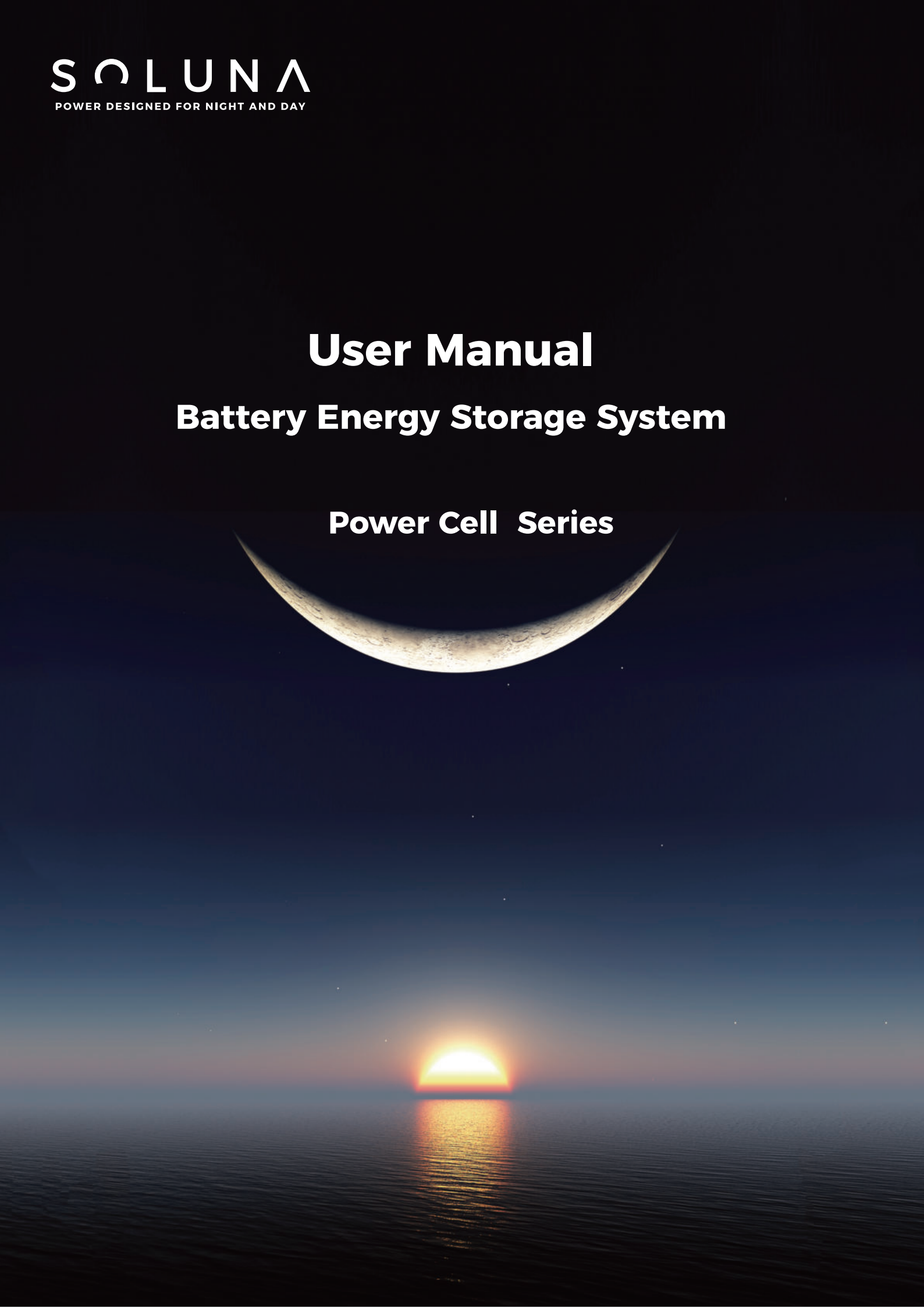
SOLUNA

POWER DESIGNED FOR NIGHT AND DAY

User Manual

Battery Energy Storage System

Power Cell Series



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About this Specification

This manual provides comprehensive instructions for installing the Power Cell Series battery. It is imperative to thoroughly read this manual before attempting to install the product and to follow the instructions diligently throughout the installation process. If you have any doubts about the requirements, recommendations, or safety procedures described in this manual, please contact Soluna immediately for advice and clarification.

The information contained in this manual is accurate at the time of publication. However, due to ongoing updates to product design and technical specifications, our company reserves the right to make changes at any time without prior notice. Additionally, the illustrations included in this manual are intended to aid in explaining system configuration concepts and installation instructions. The items depicted in the illustrations may differ from the actual items at the installation site.

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1 Introduction

Introduction

The Power Cell Series is an advanced LFP lithium battery product designed to meet the highest standards of performance and safety. Equipped with a sophisticated Battery Management System (BMS), this high-voltage battery module features CAN communication for seamless integration and monitoring. It includes comprehensive protections against under-voltage, over-voltage, over-current, over-temperature, and under-temperature, ensuring optimal performance and safety under various conditions.

With its high energy density, long lifespan, and robust reliability, the Power Cell Series stands out as a green environmental product you can trust. Its innovative design not only enhances efficiency but also contributes to sustainability, making it an ideal choice for Backup Power, Micro-grid Solutions, and Small Industrial & Commercial Energy Storage Systems.

2 Features

Features

Below are the main features of this product, showcasing its advanced capabilities and benefits.

- **Excellent Safety Performance**
  Ensures the highest level of safety under various conditions.
- **Long Cycle Life**
  Designed for extended usage without significant performance degradation.
- **Support for CAN Communication**
  Allows seamless integration and communication with other systems.
- **High Energy Density**
  Provides more power in a compact size.
- **Advanced Battery Management System**
  Monitors and manages the battery's functions for optimal performance and safety.
- **Expandable Battery Units**
  Offers flexibility to scale the system as needed.
- **Wi-Fi Monitoring**
  Enables remote monitoring and management.
- **LCD Display and Settings**
  Provides easy access to system information and configuration.
- **Fire, Smoke, and Water Detection**
  Includes comprehensive safety protections.
- **Built-in Air Conditioning with Adjustable Temperature**
  Maintains optimal operating conditions.
- **Supports Up to 5 Parallel Connections**
  Allows multiple batteries to be connected, enhancing system capacity and reliability.

3 Safety Precautions

3.1 Warning Signs

Warning signs are essential indicators designed to alert you to conditions that could result in severe injury or significant damage to the device. They serve as critical reminders to exercise caution and take necessary precautions to prevent hazardous situations. The table below outlines the warning signs used in this manual and their meanings:

Sign	Description
	High Voltage Warning: This battery pack operates at high voltage,which can cause severe injury due to electric shock.Description
	Correct Polarity: Ensure the battery polarity is correctly connected.
	Fire Safety: Keep the battery pack away from open flames or ignition sources.
	Child Safety: Store the battery pack out of reach of children.
	Installation Manual: Thoroughly read the manual before installing and operating the battery pack.
	Heavy Weight Warning: The battery pack is heavy, and improper handling may result in severe injury. Utilize proper lifting techniques.
	Electrolyte Leakage: The battery pack may leak corrosive electrolyte. Handle with care and adhere to appropriate safety procedures.
	Explosion Risk: The battery pack may explode under certain conditions.
	Disposal Instructions: Do not dispose of the battery pack with household waste at the end of its working life. Follow local regulations for disposal.
	Compliance Requirement: Failure to follow the provided requirements and guidelines may lead to physical injury or damage to the device.
	Do not short circuit.
	Grounding conductor This symbol indicates the position for connecting a groundingconductor.

3.2 Safety Instructions

For safety reasons, it is crucial that installers thoroughly familiarize themselves with the contents of this manual and all associated warnings prior to commencing the installation.

General Safety Precautions

Failure to adhere to the precautions outlined in this section can result in serious injury or property damage. Please observe the following safety guidelines:

3.2.1 Risks of Explosion

- Avoid subjecting the battery pack to strong impacts.
- Do not crush or puncture the battery pack.
- Never dispose of the battery pack in a fire.

3.2.2 Risks of Fire

- Do not expose the battery pack to temperatures exceeding 60˚C.
- Keep the battery pack away from heat sources, such as fireplaces.
- Avoid exposing the battery pack to direct sunlight.
- Ensure the battery connectors do not come into contact with conductive objects like wires.

3.2.3 Risks of Electric Shock

- Refrain from disassembling the battery pack.
- Do not touch the battery pack with wet hands.
- Keep the battery pack away from moisture or liquids
- Ensure the battery pack is kept away from children and animals.

3.2.4 Risks of Damage to the Battery Pack

- Prevent the battery pack from coming into contact with any liquids.
- Avoid subjecting the battery pack to high pressures.
- Do not place any objects on top of the battery pack

3.3 Battery Handling Guide

- Use the battery pack strictly as directed in the manual.
- Do not use the battery pack if it appears defective, cracked, broken, or fails to operate correctly.
- Do not attempt to open, disassemble, repair, tamper with, or modify the battery pack as it is not user serviceable.
- Handle the battery pack with care during transportation to avoid damage.
- Avoid impacting, pulling, dragging, or stepping on the battery pack.

3.4 Response to Emergency Situations

The Power Cell Series consists of multiple batteries designed to prevent hazards resulting from failures. However, Soluna cannot guarantee absolute safety. Please familiarize yourself with the following emergency procedure

3.4.1 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 exposed to the leaked substance, follow these steps:

3.4.2 Inhalation

- Evacuate the contaminated area immediately.
- Seek medical attention without delay

3.4.3 Eye Contact

- Rinse eyes with flowing water for at least 15 minutes.
- Seek medical attention immediately.

3.4.4 Skin Contact

- Wash the affected area thoroughly with soap and water.
- Seek medical attention immediately.

3.4.5 Ingestion

- Induce vomiting.
- Seek medical attention immediately.

3.4.6 Fire Response Procedures

In the event of a fire, always have an ABC or carbon dioxide extinguisher on hand.

The battery pack may ignite if heated above 150˚C. If a fire occurs where the battery pack is installed, follow these steps:

- **Extinguish Early**

  Attempt to extinguish the fire before the battery pack ignites.

- **Safe Relocation**

  If extinguishing is not possible but time allows, move the battery pack to a safe area before it catches fire.

- **Evacuate**

  If the battery pack has already caught fire, do not attempt to extinguish it. Evacuate the area immediately.

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

3.4.7 Wet Batteries

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

3.4.8 Damaged Batteries

Damaged batteries are hazardous and must be handled with extreme caution. They are unfit for use and may pose a danger to people or property.

If the battery pack appears damaged, pack it in its original container and return it to Soluna or your distributor.

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

3.5 Qualified Installers

This manual, along with the tasks and procedures described herein, is intended for use by skilled professionals only. A skilled professional is defined as a trained and qualified electrician or installer who possesses all of the following skills and experience:

- **Functional Knowledge**

  Understanding of the principles and operation of on-grid systems.

- **Risk Awareness**

  Awareness of the dangers and risks associated with installing and using electrical devices and the acceptable methods for mitigating these risks.

- **Installation Proficiency**

  Expertise in the installation of electrical devices.

- **Adherence to Guidelines**

  Knowledge of and compliance with this manual, including all safety precautions and best practices.

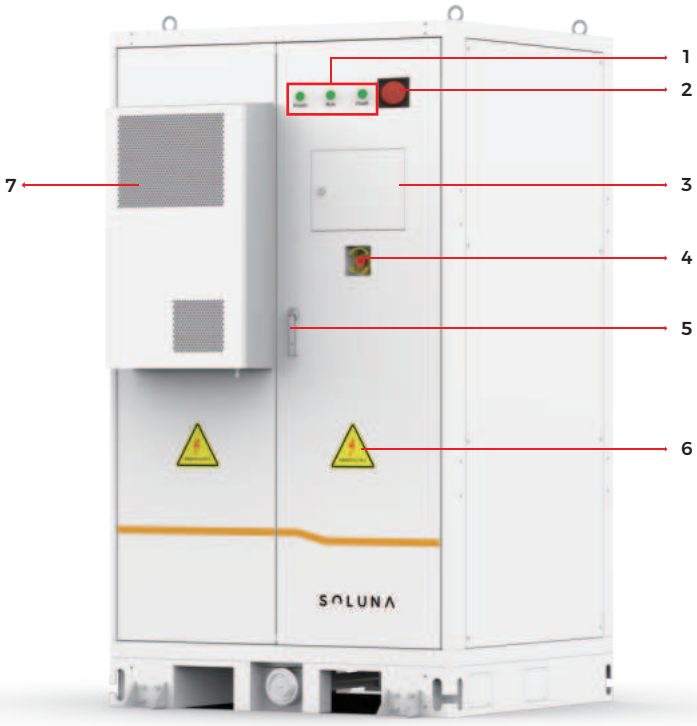
- **Battery Maintenance**

  Only authorized personnel should perform maintenance.Turn off the battery before maintenance.Periodically check voltage, SOC, and cables for damage or wear.Perform balancing maintenance (fully charge) every three months.

- **Installation Environment Requirements**

  Avoid flammable, explosive, or corrosive materials. Keep out of children's reach and avoid high temperatures.Ensure proper ventilation and avoid electromagnetic interference. Install in a sheltered, well-ventilated area, within the appropriate temperature and humidity range, and below 2000 meters altitude.

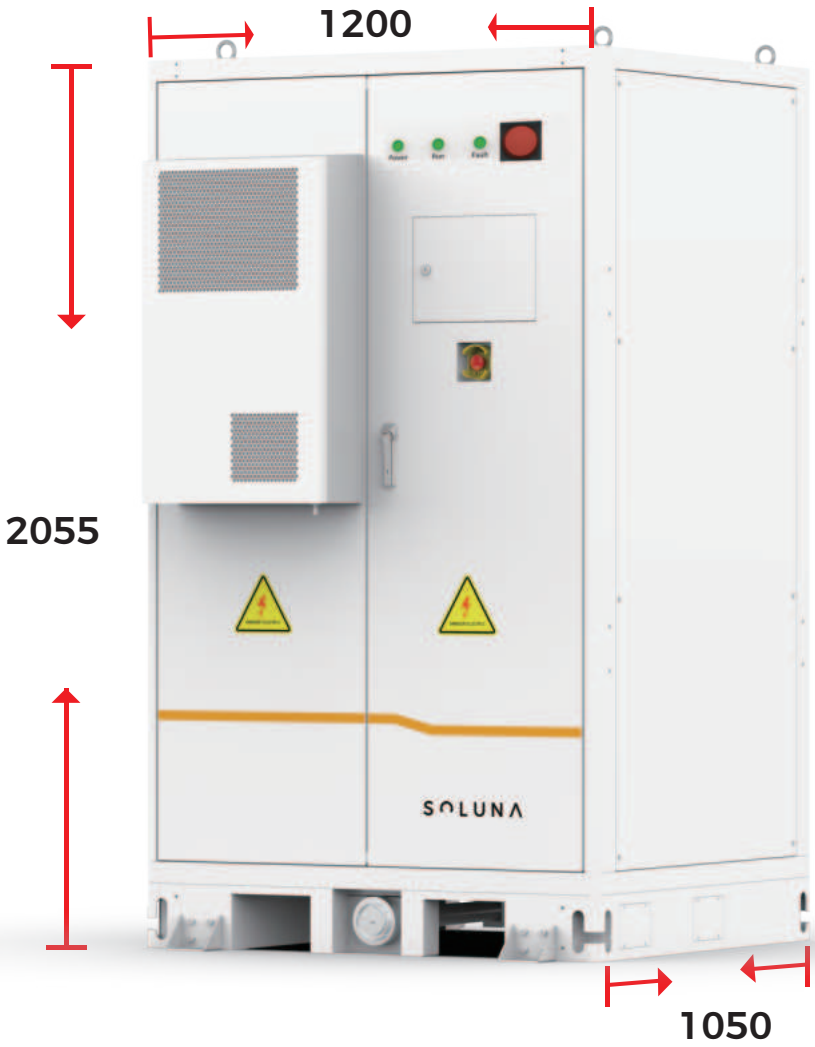
4 Appearance



No	Name	Remark
1	Status Indicator Light	Displays the current working status of the battery system.
2	Acousto-optic alarm	Emits an alarm when a fault occurs.
3	Operation display	Allows viewing and setting of battery system parameters.
4	Emergency stop button	Press this button in case of an emergency.
5	Door lock	Acts as a safety protection device.
6	Danger sign	Serves as a reminder and warning.
7	Air conditioner ①	Adjusts the temperature inside the battery system.

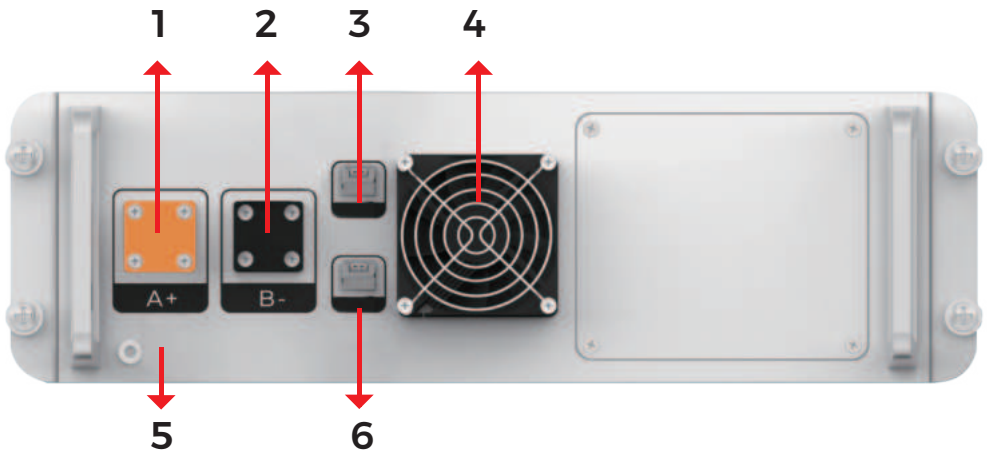
① Suitable for Use with European Grid Only: 230V 50Hz

4.2 Dimensions introduction



Width	1200	mm
Depth	1050	mm
Height	2055	mm

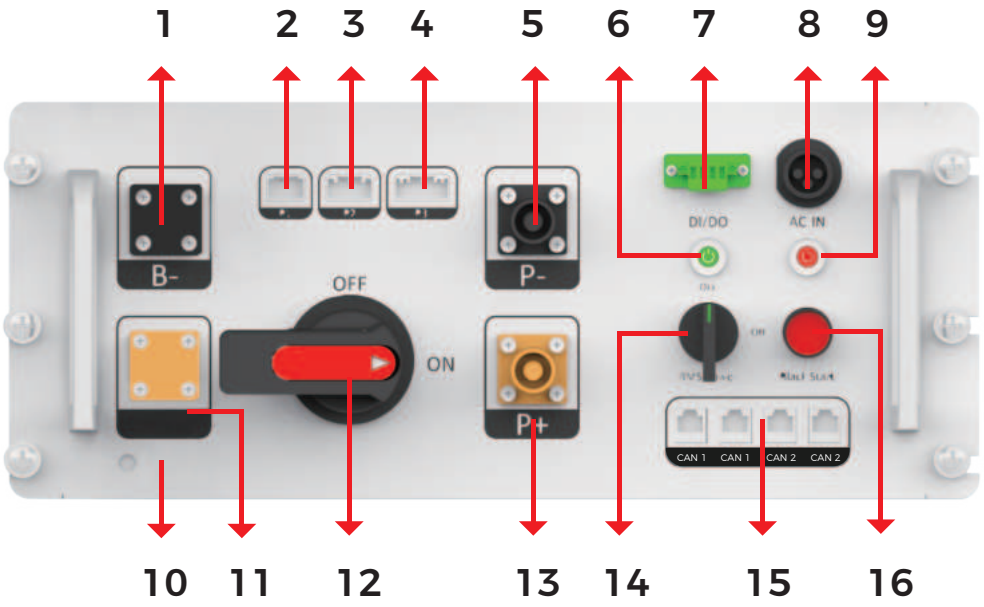
4.3 Battery module introduction



Battery module interface diagram

No	Name	Remark
1	B+	Battery Module Positive Port: Connects to the positive terminal of the battery system.
2	B-	Battery Module Negative Port: Connects to the negative terminal of the battery system.
3 / 6	P1	Battery Module Expansion Port: Allows for the expansion of the battery system.
4	Fan	Heat Dissipation Function: Manages and dissipates heat to maintain optimal operating temperature.
5	PE	Battery Module Ground Point: Provides a grounding connection for safety.

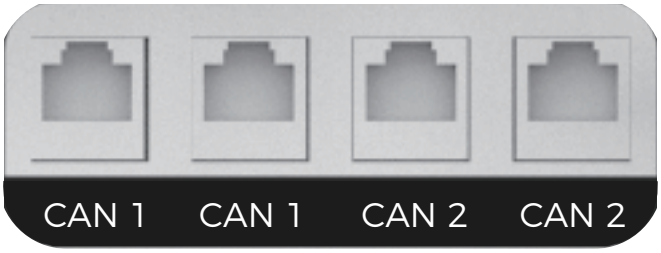
4.4 Main control module introduction



No	Name	Remark
1	B-	Battery Module Negative Port: Connects to the negative terminal of the battery module.
2	P1	Battery Module Expansion Port: Allows for the expansion of the battery system.
3	P2	Emergency Stop, Fire, Sound and Light Alarm, Access Switch Control Port: Provides connections for emergency stop, fire alarms, and other safety controls.
4	P3	LCD Communication, Air Conditioning Communication, RS485 Communication Port: Supports communication for LCD, air conditioning, and RS485 protocols.
5	P-	Output Negative of Battery Module: Connects to the negative output terminal of the battery module.

6	BMS Power Indicator Light	BMS Power Indicator: Indicates that the Battery Management System (BMS) is powered on.
7	DI/DO	LED Light Power Connection Port: Connects power to the LED light.
8	AC-IN	AC Input Port: Connects to the alternating current (AC) input.
9	Black Start Signal Indicator	Black Start Function Indicator: Indicates that the battery has entered the black start function.
10	PE	Ground Point: Provides a grounding connection for safety.
11	B+	Battery Module Positive Port: Connects to the positive terminal of the battery module.
12	Battery Circuit Switch	Battery Output Switch: Controls the on/off state of the battery output.
13	P+	Output Positive of Battery Module: Connects to the positive output terminal of the battery module.
14	BMS Power Switch	BMS Power Control: Used to control the power-on and power-off of the BMS.
15	Communi–cation Port	CAN1 and CAN2 Ports: CAN1 is used for battery parallel connections; CAN2 is used to communicate with the inverter.
16	Black Start Button	Battery Voltage Output: Press and hold for about 10 seconds to output the battery voltage.

CAN1 and CAN2 communication interface definition as follows:



CAN1 port (for battery communication)

CAN1

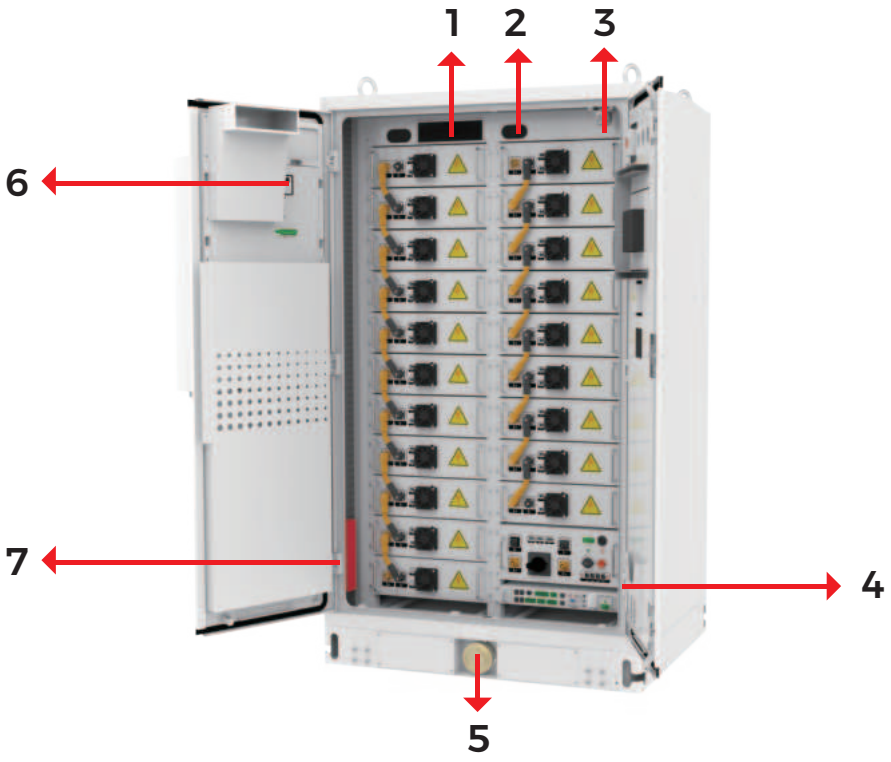
1	2	3	4	5	6	7	8
—	—	—	CAN-H	CAN-L	—	—	—

CAN2 port (for battery communication)

CAN2

1	2	3	4	5	6	7	8
			CAN-H	CAN-L			

4.5 Battery system internal introdution



No	Name	Remark
1	Smoke Detector	Photoelectric Smoke Detector: Used for smoke detection.
2	Light	Cabinet Lighting: Provides illumination inside the cabinet.
3	Door Status Sensor	Door Status Monitor: Monitors the opening and closing status of the door.
4	AC Breaker	AC Power Switch: Switches the AC power supply of the battery system on or off.
5	Water Sensor	Water Detection: Detects water based on the resistance change between both electrodes.
6	Air Conditioning Operating Panel	Air Conditioner Temperature Adjustment: Used to adjust the temperature of the air conditioner.
7	Fire Protection Device	Fire Extinguishing: Used for extinguishing fire.

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5 Technical parameters

Model	Power Cell 1206	Power Cell 1207	Power Cell 1208	Power Cell 1209	Power Cell 1210
Physical characteristics					
Dimensions (W * D * H)	1200*1050*2055mm				
Weight(kg)	820	890	960	1030	1100
Electrical characteristics					
Battery type	LFP				
Number of modules	6	7	8	9	10
Number of cell strings	72	84	96	108	120
Total energy capacity(kWh)	46.08	53.76	61.44	69.12	76.8
Usable energy capacity(kWh)	36.86	43.00	49.15	55.29	61.44
Battery nominal capacity (Ah)	200				
Voltage range(V)	201.6~252	235.2~294	268.8~336	302.4~378	336~420
Nominal voltage(V)	230.4	268.8	307.2	345.6	384
Charge voltage(V)	246.2	287.2	328.3	369.3	410.4
Discharge cut-off voltage(V)	226.8	264.6	302.4	340.2	378
Nominal charge/discharge current (Al)	100A/100A				
Max charge/discharge current (A)	100A/200A				
Recommend Depth of Discharge	80% ①				
Cycle life	≥6000 times(25℃/under standard charge and discharge conditions,charge 0.2C,discharge 0.2C) ②				
Number of expandable battery units	5				

5 Technical parameters

Model	Power Cell 1206	Power Cell 1207	Power Cell 1208	Power Cell 1209	Power Cell 1210
BMS					
Monitoring parameters	System Voltage/System Current/Cell Voltage/Cell temperature				
Communication	CAN				
Operating conditions					
Condition	Can be used indoors and outdoors				
Operating temperature	-20~50℃ ③				
Fire protection system	Aerosols				
Storage temperature	-20~60℃	≤7 days			
	-20~45℃	≤1 month			
	0~45℃	≤3 months			
	0~25℃	≤1 years			
Humidity	5%~95%				
Altitude	Max. 2,000m				
Cooling strategy	Fans and air conditioning				
Operating temperature (Recommended)	15~30℃				
Reliability & Certification					
Certificates	IEC62619/IEC62477/UN38.3/RoHS				
Protection grade	IP55				
Warranty					
Please refer to Soluna WARRANTY CONDITIONS					

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5 Technical parameters

Model	Power Cell 1211	Power Cell 1212	Power Cell 1213	Power Cell 1214	Power Cell 1215
Physical characteristics					
Dimensions (W * D * H)	1200*1050*2055mm				
Weight(kg)	1170	1240	1310	1380	1450
Electrical characteristics					
Battery type	LFP				
Number of modules	11	12	13	14	15
Number of cell strings	132	144	156	168	180
Total energy capacity(kWh)	84.48	92.16	99.84	107.52	115.2
Usable energy capacity(kWh)	67.58	73.72	79.87	86.01	92.16
Battery nominal capacity (Ah)	200				
Voltage range(V)	369.6~462	403.2~504	436.8~546	470.4~588	504~630
Nominal voltage(V)	422.4	460.8	499.2	537.6	576
Charge voltage(V)	451.4	492.4	533.5	574.5	615.6
Discharge cut-off voltage(V)	415.8	453.6	491.4	529.2	567
Nominal charge/discharge current (Al)	100A/100A				
Max charge/discharge current (A)	100A/200A				
Recommend Depth of Discharge	80%				
Cycle life	≥6000 times(25℃/under standard charge and discharge conditions,charge 0.2C,discharge 0.2C)				
Number of expandable battery units	5				

5 Technical parameters

Model	Power Cell 1211	Power Cell 1212	Power Cell 1213	Power Cell 1214	Power Cell 1215
BMS					
Monitoring parameters	System Voltage/System Current/Cell Voltage/Cell temperature				
Communication	CAN				
Operating conditions					
Condition	Can be used indoors and outdoors				
Operating temperature	-20~50℃				
Fire protection system	Aerosols				
Storage temperature	-20~60℃	≤7 days			
	-20~45℃	≤1 month			
	0~45℃	≤3 months			
	0~25℃	≤1 years			
Humidity	5%~95%				
Altitude	Max. 2,000m				
Cooling strategy	Fans and air conditioning				
Operating temperature (Recommended)	15~30℃				
Reliability & Certification					
Certificates	IEC62619/IEC62477/UN38.3/RoHS				
Protection grade	IP55				
Warranty					
Please refer to Soluna WARRANTY CONDITIONS					

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5 Technical parameters

Model	Power Cell 1216	Power Cell 1217	Power Cell 1218	Power Cell 1219	Power Cell 1220
Physical characteristics					
Dimensions (W * D * H)	1200*1050*2055mm				
Weight(kg)	1520	1590	1660	1730	1800
Electrical characteristics					
Battery type	LFP				
Number of modules	16	17	18	19	20
Number of cell strings	192	204	216	228	240
Total energy capacity(kWh)	122.88	130.56	138.24	145.92	153.6
Usable energy capacity(kWh)	98.30	104.44	110.59	116.73	122.88
Battery nominal capacity (Ah)	200				
Voltage range(V)	537.6~672	571.2~714	604.8~756	638.4~798	672~840
Nominal voltage(V)	614.4	652.8	691.2	729.6	768
Charge voltage(V)	656.6	697.6	738.7	779.7	820.8
Discharge cut-off voltage(V)	604.8	642.6	680.4	718.2	672
Nominal charge/discharge current (Al)	100A/100A				
Max charge/discharge current (A)	100A/200A				
Recommend Depth of Discharge	80%				
Cycle life	≥6000 times(25℃/under standard charge and discharge conditions,charge 0.2C,discharge 0.2C)				
Number of expandable battery units	5				
DC disconnect	Contactor/Fuse				

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5 Technical parameters

Model	Power Cell 1216	Power Cell 1217	Power Cell 1218	Power Cell 1219	Power Cell 1220
BMS					
Monitoring parameters	System Voltage/System Current/Cell Voltage/Cell temperature				
Communication	CAN				
Operating conditions					
Condition	Can be used indoors and outdoors				
Operating temperature	-20~50℃				
Fire protection system	Aerosols				
Storage temperature	-20~60℃	≤7 days			
	-20~45℃	≤1 month			
	0~45℃	≤3 months			
	0~25℃	≤1 years			
Humidity	5%~95%				
Altitude	Max. 2,000m				
Cooling strategy	Fans and air conditioning				
Operating temperature (Recommended)	15~30℃				
Reliability & Certification					
Certificates	IEC62619/IEC62477/UN38.3/RoHS				
Protection grade	IP55				
Warranty					
Please refer to Soluna WARRANTY CONDITIONS					

SOLUNA

5 Technical parameters

1:Test Conditions: 100% Depth of Discharge (DOD), 0.2℃ charge and discharge at +25±2°C for the battery at the beginning of its life. Usable energy may vary with different inverters.

2: Note: At 25±2°C of cell under 0.5C/0.5C test condition and 70% End of Life (EOL).

3: For long-term storage: Store battery cells in a temperature range of 5~45℃, with relative humidity below 65%, and in a non-corrosive environment. Charge to50-55% SOC before storage to prevent significant cycle life reduction.

NOTE

- When a level 1 alarm is triggered, the charge or discharge rate will be reduced.
- When a level 2 alarm is triggered, charge and discharge operations will be limited to 0A.
- Prolonged discharging at currents below 0.5A may lead to inaccuracies in the State of Charge(SOC)calculation.
- Storage SOC: Maintain a State of charge (SOC) between 30% and 50% for storage, and cycle the charge-discharge process every 6 months.
- Store the battery at a temperature range of 15~30 ℃, for periods not exceeding one year.

6 Equipment Inspection and Storage

6.1 Warning Signs

Before signing for the product, please check the following details:

- **Outer Packaging**

  Inspect for any damage such as holes, deformation, cracks, or other signs that could have harmed the device inside. If any damage is detected, do not open the package and contact your distributor immediately.

- **Equipment Model**

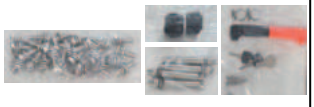
  Verify that the model received is correct. If it is incorrect, do not open the package and contact your distributor.

- **Delivered Parts**

  Check if the delivered parts are the correct type and quantity, and inspect them for damage. If any parts are damaged or incorrect, please contact your distributor.

6.2 Delivery List

After unpacking the product, ensure that all delivery are present and complete. If any components are missing or incomplete, please contact your distributor promptly.

No	Name	Quantity	Picture
1	Power Cell Series battery system	1 PCS	
2	Product manual	1 PCS	
3	Battery charging connector	1 Pair	
4	Screw	1 Bag	

6.3 Device Storage

If the battery system is not put into immediate use, please follow these storage guidelines:

- **Clean Environment**
  Ensure the storage environment is clean, with appropriate temperature and humidity ranges, and no condensation.
- **Professional Check**
  After long-term storage, have the device checked and confirmed by professional personnel before use.
- **Packing Case**
  Store devices in their packing case, with desiccant included, and seal the case.
- **Unpacked Devices**
  If the device is not installed within 3 days after unpacking, return it to its packing box.
- **Extended Storage**
  For storage periods longer than 30 days, adjust the State of Charge (SOC) to 30%-45% and fully charge and discharge the battery every three months.
- **Storage Temperature Ranges**
  - -20℃ to 60℃: Storage should not exceed 7 days.
  - -20℃ to 45℃: Storage should not exceed 7 months.
  - 0℃ to 45℃: Storage should not exceed 3 months.
  - 4.0℃ to 25℃: Storage should not exceed 1 year.
- **Humidity Range**
  Ensure the humidity is between 5-95% with no condensation. Do not install the interface if it is wet or congealed.
- **Storage Location**
  Store the device in a cool place, away from direct sunlight.
- **Hazardous Materials**
  Keep the equipment away from inflammable, explosive, corrosive, and other hazardous items.
- **Transportation and Storage**
  Ensure the battery system is not damaged during transportation and storage.
- **Fire Safety**
  Never put the battery into a fire to avoid the risk of explosion. Be cautious of high ambient temperatures as they can increase the risk of fire.

7 Installation

7.1 Installation Requirements

7.1.1 Installation Environment Requirements

- **Flammability, Explosives, Corrosion**
  Do not install the device in an environment that is flammable, explosive, or corrosive.
- **Child Safety**
  Keep the installation position out of reach of children and away from easily accessible locations.
- **Ventilation and Space**
  The installation space must meet the requirements for ventilation, heat dissipation, and operational space.
- **Protection Level**
  Ensure the device's protection level meets the requirements for outdoor installation, with ambient temperature and humidity within the appropriate range.
- **Installation Location**
  The device must be installed on the outdoor ground and cannot be installed indoors or on the roof of a building.
- **Temperature Management**
  Do not place the device in a high-temperature environment. Ensure there is no heat source near the device.
- **Ease of Operation and Maintenance**
  Install the device at a height that is easy to operate and maintain. Ensure device indicators and all labels are easy to view, and wiring terminals are accessible.
- **Altitude**
  The installation altitude of the energy storage system must be lower than 3000 meters above the maximum working altitude.
- **Electromagnetic Interference**
  Stay away from strong magnetic field environments to avoid electromagnetic interference.

Notice

To ensure optimal performance and longevity of the battery system:

- **Sun Exposure**
  Do not expose the battery system directly to sunlight. It is recommended to build a sunshade to protect it.

- **Cold Area Installation**

  Equipment installed in cold areas should be equipped with a heating system.

If the ambient temperature falls outside the operating range, the battery pack will stop operating to protect itself. The optimal operating temperature range for the battery pack is 15˚C to 30˚C. Frequent exposure to extreme temperatures can degrade the performance and shorten the lifespan of the battery pack.

7.1.2 Installation Angle Requirements

Ensure that the device is installed horizontally. It must not be tilted, placed horizontally on its side, or installed upside down.

7.1.3 Installation Foundation Support Requirements

- **Base Material**

  The device must be installed on a concrete or other non-combustible surface base.

- **Base Condition**

  Before installation, ensure that the base is level, firm, smooth, dry, and capable of bearing the necessary load without sagging or tilting.

- **Cable Routing**

  A trench or cable outlet hole must be reserved in the base to facilitate cable routing.

7.1.4 Installation Tools Requirements

You are advised to use the following installation tools. If necessary, other auxiliary tools can be used on-site

Item	Photo	Name
1		Phillips-screwdriver bit
2		Wire cutters

3		Wire stripper
4		Tape measure
5		Drill
6		Open end wrench
7		Hydraulic clamp
8		Multimeter

When handling the battery pack, it is essential to wear the appropriate safety gear to protectagainst potential hazards, installers must adhere to the relevant reguirements of international standards, such as IEC 60364, or comply with domestic legislation.

1		Safety goggles
2		Safety shoes
3		Insulated gloves

7.1.5 Installation materials

The installers should prepare the following materials.

No	Name	Description
1	Charging Cables	Battery Charging and Discharging: Connect the battery to the inverter to facilitate both charging and discharging processes.
2	Communication Line	Communication Connection: Connect the battery to the inverter for seamless communication.
3	DC Breaker	Control Disconnect: Use the control feature to disconnect the battery from the inverter when necessary.

7.2 Installation battery system

7.2.1 Remove the battery system

Caution

- **Compliance**

  Ensure that all transportation, handling, installation, and other operations comply with the laws, regulations, and relevant standards of the country and region.

- **Professional Training**

  To protect the equipment from damage during transportation, ensure that transportation personnel are professionally trained. Record the operation procedure during transportation and maintain the device's balance to prevent it from falling.

- **Pre-Installation Movement**

  Before installation, move the energy storage system to the installation site. To avoid personal injury or device damage, adhere to the following guidelines:

  - **Personnel and Tools**

    Prepare the necessary personnel and tools according to the weight of the device. Failure to do so may result in injuries due to the weight of the device.

  - **Balance**

    Ensure that the device is kept balanced to avoid falling.

  - **Locked Cabinet Door**

    3.Ensure that the cabinet door is locked during device transportation.

Notice

- **Hoisting and Transport**
  The energy storage system can be hoisted or transported to the installation site using a forklift.
- **Lifting Devices**
  When lifting devices, use flexible straps or slings. Each strap must have a load-bearing capacity of at least 3 tons.
- **Forklift Capacity**
  When using a forklift to move devices, ensure the forklift's bearing capacity is at least 3 tons.

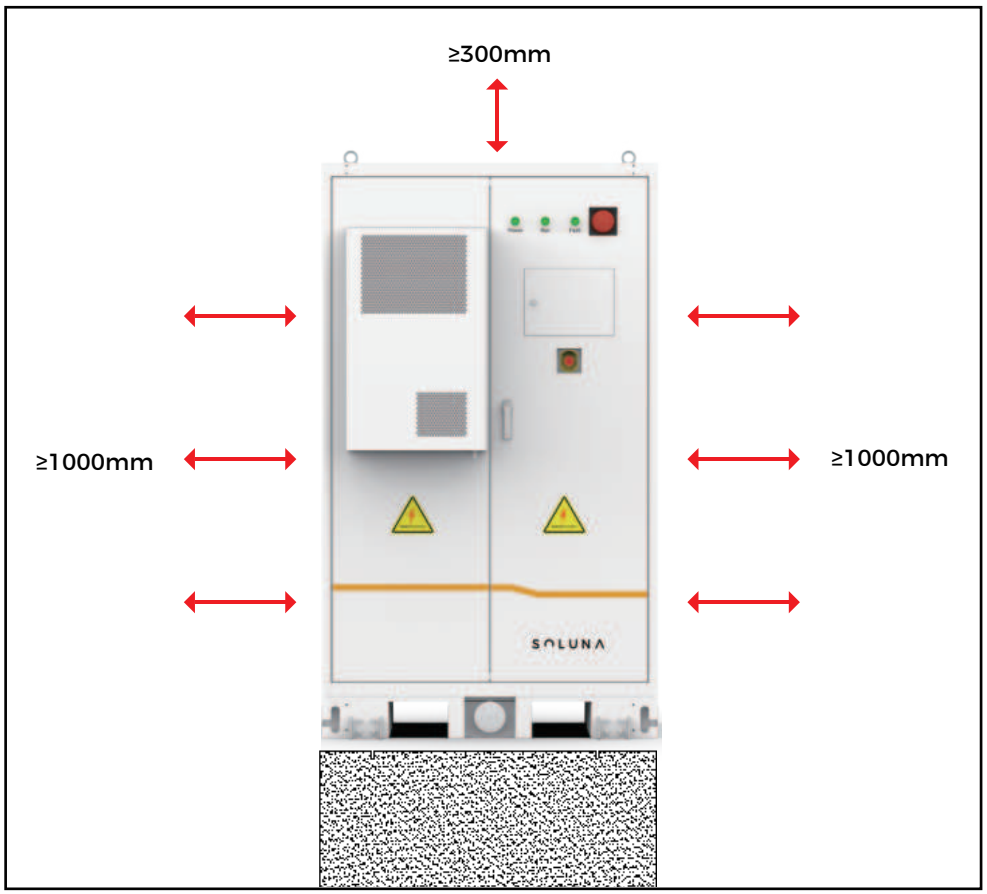
7.2.2 Installation of the Battery System

Caution

- **Vertical Installation**
  Ensure that the energy storage system is pressed vertically to the ground to avoid any tipping risk.
- **Secure Installation**
  Ensure that the energy storage system is securely installed to prevent personnel from falling over.

Installation Preparation

- **Base Installation**
  The cabinet should be installed on the ground with a base height greater than 200mm.
- **Ventilation**
  Maintain good ventilation on both sides of the cabinet, and ensure the minimum gap between both sides and the top, as shown in the following illustration.
- **Inverter Installation**
  Inverters can be installed on both sides of the cabinet.



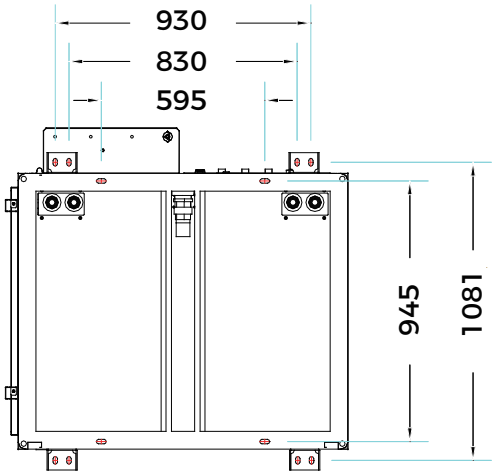
Installation dimension diagram

The key requirements for the base are a height greater than 200mm and a load-bearing capacity greater than 3000kg, with a strong emphasis on ensuring safety and firmness to provide a robust and secure solution. The foundation is crucial as it supports the entire structure, ensuring stability and durability.

Installation guidance

- **Step 1**
  Install the front and rear mounting brackets on the cabinet using M8 screws
- **Step 2: Fix the Base**
  Drill 4 holes in the ground according to the actual size.
  Use expansion screws to secure the base.
  Ensure the base has a bearing capacity of over 3000 kg.
- **Step 3**
  Secure the product to the ground

- **Step 4**
  Install the inverter mounting bracket on the left or right side of the cabinet using M8 screws



unit:mm

- **Step 5**

  Install a movable support on the inverter mounting support, and remove the bottom baffle

unit:mm

- **Step 6**

  Install the cable trough on the side where the inverter bracket is installed

- **Step 7**

  Place the cover plate onto the cable trough to secure it.

As shown in the image, there are screw holes on both sides of the machine. Above is the i-nverter mounting bracket, currently suitable with Solis and Solinteg inverters. Below is the distribution box, facilitating cable management for easy customer installation.

8 Electrical Connection

8.1 Connection Requirements

- **Safety Note**

  Ensure that power supply to the inverter and battery is cut off before making any connections to avoid electric shock.

- **Grounding Instructions**

  This product must be connected to a grounded, metallic, permanent wiring system.

- **Personal Protective Equipment**

  Wear appropriate personal protective equipment, such as safety shoes, safety gloves, and insulating gloves, during electrical connections.

- **Qualified Professionals**

  All electrical connections should be made by qualified professionals.

- **Cable Specifications**

  The cable colors mentioned in this document are for reference only. Cable specifications must comply with local laws and regulations.

- **Warranty Notice**

  Equipment damage caused by incorrect wiring is not covered under the equipment warranty.

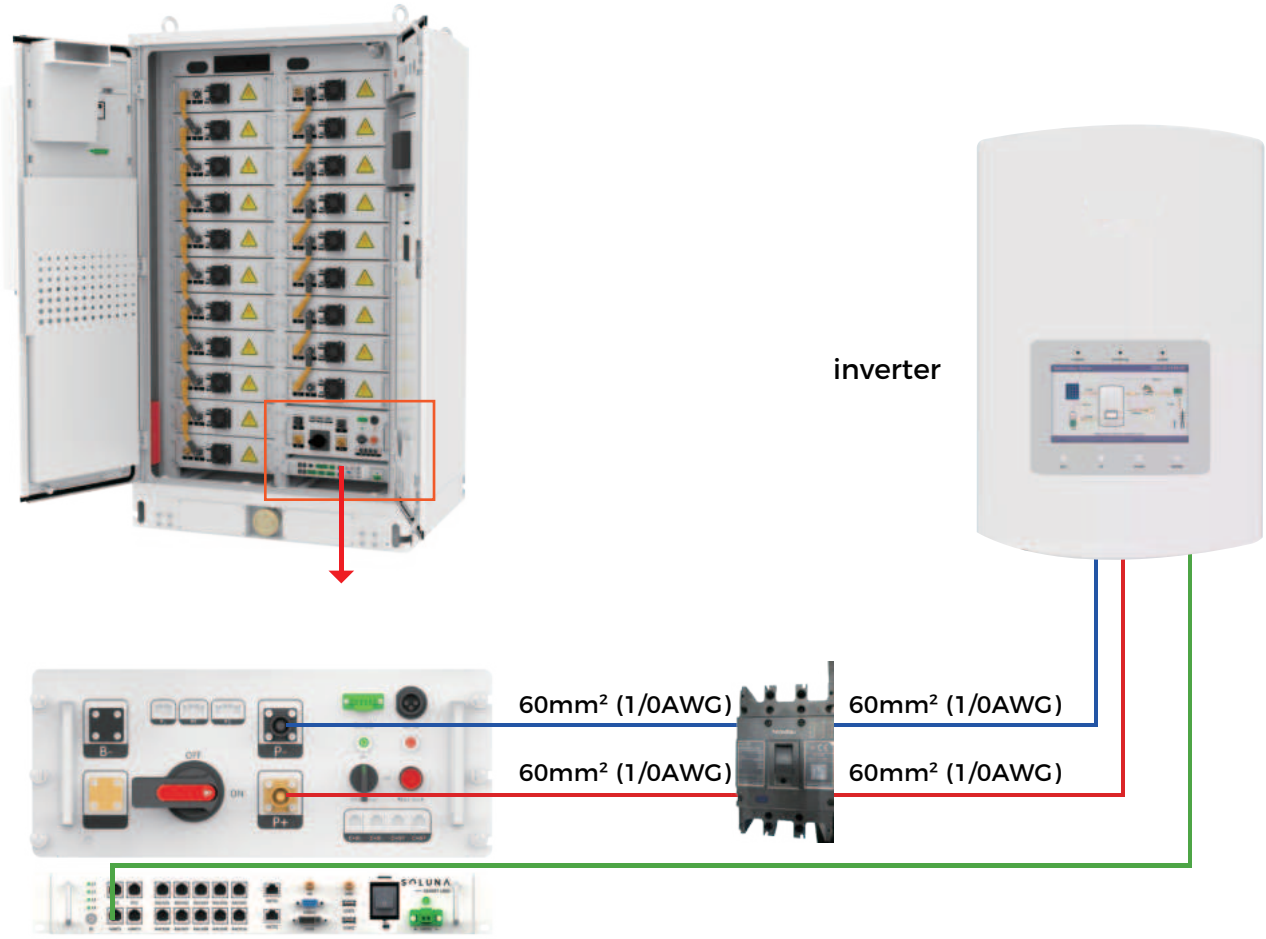
8.2 Electrical SystemConnection Diagram

Remark

The circuit breaker is optional

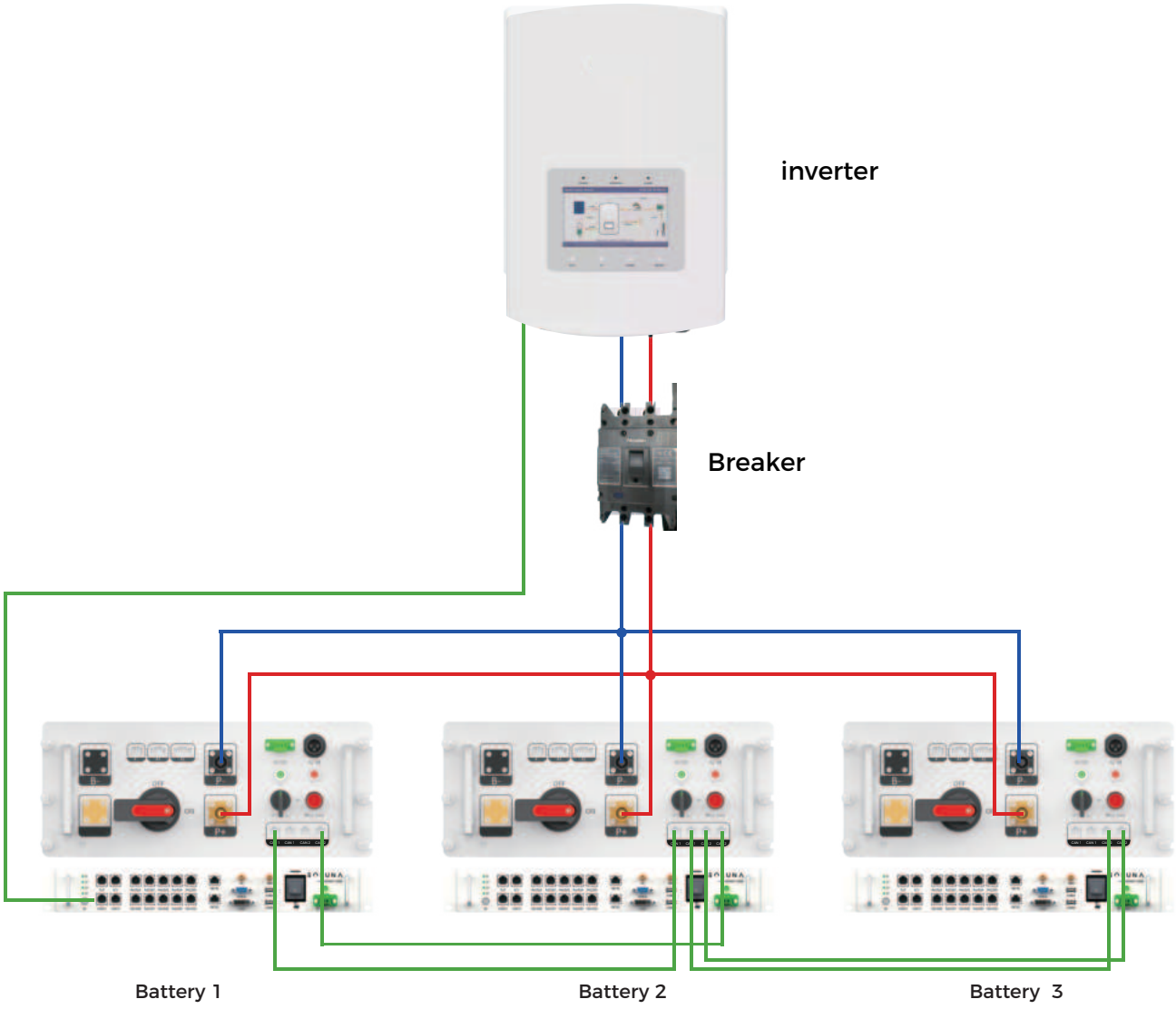
8.21 Standalone

- Communication cable
- Battery positive pole
- Battery negative pole



8.22 Multiple Clusters

- Communication cable
- Battery positive pole
- Battery negative pole



9 Operation instructions

9.1 Check Before Starting Up

- **Firm Installation**

  Ensure the equipment is installed firmly. The location should be convenient for operation and maintenance, with adequate space for ventilation and heat dissipation. Keep the installation environment clean and tidy.

- **Proper Connections**

  Ensure the protection ground cable, battery power cable, inverter power cable, communication cable, and AC cable are properly and securely connected.

- **Cable Bundling**

  Ensure cable bundling meets requirements and is reasonably distributed without any damage.

- **Switch States**

  Before powering on, make sure all switches are in the off state.

Notice

- **Battery Terminals**

  Do not reverse or short circuit the positive and negative electrodes of the battery, as this will damage the battery pack.

- **BMS Communication Line**

  Do not connect the BMS communication line incorrectly, as this will prevent the battery from working or cause damage.

- **Incorrect Wiring**

  Equipment damage caused by incorrect wiring is not covered by the equipment warranty.

9.2 System Startup

- **Step 1**: **Power On the Battery**

  Open the front door of the battery.

  Rotate the BMS Power switch to the ON position.

  Rotate the battery circuit switch to the ON position. The running indicator and the display will light up.

- **Step 2**: **Power On the Inverter**

  Turn on the inverter power PV or power grid. The inverter will start to run.

- **Step 3**: **Select Battery Protocol**
  On the inverter, select the correct battery protocol.
- **Step 4**: **Verify Battery Functionality**
  Check whether the battery can be charged and discharged.

Notice

- **Communication Requirement**

The Power Cell-150 Series must communicate with the inverter normally to function properly.

- **Off-Grid Mode**

In pure off-grid mode, without PV and power grid, press and hold the black start button for an extended time to start the system.

9.3 Status Indicator Light Introduction

No	Picture	Power	Run	Fault	Status
1		on	off	off	Power on
2		on	on	off	Charge and discharge operation
3		on	off	on	Fault
4		off	off	off	Power off

9.4 System Shutdown

- **Step 1**: **Power Off the Battery**
  Rotate the BMS Power switch to the OFF position.
  Rotate the battery circuit switch to the OFF position.
- **Step 2**: **Disconnect Inverter Power Supplies**
  Disconnect all power supplies of the inverter.
- **Step 3**: **Disconnect Air Conditioner**
  Disconnect the air conditioner

10 Maintenance and Troubleshooting

10.1 Maintenance

- **Recharging**

  It is recommended to recharge the battery system every 6 months from the time it leaves the factory.

- **Long-term Inactivity**

  When the system is not used for a long time, disconnect the battery output to avoid battery exhaustion.

- **Regular Inspections**

  During system operation, professionals should regularly check the system for abnormalities and faults. If any issues are found, they should be addressed promptly to prevent permanent damage to the battery system.

- **Cleaning**

  Professionals should regularly clean the surface and interior of the system, ensuring all power is disconnected before cleaning.

- **Storage Period Checks**

  During storage, professionals should regularly check the battery system for abnormalities. Any issues found should be dealt with promptly.

10.2 Troubleshooting

NO	Faults Phenomenon	Faults Cause	Solution
1	The power indicator is off	1)Battery low voltage 2)No AC input	1)Check the battery voltage and charge it 2)Check the AC input
2	The battery has no output voltage	1)No communication with the inverter 2)The fuse or relay or breaker is damaged	1)Check the communication connection between the battery and the inverter 1)Check the fuses,relay and breaker inside the battery

3	Battery communication exception	1)The communication cable is improperly connected or loose 2)The inverter battery protocol is incorrectly selected	1)Check the communication connection between the battery and the inverter 2)Check the Settings of the inverter
4	Battery voltage low	No charging for a long time	Connect the photovoltaic or power grid to enable the inverter to charge the battery
5	The sound and light alarm is blinking	The door was not closed tightly	Check the door
6	Fault indicator light on	The battery is seriously faulty	Check the battery fault history
7	Display screen has no communication	Display screen communication circuit abnormality	Check the display communication line
8	Display not working	Display screen power supply circuit abnormality	Check the display power supply circuit
9	Display screen failure	/	Restart the battery
10	EMS not working	EMS power supply circuit abnormality	Check the EMS power supply circuit
11	EMS network abnormality	Poor indoor network	Check whether the indoor network is normal

12	EMS communication abnormality	The inverter is not connected and the protocol does not match.	Check whether the inverter is connected, whether the inverter is turned on, and whether the protocol matches
12	Battery parallel abnormality	1) Inconsistent protocols 2) Incorrect dip resistors 3) Incorrect communication connections	1) Check the battery protocol 2) Check the DIP resistor 3) Check the communication connection
13	Air conditioning not working	Air conditioner power supply circuit is abnormal	Check the air conditioner power supply circuit

Notice

Damage to the Battery System Due to Under Voltages

- **Timely Charging**

  Charge the over-discharged system within seven days when the temperature is above 25˚C.

  Charge the over-discharged system within fifteen days when the temperature is below 25˚C.

- **Contact for Assistance**

  If the battery system doesn't start up, please contact Soluna local after-sales service within 48 hours. Otherwise, the battery could be permanently damaged.

- **Long-term Inactivity**

  If the battery system cannot be charged for a long time, please turn it off to prevent damage.

11 Depth of Discharge (DoD) setting of inverter

To make sure the battery working smoothly, we recommend the DOD setting of inverter as follows.

On-Grid DOD:80%

Off-Grid DOD:70%

Power dispatching mode DOD:70%

In energy storage systems, reducing the depth of discharge (DOD) of lithium batteries is aimed at **improving system economics, extending battery life, enhancing safety, and optimizing performance**. Below are the specific reasons:

1. Extending Battery Life

- The cycle life of lithium batteries is closely related to the depth of discharge. Deep discharge (e.g., 80%-100% DOD) accelerates battery aging, leading to faster capacity degradation.
- Reducing DOD (e.g., controlling it between 20%-80%) can significantly extend the battery's cycle life, thereby lowering long-term maintenance and replacement costs for the energy storage system.

2. Improving System Economics

- Batteries account for a significant portion of the cost in energy storage systems. Extending battery life means reducing the frequency of battery replacements and lowering the total lifecycle cost.
- Although reducing DOD decreases the available energy per cycle, the overall energy throughput (total charge-discharge capacity) may increase by extending battery life, there by improving economic efficiency.

3. Enhancing Safety

- Deep discharge increases the risk of over-discharge, causing the battery voltage to drop too low, which may lead to irreversible chemical damage (e.g., dissolution of the copper current collector in the anode).
- Reducing DOD can prevent over-discharge, minimize safety risks such as thermal runaway, and ensure stable operation of the energy storage system.

SOLUNA

12 Contact us

If you have any questions, feedback, or need assistance, please feel free to reach out to us. We are here to help!

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