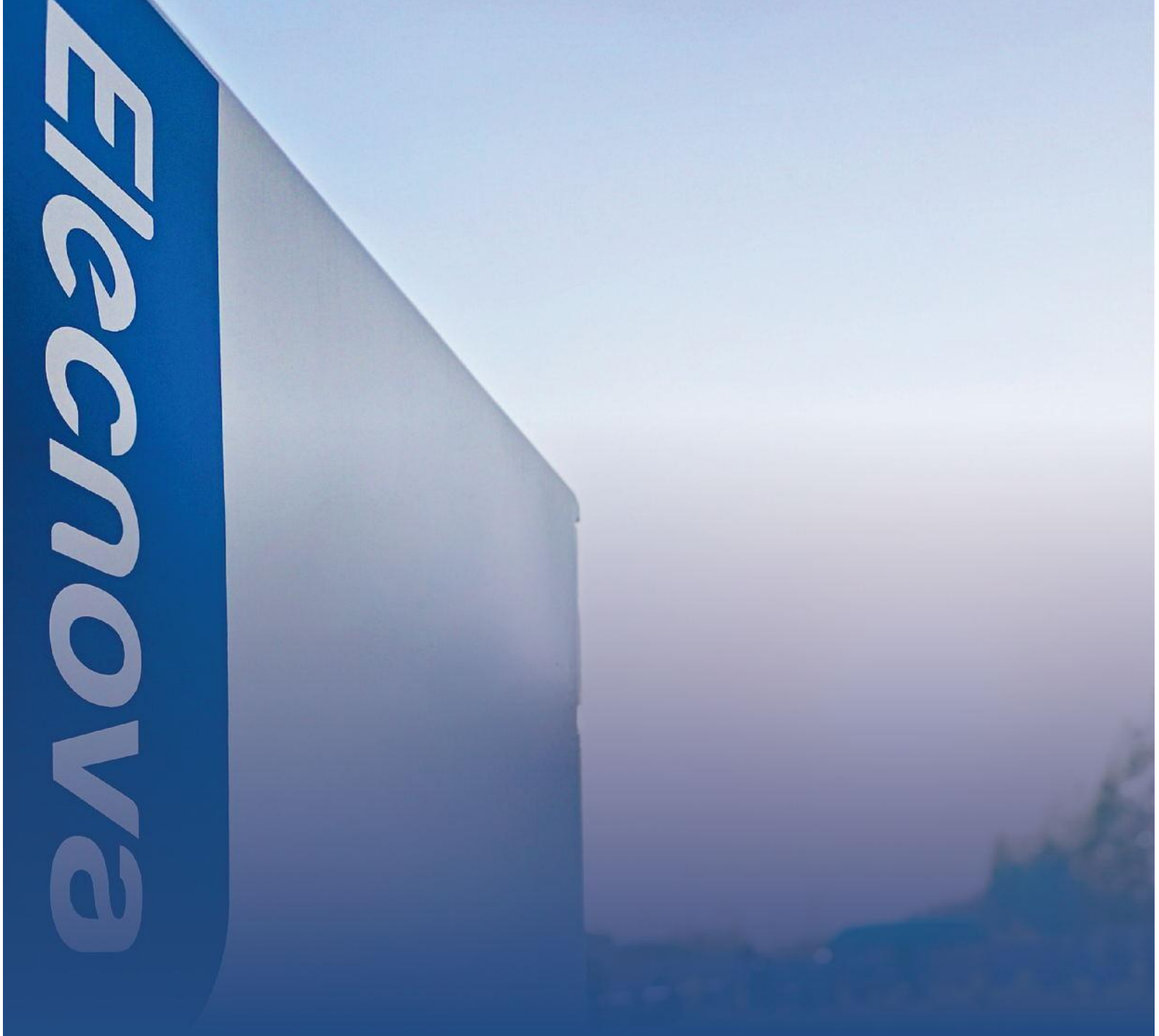

All-in-one Liquid-cooled

ESS Cabinet ECO-E233LS Installation Manual

Elecnova

Shanghai Elecnova Energy Storage Co., Ltd.

The release date identified in the change history for this Manual is correct. Elecnova reserves the right to modify products and documentation at any time.

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Revision History

Version	Description	Editor	Date	Remarks
A/1	New release (draft)	Cao Hongzhou	March 20, 2024	

Contents

1. About the Manual

1.1 Preface

Dear user, much appreciation for using this product, the all-in-one Liquid-cooled energy storage Cabinet ECO-E233LS (hereafter referred as ECO-E233LS, or the ESS Cabinet, or the Product) developed and produced by Shanghai Elecnova Energy Storage Co., Ltd (hereafter as Elecnova). We sincerely hope that the Product meets your needs, and we also hope that you are satisfied with its performance and feedback to us with your valuable comments. We will continue to evolve and continuously improve product quality.

With brand effect, technology accumulation, resource advantage and manufacturing experience of our mother company in the field of power instrument, low-voltage equipment and system integration, in order to make the utmost of our industrial chain, Elecnova aim to the full industrial chain placement of key battery material and system integration for LFP battery application. Elecnova focus on R&D, manufacturing, sales and service of BESS products to provide client with efficient, reliable, and customized BESS solutions.

1.2 Applicable Product

This Manual is applicable to ESS Cabinet, model ECO-E233LS.

1.3 Applicable Personnel

This Manual is applicable to those involved in the installation and commissioning of the product, who need to have certain professional knowledge in electrical/mechanical fields, and be familiar with electrical/mechanical schematics and components.

1.4 Usage of Manual

Read this Manual carefully before installation. Properly keep this Manual together with other documents of the ESS Cabinet, ensure easy access for relevant personnel to use them. In addition to this installation document, the following documents are also available to be used together with

- Specification of All-in-one Liquid-cooled ESS Cabinet ECO-E233LS
- User Manual of All-in-one Liquid-cooled ESS Cabinet ECO-E233LS
- User Manual of HMI Screen on All-in-one Liquid-cooled ESS Cabinet ECO-E233LS

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1.5 Usage of Symbols

To secure the safety of both personal and equipment, and to optimize installation and commissioning, pay attention to the list of symbols highlighted below:

	" DANGER" indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	"WARNING" indicates a hazardous situation which, if not avoided, may result in death or serious injury.
	"CAUTION" indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
	"Attention" indicates a potential risk, which, if not avoided, may lead to equipment malfunction or property damage.

Always pay attention to the warning signs on the cabinet. The signs include:

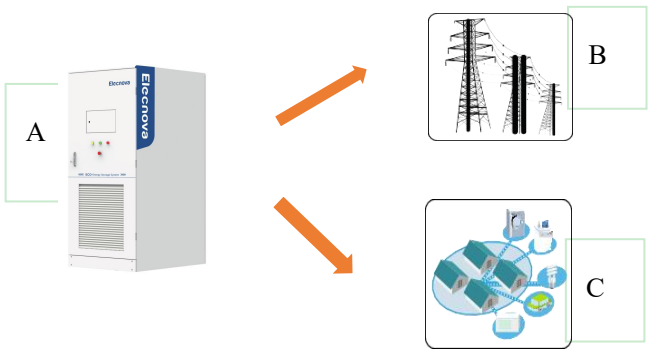
	This sign indicates that there is high voltage inside the cabinet. Touching the cabinet may lead to electric shock.
	This sign indicates that the temperature here is higher than the acceptable range for human body. Do not touch it arbitrarily to avoid personal injury.
	This sign indicates that the protective grounding (PE) terminal here needs to be firmly grounded to ensure personnel safety

2. Safety Instructions

2.1 Application Scope of Product

The ESS Cabinet is a 400V-output single battery Cluster ESS product. It provides an interface between power grid and battery to charge/discharge the LFP batteries enclosed. The product can be directly connected to 400V power grid and AC load. With ingress protection level of IP55, the product can be installed both indoor and outdoor.

The ESS Cabinet charging/discharging system is shown as below



No.	Name
A	The Cabinet BESS (including lithium battery pack)
B	Power Grid
C	Load, Commercial & Industrial applications

	"WARNING" indicates a hazardous situation which, if not avoided, may result in death or serious injury.

Read and follow this Manual

Read this Manual carefully before using the product, and keep it properly for review.

Install the Cabinet BESS in strict accordance with the description in this Manual; otherwise, serious accidents such as product damage, property loss and even personal injury/death may occur.

2.2 Safety Instructions

This section introduces the general safety rules that need to be followed during installation of the BESS. Carefully read the safety instructions in this Manual before installation. For specific safety precautions, please refer to the corresponding chapters.

	Touching Power Grid or touching the contacts and terminals that are connected to Grid may lead to electric shock and death! Do not touch the terminals or conducts connecting the Grid Damaged equipment or system fault may cause electric shock or fire! Before operation, conduct a preliminary visual inspection of the equipment for any damage or hazards. There is a fatal high voltage inside the Product! Pay attention to and comply with the warning labels on the Product.

◆ 2.2.1 Safekeeping of Manual

Read this Manual carefully before using the Product, and keep it properly for review.

Install the ESS Cabinet in strict accordance with the description in this Manual; otherwise, serious accidents such as product damage, property loss and even personal injury/death may occur.

This Manual contains important information about transportation and installation of the ESS Cabinet. Before transportation and installation, read the Manual carefully.

- ✓ Conduct transportation, installation and operation of the BESS in strict accordance with the description in this Manual; otherwise, equipment damage, personal injury/death and property loss may occur.
- ✓ Keep the manual properly to ensure easy access for personnel to review before conducting transportation, installation and operation.
- ✓ Once installation is completed, it is prohibited to put manuals or paper inside the BESS cabinet.

◆ 2.2.2 Personnel Requirements

- ✓ Only professional electricians or qualified personnel are allowed to transport, install, and operate the Product.
- ✓ Operators shall be fully familiar with the composition and working principle of the ESS Cabinet.
- ✓ Operators shall be fully familiar with the Installation Manual and User Manual of the Product.
- ✓ Operators shall be fully familiar with local standards and regulations.

◆ 2.2.3 Protection of Signs on the Cabinet

- ✓ The warning signs inside or outside the cabinet contain important information for safe operation. It is prohibited to remove the signs!
- ✓ On the back panel and on the front door of the cabinet, there are nameplates, which contain product parameter information. It is prohibited to remove the nameplates!

	Always ensure that the signs and nameplates on cabinet are clear and readable. Once a sign or nameplate on cabinet is damaged or blurred, replace it with new one soonest.

◆ 2.2.4 Warning Signs

During the installation, maintenance, inspection and repair, in order to avoid miss operation, always comply with the following instructions:

- ✓ To avoid mis-operation, put up warning signs on the front and rear side of the cabinet. Also stick warning signs nearby a switch.
- ✓ Put up warning signs or warning tapes around the installation area.

- ✓ Once commissioning is completed, lock the cabinet. Remove and keep the key properly.

◆ 2.2.5 Protection of Lithium Battery

The enclosed LFP battery system is with very high voltage. Once touched, it may cause immediate electric shock or even personnel injury/death.

	There is a deadly high voltage between positive and negative polarities of battery packs! During maintenance, make sure that the BESS is disconnected from the battery packs.

◆ 2.2.6 BESS Installation

Install the BESS in strict accordance with this Manual.

- ✓ To avoid noise disturbance, safety issues as well as other inconvenience to nearby residents, it is recommended that the ESS Cabinet is installed with enough distance from residential area
- ✓ In case that the ESS Cabinet is installed close to a residential area, a noise barrier shall be arranged to reduce the noise impact to the residents.
- ✓ It is strictly prohibited that combustible or flammable materials are stored near the BESS.

◆ 2.2.7 Electrical Connection

Electrical connection must be conducted in strict accordance with the electrical wiring diagram in this Manual

	The configuration, relevant current, voltage, power and other parameters of the LFP battery pack have been fully set-up and matched by Elecnova, and shall not be modified arbitrarily Always apply and obtain approval/permission from local Grid authority before connecting the ESS Cabinet to the power grid. And always engage professional technical personnel for installation.

◆ 2.2.8 Use of Measuring Equipment

During electrical connecting and commissioning, it is necessary to use the electrical measuring devices to ensure that electrical parameters is consistent with the requirements.

	Use high-quality measuring devices that meets onsite requirements in terms of measuring range and applicable conditions. Ensure that the measuring device is connected and used in a correct and standardized manner to avoid hazards such as electric arc. In case of conducting live measuring, take protective measures (such as wearing insulated gloves).

◆ 2.2.9 Operation under Completely Power-off Conditions

Conduct operations only after the ESS Cabinet is completely powered-off.

- ✓ Make sure that the BESS will not be accidentally re-powered on.
- ✓ Use a multi-meter to make sure that the interior components of the BESS is completely powered-off.
- ✓ Conduct necessary earthing connection.
- ✓ Use insulating covering to cover and separate the nearby live parts

✓ During whole operation, it is necessary to make sure that maintenance access ways are not blocked.

◆ 2.2.10 Moisture Protection

	The invasion of moisture is most likely to damage the BESS! Do not open the cabinet door when air relative humidity is above 95%. Avoid installation in rainy or in humid weather conditions.

◆ 2.2.11 Environment Protection

When the BESS product comes to an end of life, it shall not be treated as conventional waste. Contact a local authorized recycling agency for proper disposal.

3. Delivery & Handling

3.1 Supply Scope

The packaging box of the BESS contains the following items (The pictures are for reference only):

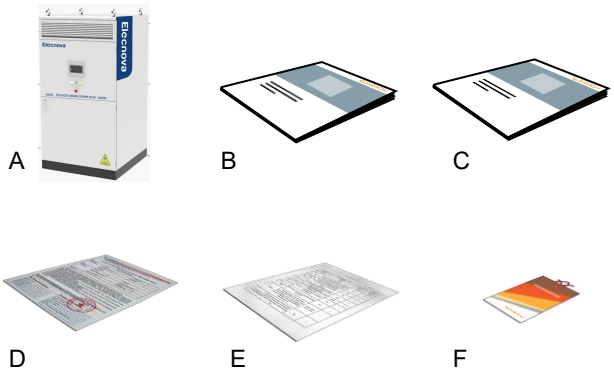


Figure 3-1 Scope of Supply

No.	Name	Quantity	Remarks
A	All-in-one ESS Cabinet ECO-E233LS	1 set	Including cabinet door key
B	User manual	1 copy	
C	Installation manual	1 copy	
D	Warranty card	1 copy	
E	Inspection report	1 copy	
F	Certificate of conformity	1 copy	

3.2 Identification of ESS Cabinet

✓ **3.2.1 Product Appearance**

The front appearance and main components of the product are shown in the figure below.

Figure 3-2 Appearance

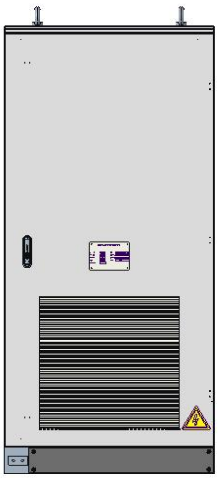


Figure 3-3 Nameplate Position

No.	Name	Description
A	LED indicators	To show power status, operation status and fault status respectively
B	LCD touch screen	To display data and execute control commands
C	Emergency stop button	To be pressed in emergency to turn off the AC-side power supply of the BESS
D	Door lock	To open and lock the front door of the BESS

✓ **3.2.2 Product Nameplate**

Users can identify the BESS through the nameplate, as shown in Figure 3-3. An aluminum nameplate is installed in the lower left corner on the back of the BESS. The information contained in the nameplate includes: model, battery type, main technical parameters, and place of origin.

	The nameplate contains important parameter information related to the BESS, so that it shall be properly protected during transportation, installation, maintenance and repair. It is strictly prohibited to damage or dismantle it!

3.3 Integrity Inspection for Transportation

The BESS is fully inspected and securely packed before leaving works. However, the product may be collided or even damaged during transportation.

3.4 Storage of BESS

In case installation is not to be conducted soon after delivery acceptance, the BESS shall be stored according to the requirements in this section. The BESS with outer packaging shall be stored in a ventilated, dry and clean indoor environment. Meanwhile, the following instructions shall be complied with:

- ✓ The ESS Cabinet shall be kept with transportation packaging, and the desiccant inside the packaging shall be retained rather than discarded.
- ✓ The warehouse ground shall be flat and strong enough to bear the weight of the BESS
- ✓ During storage, the equipment shall be ventilated and protected against moisture and the warehouse must be free from water accumulation.

- ✓ Temperature of storage environment: -20℃ to 55℃; relative humidity of storage environment: 0-95%, without condensation.
- ✓ The ESS Cabinet shall be protected against surrounding harsh conditions, such as sudden cooling, heating or collision to avoid damage.
- ✓ Regular inspection shall be conducted, generally no less than once a week. The packaging shall be checked for potential damage of rodent bites. If there is a damage to the outer packaging, it shall be remedied or replaced immediately.
- ✓ If the BESS is to be stored for more than six months, the packing shall be opened for inspection and the desiccants be renewed before repacking every 6 months.

4. Installation Design

4.1 BESS Physical Parameters

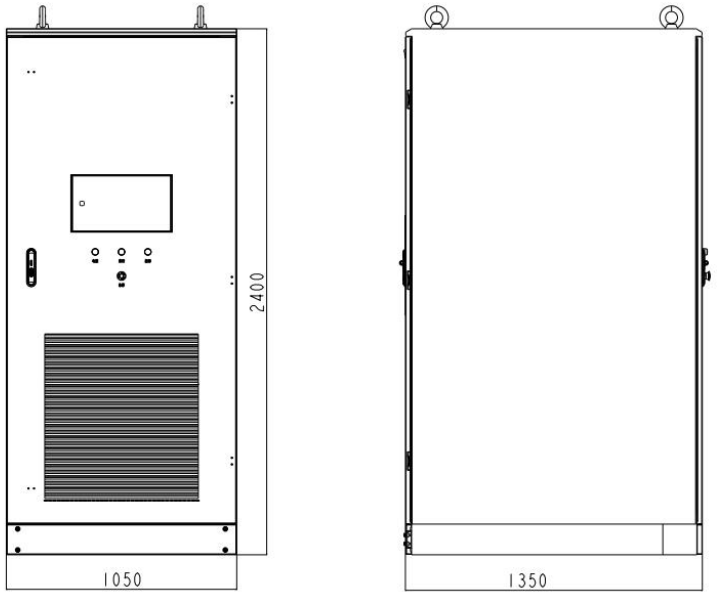


Figure 4-1 ECO-E233LS Dimensions

Width	Depth	Height
1,050mm	1,350mm	2,400mm (excluding lifting ring)

The ESS Cabinet weight is about 2,500kg

4.2 Ventilation and Heat Dissipation Requirements

The BESS HVAC adopts design front air in and rear air out. Cold air enters through the ventilation grills on the front side of Cabinet, as shown in Figure 4-2.

The ESS Cabinet ventilation fan is equipped with an air filter, which is easy to disassemble and replace. The air filter mesh is to be maintained (cleaned) regularly to ensure proper ventilation.

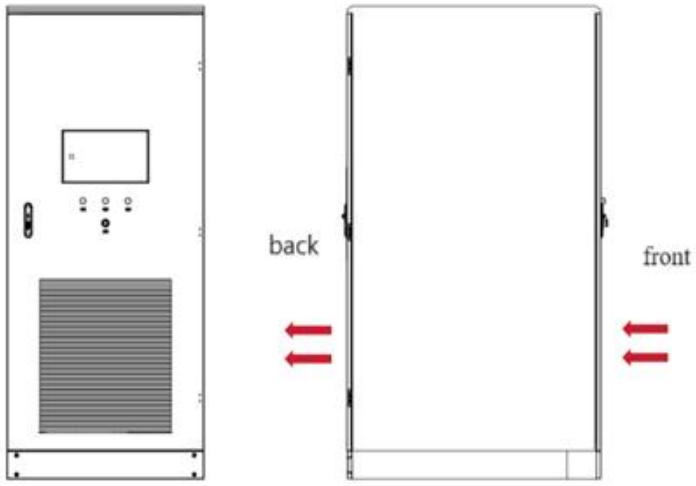


Figure 4-2 ECO-E233LS Air inlet and Outlet

4.3 Cable Design

The product in standard configuration has all connecting cables coming in and out from the bottom of the cabinet.

The positions of the inlet and outlet holes are shown in Figure 4-3. Holes in front of the cabinet are for communication cables, and the behind ones are for AC power cables.

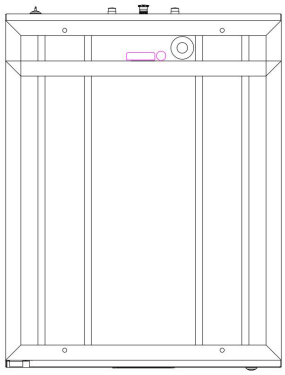


Figure 4-3 Positions of Cable Inlet and Outlet

4.4 Basic Installation Requirements

With IP55, the BESS is designed for installation in industrial environments. For safe and efficient operation, please make sure that the installation environment complies with the following instructions:

- ✓ Make sure that the installation ground is always dry, flat and free from water accumulation; Ensure that the ground is leveled without shaking and the ground is strong enough to bear the weight of the ESS Cabinet.
- ✓ The ambient temperature range at the installation site is -20℃ to 55℃; the relative humidity range shall be 0-95% (without condensation).
- ✓ Reserve sufficient space in front of and behind the cabinet for convenience of ventilation, heat dissipation, installation maintenance and safe escape.
- ✓ The ESS Cabinet grounding resistance shall be less than 4Ω.
- ✓ Ensure that the location is convenient for operations of LED indicators and LCD screen.

- ✓ There shall be no flammable gases or combustible materials nearby or in the installation area.
- ✓ The installation environment shall be clean.

4.5 Installation Environment Requirements

The ground, space, cable ducts, air ducts, ventilation equipment, and protective measures in the control room of the ESS Cabinet shall be properly designed to meet at least the following requirements.

4.5.1 Foundation Requirements

The BESS shall be installed on a concrete foundation or channel steel structure that is flame-retardant. It is necessary to ensure that the foundation is flat, solid, safe and reliable with sufficient load capacity. There shall be neither depression nor inclination on the surface of the foundation.

For the foundation construction, the cable trenches shall be pre-constructed according to the design of the BESS of which the cable entry and exit are bottom-in and bottom-out.

Holes shall be pre-drilled on the foundation. The size and position of such holes shall be consistent with the cable holes at bottom of the cabinet, so that the cabinet can be properly seated on the foundation.

The base of the cabinet is equipped with 4 positioning holes, as shown in Figure 4-4 (unit: mm).

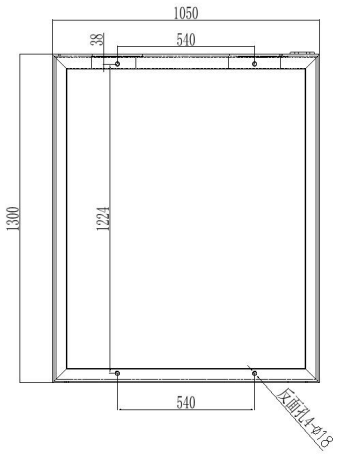


Figure 4-4 Base layout of the ESS Cabinet

◆ 4.5.2 Space Requirements

For proper installation, it is necessary to maintain an appropriate and sufficient distance to adjacent building or equipment, so as to meet the requirements of maintenance corridor, escape ways and ventilation.

The minimum space requirements of the front and rear of the BESS cabinet are shown in the figure below. If possible, it is recommended to choose spacious location, so as to ensure reliable and efficient operation

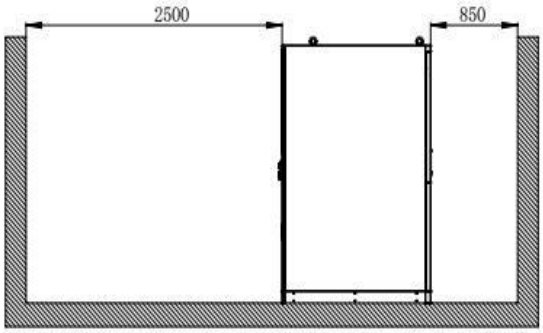


Figure 4-5 Installation Spacing

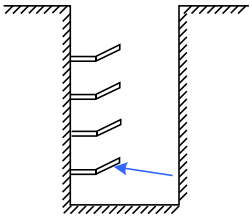
◆ 4.5.3 Cable Trunking Requirements

The ESS Cabinet adopts bottom in and bottom out wiring design. It is recommended that all external cables are routed from the cable trench for easy installation and maintenance. Concrete cable trenches shall be pre-built in the electrical control room; Steel brackets shall be installed, so as to raise the installation surface and lay the cables in raised areas (Please check relevant design standards and codes for details). In case of cable trenches are used, the ESS Cabinet may be fixed and installed with anchor screws or channel steel. In case steel brackets are used, the ESS Cabinet may be directly installed and fixed on such structure.

The cable trenches are usually designed and constructed in accordance with the relevant standards, taking into account the weight and dimensions of the ESS Cabinet.

Reliable connections are mandatory either between cable trays or from cable trays to grounding electrodes.

The cross-section drawing of cable trench is shown in the figure below. For cable laying, the communication cables and power cables shall be separated and the DC cables and AC cables shall be laid separately. This is beneficial for maintenance, and it also reduces the interference of power circuits to communication lines.



No.	Name
A	Cable trench
B	Cable tray

Figure 4-6 Design of Channel Steel

4.6 Wiring Specifications

The cables used in the system is generally classified into power cables and communication cables.

When laying communication cables, please keep them away from power cables and maintain right angles at intersections. Try to minimize the length of communication cables and maintain at least 200mm distance from power cables.

The power cables and data cables shall be placed in different cable trenches, so as to avoid the long-distance parallel routing to reduce the electromagnetic interferences to communication lines caused by power line voltage transients.

The distance between power cables and data cables shall be greater than 200mm. When the wires are cross distributed, the crossing angle shall be set to 90 degrees, and the distance may be appropriately reduced.

The recommended minimum distance between parallel shielded data cables and power cables are shown in the table below.

Parallel Line Length (m)	Minimum Distance (m)
200	0.3
300	0.5
500	1.2

The data cables shall be as close to the ground surface as possible or be supported by supporting beams, channel steel, or metal rail.

4.7 Cable Fixing and Protection

◆ **4.7.1 Cable Fixing**

Loose contact of cables to copper noses may lead to over-heating or even fire, please follow the torque requirements when tightening the screws/bolts of copper noses:

Bolt Size	M3	M4	M5	M6	M8	M10	M12	M16
Torque (N.m)	0.7-1	1.8-2.4	4-4.8	7-8	17-20	34-40	60-70	119-140

In order to reduce the stress on copper noses connecting a cable, the cable shall be fixed at another position nearby

◆ **4.7.2 Cable Protection**

The protection of cables includes the protection of communication cables and power cables. The protective measures are as follows:

- ✓ Communication cable protection:

  Due to small size, communication cables are easily broken or detached from the wiring terminals. Therefore, it is recommended to lay power cables first, and then lay communication cables, using as much cable-trays as possible, fixing comm cables with zip ties where cable trays are not applicable, keeping communication cables away from heating sources and power cables.

- ✓ Power cables protection:

  Power cables are with hazardous voltage and current, therefore during cable installation, the insulation layer of the cables shall be protected against scratch or damage, so as to avoid short circuits. The power cables shall also be properly fixed where cable trays are not applicable.

5. Mechanical Installation

5.1 Transportation of Equipment

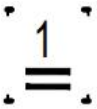
◆ **Precautions**

	The ESS Cabinet must not be disassembled during transportation or installation. Malfunctions caused by unauthorized modifications are not covered by the warranty. Transport the ESS cabinet in strict accordance with the description in this chapter! Always pay attention to the gravity center marking on the package of the cabinet! Due to the fact that the gravity center is not the mechanical center, always pay attention to the gravity center marking during transportation. With or without external package, it is strictly prohibited to tilt the ESS Cabinet with an angle exceeding 5°during transportation. If the tilt angle is too large, the cabinet may overturn. Due to its large volume and weight, personal injury/death and equipment damage may occur when tilted.

	During transportation, avoid mechanical impact on the cabinet, such as violent shaking or sudden lowering or lifting. Avoid transporting the ESS cabinet in rain. If unavoidable, please take necessary rain-proofing measures. Only personnels with license and approved by the authority are allowed to handle the ESS cabinet.
	To ensure safe and intact transportation of the Product to destination/site, please also take any other necessary auxiliary measures.

◆ 5.1.2 Transportation with Outer Package

To ensure that the ESS Cabinet is properly protected during transportation, please transport it with package as much as possible in accordance with the signs on the package. The package signs are illustrated as follows:

Sign	Meaning
	Right side up. It is prohibited to handle the cabinet lying down, tilted or upside down.
	Handle with care. Avoid damage to the ESS Cabinet caused by excessive collision and friction.
	Moisture prevention. Protect the ESS Cabinet from and against rain or moisture
	The limit of stacking layers is 1 layer
	No Rolling
	Recyclable
	Hazardous goods, category-9

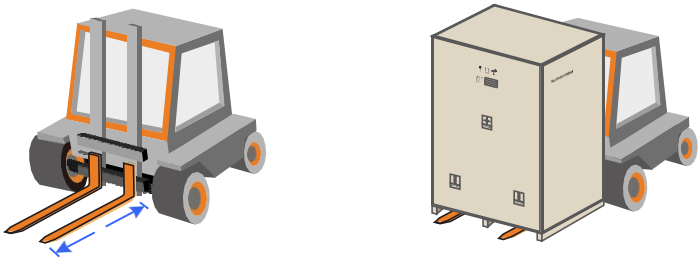
The unpackaged ESS Cabinet may be moved with forklift, pallet truck or crane. When moving the ESS Cabinet, pay attention to its weight as well as the gravity center marking and lifting marking on the package box. Ensure that the transportation equipment has sufficient load-bearing capacity and arrange support or lifting points reasonably.

- ✓ Transportation with Forklift

  Transporting the ESS Cabinet with a forklift is a standard transportation method. During transportation, the center of gravity of the box shall be placed between the two forks of the forklift. A trial forking shall be conducted before normal handling. The length of fork shall not be less than 1.6m.

When using a forklift to lift, lower, and move the ESS Cabinet, please ensure that the operation is slow and smooth. In addition, only place the ESS Cabinet on a hard and leveled ground.

Figure 5-1 Schematic Diagram of Transportation with Forklift



During the transportation with forklift, please strictly follow the safety operating procedures for forklift. The packaging of the ESS Cabinet may block the driver's sight, so auxiliary personnel shall be arranged to provide assistance.

✓ Transportation with Crane

A crane may be used to lift and transport the ESS Cabinet. For the purpose of lifting, tie two flexible lifting straps to the outer packaging box through lifting signs. The equipment shall be lifted with the hook being perpendicular to BESS gravity center. Tilting transportation is strictly prohibited!

When using a crane to lift, lower, and move the ESS Cabinet, please ensure that the operation is slow and smooth. In addition, only place the ESS Cabinet on a hard and leveled ground.

During the process of transportation with crane, please strictly follow the safety operating procedures for crane. In case of adverse weather conditions such as heavy rain, heavy fog or strong winds, the lifting operation shall be stopped.

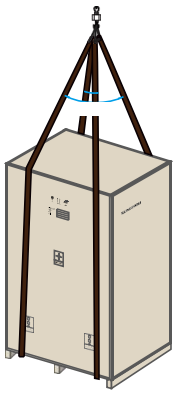


Figure 5-2 Transportation with Crane

◆ 5.1.3 Transportation without Outer Package

The transportation of ESS Cabinet without outer packaging is usually carried out near the final installation location. The unpackaged ESS Cabinet may be transported by using forklift, crane or other means.

	Before moving the ESS Cabinet to the predetermined position, it is recommended to conduct cable laying first. Considering the thickness of cables, once the ESS Cabinet is seated, cable routing operations becomes difficult and cables may be easily damaged.

✓ Transportation with Forklift

During the process of transportation with forklift, please strictly follow the safety operating procedures for forklift.

When using a forklift to lift, lower, and move the ESS Cabinet, please ensure that the operation

is slow and smooth. In addition, only place the ESS Cabinet on a hard and leveled ground.

If the unpacking location is closer to the installation location, a forklift may be used to transport the ESS Cabinet with a bottom wooden pallet. Please ensure that the gravity center of the ESS Cabinet is placed between the two forks of the forklift.

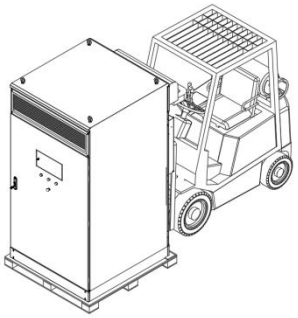


Figure 5-3 Transportation with Forklift (with Bottom Wooden Pallet)

If the wooden pallet at the bottom of the ESS Cabinet has been removed, it may be transported directly by a forklift, and the forks may be placed directly in the base fork grooves.

For the purpose of facilitating the on-site transportation, the fork grooves have been designed in advance, and the base baffle must be removed before transportation.

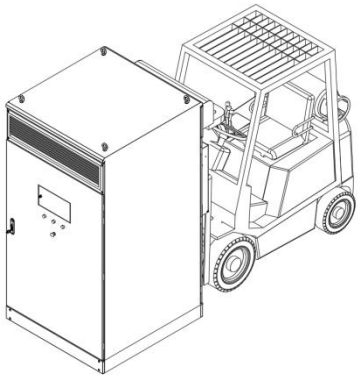


Figure 5-4 Transportation with Forklift (without Bottom Wooden Pallet)

- ✓ Transportation with Crane

For the purpose of facilitating the transportation with crane, the lifting rings are designed on the top of the ESS Cabinet. Users may directly lift and transport the ESS Cabinet through lifting rings.

During lifting operation, the center of the hook shall be perpendicular to the center of the ESS Cabinet, and a trial lifting shall be conducted. Tilted lifting is strictly prohibited. Meanwhile, during the lifting of the ESS Cabinet, please strictly follow the safety operating procedures for crane.

When using a crane to lift, lower, and move the ESS Cabinet, please ensure that the operation is slow and smooth. In addition, only place the ESS Cabinet on a hard and leveled ground.

Figure 5-5 Transportation with Crane (no package, no pallet)

5.2 On-site Installation

	It is prohibited to perform any un-related mechanical operation either inside or on the top of the ESS Cabinet. During installation, please ensure the ESS Cabinet is clean (both inside and surrounding place).

◆ 5.2.1 Removal of Packaging

	The packaging plates of the ESS Cabinet are heavy. To remove the outer packaging, please ensure that at least two workers are performing this operation simultaneously.

Please remove the transportation package of the cabinet with the following steps.

Step 1: Remove the top plate of the package box.

Step 2: Remove the wooden sides of the package box.

Step 3: Remove the shielding material from the package box.

Step 4: Remove the anchoring components that secure the Cabinet to the transportation board.

At this point, the ESS Cabinet can be detached from the wooden transportation pallet.

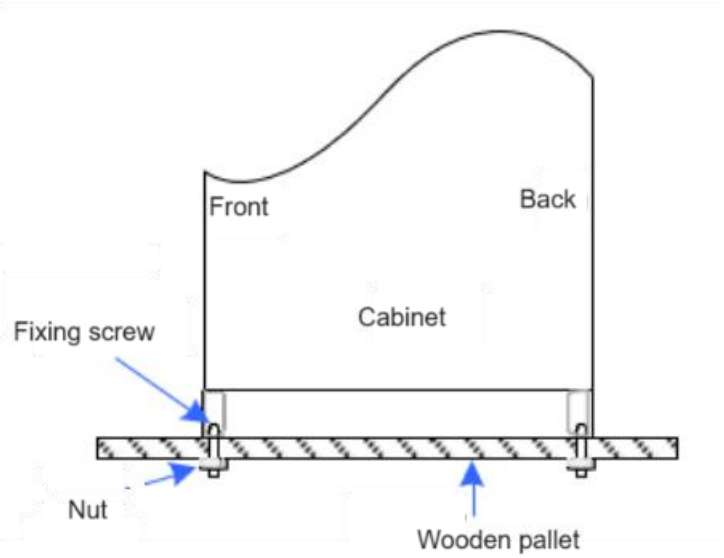


Figure 5-6 Schematic Diagram of Fixing Status of the Cabinet to Pallet

WARNING	After the ESS Cabinet is detached from the wooden pallet, it is strictly prohibited to transport the ESS Cabinet through the wooden pallet again. In addition, since now the ESS Cabinet is at risk of tipping over, please handle with special care.
	The ESS Cabinet may be repacked in accordance with the reversed steps for storage. Please keep the shielding materials and desiccants inside the box during repacking, and store the ESS Cabinet in strict accordance with the description in this Manual.

◆ 5.2.2 Inspection before Fixing

It is recommended to finalize the installation onto channel steel.

Before fixing the ESS Cabinet, please:

- ✓ Ensure that the cable trenches and the cable laying meet the installation requirements
- ✓ Ensure that the installation and openings of channel steel meet the installation requirements.
- ✓ Other than channel steel, anchor bolts may also be used to fix the ESS Cabinet on a pre-built solid foundation. In such case, it is necessary to pre-drill holes on the foundation, and the holes shall meet the requirements of the positioning holes at the bottom of the ESS Cabinet.

◆ 5.2.3 Fixing of Cabinet

	The AC side of the ESS Cabinet shall be placed close to the later-stage external transformer, so as to minimize the length of the cables from AC side of the cabinet to the later-stage transformer.

Fix the ESS Cabinet according to the following steps:

Step 1: Shift the ESS Cabinet to the destination position and align it with the installation holes.

Step 2: Fix the cabinet to the channel steel or to the foundation with M16 bolts through the pre-drilled slots on the base of Cabinet

Step 3: Install the front and rear baffles to the base of Cabinet upon completion

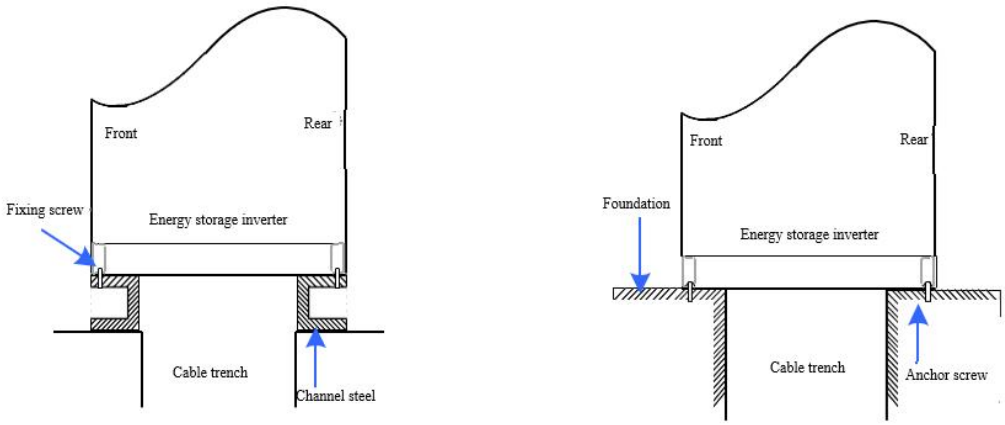
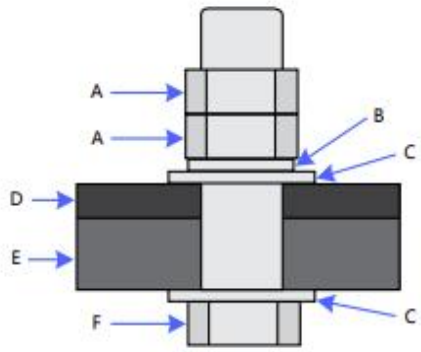


Figure 5-7 Fixing Method for ESS Cabinet



No.	Name
A	Nut
B	Spring washer
C	Flat washer
D	Base of Cabinet
E	Channel steel
F	Bolt

The connection sequence between the bottom of the ESS Cabinet and the channel steel is shown in the figure above.

	High voltage Hazard! Electric shock Hazard! Be sure not to touch any live part! Please ensure that both the AC and DC sides are not live before installation.
	All electrical connections shall comply with the electrical connection standards of the country/region where the project is located Only professional electricians or qualified personnels are allowed to conduct electrical connection for the Product. Check all cables before connection to make sure that insulation is perfect; Replace all cables of any insulation defect to avoid risk of safety problem Please perform the wiring operation in strict accordance with the wiring markings inside the equipment.

	• Mind the polarities of DC cables and the phase sequence of AC cables • Don't pull the cables hard to avoid damage to insulation. • Bending allowance shall be reserved for all cables • Take auxiliary measures to reduce stress of cables, • Once wiring operation is completed, conduct inspection carefully, so as to ensure that the wiring is correct and fixed properly. • The ESS Cabinet may be connected to the power grid only after the Grid connection is approved by local Authority and that the ESS Cabinet is installed by professional technician(s)

6. Electrical Installation

6.1 Safety Requirements for Electrical Connection

In order to ensure the safety of personnel and equipment during electrical installation, follow all safety instructions in this Manual (especially those in this chapter), complying also with local safety regulations (of destination region/country)

During the electrical connections of the ESS Cabinet, as well as all other operations carried out to the ESS Cabinet, always follow the Five Safety Rules below:

- Disconnect all external connections of the BESS and the connections to the internal power supply.
- Make sure that the BESS will not be re-powered on by all means.
- Use a multi-meter to make sure that the inside of the BESS is completely powered-off.
- Conduct necessary earthing connection and short-circuit connection.
- Use insulating coverings to cover the potentially-live parts near the operation section.

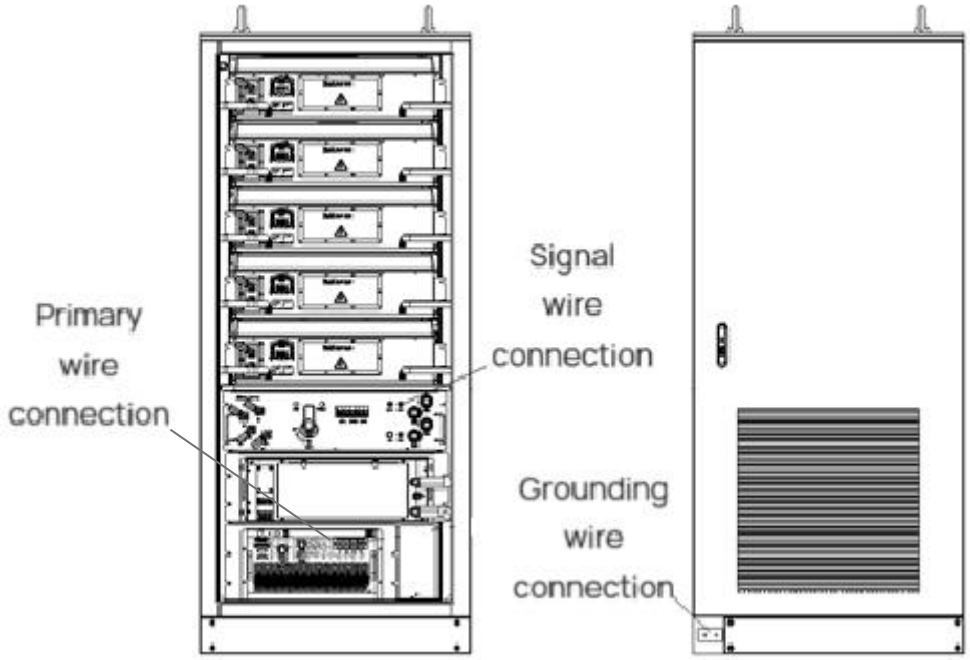
6.2 Safety Tools and Parts

The following tools and parts shall be prepared before installation:

- Torque wrench
- Screwdriver
- Stripping pliers
- Wire crimper
- Alcohol torch
- Internal hexagon wrench for cable terminal fastening
- Megohmmeter and multi-meter
- Other auxiliary tools and parts that may be used

6.3 Connection of Electrical Cables

- **6.3.1 Overview of Wiring Areas**



◆ **6.3.2 Cable Requirements**

The requirements for cable selection are as follows:

- ✓ The selected cables shall have sufficient current capacity. The current capacity of a conductor is related to the factors: 1) environmental conditions, 2) type of insulation material on the conductor, 3) cable laying method, 4) material of conductor 5) cross-section area.
- ✓ The cable diameter shall be selected according to the maximum current of the AC or DC sides with margin.
- ✓ Select cables of same specifications and same type on the same side
- ✓ Selected cables shall be flame-retardant.

The recommended specifications for connecting cables are detailed in the table below.

No.	Name	Description
1	Main power cable	AC A, B, C and N (50-70mm2 cables recommended)
2	Communication connecting cable	RS485
3	Grounding	PE (25-50mm^2 cable) or grounding flat steel

WARNING	Overloading of cables is strictly prohibited!
	The cable diameters given in the table are for copper cores. In case that aluminum cables are selected, determine the cable size reasonably based on site conditions. The recommended cable parameters are for the BESS with standard configuration. If your order is with different requirement, cable parameters may vary.

◆ 6.3.3 Cable Connection

Step 1: Make sure that the battery unit of the ESS Cabinet is disconnected.

Step 2: Strip the cable to expose copper core for a length of the-copper-nose-conduit-depth +5mm.

Step 3: Based on the cable specifications, it is recommended to use DT XX-8 copper nose terminal for wiring, where XX is the wire diameter of cable.

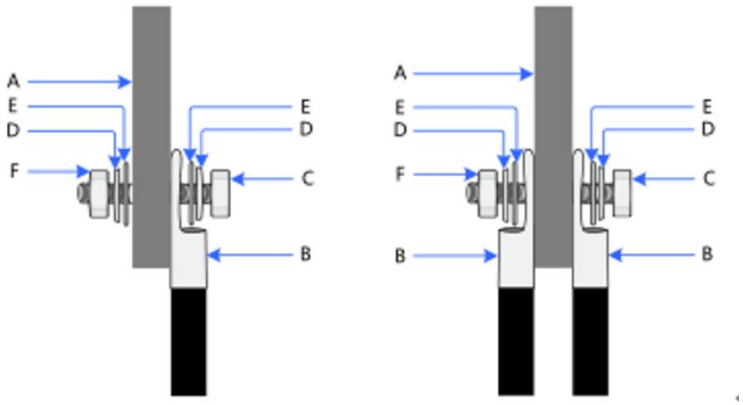
- ✓ Step 4: Crimp copper nose terminal.
- ✓ Put the exposed copper core into the copper nose conduit.
- ✓ Use a wire crimper to compress the copper nose terminal. Compress it at least twice.

Step 5: Install the heat shrink tubing.

- ✓ Select a heat shrink tubing that matches the cable size. The length of the tubing shall exceed the copper nose conduit by 20mm.
- ✓ Wrap the heat shrink tubing over the copper nose till the copper nose conduit is fully covered.
- ✓ Use a heater to tighten the heat shrink tubing.

Step 6: Connect the cables.

- ✓ Select bolts that match copper nose terminals.
- ✓ Fix the nose onto the wiring bar, minding the phase order of A-B-C-N
- ✓ Tighten the screws with screwdriver and/or wrench. The tightening torque of copper cables is 20N.m.



A	B	C	D	E	F
Copper Bar	Copper Nose Terminal	Bolt	Spring Washer	Flat washer	Nut

Step 7: Check and make sure that the wiring is securely fixed

WARNING	Comply with all safety regulations listed by the relevant on-site equipment manufacturers. Incorrect wiring sequence may cause fire. Please pay attention to the connection sequence of components. When connecting wires, ensure that the connectors are securely fastened. If the connection is loose or the contact surface oxidizes, excessive heat may be generated, which may lead to fire.

	The length of wiring screw/bolt shall be appropriate, so that the screw/bolt slightly protrudes from the connection hole of copper bar. Excessive long screw/bolt may affect the insulation performance or even lead to short circuit. Check whether any heat shrink tubing is clamped at the connection point. If clamped, remove it immediately to avoid poor contact, which may lead to heating and fire. In case of the multi-core cables used, it is recommended to add protective sleeves at each forked position, so as to prevent insulation from cracking.

6.4 Grounding of ESS Cabinet

	The grounding cables shall be well grounded! Otherwise: In case of malfunction, it may pose a fatal electric shock hazard to operators! Lightning strikes may cause equipment damage! The equipment may malfunction! The wiring shall be conducted in strict accordance with the wiring markings inside the equipment.
	Grounding connection shall comply with the following instructions: The grounding connection shall comply with the grounding standards and codes of the country/region where the project is located. The connection between the equipment and the grounding electrode shall be tightened and reliable. Upon completion of grounding, the grounding resistance shall be measured and not exceeding 4Ω

6.5 Sealing of Inlet Holes

Check carefully all the electric connections upon completion of works. When all connections are verified, seal the gaps with fireproof mud, so as to prevent small animals from entering. Don't remove the protective sponge which prevents the cables from being scratched .

6.6 Installation Checklist

Upon completion of installation, to ensure the normal operation, conduct the following inspections:

Mechanical Installation Inspection
☐ The ESS Cabinet is not deformed or damaged
☐ There is sufficient maintenance space around the Cabinet
☐ Temperature, humidity, and ventilation conditions of the environment (where the BESS is seated) meet the requirements
☐ Clear warning signs have been put up in and out of the ESS Cabinet
☐ There is no flammable, explosive or hazardous materials near the ESS Cabinet
Electrical installation inspection
☐ The ESS Cabinet grounding cables: complete and secured
☐ The ESS Cabinet power cables connection: correct and secured
☐ The ESS Cabinet communication cable connection, correct and kept at a proper distance from power cables
☐ The cables ID number: correctly and clearly identified
☐ The insulated protective cover: complete and secured and the warning signs are clear and secured

Other Inspections
☐ Inside the cabinet: no foreign objects, like tools, parts, waste or conductive dust
☐ The ESS Cabinet and cables: neat and secured

7. Annex

7.1 Technical Data

Item	Specifications	Remarks
Product model	ECO-E233LS	
DC Side Parameters		
Battery type	LFP 280Ah	
System grouping	1P260S	
Rated energy	232.96kWh	100%DOD, 25±2℃, 0.5P
Rated capacity	280Ah	
Rated voltage	832V	
Recommended voltage range	DC 728-936V	Lower limit of cell voltage 2.8V Upper limit of cell voltage 3.6V
AC Side Parameters		
Rated output power	100kW	
Maximum AC power	110kW (continuous for 1 minute)	
Rated voltage of grid	400Vac/3P+N+PE	
Rated frequency of grid	50Hz/60Hz	
AC current distortion rate	＜3%	
DC component	＜0.5%Ipn	
Power factor range	-0.98 to 0.98	
System Parameter		
Energy conversion efficiency	≥89%	BESS auxiliary power consumption excluded
Charging/discharging rate	0.5P	Constant power
Discharging depth	95%DOD	
Cycle life	≥8000 times (25±2℃)	Rated operating conditions: 25±2℃, 0.5P, and 95%DOD
Protection level	IP55	
Cooling method	Active liquid cooling	
Operating temperature	-25 to 55℃	
Relative humidity	0-95%RH, without condensation	
Altitude	≤2000m	Derated for altitude above 2,000m
Dimensions (W*D*H)	1050 * 1350 * 2400mm	
Total weight	2,570kg	
Fire Suppression System	PACK-level prediction + single-PACK protection + Aerosol fire extinguishing	
Communication interface	Ethernet/RS485	
Standards complied with	GB/T 36276, GB/T 34120, GB/T 34131, UN38.3, IEC62619, UL1973, UL9540, and CE-EMC	

7.2 Cables Reference

No.	Name	Description
1	Main power cable	AC phase A, B, C and N (50-70mm2 cables recommended)
2	Communication cable	485
3	Grounding cable	PE (25-50mm^2 cable) or grounding flat steel

7.3 Quality Warranty

Refer to Limited Warranty Letter for Elecnova ESS Products (Standard Edition).

The warranty conditions are also subject to terms and conditions of a contract.

7.4 Contact Information

For any question about the Product, please contact us with info below:

Name: Shanghai Elecnova Energy Storage Co., Ltd.

Address: 3F-T1, Hongqiaohui, Shanghai, China

T: +86 21 5439 6121, +86 199 0616 5606

Service Hotline: +86 21 5439 6121

Email: sales@elecnova-ess.com

Https://www.elecnova-ess.com

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