



# User Manual

**All-in-one ESS**

ESS-215F

215kW







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# Statement

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# 1 About This Manual

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## 1.1 Foreword

Dear User, This manual primarily introduces the 215kWh commercial and industrial energy storage battery integrated cabinet, covering product specifications, application scenarios, installation instructions, system maintenance, and relevant technical data. Before using this product, please carefully read this manual and operate the energy storage system according to the methods described herein. Failure to do so may result in equipment damage or personal injury.

## 1.2 Applicable Personnel

This manual is primarily intended for personnel involved in the transportation, installation, and other operations related to this product. Personnel must possess a certain level of electrical knowledge, be familiar with electrical schematics and the characteristics of electronic components, have the ability to handle unexpected incidents, and be thoroughly acquainted with the provisions of this manual.

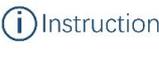
This manual is primarily intended for the following individuals:

- Sales Engineer
- Systems Engineer
- Installation and After-Sales Service Engineer
- End users

## 1.3 The Use of Symbols

To ensure the personal and property safety of users when operating this product and to enhance their efficiency in using it, this manual provides relevant information and reinforces explanations with appropriate symbols.

The following symbols may appear in this manual, with their meanings as follows:

Symbol	Explanatory Notes
	<ul style="list-style-type: none"> <li>Used to warn of emergency situations that, if not avoided, will result in death or serious personal injury.</li> </ul>
	<ul style="list-style-type: none"> <li>Used to warn of potentially hazardous situations that, if not avoided, could result in death or serious personal injury.</li> </ul>
	<ul style="list-style-type: none"> <li>Used to warn of potentially hazardous situations that, if not avoided, could result in moderate or minor personal injury.</li> </ul>
	<ul style="list-style-type: none"> <li>Used to transmit equipment or environmental safety warning messages. Failure to avoid it may result in equipment damage, loss of data, degradation of equipment performance, or other unpredictable results. “Caution” does not involve personal injury.</li> </ul>
	<ul style="list-style-type: none"> <li>Indicates additional information in the manual that emphasizes and complements the content, or may provide tips or tricks for optimal use of the product that can help you solve a problem or save you time.</li> </ul>
	<ul style="list-style-type: none"> <li>This symbol means that there is a high voltage hazard inside the product and that touching it may result in a risk of electric shock.</li> </ul>
	<ul style="list-style-type: none"> <li>This symbol means that there is a danger of high temperatures in the product and that contact should be avoided to prevent injury.</li> </ul>
	<ul style="list-style-type: none"> <li>This marking means that the product here for the protection of the ground (PE), need to be connected to the grounding wire, requires a solid and reliable connection to ensure the safety of the operator.</li> </ul>

Label 1-1 Label Explanation

For convenience of expression, abbreviations are used throughout this manual when referring to the following products.

Abbreviation	Full name
ESS	Battery Energy Storage System
BMS	High-Voltage Control Cabinet
EMS	Energy Manager
PCS	Energy Storage Converter
MPPT	Maximum Power Point Tracker
STS	Grid-Tied/Off-Grid Switch
SOC	Remaining Charge Availability Status
PV	Solar Photovoltaic
DC	Direct Current
AC	Alternating Current
SPD	Surge Protector
RCD	Leakage Current Protection
CT	Current Transformer
PE	Grounding Protection

Table 1-2 Abbreviation Reference Table

## 1.4 Instructions for Use of the Manual

Please read this manual carefully before using the product. Keep this manual and the information contained in other product components together for safekeeping and make sure it is easily accessible to the relevant personnel.

This manual is intended to help the user to quickly start up and use the battery. The information in this manual is subject to change without notice, and we reserve the right to explain the details of such change.

## **1.5 Document Version**

V1.0 (February 10, 2025) was first officially released.

# 2 Safety Information

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## 2.1 Operational Precautions

### Statement

When installing, operating, and maintaining the equipment, you must first read this manual and follow the signs on the equipment and all safety precautions in the manual. When unpacking a new product for the first time, check the product and packing list, and contact your local dealer if the product is damaged or missing parts.

The “CAUTION”, “EXPLANATION”, “WARNING” and “DANGER” in this manual are only supplementary to all safety precautions. You are also required to comply with relevant international, national, or regional standards, as well as industry practices. We are not responsible for any violation of general safety practices or safety standards in the design, manufacture, or use of the equipment.

The equipment should be used in an environment that complies with the design specifications. Otherwise, it may lead to equipment malfunction, resulting in abnormal functioning of the equipment or damage to parts, personal safety accidents, property damage, etc., which is not covered by the equipment quality warranty.

All operations, such as transportation, installation, operation, use, and maintenance of the equipment, should comply with local laws, regulations, executive standards, and customer regulatory requirements. The safety precautions in this manual are intended only as a supplement to local laws, regulations and codes.

ESSIS is not responsible if one of the following occurs:

- Damage to the equipment caused by extreme environments (earthquakes, floods, typhoons,

volcanic eruptions, etc.), force majeure, and other factors.

- Not operating under the conditions of use described in this manual.
- The installation and use environment violates relevant international, national or regional standards.
- Failure to comply with operating instructions and safety warnings in the product and documentation.
- Unauthorized disassembly, modification of the product or modification of the software code.
- Damage caused by transportation by the customer or by a third party commissioned by the customer.
- Damage caused by storage conditions that do not comply with product requirements.
- Damage caused by improper, customer or third party operation not caused by ESSIS.
- Beyond the life of the product.

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### 2.1.1 Personal Safety

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- On-site operation is strictly prohibited during installation. Installation or removal of the cable is prohibited. When the cable core comes into contact with the conductor, arcing, sparking or explosion will occur, which may result in fire or personal injury.



- When the equipment is energized, unregulated and improper operation may cause fire, electric shock or explosion, resulting in personal injury or property damage.



- It is strictly prohibited to wear conductive items such as watches, bracelets, bangles, rings, necklaces, etc. during operation to avoid electric shock burns.



- Special insulated tools must be used during operation to avoid electric shock injury or short circuit failure. The insulation voltage withstand level must meet the requirements of local laws, regulations, standards and codes.



- Special protective equipment must be used during operation, such as wearing protective clothing, insulated shoes, goggles, helmets, insulated gloves, etc.
-

## 2.1.2 Electrical Safety



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



- Unregulated and incorrect operation may cause accidents such as fire or electric shock.



- Prevent foreign objects from getting inside the equipment during operation, otherwise it may result in short-circuit failure or damage to the equipment, load power supply derating or power loss, and personal injury.



- When installing equipment that requires grounding, the protective grounding wire must be installed first; when removing the equipment, the protective grounding wire must be removed last.



- No cables are allowed to be set up to pass through the air inlet or outlet of the equipment.

## 2.1.3 Battery Safety



- It is strictly prohibited to short-circuit the positive and negative terminals of the battery, as this may result in a short-circuit of the battery. A short circuit of the battery can immediately generate a high current and release a large amount of energy, resulting in battery leakage, smoke, release of flammable gases, thermal runaway, fire, and explosion. To avoid short-circuiting of the battery, maintenance with electricity is not allowed!



- Do not expose the battery to high temperature environments or heating devices, such as high temperature sunlight, fire sources, transformers, heaters, etc. Overheating of the battery may result in liquid leakage, fumes, release of flammable gases, thermal runaway, fire or explosion.



- Mechanical vibration, dropping, collision, piercing by hard objects, and pressure shocks are strictly prohibited, otherwise the battery may be damaged or fire may result.



- It is strictly prohibited to disassemble, modify or damage the battery to avoid liquid leakage, smoke, combustible gas release, thermal runaway, fire or explosion.



- Using or replacing an incorrect battery type creates a risk of fire and explosion. Use the specified battery type recommended by the manufacturer.



- Do not allow battery terminals to come into contact with other metal objects, which may cause heat generation or electrolyte leakage.



- Battery electrolyte is toxic and volatile. In case of electrolyte leakage or abnormal odor, avoid contact with the leaking liquid or gas. Non-professionals should not approach. Contact a professional immediately to handle the situation. Professionals should wear goggles, rubber gloves, gas masks, protective clothing, etc., promptly disconnect the equipment, dismantle the leaking battery, and contact a technical engineer for treatment.



- The battery is a closed system and no gases are released under normal operating conditions. If under extreme abuse, such as under fire, pinprick, extrusion, lightning strike, overcharging or other severe conditions that may lead to thermal runaway of the battery, which may lead to breakage of the battery or abnormal chemical reaction inside the battery, which may lead to leakage of the electrolyte or generation of gases such as CO, H<sub>2</sub>, etc., the site should ensure that the measures of flammable gas emission are normal, so as to avoid leading to combustion or corrosion of the equipment.



- Gases from burning batteries can irritate eyes, skin and throat. Attention should be paid to the protective measures taken.



- The battery should be installed in the area away from liquid, and it is strictly prohibited to install it under the water pipe, air outlet and other locations that are easy to produce condensation; it is strictly prohibited to install it under the air conditioning port, vent, machine room outlet window and other locations that are easy to leak water, in order to prevent the liquid from entering into the internal equipment and causing the equipment to malfunction or short-circuit.



- When the battery is installed and tuned, it shall be equipped with fire-fighting facilities, such as fire-fighting sand, carbon dioxide fire extinguishers, etc., in accordance with the requirements of construction standards and specifications. Before putting into operation, make sure that the fire fighting facilities are in accordance with local laws, regulations and codes.

 **Warning**

- Before disassembling the packaging of the battery, during storage and transportation, it shall be ensured that the outer packaging box is intact and correctly placed according to the box marking. Inverted, sideways, vertical or diagonal placement is strictly prohibited. When stacking, it should comply with the stacking requirements on the outer packaging to avoid damage and scrapping of the battery.

 **Warning**

- After unpacking the battery, it should be placed in the required direction. Inverted, sideways, vertical, tilted or stacked is strictly prohibited, so as not to cause damage to the battery by impact or fall and scrap.

 **Warning**

- After discharging the battery, it should be recharged in time, otherwise the battery may be damaged due to over-discharge.

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## 2.1.4 Energy Storage System Security

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 **Danger**

- Do not open the cabinet door while the system is running.

 **Danger**

- Avoid standing at the cabinet door (including within the door hit) when the energy storage system fails.

 **Caution**

- Emergency evacuation from the site should be done when the fire audible alarm is triggered.

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## 2.1.5 Mechanical Safety

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 **Danger**

- Safety helmet, safety belt or waist rope should be worn for working at height, tied to firm and sturdy structural parts, and it is strictly prohibited to hang on moving unsound objects or metal with sharp edges and corners, so as to prevent hooks from slipping off and fall accidents.

 **Warning**

- Tools need to be prepared and qualified by professional organizations, prohibit the use of scarred and unqualified or beyond the inspection of the validity of the tools to ensure that the tools are firm and can not be overloaded.

 **Warning**

- Before installing the equipment into the cabinet, first make sure that the cabinet has been fixed well to avoid the cabinet being tilted and collapsed due to unstable center of gravity, resulting in the installer being smashed and the equipment being broken.

 **Warning**

- When pulling the equipment out of the cabinet, be careful of equipment that may be unstable or heavy when installed in the cabinet to avoid being crushed or smashed.

 **Warning**

- Drilling holes in the equipment is strictly prohibited. Drilling holes can damage the sealing, electromagnetic shielding performance, internal devices and cables of the equipment, and metal shavings from drilling holes into the equipment can lead to a short circuit of the circuit board.

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## 2.1.6 Environmental Safety

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 **Danger**

- It is strictly prohibited to store flammable or explosive materials in the equipment area.

 **Danger**

- It is strictly prohibited to place the equipment in an environment of flammable or explosive gases or fumes, and it is prohibited to carry out any operation in such an environment.

 **Danger**

- It is strictly prohibited to place the equipment close to sources of heat or fire, such as fireworks, candles, heaters or other heat generating devices, as heat applied to the equipment may cause damage to the equipment or cause a fire.

 **Warning**

- The equipment should be installed in an area away from liquids, and it is strictly prohibited to install it under water pipes, air vents and other locations that are prone to condensation; it is strictly prohibited to install it under air conditioning outlets, vents, server room outlet windows and other locations that are prone to leakage to prevent liquids from entering the interior of the equipment and causing equipment malfunctions or short circuits.

 **Warning**

- When the equipment is in operation, please do not cover the vent, cooling system or use other items to cover to prevent high temperature damage to the equipment or fire.
-

## 2.2 Safety Instructions

### 2.2.1 General Requirement



- It is forbidden to disable the protective devices of the equipment and to ignore the warnings and precautions in the manuals and in the equipment.



- Do not open the equipment until it has been installed or confirmed by a qualified person.



- It is forbidden to touch directly, to touch other conductors through wet objects, or to touch the power supply equipment indirectly. Before touching any conductor surface or terminal, measure the voltage at the point of contact to confirm that there is no risk of electric shock.



- When the equipment is in operation, part of the inner casing is hot and there is a risk of burns, so do not touch it.



- Installation, operation and maintenance must be carried out in accordance with the procedures in the manual. No modifications, additions, or alterations to the equipment or changes to the installation sequence may be made without authorization.



- In order to connect to the power grid for operation, permission must be obtained from the national or regional power authority.



- When liquid is found to have entered the device, turn off the power immediately and prohibit further use.



- Before installing the cable, it is important to verify that the cable labeling is correctly identified and that the cable terminals are insulated and protected.



- Ensure that all electrical component protective casings, insulation sleeves and other devices are in place after installation to avoid the risk of electric shock.



- Paint scratches that occur during transportation and installation of the equipment must be repaired in a timely manner, and prolonged exposure of the scratched portion is strictly prohibited.

 Warning

- When working in the space above the top of the equipment, protection should be added to the top of the equipment to avoid damage to the equipment.

 Warning

- It is strictly prohibited to install, use and operate outdoor equipment and cables (including but not limited to carrying equipment, operating equipment and cables, plugging and unplugging signal interfaces connected to the outdoors, working at height, outdoor installation, opening doors, etc.) under severe weather such as lightning, rain, snow, wind of more than six degrees.

 Warning

- Arc welding, cutting, and other operations on the equipment are prohibited without our evaluation.

 Warning

- Use the battery within the specified temperature range. Charging is prohibited when the ambient temperature is below the lower limit of the operating temperature to avoid internal short circuit caused by low temperature charging.

 Warning

- Before installing the battery pack, the battery should be checked for either of the following two conditions. If any one of them occurs, it is considered abnormal:

 Warning

- (1): There is obvious deformation or damage to the battery pack case;

 Warning

- (2): The voltage between the positive and negative terminals of the battery pack output is not within the normal range.

 Warning

- Determine if the positive and negative battery terminals are accidentally grounded. If accidentally grounded, disconnect the battery terminals from the grounding point.

 Warning

- Do not weld, grind, or perform similar work around the battery to avoid sparking, arcing, and fire hazards.

 Warning

- It is prohibited to use equipment that does not meet the requirements of local laws, regulations and charging and discharging regulations.

 Warning

- Battery circuits should remain disconnected during installation and maintenance.

 **Warning**

- After power components of the energy storage system are replaced or wiring is changed, it is necessary to manually initiate wiring testing to avoid abnormal system operation.

 **Warning**

- Battery damage (drops, collisions, expansion bulges or case dents, etc.) may result in leakage or release of flammable gases; do not use damaged batteries. When the battery is damaged by liquid leakage, structural deformation, etc., please contact the installer or professional operation and maintenance personnel immediately for removal and replacement. Do not store damaged batteries near other equipment or flammable materials, and keep non-professionals away from damaged batteries.

## 2.2.2 Personnel Requirements

 **Warning**

- Personnel responsible for the installation of the equipment and maintenance of the equipment must first be rigorously trained in the correct methods of operation, be aware of the various safety precautions, and be aware of the relevant standards of the country/region in which the equipment is located.

 **Warning**

- Only qualified professionals or trained personnel are allowed to install, operate and maintain the equipment.

 **Warning**

- Personnel for special scenarios such as electrical operation, work at heights, and operation of special equipment must have special operating qualifications required by the local country/region.

 **Warning**

- Only qualified professionals are allowed to remove safety devices and service equipment.

 **Warning**

- Replacement of equipment or parts (including software) must be done by qualified or authorized personnel.

 **Warning**

- Do not approach the equipment by persons other than those who will be operating it.

## 2.2.3 Environmental Requirements

 **Warning**

- When installing the equipment, please make sure that the mounting surface is solid and meets the load-bearing requirements of the equipment.

 Warning

- The installation and use environment must comply with local laws and regulations as well as relevant international and regional standards for lithium battery products. The person using this equipment is obliged to protect it from fire or other damage.

 Warning

- In areas where natural disasters such as floods, mudslides, earthquakes, typhoons, etc. are frequent, appropriate precautions need to be taken.

 Warning

- The temperature and humidity environment in which the equipment is stored should be suitable, stored in a clean, dry, well-ventilated area, and protected from dust and condensation.

 Warning

- Installation environment ground is solid, no rubber soil, weak soil or easy to sink and other adverse geology, it is strictly prohibited to choose easy to accumulate water, easy to accumulate snow and other low-lying areas, the site level should be higher than the highest historical water level in the region. When installing, operating and maintaining the equipment, it is necessary to clean the top of the water, ice and snow or other debris before opening the door, so as to avoid debris falling into the interior of the equipment. When installing the equipment, make sure the mounting surface is solid and meets the equipment's load-bearing requirements.

 Warning

- Do not place the equipment near sources of heat or fire, such as smoke, candles, heaters or other heating devices. Heating the equipment may cause damage to the equipment or cause a fire.

 Warning

- It is strictly prohibited to store flammable or explosive materials in the equipment area.

 Warning

- When the equipment is in operation, do not block vents, cooling systems, or use other items to cover the equipment to prevent heat damage to the equipment or ignition.

 Warning

- Installation, use and operation of outdoor equipment and cables (including, but not limited to, handling equipment, operating equipment and cables, plugging and unplugging signal interfaces connected to the outdoors, overhead, etc.) are strictly prohibited in inclement weather such as lightning, rainfall, heavy snowfall, strong winds. work, outdoor installation, etc.).

 Warning

- It is strictly prohibited to install the equipment in direct sunlight, dust,

fumes, volatile gases, corrosive gases, infrared radiation, high organic solvents or salts.



- Site selection should be in accordance with local laws, regulations and relevant standards.



- The equipment should be installed in an area away from liquids, and it is strictly prohibited to install it under water pipes, air outlets and other locations that are prone to condensation; it is strictly prohibited to install it under air conditioning outlets, vents, server room outlet windows and other locations that are prone to water leakage to prevent liquids from entering the interior of the equipment and causing equipment malfunctions or short circuits.

## 2.2.4 Grounding Requirements



- When installing equipment requiring grounding, the protective ground wire must be installed first; when removing equipment, the protective ground wire must be removed last.



- The equipment shall be permanently connected to the protective ground. Before operating the equipment, check the electrical connections of the equipment to ensure that it is properly grounded.



- It is prohibited to install a grounding conductor to operate the equipment.



- Damage to the grounding conductor is prohibited.



- In the case of high contact current equipment, the protective earth terminal of the equipment enclosure must be grounded before connecting the input power supply to prevent electric shocks to humans from the contact current of the equipment.

## 2.2.5 Wiring Requirements



- Cables must be selected, installed and laid in accordance with local laws and regulations.



- All cables must be securely connected, well insulated and have appropriate specifications.

 **Warning**

- Use of cables in hot environments may cause deterioration and damage to the insulation. The distance between the cable and the periphery of the heating unit or heat source area should be at least 30mm.

 **Warning**

- Cables of the same type should be tied together with a straight and neat appearance and without skin damage; cables of different types should be laid separately and entanglement or cross-laying is strictly prohibited.

 **Warning**

- Cable grooves and over-wire holes should be free of sharp edges, and the location of cable penetration pipes or over-wire holes should be protected to avoid damage to cables by sharp edges and burrs.

 **Warning**

- When wiring is completed or when leaving during the wiring process, sealing mud should be used immediately to seal the cable opening to avoid water vapor and small animals from entering.

 **Warning**

- When holding the veneer or module with exposed circuit board, you must hold the veneer or module edges that do not contain components, and it is prohibited to touch the components with your hands.

 **Warning**

- The disassembled veneer or module must be packaged with anti-static packaging material before storage or transportation.

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## 2.2.6 Maintenance Requirements

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 **Warning**

- If the device has multiple inputs, disconnect all inputs to the device and wait until the device is completely powered down before operating the device.

 **Warning**

- When installing and maintaining the battery, it is necessary to wrap the exposed cable terminals on the battery with insulating tape.

 **Warning**

- When maintaining the power or distribution equipment at the back stage of the power supply equipment, it is necessary to disconnect the corresponding output switch of the power supply equipment.

 **Warning**

- When maintaining the equipment, hang a “No Closing” sign on the upstream and downstream switches or circuit breakers, and post warning signs to prevent accidental connections. Troubleshooting must be completed before power is restored.

 Warning

- When troubleshooting and diagnosing a problem, the following safety measures must be completed if a power outage is required: power outage > power test > installing grounding wire > hanging signs and installing shields.

 Warning

- Please check the equipment connection terminal screws regularly to make sure they are tightened and not loose.

 Warning

- Avoid foreign objects (e.g. conductive objects, screws, liquids, etc.) from entering inside the battery and causing a short circuit.

 Warning

- If the cables are damaged, they must be replaced by a professional to avoid risks.

 Warning

- It is strictly prohibited to artificially alter, damage or cover up the markings and nameplates on the equipment, and promptly replace markings that have become unclear due to long-term use.

 Warning

- Solvents such as water, alcohol or oil are prohibited to clean the electrical parts inside and outside the equipment.

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## 2.2.7 Recycling Requirements

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 Warning

- Please dispose of used batteries in accordance with local laws and regulations, and do not dispose of batteries as household waste.

 Warning

- If the battery is leaking or bulging and cannot be used beyond its service life, please contact technical support or a battery recycling company for disposal.

 Warning

- Faulty batteries are prohibited from secondary use and must be disposed of as soon as possible by contacting a battery recycling company to avoid environmental pollution.

 Warning

- Avoid exposing the battery to high temperature or direct sunlight.

 Warning

- Avoid exposing the battery to high humidity or corrosive environment.
-

# 3 Products

## 3.1 Product Description

The product introduced in this manual is the ESS-215F

No.	Acronym	Description
1	ESS	Abbreviation for ESSIS
2	215	Nominal energy 215 kWh
3	F	Cooling is air-cooled

Table 3-1 Product Name Specifications

1. This product primarily includes the Pack, BMS high-voltage control cabinet, PCS, STS (optional), MPPT (optional), power distribution modules, fire protection system, and air conditioning system.
2. The fire protection system incorporates smoke detectors, temperature sensors, water immersion sensors, aerosol detectors, explosion-proof valves, and other fire safety measures to enhance overall safety.
3. This product incorporates an EMS energy manager for efficient and reliable energy management. It supports remote monitoring and firmware upgrades via Ethernet connection to a host computer or 4G network access.
4. This product features multi-level protection devices including circuit breakers, fuses, and surge protector to ensure personal safety and equipment security.

### 3.2 Overall appearance

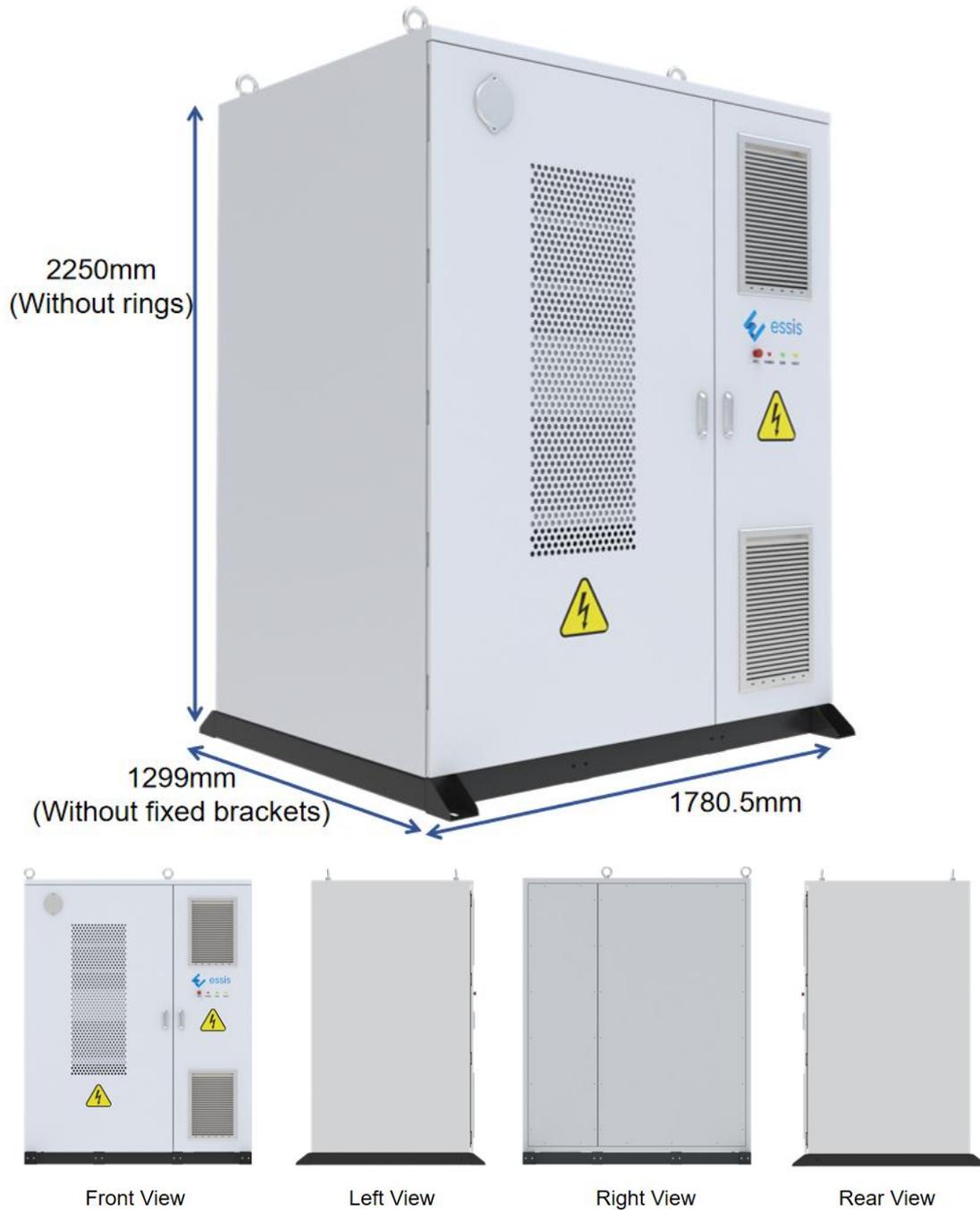


Figure 3-2 Appearance and Dimensions

### 3.3 Component Introduction



Figure 3-3 Component Overview (Door Closing)

NO.	Model	Description
1	Explosion-proof valve	Prevent leakage of gases or liquids from the enclosure
2	Air conditioner	Air conditioning exhaust outlet and duct intake
3	Emergency stop button	Emergency stop for energy storage systems
4	Red indicator light	Power status indicator: illuminates upon power-up
5	Green indicator light	Normal operation indicator: illuminates during normal operation
6	Yellow indicator light	Fault indicator: illuminates during equipment malfunction

\*Note: Do not operate the emergency stop button except in emergencies.

Table 3-4 Component Overview (Door Closure)



Figure 3-5 Component Overview (Door Opening)

NO.	Model	Description
1	Pack	The battery pack is a combination of cells connected in series, featuring a pair of positive and negative terminals for external input and output.
2	Air Conditioner	Regulates battery operating temperature to ensure optimal performance.
3	BMS	Collects battery data and controls charging/discharging processes.
4	Fan	Dissipates heat from the control side via louvered vents to maintain stable temperatures.
5	MPPT	Boosts photovoltaic power for battery and PCS supply while enabling maximum power point tracking.
6	PCS	Supports bidirectional AC/DC conversion.
7	Display Screen	Displays status and parameters of all equipment within the cabinet
8	STS	Enables automatic rapid switching between grid-connected and off-grid modes

NO.	Model	Description
9	Cabinet Control Switch	Controls power supply to 24V systems, fans, air conditioners, ventilation units, and overhead lighting within the cabinet
10	PV Isolation Switch	Provides isolation for the PV side
11	Grid Switch	Provides isolation and protection for the grid side
12	Load Switch	Provides isolation and protection for the load side

Table 3-6 Component Overview (Door Opening)



Figure 3-7 Cabinet Control Switch Overview

Introduction to BESS Cabinet Control Switches		
1	QF1	24V Auxiliary Power Master Switch
2	QF2	Fan Power Master Switch
3	SPD	Surge Protector
4	QF3	Air Conditioner Power Master Switch
5	QF4	Ceiling Light Power Master Switch
6	QF5	Fan Power Master Switch
7	MATER	Three-Phase Electricity Meter

Table 3-8 Cabinet Control Switch Overview

### 3.3.1 Power Supply and Distribution System

#### 3.3.1.1 Battery PACK

This system's PACK utilizes 280Ah lithium iron phosphate battery cells, offering excellent safety, extended service life, superior temperature performance, high energy density, low cost, pollution-free modular assembly, high strength, high structural reliability, and low maintenance costs.

The PACK employs a 1P16S cell string configuration, with each unit capable of storing 14.3kWh of energy. Utilizing air-cooled thermal management and IP20 protection rating, the front panel incorporates a service access window for convenient maintenance. Its pollution-free modular assembly ensures high structural reliability and low maintenance costs.

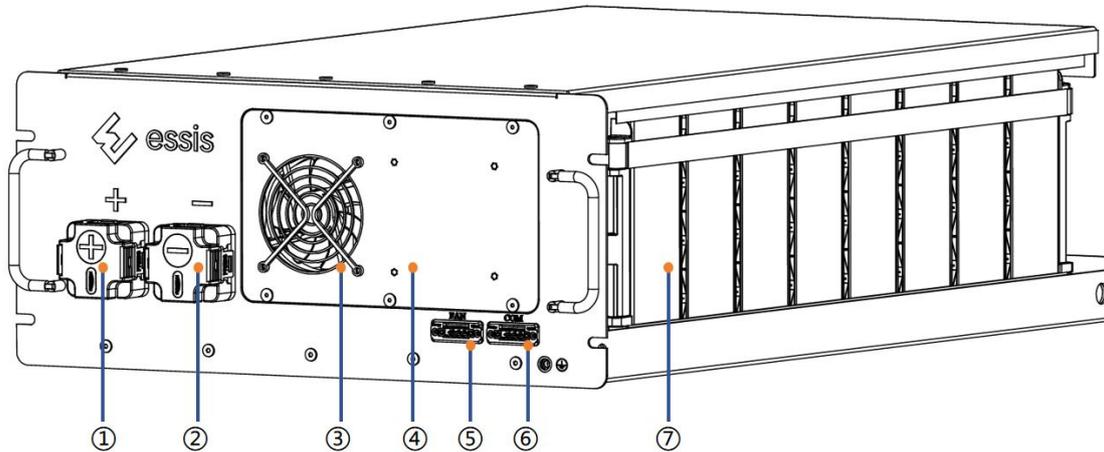


Figure 3-9 Pack Introduction

Battery Pack Introduction		
1	Positive terminal	Battery Pack External Positive Terminal
2	Negative terminal	Battery Pack External Negative Terminal
3	Fan	Airflow direction: from inside the battery pack to outside
4	Service access panel (built-in slave controller)	Quick replacement of internal fuses and secondary control box via service access panel
5	Fan power connector	Battery Pack Internal Fan Power Connector
6	Slave controller communication port	Battery Pack Secondary Control Box Communication Connector
7	Battery cell	Battery Pack Core Module, providing stored electrical power

Table 3-10 Pack Introduction

Model	ESS-R51280H
Cell Capacity	3.2V/280Ah
String Configuration	1P16S
Rated Voltage	51.2V
Supported Charge/Discharge Power	≤0.5P

Model	ESS-R51280H
Rated Charge Current	140A
Rated Discharge Current	140A
Maximum Continuous Charge Current	170A
Maximum	170A
Nominal Capacity	16.0kWh
Cooling Method	Air-cooled
Protection Rating	IP20
Operating Temperature	-35°C to +55°C
Storage Ambient Temperature	-35°C to +60°C
Transportation Ambient Temperature	-35°C to +60°C
Balancing Method	Passive balancing
Communication Interface	CAN

Table 3-11 Battery Technical Specifications

### 3.3.1.2 PCS

PCS Function: The PCS serves as a bidirectional current conversion device connecting the energy storage battery system to the grid. Its primary function is to facilitate energy exchange between the battery and the grid, controlling and managing battery charging and discharging. It enables bidirectional conversion between DC and AC, capable of converting AC to DC for battery charging, as well as converting DC to AC for supplying loads or feeding back to the grid.

The PCS in this system adopts a three-level topology with a rated output power of 105 kW.

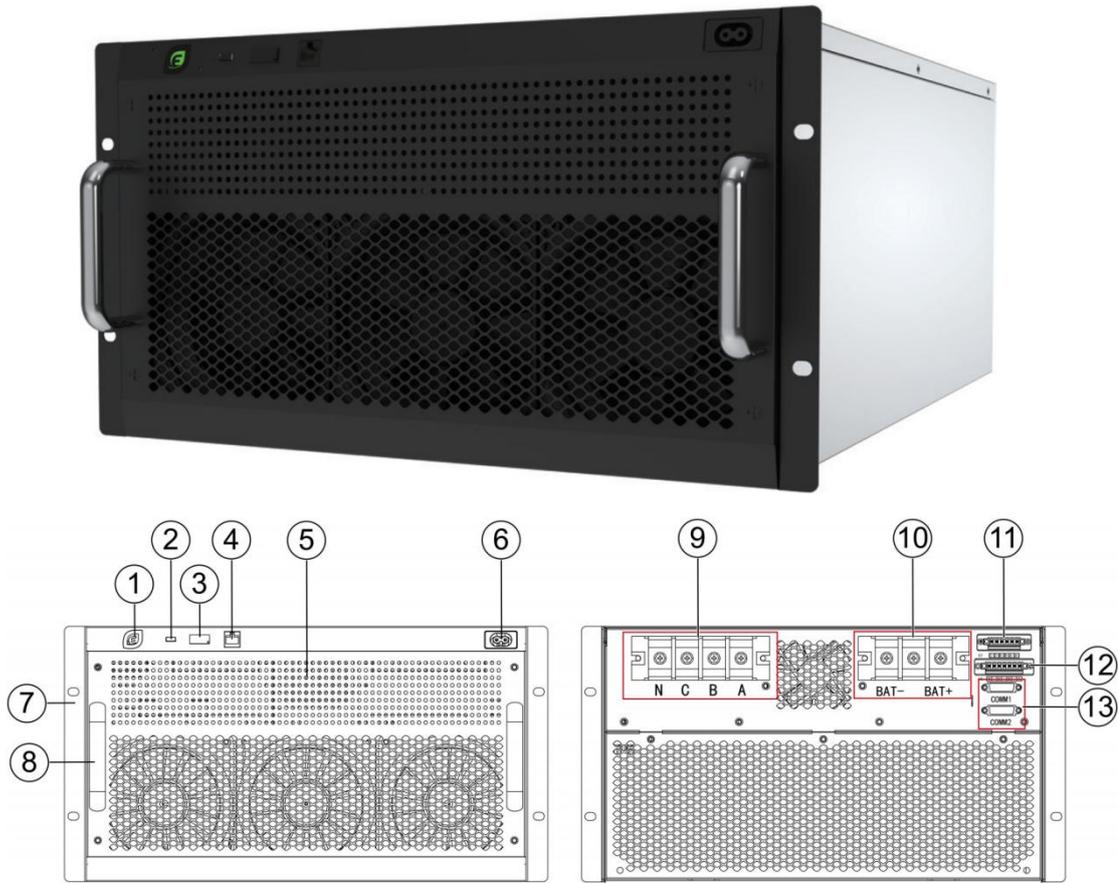


Figure 3-12 PCS Exterior View

No.	Model	Description
1	Indicator Light	<p>Green LED constantly lit during power output operation</p> <p>Green LED flashes rapidly for 0.5 seconds during standby (0kW operation)</p> <p>Green LED flashes slowly for 1 second when powered off and fault-free</p> <p>Red LED constantly lit during fault conditions</p>
2	ETH/LOCAL	Ethernet/Local debugging switch; right pull for LOCAL debugging; left pull for ETH Ethernet (reserved)
3	(IO) 6-Position DIP Switch	<p>Positions 1 and 2 used for CAN communication matching resistor connection;</p> <p>Pins 3-6: Module address setting (binary) -- Pin 6 is the least significant bit (from right to left).</p>
4	TEST Debugging Port	Factory-set backend debugging communication port (internal use only)

No.	Model	Description
5	Ventilation Port	Air duct ventilation holes, front intake/rear exhaust
6	220V Power Interface	220Vac input (internal use only)
7	Mounting Ears	Mounting ears on both sides of the module for securing it to a cabinet.
8	Handle	Rack-mount module handle (not load-bearing)
9	AC Terminal Interface	AC terminal wiring
10	DC Terminal Interface	DC terminal wiring
11	Grid Current Sampling Interface	A/B/C three-phase current input/output terminals
12	External Voltage Sampling Interface	External voltage sampling input terminal
13	Communication Port	COM (26-pin signal terminal) signal port

Table 3-13 PCS Panel Description

Technical Indicators	EPCS105
DC side	
Operating Voltage Range	615V~950V/ 650V~950V
Maximum Current	170A
AC side	
Rated Voltage	230/400V
Rated Voltage Range	±15%
Rated Frequency	50/60Hz
Wiring Method	Three-phase three-wire/Three-phase four-wire
Maintenance Method	Front maintenance/Rear maintenance
Rated Power	105kW
Maximum Power	115.5kW
Maximum Current	167A
Power Factor	0.99/-1~1
Current Distortion Rate	<3% (rated power)

Technical Indicators	EPCS105
DC Component	<0.5%
Overload Capacity	110% continuous
Maximum Efficiency	98.5%
Standard Parameters	
Altitude	4000m (Derated operation above 2000m)
Operating Temperature	-30°C to 55°C (Derated operation above 45°C)
Humidity	0%RH to 95%RH, non-condensing
Cooling Method	Intelligent air cooling
Protection Rating	IP20
Communication Method	CAN/RS485/Ethernet
Storage Temperature	-45°C~70°C

Table 3-14 PCS Parameter Table

### 3.3.1.3 BMS

The Battery Management System (BMS) serves as the intermediate unit connecting the battery cluster and the energy storage converter. It performs functions including battery cluster voltage and current acquisition, battery cluster circuit contactor control, and protection. The enclosure houses circuit breakers, contactors, fuses, pre-charge control circuits, current sensors, the Battery Cluster Control Master Unit (BCU), and switching power supplies. The integrated Battery Cluster Control Unit (BCU) features CAN and 485 communication bus interfaces, enabling communication between the high-voltage control cabinet and the energy storage battery management module, the energy storage battery management system host, the energy storage converter, and the EMS. This facilitates control, protection, and data communication functions for the energy storage battery cluster.

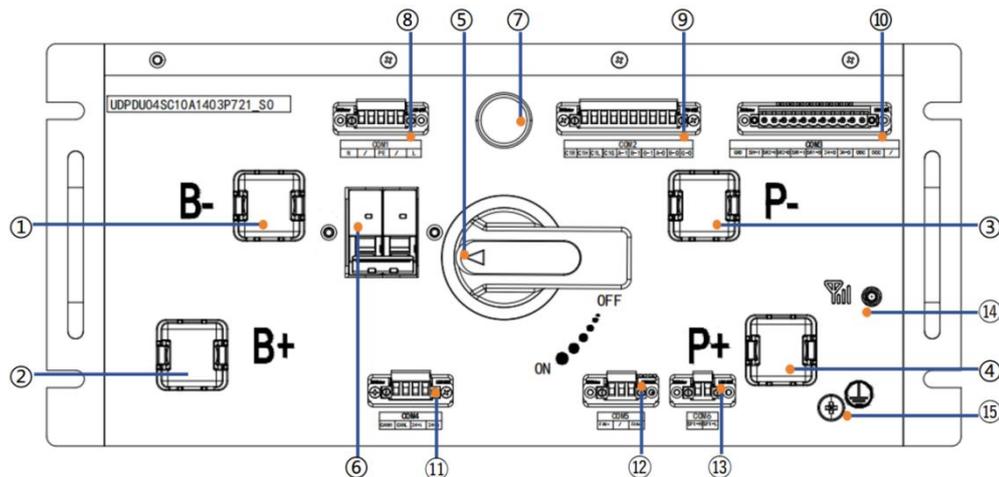


Figure 3-15 Front Panel Interface Display

No.	Name	I/O	Function Description	
1	B-	-	Battery Cluster Input Negative Terminal	
2	B+	-	Battery Cluster Input Positive Terminal	
3	P-	-	PCS Input Negative Terminal	
4	P+	-	PCS Input Positive Terminal	
5	Manual Switch	-	DC Control Cabinet Start Switch	
6	Power Switch	-		
7	Indicator Light	-		
8	COM1(5P)	N	/	External AC 220V Neutral Wire
		/	/	/
		PE	/	External AC 220V Ground Wire
		/	/	/
		L	/	External AC 220V Live Wire
9	COM2(10P)	CAN1R	I/O	Terminating Resistor
		CAN1H	I/O	Isolated CAN (Connects to PCS or External Devices)
		CAN1L	I/O	
		CAN1G	I/O	
		RS485-A1	I/O	Isolated 485 (Connects to PCS or External Devices)
		RS485-B1	I/O	

No.	Name	I/O	Function Description	
	RS485-G1	I/O	Non-Isolated 485 (Connects to Display or External Devices)	
	RS485-A0	I/O		
	RS485-B0	I/O		
	RS485-G0	I/O		
10	COM3(11P)	GND	/	
		SH-I	I	Low-side switch output 3
		SW2-I	I	Dry contact 2 (0.1A)
		SW2-O	O	
		SW1-I	I	Dry contact 1 (1A)
		SW1-O	O	
		24+O	O	Input 24V+
		24-O	O	Input 24V-
		OBC	I/O	/
		DCC	I/O	/
		/	/	/
11	COM4(4P)	CANH	I/O	Debug CANH
		CANL	I/O	Debug CANL
		24+i	I	Input 24V+
		24-i	I	Input 24V-
12	COM5(3P)	FAN+	I	Fan input
		/	/	/
		FAN-	O	Fan output
13	COM6(2P)	SPI-H	I/O	Slave control CANL
		SPI-L	I/O	Slave control CANH
14	Signal Interface	-		
15	Grounding	-		

Table 3-16 High-Voltage Box Front Panel Interface Description

### 3.3.1.4 MPPT

MPPT Function: Supports MPPT mode for connecting photovoltaic panels to achieve maximum power point tracking, enhancing panel conversion efficiency. This module features overcurrent protection, overtemperature protection, low-side over/under-voltage protection, high-side over/under-voltage protection, overpower protection, low-side short-circuit protection, and reverse connection protection. The DC input voltage on the PV side must be lower than the battery system's minimum voltage, meaning the MPPT module connects to the battery on the high-voltage side and to the photovoltaic panels on the low-voltage side.

Supports optional configuration of 0 to 3 units based on customer requirements for PV panel integration.

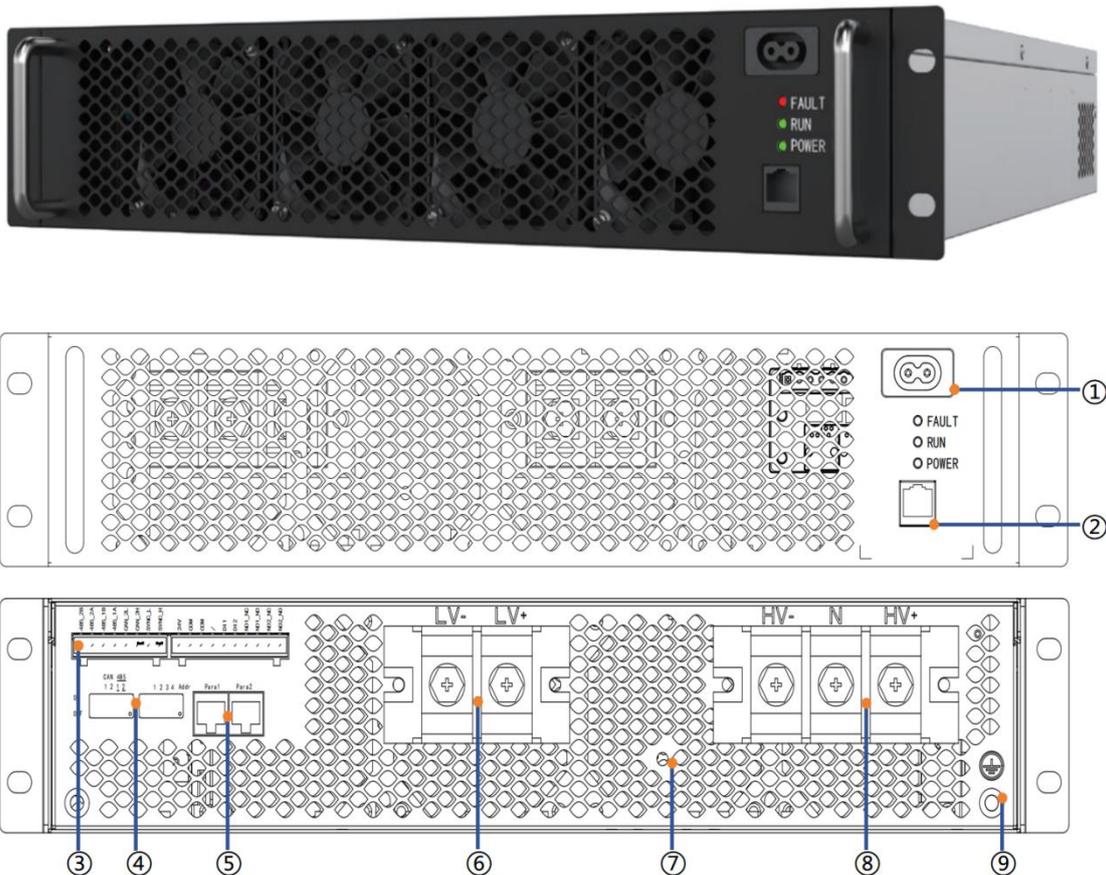


Figure 3-17 MPPT Exterior View

No.	Model	Description
1	Power Supply Debugging	220V Debugging Power Supply Interface
2	Debugging Port	Debugging Ethernet Port for troubleshooting
3	Signal Terminal	For communication
4	DIP Switch	For setting module address and connecting 485/CAN matching resistors.
5	Parallel Operation Interface	For module parallel operation.
6	Low-Voltage Side Interface	Low-voltage side wiring.
7	Surge Protection Grounding Screw	This screw must be loosened during withstand voltage testing.
8	High-Voltage Side Interface	High-voltage side wiring.
9	Grounding Screw	For connecting ground protection.

Table 3-18 MPPT External View

### 3.3.2 Safety System

#### 3.3.2.1 Fire Protection System

This system is equipped with a secure, efficient, and reliable security system and fire suppression system. In the event of a fire, it can automatically activate and immediately extinguish the flames.

Detectors (built-in smoke detectors and heat detectors) and fire suppression agents are installed at the top of the battery compartment. When either of the two detectors in the detection unit detects an anomaly, the system will cease operation and report this anomaly. Detection by both sensors triggers the release of extinguishing agents. The explosion-proof valve opens to suppress the fire, while the extinguishing agent feedback signal is transmitted to the EMS. The EMS can then relay this information to the site monitoring center or the user.

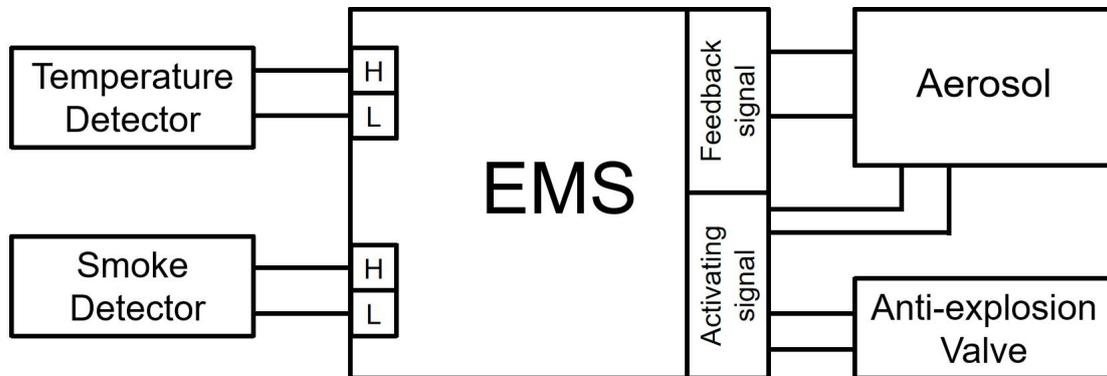


Figure 3-19 Fire Protection System Control Diagram

Maintenance of fire protection systems must comply with the fire safety regulations and ordinances of the country or region where the project is located.

Fire protection equipment should be inspected and maintained regularly to ensure all functional parameters remain within normal operating ranges.

### 3.3.2.1 Security System

Water immersion sensor: A water immersion sensor is installed at the bottom of the electrical compartment. When the sensor detects an anomaly, the system will cease operation and report the incident.

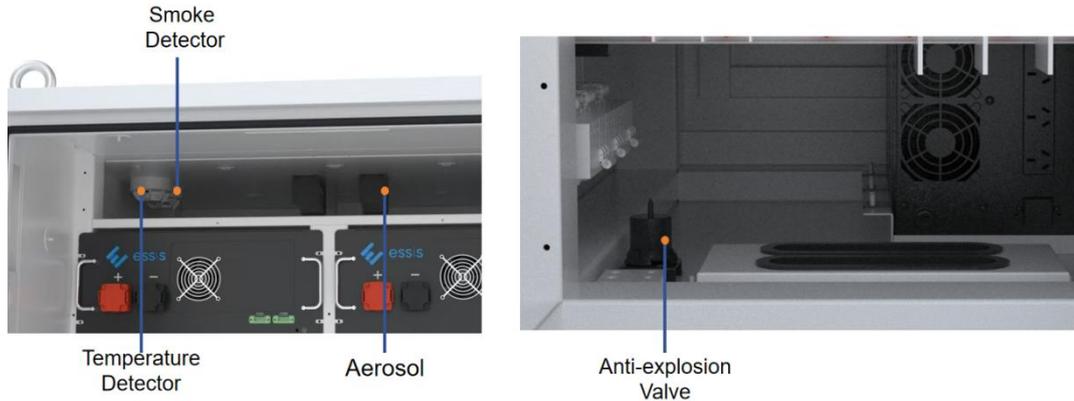


Figure 3-20 Security System Overview

## 3.4 Working Principle

### 3.4.1 Circuit Block Diagram

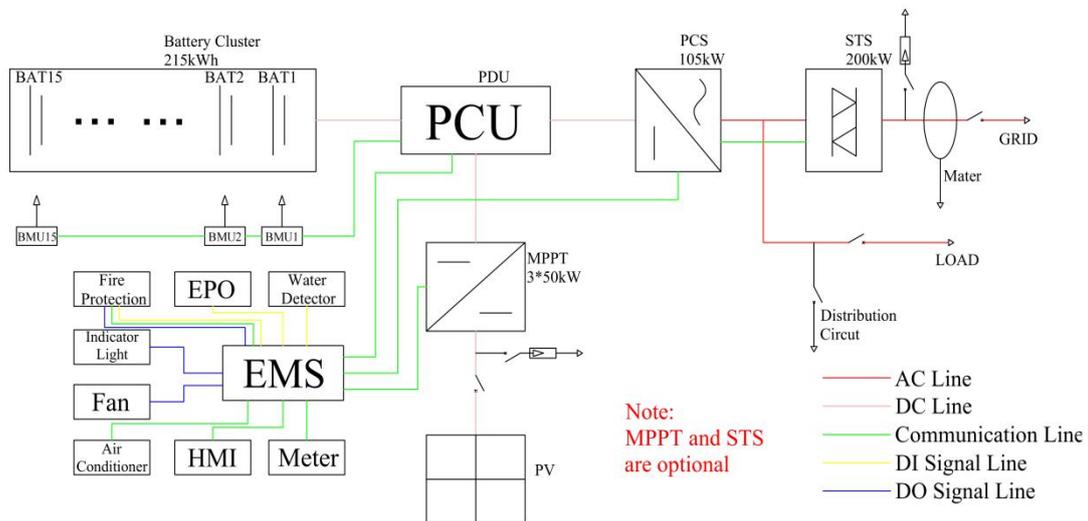


Figure 3-21 Circuit Block Diagram

### 3.4.2 Device Status

The energy storage system has a variety of device states, namely: running, standby, and shutdown.

Device status		Clarification
Run	Charge	Energy storage system is charging
	Discharge	Energy storage system is discharging
Pragmatic		Energy storage system initialization self-test process
Turn off	Abnormal Shutdown	The energy storage system enters a shutdown state due to a fault
	Command Shutdown	The energy storage system receives a shutdown command and the energy storage system enters a shutdown state.

Table 3-22 Device Status Table

# 4

## Site Preparation And Installation



- Violent loading and unloading is prohibited, otherwise it may lead to short circuit, damage (liquid leakage, rupture, etc.), fire or explosion of the battery.



- During battery installation, pay attention to the positive and negative terminals. It is strictly prohibited to short-circuit the positive and negative terminals of individual battery packs or batteries, otherwise it may lead to short-circuiting of the battery and cause fire hazard.



- During the battery installation process, it is strictly prohibited to place installation tools, metals and other conductive substances on the battery. After the battery installation is completed, clean the battery and surrounding items in time to prevent short circuit.



- It is forbidden to handle the battery through its terminals, bolts or cables to avoid damaging the battery.



- After unpacking the battery, it should be placed in the required direction. It is strictly prohibited to invert, incline, tilt or stack the battery to avoid collision or fall that may cause damage to the battery.



- In case of bad weather, such as heavy rain, fog, strong wind, etc., installation should be stopped.

### 4.1 Haulage

The entire energy storage system's cabinets and modules are transported as a single unit, meaning the battery modules are secured to the cabinets for collective shipment. When transporting the energy storage cabinets as a whole is impractical, the cabinet bodies and battery

modules may be shipped separately. Observe the markings on the packaging boxes during cabinet transportation and storage. The energy storage system employs a modular design to facilitate equipment positioning and transportation.

Each energy storage cabinet undergoes rigorous inspection and testing prior to shipment. During transportation and handling, exercise extreme caution to prevent damage to the control system's electrical components. Before unpacking, position the energy storage cabinet as close as possible to the installation site. Maintain the cabinet in an upright position throughout the entire handling process.

## 4.2 Pre-installation Inspection

Before opening the Energy Storage System components, inspect the outer packaging for visible damage, such as holes, cracks, or other signs of possible internal damage, and check the model number. If you find any abnormalities in the packaging or a mismatch in the model number, do not open it and contact your dealer as soon as possible.

In addition to the exterior inspection, the following inspections should be performed

- Check that the product nameplate data is consistent with the ordering contract, e.g. product model, rated capacity, voltage class, etc;
- Check that the factory documentation and accessories are complete;
- The battery modules of the energy storage cabinet for deformation and looseness;
- The inverter cabinet for deformation, paint loss and looseness;

If you notice any of these problems, please contact your dealer and provide a report.

## 4.3 Installation Environment

Before installation, make sure that the installation environment meets the following requirements:

Category	Requirement
Installation Site Requirements	Good ventilation, large air volume, avoid direct sunlight, avoid strong magnetism, strong light, dust and other places.
	The air inlet and outlet must be professionally treated against rain, wind, sand and dust.
	Necessary fire, water and rodent-proof treatment
	Ground surface inclination $\leq 1^\circ$ , seismic capacity $> 8$ level
Foundation Requirements	The installation surface must be flat and dry, and the ground is strictly prohibited from stagnant water.
	The bottom of the pit of the equipment foundation must be compacted and filled.
	The foundation must be higher than the highest water level in local history and at least 300mm above the horizontal ground.
	It is strictly prohibited to disturb the equipment foundation after excavation by soaking water, if soaking water is disturbed, the excavation should be continued and refilled.
	The foundation design should take into account the installation and operation and maintenance scenarios, and reserve the access and space for forklift trucks.
	The leveling error between the equipment foundation and the cabinet contact surface is $\leq 3$ mm.
	Ensure that the ground level is not shaking and can carry the weight of the energy storage equipment.
Space Requirements	Enough space must be left in front, back, left, right and above the equipment for ventilation, maintenance and escape.
Temperature Requirements	$-20\sim+50^\circ\text{C}$
Humidity	$\leq 95\%$ , condensationless
Altitude	$\leq 2000\text{m}$

Table 4-1 Installation Requirements



- Do not install the equipment in a place where it will interfere with the working and living environment, because the equipment generates noise during normal operation.

## 4.4 Preparation of Tools and Instruments

Phillips Insulated Screwdriver	Insulation torque wrench
Diagonal Nose Pliers	Wire Strippers
Wire Cutting Pliers	Art Knife
Insulation tape	Multimeter
Steel tape measure	Heat Shrink Tubing
Insulated ladder	Power forklift (load capacity >4T)
Insulated gloves	Safety helmet
Insulated shoes	Goggles

Table 4-2 Preparation of Installation Tools and Instruments

## 4.5 Space Requirements



- The installation space of the storage cabinet should be kept at an appropriate distance from the surrounding walls to ensure easy opening and closing of the door, smooth insertion and removal of modules, normal heat dissipation, and to leave enough space for users to operate.

The front and rear sides of the energy storage cabinet should not be placed flush against walls. To ensure proper operation, maintain a reasonable distance between these sides and any adjacent walls. The distance between the front door of the energy storage cabinet and any obstacles should be maintained at 1500 millimeters or more to ensure sufficient maintenance space for opening the cabinet door for maintenance and battery module removal. The distance between the front edge of the rear door and any obstacles should be maintained at a minimum of 1000 millimeters. This not only guarantees necessary maintenance space but also ensures adequate heat dissipation space for the rear air conditioning unit.

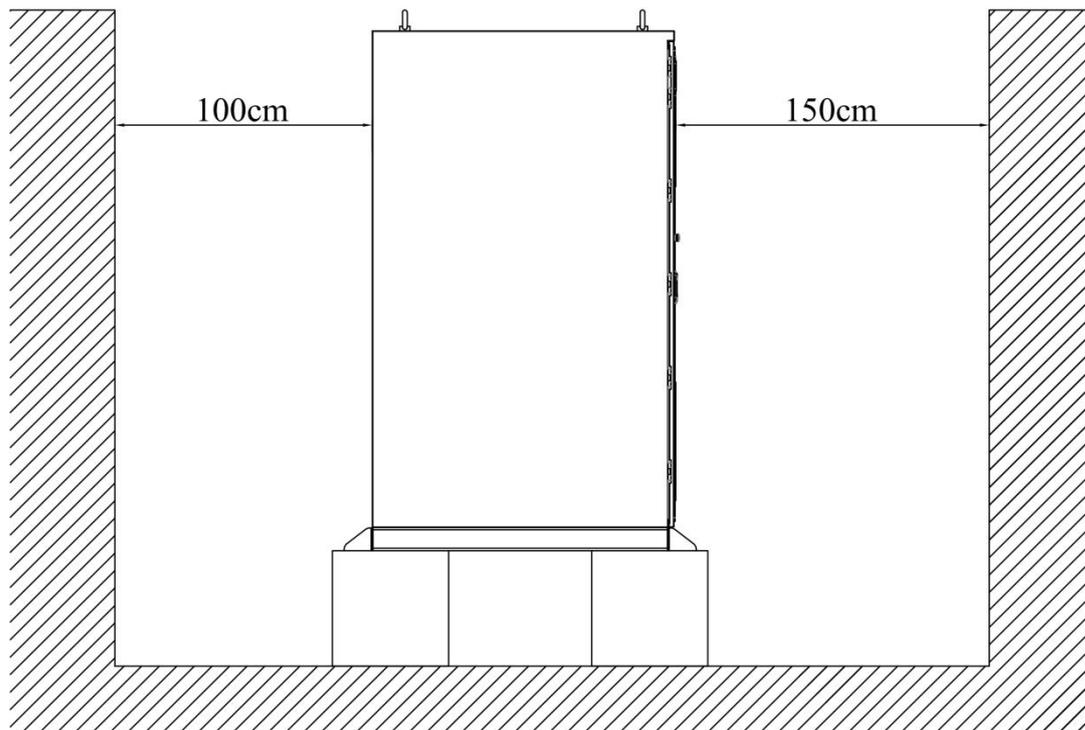


Figure 4-3 Storage Cabinet Space Requirements

## 4.6 Installation Of Energy Storage Cabinets

Step 1: Dismantle the outer packaging of the energy storage cabinet and remove the paper transportation guidelines pasted on the side of the cabinet;

Step 2: Take away accessories, information and other attachments and keep them in a safe place;

Step 3: Use the crane to lift the energy storage cabinet, transport the energy storage cabinet to the nearest location to the installation site, before lifting, please check whether the lifting ring on the top of the energy storage cabinet is stable;

Step 4: Remove the bottom forklift limit stop, keep the door closed and move the energy storage cabinet to the designated location.

Step 5: Use screws (supplied with the box) to fasten the ground adapter.



**Warning**

- Do not remove the forklift limit plates while suspended in the air. Make sure that the energy storage cabinet is placed on the ground before removing the forklift limit plates.

**Warning**

- Please make sure that the foot adapter is installed correctly and check whether the screws (supplied with the box) are tight to prevent the cabinet from being tipped over and damaged due to extreme conditions such as earthquakes.

**Warning**

- Ramps prohibit the use of a hand forklift to move the cabinet.

**Warning**

- Use only powered forklifts to transport cabinets on inclined surfaces. Power forklift trucks must have sufficient power and a stable center of gravity during inclined transport to ensure safe handling.

**Warning**

- Forklift arms must be positioned in the center of the energy storage cabinet and must extend out of the cabinet.

**Notice**

- Forklift limit stops are used for forklift arm limiting and preventing cuts to the energy storage cabinet, allowing for collision deformation and paint loss, and will be removed subsequently.

**Notice**

- When the energy storage system is not smooth, leveling shims (supplied with the box) can be used for leveling before fixing.

## 4.7 Installation of Protective Earth Wires

Install the storage cabinet grounding cable and connect it to the customer side grounding grid.

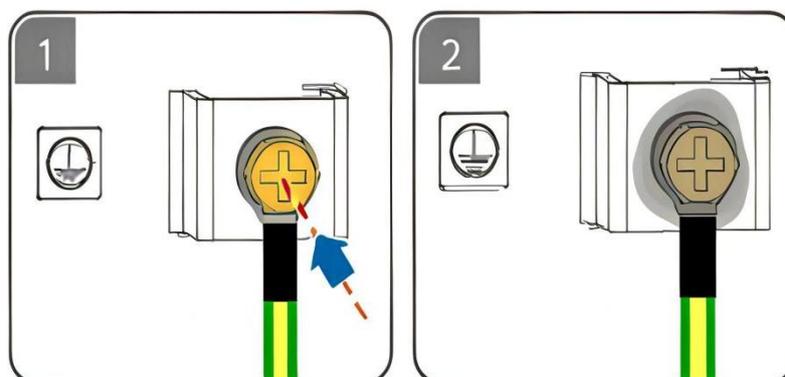


Figure 4-4 Grounding Cable Installation

# 5

## Powering Up the Energy Storage System

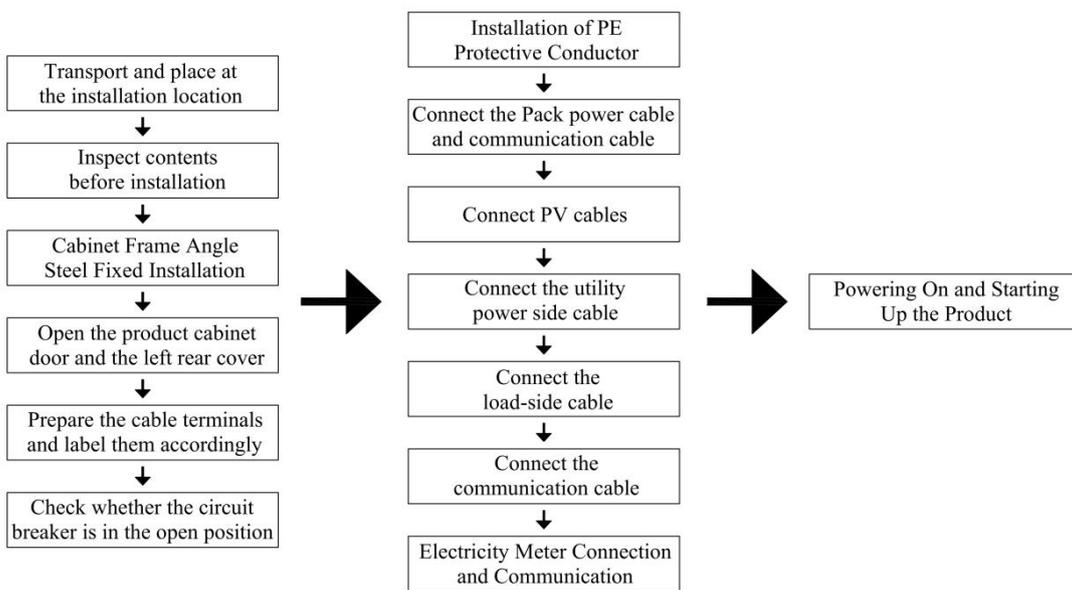


Figure 5-1 System Power-Up Sequence

## 5.1 Pre-power-up inspection

No.	Inspection items	Standard
1	Cabinet	Appearance of the equipment is intact, no damage, no rust and no paint falling off. If there is any paint falling off, please
		Carry out the operation of replacing paint.
		The label of the equipment is clearly visible, damaged labels should be replaced in time.
		The cabinet is level and the doors can be opened normally.
		The cabinet is properly grounded according to the requirements of the power distribution system.
		The number and location of accessories meet the design requirements.
2	Disconnect switch	Labeling is correct, clear and complete.
3	Cables	The disconnecting switch is in the tripping position.
4	Foreign objects	Cable mounting bolts have been tightened, and cable pulling is not loose.
5	Subcomponents	Remove all foreign objects in the cabinet, such as tools, installation residual materials, etc.
6	Touch Panel	There is no damage to the appearance of each subcomponent.

Table 5-2 Pre-Power-Up Checklist

## 5.2 Power-on Operation

---

 **Danger**

- Please wear insulated gloves and use insulated tools to avoid electric shock injury or short circuit failure.
- 

 **Warning**

- During operation, it must be ensured that the positive and negative terminals are not overlapped, so as to prevent short circuits.
- 

 **Caution**

- Observe the power-up process at the same time, and immediately power down the energy storage system when abnormal phenomenon is found, and find out the reason and solve it before continuing to power up.

 **Caution**

- If the battery is discharged or over-discharged during the installation and testing of the system, please replenish the battery in time, otherwise the battery may be damaged due to over-discharge.

 **Caution**

- If the energy storage system has not been in operation for more than half a year after assembly, it should be inspected and tested by professional personnel before it is put into operation.
- 

**Notice**

- Before the energy storage cabinet is powered up and operated for an extended period of time, remove the desiccant from the cabinet and dispose of it in accordance with the applicable waste disposal act for the location where it is installed. If the energy storage cabinet is powered up and then powered down for a short period of time, keep the desiccant inside the cabinet.
-

## Step 1: Angle steel fixing

After transporting this outdoor cabinet to the installation location, it must be secured in place. The product's base features four mounting brackets with angle iron brackets pre-installed at the front and rear for secure attachment.



Figure 5-3 Angle Steel Display

- Installation Steps

- (1) Mark the drilling location with a marker pen.
- (2) Select a drill bit matching the expansion bolt's outer diameter specification. Drill holes according to the bolt length (slightly deeper than the bolt length) until the required installation depth is reached.
- (3) Insert the expansion bolt into the hole. Screw the nut onto the bolt end and tighten it with a wrench.

## Step 2: Preparing for Wiring

- Wear insulated gloves, safety goggles, insulated shoes, and protective clothing. Use insulated tools to prevent electric shock or short circuits.

- The following tools may be required during wiring and should be provided by the customer:  
Phillips screwdriver, wire stripper, heat gun, multimeter, hydraulic pliers, flathead screwdriver, torque wrench, drill, hex socket wrench, tape measure.

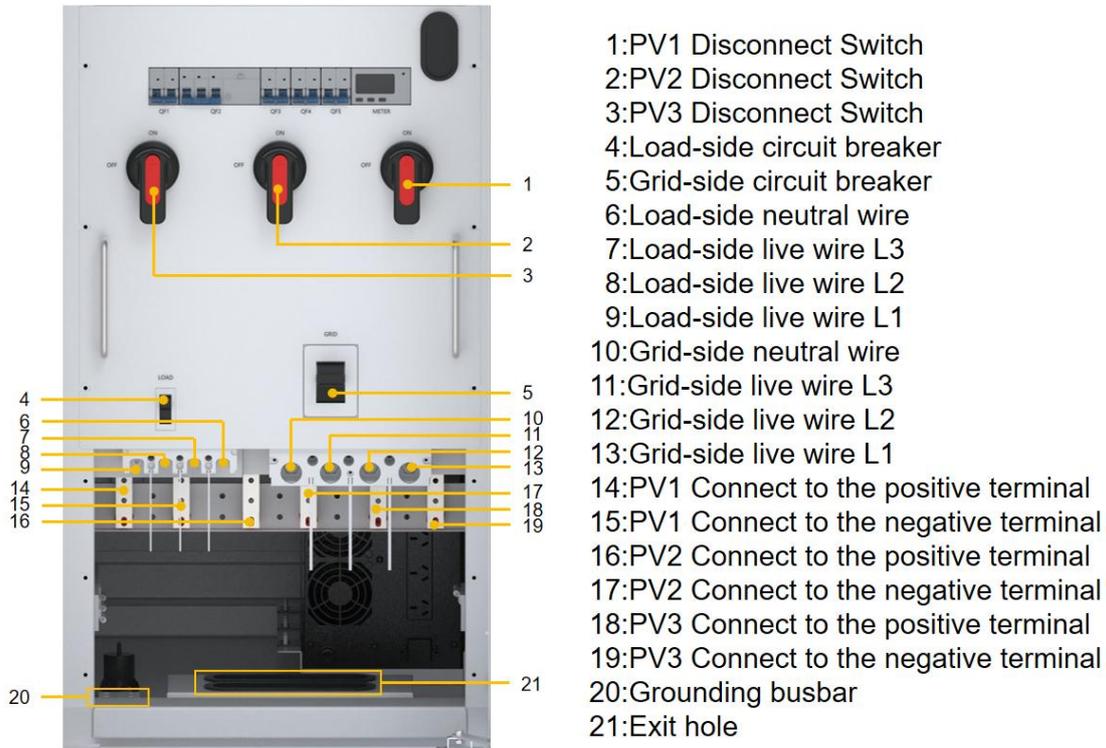


Figure 5-4 Control Panel Display

The requirements for cables and terminals are as follows:

No.	Type	Wiring Specifications	Terminal Specifications
1	LOAD	1AWG	SC50-8
2	GRID	0AWG	SC50-8
3	PV1	4AWG	SC25-8
4	PV2	4AWG	SC25-8
5	PV3	4AWG	SC25-8
6	PE	1AWG	SC50-8

Table 5-5 Recommended Cables and Terminals

The selected cables must meet the following requirements:

- The current-carrying capacity of a conductor includes but is not limited to the following factors:

- 1) Environmental conditions
  - 2) Type of conductor insulation material
  - 3) Cable installation method
  - 4) Cable material and cross-sectional area
- Cable diameter must be selected based on maximum current-carrying capacity, with sufficient length allowance.
  - Three-phase AC output cables must be of identical specifications and material.
  - Flame-retardant cables must be used.
  - All cables employed must comply with local legal and regulatory requirements.

### Step 3: Cable Connection

If copper cables are selected, the connection sequence for wiring components is as follows:

- Strip the insulation from the cable end. The stripped length should be equal to the crimping depth of the terminal plus approximately 2-3mm.
- Install heat-shrink tubing over the cable end. Insert the exposed copper core of the stripped wire into the crimping hole of the terminal (OT/DT terminal).
- Use hydraulic crimping pliers to securely crimp the copper terminal;
- Slide the heat-shrink sleeve over the copper terminal (OT/DT terminal) until it fully covers the crimping hole. Use a heat gun to shrink the sleeve tightly.

Wiring Method	Wiring Procedure
GRID Wiring	<ol style="list-style-type: none"> <li>1. Set the GRID AC circuit breaker to the OFF position and use a multimeter's AC voltage setting to verify the terminals are de-energized.</li> <li>2. Route the cable through the entry hole into the AC wiring area of the electrical cabinet.</li> <li>3. Ensure the AC cables are connected in the correct sequence: L1, L2, L3, N.</li> <li>4. Use wire strippers to remove the cable insulation, exposing the copper conductors.</li> <li>5. Crimp the OT terminals.</li> <li>6. Secure the OT terminals to the cable entry holes using M10 bolts, tightening to 18 N/m torque.</li> <li>7. After wiring, gently pull the cables to ensure sufficient slack remains.</li> </ol>

Wiring Method	Wiring Procedure
LOAD Wiring	<ol style="list-style-type: none"> <li>1. Set the LOAD AC circuit breaker to the OFF position and use a multimeter's AC voltage setting to verify the terminals are de-energized.</li> <li>2. Route the cable through the entry hole into the AC wiring area of the electrical cabinet.</li> <li>3. Ensure the AC cable connections follow the correct sequence: L1, L2, L3, N.</li> <li>4. Use wire strippers to remove the cable insulation, exposing the copper conductors.</li> <li>5. Crimp the OT terminals.</li> <li>6. Secure the OT terminals to the cable entry holes using M8 bolts, tightening to a torque of 13 N/m.</li> <li>7. After completing the connections, gently pull the cables to ensure sufficient slack remains.</li> </ol>
PV Wiring	<ol style="list-style-type: none"> <li>1. Rotate the PV DC circuit breaker's "MPPT" switch to the OFF position. Use a multimeter set to DC voltage to verify no voltage is present at the terminals.</li> <li>2. Route the cable through the entry hole into the PV DC wiring area of the electrical cabinet.</li> <li>3. Ensure the DC cables are connected in the correct P+ and P- sequence.</li> <li>4. Use wire strippers to remove the cable insulation, exposing the copper core.</li> <li>5. Crimp using OT terminals.</li> <li>6. Secure the OT terminal to the wiring hole using an M8 bolt with a tightening torque of 13 N/m.</li> <li>7. After completing the wiring, gently pull the cable to ensure sufficient slack remains.</li> </ol>
Battery Wiring	<ol style="list-style-type: none"> <li>1. Rotate the high-voltage box circuit breaker to the OFF position. Use the DC setting on a multimeter to measure P+ and P- terminals to ensure no voltage is present.</li> <li>2. Connect all batteries in series using cables, then connect them to the B+ and B- terminals of the high-voltage box.</li> <li>3. Ensure the DC cables are connected to P+ and P- in the correct sequence.</li> <li>4. Use wire strippers to remove the protective sheath from the cables, exposing the copper cores.</li> <li>5. Crimp the OT terminals.</li> <li>6. Secure the OT terminals to the wiring holes using M8 bolts, tightening to a torque of 13 N/m.</li> <li>7. After completing the wiring, gently pull the cables to ensure sufficient slack remains.</li> </ol>

Table 5-6 Cable Connections

Ensure wiring is strictly performed according to terminal phase sequence. After all electrical

connections are completed, conduct a thorough and meticulous inspection of the wiring.

Additionally, the following operations must be performed:



- Use fireproof and waterproof materials to tightly seal all cable entry/exit holes and surrounding gaps in outdoor cabinets. Securely lock cabinet doors and enclosures.



- After closing cabinet doors, ensure the sealing strips around the door edges do not curl!

## Step 4: Electric Meter Installation

This system's electricity meters are categorized into system meters and backflow prevention meters.

- System Electricity Meter:

Read the system's charge and discharge energy data, located within the power distribution module; no installation required by the customer.

- Anti-reverse flow meter:

Anti-reverse flow function: Detects whether current flows toward the grid and communicates with the system EMS. When grid-bound current is detected, it feeds back information to the EMS. The EMS responds by controlling the energy storage system's charging and reducing PV output.

The electricity meter is already mounted on the rail, but the current transformer still requires user installation.

Current transformer connection direction: Wire the current transformer in the P1 → P2 direction, meaning current flows from the grid → load.

Electric Meter Voltage Sampling Connection: Connect the meter's Ua, Ub, Uc, and Un terminals to the transformer's input terminals. Ensure correct phase sequence connection for A/B/C/N phases.

## Step 5: Check after wiring

After completing the wiring, to prevent equipment damage and property loss, the following items must be rechecked and measured:

- Before measurement, disconnect the battery-side and grid-side switches to ensure the PCS DC side and AC side are de-energized.
- Verify that the positive and negative connections between the battery and PCS, as well as the AC phase sequence, are correct and securely fastened. Measure the interphase resistance between the three phases; it should be in the megohm range. If it is in the kilohm range or lower, inspect the wiring.
- External control cables, grounding wires, and communication lines are properly connected.
- Grounding wire resistance is less than  $0.1\Omega$ . Cables are intact with no damage or cracks.
- Clear the installation area. No tools or foreign objects are left behind in the installation zone.
- Seal all cable entry/exit holes and surrounding gaps in outdoor cabinets with fireproof and waterproof materials.

## Step 6: Energy Storage Cabinet Startup

### **Important Notes:**

- The product may only be put into operation after confirmation by qualified personnel and approval from the local power authority.
- For products that have been out of service for an extended period, a thorough and detailed inspection of the equipment must be conducted before powering on. Only after ensuring all specifications meet requirements may power be applied.

### **Power-on Check:**

- Verify correct wiring connections
- Emergency stop button is in the released position
- Check that the surge protector is in the closed position
- Inspect ground wire connections to ensure no ground faults exist
- Use a multimeter to verify AC/DC side voltages meet startup requirements and eliminate overvoltage risks
- Ensure no tools or components are left inside the equipment
- Check for condensation (water film or droplets on surfaces). If present, activate cabinet fan ventilation until resolved

- Verify air conditioner operates without abnormal noise
- Inspect for foreign objects (e.g., loose wire ends, metal shavings) that could cause signal/power line short circuits

**Operational Procedure:**

- 1) Close “Q1” and “Q2” (BMS handle and circuit breaker) in sequence.

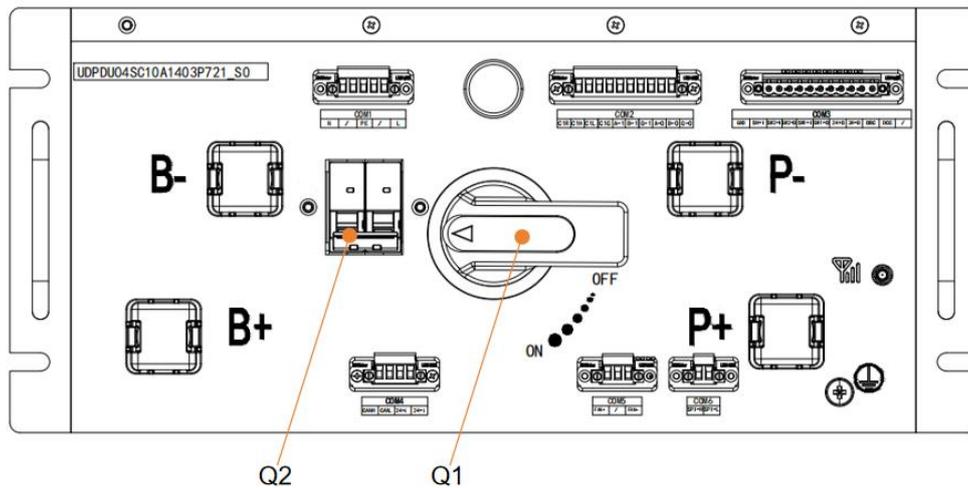


Figure 5-7 BMS Power-Up

- 2) Close the secondary circuit breakers QF1 through QF5 in sequence.

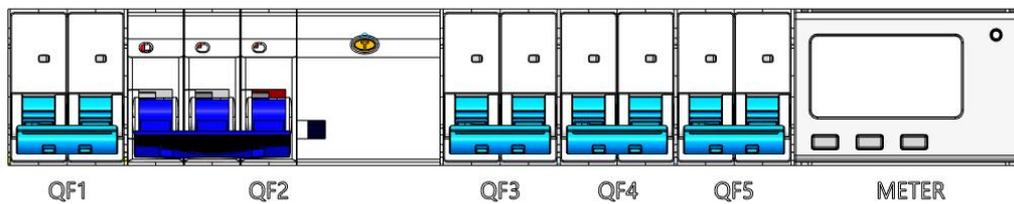


Figure 5-8 BESS Cabinet Control Switch Power-On

- 3) Close the “GRID” (AC-side circuit breaker)  
 Close the “LOAD” (load-side circuit breaker)  
 Close the “PV” (PV-side circuit breaker)

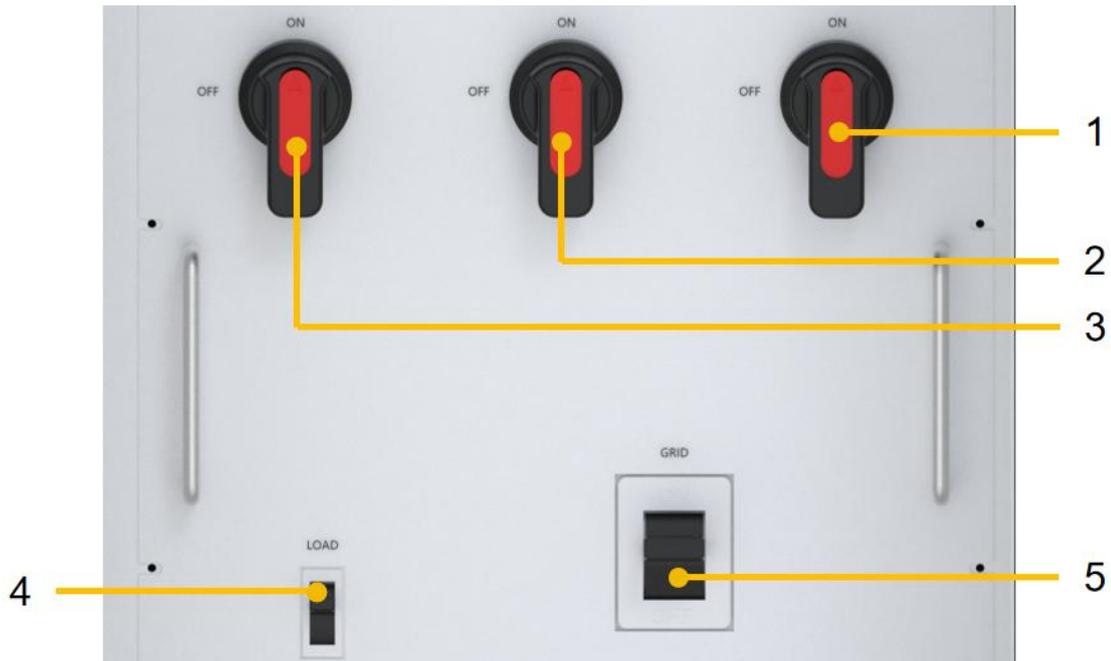


Figure 5-9 External Power Supply

- 4) Configure EMS operating modes based on application requirements, then set EMS to automatic mode.

After completing these steps, verify that the product indicator lights illuminate and the display functions. If the product is operating normally, the Run indicator will be lit while the Fault and Alarm indicators remain off. The display will show system operating status and parameters.

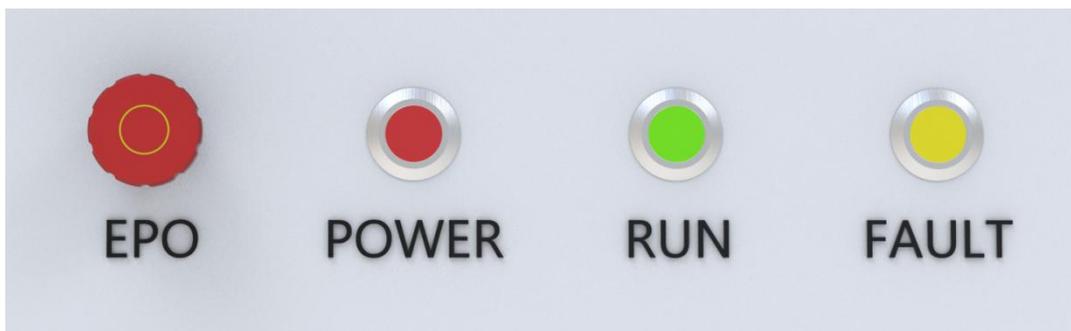


Figure 5-10 Indicator Display

## Step 7: Strategy Validation

- Use CAN communication to verify the communication debugging software and read BMS data.
- Monitor the operational status of each component via the screen and connect to the cloud platform. Through the cloud platform, remotely monitor energy storage cabinet data.

## Step 8: Verify Protection Functionality

- Manually trigger the emergency stop button to verify system response:
- DC contactors shall disconnect within  $\leq 50\text{ms}$ , and PCS output power shall drop to zero within 100ms.
- BMS shall record the fault event (code “E101: Emergency Stop”).

## 5.3 Risk Avoidance

In case of an emergency, please follow these steps:

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- Press the emergency stop switch on the outside of the cabinet door, the energy storage device automatically disconnects the AC and DC measurement switches, and the energy storage system stops running.



- If the energy storage device is in external power supply mode, it is necessary to disconnect all circuit breakers of the machine and external power supply.



- When the energy storage system is re-activated, it is necessary to ensure that the relevant faults of the energy storage equipment have been eliminated.
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# 6 Energy Storage System Power Down

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## 6.1 Pre-power-up verification

- Review the alarm lists for BMS, PCS, and EMS, and address all unresolved faults (such as insulation faults and communication interruptions).

## 6.2 Power-Off Procedure

- Step 1: Shut down the system via the screen or host computer;
- Step 2: Disconnect the “LOAD” (load-side circuit breaker);
- Step 3: Disconnect the “PV” (PV-side circuit breaker);
- Step 4: Disconnect the “GRID” (AC-side circuit breaker);
- Step 5: Sequentially disconnect “QF1” to “QF5” (secondary circuit breakers);
- Step 6: Sequentially disconnect “Q1” and “Q2” (BMS handles and circuit breakers).

## 6.3 Post-Power-On Safety Verification

Use a multimeter to test all energized parts (DC bus, AC terminals, internal capacitors of the PCS).

- DC side total voltage < 60V DC, AC side ground voltage < 5V AC
- Voltage between positive and negative terminals of battery clusters < 5V (no residual energy in equalization circuit)
- After disconnecting all battery clusters, measure DC bus ground insulation resistance using a 500V megohmmeter ( $\geq 10\text{M}\Omega$  is acceptable)

## 6.4 Physical Isolation and Identification

- Hang “Do Not Operate, Work in Progress” warning signs on all disconnected circuit breakers.
- Lock out battery cabinets and PCS cabinets.

## 6.5 Emergency Power Shutdown Plan

### 6.5.1 Rapid Power-Down for Sudden Failures

#### Scenario 1: Fire/Smoke

Immediately press the emergency stop button (E-stop) to trigger a system-wide hard power shutdown, activate the gas fire suppression system, and initiate personnel evacuation alarms.

#### Scenario 2: Battery Leakage

Wear acid-resistant protective clothing. Treat leaked electrolyte with a neutralizing agent (such as sodium bicarbonate). Disconnect the faulty battery cluster. Isolate the contaminated area.

### 6.5.2 First Aid Measures for Personnel

#### Electrical Shock First Aid:

Use an insulated hook rod to move the victim away. Immediately perform CPR (cardiopulmonary resuscitation). When calling emergency services, clearly state “high-voltage electrical shock incident” and request professional rescue.

# 7 System Maintenance Notice

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## 7.1 Important Notes

Due to environmental factors, temperature fluctuations, dust accumulation, and vibration, the internal components of energy storage systems undergo aging and wear, potentially leading to internal failures. Therefore, routine and periodic maintenance of energy storage systems is essential to ensure their proper operation.



- Only qualified and authorized personnel may perform maintenance and other operations on the energy storage system.



- During maintenance, do not leave screws, washers, or other conductive objects inside the product, as this may damage the equipment.



- After the energy storage system stops operating, wait at least 15 minutes before performing maintenance or other operations.
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During maintenance or inspection of energy storage systems, adhere to the following five safety rules to ensure the safety of personnel:

- Disconnect all external connections from the energy storage system.
- Ensure the energy storage system cannot be charged accidentally.
- Use a multimeter to verify the energy storage system is fully discharged.
- Perform necessary grounding and short-circuit connections.
- For adjacent potentially energized parts in operating components, use insulating cloth as an insulating cover.

## 7.2 Maintenance Cycle

Scope of Inspection	Inspection Items	Maintenance Cycle
Fire Protection	Is the fire suppression system complete?	Annual
	Is the fire suppression system within its validity period?	Annual
	Is the cooling system complete?	Semi-Annual
	Are the cooling system ducts blocked?	Semi-Annual
Cabinet Body and Structural Components	Is the integrated cabinet exterior deformed?	Annual
	Is the integrated cabinet exterior rusted or damaged?	Annual
	Is there moisture inside the integrated cabinet?	Semi-Annual
Wiring Harness	Are the low-voltage wiring harnesses loose or damaged?	Quarterly
	Are the high-voltage wiring harnesses loose or damaged?	Quarterly
	Do the wiring harnesses interfere with structural components?	Semi-Annual
	Are the high-voltage connections charred?	Monthly
Mechanical Components	Are structural fastening bolts loose or missing?	Monthly
	Are switches complete and securely installed?	Quarterly
	Is the air conditioning route damaged?	Semi-Annual
Gas Inspection	Is there a foul odor inside the integrated cabinet?	Daily
	Is there a pungent odor inside the integrated cabinet?	Daily
	Is there a burnt smell at high-voltage connection points?	Daily
Electrical Components	Is primary data complete?	Quarterly
	Is individual unit voltage data complete?	Quarterly
	Is individual unit temperature data complete?	Quarterly
	Are there abnormal alarms in the alarm panel?	Daily

Table 8-1 Maintenance Schedule

## Attachment

### A. Technical Data

Category	Technical Specifications	Parameters
System	Nominal Output Power	105KW
	AC Output Power and Voltage	50/60Hz;220/380,230/400Vac
	Wiring Method	3L/N/PE
	Nominal Energy	215kWh
	Dimensions (W*D*H)	1780.5*1299*2250mm
	Weight	2800kg
	AC Output Rated Current	140A
	Rated Voltage	768V
	Battery Operating Voltage	672-864Vd.c.
	Protection Rating and Corrosion Resistance Rating	IP55,C3
	Heat Dissipation Method	Air-cooled
	Storage Temperature	0°C-35°C
	Operating Temperature	-20°C-50°C
Inverter	Maximum PV Output Power (kW)	50kW*3
	PV Rated Output Voltage (V)	670
	MPPT Operating Voltage Range (V)	200-670
	Start-up Voltage (V)	250
	Maximum PV Input Current (A)	110A*3
	Maximum Short-circuit Current (A)	170A*3
	Number of MPPT	3
	Power Factor	1leading-1lagging
	THD	<3%

Category	Technical Specifications	Parameters
	Maximum Efficiency	97.80%
	MPPT Efficiency	99.90%
Battery Module	Battery Type	LiFePO4
	Battery Cluster Nominal Voltage	51.2V
	Battery Cluster Capacity	3.2V/280Ah
	Battery Cluster Energy	14.3kWh
	Battery Cluster Communication Method	CAN&RS485
	Cycle Life	≥8000 (25°C±2°C, 0.5C, 90%DOD,70%SOH)
	Battery Cluster Certification	CE,IEC62619,UN38.3

Table A Technical Data

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## B. Emergency Response

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### Notice

This product incorporates multiple safety strategies to prevent hazards caused by failures resulting from external factors.

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### Battery leakage

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#### Warning

If the battery pack has electrolyte leakage, avoid contact with the leaked liquid or gas. Electrolyte is corrosive and contact may cause skin irritation and chemical burns. If you come into contact with the leaked substance, take the following actions immediately:

- **Inhalation:** Evacuate contaminated area and seek immediate medical attention.
- **Eye Contact:** Rinse eyes with running water for 15 minutes and seek immediate medical attention.
- **Skin Contact:** Thoroughly wash affected area with soap and water and seek immediate medical attention.
- **Ingestion:** Induce vomiting as soon as possible and seek immediate medical attention.

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### Fire

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#### Warning

- In case of fire, ensure an ABC or carbon dioxide fire extinguisher is nearby. Do not use water to extinguish the fire.

#### Warning

- Firefighters must avoid contact with high-voltage components during firefighting operations, as this may pose an electric shock hazard.

#### Warning

- When temperatures exceed 130°C, the battery pack may ignite. If a fire

occurs where the battery is installed, perform the following actions:

 **Warning**

- Extinguish the fire before the battery ignites.

 **Warning**

- If the battery catches fire, do not attempt to extinguish it. Evacuate personnel immediately.

 **Warning**

- If the battery catches fire, it will produce toxic gases. Do not approach.

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## Wet cell

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 **Warning**

- If the battery is wet or submerged in water, do not attempt to approach it. Contact your dealer for technical support.

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## Battery damage

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 **Warning**

- If the battery is damaged, contact your dealer immediately for assistance, as damaged batteries are hazardous and must be handled with extreme caution.

 **Caution**

- Damaged batteries are not suitable for use and may pose a risk to personal safety or property. If the battery appears damaged, return it to your dealer.

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## Combined Heat and Smoke Detector Alarm

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 **Warning**

When the device alarm light flashes or sounds a buzzer:

- Do not approach
  - Do not open doors
  - Immediately move away
  - Remotely disconnect the power supply while ensuring your own safety
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