



BSL NEW ENERGY TECHNOLOGY CO., LTD

User Manual

ESS-GRID Station Series

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Version History

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01 Safety Instructions

1.1 Safety symbol description

When installing, operating, and maintaining equipment, please read this manual first and follow all safety precautions indicated on the equipment and in the manual. To ensure that users can better use this product and protect personal and property safety, please read the symbol prompts used below carefully.



Danger: Indicates a highly potential danger that, if not avoided, could result in death or serious injury.



Warning: Indicates moderate potential danger if not avoided, which may result in death or serious injury to personnel.



Note: Indicates a low potential danger, and failure to avoid it may result in moderate or mild injury to personnel.



Illustration: Emphasizing and supplementing content may also provide tips for optimizing product usage.

1.2 General Security



Illustration :

This equipment should be used in an environment that meets the design specifications. Otherwise, it may cause equipment failure. The resulting equipment malfunction or component damage, personal safety accidents, property losses, etc. are not within the scope of equipment quality assurance. Local laws, regulations and specifications should be followed when installing, operating and maintaining the equipment. The safety precautions in the manual are only used as a supplement to local laws, regulations and specifications. The company does not assume responsibility for any of the following situations.

1. The installation and use environment exceeds the requirements of relevant international, national and regional standards.
2. Operation not within the conditions of use described in this manual.
3. Unauthorized disassembly, modification of products or modification of software codes.
4. Failure to follow the operating instructions and safety warnings in the product and documentation.
5. Equipment damage caused by abnormal natural environment (force majeure such as earthquake, fire, storm, flood, mudslide, etc.).
6. Damage caused by the customer's failure to comply with transportation and installation requirements.
7. Damage caused by storage conditions not meeting the requirements of product documentation.
8. Damage to the hardware or data of the device due to customer negligence, improper operation or intentional damage .

9. System damage caused by a third party or customer , including relocation and installation of the system that does not comply with the requirements of this manual, and damage caused by adjustments, changes or removal of identification marks that do not comply with the requirements of this manual.

10. Defects, failures or damages caused by acts, events, omissions or accidents beyond the reasonable control of the Seller, including power outages or electrical failures, theft, war, riots, civil unrest, terrorism, intentional or malicious damage, etc.



Danger:

The equipment has high voltage. Improper operation may cause electric shock or fire, resulting in death, serious personal injury or serious property loss. Please follow the operation sequence and safety precautions given in this manual and other related documents and operate in accordance with the regulations:

1. Please check whether the pre-installed cables are connected and tightened. Check whether the device is damaged, such as holes, dents, or other signs of possible internal damage. Check that the internal components of the device are not displaced. It is forbidden to change the structure and installation sequence of the device without authorization.
2. It is forbidden to use water to clean the electrical parts inside the equipment. If liquid is found to have entered the equipment, please press the emergency stop switch immediately and notify the on-site management personnel.
3. It is forbidden to install, connect, maintain and replace with power on. Before touching any conductor surface or terminal, measure the voltage at the contact point and confirm that the protective ground wire of the equipment or the part to be repaired is reliably grounded and there is no risk of electric shock.
4. Except for the personnel who operate the equipment, other personnel are not allowed to approach the equipment. Do not power on the equipment before the equipment is installed or confirmed by professionals. When powering on for the first time or operating the main circuit with power on, at least two personnel must be present on site.



Illustration:

1. The user's operating behaviors and operating tools during transportation, handling, installation, wiring and maintenance must comply with the laws, regulations and relevant standards of the country and region where the user is located.
2. It is prohibited to reverse engineer, decompile, disassemble, adapt, implant or perform other derivative operations on the device software. It is not allowed to study the internal implementation of the device, obtain the source code of the device software, steal intellectual property rights, etc. in any way, and it is not allowed to disclose the results of any device software performance test.

1.3 Personal safety



Danger:

1. During the operation of the equipment, appropriate personal protective equipment should be worn. If a fault that may cause personal injury or equipment damage is found, the operation should be stopped immediately, reported to the person in charge, and effective protective measures should be taken.

2. Before using the tool, please master the correct use of the tool to avoid injury to others and damage to the equipment.
3. When the device is running, some internal shell temperatures are high and there is a risk of burns, so do not touch them.
4. To ensure personal safety and normal use, reliable grounding should be carried out before use.
5. When the battery module fails, the temperature may exceed the burn threshold of the touchable surface and contact should be avoided.
6. Do not open or damage the battery module. The released electrolyte is harmful to the skin and eyes and should be avoided.
7. Do not place irrelevant objects on top of the device or insert them into any part of the device.
8. Do not place flammable items around the device.
9. Batteries are strictly prohibited from being placed in fire to avoid explosion and endangerment to personal safety.
10. Do not place the battery module in water or other liquids.
11. Never short-circuit the battery module terminals. Short-circuiting the battery may cause burns.
12. Batteries may cause danger of electric shock and large short-circuit current.
13. Do not use water or detergent to clean the electrical components inside and outside the device.
14. Do not stand, lean or sit on the equipment.
15. Do not damage the modules of the device.
16. When installing the battery module, if the battery module falls or is hit hard, it will cause damage to the equipment. It is strictly forbidden to continue using it, otherwise there will be safety risks (battery leakage, electric shock, etc.).

**Warning:**

1. Remove watches, rings or other metal objects.
2. Use tools with insulated handles.
3. Wear rubber gloves and boots.
4. Do not place small tools or metal parts on top of the battery module.
5. Disconnect the charging power source before connecting or disconnecting the battery terminals.
6. Determine if the battery is accidentally grounded. If it is accidentally grounded, remove the power supply from the ground. Contact with any part of the grounded battery may cause electric shock. If these grounds are removed during installation and maintenance, the possibility of this electric shock can be reduced.

1.4 Battery leakage treatment measures



Note: When electrolyte leakage occurs, the following emergency measures can be taken depending on the severity of the leakage.

1. Ensure adequate ventilation and eliminate all ignition sources.
2. Quickly evacuate personnel to a safe area, away from the leakage area and in the upwind direction.
3. Use personal protective equipment and avoid inhaling steam, smoke, gas or dust.

4. Take measures to prevent further leakage or overflow while ensuring safety.
5. In case of a small leakage, dry sand or inert adsorbent materials can be used to absorb the leak. In case of a large leakage, a dam must be built to control it.
6. Attachments or collections should be stored in suitable sealed containers and disposed of in accordance with local laws and regulations.
7. Eliminate all ignition sources and use spark-proof tools and anti-riot equipment.



Danger:

In the event of a leak, avoid contact with leaking liquid or gas. The electrolyte is corrosive and contact may cause skin irritation and chemical burns. If you come into contact with battery electrolyte, you need to take the following measures.

1. Inhalation: Evacuate the contaminated area and move to fresh air immediately to keep breathing unobstructed; if breathing is difficult, give oxygen; if the patient ingests or inhales this substance, do not perform mouth-to-mouth artificial respiration; if breathing stops, immediately perform cardiopulmonary resuscitation; and seek medical help immediately.
2. Eye contact: Immediately rinse eyes with plenty of water for at least 15 minutes, do not rub, and seek medical help immediately.
3. Skin contact: Take off contaminated clothing immediately, wash the skin contact area with plenty of water and soap, and seek medical help immediately.
4. Ingestion: Do not induce vomiting. Never feed anything by mouth to an unconscious person. Seek medical help immediately.
5. Protection of emergency personnel: Ensure that medical personnel understand the hazardous characteristics of the product and take personal protective measures to protect themselves and prevent the spread of contamination.

1.5 Electrical safety

1.5.1 General requirements



Illustration:

1. All electrical connections must meet the electrical standards of the country/region.
2. You must obtain permission from the power department of the country/region before you can connect to the grid for power generation.
3. User-supplied cables must comply with local laws and regulations.
4. When performing high voltage operations, please use special insulating tools.



Danger: Before making electrical connections, make sure the device is not damaged, otherwise it may cause electric shock or fire.

1.5.2 Wiring requirements

1. Please select cables that comply with local laws and regulations. Cables of the same type should be bundled together, and cables of different types should be laid separately. They should not be entangled or crossed.
2. The cables used in the high-voltage stacking machine must be firmly connected, well insulated, and meet the specifications. The cable conduit or wire hole must be protected to prevent the cables from being damaged by sharp edges, burrs, etc.

3. Using cables in high temperature environments may cause aging and damage of the insulation layer. The distance between the cables and the heating device or the periphery of the heat source area should be at least 30mm.
4. To ensure construction safety, all cables should be laid and installed above 0°C. When moving cables, especially when working in low temperature environments, they should be handled with care.



Danger:

It is forbidden to install or remove the power cord while it is powered on. When the power cord core contacts the conductor, an arc or spark will be generated, which may cause fire or personal injury.

1.5.3 Grounding requirements

1. When installing equipment that needs to be grounded, the protective ground wire must be installed first; when dismantling the equipment, the protective ground wire must be removed last.
2. It is prohibited to damage the grounding conductor.
3. It is prohibited to operate the equipment without installing a grounding conductor.
4. The equipment should be permanently connected to the protective ground. Before operating the equipment, check the electrical connection of the equipment to ensure that the equipment is reliably grounded.

1.5.4 Maintenance requirements

1. Before connecting or removing cables, the protection switch of the corresponding circuit must be turned off.
2. Use a multimeter of the corresponding voltage level to check whether it is energized and ensure that the equipment is completely powered off.
3. If there is a charged object nearby, please use an insulating board or insulating tape to cover or wrap it.
4. Use the grounding wire to reliably connect the circuit to be inspected to the grounding circuit before performing operation and maintenance.



Illustration:

1. Before connecting cables, make sure the cable labels are correct.
2. If the device has multiple inputs, all inputs of the device should be disconnected and the device can be operated only after it is completely powered off.
3. After the inspection is completed, remove the grounding wire between the inspection circuit and the grounding circuit.

1.6 Mechanical safety

1. When moving equipment by hand, you should be prepared to bear the weight and wear protective gloves, anti-smash shoes and other safety protection equipment.
2. Move the equipment carefully during transportation to avoid collision or drop. Avoid scratching the surface of the equipment and damaging parts or cables.
3. When transporting equipment, the large size of the equipment may block the operator's view, so auxiliary personnel need to be arranged to assist.

1.7 Maintenance and Replacement

Please maintain the equipment only after you are familiar with and understand the contents of this manual and have appropriate tools and test equipment.

1. Before performing maintenance work, please power off the device first, then follow the instructions on the delayed discharge label and wait for the corresponding time to ensure that the device is powered off before operating the device.
2. During the maintenance process, please try to avoid irrelevant personnel entering the maintenance site, and temporary warning signs or fences must be erected for isolation.
3. If the equipment fails, please contact your dealer in time.
4. The equipment can be powered on again only after the fault has been resolved. Otherwise, the fault may expand or the equipment may be damaged.
5. Unauthorized persons are not allowed to open the cover without authorization, otherwise there will be a risk of electric shock, and the resulting malfunction is not covered by the warranty.
6. Operators, maintenance personnel and professional technicians should receive adequate training on safe use and equipment maintenance, and should operate with adequate preventive measures and personal protective equipment.
7. When moving or rewiring is required, the power input must be cut off. After waiting for 5 minutes for the internal energy of the machine to be discharged, and after using a multimeter to confirm that there is no dangerous voltage on the DC bus and the parts to be repaired inside the machine, maintenance can be started.
8. Battery maintenance should be performed or supervised by personnel familiar with batteries and the necessary precautions.
9. When replacing batteries, please replace with battery modules of the same type.
10. After the maintenance operation is completed, check immediately to ensure that no tools or other parts are left in the equipment.
11. If the device is not used for a long time, the battery needs to be stored and recharged according to this manual.



Danger:

During the operation of the equipment, there is high voltage, which may cause electric shock, resulting in death, serious personal injury or serious property loss. Therefore, before performing any maintenance work, the equipment must be powered off and the safety precautions listed in this manual and other related documents must be strictly followed.

02 Product Introduction

2.1 Product Overview

The battery system is composed of battery modules and a high-voltage control box, specially designed for micro commercial energy storage systems. It has high-voltage DC input and output ports, and is capable of storing and releasing high-voltage DC electricity according to the requirements of photovoltaic energy storage.

2.2 Model Description

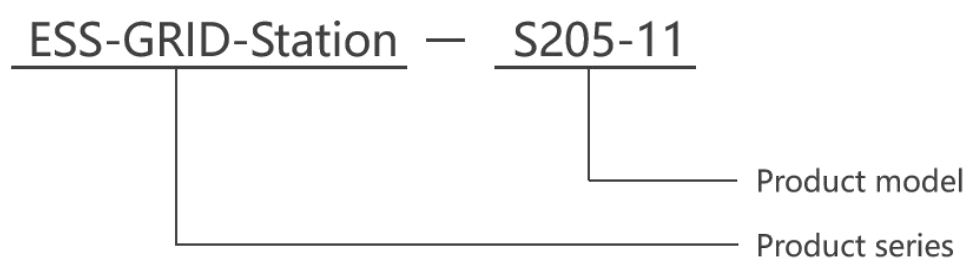


Figure 2.2-1



Illustration:

The Station series high-voltage stacked battery system can be freely configured according to the number of battery PACKs, battery capacity, and the power of the specific inverter, thereby achieving flexible configuration of the rated output power on the AC side. When using batteries of the same model in parallel clusters, it is recommended not to exceed 10 groups.

NO.	Implication	Instruction
1	Product Series	S205/S314“10~16”; Battery capacity and the number of PACKs
2	Product Module	Station Series: High Voltage Battery System

Table 2.2

S205/314-10:

S205/314-11:

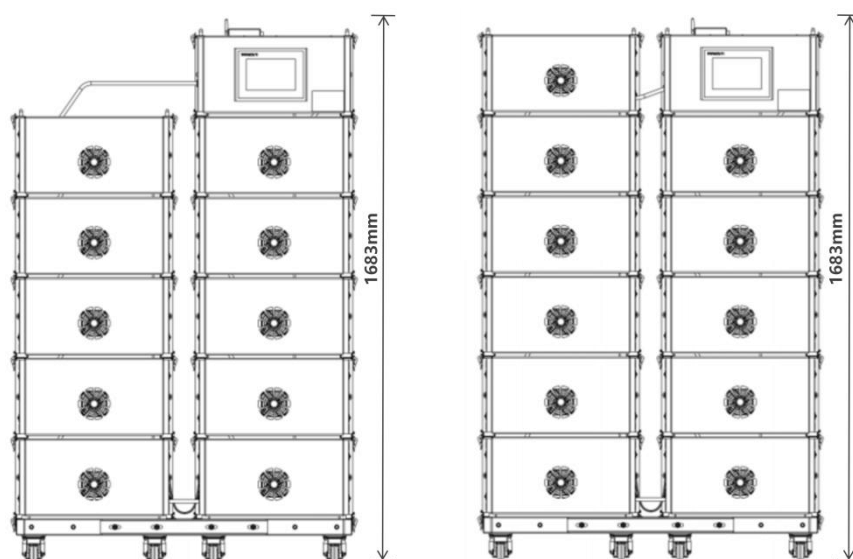


Figure 2.2-2

S205/314-12:

S205/314-13:

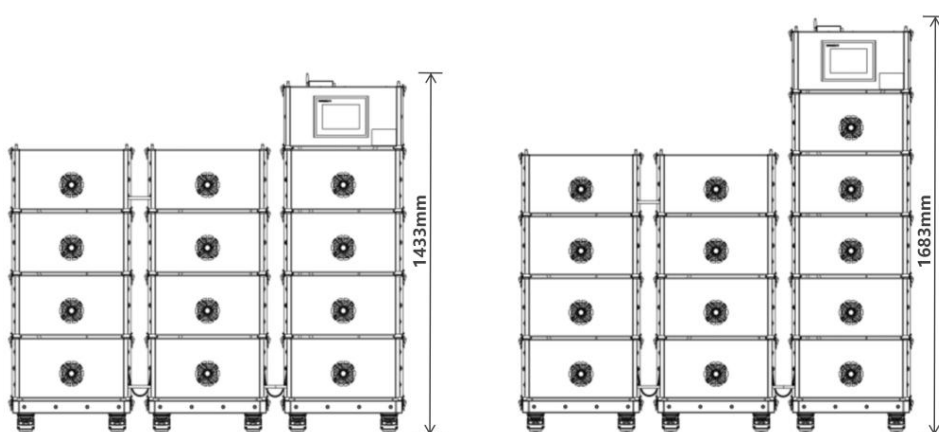


Figure 2.2-3

S205/314-14:

S205/314-15:

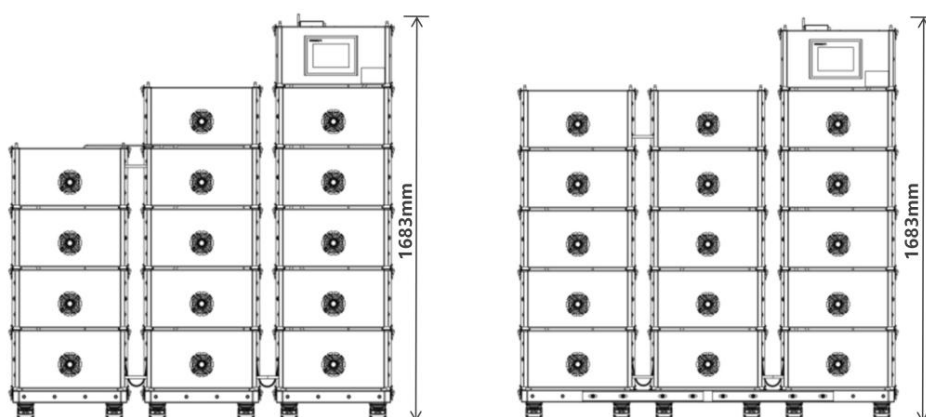


Figure 2.2-4

S205/S314-16:

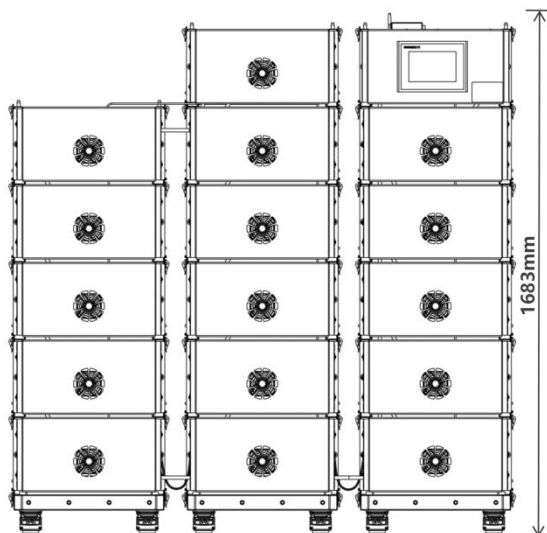


Figure 2.2-5



Illustration:

1. The actual height may vary slightly. Please refer to the actual installation height.
2. Vertical separate stacking can be freely arranged according to the project configuration.
3. It can support up to 17 battery packs. However, due to the excessively high battery voltage, it cannot be compatible with the mainstream inverters available on the market. Therefore, it is not recommended unless specifically requested by the customer.

2.3 Product Appearance

ESS-GRID Station S205-11

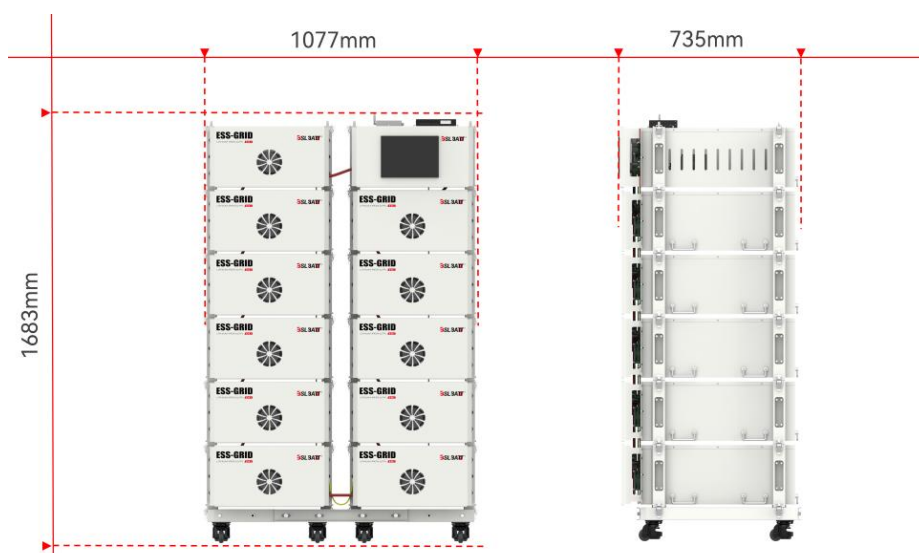


Figure 2.3



Illustration: Different projects have different configurations. In practice, the actual situation will be based on the delivery.

2.4 Product parameters

2.4.1 Battery module (PACK)

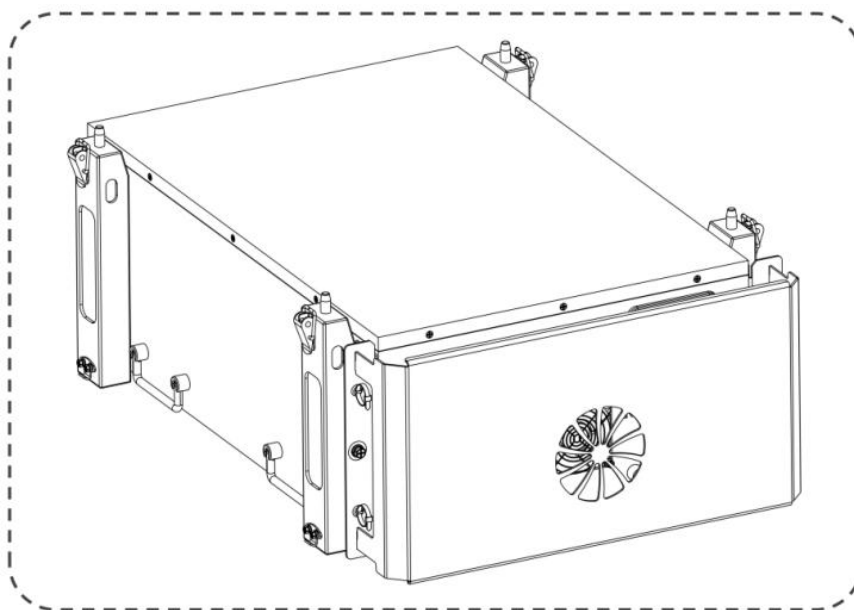


Figure 2.4.1



Illustration:

The battery module (PACK) is mainly composed of electric cells connected in series and has functions such as collecting the voltages and temperatures of each battery cell and performing balancing control. This module adopts a (BMU) dedicated chip for battery management and receives control commands through a ring bus communication method, and then reports the collected data.

Battery Box (PACK) Parameters:

General Parameter	Parameter Value
Rated Capacity	205Ah/314Ah
Cell Type	Prismatic Aluminum-case (LFP)
C-Rate	≤0.5C
Battery Configuration	1P16S
Critical Component	16 Cells,1 BMU,1 Fan
Protection level	IP20
Size(W*D*H,±10mm)	(205Ah)515*721*270mm (314Ah)515*846*270mm

Table 2.4.1

2.4.2 High-voltage box (switch box)

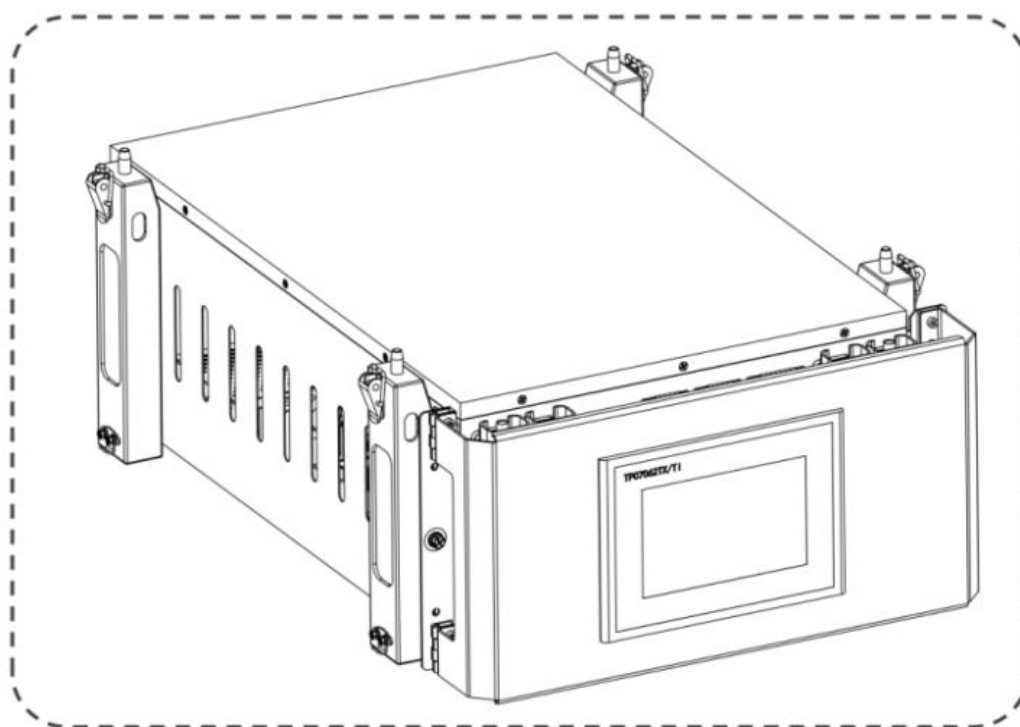


Figure 2.4.2



Illustration:

The battery cluster management unit (BCU), fuses and contactors, etc. constitute the high-voltage box (switch box), which is used for the overall monitoring, energy transmission and signal interaction of the battery cluster.

Parameters of the high-voltage box (switch box):

General Parameter	Parameter Value
Rated Current	200A
Current Sampling Range	-300A~300A
Voltage Sampling Range	50V~1500V
Size(W*D*H,±10mm)	(205Ah)515*721*270mm (314Ah)515*846*270mm

Table 2.4.2

2.4.3 Battery cluster



Illustration:

The battery cluster is composed of multiple series-connected PACKs, a single high-voltage box, and battery racks, etc.

0205Ah Battery cluster parameters:

Model	Rated Energy	Rated Voltage	System Configuration
S205-10	105.0kWh	512.0V	160S1P
S205-11	115.5kWh	563.2V	176S1P
S205-12	126.0kWh	614.4V	192S1P
S205-13	136.4kWh	665.6V	208S1P
S205-14	146.9kWh	716.8V	224S1P
S205-15	157.4kWh	768.0V	240S1P
S205-16	167.9kWh	819.2V	256S1P

Table 2.4.3-1

314Ah Battery cluster parameters:

Model	Rated Energy	Rated Voltage	System Configuration
S314-10	160.7kWh	512.0V	160S1P
S314-11	176.8kWh	563.2V	176S1P
S314-12	192.9kWh	614.4V	192S1P
S314-13	208.9kWh	665.6V	208S1P
S314-14	225.0kWh	716.8V	224S1P
S314-15	241.1kWh	768.0V	240S1P
S314-16	257.2kWh	819.2V	256S1P

Table 2.4.3-2

**Illustration:**

It is not recommended to allow the battery to operate continuously at its maximum charging and discharging current; the rated energy of the battery is valid under "25°C" conditions; the charging and discharging current and power will change according to temperature and the state of charge of the battery.

2.5 Product Details

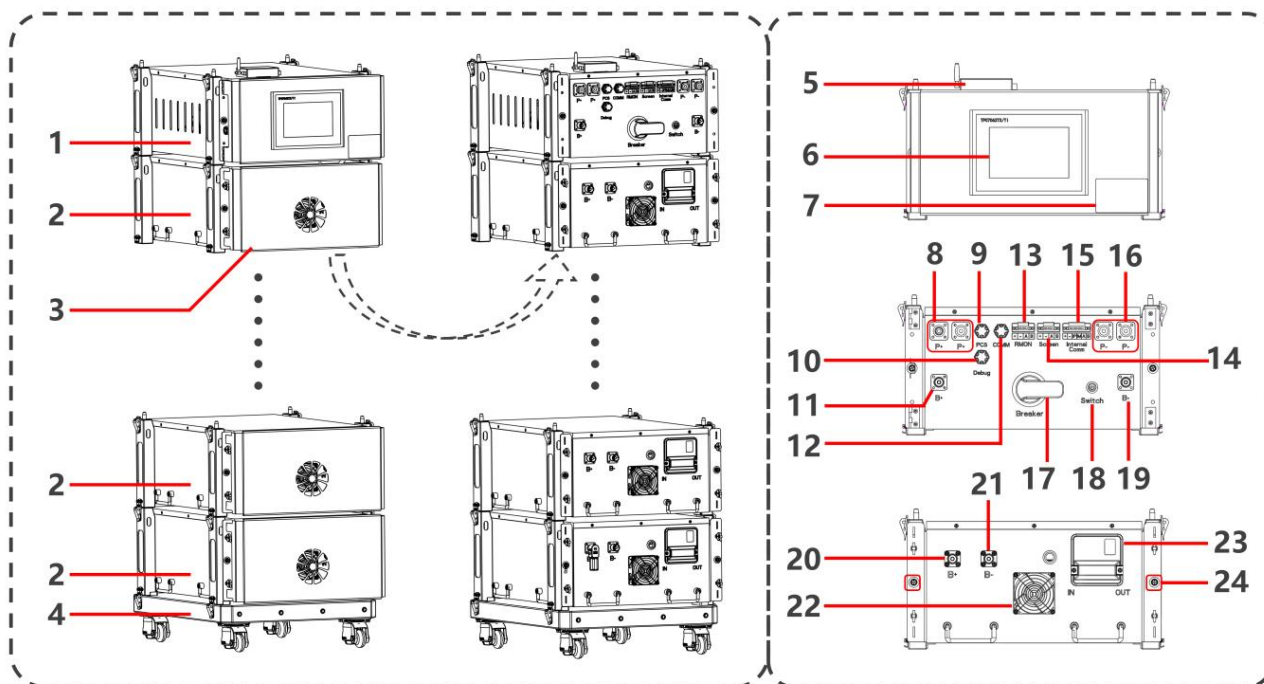


Figure 2.5

Battery Component Description Table

NO.	Item name	Illustration
1	Battery high-voltage box	Control the operation of the battery system
2	Battery module	205Ah/314Ah
3	Battery protection cover plate	/
4	Battery base	A base with pulleys, facilitating the adjustment of the battery position
5	Smart Gateway	Support remote monitoring
6	Display screen	Display battery status information
7	Battery nameplate	The "battery ID card"
8	Positive terminal socket of the high-voltage box	Connect the external positive DC cable, and it can be connected to the positive pole of the inverter.
9	PCS communication port	The battery communicates with the inverter through a connection.
10	Debugging port	Used for communicating with the computer, monitoring and upgrading the battery
11	Positive terminal interface of the high-voltage box	Connect the positive terminal of the battery box

12	Parallel communication port	The HVS batteries are connected for communication.
13	Gateway connection port	Connect the intelligent gateway device via 485 communication
14	Display screen connection port	Connect the display screen via 485 communication.
15	Internal communication ports of the high-voltage box	The communication interface between the BMU and BCU in the battery system
16	High-voltage box negative terminal socket	Connect the external negative DC cable, which can be connected to the negative terminal of the inverter.
17	DC circuit breaker	Control the on-off of the battery's high-voltage circuit
18	Power On Button	Control the "on/off" function of the low-voltage circuit in the battery system
19	Negative terminal interface of the high-voltage box	Connect the negative terminal of the battery box
20	Positive terminal interface of the battery box	Connect the positive terminal of the control box or the negative terminal of the upper battery box
21	Negative terminal interface of the battery box	Connect the negative terminal of the control box or the positive terminal of the lower battery box
22	Cooling fan	Cool the battery to reduce the probability of thermal runaway.
23	BMU	Battery management system from control
24	Protective grounding terminal	Connect the grounding cable of the battery system

Table 2.5

2.6 Product Application

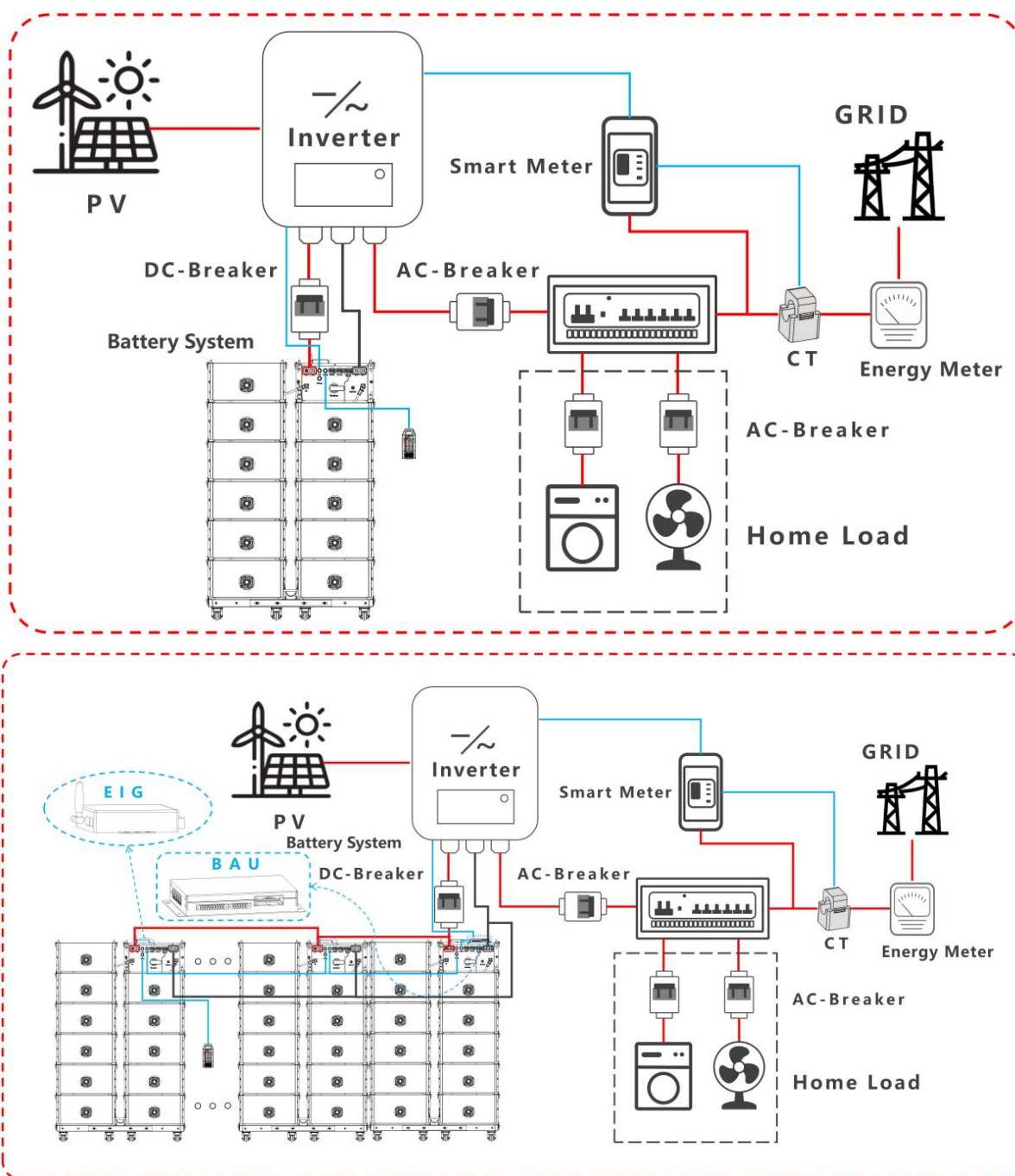


Figure 2.6-2



Illustration:

1. The battery systems in Figures 2.6-1 and 2.6-2 are respectively single-cluster and parallel-cluster.
2. Circuit breakers between the inverter and the battery, as well as between the battery systems, should be installed in accordance with local laws and regulations.

03 Product Installation

3.1 Storage before installation

- 1. Preparation before storage :** Make sure the outer packaging box of the equipment is intact and do not dismantle it ; make sure the desiccant in the box is not lost to keep the inside dry.
- 2. Storage environment requirements:** When storing the equipment, keep it away from flammable, explosive, corrosive and other items ; store the equipment in a cool place and avoid direct sunlight ; ensure that the storage environment is clean, the temperature and humidity range is appropriate, and there is no condensation.
- 3. Battery storage requirements:** The SOC (state-of-charge) range of the stored battery should be 25%~50% SOC ; the battery needs to be charged and discharged once every 6 months of storage.
- 4. Storage temperature range:** When the temperature is between -10 °C and 0°C, the storage time shall not exceed 1 month ; when the temperature is between 0°C and 35°C, the storage time shall not exceed 1 year ; when the temperature is between 35°C and 45°C, the storage time shall not exceed 1 month.
- 5. Storage humidity range:** The storage humidity range is 15 ~ 90 % RH, without condensation . If moisture and condensation are found on the battery interface, the battery system cannot be installed and should be handled properly.

3.2 Pre-installation inspection

- 1. Outer packaging inspection:** Verify whether the outer packaging is intact, including whether there are deformations, holes, cracks or other signs that may cause damage to the internal equipment.
- 2. Equipment model and delivery parts inspection:** Check whether the equipment model is consistent with the order ; confirm whether the type and quantity of the delivery parts are correct, and check whether there is any damage on the appearance.

3.3 Installation Environment

Installation environment requirements: The equipment must not be installed in a flammable, explosive, or corrosive environment ; the installation location should be out of reach of children and should be located in a location that is not easily touched accidentally ; at the same time , note that the surface of the equipment may generate high temperatures when it is running to prevent burns.

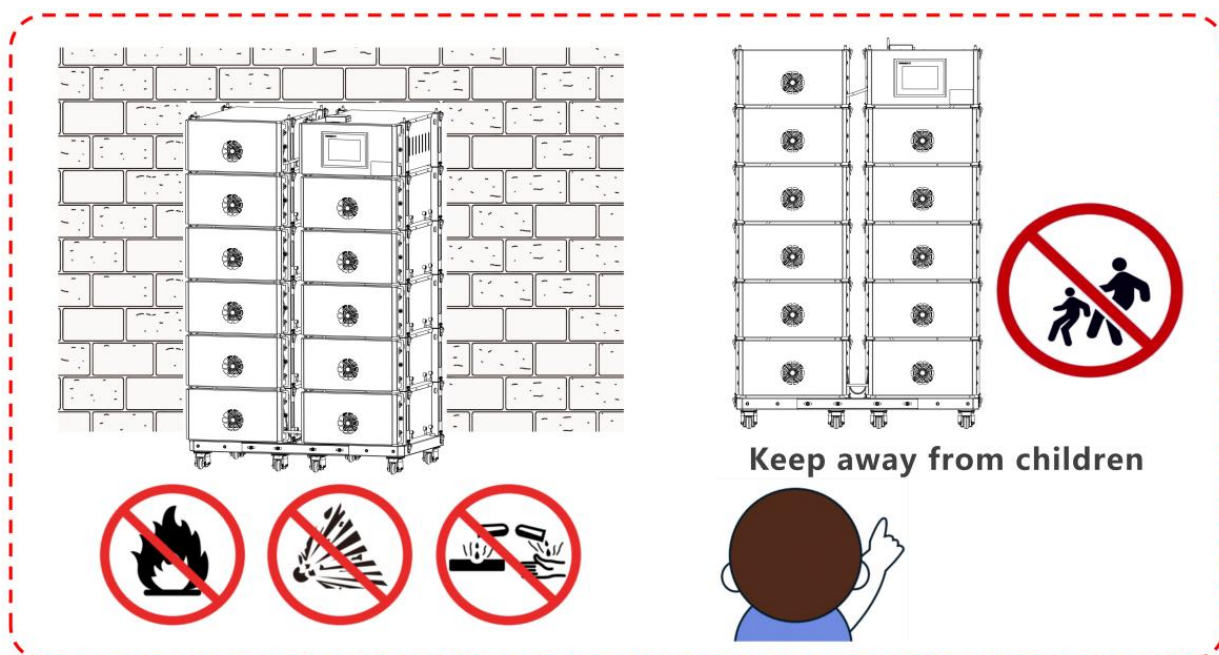


Figure 3.3-1

Notes on the installation location: Avoid installing near water pipes, cables, etc. inside the wall to prevent damage to the battery. The installation environment should avoid direct sunlight, rain, and snow. It is recommended to install it in a well-ventilated place indoors. If necessary, install an air-cooled air conditioner.

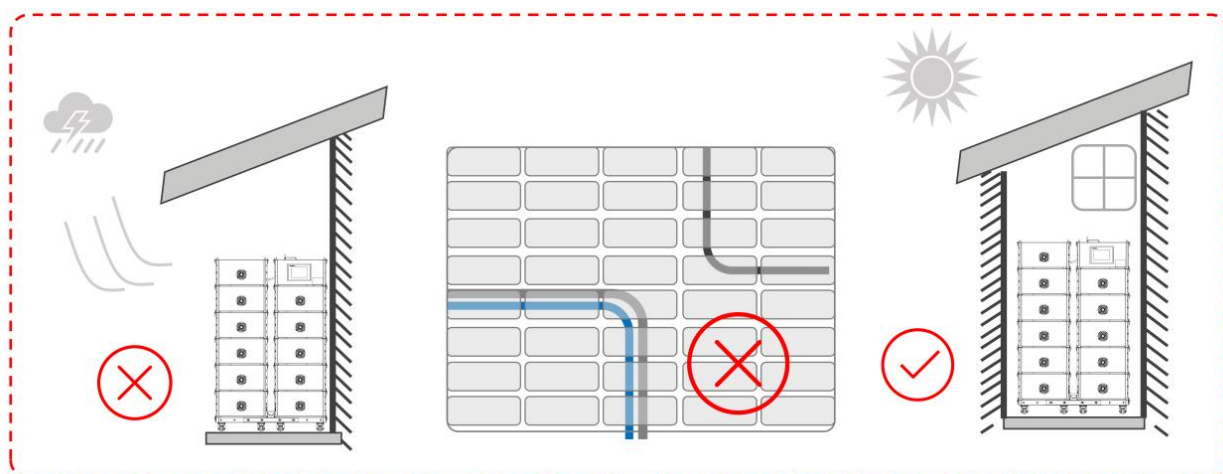


Figure 3.3-2

Installation space and environmental conditions: Ensure that the installation space meets the ventilation and heat dissipation and operating space requirements of the equipment; the protection level of the equipment is suitable for indoor installation, and the temperature and humidity of the installation environment must be kept within an appropriate range.

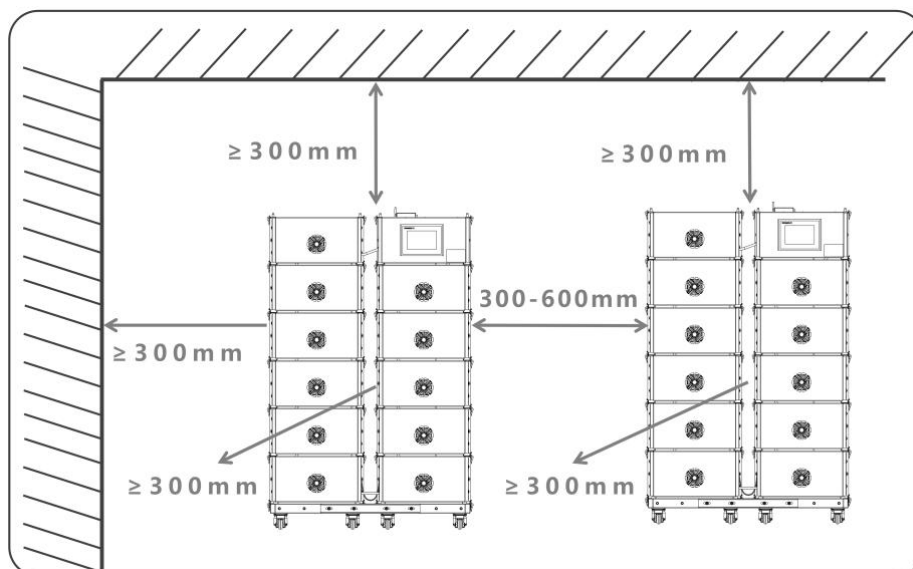


Figure 3.3-3

Equipment installation height and protection: The equipment installation height should be convenient for operation and maintenance, ensuring that indicator lights and labels are clearly visible and wiring terminals are easy to operate ; the equipment installation altitude should not exceed 2,000 meters.

Electromagnetic interference protection: The installation location should be away from strong magnetic fields to avoid interference; if there are radio stations or wireless communication devices below 30MHz near the installation location, the distance between the battery and these devices should be greater than 30 meters.

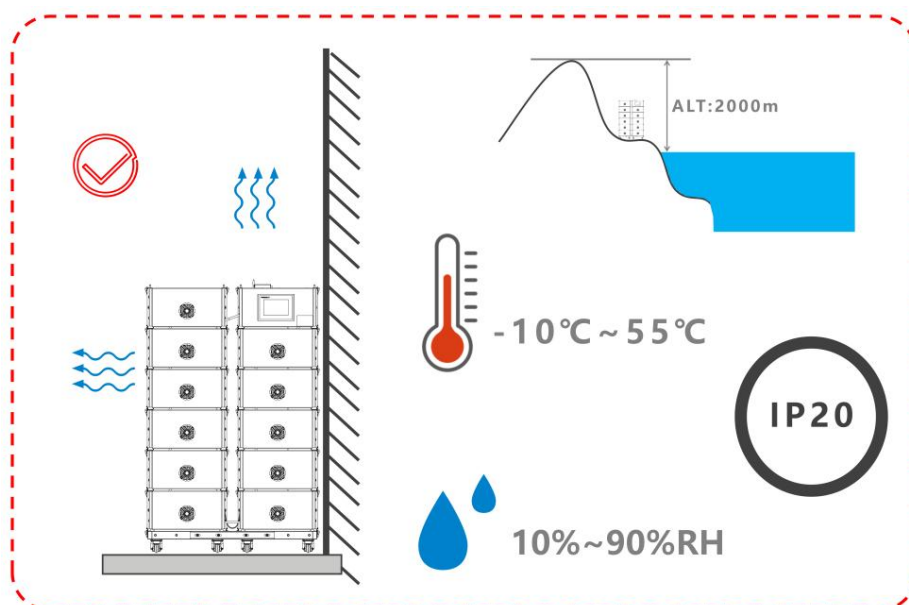


Figure 3.3-4

Requirements for installation carrier: Use non-flammable materials (such as concrete, masonry, or fire-resistant wood or metal);

The carrier must be sturdy and able to bear the weight of the equipment ; the battery system must be installed against the wall and equipped with an anti-dump bracket.

Installation angle requirements: The device must be installed horizontally to avoid tilting or inverting.

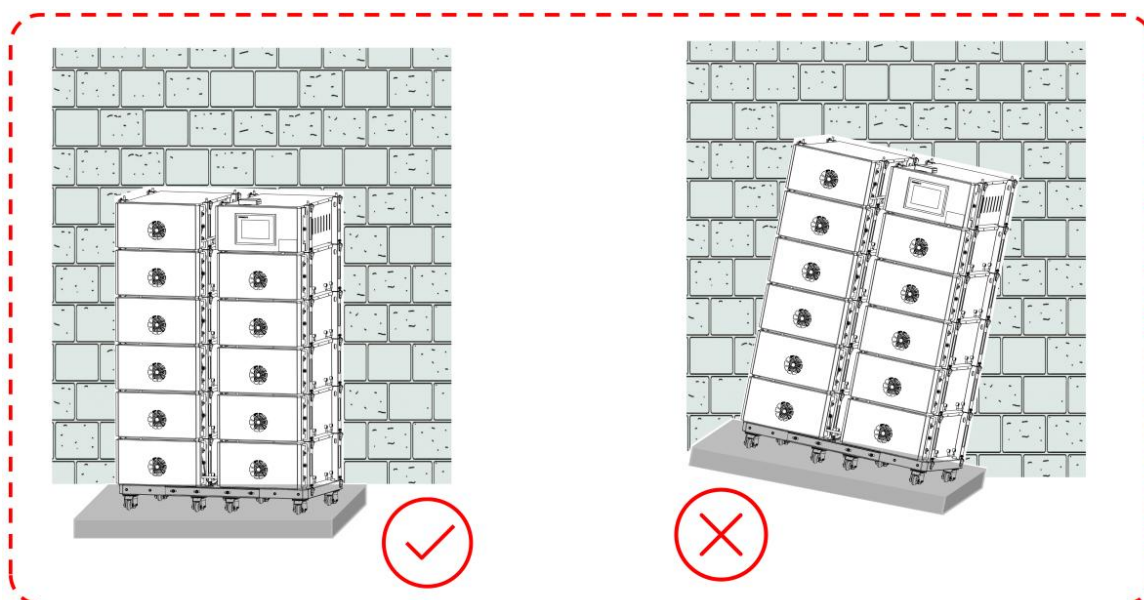


Figure 3.3-5

3.4 Prepare tools

Installation Tool Table:

NO.	Tool Name	Legend
1	Insulating gloves	
2	Protective glasses	
3	Insulated shoes	
4	Work clothes	
5	helmet	
6	Screw driver	
7	Wires strippers	
8	Hydraulic pliers	
9	Heat gun	

10	Multimeter
11	Torque wrench
12	Marking pen



Table 3.4



Illustration: This table is for reference only. The actual tools should be based on local installation standards.

3.5 Mechanical Installation



Note:

1. During transportation, handling and installation, local laws, regulations and industry standards must be observed.
2. Arrange the transporters appropriately according to the weight of the battery to prevent injuries caused by overweight handling; at the same time, be sure to wear safety gloves to protect your hands.
3. Please ensure that the battery remains balanced during transportation to avoid falling.

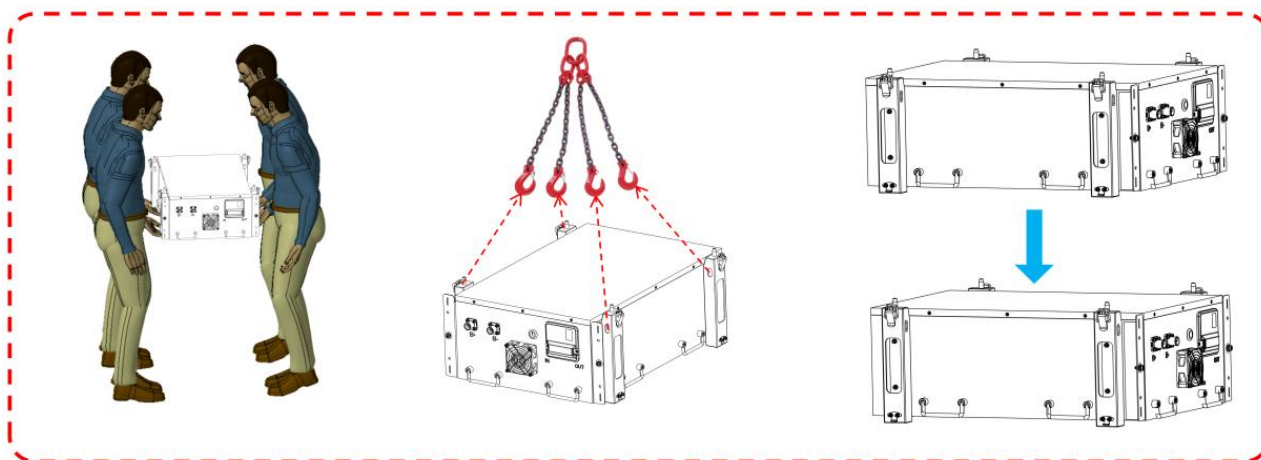


Figure 3.5-1



Illustration:

During the installation process, ensure that there are at least 2 to 4 people operating to ensure safety.

Battery system installation:

Step one:

Adjust the four rollers under the battery base, and by operating the gears, ensure that the battery base is securely fixed on the non-flammable material carrier.

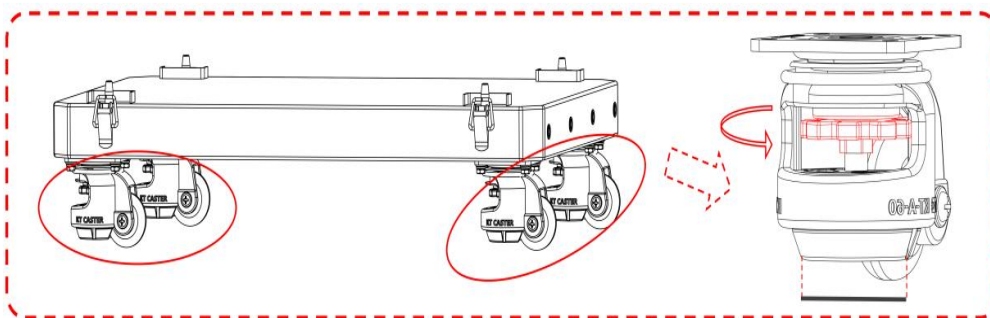


Figure 3.5-2

Step two:

Place the bottom battery PACK on the base, and fix the battery within the limit columns of the base through the installation brackets around it to ensure a secure installation.



Illustration: In the battery base, "only the tower clamps with limit pins are present around it."

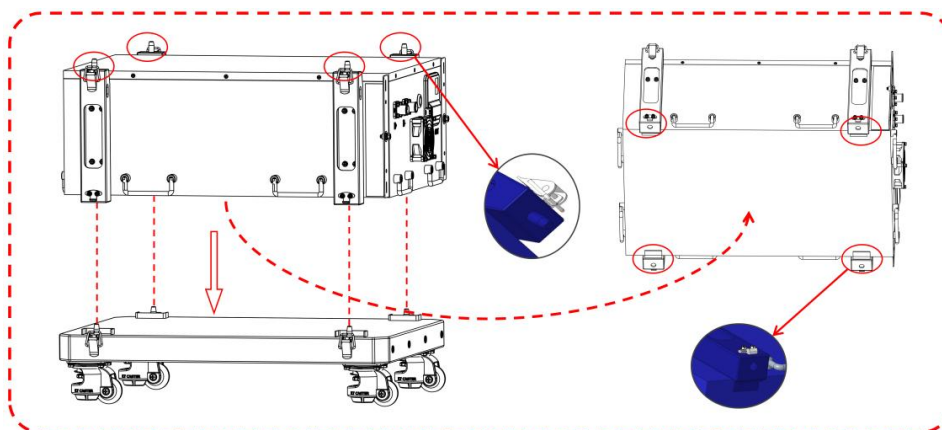


Figure 3.5-3

Step three:

When installing the battery PACK, first align the positioning holes of the upper layer batteries with the positioning pins of the lower layer batteries, and then secure the tower clamps of the surrounding brackets to ensure a stable connection between the two layers of batteries.

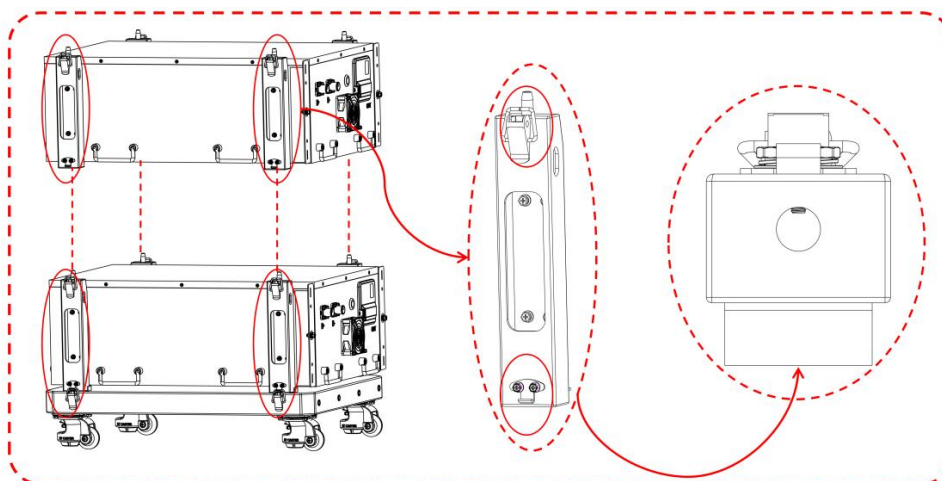


Figure 3.5-4



Illustration:

During the battery installation process, always wear insulating gloves to prevent electric shock.

Step four:

According to the battery model listed on the delivery list, repeat the "Step 3" operation until the required number of battery PACK stacks have been completed.

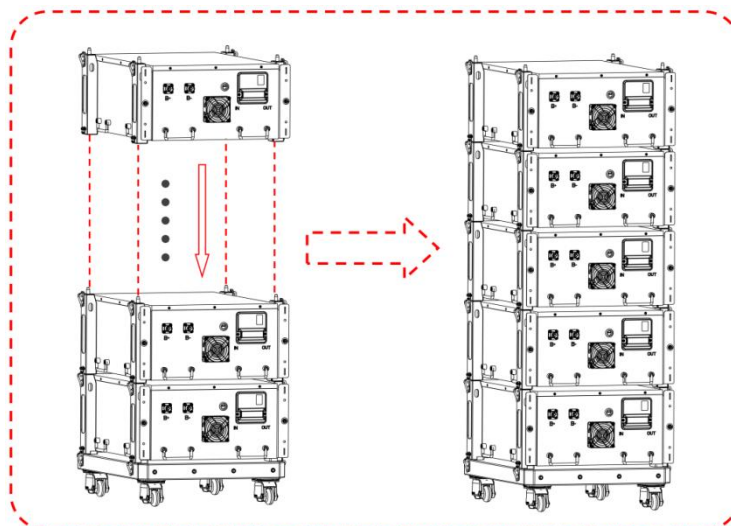


Figure 3.5-5

Step five:

Similarly, in the HV PACK battery system, the installation brackets around the control box need to be fixed using "limiting columns", "limiting holes" and "screws", and it is necessary to ensure that the control box does not loosen.

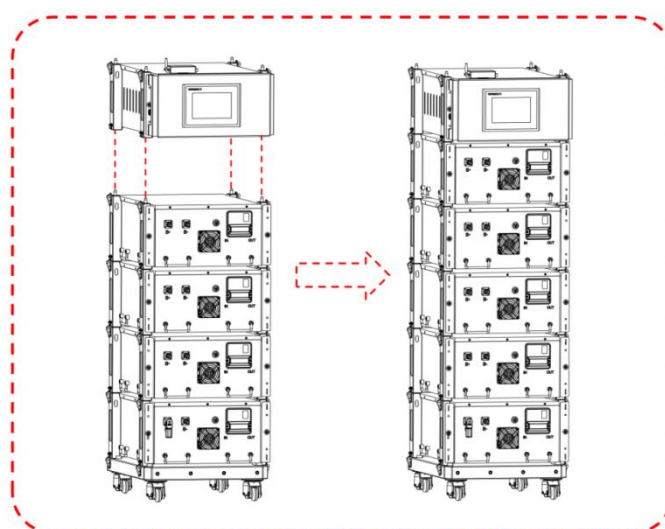


Figure 3.5-6

Step six:

After the battery system installation is completed, check whether it is installed level and firmly. If there is any inclination or shaking, the installation state of the battery system can be adjusted by rotating the adjustment gear.

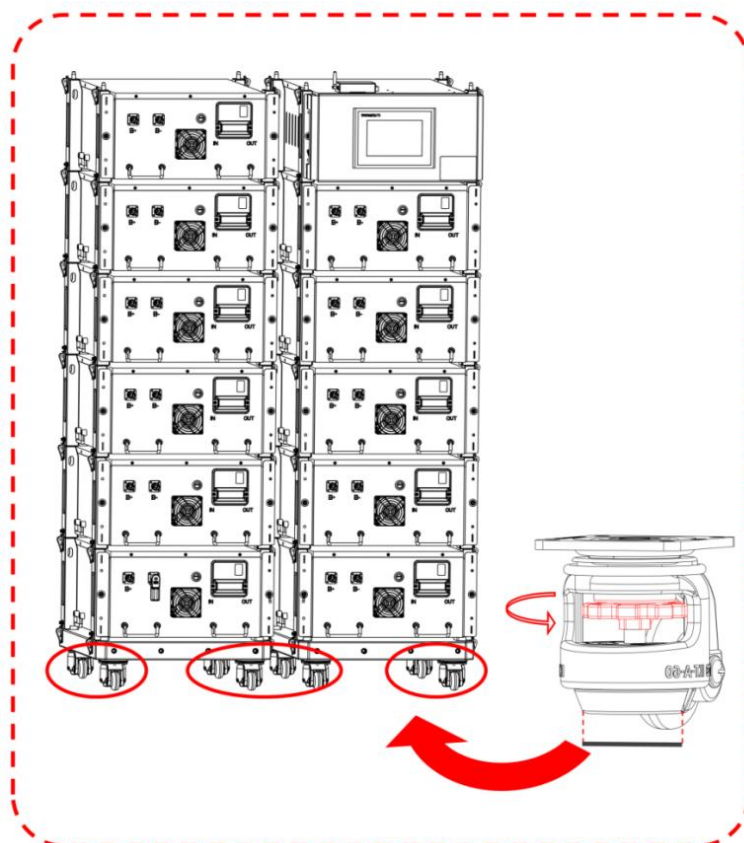


Figure 3.5-7

**Illustration:**

Ensure that the control box is always positioned above the battery. Do not install the battery on top of the control box. Also, before placing the battery base, battery or control box, make sure that the upper and lower holes are aligned.

Step seven:

After confirmation is complete, install the base fixing clips of the battery system.

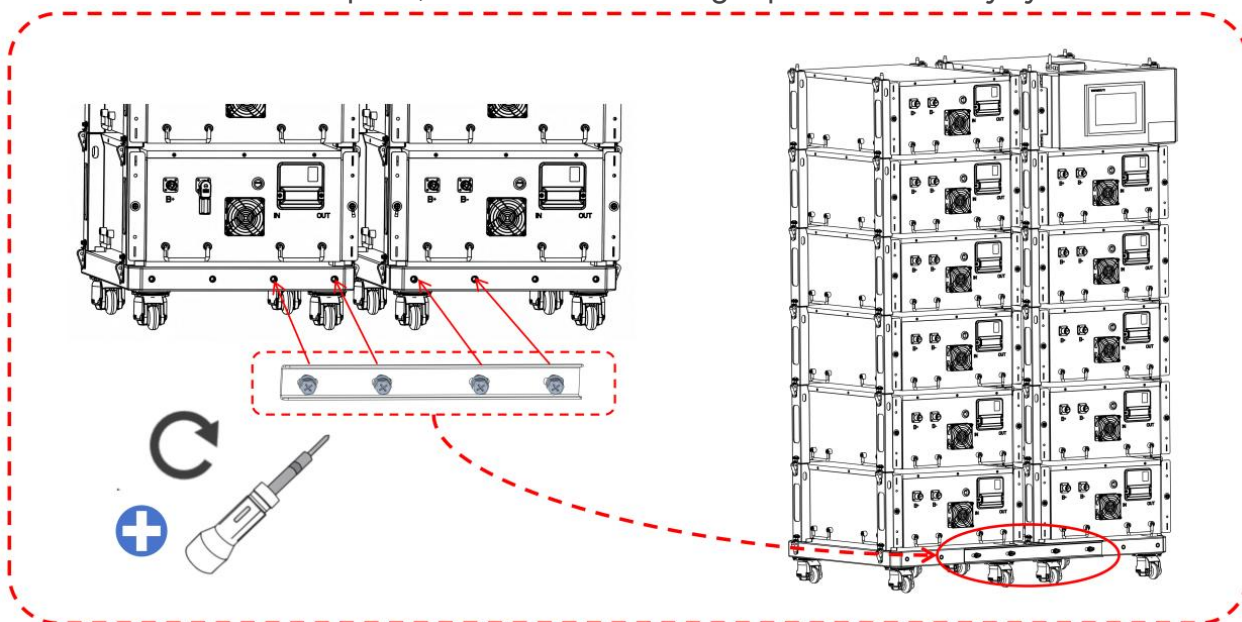


Figure 3.5-8

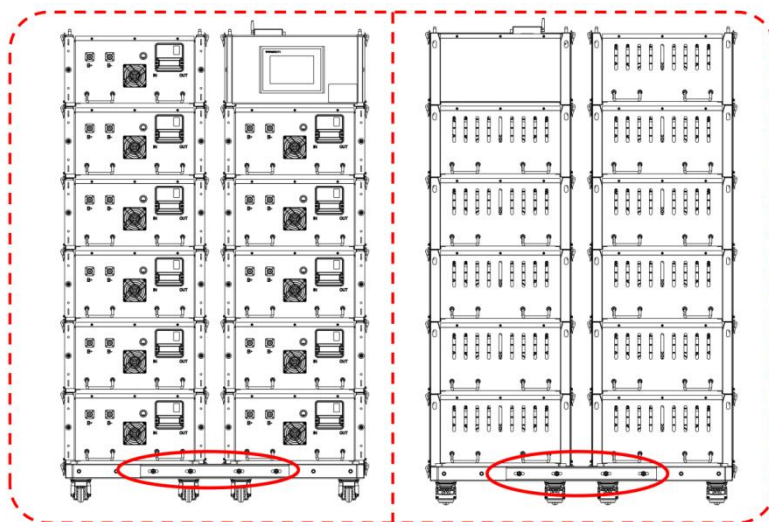


Figure 3.5-9



Illustration : Both the "front" and "back" sides of the battery system require the installation of "fixing plates".

3.6 Electrical connections



Danger:

1. Safe power-off operation

Before performing any operation on the equipment in the battery system, make sure that the equipment is completely powered off to prevent electric shock accidents ;

Strictly comply with the safety precautions in this manual and the safety signs on the equipment ;

2. Electrical connection specifications

During electrical connections, cables and component specifications that comply with local laws and regulations must be used ;Cables of the same type should be bundled together and laid out separately from cables of different types to prevent them from getting tangled or crossed ;

3. Precautions for crimping terminal blocks

When crimping the terminal, you must ensure that the conductor part of the cable is in full contact with the terminal ;

It is strictly forbidden to crimp the cable insulation together with the terminal block. Doing so may cause the equipment to fail to operate normally, or generate heat due to unreliable connection during operation, thereby damaging the inverter terminal block.



Illustration: 1. Electrical connection operations are limited to professionals.

2. The cable colors shown in the figure are for reference only. In actual operation, they should be selected according to specific circumstances.

3. Ensure that the cable specifications used comply with local laws and regulations.

3.6.1 Single battery system

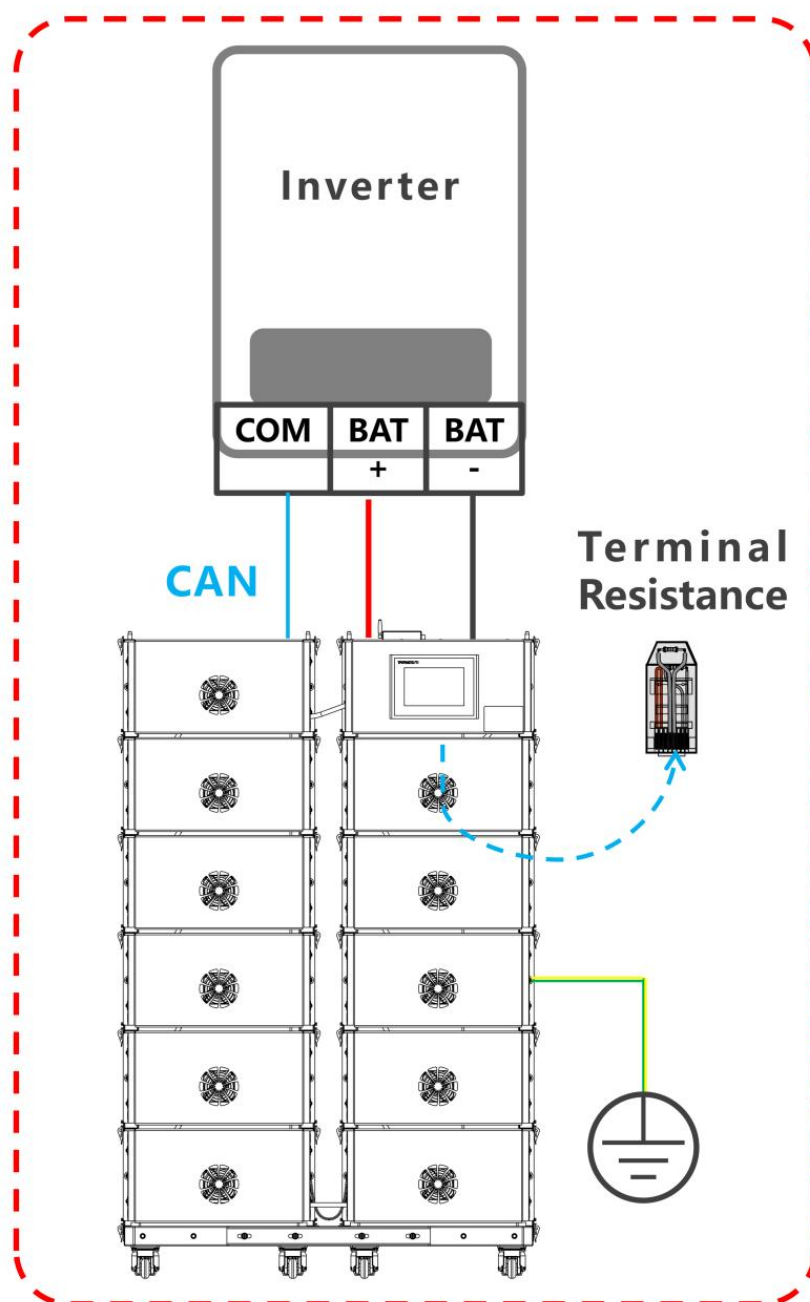


Figure 3.6.1



Note:

1. The DEBUG port is for debugging purposes. Please do not use this port when connecting communication cables.
2. Connect the PCS port to the inverter, and install a terminal resistor on the COMM port. Note that if a terminal resistor is not installed, the battery system may not function properly.

3.6.2 And cluster battery system

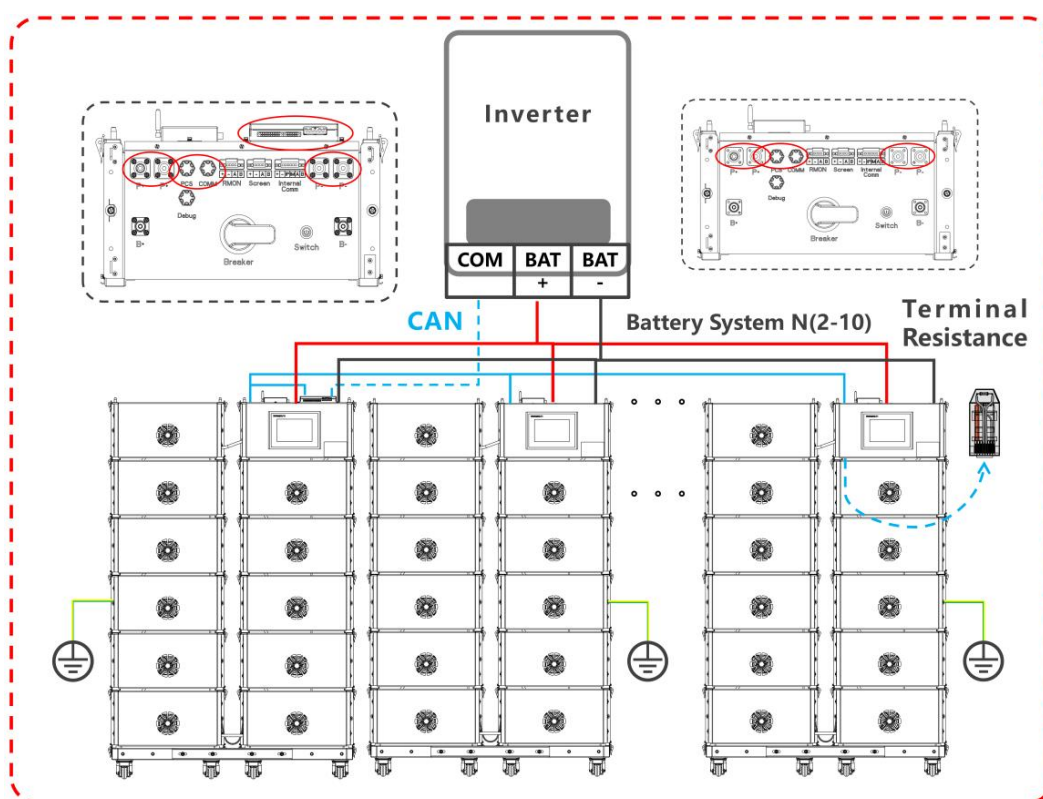


Figure 3.6.2



Note:

1. The Station battery system and clusters (requiring combiner boxes and BAU) should be used in no more than 10 groups.
2. During the cluster formation process, it is necessary to ensure that the available electricity of each battery system is consistent to ensure the balance and efficient operation of the system.
3. Ensure that the "PCS" communication port of battery system 1 is connected to the inverter, which is the port used to control the communication between the battery system cluster and the inverter.
4. Another "COMM" communication port of Battery System 1 is applied for battery and cluster connection.
5. For Battery System N (where N represents the last battery system), it is necessary to ensure that the "COMM" communication port has a terminal resistor installed.
6. The DEBUG port is for debugging purposes. Do not use this port when connecting communication lines.



Illustration:

Installing a terminal resistor is crucial for maintaining the signal integrity of the communication line. It can prevent signal reflection and attenuation. If a terminal resistor is not installed at the "COMM" port, it may cause abnormal communication in the battery system, thereby affecting the overall operation of the energy storage system.

3.6.3 Protection ground wire connection



Note:

- 1 Protective ground wire, recommended specification: Type: Outdoor single-core copper wire ; Conductor cross-sectional area: 6mm^2 .
2. Please ensure that the cable is securely fixed without loosening after the connection is completed.
3. After the battery stack is completed, the protective ground wire should be connected first to ensure safety. When removing the battery system, the protective ground wire should be removed as the last step.

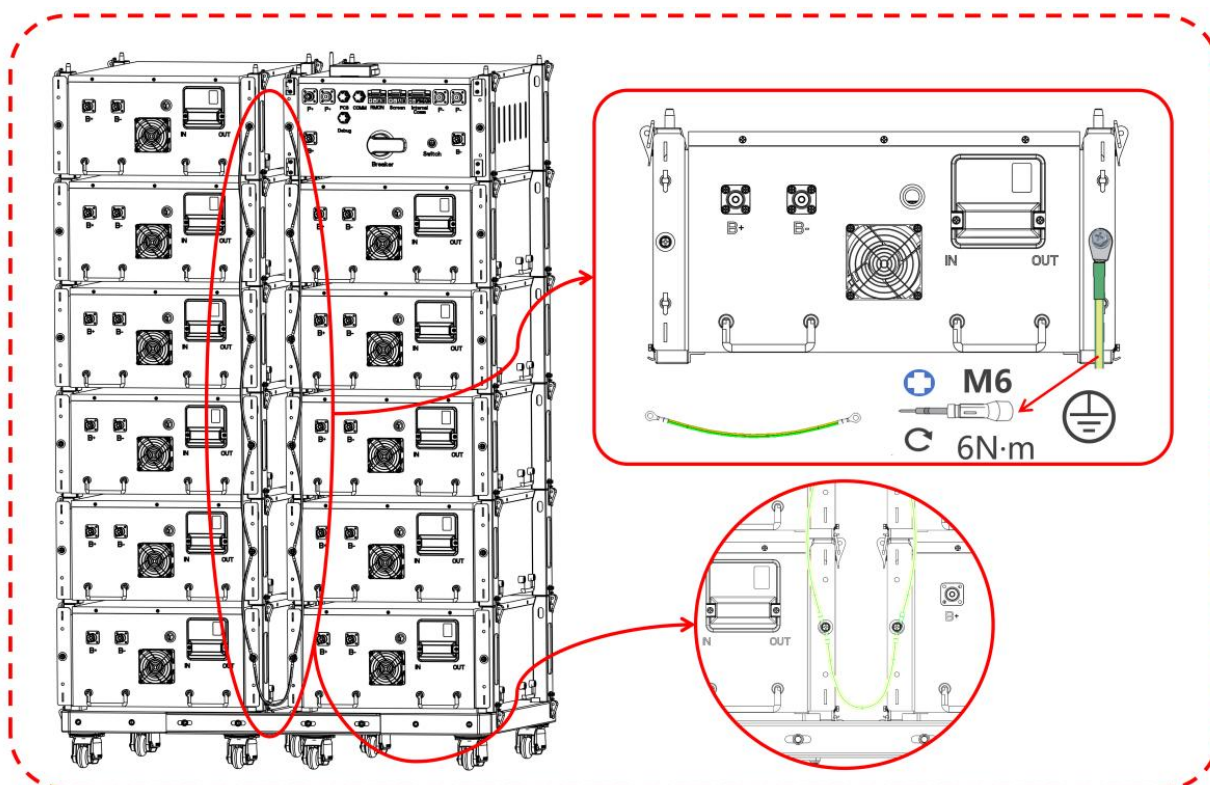


Table 3.6.3

3.6.4 Power lines are connected to communication lines

Internal power line::

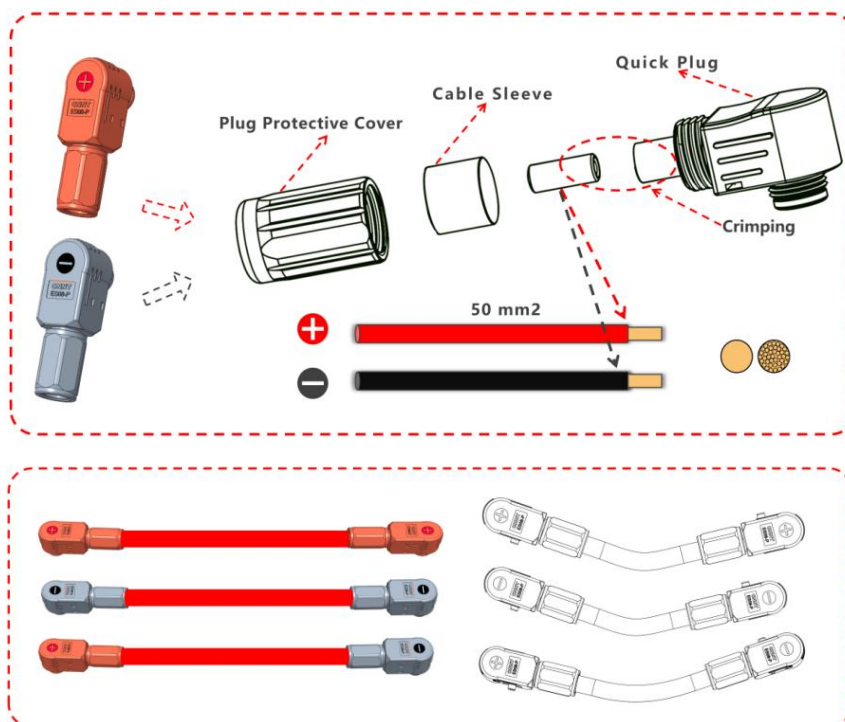


Figure 3.6.4-1



Illustration:

The power lines between the battery PACKs should be kept as equal in length as possible to ensure current balance and enhance system stability.

Battery pack power connection:

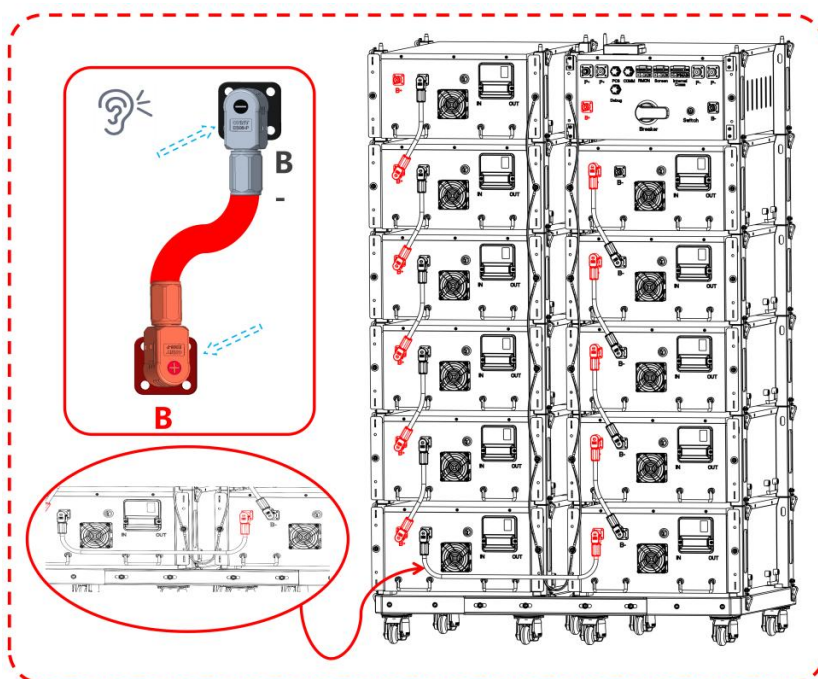


Figure 3.6.4-2

Battery pack communication connection: (BMU – Daisy chain communication)

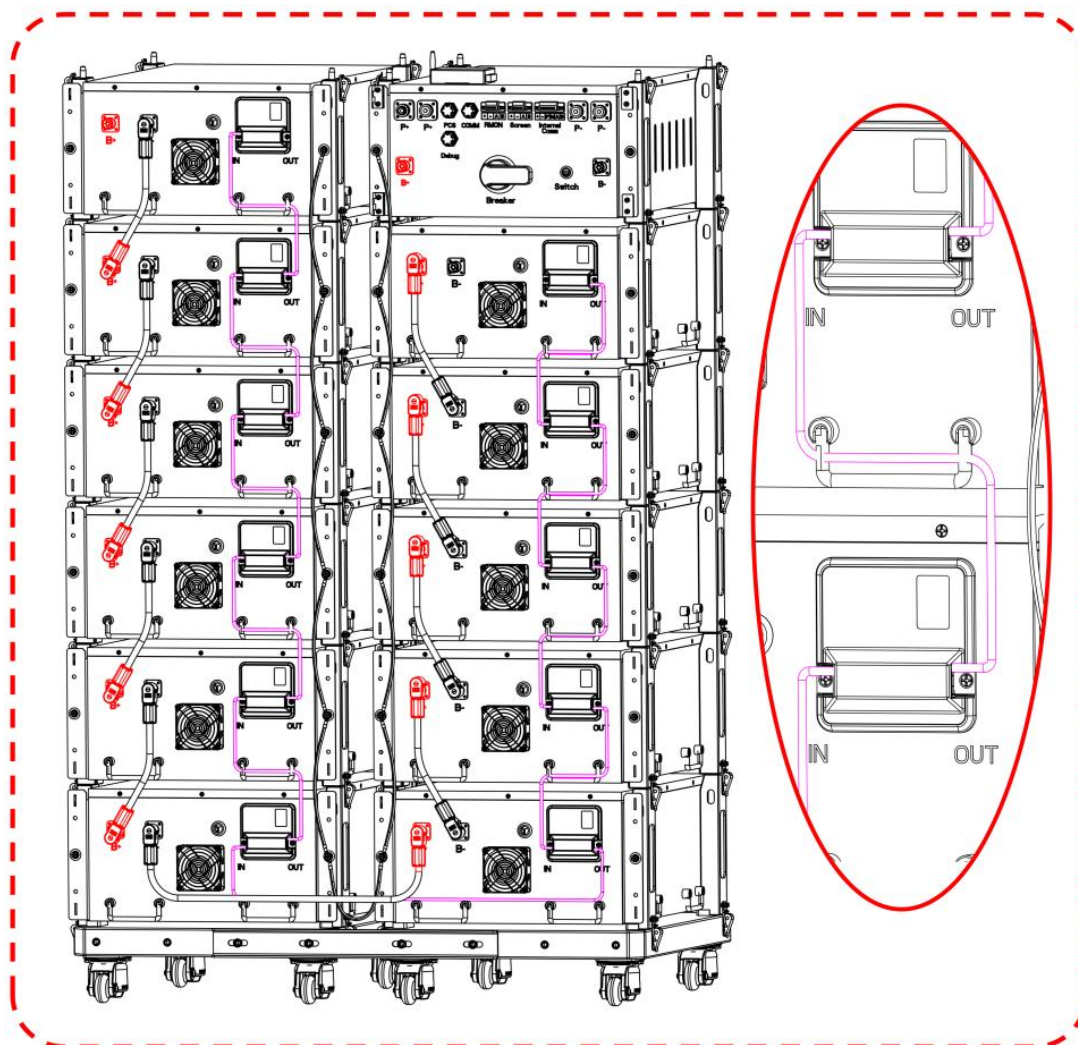


Figure 3.6.4-3

Battery pack communication line interface definition table

NO.	Interface	Name
1	IP-OUT	Positive terminal of the daisy chain output
2	IM-OUT	Negative terminal of the daisy chain output
3	IP-IN	Daisy chain input positive terminal
4	IM-IN	Daisy chain input negative terminal

Table 3.6.4



Illustration:

The daisy chain communication cable uses unshielded twisted pair cables.

Connection between the battery box and the control box:

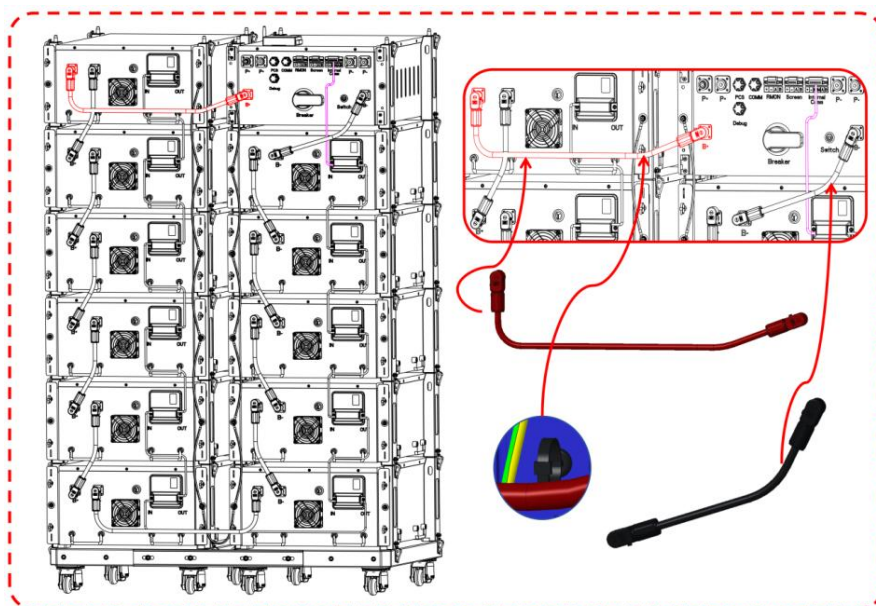


Figure 3.6.4-4



Note:

1. On the high-voltage control box, "B+" connects to the positive terminal of the battery box, and "B-" connects to the negative terminal of the battery box.
2. The "OUT" communication port on the high-voltage control box is the connection point for the BCU and BMU in the battery system.
3. At each battery box, the power connection line needs to be securely bound with cable ties to keep the cable in place.

Close the protective cover plate:

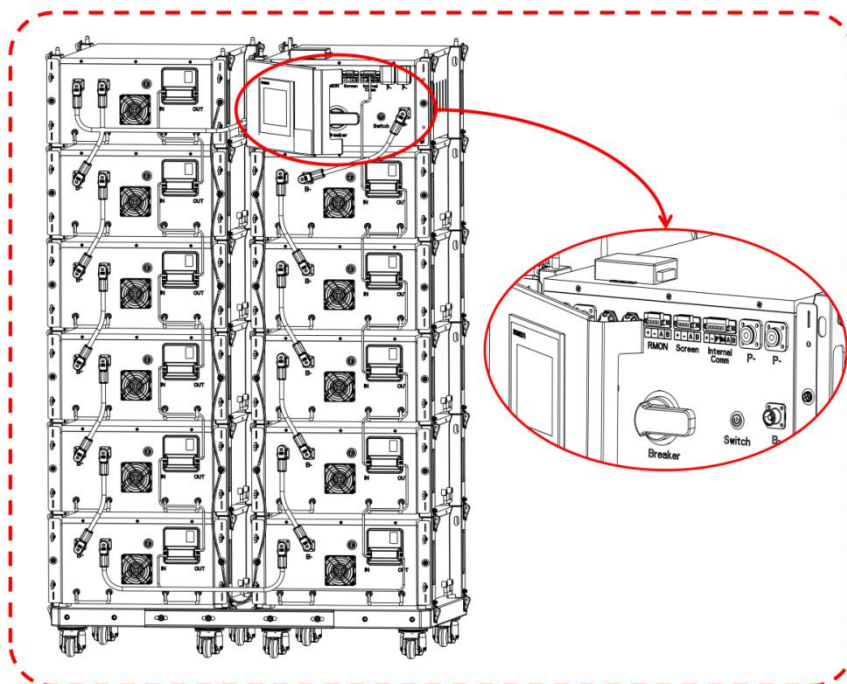


Figure 3.6.4-5

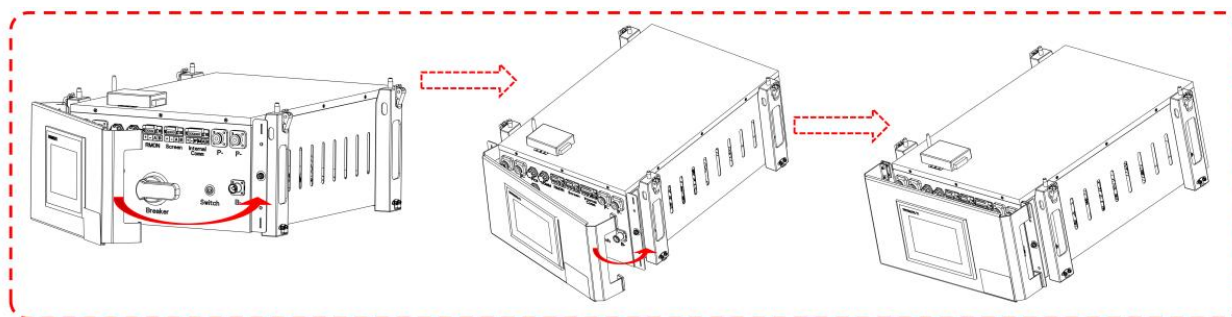


Figure 3.6.4-6

**Illustration:**

The picture above shows the operation process of closing the protective cover of the "high-voltage control box".

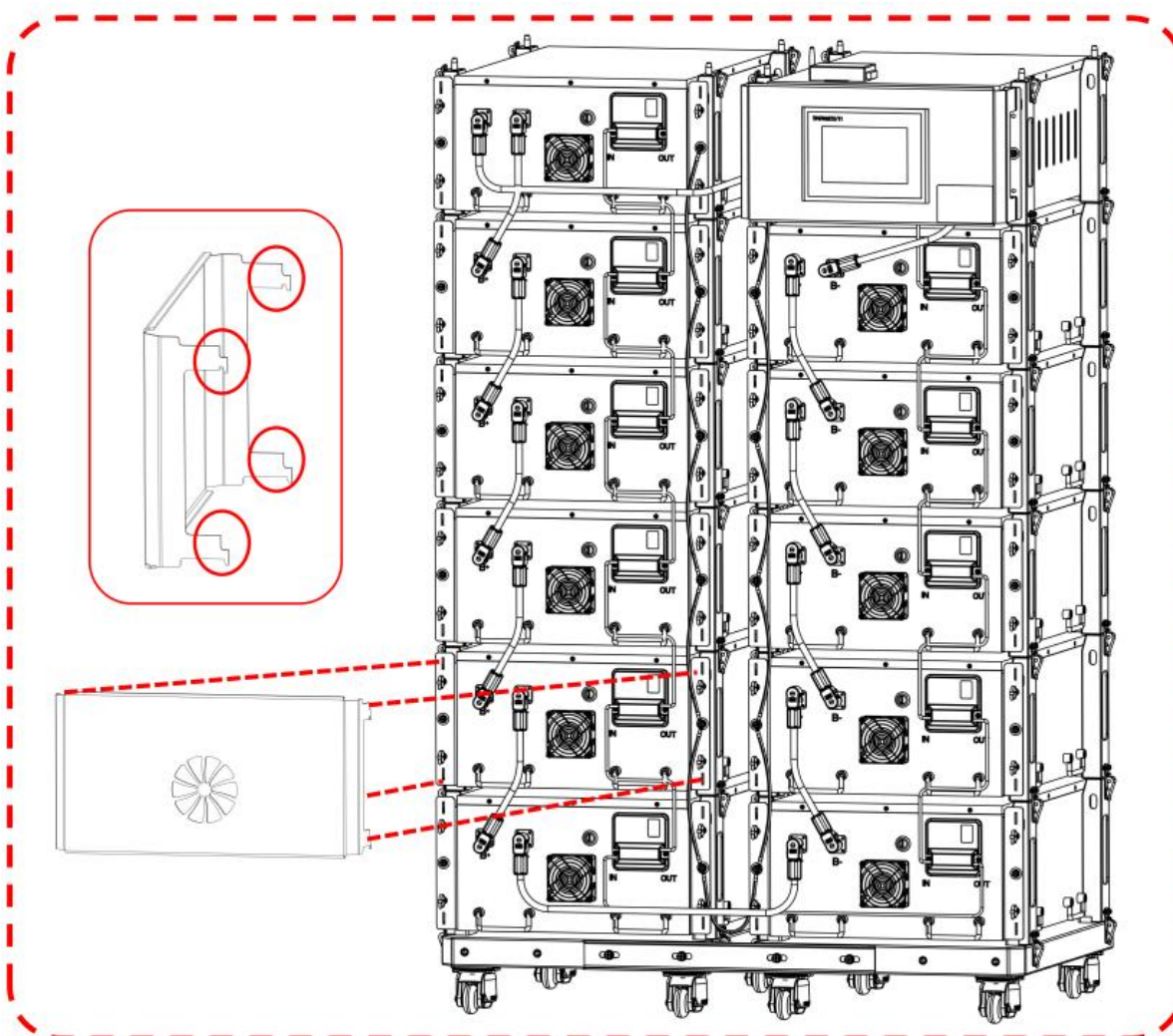


Figure 3.6.4-7

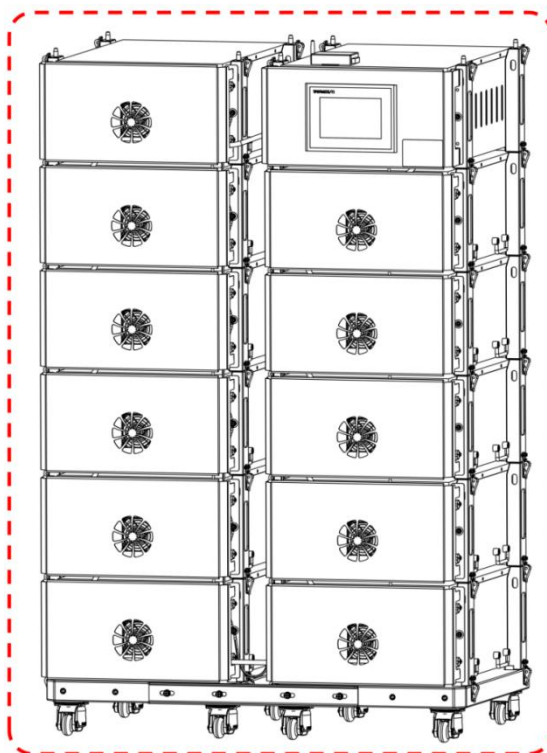


Figure 3.6.4-8

**Illustration:**

The picture above shows the operation process of closing the protective cover of the "battery box".

3.6.5 External communication port



Note: 1. Users should decide whether to use the communication cables provided with the inverter based on their installation requirements, and refer to the user manual to understand the specifications and connection methods of the cables.
2. If purchasing communication cables by themselves, it is recommended to choose standard Ethernet cables combined with RJ45 crystal connectors as the connection solution.

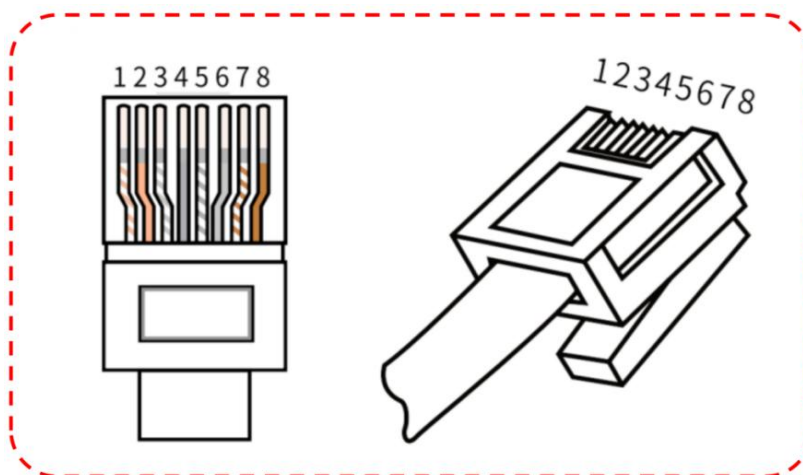


Figure 3.6.5

Port Definition Table

PIN	DEBUG	PCS	COMM
1	NC	CHA_CANH	CHA_CANH
2	NC	CHA_CANL	CHA_CANL
3	NC	GND	GND
4	CANH	NC	NC
5	CANL	NC	NC
6	NC	NC	NC
7	NC	ADD-IN+	ADD-OUT+
8	NC	ADD-IN-	ADD-OUT-

Table 3.6.5

! **Note:** This chapter only elaborates on the definition of external communication ports. It is essential to install the battery system terminal resistor to avoid electromagnetic interference and ensure the normal operation of the system.

3.6.6 External connection cable

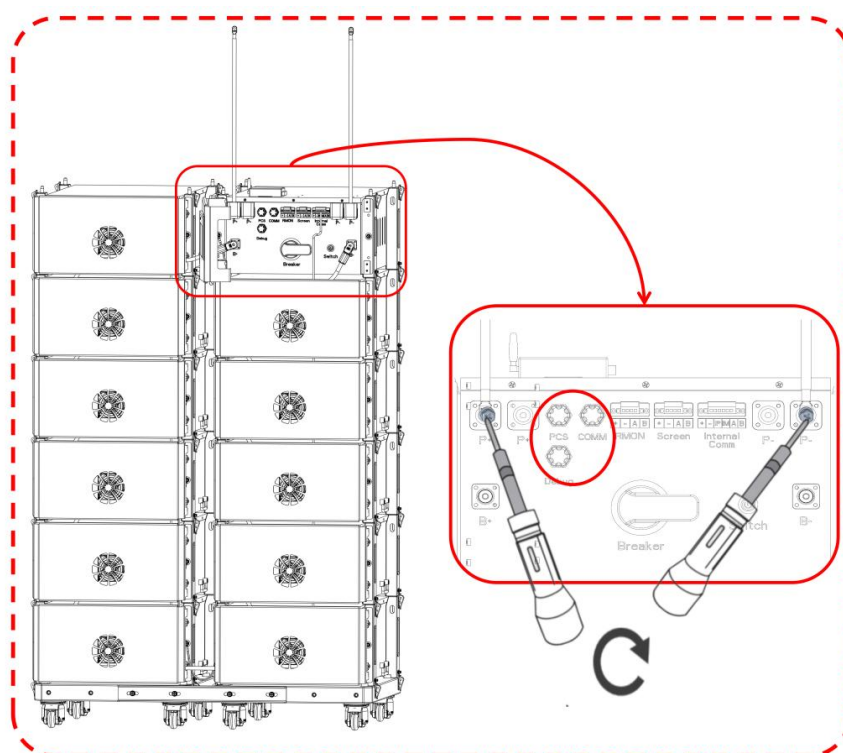


Figure 3.6.6



Illustration: Electrical system connection please refer to Appendices B, C, and D.

04 Operation and maintenance



Danger:

Please use special protective equipment and special insulating tools to prevent electric shock injuries or short-circuit faults.



Note:

1. During the power-on process, one should observe the situation while powering on. If any abnormal phenomenon is detected, the battery should be powered off immediately and the cause should be identified. After the problem is resolved, the power-on process can be resumed;
2. After the battery installation and adjustment is completed or after the battery discharge is finished, it is necessary to recharge the battery in time. Otherwise, the battery may be damaged due to over-discharge.

4.1 Check before power on

Inspection items and acceptance criteria:

NO.	Inspection items	Inspection Standards
1	System installed	Correct installation and firm and reliable
2	Reasonable cable layout	Reasonable cable layout to meet user requirements
3	Cable ties are beautiful	The cable ties should be evenly spaced and no sharp corners should be left at the cut
4	Reliable grounding	The ground connection is correct, firm and reliable
5	Disconnect switch	The "inverter" and all switches connected to the battery are in the "OFF" state
6	Cable connection in place	The DC line, AC line and communication line are connected correctly and firmly.
7	Seal unused terminals and connectors	Install waterproof covers on unused terminals and interfaces
8	The installation environment meets the requirements	Reasonable installation space and clean environment

Table 4.1

4.2 Startup Procedure

Step 1: Use a multimeter to confirm that the grid voltage is within the predetermined range;

Step 2: Close the circuit breaker between the inverter and the battery;

Step 3: Close the circuit breaker on the high-voltage control box; the "Breaker" between each high-voltage box needs to be closed in sequence (order: from near to far, first close the main cluster-battery, then close the slave cluster battery);

Step 4: Press the battery power button "SWITCH"; if it is a cluster system, before the first cluster, make sure that the voltage difference between the battery systems does not exceed 5V, then press the power button "SWITCH" between the battery systems one by one, and wait for 5 minutes for the stabilization period;

Step 5: Please power on the inverter according to the instructions in the inverter user manual to start the inverter in the system.

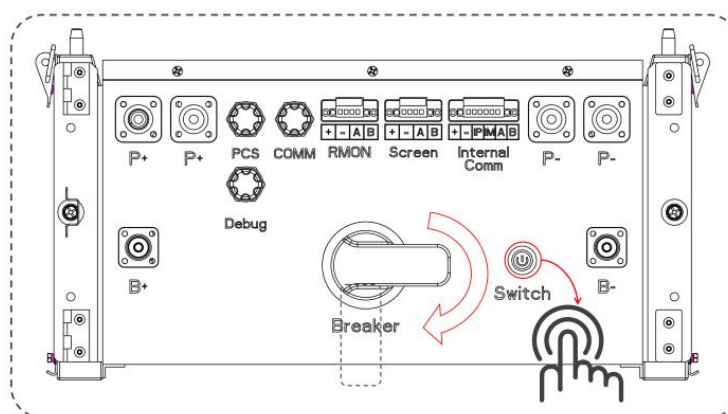


Figure 4.2-1

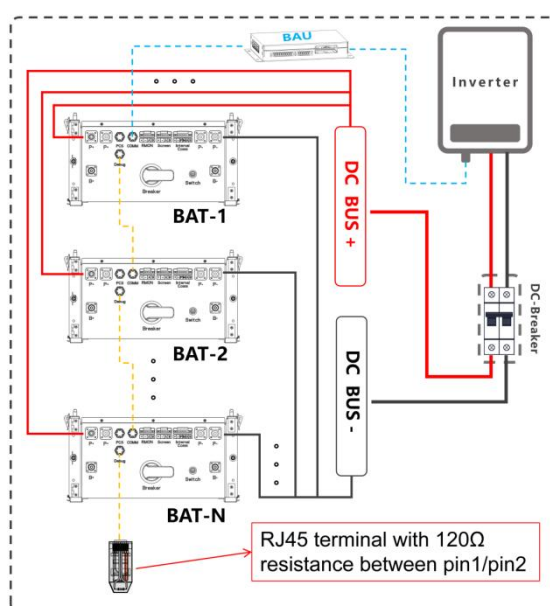


Figure 4.2-2



Illustration: Figure 4.2-2 shows the wiring diagram of the parallel cluster system.

4.3 Shutdown Procedure



Danger:

When shutting down the battery system, please strictly follow the power-down requirements of the battery system to prevent damage to the battery system.

Step 1: Please follow the user manual of the inverter to perform the power-down operation to shut down the inverter in the system;

Step 2: In the cluster system, please press the power-on button "SWITCH" on the battery system one by one to ensure that the indicator lights of each "SWITCH" are in the off state.

Step 3: If it is a cluster system, you need to disconnect the circuit breakers between each high-voltage control box (sequence: from far to near, first close the cluster-battery, then close the main cluster battery);

Step 4: Disconnect the circuit breaker between the inverter and the battery.

4.4 Central Control BAU



Illustration:

The cluster system (three-level architecture) is mainly composed of the master control unit (BAU), the main control unit (BCU), and the slave control unit (BMU), which together form the battery management system.

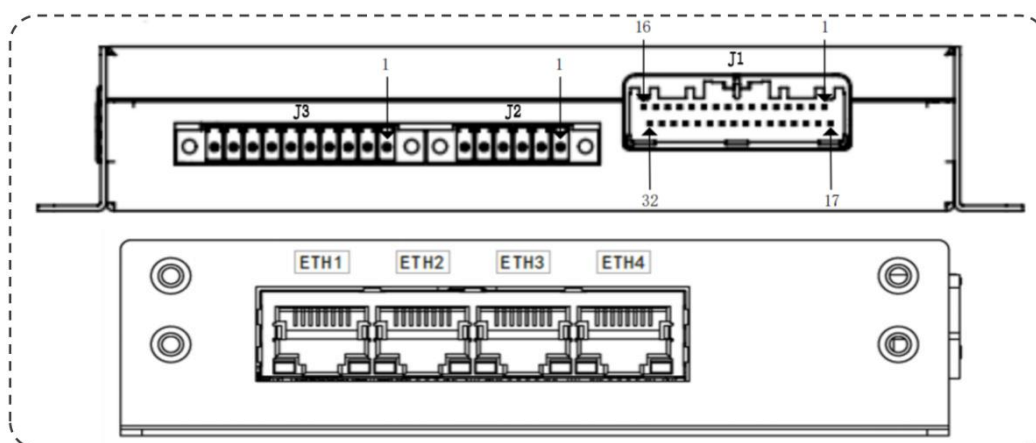


Figure 4.4

PIN	Name	Definition
J3-1	485A5	EMS Communication Modbus-RTU-A
J3-2	485B5	EMS Communication Modbus-RTU-B
J3-5	CAN2L	Inverter/EMS Communication CAN Low
J3-6	CAN2H	Inverter/EMS Communication CAN High

Table 4.4



Note:

1. Requirements for battery clusters: It is necessary to achieve the parallel connection of more than two battery clusters, and BAU provided by our company must be used.

2. It is strictly prohibited to parallel connect battery clusters composed of different numbers of battery packs (for example: a cluster containing 10 battery packs cannot be connected with a cluster containing 8 battery packs).
3. Number of parallel clusters: Theoretically, BAU supports the parallel connection of up to 32 battery clusters, but considering current flow suppression and system stability, it is recommended that the number of parallel connections does not exceed 10.
4. Communication requirements: After parallel connection through BAU, the inverter or main inverter (master control inverter) only needs to communicate with BAU, and direct communication with a single battery cluster is prohibited.

4.5 Smart Gateway

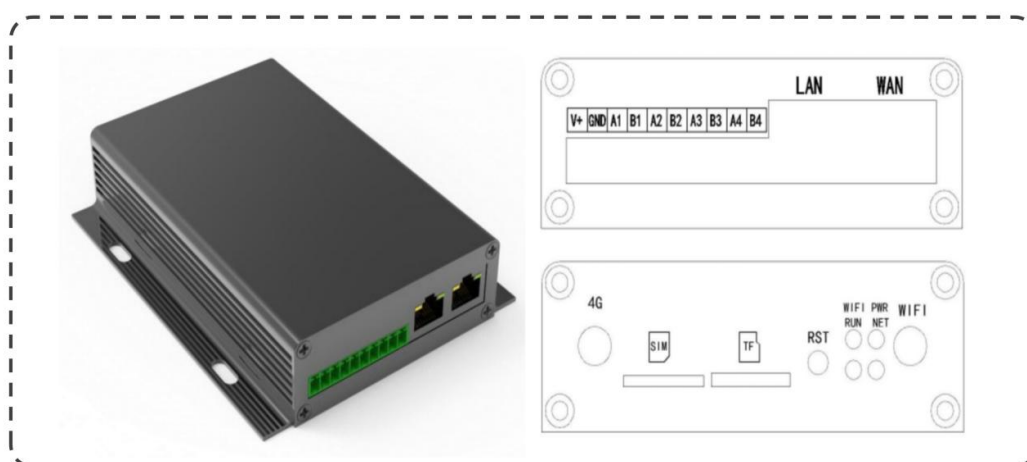


Figure 4.5

Name	Status	Instructions
PWR	Always on	Power supply is normal
	Off	Power supply is Abnormal
RUN	Off	System not started
	Flashing	System started successfully
NET	Always on	Successfully connected to the uplink network
	Off	Not connected to uplink network
	Flashing	Connecting to uplink network
WIFI	Always on	Connecting to WIFI terminal devices
	Off	Not connected to WIFI terminal device
	Flashing	Sending and receiving WIFI packets in progress

ETH WAN	Always on	Wired connection to the network
	Off	No network cable inserted
LAN	Flashing	Network port is transmitting and receiving data

Table 4.5



Illustration: The battery data can be uploaded to the cloud platform after the smart gateway successfully connects to the network.

4.6 PC-side cloud platform

Logging in and out:

<http://bmscloud.lnxall.com/map> in the browser , enter the login page, enter your account and password, and click Login.

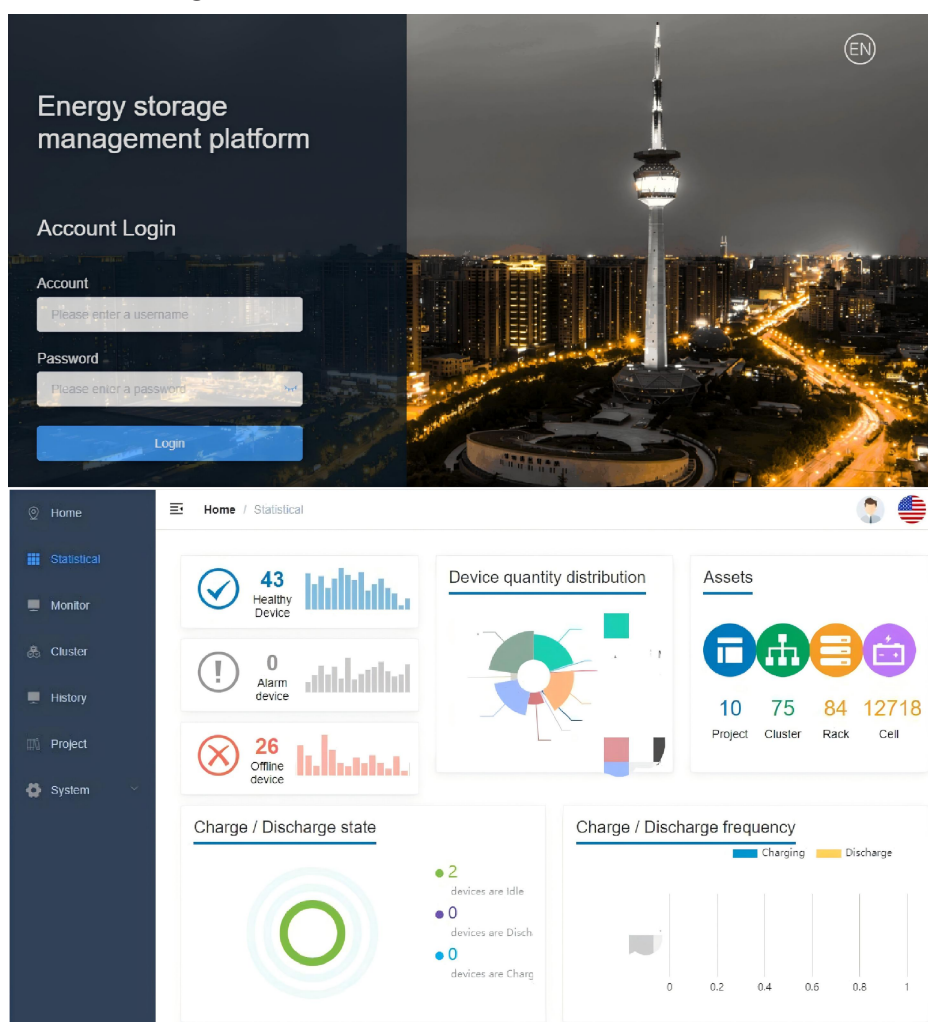


Figure 4.6



Illustration : For the cloud platform account and password required for product registration, please contact our after-sales service personnel to obtain them.

4.7 Battery Display

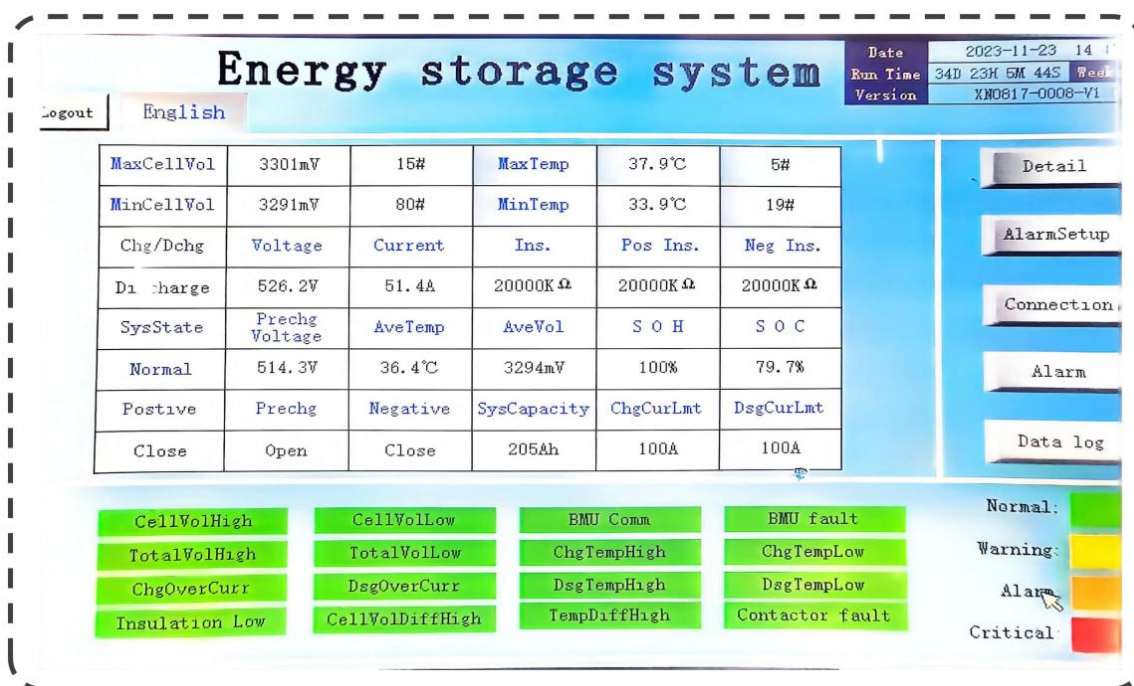


Figure 4.7

Name	Definition
Detail	Check cell voltage and battery pack temperature
Alarm Setup	Modify alarm and protection parameters (only with BSL's permission)
Connection	Manual grid connection or change communication protocol
Alarm	Check current and historical alarm records
Data log	Save screen data to USB flash drive

Table 4.7

4.8 Battery Failure Handling

When the battery system fails, it may cause the system to shut down automatically or some functions to malfunction; please troubleshoot according to the following methods. If these troubleshooting cannot solve the problem, please contact the after-sales service center in time.



Note:

When contacting after-sales service, please prepare the following information to quickly resolve the problem:

1. Battery information, such as serial number, software version, device installation time, fault occurrence time, fault occurrence frequency, etc.;

2. Equipment installation environment, such as weather conditions, etc. For installation environment recommendations, you can provide photos, videos and other documents to assist in analyzing the problem;
3. Equipment usage history, such as: frequency and duration of equipment use, number of times charged, maintenance status, etc., and also clearly specify the type of after-sales service, such as on-site repair, factory repair, or usage guidance.

Fault alarm processing table:

Fault Name	Workaround
Charging cell voltage is high /Discharge cell voltage is high	After the battery has been idle for 0.5 hours, restart the discharge immediately.If the problem persists, please contact the after-sales service center
Charging cell voltage is low /Discharge cell voltage is low	After the battery has been idle for 0.5 hours, restart the discharge immediately.If the problem persists, please contact the after-sales service center
High total charging voltage /High total discharge voltage	After the battery has been idle for 0.5 hours, restart the discharge immediately.If the problem persists, please contact the after-sales service center
Total charging voltage is low /Total discharge voltage is low	Restart charging immediately after the battery has been idle for 0.5 hours.If the problem persists, please contact the after-sales service center
Charging single cell voltage difference /Discharge cell voltage difference	After restarting the battery, if the problem still exists, please contact the after-sales service center
Total charging voltage difference /Discharge total pressure difference	After restarting the battery, if the problem still exists, please contact the after-sales service center
High temperature during charging /High discharge temperature	1. Check the installation environment temperature to ensure that the battery system installation temperature meets the battery operating temperature range; 2. Turn off the battery and restart the system after the temperature returns to normal.
Charging at low temperature /Discharge low temperature	1. Check the installation environment temperature to ensure that the battery system installation temperature meets the battery operating temperature range; 2. Turn off the battery and restart the system after the temperature returns to normal.
Charging temperature difference /Discharge temperature difference	1. Check the installation environment temperature, ensure that the battery system installation temperature meets the battery operating temperature range, and compare the temperature on the display. 2. Turn off the battery, wait for the temperature to recover, and then turn on the device. If the problem persists, please contact the after-sales service center.

Slow charge overcurrent /Continuous discharge overcurrent	After waiting for 5 minutes, the system still fails to recover and needs to be restarted.If the problem persists, please contact the after-sales service center
SOC is too low	Restart the battery and charge it. If the problem persists, please contact the after-sales service center
Insulation leakage	Check whether the cable connections are normal, such as power lines, grounding lines, etc.If the problem persists, please contact the after-sales service center
Voltage cable leakage/ Thermal sensor cable is missing	Please contact the after-sales service center
Intranet communication failure	Please contact the after-sales service center
Precharge failed	Please contact the after-sales service center
Abnormal current	Please contact the after-sales service center
BMS initialization failure	After restarting the battery, if the problem still exists, please contact the after-sales service center
Relay failure	Please contact the after-sales service center

Table 4.8

**Warning:**

If any fault other than that in Table 4.7 occurs, please contact the after-sales service center directly.

4.9 Inspection and maintenance

**Warning:**

1. If you find any problem that may affect the battery system, please contact after-sales service immediately and do not disassemble it yourself;
2. If you see the copper wire of the conductive wire exposed, do not touch it to avoid high voltage danger. Contact after-sales immediately. Do not disassemble it by yourself;
3. In case of other emergencies, please contact after-sales immediately and follow their instructions, or wait for after-sales personnel to handle the situation on site.

Inspection and maintenance table:

Maintenance content	Maintenance cycle
Check whether the battery system is loose. If so, tighten the corresponding position.	Every 6 month
Check if the shell is damaged. If so, please repaint it or contact the after-sales service center.	Every 6 month
Check whether the exposed wires are worn. If so, replace the corresponding cables.	Every 6 month
Check whether there is any debris around the battery to avoid affecting the heat dissipation of the battery.	Every 6 month
Check for water or pests to avoid long-term intrusion of the battery	Every 6 month

Table 4.9

4.10 Upper computer monitoring



Note:

- 1.Ensure that the host computer software used matches the battery system and is updated to the latest version;
- 2.Connect to the "DEBUG" port in the battery system to avoid connecting to the wrong port.



CAN Serial port communication device

Figure 4.10-1

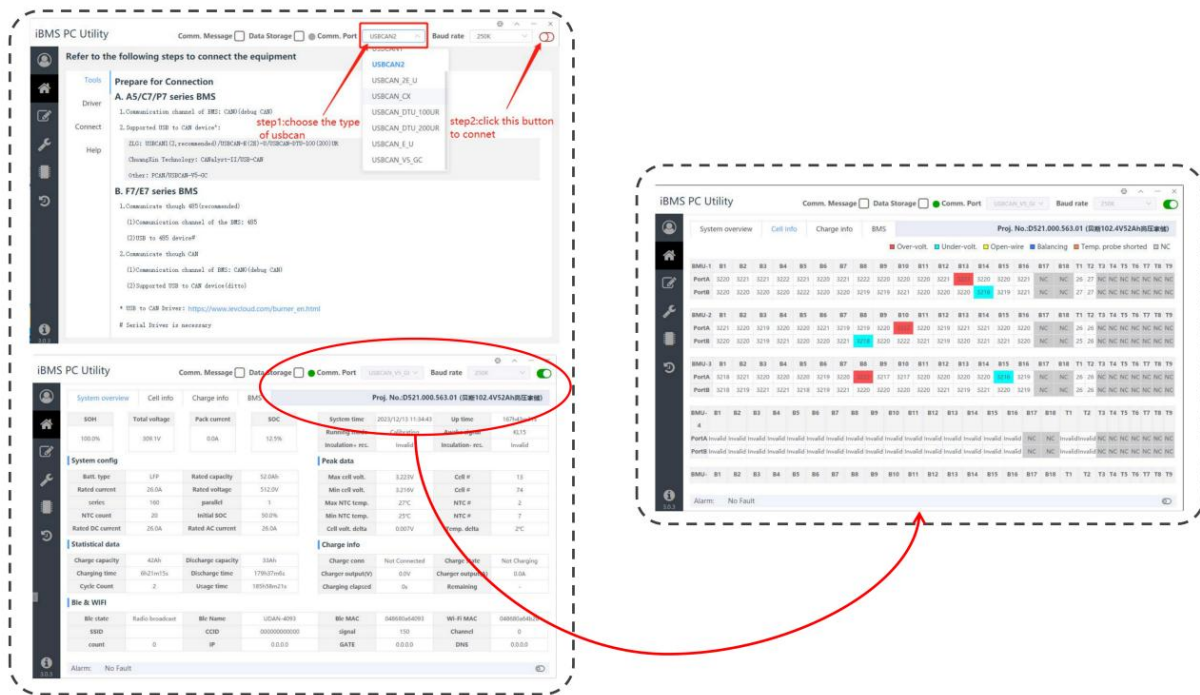


Figure 4.10-2



Illustration:

After connecting the host computer to the battery system, users can monitor and extract a series of data covering the battery's SOC (state of charge percentage), SOH (healthy state percentage), etc.; including the total voltage of the battery system, the voltage of each cell, the total current, and the current data during charging and discharging. At the same time, users can also obtain the temperature of the battery cells and the whole, as well as the battery's usage history, such as the number of charge and discharge cycles, and the accumulated charge and discharge amount. Battery safety information, such as fault codes and insulation status, is also queryable. In addition, users can access detailed information on the system configuration and upgrade and debug the equipment.

05 Warranty Service

5.1 Warranty Period

In case of correct use of the product, the warranty period agreed in the commercial contract shall prevail.

5.2 Warranty Scope

During the warranty period, if the product is caused by quality problems, our company will repair or replace the product for free. Customers should reserve a reasonable response time for our company's repair, and the replaced product will be handled by our company. Customers need to show relevant proof of purchase of the product and ensure that the product trademark is clearly visible, otherwise our company has the right to not provide warranty guarantee.

5.3 Disclaimer

In the following situations, our company has the right not to provide quality assurance, but can still provide paid maintenance services.

1. The warranty period has expired;
2. Failure to provide relevant proof of product purchase;
3. Damage caused during transportation, loading and unloading;
4. Damage caused by improper installation, modification or dismantling by unauthorized personnel;
5. Damage caused by operation under abnormal conditions or environment;
6. Machine failure or damage caused by using non-Natong parts or software;
7. Failure caused by force majeure such as fire, earthquake, flood, etc.

Appendix

Appendix A-Marking Description

Identification Instructions	
	Please read the endorsed documentation carefully
	Danger. Risk of electric shock!
	Hazardous Substance Labeling
UN38.3	Transportation Safety Certification
	Flammability risk
	Keep the battery away from open flame or ignition sources.
	Recycling
	The danger of voltages. Danger to life due to high voltages in the energy storage system
	This marking indicates that this product should not be disposed with other household wastes

Appendix B – System Connection Diagram

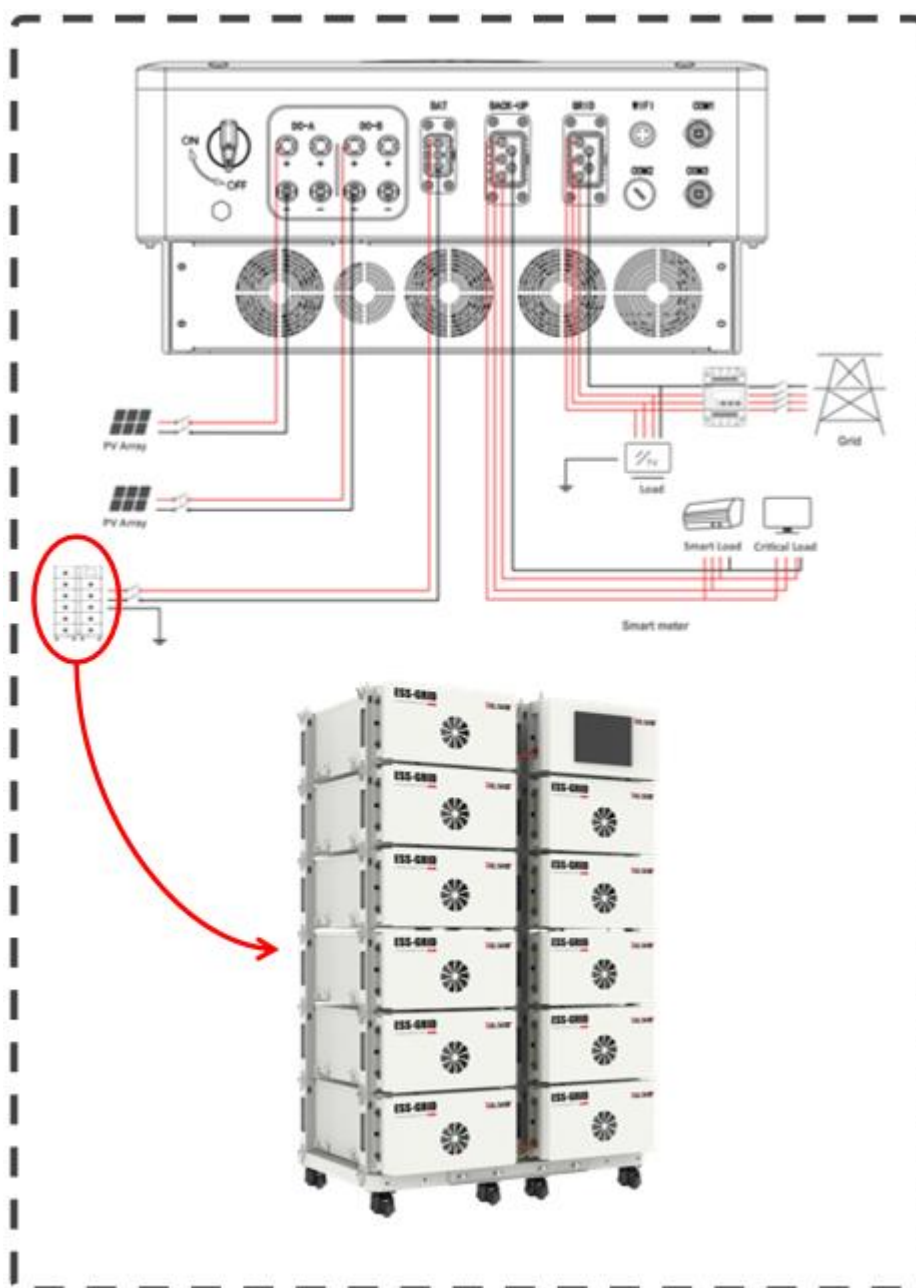


Illustration:

The figure shows the electrical system connection between the "AF3-30kTH" series of batteries from Afore New Energy and the "ESS-GRID Station" series of batteries; for detailed information about the inverter and operation instructions, please refer to the "Afore" user manual.

Appendix C – System Connection Diagram

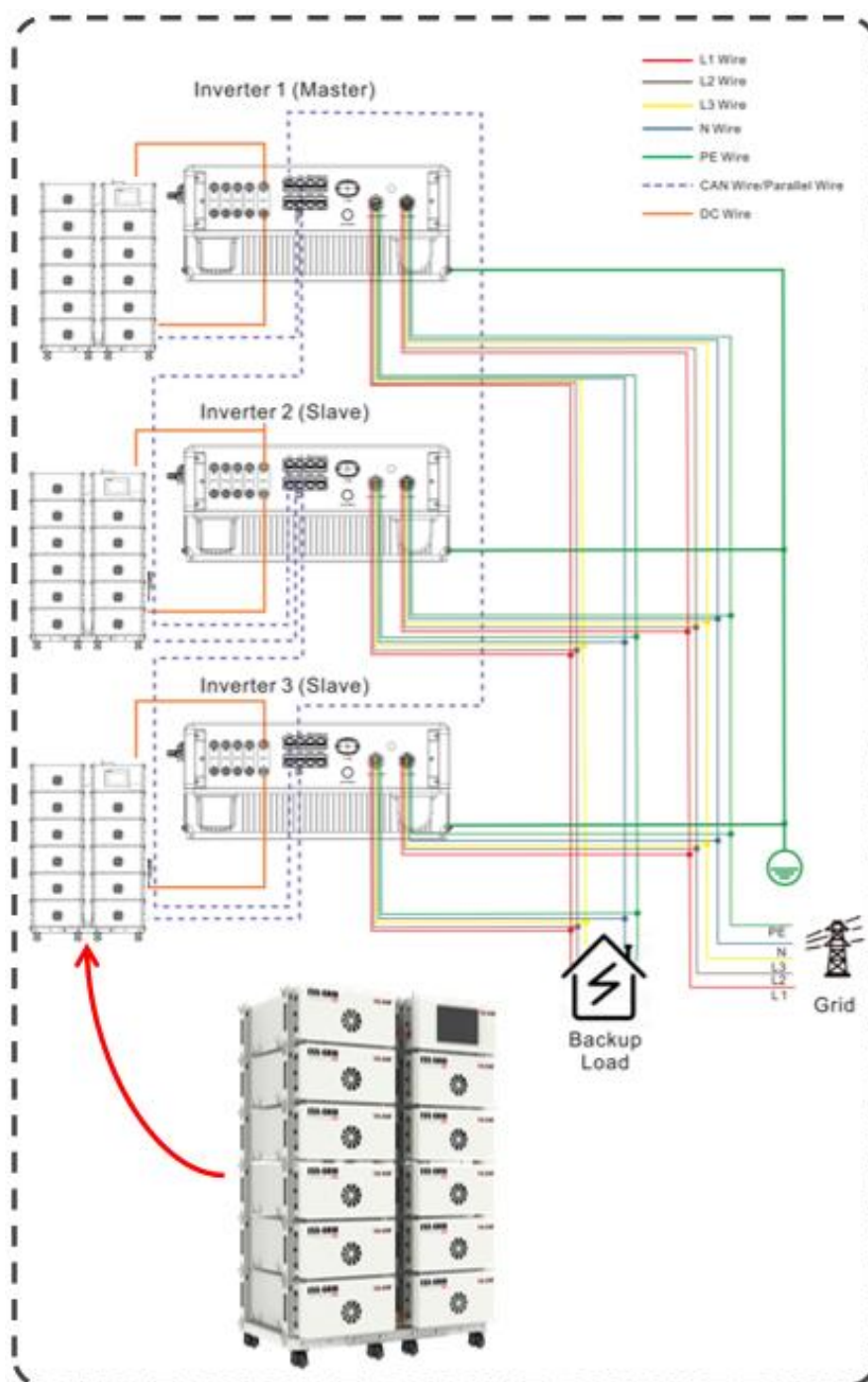


Illustration:

The figure shows the electrical system connection between the JINLANG inverter "S6-EH3P5~10K2-H" series and the "ESS-GRID Station" series of batteries. For detailed information about the inverter and operation instructions, please refer to the "JINLANG" user manual.

Appendix D – System Connection Diagram

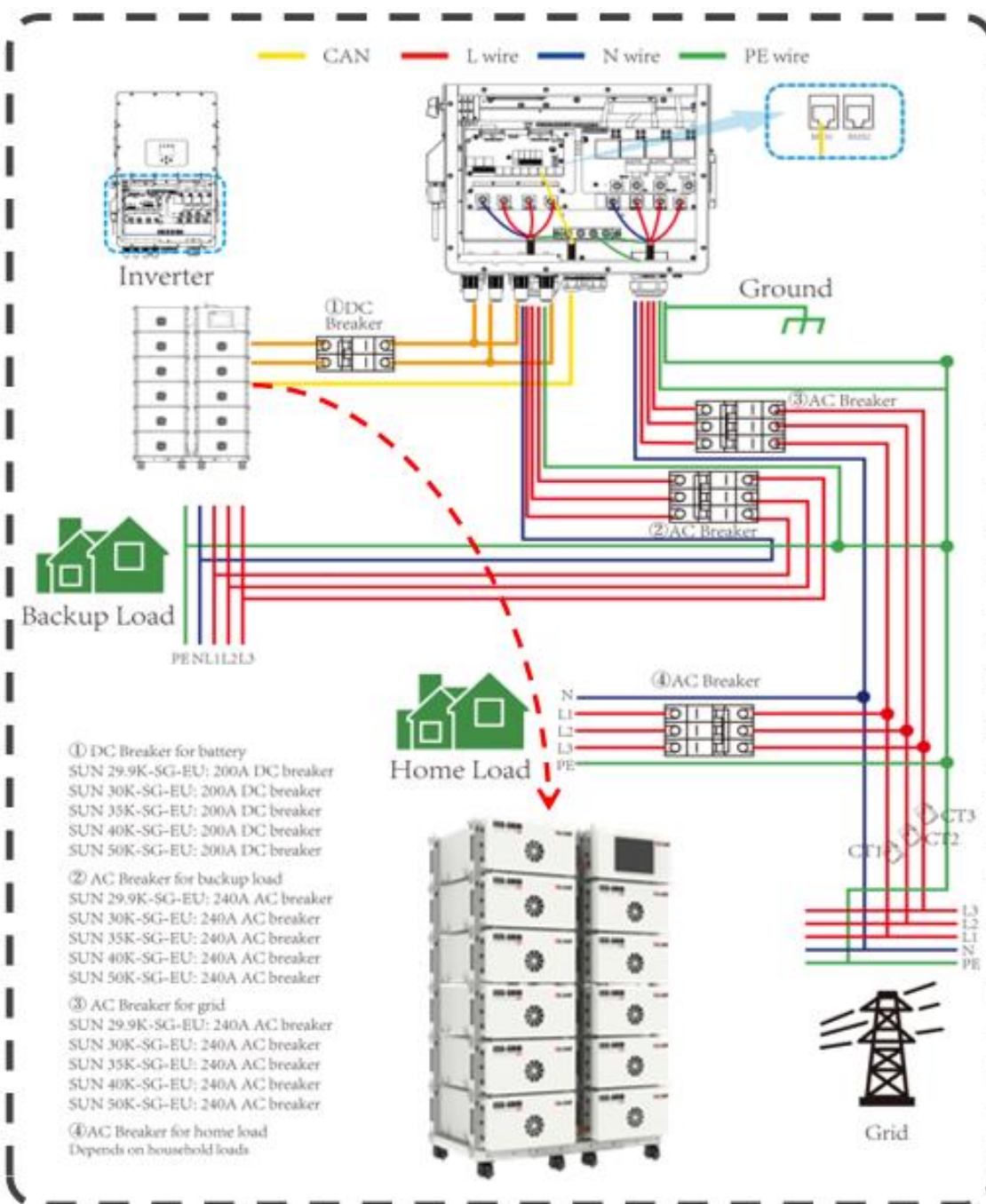


Illustration:

The figure shows the electrical system connection between the "SUN-29.9-50K-SG01LP3-EU-BM3" series of Deyi inverters and the "ESS-GRID Station" series of batteries; for detailed information about the inverters and operation guidelines, please refer to the "Deyi" user manual.

Emergency handling measures for energy storage systems

When the battery drops or is subjected to a strong impact

If the battery drops or is subjected to strong impact during installation, it may cause internal damage. Do not use it again.

- If there is a strong odor, damage, smoke or fire, immediately evacuate the people and call the police. Professional personnel should use fire-fighting equipment to extinguish the fire and handle the situation safely.
- If there is no obvious deformation or damage to the appearance, and no strong odor, smoke or fire is present, contact professional personnel to transfer the battery to an open and safe place, or contact the company for recycling treatment.

When a flood occurs

- Ensure the safety of personnel first, and then immediately cut off the power supply of the system.
- If any part of the battery is submerged in water, do not touch it to avoid electric shock. Evacuate the scene immediately and report it to the authorities.
- The flooded batteries carry the risk of electrolyte contamination and cannot be reused. They need to be recycled and disposed of by professional institutions.

When there is smoke or fire

- When there is a large amount of smoke in the storage room for batteries, it is strictly prohibited to open the door and enter to avoid the risk of explosion and the inhalation of toxic gases by personnel.
- During the firefighting process, all firefighters should wear full thermal insulation fire protection suits, wear fire-fighting filtering respirators or air respirators, fire helmets and face masks, and wear insulating protective gear such as insulated shoes. Use inert gases or Class D dry powder fire extinguishers. Water-based fire extinguishing agents (in the initial stage) are prohibited.
- After extinguishing the open flame, continuous water spraying is still required to cool down the battery. Wait until the battery temperature drops to within $\pm 10^{\circ}\text{C}$ of the room temperature, and monitor it for several hours to ensure there are no signs of temperature rise before removing it.

When the sound and light alarm is activated

Do not approach or open the door. Move away immediately.

Cut off the power supply remotely under the condition of ensuring your own safety.

When the exhaust start occurs

On-site personnel protection: Do not operate directly towards the exhaust outlet.

Post-event maintenance: Contact the service engineer for assessment.

In the event of a fire extinguishing agent eruption or a fire occurrence

Suggestions for operation and maintenance personnel:

Evacuate the scene and call the police. Provide information such as the type of battery pack, system capacity, and location distribution.

Do not re-enter the burning area or open the storage system door. Isolate the scene and keep watch.

Remote power-down the system (ensure your own safety).

Provide product information and user manual to the firefighters.

After extinguishing the fire, have professionals handle it. Do not open the door privately.

Contact the service engineer to assess and maintain.

Advice for firefighters:

Refer to the product information provided by the maintenance personnel.

Do not open the storage system door before ensuring safety.

Use control measures to extinguish the fire to prevent it from spreading to the surrounding storage cabinets.



User Manual

BSL NEW ENERGY TECHNOLOGY CO., LTD

www.bsl-battery.com
inquiry@bsl-battery.com

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Add: Building 2, Area D, Qunyi Intelligent
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