

System Manual

Battery Energy Storage System

PowerTitan-ST2752UX



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About This Manual

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

Target Group

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

The battery container 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.

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.

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.sungrow-power.com** or sales channels.

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

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.

ACAUTION

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	
A	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.	
8	No fire.	

Marks	Explanation	
+	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.	
\bigcirc	It is required to wear goggles.	
	This sign indicates that the noise is harmful, please wear earplugs.	

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1 Safety Precautions

1.1 Personnel Requirements

The hoisting, transportation, installation, wiring, operation, and maintenance of the battery container 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 battery container 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

A 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 battery.

DANGER

Electricity may still exist in the battery when the power supply of the battery container 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.

A 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 battery container to prevent accidents caused by false switching.
- Place necessary warning signs or barriers near the product.

1.3 Battery Safety

A WARNING

Do not leave the product in a low voltage or low SOC (State Of Charge) condition for a long period of time. Loss of capacity due to the following conditions is not covered by the warranty.

- Battery discharge cell voltage is below 2.7V for 120 consecutive hours.
- Any cell cluster SOC is 0% for 120 consecutive hours.
- Battery discharge cell voltage ≤2V.

A WARNING

Over or under voltage fault & alarm (detailed information can be found in the "Communication protocol \rightarrow BSC200 Info-3x table \rightarrow CMU (Battery Cluster Management Unit) fault word and CMU alarm word").

- Fault: "Cell over voltage fault", "Cell under voltage fault", "Total over voltage fault", "Total under voltage fault".
- Alarm: "Cell over voltage alarm", "Cell under voltage alarm", "Total over voltage alarm", "Total under voltage alarm".

End users must assign a high priority to above listed faults and alarms reported by the SUNGROW LC (Local Controller). When an alarm or fault is triggered, the user interface should prominently highlight these issues. Furthermore, end users should promptly contact SUNGROW for timely resolution to prevent battery warranty loss due to over-discharge or overcharge.

NOTICE

- In order to avoid triggering the warranty expiration condition, when the "Cell Under-voltage Fault" or "Cell Over-voltage Fault" is triggered, the user must contact the local team of SUNGROW within 24 hours and follow the requirements of SUNGROW to carry out the next operation.
- If the system is configured with the "Active power up" function, When the battery container minimum rack SOC reaches the threshold for this function (the threshold can be set from 0 to the lower SOC protection value, and the threshold does not exceed 5% SOC), the system will charge the battery with low power until the SOC reaches a safe threshold (5% SOC) automatically, The recharging power can be set within the range of 100 kW to 150 kW. During Active power up, when the EMS (Energy Management System) issues a charging instruction, the LC controller will prioritize the EMS charging instruction. When the EMS issues a discharging instruction, the LC controller will respond according to the specific system SOC value. SUNGROW will enable this function by default when the device is shipped from the factory, In order to minimize the risk of undervoltage of the battery that may void the warranty, SUNGROW recommends that users do not turn off the "Active power up" function.

NOTICE

- If the system will not be in operation for an extended period (7 days or more), it's recommended to increase the SOC lower limit protection value to above 10% SOC. Additionally, it is important to regularly monitor the system's SOC to avoid the risk of over discharge which will cause warranty expiration.
- During maintenance or shutdown, if the SOC of any battery cluster is 0%, the SOC needs to be charged to 15% and above within 120 hours.
- If the SOC of any battery cluster is 0% during operation, the SOC needs to be charged to 5% and above within 2 hours. Or when the SOC reaches 0%, a command can be issued by the host computer EMS to change the system mode to recharge mode.

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

- Batteries are not charged as required, thus resulting in battery capacity loss or irreversible damage.
- Batteries are damaged or dropped, or have leaked, due to improper operations or failure to perform operations as required.
- Batteries are damaged due to overdischarge as they have not been powered on in time.
- Batteries are damaged due to the use of improper equipment for charging and discharging.
- Batteries are frequently overdischarged due to improper maintenance; battery capacity is incorrectly expanded; or batteries have not been fully charged for a long time.
- Battery operation parameters are not correctly set.
- Batteries are damaged because their operating environment does not meet the requirements.
- The customer uses the batteries beyond the scenarios specified in this manual, including but not limited to, connecting extra loads.
- Batteries are not maintained in compliance with the requirements specified in the system manual.
- The product is damaged due to the customer's continued use of batteries beyond the warranty period.
- The product is damaged due to the use of defective or deformed batteries.
- Use the batteries provided by SUNGROW together with other batteries, including but not limited to batteries of other brands or batteries of different rated capacities.
- Product damage or property loss are caused due to storing or installing batteries together with flammable/explosive materials.

- Personal safety accidents and property loss are caused by battery-related operations performed by non-qualified personnel, or by personnel not wearing qualified protective equipment during operations.
- Batteries are damaged due to improper behaviors, such as eating, drinking, and smoking near the battery.

1.4 Hoisting and Transportation

WARNING

When walking on the top of the equipment, be sure to follow the standard procedure for working at heights.

1.5 Installation and Wiring

A WARNING

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

A WARNING

Only equipment designated by SUNGROW can be used. Failure to use equipment designated by SUNGROW may cause damage to the protection function and injury to personnel.

1.6 Operation and Maintenance

A DANGER

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

WARNING

Personal protective equipment is required for maintenance and service of the battery container.

Maintenance personnel must wear protective equipment such goggles, helmets, insulated shoes, gloves, etc.

A 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.

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.

A WARNING

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

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.

1.7 Personal Protective Equipment

When performing installation, maintenance, and other operations on the equipment, wear personal protective equipment (PPE) that meets the following requirements. Arc-rated clothing and equipment with an arc rating equal to or greater than the determined incident energy[®].

- Arc-rated long-sleeve shirt and arc-rated pants or arc-rated coverall or arcflash suit.0
- Arc-rated face shield and arc-rated balaclava or arc-rated flash suit hood.[®]
- Arc-rated jacket, parka, or rainwear.

Other PPE

- Hard hat
- Arc-rated hard hat liner
- Safety glasses or safety goggles
- Hearing protection
- Heavy-duty leather gloves or rubber insulating gloves with leather protectors[®]
- Leather footwear

Ť.

① Arc ratings can be for a single layer, such as an arc-rated shirt and pants or a coverall, or for an arc flash suit or a multi-layer system consisting of a combination of arc-rated shirt and pants, coverall, and arc flash suit.

② Face shields with a wrap-around guarding to protect the face, chin, forehead, ears, and neck area. For full head and neck protection, use a balaclava or an arc flash hood.

③ Rubber insulating gloves with leather protectors provide arc flash protection in addition to shock protection. Higher class rubber insulating gloves with leather protectors, due to their increased material thickness, provide increased arc flash protection.

1.8 Product Disposal

When the equipment or its internal components reach end-of-life, do not dispose of it together with household wastes. Some components inside the equipment can be recycled, while some may pollute the environment.

Contact an authorized local facility for collection.



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.

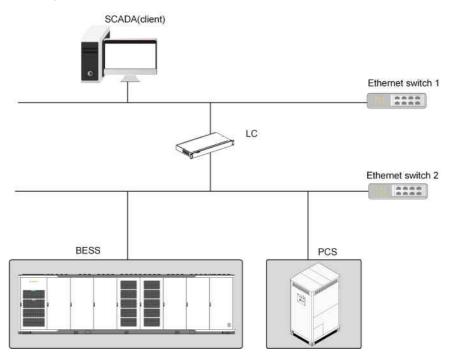


figure 2-1 System networking diagram

*The above pictures are for reference only, please refer to the actual product received!

2.2 External Design

2.2.1 Container Appearance

The appearance of BESS is shown in the following figure:

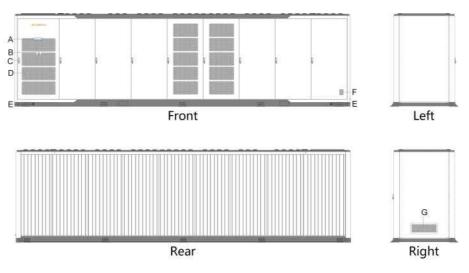


figure 2-2 Appearance

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

No.	Name	
А	LED indicator	
В	Emergency stop button	
С	Door lock	
D	Air inlet	
Е	Grounding point	
F	Nameplate	
G	Air inlet for fire suppression system	

LED Indicator

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

table 2-1 Indicator status

Status		Description	
	Standyon	The system works normally	
	Steady on	(charge and discharge)	
000000	2S periodic slow blinking	-	
	(Breathing light)	The system is normal, no charg-	
		ing and discharging.	

Status		Description
	Steady on	A fault occurs (auxiliary circuit
		breaker does not trip)
000000	Off	Auxiliary circuit breaker trips

Emergency Stop Button

In the case of an emergency, press the emergency stop button on the BESS, and the system will stop running immediately.

DANGER

After the emergency stop button is pressed, the auxiliary AC power supply of the BESS will still carry voltage. Do not touch it!

2.2.2 Mechanical Parameters

Dimensions

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

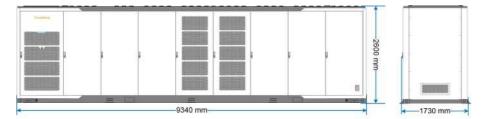


figure 2-3 Dimensions of BESS

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

The clearance space

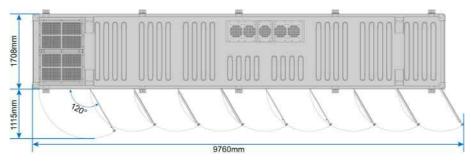


figure 2-4 The diagram of the required space when the door is opened

*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.

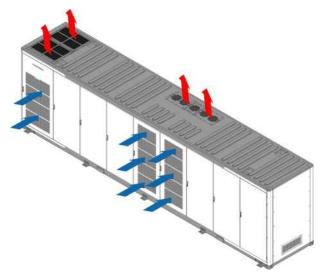


figure 2-5 Schematic diagram of ventilation

*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.

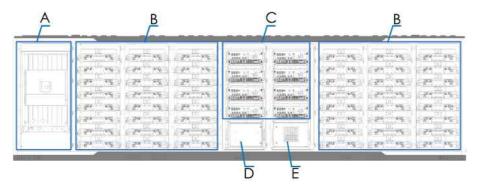


figure 2-6 BESS internal equipment

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

No.	Name
A	LCS
В	Rack
С	DC/DC

No.	Name
D	BSP
E	BCP

2.3.2 DC/DC

Product Appearance

The DC/DC is shown in the figure below.

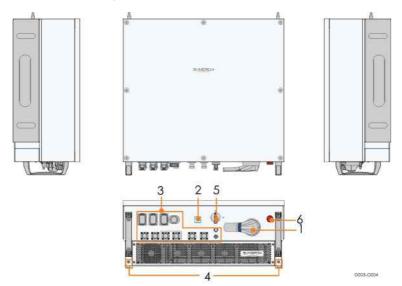


figure 2-7 Product appearance

* 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 battery.
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 power supply electrical connection of the DC/DC.
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.

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

table 2-2 LED indicator status description

2.3.3 Battery Introduction

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 PV side to the supporting power conversion system (PCS) to form energy storage systems(ESS) and store and release electric energy.

2.3.3.1 Cell

table 2-3 Cell parameters

Cell	Parameter	Value
	Size (thickness *	(71.7 ± 0.8) mm * (207.2 ± 0.8)
Na l	height * width)	mm * (173.9 ± 0.8) mm
	Weight	(5.34 ± 0.2) kg
Ý	Rated capacity	280 Ah
	Rated energy	896 Wh
	Rated voltage	3.2 V

Cell	Parameter	Value
		2.5 V∼ 3.65 V (Cell temperature T>0°C)
	Voltage range	2.0 V~ 3.65 V (Cell temperature T≤0°C)

2.3.3.2 LFP (Lithium Iron Phosphate) Battery Module

The LFP battery module is mainly composed of cells in series. 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	P573-111 / P573B-111		
	Size (W*H*D (Without	(868 ± 5 mm) * (247 ± 5 mm) *		
	terminals, spigots))	(1415 ± 5 mm)		
	Multiplying power	≤0.5C		
//6/	Cell type	Prismatic aluminum shell LFP		
	Combination	1P64S		
A CONTRACTOR	Kov componente	64 cells, 1 BMU (Battery Manage-		
4.0.4	Key components	ment Unit) and 1 fuse		
	Weight	(395±12) kg		
	Ingress protection	IP65		

2.3.3.3 Battery Cluster

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

Modole	Stacking	metho	d						
	17		00000000						
	1	FACK	РАСК	PACK	Dene	DOPO	FACE	PACK	PACK
		FACE	PACK	PACK	DC/DC	DC/DC	PACK	PACK	PACK
		PACE	PACK	PACK	DC/DC	DC/DC	PACE	PACK	PACK
	LCS	FACK	PACK	PACK	DC/DC	DC/DC	FACE	PACH	PACK
ST2752UX	1.45635.0	FACK	Раск	PACK	Dorbo	00.00	PACK	PACK	PACK
		PACK	PACK	PACK	DC/DC	DC/DC	PACK	PACK	PACK
		FACK	PACK.	PACK.	250	12:22	PACK	PACK	PACK
	1	PACK	PACK	PACK	63#	BCP	PACK	PMDK.	PWDK
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	(T				12000		- Combond	-	
	1	FACK	PACK	PACK	DC/DC	DC/DC	FACK	PACK	PACK
		FACK	PACK.	PACK	Durbhe	0000	PACK	PACK	PACK
		PAGE	PACK	PACK	DC/DC	DC/DC	PACE	PACK	PACK
	LCB	FACK	PACK	PACK	DC/DC	DC/DC	FACE	PACK	PACK
ST2695UX	1000-101	FACK	PACK	PACK			PACK	PACK	PACK
		PACK	PAGK.	PACK	DC/DC	DC/DC	PACK	PACK	PACK
		PACK	PACK	PACK	65#	BCP	PACK	PACK	PACK
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	-							_	
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		FACE	PACK PACK	PACK PACK	DC/DC	DC/DC	PACK PACK	PACK	PACK
		PAGE	PACK	PACK	DC/DC	DC/DC	PACE	PALK	Pauk
	LCS	FACK	PACK	PACK	DC/DC	0000	FACE	PACK	PACK
ST2637UX	1992	FACK	PACK	PACK	DO/DG	DC/DC	PACK	PACK	PACK
		PACK	PACK	PACK	DC/DC	DC/DC	PACK .		PACK
		FACK	PACK	PACK		1	PACK	PACK	PACK
	-	11.221421	11.3327	2422,7752	63#	BCP		242231	33277.0-1
		PACK	PACK	PACK		1257	PACK	PADK	
	ALC: NO.	PACK	PACK	PACK		1/25	PACK	PACK	
	O (HPID8	PAGE	PACK	PACK			PACK	PMCH	*1991
							FR		
		PACK	РАСК	PACK	DC/DC	DC/DC	FACE	Риск	РАСК
					DC/DC DC/DC	DC/DC	PACK PACK	PACK PACK	Раск Раск
		PACK FACK	Риск	PACK PACK	DC/DC	DC/DC	FACE	Риск	РАСК
ST2580UX		PACK FACK PACK	PACK PACK PACK	PACK PACK PACK	DC/DC DC/DC	DC/DC DC/DC	PACK PACK	Раск Раск Раск Раск	PACK PACK PACK
ST2580UX		PACK PACK PACK PACK	РАСК РАСК РАСК РАСК	PACK PACK PACK PACK PACK	DC/DC	DC/DC	PACK PACK PACK	Риск. Риск. Риск. Риск. Риск.	PACK PACK PACK PACK
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ST2580UX		PACK FACK PACK PACK PACK	РАСК РАСК РАСК РАСК РАСК РАСК РАСК	PACK PACK PACK PACK PACK PACK	DC/DC DC/DC	DC/DC DC/DC	PACK PACK PACK PACK PACK PACK PACK	PACK PACK PACK PACK PACK PACK	Раск Раск Раск Раск Раск Раск
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table 2-5 Batter	/ cluster stacking method

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

3 Transport and Storage

3.1 Precautions

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

3.2 Transport Methods

The battery container can be transported by road and sea. The battery container is highly integrated and easy to hoist, which facilitates its transport.

The battery container 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.

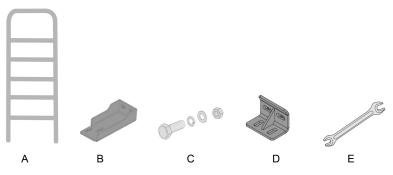
NOTICE

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

Tool Preparation

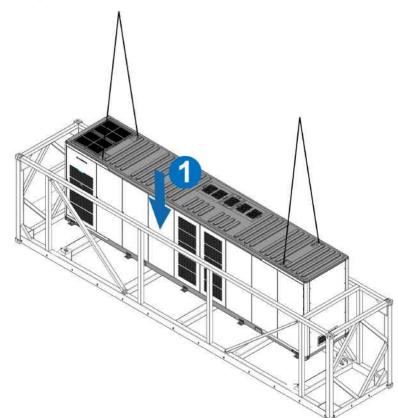


SUNGROW

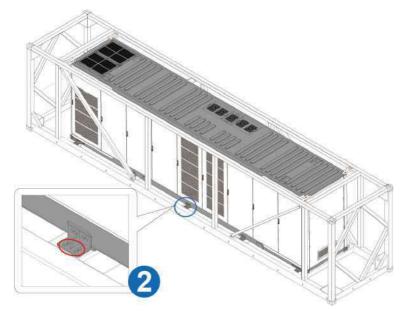
No.	Name	Component source
А	Ladder, at least 2 meters long	User provided.
В	The corner fittings	Included in the scope of supply.
С	Screws(M16x30)	Included in the scope of supply.
D	L-shaped angle steels	Included in the scope of supply.
E	Wrench	User provided.

Installation Method

Step 1 Hoist the battery container into the transport frame.

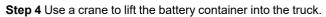


Step 2 Fix the bottom of the battery container to the bottom of the transport frame using M16x30 bolts and L-shaped angle steel with a recommended torque of 119~140 N⋅m.



Step 3 Fix the top of the battery container to the top of the transport frame using M16x30 bolts and corner fittings with a recommended torque of 119~140 N·m.







Step 5 Secure the battery container to the truck.



- - End

3.4 Requirements for Transportation

All devices in the battery container 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 the battery container in the country/region where the project is located must be observed!

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



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

The following conditions should be met for the transportation of the battery container:

- 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.
- Additional traction may be required if the battery container needs to be transported on slopes.
- Remove all obstacles that exist or may exist on the way, such as tree branches, cables, etc.
- The battery container 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 battery container must be placed in the transportation frame to avoid excessive tilt of the battery container during transportation.

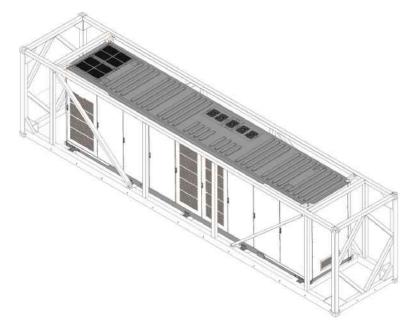


figure 3-1 Transportation frame loading diagram

A 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 3.0 tons.
- If no transportation frame is provided during land transportation, use ropes to fix the lifting ring on the top of the battery container to the hangers on the base, and then fix the hanger on the bottom to the transportation vehicle to avoid excessive tilt during transportation.

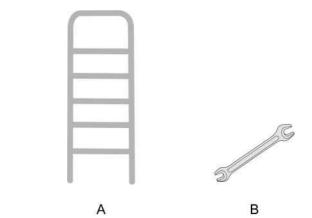


figure 3-2 Land transportation diagram

After the battery container is transported to the project site, please remove the diagonal fasteners at the top four corners of the equipment and keep them properly.

3.5 Unpacking on Arrival

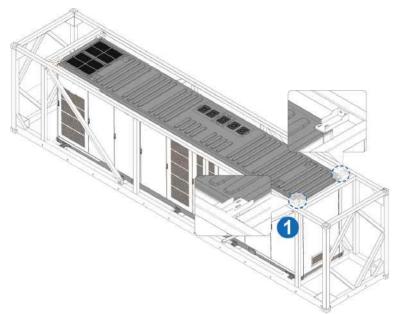
Tool Preparation



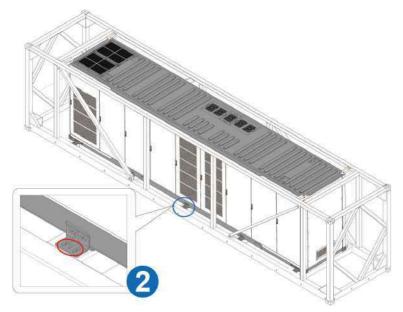
No.	Name	Component source
A	Ladder, at least 2 meters long	User provided.
В	Wrench	User provided.

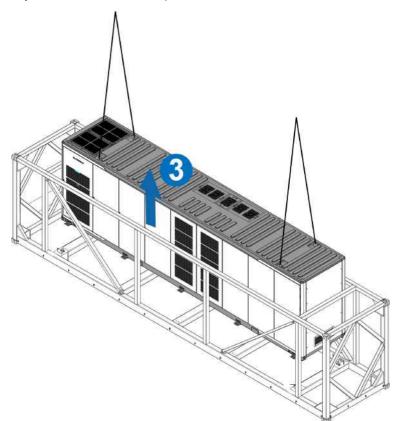
Unpacking Steps

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



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





Step 3 Lift the battery container out of the transport frame.

- - End

3.6 Storage Requirements

- To prevent possible condensation or its bottom from being soaked by rain water in the rainy season. The battery container should be stored on higher ground.
- Raise the container base if the battery container must be stored outdoors due to site conditions. The specific height should be reasonably determined based on site geological and meteorological conditions. The surface evenness shall not be greater than 5 mm.
- Store the battery container 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.
- System storage environment temperature: -30 °C ~ 50 °C, recommended storage temperature: -30 °C ~ 25 °C.

The battery attenuation coefficients at other temperatures are listed below.



Temperature range	Attenuation coefficient		
26 °C ~ 40 °C	0.1 %/month		
41 °C ~ 50 °C	0.3 %/month		

- Long-term storage of batteries is not recommended because it may cause the decrease in battery capacity. Even if the battery is stored at the recommended storage temperature, irreversible capacity fade will still occur during periods of rest. The longer it has been stored, the greater the capacity fade. Please refer to the technical protocol for specific rate of capacity fade.
- The relative humidity should be between 0~95%, without condensation.
- The air inlet and outlet of the battery container 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.

Starting from the date of departure SUNGROW factory, the battery container with a storage period of more than 6 months under the above conditions are to be charged and discharged once to bring the system SOC to 30%~40%.

4 Mechanical Installation

A 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 Deliverables Inspection

Check whether deliverables are complete against the attached packing list.

4.1.2 Product Inspection

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

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

\Lambda WARNING

• Only install the battery container when it is complete and intact.

Before installation, ensure that:

- The battery container is in good condition without any damage.
- All internal equipment is in good condition without any damage.

NOTICE

Check the equipment for bumped and broken paint, etc. To avoid rusting, paint repair is recommended. Please refer to section "Cleaning Container Appearance" for specific steps.

4.2 Installation Environment Requirements

4.2.1 Installation Site Requirement

- 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 environment around 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 of the energy storage system.



- The installation site should be away from areas where toxic and harmful gases are concentrated, and free from inflammable, explosive and corrosive materials.
- It is suggested the product be installed in a place away from the residential area. Ensure
 the distance and noise requirements specified by the local laws and regulations are met.
 If the requirements cannot be met due to geographical restrictions, use noise mitigation
 measures. For detailed solutions, consult with the designer or SUNGROW.
- Avoid installing the battery container in dusty environments with a large amount of dust, smoke, or floc. These particles may cling to the air inlets/outlets or heat sink of the battery container, thus impairing its heat dissipation performance or even getting it damaged.
- Avoid installing the battery container in places where corrosive gas or dust may be produced or accumulated, or in places within 30km (20 miles) of saline-alkaline land or pollution-generating industrial complex such as chemical plants and power plants (chemical gas class: 1C1, solid particle level: 1S2).
- Do not install the battery container in environments contaminated with halogen or sulfur pollutants.
- There are no underground facilities at the site.

NOTICE

Do not install the device in an environment with vibration and strong electromagnetic field. Strong-magnetic-field environments refer to places where magnetic field strength measures over 30 A/m.

4.2.2 Foundation Requirements

A WARNING

The battery container 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 battery container, affecting the normal opening and closing of the doors and the normal operation. Therefore, the foundation of the battery container 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.
- The container foundations are made according to the foundation plans provided by SUN-GROW or confirmed by us, with a tolerance of ±5mm on the top surface of the foundation.
- 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, the recommended height of the foundation is 300mm~500mm, the maximum should not be >700mm, the minimum should not be <300mm, if it is not within the scope of this regulation, please contact SUNGROW for verification.
- 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 battery container, 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 battery container, 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 battery container 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.



A

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.

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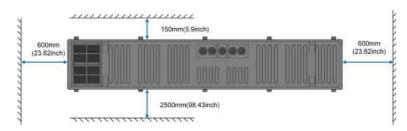


figure 4-1 Installing a single device

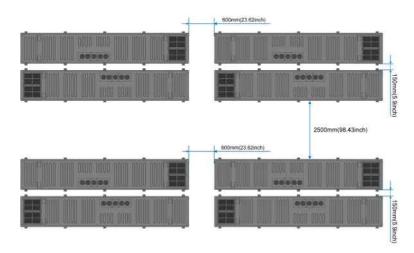


figure 4-2 Installing multiple devices

4.3 Hoisting and Fixing

4.3.1 Lifting Precautions

A 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 battery container, 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 battery container.
- 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 battery container is steady and not tilting during lifting.
- Take all necessary auxiliary measures to ensure safe and smooth lifting of the battery container.

How the battery container 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!

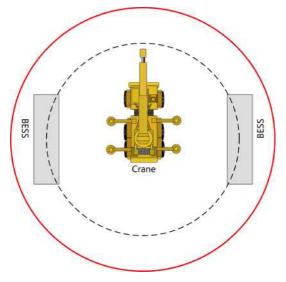


figure 4-3 Schematic diagram of crane operation

4.3.2 Lifting

Lift the battery container according to the following requirements:

- The battery container 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 battery container slowly. And during lifting, theoretically, it is required to ensure that the center of the hanger and the center of the battery container top is exactly right. In practice, try to minimize the deviation of the two centers, and ensure that the hanger and the battery container 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 battery container is in place, place it lightly and smoothly. It is strictly forbidden to throw it to places outside the vertical landing place.
- The battery container should be placed on a solid and flat site with good drainage and no obstacles or protrusions.

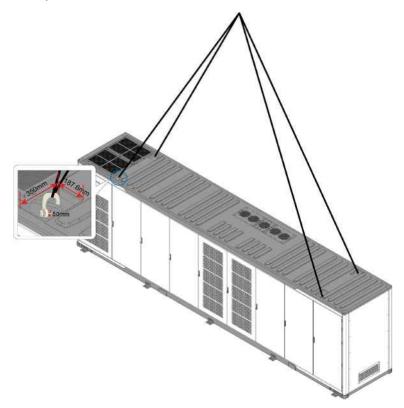


figure 4-4 Lifting schematic

Sling and shackle requirements	Specifications	
Sling	Use 6×37+1 steel wire rope, wire rope diameter ≥ 37mm	
Shackle	WLL 17t and above	
Lifting point diameter	50mm	

WARNING

- It is strictly prohibited to lift the battery container 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

The battery container shall be fixed after being transported to the installation position.

- If two battery container are placed back to back, and the distance between them is within 150 mm~170 mm, fix them as described below:
 - Fix the front bottom of the battery container with the foundation. According to actual needs, the bottom can be fixed by welding or L-shaped angle steel.
 - Use the connectors in delivery to fix the back top of the two battery container.
- If two battery container are not placed back to back, or the distance between them is greater than 600mm, fix the front and rear bottoms of the battery container to the foundation with the L-shaped angle steel in the delivery.

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

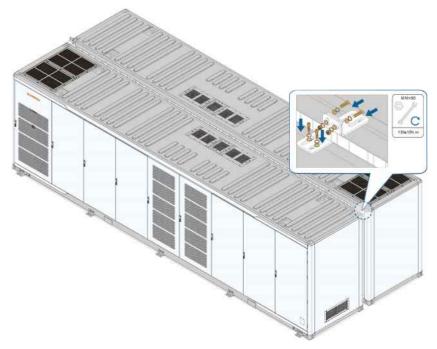


figure 4-5 Back-to-back fixed installation

Bottom Fixation

Welding fixation method

Weld and fix the bottom of the cabinet with the foundation. After completion, anti-corrosion treatment shall be taken for the welding position.

· Fixed by L-shaped angle steels

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





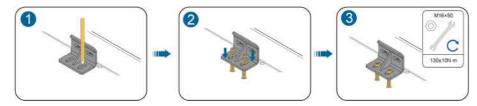
figure 4-6 Positions of L-shaped angle steels

Preparing Installation Tools

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

No.	Name	Source
1	Marker pen	User provided
2	Hammer drill	User provided
3	M16 expansion bolt	User provided
4	M16 screw	Included in the scope of supply
5	Angle steel	Included in the scope of supply

Installation Method



4.3.4 Film Removal

Before putting the battery container into operation, remove the 3M film on the DC/DC 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 battery container door.



figure 4-7 Diagram of film placement

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5 Electrical Connection

5.1 Precautions

A 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 system, 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.

\Lambda WARNING

When an external short circuit occurs in the RACK circuit and the switch box fuse produces a protective action, the fuse and the two DC contactors must be replaced at the same time.

5.2 Overview of Wiring Area

The wiring diagram of the integrated BESS is shown below:

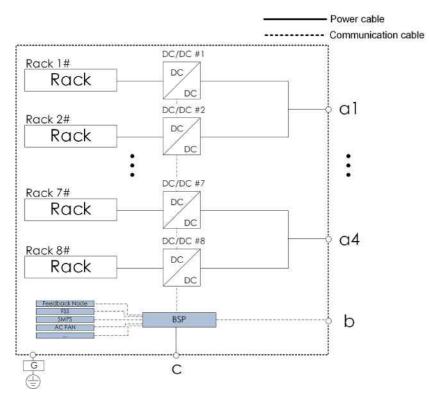


figure 5-1 Wiring diagram

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

No.	Description	Recommended cable specifications	
a1~a4	DC output port	240 mm ²	
b	Communication port	CAT5e S/FTP	
С	AC auxiliary power port	16 mm ^{2*} 4C	
G	Grounding point	-	

table 5-1 Interface description

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.

A 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



Safety gloves



Torque screwdriver



Multimeter



Goggles



Wire stripper



Screwdriver



Safety shoes







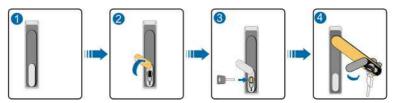
Protective clothing



Heat gun

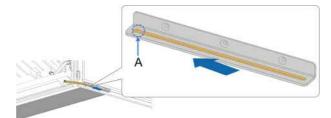
5.3.2 Opening the Container Door and Cabinet Door

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

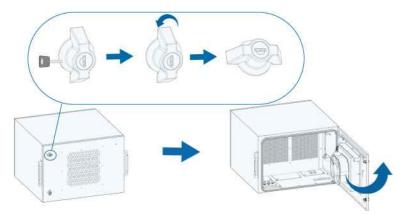


Step 2 Fix the container door.

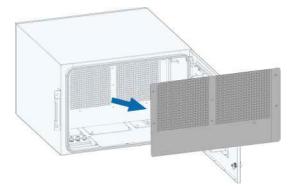
The double-end stud slides when the container door or cabinet door is opened. And when it slides into hole A, the limit rod is fixed.



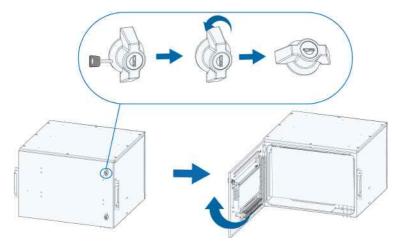
Step 3 Open the door of the BCP.



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 Prepare Cables

A DANGER

Before electrical connection, check and ensure that the cables are all intact and well-insulated. Poor insulation or cable damage may result in safety hazards. If necessary, replace the cable immediately.

The cables must meet the following requirements:

- The current carrying capacity of the cable meets 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.
- Ensure that all cables and wires have sufficient space for any bends.
- During electrical connection, do not forcibly pull any wires or cables, as this may diminish their insulation performance.
- 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.

- Keep a sufficient distance between the cables and the heat-generating components, to prevent the cable insulation layer from aging or getting damaged due to high temperature.
- After completing each connection, carefully check that the connection is correct and secure.
- Adopt necessary auxiliary measures to reduce the stress applied to cables and wires.
- Select cables with appropriate cross-sectional areas, according to the actual environmental conditions for heat dissipation of the cables laid on-site.
- Select communication cables equipped with corresponding shielding protection features according to the requirements of SUNGROW.
- Secure the power cables and the communication cables separately. Ensure a minimum space of 10cm between the lines of strong and weak electricity to avoid electromagnetic interference.
- Inspect the connection between the wiring terminal and the copper bar. If any part of the heat-shirk tubing is caught between them, remove it immediately. Otherwise, it may lead to poor contact or even damage due to heat.

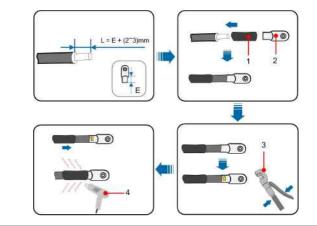
NOTICE

- The cables used should comply with requirements of local laws and regulations.
- The cable color in figures in this manual is for reference only. Please select cables according to local standards.

Crimp terminal

Crimp OT/DT terminals

Follow the steps shown below to crimp terminal.



No.	Description	No.	Description
1	Heat shrink tubing	2	OT/DT terminal
3	Hydraulic pliers	4	Heat gun

5.3.4 Copper Wire Connection

When copper cables are selected, the connection sequence of wiring parts is shown in the following figure.

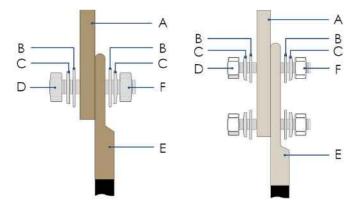


figure 5-2 Copper cable terminal connection sequence

No.	Name	No.	Name
А	Copper bus bar	D	Bolt
B Flat washer	Flatwasher	E	Copper connection
			terminal
С	Spring washer	F	Nut

DANGER

- When fastening the product and terminals, tighten the fasteners at the specified torques using proper tools and leave marks accordingly. Otherwise, the product may be damaged, and such damages will not be covered by the warranty. Unreliable connection may cause fire or even burn the product.
- During electrical connection, do not forcibly pull any wires or cables, as this may diminish their insulation performance.

NOTICE

- Bolt fastening should be firm and reliable, and the exposed wire buckle should not be less than 2 buckles.
- Use screws of an appropriate length for wiring. The screw should protrude 2–3 threads (approximately 3 mm) through the mounting hole in the copper bar. Using overly long screws may compromise insulation performance or even cause short circuits.

5.3.5 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.

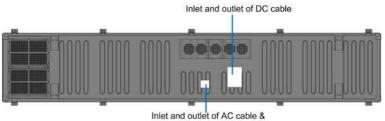




figure 5-3 Schematic diagram of bottom cable inlet and outlet (top view)

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

5.4 Ground Connection

NOTICE

Ground the product strictly following local standards and regulations.

NOTICE

- Before grounding, it is necessary to clean the periphery of the threaded port of the grounding point and the surface of the grounding point to a clean state, so as not to have an impact on the grounding performance.
- After grounding, the entire grounding area needs to be preserved from corrosion at the grounding point.



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.

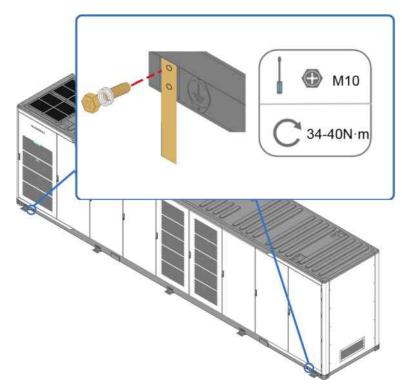


figure 5-4 Diagram of the grounding flat steel

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

Grounding Cable

Use a grounding cables of $70 \text{mm}^2 \sim 95 \text{mm}^2$ to ensure a reliable connection between the two grounding points and the grounding points of the battery container. (The grounding point is covered with protective tape before delivery. Remove the tape before wiring.)

Crimp DT terminals, refer to "5.3.3 Prepare Cables" for detailed steps. Use grounding cables to ensure a reliable connection between the two grounding points and the grounding points of the battery container. When finished, tighten them with M10 bolts.

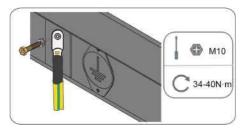


figure 5-5 Diagram of the grounding cable

*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 .

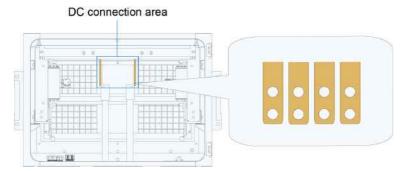


The specific grounding resistance shall comply with relevant national/local standards and regulations.

5.5 DC Output Port Connection

Overview

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

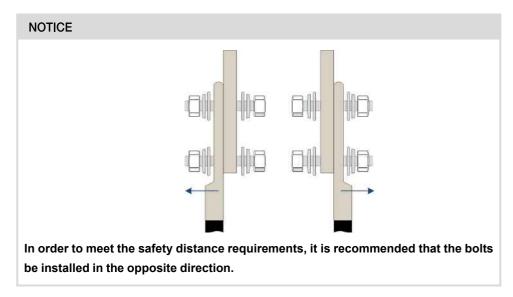


* The image shown here is for reference only. The actual product received may differ. **Procedure**

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 Crimp with DT terminal, refer to "5.3.3 Prepare Cables"。
- **Step 4** Secure the DT terminal to the wiring hole by M12 bolt with a tightening torque of 60~70 N⋅m. Refer to the "5.3.4 Copper Wire Connection" connection sequence for installation.



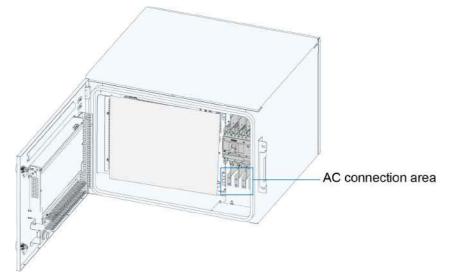
Step 5 Pull the cable back slightly after wiring to ensure that the cable is long enough.

- - 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 Crimp with DT terminal, refer to "5.3.3 Prepare Cables"。
- **Step 4** Secure the DT 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 ""5.3.4 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

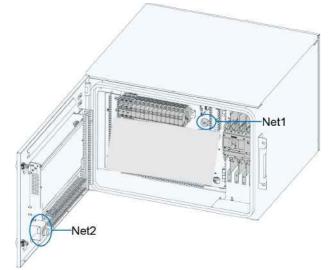
• Strictly follow the phase sequence to connect cables.

- - 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.

No.	Description
Net1	Connection to LC1000
Net2	Maintenance port

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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:

- Check all air inlets and outlets for blockage.
- Seal the gap around the cable inlet holes.
- Put all protective covers back in place firmly.

WARNING

- Moisture may enter the product if it is not properly sealed.
- 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

NOTICE

Make sure that the seal around the container door does not curl when the door is closed!

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.

\Lambda 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 SUN-GROW before any operation.

6.2 Cable Connection

Tool preparation



figure 6-1 Tools

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.

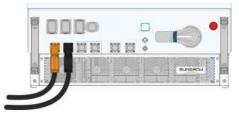


figure 6-2 The power lines between the Pack and the DCDC are connected

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.

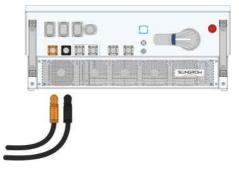


figure 6-3 Disconnect the power line between the Pack and the DCDC

Step 3 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)

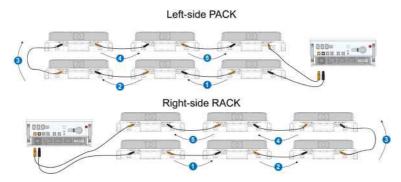


figure 6-4 Connect the power cable between the packs

WARNING When the aviation plug is plugged tightly, it will make a "click" sound. Make sure the aviation plug is plugged in tightly! PACK A and PACK B are prohibited from replacing each other.

Step 4 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.

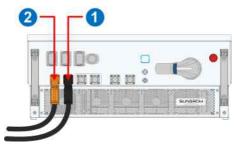


figure 6-5 Connect the power line between the Pack and the DCDC

WARNING

When the aviation plug is plugged tightly, it will make a "click" sound. Make sure the aviation plug is plugged in tightly!

- - End

7 Powering up and Shutdown

7.1 Power-on Operation

A WARNING

• The battery container can only be put into operation after confirmation by a professional and approved by the local power department.

A WARNING

• For the battery container 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 up 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 all air inlets and outlets for blockage.
- If the equipment has been stored for more than six months, the top radiator fan should be checked for proper rotation, noise or stalling before powering up.

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 SD175HV 4# and SD175HV 5#.

Step 4 Power on the BCP.

- 1 Close the miniature circuit breaker Q1.
- 2 Finish powering on the BCP.

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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 400Vac power QF1 (AC MAIN SWITCH).
- 4 Close the power switch of the LCS Q1(LCS).
- 5 Close the fan power switch Q2~Q3 (AC BRANCH SWITCH 1~2#) inside the cabinet.
- 6 Close the 24Vdc power switch Q4(DC 24V).
- 7 Close the exhaust fan switch Q5(EXHAUST FAN).
- 8 Close the power supply switch of the maintenance socket Q6(MAINTAIN SOCKET).
- 9 Close the 220Vac power switch Q7(AC 220V).
- 10 Finish powering on the BSP.

NOTICE

- Check the status of circuit breakers in the liquid cooling unit. If any circuit breaker is not closed, close it;
- If the battery container is equipped with a fire engine and a combustible gas engine, check the state of the ship type switch in the engine. If any ship type switch is in the off position, move it to the on position.

Step 6 Start the PCS.

- - End

A 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 Shutdown

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 SD175HV 4# and SD175HV 5#.

Step 4 Disconnect the BCP.

- 1 Disconnect the miniature circuit breaker Q1.
- 2 Finish powering off the BCP.

Step 5 Disconnect the BSP.

- 1 Disconnect the DC load switch QS1 inside the BSP.
- 2 Disconnect the 220Vac power switch Q7(AC 220V).
- 3 Disconnect the power supply switch of the maintenance socket Q6 (MAINTAIN SOCKET).
- 4 Disconnect the exhaust fan switch Q5(EXHAUST FAN).
- 5 Disconnect the 24Vdc power switch Q4(DC 24V).
- 6 Disconnect the fan power switch Q2~Q3 (AC BRANCH SWITCH 1~2#) inside the cabinet.
- 7 Disconnect the power supply switch of the LCS Q1 (LCS).
- 8 Disconnect the main control switch of the 400Vac power QF1 (AC MAIN SWITCH).
- 9 Disconnect the upstream power switch of the BSP.
- 10 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

8.1 General Rules

Please comply with the fire laws and regulations of the country/region where the project is located.

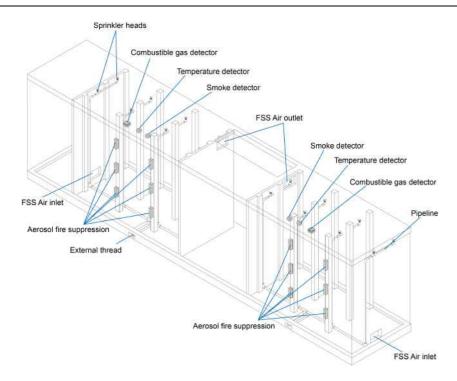
Perform regular inspection and maintenance on the fire suppression system regularly to ensure it can function properly.

8.2 Fire Suppression Equipment

The BESS cabinet has a water fire suppression system, an aerosol fire suppression system, an automatic fire alarm and linkage control system, a combustible gas detection and alarm system and an exhaust system. 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, and control the battery system with the corresponding logic control.

NOTICE

To ensure the detection accuracy of the combustible gas detectors, perform a bump test at least twice a year. If the detector fails the bump test, check and if necessary, calibrate the detector.



8.3 Exhaust System

When the detected concentration of combustible gas reaches 10% LEL, the combustible gas detector inside the BESS sends a signal to the station-level alarm host via the BSC external terminal for fire warning; meanwhile, the signal is transmitted to the EMS to shut down the BESS and enable the FACP to activate the exhaust system (turn on the air intake equipment and exhaust equipment).

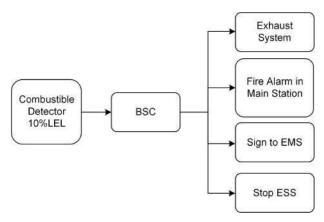


figure 8-1 Control logic of exhaust system

8.4 Water-based Fire Suppression System

The battery container is equipped with sprinkler prefabricated pipe, with which the water system can start automatically or be started manually. If an automatic sprinkler water-based fire suppression system is required, subsequent construction is necessary. Water supply pipes and equipment outside the battery container need to be connected to the battery container sprinkler connections, please decide according to the actual project.

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

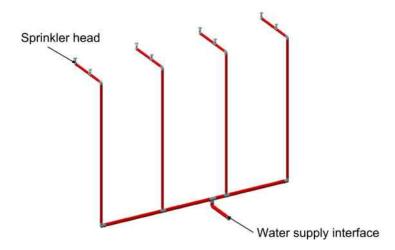


figure 8-2 Piping of water-based fire suppression system

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

8.5 Aerosol Fire Suppression System

The BESS is equipped with a aerosol fire suppression system. Aerosol generators are automatic units which are thermally activated. The aerosol fire suppression system is automatically activated when the temperature inside the container is $\geq 170^{\circ}$ C.

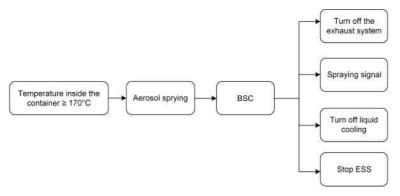


figure 8-3 Control logic of aerosol fire suppression system

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

LC200 User Manual



QR code

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 SOC Calibration Instructions

A WARNING

Do not leave the product in a low voltage or low SOC condition for a long period of time. Loss of capacity due to the following conditions is not covered by the warranty.

- Battery discharge cell voltage is below 2.7V for 120 consecutive hours.
- Any cell cluster SOC is 0% for 120 consecutive hours.
- Battery discharge cell voltage ≤2V.

WARNING

Over or under voltage fault & alarm (detailed information can be found in the "Communication protocol \rightarrow BSC200 Info-3x table \rightarrow CMU fault word and CMU alarm word").

- Fault: "Cell over voltage fault", "Cell under voltage fault", "Total over voltage fault", "Total under voltage fault".
- Alarm: "Cell over voltage alarm", "Cell under voltage alarm", "Total over voltage alarm", "Total under voltage alarm".

End users must assign a high priority to above listed faults and alarms reported by the Sungrow local controller. When an alarm or fault is triggered, the user interface should prominently highlight these issues. Furthermore, end users should promptly contact Sungrow for timely resolution to prevent battery warranty loss due to over-discharge or overcharge.

NOTICE

- In order to avoid triggering the warranty expiration condition, when the "Cell Under-voltage Fault" or "Cell Over-voltage Fault" is triggered, the user must contact the local team of Sungrow within 24 hours and follow the requirements of Sungrow to carry out the next operation.
- If the system is configured with the "Active power up" function, When the battery container minimum rack SOC reaches the threshold for this function (the threshold can be set from 0 to the lower SOC protection value, and the threshold does not exceed 5% SOC), the system will charge the battery with low power until the SOC reaches a safe threshold (5% SOC) automatically, The recharging power can be set within the range of 100 kW to 150 kW. During Active power up, when the EMS issues a charging instruction, the LC controller will prioritize the EMS charging instruction. When the EMS issues a discharging instruction, the LC controller will respond according to the specific system SOC value. Sungrow will enable this function by default when the device is shipped from the factory, In order to minimize the risk of under-voltage of the battery that may void the warranty, Sungrow recommends that users do not turn off the "Active power up" function.

NOTICE

- If the system will not be in operation for an extended period (7 days or more), it's recommended to increase the SOC lower limit protection value to above 10% SOC. Additionally, it is important to regularly monitor the system's SOC to avoid the risk of over discharge which will cause warranty expiration.
- During maintenance or shutdown, if the SOC of any battery cluster is 0%, the SOC needs to be charged to 15% and above within 120 hours.
- If the SOC of any battery cluster is 0% during operation, the SOC needs to be charged to 5% and above within 2 hours. Or when the SOC reaches 0%, a command can be issued by the host computer EMS to change the system mode to recharge mode.

10.1 Calibration During System Operation

The user needs to calibrate the SOC when the battery system is in one of the following conditions during operation.

- During operation, if the SOC does not reach 1%~5% when discharging, and does not reach 97%~100% when charging, it is recommended that a SOC calibration be performed once every 1 month.
- During operation, when the SOC reaches 1% ~5% when discharging, or the SOC reaches 97%~100% when charging, and the resting time is <2h, it is recommended that a SOC calibration be performed once every 1 month.



During operation, no additional calibration is required when the SOC reaches $1\%\sim5\%$ when discharging or $97\%\sim100\%$ when charging, and the resting time is $\ge 2h$.

• A calibration is recommended for major changes in operating conditions, such as from energy shifting to frequency regulation application.

Steps to manually perform SOC calibration

- 1 Set SOC protection limits to 1~5% on the low end, and 97~100% on the upper end.
- 2 Discharge the system until the SOC reaches the lower limit, and then let the system rest for 2h without changing the power command.
- 3 Charge the system up to the upper end SOC setting. Once the limit is reached, let the system rest for 2h without changing the power command.
- 4 SOC calibration complete. The system can be put back into operation.

11 Passive Balancing

Passive balancing generally discharges the cells with higher voltage in the battery cluster by means of resistance discharge, releasing power in the form of heat to achieve the purpose of overall cell balancing.

Passive balancing does not need to be set manually and can be turned on automatically.

Passive balancing triggered conditions

- When the difference between the SOC of the cell in the rack and the average/lowest SOC in the rack is greater than 3%. (Only one of the two conditions, average/lowest, can be selected, so please refer to the configuration of the actual project. The value 3% can be set, this is the default value.)
- Discharge to 5% SOC and then the resting time ≥2 hours (this is an optimal point where the cell level SOC imbalances within the racks will present themselves to trigger the passive cell balancing condition).

Close triggered condition

When the difference between the SOC of the cell in the rack and the average/lowest SOC in the rack <3%. (Only one of the two conditions, average/lowest, can be selected, so please refer to the configuration of the actual project. The value 3% can be set, this is the default value.)

NOTICE

After passive balancing starting, the process will be paused temporarily when the cell SOC is less than 5%. The purpose is to protect the battery, to prevent battery over discharge when low SOC.

The balancing status can not be read directly by end-user. But there is not impact to system normal operation, a register will provide to showing the balancing status later.

Time taken for passive balancing

Take the 280Ah cell as an example, 56 hours per 1% SOC difference for the balancing to complete.

Impact to system operation from end-user side

Passive balancing is no impact to normal operation for the following reasons.

- Once the passive balancing mode has been entered, the system can keep normal operation (whatever charge or discharge), the balancing process will be continuous until the SOC difference value is fixed without extra command.
- No impact to normal operation even if passive balancing is paused because of SOC lower than 5%. Because once the SOC higher than 5%, the process will be continuous again automatically without extra command, until close condition is triggered.

• End-user only need to concern if passive balancing finished before the capacity test (BOL and annual test).

12 Routine Maintenance

12.1 Precautions Before Maintenance

A WARNING

- Do not open the door to maintain the device in rainy, humid or windy days. SUN-GROW shall not be held liable for any damage caused by violation of the warning.
- Avoid opening the container door when the humidity is high in rain, snow or fog, and make sure that the seals around the container door do not curl when the door is closed.

A WARNING

- To avoid electric shock, do not perform any other maintenance operations beyond this manual.
- If necessary, contact SUNGROW customer service for maintenance.

NOTICE

In the event of heavy snowfall at the project site, please clear the snow from the top of the equipment and the surrounding area in a timely manner.



In fair weather, it is recommended to open the container door to dehumidify the equipment.

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

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.

12.3 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.

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 connec- tion	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

12.4 Container Maintenance

12.4.1 Appearance Repair



Check if the protective paint sprayed on the enclosure of the product fell off or peeled off. If so, repair it timely.

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

Solutions

Select different repair solutions based on the damage conditions.

Conditions	Solutions
Surface dirt that can be wiped off	"12.4.1.1 Detergent Cleaning"
Finish paint falls off, and the primer is intact	"12.4.1.2 Finish Paint Repair"
Primer is damaged, and the base material is exposed	"12.4.1.3 Double-Layer Paint Repair"

12.4.1.1 Detergent Cleaning

For dust or stains on the product surface, you can wipe them off using water and alcohol. **Prepared by Users**

table 12-1 Cleaning Tools

No.	Item
1	Cleaning cloth
2	Water
3	Alcohol or other non-corrosive detergents

- **Step 1** Wet the cleaning cloth (or other scrubbing tools) with water, and scrub the dirty parts on the surface.
- **Step 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.)



- - End

12.4.1.2 Finish Paint Repair

For minor scratches or surface paint chalking, where the finish paint has peeled off, but the base material is not exposed, finish paint repair is needed to restore the product appearance.

Finish Paint Selection and Mixing

table 12-2 Finish Paint Selection and Mixing

Brand and Model	Chemical Component	Mixing Ratio	Thinner	Drying Time (Minimum)
Jotun Finish	Two component	Main component		5°C 24h
Coat	Two-component chemically cured aliphatic	Main component : Hardener= 10:1 (Volume Ratio) Jotun Thinner No.10		10°C 12h
Hardtop XP or				23°C 5h
Hardtop XPL	r		40°C 3h	
AkzoNobel	Two-component	Main component	International	5°C 24h
Finish Paint	acrylic polyur- ethane paint	: Hardener= 6:1 (Volume Ratio)	GTA056	25°C 6h
Interthane 990				35°C 4h

SUNGROW

• Confirm with SUNGROW before using paints of other brands or models.

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- When using a two-component paint, first thoroughly agitate each component individually, and then mix them in the specified proportions for stirring.
- Add the thinner only after the paint and hardener have been mixed.
- Do not use paint that has exceeded its shelf life.

Prepared by Users

table 12-3 Cleaning Tools

No.	Item
1	400 mesh/600 abrasive paper
2	Cleaning cloth
3	Alcohol
4	Brush
5	Finish paint
6	Film thickness meter

Environment Requirements

- Ambient temperature: 5°C–40°C
- Base material temperature: 5°C–60°C
- Relative humidity: 10%–85%RH

Repair Steps

- **Step 1** Polish the paint surface with blistering or scratches with an abrasive paper to expose the gray primer. Use a film thickness meter to measure the primer thickness, which must be at least 150μm.
- Step 2 Use a clean brush to remove any residue from the surface.
- Step 3 Use a piece of clean cloth dipped in alcohol or detergent to remove the surface powder.

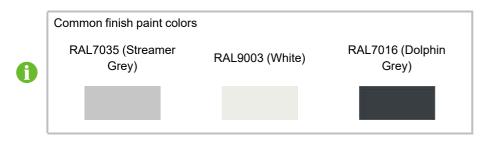






Step 4 Repair the finish paint.

1 Prepare the finish paint with the same color as the appearance.



- 2 Mix the finish paint according to the paint model and the requirements of "table 12-2 Finish Paint Selection and Mixing".
- 3 Apply the finish paint using a brush in a crosshatch pattern. Once the paint fully dried, measure the film thickness using a film thickness meter. Ensure that the single coat thickness falls between 50μm–100μm.



- 4 When applying multiple layers of paint, wait for each layer to dry completely before applying the next. The total thickness of the primer and finish paint must be at least 240µm.
- **Step 5** Inspect the paint to ensure it has a uniform color, smooth transitions, and meets the required film thickness.

- - End

12.4.1.3 Double-Layer Paint Repair

If the rusted area is large, or there are deep scratches or dents that expose the base material, perform a double-layer paint repair, including both a primer and a finish paint.

Primer and Finish Paint Selection and Mixing

Brand and model	Chemical Component	Mixing Ratio	Thinner	Drying Time (Minimum)
Jotun Primer Jotamastic 90	Two-component epoxy paint	Main component : Hardener= 3.5:1 (Volume Ratio)	Jotun Thin- ner No.17	5°C 30h 10°C 10h 23°C 3h 40°C 1.5h
AkzoNobel Primer Interseal 670HS	Two-component epoxy paint	Main component : Hardener= 5.67:1 (Volume Ratio)	International GTA220	5°C 36h 10°C 16h 25°C 10h 40°C 4h
Jotun Finish Coat Hardtop XP or Hardtop XPL	Two-component chemically cured aliphatic	Main component : Hardener= 10:1 (Volume Ratio)	Jotun Thin- ner No.10	5℃ 24h 10℃ 12h 23℃ 5h 40℃ 3h
AkzoNobel Finish Paint Interthane 990	Two-component acrylic polyur- ethane paint	Main component : Hardener= 6:1 (Volume Ratio)	International GTA056	5℃ 24h 25℃ 6h 35℃ 4h

table 12-4 Primer and Finish Paint Selection and Mixing

- Use primers and finish paints from the same manufacturer.
- Confirm with SUNGROW before using any paint from a different manufacturer.
- When using a two-component paint, first thoroughly agitate each component individually, and then mix them in the specified proportions for stirring.
- Add the thinner only after the paint and hardener have been mixed.
- Do not use paint that has exceeded its shelf life.

Prepared by users

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table 12-5 Cleaning Tools

No.	Item
1	400 mesh/600 mesh abrasive paper
2	Cleaning cloth
3	Alcohol

No.	Item
4	Brushes with different sizes
5	Grinder (conical and cylindrical polishing heads)
6	Wall putty
7	Finish coat
8	Primer
9	Film thickness meter

Environment Requirements

- Ambient temperature: 5°C–40°C
- Base material temperature: 5°C-60°C
- Relative humidity: 10%RH-85%RH

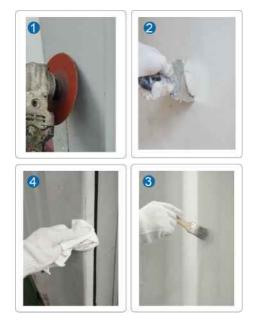
Repair Steps

Step 1 Use a grinder or abrasive paper to smooth uneven areas on the surface, achieving a smooth finish with a metallic luster. Ensure a uniform transition from rusted areas to intact coating.



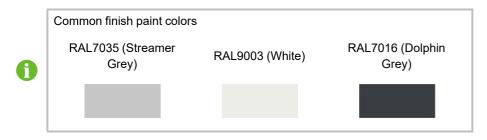
Uneven areas refer to burrs, metal fragments, slag, gaps, and sharp edges on the product.

- Step 2 For deeper defects such as scratches or dents, repair them with wall putty to ensure a flat surface.
- Step 3 Use a clean brush to remove any residue from the surface.
- Step 4 Use a piece of clean cloth dipped in alcohol to remove the surface powder.



Step 5 Repair the primer.

1 Prepare the primer with the same color as the appearance.



- 2 Mix the primer according to the paint model and the requirements of "table 12-4 Primer and Finish Paint Selection and Mixing".
- 3 Apply a primer with a small brush, and use a film thickness meter to ensure the coating thickness in corners and gaps is between 70µm–80µm.
- 4 After the first layer dries, apply another layer of primer using a brush in a crosshatch pattern. Once it is dry, check that the dry film thickness is within 100µm–300µm.
- **Step 6** Refer to "12.4.1.2 Finish Paint Repair" for finish paint repair.
- **Step 7** Inspect the paint to ensure it has a uniform color, smooth transitions, and meets the required film thickness.
 - - End

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When using spray paint, follow these steps:

- 1 Carefully cover the area outside the damaged spot (extending 800mm outward) using masking paper.
- 2 Spray the exposed area with the paint. After the paint dries, check that the dry film thickness is within the range of 100μm–300μm.

12.4.2 Checking Door Locks and Hinges

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

12.4.3 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.



12.5 Battery Maintenance

12.5.1 Maintenance Precautions

A WARNING

Do not leave the product in a low voltage or low SOC condition for a long period of time. Loss of capacity due to the following conditions is not covered by the warranty.

- Battery discharge cell voltage is below 2.7V for 120 consecutive hours.
- Any cell cluster SOC is 0% for 120 consecutive hours.
- Battery discharge cell voltage ≤2V.

A WARNING

Over or under voltage fault & alarm (detailed information can be found in the "Communication protocol \rightarrow BSC200 Info-3x table \rightarrow CMU fault word and CMU alarm word").

- Fault: "Cell over voltage fault", "Cell under voltage fault", "Total over voltage fault", "Total under voltage fault".
- Alarm: "Cell over voltage alarm", "Cell under voltage alarm", "Total over voltage alarm", "Total under voltage alarm".

End users must assign a high priority to above listed faults and alarms reported by the SUNGROW local controller. When an alarm or fault is triggered, the user interface should prominently highlight these issues. Furthermore, end users should promptly contact SUNGROW for timely resolution to prevent battery warranty loss due to over-discharge or overcharge.

NOTICE

- In order to avoid triggering the warranty expiration condition, when the "Cell Under-voltage Fault" or "Cell Over-voltage Fault" is triggered, the user must contact the local team of SUNGROW within 24 hours and follow the requirements of SUNGROW to carry out the next operation.
- If the system is configured with the "Active power up" function, When the battery container minimum rack SOC reaches the threshold for this function (the threshold can be set from 0 to the lower SOC protection value, and the threshold does not exceed 5% SOC), the system will charge the battery with low power until the SOC reaches a safe threshold (5% SOC) automatically, The recharging power can be set within the range of 100 kW to 150 kW. During Active power up, when the EMS issues a charging instruction, the LC controller will prioritize the EMS charging instruction. When the EMS issues a discharging instruction, the LC controller will respond according to the specific system SOC value. SUN-GROW will enable this function by default when the device is shipped from the factory, In order to minimize the risk of under-voltage of the battery that may void the warranty, SUNGROW recommends that users do not turn off the "Active power up" function.

NOTICE

- If the system will not be in operation for an extended period (7 days or more), it's recommended to increase the SOC lower limit protection value to above 10% SOC. Additionally, it is important to regularly monitor the system's SOC to avoid the risk of over discharge which will cause warranty expiration.
- During maintenance or shutdown, if the SOC of any battery cluster is 0%, the SOC needs to be charged to 15% and above within 120 hours.
- If the SOC of any battery cluster is 0% during operation, the SOC needs to be charged to 5% and above within 2 hours. Or when the SOC reaches 0%, a command can be issued by the host computer EMS to change the system mode to recharge mode.
- If the system is stored for a long period of time (six months or more) without operation, the system needs to do at least 1 full charge in order to activate the battery before the system is used for the first time.

For safe and efficient maintenance of the system, maintenance personnel must carefully read and observe the following safety requirements:

- 1 Have the electrician certificate issued by the Work Safety Supervision Bureau, and receive professional training before assuming their work.
- 2 Follow relevant safety precautions, use necessary tools, and wear personal protective equipment.
- 3 Do not wear metal accessories such as jewelry or watches.

- 4 Never touch the high-voltage positive and negative electrodes of the energy storage system by both hands at the same time under all circumstances.
- 5 Prior to the maintenance of the energy storage system, disconnect all high-voltage and low-voltage switches.
- 6 Do not clean this product directly with water. If necessary, use the vacuum cleaner to clean it.
- 7 Plug and remove cables in accordance with the specifications, without brute force or violent operation.
- 8 After maintenance is completed, clean tools and materials in time and check whether there are metal objects left inside or at the top of the product.
- 9 In case of any doubt on operation and maintenance of this product, contact the Customer Service Center of SUNGROW instead of operation without permission.

12.5.2 Maintenance

- PACK operating temperature: The working temperature should be kept between -30°C-50°C. The temperature charging and discharging should be 15°C-30°C and typically 25°C.
- 2 The RACK should not be charged or discharged with high magnifying power. The continuous charging and discharging current of a single rack should not exceed the rated current.
- 3 When the energy storage system is not used in a long time, it should be charged once every six months, until its SOC is 30%–40%.
- 4 When the system is used after long-term storage, it should be fully charged at least once to restore the best performance of the battery.
- 5 Regularly check whether the air duct of the cooling system is blocked and clean the system. In particular, clean the air inlet and outlet of the fan and use a vacuum cleaner if necessary, to maintain free air circulation inside the cabinet. Before dust removal, the power supply must be cut off. It is forbidden to rinse the system with water.
- 6 Regularly check whether the fastening bolts of the high-voltage cables and connecting busbars of the energy storage system are loose, whether the contacts are in good conditions, and whether the terminal surfaces are severely corroded or oxidized.
- 7 Regularly check the protective covers of high-voltage positive and negative electrodes of the PACK for ageing, damage and missing.
- 8 Regularly check cables for loosening, ageing, damage and fracture and inspect whether the insulation is in good conditions.
- 9 Regularly check the battery container for pungent odor and high-voltage connections for burning odor.
- 10 Regularly check whether the voltage, temperature and other data of the monitoring upper computer are correct and whether there are fault alarms in the alarm column.
- 11 Regularly check whether the status and alarm indicators of the energy storage system are in good conditions and whether they work properly.

- 12 Regularly check whether the emergency stop button of the energy storage system can be used, in order to quickly shut down the system in an emergency.
- 13 Regularly check whether the fire extinguishers are in good conditions and within the validity period.
- 14 Never use different types of battery modules in series or parallel.
- 15 PACK A and PACK B are prohibited from replacing each other.

A WARNING

- The battery is potentially dangerous, so appropriate protective measures must be taken during operation and maintenance!
- Incorrect operation may cause severe personal injury and property damage!
- Use the appropriate tools and protective equipment during battery operation.
- Battery maintenance must be performed by those who have battery expertise and received safety training.

12.6 Coolant Replacement

Object	Standard	Period	Tools
Coolant	 There are obvious impurities in antifreeze; Antifreeze is signifi- cantly darker in color. 	5–6 years	Water pump, hose, hose clamp, slot- ted screwdriver Note: Please contact Sungrow Cus- tomer Service to replace hardware facilities

A WARNING

Normally coolant is not a health hazard, excessive exposure may cause irritation to the eyes, skin and breathing.

NOTICE

- The coolant in the refill tank must not exceed the "H" line.
- The brand of coolant to be replaced is limited to Great Wall and Acwell, and it is recommended to use the same brand of coolant. If you choose to mix Great Wall and Acwell coolants, the mixing ratio of different coolants is limited to 9:1.

Personal protection

Wear personal protective equipment (PPE) when changing coolant. PPE should comply with relevant national standards, including but not limited to the following protective equipment.

SUNGROW

Protective parts	Protective equipment
Respiratory protection	Under normal conditions of use, it is generally not necessary to wear respiratory protection equipment. If the engineering control facility does not maintain the air concentration at a level sufficient to protect the health of personnel, choose respiratory protection equipment suitable for the conditions of use and in compliance with relevant legal requirements. If you need to wear a safety fil- ter mask, please choose a suitable mask and filter combination. Choose a filter suitable for a mixture of particulate/organic gas and vapor [boiling point >65 °C (149 °F)].
Hands protection	Use oil-resistant, chemical-resistant protective gloves.
Eyes protection	Please use protective goggles.
Skin and body protection Use non-permeable protective clothing and safety shoes.	

Disposal considerations

Waste types	Disposal measures	
Coolort	Discharges are made in accordance with local regulations and	
Coolant	are not disposed of haphazardly.	
Dubbich romport	Separate and recycle, and if it meets the relevant regulations, it	
Rubbish remnant	can be burned or reused.	
	Dispose of in accordance with all applicable local and national	
	regulations. Use recovery/recycling where feasible, otherwise in-	
	cineration is the recommended method of disposal. Empty con-	
	tainers may contain hazardous residues. Do not cut, puncture or	
Containers	weld on or near to the container. Labels should not be removed	
Containers	from containers until they have been cleaned. Contaminated con-	
	tainers must not be treated as household waste. Containers	
	should be cleaned by appropriate methods and then re-used or	
	disposed of by landfill or incineration as appropriate. Do not incin-	
	erate closed containers.	

Accidental release measures

When a coolant leak occurs, refer to the following measures to deal with it.

- Immediately contact a professional to have uninvolved persons evacuated quickly to safety.
- Cut off the source of the spill as far as possible and prevent it from entering spaces such as sewers, drains and bodies of water.
- When cleaning up spilled liquids, wear protective equipment to protect your body from contact with the spilled or released material.

• Use sand, mud or other materials that can be used as barriers to set up barriers to prevent diffusion. Recover liquid directly or store in absorbent. Clean the contaminated area with detergent, water and a hard broom. Put the collected liquid in a disposable container.

First aid measures

Contact method	Measures	
Inhalation	Move to fresh air. If breathing has stopped, give artificial respiration	
Innalation	first aid. Seek medical attention.	
	Take off contaminated clothing. Rinse the skin thoroughly with soap	
Skin contact	and water. Seek medical attention if skin inflammation or rash occurs.	
Eves contact	Flush eyes with plenty of water for at least 15 minutes. Seek medical	
Lyes contact	attention.	
	If ingested, but conscious, water or milk to drink and actively seek	
	medical help, do not induce vomiting unless instructed by healthcare	
Ingestion	patients. If you cannot get help from a doctor, please send the patient	
	and the container and label to the nearest medical emergency center	
	or hospital. Do not give any food to unconscious patients.	

12.7 Sand and Dust Cleanup

- The cycle of sand and dust cleanup is aligned with the cycle of power plant site operations and maintenance.
- Actual maintenance intervals should be adjusted to the specific installation environment of the product.
 - If the operating environment is windy or dusty, it is necessary to shorten the maintenance cycle and increase the maintenance frequency.

12.7.1 Electrical Cabinet

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Cleaning tools: air pump, vacuum cleaner.

Step 1 Use an air pump nozzle to blow the ventilation mesh on the electrical cabinet to remove sand and dust from the mesh.



figure 12-1 Electrical cabinet ventilation mesh

- * The figure is for reference only. The product received may differ.
- **Step 2** Open and secure the cabinet door and use a vacuum cleaner to clean sand and dust from the gap between the DCDCs in the electrical compartment, as shown in the red box below.

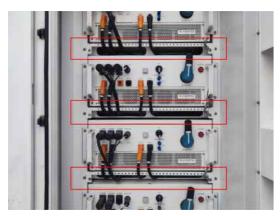


figure 12-2 Gaps between DCDCs

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

Step 3 Use a vacuum cleaner to remove sand and dust from the floor in front of the BSP/BCP as shown in the red box below.



figure 12-3 BSP/BCP front floor

- * The figure is for reference only. The product received may differ.
- Step 4 Close the cabinet door after cleaning.
 - - End

12.7.2 LCS Cabinet

Cleaning tools: air pump, vacuum cleaner, Phillips screwdriver.

Step 1 Use an air pump nozzle to blow the ventilation mesh of the liquid-cooled unit compartment hatch to remove sand and dust from the mesh.



figure 12-4 Liquid-cooled hatch ventilation mesh

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



Step 2 With the hatch open and secured, use a vacuum cleaner to clean the buildup of sand and dust from the front baffle of the liquid-cooled unit, as shown in the red box below.

figure 12-5 Liquid-cooled unit front baffle

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

Step 3 Use a Phillips screwdriver to remove the front baffle of the liquid-cooled unit.



figure 12-6 Removal of liquid-cooled unit front baffle

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

Step 4 Using a vacuum cleaner, reach the nozzle into the area underneath the liquid-cooled unit to suck up sand and dust from the baseboard.



figure 12-7 Liquid-cooled unit base plate

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

Step 5 Use a Phillips screwdriver to reinstall the front baffle of the liquid cooled unit.

Step 6 Close the cabinet door.

- - End



13 Appendix

13.1 System Parameters

table 13-1 ST2752UX/ST2695UX

Parameter	ST2752UX	ST2695UX	
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		
Operating temperature range	-30 to 50°C (> 45°C derating)		
Relative humidity	0 ~ 95 % (non-condensing)		
Max. working altitude	3000 m (> 3000 m derating)		
Cooling concept of bat- tery 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	CE, IEC 62477-1, IEC 61000-6-2, IEC 61000-6-4, IEC 62619		

table 13-2 ST2637UX/ST2580UX

Parameter	ST2637UX	ST2580UX	
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		
Operating temperature range	-30 to 50°C (> 45°C derating)		
Relative humidity	0 ~ 95 % (non-condensing)		
Max. working altitude	3000 m (> 3000 m derating)		
Cooling concept of bat- tery chamber	Liquid cooling		
Fire safety standard/ Optional	Deluge sprinker heads (standard), Fused sprinkler heads (op- tional),NFPA69 explosion prevention and ventillation IDLH gases(optional)		
Communication interfaces	RS485, Ethernet		
Communication protocols	Modbus RTU, Modbus TCP		
Compliance	CE, IEC 62477-1, IEC 61000-6-2, IEC 61000-6-4, IEC 62619		

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

Parameter	ST2523UX	ST2465UX	
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		
Operating temperature range	-30 to 50°C (> 45°C derating)		
Relative humidity	0 ~ 95 % (non-condensing)		
Max. working altitude	3000m(> 3000 m derating)		
Cooling concept of bat- tery 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	CE, IEC 62477-1, IEC 61000-6-2, IEC 61000-6-4, IEC 62619		

table 13-4 ST2408UX/ST2351UX

Parameter	ST2408UX	ST2351UX
Battery Data		
Cell type	LF	=P
Battery capacity (BOL)	2408 kWh	2351 kWh
System output voltage ange	1160 ~ 1500 V	1160 ~ 1500 V
Seneral Data		
Dimensions of battery init (W * H * D)	9340*2600*1730mm	
Weight of battery unit	24,000 kg	23,600 kg
egree of protection	IP 54	

Parameter	ST2408UX	ST2351UX
Operating temperature range	-30 to 50°C (> 45°C derating)	
Relative humidity	0 ~ 95 % (non-cor	ndensing)
Max. working altitude	3000 m (> 3000 m	derating)
Cooling concept of bat- tery 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	CE, IEC 62477-1, IEC 61000-6-2, I	IEC 61000-6-4, IEC 62619
table 13-5 ST2293UX		
Parameter	ST2293	UX
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	
Operating temperature range	-30 to 50°C (> 45°C derating)	
Relative humidity	0 ~ 95 % (non-co	ondensing)
Max. working altitude	3000 m (> 3000 ı	m derating)
Cooling concept of battery chamber	Liquid cooling	

Parameter	ST2293UX	
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	CE, IEC 62477-1, IEC 61000-6-2, IEC 61000-6-4, IEC 62619	

13.2 Tightening Torques

To avoid poor contact caused by the loosening of copper cable lugs due to stress, and to prevent heat or even fire due to increased contact resistance, make sure to tighten the screws on the cable lugs at the recommended torques:

Bolt	Torque(N·m)	Bolt	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

*Torque values listed in the table are intended for the bolt and nut assembly, and do not apply to riveted nuts or riveted screws, etc. The torque to be adopted should depend on the actual situation.

**Secure the cable at a proper point to reduce the stress on the cable lug.

13.3 Quality Assurance

When product faults occur during the warranty period, SUNGROW will provide free service or replace the product with a new one.

Evidence

During the warranty period, the customer shall provide the product purchase invoice and date. In addition, the trademark on the product shall be undamaged and legible. Otherwise, SUNGROW has the right to refuse to honor the quality guarantee.

Conditions

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

Exclusion of Liability

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

- The free warranty period for the whole machine/components has expired.
- The device is damaged during transport.
- The device is incorrectly installed, refitted, or used.
- The device operates in harsh conditions beyond those described in this manual.
- The fault or damage is caused by installation, repairs, modification, or disassembly performed by a service provider or personnel not from SUNGROW.
- The fault or damage is caused by the use of non-standard or non-SUNGROW components or software.
- The installation and use range are beyond stipulations of relevant international standards.
- The damage is caused by unexpected natural factors.

For faulty products in any of above cases, if the customer requests maintenance, paid maintenance service may be provided based on the judgment of SUNGROW.



Product data such as product dimensions are subject to change without prior notice. The latest documentation from SUNGROW should take precedence in case of any deviation.

13.4 Contact Information

In case of questions about this product, please contact us. We need the following information to provide you the best assistance:

- Model of the device
- · Serial number of the device
- Fault code/name
- · Brief description of the problem

For detailed contact information, please visit: https://en.SUNGROWpower.com/contactUS

