Sunplus
NEW ENERGY TECH

SP-LV5320-W1 Series

Installation and Operation Manual

Residential Low Voltage Lithium Battery

This manual introduces SP-LV5320-W1 from Sunplus. Please read this manual before you install the battery and follow the instruction carefully during installation process. Please contact Sunplus immediately for advice and clarification if you have any question.

Contents

Catalogue

1. Symbol Description

	Do not place near open fire or flammable materials.
	A potential hazard exists when the equipment is working. Wear personal protective equipment during operation.
	Warning electric shock. Power off the equipment before any operation.
	Grounding: indicate PE cable connection position.
	Do not place in areas accessible to children.
	Keep the battery away from open fire or ignition sources.
	Please use the equipment reasonably. In extreme cases, the equipment may cause explosion risk.
	The equipment contains corrosive electrolyte. Please avoid contact with leaked electrolyte or volatile gas.
	Read the product and operation manual before operating the battery system.
	Label for Waste Electrical and Electronic Equipment (WEEE) Directive (2012/19/EU)
	The certificate label for CE.
	Recycle label.

2. Safety precautions

 **Alert**

1) It is important and necessary to read the user manual carefully (and attachment) before installing or using battery. Failure to do so or to follow any instruction or warning in this document can result in electrical shock, serious injury, and death, or damage battery, potentially rendering it unusable.
2) After battery module cannot be discharged, it needs to be recharged within 12h.
3) Do not connect power terminal reversely.
4) All power supplies must be disconnected during maintenance.
5) Do not expose cable outside.
6) Do not use any liquid to clean the battery.
7) Do not expose battery to flammable or irritating chemicals or vapor.
8) Do not paint any part of battery, including any internal or external components.
9) Do not connect battery with PV solar wiring directly.
10) Do not install or use this product beyond provisions of the manual.
11) Direct or indirect damages caused by the above reasons are not covered by warranty claim.
12) Please contact the supplier within 24 hours if there is something abnormal.

 **Warning**

2.1 Before Connecting

1) Please check the external packaging condition before unpacking. If it is damaged, contact corresponding local retailer.
2) After unpacking, please check the products and spare parts according to spare parts list. If the product is damaged or missing, please contact your local retailer.
3) Connect to specified matching inverter.
4) Before installation, be sure to cut off the grid power and make sure battery is in turned-off mode.
5) It is prohibited to connect the battery and AC power directly.
6) All electrical wiring must be connected in accordance with local regulations.
7) Battery must connect to ground and the resistance must be less than 0.1Ω.
8) Wiring must be correct, do not misconnect the positive and negative cables, and ensure no short circuit with the external device .
9) The battery is designed in parallel, please DO NOT connect battery in series.
10) Please ensure that electrical performance of battery system is compatible with the equipment.
11) The installation onsite shall be equipped with fire-fighting facilities that meet relevant requirements, such as fire sand, dry powder fire extinguisher, etc.

2.2 In Using

1) If battery system needs to be moved or repaired, power must be cut off and battery is completely shut down.
2) It is prohibited to connect battery with different types of battery.
3) Do not connect battery to faulty inverter.
4) In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited.

5) Do not open, repair or disassemble the battery except Sunplus Battery personnel or other authorized personnel. The company shall not bear any liability or responsibility caused by violation of any safety operation or design standard, production standard, equipment safety standards or any other standards or requirements.

3. Introduction

SP-LV5320-W1 energy storage system battery is a new energy storage product developed and produced by Sunplus, which can provide reliable power supply for all kinds of equipment or systems.

SP-LV5320-W1 has built-in BMS battery management system, which can manage and monitor cells information including voltage, current and temperature.

3.1 Features

1) When multiple modules are parallel connected, module addresses are set automatically.
2) The battery module can be managed and maintained through RS232, RS485, CAN or OTA.
3) OTA upgrading on cloud platform (Optional).
4) Cathode material is made from LiFePO4 with safety performance and long cycle life.
5) Battery management system (BMS)has protection functions including over-discharge, over-charge, over-current and high/low temperature.
6) The system can automatically manage charge and discharge state and balance voltage of each cell.
7) Flexible configuration, multiple battery modules can be in parallel for expanding capacity and power.
8) Adopted self-cooling mode rapidly reduced system entire noise.
9) Small size and light weight, wall mounted and ground mounted designed module is comfortable for installation and maintenance.

3.2 Functions

Remote management and maintenance	Cell Balance
High/Low Temperature Protection	Over Voltage charging Protection
Under Voltage Discharging Protection	Charge/Discharge Current Limit
Charge/Discharge Over current Protection	Capacity Retention Calculate
Short Circuit Protection	History Record

3.3 Product parameters

No.	Items	Specification	
1	Product Name	Rechargeable Lithium Iron Phosphate Battery	
2	Module Model	SP-LV5320-W1	SP-LV5320-W2
3	Battery Type	LFP 16S1P	
4	Total Energy*¹	5.32kWh	
5	Rated Energy*²	5.05kWh	
6	Nominal Voltage	51.2V	
7	Working Voltage	43.2~57.6V	
8	Charging Voltage	57.6	
9	Max. Charge Current*³	50A	
10	Max. Discharge Current*⁴	100A	
11	Communication	RS485,CAN,WIFI	RS485,CAN
12	Storage Temperature	0℃～45℃（Recommended）	
13	Storage Humidity	≤85%（RH）	
14	Working Temperature	Charging：-10℃～50℃、 Discharging：-20℃～50℃	
15	Working Humidity	≤95%（RH） No Condensation	
16	Working Altitude	≤2000m	
17	Ingress Protection	IP65	
18	Protective Class	I	
19	Weight	45kg	
20	Dimension(W*D*H)	420mm*140mm*650mm	
21	Design Life	15Years（25℃）	
22	Cycle Life	＞6000（25℃）	
23	Scalability	Recommended ≤3， （Max. 8 in parallel）	
24	Certification	CE, IEC62619, IEC/EN 61000-6-1/3, UN38.3， IEC62368	

*Test conditions: Fresh battery,cell voltage 2.0~3.65V, 25 ± 2 ℃ , 0.5C charge and 1C discharge.

*² Test conditions: Fresh battery,95% depth of cell discharge ,25 ±2 ℃ , 0.5C charge and 1C discharge.

*³、*⁴ Depend on the temperature and SOC of battery.

3.4 Dimensions

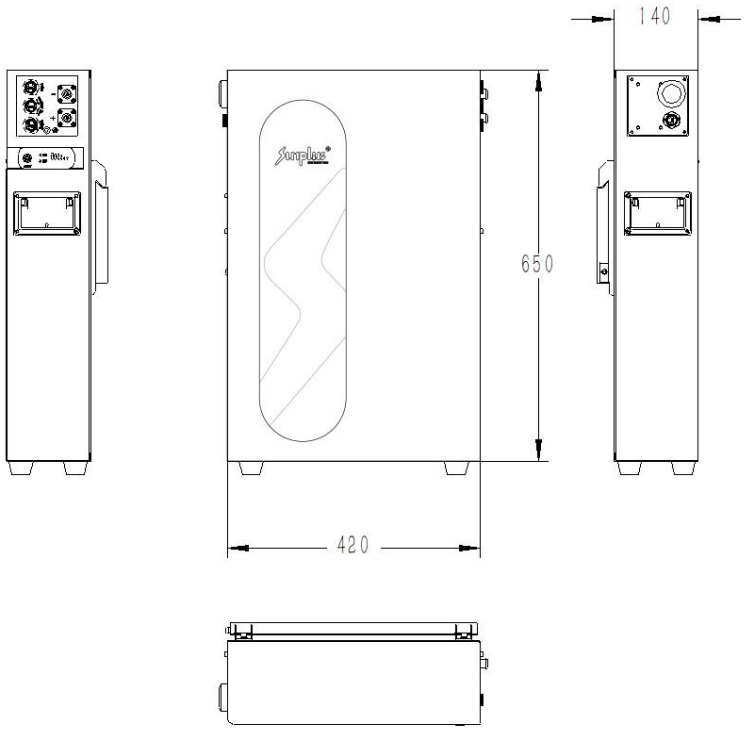


Figure 3-1

3.5 Equipment interface

Start

Turn on: When battery is dormant, press the START button for 3~6 seconds to start the battery module.
Turn off: When battery is active,press the START button for 3-6 seconds and then release to turn off the battery module.

Run

Green LED lighting to show the battery running status.

ALM

Red LED flashing to show the battery has alarm; lighting to show the battery is under protection. Inform the manufacturer or professional engineer for commissioning or maintenance.
(See LED indicator table for details)

Status	Mode	RUN	ALM	Capacity Indicator LED						Description
				6	5	4	3	2	1	
Power Off	Sleep	○	○	○	○	○	○	○	○	All OFF
Standby	Normal	1	○	Display according to actual power						Standby
	ALM	1	3							
CH	Normal	●	○	Display according to actual power						Corresponding led light flashes to indicate charging progress.
	ALM	●	3							
	OCH Protection	●	●	●	●	●	●	●	●	Stop charging
	T/C/SC/RC Protection	○	●	○	○	○	○	○	○	Stop charging
DCH	Normal	3	○	Display according to actual power						
	ALM	3	3							
	UV Protection	3	●	○	○	○	○	○	○	Stop discharging
	T/C/SC/RC Protection	○	●	○	○	○	○	○	○	Stop discharging
Failure		○	●	○	○	○	○	○	○	Stop charging and discharging

Note 1. Description of indicator light

The indicator light is off.

The indicator light is on.

The indicator light is flashing, and below table shows the flashing type.

Flashing Type	Duration of indicator on	Duration of indicator off
1 1	0.25s	3.75s
2 2	0.5s	0.5s
3 3	0.5s	1.5s

1. Description of abbreviation

Please see description of abbreviation mentioned in the table below

Abbreviation	Full Name	Abbreviation	Full Name
CH	Charge	T	Temperature
DCH	Discharge	C	Current
RUN	Work normally	SC	Short-circuit
ALM	Alarm	RC	Reverse connection
UV	Under-voltage	F	Failure
OCH	Overcharge		

SOC

6 green LEDs are used to show the battery's remaining capacity.

State		Charge						Discharge					
Capacity Indicator LED		L6	L5	L4	L3	L2	L1	L6	L5	L4	L3	L2	L1
Power	0~8%	○	○	○	○	○	2	○	○	○	○	○	●
	8~26%	○	○	○	○	2	●	○	○	○	○	●	●
	26~50%	○	○	○	2	●	●	○	○	○	●	●	●
	50~74%	○	○	2	●	●	●	○	○	●	●	●	●
	74~92%	○	2	●	●	●	●	○	●	●	●	●	●
	92~100%	2	●	●	●	●	●	●	●	●	●	●	●
Indicator Light				●						3			

Note

The indicator light is off

The indicator light is on

The indicator light is flashing, and below shows the flashing type.

Flashing Type	Duration of indicator on	Duration of indicator off
1	0.25s	3.75s
2	0.5s	0.5s
3	0.5s	1.5s

Power Terminal

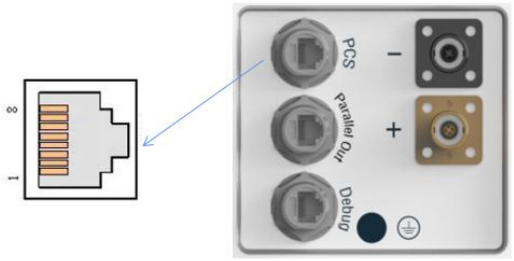
Power cable terminals: There are two pairs of terminals with the same function, which are respectively connected to the inverter and battery module.

For power cables uses water-proofed connectors. Must keep pressing this Lock Button while pulling out the power plug

PCS

The battery communicates with the inverter through CAN protocol or RS485 protocol, with default baud rates
500 kbps and 9600 bps.
The recommended communication method is the CAN protocol.

Pin	Definition
1	RS485 B
2	RS485 A
3	GND
4	CAN H
5	CAN L



Parallel RS485

It is used for communication between multiple parallel batteries.

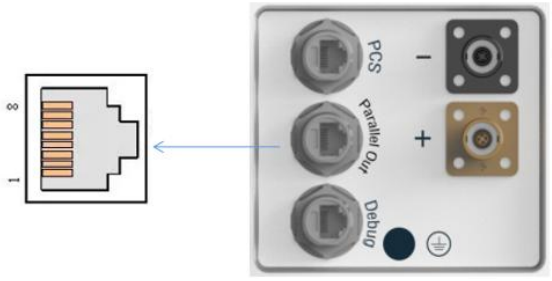
The output port of Parallel RS485 OUT is connected to the Parallel RS485 IN of the next battery, and so on. Up to 8 batteries can be connected in parallel.

The module communicating with the inverter is the host.

After the high-voltage line and communication line of the parallel machine are connected, turn on the master battery. The system starts up and carries out automatic coding, and If the coding fails, the red light will flash.

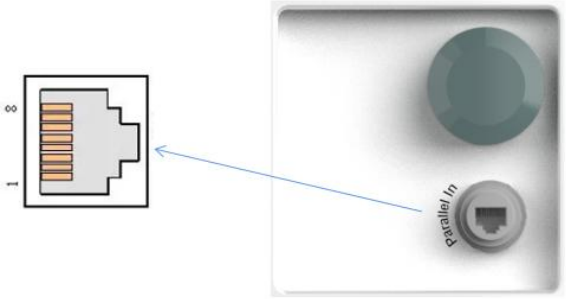
Parallel Out

Pin	Definition
1，8	RS485-B
2，7	RS485-A
3，6	GND
4	CANL
5	CANH



Parallel In

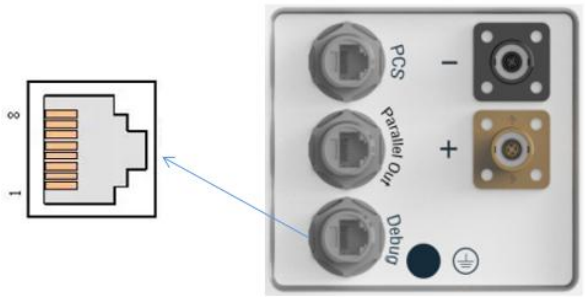
Pin	Definition
1，8	RS485-B
2，7	RS485-A
3，6	GND
4	CANL
5	CANH



Debug

Dry contact 1: On - closed at low capacity.（NO1 COM1）
Dry contact 2: On - closed under protection status. （NO2 COM2）
RS 232：Software upgrade and debugging port.

Pin	Definition
1	NO1
2	COM1
3	TX (single
4	RX (single
5	SGND
6	NO2
7	COM2



4.Safe Handling of Lithium-iron ESS Batteries Guide

4.1 Solution Diagram

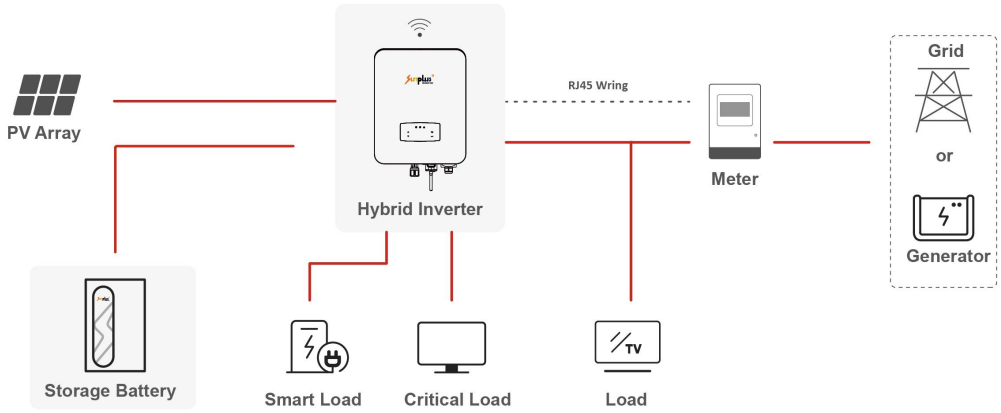


Figure 4-1

4.2 Danger label

4.3 Tool

Wire Cutter

Modular Crimping Plier

Screwdriver

Electric drill

Note

Properly use insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, cover the entire exposed metal surfaces of the available tools, except their tips, with electrical tape.

4.4 Safety Gear

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

Insulated Gloves

Safety Goggles

Safety Shoes

5.Installation and operation

5.1 Package items

Unpacking and check the Package items

1) For battery module package:

- Battery Module
- 1 * 500mm RJ45 communication cable. (communication cascade cable)（Optional）
- 1 * 1000mm 10AWG grounding cable.
- 1 * 3000mm RJ45 communication cable

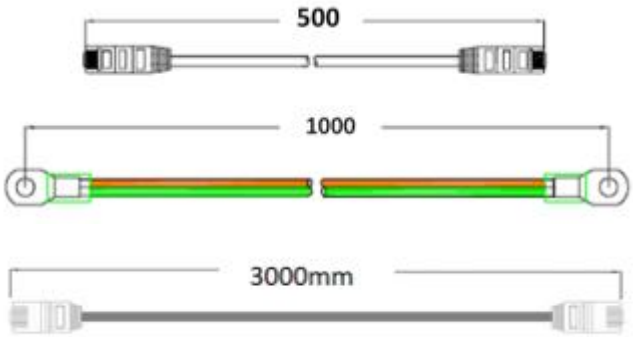


Figure 5-1

2) For external cable kits:

NOTE: Power and communication cables connect to inverter belongs to an External Cable Kit . They are in another extra small cable box.

- 2 * 2000mm power cables (4 AWG, peak current capacity 120A, constant 100A)

Figure 5-2

5.2 Cable Requirements

1) Power cable

Connect orange power cable to orange harness and black power cable to black harness. The cross-sectional area
of crimping part is 25 mm2. Withstand voltage is DC1500V, temperature range is -40 ℃~ 115 ℃, and stripped
conductor length is 23 ± 1mm. Secure back shell and check if there is any clearance. Recommended tool: manual hydraulic tong (die: 25mm)²） tensile force after crimping ≥ 1200N.
If the battery is not connected, cover the port with a protective cover.

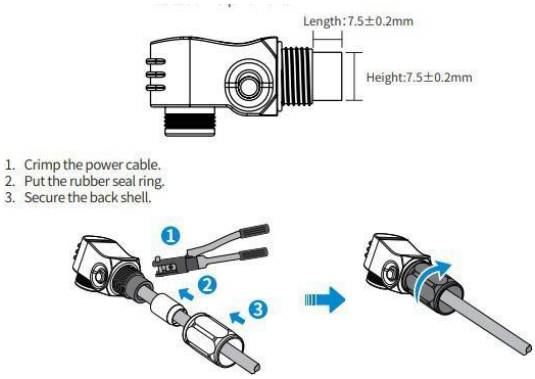


Figure 5-3

2) PE cable

Disconnect power supply and use PE cable before disassembling equipment. After crimping, traction force of
cable shall be at least 400N, and any one of the two grounding cables shall be connected to the ground. Keep
other grounding cables. Specification of PE cable:10AWG, and the cable should meet the requirement for outdoor use.

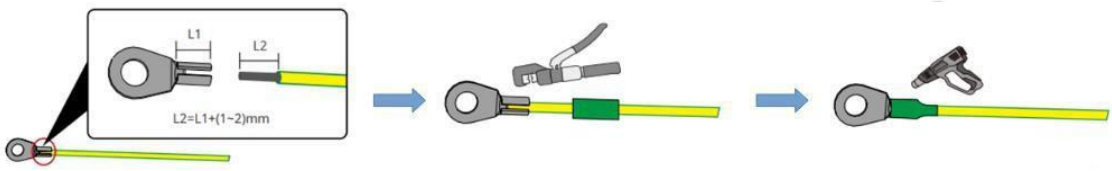


Figure 5-4

5.3 Installation Location

Make sure that installation location should meet the following condition:

1) The area should be completely water-proof.
2) The floor should be flat and level.
3) No flammable or explosive materials.
4) The ambient temperature is within the range from 0°Cto 45°C.
5) The temperature and humidity are maintained at a constantlevel.
6) There is just a little dust and dirt in the area.
7) The distance from heat source should be more than 2meters.
8) The distance from air outlet of inverter is more than 0.5meters.

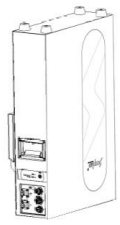
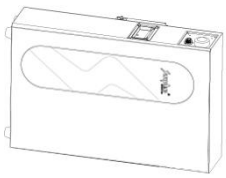
9) Installation areas should avoid direct sunlight.

10) No forced ventilation requirement for battery module, but please install in the environment allowed by the product parameters.

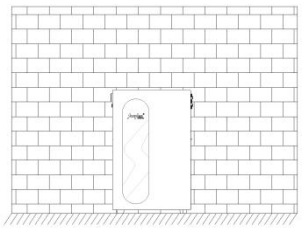
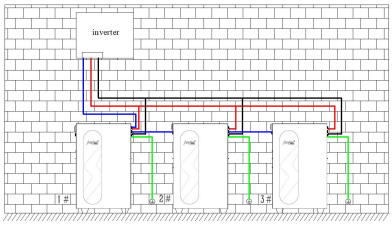
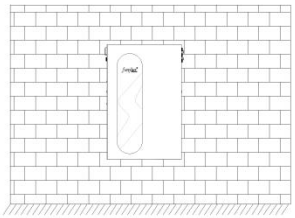
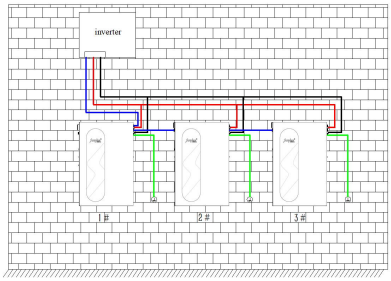
11) Before installing, check the output voltage of each module. Ensure the voltage difference of module is within 2V. If it is beyond this range, please discharge (charge) the modules or consult Sunplus.

5.4 Installation Direction

Warning

Upside down	Sidelong	Sidelong
		
NOT allowed	NOT allowed	NOT allowed

The following placements are recommended.

	Method		Cautions	
1	Ground mounted		1. Ensure that the Angle of the battery pack is less than 5°. 2. The ground is smooth and there is no water. 3. The recommended distance between battery packs is 200 mm to 400mm.	
2	Wall mounted		1. Ensure that each installation point of the battery pack can weigh at least 50kg. 2. Ensure that the bracket is close to the wall. 3. Ensure that the Angle of the battery pack is less than 5°. 4. The recommended distance between battery packs is 200 mm to 400mm.	

5.5 Installation Steps

Warning

1) Follow local electric safety and installation policy, a suitable breaker between battery system and inverter is required.
2) All installation and operation must follow local electric standard and requirements.
3) When battery modules are paralleled, the system should be powered off before installation operation.

Method 1: Groundmounted

1. Install the supports to the bottom of the battery pack using four M5 crown bolts with locking torque of 2N•m.

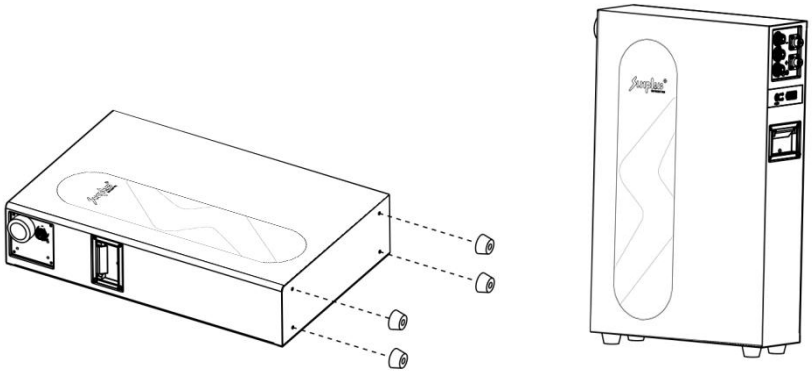


Figure 5-5

2. Ground wire connection of each module.

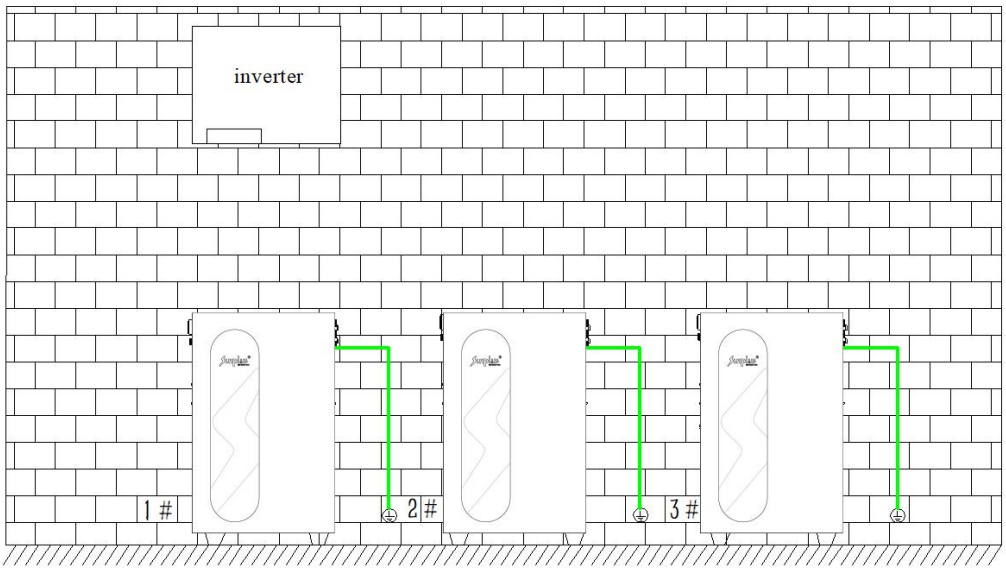


Figure 5-6

3. Connect communication cable.

First connect the parallel communication cable between the batteries.The Parallel Out of battery 1 is connected to the Parallel In of battery 2,and the Parallel Out of battery 2 is connected to the Parallel In of battery 3,And so on. Then connect the CAN or RS485 communication cable between the battery 1 (the master battery) and the inverter.Please keep the inverter and battery turned off for the above operations.

Figure 5-7

4. Connect power cable to the inverter.

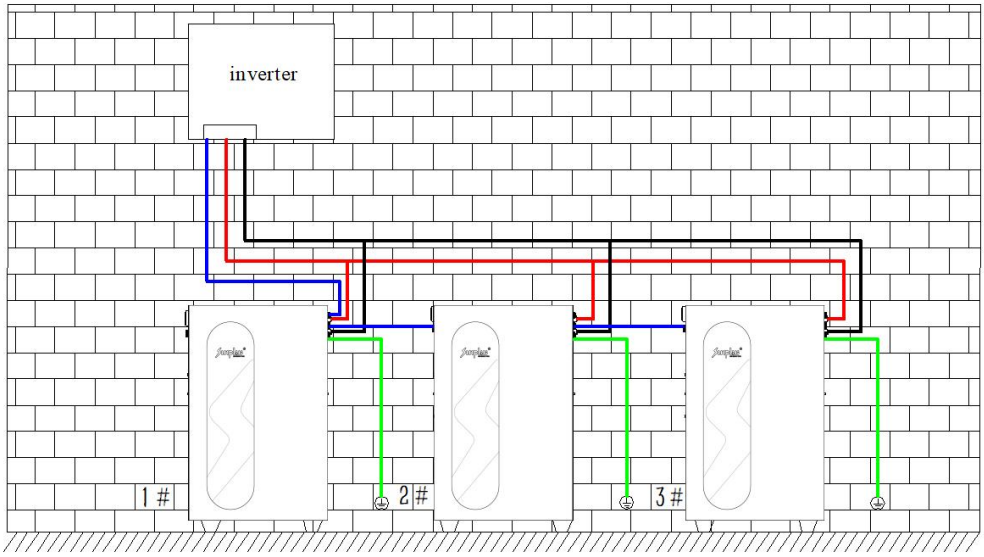


Figure 5-8

5. Press START switch of the master battery to start up, and if the system fails, the fault light will be on.

Method 2: Wallmounted

1. Mount the wall bracket to the wall using six expansion screws.

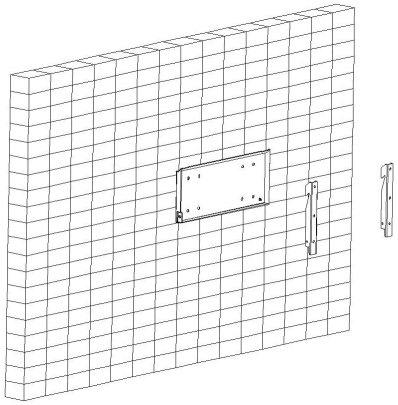


Figure 5-9

2. Install the bracket into the battery pack using six M6 bolts with locking torque of 9N•m.

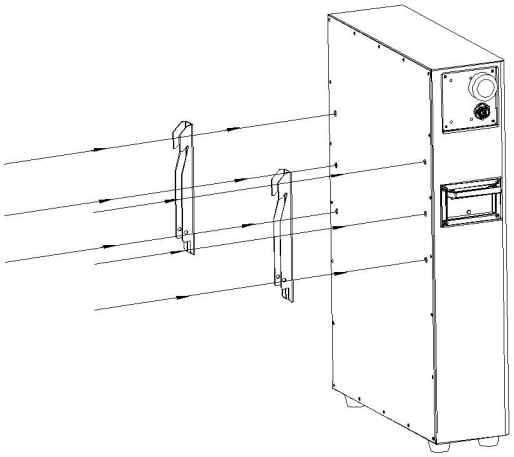


Figure 5-10

3. Install the battery pack on the wall bracket.

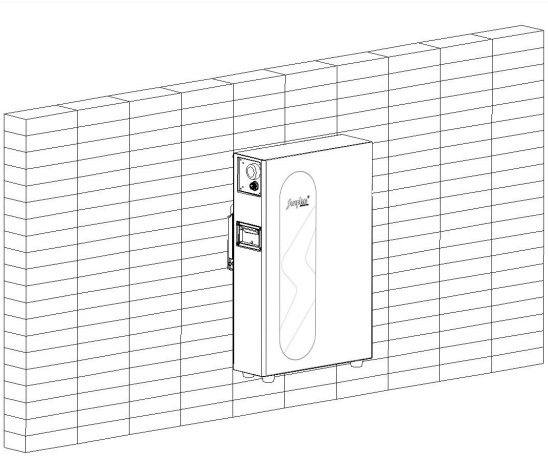


Figure 5-11

4. After connecting the cable between the battery and the inverter, reference the step in ground mounting to start the system.

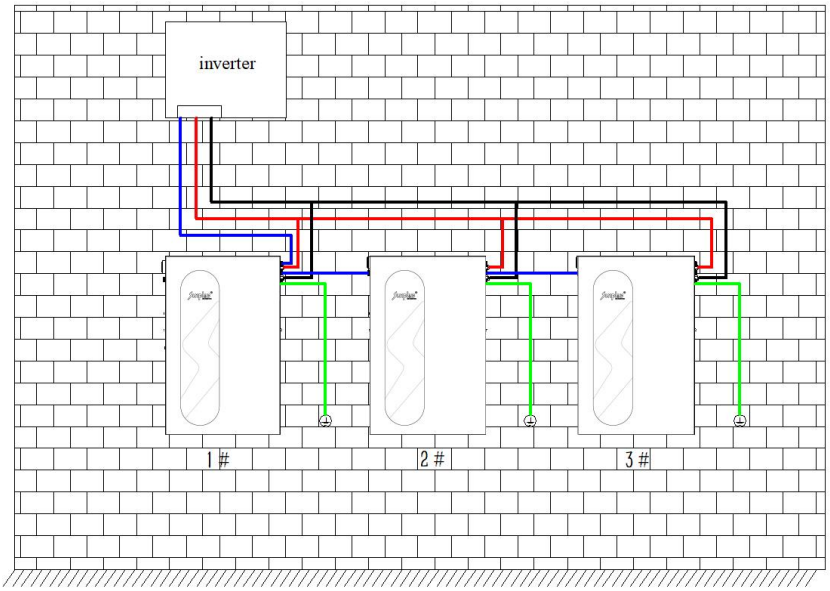


Figure 5-12

5.6 Power On

Double check that all power cables and communication cables should be properly connected.

1) The battery that communicates with inverter is the master battery and other battery modules are slave battery. (1 master battery and 7 slave battery modules at most can be configured.).
2) Press START metal switch of the master battery to start up, LED indicator lights turn on successively from “RUN” for 0.5 seconds.
3) If the system is normal, the fault light is off; Otherwise, please check the wiring or startup steps.

Note

Before capacity expansion, system should be powered off. During capacity expansion or replacement, when modules with different SOC/voltages are connected in parallel, please process the modules until the voltage difference is less than 2V,and keep the system idle for≥15 minutes or until SOC LEDs become similar (≤1 point difference).

When the system is in the sleep mode and meets any of the following conditions, the system will exit the sleep mode and enter the normal operation mode

1) Connect the charger, and the charger output voltage shall be greater than 52V
2) Press the start button (3~6s) and release the button.
3) RS232 communication activated

5.7 Power Off

When battery is in working state, press the START metal switch of the master battery and release it. The system will switch to sleep mode, and all LED indicators will be off in turn.

Note

When any of the following conditions is met, the system enters the sleep mode:

1) Single cell or module voltage over discharge protection is not released within 300 seconds.
2) Press the start button (3~6s) and release the button.
3) The lowest unit voltage is lower than the sleep voltage, and duration reaches sleep delay time (and also meets the no communication, no protection, no balance and no current state at the same time.)
4) Standby time exceeds 24 hours (no communication, no charge and discharge at the same time).
5) Forced shutdown by upper control system.
6) System hardware failure.

Before entering sleep mode, ensure that the input side is not connected to external power, otherwise it will not be able to enter the sleep mode.

6. Storage conditions

6.1 Short-term storage

Storage conditions of module: temperature 0 ~ 45℃, humidity ≤ 85%, state of charge 15%~ 40% SOC.
It is recommended that batteries operate within one month after shipment , so as to avoid the capacity loss and voltage attenuation caused by the self-discharge of lithium ion battery.

6.2 Long-term storage

Storage conditions of module: temperature 0 ~ 45℃, humidity ≤ 85%, state of charge 15% ~ 40% SOC.
If batteries are not charged for over 3 months, please charge and discharge batteries for 2-3 cycles to ensure best performance.If it is not tested or maintained for more than 6 months, Sunplus shall not be liable for any performance defects .

7. Emergency Situations

7.1 Battery Leakage

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If one is exposed to the leaked substance, immediately perform the actions described below.

1) Inhalation: Evacuate contaminated area and seek medical attention.
2) Contact with eyes: Rinse eyes with flowing water for 15 minutes and seek medical attention.
3) Contact with skin: Wash affected area thoroughly with soap water and seek medical attention.

   Ingestion: Induce vomiting and seek medical attention.

7.2 Fire

NO WATER!

Only dry powder or carbon dioxide extinguisher can be used; if possible, move the battery module to a safe area before it catches fire.

7.3 Wet Batteries

If the module is wet or submerged in water, do not let people access it, then contact Sunplus BATTERY or an authorized dealer for technical support. Cut off all power switch on inverter side.

7.4 Damaged Batteries

Damaged batteries are dangerous and must be handled with utmost care. They are not fit for use and may pose a danger to people or property. If the module seems to be damaged, pack it in its original container, then return it to authorized dealer.

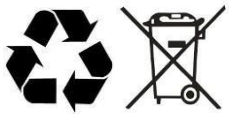
Warning

Damaged batteries may leak electrolyte or produce flammable gas.

8.Remarks

8.1 Recycle and Disposal

In case a battery (normal condition or damaged) needs disposal or needs recycling, it shall follow the local recycling regulation (i.e. Regulation (EC) Nº 1013/2006 among European Union) to process, and using the best available techniques to achieve a relevant recycling efficiency.



8.2 Maintenance

1) When the battery is idle, carry out electrical maintenance for the battery according to the storage requirements.
2) Check installation environment such as dust, water, insect etc. Make sure it is suitable for IP65 battery system. Connection of power connector, grounding point, power cable and screw are suggested to be checked every year.

8.3 Declaration of conformity

The battery system described in this document complies with the applicable European directives. The certificate is available in the download area of our websites.

Shanghai Sunplus New Energy Technology Co., Ltd.

Online Manual

0086-21-6176 5960

info@sunplusnenergy.com

www.sunplusnenergy.com

Building 4 NO.260 Maoyuan Road Fengxian District,Shanghai China