

USER MANUAL

PowerMagic 400V C&I



Shenzhen SOFARSOLAR Co., Ltd.

11/F., Gaoxinqi Technology Building, No.67 Area,
Xingdong Community, Xin'an Sub-district,
Bao'an District, Shenzhen City, China.

Email: service@sofarsolar.com

Web: www.sofarsolar.com

EU Representative Information: SofarSolar GmbH.

Add.: Kraemerstrasse 20, 72764 Reutlingen, Germany

Tel: +49 (0)7121 31767-0

E-Mail: europe@sofarsolar.com

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1 About this manual

1.1 Notice

The products, services or features you have purchased are subject to the commercial contracts and terms agreed with our company. Some or all of the products, services or features described in this document may not fall within the scope of your purchase. Unless otherwise stipulated in the contract, our company makes no express or implied statement or warranty regarding the contents of this document.

This document primarily provides information on the installation, electrical connections, and related aspects of the PowerMagic commercial and industrial energy storage system (hereinafter referred to as the “energy storage system”). Before installing or operating the energy storage system, please read this manual carefully, familiarise yourself with the safety information, and understand the system's functions and characteristics.

1.2 Target group

This manual is intended for plant operators and qualified electrical technicians. As an integral part of the energy storage equipment, the manual may be printed from the electronic version where necessary. Please keep both the printed and electronic copies properly for future reference. The equipment must always be operated strictly in accordance with the requirements set out in this manual.

1.3 Copyright statement

This manual is the copyright of Guangdong Sofar Smart Solar Technology Co., Ltd. No organisation or individual may plagiarise, partially reproduce, fully reproduce (including software), copy or distribute this document in any form or by any means. Guangdong Sofar Smart Solar Technology Co., Ltd. reserves the right of final interpretation. This manual may be updated based on

feedback from users or customers. Please visit our website at www.sofarsolar.com for the latest version.

1.4 Presentation of warnings

This manual contains information on safe operation and uses symbols to ensure the safety of persons and property as well as the efficient operation of the inverter.

- ▶ Read through the following symbol explanations carefully in order to prevent injury or property damage.

Warning symbol

	<p>The general danger symbol warns of the risk of serious injury when used with the signal words CAUTION, WARNING, and DANGER.</p>
---	--

Signal word

<p>DANGER</p>	<p>Indicates a hazardous situation which, if not avoided, will result in death or serious injury.</p>
<p>WARNING</p>	<p>Indicates a hazardous situation which, if not avoided, could result in death or serious injury.</p>
<p>CAUTION</p>	<p>Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.</p>
<p>NOTICE</p>	<p>Indicates a danger that results in damage to or destruction of the device.</p>

Sectional warnings

Sectional warnings refer to a complete section and are structured as follows:

 WARNING	
Type and source of danger	
Consequences for non observance	
▶ Avoiding the danger	

Embedded warnings

Embedded warnings are part of an action sequence and are placed right before the dangerous step.

WARNING Combination of the type/source of danger, consequences for non-observance and avoiding the danger.

1.5 Presentation of action instructions

This table shows the sequence of Action steps:

Symbol	Function
✓	This describes an action requirement
1. 2. 3.	This is the sequence of action steps that must be followed step by step
▶	This is a single action step
↳	This describes the result of the action

1.6 Note

Notes are presented in a grey bar.

Provides tips essential to the optimal operation of the product.

1.7 Abbreviations

Abbreviation	Full Term
PowerMagic	PowerMagic Commercial and Industrial Energy Storage System
SOFAR	Guangdong Sofar Smart Solar Technology Co., Ltd.

1.8 Revision history

The revision history records the details of each document update. The latest version incorporates all updates from previous versions.

2 Safety precautions

Statement

Before transporting, storing, installing, operating, using and/or maintaining this product, please read this manual carefully. Strictly follow the instructions contained herein and comply with all safety precautions marked on the product and described in this manual.

In addition to all safety instructions marked as “Danger”, “Warning”, “Caution”, “Notice” and “Note” in this manual, you must also comply with the relevant international, national, or regional standards.

The company shall not be held liable for any consequences resulting from failure to observe safe operating requirements or failure to comply with safety standards relating to the design, manufacture and use of the equipment.

The company assumes no responsibility for the following situations or any consequences arising therefrom:

- Product damage caused by force majeure events, including but not limited to earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fire, war, armed conflict, typhoons, hurricanes, tornadoes, or other extreme weather conditions.
- Product installation or operating environments that do not comply with applicable international, national, or regional standards.
- Failure to follow the operating instructions and safety warnings in the product and documentation.
- Damage caused by you or a third party entrusted by you during transportation.
- Damage caused by storage conditions not meeting the product requirements.
- Damage caused by your negligence, intentional act, gross misconduct, improper operation, or any reason not attributable to the company, including that of third parties.

2.1 Personal safety

DANGER

- ▶ Fatal high voltage exists inside the equipment.
- ▶ Observe and follow all warning labels affixed to the equipment.
- ▶ Comply with the safety precautions listed in this manual and in other related documents for this equipment.
- ▶ Follow the relevant protection requirements and safety instructions for the battery.
- ▶ Risk of electric shock if you touch live parts such as power terminals, contact points, or connectors inside the equipment.
- ▶ Always use appropriate protective equipment during operation, such as protective clothing, insulated footwear, safety goggles, safety helmets, and insulated gloves.

WARNING

- ▶ Always operate the energy storage system in strict accordance with the requirements of this manual.
- ▶ To prevent accidents, observe the following precautions:
 - Place prominent warning signs around the energy storage system to prevent accidental switching on and possible accidents.
 - Install warning signboards or safety warning tapes near the equipment.

NOTICE

- ▶ If the device indicator light is flashing red, evacuate the site immediately.

The lifting and transportation, installation and wiring, operation, and maintenance of the energy storage system must be carried out by professional technical personnel who meet the requirements of local regulations. Personnel

responsible for the installation and maintenance of the equipment must meet the following requirements:

- ▶ Must receive strict training beforehand, master the correct operating methods, be familiar with the structure and working principles of the energy storage system and its upstream and downstream equipment, and understand all safety precautions as well as the relevant standards of the country/region.
- ▶ Must have undergone professional training related to the installation and commissioning of electrical equipment, and be capable of identifying the potential hazards and their severity during equipment installation, operation, and maintenance.
- ▶ Must possess knowledge in electronics, electrical wiring, and mechanical engineering, and be familiar with electrical and mechanical schematics.
- ▶ Must be capable of responding promptly and effectively to emergencies or hazardous situations that may occur during installation or commissioning.
- ▶ Personnel engaged in special tasks such as electrical operations, working at height, or operating specialised equipment must hold special operation qualifications required by the local country/region.
- ▶ Operators of medium-voltage equipment must hold a valid high-voltage electrical work licence.
- ▶ Only personnel authorised to operate the equipment may approach it. Unauthorised persons must not come near the equipment.
- ▶ Live operation during installation is strictly prohibited. The installation or removal of cables under live conditions is forbidden. Contact between cable conductors and live terminals may cause arcs, sparks, or fire/explosion, leading to fire hazards or personal injury.
- ▶ Incorrect or improper operation while the equipment is energised may result in fire, electric shock, or explosion, leading to injury, loss of life, or property damage.
- ▶ Do not wear watches, bracelets, bangles, rings, necklaces or any other conductive items during operation to avoid electric shock or burns.

- ▶ Always use dedicated insulated tools during operation to prevent electric shock or short circuits. The insulation and voltage rating of tools must comply with local laws, regulations, standards, and codes.
- ▶ Do not disable protective devices or ignore warnings, cautions, and preventive measures indicated in this manual or on the equipment.
- ▶ If any fault occurs during operation that may result in personal injury or equipment damage, stop operation immediately, report to the person in charge, and take effective protective measures.
- ▶ Do not energise the equipment before installation is complete or before confirmation by qualified personnel.
- ▶ Do not directly touch, use other conductors to touch, or indirectly contact the powered equipment via wet objects. Measure the voltage at any contact points before touching terminals or conductive surfaces to ensure there is no risk of electric shock.
- ▶ The equipment enclosure may become hot during operation. Do not touch to avoid burns.
- ▶ Do not allow fingers, components, screws, tools, or circuit boards to come into contact with running fans to avoid injury or equipment damage.
- ▶ In the event of fire, evacuate the building or equipment area immediately, activate the fire alarm, or call the fire emergency number. Under no circumstances should anyone re-enter a burning building or equipment area.

2.2 Equipment safety

2.2.1 Energy storage system safety

DANGER

- ▶ In the event of a fault in the energy storage system, do not stand in front of the cabinet doors (including the area covered by the open doors).
 - ▶ Warning: Do not open the cabinet doors while the system is in operation.
-
- ▶ The installation layout of the energy storage system must comply with local regulations regarding fire separation distances or firewalls, including but not limited to the requirements of GB 51048-2014: Design code for electrochemical energy storage station and NFPA 855: Standard for the Installation of Stationary Energy Storage Systems.
 - ▶ The energy storage system should undergo regular fire inspections at least once per month.
 - ▶ During live inspections, pay attention to the warning labels on the equipment and avoid standing in front of cabinet doors.
 - ▶ After replacing power components or modifying wiring, manually perform wiring checks to prevent abnormal system operation.
 - ▶ It is recommended that users prepare a camera or recording device to document the detailed process of installation, operation, and maintenance.
 - ▶ The energy storage system must be enclosed with fences, walls, or other protective measures, and display safety warning signs to restrict access. This is to prevent unauthorised personnel from entering the area during system operation, which could result in personal injury or property damage.

2.2.2 Battery safety

DANGER

- ▶ Do not expose the batteries to high-temperature environments or near heat-generating equipment, such as direct sunlight, fire sources, transformers, or heaters. Overheating may cause leakage, smoke, release of flammable gases, thermal runaway, fire, or explosion.
- ▶ Do not disassemble, modify, or damage the batteries (e.g., inserting foreign objects, applying external pressure, immersing in water or other liquids), as this may result in leakage, smoke, release of flammable gases, thermal runaway, fire, or explosion.
- ▶ Do not subject the batteries to mechanical shock, drops, collisions, punctures, or pressure impacts, as this may cause battery damage or fire.
- ▶ Do not allow the battery terminals to come into contact with other metal objects, which may result in overheating or electrolyte leakage.

For the safe use of the product, technical personnel must carefully read and comply with the following safety requirements. The company shall not be held responsible for any product malfunction, component damage, personal injury, or property loss resulting from the following:

- Failure to charge the battery on time, resulting in capacity loss or irreversible damage due to the customer's actions.
- Battery damage, drops, leakage, or other issues caused by improper operation or failure to follow battery handling instructions.
- Over-discharge damage caused by failure to power on the battery in a timely manner.
- Battery damage caused by charging or discharging with inappropriate equipment.
- Frequent over-discharge due to improper maintenance, on-site system expansion, or inability to fully charge the battery over time.

- Damage caused by the incorrect configuration of battery operating parameters by the customer.
- Direct damage caused by environmental conditions that do not meet the battery's operational requirements.
- Alteration of the battery usage scenario by the customer, including but not limited to connecting additional loads to the battery.
- Failure to perform proper maintenance according to the manuals of associated equipment.
- Continued use of batteries beyond their warranty period results in product damage.
- Use of defective or deformed batteries causes product damage.
- Mixing the company's batteries with other batteries, including but not limited to batteries of other brands or different rated capacities.
- Storing or installing batteries together with flammable or explosive materials, causing product damage or other property loss.
- Battery-related operations performed by personnel without proper protective equipment, resulting in personal injury or property damage.
- Damage caused by eating, drinking, or smoking near the battery.
- Theft of the battery.

2.3 Environmental requirements

DANGER

- ▶ It is strictly forbidden to store flammable or explosive materials in the equipment area.
- ▶ Do not place the equipment in environments containing flammable or explosive gases or fumes, and never operate the equipment in such environments.
- ▶ Do not position the equipment near heat sources or open flames, such as fireworks, candles, heaters, or other heating devices, as excessive heat may cause equipment damage or fire.

- ▶ The equipment must be stored in a suitable temperature and humidity environment, in a clean, dry, and well-ventilated area, protected from dust and condensation.
- ▶ Do not install or operate the equipment outside the limits specified in the technical specifications, as this may compromise performance and safety.
- ▶ It is strictly forbidden to install, operate, or handle outdoor equipment and cables (including but not limited to equipment handling, cable operations, plugging and unplugging outdoor signal interfaces, working at height, outdoor installation, or door opening) during adverse weather conditions such as lightning, rain, snow, or strong winds above level 6.
- ▶ Do not install the equipment in environments containing dust, smoke, volatile gases, corrosive gases, infrared or other radiation, organic solvents, or areas with excessive salinity.
- ▶ Do not install the equipment in environments with conductive metallic dust or magnetic dust.
- ▶ The installation site must have solid ground free from soft soil, rubber soil, or subsidence-prone foundations. Avoid low-lying or flood-prone areas; the installation level must be higher than the region's historical maximum water level.
- ▶ If the equipment is installed in an area with dense vegetation, in addition to routine weeding, the ground beneath the equipment must be reinforced, for example by paving with cement, gravel, or similar materials.
- ▶ Before opening the equipment door during installation, operation, or maintenance, remove any standing water, ice, snow, or debris from the top surface to prevent foreign objects from falling inside.
- ▶ Ensure the installation surface is firm and capable of bearing the weight of the equipment.
- ▶ All cable entry points must be sealed. Use sealing compound for cable entries already in use, and use the supplied covers to seal unused entries.
- ▶ After installation, remove all packaging materials from the equipment area, such as cartons, foam, plastic, and cable ties.

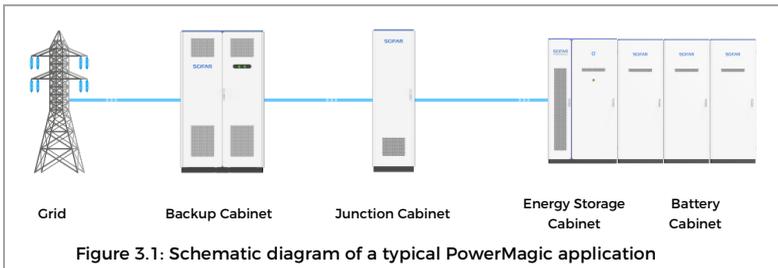
3 About the product

3.1 Overview

The PowerMagic Commercial and Industrial Energy Storage System is designed for applications such as stand-alone energy storage, PV and energy storage, integrated PV storage charge solutions, and microgrid and energy storage scenarios.

Its primary functions include reducing electricity costs for enterprises by utilising peak-valley tariff differences and serving as a reliable backup power supply.

A typical application diagram of the PowerMagic C&I energy storage system is shown below:



3.2 Functions and features

▶ **Solution**

The commercial and industrial energy storage system includes the energy storage cabinet (with PCS and liquid cooling unit), battery cabinet, combiner cabinet, and on/off-grid cabinet, providing customers with a one-stop solution.

▶ **Flexible capacity design**

The system supports flexible parallel connection and capacity expansion. Maximum system power reaches 750 kW, and maximum system capacity reaches 6,192 kWh.

▶ **Cabinet parallel design**

In terms of reducing the footprint, energy storage cabinets (with PCS and liquid cooling units) and energy storage cabinets in commercial and industrial energy storage systems can be connected in parallel, with a maximum of 6 energy storage cabinets in parallel. Energy storage cabinets and battery cabinets can also be connected in parallel, with a maximum configuration of 1 energy storage cabinet + 3 battery cabinets. The parallel cabinet solution enables higher system energy density and lower costs.

▶ **Liquid and electricity separation design**

The battery cabinet DC terminals are located at the upper part of the cabinet. During expansion, additional cabinets can be electrically and communicatively connected in a “hand-in-hand” manner at the top. The liquid cooling pipelines are arranged at the bottom. This design eliminates safety risks caused by coolant leakage near electrical connections, significantly enhancing system safety and reliability.

▶ **3 + 2 Safety design**

Designed for ultimate safety:

3 Levels of Fire Protection

- Level 1: Pack-level perfluorohexanone gas fire suppression.
- Level 2: Compartment-level and power distribution system-level perfluorohexanone gas fire suppression.
- Level 3: Water-based fire suppression.

2 Additional Safety Measures

- Explosion venting design.
- Combustible gas exhaust system.

Note: For overseas projects, aerosol-based fire suppression can be provided upon request.

▶ **Large cell compatibility**

The system design supports upgrading from 280Ah cells to 320Ah cells without changing the cabinet structure, further improving energy density.

▶ **Liquid cooling + Dehumidification**

The liquid cooling system ensures temperature uniformity, longer lifespan, and higher efficiency of battery modules. The integrated dehumidification unit

reduces dew point temperature, effectively preventing condensation inside the battery cabinet.

▶ **On/off-grid switching**

The system supports fast switching between on-grid and off-grid operation.

▶ **Local EMS functions**

1. Anti-backflow protection.
2. Balanced charging/discharging power across cabinets (based on each battery stack condition).
3. System WEB monitoring interface.
4. Demand response (non-real-time scheduling, pre-declared with grid or third-party system).
5. Peak shaving & valley filling / capacity-to-demand conversion (using local TOU pricing to smooth load curves and keep peak power within limits).

Main EMS strategies:

1. Charge batteries fully during off-peak hours, with charging power determined by system capacity and configuration.
2. Discharge during peak hours, fully utilising stored energy, with discharge power determined by peak pricing duration.
3. If residual energy remains after the peak period, continue discharging.

▶ **Remote & Local control/upgrade**

Supports both local and remote operation and software upgrades.

▶ **High efficiency & Reliability**

Easy to install and operate, the system features high conversion efficiency, comprehensive protection functions, long service life, and compliance with grid interconnection requirements in China, North America, and Europe.

3.3 Model description

The main product models involved in this article are follows:

Table 3.1 Product model

	Energy storage cabinet	Battery cabinet	Junction cabinet	Backup Cabinet
6Pack	ESS-258KLA-SA1	ESS-258KLA-BD1	PAC-750K-H1	PAC-750K-W1
5Pack	ESS-215KLA-SA1	ESS-215KLA-BD1		

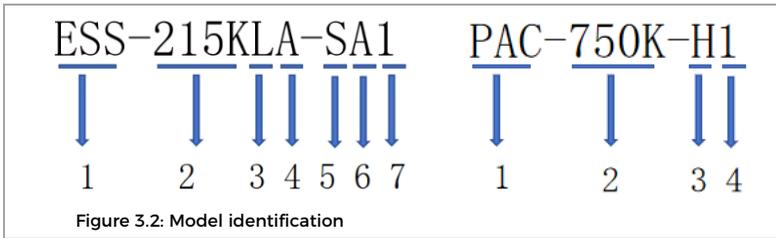


Table 3.2 Description of energy storage cabinet/battery cabinet model

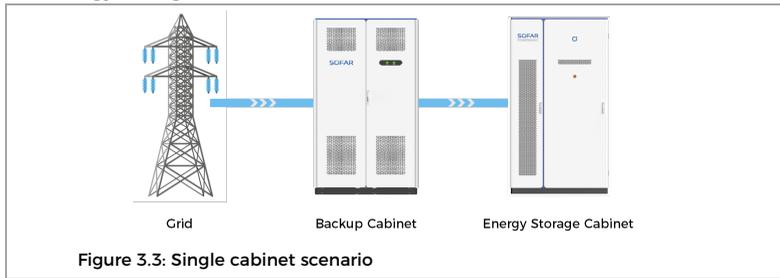
No.	Name	Meaning	Take value description
1	ESS	Product series name	Energy storage system
2	215K	Energy grade	Rated energy is 215kWh
3	L	Liquid cooling	Thermal management mode
4	A	Cell model	Example: 280Ah / 320Ah
5	S/B	With the PCS/battery	Whether the PCS module is included
6	A/D	AC/DC	Voltage type
7	1	Product version	The first generation of products

Table 3.3 Description of junction cabinet / off-grid cabinet model

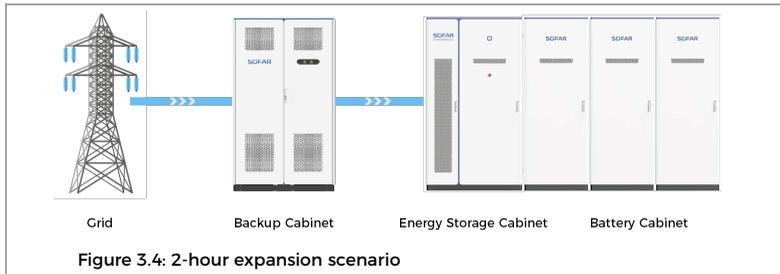
No.	Name	Meaning	Take value description
1	PAC	Product series name	Energy storage system accessories
2	750K	Power level	Rated power is 750kW
3	H/W	/	Junction cabinet / Backup cabinet
4	1	Product version	The first generation of products

3.4 System description

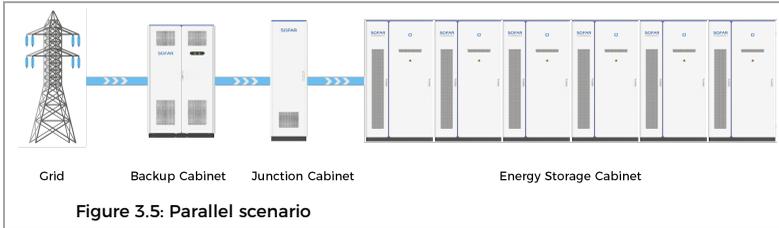
- ▶ **Single Energy storage cabinet scenario (2h):** Backup cabinet (optional) + energy storage cabinet



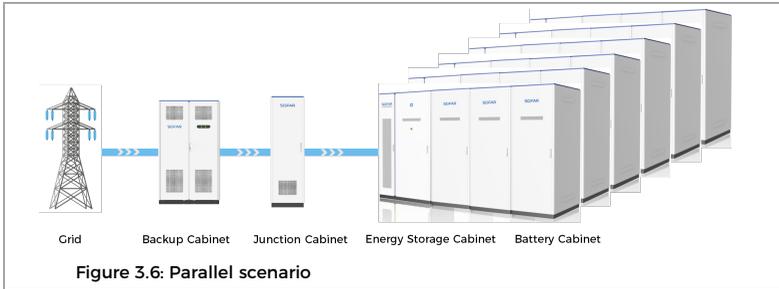
- ▶ **2-hour expansion scenario:** Backup cabinet (optional) + energy storage cabinet + battery cabinet



- ▶ **Parallel scenario (Max 6 units, 2h):** Backup cabinet (optional) + junction cabinet + energy storage cabinet



- ▶ **Parallel scenario (Max 6 units, 4h/6h/8h):** Backup cabinet (optional) + junction cabinet + energy storage cabinet + battery cabinet



3.5 Dimension

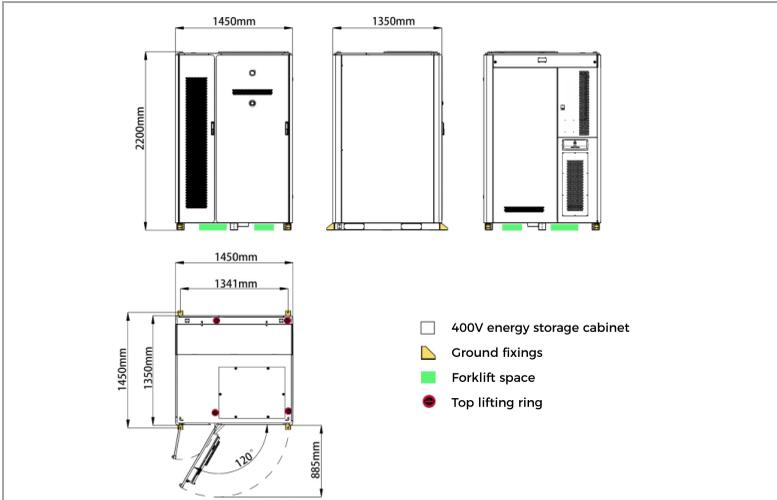


Figure 3.7: Dimensions of 400V energy storage cabinet and maximum door opening size

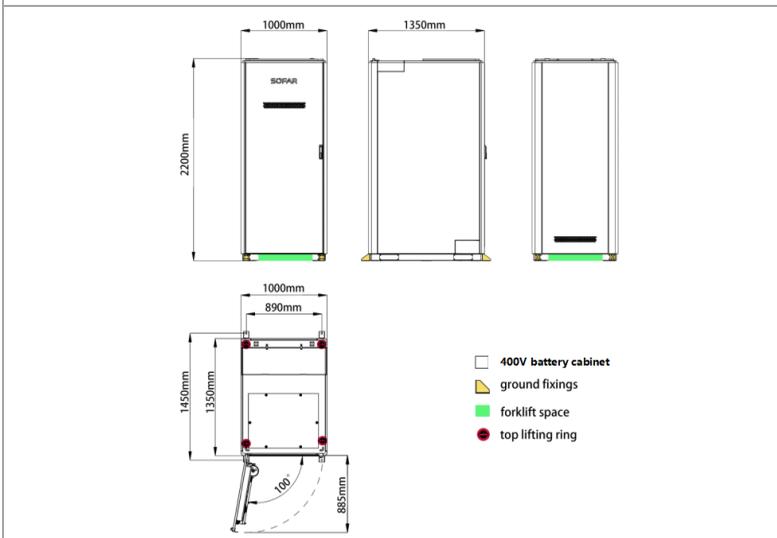


Figure 3.8: Dimensions of 400V battery cabinet and maximum door opening size

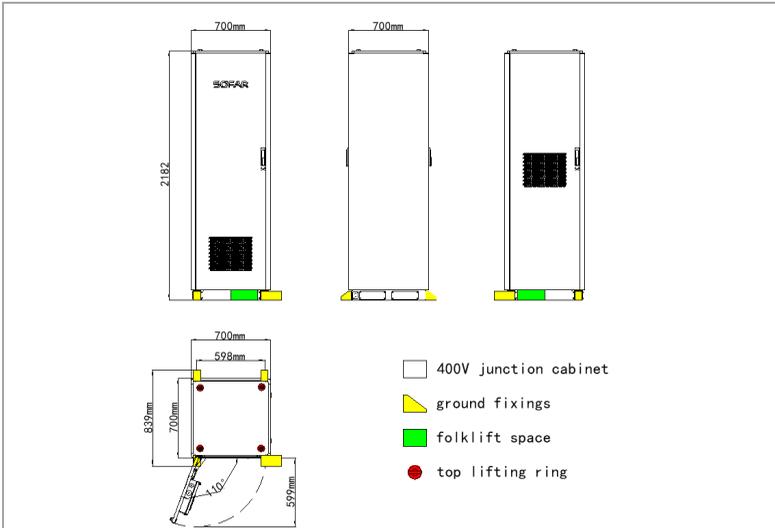


Figure 3.9: Dimensions of 400V junction cabinet and maximum door opening size

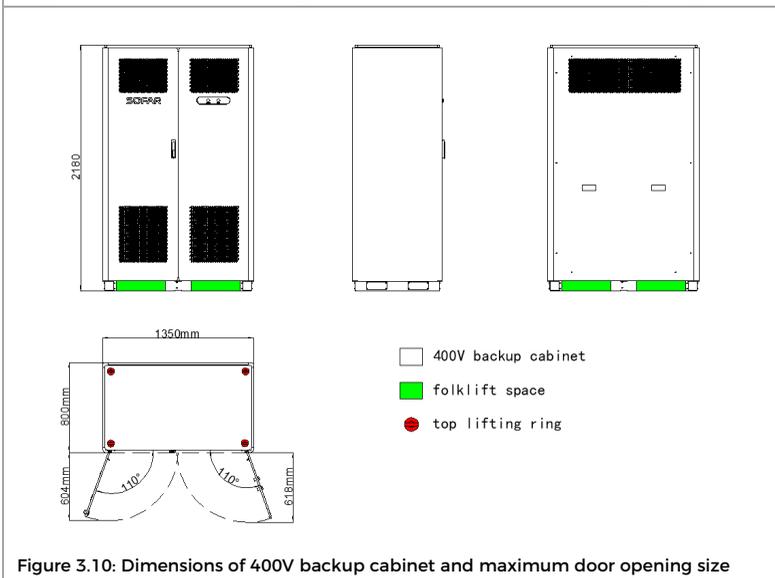


Figure 3.10: Dimensions of 400V backup cabinet and maximum door opening size

3.6 Components introduction

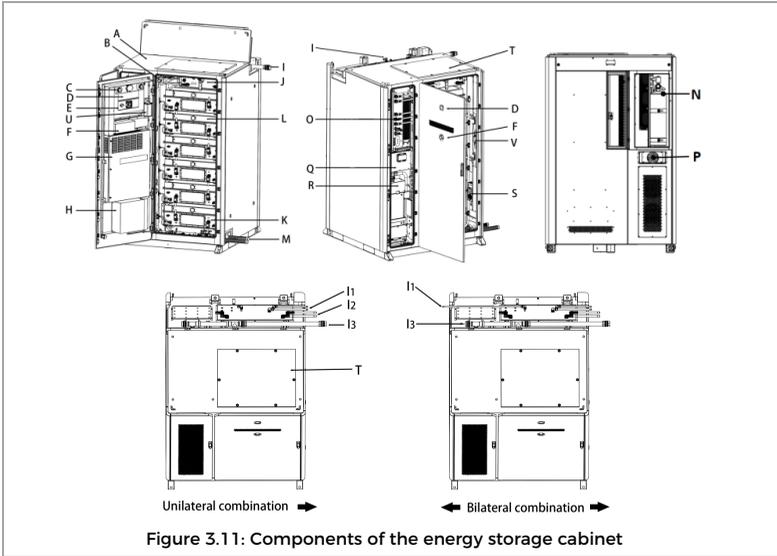


Figure 3.11: Components of the energy storage cabinet

The above pictures are for reference only, please refer to the physical objects received!

Table 3.4 Introduction of energy storage cabinet components

NO.	Name	Qty	Description
A	Cabinet enclosure	1	
B	Fuse	2	
C	Temperature/smoke/combined detectors	1	
D	Logo indicator	1	For displaying the operating status of the device
E	Buzzer/fan	1	Fire alarm/Gas emission
F	Emergency stop button	1	Emergency start, stop

NO.	Name	Qty	Description
G	Auxiliary power modules	1	
H	CSU	1	optional
I	Terminals/fire fighting pipe	1	See I1-I3 for details
J	High voltage box	1	Switch
K	Sealing board	1	
L	PACK	6	Max 6pcs
M	Liquid Cooling pipes	2	
N	Fire suppression bottle assembly	1	
O	PCS	1	
P	Water hydrant connection	1	
Q	Junction box	1	
R	Liquid cooling machine	1	
S	Dehumidification module	1	
T	Explosion vent	1	
U	Aerosol	1	optional
V	Fuses inside cluster	1	
I1	Power terminals	2	
I2	Signal terminals	2	
I3	Fire-fighting pipe	1	

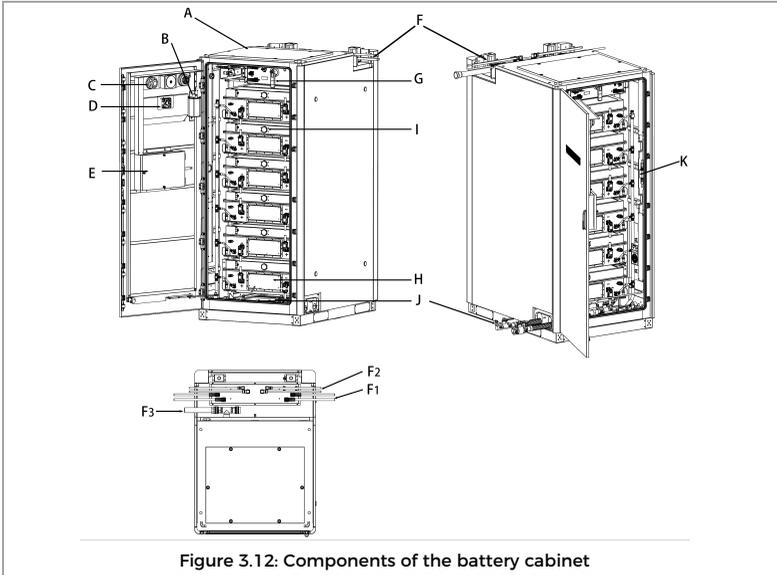


Figure 3.12: Components of the battery cabinet

Table 3.5 Introduction of battery cabinet components

NO.	Name	Qty	Description
A	Cabinet	1	
B	Aerosol	1	Optional
C	Temperature/smoke/ combined detectors	1	
D	Buzzer/fan	1	Fire alarm/Gas emission
E	Auxiliary power module	1	
F	Terminals/ firefighting pipe	1	Refer to F1-F3 for details
G	High voltage box	1	
H	Sealing board	1	
I	PACK	6	Max 6 pcs

NO.	Name	Qty	Description
J	Liquid cooling pipes	2	
K	Cluster fuses	1	
F1	Power terminals	2	
F2	Signal terminals	2	
F3	Firefighting pipe	1	

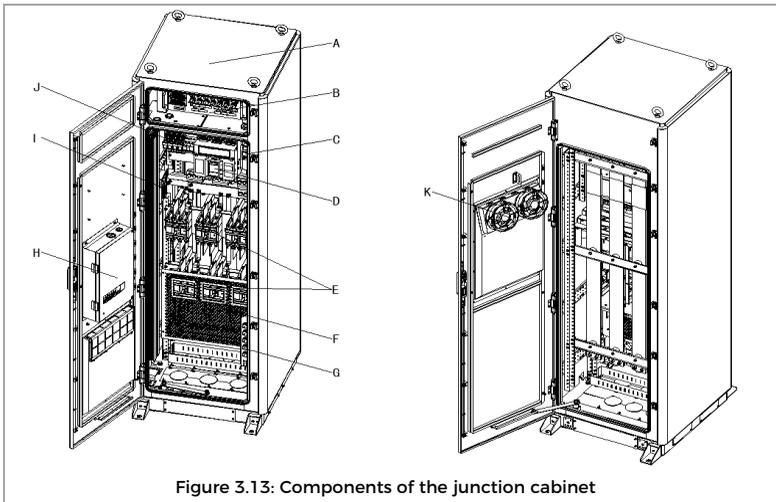


Figure 3.13: Components of the junction cabinet

Table 3.6 Introduction of junction cabinet components

NO.	Name	Qty	Description
A	Cabinet	1	
B	CSU box	1	
C	Meter	1	
D	Circuit breaker	1	

NO.	Name	Qty	Description
E	Branch circuit breaker	2-6	Max 6pcs
F	Protection plate	2	
G	Communication interface	1	
H	Junction box	1	
I	Dehumidifier	1	
J	Lightning protector	1	
K	Fan	2	

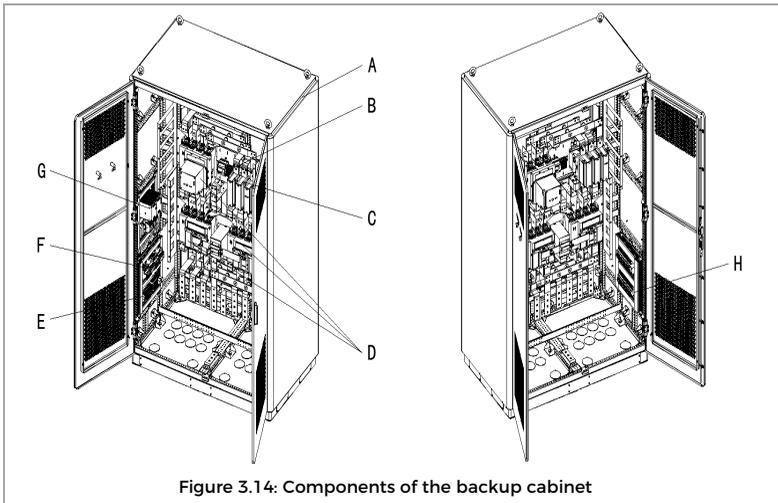


Figure 3.14: Components of the backup cabinet

Table 3.7 Introduction of backup cabinet components

NO.	Name	Qty	Description
A	Cabinet	1	
B	Meter	1	

NO.	Name	Qty	Description
C	AC contactors	4	
D	MCCB (or STS)	1	
E	Wiring terminal	1	
F	Lightning protector	1	
G	Power supply	1	
H	Miniature circuit breaker	1	

4 Transport and storage

4.1 Transport considerations

WARNING

- ▶ In the whole process of loading, unloading, transport, must comply with the project in the country/region of the container operation safety regulations!
- ▶ In the whole process of loading, unloading and transport, must meet the transport origin country, route country, destination country transport container operation specification and regulatory requirements!
- ▶ The energy storage system mechanical parameters (dimensions and weights) should be kept in mind during the operation.
- ▶ All personnel involved in loading, unloading and bolting should receive appropriate training, especially in safety.

CAUTION

- ▶ Failure to transport and store in accordance with the requirements of this manual may void the warranty.

- The energy storage system can be shipped directly to site, meeting the transportation requirements for road vehicles and vessels. For sea transport, the system complies with the IMDG Code and the International Maritime Dangerous Goods Regulations. For land transport, it complies with ADR or JT/T 617 requirements.
- Air transport is currently not permitted, and railway transport is not supported.
- Thanks to the integrated design, the system can be lifted and transported as a whole using a forklift.

Conditions for transportation and handling:

- ▶ All cabinet doors must be securely locked, and no objects may protrude from the enclosure.
- ▶ Depending on site conditions, select appropriate forklifts and tools. All tools used must meet the handling requirements of the system.
- ▶ During handling, warning signs or safety barriers must be set up to prevent unauthorised personnel from entering the operation area and avoid accidents.
- ▶ Handling must be suspended under adverse weather conditions such as heavy rain, fog, or strong winds.
- ▶ Before operation, ensure the forklift meets the load-bearing requirement: capacity ≥ 4 t.
- ▶ Recommended fork dimensions: length ≥ 1.4 m, width 80–160 cm, thickness 25–70 cm.
- ▶ Forklift lifting height requirements:
 - ▶ When the foundation height ≤ 0.3 m, lifting height ≥ 2 m.
 - ▶ When the foundation height > 0.3 m, the lifting height must be increased accordingly.

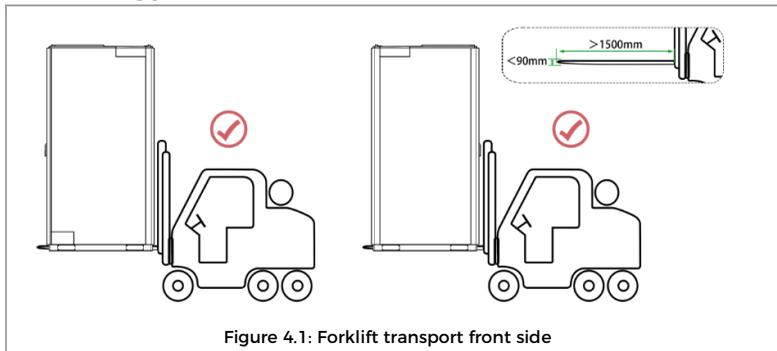


Figure 4.1: Forklift transport front side

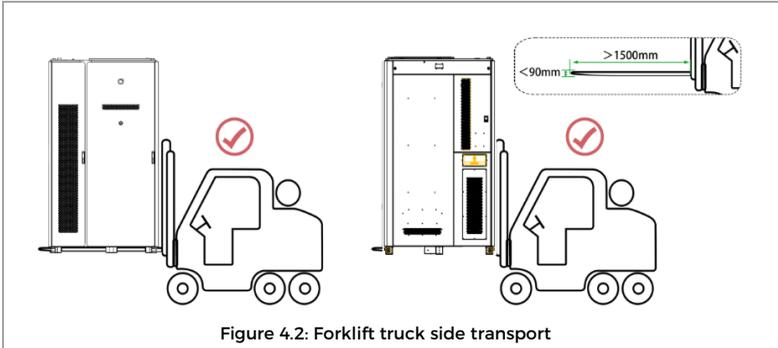


Figure 4.2: Forklift truck side transport

4.2 Storage requirements

NOTICE

- ▶ Before storage, the energy storage system should be checked and data recorded. Ensure that the cabinet door and the cabinet door of each device inside are locked, and the power switch is in a safe state.
- ▶ During storage, it is necessary to provide relevant proof of compliance with product storage requirements, such as temperature and humidity log data, storage environment photos and inspection reports.
- ▶ The energy storage system and transport time is not more than 6 months in total (counting time from the start of shipment), and should be used promptly; otherwise, lithium long-term storage will result in capacity loss.

Storage environment requirements:

- ▶ Recommended storage temperature: 20°C ~ 30°C;
- ▶ Relative humidity: 5%RH ~ 80%RH;
- ▶ Dry, ventilated and clean;
- ▶ Avoid contact with corrosive organic solvents, gases and other substances;
- ▶ The distance from the heat source should not be less than two meters;

Storage location requirements:

- ▶ The storage location of the energy storage system should have sufficient bearing capacity (single cabinet $\geq 4t$), the ground needs to be level, the flatness should be $\leq 3mm$, no slope, and there is no accumulation of materials around.
- ▶ Before storage, the energy storage system should be reasonably padded according to the local meteorological conditions, to avoid rain or ground water erosion;
- ▶ The storage location should avoid mechanical impact, heavy pressure and strong magnetic field action.

Regular inspection:

- ▶ Inspect at least once every half a month to check whether the packaging is intact and undamaged to avoid insects and rodents, and replace it immediately if it is found to be damaged. Before installing the energy storage system for long-term storage (more than 6 months), it should be inspected and tested by professional personnel before it is put into use.
- ▶ Long-term storage of batteries is not recommended due to the capacity degradation that occurs when batteries are stored for long periods of time. In addition to this, even if the battery is stored at the recommended optimal storage temperature, there will be irreversible capacity degradation due to calendar effects. The longer the storage time, the greater the irreversible degradation. Please refer to the technical agreement for specific degradation values. Stock batteries are shipped on a first-in-first-out basis.
- ▶ Calculated from the date of shipment, energy storage systems with a storage period of more than 8 months under the above conditions should be charged and discharged once to bring the system SOC up to 30%-40%, and the SOC needs to be consistent after replenishment.
- ▶ The air inlet and outlet of the energy storage system should be protected, and effective measures should be taken to prevent the intrusion of rainwater, sand and dust into the interior of the energy storage system.

5 Installation

5.1 Installation requirements

5.1.1 Installation environment requirements

- ▶ The external environment meets the requirements of GB 51048-2014: Design code for electrochemical energy storage station in China. The global compliance with NFPA 855 Standard for the Installation of Stationary Energy Storage Systems or IEC 62933-5-2: Safety Requirements for Grid-Integrated BESS Systems.
- ▶ The equipment should be installed in an area away from liquids, and should not be installed under water pipes, air outlets and other locations that are prone to condensation; it should not be installed 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.
- ▶ It is prohibited to place the equipment in an environment with flammable or explosive gases or fumes, and to perform any operation in such an environment.
- ▶ Installation of an energy storage system in a salt-affected area will cause corrosion and may result in a fire, so do not install an energy storage system outdoors in a salt-affected area. Salt-affected areas are areas within 2km of the coast or affected by sea breezes. The area affected by sea breeze varies depending on meteorological conditions (e.g. typhoons, seasonal winds) or topography (presence of dykes, hills).

5.1.2 Installation operation requirements

- ▶ The operation area should be well marked with warning signs, and there should be at least one qualified supervisor responsible for industrial safety on site.

- ▶ Operators must undergo relevant training and obtain relevant certificates of competency before taking up their duties.
- ▶ Operators should do a good job of personal protection, wear helmets and safety belts; use all kinds of tools in a reasonable and compliant manner; any tools used in the operation should undergo maintenance and quality inspection.
- ▶ If special operations or work at height are required, they should report to the safety personnel in advance and take precautionary measures.
- ▶ In case of bad weather or an unexpected situation, the work should be stopped immediately.

5.2 Foundation

5.2.1 Foundation construction requirements

Improper foundation design can lead to major issues in system placement, door operation, and long-term performance. The foundation must therefore be designed and constructed in accordance with defined standards to ensure adequate mechanical support, proper cable routing, and convenient access for maintenance.

WARNING

- ▶ The energy storage system is relatively heavy. Before constructing the foundation, a detailed assessment of site conditions—particularly geological and environmental factors—must be carried out. Foundation design and construction may only commence once these conditions have been verified.
 - ▶ An integrated foundation is mandatory.
-
- ▶ **Site Selection Requirements**
 - The installation site must not be located in low-lying areas. The installation level shall be at least 300 mm above the historical maximum water level in the region.

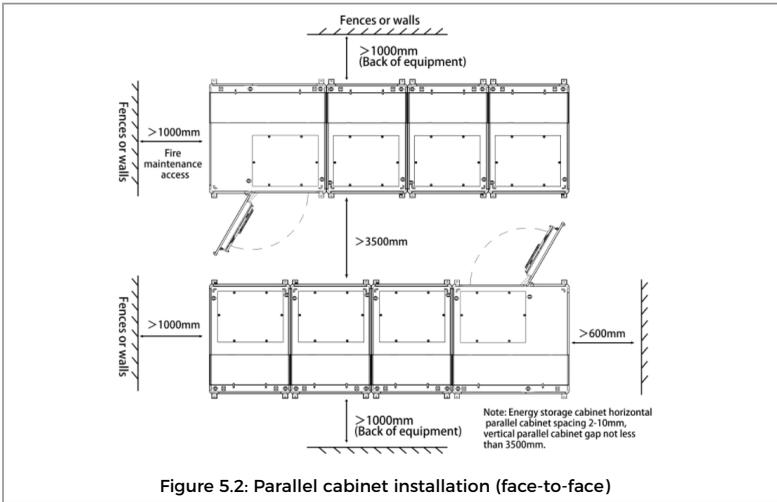
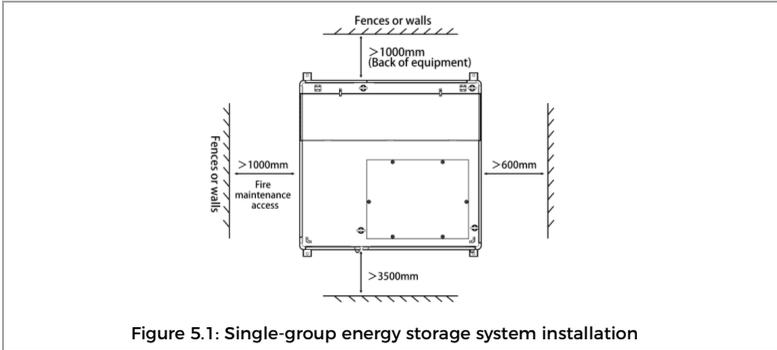
- The minimum distance to airports, underground landfill sites, riverbanks, or dams shall be ≥ 2 km.
 - The site should be open and unobstructed, ensuring a clear area of at least 10 m around the system.
 - For safety, the system shall be installed at least 12 m away from residential buildings and more than 30.5 m from densely populated facilities such as schools or hospitals. If these safety distances cannot be achieved, a fire-rated wall shall be constructed between the system and the building.
 - The site shall provide sufficient land for current installation needs and allow space for future expansion over the system's life cycle.
 - The site must be well ventilated.
- ▶ **Sites not recommended by industry standards and regulations shall be avoided, including but not limited to:**
- Areas subject to strong vibration, high noise, or intense electromagnetic interference.
 - Locations with dust, oil smoke, harmful or corrosive gases.
 - Facilities that produce or store corrosive, flammable, or explosive materials.
 - Areas with existing underground facilities.
 - Sites with problematic geological conditions, such as rubber soil, weak soil layers, waterlogging, or subsidence-prone ground.
 - Seismic fault zones or earthquake-prone areas with a seismic intensity rating higher than IX.
 - Areas exposed to direct geological hazards such as mudslides, landslides, quicksand, or karst caves.
 - Mining subsidence or displacement zones.
 - Blast hazard zones.
 - Areas at risk of flooding due to dam or levee failure.
 - Protected zones of important drinking water sources.
 - Historical and cultural heritage protection areas.
 - Densely populated sites, high-rise buildings, or underground structures.

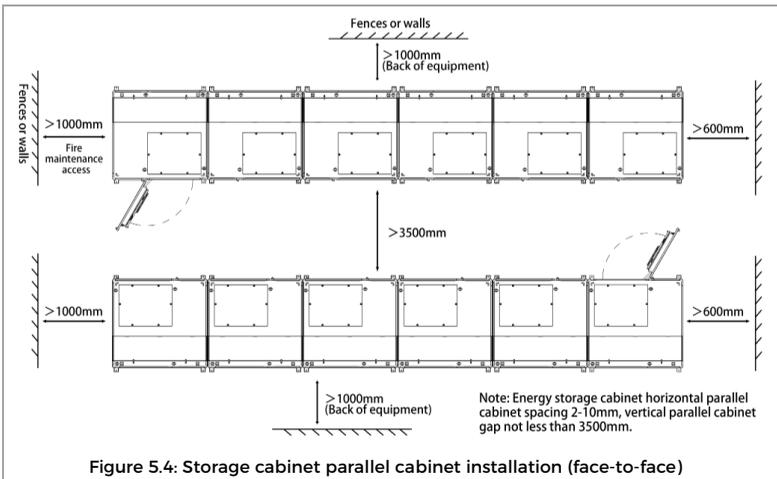
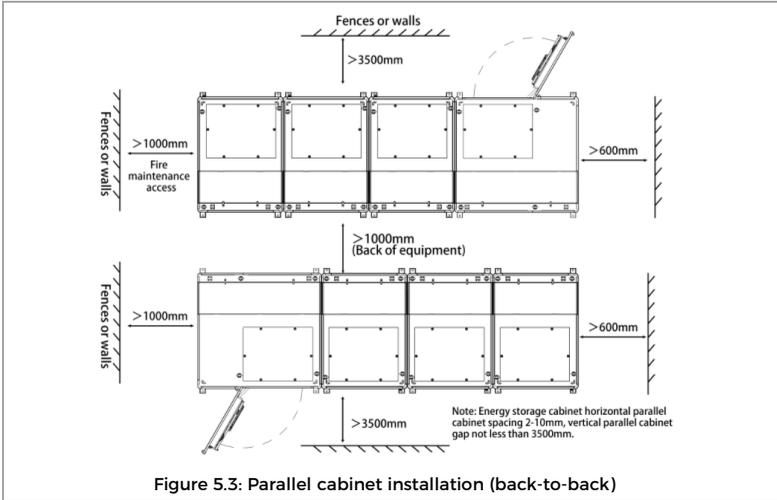
► **Foundations shall be constructed to meet, as a minimum, the following requirements:**

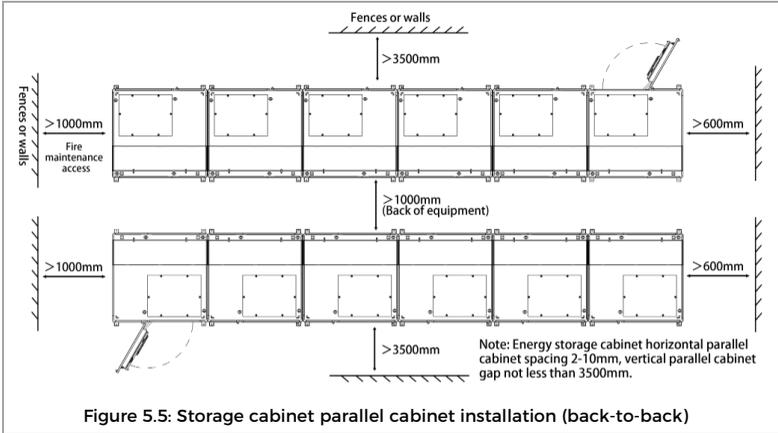
- The energy storage system must be mounted on concrete or other non-combustible surfaces, and the mounting plane must be level, firm, and flat, with sufficient bearing capacity to prohibit depressions or tilting.
- The equipment foundation is configured according to the total weight of the equipment $n \times 4t$ (n value 1-6, " n " indicates the number of energy storage cabinets) + $m \times 3t$ (m value 0-3, " m " indicates the number of battery cabinets), and when the load-bearing capacity of the foundation is not satisfied, it needs to be reviewed.
- The bottom of the pit for the equipment foundation must be compacted and filled.
- Equipment foundation excavation is strictly prohibited after soaking water disturbance, if soaking water disturbance should continue to excavate and refill.
- Equipment foundation and cabinet contact surface level error $\leq 3\text{mm}$.
- Foundations must be above the local historic high water level and at least 300mm above grade.
- Construct drainage facilities in conjunction with local geological and municipal drainage requirements to ensure that water does not accumulate at the equipment foundations. The foundations should be constructed to meet the local historical maximum rainfall drainage requirements, and the discharged water needs to be treated in accordance with local laws and regulations.
- When constructing equipment foundations, it is necessary to consider the cable outlet of the energy storage system and to reserve a trench or an inlet hole.
- The holes reserved for the foundation of the equipment and the holes in the bottom of the equipment for incoming wires should be blocked.
- The foundation is made according to the foundation plan provided by SOFAR, or the foundation plan confirmed by our company, and the tolerance of the upper surface of the foundation is required to be $\pm 3\text{mm}$.

5.2.2 Requirements for installation space

In order to ensure that the air inlet can be better air intake and maintenance, it is recommended to reserve enough space around the box installation position, the minimum space requirement is shown in the figure below:

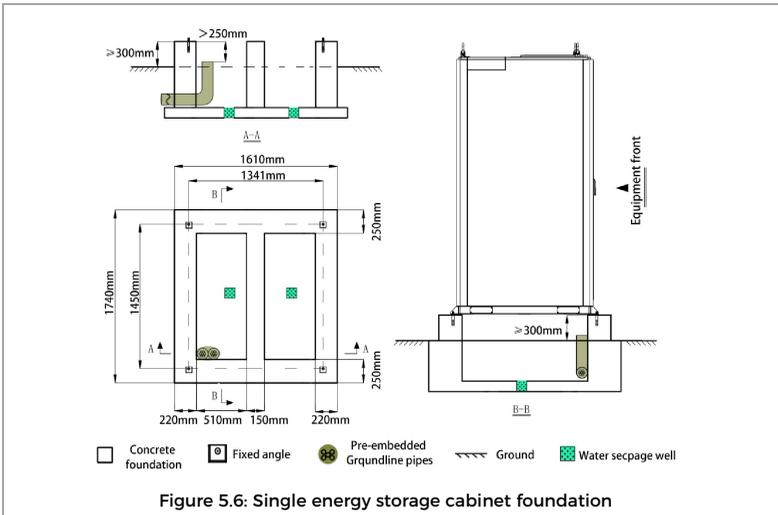


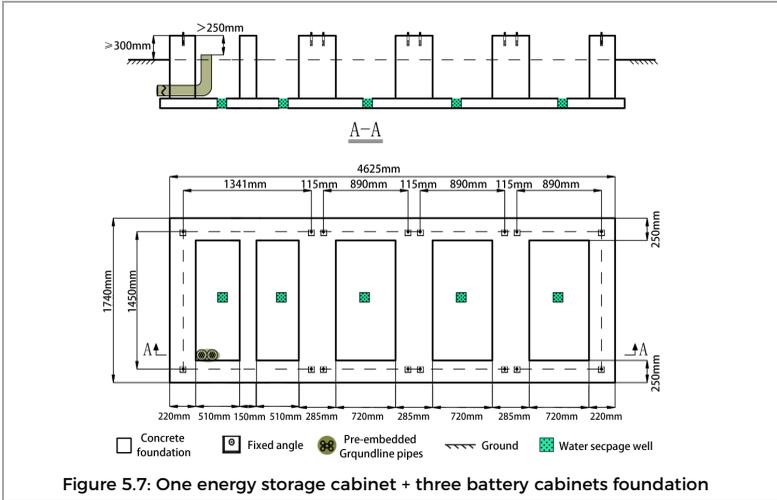




5.2.3 Recommended foundation drawing

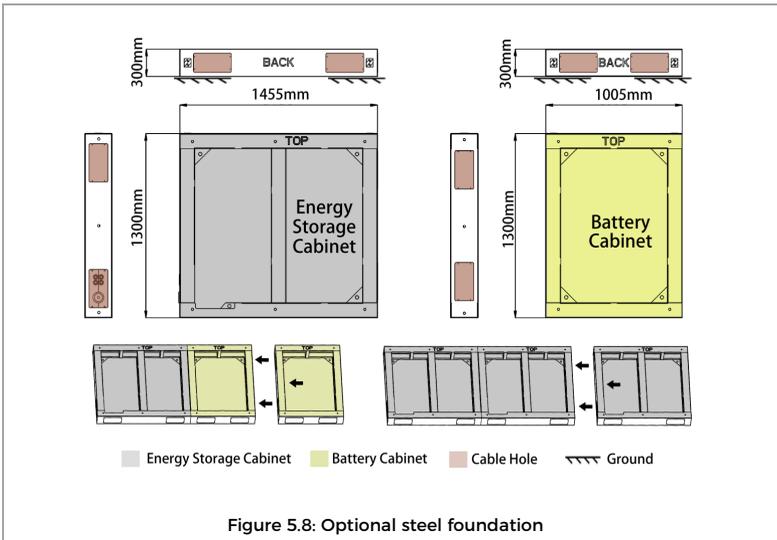
The figure below is a simplified illustration only. Detailed foundations must be constructed in accordance with foundation drawings supplied by SOFAR or with drawings approved by the Company.





5.2.4 Optional customised steel base

The figure below shows an optional steel foundation, which is applicable only to the combined installation of the energy storage cabinet and the battery cabinet.



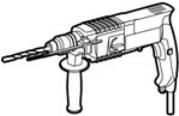
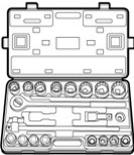
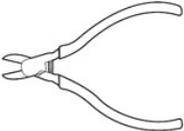
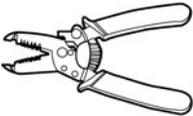
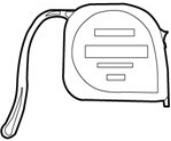
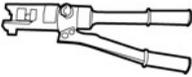
5.3 Hoisting and fixing

5.3.1 Preparation tools

NOTICE	
<p>► The tools used, such as socket wrenches, torque wrenches, and screwdrivers, must have insulated handles or be insulated tools.</p>	

The tools to be prepared before the installation of the equipment are as follows.

Table 5.1 Tools Required Before Installing the Energy Storage System.

			
<p>Hammer drill (drill bit: $\Phi 14\text{mm}$, $\Phi 16\text{mm}$)</p>	<p>Torque socket wrench</p>	<p>Moment of force spanner</p>	<p>Diagonal pliers</p>
			
<p>Wire strippers</p>	<p>One-word screwdriver Knife head: $0.6\text{mm} \times 3.5\text{mm}$</p>	<p>Rubber mallet</p>	<p>Utility knife</p>
			
<p>Marker</p>	<p>Steel measuring tape</p>	<p>Level</p>	<p>Hydraulic tong</p>

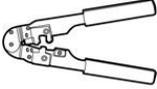
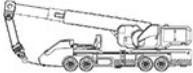
 <p>Cable cutter</p>	 <p>Crystal head clamp</p>	 <p>Vacuum clear</p>	 <p>Multimeter DC voltage range \geq 1500V DC</p>
 <p>Heat-shrinkable sleeve</p>	 <p>Heat gun</p>	 <p>Tie-line belt</p>	 <p>Insulation ladder</p>
 <p>Crane</p>	 <p>Lifting rope</p>	<p>—</p>	<p>—</p>

Table 5.2 Personal protection tools

 <p>Safety gloves</p>	 <p>Safety goggles</p>	 <p>Dust mask</p>	 <p>Safety boots</p>
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 <p>Reflective waistcoat</p>	 <p>Safety helmet</p>	 <p>Field medical chest</p>	<p>—</p>
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5.3.2 Check before installation

Verify Delivery Items

- ▶ Check all delivered items against the accompanying packing list to ensure completeness.

Inspect the Equipment

- ▶ Confirm that the received cabinets match the models specified in the order.
- ▶ Examine the energy storage system and internal components for any signs of damage, such as holes, cracks, or other potential defects.
- ▶ If any issues are identified, or if the model does not match the order, please contact your distributor immediately.

5.3.3 Installation and fixing work

 **WARNING**

- ▶ Only a complete and undamaged energy storage system may be installed!

Prerequisites:

- ▶ Before installation, make sure that the crane, sling, forklift, etc., meet the load-bearing requirements;
- ▶ Preparation of steel cables for lifting has been completed.
- ▶ Foundations have been constructed as required;

- ▶ Meet the weather requirements for lifting and forklift transport; when installing outdoors, lifting work should be stopped in case of bad weather conditions, such as heavy rain, fog, strong winds, etc.

Installation considerations:

Table 5.3 Precautions for Installation of energy storage system

Installation process	Precautions
Pre-installation	The lifting capacity of the crane exceeds 6t, and the working radius is not less than 5m. The carrying capacity of the forklift truck is at least 4t. If the working conditions at the site do not meet the requirements, it is necessary to find a professional to carry out an assessment.
	Personnel carrying out forklift transport and lifting operations are required to undergo relevant training and be qualified before taking up their duties.
	Forklifts and lifting tools need to be inspected and qualified, and tools are complete before use.
	Ensure that the lifting tool is securely fixed to a load-bearing fixture or wall.
	Confirm that the crane and cable meet the requirements before lifting.
	The doors of the energy storage cabinets are all closed and locked.
	Ensure that the steel cable is connected safely and reliably.
	A left-to-right or right-to-left lifting sequence is recommended to ensure smooth lifting.
Installation	It is strictly prohibited for unrelated persons to enter the forklift truck transport area, lifting area, or to stand under the boom.
	Ensure that the crane is in the right position and cannot be lifted for long distances.
	Keep smooth, the cabinet diagonal tilt $\leq 5^\circ$.

Installation process	Precautions
	<p>Ensure that the angle between the two lifting cables is $<60^\circ$.</p>
	<p>Forklift trucks transport and lift equipment gently, lift the equipment slowly, and the energy storage system should be lifted slowly and smoothly to avoid impact on the internal equipment.</p>
	<p>When the energy storage system is in contact with the concrete support platform, wait until the four support force surfaces are relatively uniform before removing the lifting cable and forklift arm.</p>
	<p>It is prohibited to drag the wire rope and spreader, and prohibited to use hard objects to hit.</p>

Procedure:

1. Mark the installation reference point of the energy storage system on the concrete support platform using a marker. Based on this point, use a chalk line and a long measuring tape to outline the positions of the four cabinet corners.
2. Carefully remove the external protective materials, such as wrapping film, pearl cotton, and corner protectors, with a utility knife.

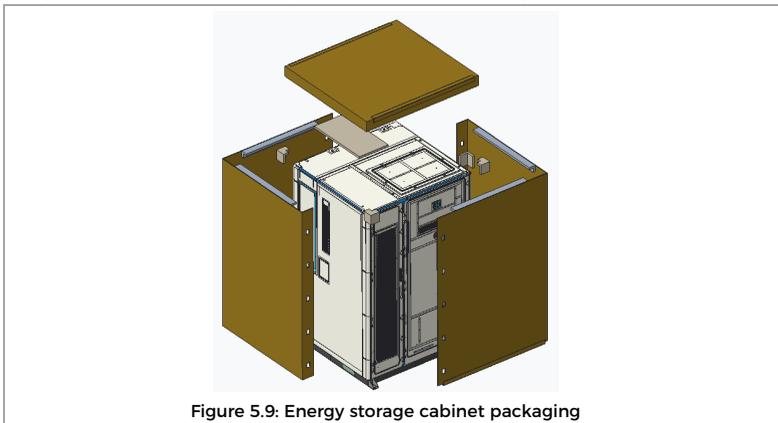


Figure 5.9: Energy storage cabinet packaging

- Align the energy storage system with the designated installation direction. Use a forklift to place the system onto the concrete support platform, or attach lifting cables to hoist it into position. Ensure that the cabinet base aligns precisely with the marked base positions on the platform.

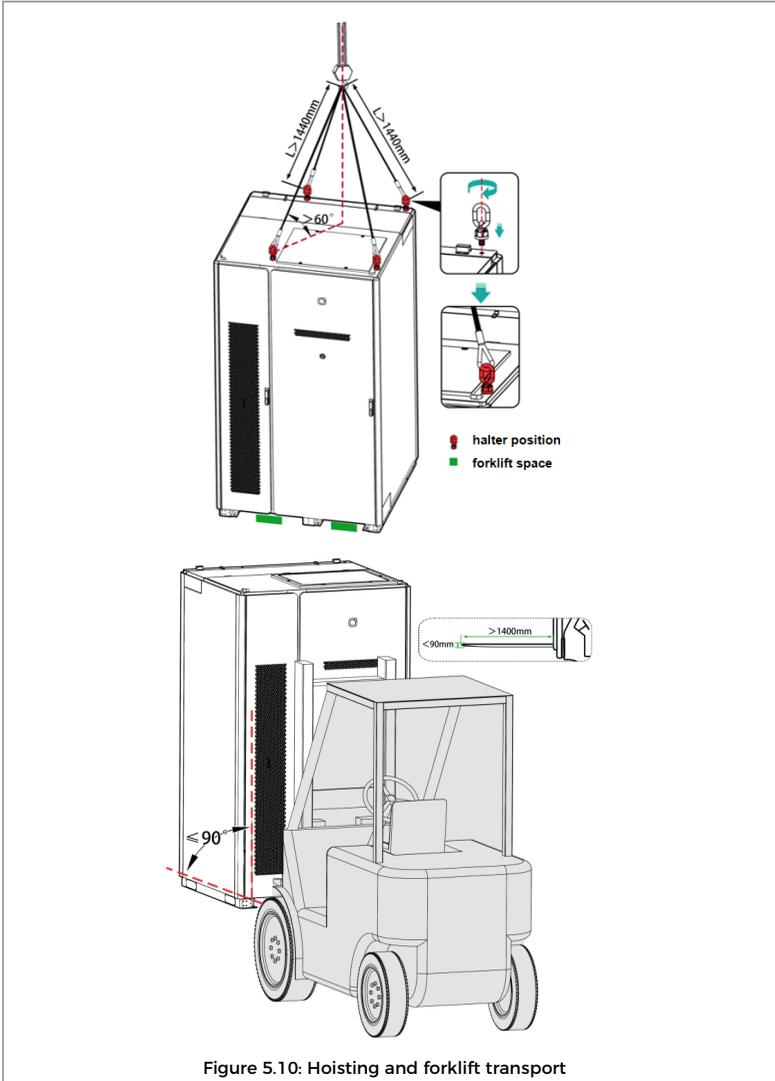


Figure 5.10: Hoisting and forklift transport

4. Cut open and remove the protective cover using a utility knife. Take out the accessories provided inside the cabinet. After opening the cabinet door, check the delivery items against the Packing List. If any parts are missing, contact your distributor immediately.
5. Secure the energy storage system using the four corner brackets.

 WARNING

- ▶ When using a forklift truck to move the equipment, please tie down and secure it according to the actual situation to ensure that there is no risk of the equipment tipping over.

NOTICE

- ▶ When hoisting the energy storage system, it is necessary to ensure that the four corners of the energy storage system coincide with the corners drawn on the concrete support platform.

NOTICE

- ▶ There are four mounting holes at the contact between the Angle steel and the base, which should be drawn when marking the mounting holes.
- ▶ Each Angle steel shall ensure that there are two installation holes fixed. When drilling, two installation holes on the outside shall be preferred. When the drilling interferes with the reinforcement in the base concrete, the inner installation holes shall be selected.
- ▶ When fixing the angle steel and the base, make sure that the expansion bolts are tightened.

During transportation, the energy storage system is additionally protected with a safety cover.

Checklist:

After the energy storage system has been hoisted and installed, a post-installation inspection must be carried out to ensure proper operation and smooth progress of subsequent installation work.

Table 5.4 Checks after installation

No.	Check the content	Method	Standards
1	Are the bolts and nuts tight?	Use a spanner to tighten again.	Bolts and nuts are tightened.
2	Does the energy storage system door open and close properly?	Perform an open and close operation on the energy storage system door.	All doors of the energy storage system can be opened and closed smoothly.

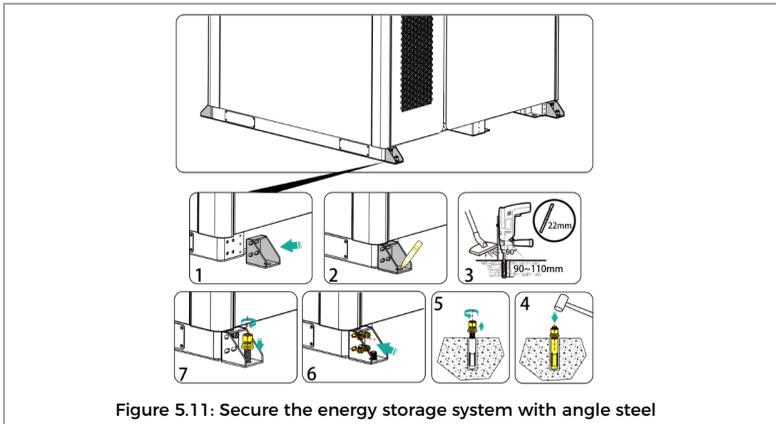
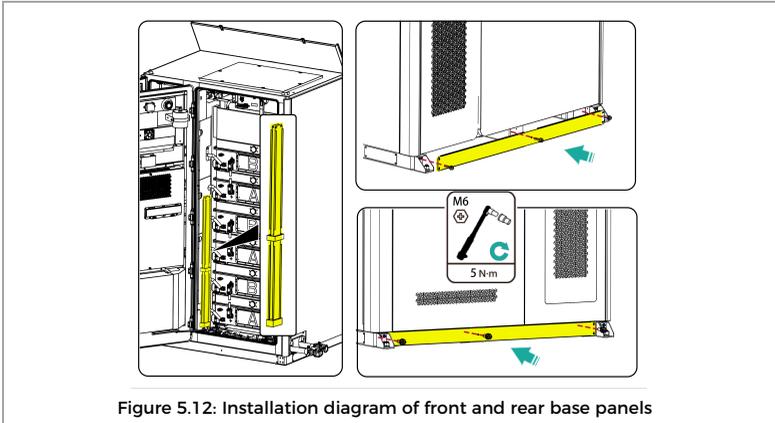


Figure 5.11: Secure the energy storage system with angle steel

6. Open the liquid cooling compartment, take out the front and rear base panels, and secure them to the designated positions on the base.



5.3.4 Cabinet combination fixing procedure

1. After the energy storage cabinet has been installed at the designated position, take out the long fixing brackets supplied with the shipment. Attach one end of the fixing bracket to the mounting holes on the base of the energy storage cabinet and tighten the screws.
2. Use the installed fixing bracket as a positioning reference. Align the battery cabinet along the bracket direction and hoist it into place until it is fully fitted against the energy storage cabinet and the fixing bracket.
3. Repeat Step 2 to hoist and position all battery cabinets. After installation, use the remaining fixing brackets to secure the entire energy storage system in sequence.

The figure below illustrates the combination scheme of 1 energy storage cabinet + 3 battery cabinets.

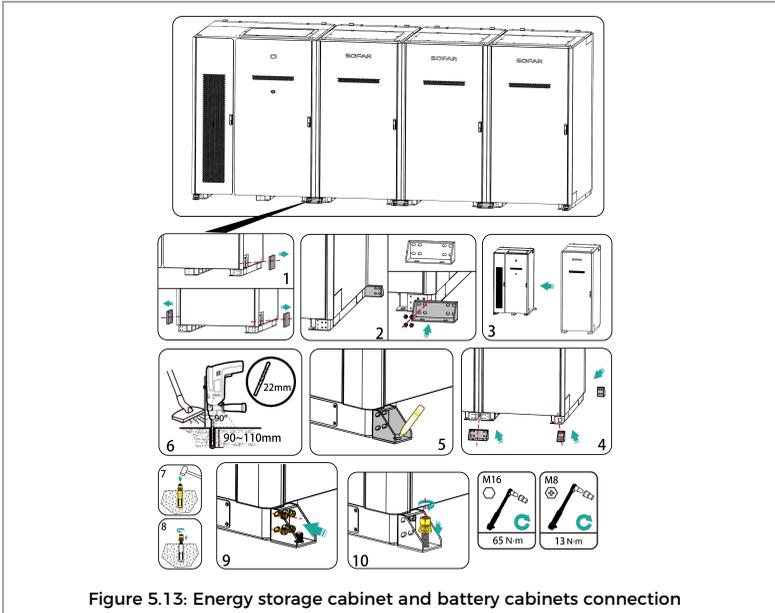


Figure 5.13: Energy storage cabinet and battery cabinets connection

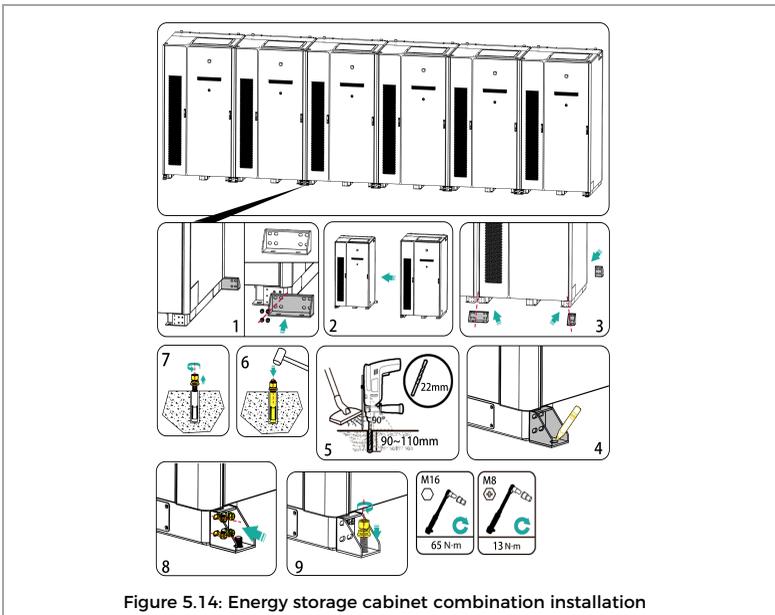
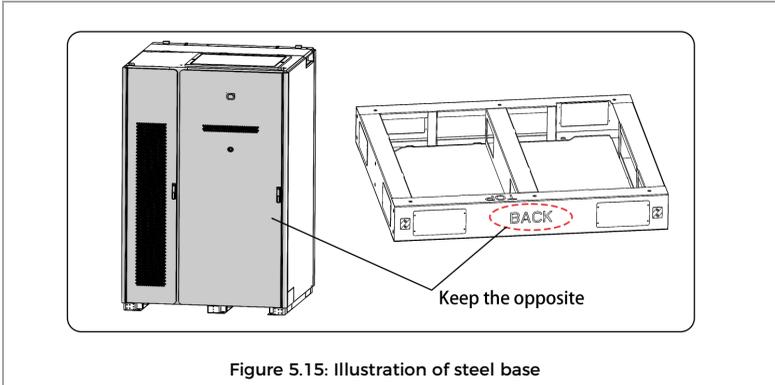


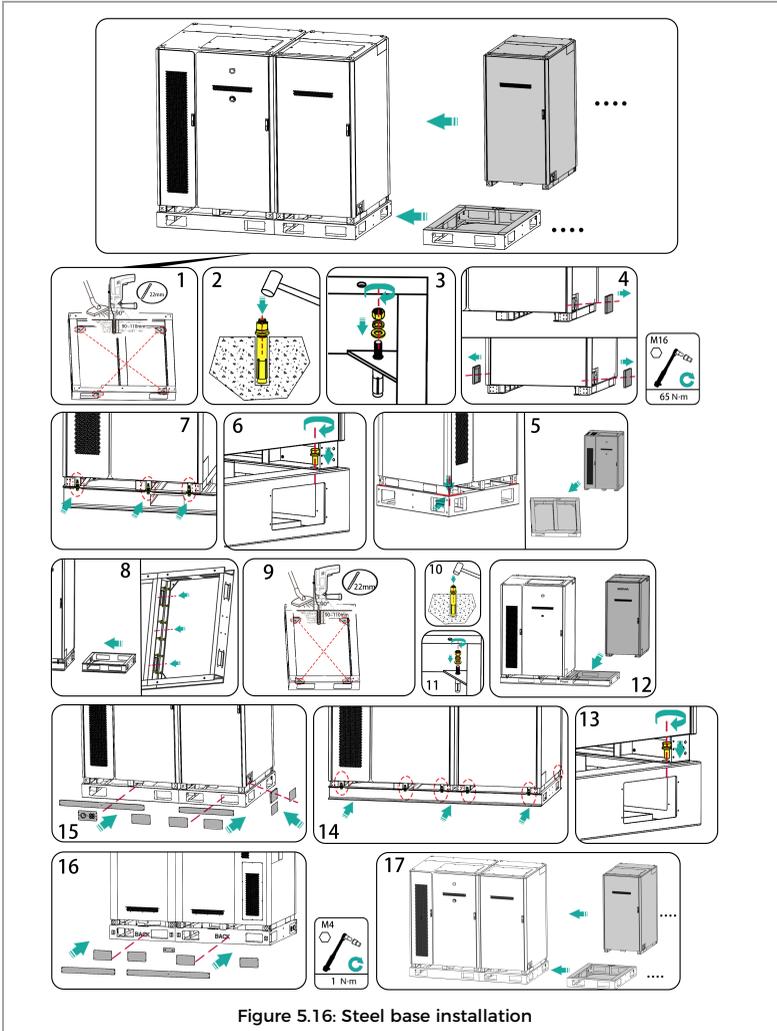
Figure 5.14: Energy storage cabinet combination installation

5.3.5 Customised steel base installation

1. Hoist or transport the steel base to the designated position using a forklift, and ensure that the **“Black”** side of the steel base faces opposite to the preset cabinet door direction.



2. Use expansion bolts to secure the steel base to the concrete floor. For a cabinet combination scheme of n (number of energy storage cabinets) + m (1-3 battery cabinets), it is recommended to first fix and level the steel base for the battery cabinets before hoisting the entire cabinet assembly.
3. Secure the energy storage cabinet and battery cabinets firmly to the steel base using bolts.
4. Install the front and rear base panels to seal the cabinet base.



6 Electrical connection

DANGER

Danger of high voltage! Electric shock hazard!

- ▶ Do not touch electrically charged parts!
- ▶ Please make sure that the AC and DC sides are not charged before installation.
- ▶ Do not place the device on flammable surfaces.

WARNING

- ▶ Before wiring, check and ensure that the polarity of all input cables is correct.
- ▶ During electrical installation, do not forcibly pull any wires or cables, as this may compromise the insulation performance.
- ▶ Ensure that all cables and wires have sufficient space for any bends.
- ▶ Adopt the necessary auxiliary measures to reduce the stress applied to cables and wires.
- ▶ After completing each connection, carefully check and ensure that the connection is correct and secure.

6.1 Safety precautions

6.1.1 Wiring requirements

- ▶ The selection, installation, and routing of cables must comply with local laws, regulations, and standards.
- ▶ Power cables must not be coiled or twisted during installation. If the cable length is insufficient, it must be replaced; joints or soldering points in power cables are strictly prohibited.
- ▶ All cables must be firmly connected, properly insulated, and of appropriate specifications.

- ▶ Cable trays and cable entry holes must be free of sharp edges. Protective measures must be applied when cables pass through conduits or entry holes to prevent damage from sharp edges or burrs.
- ▶ Cables of the same type should be bundled together, arranged neatly, and kept free from sheath damage. Different types of cables must be routed at least 30 mm apart; crossing or intertwining is strictly prohibited.
- ▶ After wiring is completed, or when work is suspended, cable entries must be sealed immediately with sealing clay to prevent moisture and small animals from entering.
- ▶ Buried cables must be reliably fixed with cable brackets and clamps. In backfill areas, cables must be laid close to the ground to avoid deformation or damage caused by soil pressure.
- ▶ When external conditions (e.g., laying method or ambient temperature) change, cable selection and verification must comply with IEC 60364-5-52 or local regulations and standards, ensuring current-carrying capacity meets requirements.
- ▶ High temperatures may cause insulation aging or damage. The distance between cables and heating elements or heat sources must be at least 30 mm.
- ▶ At very low temperatures, strong impacts or vibrations may cause cable sheaths to crack due to brittleness. To ensure installation safety, the following must be observed:
 - All cables must be installed at ambient temperatures above 0°C. During handling, especially in low-temperature conditions, cables must be handled with care.
 - If cables are stored at temperatures below 0°C, they must be kept at room temperature for at least 24 hours before installation.
 - Improper handling, such as pushing cables directly off vehicles, is prohibited, as this may damage the cables and affect current capacity and thermal performance.

6.1.2 Short-circuit protection

- ▶ During installation and maintenance of battery PACKs, wrap exposed cable terminals on the battery with insulating tape.
- ▶ Prevent foreign objects (e.g., conductive materials, screws, liquids, etc.) from entering the battery to avoid short circuits.

DANGER

- ▶ Before making electrical connections, ensure that the equipment is free from damage; otherwise, electric shock or fire may occur.
- ▶ Improper or incorrect operation may cause accidents such as fire or electric shock.
- ▶ Prevent foreign objects from entering the equipment during operation, as this may cause short circuits, equipment damage, load derating or power loss, and even personal injury.

WARNING

- ▶ For equipment requiring grounding, the protective earth (PE) conductor must be connected first during installation and disconnected last during removal.

NOTICE

- ▶ Do not route cables across the equipment's air inlet or outlet to prevent blockage.

6.1.3 Grounding requirements

- ▶ The grounding impedance of the equipment must comply with local electrical standards.
- ▶ The equipment must be permanently connected to protective earth. Before operating the equipment, check the electrical connections to ensure proper grounding.

- ▶ Do not operate the equipment without a connected grounding conductor.
- ▶ Do not damage or remove the grounding conductor.
- ▶ For equipment using a three-pin socket, ensure the grounding pin is reliably connected to protective earth.
- ▶ For equipment with high touch current, connect the protective earth terminal of the chassis before connecting the input power supply to prevent electric shock hazards.

6.1.4 ESD (electrostatic discharge) protection

Electrostatic charges generated by the human body can damage electrostatic-sensitive components on boards, such as large-scale integrated circuits (LSI).

- ▶ Before touching equipment, handling boards, modules with exposed circuit boards, or application-specific integrated circuits (ASIC), comply with ESD protection requirements: wear anti-static clothing, and use anti-static gloves or wrist straps. The wrist strap must be properly grounded.
- ▶ When holding boards or modules with exposed circuits, grasp only the edges that do not contain components. Do not touch components with your hands.
- ▶ Boards or modules that are removed must be packaged with anti-static materials before storage or transport.

6.2 Wiring preparation

6.2.1 Installation tools

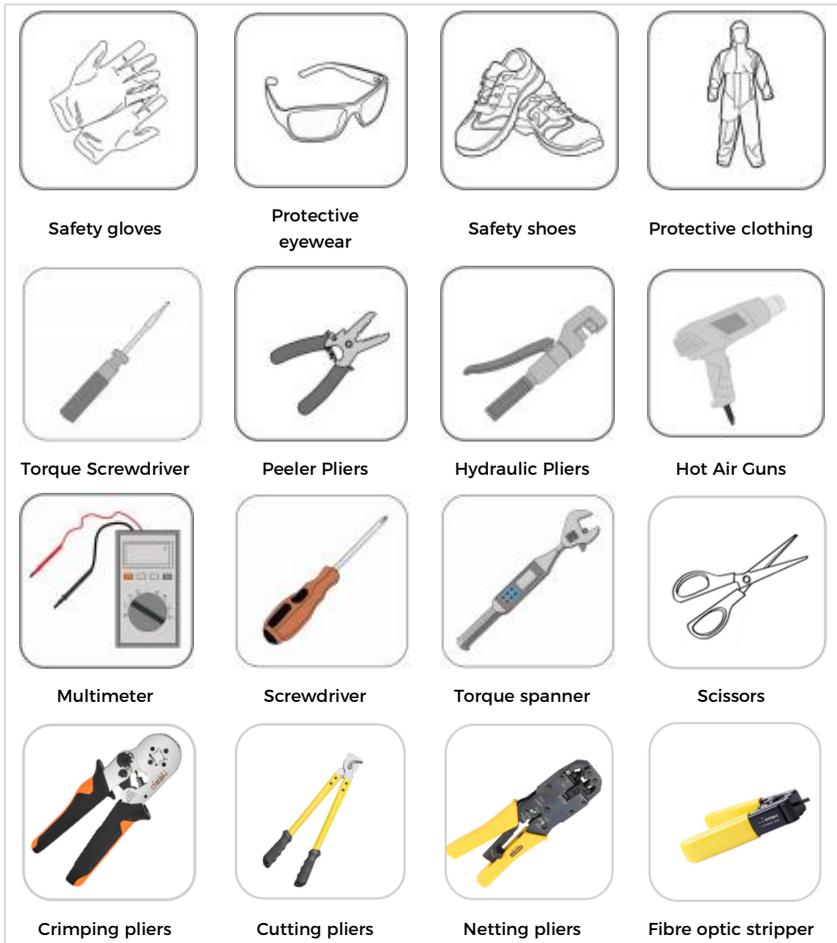


Figure 6.1: Installation Tools

6.2.2 Prepare Cables

Table 6.1 Recommended Cable Specifications

Name	Type	Scope of cross-sectional area selection	Terminal	Remarks
The PCS AC input power cord	3 core (A, B, C) outdoor copper core wire or choose armored cable	95mm ² *3	The M 8 OT / DT terminal	Storage cabinet PCS AC input three-phase power line
DC-parallel cabinet power line	Random cabinet comes with it	DC+:70mm ² DC-:70mm ²	The cable comes with a power terminal	Energy storage cabinet and battery cabinet when used
Connection cabinet signal line	Random cabinet comes with it	—	—	Energy storage cabinet and battery cabinet when used
The RS485 communication line	2 Core shielding line	(0.5~1.5mm ²)*2	Tube type cold pressure end + specified pin	Choose according to the actual configuration
The CMU communication network line	CAT 5E Outdoor shielded network cable, with an internal resistance of 1.5 Ω / 10m	—	Shield of the RJ 45 crystal head	When the energy storage cabinet does not integrate CSU, CMU to CSU
The CSU communication network cable	CAT 5E Outdoor shielded network cable, with an internal resistance of 1.5 Ω / 10m	—	Shield of the RJ 45 crystal head	When the energy storage cabinet is integrated with the CSU,

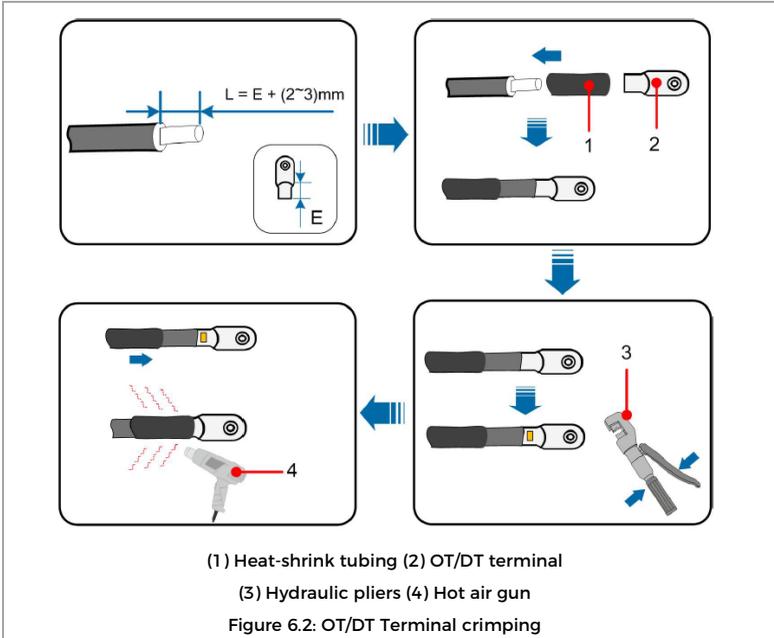
Name	Type	Scope of cross-sectional area selection	Terminal	Remarks
				the CSU goes to the industrial controller
The I / O dry contact signal line	4 core line, 8 core line, 14 core	(0.5-1mm ²) *4 (0.5-1mm ²) *8 (0.5-1mm ²) *14	Tube type cold pressure end + specified pin	Choose different number of core wires according to the actual configuration
24V power cord	2 Core line	16AWG*2	Tube type cold pressure end + specified pin	Choose according to the actual configuration
Three-phase AC voltage sampling line	3 Core line	16AWG*3	Tube type cold pressure end + specified pin	Choose according to the actual configuration
Protect the grounding wire	Single-core outdoor copper core wire or grounding flat steel	Copper core wire: (25mm ² -50mm ²) or ground flat steel: (section 40mm 4mm)	The M10 OT / DT terminal	The specific size of the grounding wire / flat steel is subject to the design of the design institute.

NOTICE
<ul style="list-style-type: none"> ▶ The cables used must comply with local laws and regulations. ▶ The cable colors shown in this manual are for reference only; please select cables according to local standards.

- ▶ Cable cross-sectional area must be selected based on the maximum current-carrying capacity, and the length must include sufficient margin.
- ▶ All DC input cables must be of the same specification and material.
- ▶ Except for the cabinet-parallel power cables and cabinet-parallel signal cables, all other cables listed in the cable schedule shall be provided by the customer.

6.2.3 Cable crimping and connection

OT/DT terminal crimping



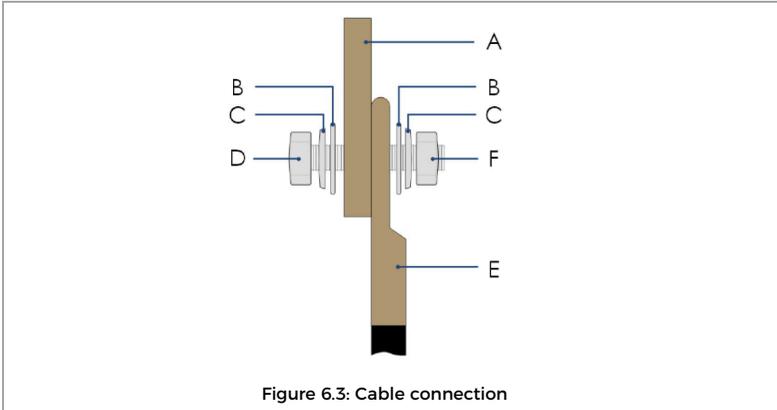


Figure 6.3: Cable connection

Table 6.2 Cable Connection Description

No.	Name	No.	Name
A	Copper row	D	Bolt
B	Flat pads	E	Copper Terminal Block
C	Spring pads	F	Nuts

6.2.4 Opening the cabinet door and equipment box door

1. Open the doors of the energy storage cabinet and battery cabinet.
Insert the key into the lock cylinder and rotate it. When the handle pops out, turn it clockwise to open the door.



Figure 6.4: opening the cabinet door

2. Fix the cabinet door

When the door is opened, the double-headed bolt of the door support will slide naturally. Once the bolt reaches the hole position (see Fig. A), the limit bar will automatically secure the door.

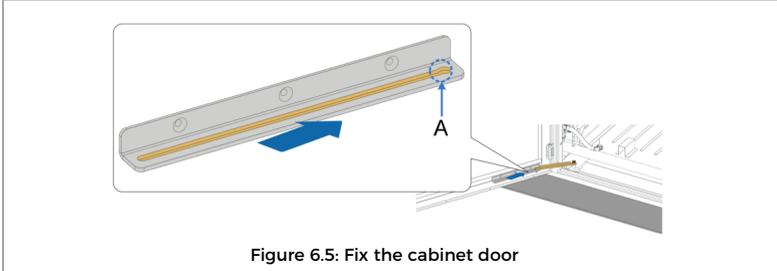


Figure 6.5: Fix the cabinet door

Images are for reference only. Please refer to the actual product received.

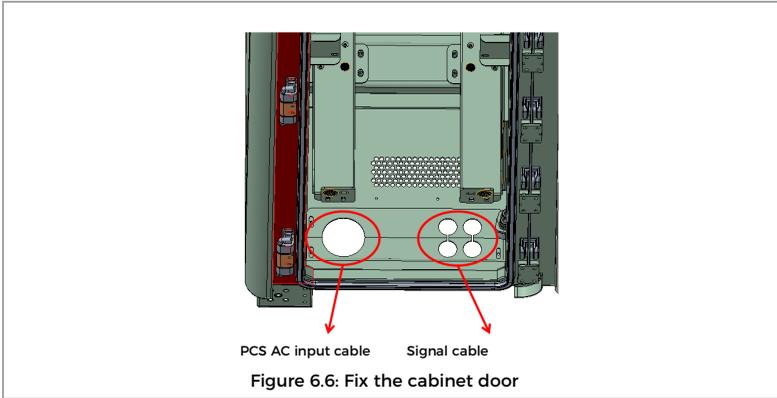
3. Remove the top cover plates between the energy storage cabinet and battery cabinet (in parallel-cabinet configurations).

6.2.5 Cable entrance design

All external connection cables to the energy storage cabinet shall enter and exit through the bottom of the cabinet. The parallel-connection cables between the energy storage cabinet and battery cabinet shall enter and exit through the top of the cabinet.

All exposed external cables must be properly protected (e.g., routed through conduits) to prevent damage by rodents. After the wiring work is completed, the cabinet's cable entry/exit holes must be tightly sealed with fireproof putty or other suitable sealing materials.

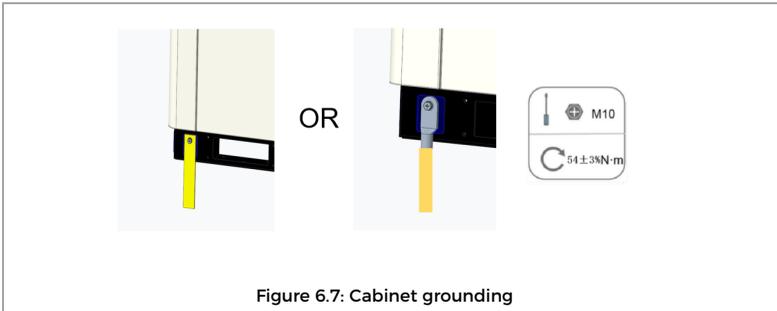
The design of the cable entry/exit holes at the bottom of the energy storage cabinet is illustrated below.



Images are for reference only. Please refer to the actual product received.

6.3 Grounding connection

There are two kinds of grounding methods: fixed with grounding flat steel or fixed by grounding cable.



Images are for reference only. Please refer to the actual product received.

Ground flat steel

- ▶ Fix the grounding flat steel to the two grounding points of the energy storage and battery cabinet base with M10x30 screws, the whole fixing surface needs to be sprayed after completion.

Grounding cable

- ▶ Use a 25 mm² to 50 mm² grounding cable to reliably connect the two grounding points of the energy storage cabinet and the battery cabinet to the grounding point of the grounding grid on site.
- ▶ The cable is crimped to the DT terminal and when crimping is complete, it is tightened using M10×30 screws.
- ▶ Please take into account the actual situation of the project site and follow the instructions of the power station staff to install the external grounding. The grounding resistance shall be measured after the grounding connection is completed, and the resistance value shall not be greater than 4 Ω.

NOTICE

- ▶ The grounding resistance values are subject to relevant national/local standards and regulations.

6.4 Cabinet-to-cabinet cable connection

The cabinet-to-cabinet cable connection is only required when the energy storage cabinet and battery cabinets are installed in a combined configuration. If the energy storage cabinet is used alone, cabinet-to-cabinet cable connection is not needed.

The cabinet-to-cabinet wiring includes DC power connections and signal connections. During on-site installation of the combined system, these connections can be completed at the same time. All required cabinet-to-cabinet cables (power and signal) are supplied with the cabinets. On-site installation only requires plug-and-play connection between the energy storage cabinet and battery cabinet.

fixed by grounding cable.

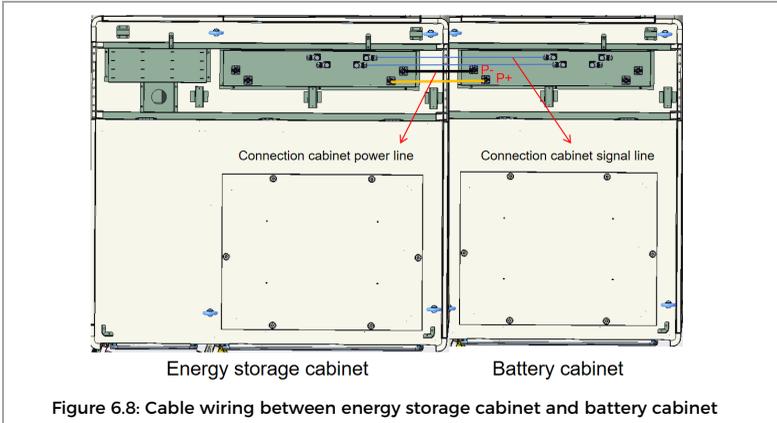


Figure 6.8: Cable wiring between energy storage cabinet and battery cabinet

Procedure:

1. Locate the cabinet-to-cabinet cables delivered with the cabinets:
 - Two power cables (positive and negative, both with connectors).
 - Two sets of signal cables (both ends equipped with signal terminals).
2. Insert the power cables and signal cables into the designated ports on the energy storage cabinet. Ensure the terminals are fully engaged and locked. Then, route the cables according to the labels to the corresponding interfaces on the battery cabinet.
3. After all cables are connected, secure them with cable ties and recheck the connectors:
 - Confirm engagement by listening for a “click.”
 - Perform a reverse pull test to ensure there is no loosening.
4. After completing the cable connections, gently pull each cable to ensure that sufficient slack is retained.
5. Install the cable protection cover.

6.5 Cabinet-to-cabinet pipeline connection

6.5.1 Liquid cooling pipeline sealing check

Both the main energy storage cabinet and the battery cabinets are shipped with coolant inside. Before starting cabinet-to-cabinet liquid cooling pipeline installation, carefully inspect the entire cabinet piping. Visually check all pipelines for leaks to ensure that the liquid cooling fittings and pipelines were not damaged during storage or transportation. If any issues are identified, immediately contact SOFAR after-sales service.

6.5.2 Cabinet-to-cabinet liquid cooling pipeline connection

Liquid cooling pipeline installation is only required when connecting an energy storage cabinet with battery cabinets, or when connecting battery cabinets together. If the energy storage cabinet is used independently, this step is not required. The installation process includes four steps: removing the side pass-through cover plate, installing the pipeline, closing the sealing slots, and final tightening.

1. Open sealing slots

Open the sealing slots between the two adjacent cabinets. Use a screwdriver to remove four M4 screws and rotate the sealing slot upward by 45°.



Figure 6.9: Remove sealing slot screws

Figure 6.10: Flip to open the sealing slot

2. Install pipelines

Loosen the pipeline clamps on both cabinets. Pass the primary supply and return hoses through the sealing slot and connect them to the quick couplers. Overcome the spring force inside the quick coupler with the help of the installation tool until the pipeline is fully engaged. Secure the couplers using the tool clip, and then use adjustable pliers to lock them in place.

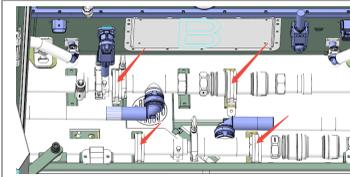


Figure 6.11: Loosen the pipeline clamps

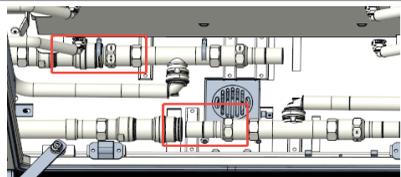


Figure 6.12: Docking couplings



Figure 6.13: Connection Tooling

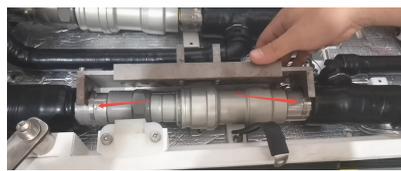


Figure 6.14: Use connecting fixtures



Figure 6.15: Use connecting fixtures

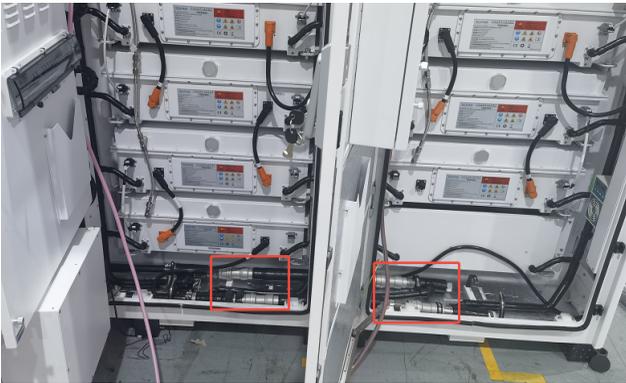


Figure 6.16: Pipe installation complete

3. Restore metal plates

Rotate the sealing slots downward by 45° to close, and reinstall the four M4 screws using a screwdriver.

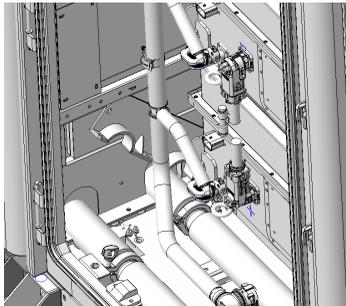


Figure 6.17: Flipping and closing the sealing slot

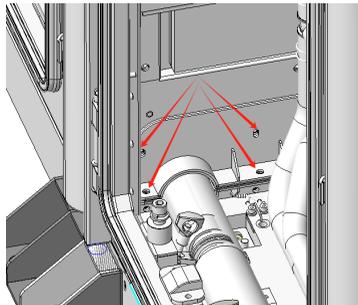


Figure 6.18: Installing screws of sealing slots

4. Closing the sealing slot

6.5.3 Firefighting pipeline connection for battery cabinets

The installation of fire protection pipelines is only installed between the energy storage cabinet and the battery cabinet. It only involves on-site installation when sharing the same fire bottle. One energy storage cabinet can be combined with up to three battery cabinets simultaneously. If the energy storage cabinet is used independently, this step is not required. The process includes four steps: opening the rotating top cover, installing the quick-connect firefighting pipeline, securing it with clamps, and closing the cover.

1. Open the rotating cover

Remove the fixing screws from the top cover and rotate it open. Secure the cover using the support rod.

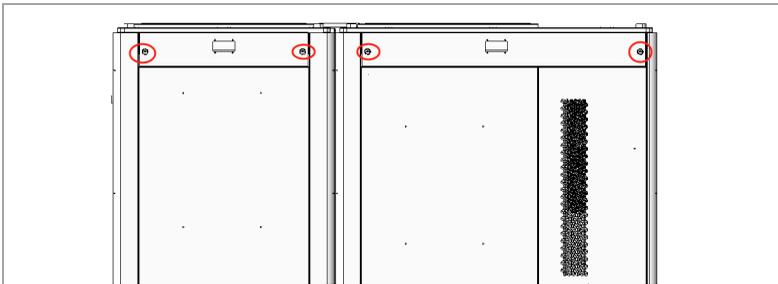


Figure 6.19: Disassembling the screws of the rotating cover plate

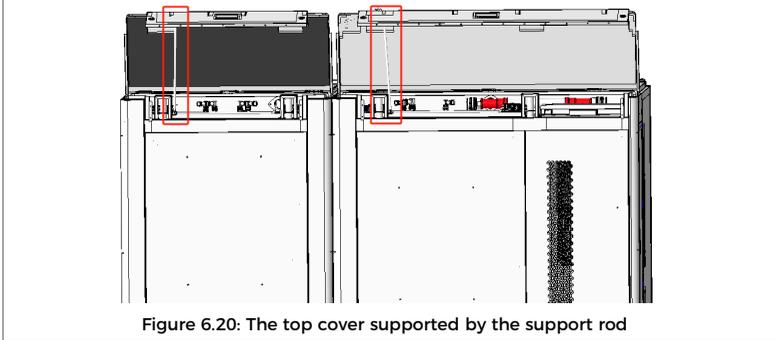


Figure 6.20: The top cover supported by the support rod

2. Install firefighting hose

Connect the braided firefighting hose to the quick coupler on the cabinet top. While pulling the coupler's outer ring to the left, insert the hose until it is fully engaged. Verify by pulling the hose gently—if it cannot be pulled

out, the connection is correct. Install quick-plug end caps at both ends of the firefighting pipeline.

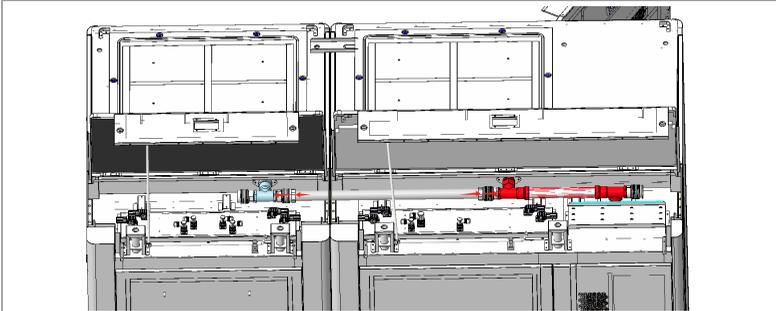


Figure 6.21: Installing fire hoses

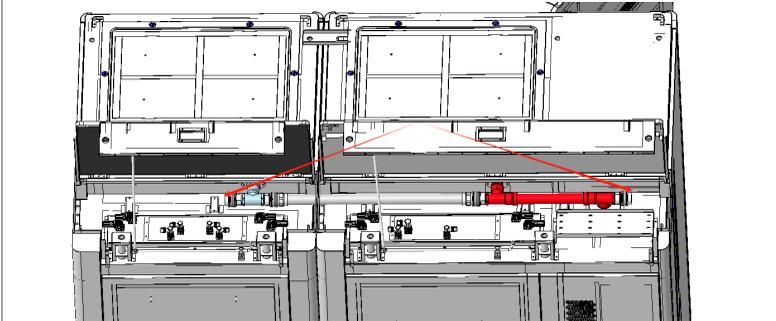


Figure 6.22: Installing quick plug at both ends

3. Secure with clamps

Fix the hose in place using clamps and tighten with two M4 screws.

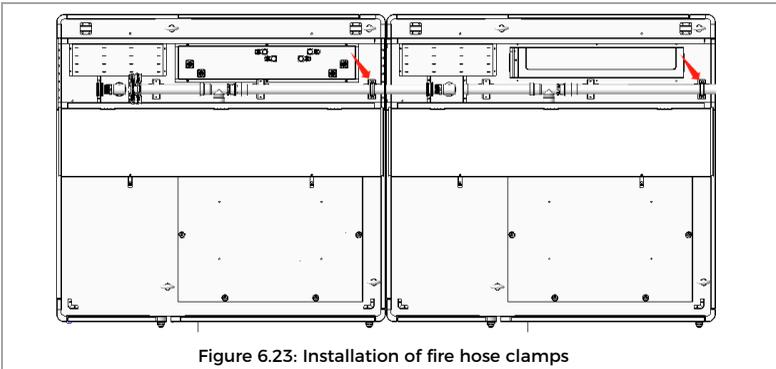


Figure 6.23: Installation of fire hose clamps

4. Close rotating cover

Lower the support rod, rotate the top cover back into position, and tighten the fixing screws.

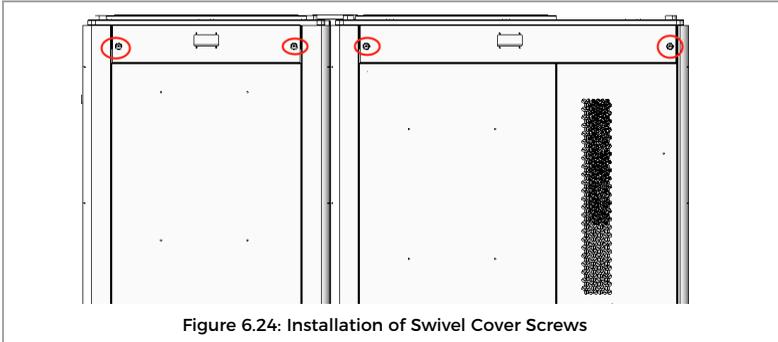


Figure 6.24: Installation of Swivel Cover Screws

6.6 PCS AC input power cable connection

The PCS AC input power cables connect at the input side of the three-phase molded case circuit breaker inside the wiring box of the liquid cooling compartment.

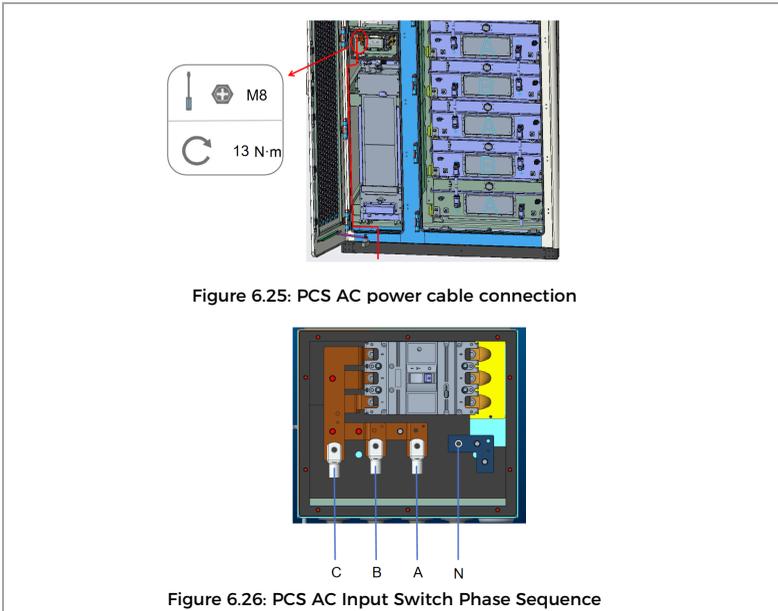


Figure 6.25: PCS AC power cable connection

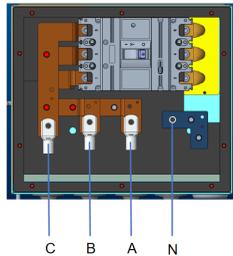


Figure 6.26: PCS AC Input Switch Phase Sequence

Procedure:

1. Switch off the upstream AC breaker and verify with a multimeter that there is no voltage on the cables leading to the energy storage cabinet.
2. Route the cables through the bottom entry holes of the cabinet, guiding them to the designated connection points according to cable markings.
3. Trim excess cable length using cable cutters.
4. Strip the insulation with wire strippers to expose the copper conductor.
5. Crimp OT terminals onto the cable ends (see section [6.2.3 Cable crimping and connection](#)).
6. Fix the OT terminals to the connection points using M8 bolts.
7. After completing the connections, gently pull each cable to ensure sufficient slack remains. Neatly bundle and secure the cables along the routing path with cable ties.

NOTICE

- ▶ The PCS AC input power cables must be connected strictly according to the designated terminal phase sequence.

6.7 Signal terminal wiring

There are signal terminals on the energy storage cabinet and no external wiring port on the battery cabinet, which are mainly used for IO signal transmission, CAN communication, 485 communication, 24V power supply and voltage sampling signal transmission. The field should be wired according to the actual configuration and refer to the following interface definition table, and the wiring of external interfaces of the energy storage cabinet is shown in the figure below.

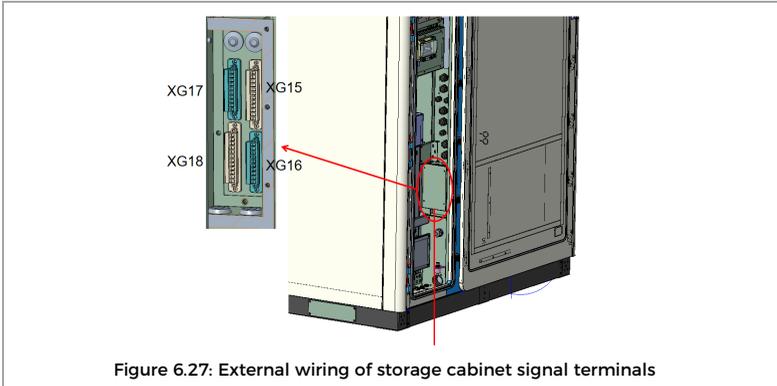


Figure 6.27: External wiring of storage cabinet signal terminals

Table 6.3 Definition of external interface terminals

External interface terminal	Pins	Description	Recommended Wire Size	Terminal Type	Remark
XG15	1-3	N/A	/	/	Internal wiring, no external connection required
	4-6	N/A			
	7-8	CSU alarm signal input to CMU			
	9-10	CMU alarm signal output to CSU			
	11-12	N/A			
XG16	1-2	Auxiliary power for junction cabinet (including dehumidifier, cooling fan, etc.) 24V	1.5mm ² *2	Tubular terminal, insertion depth 8mm	Connect if junction cabinet is present
	3-4	CSU 24V power for junction cabinet	1.5mm ² *2		
	5-10	N/A	/	/	

External interface terminal	Pins	Description	Recommended Wire Size	Terminal Type	Remark
XC17	1-2	External fault signal input to CMU	(0.5-1mm ²) *2	Tubular terminal, insertion depth 8mm	Connect external EPO or NS protection as needed
	3-4	CMU fault signal output to external	(0.5-1mm ²) *2		Connect as required
	5-10	PWM communication between PCS	(0.5-1mm ²) *2		Required for energy storage cabinet parallel operation (4 units or more)
XC18	1-12	N/A	/	/	Reserved interface, no wiring required

Procedure:

1. According to the actual system configuration, perform signal terminal wiring of the energy storage cabinet in line with the above interface definition table. Route the cables through the signal cable entry hole at the bottom of the energy storage cabinet and, based on the cable identification, connect them to the corresponding terminal plug pins.
2. Use cable cutters to trim any excess length of the cables.
3. Use wire strippers to remove the protective insulation and expose the copper conductor.
4. Use a crimping tool to crimp the cable onto the terminal pin.
5. Insert the crimped pin with cable into the corresponding pin hole of the plug according to the wiring sequence defined in the interface definition table. Secure the signal cables with the plug's matching cable clamp.

- After wiring is completed, gently pull the cables to ensure there is sufficient slack.

6.8 Communication connection

DRMs/Logic Interface Wiring

The CSU control box is equipped with a reserved DRMs/logic interface. If the customer requires DRM functionality, on-site wiring is needed from the CSU DRM interface to the client's control equipment.

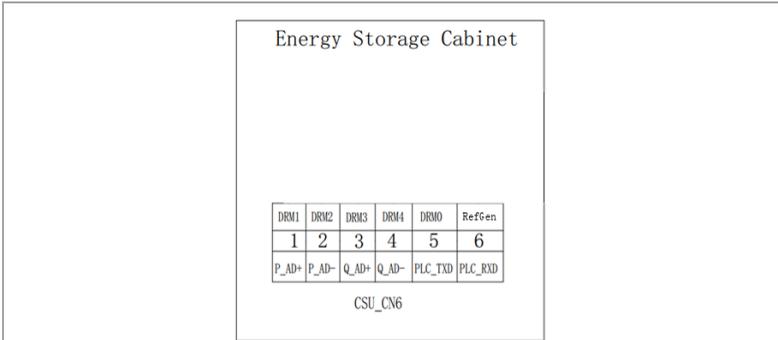


Figure 6.28: Interface diagram

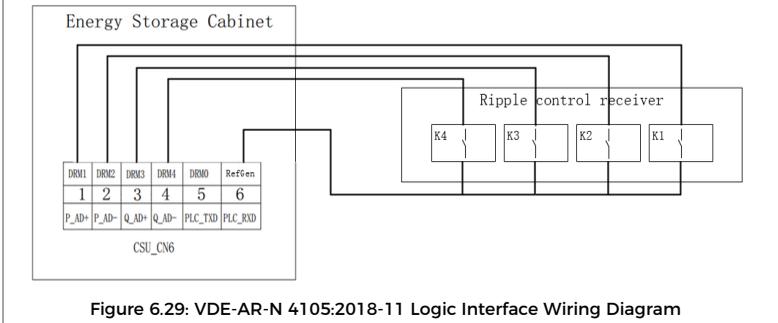
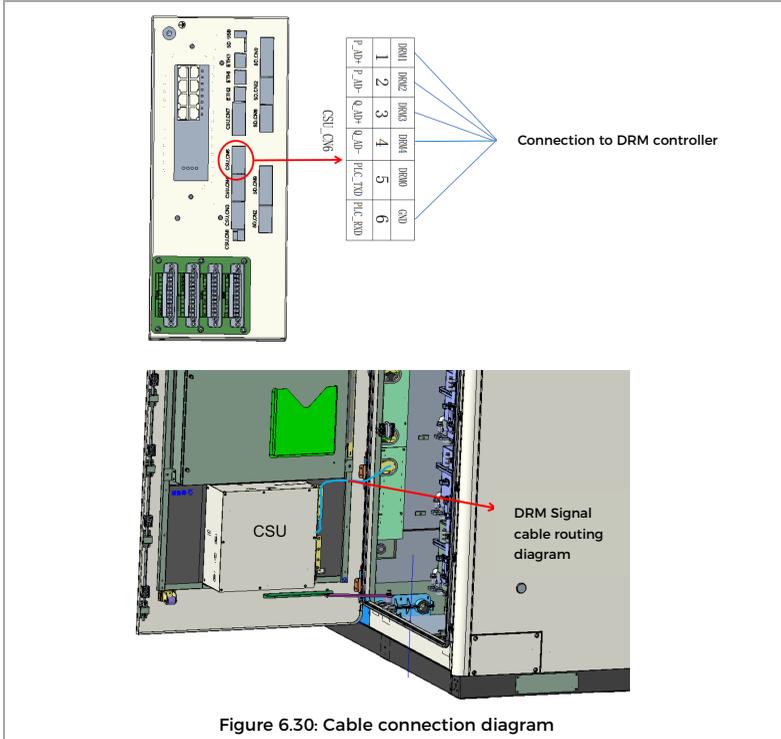


Figure 6.29: VDE-AR-N 4105:2018-11 Logic Interface Wiring Diagram

Power level setting:

No.	Name	Parameter	Power setting value
1	DRM1	K1	0%

No.	Name	Parameter	Power setting value
2	DRM2	K2	30%
3	DRM3	K3	60%
4	DRM4	K4	100%



1. Route the DRM signal cable through the signal entry hole at the bottom of the energy storage cabinet, pass it through the PG gland located in the liquid cooling compartment, and lead it to the corresponding DRM port on the CSU (CSU_CN6).
2. Use cable cutters to trim any excess cable length.
3. Strip the insulation layer of the cable with a wire stripper to expose the copper conductor.

4. Use a crimping tool to crimp the cable onto a tubular terminal (select the size of the tubular terminal according to the cable cross-section; insertion depth: 10 mm).
5. Insert the crimped cable with tubular terminals into the corresponding DRM port on the CSU according to the wiring sequence shown in the connection diagram.
6. After completing the wiring, gently pull the cable to ensure it is securely locked and that sufficient slack is reserved.

CSU Communication Cable

The CSU control box is mounted on the door panel of the energy storage cabinet. On-site, a communication network cable must be routed from the CSU's ETH1 port to the client-side WEB or EMS. The CSU communication cable connection is shown in the figure below.

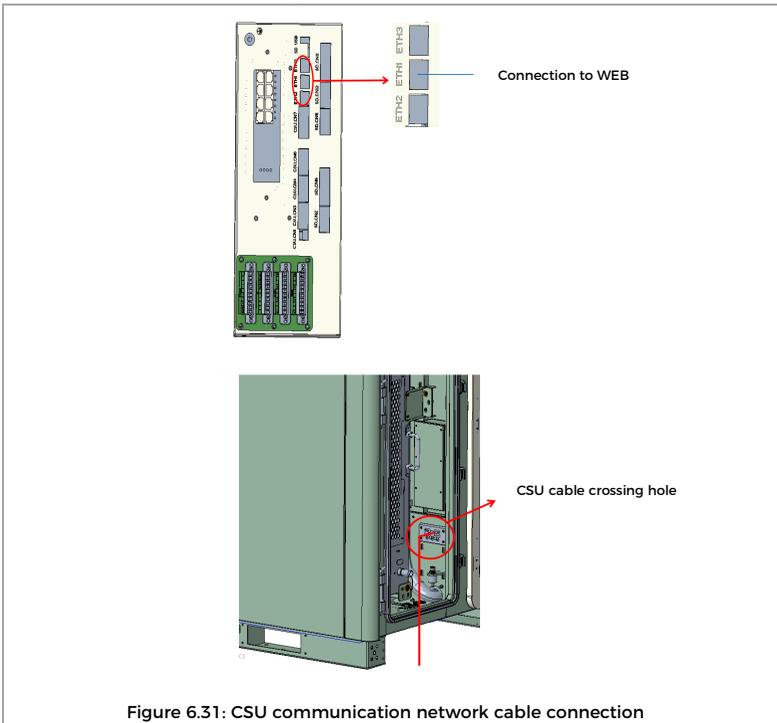


Figure 6.31: CSU communication network cable connection

1. Route the communication network cable through the signal entry hole at the bottom of the energy storage cabinet. Pass it through the corresponding routing hole in the liquid-cooled compartment and lead it to the CSU ETH1 port.
2. Use a network cable cutter to trim any excess cable length.
3. Terminate the cable with an RJ45 connector using a crimping tool. The wiring sequence at both ends can follow either the 568A or 568B standard.
4. Insert the terminated RJ45 connector into the corresponding ETH1 port on the CSU.
5. After completing the connection, gently pull the cable to ensure proper seating and leave some slack. Secure the communication cable along the routing path using cable ties.

6.9 Wiring completed

After all electrical connections are completed, perform a thorough and careful inspection of all wiring. In addition, the following actions must be taken:

- ▶ Seal the energy storage cabinet's cable entry holes and surrounding gaps tightly using fireproof and waterproof materials.
- ▶ Reinstall all panels, doors, and screws that were removed during wiring to restore the cabinet to its original state.

WARNING

- ▶ Improper sealing may allow moisture to enter.
- ▶ Improper sealing may allow rodents to enter.

7 Power on/off operation guidelines

 WARNING	
▶	The BESS can only be put into operation after confirmation by a professional and approval by the local power department.
▶	For BESS with a long shutdown time, check the equipment thoroughly and carefully to ensure all indexes are acceptable before powering it on.

7.1 Indicator lights and status descriptions

Table 7.1 SOFAR LOGO indicator status information

Type	Indicator status	Meaning	Note
Green	Green always on	Running (AC/DC relay fully closed)	
	Green flashing (1Hz)	Standby detection	
	Green flashing (2Hz)	Upgrade	
Yellow	Yellow always on	First level alarm	
	Yellow flashing (2Hz)	Secondary alarm	
Red	Red always on	Trip alarm	
	Red flashing (2Hz) + Buzzer	FFS alarm	Fire-activated faults, not faults in the FFS itself
Off	Off	Power off	

Table 7.2 PCS indicator status information

Type	Indicator status	Meaning	Note
POWER	Green light always on	DC side charged	
	Red light always on	DC side fault	Leakage current, DC side reverse connection, bus over-undervoltage
	Red light flashing	Master-slave disconnect	
RUN	Green light always on	Normal operation	
	Green light flashes	Non-grid-connected but trouble-free operation	1s on,1s off
	Red light always on	Grid-side faults	Abnormalities in grid phase, frequency, amplitude; phase loss, unbalance
ALARM	Red light always on	Device alarm	DC-side faults, grid-side faults, and alarms generated by the PCS itself
	Red light flashing	communication alarm	1s on,1s off
	Off	No alarm	

Table 7.3 High voltage box indicator status information

Type	Indicator status	Hidden meaning	Note
Green	Green light always on	Main contactor closed, manual switch QB2 disconnected	
	Slow flash 1Hz	BMS system powered, main contactor not closed	
	Flash 2Hz	The BMS system is powered, the main contactor is closed, the manual switch QB2 is closed, and the prompt can disconnect the manual switch QB2	
Red	Red light always on	System malfunction shutdown, relays are disconnected	
Off		No auxiliary power on the DC side of the system	

7.2 Power-on operation

The prerequisite for this part of the operation is that the storage cabinet is in a normal un-started state, specifically all switches of the high voltage box, auxiliary power module, and system convergence module are in the off state, the positive and negative buses of the battery clusters have not yet been connected to the battery PACKs (this step is for the first time when the power is turned on), and the three-phase AC input power cables are connected and have a normal voltage input.

7.2.1 Pre-power-on check

Before powering on the energy storage system, carefully verify the following items:

- ▶ Check whether the wiring is correct.
- ▶ Check whether the protective covers inside the equipment are installed firmly.
- ▶ Check whether the emergency stop button is released.
- ▶ Check and ensure that there is no grounding fault.
- ▶ Check whether the AC and DC voltages meet startup conditions and ensure that there is no over-voltage with a multimeter.
- ▶ Check and ensure that no tools or components are left inside the equipment.
- ▶ Check all air inlets and outlets are free of foreign objects that may be obscuring or blocking them.
- ▶ Check whether the cabinet door is closed.

7.2.2 Normal power-on procedure

The energy storage system is in its default powered-off state. Specifically:

- ▶ All switches in the energy storage cabinet and battery cabinet, including high-voltage boxes, auxiliary power modules, and PCS, are off.
- ▶ The positive and negative main bus lines of battery strings are not yet connected to the battery PACK.
- ▶ AC three-phase main input lines and auxiliary single-phase circuits are correctly connected and powered.

Personnel performing the power-on procedure must wear proper insulation protection.

1. After making sure that all the power cables between PACKs are connected correctly in the storage cabinet and the battery cabinet, the operator need to wear insulated gloves and insert the positive and negative power wire plugs into the battery cluster corresponding terminals (the other ends have already been connected to the high-

voltage box B+ and B- terminals in the factory) and then make sure the plugs are fully inserted into place.

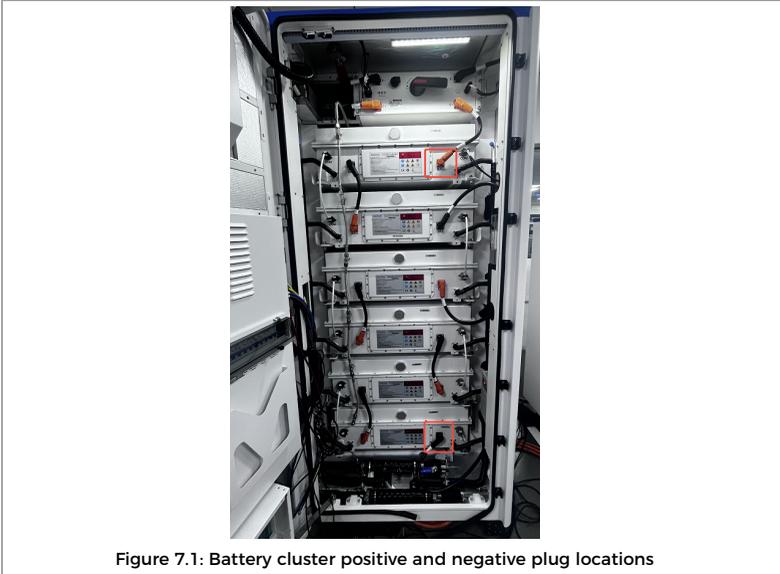


Figure 7.1: Battery cluster positive and negative plug locations

2. Power on auxiliary power module.

Measure AC220V at the main input terminals of the auxiliary power box with a multimeter. Ensure normal voltage.

Manually close QA1 (main power switch). Confirm output voltage is normal.

Sequentially close QA2 → QA3 → QA4:

- QA2: Powers the liquid cooling system.
- QA3: Powers CMU module, fire protection system, dehumidifier, water immersion switch, lighting, etc.
- QA4: Powers all BCUs in high-voltage boxes, BMUs in battery packs, high-voltage box indicators flash green slowly (1Hz).

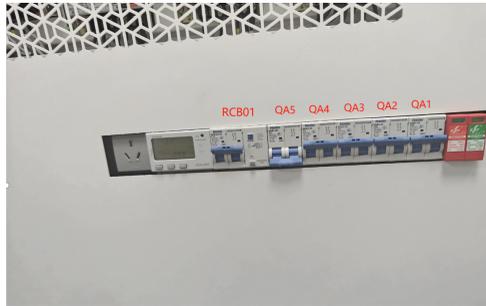


Figure 7.2: Auxiliary power module switch positions

3. Power On CSU (Single-Cabinet Scenario Only)

Close QA5 only for single-cabinet setups (used to supply CSU). For multi-cabinet setups, QA5 is not configured.

Measure DC24V at QA5 input. If normal, close QA5. CSU powers on.

↳ Auxiliary power modules in the ESS are now fully energised.

Use RCB01 socket & leakage protection as needed on-site.

4. Set QB switches on all high-voltage boxes in energy storage and battery cabinets to the ON position.

NOTICE

- ▶ AuxPower black knob small switch stays off.



Figure 7.3: High voltage box battery disconnect switch QB position

Manually close the QA1 main power switch and the QA6 surge protection switch in the auxiliary power module.

Closing QA1

↳ The green indicator on the front door of the auxiliary power module should illuminate.

Use a multi-meter to measure the input terminals of the QA0 moulded-case circuit breaker on the AC side of the PCS in the liquid-cooled cabinet. Once the input voltage is confirmed to be normal AC 400V three-phase, manually close QA0 and switch it to the “ON” position.

↳ At this time, the PCS indicator lights will show: Power—green steady, RUN—green flashing, ALARM—red steady, and the energy storage cabinet logo light remains green steady.

At this point, the manual power-on of the entire energy storage system is complete. Subsequent control logic will be coordinated and executed by the CSU, CMU, BCU, BMU, fire protection system, liquid cooling units, and other modules.

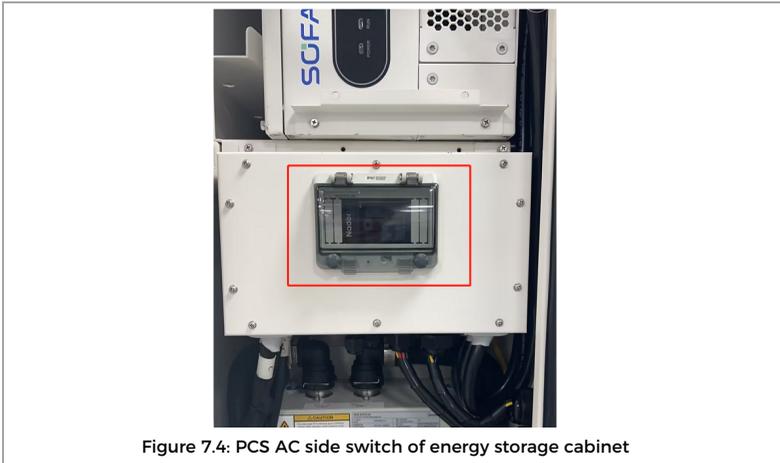


Figure 7.4: PCS AC side switch of energy storage cabinet

7.2.3 Normal power-off operation

During power-off operation, the PCS AC side module case circuit breaker QA0, the battery disconnect switch QB in the high voltage box, and the battery cluster positive and negative bus plugs should be avoided to be switched on and off or plugged in with load. Insulation protection measures are required for the personnel performing the power-off operation.

The procedure for normal power-off operation is as follows:

1. Perform the power-off operation first via the WEB interface. Once the power-off command is issued, if a PCS is connected, it will first stop charging and discharging. Then the battery string will automatically power down, and the two positive/negative main relays (KF1 and KF2) inside the high-voltage boxes, as well as the auxiliary power relay (KF4), should open.
2. Manually turn off all battery isolation switches (QB) in the high-voltage boxes of the energy storage cabinet and battery cabinet.



Figure 7.5: High voltage box battery disconnect switch QB position

3. Wearing insulated gloves, unplug the Pack-to-high-voltage-box positive and negative main power bus connectors from the battery strings in the energy storage cabinet and battery cabinet.



Figure 7.6: Battery cluster positive and negative plug locations

4. Manually open the PCS AC-side molded-case circuit breaker (QA0) in the distribution compartment of the energy storage cabinet, setting the breaker handle to the “OFF” position.
5. Manually open the upstream external three-phase AC main circuit breaker of the energy storage cabinet. At this point, the main circuit power-off of the commercial and industrial energy storage system is complete.
6. Auxiliary power-off:

Disconnect QA5 in the auxiliary power box (not applicable for 690V systems);

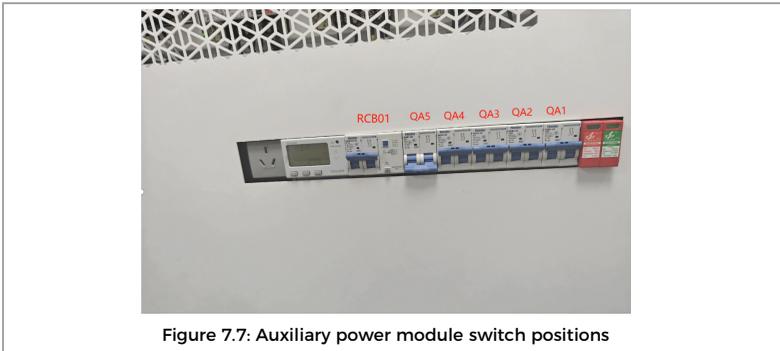
Disconnect QA4, then all BCUs in high-voltage boxes and all BMUs in battery PACKs are powered off;

Disconnect QA3 to power off all CMU modules, fire protection system, dehumidifiers, water sensors, lighting, etc.

Disconnect QA2 to power down the liquid cooling units;

Disconnect the RCD01 outlet and residual current device if engaged;

Disconnect the QA1 main input switch of the auxiliary power box.



7. Disconnect the auxiliary power box single-phase AC circuit breaker outside the energy storage cabinet, so that the auxiliary power down operation of the energy storage system is completed.

7.3 Emergency power-down operation

The premise of this step is that the energy storage system is powered up and running in the process of emergencies that require emergency power down, such as smoke, fire, electric shock and so on.

The procedure for powering down in an emergency is as follows:

1. In case of emergency, press the emergency stop button on the front door of the storage cabinet. When the emergency stop button is pressed, the PCS should stop charging and discharging the batteries, and all the positive and negative main relays (KF1/KF2) inside the high voltage box and the auxiliary relay (KF4) inside the high voltage box should be disconnected immediately.

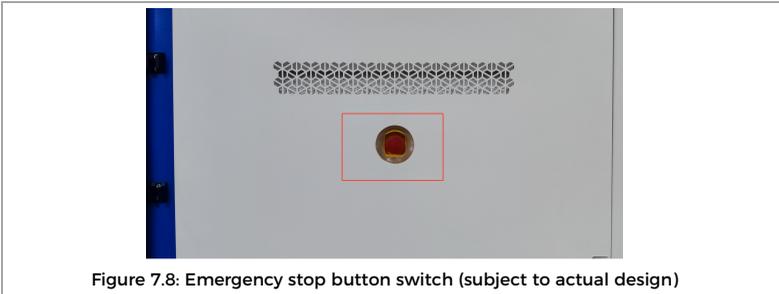


Figure 7.8: Emergency stop button switch (subject to actual design)

2. Disconnect the battery disconnect switch QB of all high voltage boxes in the energy storage cabinet and battery cabinets.



Figure 7.9: High voltage box battery disconnect switch QB position

3. Disconnect circuit breaker QA0 on the three-phase AC side of the PCS inside the storage cabinet. If necessary, continue to disconnect the AC input circuit breaker outside the storage cabinet.

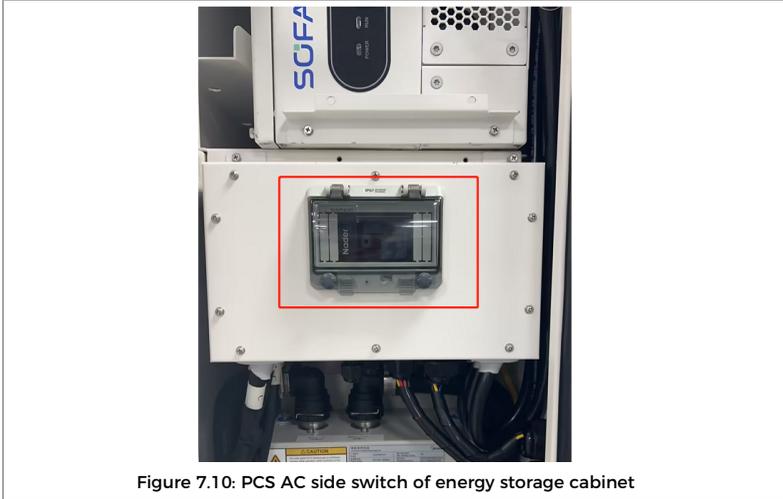


Figure 7.10: PCS AC side switch of energy storage cabinet

4. Disconnect the QA1 main power switch in the auxiliary power box. After this step, the liquid cooling unit will stop running, and devices including the CSU, CMU, BMU, BCU, dehumidifier, water sensor, fire protection system, and lighting will also lose power. For emergency power-down, this step marks the completion. If necessary, the upstream single-phase AC breaker outside the energy storage cabinet’s auxiliary power box can also be turned off.

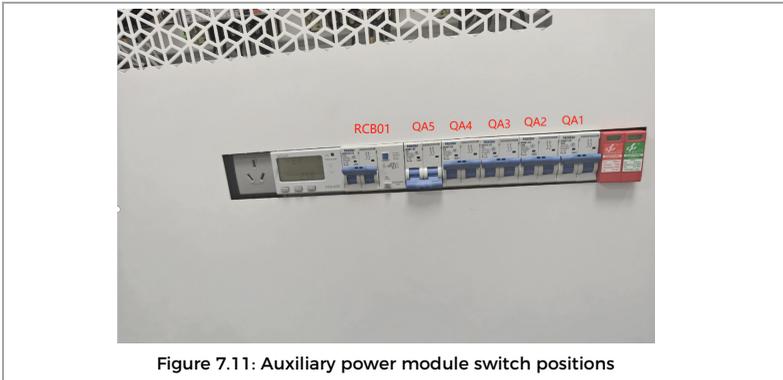


Figure 7.11: Auxiliary power module switch positions

8 Maintenance

 WARNING	
<ul style="list-style-type: none"> ▶ Please do not open the door of the battery box for maintenance in rainy, wet or windy weather, if you fail to avoid it, we will not be responsible for any damage caused. ▶ Avoid opening the door in rain, snow or foggy weather when humidity is high, and make sure that the seal around the door does not curl when the door is closed. ▶ To reduce the risk of electric shock, do not perform any maintenance or overhaul operations other than those described in this manual. If necessary, contact our customer service personnel for maintenance and overhaul. ▶ Do not leave the equipment idle or in storage for extended periods at a low state of charge (SOC $\leq 15\%$), as this may cause over-discharge of the battery, rendering it unusable. 	

8.1 Maintenance work (semi-annually to annually)

Item	Check method
Safety function	Check the emergency stop button stop function. Simulated downtime. Check the body warning labels and other equipment markings and replace them if you find them blurred or damaged.
Software maintenance	View the settable parameters of the Web.
Internal Component Inspection	Check the cleanliness of the circuit board as well as the components. Check the temperature of the heat sink as well as the dust. If necessary, use a vacuum cleaner to clean the heat sink module, etc.

Item	Check method
	<p>If necessary, replace the air filter.</p> <p>Caution! The ventilation of the air intake must be checked. Otherwise, if the module is not cooled effectively, it will malfunction due to overheating.</p>
Device Maintenance	<p>Routine inspection of all metal components for corrosion (every six months).</p> <p>Annual inspection of contactors ensures that they are mechanically well functioning.</p> <p>Checking of operating parameters (especially voltage, insulation, etc.).</p>

8.2 Maintenance work (every one to two years)

Item	Check method
Outside the container	<p>Look for flammable objects on top of the box.</p> <p>Check that the joints between the box and the foundation steel plate are secure and that there is no rust or corrosion.</p> <p>Look for damage, paint loss, oxidation, etc. on the box enclosure.</p> <p>Check that cabinet door latches etc. can be opened flexibly.</p> <p>Check that seals etc. are well fixed.</p>
Inside the container	<p>Check the inside of the energy storage integration system for foreign objects, dust, dirt and condensation.</p>
Air inlet and outlet	<p>Check the temperature of the heat sink as well as the dust. If necessary, use a vacuum cleaner to clean the heat sink module, etc.</p> <p>Check that warning signs and labels etc., are clearly visible and not defaced. Replace if necessary.</p>

Item	Check method
<p>Wiring and cable layout</p>	<p>Wait until all internal devices of the energy storage system are completely powered off before beginning the inspection! During the inspection, any nonconformities must be corrected immediately.</p> <p>Check that the cable routing is proper and there are no short circuits. Any abnormalities must be corrected immediately.</p> <p>Check that all cable entry and exit holes in the enclosure are properly sealed.</p> <p>Inspect the interior of the enclosure for any water ingress.</p> <p>Check whether the power cable connections are loose and retighten them according to the previously specified torque.</p> <p>Inspect power cables and control cables for any damage, especially the insulation in areas contacting metal surfaces for signs of cuts or abrasions.</p> <p>Check that the insulation tape on power cable terminals is intact and not peeling off.</p>
<p>Ground connection and equipotential connection</p>	<p>Check that the grounding connection is correct and that the grounding resistance value is not greater than 4Ω.</p> <p>Check for correct equipotential connections within the energy storage system.</p> <p>Check the operating parameters (especially voltage as well as insulation, etc.).</p>
<p>Fan</p>	<p>Check the operating status of the fan.</p> <p>Inspect whether the fan is clogged.</p> <p>Listen for any abnormal noise when the fan is running.</p>
<p>State of charge (SOC)</p>	<p>Check that the remaining battery capacity is $\geq 15\%$ (especially after long periods of standby or storage).</p>

Item	Check method
System status and cleanliness	<p>Inspect the following items and correct immediately if any issue is found:</p> <p>Check for any damage or deformation of the cabinet and internal equipment.</p> <p>Listen for abnormal noises from internal equipment during operation.</p> <p>Check if the internal cabinet temperature is excessively high.</p> <p>Inspect internal humidity and dust levels; clean if necessary.</p> <p>Ensure that cabinet air inlets and outlets are not blocked.</p>
Warning labels	<p>Check for foreign objects, dust, dirt, or condensation inside the energy storage system.</p>
Cable shielding and grounding	<p>Ensure that cable shielding and insulating sleeves are in good contact, and that grounding copper bars are properly fixed.</p>
Surge protection devices and fuses	<p>Verify that surge protection devices and fuses are firmly secured and in good condition.</p>
Corrosion	<p>Inspect outdoor cabinets for signs of oxidation or rust.</p>

9 Monitoring system commissioning

The monitoring system WEB interface operation includes communication cable wiring, communication settings, login interface, home page, battery cluster information, real-time alarms, parameter configuration, historical data, logging out and other displays or operations.

9.1 Communication cable connection

Through the Ethernet cable, one end is connected to the WEB port on the BESS door board, and the other end is connected to the computer's network port to establish a communication connection between the BESS and the computer. The system is powered up (see the power-on step for details) to ensure that the auxiliary power supply of the BESS is working properly (the ' POWER ' indicator light on the door panel can be observed, and if the indicator light is on, it indicates that the auxiliary power supply is working properly). After waiting for about 1 minute:

- ▶ If the computer's network port indicator light flashes, it indicates that the communication between BESS and the computer has been established.
- ▶ If the indicator light is not on, check the network connection.

9.2 Communication settings

Change the computer's network settings. Open the Internet Protocol version 4 (TCP/IPv4) properties page of the computer, select "Use the following IP address" and change the IP address to 192.168.1.100, change the subnet mask to 255.255.255.0, and leave the rest of the settings as default. Click OK to complete the settings.

9.3 Login interface

1. Open a computer browser, enter the IP address of the energy storage system "192.168.1.100" in the search field, and click the Enter key to enter the login interface.

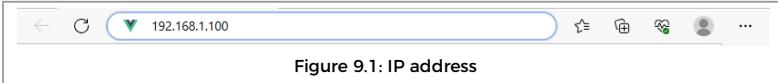


Figure 9.1: IP address

2. Enter the user name and password, click the ' login ' button, and the interface is now entered into the Home Topology Interface.

The initial user account is "user". For the initial password of the user, please contact the customer service staff.

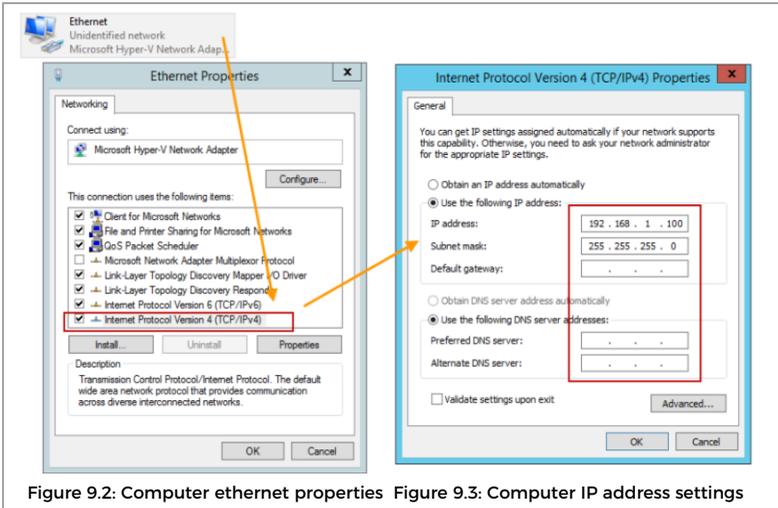


Figure 9.2: Computer ethernet properties Figure 9.3: Computer IP address settings



Figure 9.4: Login interface

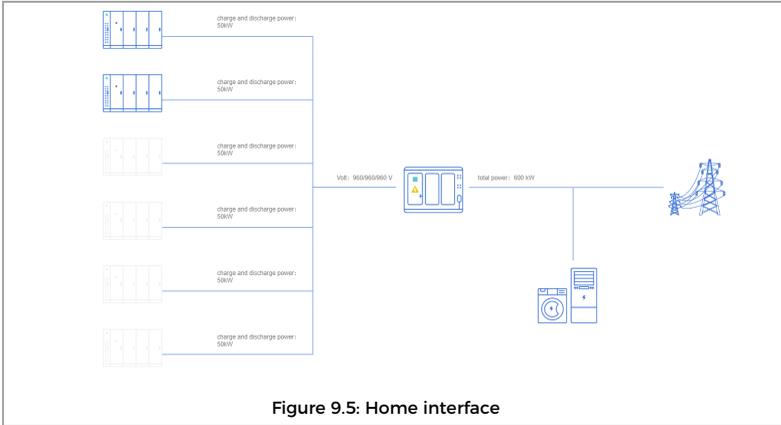


Figure 9.5: Home interface

9.4 Home main interface

In the main interface, click the icon



The status data on the home page shows that:

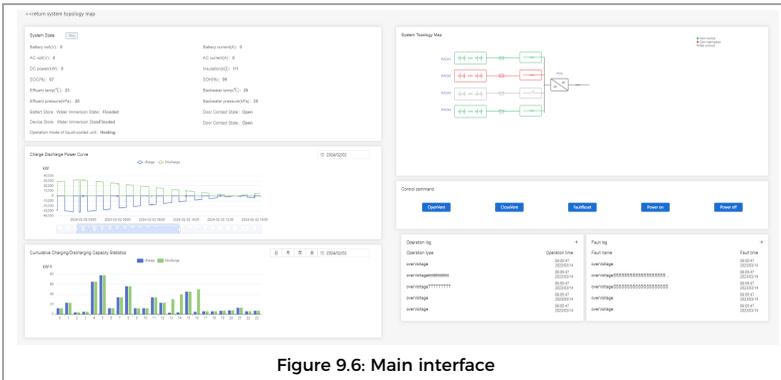
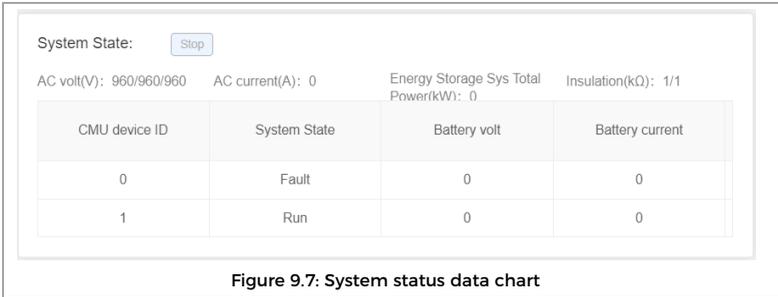


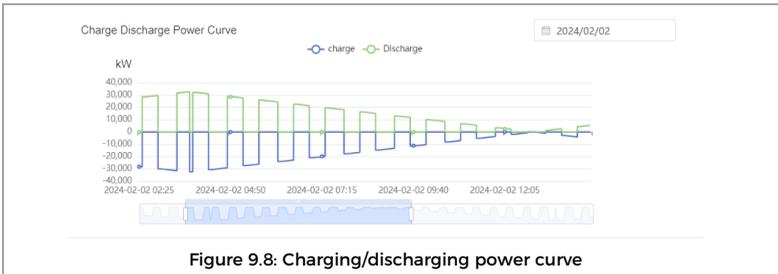
Figure 9.6: Main interface

System status



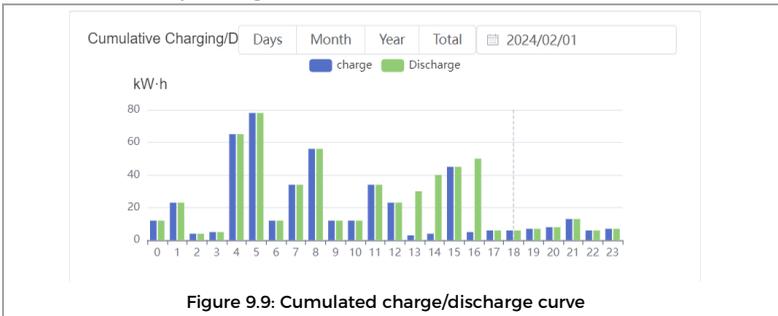
Charging/discharging power curve

The charging and discharging power curve, click on the calendar control can select the corresponding date.



Cumulated charge/discharge curve diagram

Accumulated charge and discharge statistics, click on the calendar control can choose the corresponding date.



Topology diagram

A topology diagram showing the switching state corresponding to the battery PACK.

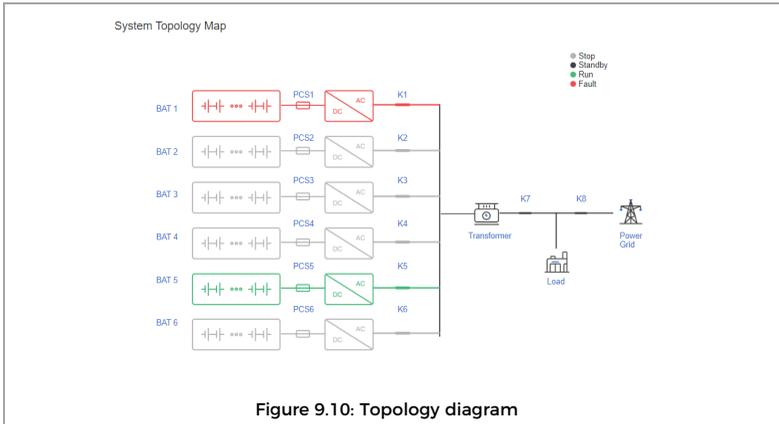


Figure 9.10: Topology diagram

Control command



Figure 9.11: Control command diagram

Operation log

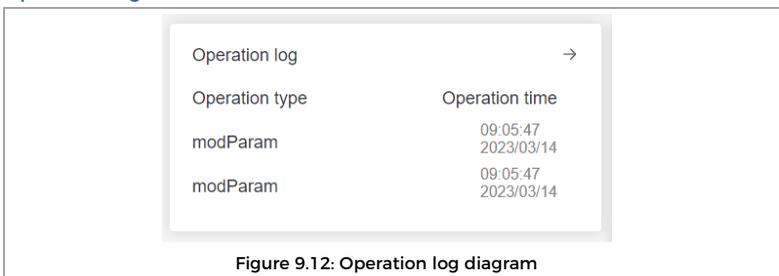
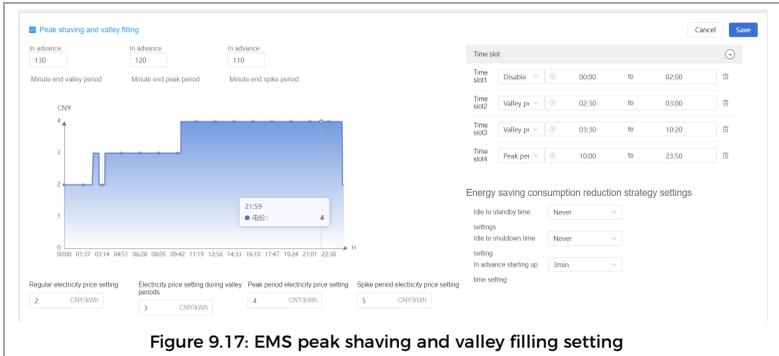


Figure 9.12: Operation log diagram

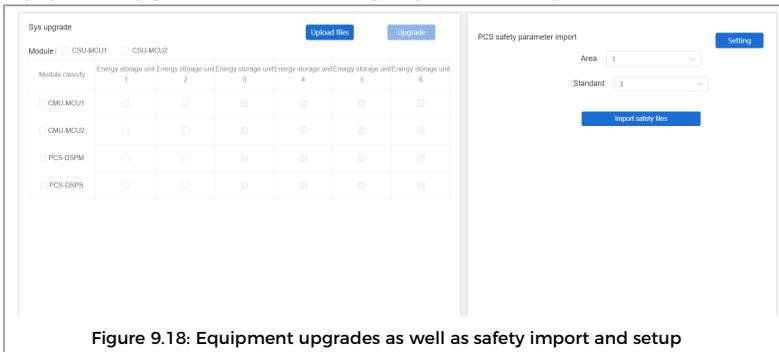
Click "→" to display the detailed data.

EMS peak shaving and valley filling setting



9.6 CSU system upgrade interface

Equipment upgrades as well as safety import and setup



9.7 CMU homepage interface

In the homepage interface of the home page, click on the icon,



as shown in the picture.

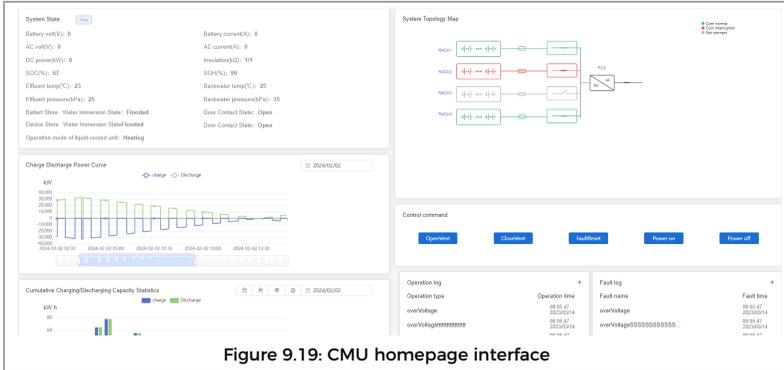


Figure 9.19: CMU homepage interface

Status data display on the home page

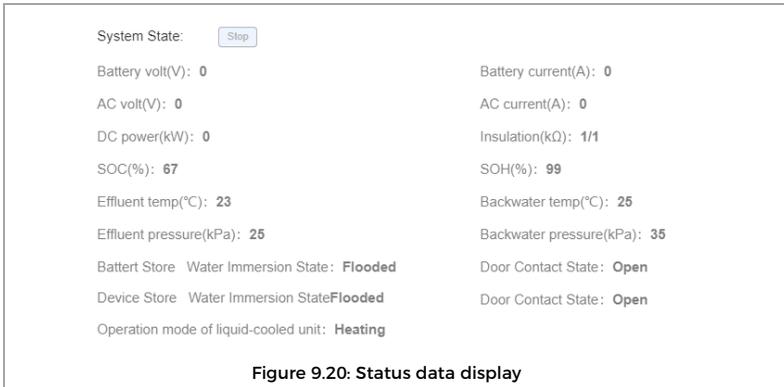


Figure 9.20: Status data display

Charging/discharging power curve

The charging and discharging power curve, click on the calendar control can select the corresponding date.

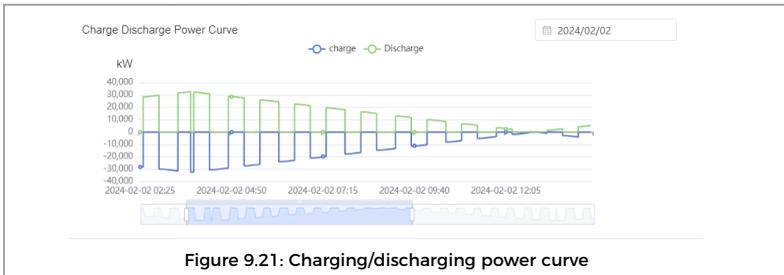


Figure 9.21: Charging/discharging power curve

Cumulated charge/discharge curve diagram

Accumulated charge and discharge statistics, click on the calendar control can choose the corresponding date.

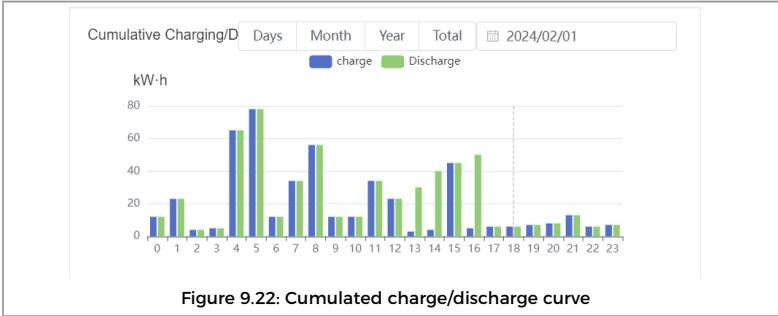


Figure 9.22: Cumulated charge/discharge curve

Topology diagram

A topology diagram showing the switching state corresponding to the battery PACK.

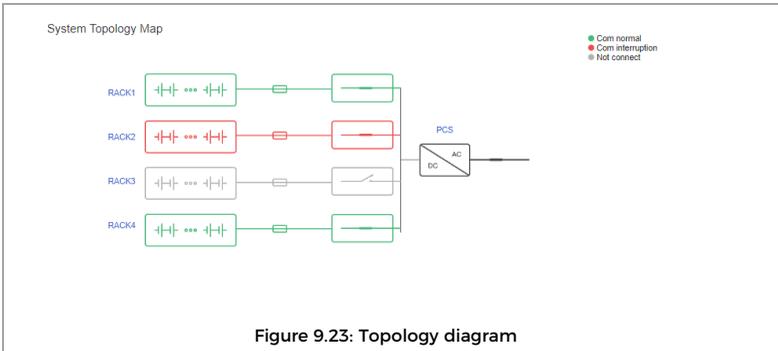


Figure 9.23: Topology diagram

Control command

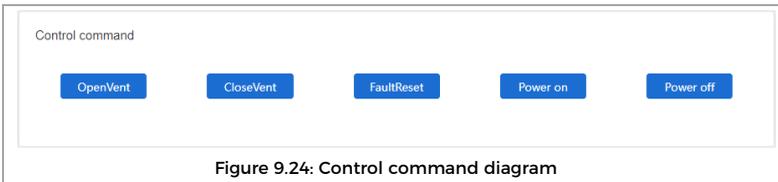


Figure 9.24: Control command diagram

9.9 Real-time alarm interface

Click the [Real-time alarm]

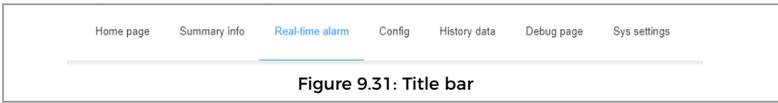


Figure 9.31: Title bar



Figure 9.32: Real-time alarm interface

9.10 Parameter configuration interface

Click the [Config]

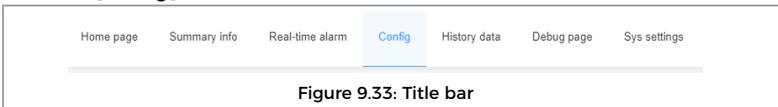


Figure 9.33: Title bar

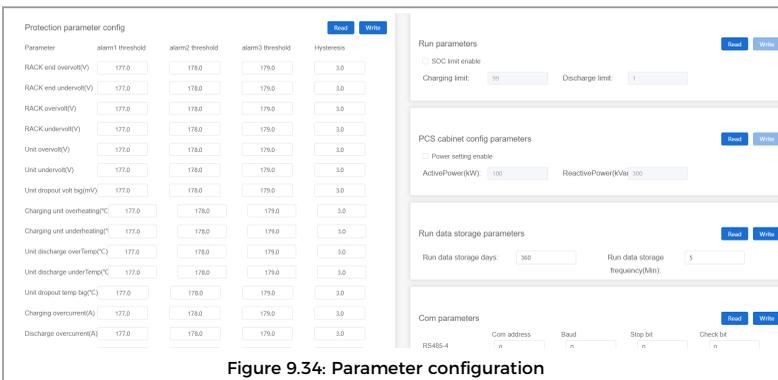


Figure 9.34: Parameter configuration

9.11 History data interface

Click the [History data]

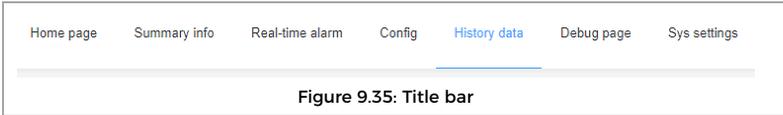


Figure 9.35: Title bar

RACK history data PCS history data

Parameter select 2024-02-01 19:56:30 language 2024-02-02 19:56:30 RACK1

time	Volt(V)	Current(A)	SOC(%)	SOH(%)	Unit Vmax(mV)	High pressure boxT(°C)	Pos insulation(KΩ)
2024/01/19:41.28	5	91	41	95	93	86	46
2024/01/19:46.28	3	96	19	97	18	43	61
2024/01/19:51.28	39	61	33	44	69	49	79
2024/01/19:56.28	52	71	29	34	99	33	16
2024/01/20:01.28	22	26	34	20	84	86	63
2024/01/20:06.28	75	31	18	69	63	20	39
2024/01/20:11.28	29	36	29	93	18	50	66
2024/01/20:16.28	84	77	14	9	27	91	21
2024/01/20:21.28	187	28	34	30	14	22	42
2024/01/20:26.28	84	77	4	61	93	80	33
2024/01/20:31.28	51	57	9	45	23	103	39
2024/01/20:36.28	99	95	71	97	104	15	45
2024/01/20:41.28	28	36	47	5	111	82	59
2024/01/20:46.28	29	105	71	67	87	77	78
2024/01/20:51.28	96	63	55	74	107	61	106

Total: 208 50/page < 1 2

Figure 9.36: Historical data

Click the  to switch the chart.

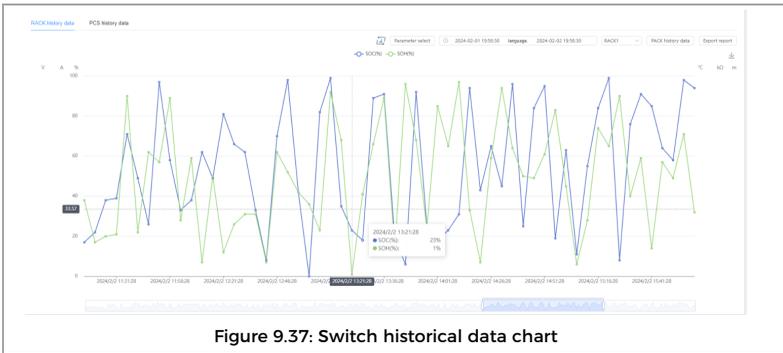


Figure 9.37: Switch historical data chart

Click the  to filter the data to be displayed.

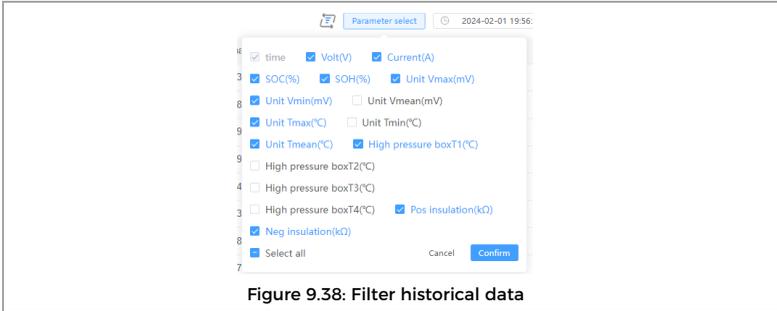


Figure 9.38: Filter historical data

Click the to to filter the data within the corresponding time period, up to 30 days. If the actual stored data meets the conditions, if the selected time period is less than 3 days, the default is to display a piece of data in 5 minutes; if the selected time period is greater than or equal to 3 days and less than 10 days, the default is to display a piece of data in 30 minutes; if the selected time period is greater than or equal to 10 days and less than or equal to 30 days, the default is to display a piece of data in 60 minutes.

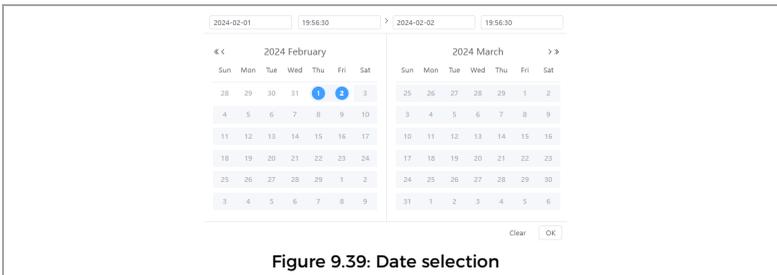


Figure 9.39: Date selection

Click the to export the data displayed for the current selection as a report file (.xlsx).

9.12 Logout

Click the to return to the login screen.

After five minutes of inactivity, the system will automatically return to the login screen.

10 Contact information

If you have any questions about this product, please contact us.

[Shenzhen SOFARSOLAR Co., Ltd.](#)

Add.:11/F., Gaoxinqi Technology Building, No.67 Area, Xingdong Community,
Xin'an Sub-district, Bao'an District, Shenzhen City, China.

[Guangdong Sofar Smart Solar Technology Co., Ltd.](#)

Add.: No.1, Dongsheng North Road, Chenjiang Street, Zhongkai High-Tech
Zone, Huizhou City.

Tel: [400-892-5766](tel:400-892-5766)

Email: service@sofarsolar.com,
support@sofarsolar.com

Web: www.sofarsolar.com

EU Representative Information:

[SofarSolar GmbH.](#)

Add.: Kraemerstrasse 20, 72764 Reutlingen, Germany

Tel: [+49 \(0\)7121 31767-0](tel:+49(0)712131767-0)

Email: europe@sofarsolar.com



ENERGY TO POWER YOUR LIFE

ADDRESS

Shenzhen SOFARSOLAR Co., Ltd.
11/F, Gaoxinqi Technology Building,
District 67, XingDong Community, XinAn Street,
Bao'An District, Shenzhen, China

EMAIL

info@sofarsolar.com

Website

www.sofarsolar.com

SOFARSOLAR 

