

Low Voltage Series

Battery Energy Storage System

User Manual

AES5.1-L Series

V1.2

Statement

- Please keep this manual in a safe place and strictly follow all safety and usage instructions in this manual. Please do not install and operate the system before reading the manual.
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Responsibility statement:

The equipment manufacturer will not bear any direct or indirect responsibility for the damage to the battery system or property damage caused by the following situations.

- The battery system has been modified or replaced without the authorization of the equipment manufacturer.
- Non-equipment manufacturer's technicians change or clear the battery system serial number.
- The design and installation of the system formed with other equipment does not meet the standards, safety regulations and other relevant requirements.
- Equipment damage caused by failure to comply with the relevant requirements of the battery system user manual.
- Equipment damage caused by improper use or misuse of the battery system.
- Device damage caused by insufficient ventilation of the battery system.
- Maintenance procedures for battery systems do not follow acceptable standards.
- Equipment damage caused by force majeure, such as earthquake, storm, lightning, overvoltage, fire, etc.
- Equipment damage caused by any external factors.

Version Information

Version	Date	Content
V1.0	2024/05/29	First release
V1.1	2024/10/23	Change the LED fault display (9.2Chapter)
V1.2	2025/03/04	Delete the dip switch description (7.2Chapter)

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1. Information in this document

1.1 Content and structure of this document

This document applies to Battery Pack AES5.1-L series.

This document describes the installation, setup, commissioning, configuration, operation, troubleshooting, and operation methods of the product user interface.

Follow all documentation that came with the product, keep them in one convenient place and have them readily available.

The illustrations in this document have been simplified to basic information and may deviate from the actual product.

1.2 Target groups

This document is intended for qualified personnel and end users. Only qualified personnel are allowed to carry out the activities marked with a WARNING sign in this document. Un-marked tasks do not require any specific qualifications and can be performed by end users.

Qualified individuals must possess the following skills:

- Learn how battery systems work and operate.
- Training on how to deal with the hazards and risks associated with the installation and use of electrical equipment, batteries and systems.
- Installation and commissioning training of electrical equipment and systems.
- Learn about applicable standards and directives.
- Understand and follow this document, including all safety precautions.
- Know and follow the battery manufacturer's documentation, including all safety precautions.

1.3 Warning message level

The following levels of warning messages may appear when handling the product.

 Danger
"DANGER" indicates a hazardous situation that, if not avoided, will result in death or serious injury.
 Warning
"WARNING" indicates a hazardous situation that, if not avoided, could result in death or serious injury.
 Cautions
Indicates a potentially hazardous situation that, if not avoided, could result in moderate or minor personal injury.
NOTICE
" NOICE" indicates a situation that, if not avoided, could result in property damage.

2. Safety

2.1 Safety Precautions for Pack

2.1.1 General Safety Precautions

Overvoltage or incorrect wiring can damage the Pack and cause a detonation, which can be extremely dangerous.

Various types of battery breakdown can lead to leakage of electrolyte or flammable gases.

The Pack cannot be repaired by the user.

Please read the "WARNING" label on the side of the Pack carefully.

It is forbidden to connect AC conductors or photovoltaic conductors directly to the Pack, and the Pack can only be connected to the inverter.

Do not charge or discharge damaged batteries.

Do not damage the Pack by dropping, deforming, impacting, cutting or piercing with sharp objects. Otherwise, electrolyte leakage or fire may occur. Do not expose the battery to open flame.

2.1.2 Emergency Response

Pack consists of multiple cells and BMS designed to avoid dangerous due to failure. But their absolute safety cannot be guaranteed.

- The following actions are recommended if the user comes into contact with the material inside the battery due to damage to the battery case.
 - Inhalation: Get out of contaminated area and seek medical attention immediately.
 - Eye Contact: Flush eyes with running water for 15 minutes and seek medical attention immediately.
 - In contact with skin: Wash contact area thoroughly with soap and seek medical attention immediately.
 - Ingestion: Induce vomiting and seek medical attention immediately.

In the event of a fire at the location of the Pack, take the following actions:

- **Extinguishing media**
 - No respirator is required for normal operation.
 - If the fire is not emerging from the battery, has not spread to it, use an ABC fire extinguisher.
- **fire instruction**
 - If a fire occurs while the battery is being charged, when it is safe to do so, disconnect the charging source.

-
- If the Pack does not catch fire, put the fire out before the Pack catches fire.
 - If the Pack is on fire, do not attempt to extinguish the fire, evacuate immediately.



Warning

May explode when heated above 150 °C.

When the pack burns, it will leak toxic gas, so keep it away.

- **Effective ways to deal with accidents**

- on land: Store damaged batteries in an isolated area and contact your local fire department or service engineer.
- In the water: If any part of the battery, inverter or wiring is submerged, keep away from water and do not touch anything.
- (Do not use the submerged battery again and contact a service engineer.)

2.2 Important Safety Instructions

This section contains safety precautions that must always be observed during installation, commissioning or use of the product.

In order to avoid personal injury and property damage and ensure the long-term use of the product, please read this section carefully and strictly observe the safety precautions.



Danger

Risk of electric shock when touching live parts or cables

High voltages are present in the conductive parts and cables of the product. Contact with live parts and cables can result in death or fatal injury from electric shock.

- Contact with non-insulated parts and cables is prohibited.
- Disconnect the product from the voltage source and ensure that it cannot be reconnected before working on the equipment.
- After disconnecting, wait 5 minutes until the capacitors are discharged.
- Do not open this product.
- Appropriate personal protective equipment should be worn when using the product.



Danger

Risk of electric shock when touching live parts or DC cables

When exposed to sunlight, photovoltaic arrays generate high DC voltages present in the DC conductors. Contact with live DC cables can result in death or fatal injury from electric shock.

- Disconnect the inverter from the voltage source and make sure that it cannot be reconnected before working on the equipment.
- Contact with non-insulated parts and cables is prohibited.
- Do not disconnect the DC connector under load.
- Appropriate personal protective equipment should be worn when installing and debugging the product and the inverter.



Warning

Risk of chemical burns from electrolytes or toxic gases

During normal operation of the battery, no electrolyte will leak from the Pack and no toxic gas will be formed. If the Pack is damaged or malfunctioning, it may result in electrolyte leakage or the formation of toxic gases when applied with care.

- Store Pack in a cool dry place.
- Do not drop the Pack or damage the Pack with sharp objects.
- Do not open the Pack.
- Do not install or operate the Pack in potentially explosive atmospheres or areas of high humidity.
- Do not install or operate the Pack if moisture seeps into the Pack (e.g., due to damage to the casing).
- In case of contact with electrolyte, flush affected area with water and seek medical attention immediately.

2.3 Symbol description

Interpretation of the symbols on the Pack nameplate and manual:

Sign	Explanation
	The equipment is potentially hazardous after installation and operation. Take precautions when operating the equipment.
	Be careful with voltage
	Risk of explosion Please use the equipment reasonably, use it in extreme cases, the equipment has the risk of explosion
	View Documentation Instructions Indicates an error, and instructions need to be looked up to determine the cause of the failure.
	The device contains corrosive electrolyte. Avoid contact with leaked electrolyte or volatile gas.
	CE Mark This product complies with the requirements of applicable EU directives.
	Before operating the equipment, please read the product manual carefully.
	Pay attention to personal protection during installation, operation and maintenance.
	The device should be kept away from open flames or sources of ignition.
	Equipment should be kept out of reach of children.
	At the end of the life of the device, do not dispose of this product with household waste, and comply with the e-waste disposal regulations applicable at the installation site.
	Equipment should be recycled in the correct category and recycled in accordance with local environmental regulations
	Do not use water to extinguish fire
	Flammability risk
	Grounding sign

3. Product introduction and application scenarios

3.1 Pack Dimension

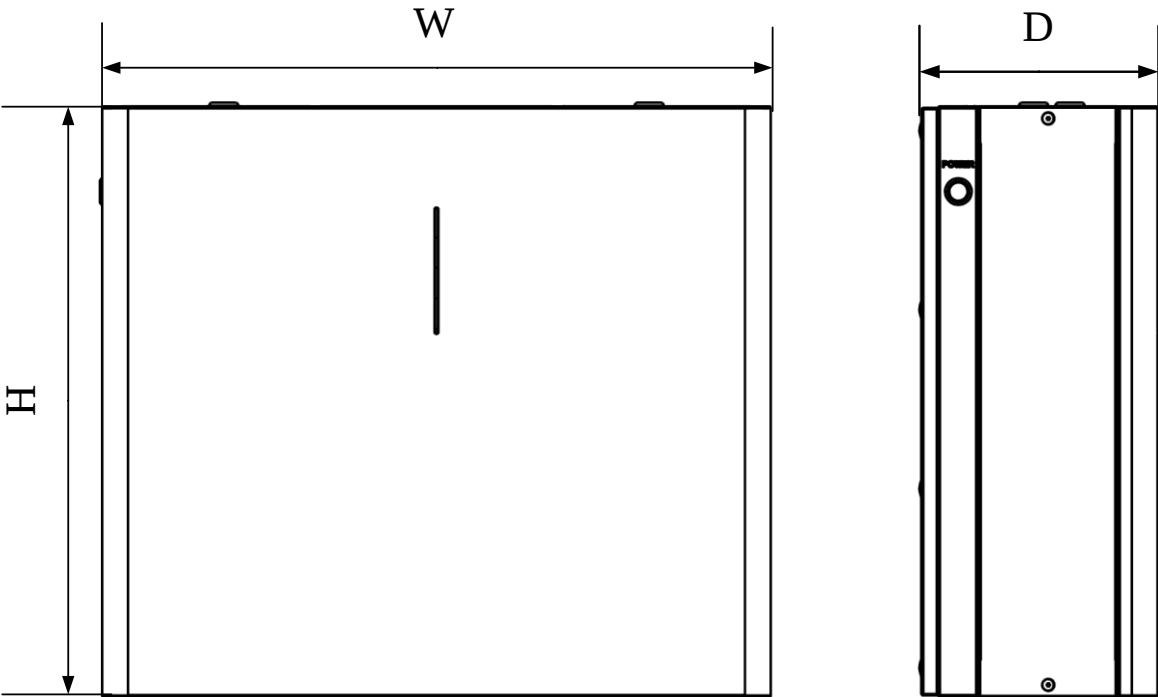
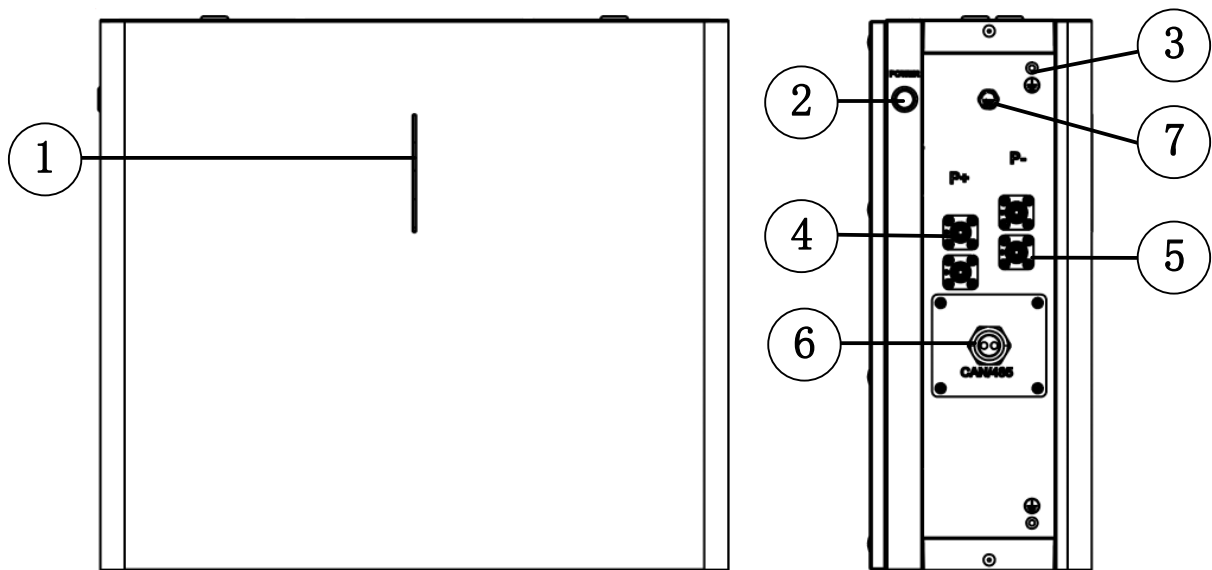


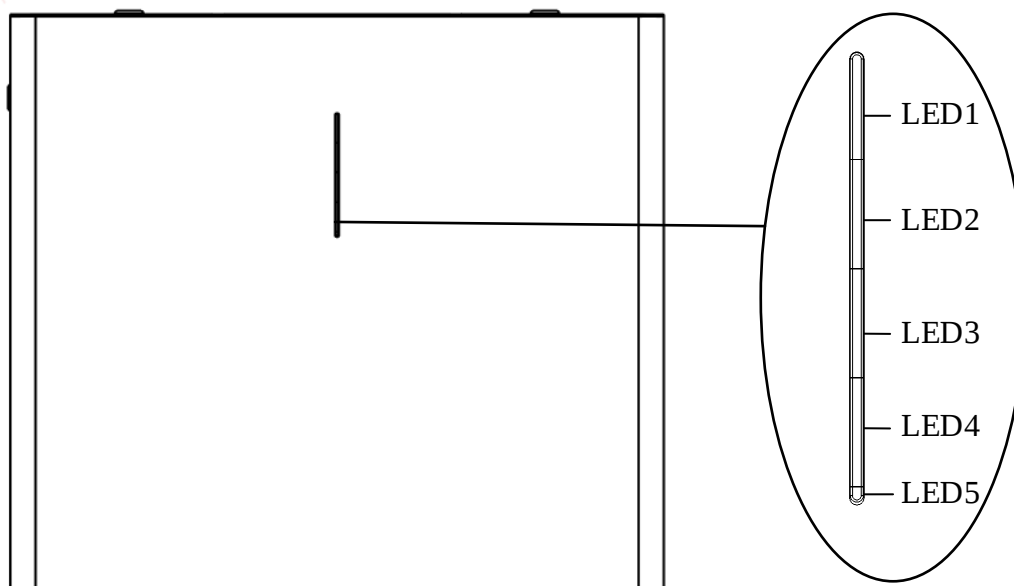
Figure 1 Pack Appearance Dimension

Item	AES5.1-L
Dimension (W*H*D)	550*485*195mm

3.2 Components introduction



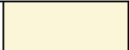
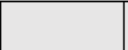
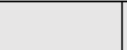
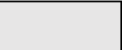
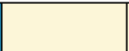
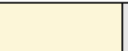
No.	Part	Description
1	Led for SOC or fault indication	Power, State, Fault indication * For details on fault display, please refer to Section 9.2
2	Power switch	Turn on / off Battery-Pack
3	Battery-Pack ground	Grounding terminal
4	DC Positive Terminal	Battery-Pack positive power connector
5	DC Negative Terminal	Battery-Pack negative power connector
6	CAN / 485 communication port	Communication transmission port
7	Pressure relief valve	Balance air pressure

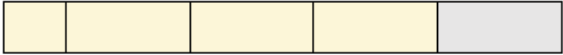
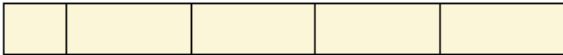


Battery-Pack LED indicator

There are 5 LED indicators on the Battery-Pack LED signal display panel, LED1 to LED5 from top to bottom. LED5 at the bottom is the status bit, and LED1 to LED4 is the SOC indicator bit, displaying the SOC operating status.

Indicator color				
				
Standby mode	Fault mode	Discharging mode	Heating mode	Charging mode

	LED 5	LED 4	LED 3	LED 2	LED 1	
Indicator LED	SOC indicator LED4(25%)~LED1(100%)					SOC description
Standby mode: LED 5 flashes white for 1s, with an interval of 2s						$0\% \leq \text{SOC} < 25\%$
Discharge mode: LED 5 blue light is always on						$25\% \leq \text{SOC} < 50\%$

Charging mode: LED 5 is always on in yellow, and flashes the corresponding indicator of the uncharged soc; in heating mode, the orange light is always on, and the soc light is always on		$50\% \leq \text{SOC} < 75\%$
Fully charged: LED1-LED 5 is always on in yellow		$75\% \leq \text{SOC} < 100\%$

4. Storage

4.1 Pack storage

When the Pack is not put into use directly, it should meet the following requirements:

1. When storing the Pack, please place it according to the label on the packing box. Do not place the battery upside down or horizontally.
2. Stack the packs according to the stacking requirements of the battery outer packaging.
3. Store the Pack out of the reach of children and animals.
4. Store the Pack in a place with minimal dust and dirt.
5. Please be careful when handling the battery, so as not to damage the battery.
6. The storage environment requirements are as follows:
 - Ambient temperature: -20~45°C(time less than 1 month); Recommended storage temperature: 15~30°C(time less than 6 month)
 - Relative humidity: 0%~ 95% (non-condensing)
 - Please place the battery in a dry, clean and well-ventilated place.
 - Please place the battery away from corrosive organic solvents and gases.
 - Batteries should be kept away from direct sunlight.
 - Keep the battery at least 2 meters away from the heat source.
7. Pack must be disconnected from external devices and hibernated. The light on the battery should be turned off.
8. The delivery of batteries should follow the principle of "first in, first out".
9. Storage SOC: 25~50% SOC, a charge-discharge cycle is required for every 6 months of storage.
10. If the device is not installed within 3 days after unpacking, it is recommended to store the device in the box.
11. If the lithium battery is stored for a long time, it may cause a loss of capacity. If the lithium battery is stored at the recommended storage temperature for 12 months, the irreversible capacity loss rate is 3%~10%. It is not recommended to store batteries for long periods of time. If the battery needs to be stored for more than 3 months, it is recommended to charge the battery at least to 50% of the SOC. If the battery is not charged in time according to 6 months, and the battery cannot be turned on due to prolonged storage, the battery will need to be repaired or replaced, and this product is automatically out of warranty, and all costs incurred during the inspection and repair period will be borne by the customer.

5. Unpacking

5.1 Check the package

Before unpacking the Pack, please check if the package has some damage and check the battery type. If there is any abnormality, please do not open the packing box and contact the after-sales service center as soon as possible.

- After unpacking the Pack, please check whether the product is complete according to the packaging information. If there is any abnormality, please contact the after-sales service center as soon as possible.

5.2 Packing List

Please confirm the materials according to the packing list inside the packaging box.

6. System Installation

6.1 Installation requirements



Warning

Danger to life due to fire or explosion

Try to be cautious in construction, electrical equipment may still cause fire.

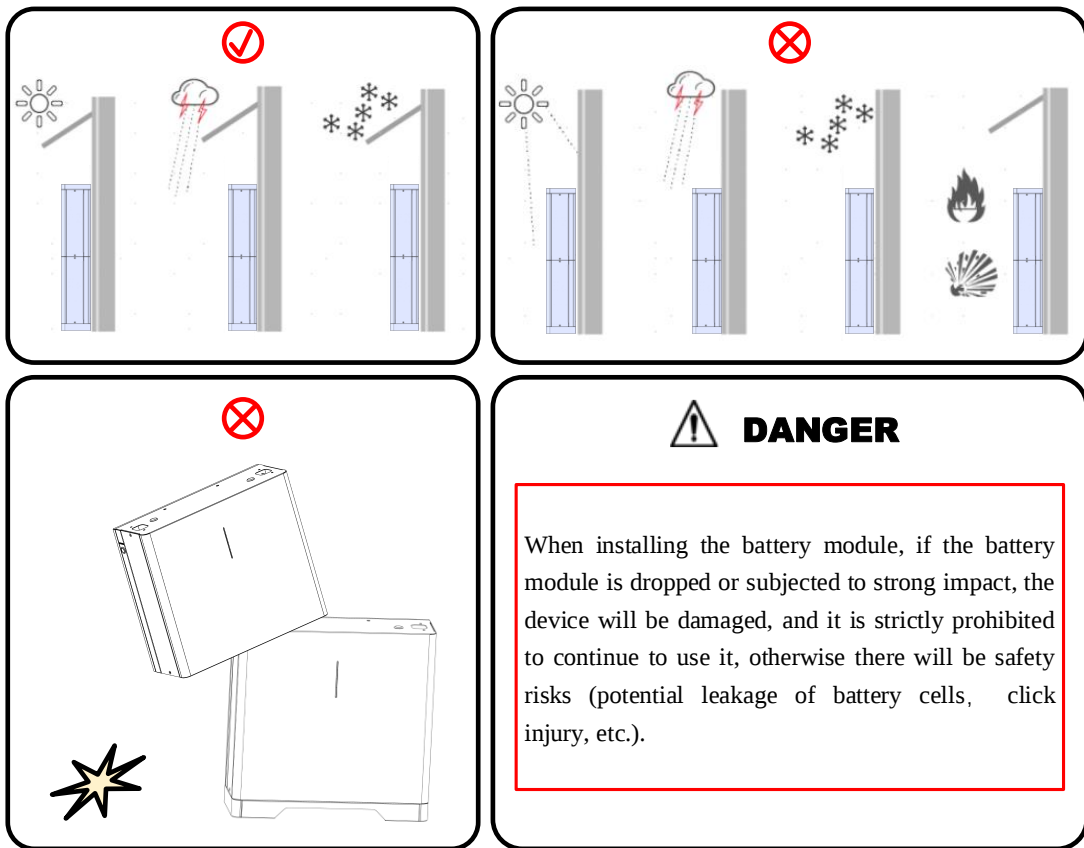
- Do not install this product in areas containing highly flammable materials or gases.
- Do not install the product in a potentially explosive atmosphere.

Basic requirements

- Do not install this product in flammable and explosive places.
- Avoid installation where children can reach.
- Do not install the product in an outdoor salt area as it will corrode and may cause a fire.
"Salt area" refers to areas within 500 meters of the coast or areas with high sea breezes.
Areas susceptible to sea breezes vary by weather conditions (such as typhoons and monsoons) or topography (such as dams and hills).

Installation Environment Requirements

- This product must be installed in a well-ventilated environment to ensure good heat dissipation.
- When installed in direct sunlight, the power of the product may be reduced due to additional temperature rise.
- Install the product in a sheltered area, or install an awning over the product.
- The optimum temperature range for Pack operation is 15 to 30°C.
- Do not expose or place the product near water sources such as downspouts or sprinklers.



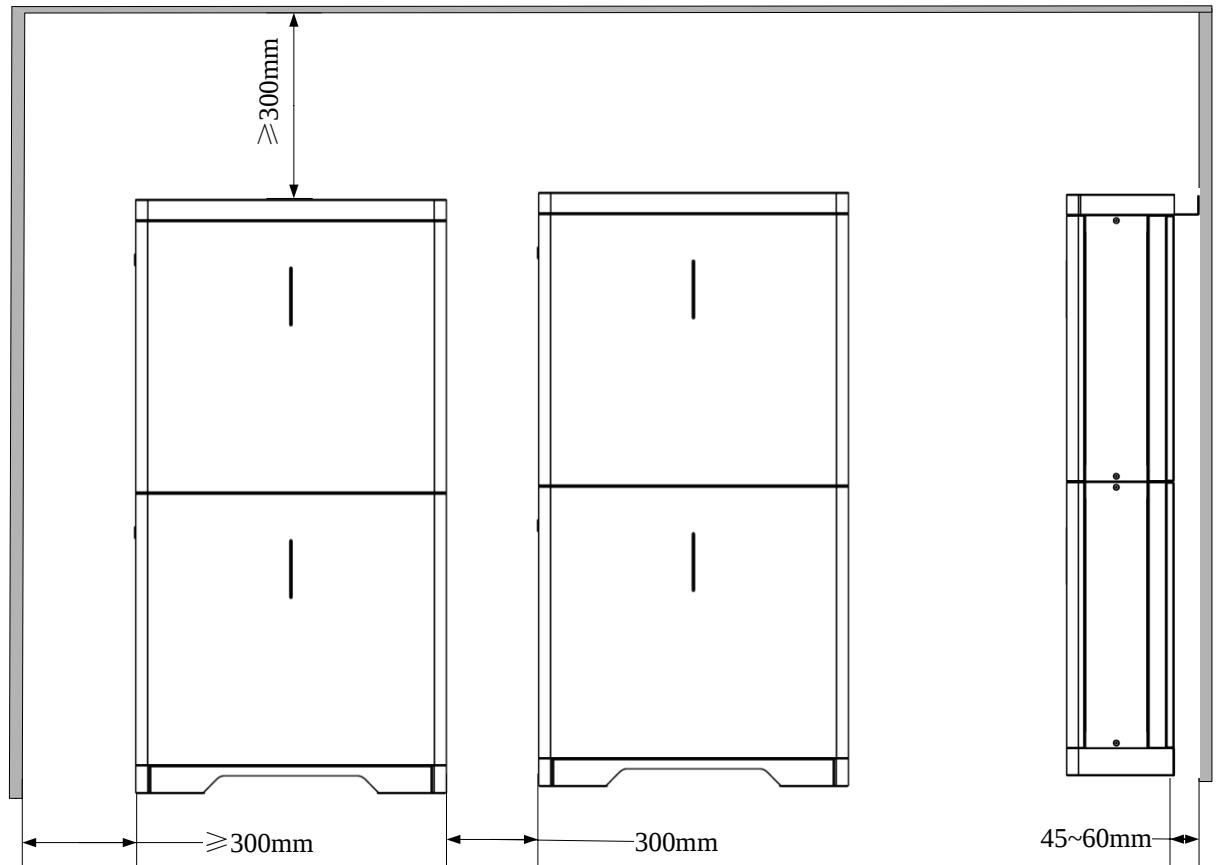
Installation structure requirements

- The installation structure where the product is installed must be fireproof.
- Do not install this product on flammable building materials.
- Do not install in places prone to water accumulation
- For floor installation, make sure the mounting surface is strong enough to withstand the weight load.
- Wall-mounted installation is not recommended. Wall-mounted installation has stricter requirements on the firmness of the wall. Consumers should investigate the cement structure of their houses before purchasing "wall hanging". Pack wall mounting, the wall must be solid brick, concrete or its equivalent strength. The bearing capacity of the installation surface should be guaranteed to be no less than 4 times the actual load capacity of the Pack.

6.2 Installation space requirements

6.2.1 Floor installation space requirements

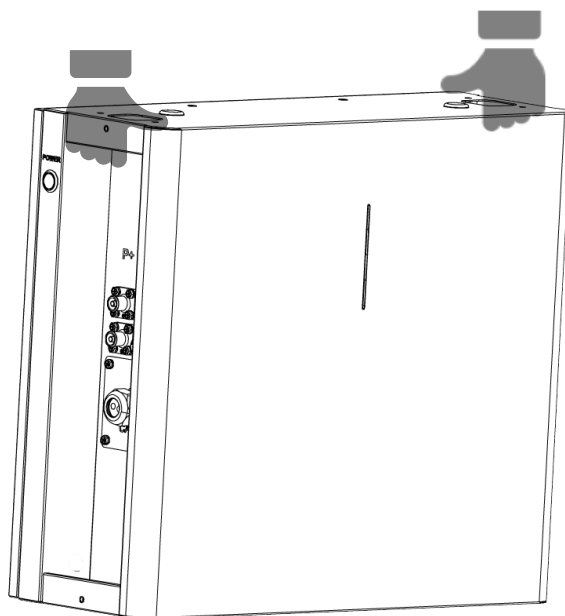
- Reserve enough space around the Pack and inverter to ensure space for installation, maintenance, and heat dissipation.



6.3 Install Pack

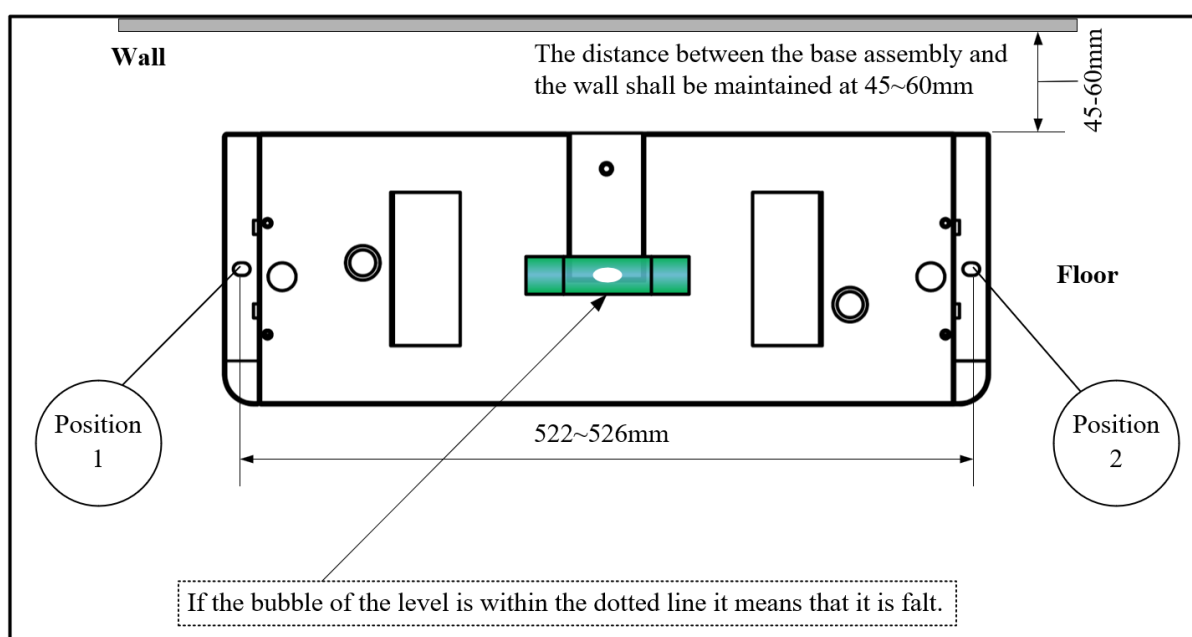
6.3.1 Installing the Pack on the Floor

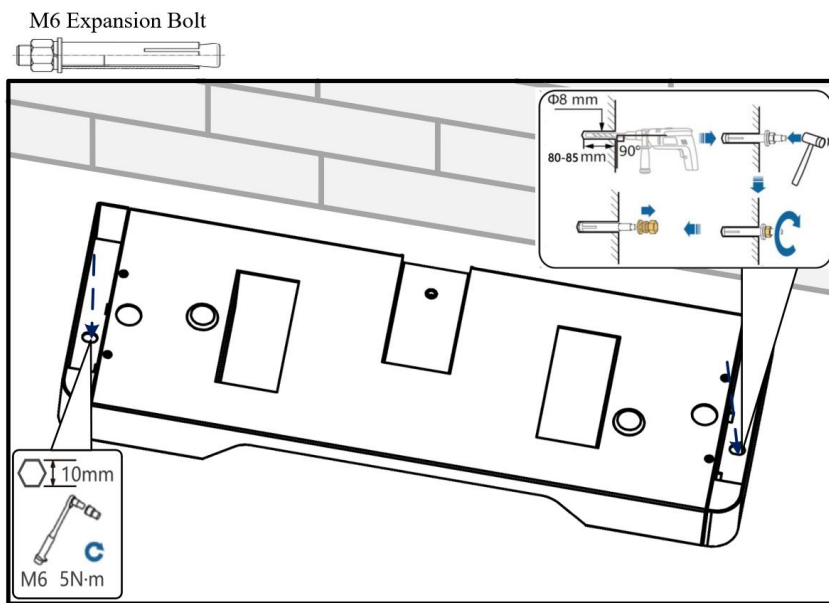
- (1) Take the Pack and accessories out of the box. Do not place the Pack upside down on the ground.



(2) Place the base assembly against the wall, 45-60mm away from the wall. Keep the base assembly level.

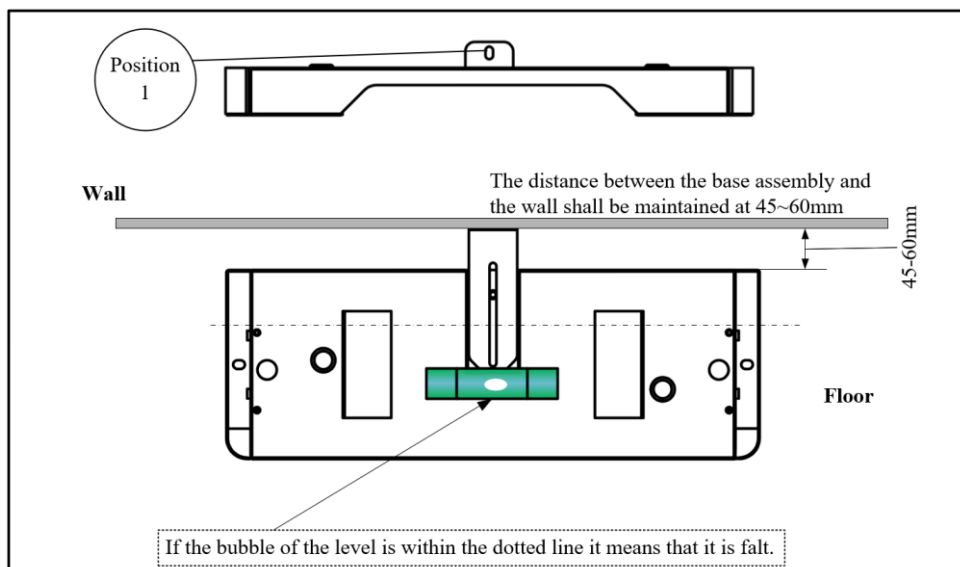
Drill holes in position 1 and 2 to install the M6 expansion screws.





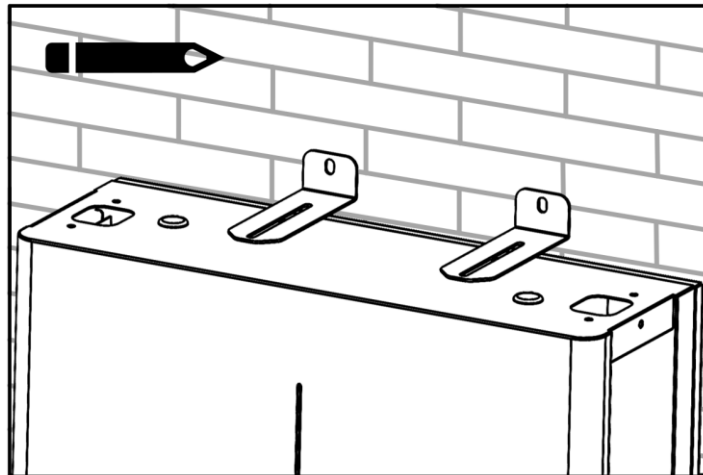
Or Place the base assembly against the wall, 45-60mm away from the wall. Keep the base assembly level.

Drill holes in position 1 to install the M6 expansion screws.

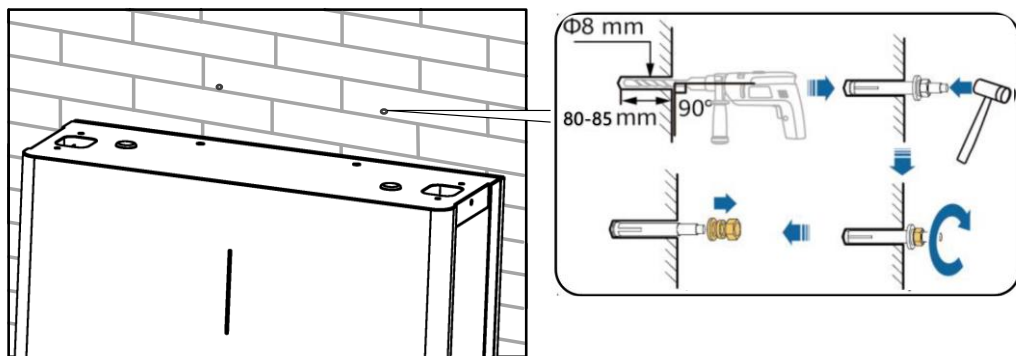


(4) Install the top fixing bracket

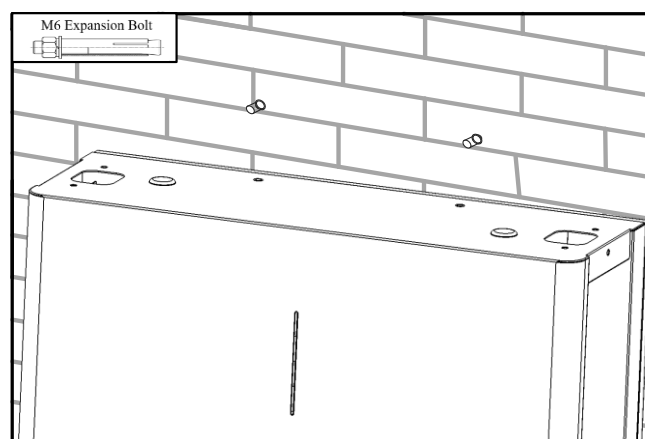
Use the fixing bracket to align the holes and mark the holes with a marker.



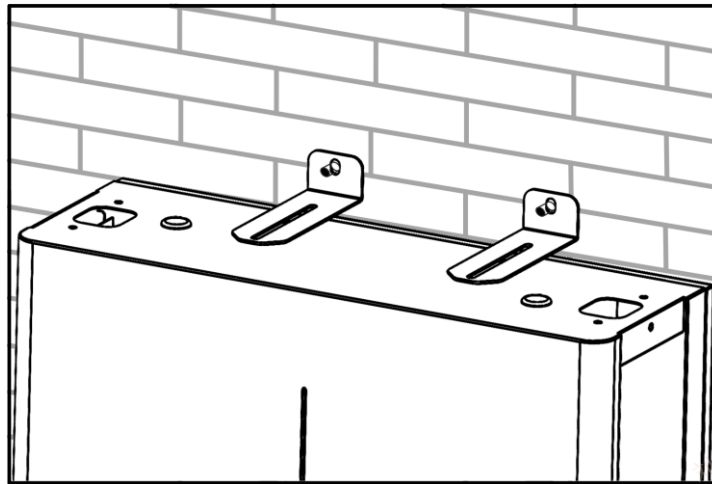
Use an impact drill to punch holes in the wall (diameter: 8mm, depth: 80-85mm) .



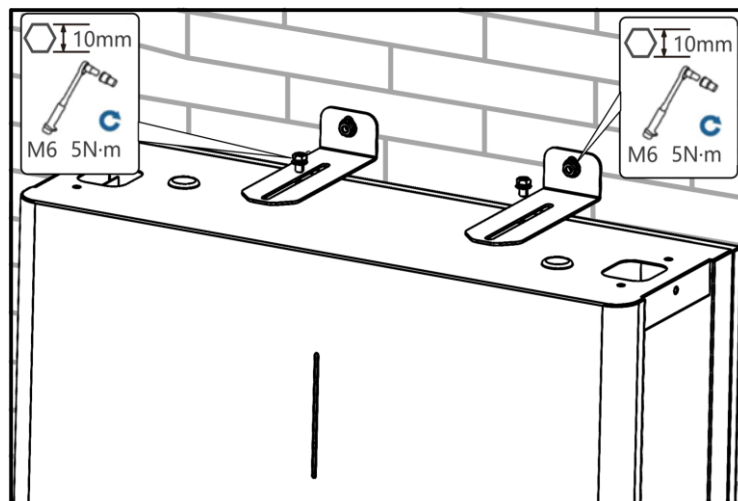
After cleaning the dust and other debris in the two holes, put the two expansion screws into the holes, and use the sleeve to fix the expansion screws on the wall .



Install the fixing bracket .



Fasten the fixing bracket



Warning

Risk of injury if the Pack is lifted or placed on the ground

Pack is very heavy, ≥ 48 kg. There is a risk of injury if the Pack is incorrectly lifted or lowered during transport and installation.

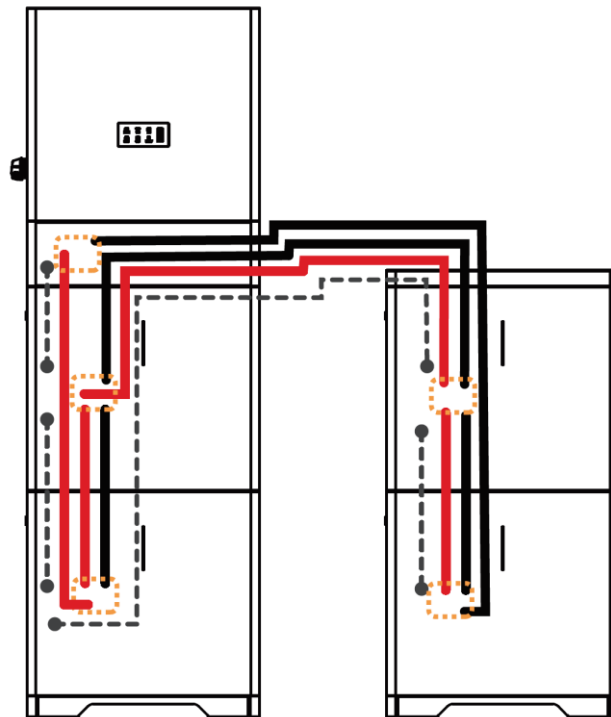
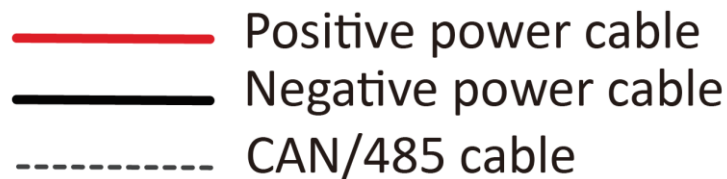
- It is forbidden to stack more than 3 packs from top to bottom.

7. System connection

Precautions

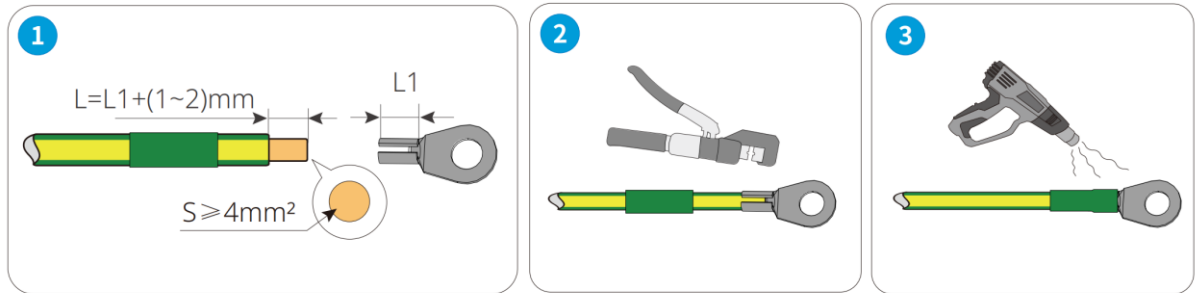
 Danger
Before wiring, please confirm that all switches of the inverter and Pack are in the "OFF" state. Otherwise, the product voltage may cause electric shock.
 Warning
• Equipment damage caused by incorrect cable connections is not covered by any warranty. • Only a certified electrician should connect the cables. • When connecting cables, operators must wear safety protection equipment.
NOTICE
The cable colors shown in the electrical connection diagrams provided in this chapter are for reference only. Select cables according to local cable codes.

7.1 System Electrical Installation Overview

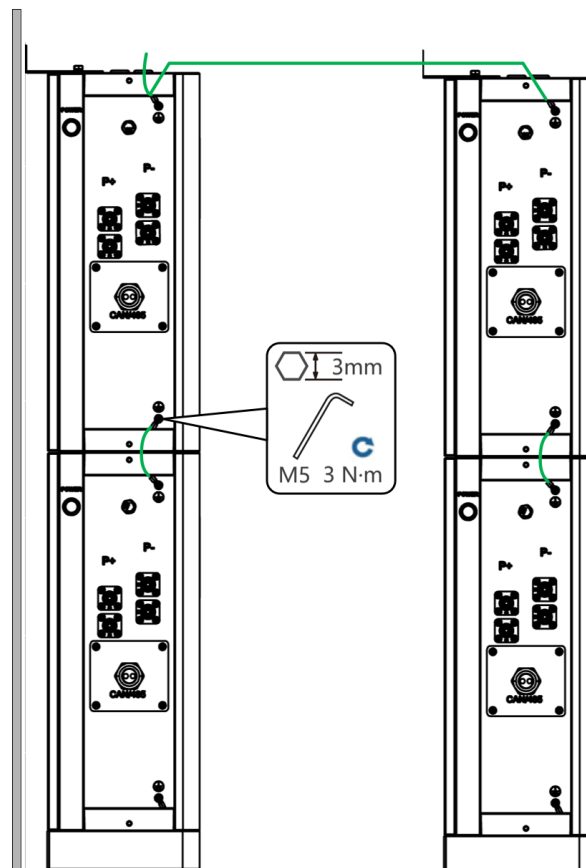


- When installing the device, the protective ground wire must be installed first; when removing the device, the protective ground wire must be removed last.
- The pull-out force after crimping should be greater than 400N.
- Protective ground conductor cross-sectional area: 5mm^2 . The wire must meet the requirements of outdoor use standard.

Connect the ground points of the module in sequence, and fasten the ground wire with the grounding screw.



Ground wire connection diagram

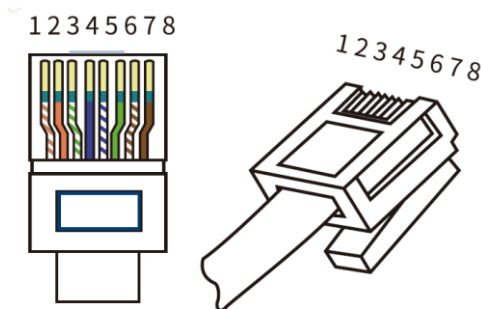


7.2 Installation of communication cable, power cable, side panel and upper cover

The communication connection ports are as follows:

Please follow the steps below to connect

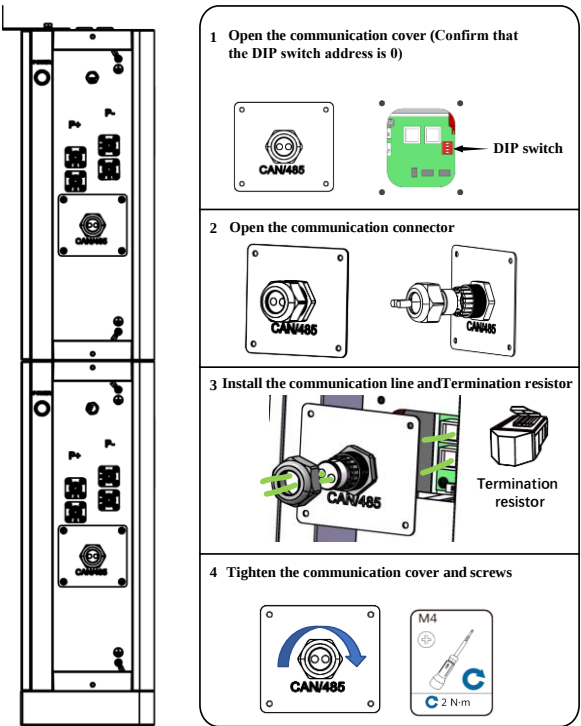
(1). Crimp RJ45 crystal head terminal communication interface



PIN	Definition
1	NC
2	NC
3	NC
4	CAN_H
5	CAN_L
6	NC
7	RS485_A1
8	RS485_B1

Adopt standard six types of network cables (4 pairs of twisted pairs) as wiring cable.

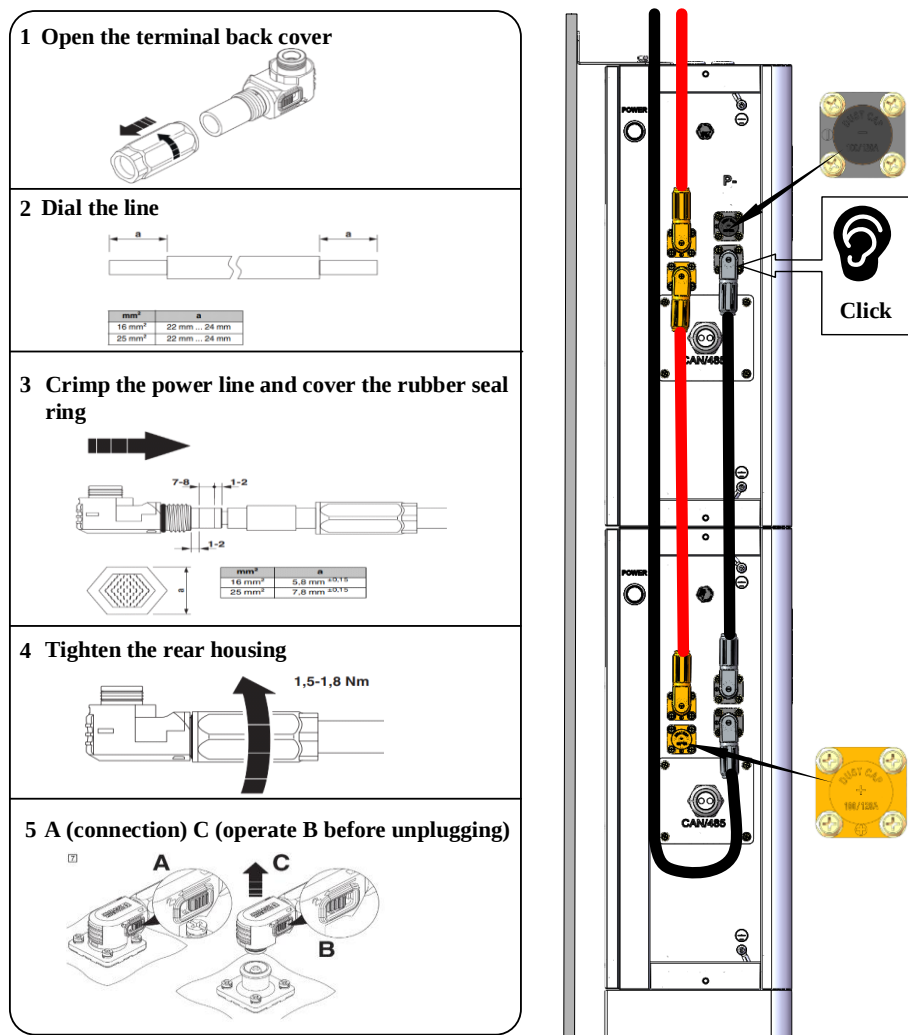
Schematic diagram of connecting communication lines



*The termination resistor is only plugged into the last battery

Power line connection:

- The orange power connector corresponds to the red sheath wire harness, the black power connector corresponds to the black sheath wire harness, and the cross-sectional area of the wire harness is 25mm^2 . The wire must meet the requirements of outdoor use standard.
- Withstand voltage level DC1500V, temperature resistance $-40\text{ }^{\circ}\text{C} \sim 125\text{ }^{\circ}\text{C}$.
- Stripped conductor length: $23\pm 1\text{mm}$.
- Tighten the rear shell of the power connector and check if there is any gap. If there is no gap, the installation is complete.
- Recommended crimping tool: Manual hydraulic crimping pliers (die: 25mm^2).
- The pull-out force after crimping shall not be less than 1200N.
- When using a single machine, any two power ports should be connected to one, and the other power port should be covered with a protective cover.
- When multiple machines are used in parallel, the positive pole of the power interface between the batteries is connected to the positive pole, and the negative pole is connected to the negative pole. The power interface reserved for the last battery needs to be covered with a protective cover.
- Power lines should be as short as possible, subject to proper installation connections.

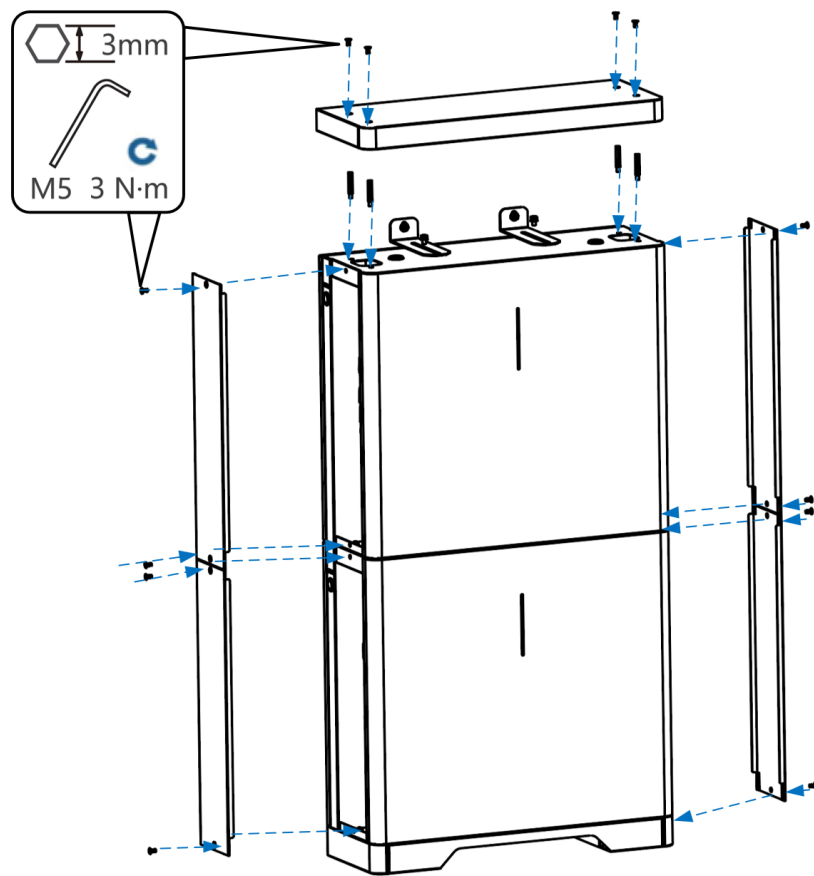


The port marked P+ is connected to the red power cable, and the port marked P- is connected to the black power cable.

Note: When the plug connector of the power cable is crimped, a "click" sound should be heard, indicating that the connection is in place.

Install the top and side covers as follows:

- (1). When installing the top cover, pay attention to that the positive power line, negative power line and communication line should go out from the PG connector of the top cover.
- (2). Before proceeding to step 3, press the buckle of the Pack decorative board.
- (3). Install the decorative board to the Pack.



8. System Operation

8.1 Check before power on

Table 8-1 Description of installation inspection items

No.	Check item	Acceptance Criteria
1	Pack and inverter installation	Pack and inverter are installed correctly, safely and reliably.
2	Cable layout	Cable layout should comply with local regulations.
3	Nylon cable tie	The cable ties are fixed evenly without burrs.
4	Ground	The ground wire connection is correct, firm and reliable.
5	Cable connection	AC cables, PV cables, Pack cables and communication cables are connected correctly, firmly and reliably.
6	Unused power terminals	Unused power terminals are blocked with waterproof caps.
7	Installation environment	The installation space is appropriate, the installation environment is clean and tidy, and there is no foreign matter.

8.2 Power on and off the product

Power on method: Long press the power button on the left of the Pack for 3 seconds.

Power off method: Long press the power button on the left of the Pack for 3 seconds.

 Warning
After the inverter and Pack are powered off, the remaining electricity and heat can still cause electric shock and burns. Therefore, please wear protective gloves and operate the product after 5 minutes of power off.

9. Maintenance and Troubleshooting

9.1 Routine maintenance

Normally, the Pack does not require maintenance and calibration.

Disconnect the inverter and Pack from all power sources before cleaning. Clean the case, cover and display with a soft cloth.

To ensure the long-term normal operation of the inverter and the Pack, it is recommended to perform routine maintenance on the inverter and the Pack.

Maintenance Checklist

Check item	Acceptance Criteria	maintenance interval
Product cleaning	Pack is free of obstructions and dust.	Every 6 to 12 months
Product damage	Pack is not damaged or deformed.	Every 6 months
Product operating status	1.Pack runs without abnormal sound. 2. Pack parameters are set correctly. This check should be done while the Pack is running normally.	Every 6 months
Electrical connections	1. The cable connection is firm. 2. The cable should be intact, especially the cable sheath should avoid scratches when it touches the metal surface.	The first maintenance is carried out 6 months after the first commissioning. Maintenance is recommended every 6 to 12 months.

9.2 Troubleshooting

Priority	indicator light	indicator light	fault category	Solution
1	LED5、LED2 red lights are always on, LED3、LED4 white lights are on, LED1 yellow light is on		AFE failure	Shut down, contact customer service
2	All red lights are on		The cell voltage difference is too large	Shut down and contact customer service.
3	LED5 Purple light is on, LED1-LED4 red lights are on		Precharge failure	Shut down and contact customer service.
4	LED5 orange light is always on, LED1-LED4 red lights are on		Failure of heating function	Shut down, wait for the temperature to rise, and restart the battery, if the problem is not solved, contact customer service
5	LED5 red light is always on, LED1 yellow light is on, LED2-LED4 white lights are on		Communication with the inverter is interrupted	Shut down, check the communication cable connection, restart the battery. If the problem is not resolved, contact customer service
	LED5 red light is always on, LED2 yellow light is on, LED1、LED3、LED4 white lights are on		Host communication lost	Shut down, check the communication cable, and restart the battery. If the problem is not resolved, contact customer service
6	2 red lights and 2 white lights are on		Battery undervoltage	In the case of charging conditions, keep pressing the switch button for 10 seconds, restart the battery pack and enter the forced charging mode, wait for the voltage to rise and return to normal.

7	LED1 、 LED3、 LED5 red lights are always on, LED2 yellow light is on, LED4 white light is on		Battery over- voltage	Restart the battery and inverter, if the problem is not solved, contact cus- tomer service
	LED1 、 LED3、 LED5 red lights are always on, LED2 white light is on, LED4 yellow light is on		Charge overcur- rent	Restart the battery and inverter, if the problem is not solved, contact cus- tomer service
	LED1 、 LED3、 LED5 red lights are always on, LED2 white light is on, LED4 blue light is on		Discharge over- cur- rent	Restart the battery and inverter, if the problem is not solved, contact cus- tomer service
8	The red-light flashes for 1 second, with 1 second intervals. The SOC light displays thepower normally.		Temperature differ- ence	Shut down, wait for the temperature to rise, restart the battery, if the problem is not solved, contact cus- tomer service
			High tempera- ture protection	Shut down, wait for the temperature to drop, restart the battery, if the problem is not resolved, contact customer service
			Low- temperature protection	Shut down, wait for the temperature to rise, restart the battery, if the problem is not solved, contact cus- tomer service
			MOS over tem- pera- ture error	Shut down, wait for the temperature to drop, and re- start the battery. If the problem is not resolved, con- tact customer service

10. AES5.1-L battery pack parameter table

Item	AES5.1-L
Battery Type	Lithium Iron Phosphate (Lithium Ion)
Weight	48±2 kg
Size (W * H * D)	550*485*195mm
Protection class	IP65
Energy capacity	5.120kWh
Available capacity	4.61kWh
Depth of Discharge (DoD)	90%
Rated voltage	51.2V
Max Current/Power Ratings	100A/2.56kW_
Operating voltage range	48Vd.c. ~ 56V d.c.
Operating temperature range *	2°C~53°C (charging mode)
	-20°C ~ 55°C (discharging mode)
Relative humidity	0% ~ 95% (non-condensing)
Type of power supply system	self-powered
Cooling type	Free cooling
Monitoring parameters	System voltage, Current, Cell voltage, Cell temperature, Mos temperature
Communication	Compatible with CAN and RS485
Safety regulations	IEC62619 (cell), IEC 62619 (Pack)
Transportation	UN38.3

*Battery performance will be derated at low or high temperature.