User Manual

RS-S51100B

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Purpose

This document describes VOLTHA RS-S51100B battery produced for Voltha Srl by cell manufacturer Shenzhen Topband Battery Co., LTD in term of its installation, electrical connection, commissioning, maintenance and troubleshooting methods. Please read this manual carefully, understand the safety information and be familiar with the operation instructions before installing and using the product.

Intended Audience

This document is intended for:

- **Installer**
- **System engineer**
- **Technical support engineer**
- **User**

Symbol Conventions

Symbol	Description
DANGEROUS	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
ATTENTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates warning information about device or environment security which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results.
NOTE	Supplements the important information in the main text. NOTE is used to address information not related to personal injury, equipment damage, and environment deterioration.

TABLE OF **CONTENTS**

1.Safety Precautions

1.1 General Safety

Declaration

Before installing, operating, and maintaining the equipment, read this document and observe all the safety instructions on the equipment and in this document.

The "NOTICE", "WARNING", and "DANGEROUS" statements in this document do not cover all the safety instructions. They are only supplements to the safety instructions. Voltha will not be liable for any consequence caused by the violation of general safety requirements or design, production, and usage safety standards.

Ensure that the equipment is used in environments that meet its design specifications. Otherwise, the equipment may become faulty, and the resulting malfunction, component damage, personal injuries, or property damage are not covered under the warranty.

Follow local laws and regulations when installing, operating, or maintaining the equipment. The safety instructions in this document are only supplements to local laws and regulations.

Voltha will not be liable for any consequences of the following circumstances:

- Operation beyond the conditions specified in this document.
- Installation or use in environments that cannot meet relevant international, national, or local standards.
- Do not observe the safety precautions specified in the warning signs and protection labels on the equipment.
- Unauthorized modification to the product or software code or removal of the product.
- Damage caused during transportation by the customer.
- Equipment damage due to force majeure , such as storms, flood, earthquakes, fire.
- Failure to follow the operation instructions and safety precautions on the product and in this document.
- Damage caused by storage conditions that do not meet the requirements
- specified in related documents
- Damage caused by storage conditions that do not meet the requirements specified in related documents.

General Requirements

- Do not work with power on during installation or wiring operation.

- Do not install, use, or operate outdoor equipment and cables in harsh weather conditions such as lightning, rain, snow, and level 6 or stronger wind.
- Please observe the warning signs and protective measures on the product.
- Please use the tools specified in this manual to install and operate this product.
- Do not use water to clean the electrical components inside or outside of a cabinet..
- Do not open the rear cover plate without authorization.
- Before contacting any conductor, please confirm whether the conductor is charged to avoid the electric shock.
- Check that the equipment is not damaged. For example, check that the battery is not dropped,bumped, or dented on the enclosure.
- Without prior consent from the manufacturer, do not alter the internal structure or installation procedure of the equipment.

NOTICE

During transportation, turnover, installation, cable connection, and maintenance, comply with the national and local laws, regulations, and relevant standards.
Understand the components and functioning of a grid-tied PV power system and relevant local standards.

1.2 Battery safety

DANGEROUS

Before using the battery system, please ensure that the power line is connected correctly. Do not connect the wrong or reverse, otherwise it may cause irreversible damage to the battery system.
Do not dismantle, modify, repair the battery box without the permission of the manufacturer, otherwise it may be dangerous or cause system damage.
Do not collide, drag, squeeze or crush the equipment. It may cause product damage.
To prevent explosions and personal injuries, do not place batteries in a fire.
Do not place the battery in a high temperature environment, otherwise the battery life may decay, seriously it may cause battery explosion and fire.
If the battery cannot start, please contact the manufacturer's after-sales service personnel. Otherwise, permanent damage to the battery may be caused.
To prevent electric shock, please disconnect the charging power supply before installing the batteries.
Do not use the battery case or the whole product is clearly defective or damaged.
To ensure that the battery is not damaged in normal use, please arrange professionally trained personnel to install and maintain products according to the manual.

1.3 Personnel Safety

DANGEROUS

When using or operating the equipment, if found the potential safety problem or equipment failure, please terminate the operation immediately, report to the responsible person and take effective measures.
Before installation and maintenance, please ensure that the mains or other power generation equipment is disconnected. Prohibit to install, maintain and move the battery with power.
When wiring, please strictly follow the sequence requirements of this manual to avoid wrong connection and reverse connection.

1.4 Personnel Requirements

NOTE

- Personnel who plan to install or maintain Voltha equipment must receive thorough training, understand all necessary safety precautions, and be able to correctly perform all operations.
- Only qualified professionals or trained personnel are allowed to install, operate, and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and inspect the equipment.
- Only professionals or authorized personnel are allowed to replace the equipment or components (including software).

1.5 Battery Emergency Measures

Battery electrolyte leakage

Avoid contact with leaked liquids or gases in the case of battery leakage or abnormal odor. Contact professionals to deal immediately. Electrolyte is corrosive and can cause irritation and chemical burns. Should you come into direct contact with the battery electrolyte, do as follows:
Inhalation: Evacuate contaminated areas, get fresh air immediately, and seek immediatemedical attention.
Eye contact: Immediately f your eyes with water for at least 15 minutes, do not rub your eyes, and seek medical attention immediately.
Skin contact: Wash the contact areas immediately with soap and water and seek medical attention immediately.
Ingestion: Emetic and seek immediate medical attention.

Battery Fire

- If a fire occurs, power off the system if it is safe to do so. Avoiding smoke damage to personnel, please open the windows to keep ventilation
- Extinguish the fire with carbon dioxide, FM-200. Do not extinguish the fire with water or ABC dry powder fire extinguisher. Personnel involved in the
- fire extinguishing must wear protective clothing and self-contained breathing apparatus.
- After the fire is put out, the battery module needs to be cooled, then moved out of the battery compartment.

2 Product introduction

2.1 overview

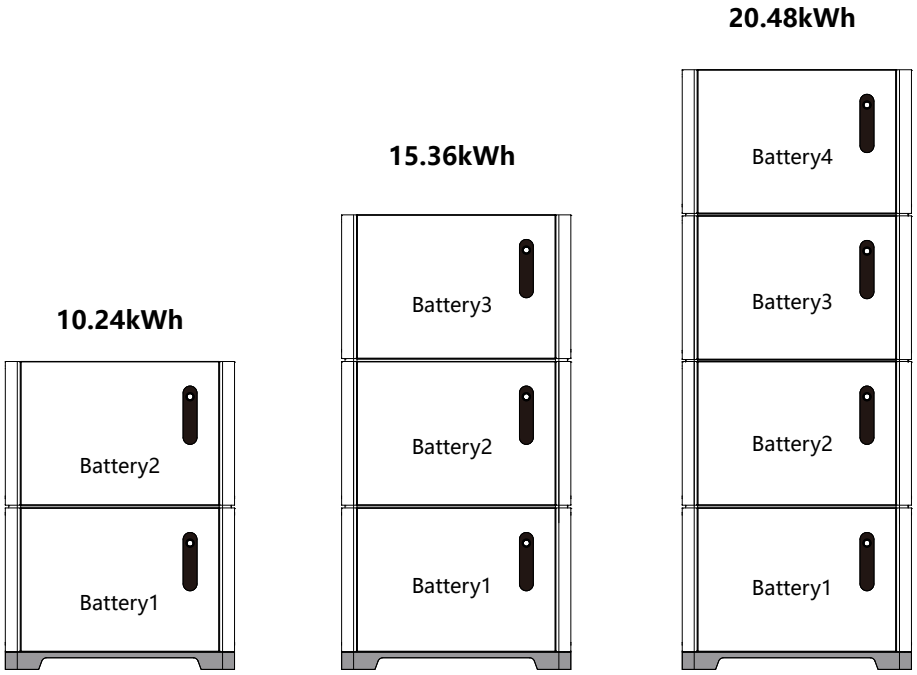
Function

VOLTHA RESS-1005B is a lithium-ion battery used for household energy storage.Its main function is to form a household energy storage system with inverters and photovoltaic modules.

Available Power:

ATTENTION

The VOLTHA RS-S51100B supports expansion of the available batteries up to a maximum of 4 battery modules of available batteries.
(Expansion conditions must strictly comply with the manufacturer's specifications. For more information, consult the manufacturer or distributor. Failure to perform the expansion operation as required may result in malfunctions such as under-voltage, over-voltage, or excessive differential pressure in the battery system.)



2.2 Application

VOLTHA RS-S51100B is designed for home energy storage. The system is generally composed of photovoltaic modules, VOLTHA RS-S51100B ,inverter, AC switch, power distribution unit and household load.

General application, as Figure 2-2-1

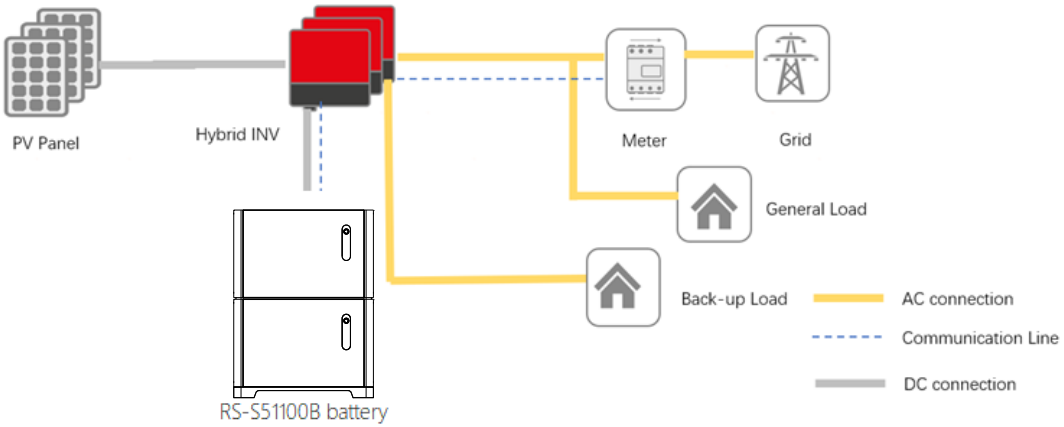


Figure 2-2-1

2.3 Apperance

Appearance of all-in-one system

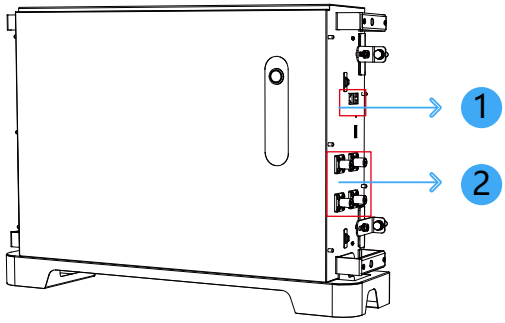


Figure 2-3-1

Number	Components
1	Communication Port (COM)
2	DC terminal (BAT)

Appearance of the battery Plate

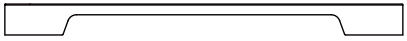


Figure 2-3-2

2.4 Dimensions

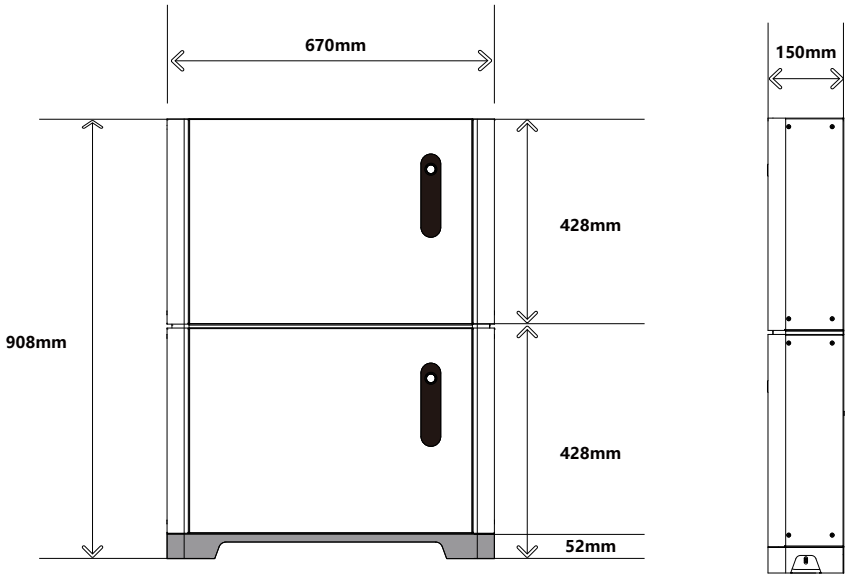


Figure 2-4-1

3 System installation

3.1 Checking Before the Installation

Before unpacking, Please check the followings:

1. Check the outer package for damage, such as cracking, deformation, opening or other signs of damage to the equipment. In case of damage, do not open the package to use the product, and please contact the dealer.
2. Check whether the model specification is correct. If the product doesn't match the specification, please contact the dealer.
3. Check whether the contents are complete and for any obvious external damage. If there is any missing or damage, please contact the dealer.

NOTE

Please read the packing list to check the quantity of deliverables shipped in the box.

3.2 Preparing tools and instruments

Category	Tools and meters				
Installation	 Diagonal pliers	 Art knife	**Personal protective articles**	 Protective gloves	 Eye protector
	 Marker pen	 Percussion drill			
	 Hammer	 Electric screwdriver		 Protective footwear	 Protective mask
	 Crimping pliers PV-SC002	 Spanner			

3.3 Installation

Installation environment

1. Ensure that the equipment is not installed in a flammable, explosive and corrosive environment before installation.
2. Installation position to avoid direct sunlight, and build an awning if necessary.
3. The installation position should avoid the range of exposure to children. The equipment may produce high temperature during operation, please beware of scald.
4. The installation position should avoid rain and snow, not to affect the normal use of the equipment.
5. The installation position should avoid the water pipes and cables in the wall, to avoid the unpredictable danger during drilling.
6. The protection level is indoor installation, and the installation environment temperature and humidity should be within the appropriate range.

7. The installation altitude should be below 2000m.

8. The installation space shall meet the requirements of ventilation, heat dissipation and operation space.

9. Keep away from the strong magnetic field and avoid electromagnetic interference. If there is a radio station or a wireless communication device below 30 MHz near the installation location, ensure that the distance between the battery and the wireless device is over 40m.

Installation location selection

Energy storage system supports two ways: floor installation and wall installation, installation requirements:

- Do not install the battery forward, inverted, backward and roll.
- Please choose solid brick structure, concrete wall and ground for installation. If other walls and ground are selected, the wall and ground should be built of flame retardant materials and can meet the load-bearing requirements of the battery.
- When installing, please ensure that there is no other unrelated equipment and inflammable, explosive items around. Enough space should be reserved to ensure the heat dissipation and safety isolation.
- When installing on the wall, items should be prevented under the battery.
- When installing, to be close to the wall to prevent the battery from dumping.

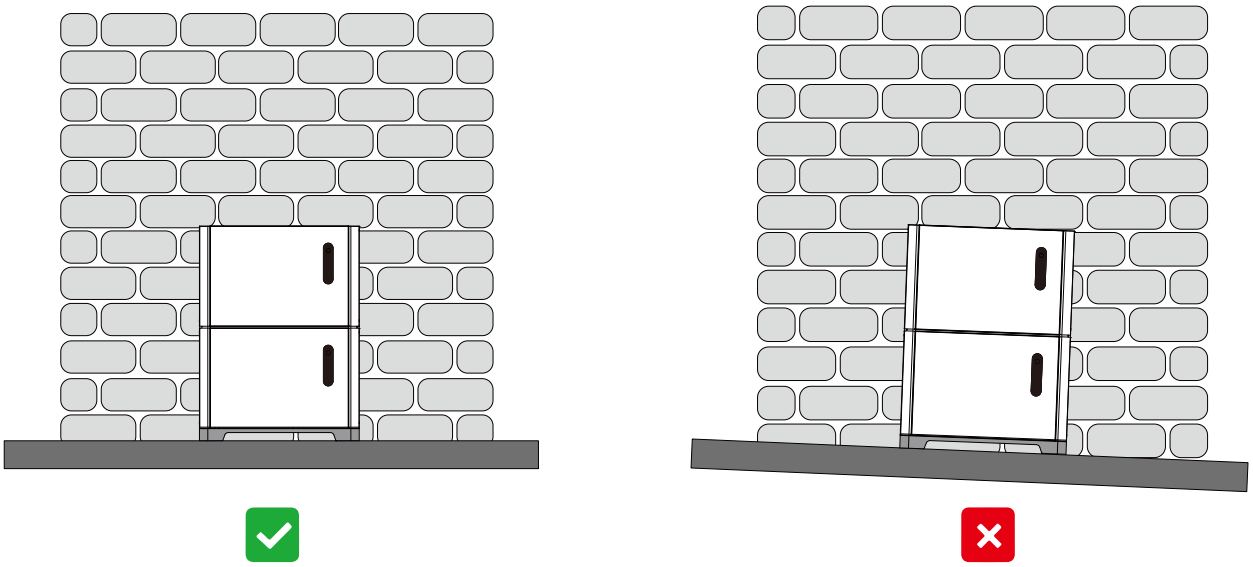


Figure 3-3-1

3.4 Energy storage system installation

3.4.1 Floor mounting size

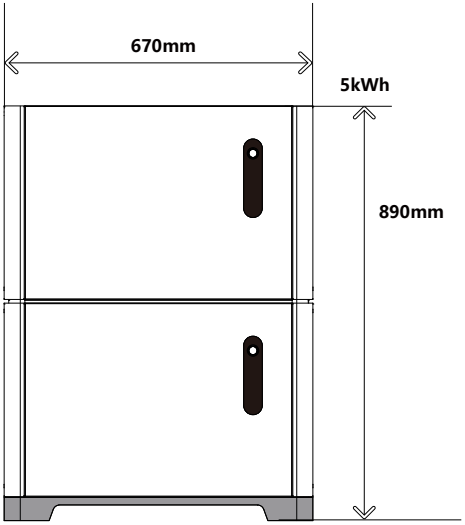


Figure 3-4-1

Steps

Step 1: Place the floor mounting bracket on the horizontal ground, align it with the wall. The distance between the bracket and the wall surface should be 10-15 mm.

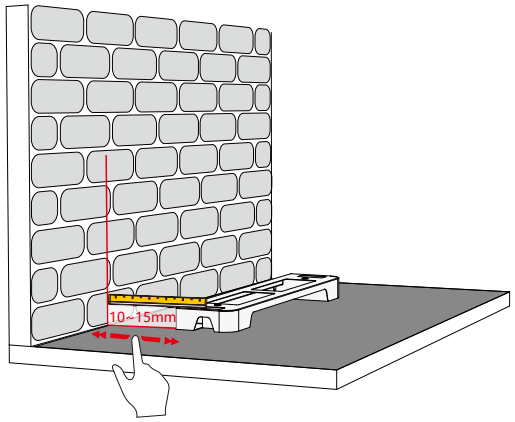


Figure 3-4-2

Step 2: Stack the battery module on the bracket.

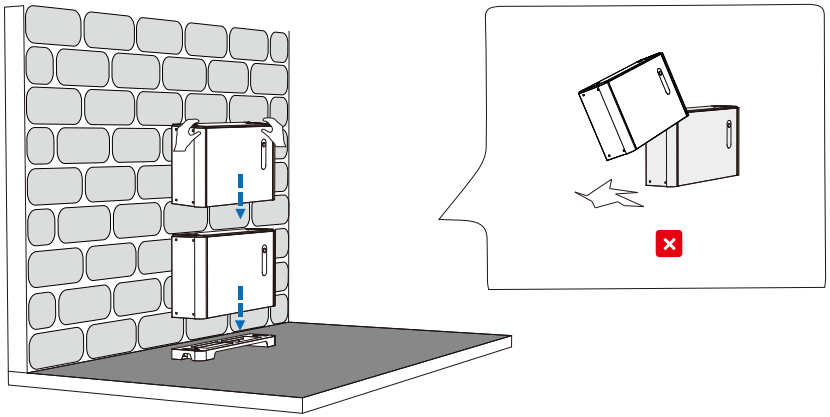


Figure 3-4-3

Step 3: Mark the mounting bracket hole on the wall with a marking pen, and remove the base, and the battery module. Use the percussion drill to punch the holes marked on the wall.

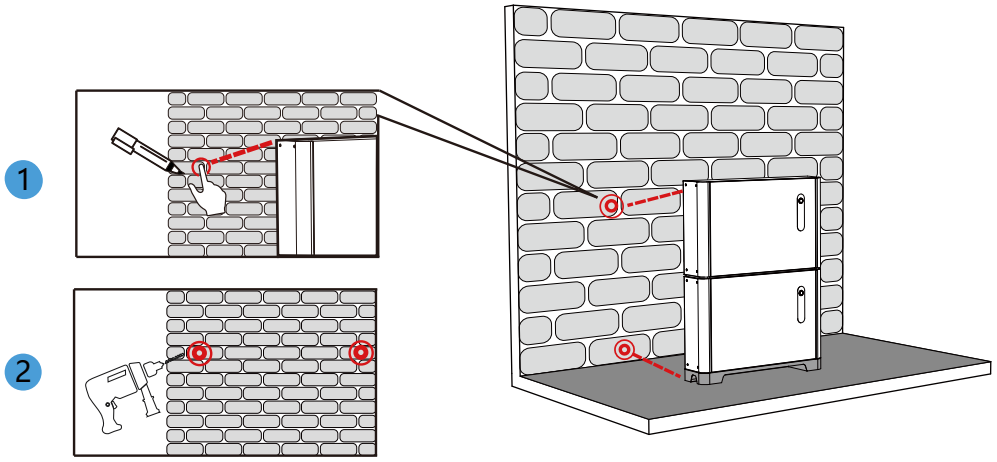


Figure 3-4-4

Step 4: Select the number of battery modules, stack the battery modules to the base, lock the connectors and fix screws.

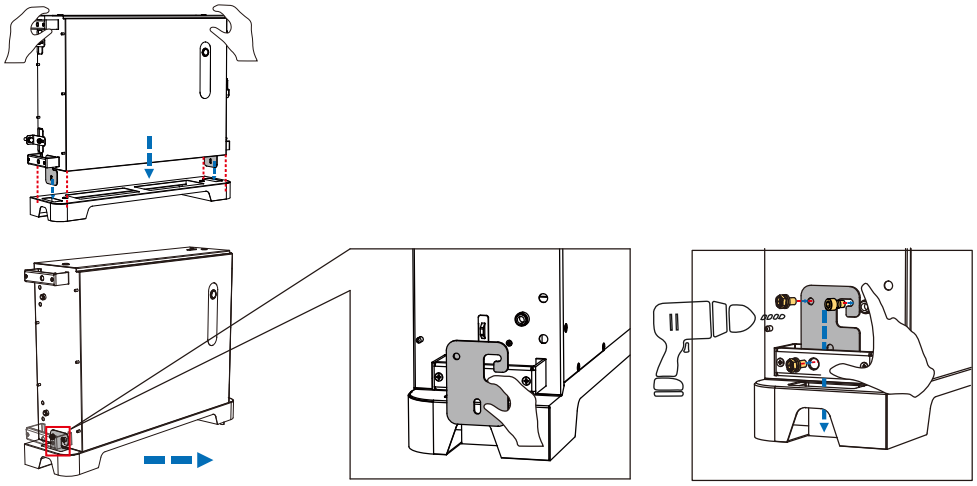


Figure 3-4-5

Step 5: Use the M8 expansion screw to attach the battery module to the wall.

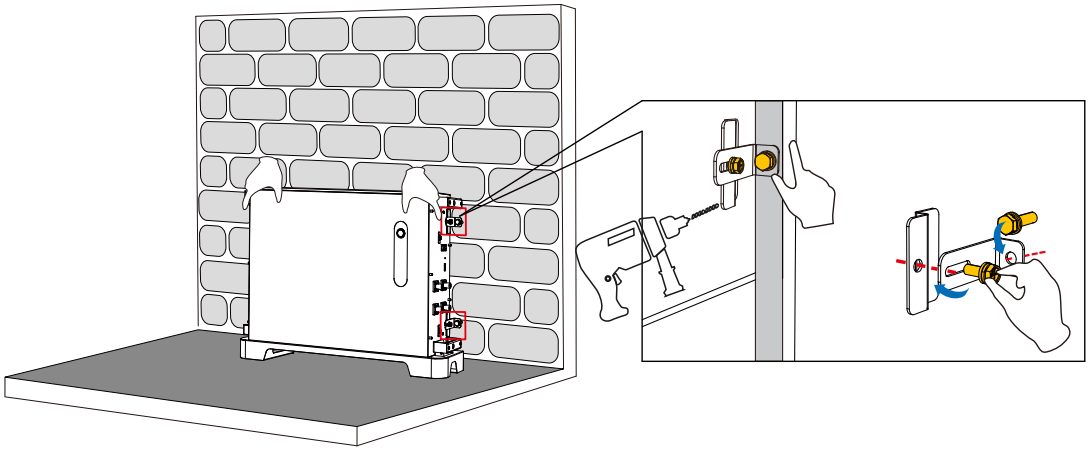


Figure 3-4-6

Step 6: Complete the module installation.

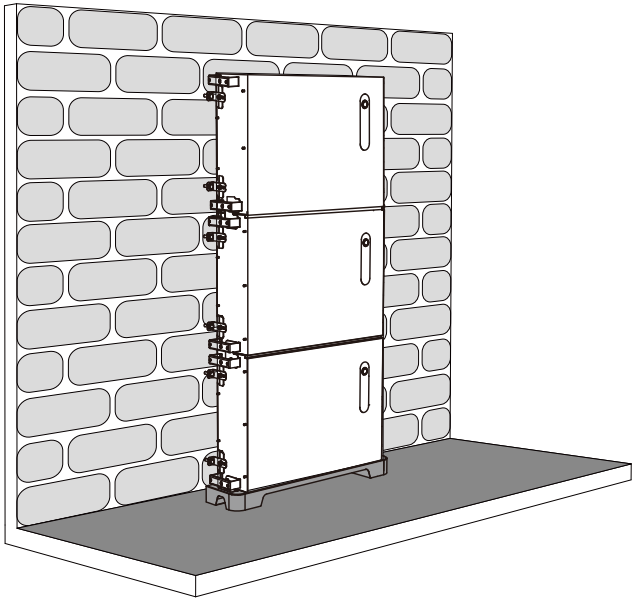


Figure 3-4-7

DANGEROUS

Before drilling, make sure to avoid the water and electricity lines embedded in the wall to keep away from danger.

NOTE

M8 * 10 expansion bolts issued with the box should be used during installation. If the length or quantity cannot meet the requirements, please prepare additional M8 stainless steel expansion bolts. The expansion bolts issued with the box are mainly suitable for solid brick concrete structure wall and concrete floor. If you choose other types of wall and ground, please ensure the load bearing requirements (1 battery module is 50kg), and choose the screws according to your requirement.

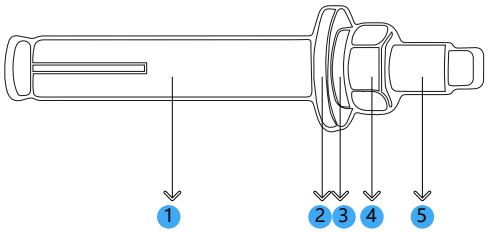


Figure 3-4-8

1	Expansion tube	3	Spring Washer
2	flat washer	4	Bolts
5	screw rod		

NOTICE

- To prevent dust from entering human respiratory tract or eyes when punching, operators should wear protective goggles and dust masks.
- After using the impact drill to punch the holes, you need to use a vacuum cleaner to cleanup the internal and external micro-dust of the holes, and then measure the hole distance, and for the holes with large errors need to be repositioned and punched.
- The upper surface of the expansion tube of the expansion screw must be guaranteed to belevel with the cement wall or ground, not concave out of the cement wall and ground, otherwise the engineering installation is not level on the wall or ground.
- The nut of one of the expansion bolts below can be tightened properly without unscrewing it all.

WARNING

For each module installed, you need to install the two side connectors and fasten screws before installing the next module.

4 Electrical connections

4.1 Safety Precautions

DANGEROUS

- Before making electrical connections, please ensure that the energy storage system "DC Switch" and all switches associated with all energy storage systems are "OFF", otherwise electrical connections may result in a risk of electric shock.
- Make sure that the appliance is disconnected when connecting it, otherwise there maybe a risk of electric shock.Please strictly observe the safety precautions in the operating instructions and the safetysigns on the equipment.
- All operations, cables and component specifications used in the electrical connection processmust comply with local laws and regulations.
- When crimping the terminal block, please ensure that the cable conductor and terminal block are in full contact, do not crimp the cable insulation and terminal block together, otherwise the equipment may not operate or the terminal block may become hot after operation, resulting in a safety hazard.

WARNING

- Damage to the equipment caused by incorrect wiring is not covered by the equipment warranty.
- Operations relating to electrical connections must be carried out by a specialist electrical technician.
- The technician must wear personal protective equipment when carrying out operations related to electrical connections.

NOTE

All electrical connection diagrams in this section refer to cable colours for information purposes only and should be selected in accordance with local cable standards (yellow and green wires may be used for earthing protection only).

4.2 Electrical connections

4.2.1 Internal connection of the energy storage system

NOTE

The internal connection cable is supplied in the box, please see the Packing List inside the package.

connect the positive and negative connectors delivered with the box to the positive and negative battery cascade terminals (BAT+, BAT-).

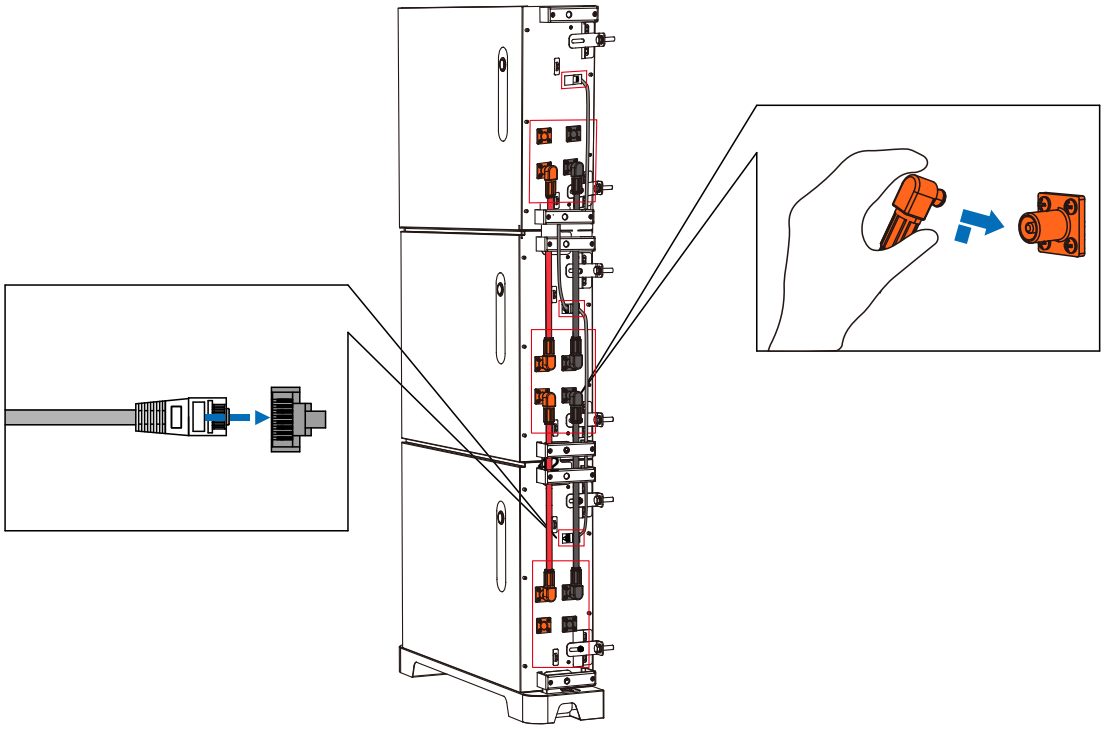


Figure 4-2-1

4.3 Connecting the power cable

ATTENTION

- Before connecting the power cable of the energy storage system, please turn off all power to the system to avoid danger.
- The red power cable delivered in the box is plugged into BAT+ and the black power cable into BAT-. The cables comply with EU and American wire standards.
- When inserting the power cable terminals, please make sure that the clips are in place.

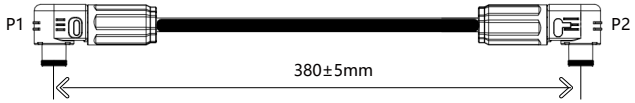


Figure 4-3-1

As shown in Figure 4-3-2 below, insert the power cables in order of black and red against the female chassis connector position and ensure that the side buttons are popped up and the clips are in place.

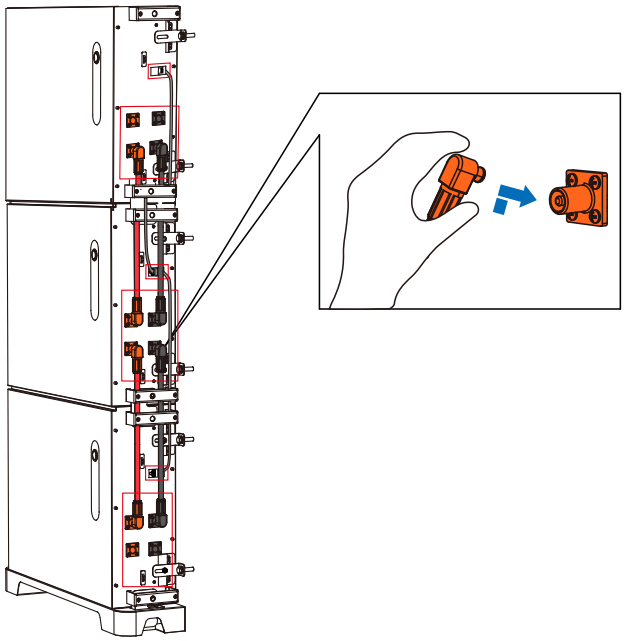


Figure 4-3-2

ATTENTION

4.4 Connecting signal cables

- Two RJ45 communication interfaces are defined identically.
- Two RJ45 communication interfaces can be connected to either one.
- The signal cable for connection is supplied with the box and does not need to be provided by the user.
- If damaged after use, the user can refer to the following wiring definitions to make their own.

RJ45 terminal

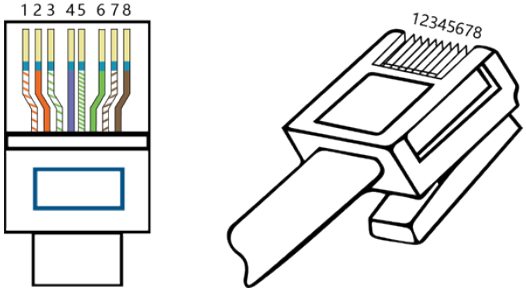


Figure 4-4-1

Battery pack crystal head wiring definition

PIN	COM	Description
1	RS485-B	Parallel communication between battery modules
2	RS485-A	
3	SGND	Grounding
4	CAN-H	Connecting to a computer
5	CAN-L	
6	SGND	Grounding
7	RS485-A	Parallel communication between battery modules
8	RS485-B	

Inverter crystal head wiring definition

PIN	COM	Description
1	RS485-B	Communication interface between battery module and inverter
2	RS485-A	
3	SGND	Grounding
4	CAN-H	Connecting to the monitor software
5	CAN-L	
6	SGND	Grounding
7	NC	None

As shown in Figure 4-4-2, the communication cable is connected as shown in the connection below.

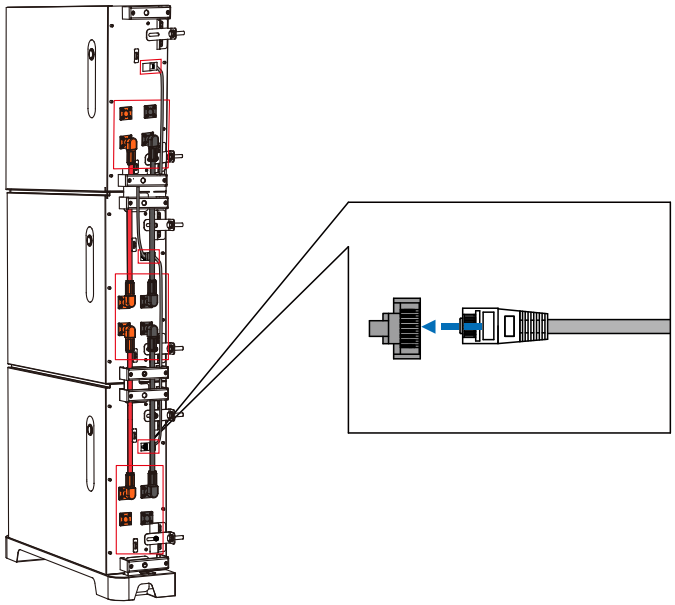


Figure 4-4-2

4.5 Installing the AC cable and side cover plate

ATTENTION

AC cables (including plugs and sockets) are supplied by the user and all cables must comply with local laws and regulations.Two RJ45 communication interfaces can be connected to either one.

DANGEROUS

- Before installing the AC cable and side cover plate, turn off the battery key switch and with the inverter off at this time, otherwise there may be a risk of electric shock.
- Please wear the correct safety gloves when installing the AC cable.
- Before installing the AC cable and the side cover, please ensure that both the internal power and signal cables are properly connected. The power cables must not be connected incorrectly or reversed, as this may cause damage to the unit and other hazards.

Mount the cover on both sides to the machine using an electric drill as shown in Figure 4-5-1

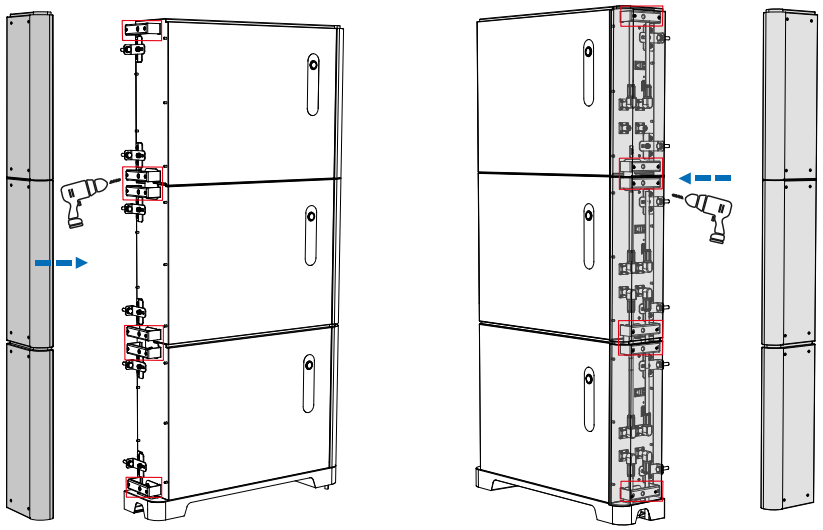


Figure 4-5-1

4.6 Installing the PV plug

ATTENTION

- Before installing the PV plug take care to turn the "DC SWITCH" switch from "ON" to "OFF

4.6.1 Introduction to PV plugs

NOTICE

- The plug for PV wiring is provided by the user, please install the PV-MC4 cable according to the specifications as follows.

The PV connector is PV-MC4, it is a set of connecting devices for connecting solar panel circuits, it can safely connect the groups of circuits, it is dustproof, waterproof, anti-ageing, easy to install, safe and has a long service life, etc. The connector has a self-locking structure,as shown in Figure 4-5-1.

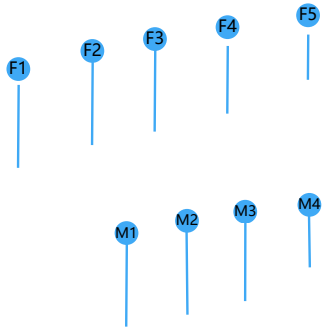


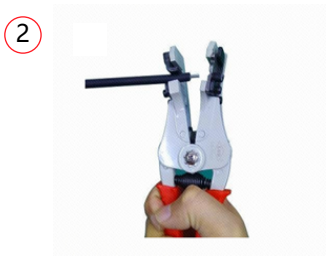
Figure 4-6-1

F1	O-shaped waterproof ring	M1	Body of male end
F2	Female end body	M2	Pillar waterproof adhesive
F3	Column waterproof adhesive	M3	Hardware connector for male end
F4	Female end hardware connector	M4	Screw nut
F5	Screw nut		

4.6.2 Installation steps

Step 1: Check that the inventory of accessories is complete.

Step 2: Strip the wire 6mm~7mm, taking care not to cut the copper wire.



Step 3: Crimping, press all copper wires completely into the copper connectors.

Step 4: Insert the cable with the copper connector crimped into the connector housing.

Step 5: Use a spanner to tighten the nut, taking care not to tilt it.

5

Step 6: Complete the mating of the male and female MC4 connectors.

6

5 System Running

5.1 Veriication Before Power-On

Before powering up the energy storage system, be sure to check the following to prevent damage to the system.

No.	Inspection items
1	The equipment is securely installed, in a location that is easy to operate and maintain, and in an environment that facilitates ventilation and heat dissipation
2	Check that power cables, communication cables, etc. are correctly and securely connected
3	The cable ties at each location meet the alignment requirements and are well distributed
4	Make sure that the "DC SWITCH" and all switches connected to the energy storage are "OFF
5	The installation environment meets the requirements, ensuring a reasonable installation space, a clean and tidy environment and no construction leftovers.

5.2 System Power-On

Before powering up the energy storage system, be sure to check the following to prevent damage to the system.

NOTICE

- Ress50U Please power up within 24 hours of opening the package; for later maintenance,power down for no more than 24 hours.
- The inverter will be activated automatically when the energy storage key switch is turned on.

Power-up procedure

Step 1: Turn the air switch under the right-hand cover from "OFF" to "ON".

Step 2: Turn on the key switches on the battery module in turn.

The battery module power indicator lights up from the bottom to the top after power-up is completed.

5.3 Battery module LED indicator instructions

Indicator light	Status
Green light	Standby

5.3.1 Definition of the light-up sequence of the indicators

●	●	●	●
L4	L3	L2	L1

5.3.2 SOC Capacity indication

Status		Charging				Discharge			
Capacity indicator		L1 ●	L2 ●	L3 ●	L4 ●	L1 ●	L2 ●	L3 ●	L4 ●
	0 ~ 25%	off	off	off	Blinking2	off	off	off	Always
	25 ~ 50%	off	off	Blinking2	Always	off	off	Always	Always
	50 ~ 75%	off	Blinking2	Always t	Always	off	Always	Always	Always
	75 ~ 100%	Blinking2	Always	Always	Always	Always	Always	Always	Always
Running lights●		Always				Blinking 3			

5.3.3 LED Status indication

System Status	Exceptional Events	LED	Description
Shutdown	Dormancy	All off	All off
Standby	Normal	Based on power indicator	Standby status
	Alarm		Reference notes
Charging	Normal	Based on power indicator (Maximum LED flashing for power indication 2)	/
	Alarm		Reference notes
	Individual over-voltage protection, overall over-voltage protection, full charge protection	Based on power indicator	
	Overcurrent protection	Based on power indicator	
Discharge	Normal	Based on power indicator	/
	Alarm		Reference notes
	Undervoltage protection	Off	Stop discharge
	Overcurrent protection	Off	Stop discharge
Temperature	protection	off	Stop charging includes three types of temperature protection: cell/MOS/ambient
Failure	Cell failure, NTC failure	off	Stop charging and discharging
	Reverse connection, short circuit protection		
	Voltage sensor failure		
	Current sensor failure		
	Charge and discharge MOS failure		

6 Technical Specifications

Items	10.24KWh	15.36KWh	20.48KWh
Cell type	LFP - Lithium iron phosphate (LiFePO4)		
Manage battery capacity	200Ah	300Ah	400Ah
Number of battery Modules	2	3	4
Battery usable energy	10KWh	15KWh	20KWh
MAX charge/ discharge current	100A	100A	100A
Nominal voltage	51.2V		
Battery Charge voltage	56V		
Float voltage range	54.6V		
AC output voltage	230V		
Operating Temperature	Charging: 0~50℃		
	Discharging: -10~55℃		
Communication to inverter	RS485/CAN		
Display	LED indicator		

WIFI	Support		
Module dimension (L*W*H)	670*156*908mm	670*156*1336mm	670*156*1765mm
Battey module weight	~100Kg	~150Kg	~200Kg
Attitude	≤4000m		
Cycle life	6000 Cycles @25℃ @70%EOL @0.2C charge & 0.5C discharge, 80% DOD		
Relative humidity	5% to 95%		
Protection rating	IP20		
Warranty	5years		
Certification	UL9540, IEC62109-1, UL1741, IEC62619, UL1973, UN38.3		

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