ZONERGY

User Manual

Battery

Limestone 5/10/15/20/25/30H-P

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Table of Contents

1 Preface

This Manual mainly sets down the methods for installation, electrical connection, commissioning, maintenance and troubleshooting of Limestone Batteries (hereinafter referred to as “the batteries”, “the equipment” or “the product”). Prior to installing and using Batteries, please read through this Manual in order to know about the safety information and get familiar with Batteries’ functions and characteristics. We may update the contents in this Manual irregularly. For the information about the latest version and details about products, please log in the official website.

1.1 Applicable Models

This file is applicable to the battery pack of the following model:

◆ Limestone 5H-P

1.2 Objects of This Manual

This Manual is applicable to:

◆ Users;

◆ Installation & maintenance personnel; and

◆ Professionals familiar with local regulations and standards, and electrical system, who have undergone specialized training and are familiar with relevant knowledge about the Batteries.

1.3 Symbols

The following symbols are used in this Manual in order to highlight relevant important information. Please read the symbols and descriptions carefully.

⚠Danger
“Danger” means highly potential dangers, which will lead to personal death or serious personal injury.
⚠Warning
“Warning” refers to moderate potential dangers, which may lead to personal deapth or serious personal injury.
⚠Care
“Care” refers to low potential dangers, which may lead to moderate or mitigated personal injury.
Attention
“Attention” means the contents that have been underlined and supplemented or skills for optimal use of the product. It could help you solve some specific problems or save your time. “Attention” does not belong to safety warning information and will not lead to personal injury or equipment and environment damage.

1.4 Version Record

This Manual of the latest version includes the contents updated in all previous versions.
File ver.: 01 ((January 6, 2023), the first release.
File ver.: 02 (February 20, 2023), modify"central control box" to "distribution box", adding parameter tables, adding product model descriptions, modifying product models in user manuals.
File ver.: 03 (May 31, 2023),modify Definition of COM Interface,modify product installation diagram.

2 Safety Precautions

Operators of the equipment shall read through this Manual first and abide by the marks on equipment and all safety precautions in this Manual.

2.1 General Safety

⚠ Danger

- ✧ Please use the equipment system under the environment complying with requirements of design specification; otherwise, the equipment may become faulty. Equipment dysfunction or part damage , personal safety accident, property loss, etc. arising therefrom do not fall into the scope of quality warranty of the equipment.
- ✧ Hot-line work is forbidden during installation.
- ✧ It is forbidden to install, use or operate outdoor equipment and cables under severe weather conditions such as thunder and lightning, rain, snow and strong wind above Scale 6 (including but not limited to handling equipment, operation equipment and cables, signal interface connected outdoors through plugging, aloft work, outdoor installation, etc.)
- ✧ In case of any fire accident, withdraw from buildings or equipment region and press fire alarm bell or dial fire telephone. In no case it is allowed to enter the burning buildings again.
- ✧ Batteries are designed according to safety regulations and have passed test. However, please operate the equipment which belongs to electrical equipment as per relevant safety instructions. Any improper operation may lead to serious injury or property loss.
- ✧ Any paint scratch in process of equipment transportation and installation must be repaired in time. The scratched part cannot be exposed to an outdoor environment in the long run.
- ✧ It is forbidden to alter, damage or cover the identification and nameplate on equipment or open the host panel of Batteries.

  All the contents in the “Attention”, “Warning” and “Danger” in this Manual do not represent all safety requirements that shall be abided by and they supplement all safety precautions only.

  The Company is not held liable for any responsibilities arising out of breach of any general safety operation requirements or safety standards for the design, production and use of equipment.

Attention

- ✧ We may update this file at all times along with the upgrade of product version or due to other reasons. The contents contained in this file cannot replace the safety precautions in product label or user manual, unless otherwise specified. All descriptions in this file are used for use guidance only.
- ✧ The equipment must be operated by professional and eligible electrical technicians, who shall be familiar with relevant local standards and safety specifications of the site where projects are located.
- ✧ Please learn the composition and working principle of the entire grid-connected PV system as well as relevant standards of country/region where projects are located.
- ✧ Make sure to use insulating tools and PPEs when operating the batteries in order to ensure personal safety. Before contacting electron devices, wear antistatic gloves, antistatic bracelet, antistatic clothing, etc. in order to prevent batteries from static damage.
- ✧ It is forbidden to carry out derivative operations against equipment software, such as reverse engineering,decompilation, disassembling, dismantling, rearrangement or implanting or study the internal part of equipment, obtain source code of equipment software, steal IPRs, etc. by any means or disclose the results of any performance test of equipment software.
- ✧ Stop operating immediately, report to the person in charge and take effective protection measures, if finding any fault that may lead to personal injury or equipment damage while operating the equipment.

✧ Please grasp the correct method to use the tools before using them in order to avoid personal injury and equipment damage. ✧ The shell temperature is high when the equipment is running, which may lead to scorching. Please avoid contacting it. ✧ Before installing the equipment, please read through this file carefully in order to know about the products and precautions contained herein.

Please install, operate and maintain the equipment as per local laws, regulations and specifications. The safety precautions in this Manual serve as the supplement to local laws, regulations and specifications. The Company does not bear responsibilities for any one of the following circumstances:

1	Failure to operate the product in line with the requirements specified in this Manual or to operate the product as per the operation instructions and safety warnings in the product and the file.
2	Install and use the product in an environment dissatisfying relevant international or national standards.
3	Product is damaged by transport arranged by the customer.
4	Equipment damage or personal injury ascribed to arbitrary dismantling of internal components, product modification or modification of software code.
5	Equipment damage caused by abnormal natural environment (force majeure such as earthquake, fire disaster, storm wind, etc.)
6	Damage of the product after storage in an environment dissatisfying the requirements of product file.

Personal Safety

Please wear proper PPEs while operating the equipment. Stop operating immediately, report to the person in charge and take effective protection measures, if finding any fault that may lead to personal injury or equipment damage while operating the equipment.
The shell temperature is high when the equipment is running, which may lead to scorching. Please avoid contacting it.
Please ensure reliable earthing prior to using the equipment, in order to ensure personal safety and normal use.
The temperature may be higher than scorching threshold value of accessible surface if batteries become faulty, so please avoid contacting the surface.
Do not open or damage battery and avoid contacting electrolyte released, which is harmful to skin and eyes.
Do not place any irrelevant object at the top of equipment or insert into any position of the equipment.
Please do not place any flammable materials near the equipment.
Do not put batteries into fire to avoid explosion which will endanger personal safety.
Do not place battery module into water or other liquid.
Do not short circuit battery terminal, for it will lead to combustion.
Batteries may lead to the risks of electric shock and large short circuit current. While using batteries, please make sure to:
1. Take off watch, ring or other metal objects.
2. Use tools with insulated handle.
3. Wear rubber gloves and boots.
4. Do not place any tools or metal parts at the top of batteries.

5. Disconnect charging power supply before connecting or disconnecting battery terminal.
Check if batteries are earthed by accident. If accidental earthing exists, please remove power supply from the ground. Contact with any part of earthing battery will lead to electric shock. The possibility of electric shock will be lowered, if removing the earthing prior to installation and maintenance. Do not clean the inside of cabinet or external electrical parts with water or cleaning agent.
Do not stand above, lean against or sit on the equipment.
Do not damage various equipment modules.
Equipment may be damaged, if battery module drops or is impacted intensively during module installation process. In such a case, do not use the battery any longer; otherwise, safety risks may happen (such as leakage of cell liquid, electric shock, etc.)

Danger and Toxicity Grade

Danger: Contact of battery terminal with other metals may lead to heating or leakage of electrolyte.
Electrolyte is flammable. Remove battery from fire immediately once electrolyte leaks.
Toxicity: Steam generated by battery combustion may irritate eyes, skin and throat.
First-aid measures
If the liquid inside battery leaks, please make treatment by referring to the “Measures for Battery Electrolyte Leakage Treatment”.

Measures for Battery Electrolyte Leakage Treatment

Take battery away from fire with absorbent cloth.
The product contains organic electrolyte. Please take the following measures if any leakage of electrolyte occurs.
Inhalation: Move to a place with fresh air and receive treatment.
Skin contact: Clean contacted area with plenty of water and soap immediately. Improper procedures may lead to skin pains.
Eye contact: Flush eyes with plenty of clean water immediately for at least 15 min and do not rub eyes. Receive treatment. Improper procedure may lead to eye irritation.
Swallowing: Rinse the mouth immediately and then see a doctor immediately.

Attention for Installation Site

It is forbidden to install the equipment near the equipment that generates high-frequency noise.
It is forbidden to install the equipment near electrical products easily subject to the influence of electrical noise. Use of communication device may lead to mutual interference, resulting in the failure of normal work.
It is forbidden to install the equipment near the influence of amateur wireless antenna. If solar power generation system is installed near the site of amateur wireless antenna, the highly sensitive amateur wireless equipment may receive electrical noise generated by solar power generation equipment and wiring, probably causing communication barriers.
It is forbidden to install the equipment under other special conditions, which may lead to electric shock, fire disaster, fault and electromagnetic noise.
Keep a certain distance between the installation position, and TV antenna or radio antenna cable.
Do not connect gas pipeline or water pipeline, telephone or earthing circuit of lightning rod or earthing circuit of products designed with earthing circuit breaker.
When the equipment is running, do not use power supply for the following purposes:
1. Medical devices directly related to people’ s life;
2. Control equipment such as train and elevator, which may lead to personal injury.
3. Computer system with social and public importance.
4. Equipment in the same type with those described above.
5. Near medical devices.

2.2 Personnel Requirements

The personnel responsible for Zonergy equipment shall undergo strict training first, in order to grasp safety precautions and the correct operation methods.
Professionals with the corresponding qualifications or well-trained personnel are allowed to install, operate and maintain the equipment only.
Professionals with the corresponding qualifications are allowed to dismantle safety facilities and overhaul equipment.
All equipment operation-related personnel, including operators, well-trained personnel and professionals, shall have the special operation qualifications required by the local country, such as qualifications for aloft work, operation of special kind of equipment, etc.
Professionals or authorized personnel are allowed to change the equipment or parts (including software) only.
Professionals: Refer to the personnel having undergone training or with equipment operation experience, who are clear about the source and seriousness of various kinds of potential dangers during equipment installation, operation and maintenance.
Well-trained personnel: Refer to the personnel having undergone the corresponding technical training with required experience, who could be aware of the risks that may be caused by some specific operations and take measures to minimize the risks of themselves or others.
Operators: Refer to the operators that may contact the equipment, in addition to well-trained personnel and professionals.

2.3 Electrical Safety

Earthing requirements

Install protection earthing lead before installing the equipment that needs earthing but dismantle it at last when dismantling equipment.
It is forbidden to damage earthing conductor.
It is forbidden to operate the equipment before installing earthing conductor.
The equipment shall be connected to protection earthing lead permanently. Check the electrical connection of the equipment prior to operation, in order to ensure the equipment has been earthed reliably.

Conventional Requirements

Before electrical connection, make sure the equipment is free of any damage. Otherwise, electric shock or fire disaster may occur.
All electrical connections must satisfy the electrical standards of local country/region.
Grid connection for power generation is not allowed before the permission from local country/region is obtained.
Wire provided by user shall satisfy the requirements of local laws and regulations.

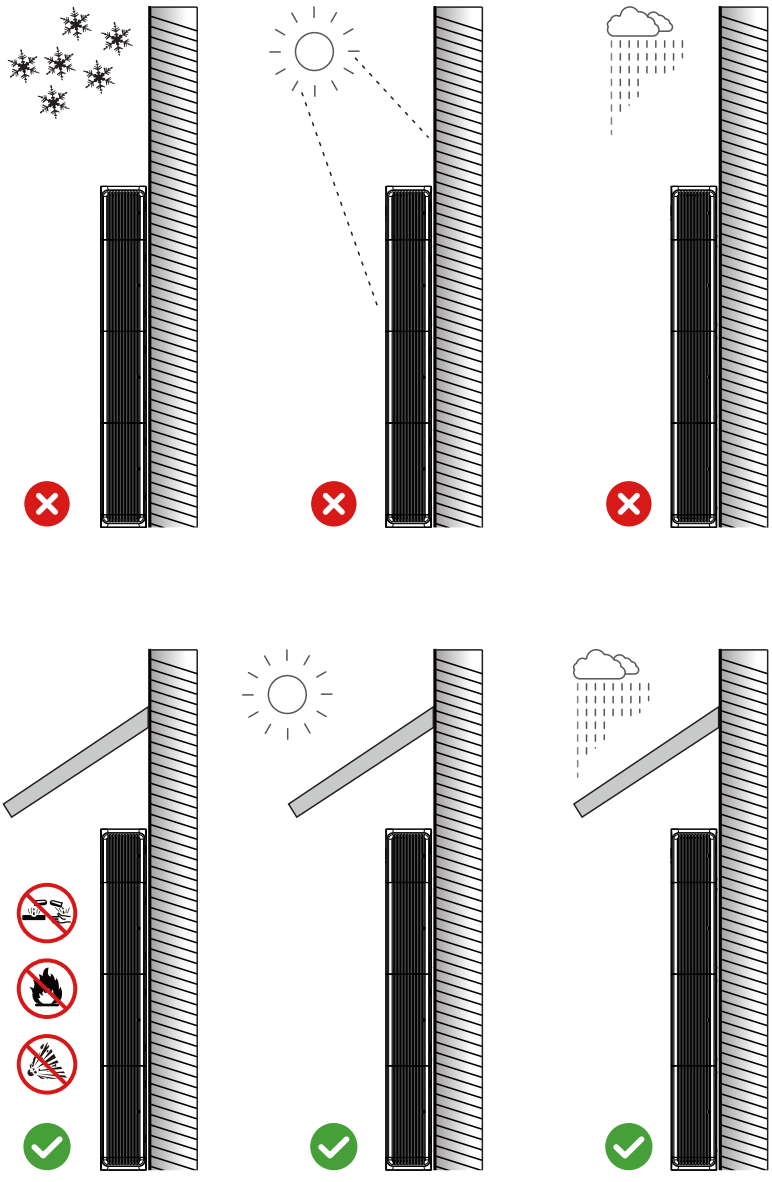
DC Operation

⚠ Danger

- ✧ It is forbidden to install or remove power cord before power-off. Electric arc or spark mat be generated at the moment when power cord core meets conductor, which may lead to fire disaster or personal injury.
- ✧ If any electrified part may be touched before electrical connection of equipment, cut off the breaking device corresponding to the backing stage of equipment.
- ✧ Prior to connecting power cord, confirm if the label and identification of power cord are correct.
- ✧ If the equipment has several channels of inputs, cut off all these inputs of equipment and do not operate the equipment until it is totally powered off.

2.4 Requirements for Installation Environment

Install the equipment under a dry and well-ventilated environment in order to ensure favorable heat dissipation effect.
It is recommended to install the equipment in places with shielding measures or where a sunshade is set.
Avoid direct sunshine or rain and ensure the surroundings are clean and free of a large amount of infrared ray, radioactive ray, organic solvent, corrosive gas, etc.
Do not install the equipment near fire source.
Keep the equipment beyond children' s reach.
Avoid installing the equipment near fire source, such as faucet, underground pipeline and water sprinkler, in order to avoid the possibility of water seepage.
Install the equipment on solid and even bearing surface.
Avoid any inflammable and explosive articles near the equipment.
Do not shield ventilation opening or heat dissipation system while the equipment is running in order to avoid fire disaster due to high temperature.
Do not place or operate the equipment in an environment with inflammable and explosive gas or fume.



The equipment can be installed either indoors or outdoors, as long as the requirements above can be met.

Attention
✧ Working temperature plays a key role in influencing the equipment' s running and service life. Please install the equipment in such an ambient environment or an environment superior to the above.

2.5 Transportation Requirements

UN No.: 3480 (lithium ion battery)
Ensure the batteries will not be damaged during transportation and storage.
Handle with care and consider its weight when lifting batteries.
Do not impact, pull, drag or pedal the equipment or place any irrelevant object into any part of the battery system.
Make sure the equipment is transported by well-trained professionals and record operation details in the entire process.
Ensure the equipment is placed stably and evenly, for equipment titling may lead to equipment damage and personal injury.
Make ensure carbon dioxide, Novac1230 or FM-200 fire extinguisher is available nearby.
Please use fire extinguishers with recommended materials for putting out fire instead of with water or ABC dry powder fire extinguisher. Firefighters must wear protection suit and self-contained breathing apparatus.
Batteries may be exposed to the risks of explosion when the ambient temperature is greater than 150°C.
Please use proper tools and take protective measures when installing and maintaining heavy equipment. Improper operation may lead to personal injury.
Cable used under a high temperature may lead to aging and damage of insulation layer. Please ensure the distance between cable and heating elements, or between the surroundings of heat source region is 30mm at least.
The same kind of cables should be bound while cables of different kinds should be arranged by leaving a distance of 30mm at least. It is forbidden to twine or overlap the cables.

2.6 Handling and Storage

It is forbidden to contact battery terminals or contact the terminals with other metals while packaging batteries. Instead, place clapboard inside the packaging box or package batteries with independent plastic bags so as to avoid mixing batteries.
The packaging boxes should be made of solid materials and avoid damaging the boxes during transportation by vibration, impaction, dropping or stacking.
Prevent water from permeating packaging box when the box is stored and transported.
Store batteries under a room temperature and ensure the charging capacity is 30%-40% of the full capacity.
Do not store batteries at any place over 35°C or under direct sunshine or near furnace.
Do not store batteries in an environment with high humidity.
Do not expose batteries in condensate and water drops or ensure the batteries will not be exposed under a frozen condition during transportation process.
It is forbidden to contact battery terminals mutually or contact the terminals with other metals when installing batteries according to the decree of local government or the minimum standards issued by relevant government.

2.7 Commissioning and Testing

Set parameters correctly by professionals, when the equipment is powered on for the first time. Error setting may lead to the inconsistency of the equipment with the certification of local country/region and finally influence normal running of equipment.

2.8 Maintenance and Change

⚠ Danger

- ✧ Electric shock may occur while the equipment is running, causing personal injury and death, serious personal injury or serious property loss. Therefore, power off equipment before any maintenance and operate in strict accordance with the safety precautions in this manual and other relevant files.
- ✧ Please maintain the equipment after mastering the contents in this manual with proper tools and test devices.
- ✧ Prior to maintenance, power off the equipment. Wait for a certain period of time specified in the delayed discharge label and operate the equipment after ensuring it has been powered off.
- ✧ During maintenance, avoid any irrelevant personnel from entering the site. Set a temporary warning mark or fence for isolation, where necessary.
- ✧ If the equipment becomes faulty, please contact your dealer in time for treatment.
- ✧ Do not power on the equipment again until fault is totally removed. Otherwise, fault may become more serious or lead to equipment damage.
- ✧ It is forbidden to open the cover plate without authorization; otherwise, electric shock may happen. Any fault arising out of the problem above does not fall into the scope of warranty.
- ✧ Operation and maintenance personnel, and professional technicians shall undergo training on use safety and equipment maintenance fully and carry out the corresponding work on the basis of full preventive measures and PPEs.
- ✧ If wire needs moving to another site or wiring is required again, please cut off power supply. Start maintenance after the energy inside the equipment has been totally released and confirming the DC bus and to-be-repaired part inside the machine have no dangerous voltage with a multimeter.
- ✧ Please maintain the batteries by or under the witness of personnel who are familiar with batteries and have the corresponding preventive measures.
- ✧ Replace batteries with the batteries or battery pack of the same type.
- ✧ After finishing maintenance, check if there is any tool or other parts left inside the equipment.
- ✧ If the equipment will not be used for a long period of time, store batteries and recharge the equipment according to this manual.

3 Product Introduction

3.1 Introduction to Product

This file mainly introduces Limestone P series battery energy storage system (BESS) as well as its installation, debugging and testing, maintenance, technical parameters, etc.
The BESS is mainly composed of Limestone 5H-P battery (the battery) and Limestone Dbox distribution box (distribution box).
If the product model name is followed by "-DB", it means it is a battery system with a distribution box, which can be used with Zonergy Venus S series inverter.

Functions

The BESS stores and discharges electric energy based on the requirements of inverter management system and the input and output ports of BESS belong to low-voltage DC current.
Battery recharging: Battery module. The battery distribution box and inverter energy storage terminal (BAT+, BAT-) are connected to recharge batteries under inverter' s control and store excessive photovoltaic energy into batteries.
Battery discharge: If the photovoltaic energy is not enough to supply power for load, the system needs to control the power supply of battery for load and supply the battery energy to load via inverter.

Model

Battery module model of Limestone Battery BESS: Limestone 5H-P (as shown in Figure 3-1)

Figure 3-1 Model Identification

Table 3-1 Descriptions of model

1. Name of product series:

Product type	Series name
Energy storage battery for households	Limestone

2. Electric quantity:

Electric quantity	
kWh	5kWh->5

3. Charge – discharge rate:

Symbols	Charge/Discharge Rate
H	0.5C
F	1C
D	2C
T	3C
Q	4C

4. Connection mode of battery Pack: P – Parallel; S- Serial.

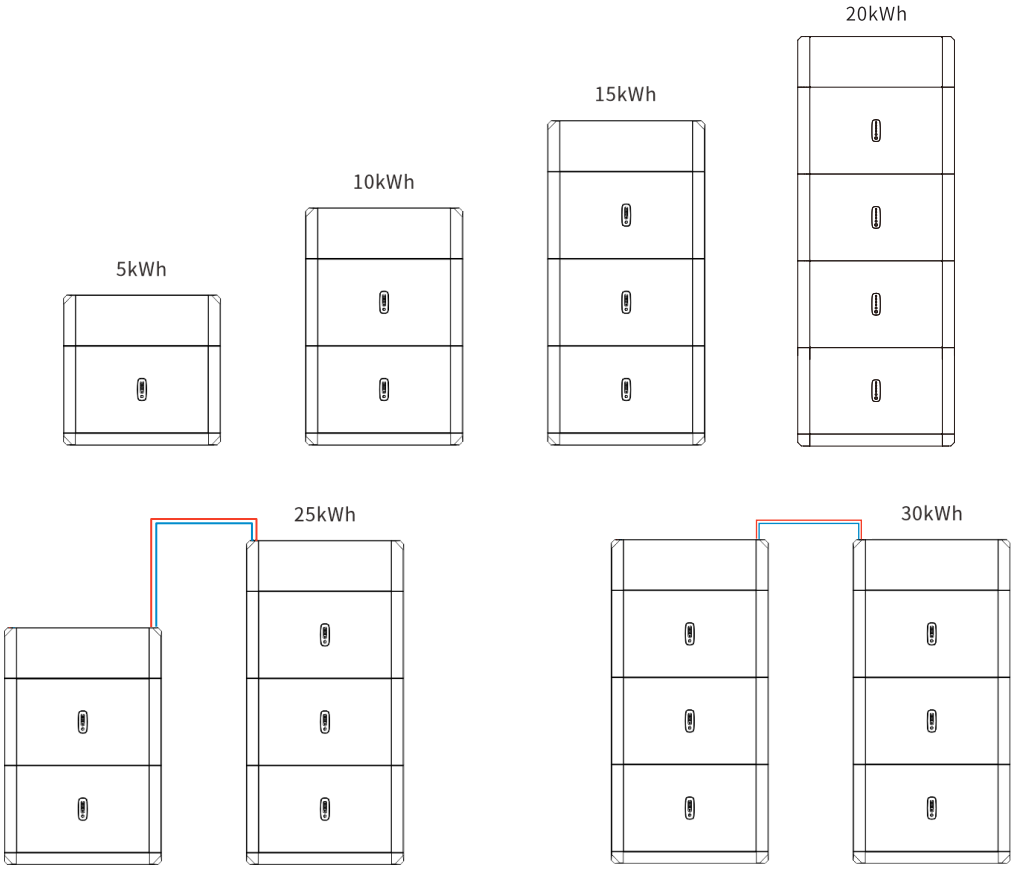


Figure 3-2 Model Identification

4 batteries and 1 distribution box can be installed in each row of batteries at most. If there' re 4 batteries required, install them in double rows (see Figure 3-2).
Make sure the distribution box is above the battery. Do not install battery above the distribution box.
The product installation and wiring steps are described in this manual by taking the installation of 3 batteries as an example.

3.2 Appearance

Overall Appearance (as shown in Figure 3-3)

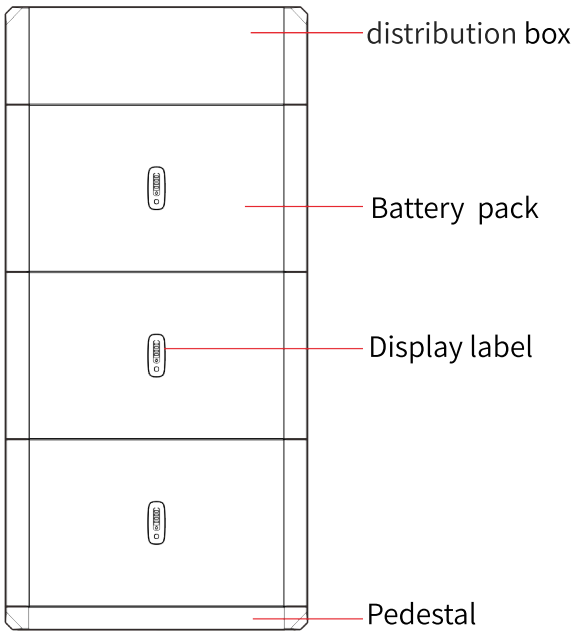


Figure 3-3 Overall Appearance

Appearance of Battery Pack (as shown in Figure 3-4)

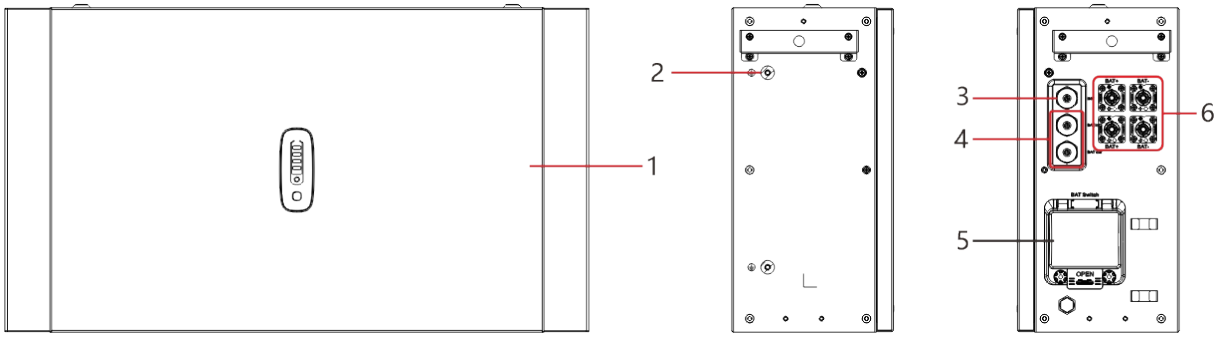


Figure 3-4 Appearance of Battery Pack

No.	Parts
1	Battery pack
2	Earthing point
3	COM communication (connecting INV of distribution box)
4	COM communication (BAT in/BAT out, battery pack parallel operation)
5	Circuit breaker
6	Battery connector (BAT +/BAT-, battery pack parallel operation)

Appearance of distribution box (as shown in Figure 3-5)

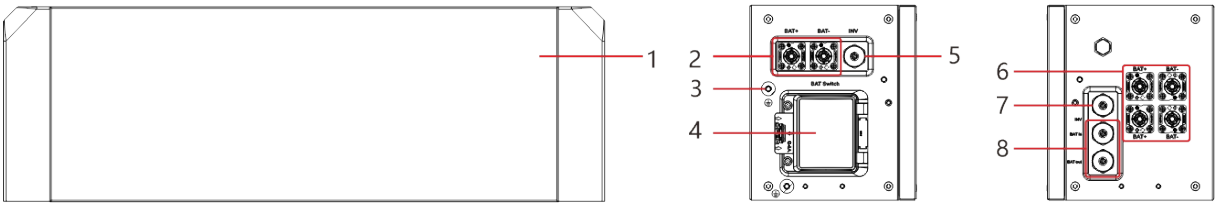
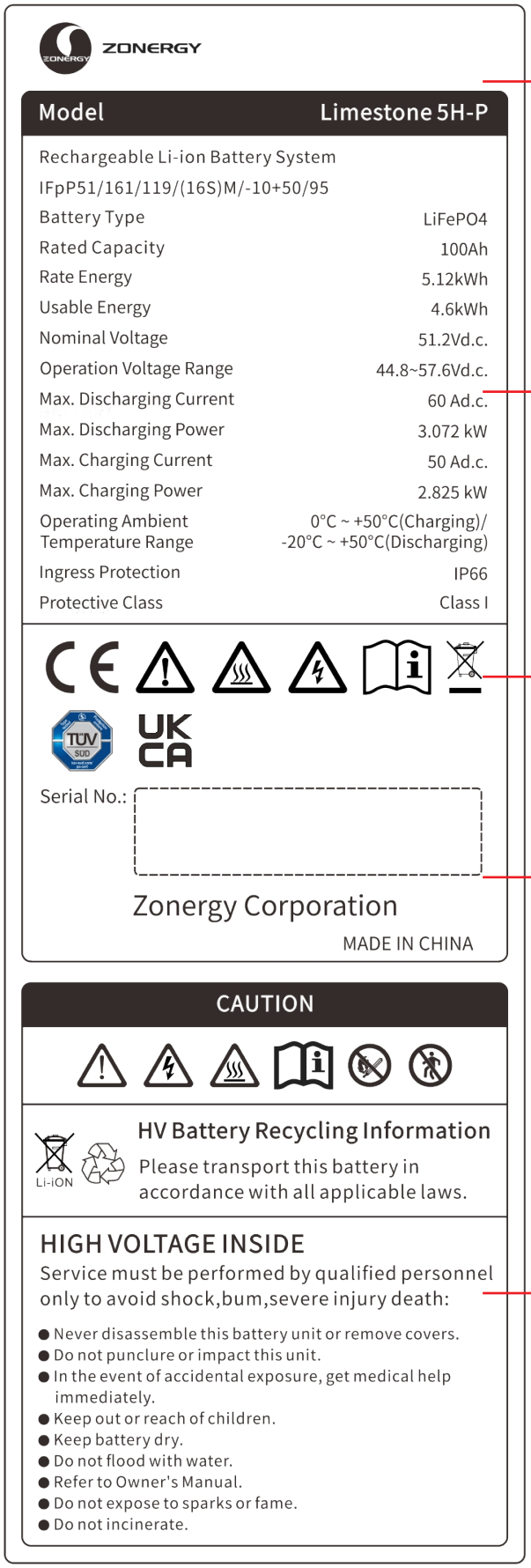


Figure 3-5 Appearance of Distribution Box

No.	Parts
1	distribution box
2	Battery connector (BAT +/BAT -, connecting inverter)
3	Earthing point
4	Circuit breaker
5	COM communication (connecting inverter)
6	Battery connector (BAT+/BAT -, battery pack parallel operation)
7	COM communication (connecting battery pack INV)
8	COM communication (BAT in/BAT out, battery pack parallel operation)

Parameter Labels



Company logo, and product type and model

Technical parameters of product

Safety mark and certification mark of products

Manufacturer and serial No.

Precautions

4 System Installation

4.1 Check Prior to Installation

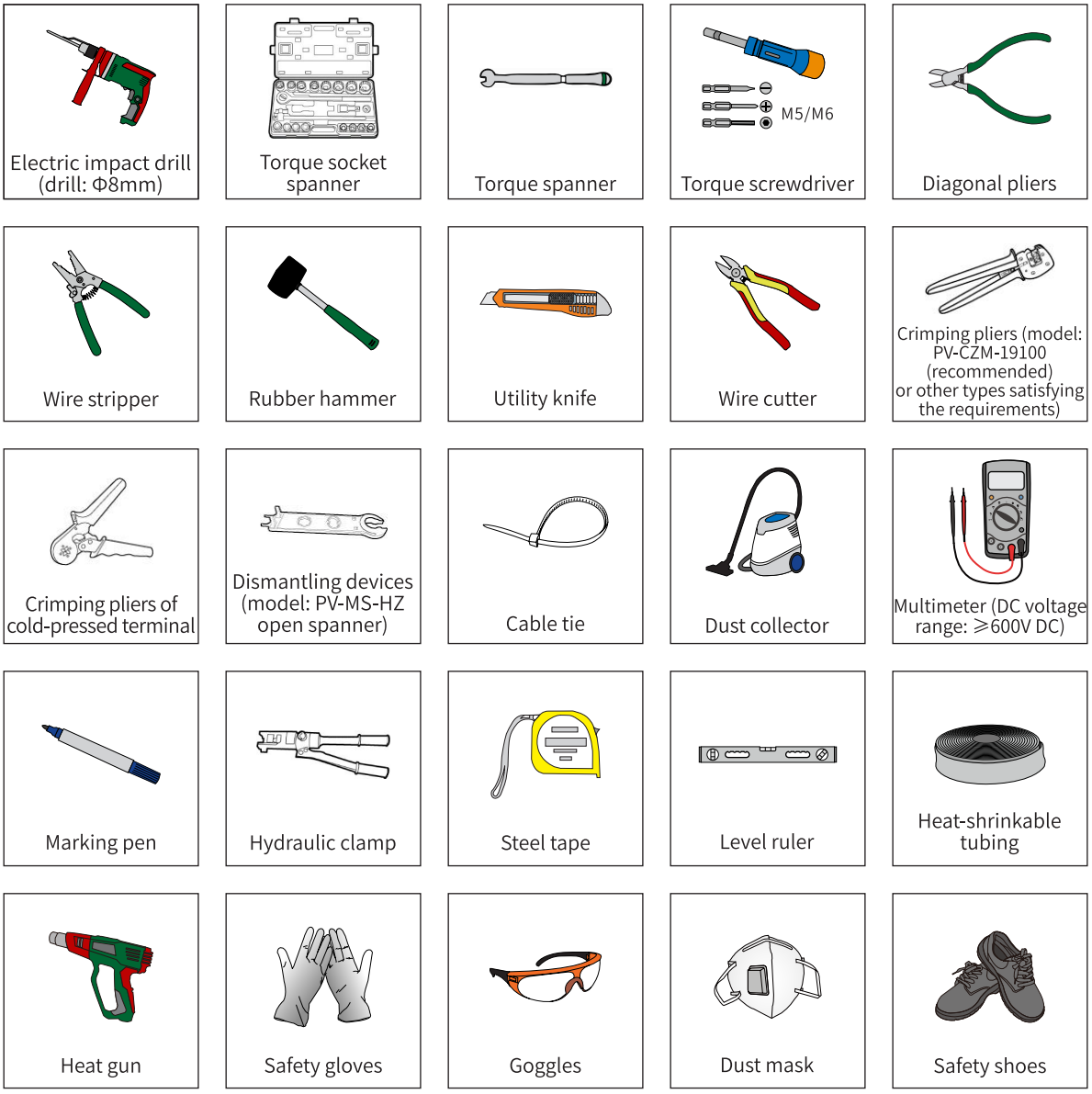
Check outer package

Prior to unpacking the outer package, please check if the outer package is damaged, such as holes, cracks or other internal damages and the product model. Do not unpack the product and contact your dealer as soon as possible, if the package is abnormal or the product model does not meet the requirements.

Check deliverables

After unpacking the outer package, please check if the parts inside are intact and have any obvious appearance damage. Please contact your dealer, if there is any missing part or damaged part.
Remarks: See the Packing List inside the packaging box for the quantity of the parts delivered inside the box.

4.2 Preparations of Tools and Instruments



4.3 Determination of Installation Site

Basic Requirements

The temperature of chassis is very high when battery is running so please avoid installing it in a place where it is frequently touched.

Do not install the equipment at the site where inflammable and explosive articles are saved.
Do not install the equipment within children' s reach.

Requirements for Mounting Angle

The batteries can be mounted either on the ground or on walls.
Do not mount the batteries forward, horizontally, upside down, backward or obliquely at one side.

Requirements for Mounting Space

Leave certain space around the batteries during installation in order to ensure sufficient mounting and heat dissipation space (as shown in Figure 4-1).

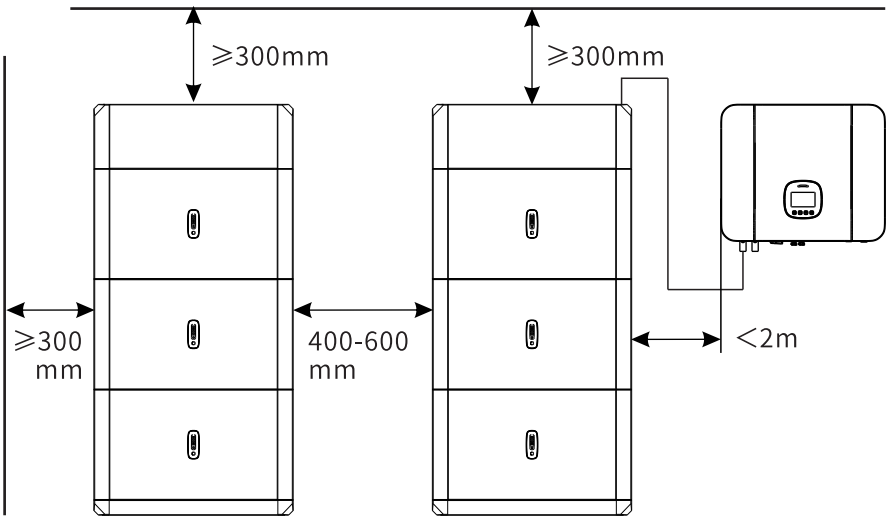


Figure 4-1 Mounting Space

4.4 Battery Mounting

Mounting Instructions

Dimensions of ground mounting holes of battery (as shown in Figure 4-2).

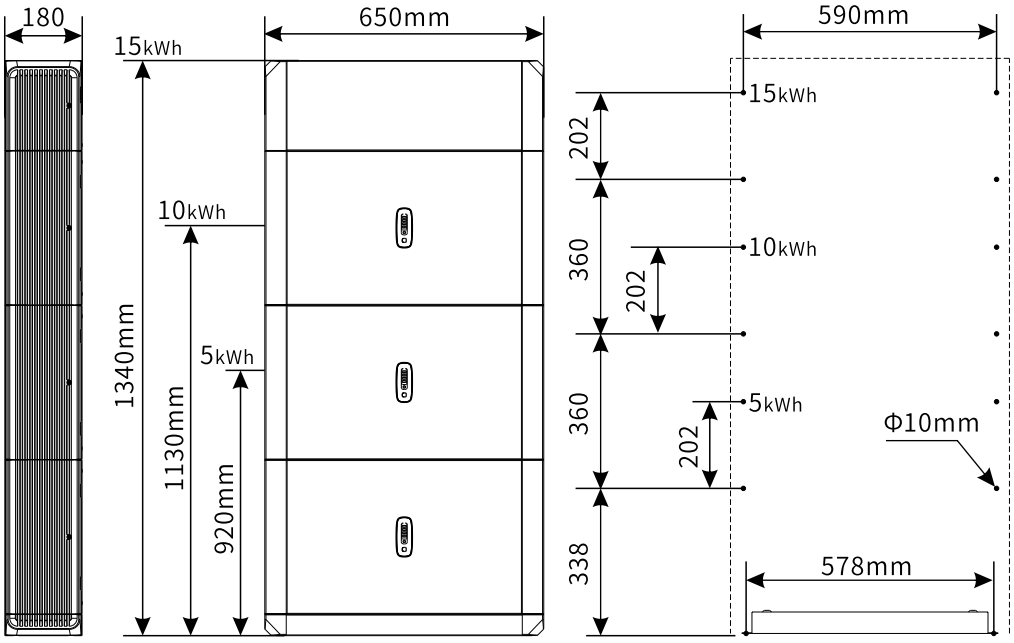


Figure 4-2 Ground Mounting Dimensions

Operation Steps

Step 1

Align the ground mounting bracket with wall surface and leave a distance of 15mm~20mm between the bracket and wall surface.

Step 2

Mount battery wall bracket (as shown in Figure 4-3);

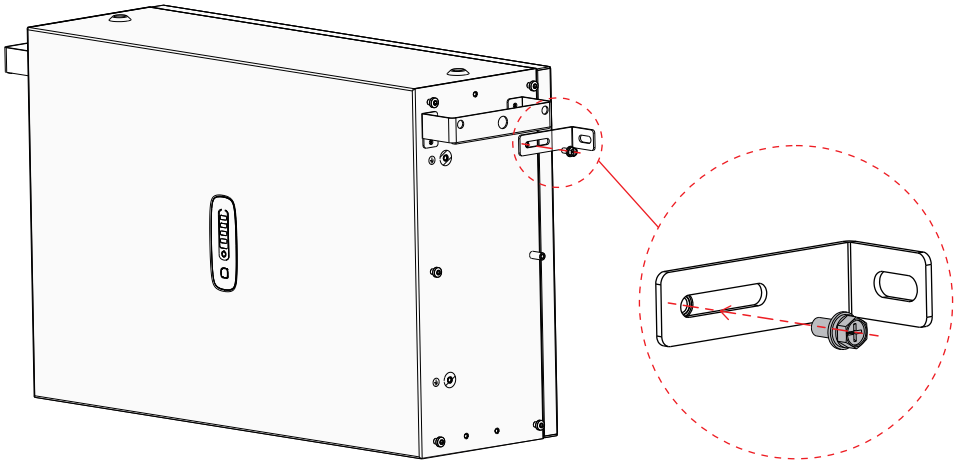


Figure 4-3 Wall Mounting Bracket

Step 3

Pile 1-3 batteries on the pedestal in order and mark the position to be punched with a marking pen. Remove battery pack (as shown in Figure 4-4);

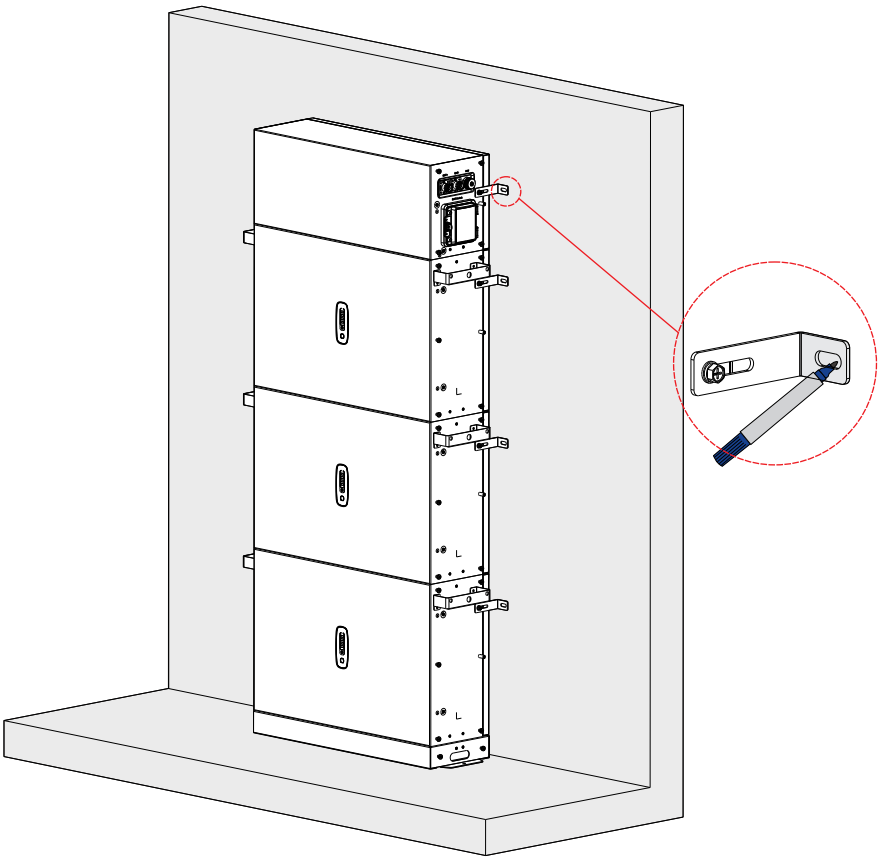


Figure 4-4 Marking of Punched Position

Step 4

Punch a hole (hole diameter: 10mm; hole depth: 80mm) with an electric impact drill and set plastic tube into wall (as shown in Figure 4-5).

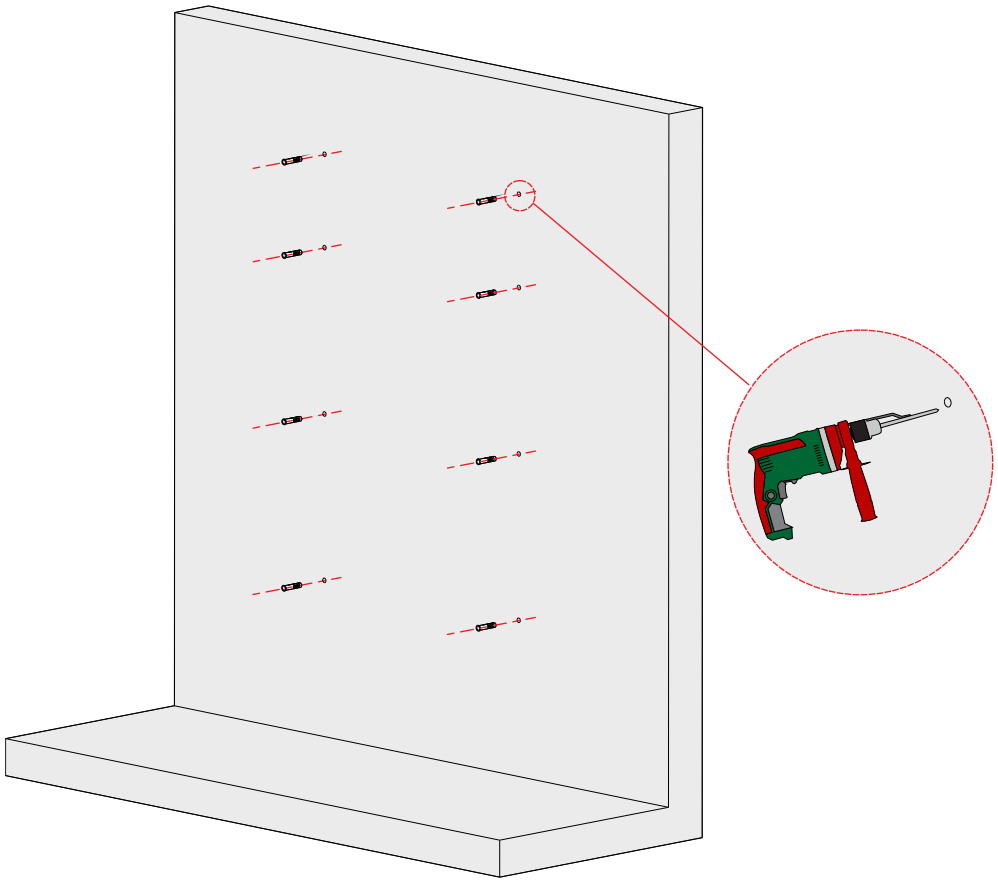


Figure 4-5 Punching with Electric Impact Drill

⚠ Danger

✧ Avoid the water and electricity lines inside walls during punching in order to avoid danger.

Note

✧ Operators shall wear goggles and dust mask during punching process in order to prevent dust from entering respiratory tract or eyes.
✧ Keep out the equipment with such objects as paperboard during punching in order to avoid dust from falling.
✧ Clean the dusts inside and outside all holes using a dust collector and then measure the hole distance. Relocate and punch holes with significant errors.

Step 5

Fix the first battery on the pedestal and then pile the second and third ones on the first battery pack. Mount them from upper to lower side and tighten the fastenings on both sides. Then fix them on wall with fasteners (as shown in Figure 4-6).

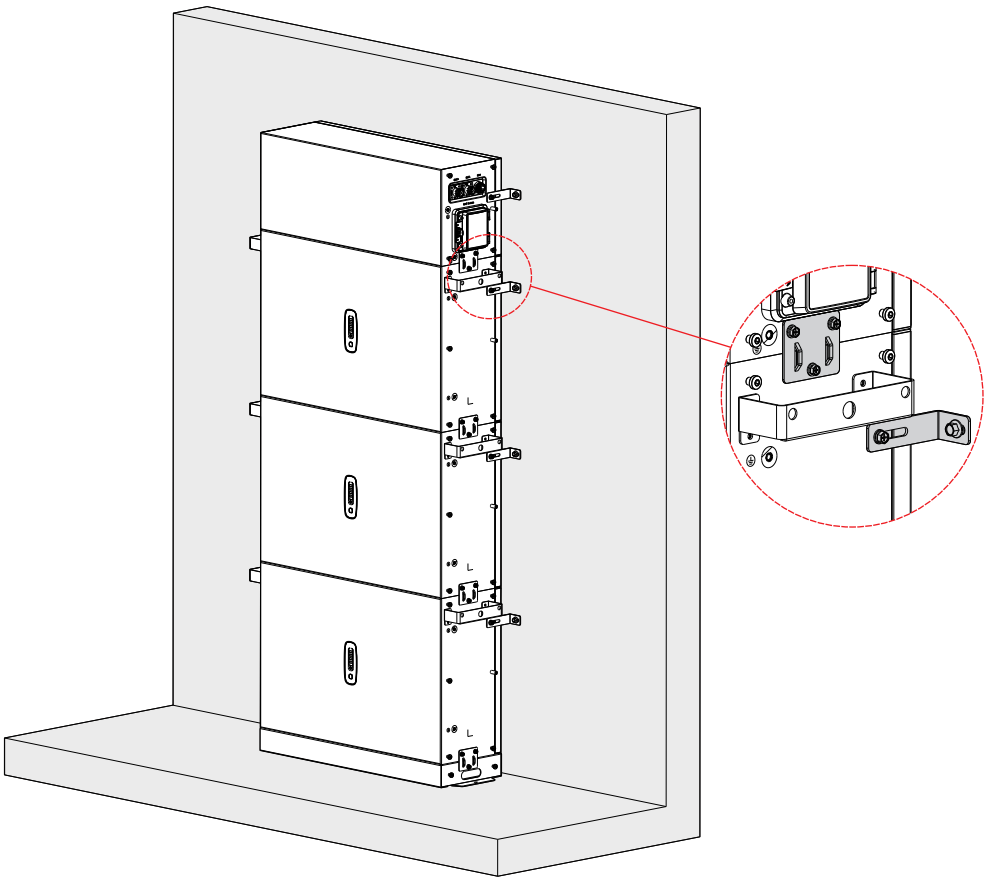


Figure 4-6 Fasteners for Fixing Battery Pack

⚠Warning

✧ Fix both battery and distribution box on wall surface in order to avoid any damage after titling.

Attention

✧ When the battery is fixed on wooden wall surface, fix it with tapping screw and ensure the load-bearing requirements can be met (weight of 1 battery: 50kg).

✧ If the distance between battery system and wall is larger due to raised waterproof groove on wall surface, L-shaped fixed part accompanied with the box may not satisfy the fixing requirements. In such case, user should buy the L-shaped fasteners by ensuring they meet the load-bearing requirements (weight of 1 battery: 50 kg).

5 Electrical Connection

Precautions

Danger

✧ Prior to electrical connection, make ensure “DC Breaker” of battery and all switches connected with battery are “OFF”; otherwise, electric shock may happen to battery.

Warning

✧ Equipment damage caused by incorrect wiring does not fall into the scope of warranty.
✧ Electrical connection must be finished by professional electrical technicians only.
✧ Operators must wear PPEs during electrical connection.

Attention

✧ The cable colors in all electrical connection diagrams of this chapter are for reference only. Please choose cables according to the local cable standards (cables with yellow and green colors can be used for earthing protection only).

5.1 Cable Preparation

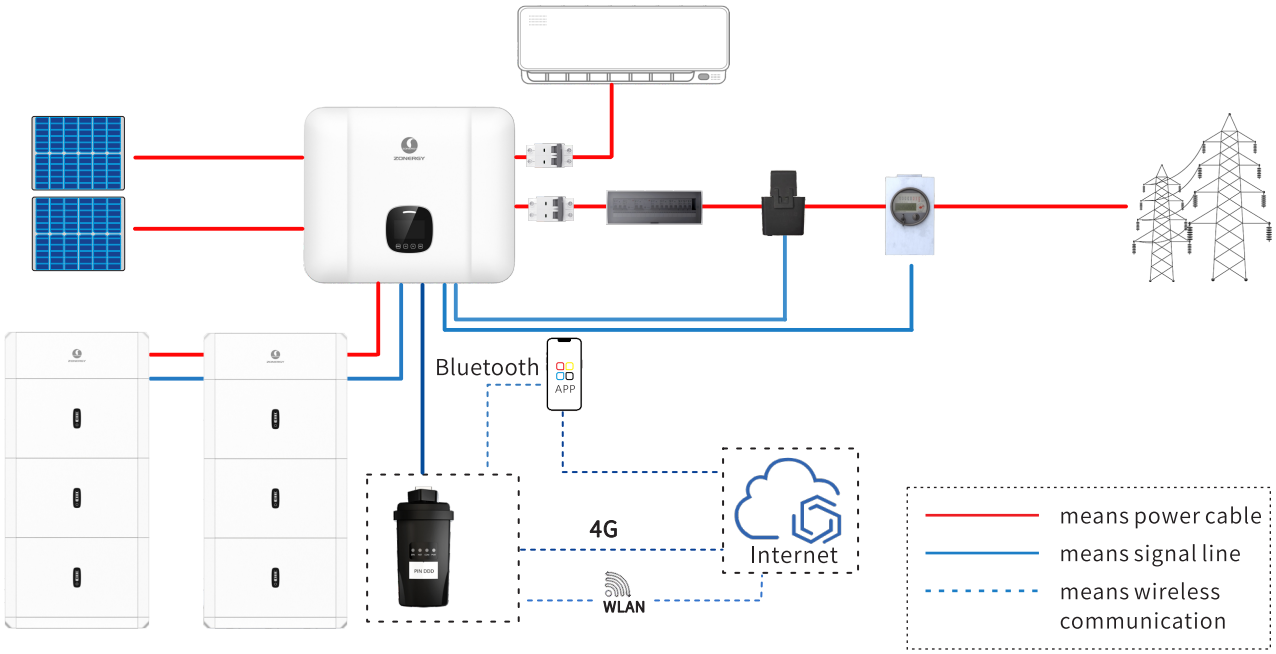


Figure 5-1 Schematic Diagram of System Connection

Cables accompanied with battery

No.	Cables	Type	Source
1	DC input cable (between distribution box and battery)	Outdoor photovoltaic cable universally used in the industry	Self-prepared
2	Signal line (between distribution box block – battery, distribution box – inverter) signal line	Outdoor shielded twisted pair (8 cores)	Self-prepared
3	Earthing lead (between distribution box and battery)	Outdoor single copper core cable	Self-prepared

Attention

✧ The min. diameter of cable should be determined according to local cable standards.
✧ Choose cables by considering the following factors, including rated current, cable type, laying mode , ambient temperature and max. expected line loss.

5.2 Electrical Connection

The internal connection cables are delivered with box. See the Packing List for the parts inside the packing box.

5.2.1 Mounting of earthing lead

⚠ Danger

✧ Please confirm the earthing lead has been connected reliably. Electric shock may happen once the lead is not connected or becomes loose.

Attention

✧ It is suggested to apply silica gel or paint onto the external side of earthing terminal after the earthing lead is mounted.

Step 1

Connect the distribution box and battery earthing lead (as shown in Figure 5-2).

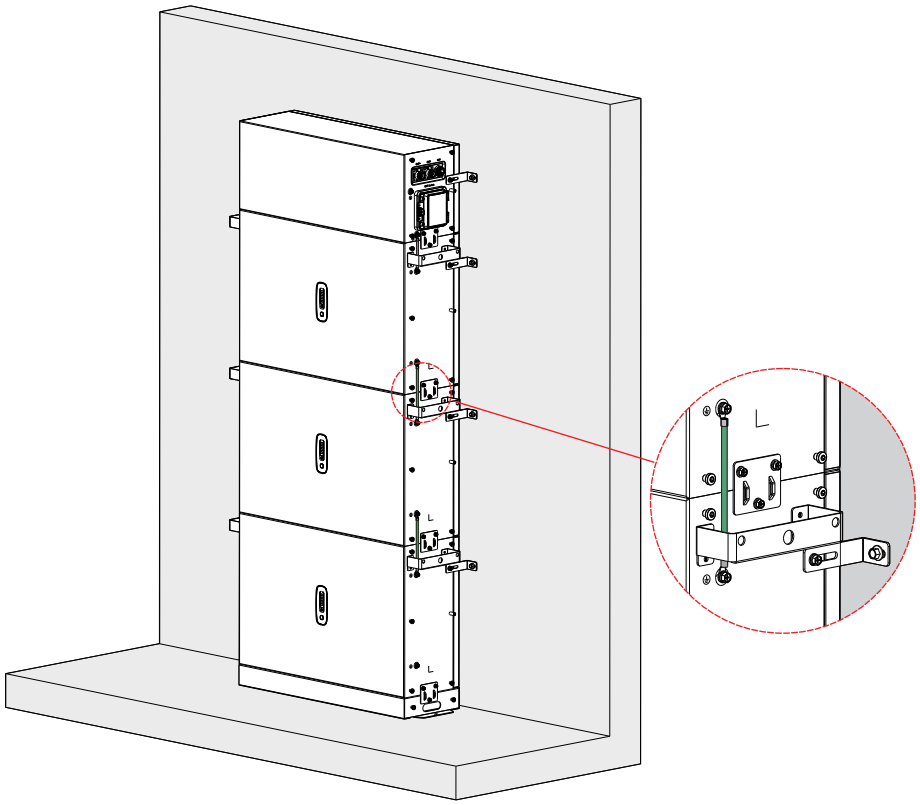


Figure 5-2 Connection of Internal Earthing Lead

Mounting of Internal DC Terminal

Insert the anode and cathode connectors delivered together with the battery into the anode and cathode of battery cascade terminal (BAT+, BAT-) (as shown in Figure 5-3).

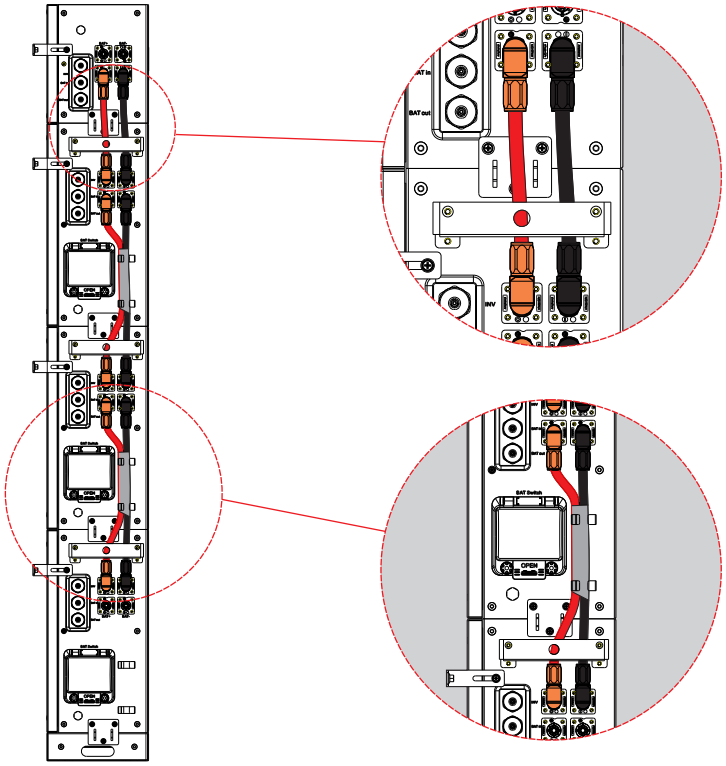


Figure 5-3 DC Line Connection of Battery System

The DC terminal between distribution box and battery pack are connected by DC connection harness delivered together with battery module (Amphenol terminal).

Note
✧ Pull back the DC input line after anode and cathode connectors are set in place to make sure the line has been connected and fastened firmly.

5.2.2 Connection of signal line

Communication between distribution box and battery, and between batteries is realized via RJ-45 quick connector. The wiring mode is shown below (as shown in Figure 5-4):

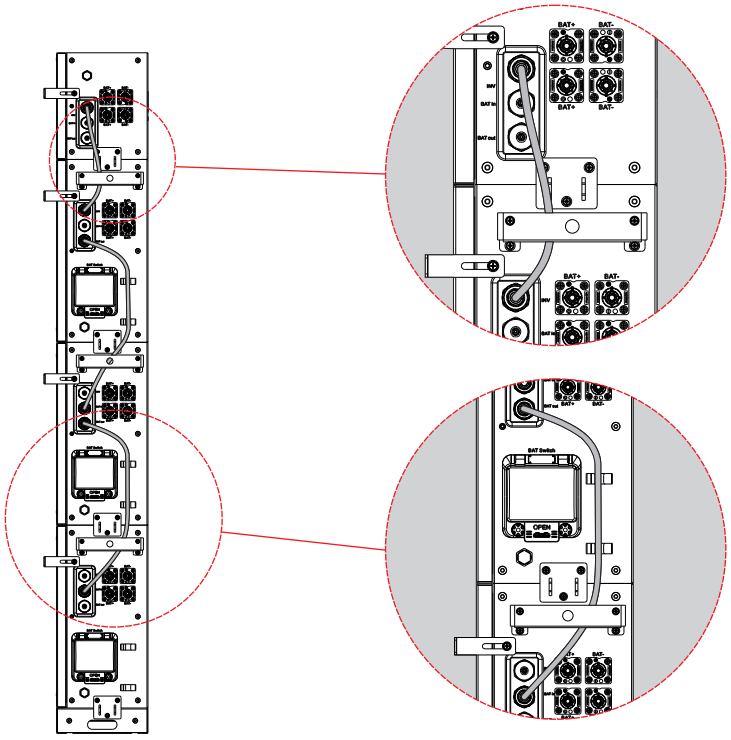


Figure 5-4 Connection of Signal Line between distribution box and Battery Pack

5.3 External Electrical Connection of Battery System

Connection schematic diagram (as shown in Figure 5-5)

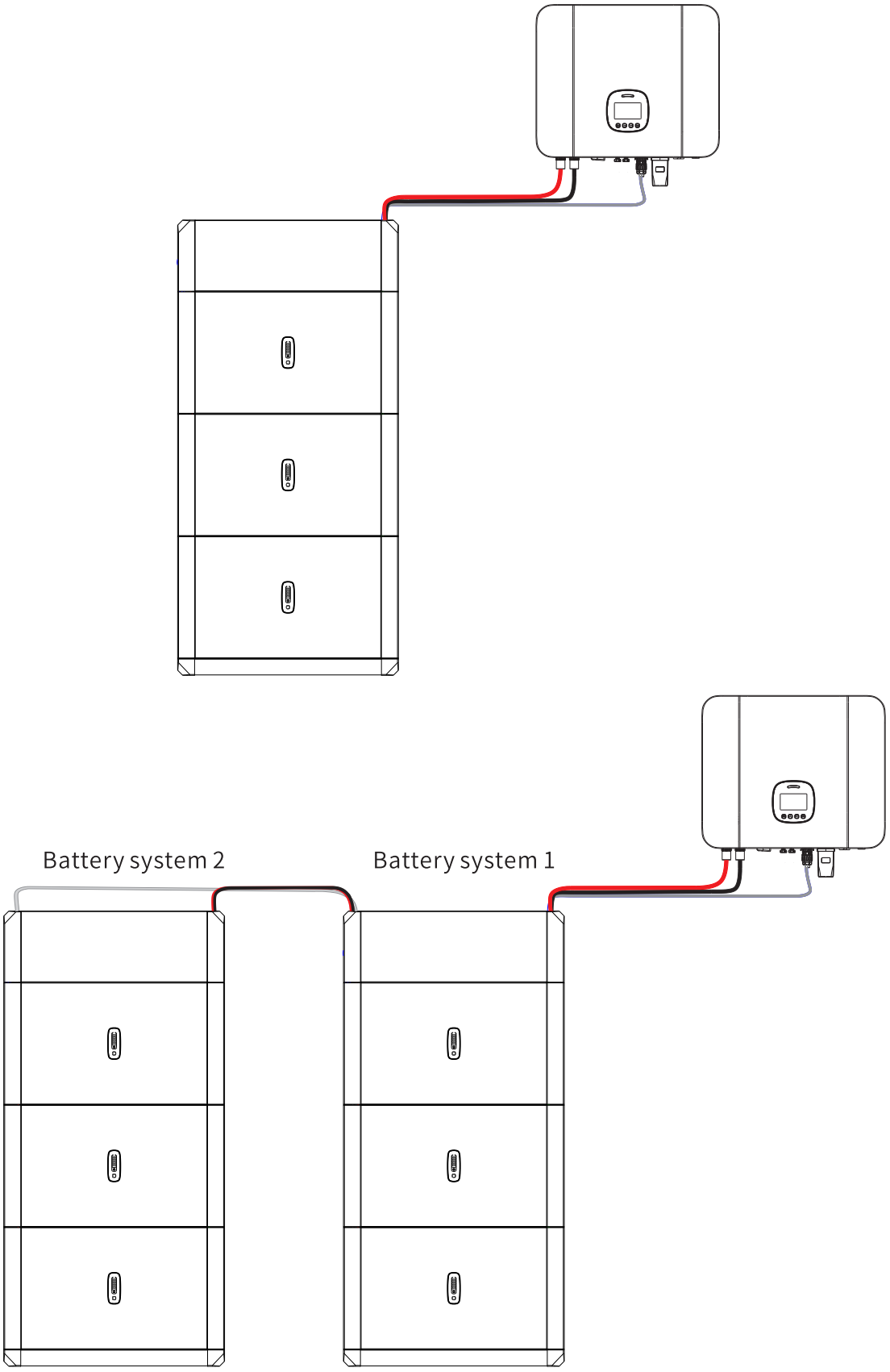


Figure 5-5 Connection Schematic Diagram (Inverter + Battery system)

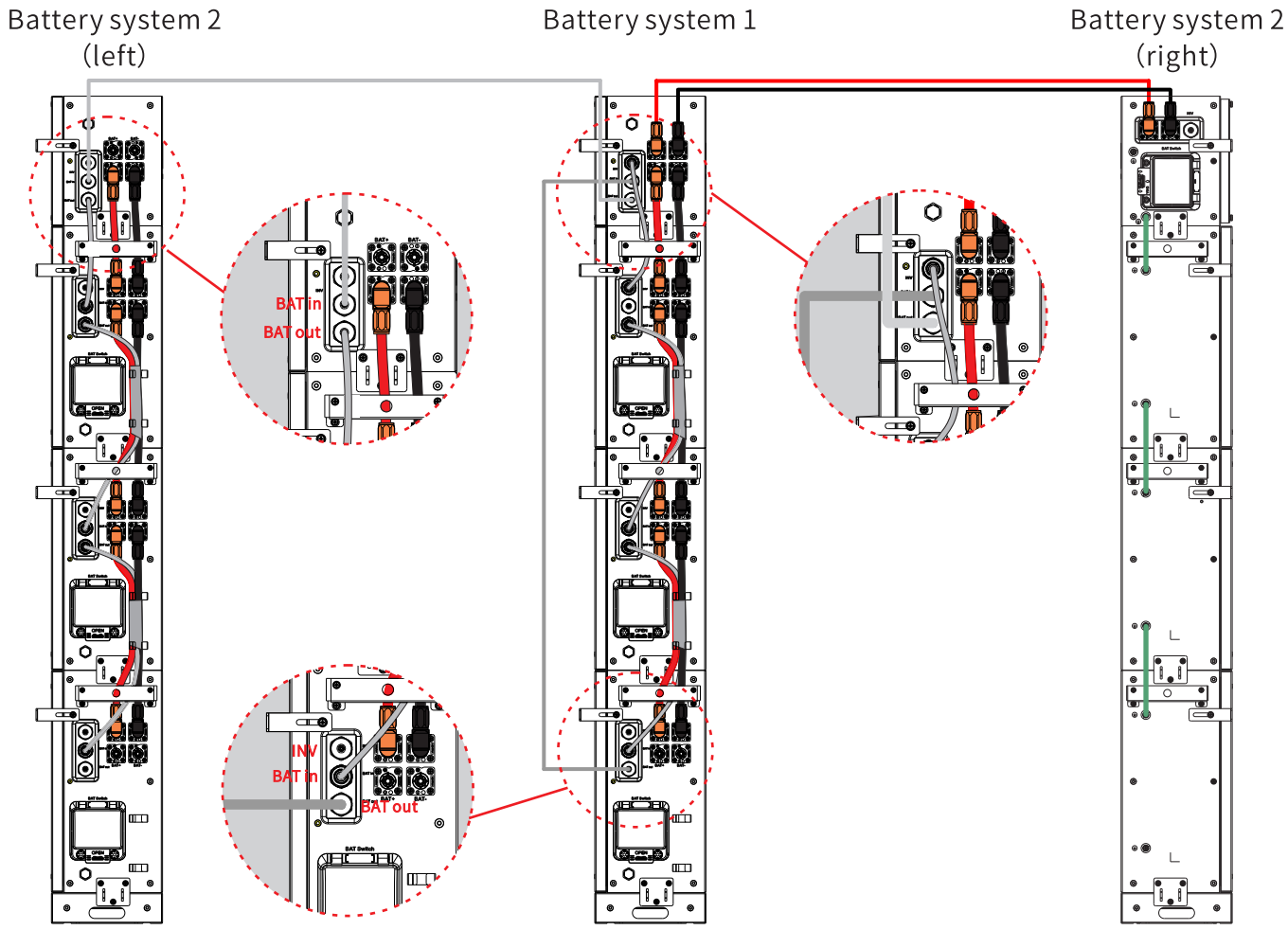


Figure 5-5 Connection Schematic Diagram (Inverter + Battery system)

Wiring Hole of Cable

Cut off the outlet hole at the left or right side of distribution box according to the routing mode, and run battery parallel operation harness and communication harness through wiring hole (as shown in Figure 5-6).

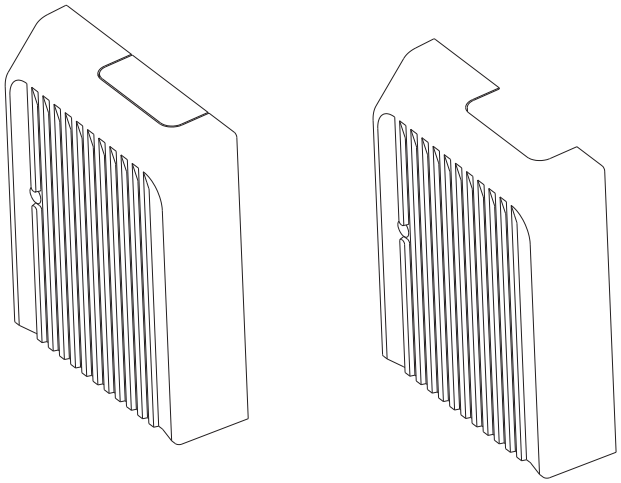


Figure 5-6 Outlet Hole of Cable

Attention
✧ Cut off outlet hole after installing harness in order to avoid cutting off outgoing line board by mistake.

5.3.1 Mounting of protection earthing lead

Attention

Danger

✧ Please confirm if the protection earthing lead has been connected reliably. Electric shock may occur , if the lead is not connected or becomes loose.

Attention

✧ It is suggested to apply silica gel or paint onto the external side of earthing terminal after the earthing lead is mounted.

Operation Steps

Step 1

Crimping of OT terminal (as shown in Figure 5-8).

Note

✧ Avoid scratching the core while stripping wire.
✧ The cavity formed by conductor crimping sheet of OT terminal should clad wire core totally and the core should be connected with OT terminal closely.
✧ Heat-shrinkable tubing or insulated packaging tape can be used at the crimping site for cladding.
✧ Cladding with heat-shrinkable tubing is introduced below.
Pay special attention to protection while using heat gun in order to avoid burning the equipment.

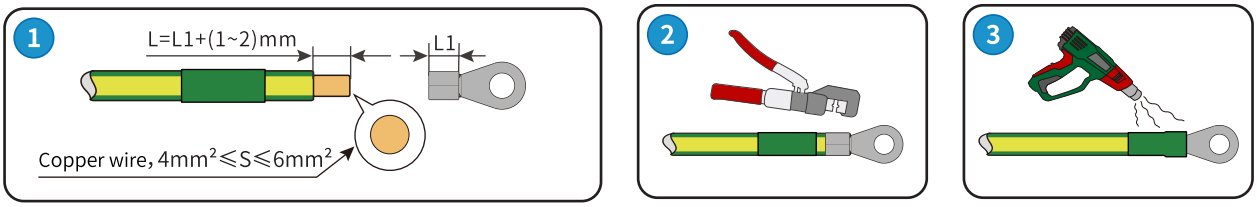


Figure 5-8 Crimping of OT Terminal

Step 2

Connect the earthing point of distribution box and external earthing point (as shown in Figure 5-9).

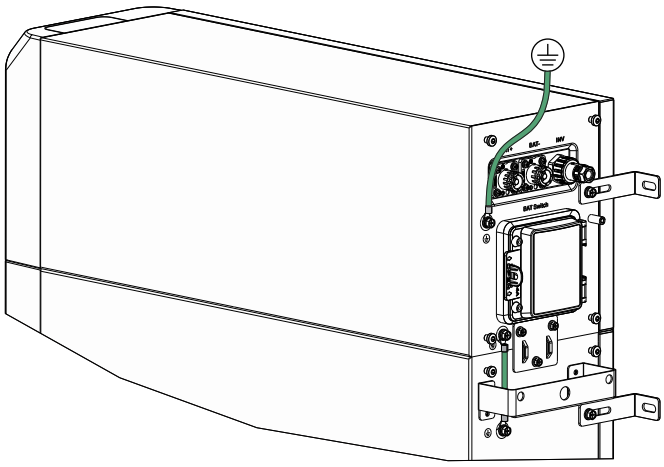


Figure 5-9 Earthing of Protection Earthing Lead

Attention
✧ Apply silica gel or paint onto the external part of earthing terminal after finishing mounting earthing lead for the purpose of protection.

5.3.2 Mounting of DC input line

Connect DC Input Line of Inverter

Insert the anode and cathode connectors (Amphenol terminals) inside the distribution box into DC "BAT +" and "BAT –" input terminals corresponding to inverter (as shown in Figure 5-10).

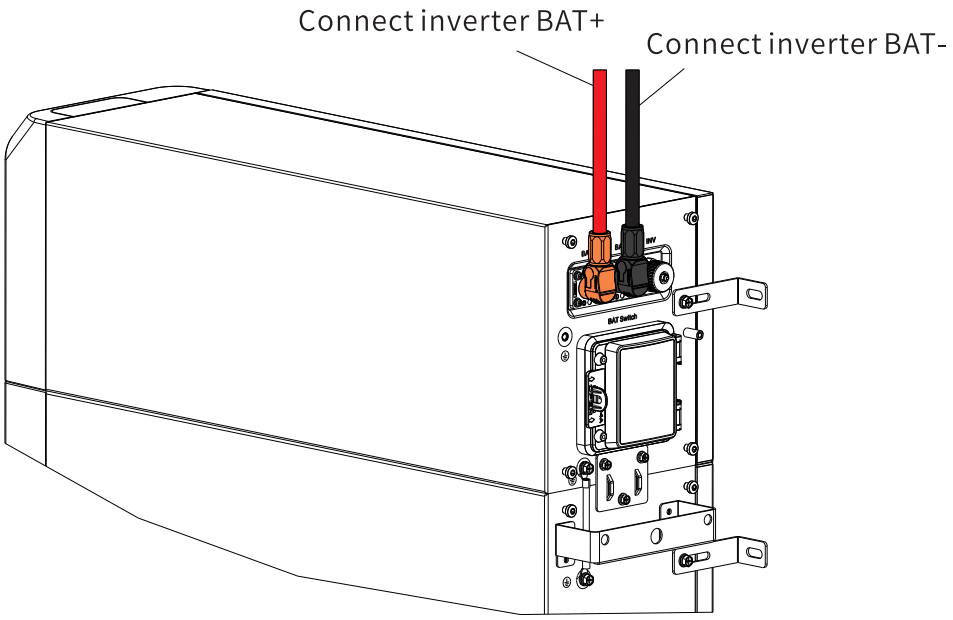


Figure 5-10 Connection of DC Input Line

Note
✧ Make BAT+ and BAT- lines of DC input close as much as possible during installation. ✧ "Click" sound will occur after anode and cathode connectors are set in place. Then rotate DC input line to the right and left sides to make sure they have been connected firmly.

5.3.3 Connection of signal line

Connect the signal line between distribution box and inverter

Insert JR-45 connection terminal into INV communication port corresponding to the right side of distribution box (as shown in Figure 5-11).

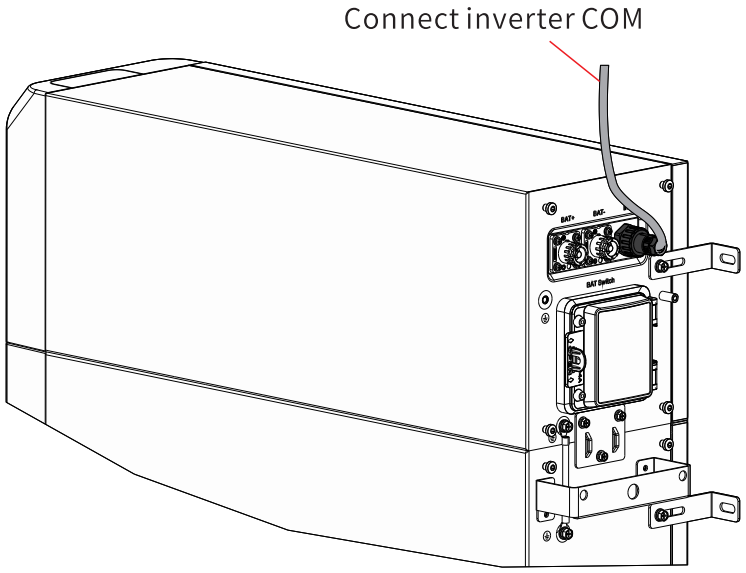


Figure 5-11 Connection of Signal Line

Definition of COM interface (as shown in Figure 5-12)

RJ45	Color	Port definition	16 PIN COM
1	Orange white		
2	Orange		
3	Green white		
4	Blue	CANL	4
5	Blue white	CANH	3
6	Green		
7	Brown white	485A_BMS	11
8	Brown	485B_BMS	12

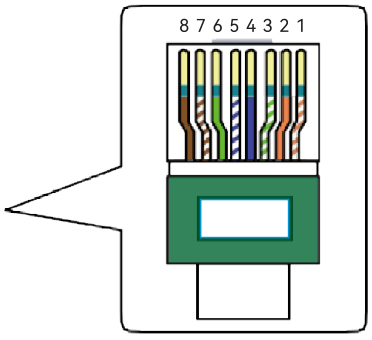


Figure 5-12 Definition of COM Interface

5.4 Enclosure Installation

Install the external protective cover and fasten it with bolts after electrical connection is finished and cable has been connected correctly and reliably (as shown in Figure 5-13).

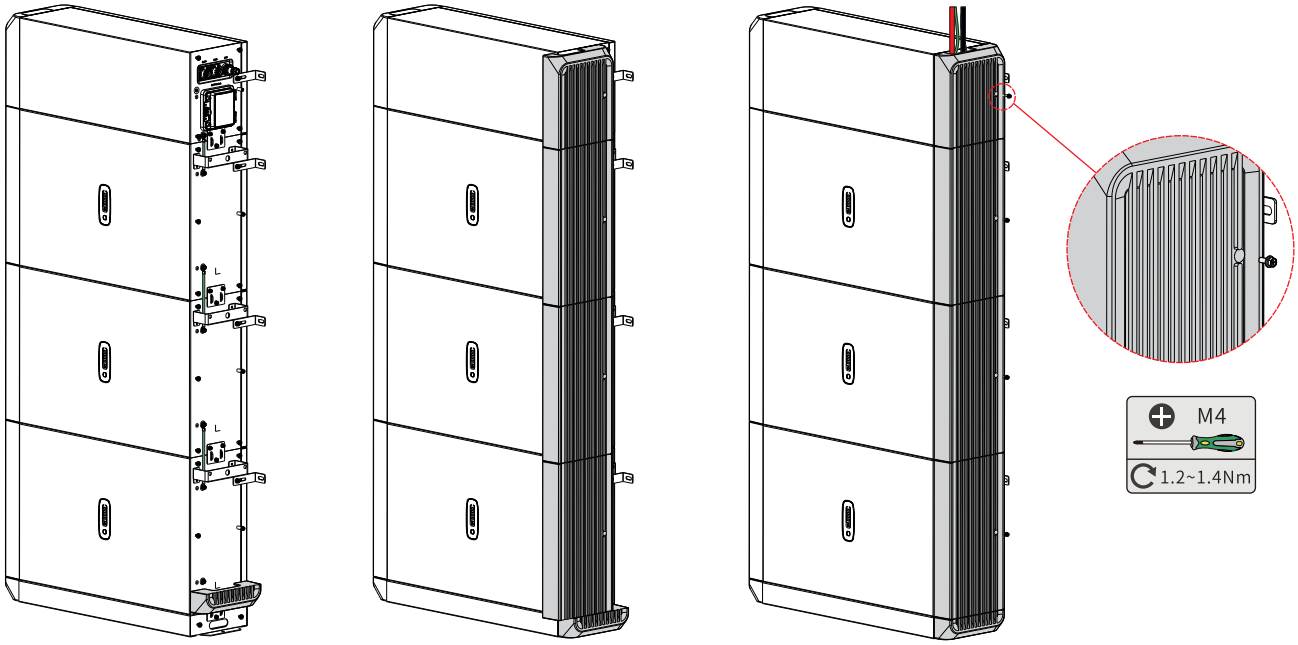


Figure 5-15 Enclosure Installation

6 System Debugging and Testing

Set parameters correctly by professionals when the equipment is powered on for the first time. Error setting may lead to incompliance of the equipment with certification of local country/region, influencing the normal work of equipment.

6.1 Check Prior to Power-on

Table 6-1 Check Items and Acceptance Standards

No.	Items	Acceptance Standard
1	The battery has been installed	The battery should be installed correctly, firmly and reliably.
2	Cable tie is bound elegantly	Cable tie should be even and no sharp corner is allowed at the cut site.
3	Reliable earthing	Earthing lead should be connected correctly, firmly and reliably.
4	Switch disconnection	“DC Breaker” and all switches connected with battery are under “OFF” status.
5	Cable has been connected in place	AC output lead, DC output lead, battery line and signal line should be connected correctly, firmly and reliably.
6	Sealing without terminal and interface	Waterproof cover should be used at the site where neither terminal nor interface is used.
7	Installation environment satisfies the requirements	Installation space should be reasonable, clean, tidy and free of any construction leftovers.

6.2 System Power-on

See Figure 6-1 for panel introduction:

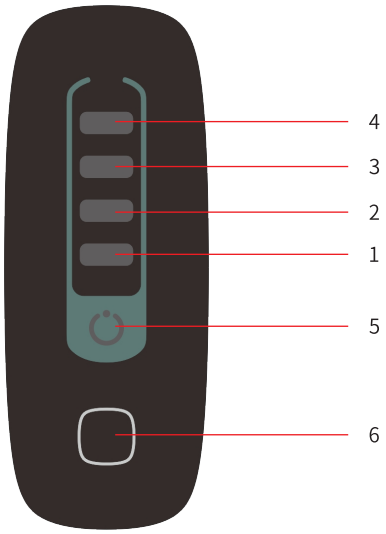


Figure 6-1

No.	Parts	Remarks
1	Power indicator light 1	0＜SOC≤25%
2	Power indicator light 2	25＜SOC≤50%
3	Power indicator light 3	50＜SOC≤75%
4	Power indicator light 4	75＜SOC≤100%
5	Status indicator light	Running/Warning
6	Buttons	Awakening/Sleep

Attention
✧ Press Awakening/Sleeping button (for 3-6s) to awaken battery (for parallel operation of several batteries, awaken host first) and close circuit breaker. ✧ It is suggested to install plastic board after finishing debugging.

Description of LED Indicator Light

Table 6-2 LED Indicator Light

Status	Normal/Warning/ Protection	Status Indicator Light		Power Indicator Light				Remarks
		●	●	●	●	●	●	
Shutdown	Sleep	Off	Off	Off	Off	Off	Off	All off
Standby	Normal	Flash 1	Off	Subject to power indication				Standby status
	Warning	Off	Flash 3					Module low voltage
Charging	Normal	Normally on	Off	Subject to power indication (The max. power indicator light flashes, flash 2)				The max. power indicator light flashes (flash 2). Warning indicator light does not flash if there is an overcharge warning
	Warning	Off	Flash 3					
	Overcharge protection	Normally on	Off	Normally on				
	Temperature/Overcurrent/Failure protection	Off	Normally on	Off				
Discharge	Normal	Flash 3	Off	Subject to power indication				
	Warning	Off	Flash 3					
	Undervoltage protection	Off	Off	Off				Stop discharging
	Temperature/Overcurrent/Short circuit/Reverse connection/Failure protection	Off	Normally on	Off				Stop discharging
Failure		Off	Normally on	Off				Stop charging and discharging

Table 6-3 Capacity Indicator Light

Status	Capacity	Capacity Indication	Remarks
Charging	0<SOC≤25%		The max. power indicator light will flash during charging (Flash 2)
	25<SOC≤50%		
	50<SOC≤75%		
	75<SOC≤100%		
Discharging	0<SOC≤25%		The power indicator light is normally on (the max. power indicator light does not flash)
	25<SOC≤50%		
	50<SOC≤75%		
	75<SOC≤100%		

Table 6-4 Flashing Descriptions

Flashing Mode	Cycle
Flashing 1	4S
Flashing 2	1S
Flashing 3	2S

6.3 Outage of Battery System

Please follow the sequence below when closing battery system in order to avoid damaging the system:

1. Take off the battery and plastic board of distribution box.
2. Disconnect battery and circuit breaker of distribution box.
3. Disconnect the communication of battery system and inverter (unplug communication wire or close inverter).
4. Press Awakening/Sleep buttons (for 3-6s) and all the indicator lights will be off.
5. Assemble the plastic board.

7 Technical Parameters

Item	Specifications		
Product name	Rechargeable Li-ion Cell	Rechargeable Li ion Battery pack	Rechargeable Li ion Battery System
Type/model	LF100LA	Limestone 5H-P	Limestone 5H-P-DB
Nominal voltage	3.2Vd.c.	51.2Vd.c.	51.2Vd.c.
Rated capacity	102 Ah	100Ah	100Ah
Recommended charging voltage by manufacturer	3.65V	any cell reaches 3.65V	any cell reaches 3.65V
Upper limit charging voltage	3.9V	any cell reaches 3.65V	any cell reaches 3.65V
Recommended charging current by manufacturer	50A	50A	50A
Maximum continue charging current	100A	50A	50A
Recommended discharging current by manufacturer	50A	50A	50A
Maximum continue discharging current	250A	60A	60A
Standard charging temperature range	0°C to 65°C	0°C to 50°C	0°C to 50°C
Standard discharge temperature range	-30°C to 65°C	-20°C to 50°C	-20°C to 50°C
Storage temperature range	-	0°C to 35°C	0°C to 35°C
Standard charging method by manufacturer	Charge at constant current 50A until the voltage reaches 3.65V, then charge at 3.65V till charge current is 0.05/tA (5.1A)	Charge at constant current 50A until voltage reaches 57.6V or any cell reaches 3.65V	Charge at constant current 50A until voltage reaches 57.6V or any cell reaches 3.65V
Charging method for internal short-circuit test	Charge at constant current 50A until the voltage reaches 3.65V, then charge at 3.65V till charge current is 0.05/tA (5.1A)	-	-
Final discharge voltage	2.0V	any cell reaches 2.7V	any cell reaches 2.7V
Dimension	T*W*H: (49.9±1.0)mm* (160.0±1.0)mm* (118.5±1.0)mm	W*H*D: 650mm*360mm*180mm	W*H*D: 650mm*570mm*180mm
Weight	(1.98±0.1)kg	50kg	60kg
Connecting type	-	16S	16S

Overcharge protected voltage supply by battery system	-	3.65V/cell	3.65V/cell
Overcharge protected current supply by battery pack	-	⩽100A	⩽100A
Overheating protect temperature supplied by battery pack	-	⩾60°C	⩾60°C

Technical Parameters						
	Limestone 5H-P-DB	Limestone 10H-P-DB	Limestone 15H-P-DB	Limestone 20H-P-DB	Limestone 25H-P-DB	Limestone 30H-P-DB
Batteries	Limestone 5H-P (5.12kWh,51.2V)					
Number of batteries	1	2	3	4	5	6
Nominal capacity	5.12kWh	10.24kWh	15.35kWh	20.48kWh	25.64kWh	30.72kWh
Rated capacity	4.6kWh	9.21kWh	13.81kWh	18.43kWh	23.04kWh	27.65kWh
Battery dimensions (W*H*D)MM	650×360×180	650×360×180 *2	650×360×180 *3	650×360×180 *4	650×360×180 *5	650×360×180 *6
Battery weight	50KG	50KG*2	50KG*3	50KG*4	50KG*5	50KG*6
Dimensions of distribution box(W*H*D)MM	650×210×180	650×210×180	650×210×180	650×210×180 *2	650×210×180 *2	650×210×180 *2
Weight of distribution box	10KG	10KG	10KG	10KG*2	10KG*2	10KG*2
Nominal charging/ discharging current	50A	100A	100A	100A	100A	100A
Nominal charging/ discharging power	2.5KW	5KW	5KW	5KW	5KW	5KW
Battery model	LiFePO4(LFP)					
Rated voltage	51.2V					
Range of working voltage	44.8-57.6V (cut-off voltage of standard charging/discharging: 3.65V/2.5V)					
Protection grade	IP66					
Installation mode	Ground					
Working temperature	-20-+50°C					
Communication mode	RS-485 and CAN compatible					
Standards and certifications	IEC62619, IEC61000-6-l/-3, IEC63056, IEC62040, UN38.3, MSDS, RoHS, WEEE, CE and TÜV					

8 Maintenance

Table 8-1 Maintenance List

No.	Maintenance Items	Cycle
1	If the battery is not put into use, charge the battery fully first and then discharge it by 30%-40%	For every 3 months
2	Check if the exposed wire is worn. If yes, please change the corresponding cable or contact our after-sales service center.	For every 6 months
3	Check if the enclosure is damaged. If yes, make repairing through painting or contact our after-sales service center.	For every 6 months
4	Check if the wall bracket is installed firmly. If not, fasten the corresponding position.	For every 6 months
5	Check if there are any foreign matters surrounding the battery. If yes, do cleaning in order to avoid heat dissipation of battery.	For every 6 months
6	Check if there is any water or insect in order to avoid damaging the battery.	For every 6 months

◆ Upon discovering any problem that may damage battery or the inverter system, please contact our after-sales service specialist and do not dismantle it at will.

◆ Do not touch exposed internal copper wire, for high voltage may cause risks. Please contact our after-sales service specialist and do not dismantle it at will.

◆ In case of any other emergencies, please contact after-sales service specialist as soon as possible and operate under the specialist’ s guidance or wait for specialist’ s site operation.

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