USER MANUAL

PowerMagic 400V C&I



Shenzhen SOFARSOLAR Co., Ltd.

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

SOFARSOLAR GmbH
Krämerstrasse 20
72764 Reutlingen
Germany

Email: service.uk@sofarsolar.com
service@sofarsolar.com
Web: www.sofarsolar.com

Document number
Issue 01 / 15.2025
English

Content

1 Safety Precautions 1
1.1 Personal safety 2
1.2 Equipment Safety 4
1.3 Environmental requirements 6
2 Product Introduction 8
2.1 Product Description 8
2.2 Functions and features 8
2.3 Description of the model 10
2.4 System architecture description 12
2.5 Overall dimension 13
2.6 Components introduction 16
3 Transport and storage 21
3.1 Transport considerations 21
3.2 Storage requirements 23
4 Installation 25
4.1 Installation 25
4.2 Foundation 26
4.3 Hoisting and fixing 33

5 Electrical connection 46
5.1 Safety precautions 46
5.2 Wiring preparation 50
5.3 Ground connection 55
5.4 Cable wiring between cabinets 56
5.5 Pipe Installation Between Cabinet 57
5.6 AC power cord connection of PCS 67
5.7 Signal terminal wiring 69
5.8 Communication cable connection 73
5.9 Operations after cable wiring 75
6 Powering up and shutdown operation specifications 76
6.1 Indicator lights and status descriptions 76
6.2 Power-on operation 78
6.3 Power-down operation under normal conditions 82
6.4 Emergency power-down operation 84
7 Routine maintenance 86
7.1 Maintenance work (semi-annually to annually) 86
7.2 Maintenance work (every one to two years) 87
7.3 Maintenance work (every two years) 89

8 Monitoring system commissioning 90
8.1 Communication cable wiring 90
8.2 Communication settings 90
8.3 Login interface 91
8.4 Home main interface 92
8.5 CSU system management interface 98
8.6 CSU system upgrade interface 99
8.7 CMU homepage main interface 99
8.8 CMU Summary Information Screen 104
8.9 Real-time alarm interface 104
8.10 Parameter configuration interface 105
8.11 Historical Data Interface 106
8.12 Log out 108
9 Contact information 109

About this manual

Caution

Your purchase of products, services or features, etc. shall be governed by the Company's commercial contracts and terms and conditions, and all or some of the products, services features described in this document may be excluded from your purchase. Unless otherwise agreed in the contract, the Company makes no representations or warranties, express or implied, with respect to the contents of this document.

This document mainly introduces the installation, electrical connection, commissioning and troubleshooting methods of PowerMagic SOFAR commercial&I Energy Storage System.Please read this manual carefully to understand the safety information familiarize, functions and features of system before installing and using the energy storage system.

Target Group

This manual is for operators of the power storage plant and qualified technical personnel. As this manual is an important part of the energy storage equipment, you may print out the electronic copy of the user's manual in paper form as required and keep the paper and electronic files in a safe place for subsequent reference. Anyone operating the equipment at any time must do so in accordance with the requirements of this manual.

Copyright Statement

The copyright of this manual is owned by SOFAR. It may not be copied – neither partially nor completely – by companies or individuals (including software, etc.) and must not be reproduced or distributed in any form, or with the appropriate means. SOFAR reserves the right to final interpretation. This manual may be amended following feedback from users or customers. Please consult our website at http://www.sofarsolar.com for the latest version.

The current version was updated on 2023/10/10.

Symbol Explanations

The following symbols may appear in this document and what they represent is as follows.

DANGER

- Indicates a high level of potential danger which, if not avoided, will result in death.

WARNING

- Indicates a moderate potential hazard that could result in death or serious injury if not avoided.

CAUTION

- Indicates a low potential hazard which, if not avoided, could result in moderate or minor injury to personnel.

NOTICE

- Indicates a potential risk that, if not avoided, could result in equipment not functioning properly or property damage.

Additional information in the manuals highlights and supplements the content and may also provide tips or tricks to optimise the use of the product, help you solve a problem or save you time.

Abbreviations

Abbreviations	Complete designation
PowerMagic	SOFAR C&I battery energy storage system
SOFAR	GUANGDONG SOFAR SMART SOLAR TECHNOLOGY CO.,LTD

Revision History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier versions.

1 Safety Precautions

Statement

Before transporting, storing, installing, operating, using and servicing this product, read this manual firstly, follow the contents strictly and follow all safety precautions marked on the product and in the manual.

The "DANGER", "WARNING", "CAUTION"," NOTICE" and "INSTRUCTION" in this manual do not imply that all safety matters should be observed, and you are required to comply with relevant international, national or regional standards.

The Company shall not be liable for any violation of the requirements for safe operation or for any violation of the safety standards for the design, production and use of the equipment.

The Company shall not be liable for any of the following or the results thereof:

- **Damage to products caused by force majeure such as earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, and extreme weather.**
- **The product installation and use environment does not comply with relevant international, national or regional standards.**
- **Failure to follow the operating instructions and safety warnings in the product and documentation.**
- **Damage caused by transport by you or a third party commissioned by you;**
- **Damage caused by storage conditions that do not meet product requirements.**
- **Damage caused by you or a third party that is negligent, intentional, grossly negligent, improperly operated or not caused by us.**

1.1 Personal safety

DANGER

- Lethal high voltage is present inside the equipment!
- Observe and comply with the warning signs on the equipment.
- Observe the safety precautions listed in this manual and other relevant documents for this equipment.
- Observe the relevant protective requirements and precautions for batteries.
- There is a risk of electric shock from touching the power supply or the contacts, terminals, etc. connected to it inside the equipment!
- Special protective equipment must be used during operation, such as protective clothing, insulated shoes, goggles, safety helmets and insulated gloves.

WARNING

- Always use the energy storage system in accordance with this manual.
- To prevent accidents, observe the following precautions:
- In the vicinity of the energy storage system, place visible warning signs to prevent accidents caused by misclosing.
- In the vicinity of the equipment, erect warning signage or set up safety caution tape.

NOTICE

- The indicator light of the equipment should be evacuated from the scene when the red light is flashing.

The lifting and transportation, installation and wiring, operation and maintenance of energy storage system must be carried out by professional and technical personnel in accordance with local norms. Operators responsible for the installation and maintenance of equipment need to meet the following requirements:

- You must first undergo rigorous training, master the correct operation method, be familiar with the composition and working principle of the energy storage system and its front and rear equipment, and understand the various safety precautions and the relevant standards of your country/region.
- A person who has received professional training related to the installation and commissioning of electrical equipment and who is able to be aware of the various potential sources of hazards and the magnitude of the hazards during the installation, operation, and maintenance of the equipment.
- Should have some electronic, electrical wiring and mechanical expertise and be familiar with electrical and mechanical schematics.
- Emergency response capability should be available in the event of a hazardous or unexpected situation during installation or commissioning.
- Personnel in special scenarios such as electrical operations, work at heights, and operation of special equipment must have special operating qualifications required by the local country/region.
- Operators of medium voltage equipment must hold a high voltage electrician's licence.
- Keep persons other than those operating the equipment away from the equipment.
- The installation process is strictly prohibited to operate with electricity. It is prohibited to install or remove cables with electricity. The wire and cable cores will generate electric arc, electric spark or fire and explosion at the moment of contacting the conductor, which can lead to fire or personal injury.
- When equipment is energized, unregulated and incorrect operation may produce a fire, electric shock or explosion, resulting in injury, death or property damage.
- It is strictly prohibited to wear watches, bracelets, bangles, rings, necklaces and other easily conductive objects during operation to avoid electric shock burns.
- Special insulated tools must be used during operation to avoid electric shock or short-circuit faults, and the insulation voltage withstand level must meet the requirements of local laws and regulations, standards and codes.
- Do not deactivate equipment protection devices and ignore warnings, cautions and precautions in manuals and on equipment.
- During the operation of the equipment, if a fault is detected that may lead to personal injury or equipment damage, the operation should be terminated immediately, reported to the person in charge, and effective protective measures should be taken.
- Do not power up the unit without completing the installation or without

professional confirmation.

- It is prohibited to contact the power supply equipment directly, with other conductors or indirectly through wet objects, and the voltage at the point of contact should be measured before contacting any conductor surface or terminal to confirm that there is no danger of electric shock.
- When the unit is in operation, the housing is hot and there is a risk of burns, so do not touch it.
- Do not allow fingers, parts, screws, tools or veneers to touch the running fan to avoid injury to hands or damage to the unit.
- In the event of a fire, evacuate the building or equipment area and ring the fire alarm or call the fire alarm. Under no circumstances should you re-enter a burning building or equipment area.

1.2 Equipment Safety

1.2.1 Energy storage system safety

DANGER

- Avoid standing at the cabinet door (including within the opening range of the door) when the energy storage system is malfunctioning.
- It is forbidden to open the cabinet door when the system is running.

- The layout of the energy storage system installation must meet fire distance or fire wall requirements as specified by local standards, including but not limited to 《GB 51048-2014 Design Code for Electrochemical Energy Storage Station》、《NFPA 855 Standard for the Installation of Stationary Energy Storage Systems》specification requirements.
- When inspecting the system with electricity, pay attention to the hazard warning signs on the equipment and avoid standing at the cabinet door.
- After the power components of the energy storage system are replaced or the wiring is changed, it is necessary to manually start the wiring detection to avoid abnormal system operation.
- It is recommended that users provide their own camera devices to record the detailed process of installation, operation and maintenance of the equipment.
- The energy storage system must be equipped with protective measures such as fences and walls, and safety warning signs must be erected for isolation, so as to avoid the entry of unauthorized personnel during the operation of the equipment, which may lead to personal injury or property damage.

1.2.2 Battery Safety

DANGER

- Do not expose the battery to high temperature environments or around heat-generating equipment, such as high temperature sunlight, sources of ignition, transformers, heaters, etc. Overheating of the battery may cause leakage, smoke, release of flammable gases, thermal runaway, fire or explosion.
- It is strictly prohibited to disassemble, modify or damage the battery (e.g. inserting foreign objects, extruding with external force, immersing in water or other liquids), which may cause battery leakage, smoke, release of flammable gases, thermal runaway, fire or explosion.
- It is strictly prohibited to subject the battery to mechanical vibration, dropping, collision, piercing by hard objects and pressure shock, or it may lead to battery damage or fire.
- It is strictly prohibited for the battery terminals to come into contact with other metal objects, which may cause heat generation or electrolyte leakage.

For safe use of the product, the technician should carefully read and strictly observe the safety requirements. The Company shall not be liable for product functional abnormality, component damage, personal safety accident, property loss, or other damage caused by the following reasons:

- The batteries are not charged as required, resulting in capacity loss or irreversible damage to the batteries.
- A battery is damaged, falls, or leaks due to improper operations or failure to operate the battery as required.
- The batteries are not powered on in time, which causes damage to the batteries due to over discharge.
- The damage is caused to batteries due to the use of improper equipment for charging and discharging.
- Batteries are frequently over discharged due to improper maintenance, capacity is incorrectly expanded, or the batteries have not been fully charged for a long time.
- Battery operation parameters are incorrectly set.
- Damage is caused to batteries because the battery operating environment does not meet the requirements.
- The customer uses the batteries beyond the scenarios specified in this manual, including but not limited to connect extra loads.
- Batteries are not maintained based on the system manual.

- The product is damaged due to the customer's continued use of batteries beyond the warranty period.
- The product is damaged due to the use of defective or deformed batteries.
- Use batteries provided by the Company with other batteries, including but not limited to batteries of other brands or batteries of different rated capacities.
- Product damage or property loss are caused due to storing or installing batteries with flammable/explosive materials.
- Personal safety accidents and property loss are caused by battery-related operations performed by non-professional personnel, or by not wearing qualified protective equipment during operations.
- The battery is damaged due to eating, drinking, smoking and other behaviors near the battery.
- Batteries are stolen.

1.3 Environmental requirements

DANGER

- It is strictly prohibited to store flammable or explosive substances in the equipment area.
- It is strictly prohibited to place the equipment in an environment of flammable or explosive gases or fumes, and it is prohibited to carry out any operation in such an environment.
- It is strictly prohibited to place the equipment close to sources of heat or fire, such as pyrotechnics, candles, heaters or other heat-generating devices; heat applied to the equipment may cause damage to the equipment or lead to fire.

- Equipment should be stored in a suitable temperature and humidity environment, in a clean, dry, well-ventilated area, and protected from dust and condensation.
- It is strictly prohibited to install and operate the equipment beyond the range specified in the technical specifications, otherwise the performance and safety of the equipment will be affected.
- It is strictly prohibited to install, use and operate outdoor equipment and cables (including, but not limited to, handling equipment, operating equipment and cables, plugging and unplugging signal interfaces connected to the outdoor area, working at height, outdoor installation, opening doors, etc.) under severe weather conditions such as thunder, lightning, rain, snow, and gusts of wind of more than six degrees.

- It is strictly prohibited to install the equipment in an environment with dust, fumes, volatile gases, corrosive gases, infrared and other radioactive radiation, organic solvents or excessive salt content.
- It is strictly prohibited to install the equipment in an environment with metallic conductive dust, conductive magnetic dust.
- Installation environment ground is solid, no rubber soil, weak soil or easy to sink and other adverse geological, strictly prohibit the selection of low-lying areas or areas prone to waterlogging, site level should be higher than the highest historical water level in the region.
- If the equipment is installed in a site with heavy vegetation, in addition to routine weeding, the ground underneath the equipment needs to be hardened, e.g., by laying cement, gravel, etc.
- When installing, operating, or maintaining the unit, clean the top of the unit of any standing water, ice, snow, or other debris before opening the door to prevent debris from falling into the interior of the unit.
- When mounting the equipment, make sure that the mounting surface is sturdy and meets the equipment's load-bearing requirements.
- The line holes need to be sealed. The line holes that have been lined are sealed with sealing mud, and the line holes that have not been lined are sealed with the cover of the equipment.
- After installing the equipment, empty packing materials such as card-board boxes, foam, plastic, cable ties, etc. should be removed from the equipment area.

2 Product Introduction

2.1 Product Description

PowerMagic C&I battery energy storage systems is mainly used in energy storage project, photovoltaic + energy storage system, integrated PV-storage-charging station, micro-grid and other scenarios, which mainly save the electricity cost for enterprises through the peak and valley electricity price difference, demand response and ancillary service and so on.

Typical applications of the PowerMagic C&I energy storage system are illustrated below:

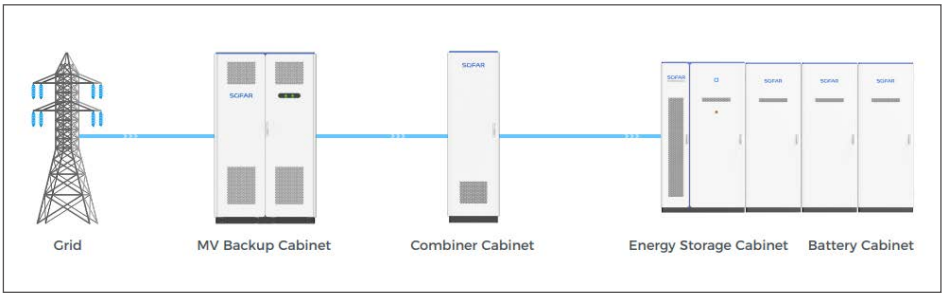


Figure 1: Schematic diagram of a typical PowerMagic application

2.2 Functions and features

Solutions

PowerMagic energy storage system includes: energy storage cabinet (with PCS and liquid cooling unit), battery cabinet, 400V Junction Cabinet, Backup cabinet, to provide a one-stop solution for customers.

Flexible capacity design

In terms of different capacity requirements, PowerMagic can flexibly realize the capacity expansion both in AC side and DC side.Up to 6 energy storage cabinets can work in parallel with one 400V junction cabinet. And each one energy storage cabinet can connect with maximum 3 battery cabinet, which makes the system duration hours from default 2 hours to 8 hours.

Liquid and electricity separation design

The DC cables of the system is designed on the top of the cabinets and the pipes for the liquid cooling system is at the bottom of the cabinets. Through this design scheme, the potential risks of electrical connection safety problems caused by the leakage of cooling liquid is eliminated, which can greatly improve the safety and reliability of the system.

3 + 2 Safety Design

'3' refers to the 3 levels of fire supression in PowerMagic.

The first level is pack level perfluorohexanone gas fire fighting.

The second level refers to the cabinet level + auxiliary box level perfluorohexanone gas fire fighting.

The third level refers to water fire fighting.

'2' refers to the explosion vent design and combustible gas emissions design.

Note: Overseas versions can be fitted with optional aerosol solutions according to customer requirements.

Compatible with larger cell design

Without changing the cabinet structure, PowerMagic can upgrade the 280Ah cell to the 320Ah cell, further improving the energy density.

Liquid cooling + Anti-condensation system

The liquid cooling system of PowerMagic can effectively solve the problems of temperature unbalance, short life and low efficiency among the batteries. By adding the anti-condensation device, the dew point temperature can be effectively reduced to lower the condensation possibility.

Auto gird on/off

PowerMagic energy storage system can meet the fast on-grid and off-grid auto-switching requirements.

Local EMS Features:

- **System against backflow.**

Parallel charging and discharging power equalisation.(allocation of charging and discharging power to each storage cabinet according to the state of each battery stack)

- **System WEB monitoring interface.**
- **Demand-side response.**

No real-time dispatch, prior declaration, communication with grid or thirdparty media for reporting.

- **Peak shaving/capacity to demand.**

Input of local peak and valley tariff information, smoothing of load profiles and ensuring that peak power is within limits).

- **Supports remote and local control and upgrade.**

Local EMS primary strategy:

1. **Ensure that you fill the battery up during low tariff hours, and decide on the charging power according to your capacity/power configuration.**
2. **Peak tariff time discharges, in which the power is discharged, and the discharged power is calculated according to the peak tariff time period.**
3. **After receiving in the peak tariff time period, if there is still remaining power, it can continue to discharge**

2.3 Description of the model

The main product models involved in this article are follows:

Table 1: Product model number

	Energy storage cabinet	Battery cabinet	Converter cabinet	And off-grid cabinet
6Pack	ESS-258KLA-SA1	ESS-258KLA-BD1	PAC-750K-H1	PAC-750K-W1
5Pack	ESS-215KLA-SA1	ESS-215KLA-BD1		

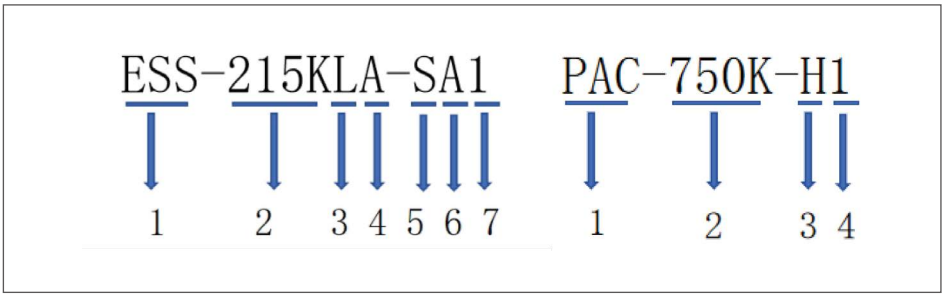


Figure 2: Model identification

Table 2: Model Identification Description of energy storage cabinet / battery cabinet

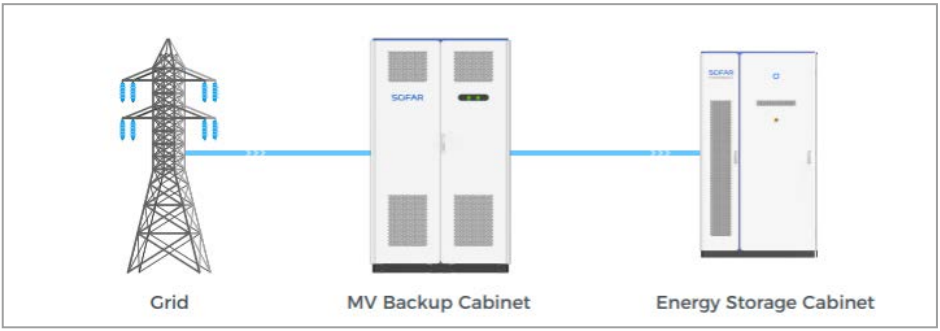
Identification	Name	Meaning	Take value description
1	ESS	Product series name	Energy storage system
2	215K	Energy grade	Rated energy is 215kWh
3	L	Liquid cooling	Thermal management mode
4	A	Cell model	Example: 280Ah / 320Ah
5	S/B	With a PCS / battery	Whether the PCS module is included
6	A/D	AC/DC	Voltage type
7	1	Product version	The first generation of products

Table 3: Model Identification Description of junction cabinet / off-grid cabinet

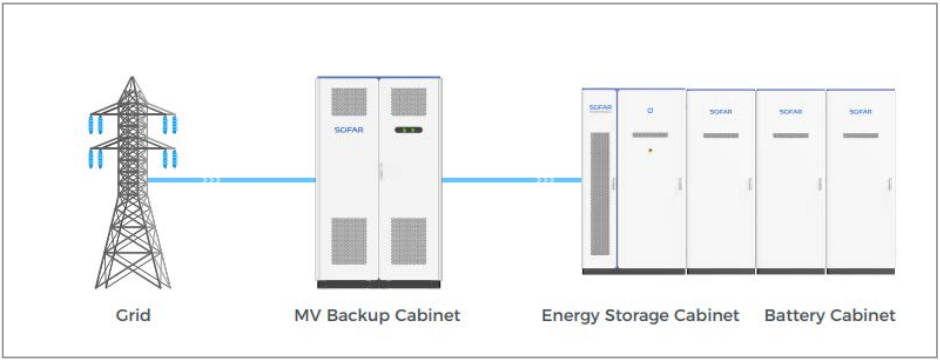
Identification	Name	Meaning	Take value description
1	PAC	Product series name	Energy storage system kit
2	750K	Power level	Rated power is 750kW
3	H/W	/	Conbiner cabinet / And off-grid cabinet
4	1	Product version	The first generation of products

2.4 System architecture description

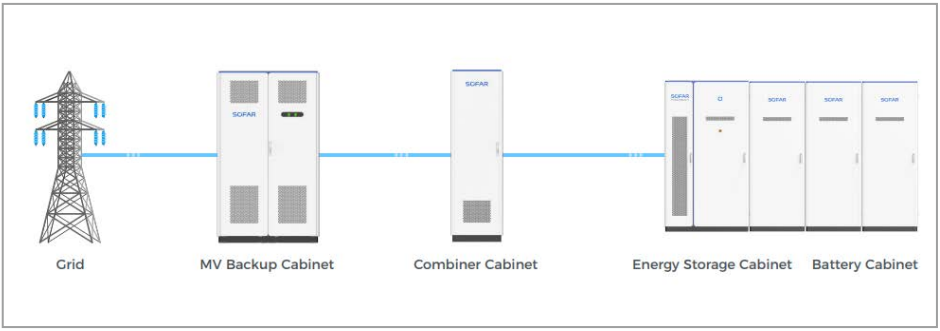
- Single Energy storage cabinet scenario (2h): Back up cabinet (optional) + one energy storage cabinet.



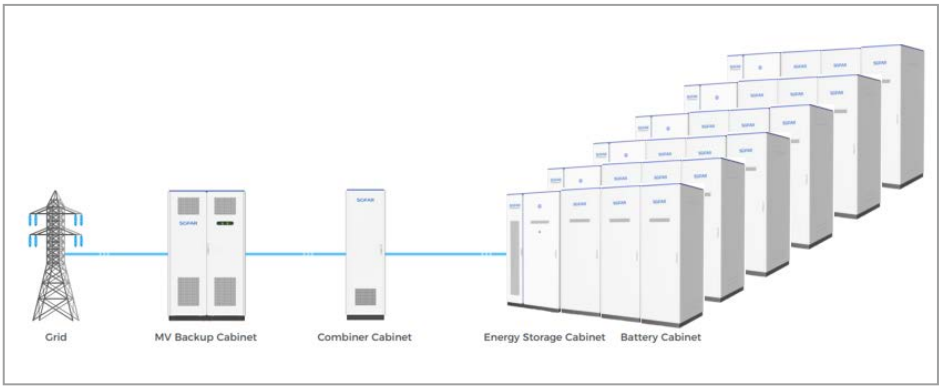
- Single Energy storage cabinet scenario(4h/6h/8h): Back up cabinet (optional) + one energy storage cabinet +1 ~ 3 battery cabinets.



- Multi Energy storage cabinets scenario (2h): Back up cabinet (optional) + 400V Junction cabinet + 2 ~ 6 energy storage cabinets.



- Multi Energy storage cabinets scenario (4h / 6h / 8h): Back up cabinet (optional) + 400 Junction cabinet + 2 ~ 6 energy storage cabinets + 6~18 battery cabinets.



2.5 Overall dimension

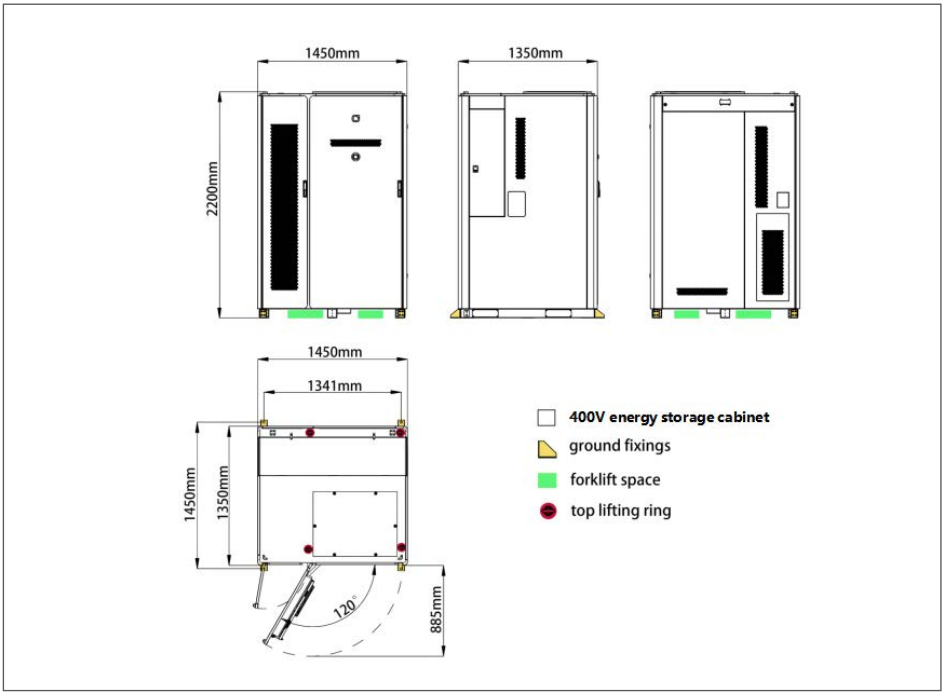


Figure 3: Dimension and maximum door opening size of 400 V energy storage cabinet

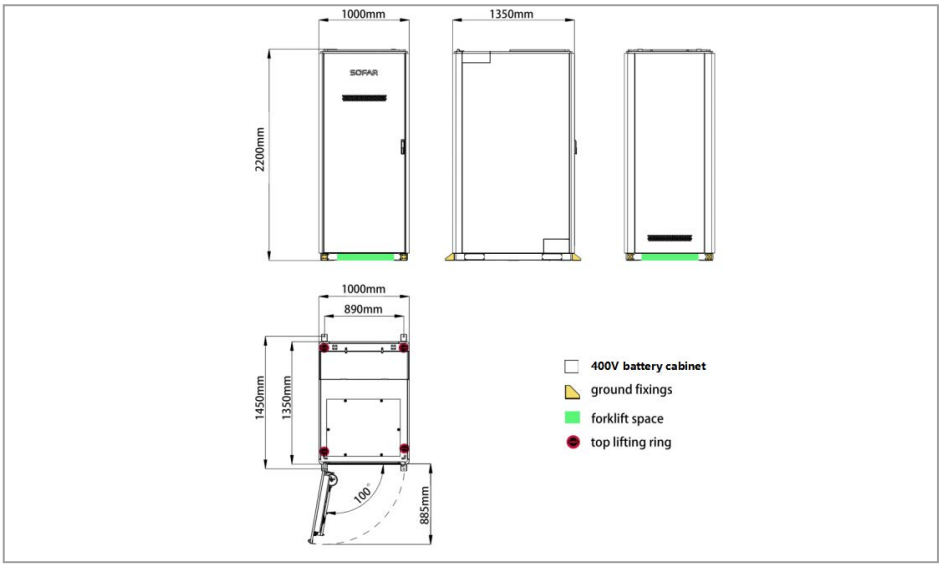


Figure 4: Dimension and maximum door opening size of 400 V battery cabinet

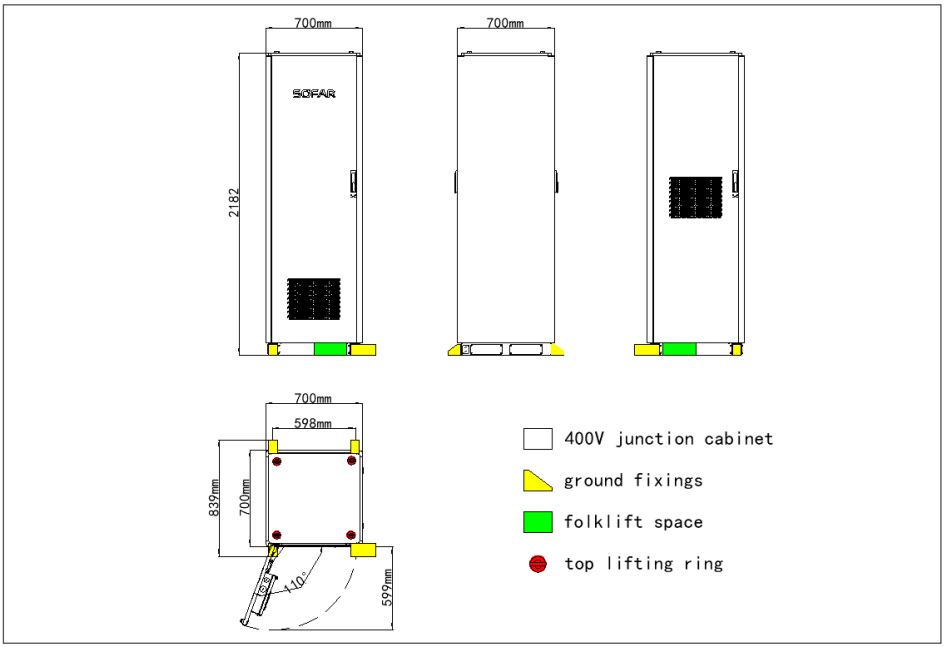


Figure 5: Dimension and maximum door opening size of the 400V junction cabinet

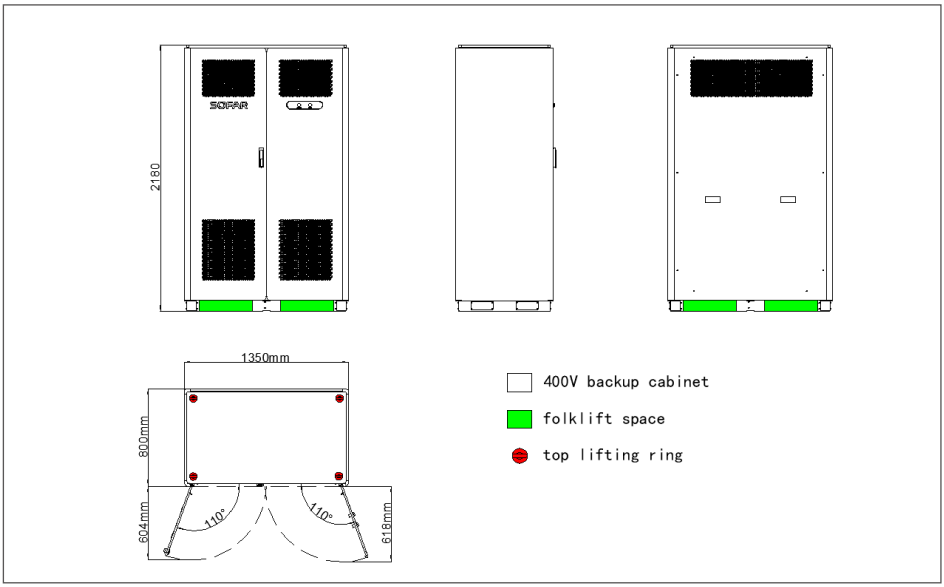


Figure 6: Dimension and maximum door size of the 400V backup cabinet

2.6 Components introduction

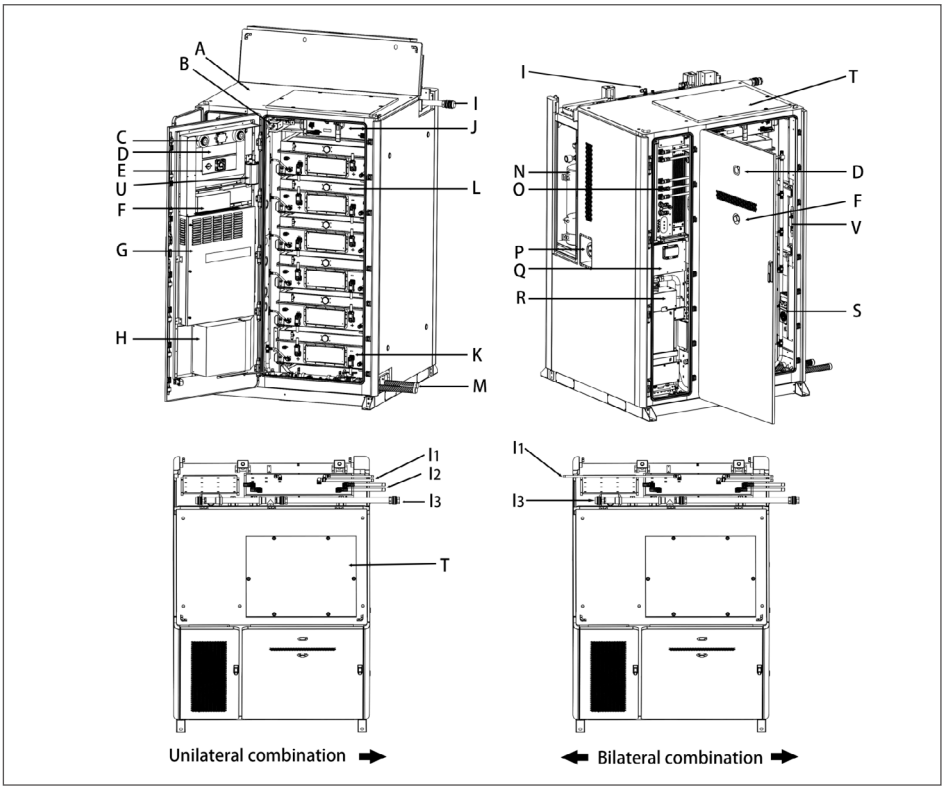


Figure 7: Components of the energy storage cabinet

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

Table 4: Introduction of energy storage cabinet components

NO.	Name	Qty	Statement
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

NO.	Name	Qty	Statement
E	Buzzer/fan	1	Fire alarm/Gas emission
F	Emergency stop button	1	Emergency start, stop
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	5 or 6	5 packs in 215kWh cabinet 6 packs in 258kWh cabinet
M	Liquid Cooling pipes	2	
N	Fire suppression bottle assembly	1	
O	PCS	1	125kW PCS
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	

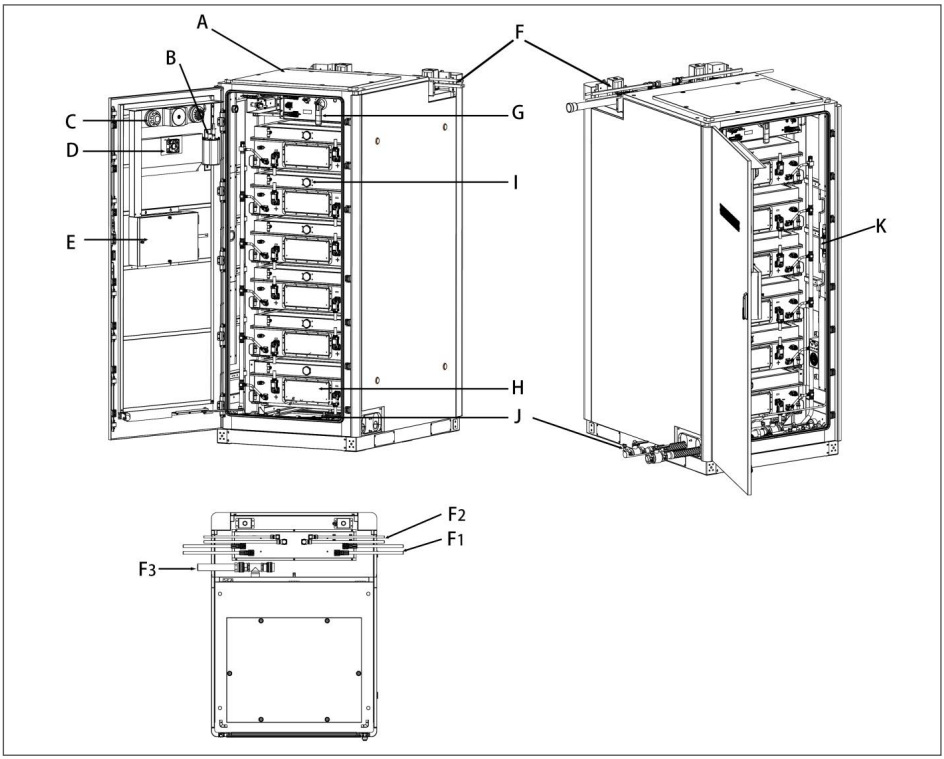


Figure 8: Battery cabinet components

Table 5: Introduction of battery cabinet components

NO.	Name	Qty	Statement
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	See F1~F3 for details
G	High voltage box	1	
H	Sealing board	1	

NO.	Name	Qty	Statement
I	PACK	5 or 6	5 packs in 215kWh cabinet 6 packs in 258kWh cabinet
J	Liquid cooling pipes	2	
K	Cluster fuses	1	
F1	Power terminals	2	
F2	Signal terminals	2	
F3	Firefighting pipe	1	

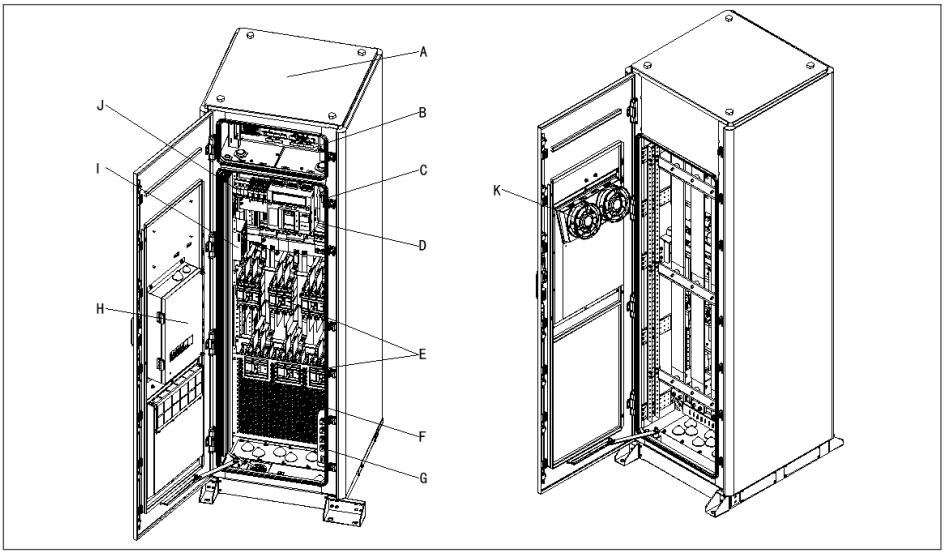


Figure 9: 400V Junction cabinet components

Table 6: Introduction of components of 400V backup cabinet

NO.	Name	Qty	Statement
A	Cabinet	1	
B	CSU box	1	
C	Meter	1	
D	Circuit breaker	1	
E	Branch circuit breaker	2~6	Max 6pcs

NO.	Name	Qty	Statement
F	Protection plate	2	
G	Communication interface	1	
H	Junction box	1	
I	Dehumidifier	1	
J	Lightning protector	1	
K	Fan	2	

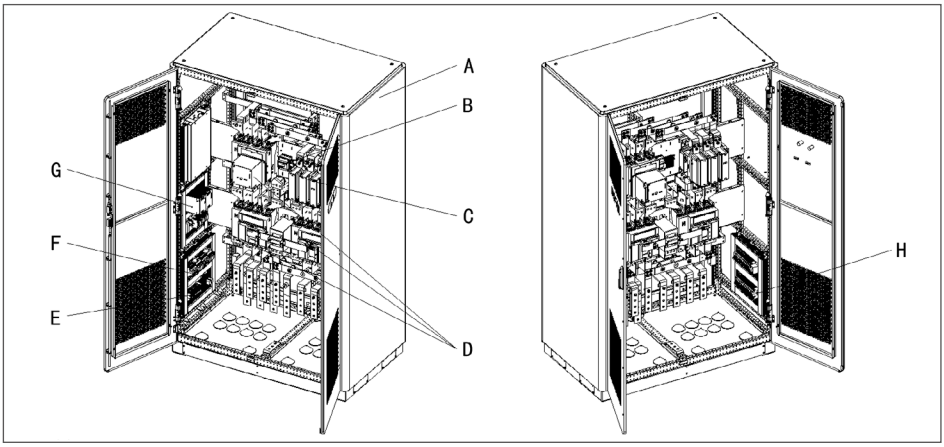


Figure 10: 400V Backup cabinet components

Table 7: Introduction of components of 400V backup cabinet

NO.	Name	Qty	Statement
A	Cabinet	1	
B	Meter	1	
C	ACt contactors	4	
D	MCCB (or STS)	1	
E	Wiring terminal	1	
F	Lightning protector	1	
G	Power supply	1	
H	Miniature Circuit Breaker	1	

3 Transport and storage

3.1 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 delivered directly to the site to meet the requirements for transport by vehicle or ship; it complies with the IMDG CODE and the International Maritime Dangerous Goods Code (IMDG CODE) transport requirements for sea transport, and with ADR or JT T617 transport requirements for land transport.
- The Energy Storage System is not currently permitted for air transport and does not support rail transport.
- With the integrated design of the energy storage system, handling only requires the use of a forklift to lift and transport the entire chassis.

Transportation and mobile energy storage systems should meet the following conditions:

- The doors of each cabinet of the energy storage system are locked tightly, and there are no foreign objects sticking out of the box.
- According to the site conditions, choose the appropriate forklift, tools, the tools used must meet the energy storage system handling requirements.

- Be sure to set up warning signs or warning belts when handling to avoid non-staff entering the operation and transport area to avoid accidents.
- In case of bad weather conditions, such as heavy rain, fog, strong wind, etc., the operation should be stopped.
- Before using the forklift, you should make sure that the forklift meets the load-bearing requirements: the load-bearing capacity needs to be ≥4t.
- Recommended fork blade length ≥1.4m, width 80cm~160cm, thickness 25cm~70cm.
- Forklift lifting height requirements: when the height of the foundation is ≤0.3m, the lifting height is ≥2m; when the height of the foundation is >0.3m, the lifting height is increased accordingly.

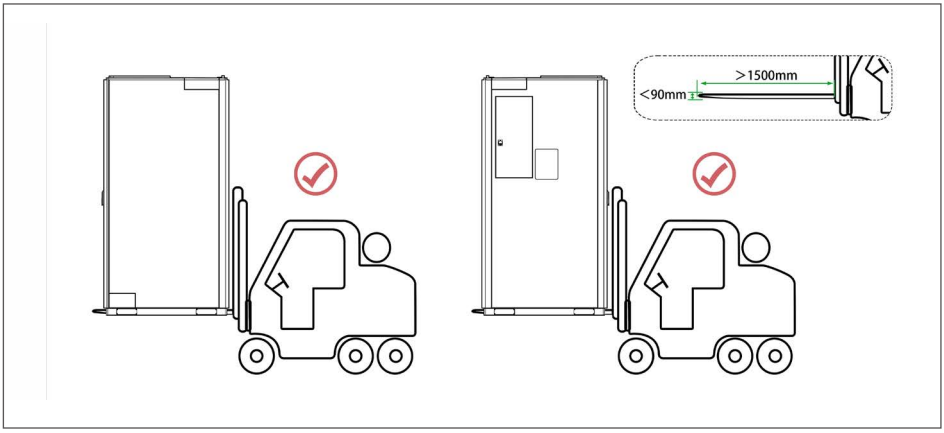


Figure 11: Forklift transport front side

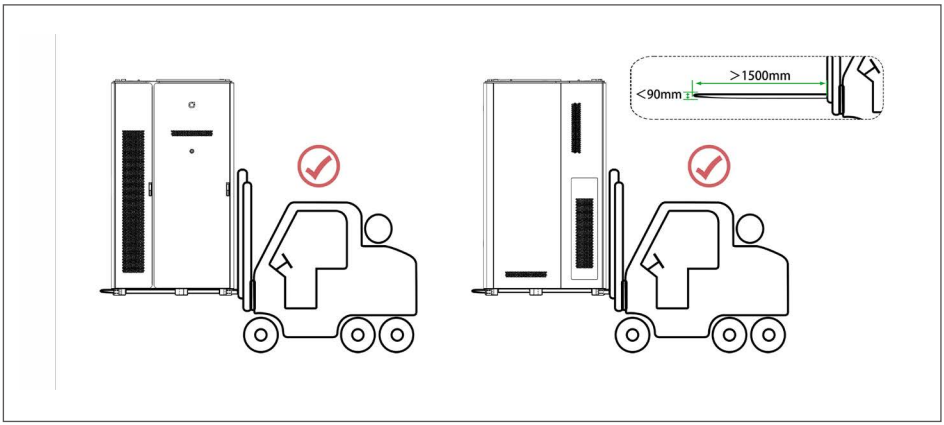


Figure 12: Forklift side transport

3.2 Storage requirements

- Before storage, the energy storage system systems 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), should be used in a timely manner, lithium long-term storage will exist capacity loss.

Storage environment requirements:

- Recommended storage temperature: 20℃～30℃.
- 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 ≥ 4t), the ground needs to be level, the flatness should be ≤ 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 6 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.

4 Installation

4.1 Installation

4.1.1 Installation environment requirements

- The external environment meets the requirements of 'GB 51048-2014 Design code for electrochemical energy storage station in China. Overseas project comply with NFPA 855 Standard for the Installation of Stationary Energy Storage Systems or IEC 62933-5-2 Safety Requirements For Grid-Integrated BESS.
- 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).

4.1.2 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 if any in advance and take precautionary measures.
- In case of bad weather or unexpected situation, the work should be stopped immediately.

4.2 Foundation

4.2.1 Foundation construction requirements

Unreasonable foundation construction plan will bring more difficulties or troubles to the placement, opening and closing of the door and later operation of the BESS. Therefore, the foundation of the energy storage system must be designed and constructed in accordance with certain standards beforehand, so as to meet the requirements of mechanical support, cable routing, and later maintenance and overhaul.

⚠ WARNING

- As the energy storage system is heavy, the conditions of the installation site (mainly geological and climatic conditions) should be examined in detail before the foundation is constructed. Only on this basis can the design and construction of the foundation begin.
- Integrated foundations must be used.

Site selection requirements:

- The installation location should not be in a low-lying area and the installation level should be at least 300mm above the highest historical water level in the area.
- Distance from airports, buried waste disposal sites, river banks or dams should be ≥ 2km.
- Choose an open location and ensure that there are no obstacles within 10m of the site.
- Considering safety, the distance between the energy storage system and residential buildings is ≥12m, and the distance from schools, hospitals and other densely populated buildings is >30.5m, or the distance should follow the local distance or regulation If this safety distance is not met, the firewall between the energy storage system and the building should be built , convenient transport conditions and reliable fire suppression system should also be provided.

- Meet the necessary installation site area -, and should leave enough room for capacity expansion according to the needs of the whole life.
- Choose a well-ventilated site.

Site locations should avoid scenarios that are not recommended by industry standards and regulations, including but not limited to the following lots, areas, and places:

- Strong vibrations, strong noise sources and strong electromagnetic field interference areas.
- Places that generate or have dust, fumes, noxious gases, corrosive gases, etc.
- Places where corrosive, flammable and explosive substances are produced or stored.
- Sites with existing underground facilities.
- Undesirable geological conditions such as rubbery soils, weak soils, ground prone to waterlogging and subsidence.
- Earthquake faults and seismic zones with a defence intensity higher than nine degrees.
- Sections with direct hazards such as mudslides, landslides, quicksand, and caves.
- Within the boundaries of the mining trap (stagger) area.
- Within blasting hazard.
- Areas that could be inundated if a dam or dike breaks.
- Important sanitary protection areas for water supply sources.
- Historic Monuments and Sites Conservation Area.
- Intensively populated places, high-rise buildings, underground buildings.

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*4t (n value 1~6, "n" indicates the number of energy storage cabinets) + m*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 ≤ 3mm.
- 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 ±3mm.

4.2.2 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:

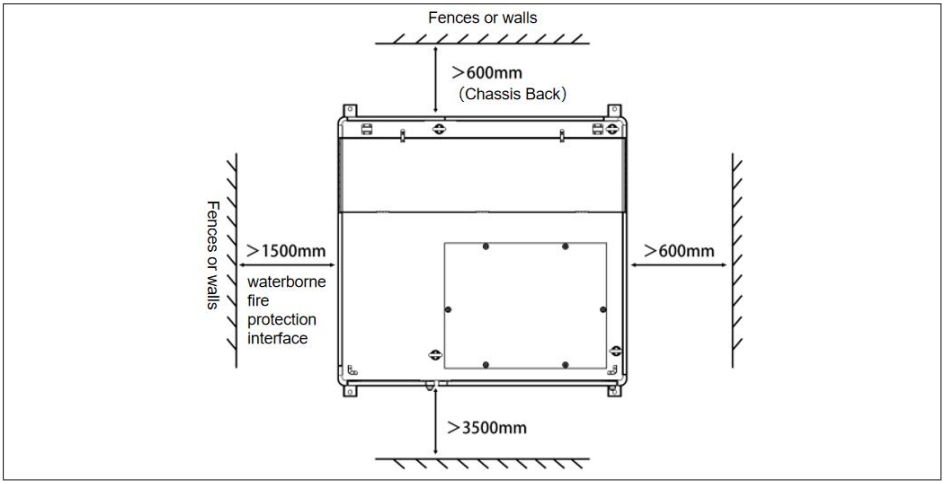


Figure 13: Single-group energy storage system installation

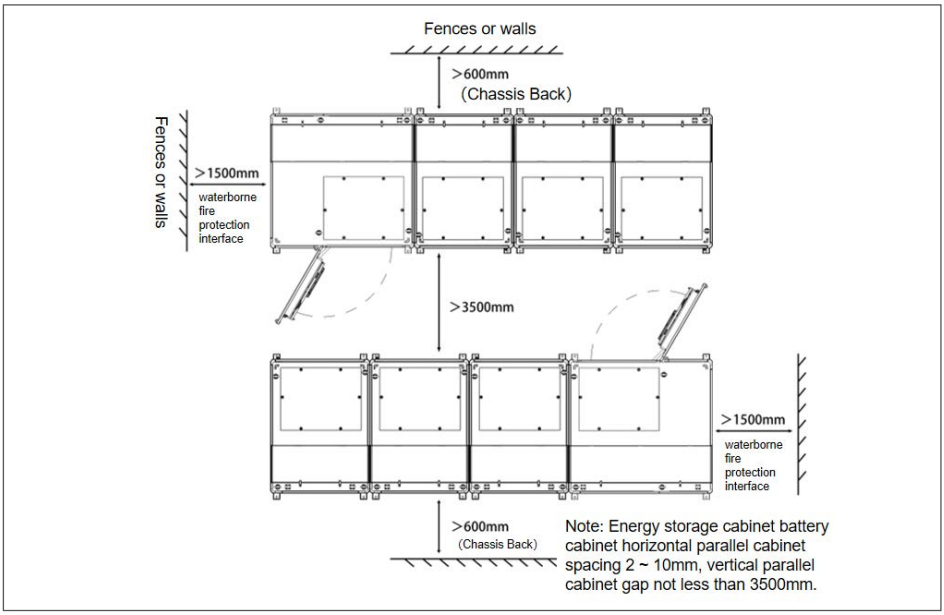


Figure 14: Parallel cabinet installation (face-to-face)

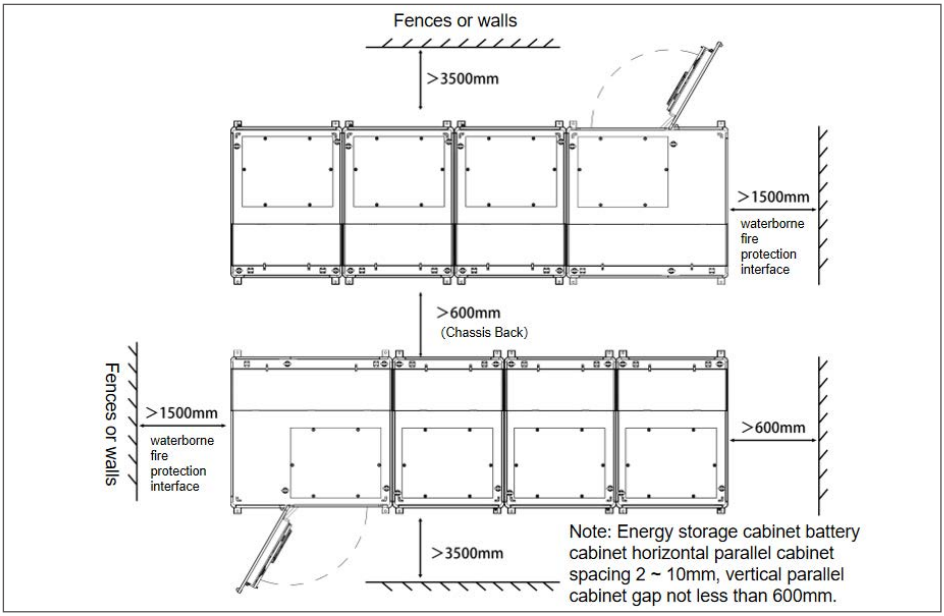


Figure 15: Parallel cabinet installation (back-to-back)

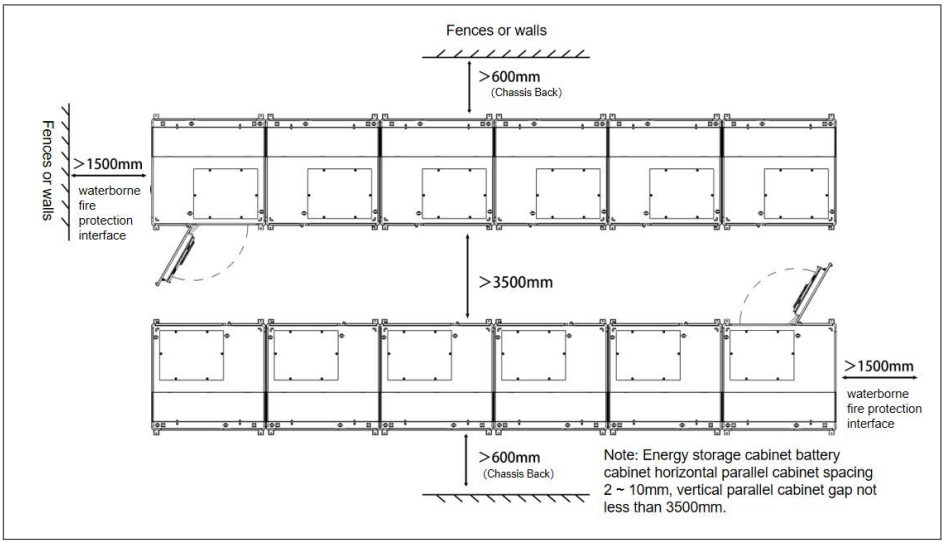


Figure 16: Storage Cabinet Parallel Cabinet Installation (Face-to-Face)

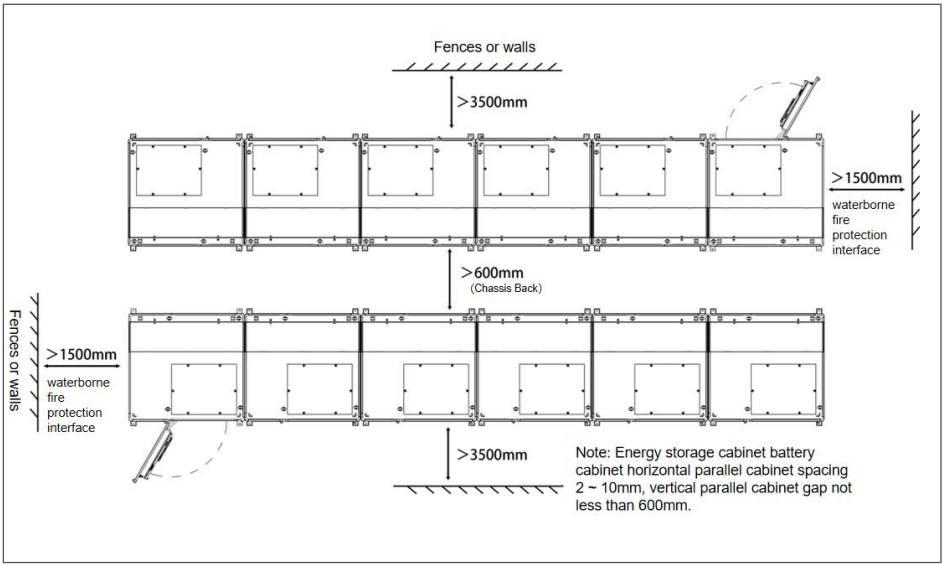


Figure 17: Storage Cabinet Parallel Cabinet Installation (Back-to-Back)

If the waterborne fire protection interface is not used, then the side distance can be reduced to 600mm.

4.2.3 Recommended foundation drawing

The below diagram is only a simple schematic, more detailed foundations should be made in accordance with the foundation drawing provided by SOFAR or the foundation plan should be confirmed by SOFAR.

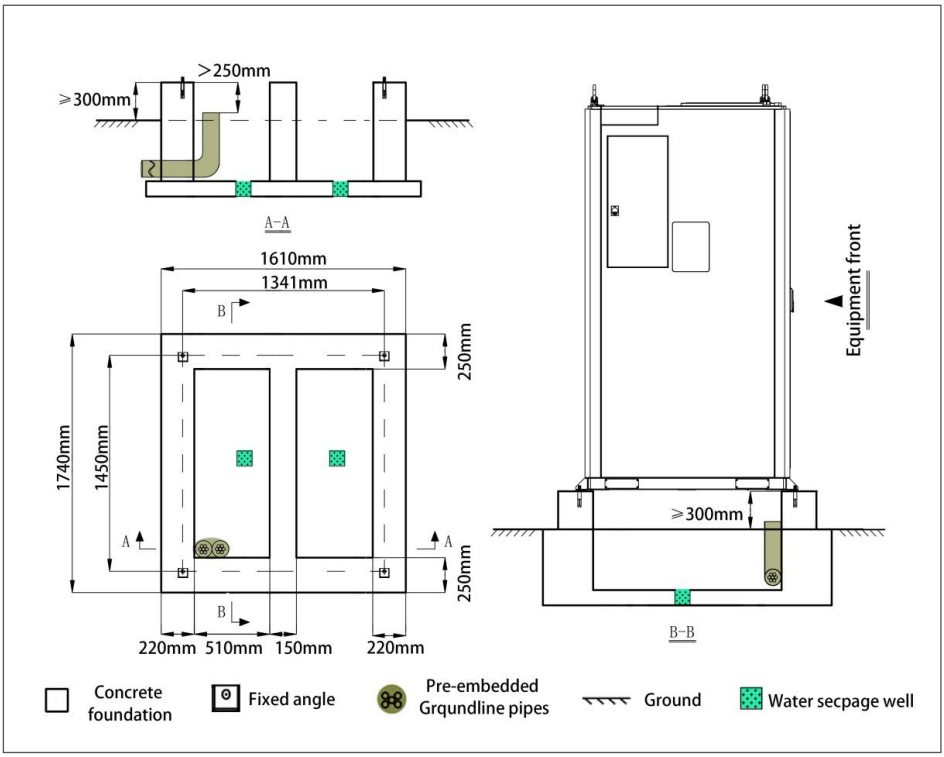


Figure 18: Single energy storage cabinet foundation

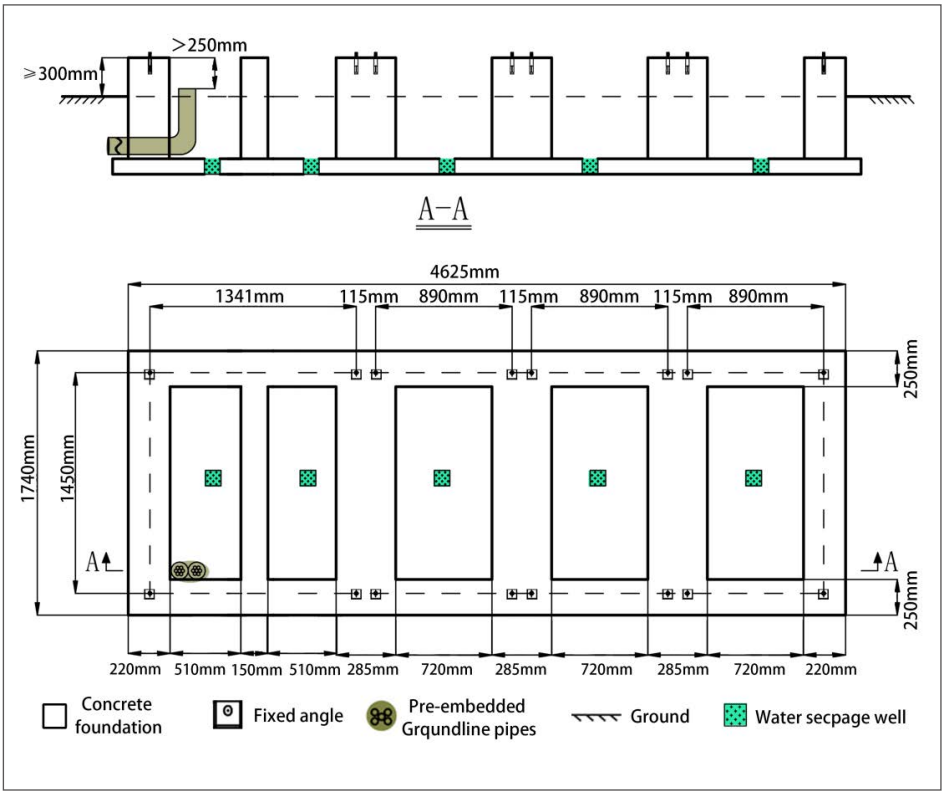


Figure 19: One energy storage cabinet + three battery cabinets foundation

4.2.4 Optional customized steel base

The optional steel base is only available for energy storage cabinet and battery cabinets parallel connection scheme to keep all the cabinets in the level. All the cabinets are fixed to the base by screws.

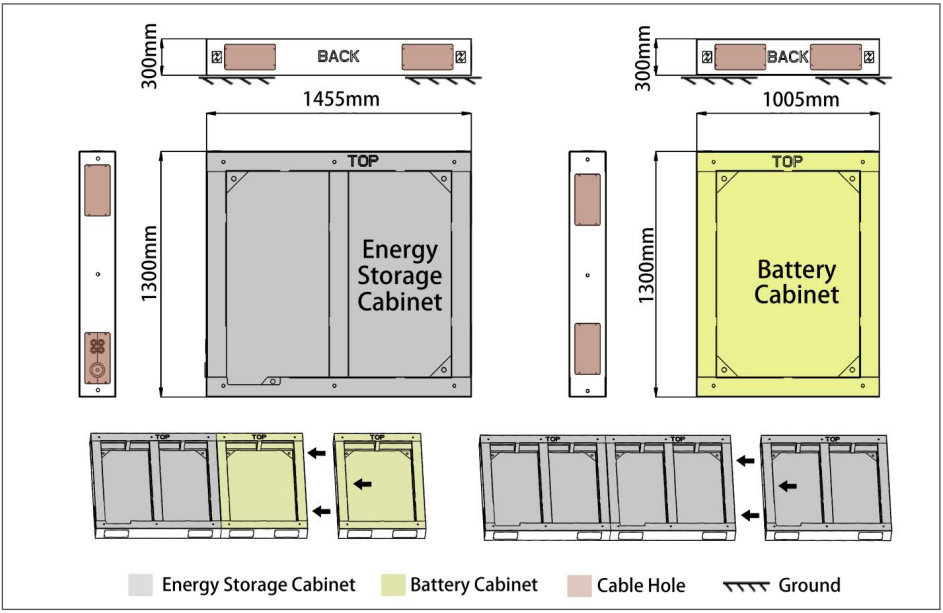


Figure 20: Optional steel foundation

4.3 Hoisting and fixing

4.3.1 Preparation tools

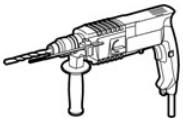
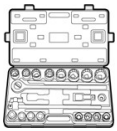
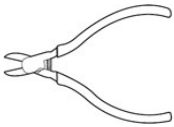
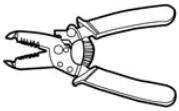
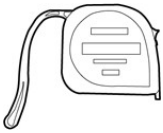
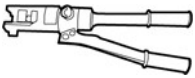
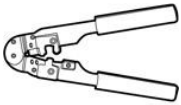
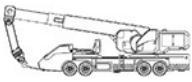
NOTICE

- The handles of tools used, including socket wrenches, torque spanners, screwdrivers, etc., need to be insulated or insulated tools used.

Preparation tools

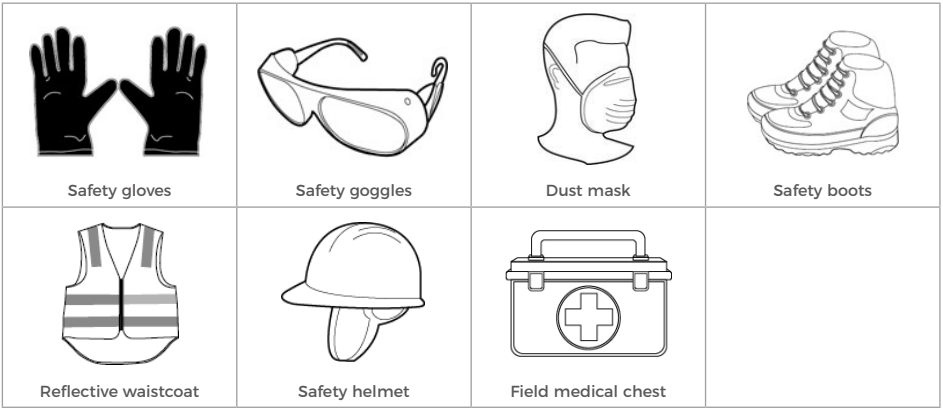
The tools to be prepared before the installation of the equipment are as follows.

Table 8: Tools to be prepared before energy storage system installation

 Hammer drill (drill bit : Φ14mm、Φ16mm)	 Torque socket wrench	 Moment of force spanner	 Diagonal pliers
 Wire strippers	 One word screwdriver Knife head : 0.6mm× 3.5mm	 Rubber mallet	 Utility knife
 Marker	 Steel measuring tape	 Level	 Hydraulic tong
 Cable cutter	 Crystal head clamp	 Vacuum clear	 Multimeter DC voltage range ≥ 1500V DC
 Heat-shrinkable sleeve	 Heat gun	 Tie-line belt	 Insulation ladder
 Crane	 Lifting rope		

Personal protection tools

Figure 21: Installation of personal protective tools for the energy storage system



4.3.2 Check before installation

Inspection of deliverables

Check the completeness of the deliverables against the accompanying packing list.

Inspecting equipment

- **Check whether the cabinet actually received is consistent with the ordered model.**
- **Inspect the energy storage system and internal equipment to ensure that there is no damage, such as holes, cracks, or other signs of possible internal damage.**
- **If you find a problem or have questions or if the unit model does not match, contact your dealer.**

4.3.3 Installation and fixing work

⚠ WARNING

- Only a complete energy storage system without any damage can 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 9: Precautions for Installation of Energy Storage System

Installation process	Caveat
Before installation	The lifting capacity of the crane is more than 6t and the working radius is not less than 5m; the carrying capacity of the forklift truck is ≥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 process	Caveat
Installation	It is strictly prohibited for unrelated persons to enter the forklift truck transport area, lifting area, and 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 ≤ 5 °.
	Ensure that the angle between the two lifting cables is <60°.
	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.
	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.
	It is prohibited to drag the wire rope and spreader, and prohibited to use hard objects to hit.

Operating steps

1. Determine the base points of the energy storage system installation on the concrete support platform and record the base points with a marker. Based on the mounting base points, draw the locations of the four corner pieces of the energy storage system using an inkwell and a long leather tape measure.
2. Remove the wrapping film, pearl cotton,packing carton,and corner protection paper from the outside of the unit.

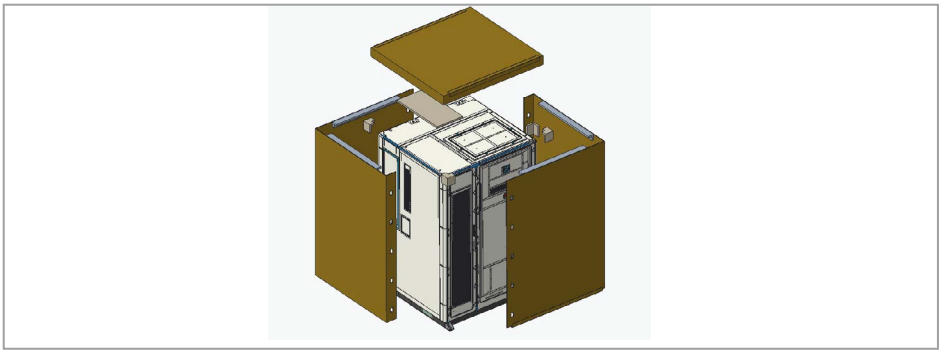


Figure 22: Unpacking Schematic for Energy Storage Cabinet

3. Adjust the direction of the energy storage system to be consistent with the set installation direction, use a forklift truck to fork onto the concrete support platform, or connect the lifting cable to lift the energy storage system onto the concrete support platform. When installing the energy storage system, it must be ensured that the base of the energy storage system coincides with the base position drawn on the concrete support platform.

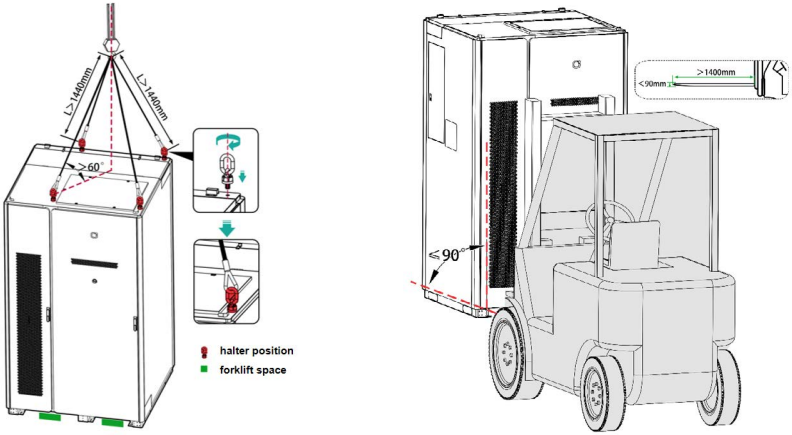


Figure 23: Schematic diagram of lifting and forklift transportation

4. **Remove the shield by cutting through it with a utility knife. Remove the mounting parts supplied with the box. After opening the door, please check the delivered parts and quantity according to the Packing List, if there are any missing parts, please contact your dealer as soon as possible.**
5. **Fixieren Sie das Energiespeichersystem auf dem Sockel oder Fundament.**

⚠ 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 drill 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.

Checklists

After the lifting of the energy storage system is completed, a post-installation inspection is required to ensure normal use and smooth subsequent installation.

Table 10: Checks after installation

No.	Check the content	Inspection method	Inspection standards
1	Are the bolts and nuts tight?	Use a spanner to tighten again.	Bolts and nuts are tightened.

No.	Check the content	Inspection method	Inspection standards
2	Does the energy storage system door open and close properly?	Perform an open and close energy storage system door operation.	All doors of the energy storage system can be opened and closed smoothly.

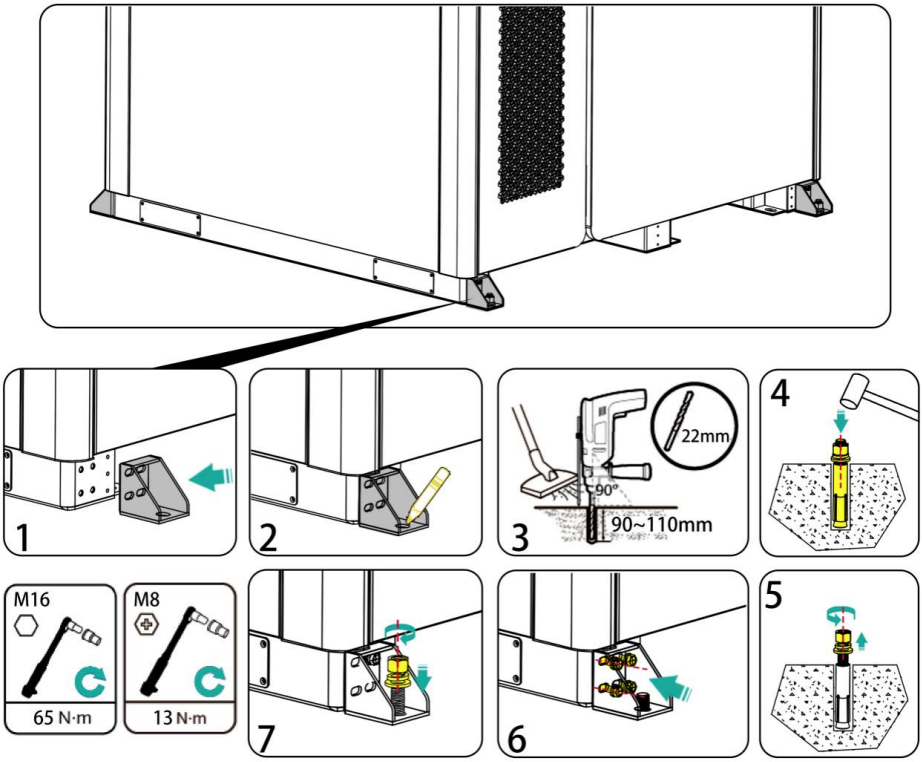


Figure 24: Angle steel fixed energy storage system is us

6. **Take out the front and rear sealing plates of the base from the kit and rear sealing plates and lock them into place on the base.**

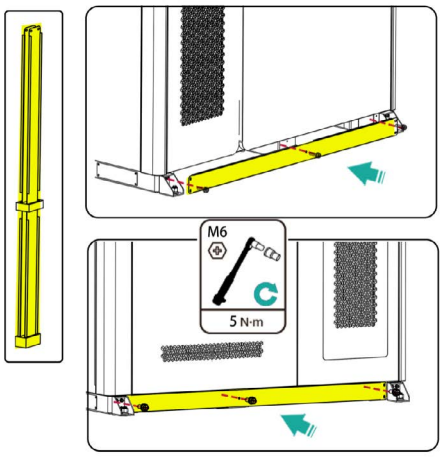


Figure 25: Schematic diagram of the installation of the front and rear sealing plate

4.3.4 Fixed operation of cabinets connection scheme

1. After making sure that the energy storage cabinet has been installed in the preset position, remove the long fixing angle piece shipped with the box, attach one end of the fixing angle piece to the mounting holes on the base of the energy storage cabinet and lock the screws.
2. The locked fixed corner piece is taken as the positioning part, and as a reference, lift the battery cabinet along the direction of the positioning piece, so that the battery cabinet can fully fit the energy storage cabinet and the fixed corner parts, and complete the lifting.
3. Repeat step 2 above to secure the energy storage system sequentially using the remaining angles after all battery cabinets have been lifted to the place.

The illustration shows 1PCS energy storage cabinet + 3PCS battery cabinet parallel cabinet scheme.

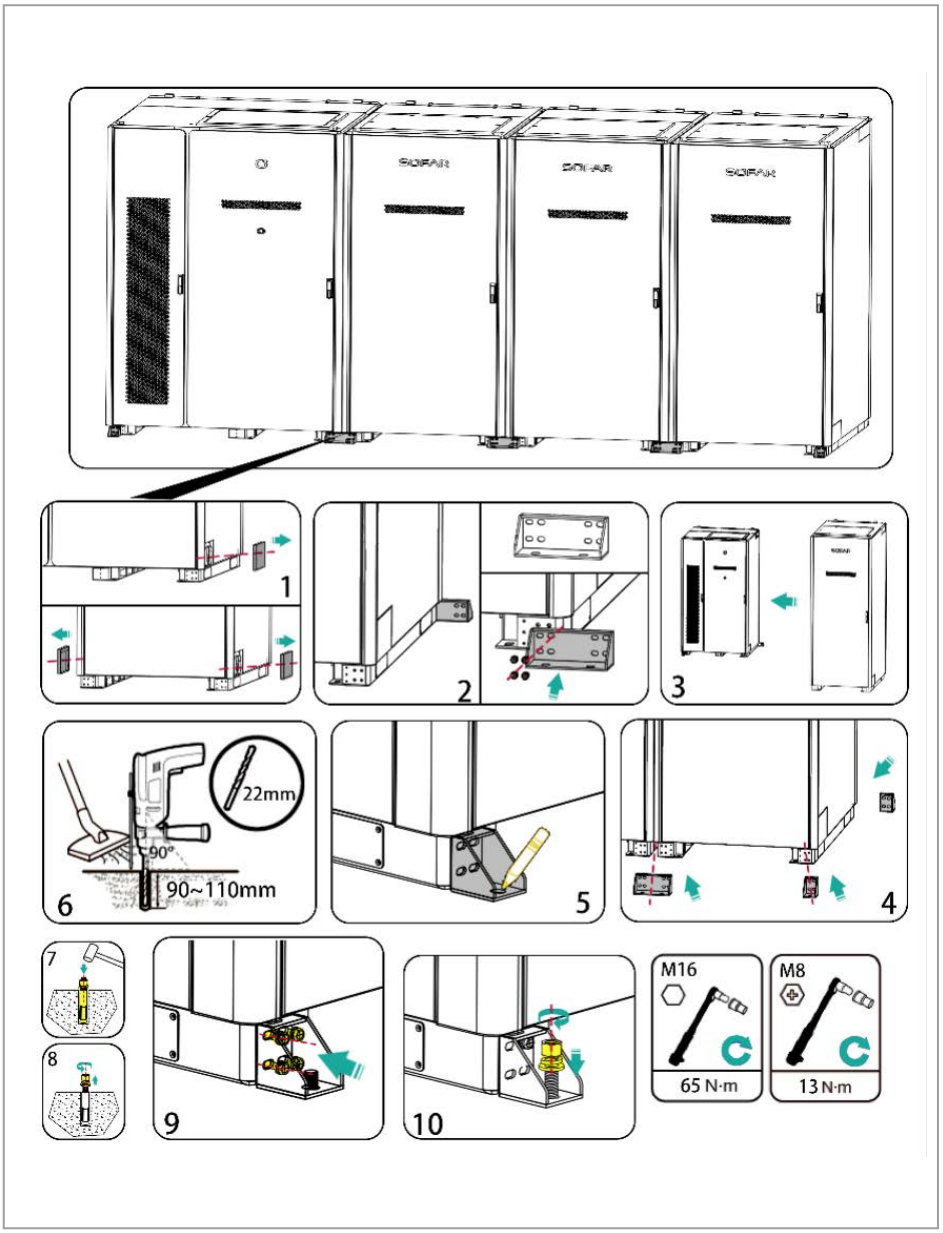


Figure 26: Installation scheme of energy storage cabinet and battery cabinets connection

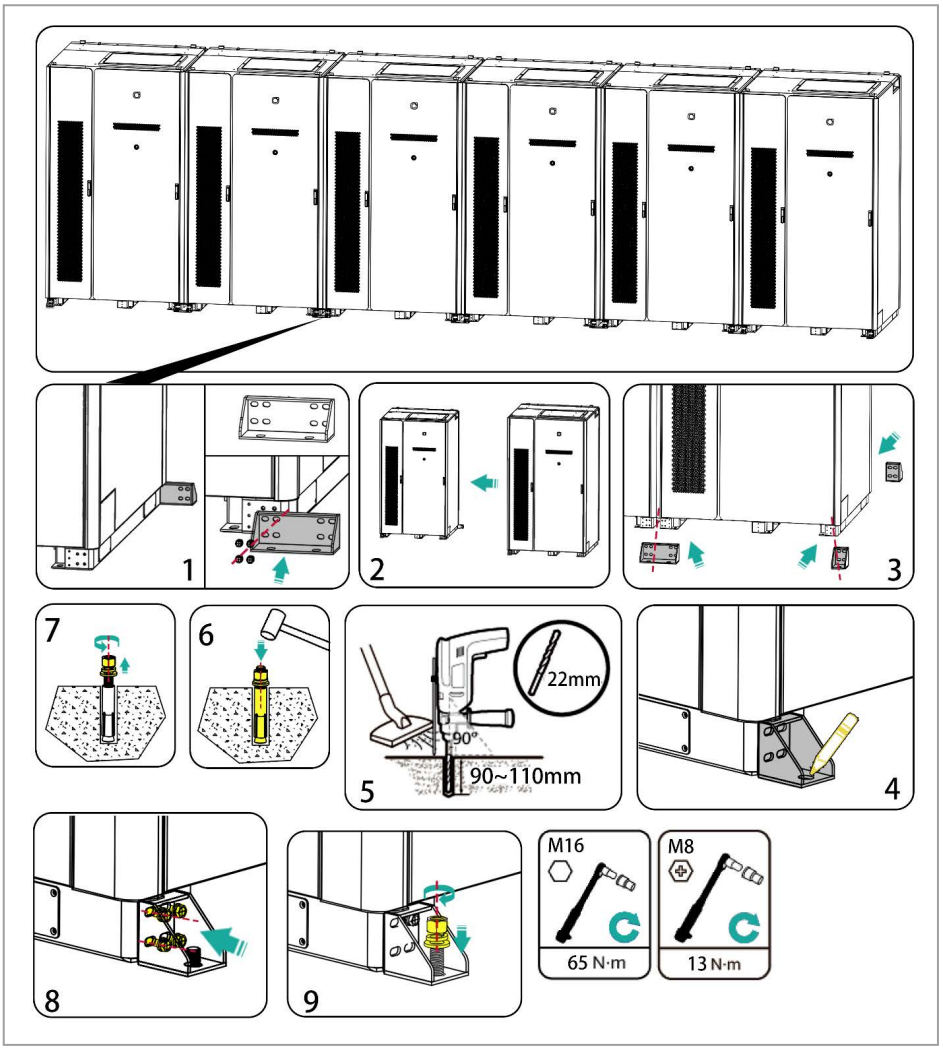


Figure 27: Schematic of the installation of energy storage cabinets connection

4.3.5 Customized steel base installation

1. Lift or forklift the steel base into position and make sure that the “BACK” side of the steel base is in the opposite direction as the preset door opening;

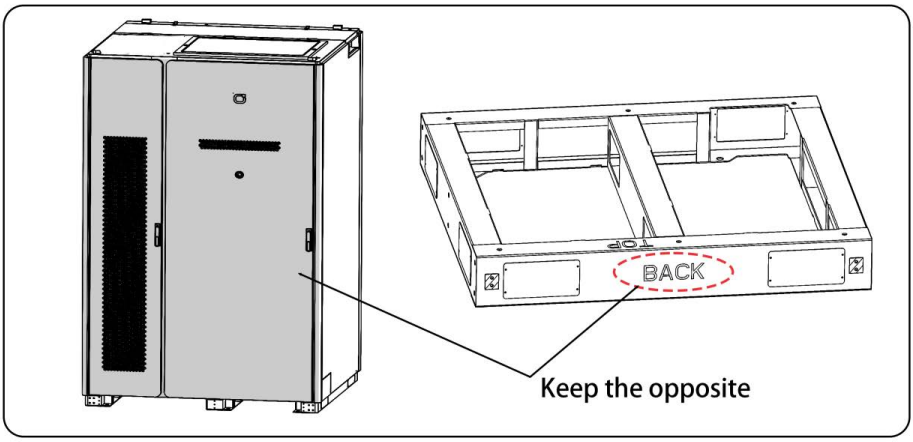


Figure 28: Schematic diagram of the steel base

2. Use expansion bolts to fix the steel base with the cement floor. If the parallel cabinet scheme of n (n value is 1, "n" indicates the number of energy storage cabinets) + m (m value is 1~3, "m" indicates the number of battery cabinets) is adopted, it is preferred to fix the steel base for extra battery cabinet and level it before carry out the overall cabinet lifting operation.
3. Use the bolts to fix the energy storage cabinet, the battery cabinet and the steel base firmly.
4. Remove the sealing plate and block the front and back of the equipment base.

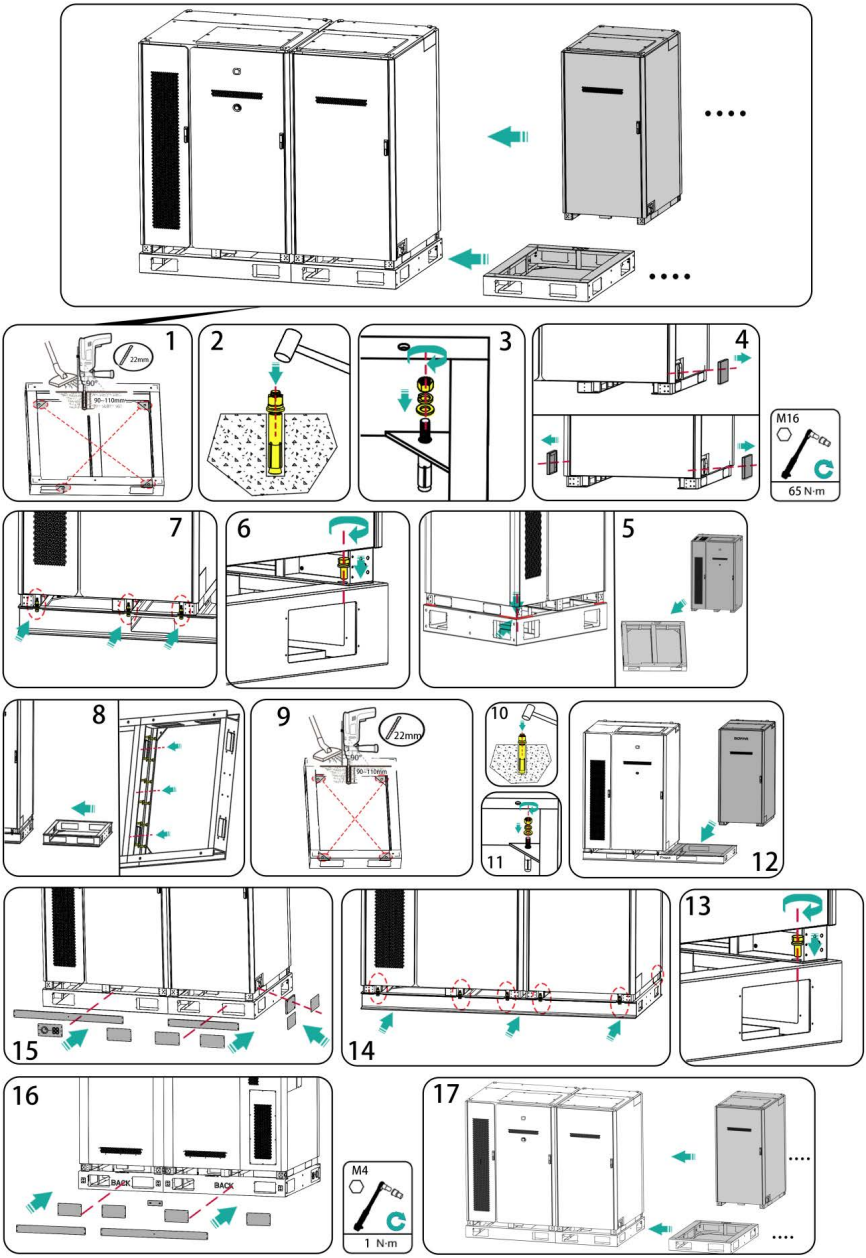


Figure 29: Installation diagram of steel based solution

5 Electrical connection

DANGER

- Danger of high voltage! Danger of electric shock!
- 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 cablesand wires.
- After completing each connection, carefully check and ensure that theconnection is correct and secure.

5.1 Safety precautions

5.1.1 Wiring requirement

- **Cable selection, erection and routing must follow local laws, regulations and codes.**
- **In the process of laying out the power supply line, it is strictly prohibited to make loops or twists. If the length of the power cord is found to be insufficient, the power cord must be replaced again, and it is strictly prohibited to make joints or welding points in the power cord.**
- **All cables must be securely connected, well insulated, and of the proper gauge.**
- **Cable grooves and crossing holes should be free of sharp edges, and the location of cable penetration pipes or crossing holes should be protected to avoid damage to the cables by sharp edges, burrs, and so on.**

- Cables of the same type should be tied together, straight and neat in appearance, without outer skin damage; cables of different types should be placed at least 30mm apart, and it is prohibited to entangle or cross-lay each other.
- When wiring is completed or when leaving during wiring, immediately seal the cable opening with sealing mud to avoid water vapour and small animals.
- Buried cables need to be reliably fixed with cable holders and cable clamps, and cables in the backfilled area should be ensured to fit tightly with the ground to prevent deformation or damage to the cables caused by the force of backfilling.
- When external conditions (e.g., laying method or ambient temperature, etc.) change, cable selection should be verified by reference to IEC-60368-5-52 or local codes and regulations, e.g., whether the current-carrying capacity meets the requirements.
- Cables used in high temperature environments may cause deterioration and breakage of the insulation, and the distance between the cable and the periphery of the heat generating device or heat source area should be at least 30mm.
- When the temperature is too low, violent shocks and vibrations may cause brittle cracking of the plastic sheath of the cable. To ensure safe construction, the following requirements should be followed:
- All cables should be laid and installed above 0˚C. When handling cables, especially when working in low-temperature environments, they should be handled gently.

5.1.2 Short-circuit protection

- When installing and maintaining the battery PACK, it is necessary to wrap the exposed cable terminals on the battery with insulating tape.
- Avoid foreign objects (such as conductive objects, screws, liquids, etc.) from entering the inside of the battery and causing a short circuit.

DANGER

- Before making electrical connections, make sure the device is undamaged or it may cause electric shock or fire.
- Unregulated and incorrect operation may cause accidents such as fire or electric shock.
- In the process of operation, it is necessary to prevent foreign matter from entering the equipment, otherwise it may lead to short circuit failure or damage of the equipment, load supply. Electricity down or power down, and personal injury.

WARNING

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

NOTICE

- No cables are allowed to pass through the air inlet or outlet of the equipment to avoid obstruction.

5.1.3 Grounding requirement

- **The ground impedance of the device must meet the requirements of the local electrical standards.**
- **The equipment should be permanently connected to a protective ground. Before operating the equipment, check the electrical connections of the equipment to ensure that it is reliably grounded.**
- **Do not operate the device without a ground conductor installed.**
- **Do not damage the ground conductor.**
- **For equipment using three-pronged sockets, it must be ensured that the ground terminal in the three-pronged socket is connected to the protective ground.**
- **For a device with high contact current, ground the protective grounding terminal of the device cover before connecting the input power to prevent electric shock caused by the contact current of the device.**

5.1.4 Antistatic requirements

The static electricity generated by the human body may damage the electrostatic sensitive components on boards, such as the large-scale integrated circuit (LSI).

- **When touching the equipment, before holding a single board, a module with exposed circuit boards, or a dedicated integrated circuit (ASIC) chip, etc., please observe the static protection specification, and wear anti-static overalls, anti-static gloves or wristbands, and the other end of the anti-static wristbands should be well grounded.**
- **When holding a board or a module with an exposed circuit board, hold the edge of the board or module without components. Do not touch the components with your hands.**
- **The removed boards or modules must be packaged in anti-static wrapping material before storage or transport.**

5.2 Wiring preparation

5.2.1 Preparation of installation tools

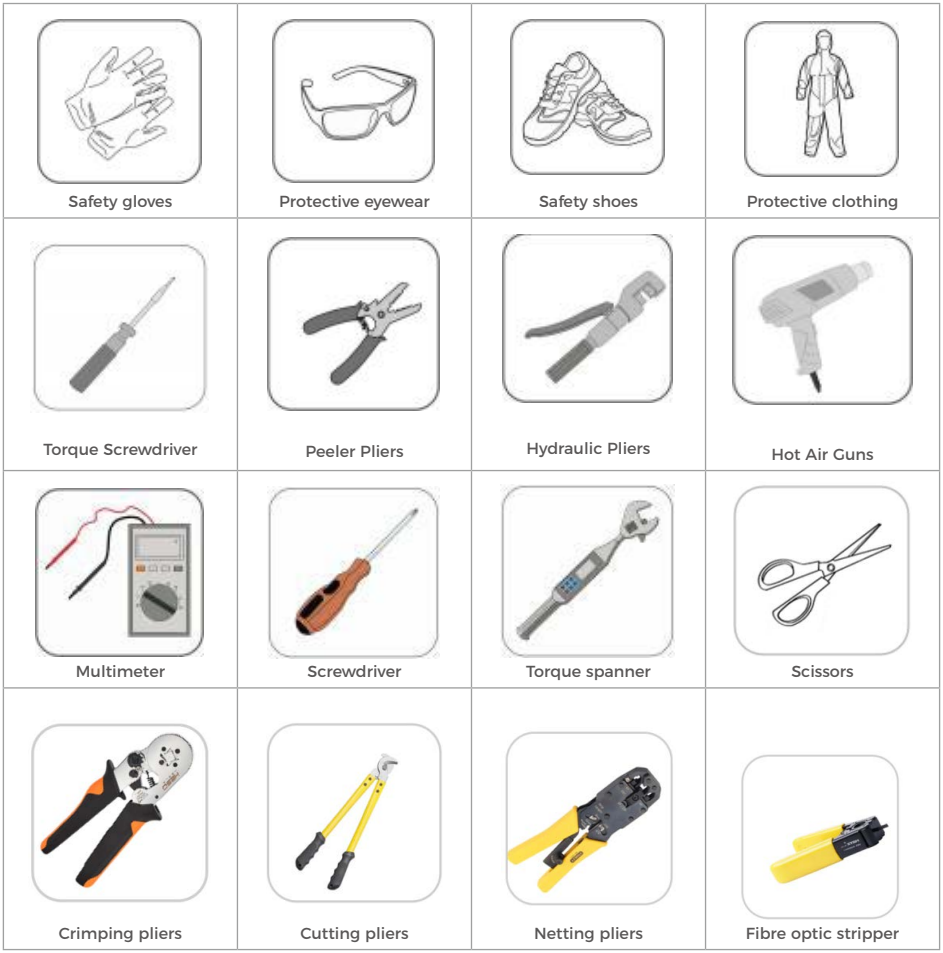


Figure 30: Installation Tools

5.2.2 Prepare Cables

Table 11: Cable preparation table

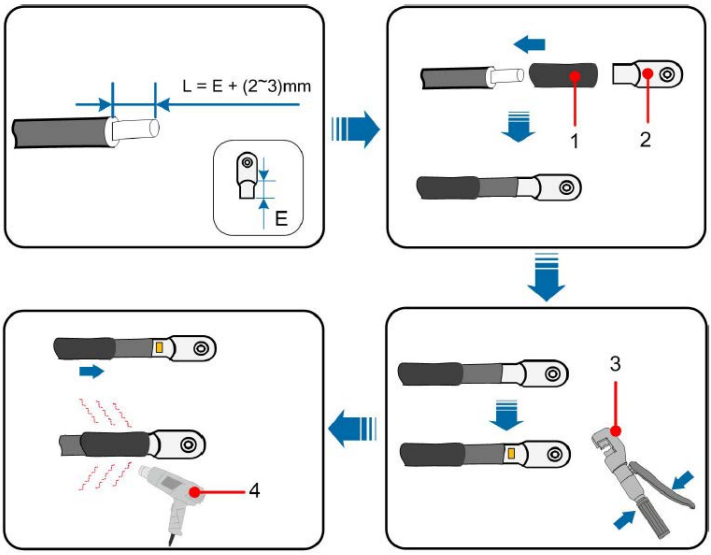
Name	Type	Scope of cross-sectional area selection	Terminal	Remarks
The PCS AC input power cord	3 core (A, B, C) outdoor copper core wire or choose armored cable	95mm²*3	The M 8 OT / DT terminal	Storage cabinet PCS AC input three-phase power line
DC-parallel cabinet power line	Random cabinet comes with it	DC+:70mm² DC-:70mm²	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	(0.5~1.5mm²) *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, the CSU goes to the industrial controller
The I / O dry contact signal line	4 core line, 8 core line, 14 core	(0.5~1mm²) *4 (0.5~1mm²) *8 (0.5~1mm²) *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: (25mm²~50mm²) 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.

ACHTUNG

- The cables used should comply with local laws and regulations.
- The cable colours involved in the illustrations in this manual are for reference only, please select cables according to local cable standards.
- The diameter of the cable must be selected in accordance with the maximum load capacity and the length must be allowed for.
- All DC input cables should be of the same specification and material.

5.2.3 Cable compression and connection

OT/DT terminal crimping



①	Heat Shrinkable Tubing	②	OT/DT Terminal
③	Hydraulic pliers	④	Hot air gun

Figure 31: OT/DT Terminal Crimping

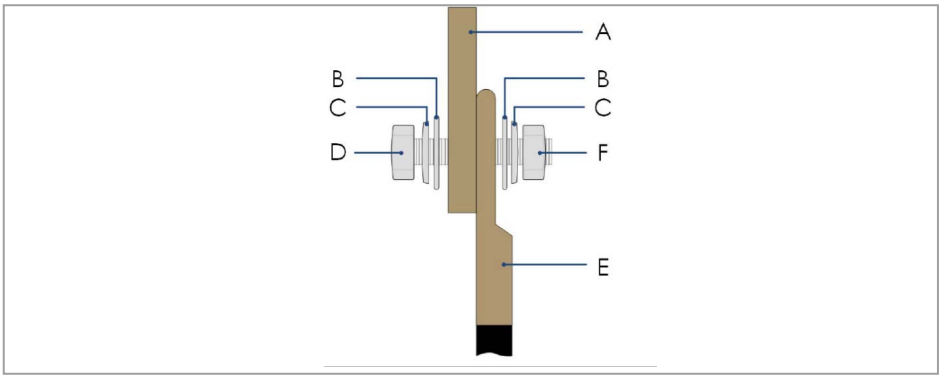


Figure 32: Cable Connection

Table 12: Cable Connection Description

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

5.2.4 Open the cabinet doors and equipment compartment doors

1. Open the door of the energy storage cabinet and battery cabinet, move the cover of the door lock hole to the top of the lock hole with the key and rotate. After the door handle pop up and rotates clockwise, open the cabinet door.

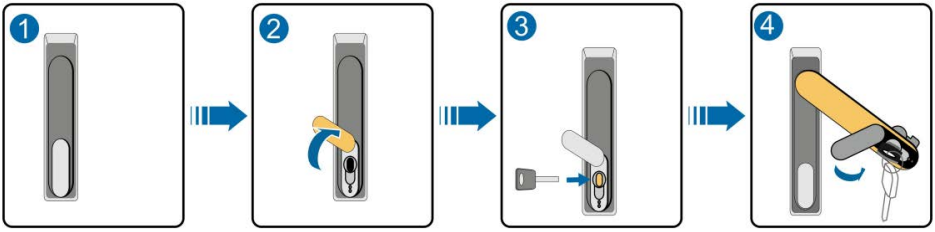


Figure 33: Schematic diagram of cabinet door opening

2. **Fix the cabinet door.**

When the cabinet door is opened, the double-headed bolt of the door support will slide naturally. When the double headed bolts slide into the holes (Point A), the limiting bar will be fixed automatically.

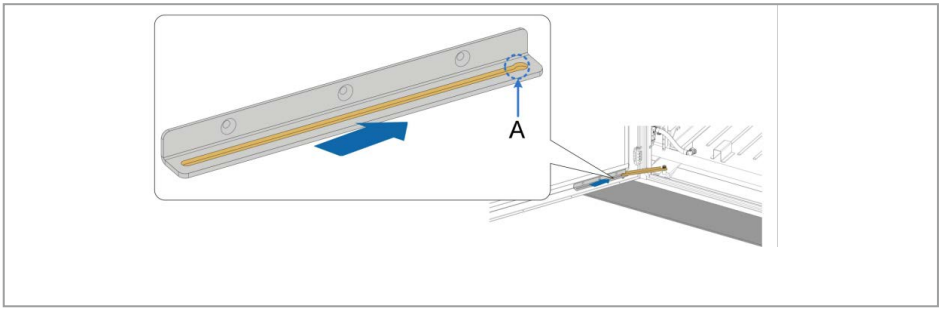


Figure 34: Schematic diagram of the fixed cabinet door

3. **Remove the top sealing plate of the energy storage cabinet and the battery cabinet.**

5.2.5 Cable entrance design

The connection cables between the energy storage cabinet and external equipment are uniformly fed in and out from the bottom of the cabinet. The parallel cabinet cable of the energy storage cabinet and the battery cabinet enters and exits from the top of the cabinet. All cables pulled out of the cabinet need to be well protected, such as laying through the pipe, in order to prevent rodents from damaging the cables. At the end of the wiring work, the energy storage cabinet inlet and outlet holes should also be fire clay or other suitable materials sealed tightly. The design of the cable access holes at the bottom of the energy storage cabinet is shown in the following diagram.

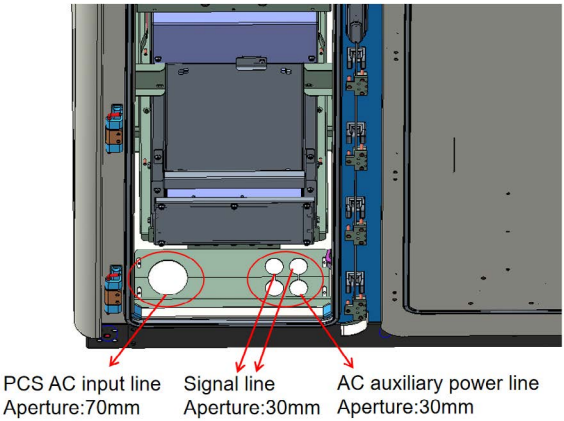


Figure 35: Cable entry and exit holes at the bottom of the energy storage cabinet

5.3 Ground connection

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

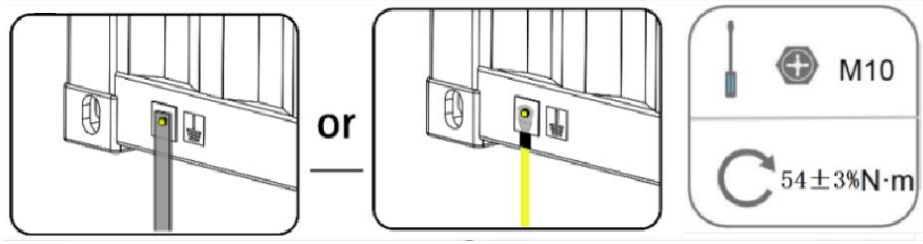


Figure 36: Schematic diagram of cabinet grounding

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 M10x30 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 4Ω.

NOTICE

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

5.4 Cable wiring between cabinets

The parallel cabinet cable wiring only happens when the energy storage cabinet and the battery cabinet are connected together. The cabinet cables wiring including DC power cable wiring and signal cable wiring, and these cables are shipped with the cabinets and has plug-in connection .

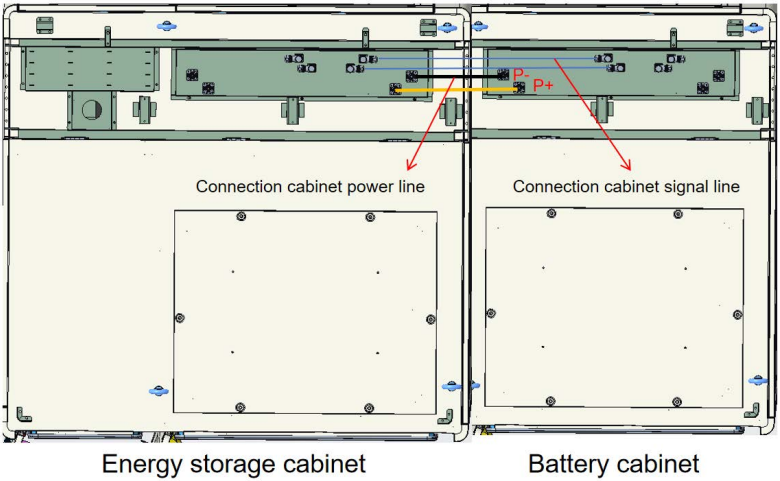


Figure 37: Cable wiring between energy storage cabinet and battery cabinet

Procedure

1. Locate the parallel cable that comes with the random cabinet, containing two power cables (one positive and one negative, with plugs at both ends) and two sets of signal cables (with signal terminals at both ends).
2. Plug the power and signal cables into the energy storage cabinet first, make sure the terminals have been plugged into place and locked, and then according to the cable identification, lead them to the corresponding interface wiring of the battery cabinet of the parallel cabinet.
3. After all the cables of the parallel cabinet are connected, tie the cables to fix them, and check whether the plug is plugged in place again. (Judgement method:
   a. Can hear the sound of installation in place
   b. reverse pull the cable without loosening)
4. When wiring is complete, gently tug on the cable to ensure that margin is left.
5. Install the cable guard cover.

5.5 Pipe Installation Between Cabinet

5.5.1 Sealing inspection of liquid cooling pipelines in cabinets

Before starting the installation of the liquid cooling pipelines for cabinet consolidation, the air tightness of each cabinet should be checked to ensure that the liquid cooling pipelines of the cabinets are not damaged during storage and transportation. If it is found that the air tightness of the cabinet does not meet the requirements during inspection, timely contact should be made with the after-sales service personnel. Due to the fact that the energy storage main cabinet is transported with liquid, it is sufficient to visually inspect all parts of the pipeline for any leakage, and there is no need for pressure testing. The following pressure test is only applicable to battery cabinets.

1. Check and confirm that the ball valve of the cabinet is in a closed state (the handle of the ball valve is parallel to pipeline). Remove the cover and sealing ring at the right end of the first level pipeline of the cabinet to be inspected, and properly store the removed cover and sealing ring.

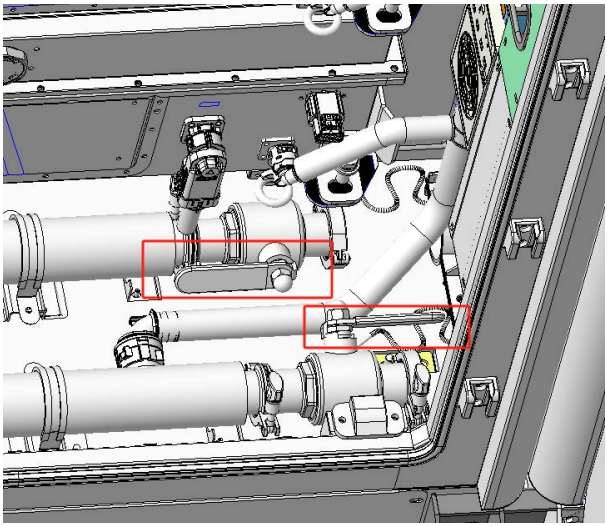


Figure 38: Checking and confirming the direction of the ball valve handle

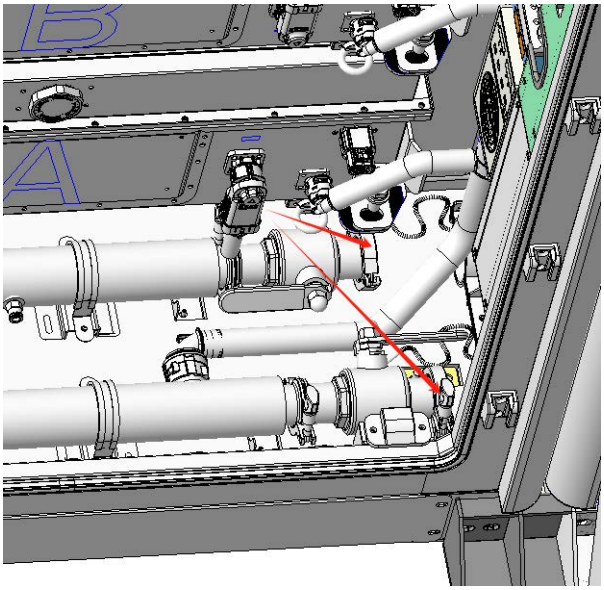


Figure 39: Position of the first level pipe cover on the right side of the cabinet

2. Connect the flange head of the pressure maintaining fixture to the flange head at the end of the first stage pipeline and install the sealing ring. Use a torque wrench to tighten the clamp screws at the connection, with a torque of 6-8Nm.



Figure 40: Schematic diagram of tooling

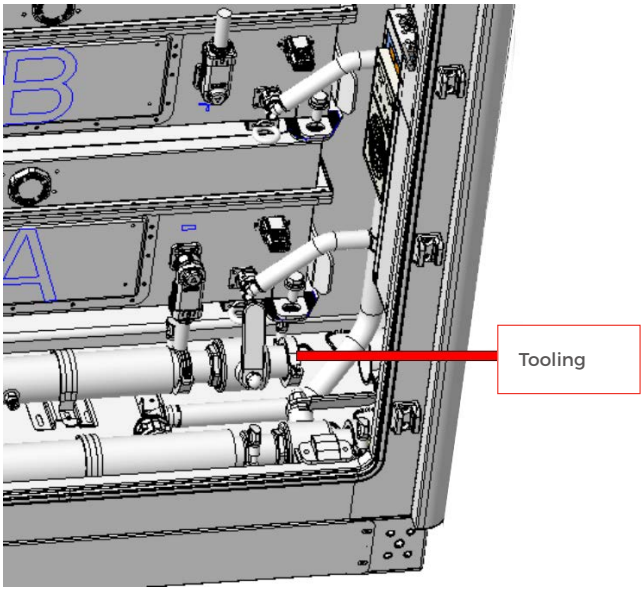


Figure 41: Schematic diagram of opening ball valve

3. Open the ball valve on the first stage pipe connected to the fixture (the handle of the ball valve is perpendicular to the direction of the pipeline). Perform pressure holding operation. If the pressure test does not meet the requirements, contact the after-sales service personnel in a timely manner. Alternatively, the pipes inside the cabinet can be reinstalled and subjected to a pressure test to troubleshoot before proceeding with the next cabinet consolidation operation.
4. After the pressure test is completed, insert a plastic tube with an outer diameter of 8mm into the discharge port for pressure relief. Do not proceed to the next step until the pressure relief is complete to avoid unnecessary injury. After completing the pressure relief, remove the fixture, install the removed sealing ring, clamp, and cover back in place, and tighten the clamp screw with a torque wrench to 6-8Nm. Remove the pressure relief plastic pipe and close the ball valve of the first stage pipeline.

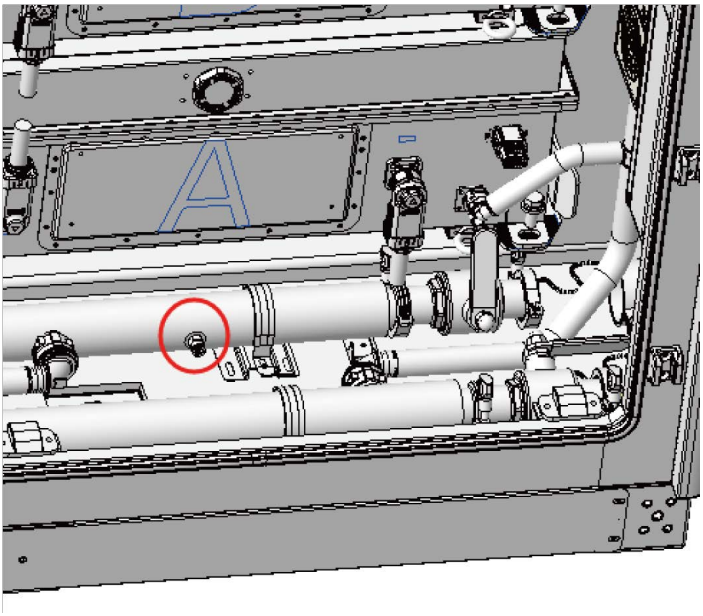


Figure 42: Schematic diagram of discharge port



Figure 43: Plastic pipe

5.5.2 Installation of liquid cooling pipelines during cabinet consolidation

The installation of liquid cooling pipelines only involves on-site installation when the energy storage main cabinet is combined with the battery cabinet or when the battery cabinet is combined with the battery cabinet. If the energy storage main cabinet is used separately, it does not involve the installation of liquid cooling pipelines for cabinet integration. The installation of the liquid cooling pipeline for the cabinet includes four steps: removing the side pipe cover plate of the cabinet, opening the sealing groove, installing the pipeline, and closing the sealing groove.

1. Open the sealing slot. Open the two sealing slots between two parallel cabinets, use a screwdriver to remove four M4 screws, and rotate the sealing slots 45 degrees upwards to open them.

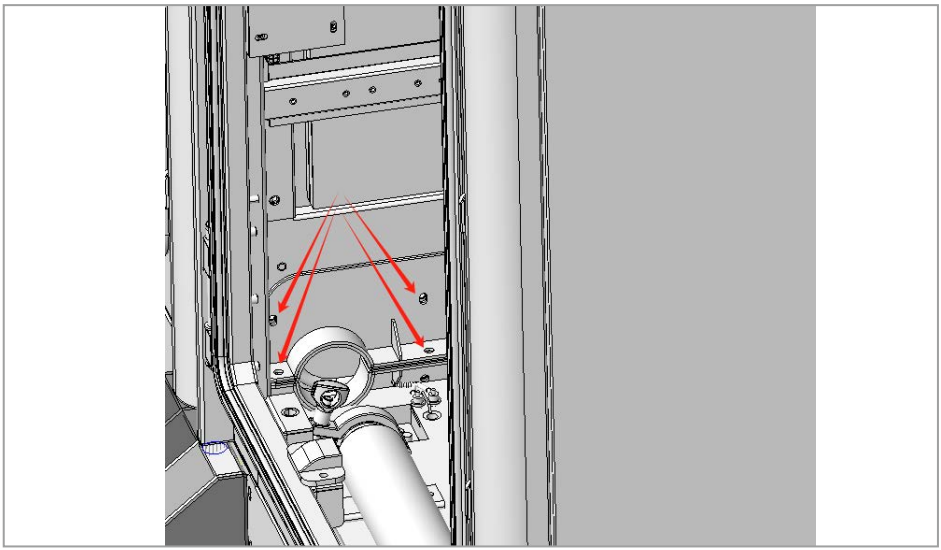


Figure 44: Disassembling the sealing slot screws

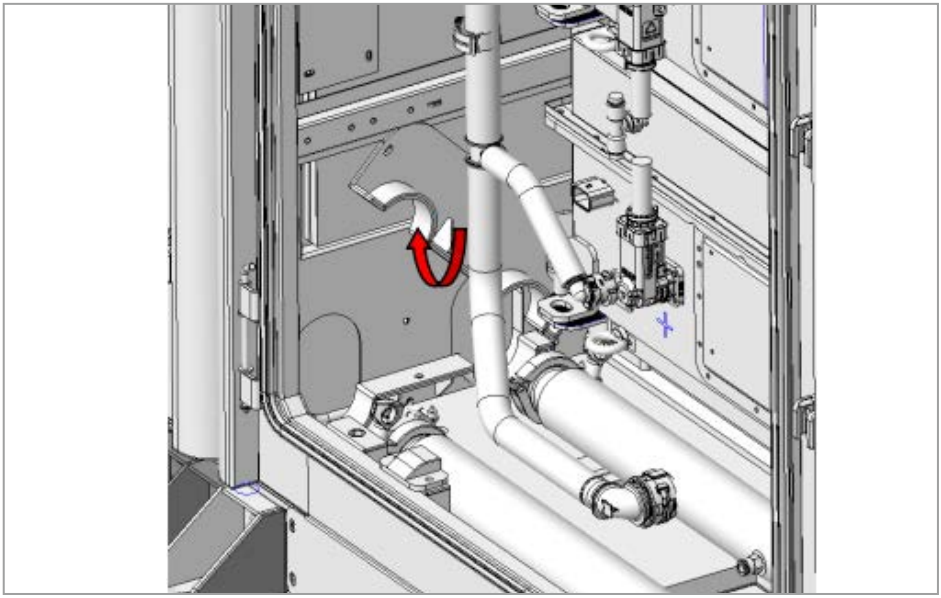


Figure 45: Flipping and opening the sealing slot

2. Install the pipeline. Loosen the clamp at the end of the liquid cooling pipeline of the two parallel cabinets, and remove the covers and sealing rings inside the clamps of the two cabinets. Properly store the removed covers and sealing rings. Thread the hose through the sealing groove of the two parallel cabinets and connect the sealing ring, hose, and liquid cooling pipeline of the two cabinets with clamps. Use a torque wrench to tighten the clamp screws to a torque of 6-8Nm.

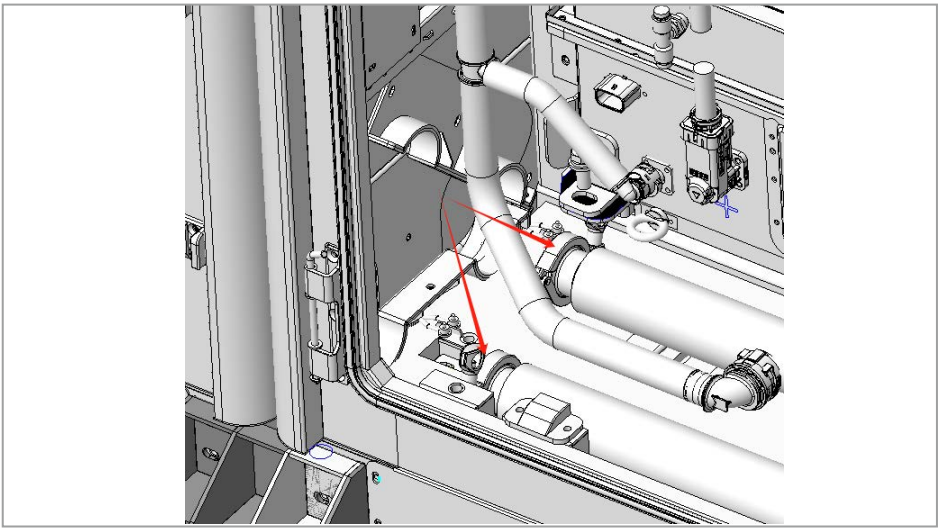


Figure 46: Loosen and remove the clamp

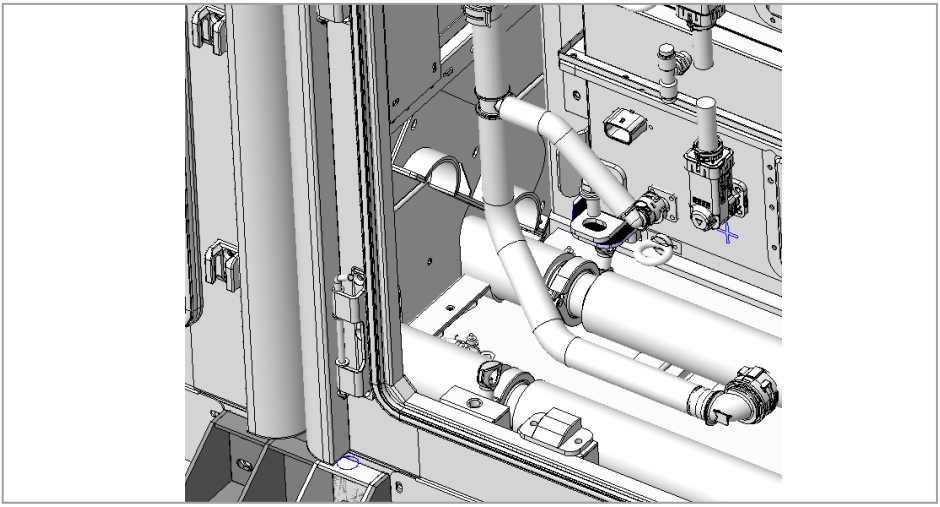


Figure 47: Install hose and lock clamp

After locking the clamp, the clamp screw should not exceed the bottom surface of the battery pack to avoid affecting the subsequent maintenance of the battery pack.

3. **Close the sealing slots of two parallel cabinets. Rotate the sealing slot 45 degrees downwards to close it, and reinstall the four M4 screws with a screwdriver.**

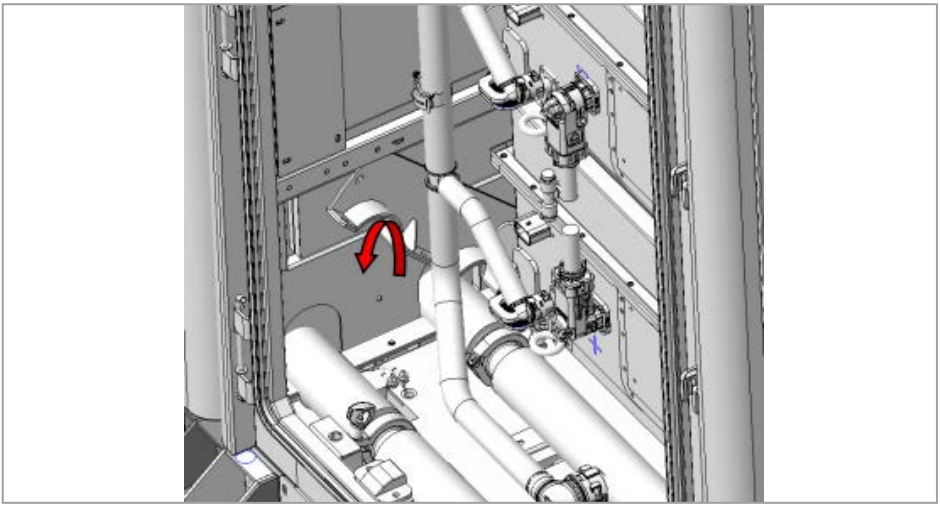


Figure 48: Flipping and closing the sealing slot

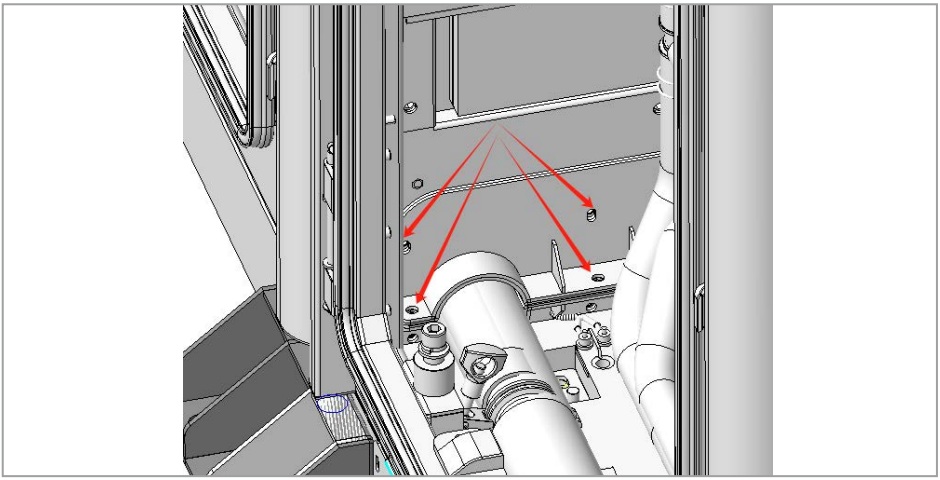


Figure 49: Installing screws of sealing slots

5.5.3 Installation of fire protection pipelines in parallel cabinets

The installation of fire protection pipelines is only installed between the energy storage cabinet and the energy storage cabinet or 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 or six energy storage cabinets simultaneously. If the energy storage cabinet is used alone, it does not involve the installation of fire protection soft circuits for cabinet integration. The installation of the liquid cooling hose for the cabinet includes four steps: opening the rotating cover plate, installing the quick connect fire pipeline, installing the pipeline clamp, and closing the rotating cover plate.

1. **Remove the fixing screws of the rotating cover plate on the top of the cabinet and open it by rotating it. And support the support rod well.**

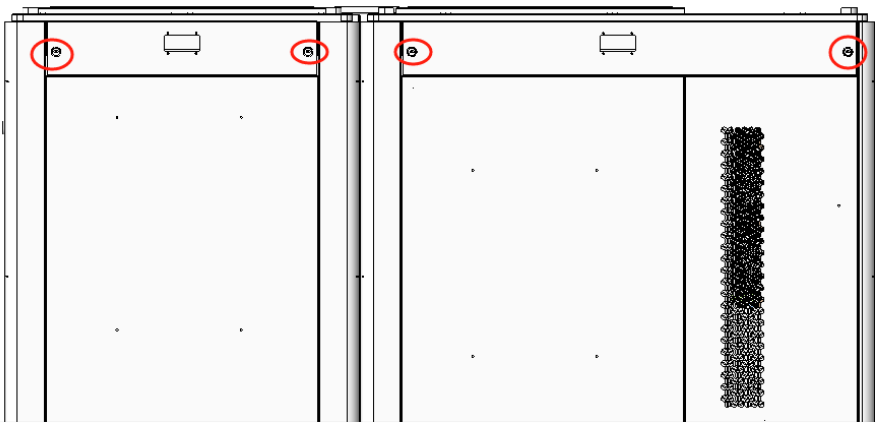


Figure 50: Schematic diagram of disassembling the screws of the rotating cover plate

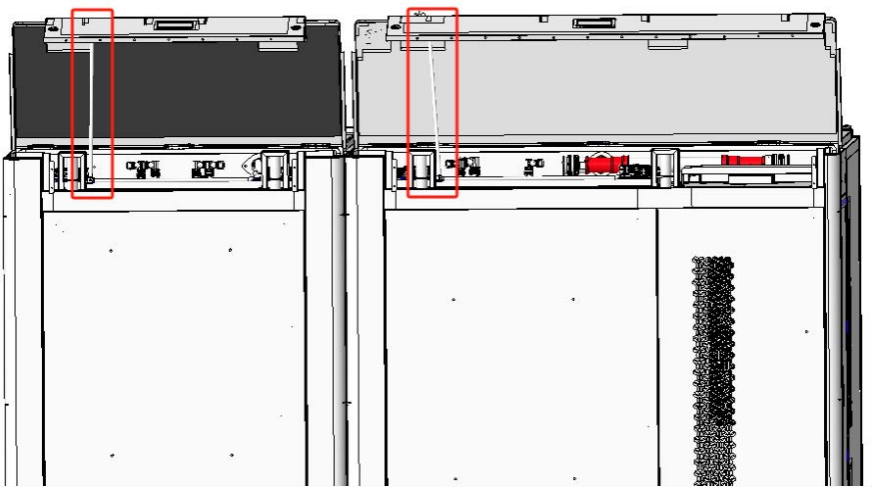


Figure 51: Schematic diagram of the state of the top cover supported by the support rod

2. **Install the hose of the fire protection cabinet into the quick connector of the cabinet top pipeline. During installation, pull the outer iron ring of the quick connector backwards and insert the fire protection hose into place. After installation, use your hands to pull it. If it cannot be pulled, it means it has been installed in place. Install quick plug plugs at both ends of the fire protection pipeline on the top of the cabinet. As shown in the figure.**

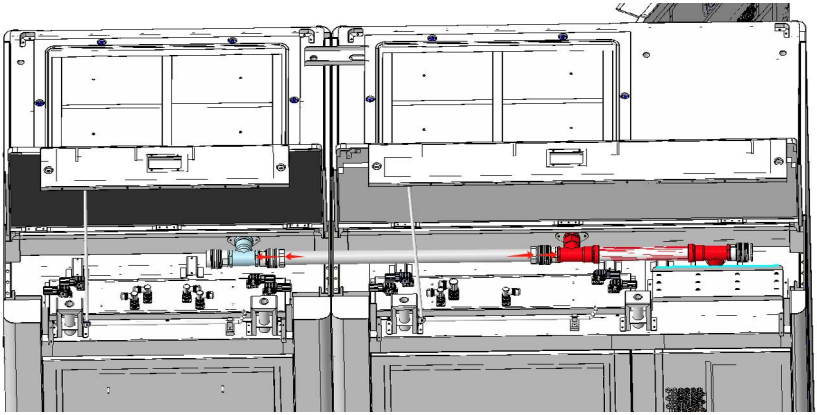


Figure 52: Schematic diagram of installing fire hoses

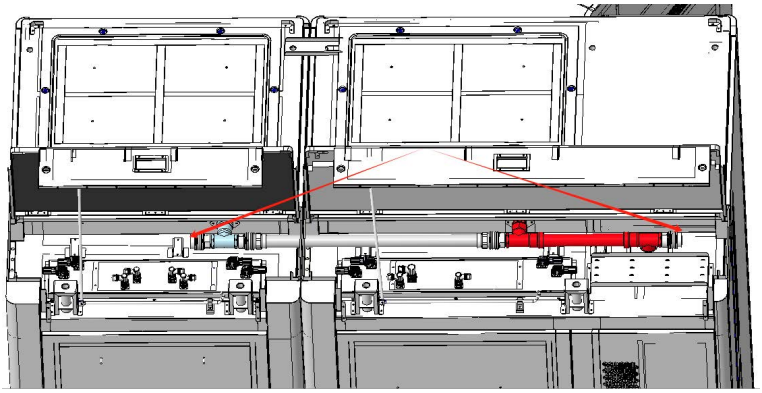


Figure 53: Schematic diagram of installing quick plug plugs at both ends

3. **After the fire hose is installed in place, install the clip of the fire hose and tighten the clip with two M4 screws.**

5.6 AC power cord connection of PCS

The PCS AC power cable wiring is located on the input side of the threephase AC moulded case circuit breaker in the junction box in the liquidcooled compartment of the energy storage cabinet. The AC power line wiring is shown below.

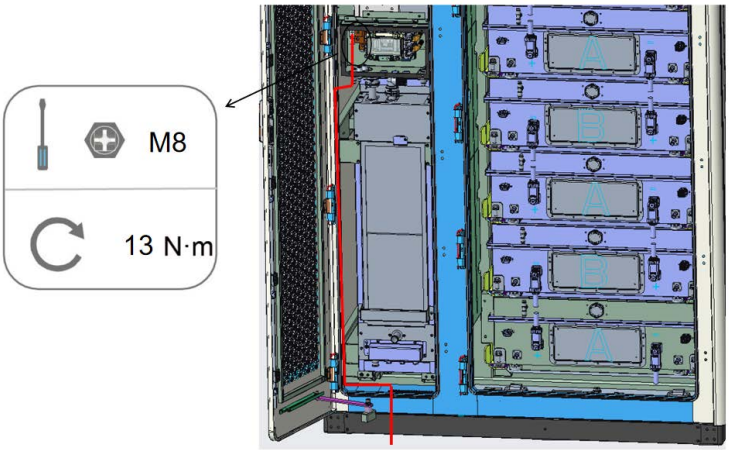


Figure 54: Schematic diagram of PCS AC power cable laying

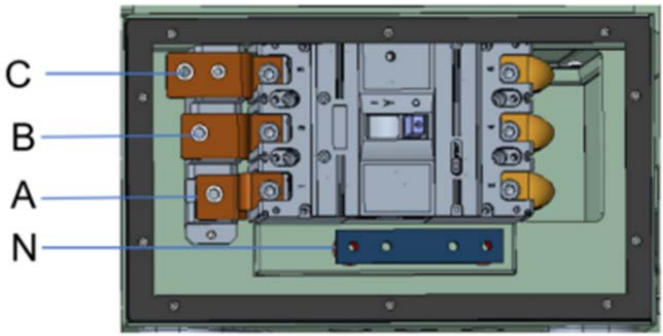


Figure 55: PCS AC Input Switch Phase Sequence (400V Energy Storage System)

Operating procedure

1. Disconnect the front AC circuit breaker and measure with a multimeter to determine that there is no voltage on the power line leading to the energy storage cabinet.
2. Pass the cable through the inlet hole at the bottom of the energy storage cabinet and lead it to the corresponding wiring position according to the cable identification.
3. Cut excessively long cables with wire cutters.
4. Use wire pers to strip the cable cover and expose the copper core.
5. For compression of OT terminals, please refer to “5.3.3 Cable compression and connection”.
6. With the M6 bolt, secure the OT terminal to the wiring hole.
7. When wiring is complete, gently tug on the cables to ensure that there is margin, and tie off the cables with cable ties according to the alignment path.

NOTICE
▶ The PCS AC input power cord must be wired strictly according to the terminal phase sequence.

5.7 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. There is a difference in the number and definition of external interfaces between the integrated CSU and the non-integrated CSU of the energy storage cabinet, 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.

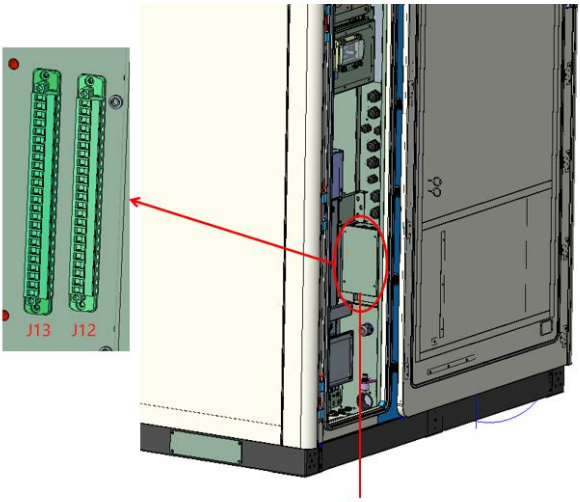


Figure 56: Schematic diagram of external wiring of storage cabinet signal terminals

Table 13: Definition of external interface terminals for the energy storage cabinet without CSU

External interface terminal	Terminal Pins	Feet instructions	Recommended line diameter range	Remarks
J12	1~2	The CAN communication between the CSU and the PCS	(0,5~1,5 mm²) *8	
	3~4	Carrier synchronization between the CSU and the PCS		
	5~6	CSU alarm signal input to CMU		
	7~8	CMU alarm signal output to CSU		
	9~12	/	/	No wiring
	13~14	24V power supply for sink cabinet dehumidifier	16AWG*2	
	15~16	Confluence cabinet CSU 24V power supply	16AWG*2	
J13	1~2	External alarm signal input to CMU	(0,5~1,5 mm²) *8	Reserved interface, without wiring
	3~4	CMU output external fault		Pre-wired interface, no wiring required
	5~6	CAN communication between PCS and PCS		No wiring is required for this pin on a single storage cabinet.
	7~8	Carrier synchronisation between PCS and PCS		No wiring is required for this pin on a single storage cabinet.

Table 14: Definition of external interface terminals for the energy storage cabinet with CSU

External interface terminal	Terminal Pins	Feet instructions	Recommended line diameter range	Remarks
J12	1~2	CSU communicates with counter-current meter 485	(0,5~1,5 mm²) *16	
	3~4	CSU and backup cabinet		
	5~6	CSU and backup cabinet STS often open state detection		
	7~8	Detection of CSU and backup cabinet QF 3 switch		
	9~10	CSU and backup cabinet SPD1 state detection		
	11~12	CSU and backup cabinet SPD2 state detection		
	13~14	CSU with backup cabinet QF1 switch opening and closing status detection		
	15~16	Detection of CSU and backup cabinet QF 2 switch		
J13	1~2	External alarm signal input to CMU	(0.5~1mm²)*8	Pre-wired interface, no wiring required
	3~4	CMU output external fault		Pre-wired interface, no wiring required
	5~6	Local management alarm signal input to CSU		
	7~8	CSU alarm signal output to local management		

External interface terminal	Terminal Pins	Feet instructions	Recommended line diameter range	Remarks
J14	1~2	CSU control and backup cabinet STS closure	(0,5~1,5 mm²) *8	
	3~4	CSU control and backup cabinet switch QF1 closure		
	5~6	CSU control and backup cabinet switch QF1 disconnection		
	7~8	CSU control and backup cabinet switch STS disconnection		
	9~10	The CSU draws 24V from the grid side of the backup cabinet.	16AWG*2	
	11~13	/	/	No wiring required
	14~16	CSU collects and disconnects grid-side line voltage from the cabinet	16AWG*3	

Operating procedure

1. Find the matching plugs and pins for the terminals that come with the cabinet.
2. According to the actual configuration of the system, according to the above table interface definition for the storage cabinet external signal terminal wiring, the cable through the bottom of the storage cabinet signal into the hole, according to the cable identification, lead to the corresponding terminal block plug pins for wiring.
3. Cut excessively long cables with wire cutters.
4. Use wire strippers to strip the protective coating from the cable to expose the copper core.
5. Use crimping pliers to crimp the cable to the pins.
6. Insert the wired pins into the corresponding pin holes of the plug in accordance with the wiring sequence of the interface definition table, and lock the signal wires with the crimp clips provided with the plug.
7. After the wiring is completed, gently pull the cable to ensure the margin.

5.8 Communication cable connection

CMU communication line

If the CSU is not integrated in energy storage cabinet, perform this step. The external network cable is from the external CSU to go to the CMU of the energy storage cabinet, the communication network cable wiring location in the auxiliary power module output RJ45 port, the CMU communication network cable wiring as shown below.

1. Pass the communication network cable through the signal inlet hole at the bottom of the energy storage cabinet, and after passing through the PG header at the corresponding position of the liquid-cooling compartment of the energy storage cabinet, lead it to the corresponding wiring position of the auxiliary power module according to the cable identification.
2. Cut off any excessively long cables with a network cable cutter.
3. Use the network cable clamp to crimp the crystal head to the network cable, the network cable wire sequence at both ends of the uniform 568A standard or 568B standard can be.
4. After crimping is complete, insert the crystal head into the RJ45 port of the Auxiliary Power Module.
5. After the wiring is completed, gently tug on the cable to ensure that there is a margin, the corresponding PG header must lock the cable, and tie up the communication network cable according to the alignment path.

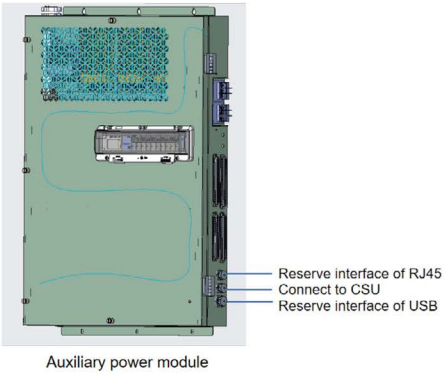


Figure 57: Schematic diagram of CMU communication network cable connection

CSU communication network cable

If the CSU is integrated in energy storage cabinet, perform this step. Then the external network cable is going from the host computer to the CSU of the energy storage cabinet, the communication network cable wiring position is at the RJ45 port of the CSU, and the communication network cable wiring of the CSU is shown in the following figure.

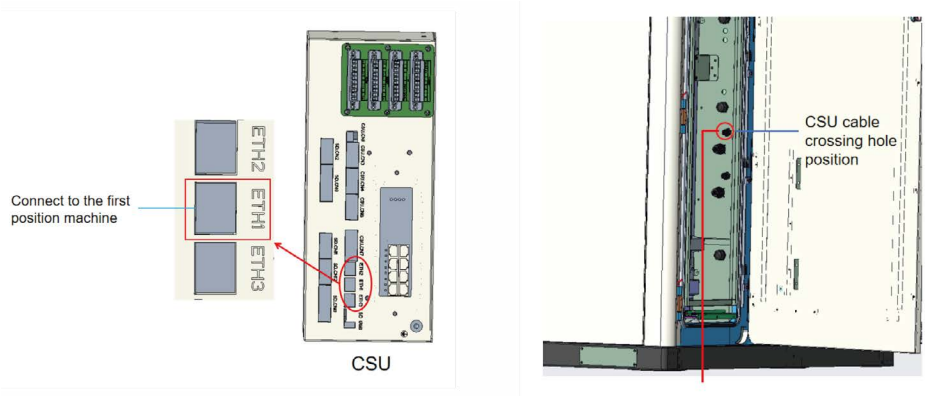


Figure 58: Schematic diagram of CSU communication network cable connection

1. Pass the communication network cable through the signal inlet hole at the bottom of the energy storage cabinet, and after passing through the PG header at the corresponding position of the liquid-cooling compartment of the energy storage cabinet, lead it to the corresponding wiring position of the auxiliary power module according to the cable identification.
2. Cut off any excessively long cables with a network cable cutter.
3. Use the network cable clamp to crimp the crystal head to the network cable, the network cable wire sequence at both ends of the uniform 568A standard or 568B standard can be.
4. After crimping is complete, insert the crystal head into the RJ45 port of the Auxiliary Power Module.
5. After the wiring is completed, gently tug on the cable to ensure that there is a margin, the corresponding PG header must lock the cable, and tie up the communication network cable according to the alignment path.

5.9 Operations after cable wiring

After all cable wiring has been made, the following operations are also required:

- **Use fireproof and waterproof materials to tightly seal the outlet holes and gaps around the energy storage cabinet.**
- **All wiring removed cover plates, door panels, and screws need to be reinstalled and restored.**

WARNING

- If not properly sealed, moisture may enter.
- If not properly sealed, rodents may enter.

6 Powering up and shutdown operation specifications

⚠ WARNING

- The BESS can only be put into operation after confirmation by a professional and approved 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.

6.1 Indicator lights and status descriptions

Table 15: SOFAR LOGO indicator status information

Type	Indicator status	Hidden 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 alert	
	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)
Go out	Go out	Turn off	

Table 16: PCS indicator status information

Type	Indicator status	Hidden 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-under-voltage
	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 Alarms	DC-side faults, gridside faults, and alarms generated by the PCS itself
	Red light flashing	Communication alarm	1s on,1s off
	Go out	No alarm	

Table 17: 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	

Type	Indicator status	Hidden meaning	Note
Red	Red light always on	System malfunction shutdown, relays are disconnected	
Go out		No auxiliary power on the DC side of the system	

6.2 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.

6.2.1 Check before powering on

- 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

6.2.2 Steps for powering up under normal conditions

After making sure that the energy storage system is in a normal un-started state, the power-on operator needs to take insulation protection measures.

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 59: Battery Cluster Positive and Negative Plugs Locations

2. Use a multimeter to measure whether there is AC220V AC power at the main input of the auxiliary power box in the energy storage cabinet, If yes, then close the QA1 total power switch, use a multimeter to measure the output voltage of QA1 is normal. Then close QA2 to power the liquid-cooling machine. Then close QA3 to power the CMU module, the fire fighting system, dehumidifier, flood sensor switch, lighting and other equipment. Then close QA4 to power the BCU and indicator light (the green light will be flashing with the 1Hz frequency) in the high-voltage box, the BMUs in the PACKs.

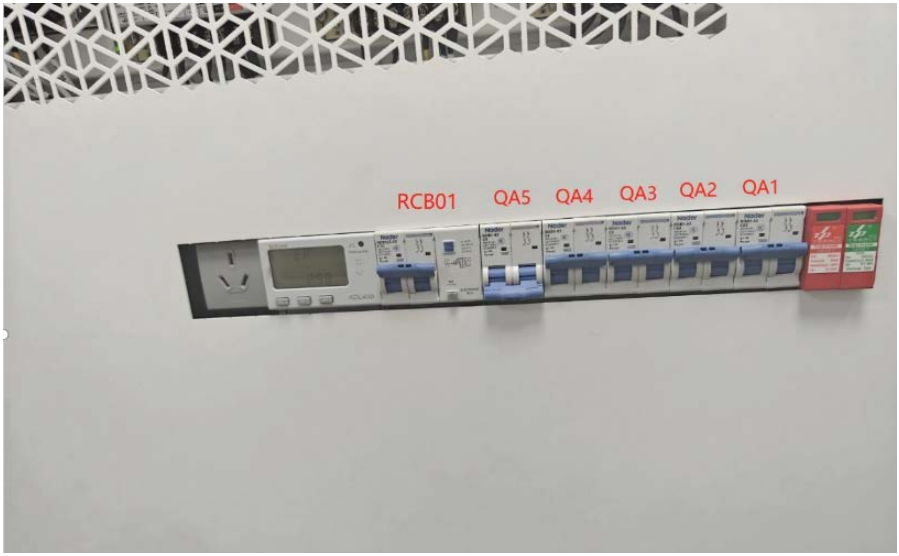


Figure 60: Switches in the auxiliary power module

3. Note that this QA5 switch is only configured in a single energy storage cabinet scenario for CSU power supply. In other scenarios, QA5 is not configured. Before closing the switch, you need to use a multimeter to measure whether the voltage of QA5 is DC 24V , if the input voltage is 24V, then close QA5 to power CSU. After this, all auxiliary power supply of energy storage system is completed. The socket and leakage protection switch RCB01 on the auxiliary power box of the energy storage cabinet can be used according to the customer needs.
4. Put the isolation switch QB of high-voltage boxes in the energy storage cabinet or the battery cabinet in the "ON" position.



Figure 61: Battery Disconnect Switch QB in High Voltage Box

Manually close the QA1 main power switch in the auxiliary power module. The green light on the front door of the auxiliary power module should be illuminated after closing the QA1 main power switch. Using a multimeter to measure the circuit breaker QA0 input is normal three-phase AC400V,if yes then close the QA0, and then the PCS indicator is bright and the SOFAR LOGO light in the door is green. Please refer to the Table 6.2 to check the PCS status.

At this point, the power-on operation of the energy storage system is completed, and then the subsequent control logic will be collaborated by CSU, CMU, BCU, BMU, fire protection system, liquid cooling unit and other modules.

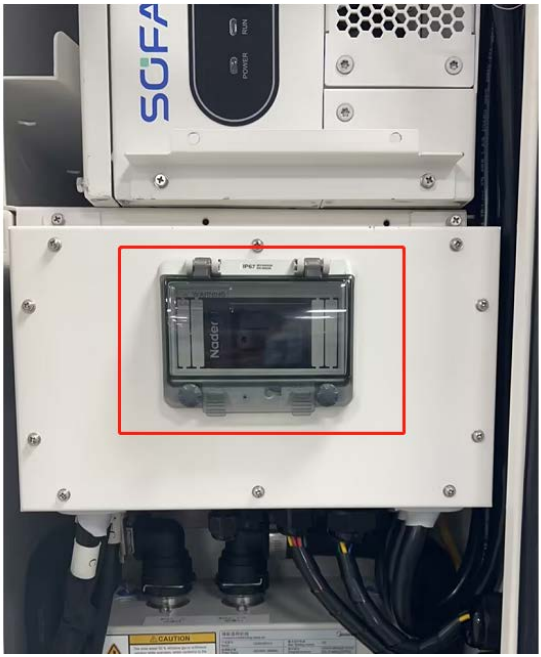


Figure 62: PCS AC side switch QA0 of energy storage cabinet

6.3 Power-down operation under normal conditions

During power-down 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-down operation.

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

1. **It is necessary to carry out the power-down operation on the WEB interface first. After the power down command is issued, if there is a PCS connected, the PCS should stop charging and discharging first, and then the battery cluster will automatically carry out the power down operation, and at the same time, the two positive and negative main relays (KF1 and KF2) and auxiliary relay (KF4) inside the corresponding high-voltage box should be able to be disconnected.**
2. **Manually disconnect all high-voltage box battery disconnect switches QB in the energy storage cabinet and battery cabinets.**



Figure 63: High Voltage Box Battery Disconnect Switch QB

3. **With insulated gloves, unplug the positive and negative power bus plugs from the Pack to the high voltage box in the battery cluster of the energy storage cabinet and battery cabinets.**



Figure 64: Battery Cluster Positive and Negative Bus Plug Locations

4. Manually switch off the PCS AC side module case circuit breaker QA0 in the distribution compartment of the energy storage cabinet.
5. Manually switch off the three-phase AC main circuit breaker outside the energy storage cabinet, so that the main circuit of the energy storage system is powered down.
6. Auxiliary power part of the power down
   a. Disconnect the QA5 circuit breaker in the auxiliary power box.
   b. Disconnect the QA4 circuit breaker in the auxiliary power box, then all the BCUs in the high-voltage box, all the BMUs in the battery PACK are powered down.

c. Disconnect the QA3 circuit breaker, then the CMU module, fire fightin system, dehumidifier, flooding switches, lighting and other equipment is powered down.
d. Disconnect the QA2 Circuit breaker, then the cabinet liquid cooling unit power down.
e. Disconnect the socket and RCD01 leakage protection switch (if there is a closed switch is disconnected).
f. Disconnect the auxiliary power box total input switch QA1.



Figure 65: Functional switch within the auxiliary power module

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.

6.4 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 66: 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.
3. Disconnect circuit breaker QA0 on the three-phase AC side of the PCS inside the storage cabinet, and continue to disconnect the AC input circuit breaker outside the storage cabinet, if necessary.
4. Disconnect the QA1 main power switch in the auxiliary power box, the emergency power down operation can be ended at this step, if necessary, you can continue to disconnect the external single-phase AC power switch outside the auxiliary power box

7 Routine maintenance

⚠ WARNING

- 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.

7.1 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. Replace air filter if necessary. Caution! The ventilation of the air intake must be checked. Otherwise, if the module is not cooled effectively, it will malfunction due to overheating.

Item	Check method
Device Maintenance	Routine inspection of all metal components for corrosion (every six months). Annual inspection of contactors ensures that they are mechanically well functioning. Checking of operating parameters (especially voltage, insulation, etc.).

7.2 Maintenance work (every one to two years)

Item	Check method
Outside the container	Look for flammable objects on top of the box. Check that the joints between the box and the foundation steel plate are secure and that there is no rust or corrosion. Look for damage, paint loss, oxidation, etc. on the box enclosure. Check that cabinet door latches etc. can be opened flexibly. Check that seals etc. are well fixed.
Inside the container	Check the inside of the Energy Storage Integration System for foreign objects, dust, dirt and condensation.
Air inlet and outlet	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
Wiring and cable layout	Be sure to wait until the internal equipment of the energy storage system is completely de-energised before starting the inspection! If any non-conformities are found during the inspection, please correct them immediately. Check whether the cable arrangement is standardised and whether there are any short circuits. If there is any abnormality, correct it immediately. Check that all inlet and outlet holes in the box are well sealed. Check for water seepage inside the box. Check the power cable connections for looseness and retighten them according to the torque previously specified. Check power and control cables for damage, especially cut marks on the skin in contact with metal surfaces. Check that the insulating wraps of the power cable terminals are not detached.
Ground connection and equipotential connection	Check that the grounding connection is correct and that the grounding resistance resistance value is not greater than 4Ω. Check for correct equipotential connections within the energy storage system. Check the operating parameters (especially voltage as well as insulation, etc.).
Fan	Check the operating status of the fan. Check if the fan is clogged. Check if there is abnormal noise when the fan is running.

7.3 Maintenance work (every two years)

Item	Check method
System status and cleaning	Check the following items and correct them immediately if they do not meet the requirements: Look for damage or deformation of the case and internal equipment. Check the internal equipment for abnormal noise during operation. Check for excessive temperatures inside the box machine. Check that the humidity and greyness inside the box are within normal limits. Clean if necessary. Check to see if the box air inlet and outlet are blocked.
Warning marks	Check whether the warning labels and marks are clearly visible and free of stains and damage.Replace them if necessary.
Air inlet and outlet	Check that warning signs and labels etc. are clearly visible and not defaced. Replace if necessary.
Ground of the shielded layer of cables	Check whether the cable shielding layer is in good contact with the insulation sleeve and whether the copper bus bar is firmly fixed.
Surge protection device and fuse	Check whether the surge protection device and fuse are surge protection device fastened.
Corrosion	Check whether there is oxidation or rust inside the container.

8 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.

8.1 Communication cable wiring

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 computer has been established.**
- **If the indicator light is not on, check the network connection.**

8.2 Communication settings

Change your 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, as shown in Figure 67 and Figure 68.

8.3 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 shown in Figure 69.



2. After entering the user name and password, click the ‘ login ‘ button, the interface is now entered into Figure 70 Home Topology Interface.

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

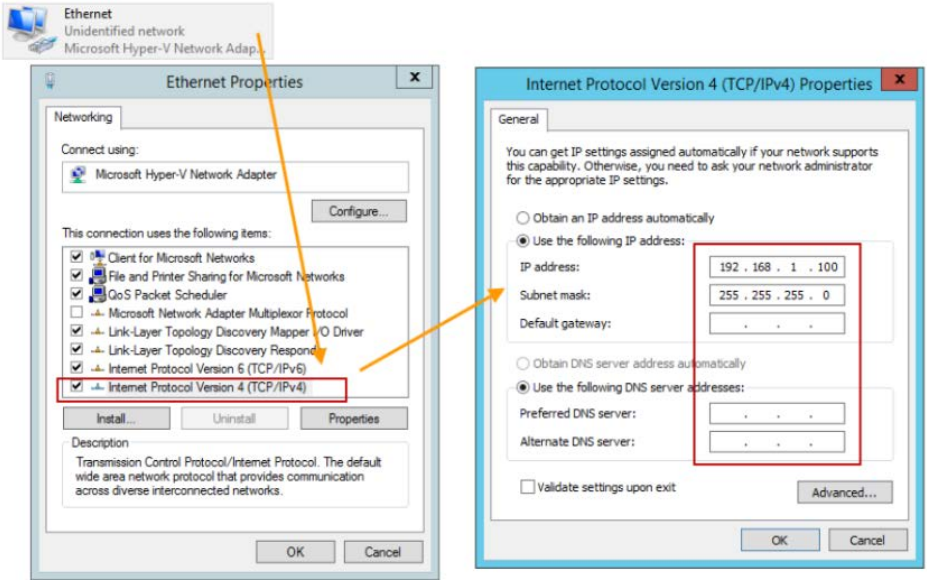


Figure 67: Computer Ethernet Properties

Figure 68: Computer IP address settings



Figure 69: Login Interface

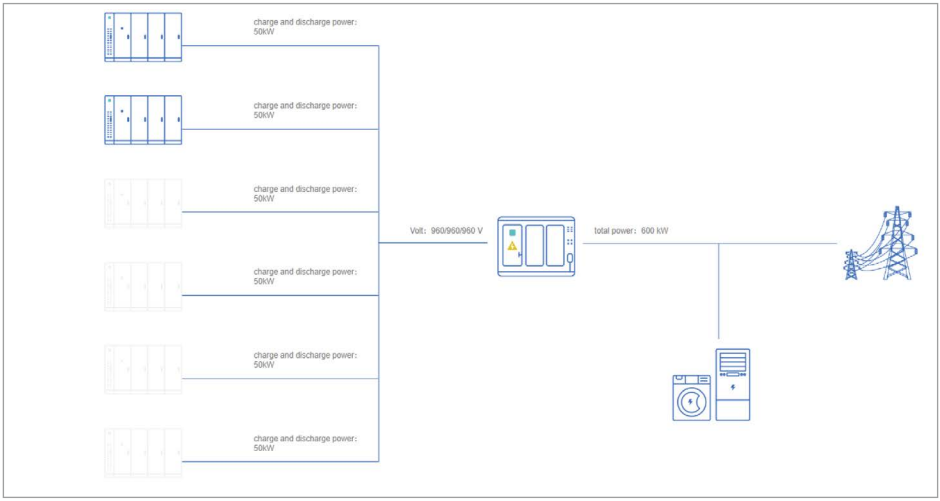


Figure 70: Home Topology Graphics Interface

8.4 Home main interface

In the Home main screen, click the iconas  shown in Figure 71.The status data on the home page shows that:

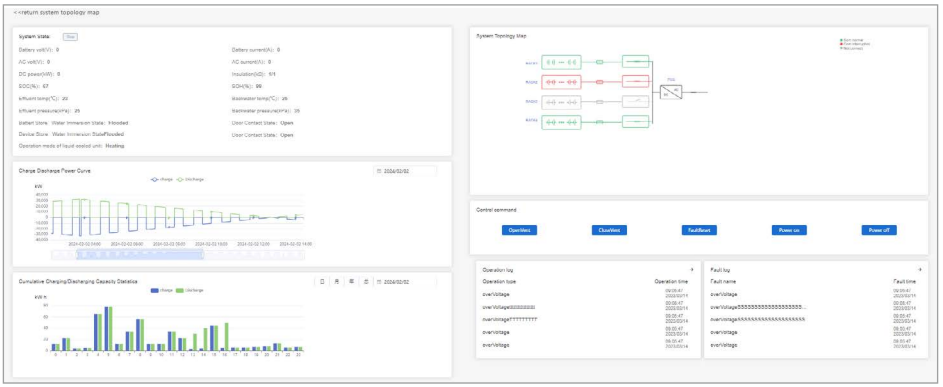


Figure 71: Main interface diagram

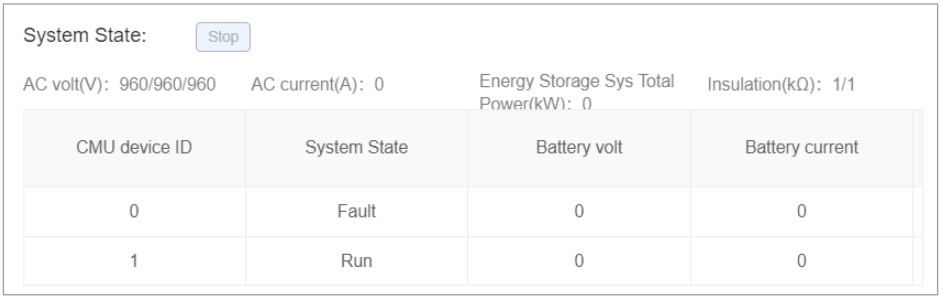


Figure 72: Status data diagram of the home page

Charging and discharging power curve, click on the calendar control can select the corresponding date :

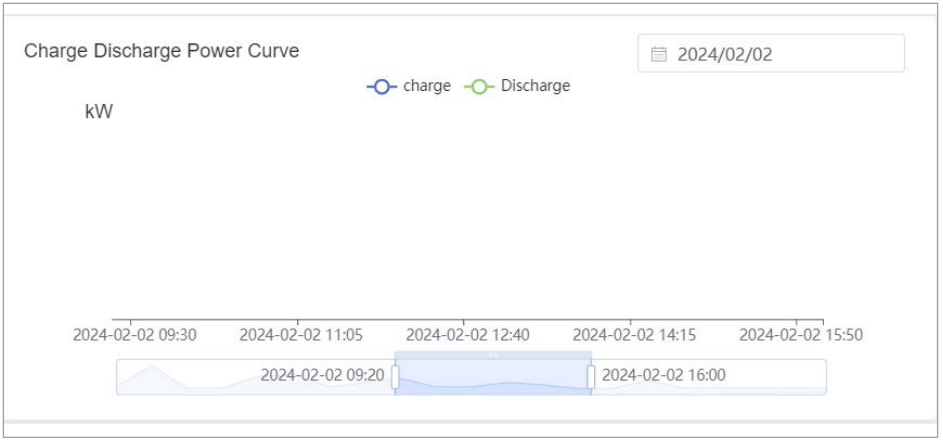


Figure 73: Charging and discharging power curve diagram

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

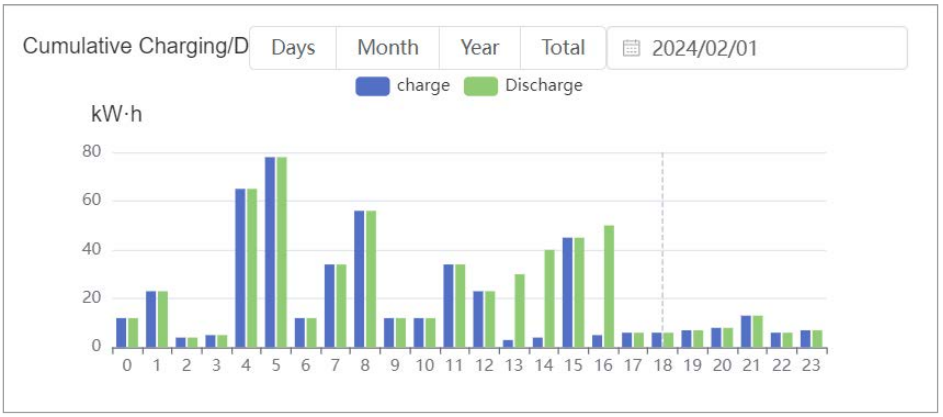


Figure 74: Cumulative charge-discharge curve diagram

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

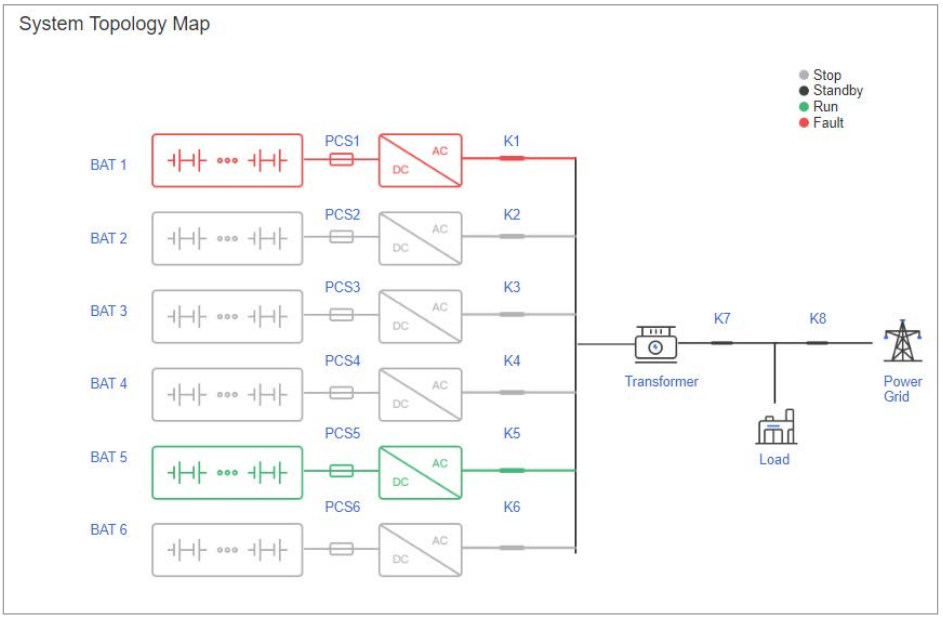


Figure 75: Topography

Control command:

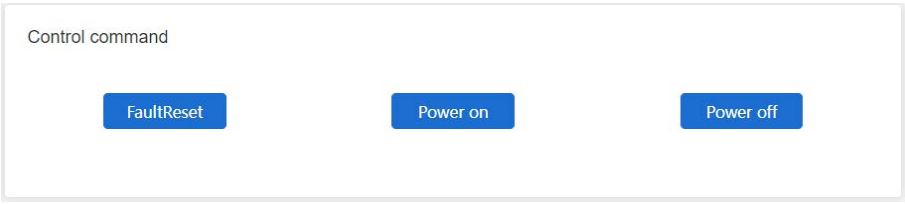


Figure 76: Control command diagram

Operation log :

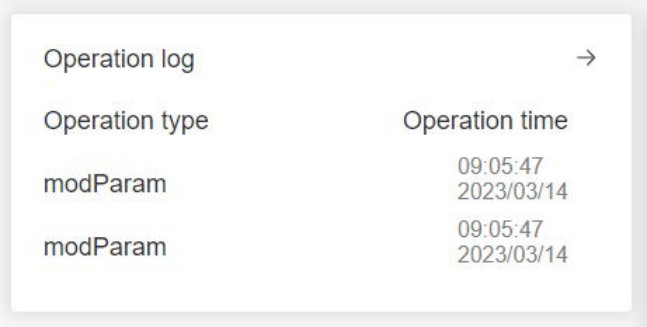


Figure 77: Operation log diagram

Click "→" to display the detailed data, as shown in Figure 79.

Click on the icon <<return to return to the previous page.

Fault log:

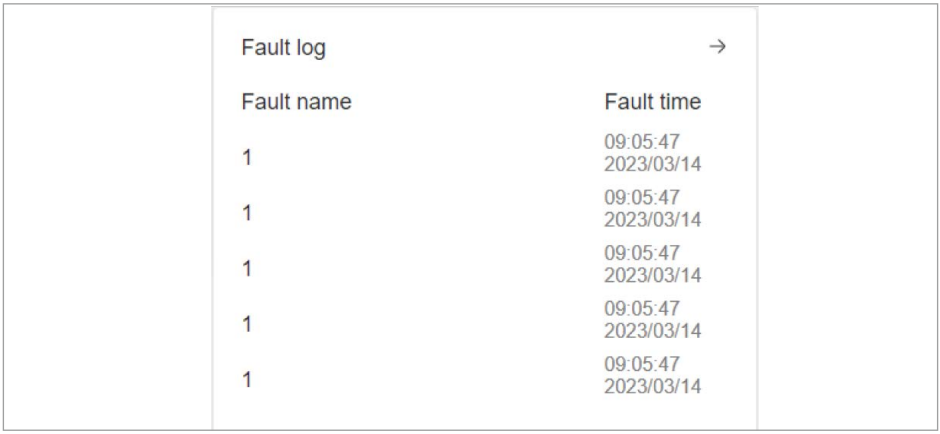


Figure 78: Fault log diagram

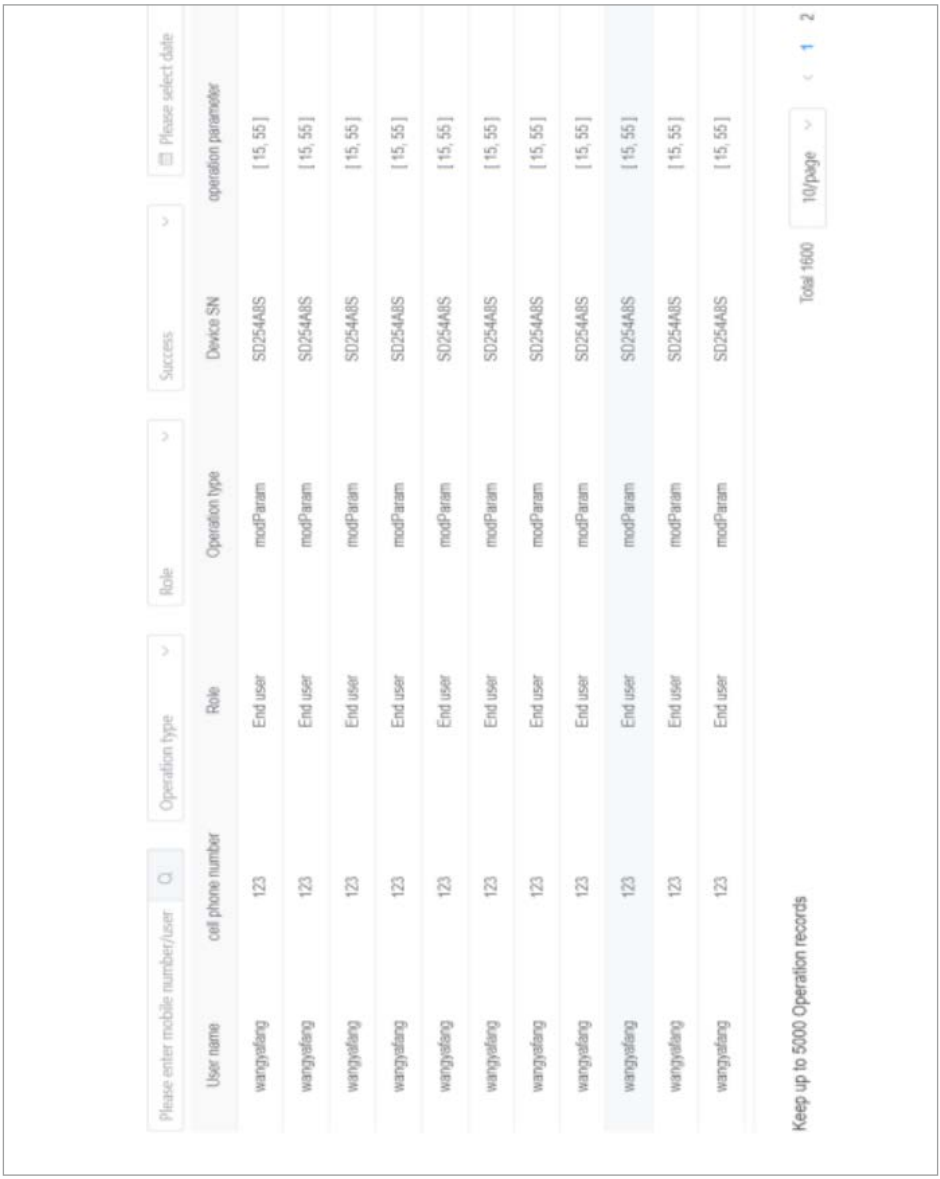


Figure 79: Detailed operation data

Click "→" to display the detailed data, as shown in Figure 80.

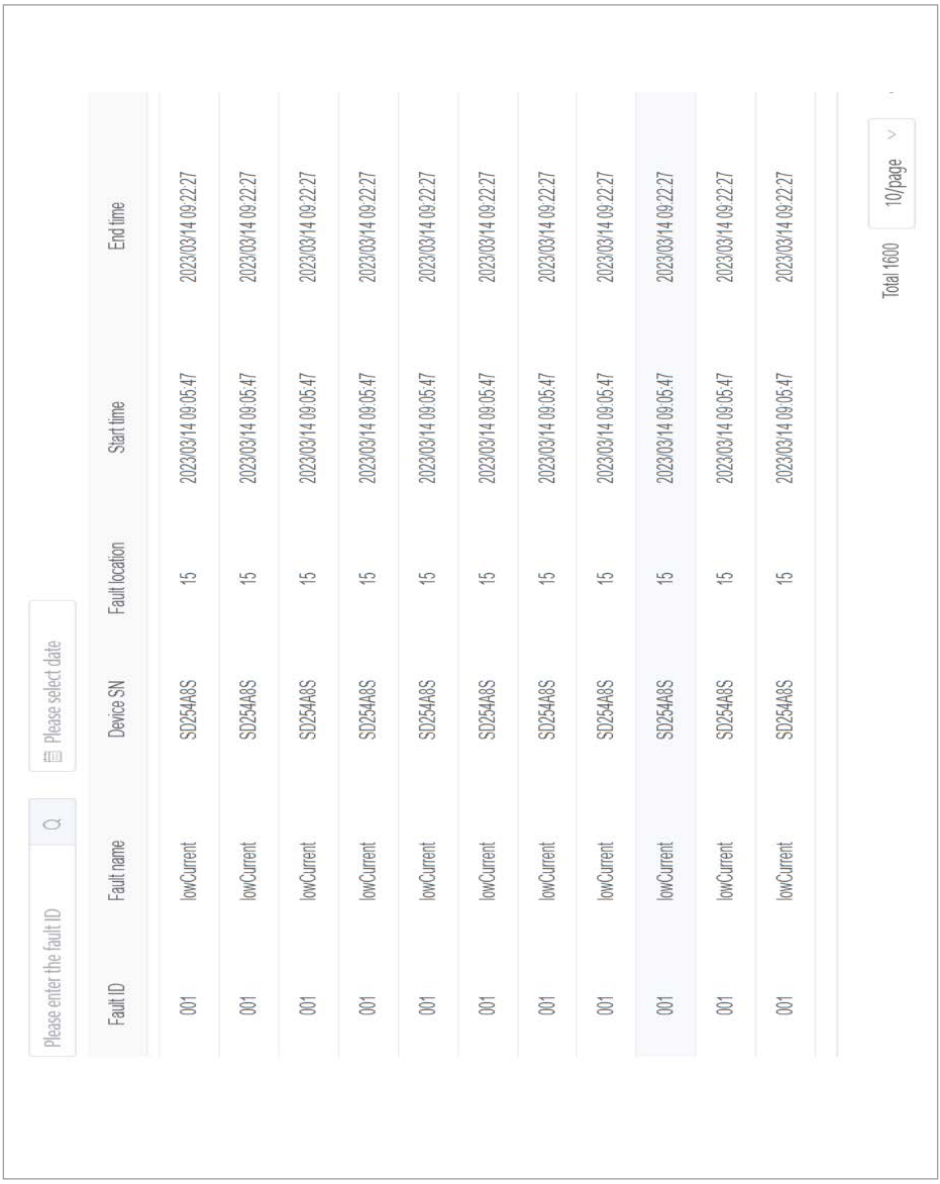


Figure 80: Detailed fault data Fig

Click on the icon <<return to return to the previous page.

8.5 CSU system management interface

EMS information settings:

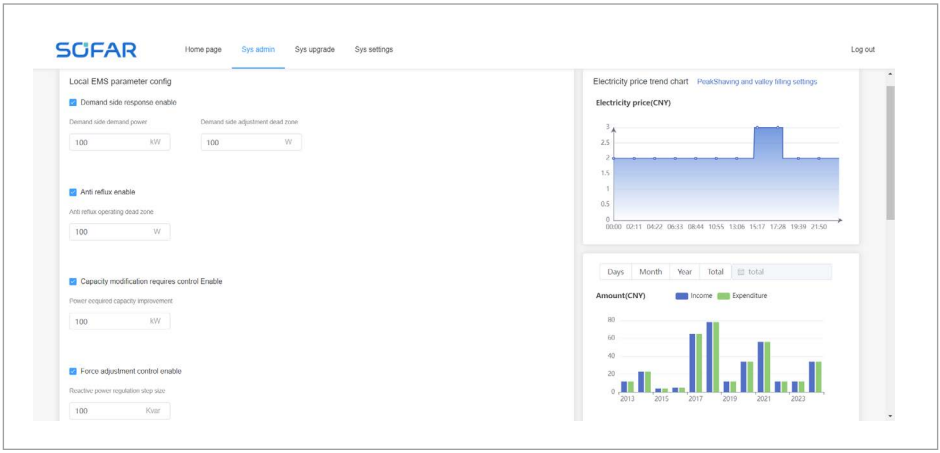


Figure 81: EMS information setting diagram

EMS peak shaving setting:

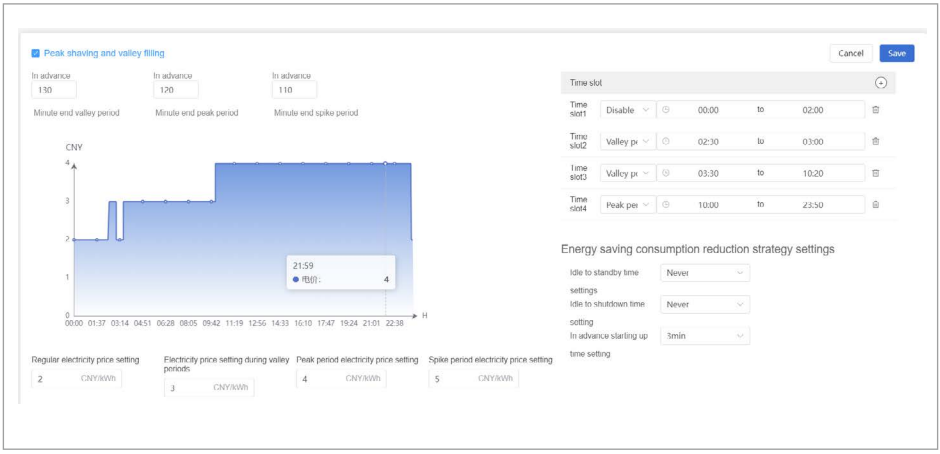


Figure 82: EMS Peak Shaving Setup Map

8.6 CSU system upgrade interface

Includes equipment upgrades and safety import and setup:

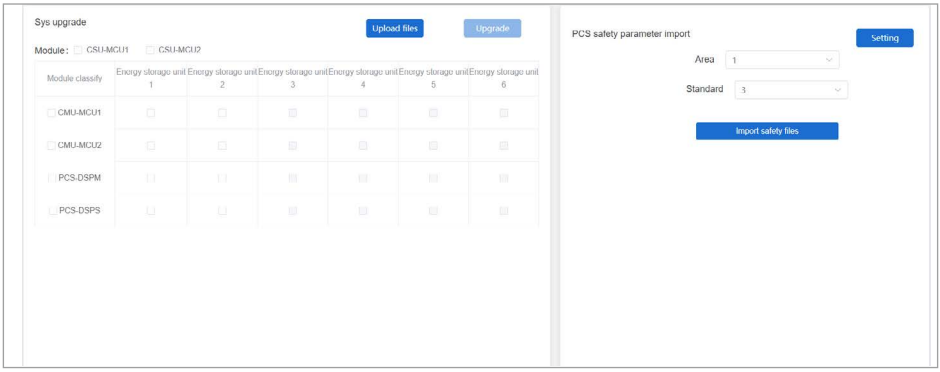


Figure 83: Device Upgrade and Safety Regulation Import and Setup Diagrams

8.7 CMU homepage main interface



On the home page main screen, click on the icon as shown in the figure.

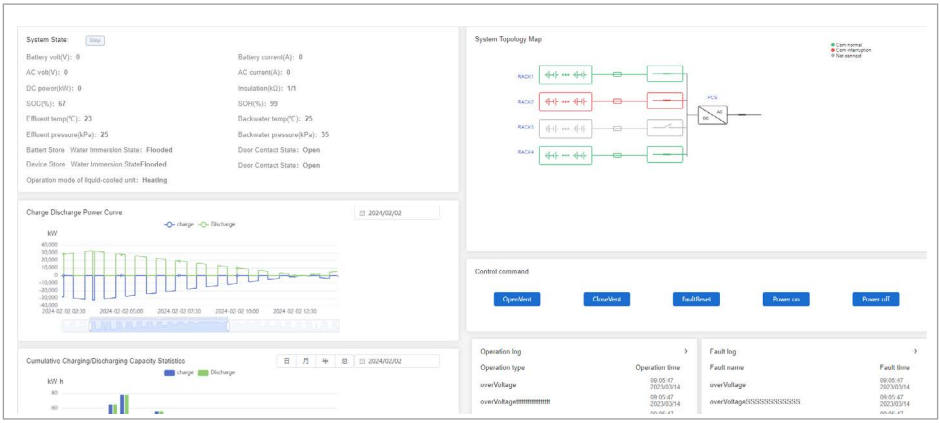


Figure 84: CMU Home Page Main Interface Diagram

8.7.1 Status data display on the home page

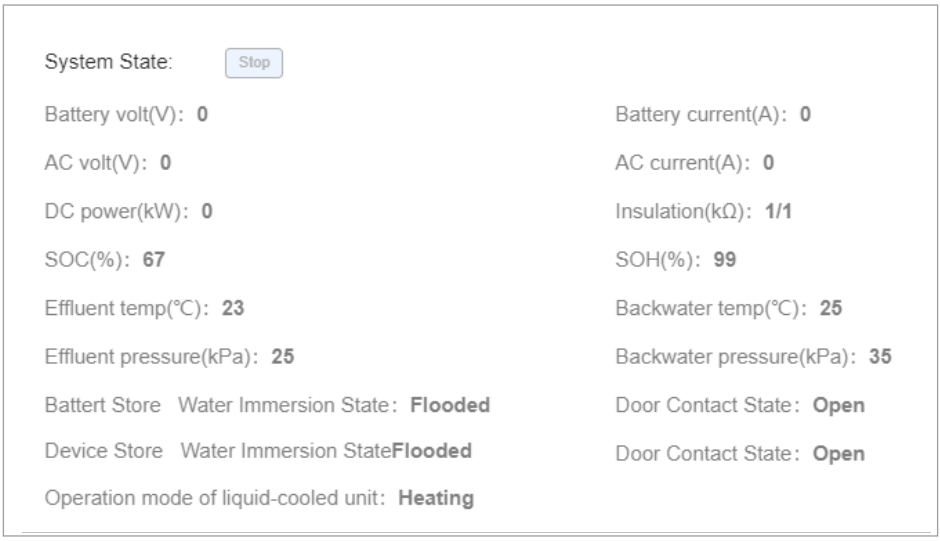


Figure 85: CMU Home Page Status Data Map

8.7.2 Charge/discharge power curve

Click the calendar control to select the corresponding date:



Figure 86: Charging and discharging power graphs

8.7.3 Cumulative charge and discharge quantity statistics

Click the calendar control to select the corresponding date:

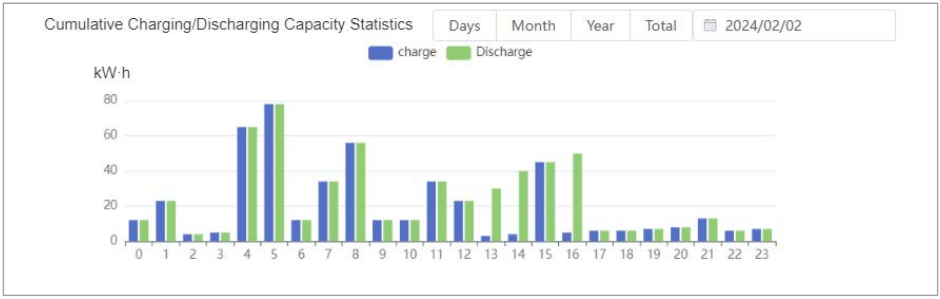


Figure 87: Cumulative charge/discharge graphs

8.7.4 Topological graph

Display the switch status corresponding to the battery PACK:

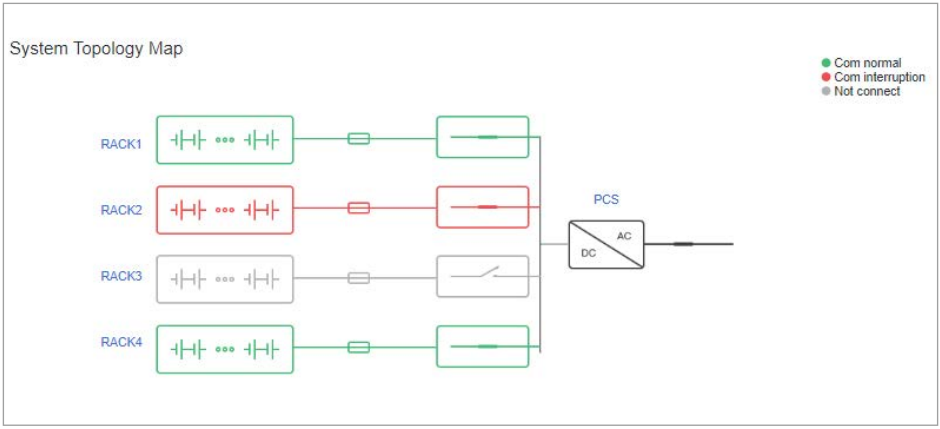


Figure 88: Topology diagram

8.7.5 Control Commands

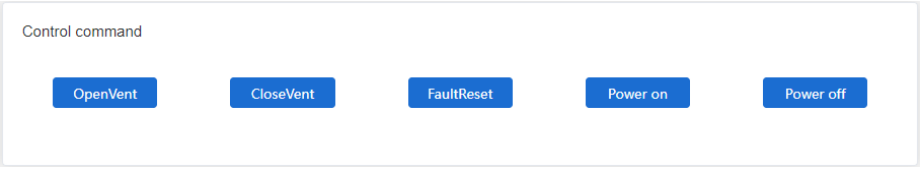


Figure 89: Topology diagram

8.7.6 Operation Log

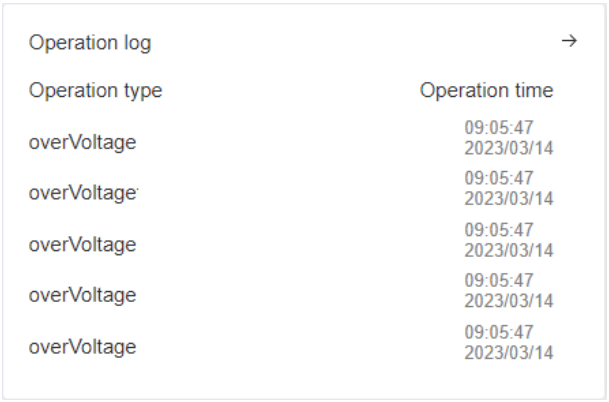


Figure 90: Operation Log Diagram

Click "→" to display the detailed data:

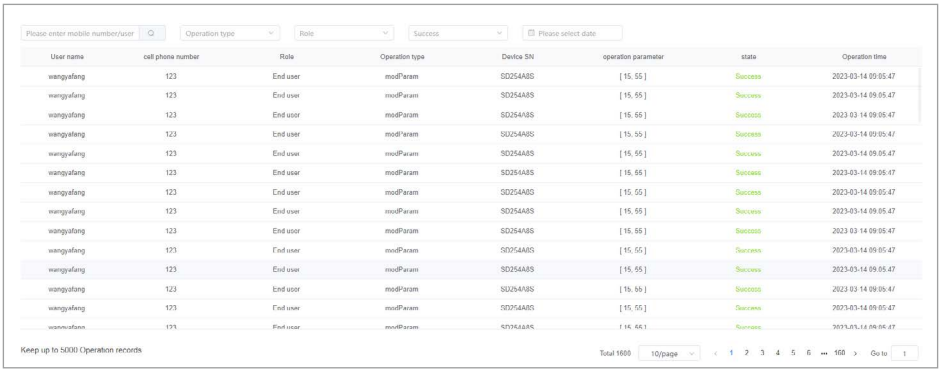


Figure 91: Detailed Data Map

Click the icon <<return, to return to the previous page.

8.7.7 Fault Log

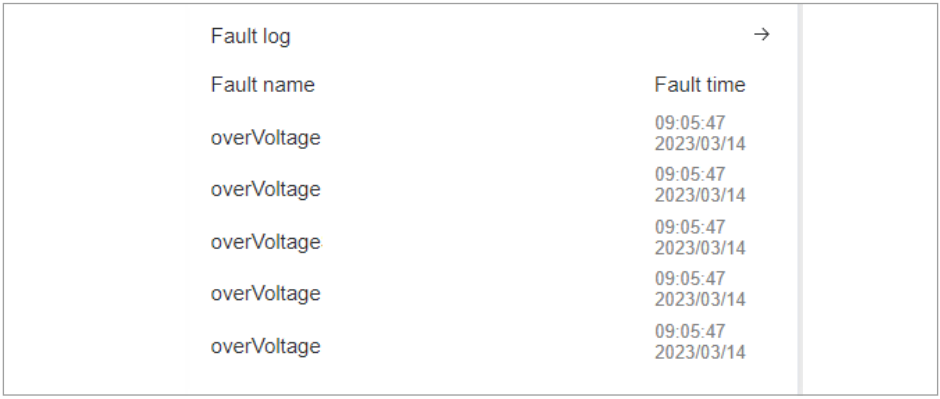


Figure 92: Error Log Diagram

Click "→" to display the detailed data:

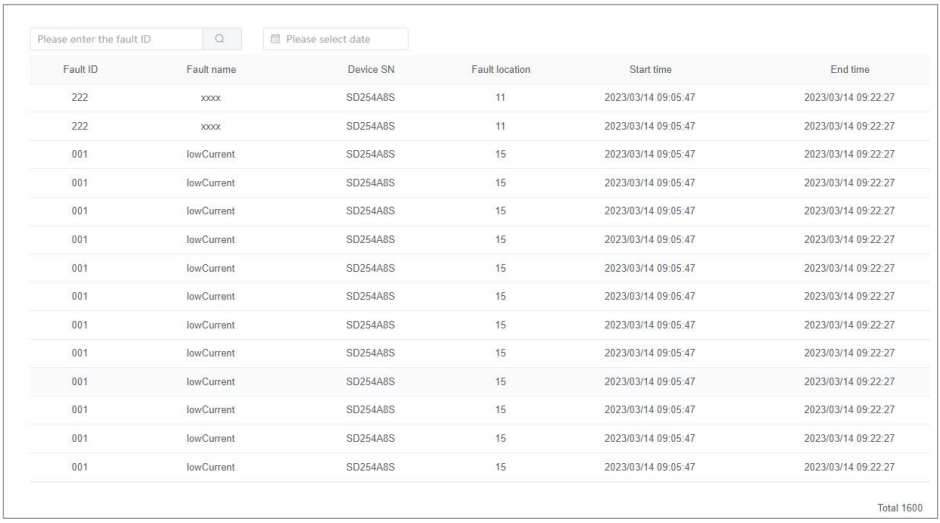


Figure 93: Fault Detail Data Graph

Click the icon <<return to return to the previous page.

8.8 CMU Summary Information Screen



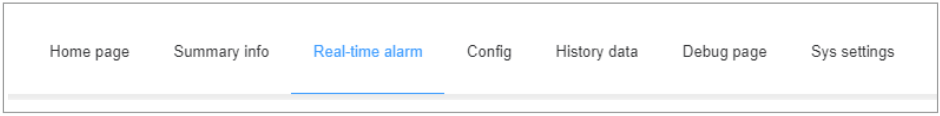
Click on the Electrical Summary Information icon, as shown in Figure 94.



Figure 94: Summary Information Map

8.9 Real-time alarm interface

Click on the Real-time Alerts icon.



as shown in Figure 95.

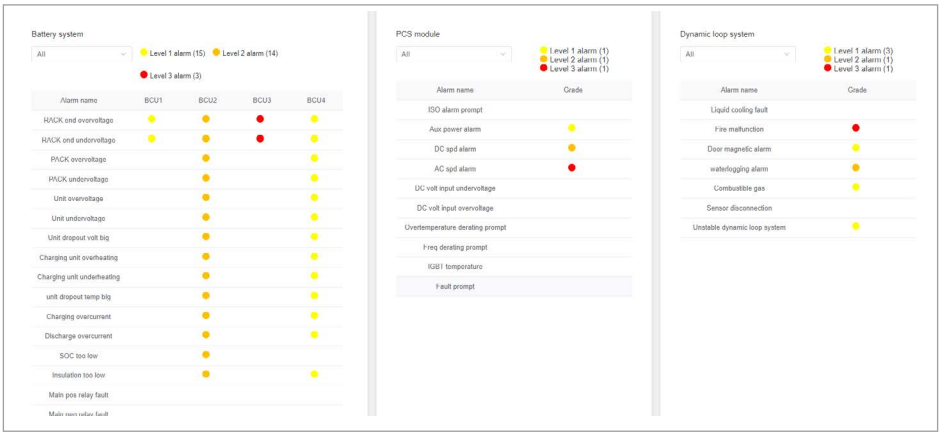
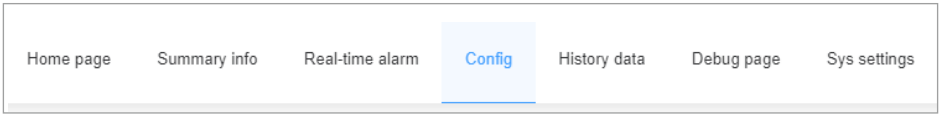


Figure 95: Real-time alarm graph

8.10 Parameter configuration interface

Click on the Parameter Configuration icon



Click on the Electrical Summary Information icon, as shown in Figure 96.

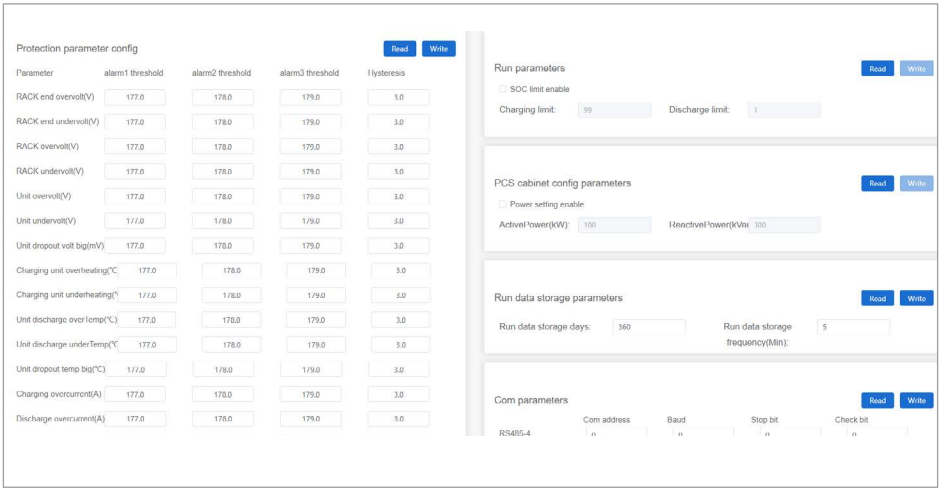


Figure 96: Parameter Configuration Diagram

8.11 Historical Data Interface

Click on the Historical Data icon



as shown in Figure 97.

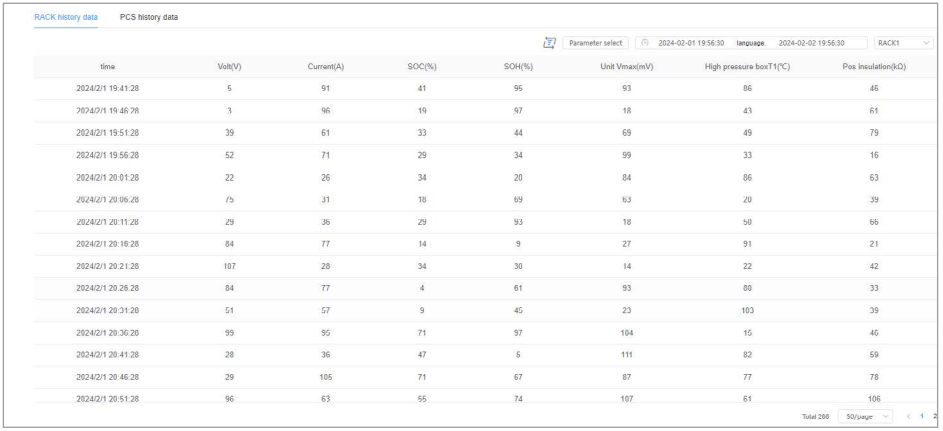


Figure 97: Historical Data

Click on the icon  to switch charts, as shown in Figure 98.



Figure 98: Historical Data Graph

Click Parameter select to filter the data to be displayed.

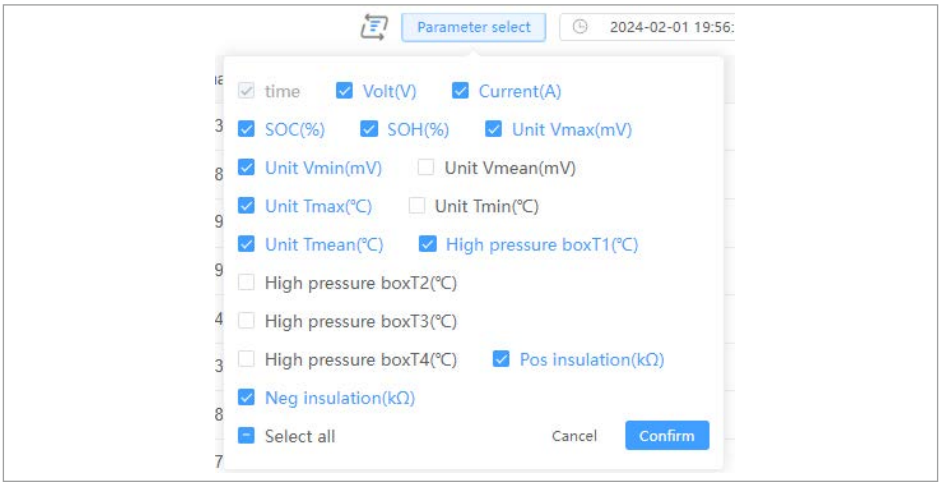


Figure 99: Filtering Historical Data Graph

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

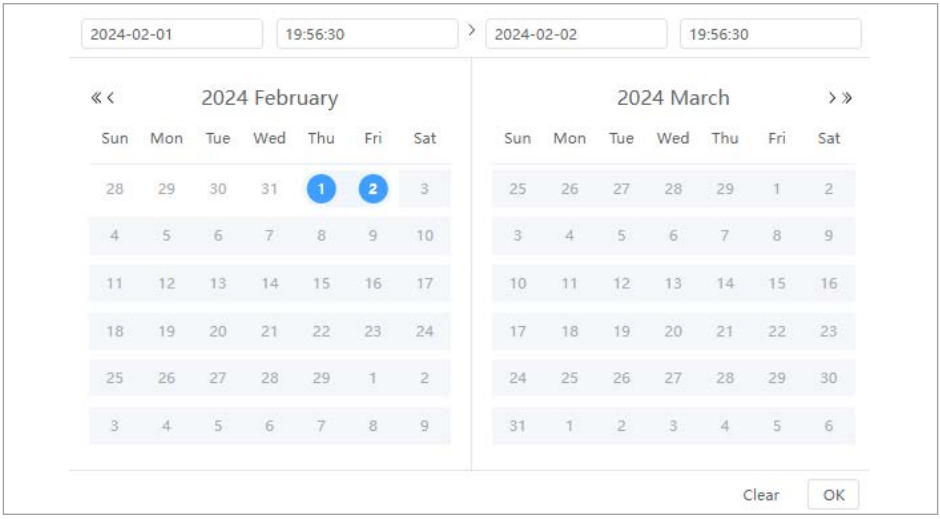


Figure 100: Date Selection Chart

Click Export report to export the data displayed by the currently selected item to a report file (.xlsx).

8.12 Log out

Click the icon Log out in the upper right corner to return to the login screen.

After 5 minutes without any operation, you will be automatically returned to the login screen.

9 Contact information

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

Tel.: 400-892-5766

E-Mail: support@sofarsolar.com

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

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