

ST2752_2293UX-US-SEN-Ver12-202204

PowerTitan-ST2752UX-US/ST2695UX-US/ST2637UX-US/ ST2580UX-US/ST2523UX-US/ST2465UX-US/ST2408UX-US/ ST2351UX-US/ST2293UX-US

Battery Energy Storage System

System Manual

SUNGROW

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About This Manual

This manual describes the transportation and storage, mechanical installation, electrical connection, power-on and power-off operation, LCD operation, troubleshooting, and maintenance of the BESS.

Target Group

This manual is for operators of the power storage plant and qualified technical personnel.

The BESS must and can only be installed by professional technicians who meet the following requirements:

- Has been trained
- Read this manual thoroughly and understand the safety instructions related to operations
- Be familiar with local standards and relevant safety regulations of electrical systems

How to Use This Manual

Please read this manual carefully before using the product and keep it properly at a place for easy access.

Contents of the manual may be updated and amended continuously, so it is possible that there may be some errors or slight inconsistency with the actual product. Please refer to the actual product purchased, and the latest manual can be obtained from support.sungrowpower.com or sales channels.

Symbol Explanations

To ensure the safety of the users and their properties when they use the product and to make sure that the product is used in an optimal and efficient manner, this manual provides users with the relevant safety information highlighted by the following symbols. Below is a list of symbols that are used in this manual. Review them carefully to make better use of this manual.

⚠ DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a moderately hazardous situation which, if not avoided, will result in death or serious injury.

⚠ CAUTION

Indicates a slightly hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE
Indicates a potential hazard which, if not avoided, will result in device malfunction or property damage.

“NOTE” indicates additional information, emphasized contents or tips that may be helpful, e.g., to help you solve problems or save time.

Symbol on Products

Always note hazard warnings on the machine body, including:

Marks	Explanation
	High voltage inside! Risk of electric shock by touching it!
	This symbol indicates a protective ground terminal which needs to be firmly grounded to ensure the safety of operators.
	Read the instructions before performing any operation on the product.
	Live parts! Do not touch them until 5 minutes after disconnection from the power sources.
	Pay attention to the danger. Do not operate this product in the live status!
	Pay attention to heavy objects. Lifting of heavy objects may lead to back injuries. Please lift heavy objects with appropriate tools.
	Pay attention to explosion.
	Pay attention to corrosion.
	Do not dispose of this product as household waste.
	No fire.
	There should be a medical center nearby.
	In case of contact with eyes, rinse the eyes immediately with running water or normal saline; and seek medical help in time.
	It is required to wear goggles.

Abbreviations

Complete designation	Abbreviations
Battery Energy Storage System	BESS
Energy Storage System	ESS
Battery Connection Panel	BCP
Battery Supply Panel	BSP
Power Conversion System	PCS
DC/DC Converter	DC/DC
Fire Suppression System	FSS
SCADA (Supervisory Control And Data Acquisition) System	SCADA System
Liquid Cooling System	LCS
Local Controller	LC
Energy Management System	EMS
Switching Mode Power Supply	SMPS
Battery Module	BM (also referred to as PACK)
Battery Cluster	BC (also referred to as PACK)
Battery Management Unit	BMU
Battery Cluster Management Unit	BCMU (collectively referred to as CMU)
Battery System Management Unit	BSMU (collectively referred to as SMU)
Battery Management System	BMS
State Of Charge	SOC
State Of Energy	SOE
State Of Health	SOH
State Of Safety	SOS

Unless otherwise specified, devices in this manual are referred to as the abbreviations above.

Note

In order to provide customers with the best usage experience, the products and product manuals are always in the process of improvement and upgrade. If the manual received is slightly inconsistent with the product, it may be a result of product version upgrade, and the actual product shall prevail.

The figures in this manual are for reference only. The actual product received may differ.

Contents

1 Safety Precautions

1.1 Personnel Requirements

The hoisting, transportation, installation, wiring, operation, and maintenance of the BESS must be carried out by professional electricians in accordance with local regulations. The professional technician is required to meet the following requirements:

- Know electronic, electrical wiring and mechanical expertise, and be familiar with electrical and mechanical schematics.
- Be familiar with the composition and working principles of the BESS and its front- and rear-level equipment.
- Have received professional training related to the installation and commissioning of electrical equipment.
- Be able to quickly respond to hazards or emergencies that occur during installation and commissioning.
- Be familiar with the relevant standards and specifications of the country/region where the project is located.

1.2 Electrical Safety

⚠ DANGER

- **Touching the power grid or the contact points and terminals in the devices connected to the power grid may lead to electric shock!**
- **The battery side or the power grid side may generate voltage. Always use a standard voltmeter to ensure that there is no voltage before touching.**

⚠ DANGER

Lethal voltages are present inside the device!

- **Note and observe the warnings on the product.**
- **Respect all safety precautions listed in this manual and other pertinent documents.**
- **Respect the protection requirements and precautions of the lithium battery.**

DANGER

Electricity may still exist in the battery when the power supply of the BESS is disconnected. Wait 5 minutes to ensure the equipment is completely voltage-free before operating.

WARNING

All operations, such as hoisting, transportation, installation, wiring, operation, and maintenance must comply with the relevant codes and regulations of the region where the project is located.

WARNING

Always use the product in accordance with the requirements described in this manual. Otherwise, equipment damage may occur.

NOTICE

To prevent misuse or accidents caused by unrelated personnel, observe the following precautions:

- Post prominent warning signs around the BESS to prevent accidents caused by false switching.
- Place necessary warning signs or barriers near the product.

1.3 Hoisting and Transportation

WARNING

Follow the procedures for working at heights when walking on the top of a container.

1.4 Installation and Wiring

WARNING

In the whole process of mechanical installation, the relevant standards and requirements of the project location must be strictly observed.

⚠ WARNING

Only equipment designated by SUNGROW ENERGY STORAGE TECHNOLOGY CO., LTD. (hereinafter referred to as "SUNGROW") can be used. Failure to use equipment designated by SUNGROW may cause damage to the protection function and injury to personnel.

1.5 Operation and Maintenance

⚠ WARNING

Personal protective equipment is required for maintenance and service of the BESS.
Maintenance personnel must wear protective equipment such goggles, helmets, insulated shoes, gloves, etc.

⚠ WARNING

There are no user-maintainable parts inside the battery unit.
Only personnel approved by SUNGROW can remove, replace and dispose of the batteries. Users are not allowed to maintain batteries without guidance.

⚠ WARNING

To avoid electric shock, do not perform any other maintenance operations beyond those described in this manual.
If necessary, contact Sungrow Customer Service for maintenance.

⚠ WARNING

To ensure continuous fire protection, replacement of internal components should only be performed by professional personnel.

⚠ DANGER

Dismantling or burning the battery may cause it to catch fire.

NOTICE

Do not spray paint any internal or external component of the product.
Do not use cleaning agents to clean the product or expose it to harsh chemicals.

⚠ WARNING

Protective tools such as goggles are required when carrying out coolant (glycol solution) or liquid cooling pipeline maintenance.

2 Product Description

2.1 Product Introduction

PowerTitan is mainly used in large and medium-sized energy storage power plants. It adopts standard BESS design and modular design to realize the integration of energy storage system. Through liquid cooling method, it can better balance the system temperature. Through the combination of power storage equipment, power conversion equipment and electronic devices, together with intelligent operation and maintenance, it contributes to easier installation and O&M. Through systematic safety design, it ensures a more efficient battery performance and longer service life.

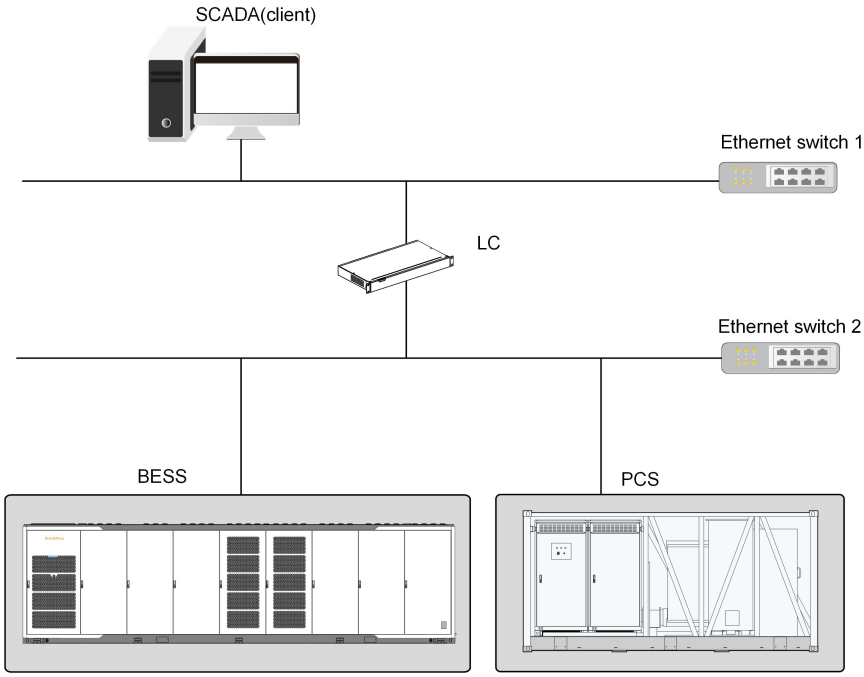


Figure 2-1 System networking diagram

2.2 External Design

2.2.1 Container Appearance

The appearance of BESS is shown in the following figure:

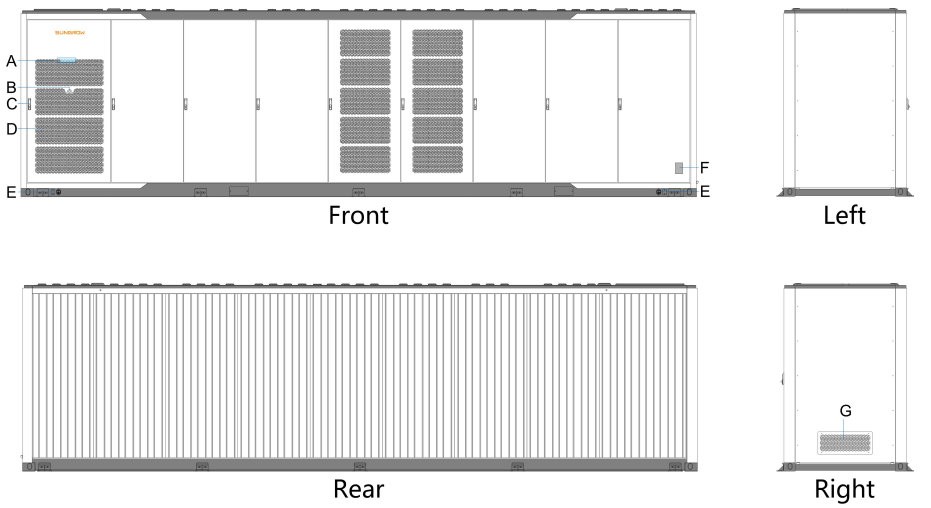


Figure 2-2 Appearance

No.	Name
A	LED indicator
B	Emergency stop button
C	Door lock
D	Air inlet
E	Grounding point
F	Nameplate
G	Air inlet for fire suppression system

* The figure is for reference only. The product received may differ.

NOTICE

The nameplate contains important parameter information related to the BESS, and shall be protected during transportation, installation, maintenance and troubleshooting. It is strictly prohibited to damage or dismantle the nameplate.

LED Indicator

The LED indicators are located at the top of the monitoring window. Colors and status of indicators are explained below.

Table 2-1 Indicator status

Status	Description
Steady on	The system works normally (-charge and discharge)

Status		Description
	2S periodic slow blinking (Breathing light)	The system is normal, no charging and discharging.
	Off	A fault occurs (auxiliary circuit breaker does not trip)
	Off	Auxiliary circuit breaker trips

Emergency Stop Button

In case of emergency, press this button to disconnect the electrical connection inside the BESS.

2.2.2 Mechanical Parameters

Dimensions

The external dimensions of the container are shown in the figure.

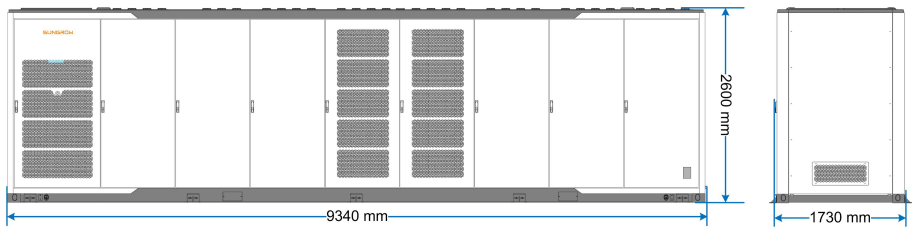


Figure 2-3 Dimensions of BESS

*The figure is for reference only and the actual product shall prevail!

The clearance space

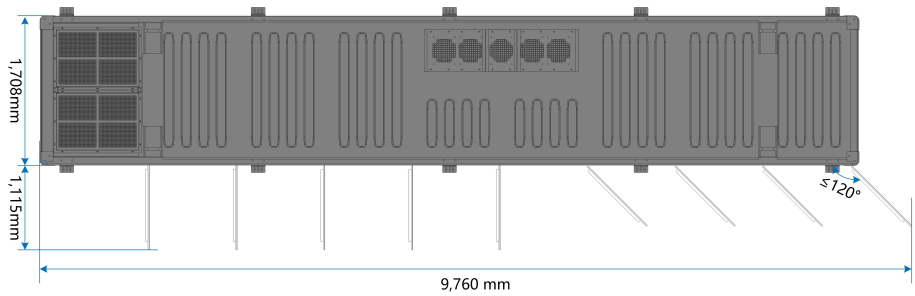


Figure 2-4 The diagram of the required space when the door is opened

*The figure is for reference only and the actual product shall prevail!

2.2.3 Ventilation Design

The BESS intakes air from the front side and expels it from the top, as shown below.

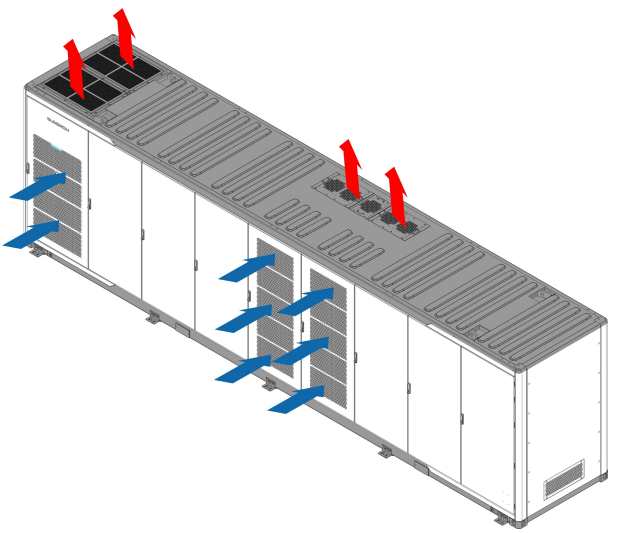


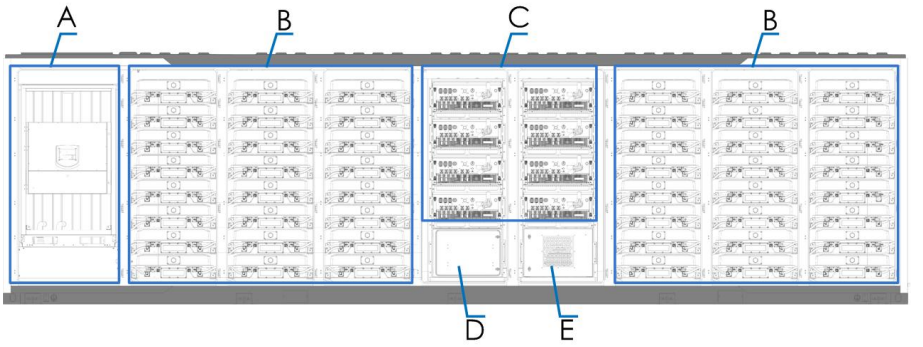
Figure 2-5 Schematic diagram of ventilation

*The figure is for reference only and the actual product shall prevail!

2.3 Internal Design

2.3.1 Internal Equipment

The main electrical equipment in the BESS is shown in the figure below.



* The figure is for reference only. The product received may differ.

No.	Name
A	LCS
B	Rack
C	DC/DC
D	BSP
E	BCP

2.3.2 DC/DC

Product Appearance

The DC/DC is shown in the figure below.

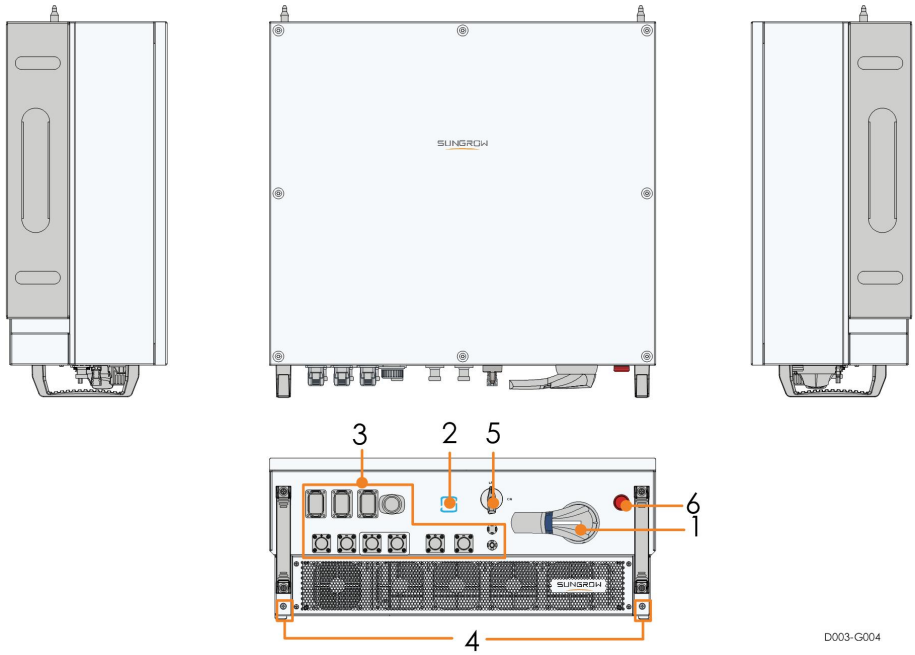


Figure 2-6 Product Appearance

* The image shown here is for reference only. The actual product received may differ.

No.	Name	Description
1	DC Switch	To safely stop the power conversion between the DC/DC and the inverter.
2	LED indicator	To indicate the current working status of the DC/DC.
3	Wiring area	Including DC side terminals and communication terminals.
4	Grounding terminal	For protective grounding of the equipment.
5	Auxiliary power switch	To safely cut off the electrical connection between the DC/DC and PV modules.
6	Emergency stop button	Only for emergencies. Press this button to immediately shut down the device.

LED Indicator Panel

This panel is for users to check the current working status of the DC/DC.

Table 2-2 LED indicator status description

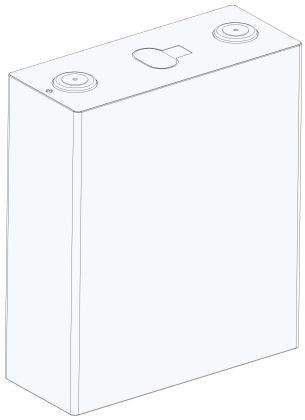
Indicator	Status	Status description
 Blue	Steady on	DC/DC is in operation.
	Fast blinking (Interval: 0.2s) 	Bluetooth is connected and there is data communication; No fault is detected.
	Slow blinking (Interval: 2s) 	The DC/DC is powered on, and is in the emergency stop state, standby state or start-up state.
 Red	Steady on	A fault occurred (The DC/DC shuts down immediately).
	Quick blinking (Interval: 0.2s) 	Bluetooth is connected and there is data communicationl; A fault occurred.
 Off	Off	The DC/DC is powered off.

2.3.3 Battery

Standardized and unitized battery modules are developed based on lithium-iron cells. The battery clusters are connected with DC/DC in series, then DC/DC are connected in parallel in battery side to the supporting power conversion system (PCS) to form energy storage systems(ESS) and store and release electric energy.

Cell

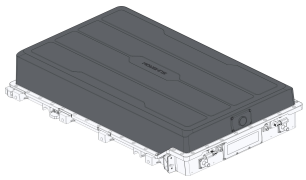
Table 2-3 Cell parameters

Cell	Parameter	Value
	Size (thickness * height * width)	71.7 ± 0.8 mm * 207.2 ± 0.8 mm * 173.9 ± 0.8 mm
	Weight	5.34 ± 0.2 kg
	Rated capacity	280 Ah
	Rated energy	896 Wh
	Rated voltage	3.2 V
	Voltage range	2.5 V ~ 3.65 V

LFP Battery Module

The LFP battery module is mainly composed of cells in series, and has the functions of voltage and temperature acquisition and balance control of all individual cells. The dedicated cells are used for battery management. Control commands are received by means of daisy chain communication, and the collected data is reported.

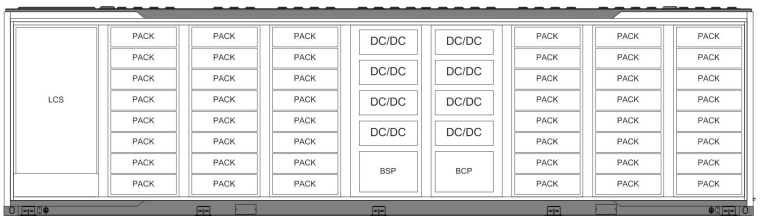
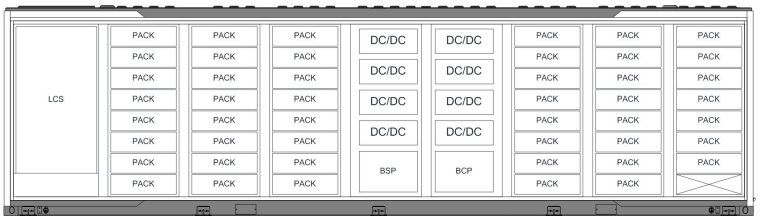
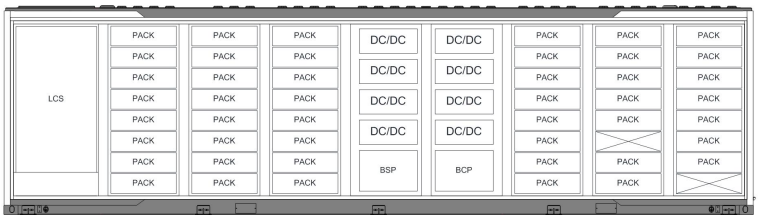
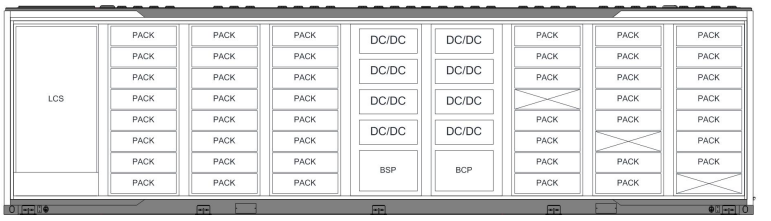
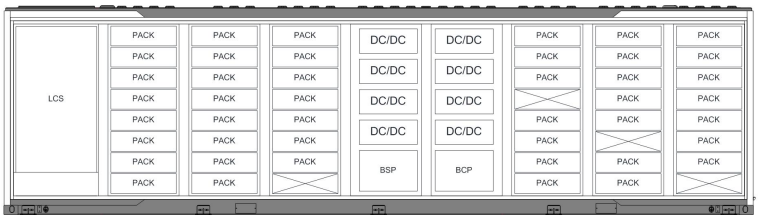
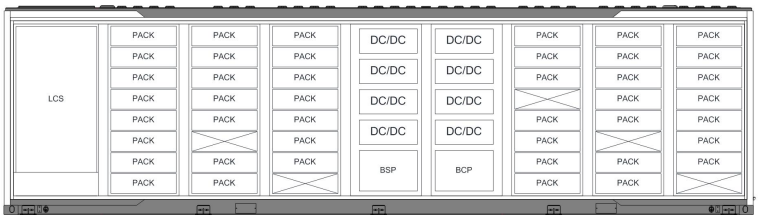
Table 2-4 LFP battery parameters

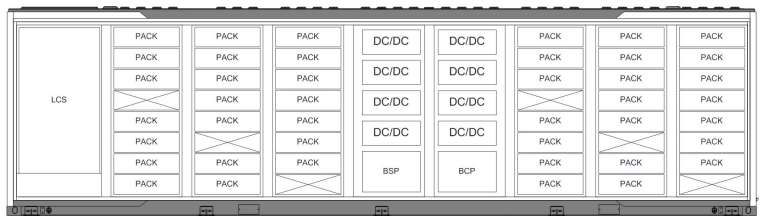
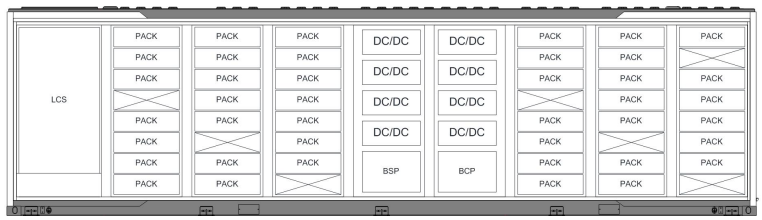
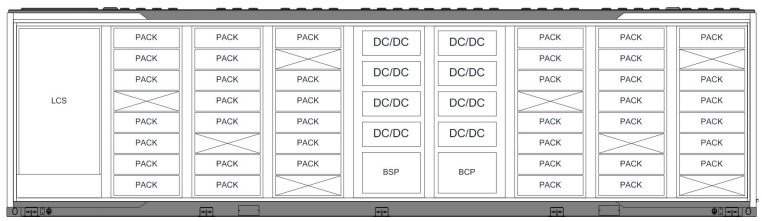
LFP battery module	Parameter	Value
	Model	P573-V111, P573B-V111
	Size (W*H*D (Without terminals, spigots))	(868 ± 5 mm) * (247 ± 5 mm) * (1415 ± 5 mm)
	Multiplying power	⩽0.5C
	Cell type	Prismatic aluminum shell LFP
	Combination	1P64S
	Key components	64 cells, 1 BMU and 1 fuse
	Weight	⩽400kg
	Ingress protection	IP65

Battery Cluster

The battery cluster is composed of multiple PACKS in series, fuse, etc.

Table 2-5 Battery cluster stacking method

Modole	Stacking method
ST2752UX-US	
ST2695UX-US	
ST2637UX-US	
ST2580UX-US	
ST2523UX-US	
ST2465UX-US	

Modole	Stacking method
ST2408UX-US	
ST2351UX-US	
ST2293UX-US	

Note: x means no equipment, PACK means battery module, DC/DC means DC converter.

2.3.4 Cable Entry Design

The cables between the BESS and external equipment are routed from the bottom of the BESS. Take measures to protect all cables of the BESS, such as laying cable protection tubes, to prevent rodents from damaging the cables. The cable inlet and outlet holes on bottom of the BESS are shown in the figure below.

Drill holes for cable entry based on on-site cable routing.

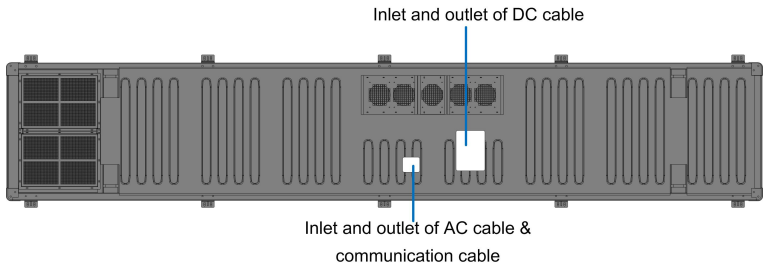


Figure 2-7 Schematic diagram of bottom cable inlet and outlet (top view)

* The figure is for reference only. The product received may differ.

3 Transport and Storage

3.1 Precautions

⚠ WARNING

Failure to transport and store the product in accordance with the requirements in this manual may invalidate the warranty.

3.2 Transport method

BESS can be transported by road, sea, and rail. The BESS is highly integrated and easy to hoist, which facilitates its transport. Currently, BESS is not permitted for air transport and there is no specific guidance on rail transport.

BESS leaves its manufacturing factory by truck. While domestic shipments can be made using only trucks, cross-country shipments usually require a combination of truck-ship-truck transport. In this case, the cargo needs to be transferred from the truck to the ship at or near the port of destination and vice versa.

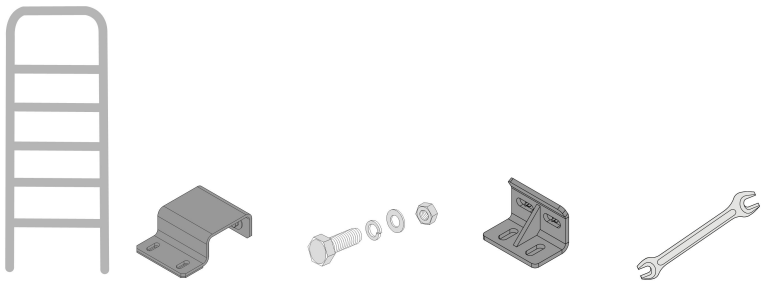
NOTICE

In most cases, the total weight of the truck and the cargo exceeds the limits allowed by general roads. In such cases, an overweight permit from the country or region of transport may be required.

3.3 Crating Before Transport

Since the BESS container is not a standard size, it is required to put the container into SUNGROW's special standard container frame before shipping.

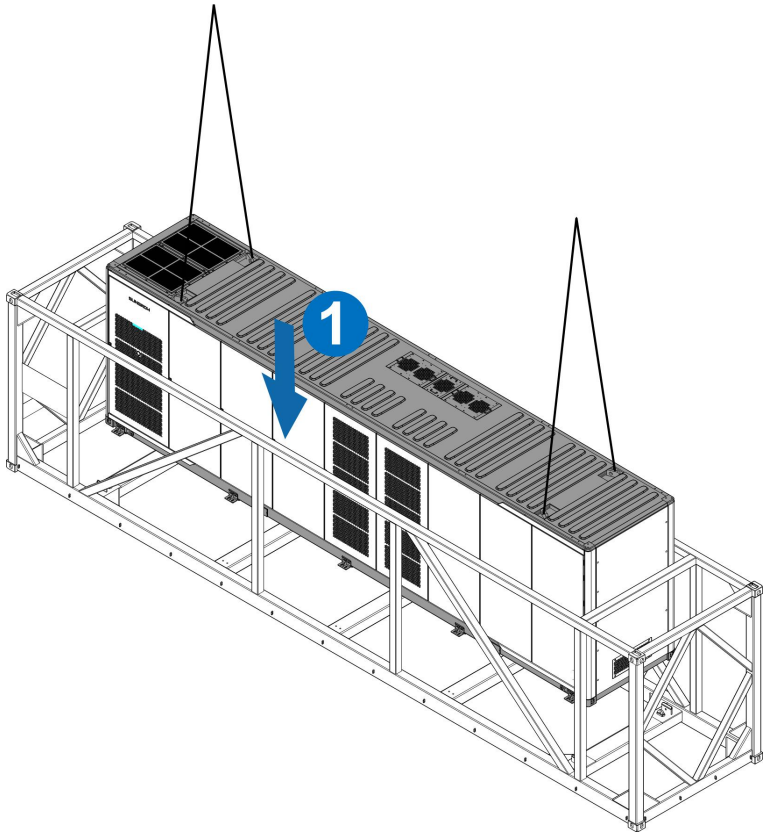
Tool Preparation



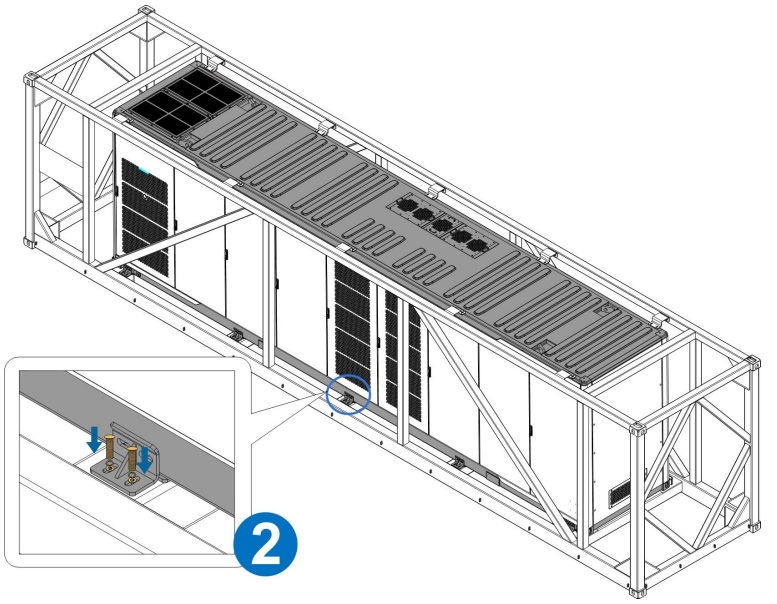
No.	Name	Component source
A	Ladder, at least 2 meters long	Not included in the scope of supply.
B	The corner fittings	Included in the scope of supply.
C	Screws(M12x30)	Included in the scope of supply.
D	L-shaped angle steels	Included in the scope of supply.
E	Wrench	Not included in the scope of supply.

Installation Method

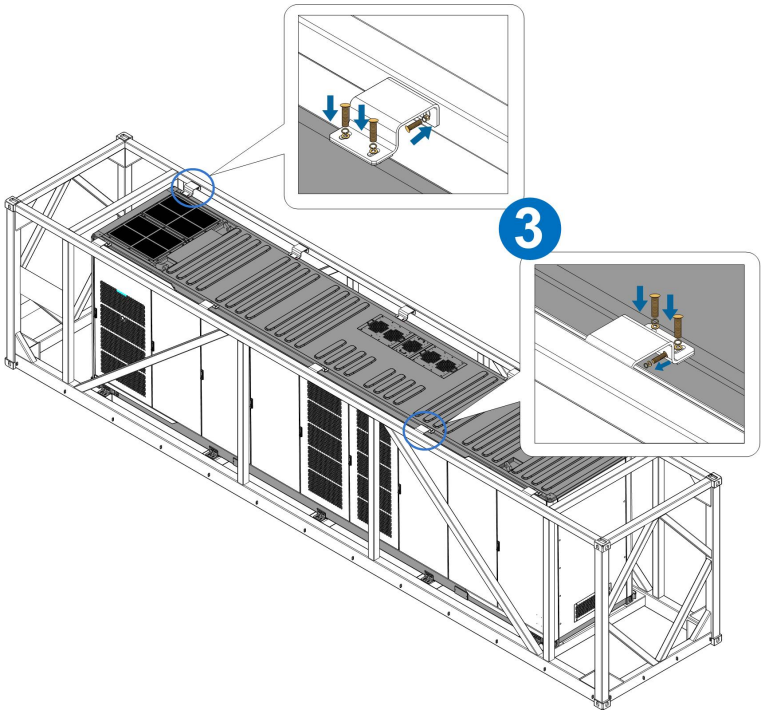
Step 1 Hoist BESS into the transport frame.



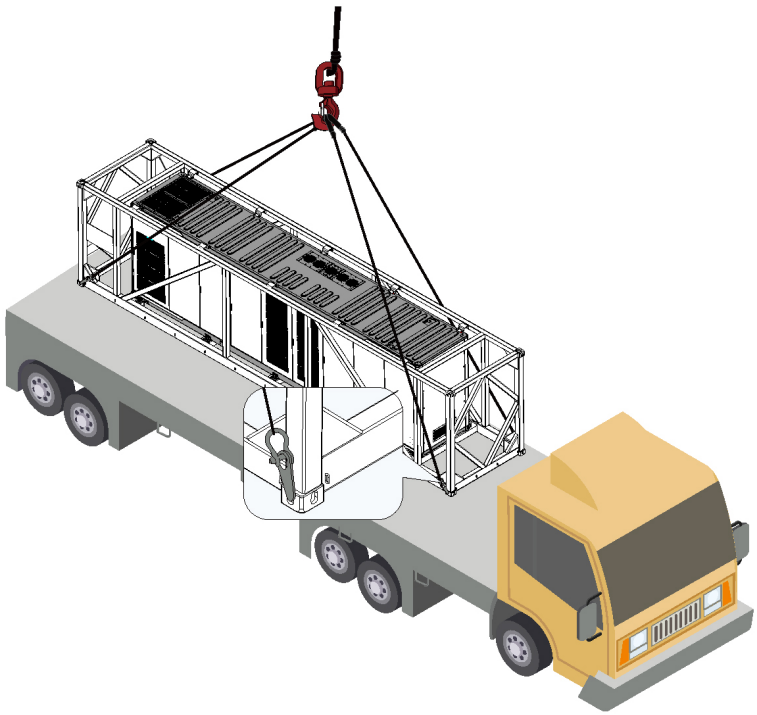
Step 2 Fix the bottom of BESS to the bottom of the transport frame using M12x30 bolts and Lshaped angle steel with a recommended torque of 60 - 70 N.m.



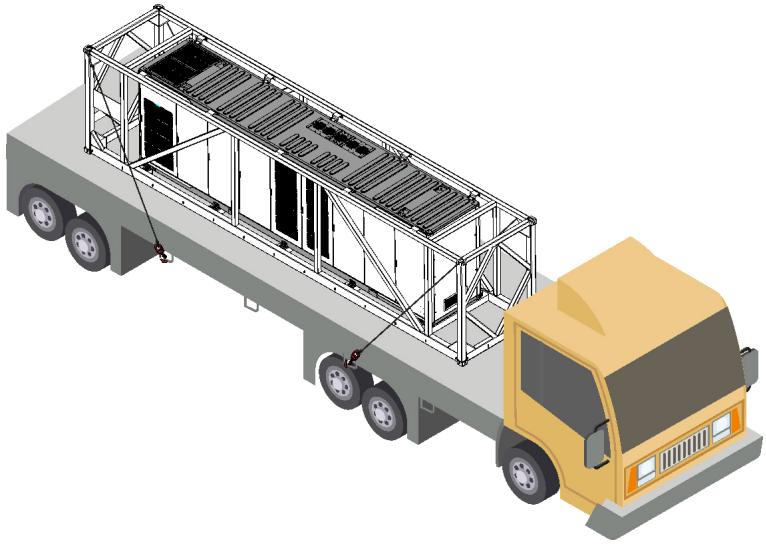
Step 3 Fix the top of BESS to the top of the transport frame using M12x30 bolts and corner fittings with a recommended torque of 60 - 70 N.m.



Step 4 Use a crane to lift the BESS into the truck.



Step 5 Secure the BESS to the truck.



- - **End**

3.4 Requirements for Transportation

All devices in the BESS have been installed and fixed before leaving the factory, and they can be hoisted and transported as a whole during transportation.

⚠ WARNING

In the whole process of loading, unloading, and transportation, the safe operation regulations of BESS in the country/region where the project is located must be observed!

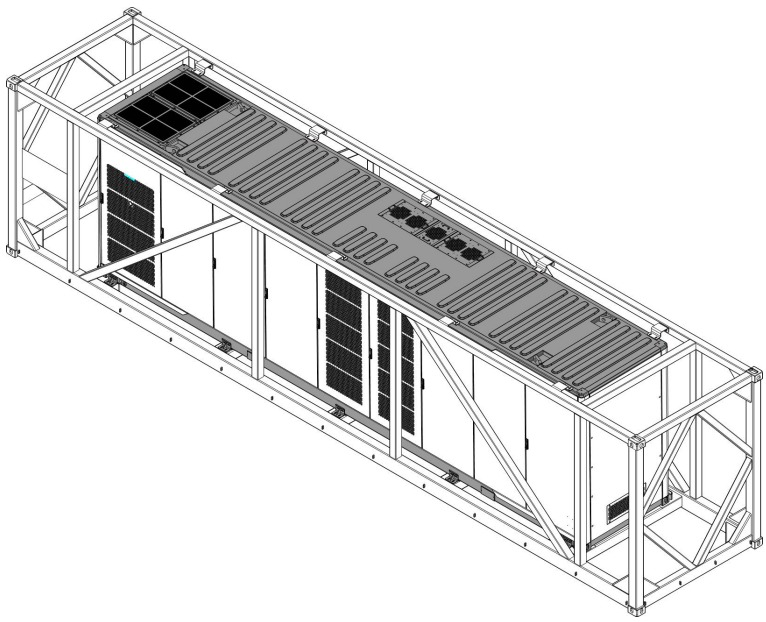
- **All tools used for the BESS and during operation shall be properly maintained.**
- **All personnel engaged in loading, unloading and anchoring should have received relative training, especially in safety.**

NOTICE

During the whole process of loading, unloading and transportation, the mechanical parameters (overall dimensions and weight) of the BESS should always be kept in mind.

The following conditions should be met for the transportation of BESS:

- All cabinet doors are locked.
- Select appropriate crane or lifting tool according to the site conditions. The lifting tool used shall have a sufficient load bearing capacity, boom length and radius of rotation.
- When hoisting an BESS, it is recommended to use two cranes.
- Additional traction may be required if BESS needs to be transported on slopes.
- Remove all obstacles that exist or may exist on the way, such as tree branches, cables, etc.
- The BESS should be transported and moved under good weather conditions.
- Be sure to set up warning signs or warning area to prevent non-staff from entering the lifting area to avoid accidents.
- During shipping, the BESS must be placed in the transportation frame to avoid excessive tilt of the BESS during transportation.

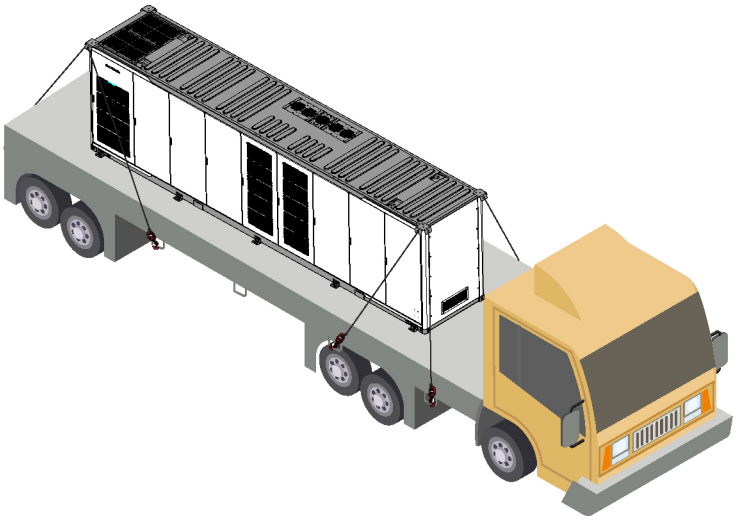


WARNING

PowerTitan's frame boxes can be disposed of in the following ways after arriving at the destination port by sea.

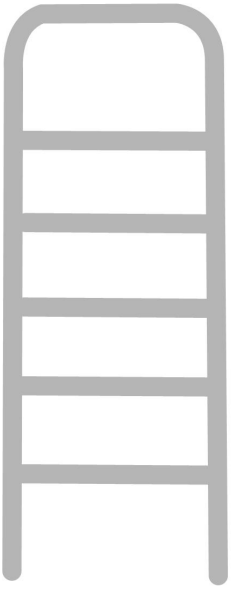
- **Under a DDP agreement, SUNGROW would dispose of the frame box at the destination port.**
- **Under a CIF or a FOB agreement, the customer would dispose of frame boxes. To reduce the freight costs of the frame boxes, we propose to dismantle the frame boxes at the port and sell them to the recycling company in the form of profiled bars. The steel type of the frame box is weathering steel spa-h and the total weight is about 3.4 tons.**

- If no transportation frame is provided during land transportation, use ropes to fix the lifting ring on the top of the BESS to the hangers on the base, and then fix the hanger on the bottom to the transportation vehicle to avoid excessive tilt during transportation.

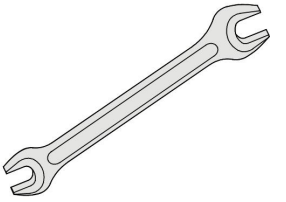


3.5 Unpacking on Arrival

Tool Preparation



A

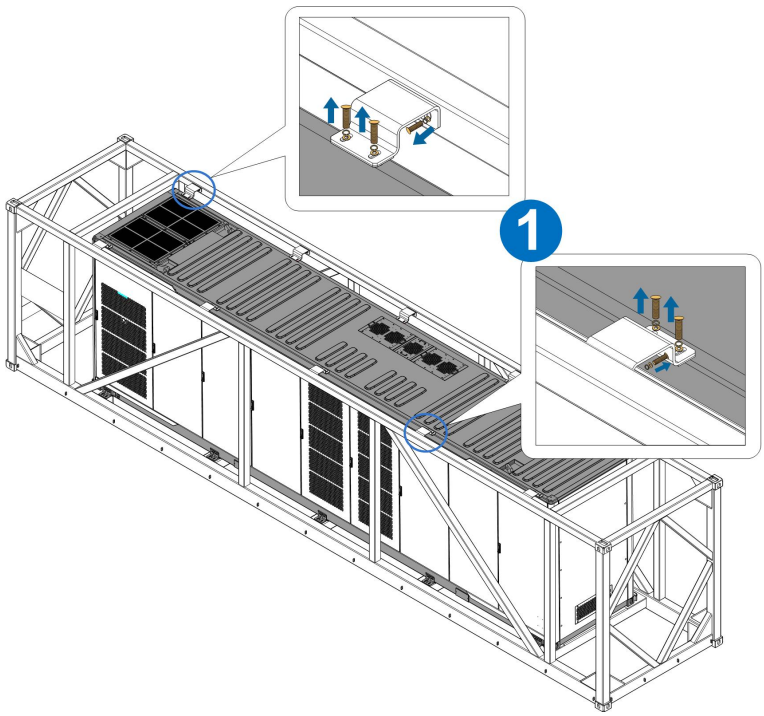


B

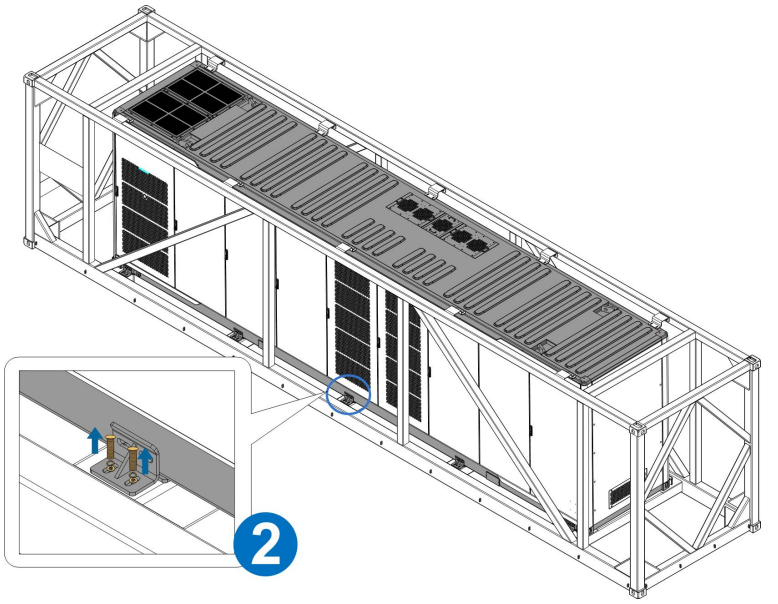
No.	Name	Component source
A	Ladder, at least 2 meters long	Not included in the scope of supply.
B	Wrench	Not included in the scope of supply.

Unpacking Steps

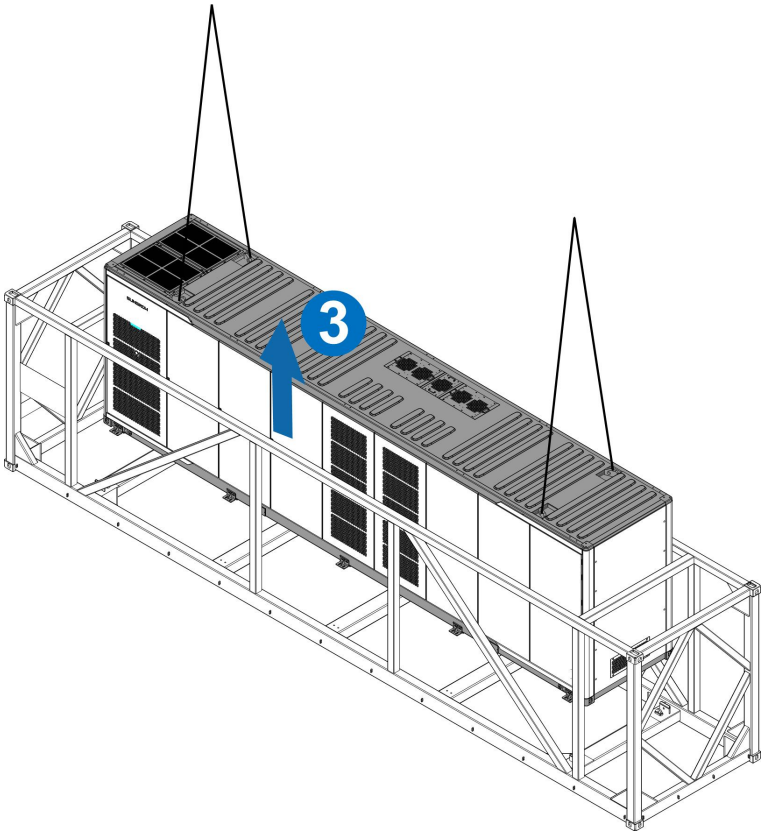
Step 1 Remove the corner fittings connecting the top of the BESS and the transport frame.



Step 2 Remove the corner fittings connecting the bottom of the BESS and the transport frame. There is no need to remove the corner fittings from the BESS to prevent them from being lost during transportation.



Step 3 Lift the BESS out of the transport frame.



- - **End**

3.6 Storage Requirements

- Store the BESS indoors, for example, large warehouse or workshop, to prevent possible condensation or its bottom from being soaked by rain water in the rainy season.
- If the BESS must be stored outdoors due to site conditions, the container base must be raised. The specific height should be reasonably determined based on site geological and meteorological conditions.
- Store the BESS on a dry, flat, and stable ground with sufficient carrying capacity and without any vegetation cover. The ground must be flat and dry.
- Before storage, ensure that the doors of the container and all internal equipment are locked.
- The storage temperature should be between -30℃~+50℃, and the relative humidity should be between 0~95%, without condensation.

NOTICE

During storage, if the ambient temperature exceeds the range, turn on the air conditioner inside the container to keep important internal components in a suitable temperature.

- The air inlet and outlet of the BESS should be effectively protected to prevent rain water, sand and dust from penetrating into the container.
- Carry out periodic inspections. Check the container and the inner equipment for damage at least every half a month.
- Before installing a container that has been stored for more than six months, open the door to visually check and ensure that there is no condensation. Check the container and the inner equipment for damage. Check the product after it is powered on and starts. If necessary, request professionals for testing before installation.
- PACKs should be stored in a clean and dry place and not be exposed to the blazing sun and rain. No harmful gases, flammable and explosive products, or corrosive chemicals should be placed at the storage site. Protect the batteries from mechanical shock, heavy pressure, strong magnetic field, and direct sunlight.
- Pay attention to possible hazards in the surrounding environment, such as sudden temperature changes or collisions, to prevent any damage to the PACK.
- Regularly inspect the device. Ensure that the packaging is not damaged in any way and prevent any damage that may be caused by pests and animals. Replace the packaging immediately if it is damaged.
- The packing box cannot be tilted or turned upside down.

If the PACKs have been stored for more than 6 months, charge them to raise the system SOC to 50%~80%. The SOC of PACKs must be the same after charging.

4 Mechanical Installation

⚠ WARNING

During the whole process of mechanical installation, the relevant standards and requirements of the project site must be strictly observed.

4.1 Inspection Before Installation

4.1.1 Checking Deliverables

Check whether deliverables are complete against the attached packing list.

4.1.2 Checking Product

- Check whether the container received is the ordered one.
- Check the BESS and the internal equipment for any damage.

If any problems are found or there is any question, please contact the forwarding company or SUNGROW.

⚠ WARNING

Only install the BESS when it is complete and intact.
Before installation, ensure that:

- **The BESS is in good condition, without any damage.**
- **All devices in the BESS are intact, without any damage.**

4.2 Installation Environment Requirements

4.2.1 Installation Site Requirements

- The climate environment and geological conditions, such as stress wave emission and underground water level, should be fully considered when selecting the installation site.
- The installation site should be dry and well ventilated.
- There should be no trees around the installation site to prevent branches or leaves blown off by heavy winds from blocking the door or air inlet.
- The installation site should be away from areas where toxic and harmful gases are concentrated, and free from inflammable, explosive and corrosive materials.
- The installation site should be far away from residential areas to avoid noises.

4.2.2 Foundation Requirements

⚠ WARNING

The BESS is heavy as a whole. Before constructing the foundation, it is necessary to inspect the installation site in detail (mainly referring to the geological conditions and environmental climatic conditions, etc.). Commence the design and construction of the foundation only after confirming that all requirements are met.

Unreasonably constructed foundation will bring great troubles to the installation of the BESS, affecting the normal opening and closing of the doors and the normal operation. Therefore, the foundation of the BESS must be designed and constructed according to certain standards to meet the requirements of mechanical support, cable routing and later maintenance and overhaul.

At least the following requirements shall be met during foundation construction:

- The soil at the installation site should be compact. It is recommended that the relative density of soil at the installation site be no less than 98%. Take relevant measures to ensure a stable foundation in case of loose soil.
- Compact and fill the foundation pit to provide sufficient and effective support for the container.
- Raise the foundation to prevent the container base and the interior from rain erosion.
- The cross-sectional area and height of the foundation should meet the requirements.
- Construct corresponding drainage in conjunction with local geological conditions.
- Built a cement foundation with sufficient cross-sectional area and height. The foundation height is determined by the construction party according to the site geology.
- Consider cable routing when building the foundation.

- To facilitate subsequent electrical wiring, it is recommended to pre-set a cable trench in the foundation according to the position of cable inlet holes of the BESS, and pre-embed the conduit.
- The dregs excavated during foundation construction should be removed immediately to avoid latter impact on lifting.

- Built a maintenance platform around the foundation to facilitate later maintenance.
- During the foundation construction, reserve enough space for the AC/DC side cable trench according to the position and size of the cable inlet and outlet holes of the BESS, and pre-embed the cable conduit.
- Determine the specifications and quantity of the perforating gun according to the model and quantity of the cables.

- A drainage system is necessary to prevent the bottom or internal equipment of the BESS from being soaked in water during the rainy season or during heavy rainfall.
- Both ends of all embedded pipes should be temporarily sealed to prevent impurities from entering and causing troubles to later wiring.
- After all cables are connected, cable inlet and outlet and connector should be sealed with fireproof mud or other suitable materials to prevent rodent access.

Pre-embed the grounding unit according to the relevant standards of the country/region where the project is located.

4.2.3 Installation Spacing Requirement

To ensure better heat dissipation at the air outlet, reserve enough space around the installation site. The following figure shows the required minimum spacing.

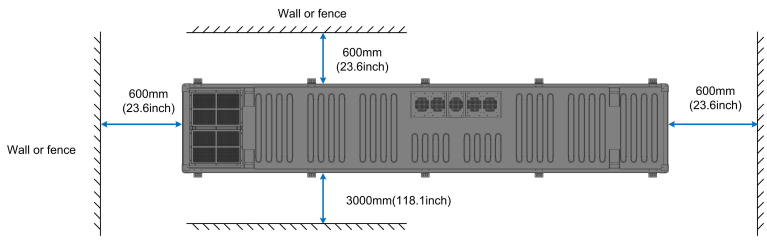


Figure 4-1 Installing a single device

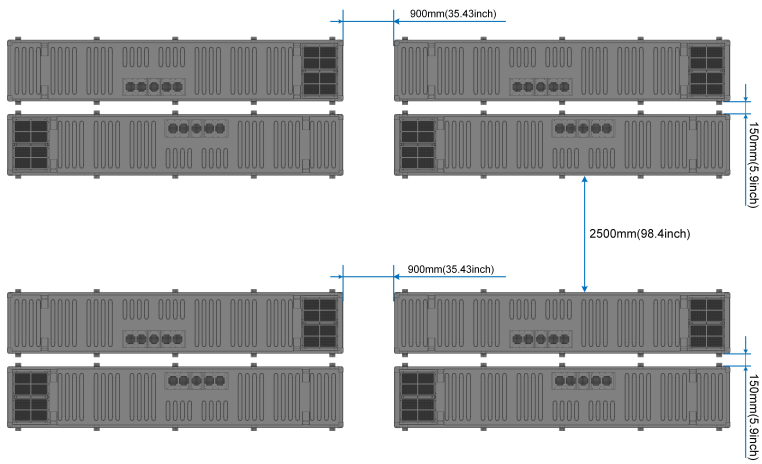


Figure 4-2 Installing multiple devices

4.3 Lifting and Fixing

4.3.1 Lifting Precautions

⚠ WARNING

- **In the process of lifting, it is necessary to operate in strict accordance with the safety operation rules of the crane.**
- **No one is allowed to stay within 5m to 10m of the operating area. In particular, it is strictly prohibited to stand under the lifting arm and the lifted machine to avoid casualties.**
- **In case of bad weather, such as heavy rain, fog, gust, etc., the lifting work should be stopped.**

When lifting the BESS, ensure that at least the following requirements are met:

- Lift from the top lifting holes, and ensure on-site safety during lifting.
- Professional personnel should direct the whole lifting process on site.
- Select appropriate lifting machine according to the site conditions. It is recommended that the bearing capacity of the selected lifting machine shall ⩾ 200,000kg.
- The strength of the sling used should be able to bear the weight of the BESS.
- Ensure safe and reliable connections of all slings and an equal length of slings connected to corner fittings.
- The sling length can be adjusted according to the actual situation on site.
- Ensure that the BESS is steady and not tilting during lifting.
- Take all necessary auxiliary measures to ensure safe and smooth lifting of the BESS.

How the BESS is hoisted by a crane is shown in the figure below. The inner dashed circle indicates the crane operation range. When the crane is working, it is strictly forbidden to stand in the solid circle!

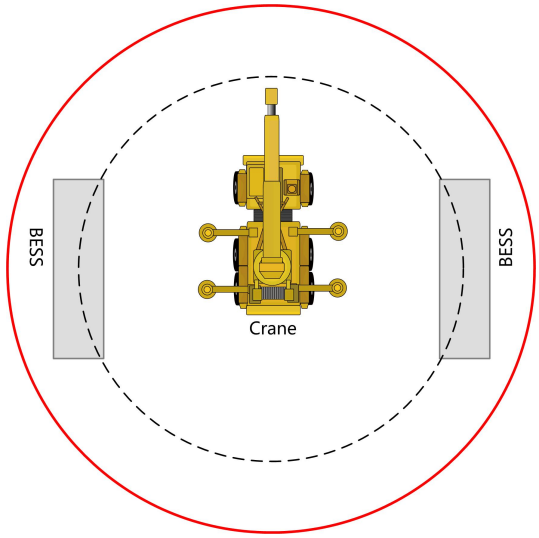


Figure 4-3 Schematic diagram of crane operation of one crane

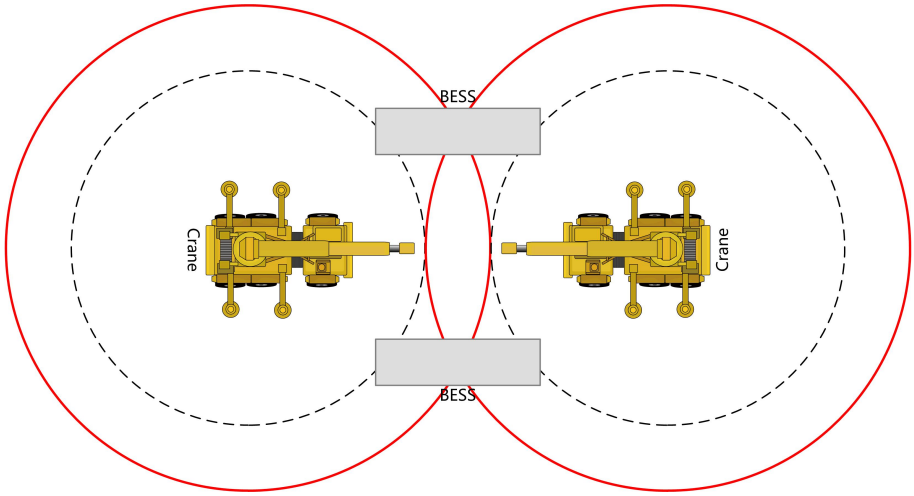


Figure 4-4 Schematic diagram of crane operation of two cranes

4.3.2 Lifting

Lift the BESS according to the following requirements:

- The BESS should be lifted vertically. Never drag the container on the ground or on the top of the lower container, and never pull and push it on any surface.
- Lift the BESS slowly. And during lifting, theoretically, it is required to ensure that the center of the hanger and the center of the BESS top is exactly right. In practice, try to minimize the deviation of the two centers, and ensure that the hanger and the BESS top is parallel through visual inspection to ensure the stability of the lifting. The crane should move at a very slow speed at the moment of lifting and lift at a constant speed later.

- When the BESS is in place, place it lightly and smoothly. It is strictly forbidden to throw it to places outside the vertical landing place.
- The BESS should be placed on a solid and flat site with good drainage and no obstacles or protrusions.

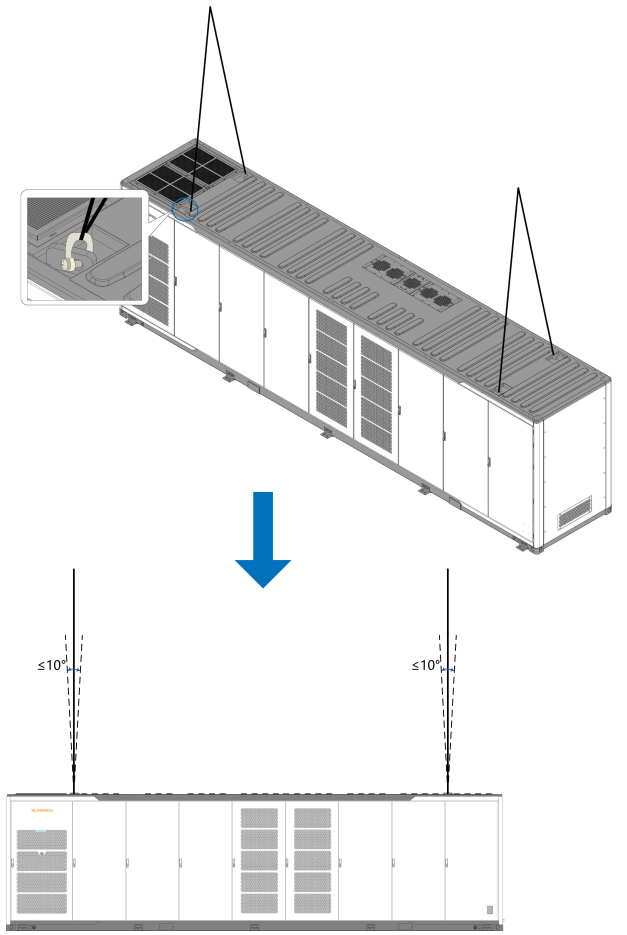


Figure 4-5 Lifted by two cranes

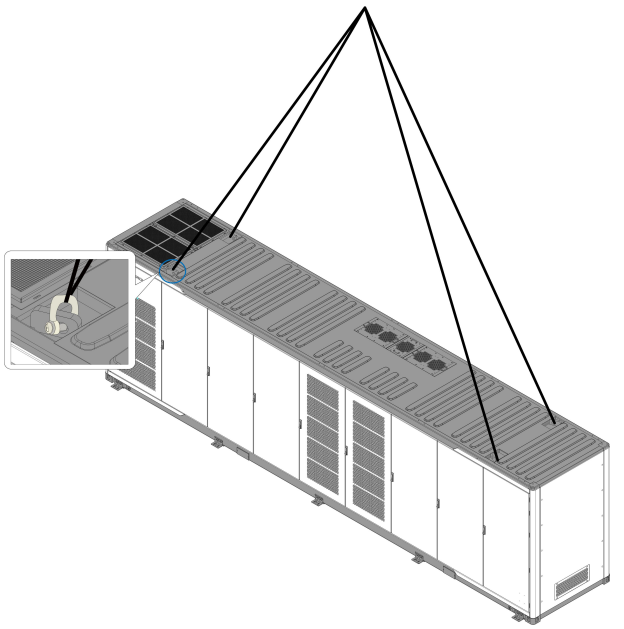


Figure 4-6 Lifted by a single crane

Sling and shackle requirements	Specifications
Sling	Use 6 × 37+1 steel wire rope, wire rope diameter ⩾ 39mm, steel wire diameter ⩾ 1.8mm
Shackle	WLL 25T and above

⚠ WARNING

- **It is strictly prohibited to lift the BESS through the bottom.**
- **The lifting work shall be in accordance with the relevant standards and specifications of the country/region where the project is located.**
- **SUNGROW shall not be held liable for any personal injury or property damage caused by violating relevant requirements or other safety precautions.**

4.3.3 Fixed Installation

If two BESS are placed back to back, and the distance between them is less than 150mm, fix them as described below:

- Use the angle steel at the bottom of the container to fix the front bottom to the foundation.
- Use the connectors in delivery to fix the back top of the two BESS.

Fixed by Welding

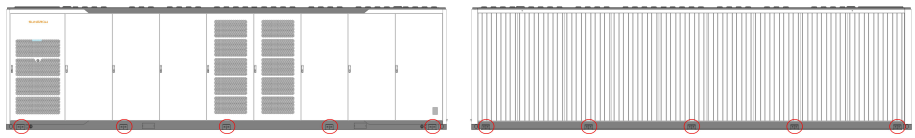
Before welding, remove the L-angle steel at the bottom, and then fix the bottom of the container on the foundation. Take appropriate measures to prevent corrosion of solder joints after welding.

Fixed by L-shaped Angle Steels

If two BESS are not placed back to back, or the distance between them is greater than 600mm, fix the front and rear bottoms of the BESS to the foundation with the L-shaped angle steel in the delivery.

Fixed by L-shaped angle steels (Distance between the two BESS ⩾600mm)

Positions need to be fixed with L-shaped angle steels at the bottom of the BESS are circled in the figure below.

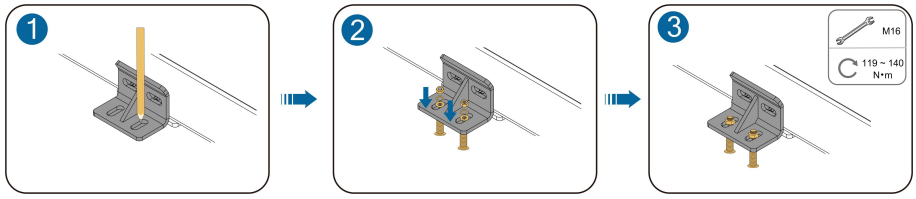


Preparing Installation Tools

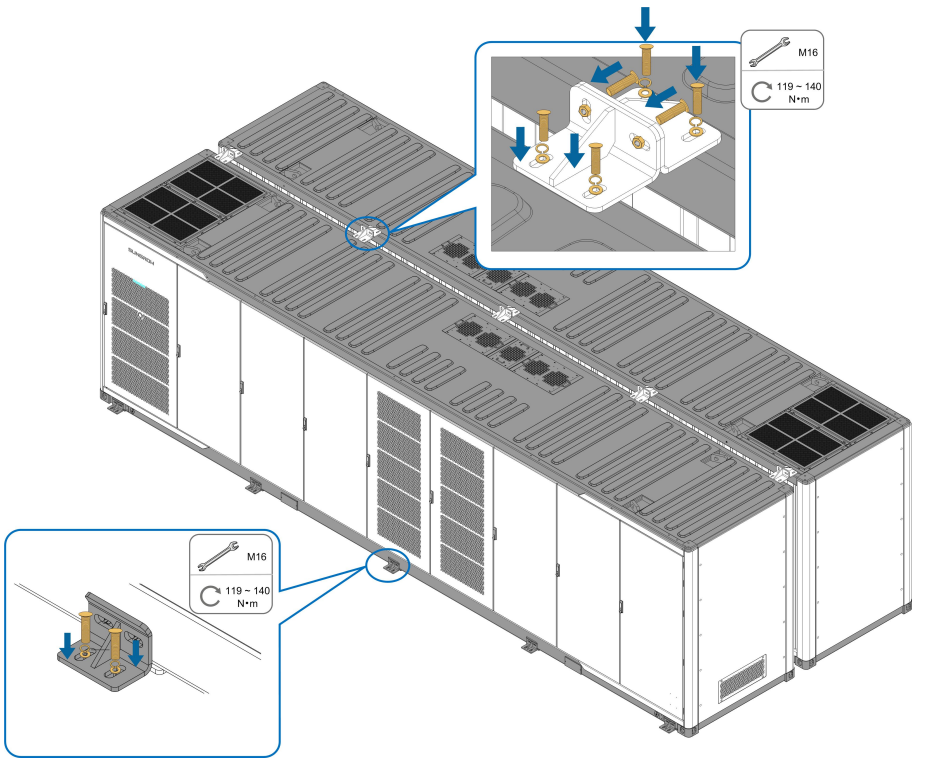
Tools that may be used when installing L-angle steel are as follows:

No.	Name	Source
1	Marker pen	Not included in the scope of supply
2	Hammer drill	Not included in the scope of supply
3	Angle steel	Included in the scope of delivery
4	M16 expansion bolt	Not included in the scope of supply
5	M16 screw	Included in the scope of delivery

Installation Method



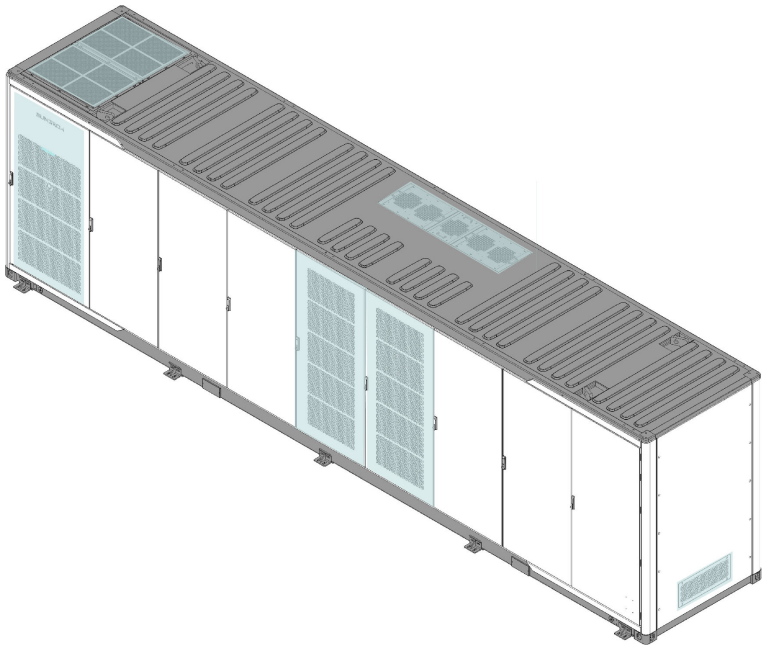
Top Fixation (Distance between the two BESS is 150mm ± 20)



4.3.4 Film Removal

After fixing the BESS, remove the 3M film on the DCDC cabinet door, the cabinet door of the liquid cooling unit, the mesh of the top fans, the top mesh of the liquid cooling unit, the bottom mesh of the liquid cooling unit, and the mesh at the right side fire suppression air inlet.

Remove the 3M sticker with the yellow label "Key" to obtain the key to open the BESS cabinet door.



5 Electrical Connection

5.1 Precautions

DANGER

High voltage! Electric shock!

- It is strictly forbidden to directly touch the live parts in the unprotected state!
- Before installation, ensure that the all switches are off.

WARNING

Sand and moisture penetration may damage the electrical equipment in the BESS, or affect their operating performance!

- Avoid electrical connections during sandstorms or when the relative humidity in the surrounding environment is greater than 95%.
- Perform electrical connection when there is no sandstorm and the weather is fair and dry.

WARNING

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

5.2 Overview of Wiring Area

The wiring diagram of the integrated BESS is shown below:

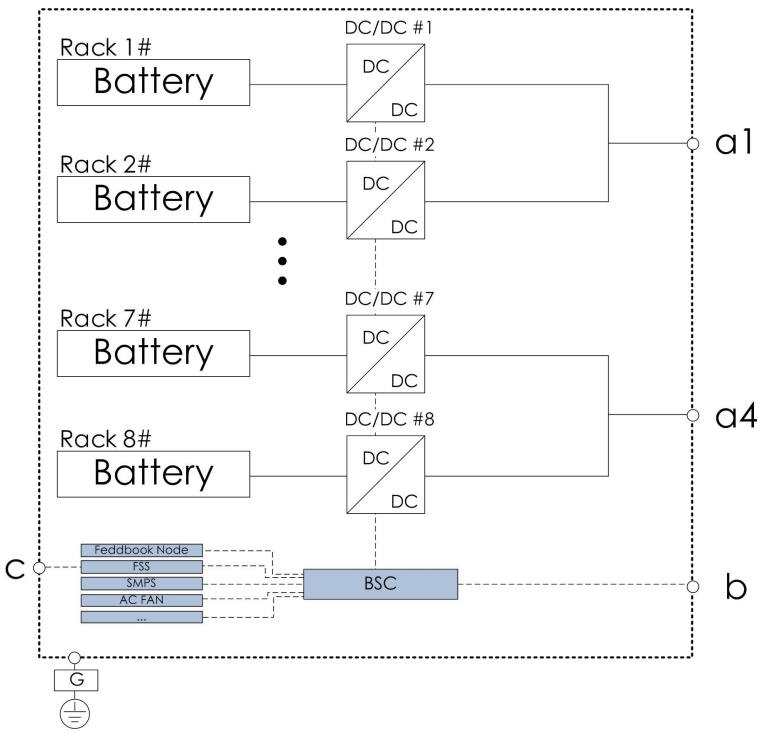


Figure 5-1 Wiring diagram

*The diagram only describe the on-site wiring, and the internal wiring is for reference only.

Table 5-1 Interface description

No.	Description	Recommended cable specifications
a1~a4	DC output port	500 kcmil
b	Communication port	Armored wire is recommended
c	FSS connection port	For specific wiring, please refer to the specific fire drawings of the corresponding project
G	Grounding point	-

⚠ WARNING

- **All electrical connection must be carried out strictly in accordance with the wiring diagram.**
- **All electrical connections must be carried out when the equipment is completely uncharged.**

⚠ WARNING

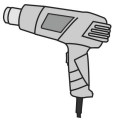
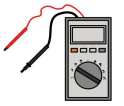
Only qualified electricians can perform the electrical connection. Please comply with the requirements in "Safety Precautions" in this manual. SUNGROW shall not be held liable for any personal injury or property damage caused by ignoring these safety precautions.

NOTICE

- The installation scheme of the BESS must be in full accordance with the regulations or standards where the project is located.
- Failure to follow the installation requirements in this manual may result in faulty device or system, and the damage caused is not covered by the warranty.

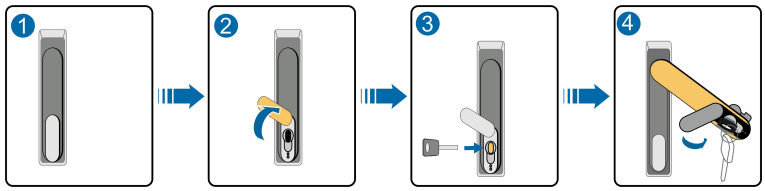
5.3 Preparation Before Wiring

5.3.1 Preparing Installation Tools

Classification	Name and Graphics		
Installation Tools	 Torque screwdriver	 Wire stripper	 Terminal crimping tool
	 Heat gun	 Multimeter	 Screwdriver
	 Torque wrench		
Protective tools	 Protective gloves	 Goggles	 Safety shoes
	 Protective clothing		

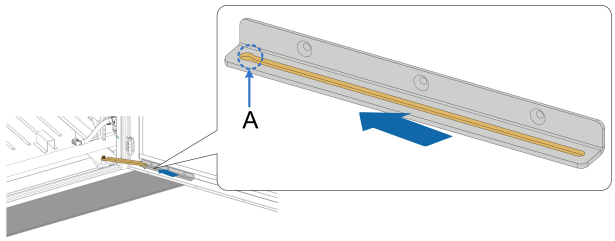
5.3.2 Opening the Container Door and Cabinet Door

Step 1 Open the container door with the randomly equipped key.

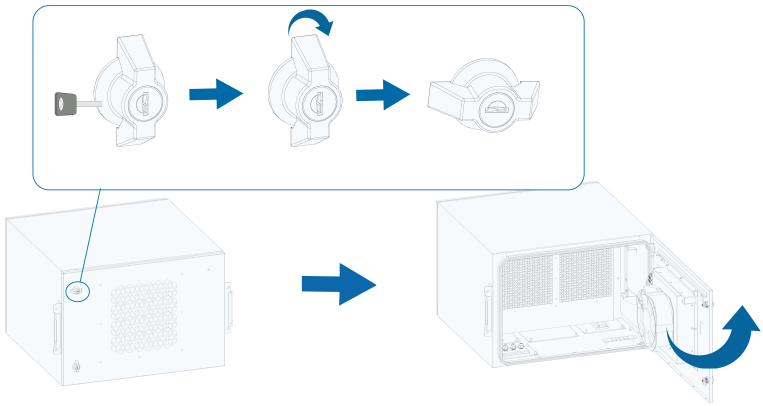


Step 2 Fix the container door.

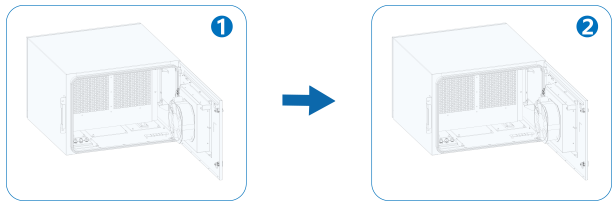
The double-end stud slides when the container door or cabinet door is opened. And when it slides into hole A, the limit rod is fixed.



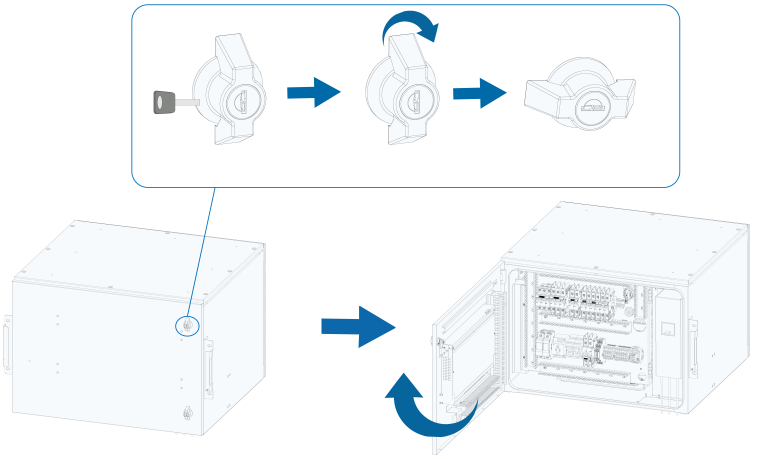
Step 3 Open the door of the BCP.



Step 4 Remove the protective cover of the wiring area in the BCP.



Step 5 Open the door of the BSP.



- - End

*The figure is for reference only and the actual product shall prevail.

5.3.3 Preparing Cables

The cables must meet the following requirements:

- The current carrying capacity of the cable shall meet requirements. Factors affecting the current carrying capacity of a conductor include but are not limited to:
  - Environmental conditions;
  - Type of the insulation material of the conductor;
  - Cabling method;
  - Material and cross-sectional area of the cable;
- Select cables with a proper diameter according to the maximum load, and the cables should be long enough.
- All DC input cables must be of the same specifications and materials.
- AC output cables of three phases must be of the same specifications and materials.
- Only flame retardant cables can be used.

NOTICE

- **Cables used shall comply with the requirements of local laws and regulations.**
- **The cable colors in figures in this manual are for reference only. Please select cables according to local cable standards.**

5.4 Ground Connection

NOTICE

Ground the product strictly following local standards and regulations.

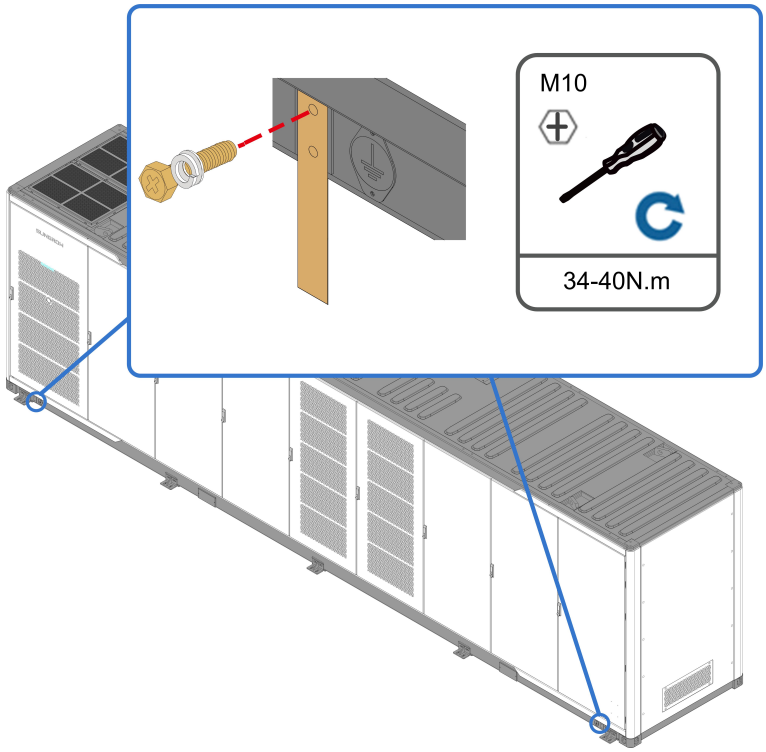
Both grounding points must be grounded to ensure a reliable grounding.

Overview

There are two grounding methods: fixing by wielding with grounding flat steel and fixing with grounding cable. For the location of the grounding point, please refer to "**Container Appearance**".

Grounding Flat Steel

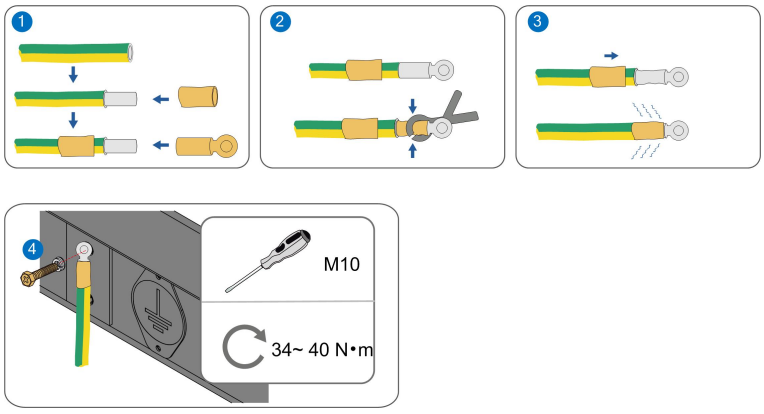
Remove the protective tape from the grounding point and weld 60mmx100mm hot-dip galvanized flat steel to the grounding point. Spray the entire fixed surface after ground connection.



*The figure is for reference only and the actual product shall prevail.

Grounding Cable

Use a grounding cables of 70mm² ~ 95mm² to ensure a reliable connection between the two grounding points and the grounding points of the BESS. (The grounding point is covered with protective tape before delivery. Remove the tape before wiring.)



*The figure is for reference only and the actual product shall prevail.

Please perform the external grounding connection according to the actual on-site condition and the instructions of the plant personnel.

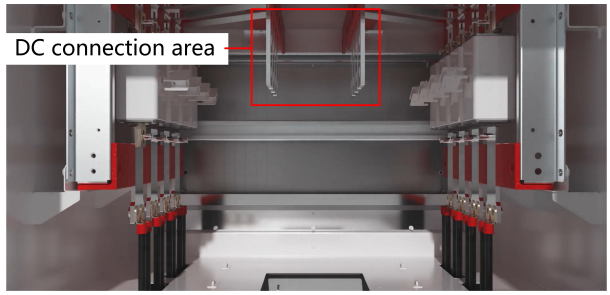
The grounding resistance shall be measured after the ground connection is finished, and the resistance value shall be no more than 4Ω.

The specific grounding resistance shall comply with relevant national/local standards and regulations.

5.5 DC Output Port Connection

Overview

The DC output port inside the BCP is shown in the following figure.



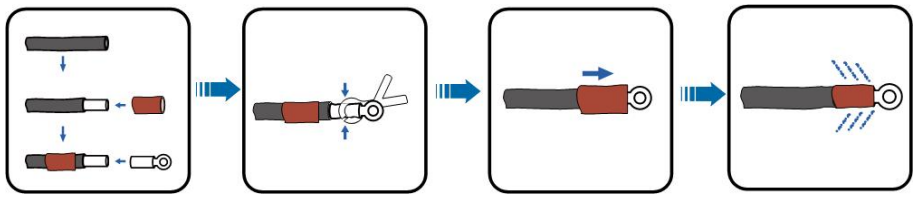
* The image shown here is for reference only. The actual product received may differ.

Procedure

Step 1 Lead the cable into the BCP wiring area through the inlet hole, and mark the cable polarity.

Step 2 Strip the protective layer of the cable to expose the copper core of the wire with strippers.

Step 3 Install the OT terminals to the wire and crimp them with a crimping tool. Install a heat-shrink tube to the terminal and heat it with a heat gun.



Step 4 Secure the OT terminal to the wiring hole by M12 bolt with a tightening torque of 60~70 N.m.

- If copper wires are used, fasten the bolt assembly as shown below.

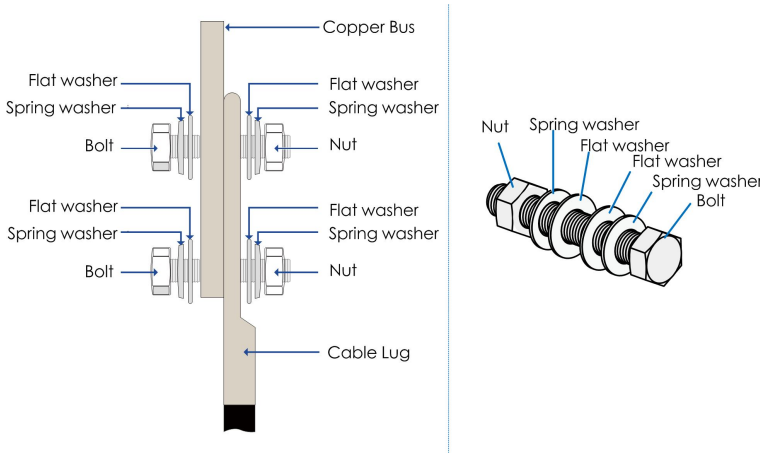


Figure 5-2 Copper wire connection

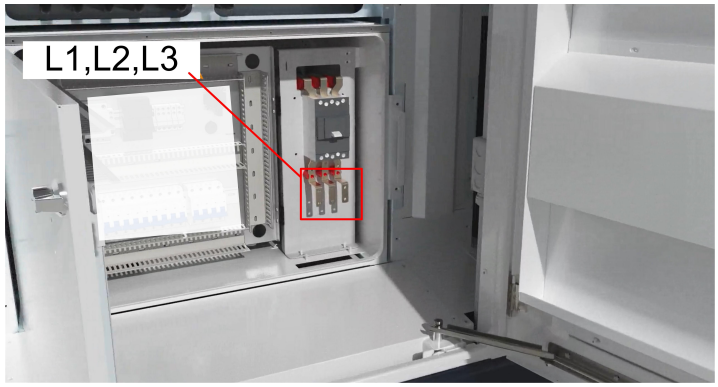
Step 5 Pull the cable back slightly after wiring to ensure that the cable is long enough.

- - End

5.6 Auxiliary Power Supply Port Connection

Overview

The auxiliary power supply port inside the BSP is shown in the following figure.



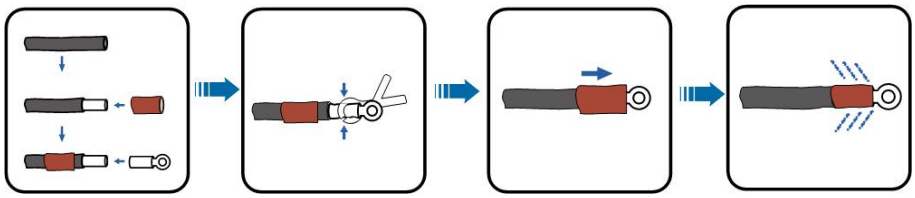
* The image shown here is for reference only. The actual product received may differ.

Procedure

Step 1 Lead the cable into the BSP wiring area through the inlet hole, and mark the cable phase.

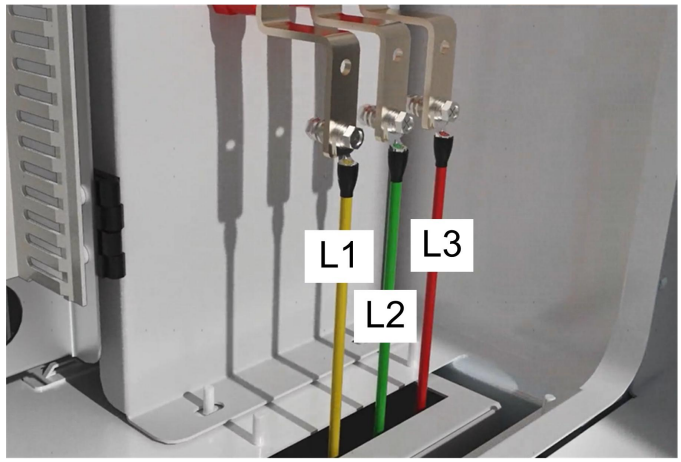
Step 2 Strip the protective layer of the cable to expose the copper core of the wire with strippers.

Step 3 Install the OT terminals to the wire and crimp them with a crimping tool. Install a heat-shrink tube to the terminal and heat it with a heat gun.



Step 4 Secure the OT terminal to the wiring hole by M5 bolt with a tightening torque of 4~4.8 N. m. (For detailed wiring procedure, please refer to “"Figure 5-2 Copper wire connection"” .

Step 5 Pull the cable back slightly after wiring to ensure that the cable is long enough.



* The image shown here is for reference only. The actual product received may differ.

NOTICE

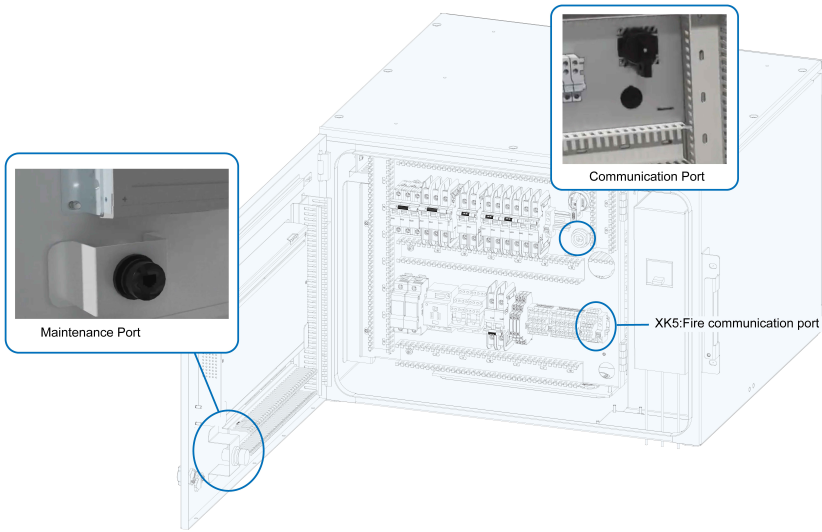
- **Strictly follow the phase sequence to connect cables.**

- - End

5.7 Ethernet Communication Port Connection

Overview

The Ethernet communication port inside the BSP is shown in the figure below.



* The image shown here is for reference only. The actual product received may differ.

Procedure

Step 1 Lead the CAT-5e cable into the BSP wiring area through the inlet hole.

Step 2 Connect the Ethernet port to the external device.

- - End

5.8 Post-wiring Operations

Check the wiring thoroughly and carefully when all electrical connections have been completed. In addition, perform the following operations:

- Seal the gap around the cable inlet holes.
- Put all protective covers back in place firmly.

⚠ WARNING

- **Rodents may enter if the product is not properly sealed.**

Locking Cabinet Doors and Container Door

Step 1 Reinstall the protection cover of the wiring area in the reverse order of removal.

Step 2 Close the doors of the BSP and the BCP, lock the doors, remove the keys and store them securely.

Step 3 Lock the container door, pull out the key, and store it securely.

- - End

6 Battery connection

6.1 Precautions

Always follow the safety instructions in this manual. In order to avoid personal injury and property damage that may occur during installation or operation, and extend the service life of this product, please carefully read all safety instructions.

Improper or incorrect use may result in:

- A threat to the life and personal safety of the operator or third parties;
- Damage to the energy storage system or other property of the operator or third party.

- The safety precautions in this manual do not cover all specifications to be followed, and all operations should be performed based on the site conditions.
- SUNGROW shall not be liable for any loss arising from failure to follow the safety precautions in the manual.

⚠ WARNING

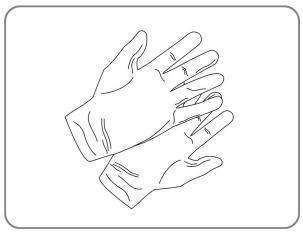
- **While installing the device with hazardous voltage, follow relevant regulations and local installation safety guidelines.**
- **Please observe the regulations on the correct use of tools and personal protective equipment.**
- **All connections must be carried out with distinctive guidance. Any guess and ambiguous attempts must be prohibited.**
- **Tools with an insulating protective coating must be used.**

- Connecting cables should meet the voltage and current requirements.
- All connectors must be safe and reliable to avoid loosening or virtual contact. They must be corrosion-resistant, wear-resistant and shock-proof.
- All connections must comply with the requirements of relevant national standards to prevent arc discharge in any form.
- The connections of internal batteries must be equipped with anti-vibration and antiloosening devices. Temperature, voltage and current sensors must be connected safely and reliably, to prevent loosening, ageing and extrusion. All sensor cables must be free of metal exposure.
- Any type of short circuit should be prevented in the connection process.
- Operators must use this product with personal protective equipment.

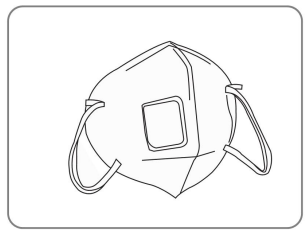
- All connections must be carried out with distinctive guidance. Any guess and ambiguous attempts must be prohibited.
- Key connections must be correct, reliable (without loosening) and in good contact, without short-circuits.
- All the finished connections must be measured and confirmed one by one.
- All connections must not be in contact with the casing or other components or shortcircuited.
- If there are other uncertain factors, please consult the after-sales technicians of SUNGROW before any operation.

6.2 Cable connection

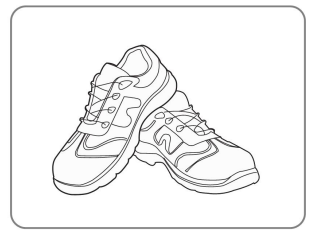
Tool preparation



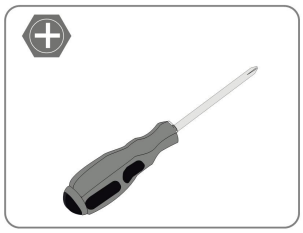
Gloves



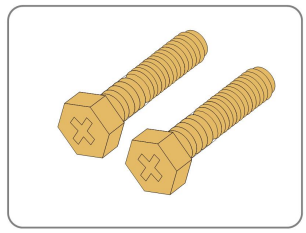
Mask



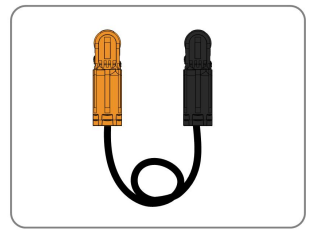
Shoes



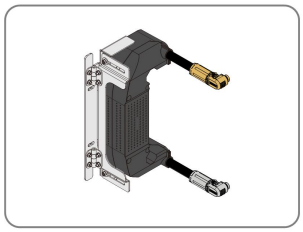
Phillips



Cross recessed hexagon head screw（M6）

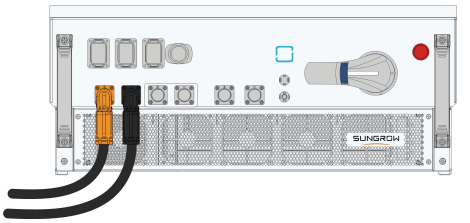


Cable

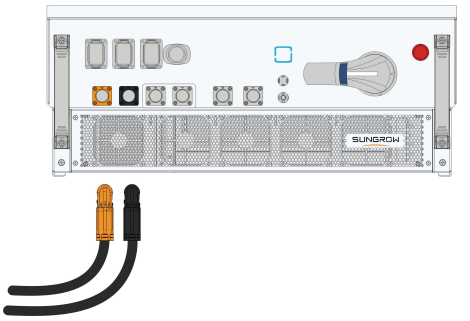


Fuse

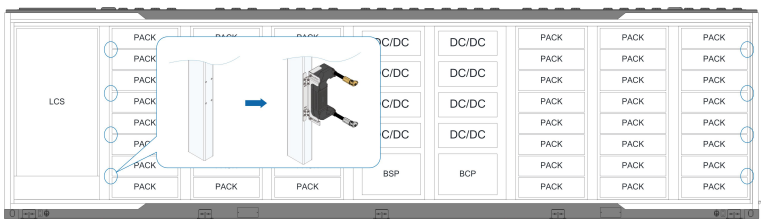
Step 1 Wear insulating shoes and high-voltage gloves before connecting power cables. At this time, the power lines between the packs of the battery system are all disconnected, and only the power lines between the pack and the DCDC are connected.



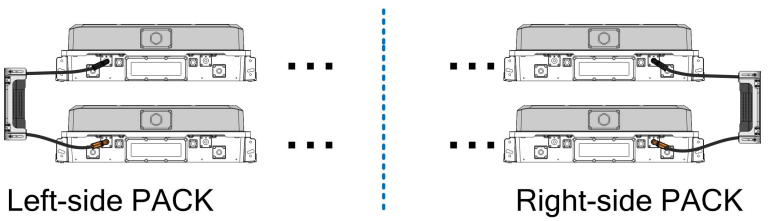
Step 2 Before connecting the power line between the PACKs, disconnect the power line between the Pack and the DCDC, as shown in the figure below.



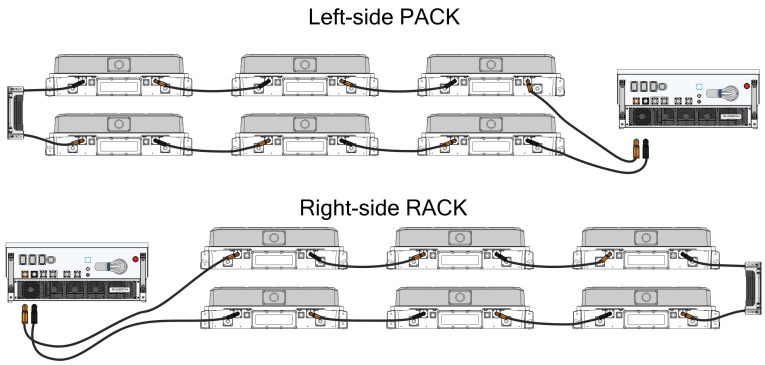
Step 3 Install the fuse. Open the container door, there are four sets of mounting holes reserved on the leftmost and rightmost door frames of the battery box, and use M6 hexagonal Phillips screws to fix the fuses on the mounting holes.



Step 4 Correctly insert the aviation plug that comes with the fuse into the battery base.



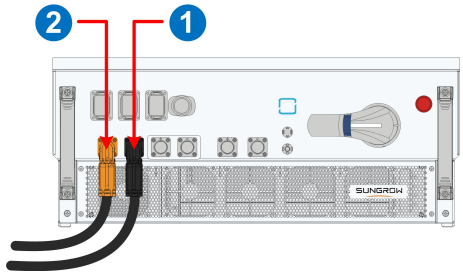
Step 5 Connect the power cable between the packs. Connect the power line between two adjacent PACKs vertically or between two adjacent PACKs horizontally, and you will hear a clicking sound after the air plug is plugged in tightly. (Note: the positive pole of the aerial plug is inserted into the base against the positive pole, and the negative pole is inserted against the negative pole. The positive pole is the orange plug, and the negative pole is the black plug)



Step 6 Connect the power connection line between the Pack and the DCDC :

1 Connect the power cable between the Pack and the negative terminal of the DCDC terminal.

2 Connect the power cable between the Pack and the positive terminal of the DCDC terminal.



- - End

7 Power-on and Power-off Operation

7.1 Power-on Operation

⚠ WARNING

- **The BESS can only be put into operation after confirmation by a professional and approved by the local power department.**

⚠ WARNING

- **For BESS with a long shutdown time, check the equipment thoroughly and carefully to ensure all indexes are acceptable before powering it on.**

7.1.1 Inspection Before Powering up

Before powering on the equipment, check the following items carefully.

- 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 the status of the power supply switch QF of the liquid cooling system, and ensure that all switches are closed.

7.1.2 Powering on Steps

Step 1 Power on the BESS.

Step 2 Close the load switch SWITCH 1 on the panels of SD175HV 1#~8#;

Step 3 Close the load switch SWITCH 2 on the panels of:

- ST2752UX: SD175HV 4# and SD175HV 5#
- ST2695UX: SD175HV 3# and SD175HV 4#
- ST2637UX: SD175HV 3# and SD175HV 4#
- ST2580UX: SD175HV 3# and SD175HV 4#
- ST2523UX: SD175HV 2# and SD175HV 3#
- ST2465UX: SD175HV 3# and SD175HV 4#

- ST2408UX: SD175HV 3# and SD175HV 4#
- ST2351UX: SD175HV 3# and SD175HV 4#
- ST2293UX: SD175HV 3# and SD175HV 4#

Step 4 Power on the BCP.

1 Close the miniature circuit breaker Q1 (TEMP CONTROL);

2 Finish powering on the BCP.

Step 5 Power on the BSP.

1 Close the upstream power switch of the BSP.

2 Close the DC load switch QS1 in the BSP;

3 Close the main control switch of the 480Vac power QF1 (AC MAIN SWITCH);

4 Close the fire suppression 230Vac power supply switch Q7 (FSS);

5 Close the power switch of the LCS Q1(LCS);

6 Close the branch circuit breaker of the transformer Q2 (TRANSFORMER);

7 Close the power supply switch of the maintenance socket Q3(MAINTAIN SOCKET) and the switch of the switching power Q4(DC 24V);

8 Close the fan power switch Q5 (AC BRANCH SWITCH1#) and switch Q6 (AC BRANCH SWITCH2#) inside the cabinet;

9 Finish powering on the BSP;

Step 6 Start the PCS.

- - End

⚠ WARNING

If one circuit breaker trips during power-on process, suspend closing other circuit breakers and immediately check whether a short circuit occurs to downstream loads of the tripped circuit breaker;

7.2 Power-off Operation

7.2.1 Planned Powering off

Step 1 Shut down the ESS;

Step 2 When SD175HV 1#~8# shut down, disconnect the load switch SWITCH 1 on the panels of each SD175HV;

Step 3 Switch the load switch SWITCH 2 on the panels of:

- ST2752UX: SD175HV 4# and SD175HV 5#
- ST2695UX: SD175HV 3# and SD175HV 4#
- ST2637UX: SD175HV 3# and SD175HV 4#

- ST2580UX: SD175HV 3# and SD175HV 4#
- ST2523UX: SD175HV 2# and SD175HV 3#
- ST2465UX: SD175HV 3# and SD175HV 4#
- ST2408UX: SD175HV 3# and SD175HV 4#
- ST2351UX: SD175HV 3# and SD175HV 4#
- ST2293UX: SD175HV 3# and SD175HV 4#

Step 4 Disconnect the BCP.

1 Disconnect the miniature circuit breaker Q1 (TEMP CONTROL);

2 Finish powering off the BCP;

Step 5 Disconnect the BSP.

1 Disconnect the DC load switch QS1 inside the BSP;

2 Disconnect the power switch of the maintenance socket Q3 (MAINTAIN SOCKET), the AC power supply switch Q4 (DC 24V), the fan power supply switch Q5 (AC BRANCH SWITCH1#), and the switch Q6 (AC BRANCH SWITCH2#) inside the cabinet;

3 Disconnect the power supply switch of the LCS Q1 (LCS) and the branch switch of the transformer Q2 (TRANSFORMER) inside the cabinet;

4 Disconnect the main control switch of the 480Vac power QF1 (AC MAIN SWITCH);

5 Disconnect the fire suppression 230Vac power supply switch Q7 (FSS)

6 Disconnect the upstream power switch of the BSP.

7 Finish powering off the BSP;

- - End

7.2.2 Unplanned (Emergency) Shutdown

- Fire incident:

  Contact local fire department professionals.

- Unplanned outage (shutdown due to faults):

  Contact SUNGROW.

8 Fire Suppression

⚠ WARNING

An automatic fire suppression system is equipped inside the BESS. Do not flip the fire suppression switch unless an emergency occurs.

8.1 General Rules

⚠ WARNING

Please comply with the fire laws and regulations of the country/region where the project is located.
Check and maintain the fire equipment regularly to ensure a normal operation of all functions.

⚠ WARNING

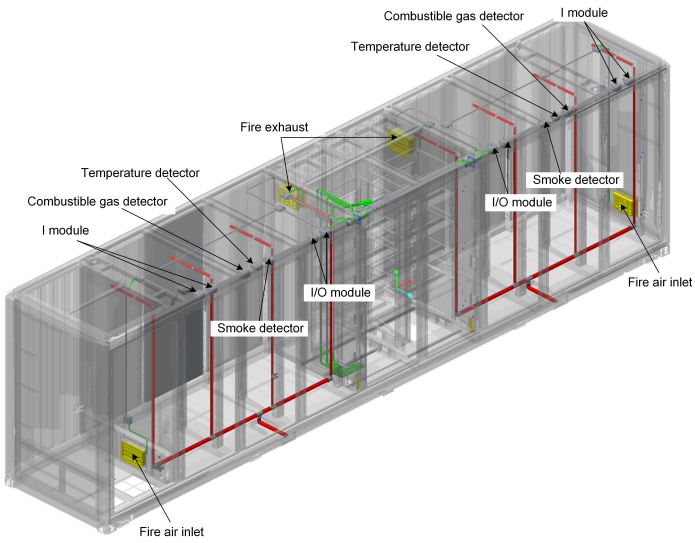
All fire-related components (combustible gas sensor, smoke sensor, temperature sensor, input and output modules, aerosol (if any)) in the BESS products sold by SUNGROW in the UL area meet UL standards. For other certification or to meet other fire protection requirements in the project location, please contact SUNGROW individually.

⚠ WARNING

If thermal runaway or a fire occurs inside the BESS, do not open the door of the PowerTitan. The cabinet door can only be opened by professionals after the professionals or firefighters confirm that the fire and potential hazards are eliminated on site.

8.2 Fire Suppression Equipment

The BESS has a water fire suppression system that can effectively extinguish the fire. It is equipped with combustible gas detectors, smoke detectors, and temperature detectors. If any abnormality is detected, the system sends a signal to the station-level alarm host through the BSP external terminal for early warning of fire.



8.3 Exhaust System

When the concentration of combustible gas is detected to reach 10% LEL, the combustible gas detector in the BESS sends a signal to the station-level alarm host for fire warning through the BSP external terminal, while the signal is transmitted to the EMS to shut down the BESS and turn on the exhaust system (start the air intake equipment and exhaust equipment).

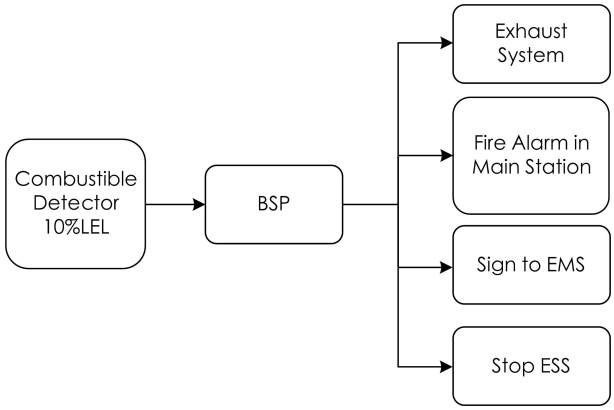


Figure 8-1 Control logic of water fire suppression system

8.4 Water Fire Suppression System

The BESS is equipped with a sprinkler system. In the event of thermal runaway, the sprinkler system can be automatically controlled by the station-level fire alarm system or manually intervened to suppress the fire.

The sprinkler system adopts upright nozzles to ensure that the water can be sprayed to all areas in the cabinet.

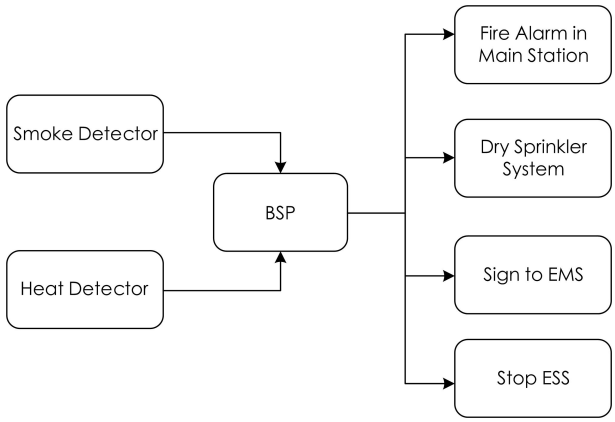


Figure 8-2 Control logic of water fire suppression system

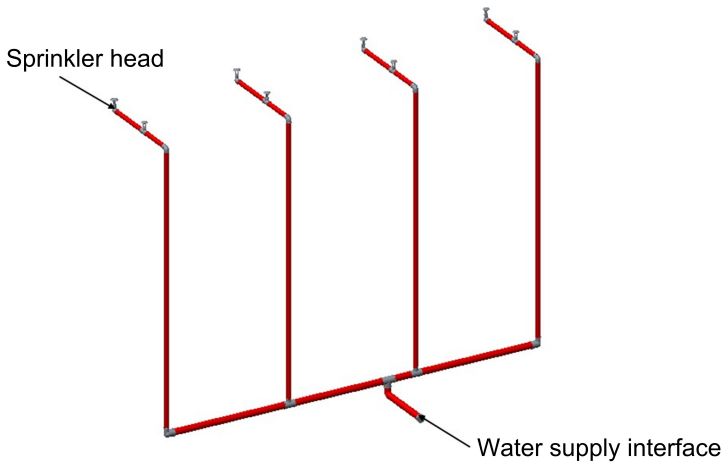


Figure 8-3 Piping of water fire suppression

9 Troubleshooting

When the BESS changes abnormally, it is recommended to conduct preliminary investigation through the faults and troubleshooting methods described in the following LC200 manual.

Link	QR code
LC200 User Manual	

If you still cannot solve the problem or still have questions with the help of the manual, please contact SUNGROW. It is recommended to provide the following information synchronously after powering on again:

- Models and serial numbers of the BESS and internal equipment
- Fault information and brief description
- If possible, provide photos of the fault site

10 Routine Maintenance

10.1 Precautions Before Maintenance

⚠ WARNING

Do not open the door to maintain the BESS in rainy, humid or windy days. SUNGROW shall not be held liable for any damage caused by violation of the notice.

⚠ WARNING

To avoid electric shock, do not perform any other maintenance operations beyond those described in this manual.
If necessary, contact Sungrow Customer Service for maintenance.

10.2 Item and Period for Container Maintenance

10.2.1 Maintenance (Every two years)

Item	Check method
System status and cleaning	Check the following items, and correct immediately those failing to meet the relevant requirements: • Check whether there is any damage or deformation of the container and internal devices. • Check if there is abnormal noise during operation of internal devices. • Check whether the temperature in the container is excessively high. • Check whether the humidity and the amount of dust inside the container are within the normal range. Clean the equipment if necessary. • Check whether the air inlet and outlet of the BESS are blocked.
Warning marks	Check whether the warning labels and marks are clearly visible and free of stains and damage. Replace them 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.

Item	Check method
Surge protection device and fuse	Check whether the SPD and fuse are properly fastened.
Corrosion	Check whether there is oxidation or rust inside the container.

10.2.2 Maintenance (Once a year)

Item	Check method
Outside the container	Check the following items, and correct immediately those failing to meet relevant requirements: • Check whether there are flammable objects on the top of the container. • Check whether the welding points between the container and the foundation steel plate are firm and whether there is corrosion. • Check whether there is any damage, flaking paint or sign of oxidization on the enclosure. • Check whether the lock of the cabinet door can be unlocked flexibly. • Check whether the sealing strip is fixed properly.
Inside the container	Check whether there are foreign objects, dust, dirt, and condensed water inside the integrated energy storage system.
Air inlet and outlet	Check the temperature of the radiator and the amount of dust accumulated. Clean heat-dissipation modules with a vacuum cleaner if necessary.
Wiring and cable layout	Completely power off the devices inside the BESS before checking. For any non-conformances found during inspection, correct them immediately. • Check whether the cable layout is normal and whether there is a short circuit. For any non-conformances found during inspection, correct them immediately. • Check whether all cable entry are well sealed. • Check whether there is water seepage inside the BESS. • Check whether the power cables are loose, and fasten them again by the torque specified previously. • Check whether the power cables and control cables are damaged, especially if the surface contacting the metal surface is cut. • Check whether the insulation tapes on the power cable terminals fall off.

Item	Check method
Ground connection and equipotential connection	• Check whether the ground connection is correct and the grounding resistance shall be no more than 4Ω. • Check whether the equipotential connection inside the integrated BESS is correct.
Fan	• Check the running status of fans. • Check whether fans are blocked. • Check if there is abnormal noise during operation of the fans.
Screw	Check whether internal screws fall off.

10.2.3 Maintenance (Every half a year to once a year)

Item	Check method
Safety function	• Check whether the shutdown key on the touchscreen and the emergency stop button work normally. • Simulate shutdown. • Check the warning marks and other device marks, and replace them timely when they are fuzzy or damaged.
Software maintenance	Check the settable parameters on the Web.
Internal components inspection	• Check the cleanness of the circuit board and other elements and components. • Check the temperature of the radiator and the amount of dust accumulated. Clean heat-dissipation modules with a vacuum cleaner if necessary. • Replace the air filter screen when necessary. **Note!** It is necessary to check ventilation of the air inlet. Otherwise, fault may occur due to overheating if the module cannot be cooled effectively.
Device maintenance	• Carry out regular inspection for corrosion of all metal components (once per half a year). • Check the contactors (auxiliary switches and micro-switches) annually to ensure the good mechanical operation. • Check the running parameters (especially voltage and insulation).

10.3 Maintenance of Liquid Cooling System

The following provides the recommended maintenance periods. The actual maintenance period shall be adjusted reasonably in consideration of the specific installation environment of the product.

Factors like the power plant scale, the location, and the site environment can affect the maintenance period of the product. It is necessary to shorten the maintenance period and increase the maintenance frequency in the event of heavy sandstorm or dust in the operation environment.

Item	Content	Check method	Maintena-nce tools
Fan	Check whether the fan blades cannot rotate or are damaged. If so, replace the fan.	1. The fan blade rotates smoothly without abnormal noise; 2. No damage to fan blade. Note: Check this item at least half a year. Blade damage inspection is not mandatory.	Screwdriver with long handle
Water pump	1. Check whether over 5% of the cooling air inlet hole of the water pump is blocked. If so, clear it with a brush; 2. Visually inspect the pump body (not the joint parts) and check whether there is obvious water dripping (except condensate). If so, replace the sealing ring of the pump.	1. The water pump runs smoothly without abnormal noise; 2. There is no obvious dripping on the pump body (except condensate).	Brush
Water system	Check the high and low pressure of the water system through HMI. The high pressure should be 2.8bar and the low pressure should be 0.2 bar. 1. If the high pressure is higher than 2.8bar, check whether the filter of the water system is dirty and blocked; 2. If the low pressure is lower than 0.4 bar, replenish the water in the system.	High pressure < 2.8bar; Low pressure > 0.4 bar	Slotted screwdriver, Phillips screwdriver, water pump, water pipe, clamp.

⚠ WARNING

If the BESS has a "communication failure or failure of the liquid-cooled unit", please contact the after-sales service personnel in time to ensure the functional integrity of the system.

10.4 Maintenance of DC/DC

⚠ WARNING

Risk of inverter damage or personal injury due to incorrect service!
Before any maintenance operation, the following steps must be followed:

- Wait at least 5 minutes for inner capacitors to discharge completely before performing internal maintenance or troubleshooting.
- Test the product with a tester to make sure that there is no voltage or current.

⚠ CAUTION

A temporary warning sign or barrier must be posted to keep non-related persons away while performing electrical connection and service work.

⚠ WARNING

When disassembling and maintaining the DC/DC, first remove the cable fixing parts under the DC/DC to ensure that the cables are squeezed during disassembly and maintenance.

NOTICE

Reboot the converter only after all faults that may affect the safety performance of the converter are cleared.
The converter does not contain any part that require maintenance. Do not change the internal components of the converter unless you are authorized to do so.
Please contact Sungrow Customer Service for maintenance service. Otherwise SUNGROW shall not provide any warranty or be held liable for any losses due to such negligence.
Touching the PCB or other static sensitive components may cause damage to the device.

- Do not touch the circuit board unnecessarily.
- Observe the regulations to protect against electrostatic and wear an anti-static wrist strap.

Regular Maintenance and Maintenance Period

Check item	Check method	Maintenance Period
System cleaning	Check whether the air outlet and heat sink are blocked by dust and other objects. Clean the air outlet and the heat sink if necessary.	Once per six months to a year (depending on the amount of dust in the working environment)
Cable inlet hole	Check whether the cable inlet hole of the device is fully sealed. If not, fill the crack with fireproof and waterproof materials.	Once a year
Electrical connecti-on	Check whether cables are loose or fall off. Check whether the cable is damaged, especially the part in contact with the metal enclosure.	Once per six months to a year

10.5 Cabinet Maintenance

10.5.1 Cleaning Enclosure

If there is rust on the outer surface of the BESS, clear it with abrasive paper or brush.
Clean the outer surfaces of the BESS with a mop or large cleaning cloth in the event of heavy dust thereon.
Clean the top and then the sides. Wash it directly, or wash and flush with water simultaneously.

10.5.2 Checking Door Locks and Hinges

Check whether the door locks and hinges of the inverter can be used normally after cleaning. Lubricate the door lock holes and hinges properly when necessary.

10.5.3 Checking Sealing Strips

If the sealing strip is in good condition, it can effectively prevent water seepage inside the container. Therefore, carefully check the sealing strip and replace it immediately if there is any damage.

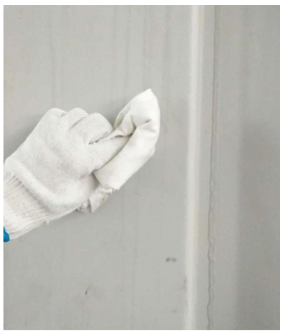
10.5.4 Paint Repair

Inspect the appearance of the box:
Case 1: Dirt on surface caused by water spots and dusts can be cleaned.
Case 2: Surface dirt and damaged finish, which cannot be cleaned.
Case 3: Primer is damaged, and the base material is exposed.

Maintenance steps for Case I:

Material:

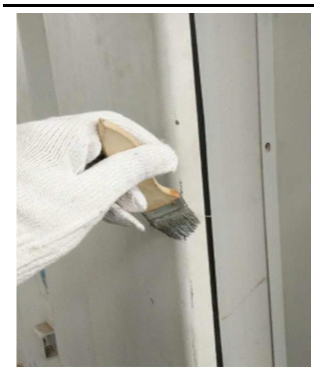
- Cleaning cloth
- Water
- Alcohol or other non-corrosive detergent

Graphics	Step
	1. Wet the cleaning cloth (or other scrubbing tools) with water, and scrub the dirty parts on surface.
	2. If the dirt cannot be cleaned with water, scrub with 97% alcohol till the surface is acceptable. (Or try to use non-corrosive detergents that are generally used locally)

Maintenance steps for Case II:

Material:

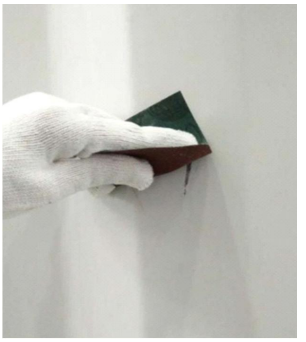
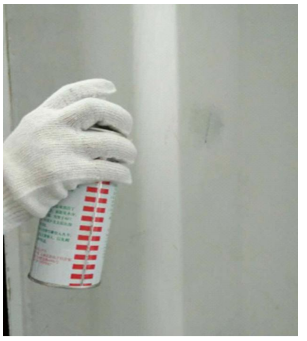
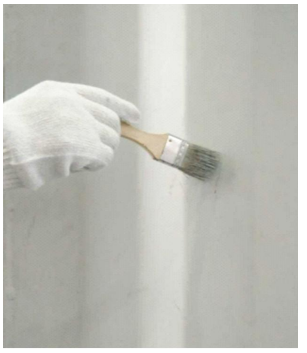
- Abrasive paper
- Cleaning cloth
- Water
- Alcohol
- Brush
- Oil paint

Graphics	Step
	1. Polish the paint surface with blistering or scratches with an abrasive paper for a smooth surface.
	2. Wet the cleaning cloth with water or 97% alcohol, and scrub the damaged parts to remove surface stains.
	3. Perform paint repair for the scratched parts with a soft brush after the surface is dried; Brush the paint as uniform as possible.

Maintenance steps for Case III:

Material:

- Abrasive paper
- Cleaning cloth
- Water
- Alcohol
- Zinc primer
- Brush
- Oil paint

Graphics	Step
	1. Polish the damaged parts with an abrasive paper to remove rust and other burrs for a smooth surface
	2. Wet the cleaning cloth with water or 97% alcohol, and scrub the damaged parts to remove surface stains and dust.
	3. Spray the parts with base material exposed with zinc primer for protection after drying of the surface. Ensure to cover the bare base material completely.
	4. Perform paint repair for the damaged parts with soft brush after the primer is dried, and brush the paint uniformly.

Check whether the protective paint sprayed on casing of the integrated BESS fell off or peeled off; if so, repair it timely.

Spray a special protective paint to the exterior of the integrated BESS every 5 years.

10.6 Battery Maintenance

10.6.1 Regular Maintenance and Maintenance Period

The following provides the recommended maintenance periods. The actual maintenance period shall be adjusted reasonably in consideration of the specific installation environment of the product.

Factors like the power plant scale, the location, and the site environment can affect the maintenance period of the product. It is necessary to shorten the maintenance period and increase the maintenance frequency in the event of heavy sandstorm or dust in the operation environment.

Maintenance Once Every Two Years

Check item	Check method
RACK status and cleaning	Check the following items, and correct immediately those failing to meet relevant requirements: • Check whether there is any damage or deformation of the RACK and internal devices. • Check if there is abnormal noise during operation of internal devices. • Check whether the temperature in the RACK is excessively high. • Check whether the humidity and the amount of dust inside the RACK are within the normal range. Clean the equipment if necessary. • Check whether the air inlet and outlet of the RACK are blocked.
Warning marks	Check whether the warning labels and marks are clearly visible and free of stains and damage. Replace them if necessary.
Wiring and cables	Check the switch gear and the battery module, and whether the battery modules are connected correctly.
Corrosion	Check whether there is oxidation or rust inside the RACK.

Maintenance Once A Year

Check item	Check method
Switch gear and the enclosure of the battery module	Check the following items, and correct immediately those failing to meet relevant requirements: • Check whether there are flammable objects on the top of the RACK. • Check whether the welding between the RACK and the foundation steel plate is firm and whether there is rust at the welding points. • Check whether there is any damage, flaking paint or sign of oxidization on the enclosure. • Check whether there are foreign objects, dust, dirt, and condensed water inside the RACK.
Wiring and cable layout	Completely power off the devices inside the RACK before checking. For any non-conformances found during inspection, correct them immediately. • Check whether the cable layout is normal and whether there is a short circuit. For any non-conformances found during inspection, correct them immediately. • Check whether all inlet and outlet holes are well sealed. • Check whether there is water seepage inside the RACK. • Check whether the power cables and the copper bar are loose, and fasten them again by the torque specified previously. • Check whether the power cables and communication cables are damaged, especially the part in contact with the metal enclosure.
Ground connection	Check whether the ground connection is correct and the grounding resistance shall be no more than 4Ω.
Fan	• Check the fan for faults, such as stalling or stopping. • Check whether there is abnormal noise during operation of the fans.
Screw	Check whether the internal screws fell off or corroded.

Maintenance Every Six Months to A Year

Check item	Check method
Ambient temperature and humidity	• Check the ambient temperature record and check whether the temperature is within the allowable range. • Check the ambient humidity record and check whether the humidity is within the allowable range.
Functions	• Check the working status of the DC contactor: In the case of shutdown, issue an open/close command to check whether the contactor is normal. • Measure whether the 24V output voltage is within the specified range. • Check the operation record of the RACK and check whether the current, voltage and temperature are within the allowable range.

10.6.2 Maintenance Notices

For safe and effective maintenance of the system, maintenance personnel are requested to carefully read and observe the following safety requirements.

1 Hold an electrician's license issued by the Safety Supervision Bureau and pass the professional training before starting work.

2 Observe related safety precautions, use necessary tools, and wear personal protective equipment.

3 It is strictly forbidden to wear jewelry or metal accessories such as watches.

4 It is strictly forbidden to touch the HV positive and negative poles of the BESS with both hands at the same time.

5 Disconnect all HV and LV switches before maintaining the BESS.

6 It is strictly forbidden to clean the BESS with water directly. Use a vacuum cleaner if necessary.

7 Do not use brute force or violence when plugging or unplugging cables.

8 Clean up tools and materials after maintenance and check if there are any metal objects left inside or on top of the equipment.

9 If there is any question about the operation and maintenance of the equipment, please contact Sungrow Customer Service. It is strictly forbidden to operate the equipment arbitrarily.

10.6.3 Device Maintenance

1 Recommended ambient temperature during usage: 0℃ ~45℃. During battery charging and discharging, the temperature should be kept between 15 ℃ and 30 ℃, and 25 ℃ is a recommended value.

2 Avoid charging and discharging RACK at high rate, and the continuous charging and discharging current of a single RACK should not exceed 151A.

3 When the BESS is left unused for a long time, the system shall be charged and discharged once every 6 months to make the SOC of the system between 50% and 80%. And the SOC shall be consistent after charging.

4 If the system is not used for a long time, fully charge it at least once before using it for the first time to restore the battery performance to optimum condition.

5 Check whether the air duct of the heat dissipation system is blocked. Clean the system regularly, especially the air intake and exhaust vents of the fans. Use a vacuum cleaner if necessary to ensure that air can freely circulate in the cabinet. It is necessary to disconnect the power supply before cleaning the dust; Cleaning with water is strictly prohibited.

6 Regularly check whether the bolts connecting the HV cables and connection bars of the BESS are loose, whether they are in good contact, and whether the terminal surfaces are corroded or oxidized.

7 Regularly check the positive and negative HV protective covers of the PACK for aging, damage and missing.

8 Regularly check whether cables are loose, aging, damaged and broken, and whether the insulation is good.

9 Regularly check whether there is irritating smell in the battery cabinet and whether there is burning smell in the HV connection part.

10 Regularly check whether the data such as voltage and temperature are normal on the monitoring host computer, and whether there is any alarm in the alarm bar.

11 Regularly check whether the status indicator and the alarm indicator of BESS are in good condition and can work normally.

12 Regularly check whether the emergency stop switch of the BESS still works to ensure that the system can be quickly stopped in an emergency.

13 Regularly check whether the fire suppression devices are in good condition and whether they are within the validity period.

14 It is forbidden to use different types of battery modules in series or parallel.

WARNING

- The battery is potentially hazardous. Take proper precautions when operating and maintaining it.
- Improper operation may result in serious personal injury and property damage!
- The battery must be operated with proper tools and protective equipment.
- The battery can only be maintained by personnel with battery expertise and safety training experience.

10.7 Coolant Replacement

Object	Standard	Period	Tools
Coolant	1. There are obvious impurities in antifreeze; 2. Antifreeze turns from pink to dark red.	5-6 years	Water pump, hose, hose clamp, slotted screwdriver Note: Please contact Sungrow Customer Service to replace hardware facilities

11 Appendix

11.1 System Parameters

Table 11-1 ST2752UX-US/ST2695UX-US

Parameter	ST2752UX-US	ST2695UX-US
Battery Data		
Cell type	LFP	
Battery capacity (BOL)	2752 kWh	2695 kWh
System output voltage range	1160 ~ 1500 V	1160 ~ 1500 V
General Data		
Dimensions of battery unit (W * H * D)	9340*2600*1730mm	
Weight of battery unit	26,400 kg	26,000 kg
Degree of protection	IP 54/Type 3R	
Operating temperature range	-30 to 50℃ (> 45℃ derating)	
Relative humidity	0 ~ 95 % (non-condensing)	
Max. working altitude	3000m	
Cooling concept of battery chamber	Liquid cooling	
Fire safety standard/ Optional	Deluge sprinker heads (standard), Fused sprinkler heads (optional),NFPA69 explosion prevention and ventillation IDLH gases(optional)	
Communication interfaces	RS485, Ethernet	
Communication protocols	Modbus RTU, Modbus TCP	
Compliance	UL9540,UL9540A/NFPA 855	

Table 11-2 ST2637UX-US/ST2580UX-US

Parameter	ST2637UX-US	ST2580UX-US
Battery Data		
Cell type	LFP	
Battery capacity (BOL)	2637 kWh	2580 kWh
System output voltage range	1160 ~ 1500 V	1160 ~ 1500 V
General Data		
Dimensions of battery unit (W * H * D)	9340*2600*1730mm	
Weight of battery unit	25,600 kg	25,200 kg
Degree of protection	IP 54/Type 3R	
Operating temperature range	-30 to 50℃ (> 45℃ derating)	
Relative humidity	0 ~ 95 % (non-condensing)	
Max. working altitude	3000m	
Cooling concept of battery chamber	Liquid cooling	
Fire safety standard/ Optional	Deluge sprinker heads (standard), Fused sprinkler heads (optional),NFPA69 explosion prevention and ventillation IDLH gases(optional)	
Communication interfaces	RS485, Ethernet	
Communication protocols	Modbus RTU, Modbus TCP	
Compliance	UL9540,UL9540A/NFPA 855	

Table 11-3 ST2523UX-US/ST2465UX-US

Parameter	ST2523UX-US	ST2465UX-US
Battery Data		
Cell type	LFP	
Battery capacity (BOL)	2523 kWh	2465 kWh
System output voltage range	1160 ~ 1500 V	1160 ~ 1500 V

Parameter	ST2523UX-US	ST2465UX-US
General Data		
Dimensions of battery unit (W * H * D)	9340*2600*1730mm	
Weight of battery unit	24,800 kg	24,400 kg
Degree of protection	IP 54/Type 3R	
Operating temperature range	-30 to 50℃ (> 45℃ derating)	
Relative humidity	0 ~ 95 % (non-condensing)	
Max. working altitude	3000m	
Cooling concept of battery chamber	Liquid cooling	
Fire safety standard/ Optional	Deluge sprinker heads (standard), Fused sprinkler heads (optional),NFPA69 explosion prevention and ventillation IDLH gases(optional)	
Communication interfaces	RS485, Ethernet	
Communication protocols	Modbus RTU, Modbus TCP	
Compliance	UL9540,UL9540A/NFPA 855	

Table 11-4 ST2408UX-US/ST2351UX-US

Parameter	ST2408UX-US	ST2351UX-US
Battery Data		
Cell type	LFP	
Battery capacity (BOL)	2408 kWh	2351 kWh
System output voltage range	1160 ~ 1500 V	1160 ~ 1500 V
General Data		
Dimensions of battery unit (W * H * D)	9340*2600*1730mm	
Weight of battery unit	24,000 kg	23,600 kg
Degree of protection	IP 54/Type 3R	

Parameter	ST2408UX-US	ST2351UX-US
Operating temperature range	-30 to 50℃ (> 45℃ derating)	
Relative humidity	0 ~ 95 % (non-condensing)	
Max. working altitude	3000m	
Cooling concept of battery chamber	Liquid cooling	
Fire safety standard/ Optional	Deluge sprinker heads (standard), Fused sprinkler heads (optional),NFPA69 explosion prevention and ventillation IDLH gases(optional)	
Communication interfaces	RS485, Ethernet	
Communication protocols	Modbus RTU, Modbus TCP	
Compliance	UL9540,UL9540A/NFPA 855	

Table 11-5 ST2293UX-US

Parameter	ST2293UX-US
Battery Data	
Cell type	LFP
Battery capacity (BOL)	2293 kWh
System output voltage range	1160 ~ 1500 V
General Data	
Dimensions of battery unit (W * H * D)	9340*2600*1730mm
Weight of battery unit	23,200 kg
Degree of protection	IP 54/Type 3R
Operating temperature range	-30 to 50℃ (> 45℃ derating)
Relative humidity	0 ~ 95 % (non-condensing)
Max. working altitude	3000m
Cooling concept of battery chamber	Liquid cooling

Parameter	ST2293UX-US
Fire safety standard/ Optional	Deluge sprinker heads (standard), Fused sprinkler heads (optional),NFPA69 explosion prevention and ventillation IDLH gases(optional)
Communication interfaces	RS485, Ethernet
Communication protocols	Modbus RTU, Modbus TCP
Compliance	UL9540,UL9540A/NFPA 855

11.2 Tightening Torque

To prevent the copper crimp terminals from being loosened by the force, thus causing poor contact, and to avoid heat or even fire due to increased contact resistance, ensure that the following torque requirements are met when fastening the screws of the copper crimp terminals.

Screw	Torque (N · m)	Screw	Torque (N · m)
M3	0.7 ~ 1	M8	18 ~ 23
M4	1.8 ~ 2.4	M10	34 ~ 40
M5	4 ~ 4.8	M12	60 ~ 70
M6	7 ~ 8	M16	119 ~ 140

To reduce the stress on the copper crimp terminal, fix the cable at an appropriate position.

11.3 Quality Assurance

When any product fault occurs during the warranty period, Sungrow Power Supply Co., Ltd. (Hereinafter refer to as Company) will maintain or replace the product for free.

Evidence

During Company's warranty period, the custom shall provide the product purchase invoice and date. Meanwhile the trademark should be clearly legible. Otherwise Company has the right to exclude liability claims.

Conditions

- After replacement, unqualified products shall be processed by the Company.
- The customer shall give the Company a reasonable period to repair the faulty device.

Exclusion of Liability

In the following circumstances, the Company has the right to refuse to honor the quality guarantee:

- If the free warranty periods for the whole machine/components have expired.

- The equipment is damaged during transportation.
- If the device was incorrectly installed, refitted, or used.
- The equipment operates under harsh conditions beyond those described in this document.
- If the fault or damage was caused by installation, repairs, modification, or disassembly performed by a service provider or personnel other than this Company.
- If the equipment is installed and used beyond stipulations of relevant international standards.
- If the damage was caused by an abnormal natural environment.

If the customer requires maintenance of faulty products in any of above cases, the paid maintenance service may be provided following the judgment of the Company's service institution.

If the size and parameters of the product are changed, the latest information of the Company will prevail without notice.

11.4 Contact Information

If you have any questions about this product, please reach out to us. In order to be more responsive and provide you with better service, please offer the following information:

- Device model
- Device SN
- Fault code/name
- Brief description of fault phenomenon

HQ Tel: 0551 - 6532 7878 / 0551 - 6532 7877

For more contact information, see **https://www. sungrowpower. com/headquarter. html**.