RBmax5.1L/RBmax5.1L2

User Manual

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RBmax5.1L/RBmax5.1L2

Type	Parameter
Product Name	Battery System
Product Model	RBmax5.1L/RBmax5.1L2
Prepared by	QC. Yan
Examined by	QW.Qiu / HY.Zheng

Revision Records

Revision	Date	Reasons for Revision	Revised by	Released by
V1.0	November 24,2023	First edition	QC.Yan	
V1.1	May 9,2025	Added circuit breaker specifications; Add the minimum distance to the heat source	QC.Yan	
V1.2	June 5,2025	Added old logo nameplate and communication interface definition	QC.Yan	
V1.3	September 15,2025	Update the grounding details of the product	QC.Yan	

CONTENTS

Preface

The contents of the manual include safety considerations, product overview, installation,commissioning etc. for RBmax5.1L battery system manufactured by RoyPow (Huizhou) Technology Co., Ltd.

- The target audiences of this user manual are:
  - System engineers
  - Technical support engineers
  - Product end users
- This is a lithium-ion battery product. Any inappropriate operation may cause malfunction disasters, such as electric shock, fire and so on. Therefore, please strictly follow the contents in this manual to operate before use. Warning messages with different severity are displayed in product labels and the manual, with specific meanings below:

Danger	Indicates high level risk hazards that may cause death or severe injuries
Warning	Indicates medium level risk hazards that may cause death or severe injuries
Caution	Indicates low level risk hazards that may cause minor or medium injuries

- Terminology Explanation
  - BOL (Begin Of Life)
  - SOC(State Of Charge)
  - EOL(End Of Life)
  - DOD(Depth Of Discharge)
  - RH(Relative Humidity)
  - RT(Room Temperature)
  - BMS(Battery management system)
  - DC(direct current)
  - PV(photovoltaic)
  - STC(Standard Test Condition): Under STC condition, discharge to 2.5V at 0.5c constant current, and let it stand for 30min; Charge to 3.65V at 0.5c constant current, let it stand for 5min, then charge to 3.65V at 0.05c, and let it stand for 30min. Discharge at a constant current of 0.5c until the voltage reaches 2.5V to cut off the energy released.

1. Safety

1.1 Safety Statememt

While install, operate, and maintain the equipment, please read the manual first, and follow all safety considerations included in equipment labels and the manual.

”Danger”, “Warning” and “Caution“ items in the manual do not represent all safety considerations that you should follow, but only the supplement of those considerations. RoyPow is not liable for any consequences due to the breach of safety operation requirements or the violation of safety criterion of design, produce and use of the equipment.

The equipment should be used under the condition aligned with designed specification requirements, otherwise may cause equipment fault, and the consequent equipment malfunction or parts damage, personnel safety accident, property loss etc. are not included within the equipment quality warranty scope.

When you install, operate, and maintain the equipment, local laws, regulations, and standards shall be abided by. The safety considerations within this manual are only the supplement for local laws, regulations, and standards.

RoyPow is not liable for the occurrence of any of the following situations:

- Damages to hardware or data caused by clients’ negligence, improper operation or intended damage.
- System damages caused by a third party or customer, including: handling, installation, commissioning, change or removal of identification marks etc.，which are incompliance with the requirements of this manual.
- Customer fails to follow the operating instructions and safety warnings from the product and manual.
- Customers use Non-RoyPow provided materials to replace part of product components by themselves.
- The equipment is not running under the condition described in this manual.
- The installation and using environment are incompliance with regulations of international, national, or local standards.
- Remove or alter products or modify software code without authorization.
- Equipment damages caused by abnormal climates (force majeure, such as earthquake, fire, storm, flood, debris flow etc.).
- Damages caused by storage condition incompliance with the requirements in the product documents.

1.2 Safety Requirements

Personnel Safety

The operator who is responsible for installing and maintaining RoyPow products must go through a strict training, understand each safety consideration, and master correct operation method.

- Only qualified professionals or well trained and licensed personnel are allowed to install, operate, and maintain the equipment.
- Personnel who operates the equipment, including operators, qualified personnel, and professionals, shall hold the special operation qualifications (such as high voltage operation, aloft work and special equipment operation) required by the local government.
- When operating a high voltage system, at least two people are required, with one person to operate and the other person to supervise and protect.

Operators should follow the requirements below during the operation:

- Appropriate personal protective equipment should be worn during the operation.
- If a malfunction which may cause personal injury or equipment damage is found, stop the operation immediately, report it to the person in charge, and take effective protective measures.
- Before using the tools, please master the correct using method and prevent personnel injury or equipment damage.
- When the equipment is running, the temperature of enclosure is relatively high, and may cause burns. Please do not touch.
- To ensure personal safety and proper working, a reliable grounding shall be completed before use.
- When a battery fault occurs, the temperature may higher than the burn threshold of touchable surface. Please do not touch it.
- Please do not open or damage the battery. The released electrolyte may be harmful to skins and eyes. Please do not contact it.
- Please do not place irrelevant items around the equipment or insert into any location of the equipment.
- Please do not place any flammable items around the equipment.
- Placing the battery on fire is strictly prohibited to prevent explosion and jeopardize personal safety.
- Please do not place the battery module in water or other liquids.
- Please do not short circuit battery terminals as it may cause fire.
- While using the battery, please remove metal items such as watch, ring etc., use tools with insulation handle, wear rubber gloves and boots.
- Please do not place any metal tools or parts on top of the battery.

- Before connecting or disconnecting battery terminals, please disconnect charging power, and make sure no-power at the power supply with multimeter.
- Determine whether the battery is accidentally grounded. If so, please remove the power supply from the ground.
- Please do not clean interior or exterior electrical components of the cabinet with water or detergent.
- Please do not stand on, lean to, or sit on the top of the equipment.
- Please do not sabotage any equipment module.

Battery Safety

RoyPow is not liable to any equipment malfunction or component damage, personal safety accident, property loss etc. due to following reasons:

- Clients fail to charge promptly and cause battery overdue storage, which result in battery capacity loss or irreversible damage etc.
- Battery damage, drop, leaking etc. due to improper operation or failure of following requirement to connect the battery.
- When the battery is installed onsite and connected to the system, it is over discharged as the client fails to power it on promptly, and result in damage.
- Customers fail to set up battery operation management parameters correctly.
- The client or any third party alters battery usage scenarios without informing RoyPow, such as connecting additional workload to the battery by themselves; mixture use of RoyPow battery with batteries from other companies, including but not limited to: mixture use with other brand batteries, mixture use with different rated capacity batteries etc.
- As the onsite equipment operation environment or external power parameters cannot satisfy the environment requirements for normal operation, including too high/low battery operating temperature, unstable grid condition, and too high/low grid voltage, which directly damage the battery.
- Battery frequently over discharge due to clients' improper maintenance; clients' onsite capacity expansion or the battery is not fully charged for a long time.
- Clients fail to conduct correct maintenance for the battery in accordance with corollary equipment instruction manual, including but not limited to: fails to regularly inspect for tightness of battery terminals etc., battery is stolen, battery is beyond the quality warranty period.

⚠ Danger

✧ Please do not expose the battery to a high temperature environment or place around a heat generating devices, such as sunshine, fire, transformer, heater etc.

- ✧ Battery removal, alteration or sabotage is strictly prohibited (such as insert foreign matters, immerse into water or other liquids etc.), to prevent battery from leaking, overheat, on fire or explosion.
- ✧ Please consider following safety risks thoroughly prior to any operation of the lithium-ion battery energy storage system:
  - ■ Battery electrolyte is flammable, toxic and volatile.
  - ■ Battery thermal runaway will generate flammable gas and toxic gases, such as CO, HF etc.
  - ■ Gas generated after the battery thermal runaway will accumulate and is risky for deflagration and explosion.

- ➢ The battery must be stored separately and placed in the exterior package to prevent from mixing with other items, storing openly stored or stacking too high.
- ➢ Using batteries beyond the quality warranty period is strictly prohibited.
- ➢ Normally, exterior package of the battery shouldn't be removed. Please follow professional's instruction to charge the battery if necessary. Once charging is completed, please return the battery to the package.
- ➢ While handling the battery, please follow the direction instruction, inversion and incline is prohibited.
- ➢ Battery collision should be avoided.
- ➢ Please do not conduct works like welding, grinding etc. to prevent fire hazards caused by spark or arc generated.
- ➢ Please use the battery under the temperature within the range specified in this manual.
- ➢ Please do not use damaged battery (damages due to dropping, collision or dent on the enclosure etc.). Damaged battery may cause flammable gas releasing. Please do not place them close to undamaged products.
- ➢ Please do not place damaged batteries close to flammable materials, and non-professionals shall not approach.
- ➢ While damaged batteries are stored, they should be monitored to ensure that no signs of fog, fire, electrolyte leaking, or heating is observed.

Environment Safety

- ➢ The installation and usage environment shall abide by stipulations of local laws and regulations as well as relevant international, national, and local standards regarding lithium-ion battery products.
- ➢ The installation location is inaccessible to children, away from areas for daily work and life, including but not limited to: work room, bedroom, lounge, living room, music room, kitchen, study room, game room, home theatre, sunlight room, rest room, shower, laundry, and loft.

- For garage installation, please keeps it away from vehicle heading direction. It's recommended to mount on the wall above vehicle bumper to avoid accidental collision.
- For basement installation, please maintains the ventilation. Do not place any flammable and explosive items around the equipment. It's recommended to mount on the wall to avoid water accumulation.
- The installation position should be dry and well-ventilated, and the equipment is fixed on a solid and flat supporting surface.
- Please select a sheltered installation site, or build an awning to avoid direct sunlight or rain.
- Please ensure that the installation environment is clean, without existence of large amount of IR radiation, organic solution, and corrosive gas etc.
- For regions with frequent occurrence of natural disasters such as flood, debris flow, earthquake, typhoon etc., corresponding preventive measures should be implemented for the installation.
- The installation location should be far away from fire source and heat source. Please do not place any flammable or explosive items around the equipment.
- The installation location should avoid water accumulation. It should be away from water sources such as taps, sewer line, sprinklers etc. to prevent water infiltration.
- When the equipment is running, the temperature of case and cooling fins are relatively high. Do not install it at any location with easy access.
- While the equipment is running, please do not block the air vent or cooling system, to prevent fire caused by high temperature.
- Placing the equipment close to flammable or explosive gas or smog is prohibited, and any operation in such environment is prohibited.
- Installing in any mobile environments, such as boat, train, vehicle etc. is prohibited.
- Under backup scenarios, please do not use the power supply for following purposes:
  - Used in medical equipment directly related to human life.
  - Used in control equipment such as trains, elevators etc., which may cause personal injuries.
  - Used in a computer system which is crucial to society and public.
  - Used at locations close to a medical equipment.
  - Same type of equipment as described above.
- Battery systems installed in a high salt fog environment will be corroded. At high salt fog area, please do not install it outdoor. High salt fog area refers to those areas 500 meters inward coastline or influenced by ocean breeze. The condition of ocean breeze influence area varies depending on weather condition (such as typhoon, monsoon) or terrain (with dam, massif).

⚠ Caution

- ✧ The operation and lifetime of energy storage system is related to the working temperature. Please install the energy storage system in an area with equal or better environmental temperature.
- ✧ The working temperature of battery is -20-55℃ . If it's installed in a cold environment, battery will initiate the built-in thermal control system (optional) to heat up the battery and get better performance. The heating process will consume rechargeable power, which means a temporary decreasing coefficient energy efficiency. If the equipment is stored in a cold environment (such as 0℃) before the installation, battery needs to warm up for some time (< 2h) then become rechargeable. It's recommended that battery should be placed in a warm location before the installation to help it work quickly and effectively.
- ✧ If the environment temperature where the battery installed is lower than 10℃, charge/discharge power rate of battery module will decrease.

Operation Safety

When the equipment is under higher voltage. Non-standard operation may result in electric shock or fire, causing personnel death, severe personal injuries, or serious property loss. Please operation by standard.

- ➢ It's prohibited to install or operate outdoor equipment and cables under harsh weathers, such as thunderstorm, rain, snow, and gales above 10m/s, including but not limited to handling equipment, operate equipment and cables, plug/unplug signal ports connected outdoor, aloft work, outdoor installation etc.
- ➢ Please follow the operating sequence and safety considerations specified in the manual and other relevant documents.
- ➢ Please follow the caution labels, warnings, and protective measures shown on the equipment.
- ➢ Please follow the requirements of the manual, use appropriate tools, and master the correct usage of tools.
- ➢ It's prohibited to install or operate outdoor equipment and cables under harsh weathers, such as thunderstorm, rain, snow, and gales above 10m/s, including but not limited to handling equipment, operate equipment and cables, plug/unplug signal ports connected outdoor, aloft work, outdoor installation etc.
- ➢ Please follow the operating sequence and safety considerations specified in the manual and other relevant documents.

- Please follow the caution labels, warnings, and protective measures shown on the equipment.
- Please follow the requirements of the manual, use appropriate tools, and master the correct usage of tools.
- Cleaning the equipment with water is prohibited.
- Before contacting any conductor surface or terminal, please check the voltage of the contact point and ensure no risk for electric shock exists.
- Paint scratch occurred during equipment transportation and installation must be repaired promptly. The scratched part is strictly prohibited to expose to outdoor environment for long time.
- During the handling process, it's prohibited to affect the component of battery terminals, and it's not allowed to conduct hoist handling via the bolt of battery terminals.
- In any cases, please do not alter equipment structure and installation sequence without manufacturer's permission.
- If a fire hazard occurs, please evacuate immediately and call for emergency rescue. In any cases, it's strictly prohibited to re-enter the building on fire.
- During transportation, transfer, installation and cable connection, requirements of national and local laws and regulations as well as relevant standards shall be satisfied.
- Materials brought by the user and tools needed during the operation must be aligned with the requirements of national and local laws and regulations as well as relevant standards.
- You should adequately be familiar with the constitution and principles of the entire battery system, as well as the relevant national and local standards.
- All electrical connections must be aligned with the national/local electrical standards.
- Grid-connected operations must be licensed by the country's power authority.
- User-supplied cables should comply with local laws and regulations.
- Please use dedicated insulating tools when you conduct high voltage operations.

Installation Safety

- Before the installation, please check the package integrity. Batteries with broken package cannot be used.
- During the installation, please be careful with positive/negative poles, which are prohibited to be short circuited.
- During the installation, a torque wrench is used to ensure that the screws are tightened without loosening, which should be checked regularly
- Once the equipment is installed, please remove the empty packing material around the equipment area, such as carton box, foam, plastics, cable ties etc.
- The minimum distance from any heat source must be kept 600mm.

Grounding Safety

- For equipment with grounding required, protective grounding wire must be installed first during the installation; when the equipment is removed, the grounding wire should be removed at last.
- Sabotaging the grounding conductor is prohibited.
- Operating the equipment without the grounding conductor installed is prohibited.
- The equipment should be permanently connected to the protective ground wire. Before operating the equipment, please check the electrical connection to ensure that the equipment is securely grounded.
- The grounding resistance of the equipment should be less than 0.1Ω.
- While multiple equipment is running in parallel, it's required to ensure that the grounding resistance of each equipment is consistent.

Equipment Operation

- Before the electrical connection, the corresponding breakers of the upper level must be disconnected if the risk of touching live parts exists.
- Before connecting to the power supply, it is crucial to confirm that the label on the power supply is correct first, then make the connection.
- If the equipment has multiple inputs, all inputs of the equipment should be disconnected. Operations to the equipment are only allowed once it is entirely powered off.

⚠ Danger

✧ Live installation and removal of mains lead is prohibited. The instant mains lead contacting a conductor, it will generate electrical arc or electrical spark, which may cause fire hazard or personal injuries.

Wiring Safety

- Using cables in a high temperature environment may cause insulation layer aging and damage. The minimum distance between cables and heating devices or outer ring of heat source area is 30mm.
- Same type of cables should be tied together. Different type of cables should be placed separately with minimum interval of 30mm. Twine or cross layout is prohibited.
- Cables used in the main circuit of the battery system must be connected securely, with good insulation and proper specification implemented.
- Locations for cable through or entrance holes must come with protection to prevent cable from damaging by sharp edge or glitch.
- If the temperature is too low, vigorous impact or vibration may cause crack on cable's

plastic sheath. To ensure operation safety, please follow the requirements below:

a. All cables should be installed above 0 ℃. While handling cables, especially in the low temperature environment, please handle them gently.
b. If the cable storage temperature is lower than 0℃, before cabling, cables must be moved to a room temperature environment and stored there for more than 24 hours.

Handling and Transportation Safety

Handling Requirements

The energy storage system should be handled in accordance with the local laws and regulations, as well as industrial standards. Rough handling may cause battery within the cabinet short circuited, or battery leaking, crack, explosion or on fire.

Shipping Prerequisite

Before the shipment, the battery must be checked for integrity, without symptoms like obvious odor, smoking or on fire discovered. Otherwise, the departure is prohibited.

⚠ Caution

✧ Products can be delivered directly to the premise, available for vehicle and shipping transportation. The transfer package must be solid. Please handle it with care during handling and transportation, and take precautions against moisture. With the influence of external environment (such as temperature, transportation, storage etc.), product specification parameters are subject to the date of manufacture.

Requirements of Transportation Process

The battery module satisfies the UN38.3 transportation standard. During battery system transportation, special rules regarding road freight transportation and current Dangerous Cargo Act must abide by, particularly the revised European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR). During ocean transportation, International Maritime Dangerous Goods Code (IMDG CODE) requirements should be followed. Supervising and administrative requirements of local government of country of departure, countries of pathway and the destination shall be satisfied. The supervising and administrative requirements of International Dangerous Goods Code and corresponding national transportation administrative authority shall abide by.

⚠ Danger

The following conditions are prohibited during handling and transportation:

✧ Directly expose to rain or snow or drop into water.
✧ Dropping or mechanical impact.
✧ Inversion or toppling.

Drilling Safety

The following safety cautions shall be considered while drilling holes on the wall/ground:

- Please wear goggles and protective gloves while drilling holes.
- While drilling holes, proper shield shall be placed for the equipment to prevent debris dropping into the equipment. Please clean and clear debris after drilling.

Handling Safety

When handling heavy objects, please prepare for load bearing, and prevent being crushed or sprain by the heavy objects.

When handling the equipment with hands, please wear protective gloves to prevent being injured.

During the handling, the local maximum weight regulation for labors shall be strictly followed. If the weight is beyond the specified amount, multiple people or forklift is required.

＜18kg　　18~32kg　　32~55kg　　＞55kg

Maintenance and Replacement

⚠ Danger

- When the equipment is running, high voltage exists and may generate electric shock and cause death, severe personal injuries, or serious property loss. Therefore, you must power off the equipment before any maintenance, ensure dangerous power doesn't exist with multimeter, and operate in accordance with safety considerations specified in the manual and other relevant documents.

- Please maintain the equipment under the condition that you are familiar with contents of the manual and holding proper tools and test devices.
- Before the maintenance, please power off the equipment, then wait for times specified in the instruction of delayed discharge label to ensure that the device is power off, then start the operation.
- During the maintenance, irrelevant personnel should be avoided to access to the maintenance site. A temporary warning sign or a fence must be setup for isolation.
- For any fault occurs to the equipment, please contact your vendor for further treatment.
- The equipment shall not be powered on unless the fault is resolved, otherwise, it may cause fault expansion or equipment damage.

- Please do not open the cover without authorization, as risks of electric shock may exist, and faults resulting from it are beyond the warranty scope.
- Maintenance personnel and professional technicians should have thorough trainings regarding safety use and equipment maintenance, and the equipment should be operated under the condition that sufficient preventive measures and personal protective equipment are in place.
- If movement or cable reconnection is required, the power supply must be cut off for at least 5 minutes to let the internal energy completely released, confirm with multimeter that dangerous power doesn't exist at DC bus and internal maintenance location, then start the maintenance.
- The battery maintenance should be conducted or supervised by personnel who is familiar with the battery and the preventive measures required.
- While replacing the battery, please use the same type of battery or battery module.
- Once the maintenance is completed, please verify if any tools or other parts are left inside the equipment immediately.
- If the equipment is not in use for a long time, please follow the manual to store and charge the battery.

1.3 Emergency Operation

Emergency

Dangers: When a battery terminal contacts with other metals, it may cause heat or electrolyte leaking. Electrolyte is flammable, if it leaks, please remove the battery from the fire immediately.

Poisonous: Steam generated by battery burning may stimulate eyes, skin, and throat.

Electrolyte is corrosive, exposing to it may cause skin stimulation and chemical burn. For any battery electrolyte exposure, please take the following measures:

- Inhalation: Evacuate the contaminated area, breath fresh air immediately, and seek medical help.
- Eye contact: Rinse eyes with a lot of water immediately for 15 minutes in minimum, do not rub and seek medical help.
- Skin contact: Rinse the contact area with a lot of water and soap immediately and seek medical help.
- Ingestion: Seek medical help immediately.

⚠ Danger

- ✧ For any electrolyte leaking or odor smell, please avoid contacting the leaked liquid or gas. For non-professionals, please do not approach, and contact professionals to deal with the situation immediately. Professional personnel shall wear goggles, rubber gloves, gas mask, protective clothing etc. to prevent injuries caused by electrolyte overflow.

Fire Hazard

1. When a fire disaster occurs, please quickly transfer people to a safe place and setup an isolation area.
2. Once you are secure, remotely save system information, and send them to the supplier and power off the system remotely. Meanwhile, call emergency service and wait for firefighters to put the fire down.
3. Firefighters should avoid contacting high voltage components during fire extinguishment, otherwise they may under risks of electric shock.
4. When the battery temperature is too high, it may cause battery deformation, damage, or electrolyte overflow, leaking poisonous gas. Hence respiratory protective equipment should be worn. Please do not approach and avoid skin stimulation and chemical burn.
5. Once the fire is extinguished, please wait for at least 24 hours and confirm with the supplier that the inspection is completed, then you can approach and dispose it.

Flood

1. When flood occurs, please quickly transfer people to a safe place. Once you are secure, remotely power off the system.
2. If any part of the battery is immersed in water, please do not touch the battery to prevent from electric shock.
3. Once the flood retreats, please contact the supplier for further treatment.
4. Please do not use flooded battery. Contact the recycle company for disposition.

Dropping

- ➢ While installing the battery, if the battery drops or impacted vigorously, it may result in internal damage of the equipment, and further usage is prohibited, otherwise it may have safety risks (such as cell leaking, electric shock etc.)
- ➢ When the battery drops, if symptoms like obvious odor, broken, smoking, or fire occur, please evacuate personnel immediately, call the police, and contact professionals. The professional will use fire control equipment to put out fire while their safety is secured.
- ➢ If the battery drops, and no obvious deformation or broken is observed on the appearance,

and no obvious odor, broken, smoking, or fire is spotted, please contact professionals to transfer the battery to an open and safe place, or contact recycle company for disposition.

Other Emergency Measures

For other emergency situations, please quickly transfer people to a safe place based on the onsite situation, remotely retrieve battery system information and contact supplier for further support. If the accident is urgent and may be expanded, please call emergency service promptly and seek for fire rescue.

1.4 Others

Battery Recycle

Please dispose wasted batteries in accordance with local laws and regulations. They cannot be disposed as household waste. Inappropriate disposal of battery may result in environment pollution.

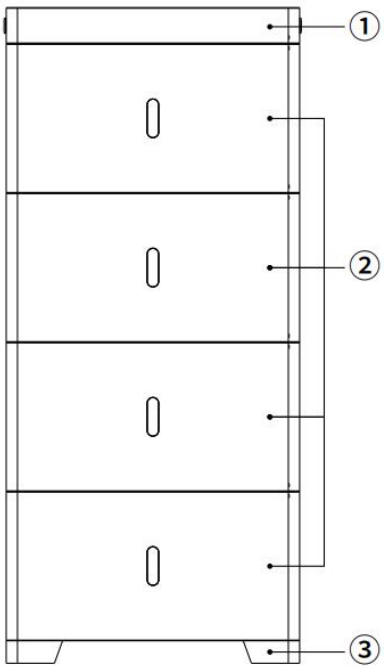
- If leaking or damage occurs to the battery, please contact technical support or a battery recycle company for disposition.
- When a battery is beyond usage lifetime and becomes unusable, please contact a battery recycle company for disposition
- Please do not place wasted batteries under high temperature or direct sunlight.
- Please do not place wasted batteries under high humidity or corrosive environment.

2. Product Overview

RBmax5.1L/RBmax5.1L2 battery system is composed with 1-8 of parallel 16S1P (5.12kWh) battery modules, for which stack configuration is available, to build up a 5.12-40.96 kWh battery system. The default configuration of the system includes a 5kW inverter(SUN series), which can implement functions like peak-loading shift, emergency backup, virtual power plant etc.

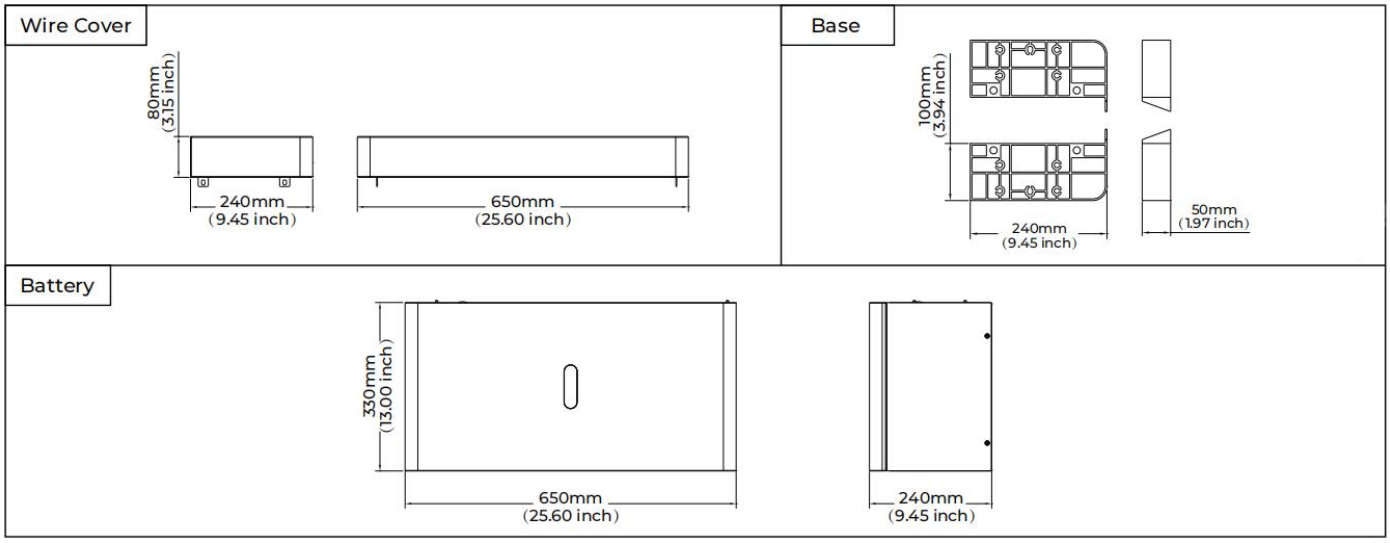
Notice: RoyPow recommends using the RoyPow Sun Series inverters to ensure optimal compatibility with our home storage battery packs. Using other brands not certified by RoyPow may lead to product malfunctions and violate warranty terms.

2.1 Product Information



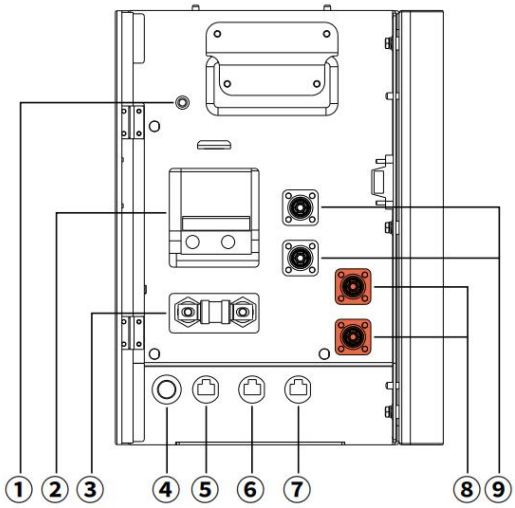
Item	Description
①	Top cover
②	Module (1-4 optional)
③	Base

Appearance



Product Size

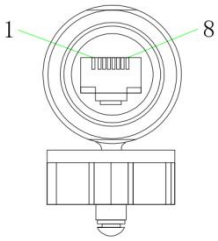
2.2 Information on the Interface of product



1. Grounding	Battery case GND	6. RS485 IN	Master slave packet communication input port
2. Breaker	Main circuit switch (2P,Voltage DC80-125V, Current: 125A)	7. RS485 OUT	Master slave packet communication output port
3. Fuse	Short circuit insurance	8. BAT+	Battery positive pole
4. ON/OFF	Battery pack button switch	9. BAT-	Battery negative pole
5. CAN/RS485	Inverter communication port、Battery pack monitoring port	/	/

⑤ CAN/RS485

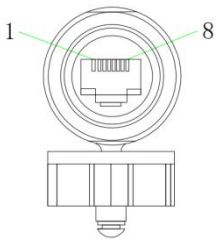
PIN View



Definition	
1	
2	
3	
4	CANH
5	CANL
6	
7	485-1A
8	485-1B

⑥ RS485 IN

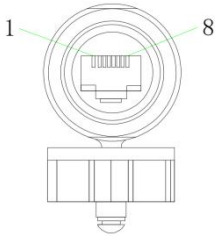
PIN View



Definition	
1	A1
2	GND
3	DI3+
4	
5	
6	DI3-
7	485-2A
8	485-2B

⑦ RS485 OUT

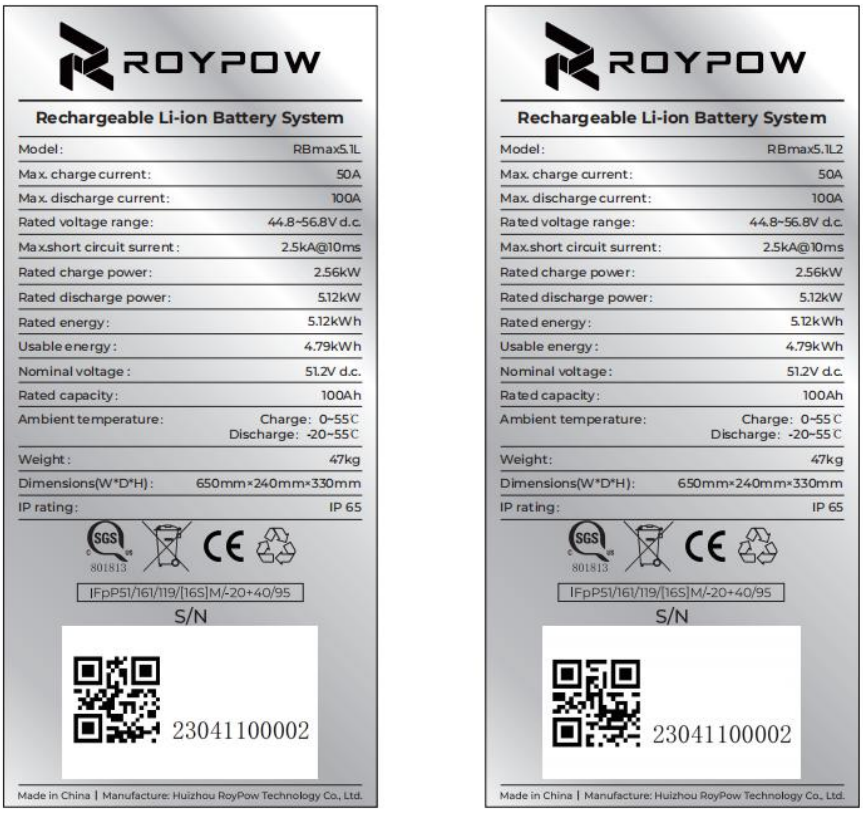
PIN View



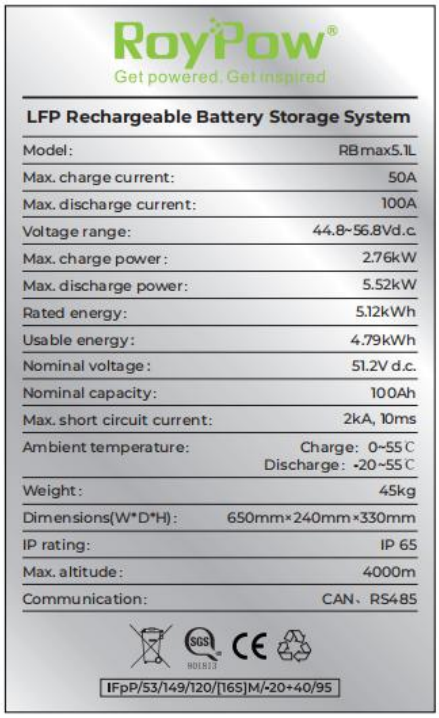
Definition	
1	
2	
3	DO3+
4	A2
5	GND
6	DO3-
7	485-2A
8	485-2B

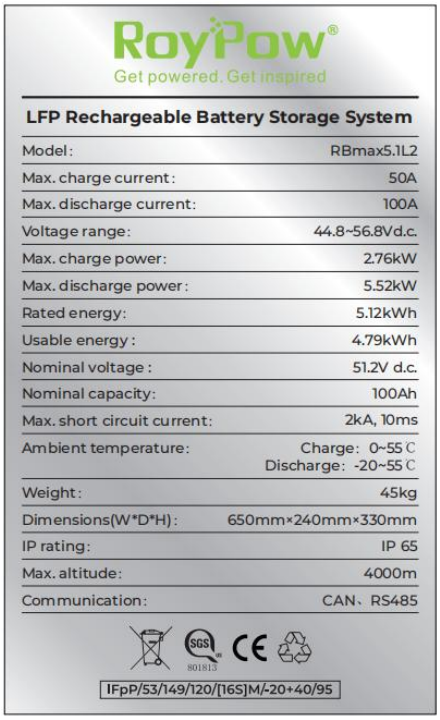
2.3 Label Description

Label Name	Meaning	Label Name	Meaning
	Potential risks exist for equipment operation!		Keep away from flame!
	High voltage risk!		Keep away from children!
	Explosive risk exists under extreme conditions!		Authorized personnel only!
	Equipment contains corrosive electrolyte, please avoid contacting, be careful with corrosion!		The equipment shall be disposed according to local regulations as it's not household waste!
	Flammable item, be careful of fire!		The battery system must be disposed at a proper facility for environmentally safe recycling.
	Grounding required!		Please read the user manual before use!
	Protective clothing required!		



Product Nameplate





Product Nameplate

Caution Label

3. Installation Tools

Required installation tools

			
Wire cutter	crimping modular plier	screw driver set	Intelligent electric screwdriver
			
sleeve piece	Multimeter (measuring span ≥600VDC)	Metal level	cleaner
			
safety gloves	goggles	dust mask	safety shoe

If insulated tools are not available, cover the entire exposed metal surfaces with available insulated alternatives, except their tips, with electrical tape.

4. Package List and Installation Requirements

4.1 Packing List

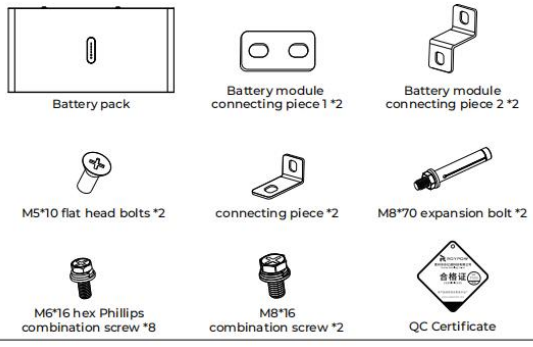
RoyPow RBmax5.1L/RBmax5.1L2 product composes with 1-8 modules, 1 joint box and 1-2 chassis. For more information, please refers to Section 2.1 Configuration. Before the installation, please double-check the packing list carefully for missing parts or mis-sending. For any occurrence of package damage, deformation, and crack of interior parts, please contact the vendor promptly for replacement.

All-in-one means RoyPow provides inverter and battery module at the same time.

CONFIGURATION LIST

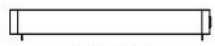
Model	Battery box (pcs)	Accessory box (pcs)
RBmax5.1L / RBmax5.1L2	1	1
2*RBmax5.1L / 2*RBmax5.1L2	2	1
3*RBmax5.1L / 3*RBmax5.1L2	3	1
4*RBmax5.1L / 4*RBmax5.1L2	4	1
5*RBmax5.1L / 5*RBmax5.1L2	5	1
6*RBmax5.1L / 6*RBmax5.1L2	6	1
7*RBmax5.1L / 7*RBmax5.1L2	7	1
8*RBmax5.1L / 8*RBmax5.1L2	8	1

Battery box



Accessory box

STRUCTURE COMPONENT


top cover


RJ45 plug connecting cable*2


M8*70 expansion bolt *2

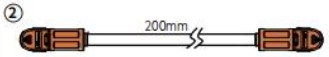

Warranty card

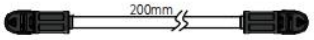

QC Certificate

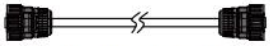

Installation paper

ITEM	①(set)	②(set)	③(set)	④/⑤(set)	⑥(set)
RBmax5.1L/RBmax5.1L2	1	×	1	1	×
2*RBmax5.1L/2*RBmax5.1L2	1	1	1	1	×
3*RBmax5.1L/3*RBmax5.1L2	1	2	1	1	×
4*RBmax5.1L/4*RBmax5.1L2	1	3	1	1	×
5*RBmax5.1L/5*RBmax5.1L2	1	3	2	1	1
6*RBmax5.1L/6*RBmax5.1L2	1	4	2	1	1
7*RBmax5.1L/7*RBmax5.1L2	1	5	2	1	1
8*RBmax5.1L/8*RBmax5.1L2	1	6	2	1	1

CABLE COMPONENT

② 200mm

Positive pole cable

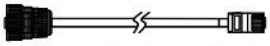
200mm

Negative pole cable


8 coreconnecting cable 1 (gray)

④

Positive pole cable 1


Negative pole cable 1

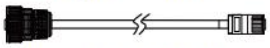

8 coreconnecting cable 2 (black)

③

RBmax 5.1L bottom base

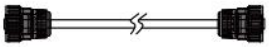
⑤

Plug (orange) Plug (black)


8 coreconnecting cable 2 (black)

⑥

Positive pole cable 2 Negative pole cable 2


8 coreconnecting cable 3 (gray)

Line length of ⑥ > ②

Note: ④ or ⑤ are optional components, only one of them will appear.

4.2 Installation Requirements

- Installation angle requirements

Energy storage system supports installing on the ground and mounting on the wall. Tilt forward, horizontal, inversion, tilt backward and side lurch energy storage installation are not allowed. The inclination angle of the floor and wall should less than 3 °.

- Installation location requirements

Please select a solid brick-concrete structure, concrete wall, and ground for installation. If other types of walls and grounds are selected, it shall be built with flame-resistant material and able to satisfy load-bearing requirements. Ground flatness requirement: the flatness deviation is less than ±4mm with 1m.

- Installation space requirements

When the energy storage system is installed, please ensure that no other equipment (in addition to RoyPow relevant equipment, shield), flammable and explosive items are placed around. Please preserve sufficient space to ensure the requirements of installation radiating and safety isolation are satisfied.

To improve energy storage system's efficiency, the distance between the battery module and inverter should be kept in 2 meters.

During wall mounting installation, nothing is allowed to be placed under the energy storage

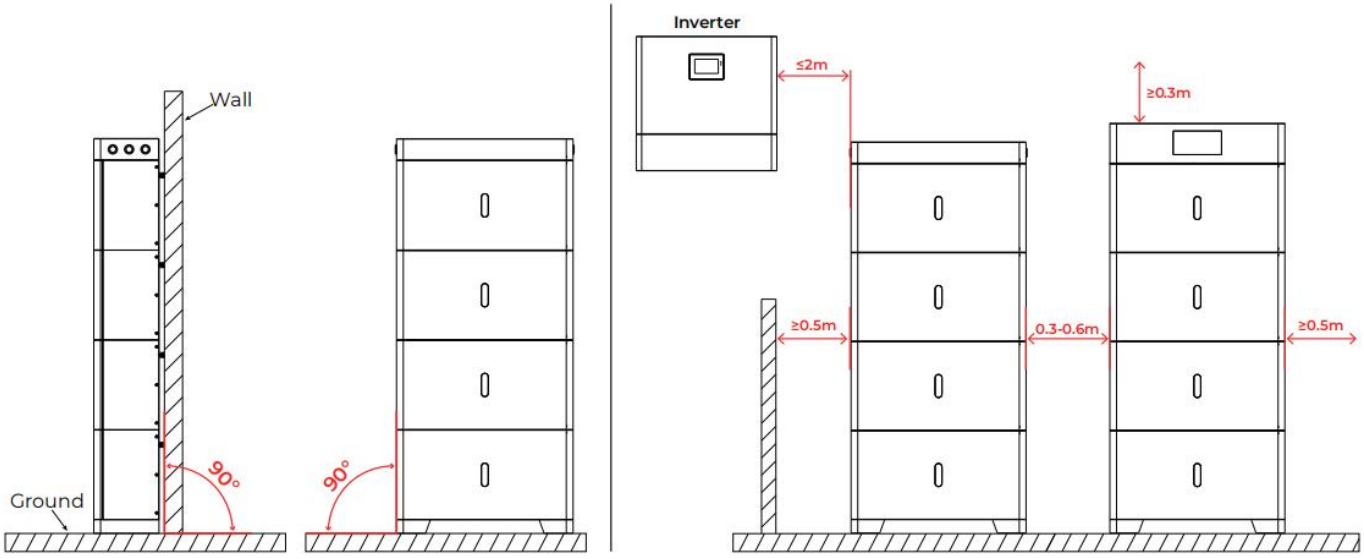
system.

- Installation environment requirements

The working temperature range of the battery system: -20 to 55℃; the ideal temperature is 23-27℃. RoyPow recommends installing it in a location with environment temperature of 0-30℃, within which, the energy storage system will restrain its partial properties to extend system lifetime. For cold regions, indoor installation is recommended, and heating system (optional) is needed if possible. For warm regions, it's recommended to install it in a location away from direct sunlight, and shield is recommended as well.

Please do not immerse the battery system in water. The base cannot be placed in the rain or other water sources. It's recommended to place the system base above the flooding level to prevent immersion.

- Before the installation of the energy storage system, please clean the surrounding to avoid dusts.
- During the installation, a fire extinguisher should be equipped onsite. The extinguisher status should be checked regularly to ensure its availability.
- Before the installation, please confirm if the foundation status is appropriate as well as grounding system's integrity. The grounding resistance should be less than 0.1Ω.



5. Installation and Wiring

1. Install the base and the first battery module

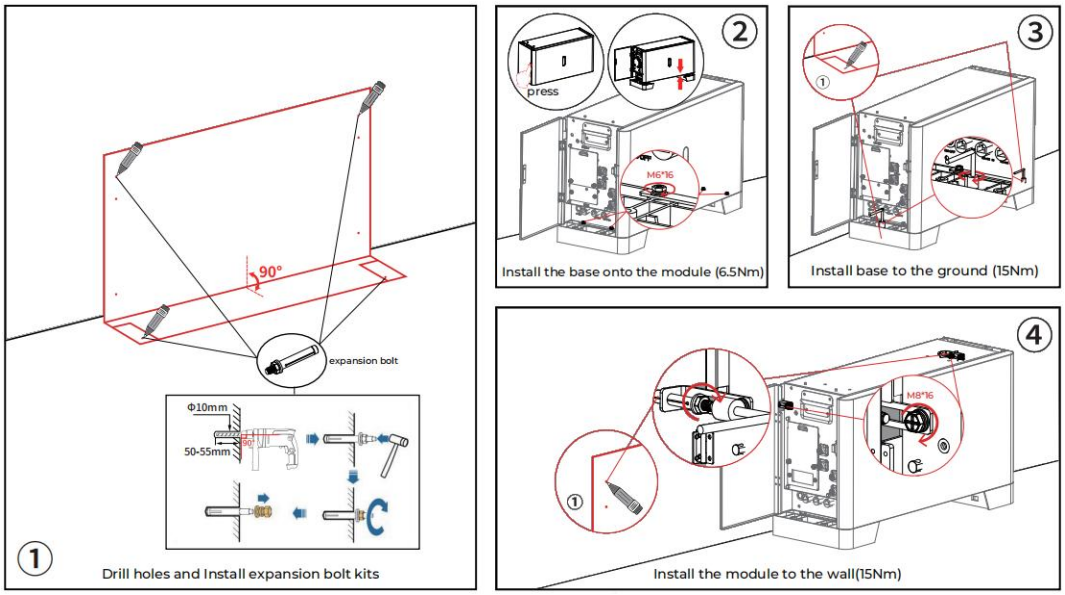
① Place the installation cardboard at the ground installation location, mark the installation holes on the floor and wall, and drill holes (diameter 10mm, depth 50-55mm), insert expansion bolt components into each hole, and loosen the nut in the opposite direction. Remove the nut and washer.

② Press the left side panel of the battery with your hand to open it, grab the handle and place the battery on the base. Use a wrench to tighten the bolts (6.5Nm) on both sides to fix the battery and the base.

③ Place the fixed first battery module and base on the ground installation location, align the installation holes, and tighten the nuts (15Nm) on both sides of the ground with a wrench.

④Fix the corner bracket. In the direction close to the wall: tighten the nut (15Nm) with 90 degrees of torque. In the direction close to the battery: use M8 bolts to fix the corner bracket to the battery pack (15Nm).

Note: When drilling, make sure the drilling location is away from water pipes and cables on the ground and walls to avoid danger. Please wear goggles and dust masks when drilling to prevent dust from being inhaled into the respiratory tract or falling into the eyes.



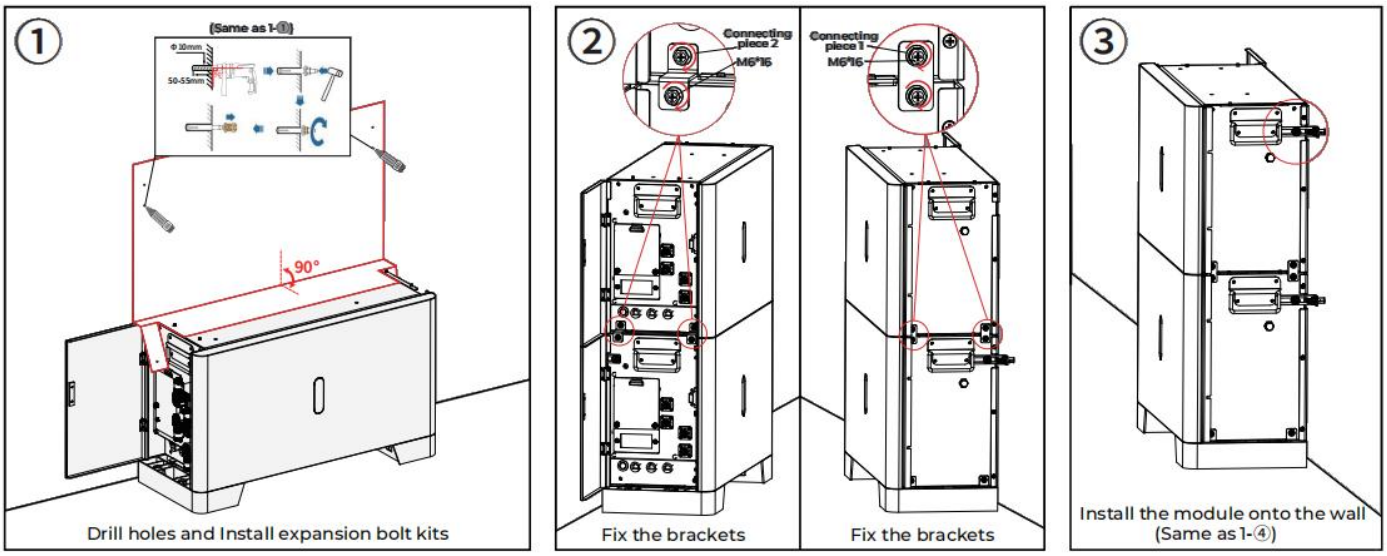
2. Install other battery modules

① Put the installation card on the first battery module, mark the installation holes on the wall and punch holes (10mm in diameter, 50-55mm in depth), insert the expansion bolt assembly into the two holes, and loosen the nuts in the opposite direction , remove the nut and washer.

② Place the battery module on top of the first battery module, and lock the connectors 1/2 on both sides of the battery module with nuts.

③ Fix the corner bracket, the direction against the wall: tighten the nut with 90 degree torque (15Nm), the direction against the battery: fix the corner bracket to the battery pack with M8 bolts (15Nm).

If you purchased multiple battery modules, repeat step 2 for installing the battery modules.

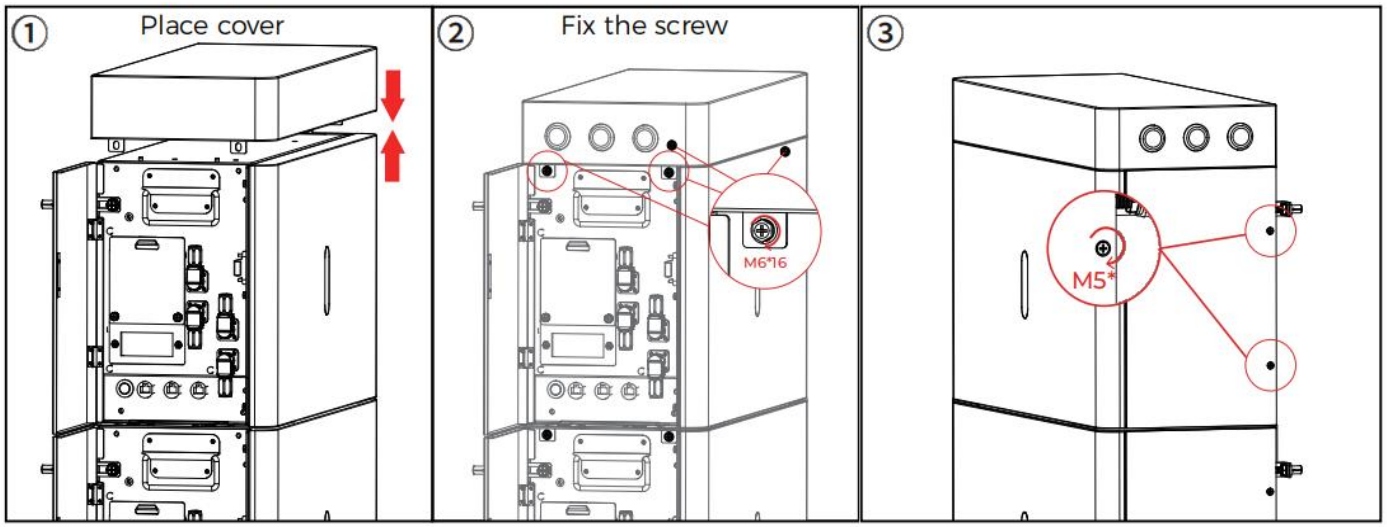


3. Install the top cover and fix the battery side panel (this step is after completing the system wiring)

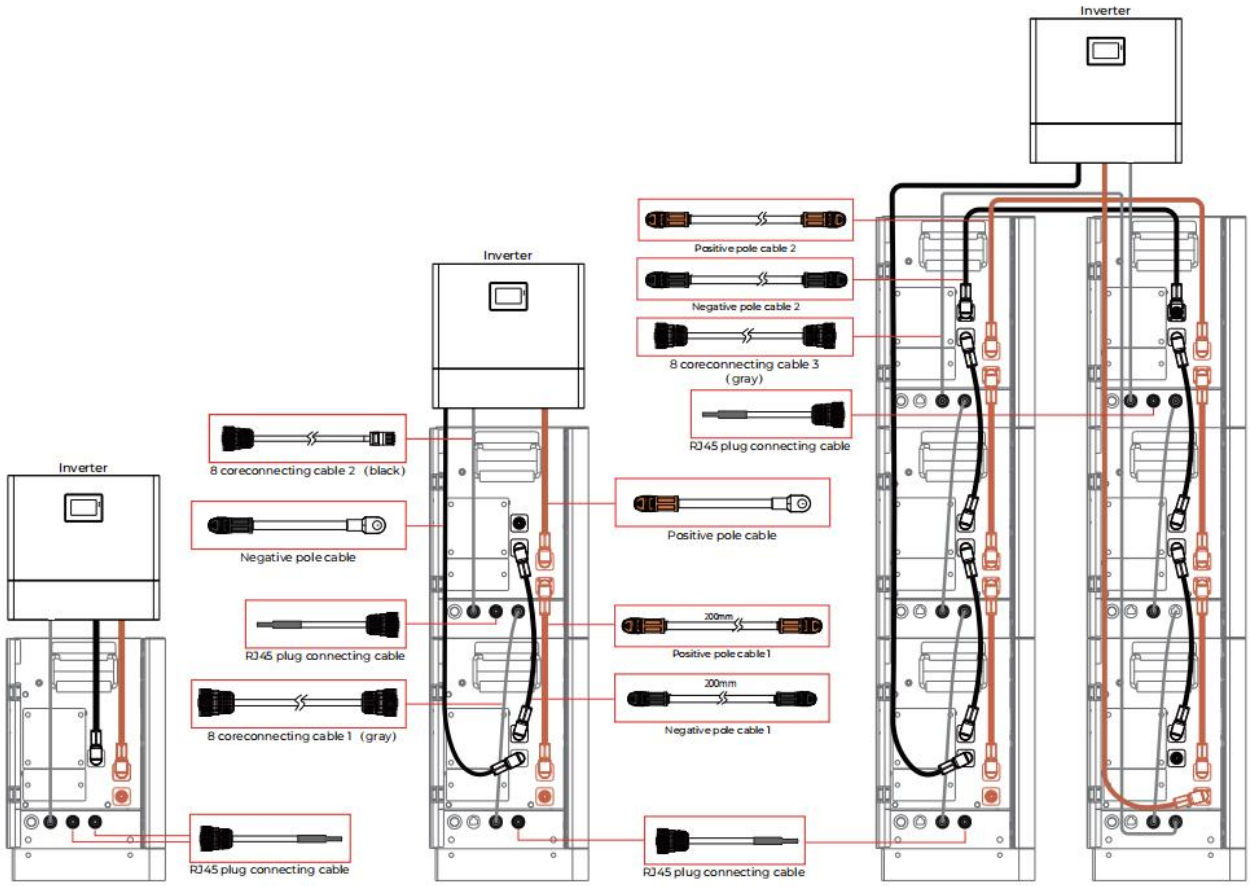
① Put the top cable protection cover on top of the battery module.

② Use 4 screws to lock both sides of the top cable protection cover.

③ Fasten the right panel of all battery modules with screws.



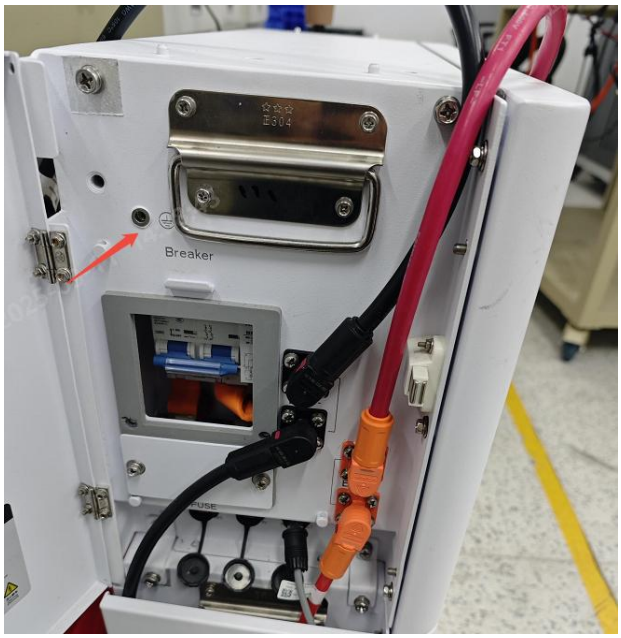
4.Wiring Diagram



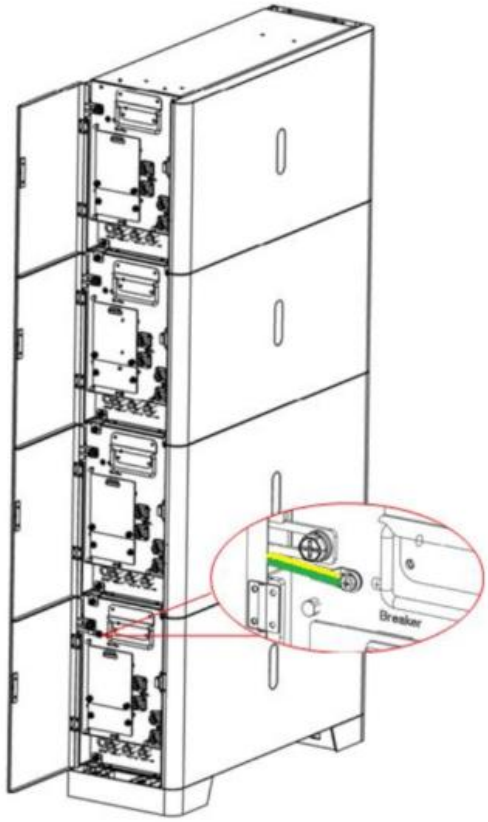
RBmax5.1L/ RBmax5.1L2 2*RBmax5.1L/ 2*RBmax5.1L2 6*RBmax5.1L/ 6*RBmax5.1L2

5.Grounding

The ground between the battery packs, as shown in the figure, is connected by installing iron plates.



Use M6 bolts (with a torque of 6.5 Nm) to fix the ground wire with M6 ring terminals on the last battery pack of each row, at the location marked with a grounding symbol on the battery pack. The other end of the ground wire is connected to the earth. It is recommended to use AWG.10 or 12 yellow-green wires.



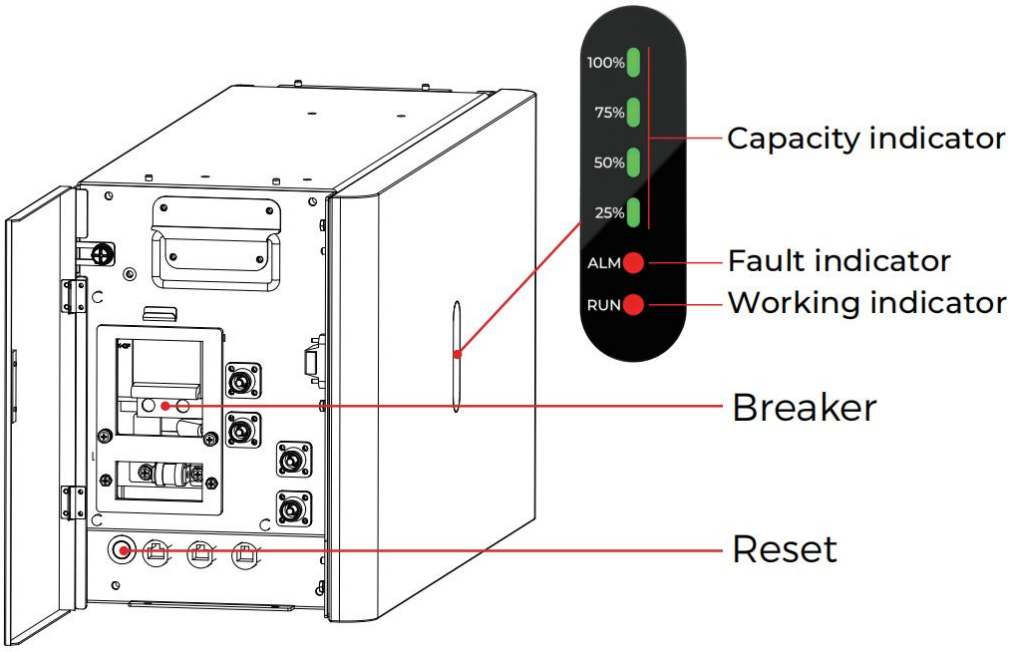
6. Commissioning and Maintenance

6.1 System Power On and Off

6.1.1 Power on inspection

Tab. 1 Power on check list

SN	Inspection Items	Acceptance standard
1	Energy storage system is installed in place	The installation is correct, secure, and reliable.
2	Cable layout is reasonable	Cable layout is reasonable and satisfies users' needs
3	The colligation of cable ties is artistic	Cable ties are even, without sharp corner left at the cutting place.
4	Secure grounding	The grounding wire is connected correctly, secure, and reliable, and the grounding resistance is less than 0.1Ω.
5	Disconnect the breaker	The breaker of the energy storage system is on "OFF" position.
6	Cable connection is in place	AC output cable, DC input cable and signal cable are connected correctly, secure, and reliable.
7	Unused terminals and ports are sealed	Water resistant cover is used on unused terminals and ports.
8	Installation environment is aligned with requirements	The installation layout is reasonable, the environment is clean and tidy, without construction remains left.



System status	Protection/Alarm/Normal	RUN	ALM	Battery LED				description
		●	●	●	●	●	●	
Shutdown	dormancy	OFF	OFF	All OFF				All OFF
Standby	normal	Blink -1	OFF	All OFF				standby mode
	alarm	Blink -3	Blink -3					ALM and RUN LED enter Blink-3
Charging	normal	ON	OFF	According to battery indicator				highest LED enters blink-2 state
	Overcurrent alarm	ON	Blink -3	According to battery indicator				highest LED enters blink-2 state
	Overvoltage protection	ON	OFF	ON				RUN LED is on if grid has power. If grid no power, LED in standby mode.
	Overcurrent protection (when using unlimited current function)	OFF	ON	OFF				/
Discharge	normal	Blink -3	OFF	According to battery indicator				According to battery indicator
	alarm	Blink -3	Blink -3					ALM and RUN LED enter Blink-3
	Protection against overcurrent, short circuit, reverse connection, etc.	OFF	ON	OFF				/
Other faults	Temperature protection	OFF	ON	OFF				/
	Address allocation failed	OFF	Blink -3	OFF				/

Note: Alarm refers to the following categories: excessive pressure difference, low capacity, low individual voltage, low overall voltage, charging overcurrent, discharging overcurrent, high cell temperature, low telecommunications temperature, high ambient temperature, low ambient temperature, and high MOS temperature.

Blinking status	ON	OFF
Blink-1	0.25S	3.75S
Blink-2	0.5S	0.5S
Blink-3	0.5S	1.5S

status	charging				discharging			
capacity LED	25%●	50%●	75%●	100%●	25%●	50%●	75%●	100%●
0~25%	Blink	OFF	OFF	OFF	ON	OFF	OFF	OFF
25~50%	ON	Blink	OFF	OFF	ON	ON	OFF	OFF
50~75%	ON	ON	Blink	OFF	ON	ON	ON	OFF
75~100%	ON	ON	ON	Blink	ON	ON	ON	ON

6.1.2 Battery System Power On

Before powering on the energy storage system, please check whether all harnesses wiring is correct, and matches inverter connection voltage.

Single battery module power on

1. Ensure the power on preparation is ready.
2. Close the breaker. Push the breaker from OFF to ON position.

3. Press reset button to start the battery system.

...End

Multi-battery module power on

1. Ensure power on preparation is ready
2. Close breakers in turn. Push the breakers from OFF to ON position.
3. Press reset button of master module to start the battery system.

...End

⚠ Warning

✧ When battery modules are connected in parallel, power on is allowed only when the voltage difference between battery modules is less than 1V.

6.1.3 Battery System Power Off

⚠ Warning

✧ Once the system is powered off, the case still has electric residuals and remains hot, which may cause electric shock or burn. Therefore, please wait for 5 minutes after the system is powered off and conduct battery module maintenance with gloves on. Before any battery module maintenance, please ensure that all indicators are off.

Single battery module power off

1. Disconnect inverter or DC breaker of charger.
2. Long-press reset button for 3s or more, the breathing light is solid on, then off, BMS is shutdown.
3. Disconnect battery module breaker, push it from ON to OFF position.

...End

Multi-battery module power off

1. Disconnect inverter or DC breaker of charger.
2. Long-press reset button of master module for 3s or more, the breathing light is solid on, then off, BMS is shutdown.
3. Disconnect battery module breakers in turn, push them from ON to OFF position.

...End

6.2 Replacement of main components

Please refers to the Maintenance Manual

6.3 Routine Maintenance

Battery storage requirements

1. Store in a dry, clean, and ventilated location, and prevent dust and moisture corrosion.

Rain or ground water ponding corrosion is prohibited.

2. Avoid exposing to corrosive organic solutions or gases etc.
3. Avoid direct sunlight.
4. During storage, please make records according to product storage requirements in this manual, such as humidity, storage condition etc.
5. Long term battery storage is not recommended. Lithium-ion batteries will loss capacity after long term storage. In general, irreversible capacity loss of the battery is 3% to 10% after 12 months 'storage under recommended storage temperature.
6. Storage condition should abide by requirements of local regulations and standards.
7. Batteries stored beyond expire date should be inspected and tested by professionals before use.
8. While batteries are stored, please follow the package signs to place them correctly. Do not put them inversion or side lay.
9. While stacking battery packing cartons, please follow stacking instruction on the package.
10. Please be gentle while handling batteries, and colliding the battery is strictly prohibited.
11. While batteries are stored, they must be disconnected with external connections, and indicators on the battery panel are all off.
12. Battery systems cannot be stored for a long term and should be used in a timely manner. Batteries stored for more than 3 months should be maintained with methods below:
    a) Charge the energy storage system to cut-off condition (maximum voltage of single cell >3.55V), stop charging and rest for 1 hour.
    b) Discharge the energy storage system to cut-off condition (minimum voltage of single cell >3.55V), stop discharging and rest for 1 hour.
    c) Charge the energy storage system to 30% SOC and stop
13. Low-battery status storage. After the battery is powered off, internal module static power dissipation and its own self discharge loss exists. Hence, low-battery status storage should be avoided and charge the battery promptly. Otherwise, the battery may be damaged due to over discharge and the battery module replacement might be required.
14. Scenarios that may trigger low-battery storage, including but not limited to:
    - DC breaker on the power control module is not disconnected.
    - The energy storage system cannot enter charge status after discharging due to system faults.
    - The system fails to add or configure the energy storage system, which causes the battery unable to enter charging status.
    - The grid is powered off for a long time, which causes the battery unable to enter charging status.

Regardless of the low-battery scenarios, the battery must be charged based on the maximum

interval SOC permitted once the battery is completely powered off. If you fail to charge the battery beyond the maximum interval, it may be damaged due to over-discharge.

SOC upon power off before storage	Maximum charge interval
SOC≥5%	30 days
0≤SOC<5%	7 days

⚠ Caution

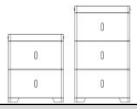
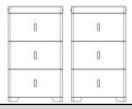
✧ Once the battery SOC drops to 0%, it should be charged within 7 days. RoyPow will not provide corresponding quality warranty services if the battery is permanently damaged due to customer fails to charge battery in time.

Inspection items	Inspection method	Maintenance cycle
Clean System	Check cooling fins for obstruction and dust regularly.	Every six months
System operation status	Inspect the energy storage appearance for damage or deformation Listen to the running energy storage system for abnormal sounds. While the energy storage is running, check if each parameter is corrected configured.	Every six months
Electrical connecti on	Check cable wiring for fall off or loosening. Check cables for damage, focus on cut marks on the surface cable has contact with metal. Check if unused DC input terminal, energy storage terminal, COM port, and waterproof cover are tightened.	Every six months
Grounding reliability	Check for grounding wire for reliability	Annually

7. Technical specification

Model (Including base and cover)	**RBmax5.1L**	**2*RBmax 5.1L**	**2*RBmax 5.1L2**	**3*RBmax 5.1L**	**3*RBmax 5.1L2**	**4*RBmax5.1L**	**4*RBmax5.1L2**
							
Electric Data							
Nominal Energy (kWh)	5.12kWh	10.24kWh		15.36kWh		20.48kWh	
Usable Energy (kWh)	4.79kWh	9.58kWh		14.37kWh		19.16kWh	
Battery Chemistry	LFP ($LiFePO_4$)						
Nominal Voltage (V)	51.2						

Operating Voltage Range (V)	44.8~56.8						
Max. Continuous charge Current (A)	50	100		100	150	100	200
Max. Continuous Discharge Current (A)	100	100	200	100	200	100	200
General Data							
Weight (Kg)	48.5	94.1	94.3	139.7	140	185.3	185.7
Dimensions (W × D × H) (mm)	650*240*460	650*240*790		650*240*1120		650*240*1450	
Operating Temperature (°C)	0~ 55℃ (Charge) , -20~55℃ (Discharge)						
Storage temperature (°C)	>1 month：0~35℃						
	≤1 month： -20~45℃						
Relative Humidity	≤ 95%						
Max. Altitude (m)	4000 (>2000m derating)						
Protection Degree	IP 65						
Mounting Options	Ground-Mounted Wall-Mounted						
Communication	CAN，RS485						
Discharge Depth	92%						
Certification							
Safety	IEC62619，UL1973						
EMC	EN 61000-6-1, EN 61000-6-3						
Transportation	UN38.3						
Country of production	China						

Model (Including base and cover)	**5*RBmax 5.1L**	**5*RBmax 5.1L2**	**6*RBmax 5.1L**	**6*RBmax 5.1L2**	**7*RBmax 5.1L**	**7*RBmax 5.1L2**	**8*RBmax5.1L**	**8*RBmax5.1L2**
								
Electric Data								
Nominal Energy (kWh)	25.6kWh		30.72kWh		35.84kWh		40.96kWh	
Usable Energy (kWh)	23.95kWh		28.74kWh		33.53kWh		38.32kWh	
Battery Chemistry	LFP ($LiFePO_4$)							
Nominal Voltage (V)	51.2							
Operating Voltage Range (V)	44.8~56.8							
Max. Continuous charge Current (A)	100	200	100	200	100	200	100	200
Max. Continuous Discharge Current (A)	100	200	100	200	100	200	100	200
General Data								
Weight (Kg)	233.8	234.3	279.4	280	325	325.7	370.6	371.4

Dimensions (W × D × H) (mm)	650*240*790+ 650*240*1120	650*240*1120+ 650*240*1120	650*240*1120+ 650*240*1450	650*240*1450+ 650*240*1450
Operating Temperature (°C)	0~ 55℃（Charge）， -20~55℃（Discharge）			
Storage temperature (°C) Delivery SOC State (20~40%	>1 month：0~35℃			
	≤1 month： -20~45℃			
Relative Humidity	≤ 95%			
Max. Altitude (m)	4000 (>2000m derating)			
Protection Degree	IP 65			
Installation Location	Ground-Mounted Wall-Mounted			
Communication	CAN，RS485			
Discharge Depth	92%			
Certification				
Safety	IEC62619，UL1973			
EMC	EN 61000-6-1, EN 61000-6-3			
Transportation	UN38.3			
Country of production	China			

8. Trouble shooting

The following are solutions to common faults. If the fault still exists, please contact vendor/RoyPow Customer Service Center promptly.

Fault Category	Fault Action	Possible Reasons	Recommended Solutions
Single cell overvoltage	limit the charging current as 0 (BMS requested charging current is 0)	1、Inverter is not responding to BMS; 2、Wiring error or sampling line breakage; 3、BMS fault;	1、Commissioning inverter; 2、Check communication line or sampling line for breakage, if so, replace the harness; 3、Replace BMS
Single cell undervoltage	limit the discharging current as 0 (BMS requested charging current is 0)	1、Inverter is not responding to BMS; 2、Wiring error or sampling line breakage; 3、BMS fault; 4、Not used for a long time	1、Commissioning inverter; 2、Check communication line or sampling line for breakage, if so, replace harness; 3、Replace BMS 4、Restart and charge in promptly;
Total overvoltage	limit the charging current as 0	Same as single cell overvoltage	Same as single cell overvoltage
Total undervoltage	limit the discharging current as 0	Same as single cell undervoltage	Same as single cell undervoltage
Charge over current	Warning, current is limited as 10A	1、Inverter is not responding to BMS; 2、BMS fault;	1、Commissioning inverter; 2、Replace BMS

Discharge over current / short circuit	Warning	1、 Inverter is not responding to BMS; 2、BMS fault; 3、Short circuit exists inside / outside the equipment;	1、Commissioning inverter; 2、Replace BMS 3、Check external circuit for short circuit(s), if so, handle the short circuit point (s);
Single cell voltage mismatches with total voltage	disconnect breaker disconnect charging/discharging MOS	Voltage measuring module accuracy shift	Replace BMS;
Current measurement distortion	disconnect breaker disconnect charging/discharging MOS	Current measuring module damaged	Replace BMS;
Parallel operation of master and slave fails	disconnect charging/discharging MOS	Master / slave communication loop blocked BMS port invalid	1、Check communication line or sampling line for breakage, replace harness; 2、Replace BMS;
high temperature of discharging/charging MOS	Alert, and request inverter discharging current as 0	1、Environment temperature is too high; 2、Wiring error, sampling line breakage, or NTC fault; 3、BMS fault; 4、Internal duct blocked	1、Determine if the environment temperature is too high, and place it to run under proper temperature; 2、Check sampling line or NTC for breakage, replace harness; 3、Replace BMS; 4、Clear BMS cooling duct;
low temperature of discharging/charging MOS	Alert, and request inverter discharging current as 0	1、Environment temperature is too low; 2、Wiring error, sampling line breakage, or NTC fault; 3、BMS fault;	1、Check if the environment temperature is too low, and place it to run under proper temperature; 2、Check sampling line or NTC for breakage, replace harness; 3、Replace BMS;
high temperature of environment	Alert, and request inverter charging/discharging current as 0	Same as high temperature charging	Same as high temperature charging
low temperature of environment	Alert, and request inverter charging/discharging current as 0	Same as low temperature charging	Same as low temperature charging
SOH is too low	disconnect breaker disconnect charging/discharging MOS	1、System lifetime expired; 2、BMS fault;	1、Replace module; 2、Replace BMS;
Malfunction of discharging/charging MOS	disconnect breaker disconnect charging/discharging MOS	MOS fault;	Replace BMS;
Voltage sampling component damage	disconnect charging/discharging MOS	AFE damage	Replace BMS;
NTC breakage	disconnect charging/discharging MOS	NTC breakage	Replace sampling line;
Charger transposition	disconnect charging/discharging MOS	Inverter transposition	Check charger for transposition, and make adjustment;

Aerosol feedback line breakage	disconnect charging/discharging MOS	Aerosol feedback line breakage or the aerosol has acted	1、Check aerosol feedback line for breakage, and replace feedback line; 2、Check if aerosol is started, if so, replace the battery module;
Protection under extreme conditions	disconnect breaker disconnect charging/discharging MOS	1、Cell voltage lower than 1.85V 2、Cell voltage higher than 3.85V 3、Cell temperature higher than 65℃ 4、Cell temperature lower than -35℃	Replace the battery module;

THANKS!

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