User Manual

Lithium Battery Pack

Soluna Bes 5K Pack

Mar.2024 | Revision A.2

About This Manual

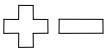
This manual describes how to install the Soluna Bes 5K Pack battery. Please read this manual carefully before you start to install the product, and follow the instructions throughout the installation process. If you are not sure about any of the requirements, recommendations, or safety procedures described in this manual, please contact Soluna immediately for advice and clarification. The information included in this manual is accurate at the time of publication. However, with regards to the product design and technical specification updates, our company reserves the right to make changes at any time without prior notice. In addition, the illustrations in this manual are meant to help explain system configuration concepts and installation instructions. The illustrated items maybe different from the actual items at the installation location.

Content

1 Safety Precautions

1.1 Warning Signs

Warning signs are used to warn you about the conditions that may cause severe injury or damage to the device. They instruct you to exercise caution to prevent danger. The following table describes the warning signs used in this manual.

Sign	Description
	This battery pack contains high voltage which can cause electric shock resulting in severe injury.
	Make sure that the battery polarity is connected correctly.
	Keep the battery pack away from open flame or ignition sources.
	Keep the battery pack away from children.
	Read the manual before installing and operating the battery pack.
	The battery pack is heavy enough to cause severe injury.
	The battery pack may leak corrosive electrolyte.
	The battery pack may explode.
	The battery pack should not be disposed with household waste at the end of its working life.
	Physical injury or damage to the devices may occur if related requirements are not followed.

1.2 Safety Instructions

For safety reasons, installers are responsible for familiarizing themselves with the contents of this manual and all warnings before performing installation.

General Safety Precautions

⚠	Failure to observe the precautions described in this section can cause serious injury to persons or damage to property, observe the following precautions.

1.2.1 Risks of Explosion

● Do not subject the battery pack to strong impacts.
● Do not crush or puncture the battery pack.
● Do not dispose of the battery pack in a fire.

1.2.2 Risks of Fire

● Do not expose the battery pack to temperatures in excess of 60°C.
● Do not place the battery pack near a heat source, such as a fireplace.
● Do not expose the battery pack to direct sunlight.
● Do not allow the battery connectors to touch conductive objects such as wires.

1.2.3 Risks of Electric Shock

● Do not disassemble the battery pack.
● Do not touch the battery pack with wet hands.
● Do not expose the battery pack to moisture or liquids.
● Keep the battery pack away from children and animals.

1.2.4 Risks of Damage to the Battery Pack

● Do not allow the battery pack to come in contact with liquids.
● Do not subject the battery pack to high pressures.
● Do not place any objects on top of the battery pack.

1.3 Battery Handling Guide

● Use the battery pack only as directed.
● Do not use the battery pack if it is defective, appears cracked, broken or otherwise damaged, or fails to operate broken or otherwise damaged, or fails to operate.
● Do not attempt to open, disassemble, repair, tamper with, or modify the battery pack. The battery pack is not user serviceable.
● To protect the battery pack and its components from damage when trans- porting, handle with care.
● Do not impact, pull, drag or step on the battery pack.
● Do not subject it to any strong force.
● Do not insert foreign objects into any part of the battery pack.
● Do not use cleaning solvents to clean the battery pack.

1.4 Response to Emergency Situations

The Soluna Bes 5K Pack battery pack comprises multiple batteries that are designed to prevent hazards resulting from failures. However, Soluna cannot guarantee their absolute safety.

1.4.1 Leaking Batteries

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. Electrolyte is corrosive and contact may cause skin irritation and chemical burns. If one is exposed to the leaked substance, do these actions:

1.4.2 Inhalation

Evacuate the contaminated area, and seek medical attention immediately.

1.4.3 Eye Contact

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

1.4.4 Skin Contact

Wash the affected area thoroughly with soap and water, and seek medical attention immediately.

1.4.5 Ingestion

Induce vomiting, and seek medical attention immediately.

1.4.6 Fire

	The battery pack may catch fire when heated above 150°C. If a fire breaks out where the battery pack is installed, do these actions.

In case there is a fire, always have an ABC or carbon dioxide extinguisher.

● Extinguish the fire before the battery pack catches fire.

● If it is impossible to extinguish the fire but you have time, move the battery pack to a safe area before it catches fire.

● If the battery pack has caught fire, do not try to extinguish the fire. Evacuate people immediately.

	If the battery catches fire, it will produce noxious and poisonous gases. Do not approach.

1.4.7 Wet Batteries

If the battery pack is wet or submerged in water, do not try to access it. Contact Soluna or your distributor for technical assistance.

1.4.8 Damaged Batteries

Damaged batteries are dangerous and must be handled with extreme caution. 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 Soluna or your distributor.

⚠	Damaged batteries may leak electrolyte or produce flammable gas. If you suspect such damage, immediately contact Soluna for advice and information.

1.5 Qualified Installers

This manual and the tasks and procedures described herein are intended for use by skilled workers only. A skilled worker is defined as a trained and qualified electrician or installer who has all of the following skills and experience:

- Knowledge of the functional principles and operation of on-grid systems.
- Knowledge of the dangers and risks associated with installing and using electrical devices and acceptable mitigation methods.
- Knowledge of the installation of electrical devices.
- Knowledge of and adherence to this manual and all safety precautions and best practices.

2 Product Introduction

The Soluna Bes 5K Pack is an LiFePO4 lithium battery product with BMS (battery management system). It is a battery module with CAN / RS485 communication, under-voltage, over-voltage, over-current, over-temperature, under-temperature protection functions. It has the characteristics of high energy density, long life, safety and reliability and so on, and is your trustworthy green environmental product.

2.1 Features

- Excellent safety performance.
- Long cycle life.
- Support for CAN / RS485-communication.
- Parallel interconnection of several systems.
- Number of expandable battery units.

2.2 Application

- Back-up power.
- Micro-grid.
- Home Energy Storage system.

2.3 Outline Dimensions

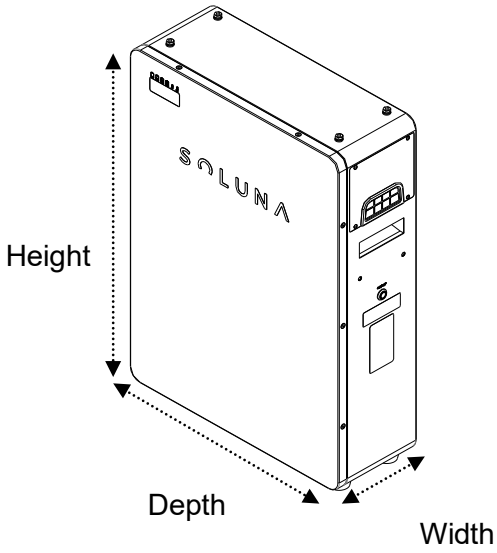


Figure 2.1 Outline dimension

Width	157	mm
Depth	420	mm
Height	595	mm
Weight	48	kg

2.4 Technical Data

Physical Characteristics

Width	157 mm
Depth	420 mm
Height	595 mm
Weight	48 kg

Electrical Characteristics

Battery type	LFP
Total Energy Capacity	5.12kWh
Usable Energy Capacity	4.60kWh
Battery Capacity (Nominal)	100Ah
Nominal Voltage	51.2V
Usable Voltage Range	48~57.6V
Charge Current (Recommended)	75A
Discharge Current (Recommended)	75A
Max. Continuous Charge Current	75A
Max. Continuous Discharge Current	75A

DOD	90%
Internal resistance	≤60mΩ
Cycle life @ 25℃ (under standard charge and discharge conditions，charge 0.2C,discharge 0.2C)	≥6000
DC Disconnect	MOS Fuse

Warranty

Please refer to Soluna WARRANTY CONDITIONS

BMS

Power consumption	<3W (work), <100mW (sleep)
Monitoring parameters	System Voltage System Current Cell Voltage Cell Temperature
Communication	CAN / RS485
Protection	Over Voltage Under Voltage Over Current Over Temperature Under Temperature

System Configuration

Module parallel	1~16 Parallel

Operating Conditions

Installation Location	Indoor Outdoor
Operating Temperature	-10~50 ℃
Operating Temperature (Recommended)	15~30 ℃
Storage Temperature	-20~60 ℃
Humidity	5%~95%
Altitude	Max. 2,000 m
Cooling Strategy	Natural Convection

Reliability & Certification

Certificates	Cell：UL1642
	Battery Module:CE、RoHS、 Compliant with:IEC62619
Transportation	UN38.3
Ingress Rating	IP54

2.5 Appearance

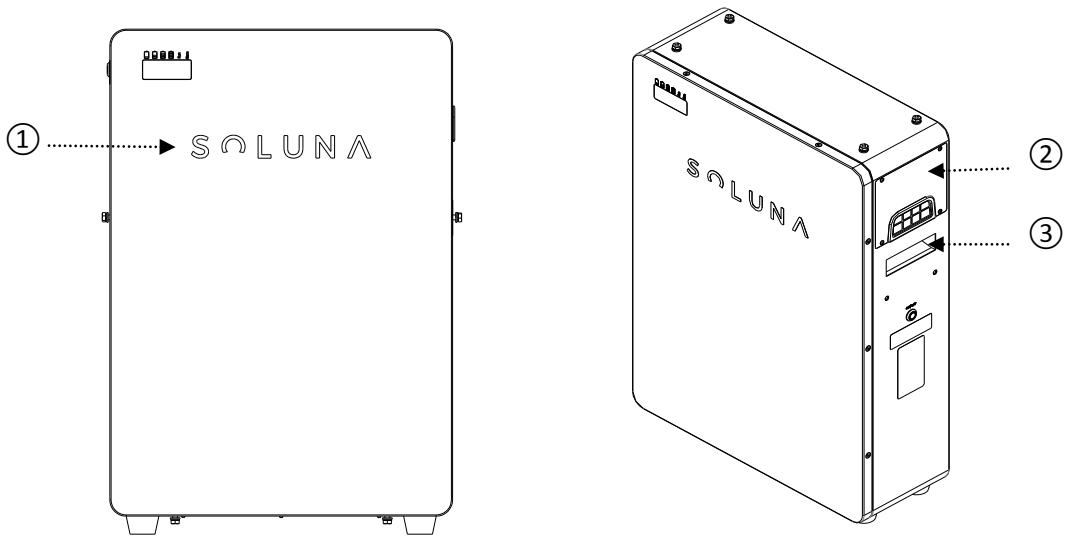


Figure 2.2 Appearance

Number	Name	Remark
①	Logo	
②	Entry	
③	Handle	

2.6 Connection Port

User can see the connections port of Soluna Bes 5K Pack after the cover plat is opened, Please find the following pictures for details.

Remark:

① : Screw torque standard: 0.24-0.36N*m
② : Screw torque standard: 4.40-5.20N*m

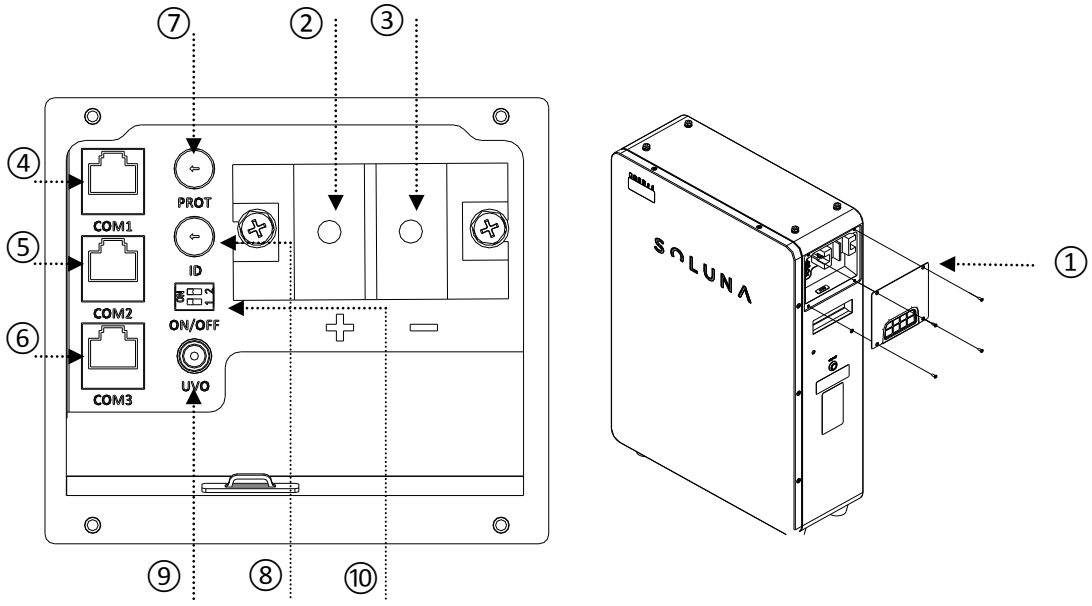


Figure 2.3 Connection port

Number	Name	Remark
①	Cover plat	
②	Battery+	Positive pole of battery
③	Battery-	Negative pole of battery
④	COM 1	CAN / RS-485
⑤	COM 2	CAN / RS-485
⑥	COM 3	CAN / RS-485
⑦	Protocol Rotary switch	
⑧	ID Rotary Switch	
⑨	UVO	0V charging port
⑩	DIP	CAN communication use

2.7 COM Communication Interface Definition

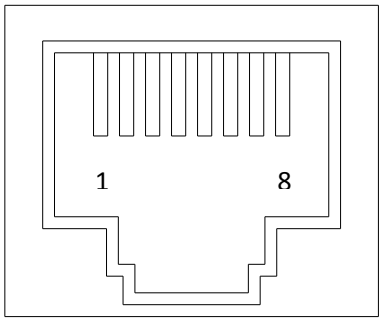


Figure 2.4 Interface definition

COM 1:

1	2	3	4	5	6	7	8
RS-485A (WIFI)	RS-485B (WIFI)	12V	CAN-H	CAN-L	GND	RS-485A	RS-485B

COM 2:

1	2	3	4	5	6	7	8
RS-485A (WIFI)	RS-485B (WIFI)	12V	CAN-H	CAN-L	GND	RS-485A	RS-485B

COM 3:

1	2	3	4	5	6	7	8
NC	NC	NC	CAN-H	CAN-L	NC	RS-485A	RS-485B

Remark:

1) COM 1 is used for BMS monitoring.

2) COM 2 is used for BMS monitoring.

3) COM 3 is used for inverter communication.

2.8 LED Lights Definition

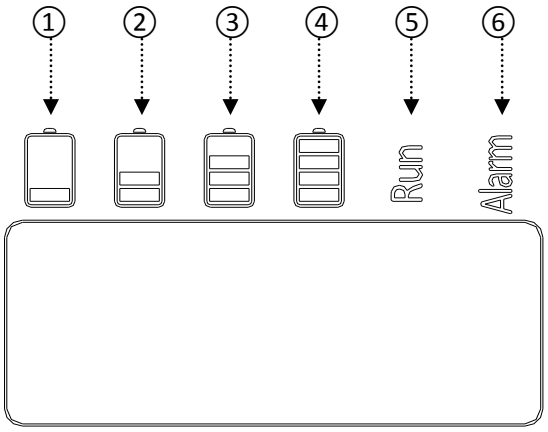


Figure 2.5 LED lights definition

Number	Name	Remark
①	25% capacity indicator	Green light
②	50% capacity indicator	Green light
③	75% capacity indicator	Green light
④	100% capacity indicator	Green light
⑤	Run indicator light	Green light
⑥	Alarm indicator light	Yellow light

2.9 Master & Slave Setting

First locate the ID Rotary Switch on the operation panel.
When the battery packs are connected in parallel, the address of battery module can be set up from the dial switch. Each address is the independent one.

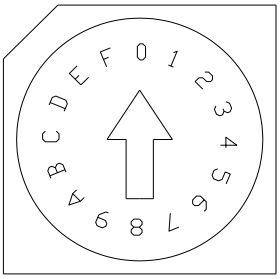


Figure 2.6 ID definition

Address	Location of Dial Switch	Remark
0	0	One battery module （Master）
1	1	Set as Pack 1
2	2	Set as Pack 2
3	3	Set as Pack 3
4	4	Set as Pack 4
5	5	Set as Pack 5
6	6	Set as Pack 6
7	7	Set as Pack 7
8	8	Set as Pack 8
9	9	Set as Pack 9
10	A	Set as Pack 10
11	B	Set as Pack 11
12	C	Set as Pack 12
13	D	Set as Pack 13
14	E	Set as Pack 14
15	F	Set as Pack 15

2.10 Protocol Rotary Switch

First locate the Protocol Rotary switch on the operation panel.
When the inverter is selected, the communication protocol can be selected through the rotary switch. Each address is independent.

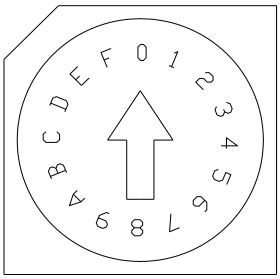


Figure 2.7 PROT definition

Address	Location of Dial Switch	Inverter communication protocol
0	0	Soluna Energy_Default(Asiwei、Solis、Victron、Goodwe)
1	1	Soluna (Deye、Afore、Hoymiles、APstorage、Megarevo)
2	2	SMA
3	3	Voltronic
4	4	Must
5	5	Phocos Any-Grid
6	6	
7	7	
8	8	
9	9	
10	A	
11	B	
12	C	
13	D	
14	E	
15	F	

3 Installation

3.1 Unpacking the Package

1）Cut the Packing tape and open the carton，and remove the EPE foam.

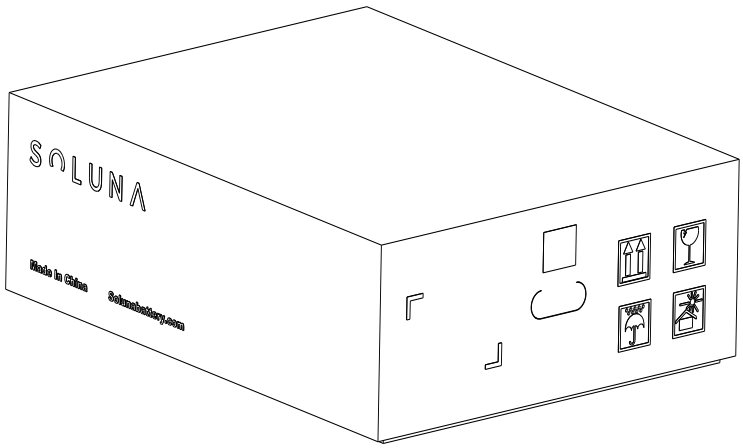


Figure 3.1 Package

⚠	The battery pack is too heavy for one to carry. Make sure that two or more persons are moving the battery pack together.

2） Pull out the Battery Pack, and remove the Scale board、PE bag、Carton、 EPE Foam.

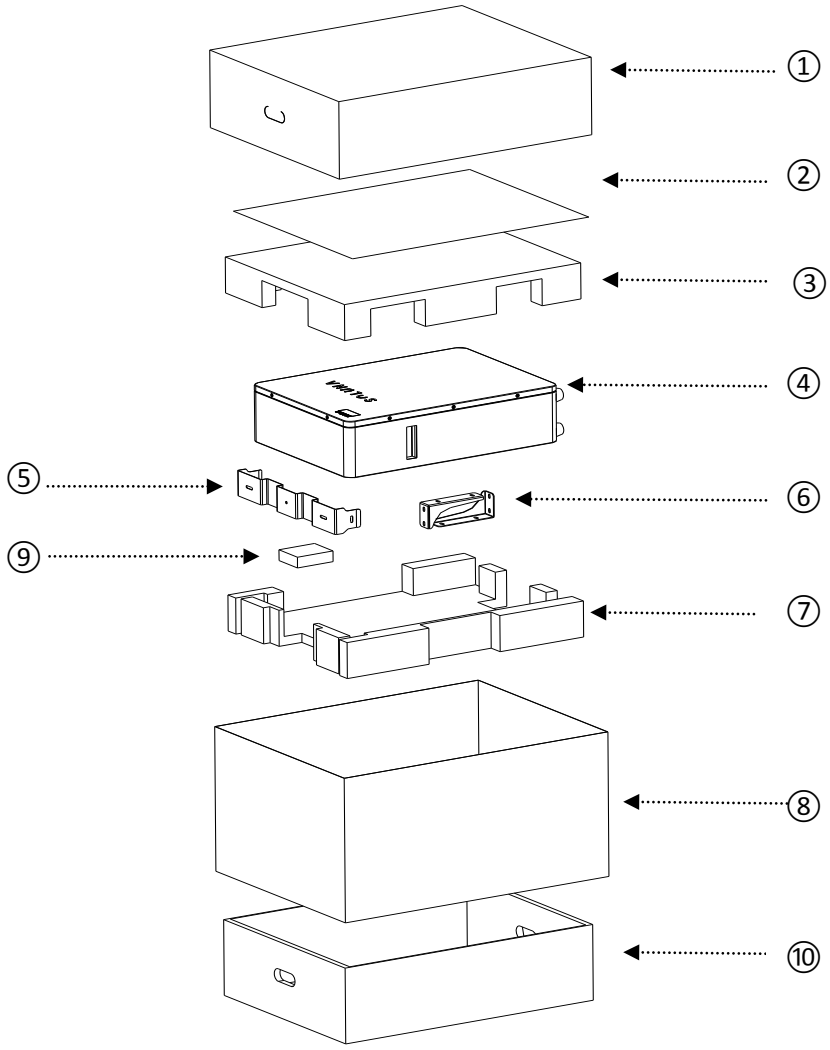


Figure 3.2 Unpacking the Package

Number	Name	Remark
①	Upper cover of Packing case	
②	Positioning plate	
③⑦	EPE foam	
⑤⑥	Accessories Package	
④	Soluna Bes 5K Pack	
⑧	PE bag	
⑨	Package	
⑩	Lower cover of Packing case	

3.2 Packing Lists

The following table lists including the numbers of each item. If anything is damaged or missing, contact Soluna or your distributor.

Item	Name	Qty (pcs)	Remark
1	Soluna Bes 5k Pack	1	
2	Expansion Bolt M6*80	6	
3	Screws-M3*8	2	
4	Flat Screw Driver	1	
5	Star Screw Driver	1	
6	Communication Cable	1	
7	Wall Support	1	
8	Wall Bracket	2	
9	M5 Screw	6	
10	Positioning Plate	1	

3.3 Installation Materials

These installation materials shall be prepared by installers.

- Charging cables.
- Network cable.

3.4 Installation Location

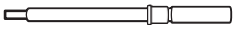
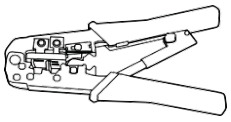
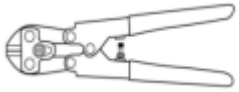
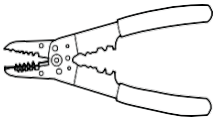
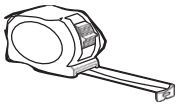
We recommend the Soluna Bes 5K Pack for home energy storage systems, if not, please make sure that the installation location meets the following conditions:

- The building is designed to withstand earthquakes.
- The location is far away from the sea, to avoid salt water and humidity.
- The floor is flat and level.
- There are no flammable or explosive materials nearby.
- The ambient temperature is between 15 and 30°C.
- The temperature and humidity stays at a constant level.
- There is minimal dust and dirt in the area.
- There are no corrosive gases present, including ammonia and acid vapor.

⚠	If the ambient temperature is outside the operating range, the battery pack stops operating to protect itself. The optimal temperature range for the battery pack to operate is 15°C to 30°C. Frequent exposure to harsh temperatures may deteriorate the performance and lifetime of the battery pack.

3.5 Installation Tools

The following tools are required to install the battery pack:

Item	Photo	Name
1		Phillips-screwdriver bit
2		Hexagon wrench
3		Network crimper
4		Wire cutters
5		Wire stripper
6		Tape measure

Remark:
Use properly insulated tools to prevent accidental electric shock or short circuits.

3.6 Safety Gear

Wear the following safety gear when handing with the battery pack. Installers must meet the relevant requirements of international standards, such as IEC 60364, or the domestic legislation.

Item	Photo	Name
1		Insulated gloves
2		Safety goggles
3		Safety shoes

3.7 Wiring Specification

In order to standardize the wiring specification of the Soluna Bes 5K Pack, the following requirements are required for connecting wires of the Soluna Bes 5K Pack.

Battery Wire	Communication Cable
It is recommended to use 26 mm² (3AWG)of conductor with double insulation.	It is recommended to use Standard communication cable with shielding function.

3.8 Battery Units Parallel Communication Connection

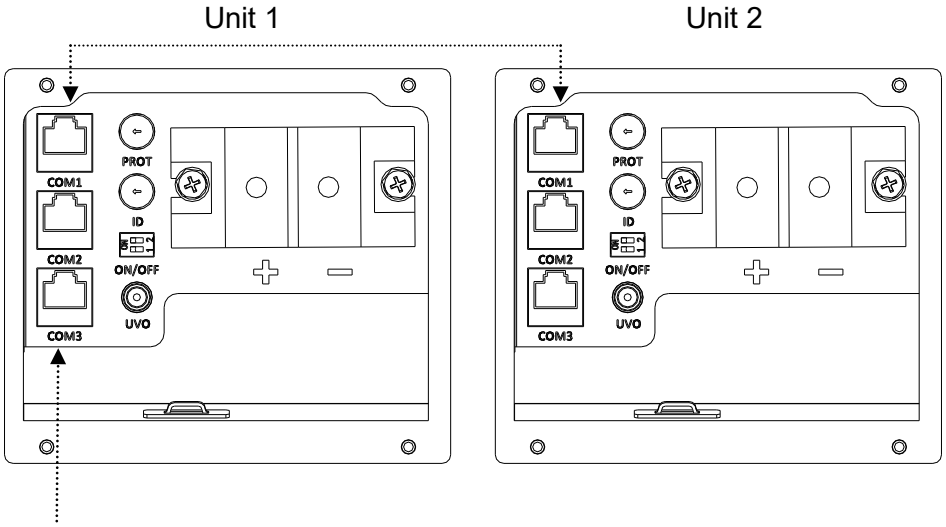


Figure 3.3 Communication connection

Remark

1) The master and slave are connected by COM 1 or COM 2.
2) The COM 3 of the master is connected to the inverter.
3) Please find the above drawings for details.

3.9 Installation Method

The following two methods are recommended for installing the Soluna Bes 5K Pack：

3.9.1 Wall Mounting

1) Put the positioning cardboard against the wall to mark the location of the mounting holes.
2) Use a percussion drill to make holes at the marked positions, and the size of the hole is ø 10mm.
3) Use 6 expansion screws to install the wall bracket and the wall mounting bracket to the wall.
4) Put the battery on the wall bracket.
5) Install the product on the bracket with 6 M5 screws (Screw torque standard:3.60-4.40 N*m).
6) After fixing the product, install the wire harness.

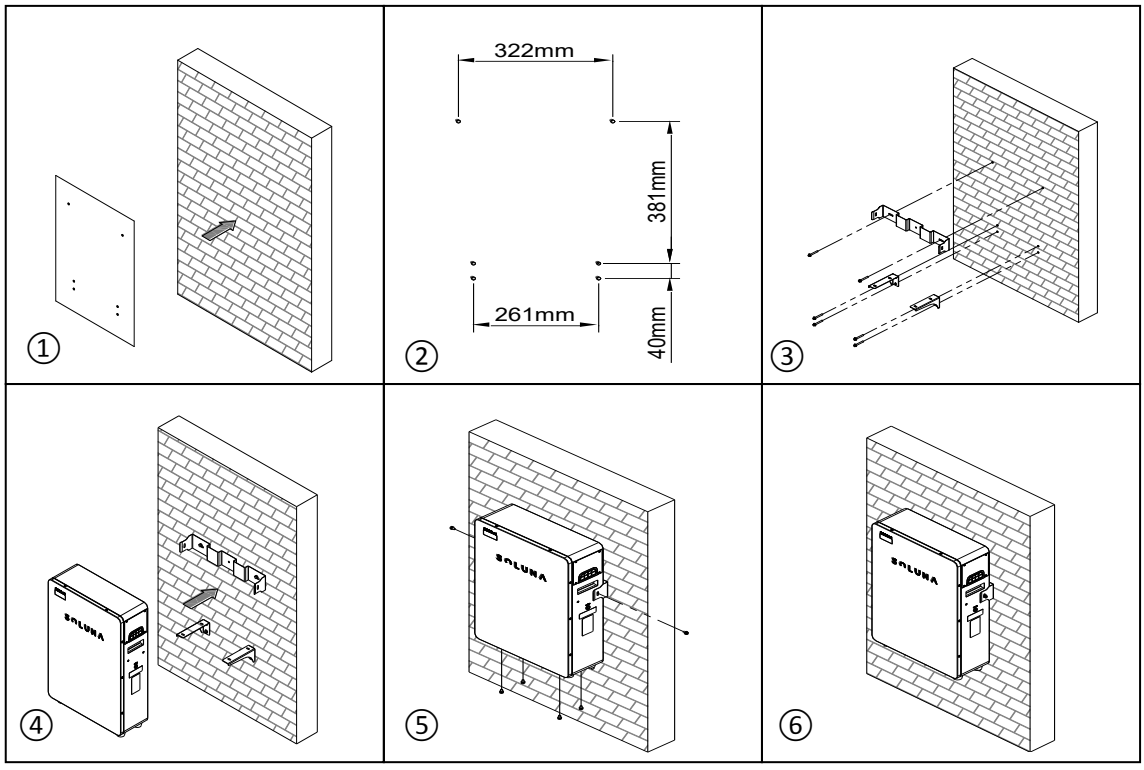


Figure 3.4 Wall Mounting

3.9.2 Floor Mounting

1) Use a percussion drill to make holes at the marked positions, and the size of the hole is ø 10mm.
2) Use 2 expansion screws to install the wall bracket and the wall mounting bracket to the wall.
3) Put the battery on the wall bracket.
4) Install the product on the bracket with 2 M5 screws (Screw torque standard:3.60-4.40N*m).
5) After fixing the product, install the wire harness.

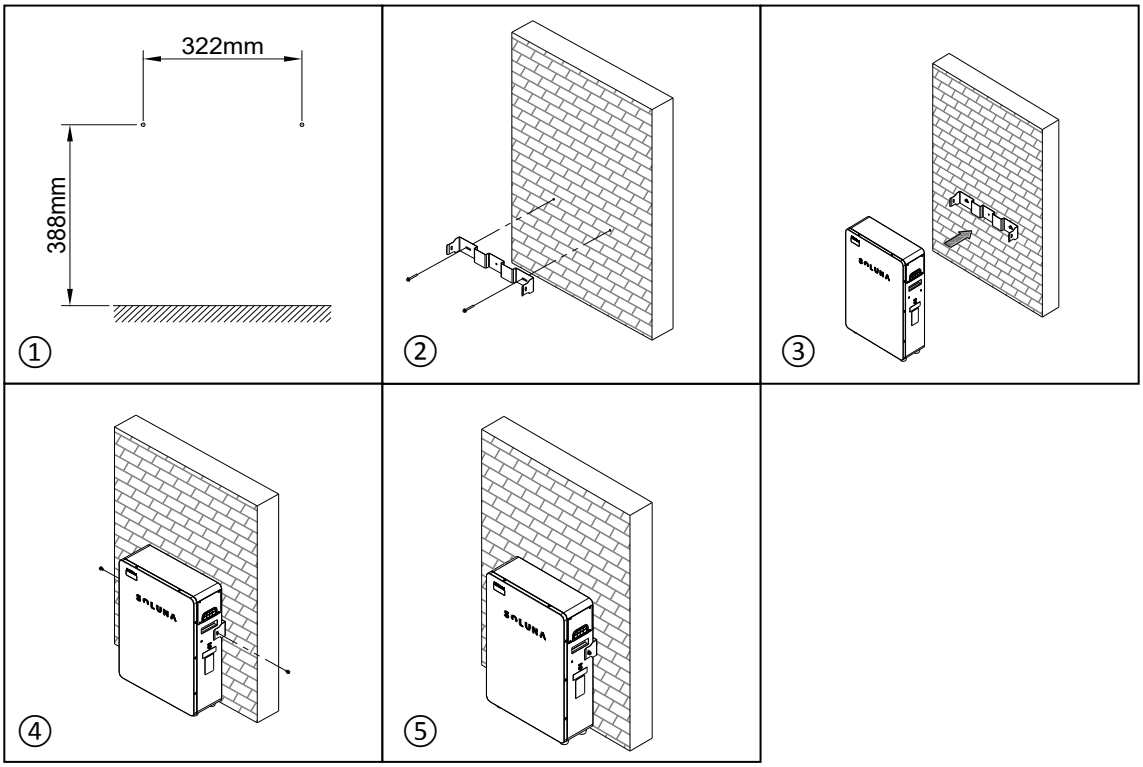


Figure 3.5 Floor mounting

4 How to Operate the Soluna Bes 5K Pack

Please see below information for details to start the Soluna Bes 5K Pack.
Press the ON/OFF button, and the Soluna Bes 5K Pack will start working within 15 seconds. The Soluna Bes 5K Pack will stop output if there is no communication between battery and inverter within 10 minutes.

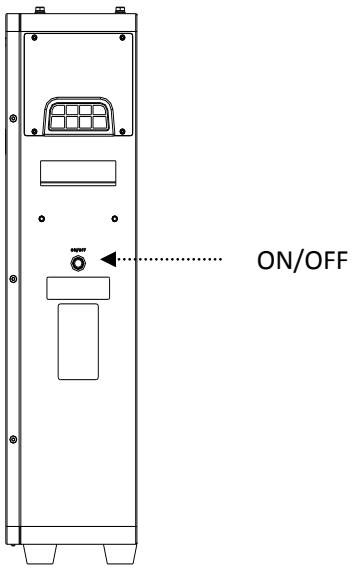


Figure 4.1 ON/OFF

5 Electrical Connection

There are 2 ways to connect the battery to the inverter. The details are as follows.

5.1 Connection of Single Battery to the Inverter

Please find the following diagram for details.

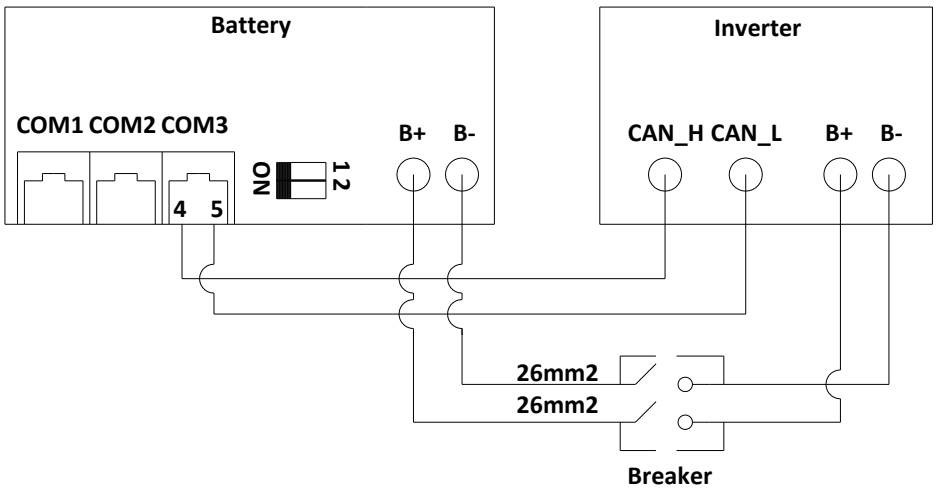


Figure 5.1 CAN Communication Electrical connection

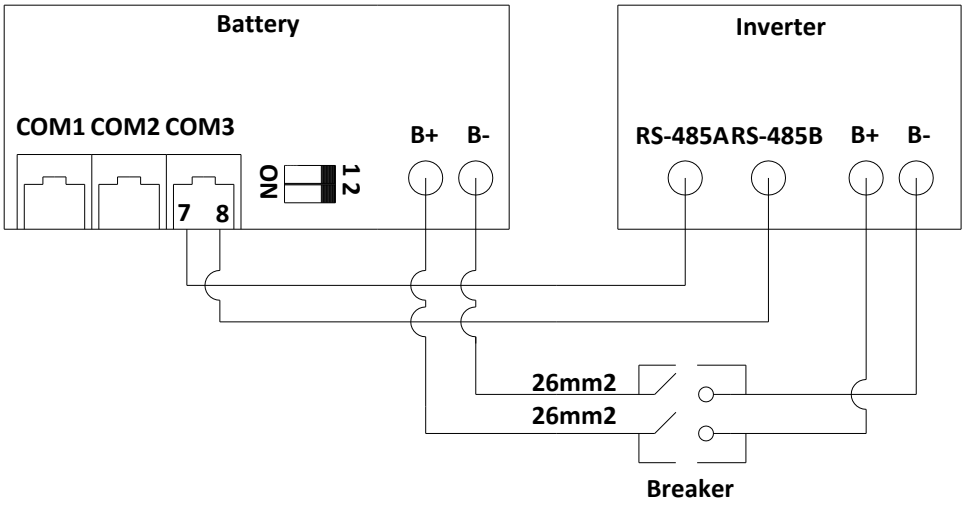


Figure 5.2 RS485 Communication Electrical connection

Remark

When using the CAN interface to communicate with the inverter, either or both of the Dip Resistance 1 & 2 should be in the “ON” position.

5.2 Connection of Multiple Batteries to the Inverter

Please find the following diagram for details.

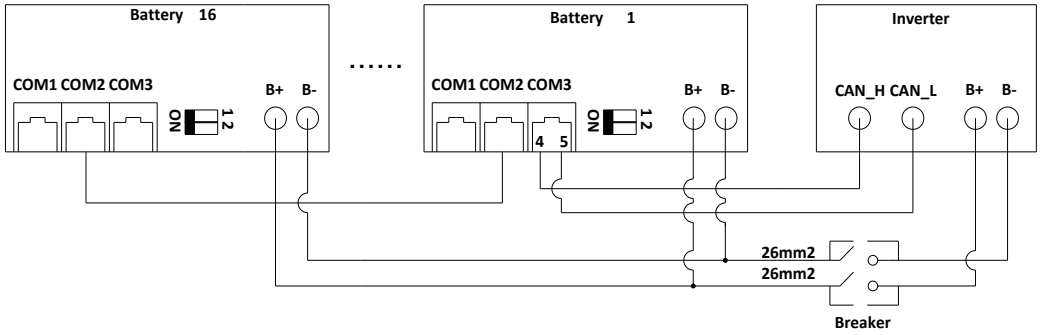


Figure 5.3 CAN Communication Electrical connection

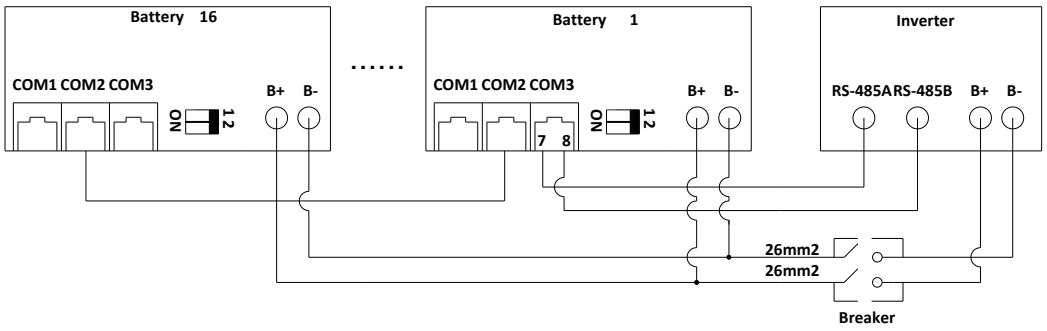


Figure 5.4 RS485 Communication Electrical connection

Remark

When using the CAN interface to communicate with the inverter, either or both of the Dip Resistance 1 & 2 on the first & last battery should be in the “ON” position.

6 Trouble Shooting Guideline

Please find the following table for details:

Phenomenon	LED Alarm	Cause	Solution
System not working properly；	Flashes 1 time every 5 seconds；	Battery ID address is duplicated；	Check whether the battery ID has duplicate addresses. After modification, please shut down and restart all batteries with duplicate addresses；
The system shuts down after running for about 10 minutes；	Flashes twice every 5 seconds；	Master battery protocol and inverter protocol are not compatible；	Check the master battery protocol address, please restart the master after modification；
System not working properly；	Flashes 3 times every 5 seconds；	Hardware Fault；	Immediately turn off the battery and contact ； after-sales personnel；
When the number of batteries is more than 2, the battery will stop charging and discharging intermittently；	Flashes 4 times every 5 seconds；	The voltage difference between the batteries is more than 1.5V；	The battery is charged and discharged normally. When the voltage difference between the batteries is less than 1.5V, the battery will be automatically paralleled successfully. At the moment of paralleling, the battery will stop charging and discharging intermittently and then resume work. This is a normal phenomenon；
The system shuts down after running for about 10 minutes；	Flashes 5 times every 5 seconds；	The communication between the master and the inverter is interrupted；	1. Check whether the protocol dial position of the master battery corresponds to the inverter protocol； 2. Check whether the communication cable between the master and the

			inverter is correct, whether the communication interface is plugged in correctly, and whether it is inserted firmly； 3. If the above cannot be solved, please contact the after sales personnel；
The master is running normally, and the battery of the slave is turned off；	Flashes 6 times every 5 seconds；	No communication between master and slave ；	Check whether the communication cable between the master and slave is correct, whether the communication interface is plugged in correctly, and whether it is inserted firmly；
System not working properly；	Flashes 7 times every 5 seconds；	There is a problem with the charging MOSFET；	Stop charging and discharging, turn off the battery and contact the after-sales personnel, do not touch the positive and negative poles of the battery, let the professionals finalize；
System not working properly；	Flashes 8 times every 5 seconds；	There is a problem with the discharging MOSFET；	Stop charging and discharging, turn off the battery and contact the after-sales personnel, do not touch the positive and negative poles of the battery, let the professionals finalize；
The battery cannot be charged or discharged；	Flashes 9 times every 5 seconds；	The battery temperature detection harness is damaged；	Please contact the after sales personnel and let the after sales personnel handle it；
System not working properly；	Alarm LED always on and SOC is lower than 25%；	The battery triggers the mandatory protection state；	1. Power off and restart the battery for charging； 2. Contact the after sales personnel；

No output after battery power on；		1. The master address is wrong； 2. MOSFET open； 3. FUSE burnt；	1. Check whether master address is 0； 2. Is the positive and negative wiring of the battery correct； 3. Check whether there is protection through the monitoring software； 4. Measure whether the voltage of the positive and negative poles of the battery is low, lower than 44.8V； 5. Contact the after sales personnel；
The battery cannot be charged or discharged；	LED always on；	Trigger over temperature/under temperature/temperature difference/alarm and protection；	Please contact after sales personnel；

7 Contact Us

If any questions for Soluna system, please contact us.

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