician knife	/	/
8	Current clamp meter	UT204	Test

9	Insulating gloves	/	Electrical insulation
10	RS485 communication line	/	Communication debugging
11	Computer	/	Debug equipment and read parameters
12	Percussion drill	M10 drilling bit	Drilling

( 3 ) Install wiring

- a、 Wall mounted installation is adopted to fix the system on the wall bracket, as shown in Figure 4-2.
- b、 Connect the battery output terminals P+and P - on the product chassis to the "+" and "-" poles of the DC output terminal of the DC power module with red and black cables with a wire diameter of more than 25 square meters. For multi-level connection, connect the batteries in parallel, as shown in Figure 4-1
- d、 Connect the communication interface of the battery pack with the dynamic environment communication interface with the standard network interface communication cable.

### 4.3 Installation Instructions

The battery pack can be operated in a single unit or in parallel, with a maximum of 16 groups in parallel. The following figure takes three groups of parallel installation as an example, which can be installed as shown in Figure 4-1.



Figure 4-1 Parallel installation diagram

## 4-2 installation diagram

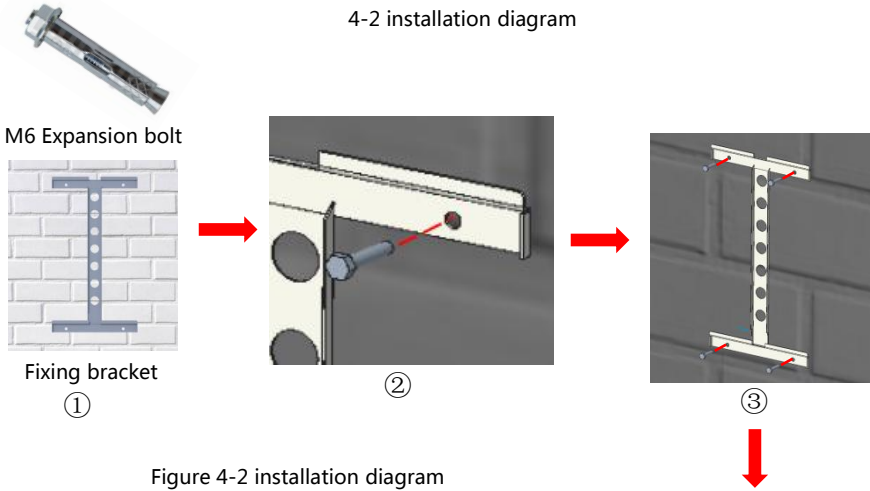
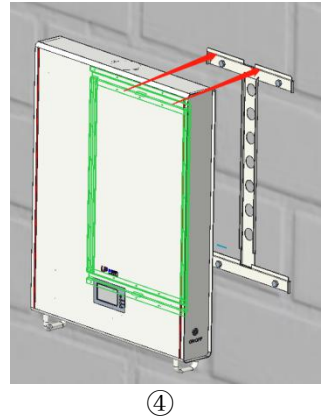


Figure 4-2 installation diagram

Installation sequence	Installation Instructions
①	Prepare support, expansion bolt, wall mounted battery and impact drill
②	Place the support against the wall, make hole marks, and punch holes
③	Install the M6 expansion bolts into the four mounting holes in turn
④	Two people lift the battery and use the battery backplane hook to hang the bracket
Note: It should be installed on the wall with hard lime or cement surface. It is prohibited to install it on the hollow slab or the wall with foam!	



## 5 Maintenance

### 5.1 Routine Maintenance

( 1 ) The battery pack shall be watched by professionals during charging, meanwhile ensure that the plug and socket are in good contact, the charging equipment works normally, and all connection points of the battery pack are in good contact. In case of abnormality, power off immediately and charge only after repair;

( 2 ) Before charging and discharging the battery pack, you can use the BMS upper computer to read the battery voltage, temperature, pressure differential and other states to ensure that all values are within the normal range;

( 3 ) If there is a large amount of dust, metal chips or other sundries on the upper cover and pole of the battery pack, clean them with compressed air in a timely manner, and do not use water or water soaked objects for cleaning;

( 4 ) When the battery pack is charging or discharging , it is prohibited to splash water or other conductive objects onto the battery upper cover and pole, for example, to expose the battery pack to heavy rain for use;

( 5 ) Estimate the charging time and discharging time of the battery according to the actual use state of the battery pack, observe whether the battery pack is abnormal at the end of charging and discharging with the BMS upper computer, for example,whether the pressure differential of the battery is large.

Table5-1 Routine maintenance

No.	Maintenance content	Operation method	Remarks
1	Check the positive and negative terminal screws to see if they are loose	Wear insulating gloves and gently shake the insulating rubber sleeve of the positive and negative electrodes	When checking the positive and negative pole screws of the battery, please wear insulating gloves to prevent electric shock, and do not use too much force
2	Check whether there is a fault alarm	Check whether the battery pack panel LED display lamp and switching power supply display screen are abnormal	If there is a fault, it should be dealt with in time, and the battery system should not be allowed to work in case of a fault
3	Check whether the total voltage is normal	Check the switching power supply or measure with a multimeter	
4	Check battery pack information	Enter the battery management interface on the dynamic environment monitoring system display screen or BMS upper computer to check whether the battery voltage, temperature, current and SOC information are normal and record them	Timely handle battery failures such as voltage, temperature, current and SOC

## 5.2 Regular maintenance

( 1 ) Check the voltage data of the BMS upper computer and the actual battery voltage value to ensure the accuracy of the BMS voltage collection. If they are inconsistent, they should be calibrated. The error between the collected voltage and the actual battery voltage should not exceed 5mV (once a month);

( 2 ) Check the temperature acquisition data and the actual temperature value of the BMS upper computer. The error between the collected data and the actual temperature value is not allowed to exceed 3 °C to ensure that the battery will not be charged or discharged when the temperature is too high or too low (once a month);

( 3 ) Check the current acquisition data and actual current value of the BMS upper computer, and the error is not allowed to exceed 1% to ensure that the battery will not be charged or discharged by over current (once a month);

( 4 ) Check whether the conductive belt, voltage acquisition terminal and other nodes are loose, fallen, rusted or deformed, and ensure that the series and parallel harness used by the battery pack is firm and reliable (once a month);

( 5 ) Check the battery shell for cracks, deformation, pole looseness, bulge and other abnormalities (once a month).

Table5-2 Regular maintenance content

Cycle	Item	Treatment measures
	Visual inspection	If the appearance is damaged, leaking or deformed, disconnect the faulty battery pack, take photos and replace it.
Quarterly	Appearance cleaning	Clean the appearance with a cotton cloth. Because the voltage of the battery pack is high, pay attention to safety when cleaning.
	Connection Status	Check the bolts at each terminal and retighten them if they are loose. If the temperature of the connecting wire exceeds 50 °C (feel hot), check and find the cause.
Semi annually	Battery Status	At the end of the charging period, measure and record the bus voltage and the positive and negative terminal voltage of the battery pack, and the two voltages shall be consistent. Otherwise, check whether the cable at the corresponding connection is faulty.
		In the first year, you should collect real-time data at the end of discharge at least once every six months.
		From the second year, the on-site capacity will be determined every three months. If the historical alarm information is displayed through RS485 Frequent overcharge and overdischarge of a certain electric core indicates that the electric core has touched the charging protection point and discharge protection point for a long time. This may lead to insufficient standby time, and it is recommended to replace it in time

### 5.3 Trouble Shooting

If the battery pack fails during use, the following table can be used for troubleshooting. The troubleshooting personnel need to have corresponding professional knowledge and skills, and at least two people should work together. The troubleshooting site needs to have corresponding fire fighting capabilities. If the above troubleshooting process fails to solve the problem, please consult after-sales service.

Table5-3 Common fault phenomena and troubleshooting table

Fault phenomena	Content and sequence of troubleshooting
Unable to start	a. Press and hold the RESET key to restart.
Unable to communicate	a. Check whether the BMS is powered on; b. Check whether the physical connection of communication cable and crystal head is stable; c. Check whether the crystal head is connected with the correct pin; d. Check whether the dial switch is turned to the correct position.
Unable to charge	a. Check whether the BMS is powered on; b. Check whether the BMS alarm indicator is on; c. Check if the BMS is set to allow charging; d. Check whether the charging cable is correctly and completely connected; e. Check whether the battery pack is fully charged.
Unable to discharge	a. Check whether the BMS is powered on; b. Check whether the BMS alarm indicator is on; c. Check if the BMS is set to allow discharging; d. Check whether the charging cable is correctly and completely connected; e. Check whether the battery pack is in the state of power loss.
Warning indicator on	a. Check whether+ - and its cable are short circuited; b. Check the battery pack for physical damage; c. Check whether the temperature of the battery pack triggers protection; d. Check whether the charging and discharging current of the battery pack triggers the protection.

## 6 Packing / Shipping / Storage

(1) The battery pack shall be packaged as a whole to ensure that the product is free from any harmful gas, chemical pollution, moisture and mechanical damage during handling, transportation and storage; The packing box has been marked with: product name, model and specification, date of manufacture, quantity, batch number, etc

(2) When handling the product, it shall be handled with care and shall not be subjected to external fierce impact; During transportation, the product shall be placed strictly in the direction marked on the packaging box to avoid product vibration and inversion.

(3) The battery pack shall be stored in a dry warehouse without exposure to the sun and rain; Products with a storage period of more than 6 months shall be aligned for capacity check test and power supply treatment. Products with a storage period of more than 1 year shall be reinspected and can only be used after qualification.