

USER MANUAL

SF-5KWH-L1



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1 About this manual

This manual introduces SF-5KWH-L1 LFP Battery Product from SOFAR.

- ▶ Carefully read this manual before use!
- ▶ Treat this manual as an integral component of the device.
- ▶ Keep this manual in close proximity to the device, including when it is
- ▶ handed over to another user or moved to a different location.

This manual contains important safety information on installation, operation and maintenance of the device.

- ▶ Read and observe all given safety information.

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▶ Target Group

This document is intended for professional electrical engineers who are responsible for battery installation and commissioning, including technical support engineers, system engineers, electrical engineers and end user.

1.1 Copyright declaration

The copyright of this manual is owned by SOFAR. It may not be copied – either partially or completely – by companies or individuals (including software etc.) and must not be reproduced or distributed in any form or with any means. SOFAR reserves the right to final interpretation. This manual may be amended following feedback from users or customers.

Consult our website at <https://www.SOFAR.com> for the latest version.

1.2 Presentation of warnings

This manual contains information on safe operation and uses symbols to ensure the safety of persons and property as well as the efficient operation of the SF-5KWH-L1.

- Read through the following symbol explanations carefully in order to prevent injury or property damage.

1.2.1 Warn symbol

	The general danger symbol warns of the risk of serious injury when used with the signal words CAUTION, WARNING and DANGER.
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1.2.2 Signal words

DANGER	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a danger that will result in damage to or destruction of the inverter.

1.2.3 Sectional warnings

Sectional warnings refer to a complete section and are structured as follows:

 WARNING
Type and source of danger Consequences of non-observance ► Avoiding the danger

1.2.4 Embedded warnings

Embedded warnings are part of an action sequence and are placed right before the dangerous step.

WARNING Combination of type/source of danger, consequences for non-observance and avoiding the danger.

1.3 Presentation of action instructions

This table shows the sequence of Action steps:

Symbol	Function
✓	This describes an action requirement
1. 2. 3.	This is the sequence of action steps that must be followed step by step
►	This is a single action step
↪	This describes the result of the action

1.4 Note

Notes are presented in a grey bar.

- Provides tips essential to the optimal operation of the product.

2 Safety

This section contains safety information that must be observed at all times when working on or with batteries. To prevent personal injury or property damage and to ensure long-term operation of the batteries, read this section carefully and observe all safety information at all times.



WARNING

Environmental requirement

- ▶ The battery is IP20 rated and should only be installed indoors
- ▶ Do not expose the battery to temperature above 50°C
- ▶ Do not place the battery near any heat sources
- ▶ Do not expose the battery to moisture or liquids
- ▶ Do not expose the battery to corrosive gases or liquids
- ▶ Do not expose the battery to direct sunlight for extended periods of time
- ▶ Do not allow the battery power terminals to touch conductive objects such as wires
- ▶ Place battery in secure location away from children and animals



WARNING

Operation precautions

- ▶ Do not disassemble the battery
- ▶ Do not touch the battery pack with wet hands
- ▶ Do not crush, drop or puncture the battery
- ▶ Do not reverse the polarity or connect in series
- ▶ Do not short circuit the terminals, remove all items that could product a short circuit before installation and handling
- ▶ Always dispose of the product according to local safety regulations

- ▶ Store and recharge battery in a manner in accordance with this user manual
- ▶ Ensure reliable grounding
- ▶ Disconnect battery from power/load and then power off battery before installation and maintenance
- ▶ When storing or handling, do not stack up batteries when outside

**WARNING****Protective package**

- ▶ Packaged batteries should not be stacked more than specified number stipulated on the package
- ▶ Continued operation of a damaged battery can result in dangerous situation that may cause severe injury due to electrical shock

3 Technical Items

No.	Terms	Comment
1	Discharge	Battery output power for load
2	Charge	To put electricity into battery by charger
3	Full charge	Battery had been full charged, SOC is 100%.
4	Standby	Ready for charging or discharging
5	Shutdown	Power off
6	SOC	State of Charge (Useable capacity)
7	Battery voltage	The voltage between B+/B-
8	Cell voltage	Single cell voltage
9	Pack voltage	The voltage between P+/P-
10	Alarm	Indicate that the battery is in abnormal status
11	Protect	Battery stops charging or discharging and is recoverable
12	Fault	Battery or BMS is broken, need to be replaced
13	Over discharged	Battery is lack of electricity, and needs to be recharged in time

4 Product Overview

4.1 Brief Introduction



Product overview

SOFAR SF-5KWH-L1 is a battery system with an operating voltage range between 44.8~57.6V. It is utilized in household energy storage applications and works together with a low-voltage PCS to realize the goal of energy storage for the home.

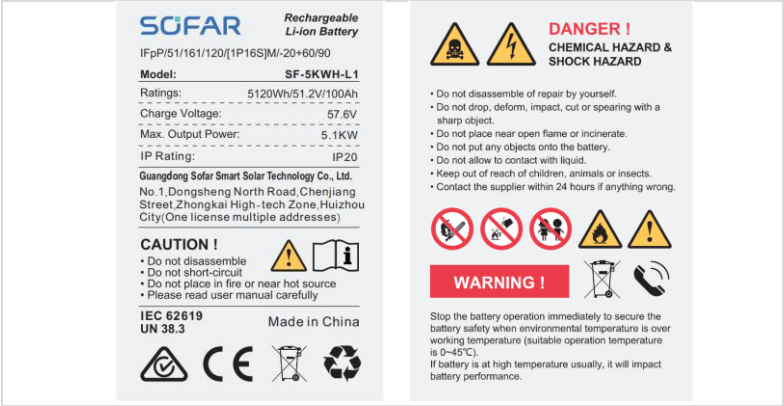
SOFAR SF-5KWH-L1 has built-in BMS (battery management system), which can manage and monitor cells information including voltage, current and temperature. What's more, BMS can balance cells charging to extend cycle life. BMS has protection functions including over-discharge, over-charge, over-current and high/low temperature; the system can automatically manage charge state, discharge state and balance state.

Multiple batteries can connect in parallel to expand capacity and power for larger capacity and longer power supporting duration requirements, SOFAR SF-5KWH-L1 support up to 16 parallel operations.

4.2 Product Nameplate

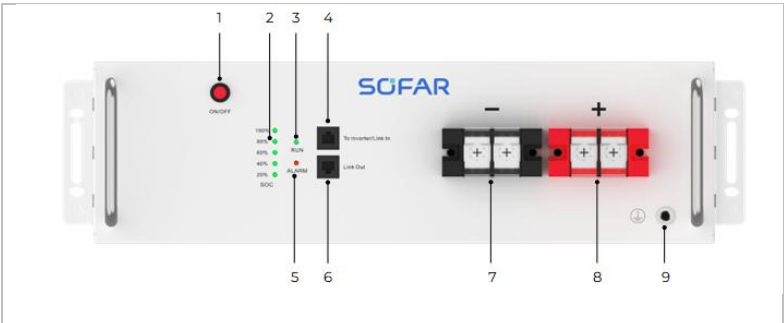
The type labels were attached on the product, which contain the product identification information. For safe usage, the user must be well-informed of the contents in the type labels.

The type labels include:



► The picture is for reference only, please refer to the actual product.

4.3 Interface Introduction

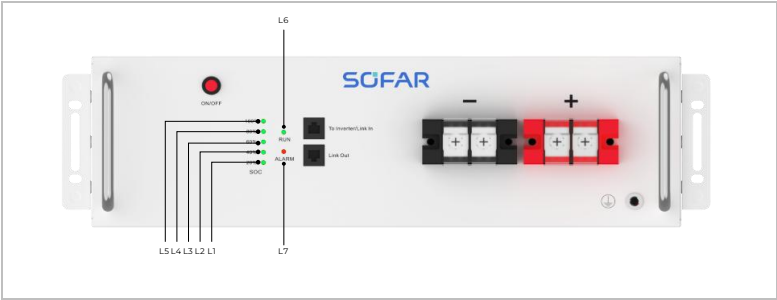


No.	Items	No.	Items
1	ON/OFF switch	6	Communication output (Battery)
2	SOC Indicator	7	P-
3	Running indicator	8	P+
4	Communication input (Battery/Inverter)	9	Grounding
5	Alarm indicator		

4.3.1 Start Button

1. Press start button to enter the standby detection state, the run will flash at intervals of 0.5s for more than 3s and then release the button, the LED which are used to battery Level Indicator will light according to the battery level, and then enters to automatic coding. After the automatic coding, L6 shows the running status.
2. In parallel system, connect the parallel communication wiring according to section 4. 3. 1, then long press the start button of the Master PACK, after normal startup, the battery system will automatically encode and assign ID to each parallel PACK, and then the parallel system will run normally.
3. Press start button of Master PACK more than 3s and then release the button, all LED will go off to shut down the battery module. In parallel system, the master pack will shut down after all slave packs shut down.

4.3.2 LED Indicator Definition



- ▶ L1 to L5: Green, show the battery level, each light indicate 20% SOC.
- ▶ L6: Green, show battery running status, long bright if equipment is normal.
- ▶ L7: Red, show battery running status, long bright if equipment failure or protected.

Table 4-1 LED indicator instructions

Status		ALM	RUN	Battery level indicator					Descriptions
		L7	L6	L5	L4	L3	L2	L1	
Shutdown		OFF	OFF	OFF	OFF	OFF	OFF	OFF	All OFF
Standby		OFF	Light	According to the battery level					Indicates Standby
Charging	Normal	OFF	Light	According to the battery level					The highest capacity indicator LED flashes (flash 1), others lighting
	Full Charged	OFF	Light	Light	Light	Light	Light	Light	Turn to standby status when charger off
	Protection	Light	OFF	According to the battery level					Stop charging
Discharging	Normal	OFF	Light	According to the battery level					
	UVP	Light	OFF	OFF	OFF	OFF	OFF	OFF	Stop discharging
	Protection	Light	OFF	According to the battery level					Stop discharging
Fault		Light	OFF	According to the battery level					Stop charging and discharging

Table 4-2 Charging battery level indicators instructions

Status		RUN	Charging				
Battery level indicators		L6 	L5 	L4 	L3 	L2 	L1 
Battery level (%)	SOC < 20%	Light	OFF	OFF	OFF	OFF	Flash 1
	20% ≤ SOC < 40%		OFF	OFF	OFF	Flash 1	Light
	40% ≤ SOC < 60%		OFF	OFF	Flash 1	Light	Light
	60% ≤ SOC < 80%		OFF	Flash 1	Light	Light	Light
	80% ≤ SOC < 100%		Flash 1	Light	Light	Light	Light
	SOC=100%		Light	Light	Light	Light	Light

Table 4-3 Discharging Battery Level Indicators Instructions

Status		RUN	Discharging				
Battery level indicators		L6 	L5 	L4 	L3 	L2 	L1 
Battery level (%)	SOC < 5%	Light	OFF	OFF	OFF	OFF	OFF
	5% ≤ SOC < 20%		OFF	OFF	OFF	OFF	Light
	20% ≤ SOC < 40%		OFF	OFF	OFF	Light	Light
	40% ≤ SOC < 60%		OFF	OFF	Light	Light	Light
	60% ≤ SOC < 80%		OFF	Light	Light	Light	Light
	80% ≤ SOC		Light	Light	Light	Light	Light

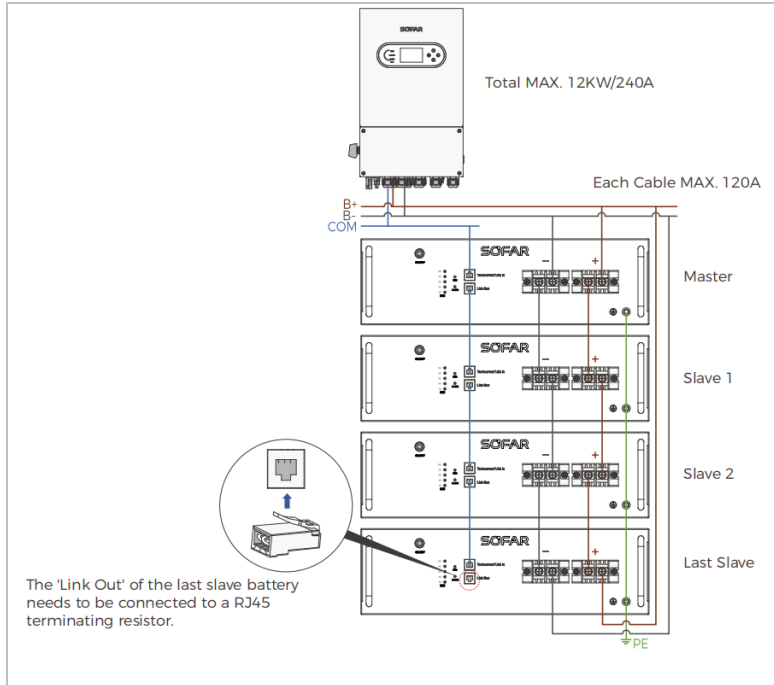
The flashing instructions

- Flash 1 - light on 0.5s / off 0.5 seconds

4.4 Interface Introduction

4.4.1 Wiring instructions

Suggest Wiring Diagram:



- ▶ You are advised to use the power cable with size min. 25mm² or 4AWG (1500V, 100A), The length of the wire is determined according to the actual requirements. Or buy the corresponding cable options.
- ▶ Before assembling Power cable, label the cable polarities correctly to ensure correct cable connections.
- ▶ The power cable installation and connected must training skilled of professional personal.

1. Power cable wiring instructions

Power cable terminals: Each terminal has two connections.

Single module: Each **P+/-** terminal has two connections, you can use either one for wiring.

Parallel system: Multiple batteries can connect in parallel to expand capacity and power for larger capacity and longer power supporting duration requirements.

- ▶ **P+** must connect to master pack, and **P-** must connect to last slave pack.

Master pack: one of the **P+** terminals connect to PCS, the other one paralleling to another battery for capacity expanding.

Last slave pack: one of the **P-** terminals connect to equipment, the other one paralleling to another battery for capacity expanding.

Other slave pack: for each pair terminals, paralleling to another battery for capacity expanding.

2. Parallel communication cable wiring instructions

To Inverter/Link In and **Link Out** communication terminal (RJ45 port) is integrated with the signal for automatic coding function, it's can automatic identification the parallel connected slave batteries by internal control software of master battery.

- ▶ The connection order of Port In and Port Out should not be wrong, otherwise it will lead to the automatic coding failed.

It is required that the **To Inverter/Link In** of the master PACK should be connected to the PCS, and the parallel communication wire is connected to the **To Inverter/Link In** of the first slave PACK from the **Link Out** of the master PACK. Then the **Link Out** of the first slave PACK is connected to the **To Inverter/Link In** of the second slave PACK. The **Link Out** of the second slave PACK is then connected to the **To Inverter/Link In** of the third slave PACK, and so on. The parallel system supports up to 16 parallel operations, and **Link Out** of the

last slave PACK needs to be connected to a RJ45 terminal resistor (missing the terminal resistor may cause battery communication failure).

3. PCS communication cable wiring instructions

The **To Inverter/Link In** communication port of the Master pack is connected to PCS.

4. Grounding wiring instructions

The ground wire of the battery system needs to be connected reliably. Connect the grounding of the parallel system first, and then ground it nearby through the connection point of one of the battery packs.

4.4.2 Link Port and Automatic Coding Function

To Inverter/Link In and **Link Out** Communication follow CAN protocol, for communication between multiple parallel batteries.

After confirming the wiring is correct (refer to section 4. 3. 1), press the start button of the master pack long.

After normal startup, the parallel battery system will automatically code and assign ID to each parallel PACK, and then the parallel system will run normally (refer to section 4. 2. 1).

4.4.3 Link Port

CAN Communication Terminal (RJ45 port) follow CAN protocol, connect to communication port.

BMS controls the charging current/charging voltage or discharge current/discharge cut-off voltage of the PCS through CAN communication according to the battery voltage and battery temperature.

- Through the SOFAR PCS, skilled peoples can set the fully charged time period.

PIN	Definition
Pin 1	RS485A
Pin 2	RS485B
Pin 3	CANH (to battery)
Pin 4	CANH (to PCS)
Pin 5	CANL (to PCS)
Pin 6	CANL (to battery)
Pin 7	GND/ID_OP-
Pin 8	ID_IN+/ID_OP+

5 Installation Guide

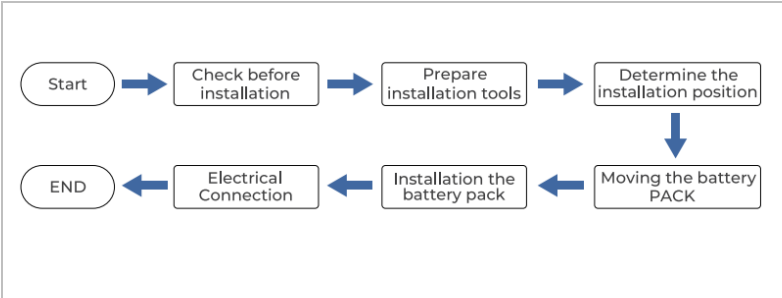


Table 5-1 Installation flow chart

5.1 Checking Before Installation

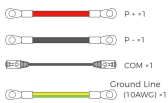
5.1.1 Checking Outer Packing Materials

Packing materials and components may be damaged during transportation. Therefore, check the outer packing materials before installing the battery. Checking the surface of packing materials for damage, such as holes and cracks. If any damage is found, do not unpack the battery and contact the dealer as soon as possible. You are advised to remove the packing materials within 24 hours before installing the battery.

5.1.2 Checking Deliverables

After unpacking the battery, check whether deliverables are intact and complete. If any damage is found or any component is missed, contact the dealer.

The below table shows the components and mechanical parts that should be delivered.

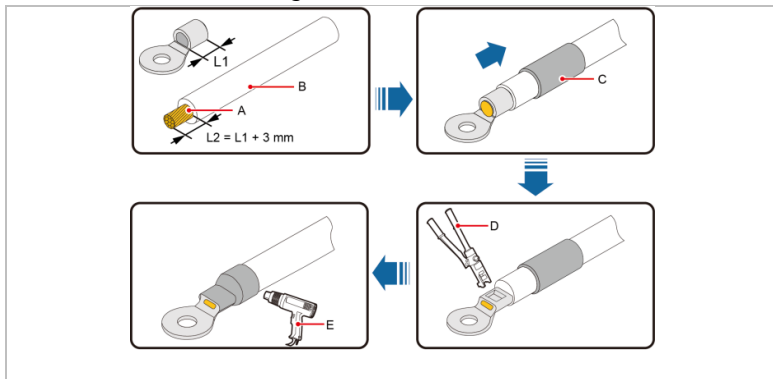
NO.	Pictures	Quantity	Description
1		1 pcs	Battery
2		2 pcs	Hanging rack
3		1 pcs	Wall bracket 1
4		1 pcs	Wall bracket 2
5		5 pcs	M6*14
6		4 pcs	M6*9
7		4 pcs	M8*80
8		6 pcs	M4*10
9		1 pcs	Terminal resistance
10		1 pcs	communication line adapter
11		2 pcs	Heat shrink tube
12	  P++ *1  P-- *1  COM *1  Ground Line (10AWG) *1	1 pcs	Output cables (4AWG/1500MM)
13		1 pcs	Test report
14		1 pcs	Quick installation guide

The following accessories are configured according to the number of parallel machines in the battery system. For example:

NO.	Pictures	Quantity	Description
1		4 pcs	Stacking Brackets

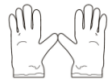
- ▶ The standard output power cable is optional accessories component part, the customer can be according the actual installation requirements customize the output power cable from SOFAR when the product sold in local or importers provide.
- ▶ You are advising use the provide standard accessories part from SOFAR or customize the identical specification accessories component part from SOFAR or importers.

Power cable terminal making instructions:



A	Core wire	B	Insulation layer
C	Heat shrink tubing	D	Hydraulic pliers
E	Heat gun		

5.2 Tools

No.	Tool	Model	Function
01		Knife	Installation
02		Hammer drill Recommended drill diameter ≥ 10 mm	Used to drill holes in the wall.
03		Socket wrench(10/16mm)	Installation
04		Rubber mallet	Installation
05		Cross screwdriver	Wiring
06		Inclinometer	Installation
07		Measuring tape	Used to measure distances
08		Diagonal pliers	Installation
09		Marker	Used for marking
10		ESD gloves	for the installer
11		Safety goggles	for the installer
12		Anti-dust respirator	for the installer
13		Safety shoes	For the installer

5.3 Installation requirements

5.3.1 Installation environment Requirements

- ▶ Install the battery in the indoor environment.
- ▶ Place battery in secure location away from children and animals.
- ▶ Do not place the battery near any heat sources and avoid sparks.
- ▶ Do not expose the battery to liquids.
- ▶ Do not expose the battery to direct sunlight.

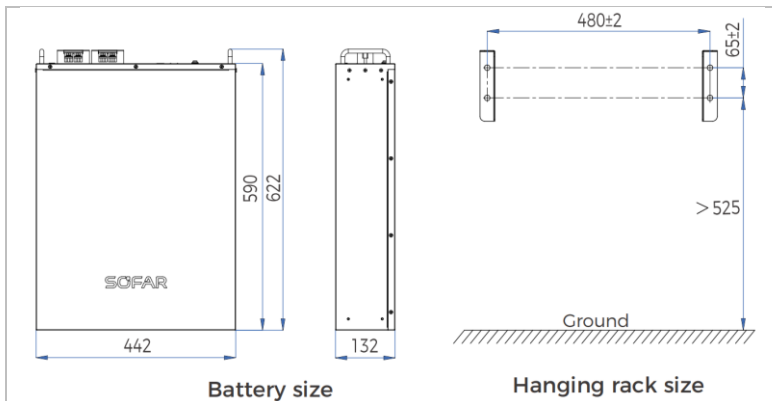
5.3.2 Installation carrier requirements

- ▶ The mounting carrier shall have fire resistance. Do not install batteries on flammable buildings.
- ▶ The mounting carrier surface shall meet the load bearing requirements.

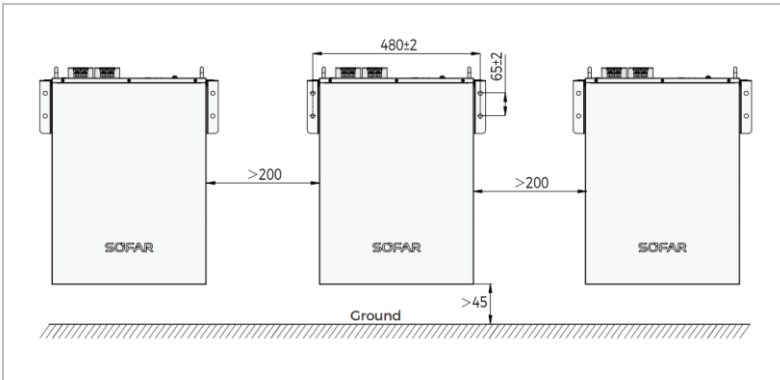


5.4 Installation instructions

5.4.1 Dimensions



Minimum mounting distance of the battery pack:

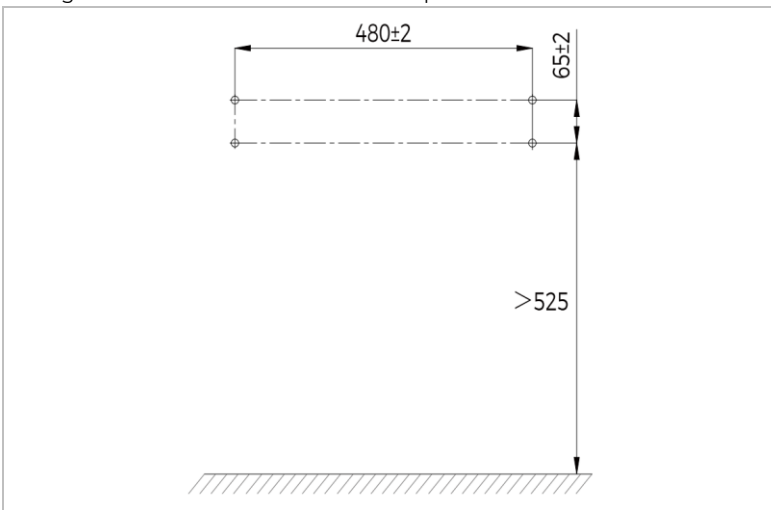


5.4.2 Installation Step

- ▶ Single Machine installation step for suspended on wall

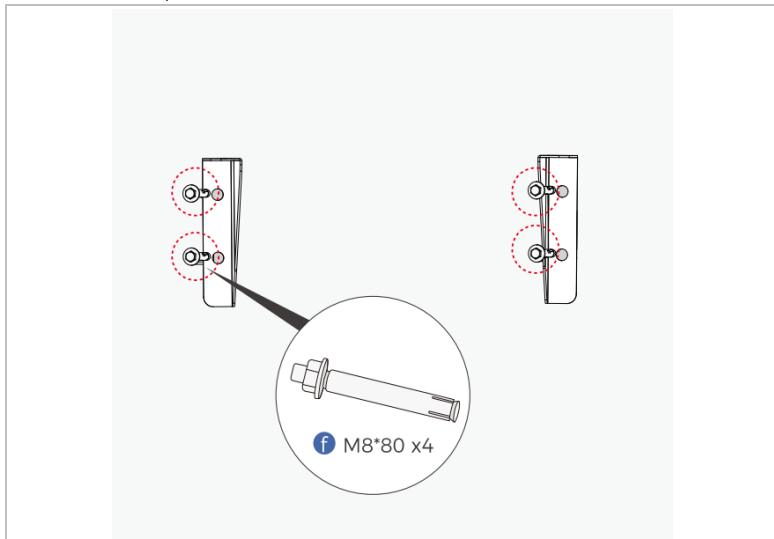
Step 1

To determine the position for drilling holes, and then mark the hole position by using a marker, use the hammer drill to drill hole on the wall. Keeping the hammer perpendicular to the wall, do not shake when drilling, so as not to damage the walls. Each borehole has a depth of 80mm.

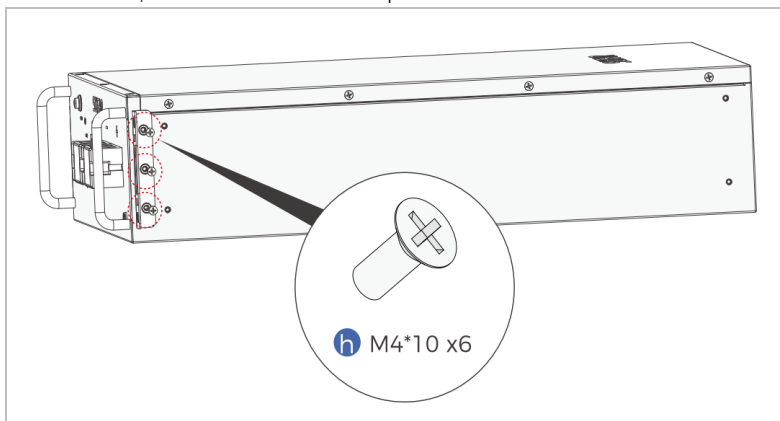


Step 2

Install two hanging racks on the wall use four M8*80 expansion screws, electric screwdriver torque 12 N·m.

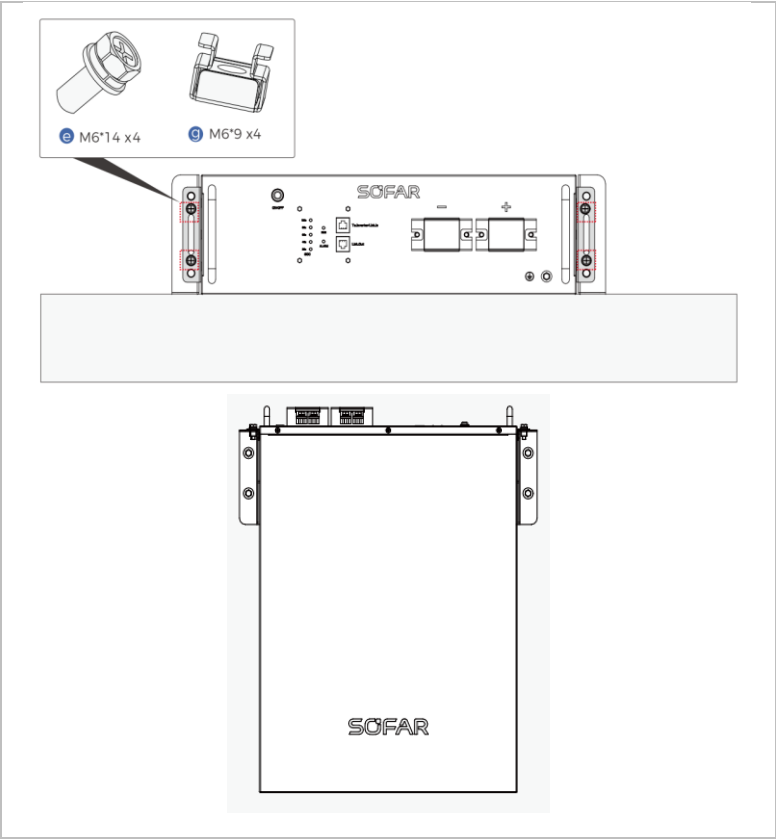
**Step 3**

Install wall bracket 1 and wall bracket 2 to both sides of the battery with six M4*10 screws, electric screwdriver torque 1.2 N·m.

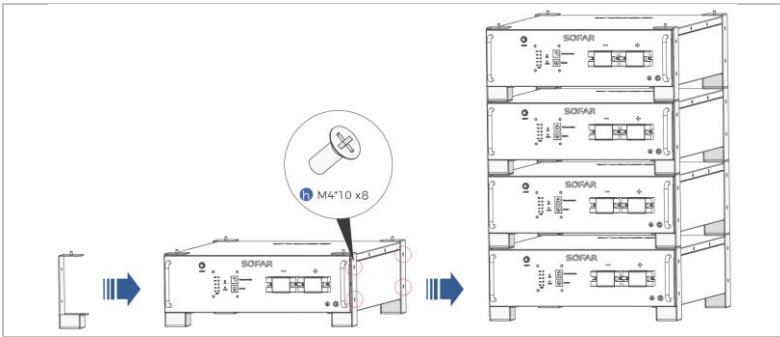


Step 4

Lap the wall brackets on both sides of the battery onto the hanging rack, use four M6*14 screws and four M6*9 square nut, electric screwdriver torque 5 N·m.

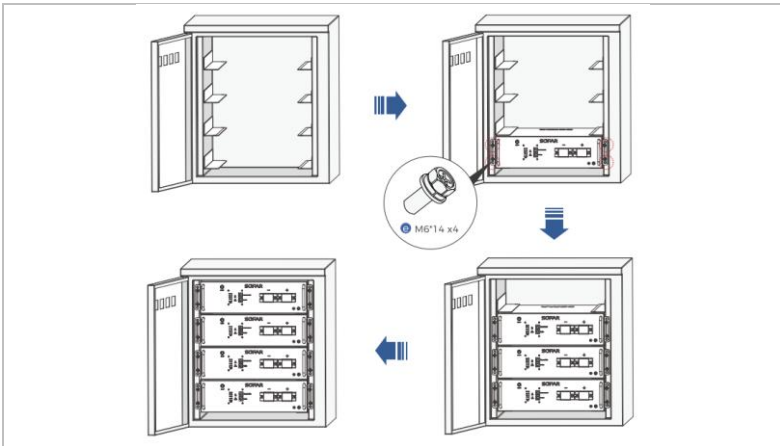


▶ With simple bracket installation



1. Use eight M4*10 screws to lock the four brackets to the corners of the battery, electric screwdriver torque 1.2 N·m.
2. Align the limit holes of the upper and lower brackets with the ejector pins and then directly stack the batteries.

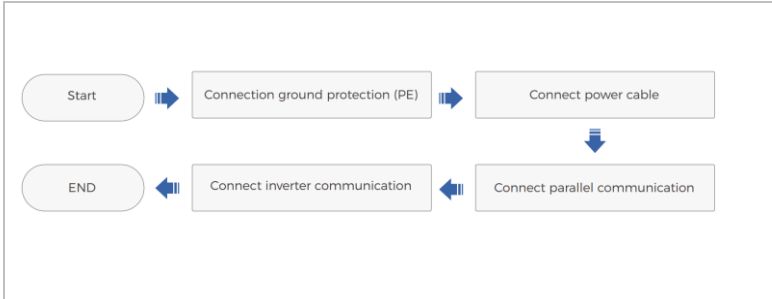
▶ With standard 19 inches cabinet or rack installation



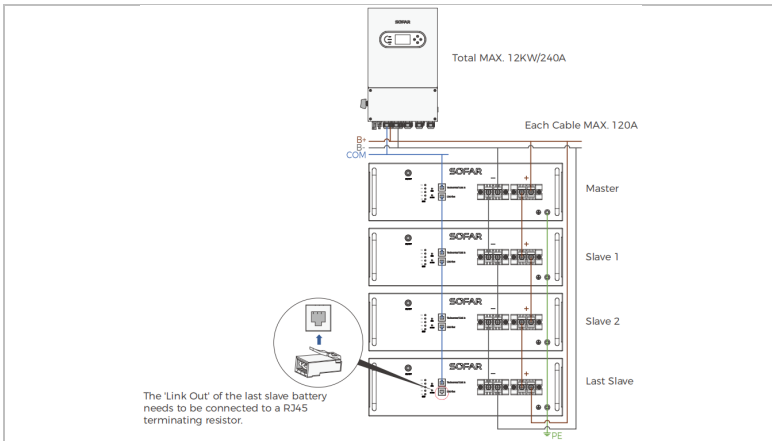
1. Install wall bracket 1 and wall bracket 2 to both sides of the battery with six M4*10 screws, electric screwdriver torque 1.2 N·m.
2. Tuck the battery into the cabinet, use four M14*4 screws, electric screwdriver torque 5 N·m.

5.5 Electrical Connection

5.5.1 Electrical Connection Process



5.5.2 System Wiring Diagram



1. Connect all battery Ground lines to the PE with M6*14 screws, electric screwdriver torque 5 N·m.
2. Connect the positive terminals of the batteries all together, and the negative terminals all together as well;
3. The communication cable of the PCS is connected to "**To inverter/Link In**" of the master battery, "**Link Out**" of the master battery is connected to "**To inverter/Link In**" of the slave battery 1, and so on;

4. The “**Link Out**” of the last slave battery needs to be connected to a RJ45 terminating resistor.

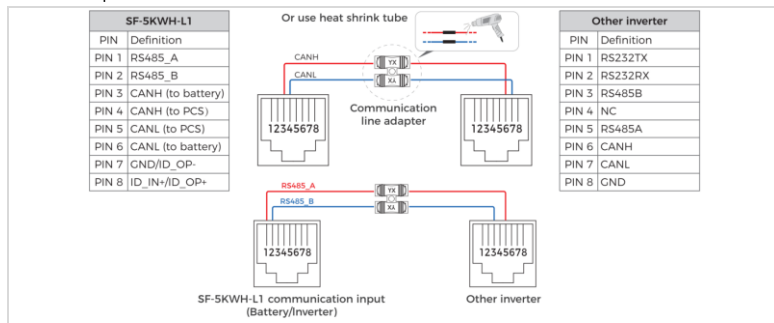
- Battery supports up to 16 parallel.

5.5.3 Connect inverter communication

If the SF-5KWH-L1 battery is used in conjunction with other inverters, the communication lines must be modified according to the pin definitions of the communication port and correctly use communication line adapter or heat shrink tube to connect CANH/RS485_A and CANL/RS485_B pins of the master battery and the inverter.

Attention: Other wires need to be cut, especially PIN 7 and PIN 8.

For example



- It's recommended to use the method of applying heat shrink tube, if have a hot air gun.
- Avoid connecting CAN and 485 simultaneously, prioritize connecting CAN.

6 Cleaning and Maintenance

6.1 Cleaning

⚠ CAUTION

Please power off the system before cleaning.

- ▶ It is recommended that the SOFAR SF-5KWH-L1 should be cleaned periodically. If the enclosure is dirty, please use a soft, dry brush or a dust collector to remove the dust. Liquids such as solvents, abrasives or corrosive liquids should not be used to clean the enclosure.

6.2 Maintenance

6.2.1 Recharge Requirements During Normal Storage

The storage temperature should not be more than 45°C and less than 10°C. The batteries must be periodically charged before the time limit specified in the table below. The batteries should be used in time.

Recharge conditions when in storage

Ambient Temperature (°C)	$T \leq -10$	$-10 < T \leq +45$	$T > 45$
Maximum Storage Time (Months)	Prohibited	24	Prohibited

6.2.2 Recharge Requirements When Over Discharged

Please recharge the over discharged (90%DOD) batteries in a timeframe that is in accordance to the following table, otherwise the over discharged battery modules will be damaged.

Recharge conditions when battery is over discharged

Storage Environment Temperature	Storage Time	Note
-10~25°C	≤15 days	Battery Pack disconnect to PCS
25~45°C	≤7 days	
-10~45°C	< 12 hours	Battery Pack connect to PCS

6.2.3 Replacement or Expand capacity

The maintenance of batteries requires a person with professional skills.

1. Before replacement or expand capacity, please cut off the whole system, include PCS and Battery system; at the same time, PCS is disconnected from the power grid;
2. After PCS is confirmed to be disconnected from the power grid, turn off the battery power supply and disconnect the connection line between the battery and PCS.
3. Remove or install new battery refer to section 5. 4, and then restart refer to section 4. 2. 1.

6.2.4 Emergency

Please cut off the power supply and turn off the battery in an emergency.

1. Wet Batteries

If the battery pack is wet or submerged in water, do not let people access it, and then contact SOFAR or an authorized dealer for technical support.

2. Fire

NO WATER! Only dry powder fire extinguisher can be used; if possible, move the battery pack to a safe area before it catches fire.

3. Leaking Batteries

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

Inhalation: Evacuate the contaminated area, and seek medical attention.

Contact with eyes: Rinse eyes with flowing water for 15 minutes, and seek medical attention.

Contact with skin: Wash the affected area thoroughly with soap and water, and seek medical attention.

Ingestion: Induce vomiting, and seek medical attention.

4. Damaged Batteries

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

7 Data Sheet

Model	SF-5KWH-L1
System Parameters	
Battery type	LFP
Total energy	5120Wh
Usable energy	4608Wh
Rated voltage	51.2V
Operating voltage range	44.8V~57.6V
Rated charging/discharging power	2560W
Rated charging/discharging current	50A
Max. charging/discharging current	50A/100A
Max. Parallel Quantity	16pcs
General Parameters	
Communication	CAN
Dimension (W*H*D)	442*590*132mm
Weight	45kg
Protection rating	IP20
Cooling	Natural
Operating temperature	Charge: 0°C ~ +55°C / Discharge: -20°C ~ +60°C
Humidity	5%~95%
Installation	Wall Mounted/ Bracket Stacking / In-cabinet
Max. operating altitude	2000 m
Standard	
UN38.3, IEC62619, IEC62040-1, SAA etc	

- Operating current derating according to cell voltage and battery temperature.



ENERGY TO POWER YOUR LIFE

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