

Operation Manual

SB-12V-100Ah (LiFePO₄)

Lithium Battery

12V100Ah

Document Version: 02.3

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Step4Net TM

1 Foreword

Overview

This document mainly introduces the product introduction, installation method, use instruction, precautions, fault treatment and maintenance of lithium ion battery, etc., to provide installation instruction, use instruction and technical support for on-site installation personnel, users, maintenance engineers and technical support engineer.





Applicable Readers

This document mainly applies to the following people objects:

- Hardware installation engineer
- Technical support engineer
- Maintenance engineer
- Operator

Signs

The following signs may appear in this article, and they represent the following meanings.

Symbol	Define	Explain
	Dangerous	Hazards with a high risk of causing death or serious injury if not avoided.
	Warning	Hazards of moderate risk that, if not avoided, may result in death or serious injury.
	Attention	Hazards with low risk that may result in mild or moderate injury if not avoided.
	Instructions	Supplementary statements to the main information in the text. “Instruction”: Not a security warning message

2 Safety Precautions

2.1 Safety Precations

Before carrying out battery work, you must carefully read the safety precautions and understand the correct installation and connection method of the battery.

- Prohibit to turn it upside down, tilt, or collide.
- Prohibit to short-circuit the positive and negative poles of the battery,
- Do not place installation tools on the battery during battery installation.
- During installation, maintenance and other operations, the battery circuit should be kept disconnected.
- Do not disassemble, squeeze, bend, deform, pierce, or shred the battery without the authorization of Step4Net authorized dealers.
- Do not exceed the temperature range
- Do not modify the battery, do not immerse the battery in water or other liquids.
- Do not put a battery module into a fire.
- Please check the bolts at the connecting end of the battery regularly to make sure the bolts are tight and not loose.

2.2 Abuse Operation

The battery pack needs to avoid abuse operations under the following (including but not limited to) conditions:

Abuse Operation	Protection Description
Reverse connection of positive and negative poles	If the positive and negative poles are connected reversely, the battery will be directly damaged.
External short circuit	If the battery pack is short circuited externally, the battery will be directly damaged.

3.1 Product Features

SB-12V-100Ah (LiFePO4) is a new type of lead-acid replacement lithium battery product developed and produced by Step4Net according to the market demand, which can provide reliable power supply for 12V electrical equipment.

SB-12V-100Ah (LiFePO4) is equipped with an intelligent battery management system (BMS), which can effectively monitor and manage the voltage, current, temperature and other information of the battery. Professional battery management functions are provided to effectively extend the cycle life of the battery and optimize the use experience.

- **High energy density**

Higher volume ratio energy and weight ratio energy.

- **Maintenance-free**

The battery pack is maintenance-free in the process of using, which can save customers' battery operation, maintenance testing costs and reduce the frequency of on-site replacement.

- **Long cycle life**

The battery pack life is 3 times longer than the ordinary lead-acid batteries.

- **Excellent temperature characteristic**

When charging, the battery working temperature can reach 0°C ~ + 60°C(recommended using temperature: +15 ~ + 35°C). When discharging, the battery working temperature can reach -20°C~60°C (recommended using temperature: 15~35°C)

3.2 Products Structure

3.2.1 Dimentions

Battery appearance and dimentions :

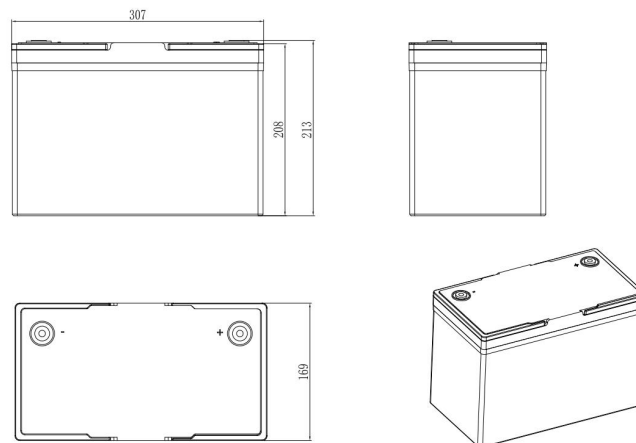


Figure 1 Battery appearance and dimentions (mm)

Length: 307 mm

Weight: 169 mm

Height: 208mm

3.2.2 Operation Panel

Battery operation panel display:

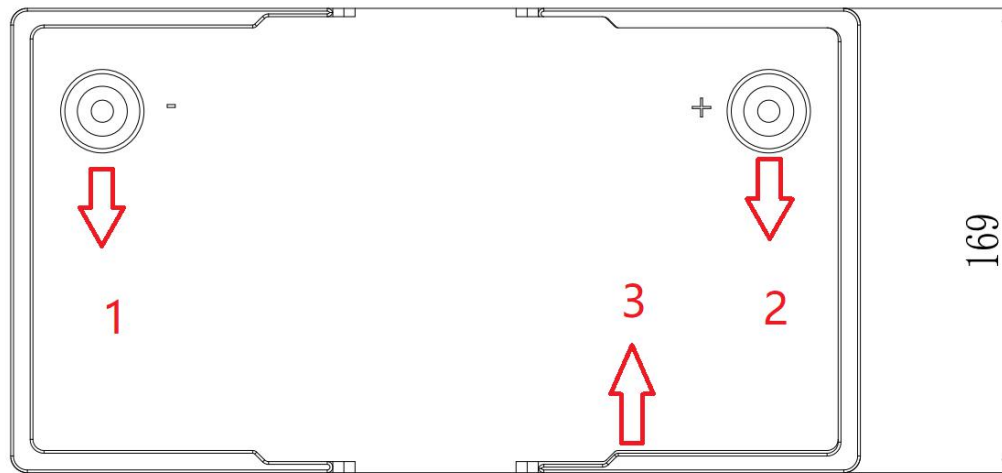


Figure 2 Battery operation panel

Functions of battery operation panel:

Table 1 Description of functions

No.	Name	Description	Note
1	Battery negative output	Negative terminal	M8 mounting bolts
2	Battery positive output	Positive terminal	M8 mounting bolts
3	Lifting handle	Convenient to carry	

3.2.3 Parameters

Main technical parameters of the battery are shown in the following table:

Table2 Battery Parameters

No.	Parameters	Specification	Note
1	Nominal capacity	100 Ah	Largest capacity updated: 300Ah
2	Rated voltage	12.8 V	
3	Nominal energy	1280 Wh	
4	Charging end voltage	14.4 V	External charger/controller setting voltage
5	Limited charging voltage	14.6 V	
6	Max. continue charging current	100 A	
7	Discharge end voltage	10.8 V	External charger/controller setting voltage
8	Limited charging voltage	10 V	
9	Max. continue discharge current	100 A	
10	Allowed operation Temp. range	Charge: 0°C~55°C	Recommend Temp. range: 15°C~35°C
		Discharge: -20°C~60°C	
11	Allowed operation humidity range	≤95% RH	Storage
		≤85% RH	Operation
12	Storage Temp. range	15°C~35°C	
13	IP grade	IP65	
14	Weight	11.5 kg	
15	Shell material	ABS	

3.3 Basic Function

- **Series & Parallel**

SB-12V-100Ah (LiFePO4) batteries maximum support to use in 4 series or 4 parallel (capacity \geq 100Ah versions), parallel is only used to expand capacity.

- **Over/Under Voltage Protection**

SB-12V-100Ah (LiFePO4) battery support single cell voltage detection and protection, system operation voltage allowed in 10.8~14.4V.

- **Over Current Protection**

SB-12V-100Ah (LiFePO4) battery support charge/discharge current detection and protection, when continue current exceeded the allowable current range, charge/discharge process will be stopped to protect cell.

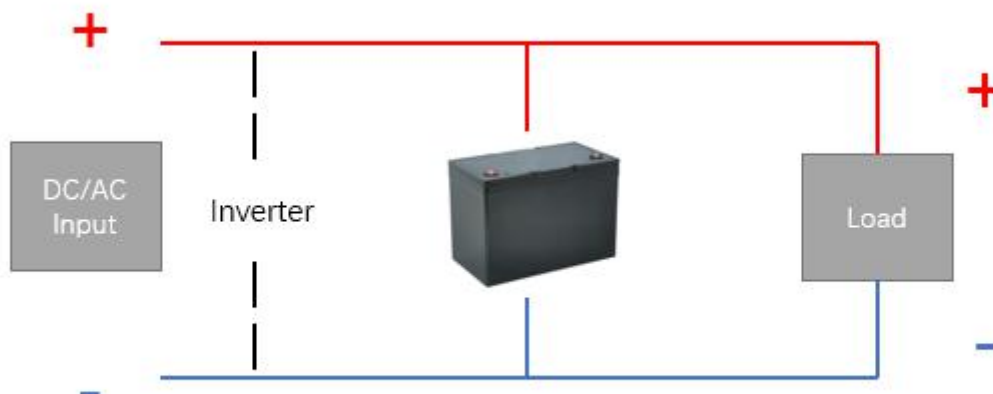
- **Temperature Protection**

SB-12V-100Ah (LiFePO4) battery support cell temperature detection and protection, when the ambient temperature exceed the operate temperature range, charge/discharge process will be stopped to protect cell

3.4 Application Scenario

The battery pack is used to provide 12V DC power or connect inverter for AC power, and can be used for household energy storage, solar energy storage, camping, golfcart, marine and floor machine etc.

The normal working operation diagram of the battery pack can be as shown in the figure below.



4 Installation





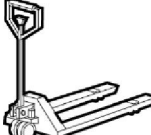


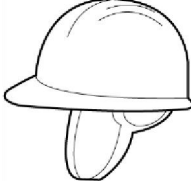

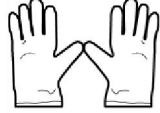
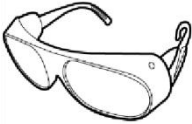

4.1 Tools Preparation

ATTENTION

Use insulated tools to avoid electric shock. If tools without insulation protection are used, it is necessary to wrap the exposed metal parts with insulating tape.

The following table describes the tools and instruments that may be used prior to the install operation

Table 3 Installation tools

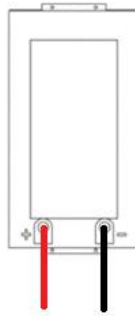
Electric screwdriver	Cross screwdriver	Torque spanner	Claw hammer
			
Manual forklift	Multimeter	Protective gloves	Safety helmet
			
Insulated shoes	Anti-static gloves	Goggles	Insulating tape
			

1. Please choose the site to be used for installation. It is recommended that the ground is flat, the space is large, and the ventilation is good.
2. Confirm that the battery is in the normal voltage range (12V~13.4V).



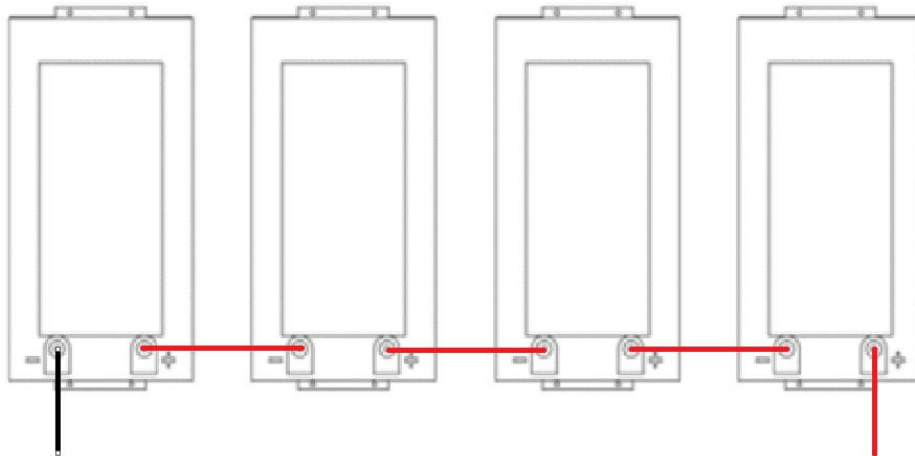
3. Connect the battery power cable (the power cables use 25mm² wire diameter). "+" is connected to the

positive pole of the electrical equipment, and "-" is connected to the negative pole of the electrical equipment (before connecting the power line, make sure that the charging device is normally powered on).



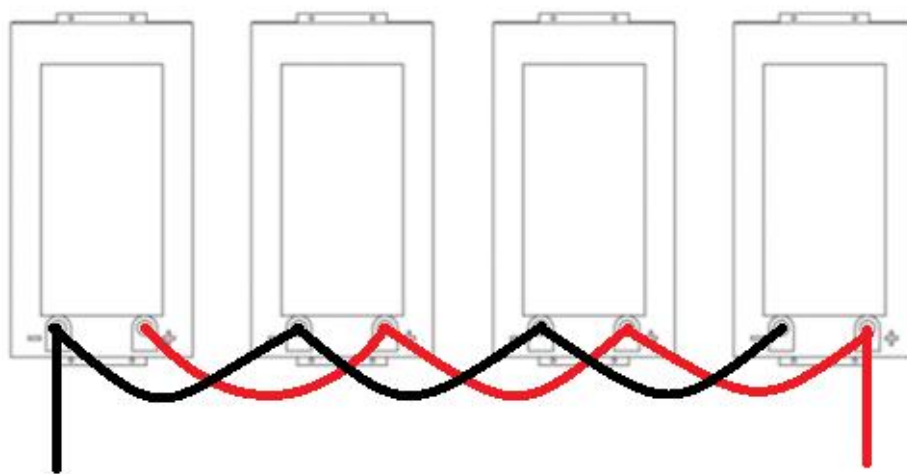
4. Four-string connection:

the "+" of the first battery is connected to the "-" of the second battery through the power line; the "+" of the second battery is connected to the "-" of the third battery through the power line; the third The "+" of the battery is connected to the "-" of the fourth battery through the power line; the "-" of the first battery is connected to the negative electrode of the electrical equipment, and the "+" of the fourth battery is connected to the positive electrode of the electrical equipment.



5. Four parallel connection mode:

the "+" of the first battery is connected to the "+" of the second battery through the power line; the "+" of the second battery is connected to the "+" of the third battery through the power line; the third battery The "+" of the battery is connected to the "+" of the fourth battery through the power line; the "-" of the first battery is connected to the "-" of the second battery through the power line; the "-" of the second battery is through the power line Connect the "-" of the third battery; the "-" of the third battery is connected to the "-" of the fourth battery through the power line; the "-" of the first battery is connected to the negative electrode of the electrical equipment, and the fourth battery's "-" "+" connect the positive pole of the electrical equipment.



4.2 OOB (out of box audit)

- 1 Move the battery to the location where it was installed.

ATTENTION

Battery is heavy, if possible, please use tools to assist handling.

- 2 Use a claw hammer to open the box and check if the items are complete.
- 3 Check the appearance of the battery for any breakages or scratches.

说明

If any damage or scratches are found in the battery, please do not proceed to the next installation. Please contact Vestwoods Technology or an authorized dealer in time.

4.3 Install Battery

ATTENTION

- Batteries should be installed by professionally trained personnel. Private installation is strictly prohibited.
 - Insulated tools should be used during installation to avoid electric shock. If tools without insulation protection are used, it is necessary to wrap the exposed metal parts with insulating tape.
-

- 1 Verify that the battery is in the normal voltage range (12V~13.4V)

-
- 2** Connect the battery power line. The output positive pole of the battery is connected to the positive pole of the electrical equipment, and the output negative pole is connected to the negative pole of the electrical equipment (please ensure that the charging equipment is normally powered on before connecting the power line).
-



Pay attention to the polarity of positive and negative battery, do not short/reverse connection.

5 Operation Instructions

5.1 Normal Use

When HT battery is used for the first time, the default factory capacity is about 30%.

When HT battery is not used for a long time, it is necessary to recharge the battery and then store it.

5.2 Charging

When the battery power is low, charge it in time. The following requirements should be observed when charging the battery:

- Use the battery only with a standard-conforming charger. The use of substandard charger may damage the battery, serious cases may lead to fire, or even explosion.
- Try to charge in the ventilated situation.
- Before charging, check the appearance of the battery is clean and the cable connection is firm.

5.3 Parallel

When using batteries in parallel, the following requirements should be observed

- Parallel modules need to be in the same state, SOC empty or fully charged.
- When a single module needs to be used in parallel and does not meet the previous requirement, it is necessary to measure whether the voltage of the next module is consistent. It is not recommended to connect in parallel when the voltage difference is greater than 0.5V.
- The number of modules in parallel cannot exceed 4.

6 Maintenance & Storage & Shipment

6.1 Battery Maintenance

6.1.1 Battery Maintenance Precautions

- Insulating tools or wrapping tools are required for battery maintenance.
- Do not place any debris on the top of the battery.
- Do not use any organic solvent to clean the battery.
- Do not smoke or use an open flame near the battery pack.
- After the battery is discharged, the battery should be charged in time to avoid affecting the service life of the battery.
- All maintenance work must be carried out by professionals.

6.1.2 Routine Maintenance

When the battery is in use, the following operations should be carried out every month to maintain the battery:

- Check the appearance of the battery and make sure the appearance is clean and free of stains. No bruising, breaking or cracking around; No liquid leakage phenomenon; Shell without deformation, bulging phenomenon. If the appearance of the battery is abnormal, contact SB-12V-100Ah (LiFePO₄) authorized dealers in time.
- Check whether the battery bolt is tight. If the battery bolt is loose, tighten it with an insulating tool.
- Check whether the battery cable is in good condition and no aging cracking phenomenon. If there is any abnormality, timely contact SB-12V-100Ah (LiFePO₄) authorized dealers.

6.2 Battery Storage

When the battery is not used for a long time, the battery should be stored in a clean and dry ventilated room, the storage temperature is 10°C ~ 35°C, and should be fire prevention and heat prevention, avoid contact with corrosive elements.

If the battery is not used for a long time, it should be charged every once in a while. Charging requirements are as follows:

Table 4 Requirements of storage charging

Storage temperature	Charging interval	Charging program
10°C~30°C	Every 1 month	1. Charge at 0.2C to 14.4V. 2. Discharge at 0.2C to 10.8V. 3. Charge at 0.2C for 2~3 hours.
0°C~10°C or 30°C~45°C	Every half month	

6.3 Shipment

It is suitable for the transportation of vehicles, ships and airplanes. During transportation, shading, sun protection and civilized loading and unloading should be performed. The box containing the product is allowed to be transported by any means of transportation. In the process of loading and unloading, the battery should be handled with care to prevent falling, rolling, and heavy pressure. Avoid direct rain and snow and mechanical impact during transportation.

7 Fault Handling

7.1 Emergency

7.1.1 Battery Leakage

If the battery leaks, avoid contact with the leaking liquid or gas. If an individual is exposed to a leak and has any of the following conditions, please seek medical advice immediately:

- Inhaled gas: Please evacuate the leaking environment and seek medical advice at the first time.
- Eye contact: flush eyes with running water for 15 minutes and seek medical attention immediately.
- Skin contact: Wash contact area thoroughly with soapy water and seek medical advice immediately.
- Ingestion of liquid: induce vomiting and seek medical advice immediately.

When the battery leaks, it is strictly prohibited to continue to use, please contact SB-12V-100Ah (LiFePO₄) authorized dealers in time.

7.1.2 Battery Fire

If a battery fire occurs, get away from the battery as soon as possible and evacuate people. Use water to extinguish the fire if surrounding conditions are available. And after the fire is extinguished, continue to use a lot of water to water the battery.

After the battery fire, it is strictly prohibited to continue to use, please contact SB-12V-100Ah (LiFePO₄) authorized dealers in time.

7.1.3 Battery Flooding

If the battery becomes wet or flooded, turn off the car key switch and power off the vehicle. When the battery is wet or immersed in water, it is prone to leakage. Do not contact the battery directly.

If the battery is wet or flooded, it is strictly prohibited to continue to use it. Please contact SB-12V-100Ah (LiFePO₄) authorized distributors in time.

7.1.4 Damage Battery

If the battery has been damaged, it is strictly prohibited to continue to use, please contact SB-12V-100Ah (LiFePO₄) authorized dealers in time.

7.2 Troubleshooting

7.2.1 Unable to discharge

-
1. If the battery is not used for a long time, it will enter standby mode. If the battery stay in this state for a long time and the output voltage is too low, please refer to the following operations for exception elimination:
 - Recharge the battery. If the battery can charge normally, it means that the wake-up circuit inside the battery is abnormal. Please contact SB-12V-100Ah (LiFePO4) authorized dealers for processing.
 - Recharge the battery. Use dc power supply to charge battery with small current value, if the battery cannot be charged normally, please contact SB-12V-100Ah (LiFePO4) authorized for processing.
 2. If the battery is over discharged to under voltage protection, the discharge circle will be opened until the battery voltage recovered
 - Recharge the battery. If the battery can charge normally, it means that the wake-up circuit inside the battery is abnormal. Please contact SB-12V-100Ah (LiFePO4) authorized dealers for processing.
 - Recharge the battery. Use dc power supply to charge battery with small current value, if the battery cannot be charged normally, please contact SB-12V-100Ah (LiFePO4) for processing.

7.2.2 Charging Abnormal

When the battery cannot be charged, please refer to the following operations for exception exclusion:

- Check whether the charger can work properly and whether the mains voltage is normal.
- Check whether the battery cable is connected firmly, and there is no disconnection.

If reference to the above operations can not locate the problem, please timely contact SB-12V-100Ah (LiFePO4) authorized dealers for processing.

8 Warranty Explain

In addition to the following and the conditions specified in the contract can be SB-12V-100Ah (LiFePO4) authorized dealers for reasonable warranty and maintenance.

- 1** Without the authorization of SB-12V-100Ah (LiFePO4) authorized dealers, the battery failure caused by disassembly, maintenance and other operations is not within the warranty scope.
- 2** The battery damage caused by negligence during storage and transportation is not covered by the warranty.
- 3** The damage to the battery caused by continuous overloading outside the battery's electrical parameters is not covered by the warranty.
- 4** Without the authorization of SB-12V-100Ah (LiFePO4) authorized dealers, the battery test without permission causing adverse consequences is not within the scope of warranty.
- 5** Non-battery problems, due to improper operation and match caused by adverse consequences are not within the warranty scope.
- 6** The battery damage caused by natural force, force majeure or uncontrollable factors, such as earthquake, typhoon, tornado, volcanic eruption, flood, lightning, snow, war, etc., is not covered by the warranty.
- 7** The product serial number is changed, blurred or torn, which is not covered by the warranty.

NOTE

The final interpretation right belongs to the manufacturer.

