

GSL ENERGY

Much More Than Grade A

User Manual

BESS-R40K-R



Contents

1. Preface	1
2. Safety Precautions	2
3. Product Presentation	5
4. Part Introduction	8
4.1 Battery System	9
4.2 Master Control Module	10
4.3 Fire Extinguisher System	11
4.4 Electrically Actuated Explosion Relief Valve	12
4.5 UPS	12
4.6 Auxiliary DC Power Supply System	12
4.7 Three-phase Inverter (Optional)	13
5. Transportation, Inspection, and Storage	14
5.1 Transportation Requirements	14
5.2 Check Before Signing	14
5.3 Equipment Storage	15
6. Installation	16
6.1 Installation Requirements	16
6.2 Install	19
6.3 Safety Precautions	21
6.4 Cable Requirements	21
6.5 Multi-Unit Wiring	22
6.6 System Wiring	23
6.7 Electrical Connection Diagram Description	24
7. Test Operation of Battery Racks	26
7.1 Check Before Charging	26
7.2 Power on the Equipment	26
7.3 Power on the Battery Racks	27
8. System Maintenance	27
8.1 Power Down the Battery Racks	27
8.2 Maintenance Precautions	28
8.3 Maintenance Requirements	28
8.4 Routine Maintenance	29
8.5 Cabinet Maintenance	31
8.6 Battery Maintenance	31
8.7 The Battery Racks Maintenance	32
8.8 Removal of the Battery Racks	32
8.9 Scrapped Battery Racks	32
9. Fault Treatment	33
10. Emergency Handling Plan	35
10.1 Fire	35
10.2 Water Logging	35
11. Quality Assurance Instructions	37
11.1 Quality Warranty Regulations	37
11.2 Exemption Scope of Quality Warranty Liability	37

1. Preface

This document primarily covers the product information, installation and wiring procedures, configuration and testing guidelines, troubleshooting, and maintenance instructions. Before installing and using this product, it is imperative to thoroughly read this manual. Doing so will ensure your understanding of the safety information and acquaint you with the features and characteristics of the product.

1.1 Applicable Products

This manual applies to the product. In this manual, unless specifically noted otherwise, the term "battery racks" refers collectively to the series of products mentioned above.

1.2 Applicable Audience

This manual is intended for professional personnel who are familiar with local regulations and standards, have undergone specialized training, and possess a thorough knowledge of this product.

1.3 Symbol Definitions

For better use of this manual, the following symbols are used to highlight important information. Please read the symbols and instructions carefully.

Danger
Indicates a high potential for danger. Failure to avoid this hazard could result in death or serious injury.
Warning
Indicates a moderate potential for danger. Failure to avoid this hazard could result in death or serious injury.
Caution
Indicates a low potential for danger. Failure to avoid this hazard could result in moderate or minor injury.
Note
Indicates an emphasis or supplement to the content. It may also provide tips or tricks for optimizing the use of the product, helping you resolve issues or save time.

2. Safety Precautions

The safety precautions information included in this document is always observed when operating the equipment.

Note

The equipment has been designed in strict accordance with the safety regulations and qualified for the test, but as electrical equipment, the relevant safety instructions shall be observed before any operation of the equipment, and any improper operation may lead to serious injury or property loss.

2.1 General Security

Note

- Due to product version upgrades or other reasons, the content of this document may be updated periodically. Unless specifically agreed upon, the content of this document does not supersede the safety precautions listed on product labels. All descriptions in this document are provided for guidance only.
- Carefully read this document before installing the equipment to understand the product and relevant precautions.
- All operations on the equipment must be performed by qualified electrical technicians who are familiar with the relevant standards and safety regulations applicable to the project location.
- When performing operations on the equipment, use insulated tools and wear personal protective equipment to ensure personal safety. When handling electronic Instructions s, wear anti-static gloves, anti-static wristbands, and anti-static clothing to protect the equipment from electrostatic damage.
- The manufacturer is not responsible for equipment damage or personal injury caused by failing to install, use, or configure the equipment according to this document or the corresponding user manual. For more information on product warranties, please visit the official website.

2.2 System Safety

Danger

- Always adhere to the safety precautions and product warnings listed in this manual, other related documents, and on the product itself.
- Strictly comply with all local laws, regulations, and industry standards when operating the equipment.
- To protect the equipment during transportation, ensure that transport personnel are professionally trained. Record the handling procedures and maintain the balance of the equipment to prevent falls.
- Follow local laws and industry standards during loading and unloading. Rough handling can cause short circuits or damage to the battery battery rack's, potentially leading to electrolyte leakage, fires, or explosions.
- As this is heavy equipment, use appropriate tools and take protective measures during installation and maintenance. Improper handling can result in personal injury or product damage.
- The equipment contains lethal high voltage and poses an electric shock hazard; do not touch it casually.
- Non-professionals must not open battery racks doors or touch internal Instructions s without permission, as this may lead to electric shock.
- Do not operate the equipment if it is damaged or faulty, as this may increase the risk of electric shock and fire.
- When a ground fault alarm is triggered, the equipment may contain lethal high voltage, posing an electric shock hazard.
- Before operating the equipment, ensure that the system is properly grounded and that all necessary safety measures are taken to prevent electric shock.
- Do not open battery racks doors or touch any terminals or Instructions s while the equipment is in operation, as this may result in electric shock.
- Before installing, wiring, or maintaining the equipment, ensure that all switches are turned off.
- Do not disassemble or modify any part of the equipment without official authorization from the manufacturer. Damage caused by unauthorized modifications is not covered by the manufacturer's responsibility.

Warning

- Do not strike, pull, drag, or step on the equipment. Avoid piercing the equipment casing with sharp objects and do not place unrelated items inside the battery racks.
- The equipment is equipped with an automatic fire suppression system. Do not activate the fire suppression switch unless in an emergency.
- Choose cables that comply with local laws and regulations.
- Ensure that the voltage and frequency at the grid connection point meet the specifications required by the battery racks.
- It is recommended to add circuit breakers or fuses as protection devices on the AC side of the equipment.
- Do not place the equipment in a high-temperature environment. Ensure that there are no heat sources near the equipment.

Danger

- After installation, ensure that the labels and warning signs on the battery racks are clearly visible. Do not obstruct, deface, or damage them.

2.3 Label Instructions

	High voltage danger. There is high pressure during the equipment. When operating the equipment, make sure the equipment is powered off.		Potential hazard after equipment operation. When operating, please protect yourself.
	There is high temperature on the surface of the equipment, no touch when the equipment is running, otherwise it may cause scald		Protect the ground wire connection point.
	Battery recycling: the equipment should not be treated as household waste. Please treat the equipment according to local laws and regulations, or send it back to the equipment manufacturer. System recycling: the equipment should not be treated as household waste, please treat the equipment according to the local laws and regulations, or send it back to the equipment manufacturer.		

2.4 Battery Safety

Warning

If the battery leaks electrolyte, avoid contact with the leaked liquid or gas. Electrolyte is corrosive and can cause skin irritation and chemical burns. If contact occurs, follow these steps:

- Inhalation: Move away from the contaminated area and seek medical assistance immediately.
- Eye Contact: Rinse eyes with water for at least 15 minutes and seek medical assistance immediately.
- Skin Contact: Wash the affected area thoroughly with soap and water and seek medical assistance immediately.
- Ingestion: Induce vomiting and seek immediate medical attention.

Warning

- A burning battery may release toxic and harmful gases.
- In the event of a fire, immediately call the fire department and notify firefighters, providing them with relevant product information.
- If safe to do so, disconnect the power supply to the equipment by turning off the upstream and downstream switches.

2.5. Personnel Requirements

Note

- Personnel responsible for the installation and maintenance of the equipment must undergo rigorous training to understand all safety precautions and master the correct operating procedures.
- Installation, operation, maintenance, and replacement of the equipment or its Instructions s should only be performed by qualified professionals or trained personnel.

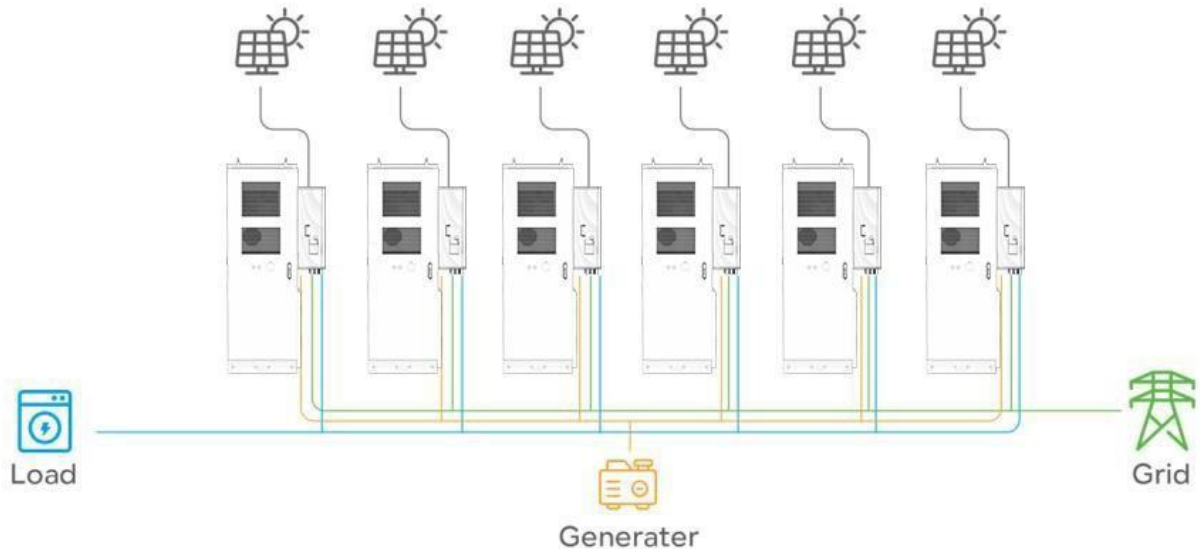
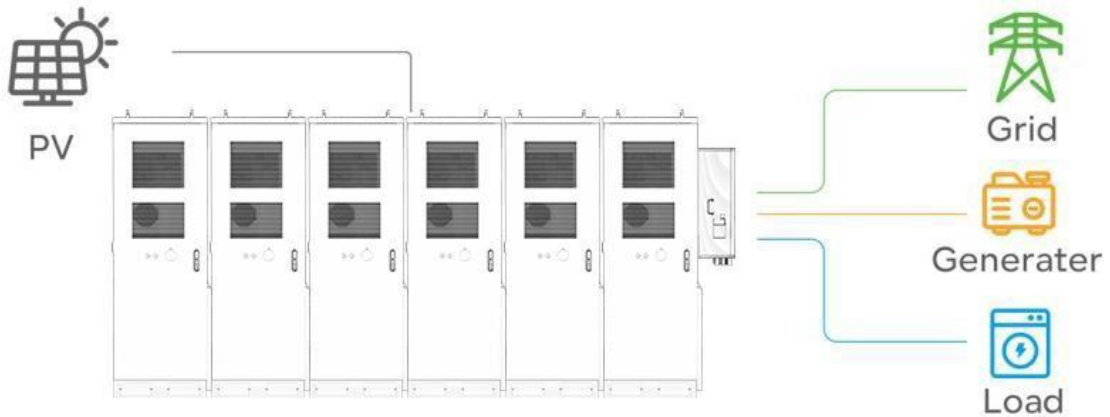
3. Product Presentation

3.1 Product Profile



The battery racks integrates an energy management and storage system to control and optimize the flow of energy. It can supply electricity from the grid to loads, store it in batteries, or feed it back into the grid.

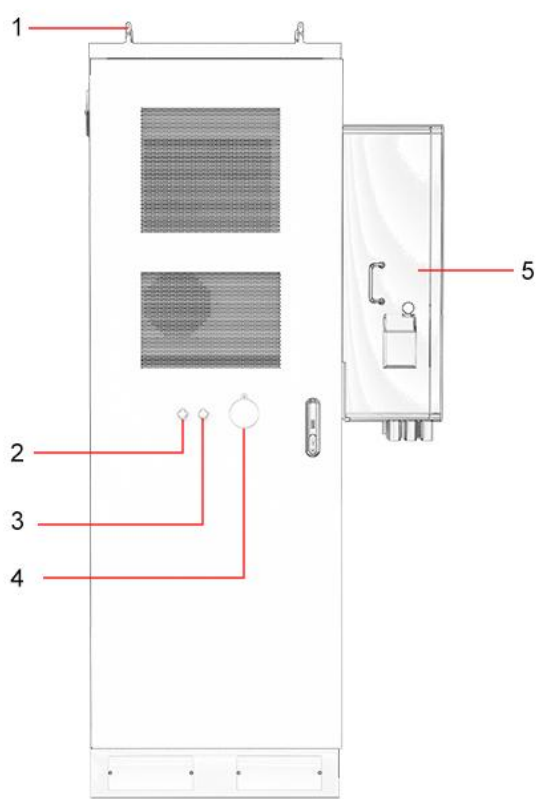
3.2 Application Scenarios



Warning

- This battery racks is suitable for industrial and commercial scenarios.
- In the battery racks, try to avoid using loads with high startup currents, such as high-power pumps, as this may cause the system to fail due to excessive instantaneous power.
- Battery current may be affected by factors such as temperature, humidity, and weather conditions, which may cause current limiting and affect the system's load capacity.

3.3 Appearance Instructions

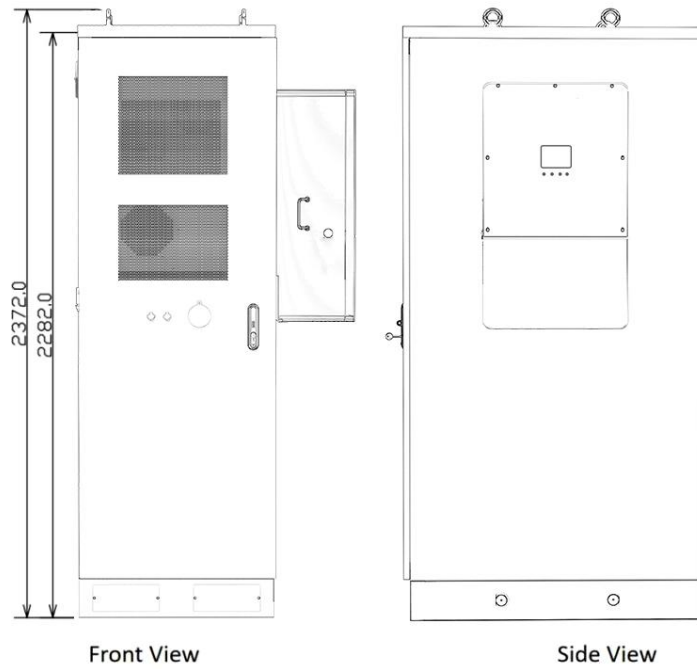


1	Lifting ring
2	Fault light
3	Running light
4	Emergency stop
5	Three-phase inverter (Optional)

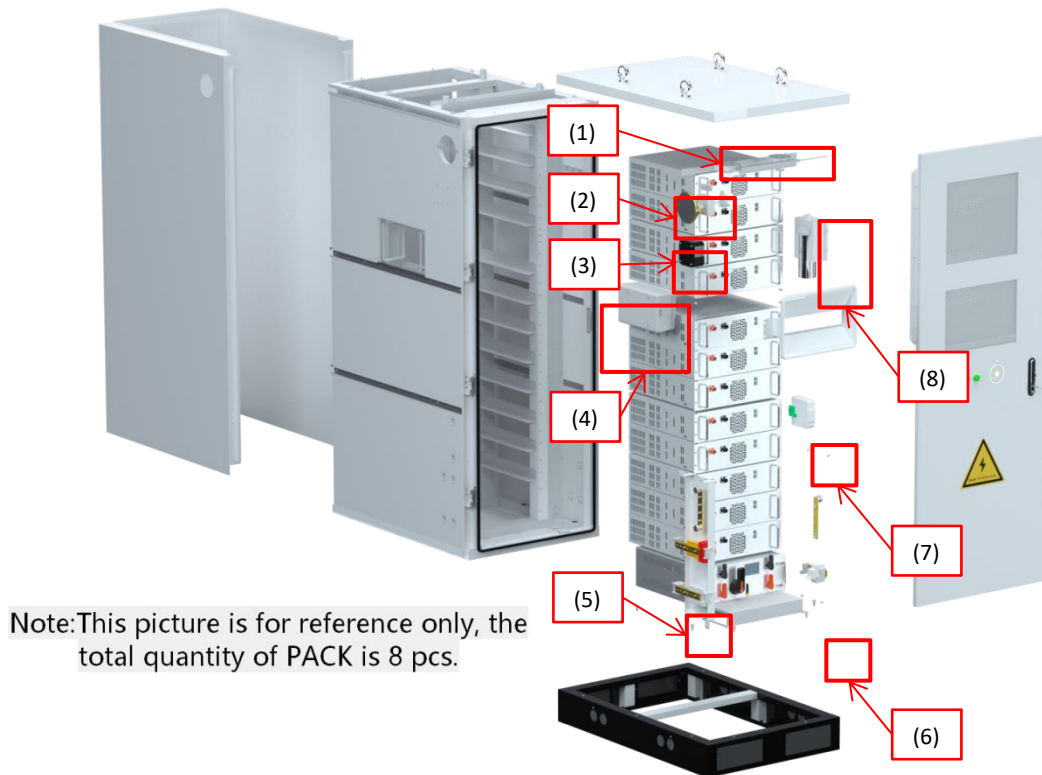
3.4 Indicator Light Description

Indicator lamp status		Description
	RUN	Green light always on = the battery racks works normally
	STOP	Battery rack has stopped working

3.5 Sizing Specification



4.Part Introduction

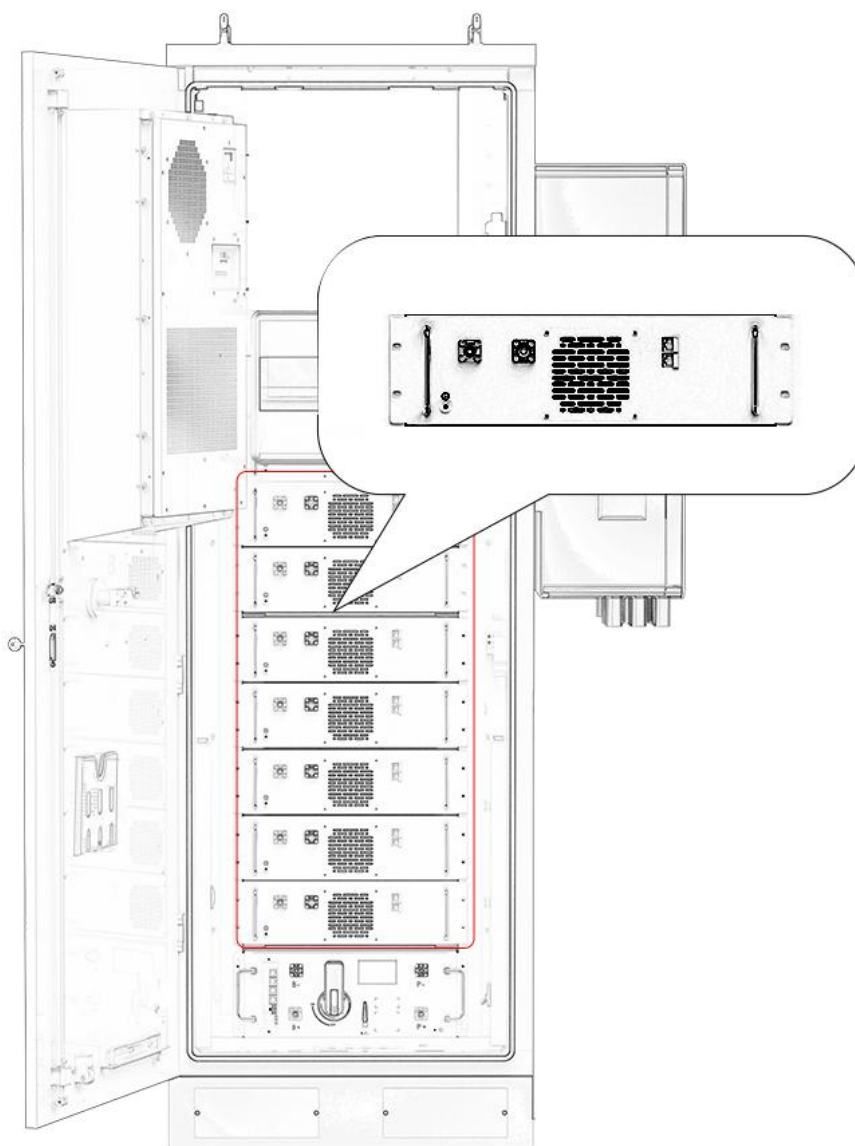


No.	Module	Note
1	Smoke and Heat Detector	
2	Electrical Actuated Explosion Relief Valve	
3	Gas Detector	
4	UPS	
5	Single-Phase Surge Protection Device	SPD

6	Miniature Circuit Breaker	
7	24Vdc Switch Power Supply	SPS
8	Aerosol Fire Extinguisher	

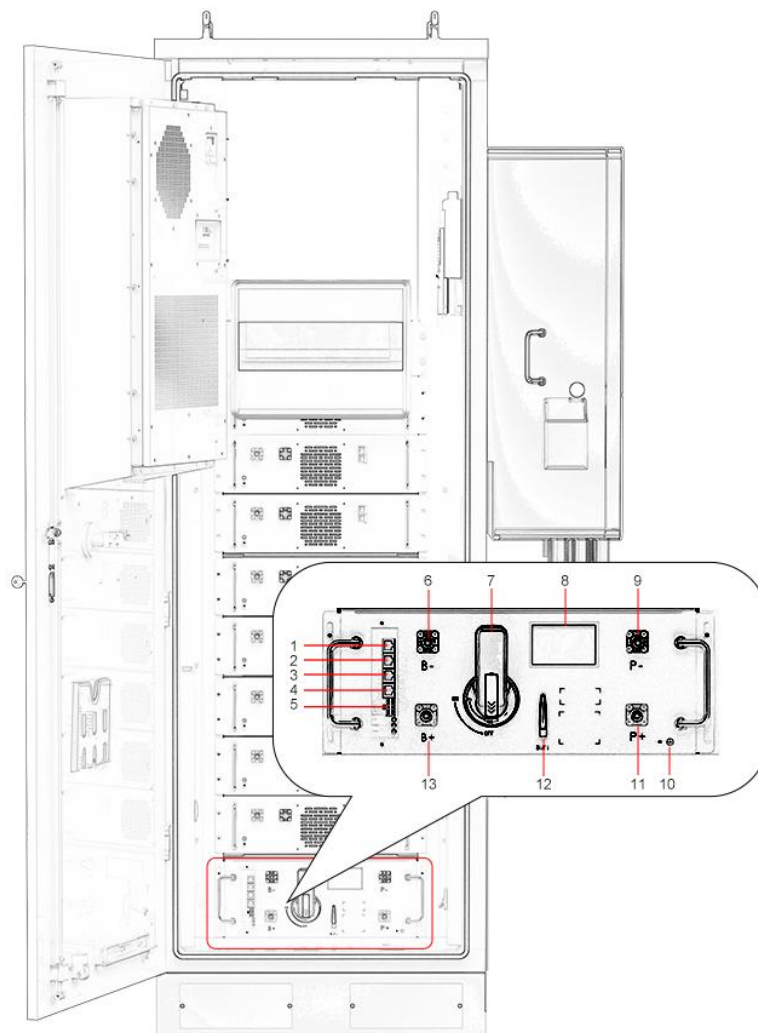
4.1 Battery System

The battery racks contains the battery module and the high-voltage control box. The battery module stores and releases the electric energy; the high voltage control box controls the battery charge and discharge.



No.	Project	Parameters	Remarks
1	Configuration	1P16S	
2	Rated energy	5.12kWh (100Ah)	
3	Rated voltage	51.2V	
4	Allowable voltage range	40V~57.6V	For cell 2.5V~3.6V
6	Rated charge/discharge power	1P	
7	Storage temperature	-30℃~60℃	
8	Battery cooling method	Forced air cooling	
9	Fire fighting	Aerosols	
10	Dimension	500mm*482.6mm*133mm	
11	Weight	45kg	
12	Battery operating temperature	-20~55℃for discharge 0~55℃for charge	

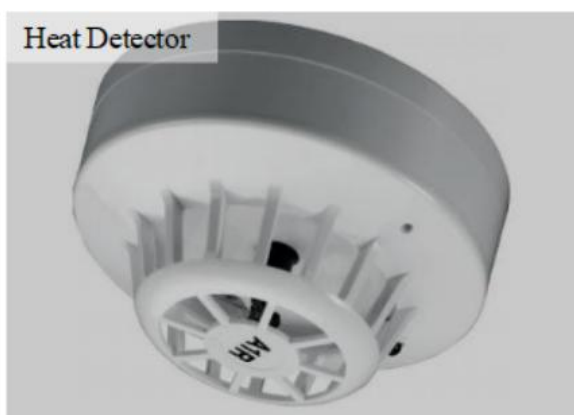
4.2 Master Control Module



NO.	Description	Function Description
①	BSU	Connect slave control BSU
②	PCS	Connect inverter PCS
③	EMS	EMS
④	IPC	Connect to the industrial control screen
⑤	Integrated Port	Dry Contact Input / Temperature Input / Dry Contact Output
⑥	B-	Battery Total Negative Input
⑦	DC breaker	Turn on/off the system
⑧	LCD Display	LCD Display
⑨	P-	Battery Negative Output
⑩	Grounding	Grounding
⑪	P+	Battery Positive Output
⑫	WiFi	WiFi
⑬	B+	Battery Total Positive Input

4.3 Fire Extinguisher System

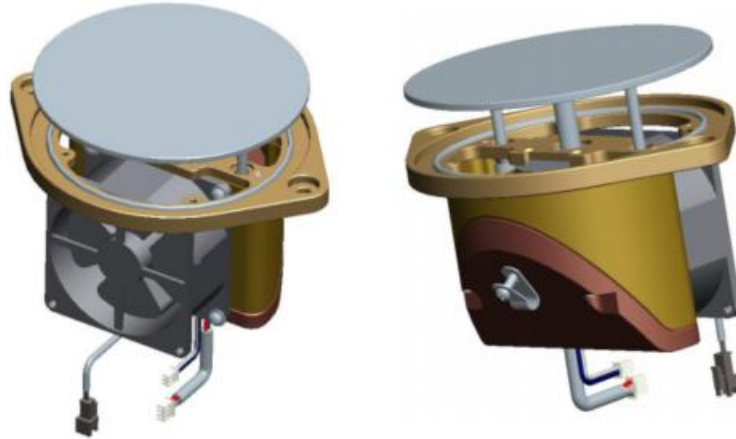
This firefighting system uses aerosol as fire extinguishing agent. It is mainly equipped with a fire extinguishing controller, smoke detector, temperature detector.



No.	Module	Remarks
1	Smoke Detector	Smoke Concentration Detection
2	Heat Detector	Heat Detection
3	Aerosol Fire Extinguisher	Fire Suppression

4.4 Electrically Actuated Explosion Relief Valve

In case of an extreme thermal runaway inside the battery cabinet, the electrically actuated pressure relief valve is capable of interlocking with the fire-fighting monitoring system to actively open its valve cover for pressure relief, thereby achieving explosion relief and suppression safety protection. Additionally, integrated with a fan unit, this valve can actively expel hazardous gases from thermal runaway and lower their concentration within the cabinet.



4.5 UPS

When a power outage occurs on the AC grid side, the UPS module can provide emergency power support for the system's high-voltage control box and fire-fighting monitoring system.



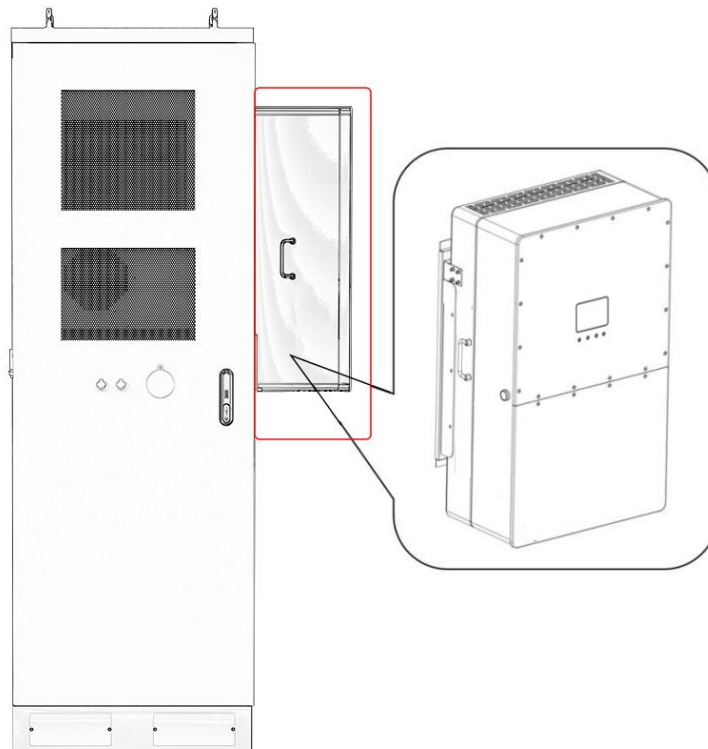
4.6 Auxiliary DC Power Supply System

The 24V DC power module has its input side connected to the output side of the UPS, providing uninterrupted power output for the functional components within the system that require a 24V DC power supply.



4.7 Three-phase Inverter (Optional)

In the battery racks, the inverter (Power Conversion System) manages and controls the charging and discharging of the batteries. It converts DC (Direct Current) to AC (Alternating Current) or vice versa, facilitating the storage and release of electrical energy. The inverter also monitors and regulates voltage and current levels to ensure the safe and efficient operation of the system.



5. Transportation, Inspection, and Storage

5.1 Transportation Requirements

5.1.1 Transportation process requirements

1) Battery racks inspection before loading

- Before loading, the exterior and interior of the transport vehicle should be checked to ensure the internal cleanliness, and the vehicle should be equipped with hooks;
- Check the outer packaging and label information before loading to ensure the integrity of the outer packaging and the accuracy of the goods information.

2) Battery racks loading

- Need to use the forklift that meets the load of the battery racks, the forklift passes the annual inspection, and the forklift is not allowed to move during the lifting operation;
- The battery racks monomer weight is large, the space in the car should be reasonably fixed with the corresponding filling material and binding to bind the battery racks;
- After completing the packing operation, it shall be reinspected to confirm whether the strap is fixed and protected is secure.

3) Battery racks transportation

- The high speed of the vehicle shall not exceed the speed stipulated by the traffic regulations, and try to avoid bumpy road transportation;
- Sudden braking and sharp turning are prohibited during the vehicle driving process;
- Keep the vehicle in good condition, check the delivery situation of the vehicle frequently, and give feedback to solve the problems found in time.
- For battery racks unloading, appropriate unloading tools shall be prepared according to the loading list before unloading.

5.2 Check Before Signing

Before signing for the product, please check the following contents in detail:

- 1) Check the outer package for damage, such as deformation, opening, cracks or other signs of possible damage to the equipment inside the packing box. In case of damage, do not open the package and contact us.
- 2) If an inverter is configured, please check whether the inverter model is correct. If there is any discrepancy, do not open the package and contact us.
- 3) Check whether the type and quantity of the deliverable are correct, and whether the appearance is damaged. For any damage, please contact us.

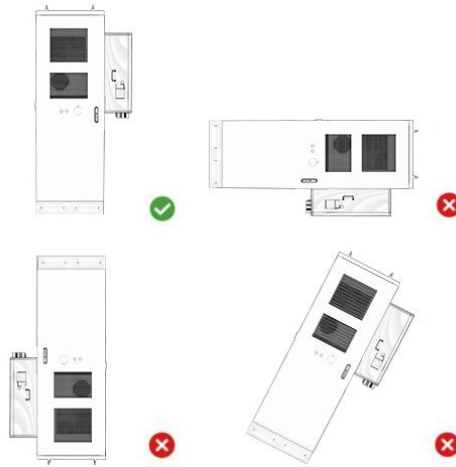
5.3 Equipment Storage

If the battery racks is not immediately put in operation, store requirements are the following:

- 1) Ensure a clean storage environment, a suitable temperature and humidity range, and no condensation.
- 2) After long-term storage, it should be checked and confirmed by professional personnel before further use.
- 3) The equipment shall be packed in boxes and sealed after desiccant in the box.
- 4) If the installation is not conducted within 3 days after unpacking, it is recommended to put the equipment in the box.
- 5) Store the cell in a clean, dry, and well-ventilated location with ambient temperature between
- 6) $-30^{\circ}\text{C} \sim 60^{\circ}\text{C}$, better between -10°C and 40°C . In addition, relative humidity of 10%RH ~90%RH. Keep away from corrosive materials and magnetic field, fire and heat sources. Do not upside down, crush and press. If battery is not in use, total storage time is not recommended for more than 3 months.
- 7) The equipment shall be stored in a shade to avoid direct sunlight.
- 8) Equipment storage should be far away from flammable, explosive, corrosive and other items.
- 9) Ensure that the battery racks is not damaged during transportation and storage.
- 10) Do not put the battery into the fire, otherwise there is a risk of explosion.
- 11) The battery system has a risk of fire when the ambient temperature is too high.

6. Installation

6.1 Installation Requirements



6.1.1 Installation environment requirements

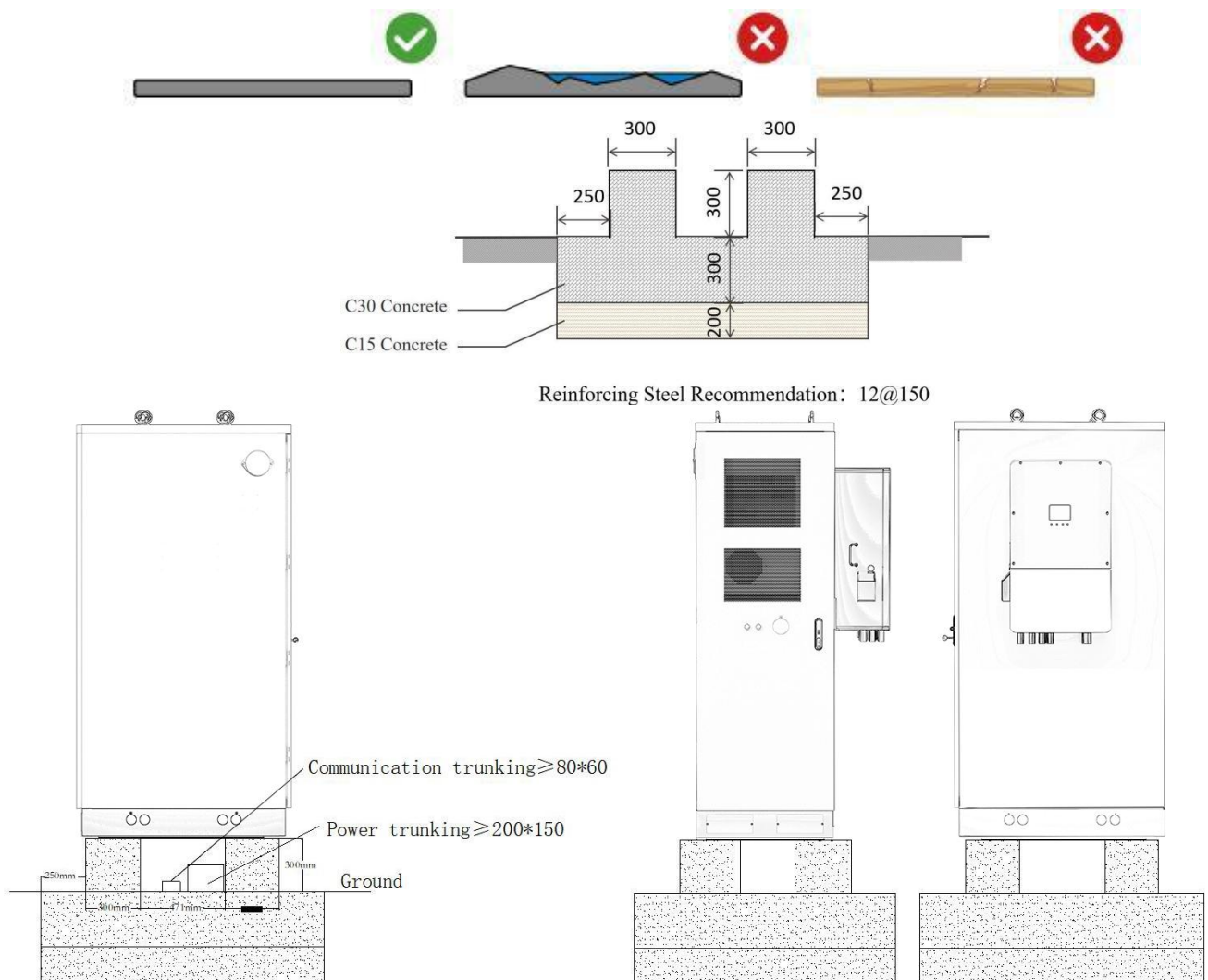
- 1) The battery racks should not be installed in flammable, explosive, corrosive and other environment.
- 2) The battery racks should be installed in a place that is not easily accessible to children.
- 3) The installation space shall meet the requirements of battery racks ventilation and heat dissipation and the requirements of operation space
- 4) The protection level of the battery racks meets the outdoor installation, and the installation environment temperature and humidity should be within the suitable range.
- 5) Do not place the battery racks in a high temperature environment to ensure that there is no heat source near the battery racks.
- 6) The installation height of the battery racks should be easy for operation and maintenance, ensure that the battery racks indicators, all labels are easy to view, and the terminals are easy to operate.
- 7) The battery racks is installed at an altitude of 2,000 m below the highest working altitude.
- 8) Keep away from the strong magnetic field environment and avoid electromagnetic interference.

6.1.2 Installation angle requirements

Ensure that the battery racks is installed horizontally, not tilted, horizontally or inverted.

6.1.3 Install the base requirements

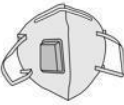
- Floor board thickness 200mm, concrete strength class C15.
- The floor thickness is 300mm, concrete strength class C30.
- Each side protrudes 250mm from the edge of the battery racks.
- Ditch requirements:
 - 1) The battery racks adopts the bottom entry line, and the trench must be dust and rodent designed to prevent the foreign body from entering.
 - 2) There must be waterproof and moisture-proof design in the trench to prevent cable aging and short circuit and affect the normal operation of the battery racks.
 - 3) Due to the thick cable of the battery racks, the position of the cable should be fully reserved in the design to ensure the smooth connection of the cable without wear.



6.1.4 Installation tool requirements

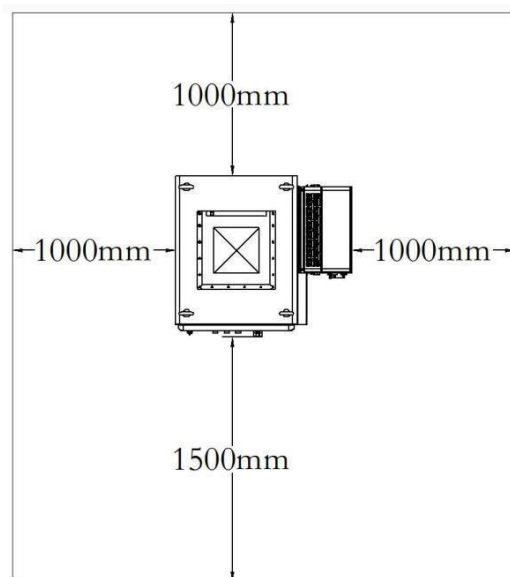
When installing, the following installation tools are recommended. If necessary, other

auxiliary tools can be used on site.

 Goggles	 Safety Shoes	 Safety Gloves	 Dust Mask	 Crystal Pliers
 Diagonal Cutting Pliers	 Wire Stripping Pliers	 Impact Drill	 Hot Air Gun	 Vacuum Cleaner
 Marker Pen	 Level	 Heat Shrink Tubing	 Rubber Mallet	 Multimeter
 M12 Socket Wrench	 Cable Ties	 M8/M6/M4 Torque Screwdriver	 Crimping Pliers	

6.2 Install

6.2.1 Installation space requirements



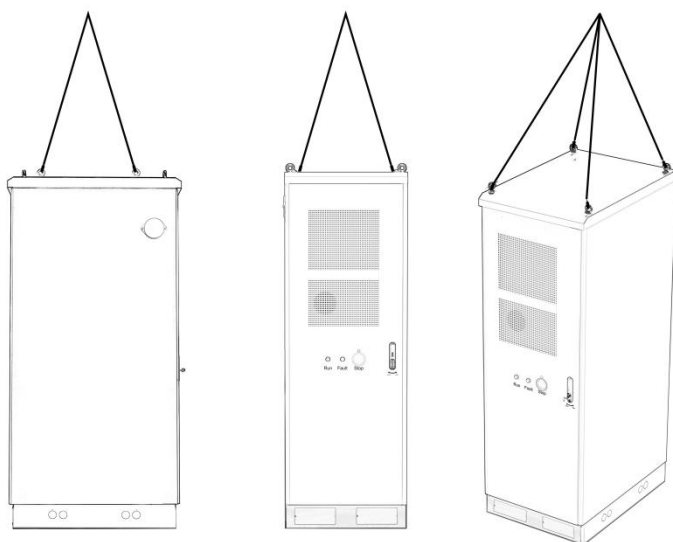
6.2.2 Moving the battery racks

Caution

- During transportation, handling, installation, and other operations, all applicable laws, regulations, and standards of the country or region must be met.
- To protect the battery racks from damage during transportation, ensure that the transport personnel are professionally trained. Record the steps taken during transportation and maintain balance of the battery racks to prevent it from falling.
- Before installation, the battery racks must be moved to the installation site. During this process, to avoid personal injury or damage to the battery racks, please observe the following points:
 - a. Allocate appropriate personnel and tools according to the weight of the battery racks to prevent it from exceeding the safe carrying capacity of individuals and causing injuries.
 - b. Ensure that the battery racks remains balanced during movement to prevent it from falling.
 - c. Ensure that battery racks doors are securely locked during the movement of the battery racks.

Crane-lift transportation (optional)

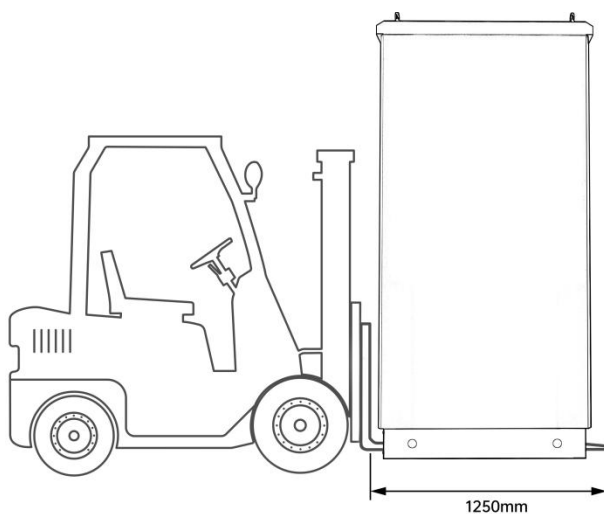
Step 1: Use the sling with the hook or the U-shaped hook to work on the ceiling of the battery racks. Step 2: Use the lifting device to lift the battery racks for handling.



Forklift handling battery racks (optional)

Step 1: Remove the front baffle of the battery racks.

Step 2: Use the forklift to carry the battery racks and place the center of the battery racks at the center of the forklift.



The battery racks should be moved to the designated position by means of forklift transfer or lifting, and the lifting ear should be re-checked and painted up if necessary.

6.2.3 Install the battery racks

Note

- Ensure that the battery racks is vertically close to the ground without the risk of dumping.
- Ensure that the battery racks is firmly installed to prevent dumping and personnel.

6.3 Safety Precautions

Danger

- Before making electrical connections, disconnect the AC switch and battery switch of the battery racks to ensure that the device is powered off. Do not operate under power, as this can lead to electric shock or other dangers.
- Similar cables should be bundled together and separated from different types of cables; do not allow them to tangle or cross each other.
- If the tension on the cables is too high, it may cause poor connections. When wiring, leave some extra length before connecting the cables to the connection terminals of the energy storage system.
- When crimping terminal connectors, ensure that the conductor part of the cable makes full contact with the terminal connector. Do not crimp the cable insulation along with the terminal connector, as this can prevent the device from operating properly or cause overheating due to unreliable connections, leading to damage to the terminal strips of the energy storage system.

Note

- For electrical connection, please wear safety shoes, protective gloves, insulating gloves and other personal protective battery racks as required.
- Only professionals are allowed to perform electrical connections.
- The cable color in the drawing of this paper is for reference only, and the specific cable specifications should meet the local regulations.

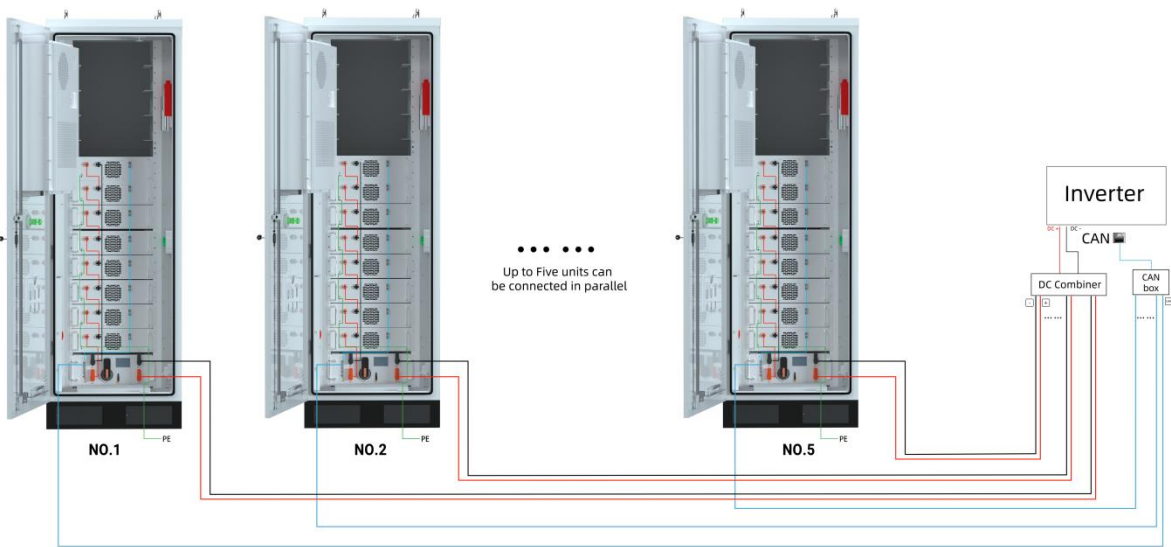
6.4 Cable Requirements

Wiring Location	Rated Voltage/Current	Terminal Specifications	Cable Model	Remarks
Main Control Box Wiring Area	DC:1000V/160A	SC25-8	UL4AWG	User-supplied
AC Auxiliary Power Source Wiring Area	US/5kW/AC480+15%/60Hz	RV3.5-5	UL12AWG	User-supplied
LAN Wiring Area	/	RJ45	CAT5e	User-supplied

6.5 Multi-Unit Wiring

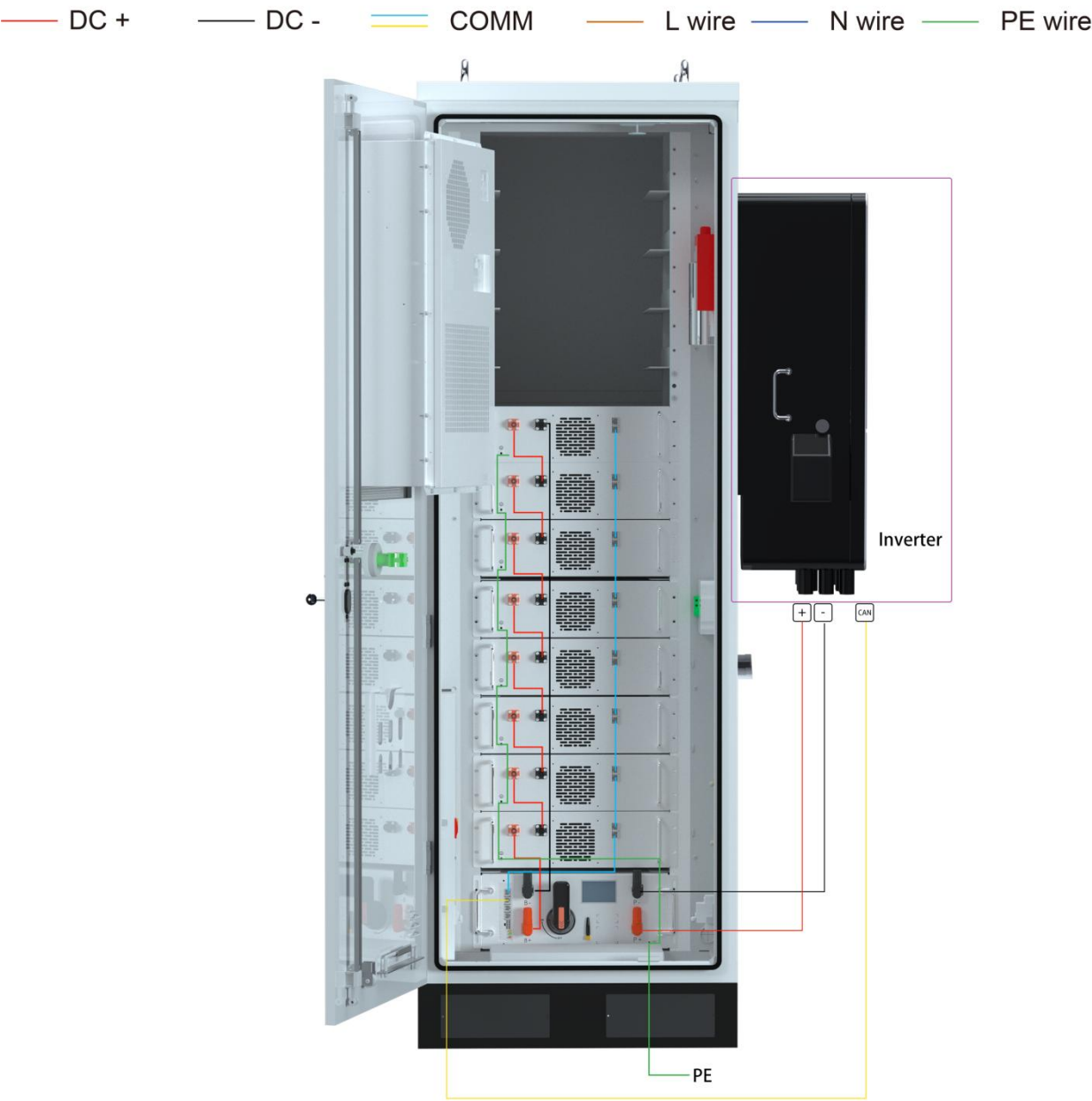
To operate all battery racks in parallel (with a maximum allowable parallel quantity of 5 units), the positive and negative terminals on the master control module of each R60 unit shall be connected to the corresponding positive and negative copper busbars in the DC combiner box respectively; the corresponding parallel-connected inverters can be connected to the positive and negative copper busbars.

Use Cat5e or higher-grade RJ45 Ethernet cables. After setting the address of each main control module, aggregate the communication of all modules through a splitter and output it to the corresponding communication port of the inverter.



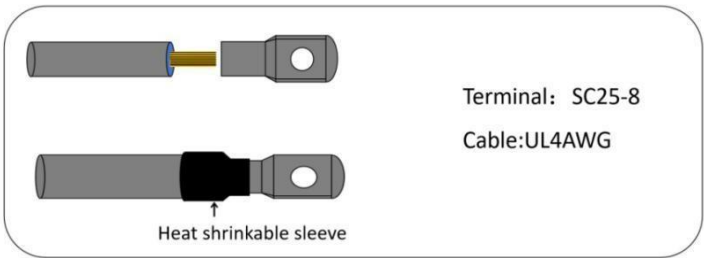
6.6 System Wiring

Connect the battery system power positive and negative to the inverter, and the communication line to the inverter's BMS port.



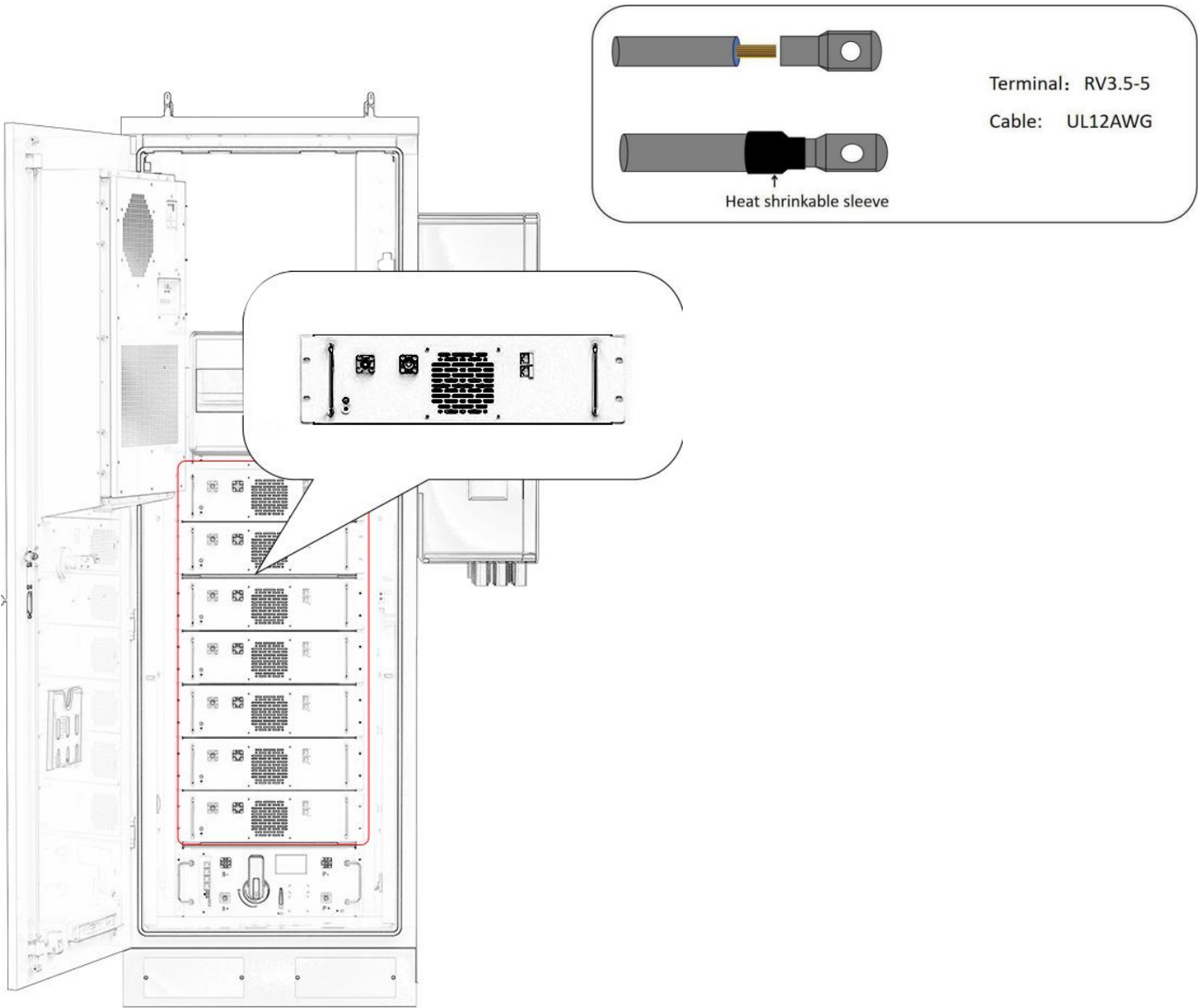
6.7 Electrical Connection Diagram Description

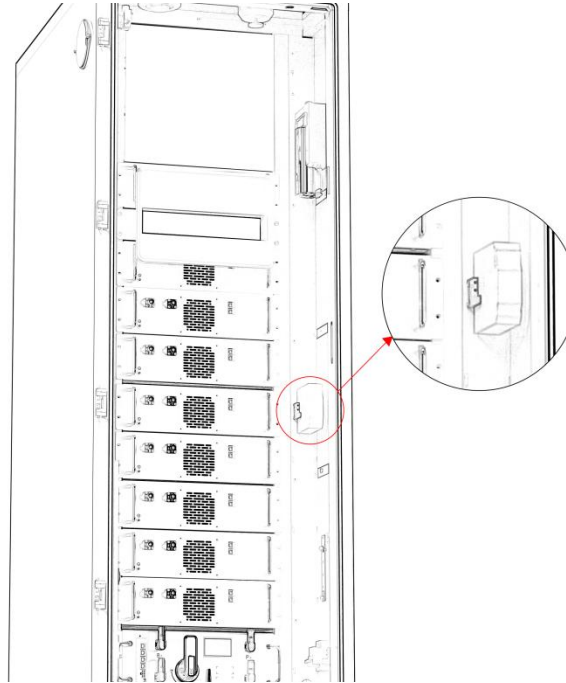
6.7.1 Connecting the three-phase inverter



Connecting the P+ and P- Terminals to the DC Side of the Three-Phase Inverter.

6.7.2 Connecting the AC auxiliary power source

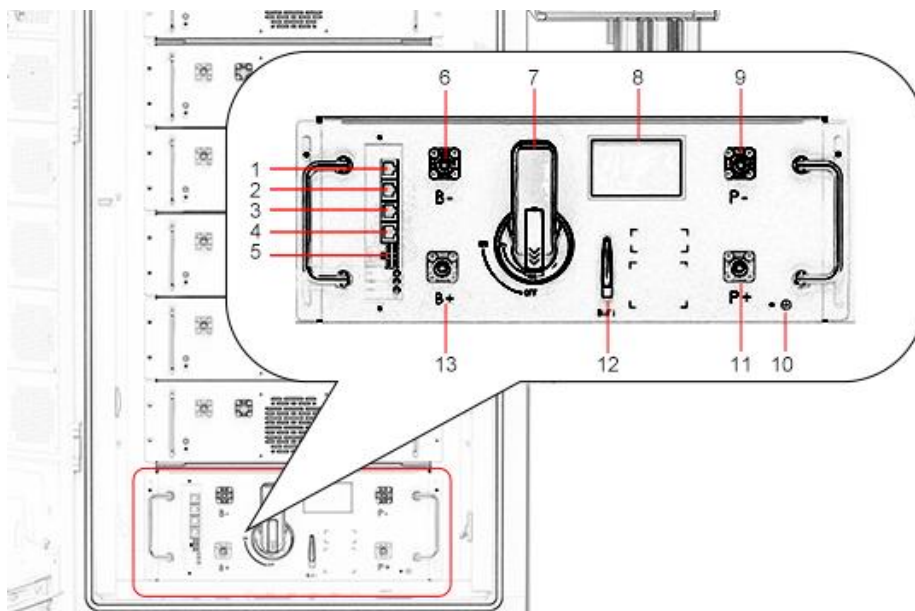




Warning

- When wiring, the AC line perfectly matches the "L", "N", ports of the AC terminal. If the cable is not connected correctly, the battery racks may be damaged.
- Make sure that the core is fully connected to the terminal hole and not exposed.
- Ensure that the cable connection is fastened, otherwise the battery racks operation may damage the battery racks.

6.7.3 Connect LAN communication cable



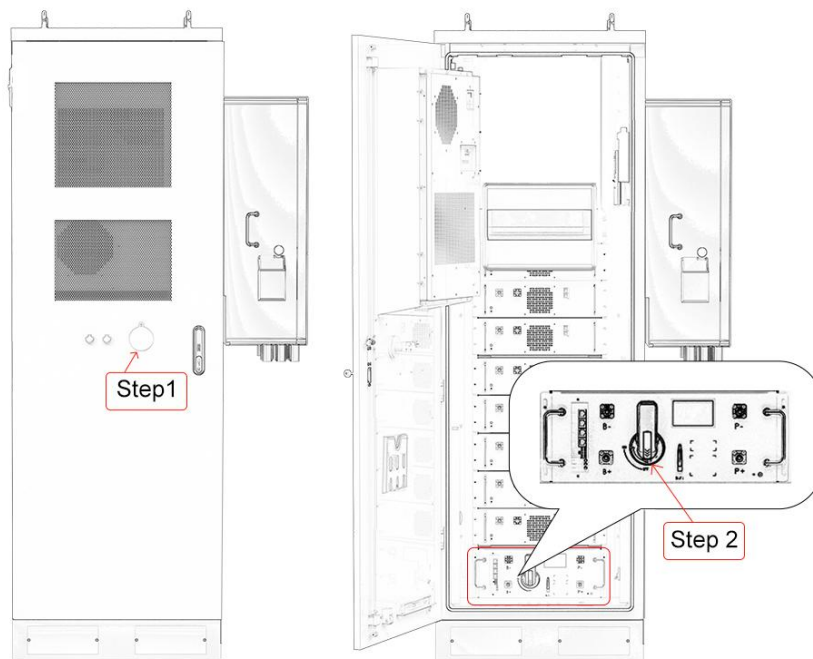
7.Test Operation of Battery Racks

7.1 Check Before Charging

No.	Check items
1	The battery racks is installed firmly installed, the installation position is convenient for operation and maintenance, the installation space is convenient for ventilation and heat dissipation, and the installation environment is clean and tidy.
2	Protect the ground line, grid-connected AC line, load line and communication line are correctly and firmly connected.
3	Cable binding meets the wiring requirements, reasonable distribution and no damage.
4	Battery cluster switch, AC switch and DC power switch have been disconnected.
5	The voltage and frequency of the grid-connected access point of the battery racks meet the grid-connected requirements.

7.2 Power on the Equipment

1. Check the EPO knob, make sure it is released.
2. Turn the Miniature Circuit Breakers to power on the auxiliary power supply.
3. Check the position of the circuit breaker and rotate it to the closed position.
4. Rotate the SA switch to the ON position.



7.3 Power on the Battery Racks

Note

- After the battery racks is powered on, if there is no abnormal situation and fault alarm, please close the battery racks door.
- Close the battery racks door and keep the key properly.

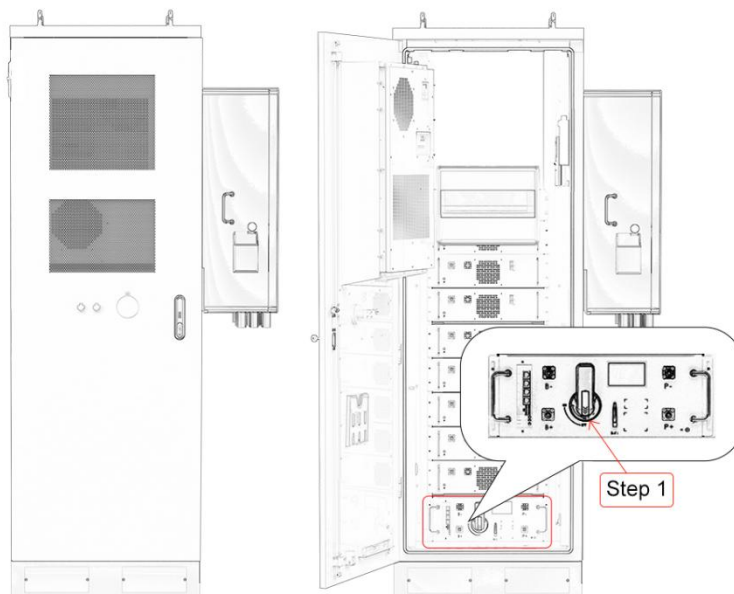
8. System Maintenance

8.1 Power Down the Battery Racks

Danger

- Ensure that the battery cabinet is DE-energized during operation and maintenance of the battery cabinet. Operating the battery cabinet with electricity may result in damage to the battery cabinet or risk of electric shock.
- After the battery racks is disconnected, the internal component is discharged for a certain time. Please wait until the battery racks is required to be completely discharged according to the required label time.
- When emergency, please use an emergency stop switch to make an emergency call for the battery racks.

1. Under normal operating conditions, issue a shutdown command via the control interface of the high-voltage inverter (or the energy management system of the PCS), ensuring that the primary circuit on the DC side is in the disconnected state.
2. Rotate the DC isolation switch to the OFF position.



8.2 Maintenance Precautions

- Do not open the outdoor cabinet for maintenance during rainy, humid, or windy weather. If damage occurs due to unavoidable circumstances, GSL assumes no responsibility.
- To reduce the risk of electric shock, do not perform any maintenance or inspection operations outside of those specified in this manual

8.3 Maintenance Requirements

1. Personnel must hold professional certificates and have undergone qualified professional training before starting work.
2. Adhere to relevant safety precautions, use necessary tools, and wear personal protective battery racks.
3. Do not wear jewelry, watches, or other metal accessories.
4. Under no circumstances should both hands touch the high-voltage positive and negative terminals of the energy storage system simultaneously.
5. Before maintaining the battery energy storage system, disconnect all high-voltage and low-voltage switches.
6. During cleaning operations, do not wash directly with water. Use a vacuum cleaner if necessary.
7. When plugging or unplugging cables, operate according to standards; do not use excessive force.
8. After maintenance, promptly clean up tools and materials, and check for any metal objects left inside or on top of the battery racks.
9. If you have any questions about operating or maintaining the battery racks, contact GSL's after-sales service center. Do not operate without authorization.

8.4 Routine Maintenance

Project List	Inspection Method	Maintenance Cycle
System Status and Cleanliness	Check the following items. Correct any issues immediately: ● Check if the outdoor cabinet and internal battery racks are damaged or deformed. ● Check for abnormal noises during operation. ● Check if the internal temperature is too high. ● Check if the internal humidity and dust levels are within normal range. Clean if necessary. ● Check if the intake and exhaust vents ● are blocked.	Every two years
Warning Signs	Check if warning signs and labels are clearly visible and undamaged. Replace if necessary.	
Cable Shield Grounding	Check if the cable shield is in good contact with the insulating sleeve and if the grounding copper strip is securely fixed.	
Corrosion	Check for oxidation or rust inside the outdoor cabinet.	
Cabinet Exterior	Check the following items. Correct any issues immediately: ● Check if there are flammable objects on the top of the outdoor cabinet. ● Check if the welding points between the outdoor cabinet and the base steel plate are secure and free of rust. ● Check if the cabinet shell is damaged, chipped, or oxidized. ● Check if the door lock operates smoothly. ● Check if the seals are properly fixed.	Annually
Cabinet Interior	Check for foreign objects, dust, dirt, and condensation inside the energy storage integrated system.	
Intake and Exhaust Vents	Check the temperature and dust level of the heat sink. Clean with a vacuum cleaner if necessary.	

Wiring and Cable Layout	Ensure the energy storage integrated system is completely powered off before inspection. Correct any issues immediately: ● Check if the cable layout is standard and if there are any short circuits. ● Check if all cable entry and exit holes are sealed. ● Check for water ingress inside the cabinet. ● Check if power cable connections are loose and tighten according to the specified torque. ● Check for damage to power and control cables, especially for cuts on surfaces in contact with metal. ● Check if the insulation wrapping of power cable terminals has fallen off.	
Fans	Check the fan operation: ● Check if the fans are blocked. ● Check for abnormal noise during operation.	
Screws	Check for dropped screws inside the outdoor cabinet.	
Functions	Check the emergency stop button function: ● Simulate a shutdown. ● Check if the warning signs and labels on the body and other battery racks are clear and undamaged. Replace if necessary.	Every six months
Internal Component Inspection	Check the cleanliness of circuit boards and components: ● Check the temperature and dust level of the heat sink. Clean with a vacuum cleaner if necessary. ● Clean or replace air filters if necessary. ● Ensure the intake vents are unobstructed.	
Intake and Exhaust Vents	Check the temperature and dust level of the heat sink. Clean with a vacuum cleaner if necessary.	

- The maintenance cycles provided in this section are recommendations. Actual maintenance cycles should be determined based on the specific installation environment.
- Factors such as plant size, location, and site conditions can affect maintenance cycles. If the operating environment is dusty or sandy, it may be necessary to shorten the maintenance cycle and increase the frequency of maintenance.

8.5 Cabinet Maintenance

8.5.1 Appearance damage repair measures

Note

Check if the protective paint on the cabinet shell has peeled off or chipped. Repair if necessary.

8.5.2 Door lock inspection

Check if the door locks of the energy storage integrated system are functioning normally and in good condition. Lubricate the lock holes if necessary.

8.6 Battery Maintenance

Project List	Inspection Method	Maintenance Cycle
Battery Cluster Status and Cleanliness	Check the following items. Correct any issues immediately: ● Check if the battery cluster and internal battery racks are damaged or deformed. ● Check for abnormal noises during operation. ● Check if the internal temperature is too high. ● Check if the internal humidity and dust levels are within normal range. Clean if necessary.	Every two years
Warning Signs	Check if warning signs and labels are clearly visible and undamaged. Replace if necessary.	
Wiring and Cables	Check the connections between the switch box (if present) and battery modules, and between battery modules.	
Corrosion	Check for oxidation or rust inside the battery cluster.	

8.7 The Battery Racks Maintenance

1. Before using the system for the first time after long-term storage, fully charge the system at least once to restore the battery performance to its best state.
2. Regularly check if the high-voltage cables and connection strips are loose, if the contacts are good, and if the terminal surfaces are severely rusted or oxidized.
3. Regularly check if the cables are loose, aged, damaged, or broken, and if the insulation is good.
4. Regularly check for any pungent odors inside the battery cabinet and for any burning smells at high-voltage connection points.
5. Regularly check if the status and alarm indicator lights of the battery energy storage system are intact and functioning properly.
6. Regularly check if the emergency stop switch is effective to ensure rapid system shutdown in emergencies.
7. Regularly check the fire extinguishing device to ensure it is in good condition and within the validity period.
8. Do not connect different types of battery modules in series or parallel.

8.8 Removal of the Battery Racks

Warning

- Ensure that the battery racks has been powered off.
- Wear personal protective the battery racks when operating the battery racks.

Step 1: Open the battery racks door

Step 2: Disconnect all the electrical connections of the battery racks, including: AC line, communication line, and protective ground wire.

Step 3: Properly preserve the battery racks. If the subsequent the battery racks needs to be put into use, ensure that the storage conditions meet the requirements.

8.9 Scrapped Battery Racks

If the battery racks cannot be used and needs to be scrapped, please dispose the battery racks according to the electrical waste treatment requirements of the regulations where the battery racks is located. The battery racks should not be treated as household waste.

9. Fault Treatment

Please troubleshooting according to the following methods. If the troubleshooting method cannot help you, please contact the after-sales service center.

When contacting the after-sales service center, please collect the following information to easily solve the problem quickly.

- 1) Energy storage system information, such as serial number, software version, the battery racks installation time, fault occurrence time, fault occurrence frequency, etc.
- 2) Energy storage system installation environment, such as: weather conditions, installation environment recommendation can provide photos, videos and other documents to assist the analysis of problems.

Battery System Technical Data

Battery Energy Storage	Optional 1*	Optional 2**
Model Number	BESS-R40K-R	BESS-R40K-R
Cell Type	LiFePO4	LiFePO4
Module Energy (kWh)	5.12	5.12
Module Nominal Voltage (V)	51.2	51.2
System Combination	1P64S	1P128S
System Nominal Voltage (V)	204.8	409.6
System Nominal Power (kW)	20	40
System Operating Voltage (V)	172.8-230.4	345.6-460.8
System Battery Energy (kWh)	40	40
Charge/Discharge Current (A)	66.7	100

Inverter Parameters (Optional)

Battery Operating Data (BAT/ DC Side)	
Battery Cell Type	LFP Cell
Nominal DC Voltage	409.6V
Operating Voltage Range	345.6-460.8V
Max. Battery Charge / Discharge Current	100A
BMS Communication Protocol	CANBUS 2.0 ModBus_RTU RS485 ModBus_TCP via WiFi/ RJ45 Ethernet Cable
Inverter Operating Capability	
Battery Voltage Range	300-750V
Communication with BMU	CANBUS 2.0 ModBus_RTU RS485 ModBus_TCP via WiFi/ RJ45 Ethernet Interface
Quantity of Battery Input Interface	1 (At least)
Quantity of Battery Communication Interface	1 (At least)
Category	
Ground Fault Detection — NEC 690.5	Integrated
Protection Class/ Over voltage Category	DC (Battery II), AC (II)
Surge Protection	DC Type II / AC Type III

10. Emergency Handling Plan

10.1 Fire

Step 1: Evacuate the site personnel to the safe area, delimit the safety isolation area, and call the alarm number according to the scene situation.

Step 2: To ensure personal safety, perform the following operations conditionally:

- 1) If the wiring harness smoke and fires, use carbon dioxide or dry powder fire extinguisher to put out the fire.
- 2) If the energy storage battery catches fire, use high pressure water gun to put out the fire at a distance.
- 3) If smoke inhalation occurs accidentally, please transfer it as soon as possible and seek medical attention.

Step 3: Notify the system manufacturer to get further processing opinions.

If the fire is caused by abnormal charging and discharge, be sure to turn off the power supply at the first time, and then perform the fire extinguishing action.

10.2 Water Logging

Step 1: No matter whether the system is powered on or not, evacuate the site personnel to a safe area and draw a safety isolation area.

Step 2: Notify the system supplier and repair it after the water is removed.

Step 3: Do not start the system before the system manufacturer gives the system safety judgment result.

10.2.1 Transportation

Transport the cell in forms of package by truck, railway, ship or airplane. Severe vibration, impact, crush, exposure to the sun and rain during transportation should be avoided. The SOC of cell should be kept between 25%~35%.

10.2.2 Storage

Store the cell in a clean, dry, and well-ventilated location with ambient temperature between 30°C~60°C, better between -10°C and 40°C. In addition, relative humidity of 10%RH ~90%RH. Keep away from corrosive materials and magnetic fields, fire and heat sources. Do not upside down, crush and press. If battery is not in use, total storage time is not recommended for more than 3 months.

10.2.3 Firefighting System

This firefighting system uses aerosol as fire extinguishing agent. It is mainly equipped with a fire extinguishing controller, smoke detector, temperature detector, alarm bell, sound and light alarms, gas release door light, and emergency start/stop button.

When the smoke and temperature detectors detect fire signals at the same time and feed them back to the fire extinguishing controller, the alarm bell and sound and light alarm are triggered together. 30 seconds after alarming, the firefighting device releases extinguishing agent, aerosol, to the protection zone for fire extinction. At the same time, the gas release door lights up.

If the alarms fail during a fire, the emergency start/stop button should be pressed manually to release extinguishing agent. This button also can work to stop releasing while a false alarm occurs.

Following Figure demonstrates the working flow of firefighting system for reference.

11. Quality Assurance Instructions

11.1 Quality Warranty Regulations

- During the quality warranty period, GSL shall provide the quality warranty service by GSL for the faults caused by the quality defect of the battery system.
- GSL provides paid services for products beyond the quality warranty period.
- Any fault that is not responsible for GSL is not within the responsibility of the quality warranty.
- During the quality warranty period, the ownership of the faulty parts replaced by GSL for free shall belong to GSL.

11.2 Exemption Scope of Quality Warranty Liability

GSL does not provide a quality warranty service for:

- Various faults caused by not using, maintaining, and repairing the products according to the provisions of this manual.
- The product has been subjected to excessive water immersion, impact, or other forms of damage exceeding its capacity to withstand.
- Without the authorization of GSL's after-sales service department and service station, the company carries out modifications, installation, assembly, and adjustments to the battery system.
- Any damage caused when a customer handles a fault in the battery system without prior authorization from GSL's after-sales department or service station.
- Quality issues arising from not using genuine parts provided by our company.
- Damage caused by using charging equipment that does not meet national standards or by non-standard charging operations.
- Damage caused by force majeure events such as earthquakes, typhoons, floods, chemical pollution, lightning strikes, hail, sandstorms, flying debris, fires, political disasters, and secondary compensation claims based on these damages.

Remark: This manual will be continuously updated and revised, but it is inevitable that there will be slight discrepancies with the actual product. Users should refer to the actual product purchased. If you encounter any problems in using the product, please contact us.