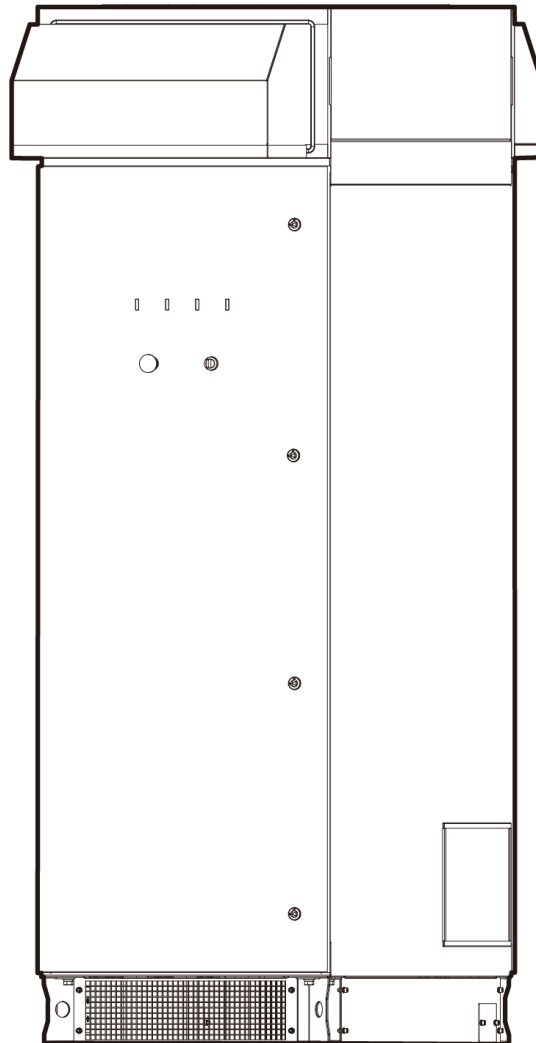


EH Series 1500V Energy Storage Converter

User Manual



Applicable models:
EH-1250-HB-UD
EH-1250-HB-UD-US

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Preface

Thank you for choosing the product from Sineng Electric Co., Ltd. (hereinafter referred to as Sineng). This manual describes instructions on proper use of the product. Please read this manual carefully before using the product. Please keep this manual properly for future reference.

Overview

This manual mainly introduces the safety precautions, product introduction, installation, electrical connections, power-on commissioning, maintenance and technical indicators of the following energy storage converter models. This manual is designed to help you understand and use the product correctly. It can also be used as training and operation materials for operators, on-site maintenance personnel and other personnel.





- EH-1250-HB-UD
- EH-1250-HB-UD-US

Intended Audience

- Technical support engineers
- Commissioning engineers
- Maintenance engineers
- Hardware installation engineers

Sign Conventions

The following symbols are used in the description of safety or critical information in this manual. Please pay attention or abide by the information marked with the following signs.

| Symbol | Description |
|--|--|
|  Danger | Indicates that a seriously dangerous situation may occur, which, if not avoided, may result in serious personal injuries or casualties. |
|  Warning | Indicates that a potentially dangerous situation may occur, which, if not avoided, may result in personal injuries, equipment damage, etc. |
|  Caution | Indicates that an unpredictable situation may occur, which, if not avoided, may result in equipment damage, performance deterioration, data loss, etc. |
|  Note | Indicates key information elaboration and operational tips. |

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Chapter 1 Safety Precautions

1.1 Declaration

Before transporting, storing, installing, operating, using or/and maintaining the equipment, please read this manual, operate in strict accordance with the instructions, and follow all safety precautions marked on the equipment and in the manual. In this manual, "equipment" refers to the products, software, components, spare parts and/or services related to this manual. The "company" refers to the manufacturer (producer), seller and/or service provider of the equipment. "You" refers to the person who transports, stores, installs, operates, uses and/or maintains the equipment.

The "Danger", "Warning", "Caution", and "Tips" in this manual do not cover all safety precautions that should be observed. You must also comply with relevant international, national or regional standards and industry practices. **Sineng does not assume any liability caused by violation of safe operation requirements or violation of safety standards for the design, production and use of equipment.**

This equipment should be used in an environment in line with the design specifications. Otherwise, equipment failure, equipment malfunction or component damage that may be caused will not be covered by the equipment warranty. Sineng will not be liable for compensation for related personal injuries and property losses, etc.

All operations such as transportation, storage, installation, operation, use and maintenance should comply with applicable laws, regulations, standards and specifications.

Reverse engineering, decompilation, disassembly, adaptation, implantation and other derivative operations on the equipment software are prohibited. It is not allowed to study the internal implementation logic of the equipment, obtain the source code of the equipment software, or infringe on intellectual property rights in any way, nor disclose the results of any equipment software performance test.

Sineng will not be liable for any of the following situations or their consequences:

- Equipment damage is caused by earthquakes, floods, volcanic eruptions, mudslides, lightning strikes, fires, wars, armed conflicts, typhoons, hurricanes, tornadoes, extreme weather, and force majeure;
- The equipment is not operated in the service conditions specified in this manual;
- The installation and application environment does not comply with relevant international, national or regional standards;
- The equipment is installed and used by unqualified personnel;
- Failure to operate the equipment according to the operating instructions and safety warnings in the product and manual;
- The equipment is disassembled or modified or software code is modified without authorization;
- Equipment damage is caused by transportation by the customer or third-party shipping company;
- Equipment damage is caused by storage conditions that do not meet the requirements described in the manual;
- The materials and tools prepared by the customer do not meet the requirements of local laws, regulations and relevant standards;
- Equipment damage is caused by customer or third party's negligence, intentionality, gross negligence, improper operation, or non-Sineng reasons.

1.2 Personal Safety



Danger

- It is prohibited to perform live operations during installation. It is prohibited to install or remove cables while the power is on. Arcing or sparks may occur at the moment when a cable core contacts a conductor, which may cause fire or personal injuries.
 - When the equipment is energized, non-standard or incorrect operations may cause fire, electric shock or explosion, resulting in casualties or property loss.
 - It is prohibited to wear watches, bracelets, rings, necklaces and other conductive accessories during the operation to avoid being burned by electric shock.
 - Special insulating tools must be used during the operation to avoid electric shock injuries or short-circuit faults. The insulation withstand voltage must meet local laws, regulations, standards and specifications.
-



Warning

- Special protective equipment must be used during the operation, such as protective clothing, ESD shoes, goggles, hard hats, and ESD gloves.
-

1.2.1 General Requirements

- Do not deactivate equipment protection devices or ignore warnings, cautions and prevent measures in the manual and equipment.
- During the operating of the equipment, if a fault that may cause personal injuries or equipment damage is discovered, immediately terminate the operation and report to the responsible personnel. Then, take effective protective measures.
- Do not power on the equipment before it has been installed or confirmed by professionals.
- It is prohibited to contact the power supply equipment directly, using other conductors, or indirectly through wet objects. Before contacting any conductor surface or terminal, measure the voltage of the contact point to confirm that there is no risk of electric shock.
- When the equipment is operating, the enclosure temperature is high and there is a risk of burns. Please do not touch the enclosure.
- It is prohibited to let your fingers, parts, screws, tools or boards come into contact with the running fan to avoid injuries to your hands or damage to the equipment.
- If fire occurs, evacuate the building or equipment area immediately and press the fire alarm or call the fire emergency hotline. Under no circumstances should you re-enter the burning building or equipment area.

1.2.2 Personnel Requirements

- Personnel operating the equipment include professionals and trained personnel.
 - Professionals: People who are familiar with the principles and structure of equipment, have experience in training or operating the equipment, and understand the potential sources and magnitudes of hazards during equipment installation, operation, and maintenance.
 - Trained personnel: People who have undergone appropriate technical and safety training, can be aware of the hazards that may arise when performing an operation, and can take steps to minimize the risk to themselves or other persons.
- Personnel who install and maintain the equipment must undergo strict training, master correct operation methods, and understand various safety precautions and relevant standards of the country/region where the equipment is located.

- Only qualified professionals or trained personnel are allowed to install, operate and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and service equipment.
- Personnel operating in special scenarios such as electrical operations, climbing operations, and special equipment operations must have the special operation qualifications required by the local country/region.
- Replacement of equipment or parts (including software) must be implemented by authorized professionals.
- Except for those who operate the equipment, other personnel are prohibited to approach the equipment.

1.3 Electrical Safety



Danger

- Before making electrical connections, ensure that the equipment is not damaged. Otherwise, it may cause electric shock or fire.
- Improper and incorrect operations may cause accidents such as fire or electric shock.
- During the operation, prevent foreign objects from entering the equipment. Otherwise, it may cause short circuit or damage to the equipment, derating or power outage of the load, as well as personal injuries.
- When installing equipment that needs to be grounded, the protective ground cable must be installed first. When dismantling the equipment, the protective ground cable must be removed last.

1.3.1 General Requirements

- Installation, operation and maintenance must be carried out in accordance with the procedures in the manual. Do not modify, install or change equipment without authorization, and do not change the installation sequence without authorization.
- Grid-connected operating requires the permissions from the power department of the country or region where the equipment is located.
- Comply with power station safety regulations, such as operation ticket and job ticket systems.
- Set up temporary fences or warning ropes in the working area and hang "No Entry" signs to prevent unrelated persons from entering the working area.
- Before installing or removing the power cables, disconnect the equipment and its upper-level and lower-level switches.
- Before operating the equipment, carefully check that the tools are qualified and registered. After the operation is completed, take the tools back according to the claimed quantity to prevent them from being left inside the equipment.
- Before installing power cables, confirm that the cable labels are correct and the cable terminals are insulated.
- When installing the equipment, use a torque tool with an appropriate range to tighten the screws. When using a wrench to tighten, ensure that the wrench is not skewed and the error of torque does not exceed 10% of the specified value.
- Use a torque tool to secure the bolts and double check using the red and blue markings. After confirming that a bolt is tightened, paint a blue mark on the bolt. After the inspector confirms that the bolt is tightened, paint a red mark (the line mark must span the edge of the bolt).
- If the equipment has multiple inputs, all inputs of the equipment should be disconnected, and the equipment can only be operated after it is completely powered off.

- When maintaining the lower-level power consumption or power distribution equipment of the power supply equipment, it is necessary to disconnect the corresponding output switch of the power supply equipment.
- During equipment maintenance, hang a "No closing" sign on the upper-level and lower-level switches or circuit breakers, and post warning signs to prevent accidental connections. The equipment can only be powered on after the fault is rectified.
- Regularly check the equipment connection terminal screws to make sure they are tightened properly.
- If a cable is damaged, it must be replaced by a professional to avoid risks.
- It is prohibited to alter, damage or cover the signs and nameplates on the equipment, and promptly replace unclear signs that have been used for a long time.
- It is prohibited to clean the internal and external electrical parts of the equipment with solvents such as water, alcohol or oil.

1.3.2 Ground Requirements

- The equipment ground impedance should meet the requirements of local electrical standards.
- The equipment must be connected to the protection ground. Before operating the equipment, check the electrical connection of the equipment to ensure that the equipment is reliably grounded.
- It is prohibited to operate the equipment when the grounding conductor is not installed.
- It is prohibited to destroy the grounding conductor.

1.3.3 Wiring Requirements

- The selection, installation, and routing of cables must comply with local laws, regulations, and specifications.
- Looping and twisting of cables are prohibited. If the length of the power cable is not long enough, replace the power cable. It is prohibited to make joints or solder joints in the power cable.
- All cables must be securely connected, well insulated, and of appropriate size.
- Cable troughs and cable holes should have no sharp edges. Cable tubes or cable holes must be protected to prevent cables from being damaged by sharp edges, burrs, etc.
- Cables of the same type should be tied together, with a straight and neat appearance and no skin damage. Cables of different types should be laid out separately, and cables must not entangle or cross each other.
- Buried cables need to be reliably secured using cable supports and cable clamps. The cables in the backfilled soil area must be closely attached to the ground to prevent the cables from being deformed or damaged due to force exerted when the soil is backfilled.
- When external conditions (such as laying methods or ambient temperature) change, verify cable selection by referring to IEC-60364-5-52 or local regulations and specifications, such as whether the current carrying capacity meets the requirements.
- The insulation layer of cables may be aged or damaged if the cables are used in high-temperature environments. The distance between the cable and the heating device or the periphery of the heat source area must be at least 30 mm.
- The torsion angle between the plane of the OT terminal of the power cable and the plane of the input copper bar should not exceed 15 degrees.
- After the power cables are installed, tie them to the supports.
- Cable routing should avoid the line cutting position of the platform.
- The torsion angle between the central axis of the power cable and the input copper bar in the vertical direction should be less than 5 degrees.

1.4 Environment Requirements



Danger

- It is prohibited to place the equipment in an environment with flammable or explosive gases or smoke, or perform any operation on the equipment in such environment.
 - It is prohibited to store flammable and explosive items in the equipment area.
 - It is prohibited to place the equipment close to heat or fire sources, such as fireworks, candles, heaters, or other heating devices. The heating may cause damage to the equipment or cause a fire.
 - The equipment should be installed in an area away from liquids. It is prohibited to install the equipment under water pipes, air outlets and other places where condensation is likely to occur. It is prohibited to install the equipment under air conditioners, vents and other places that are prone to water leakage to prevent liquid from entering the equipment and causing equipment failure or short circuit.
-



Warning

- When the equipment is operating, do not block the air outlets and cooling system, or cover it with other objects to prevent equipment damage or fire due to high temperature.
 - The equipment should be installed in an area away from liquids. It is prohibited to install the equipment under water pipes, air outlets and other places where condensation is likely to occur. It is prohibited to install the equipment under air conditioners, vents and other places that are prone to water leakage to prevent liquid from entering the equipment and causing equipment failure or short circuit.
-

1.4.1 General Requirements

- The equipment should be stored in a suitable temperature and humidity environment, where is clean, dry, and well-ventilated. It should be protected from dust and condensation.
- It is prohibited to install and operate the equipment beyond the range specified by the technical specifications. Otherwise, the performance and safety of the equipment will be affected.
- It is prohibited to install, use and operate outdoor equipment and cables (including but not limited to handling the equipment, operating the equipment and cables, plugging and pulling signal interfaces connected outdoors, performing high-altitude work and outdoor installation, and opening doors) in severe weather such as lightning, rain, snow, and strong winds above level 6.
- It is prohibited to install the equipment in an environment with dust, smoke, volatile gases, corrosive gases, infrared and other radioactive rays, organic solvents or excessive salt content.
- It is prohibited to install the equipment in an environment with metal conductive dust or magnetic conductive dust.
- It is prohibited to install the equipment in areas prone to the growth of fungi, mold and other microorganisms.
- It is prohibited to install the equipment in areas with strong vibration, strong noise sources and strong electromagnetic field interference.
- Site selection should comply with local laws, regulations and relevant standards.
- The installation environment should have a solid ground, without rubber soil, soft soil, or unfavorable geology such as easy sinking. Low-lying areas that are prone to water accumulation or snow accumulation are not allowed. The site level should be higher than the historical highest water level in the area.
- It is prohibited to install the equipment in a place where water can flood it.

- If the equipment is installed in a place with lush vegetation, in addition to routine weeding, the ground under the equipment needs to be hardened, such as laying cement, stones, etc. (the area should be no less than 3 m×2.5 m).
- Equipment installed in soil salinization areas will be corroded. Please do not install it outdoors in soil salinization areas. Soil salinization areas refer to areas within 500 m from the coast or affected by sea breezes. The areas affected by sea breezes vary depending on meteorological conditions (such as typhoons and seasonal winds) or topography (such as dams and hills).
- During installation, operation, and maintenance, the accumulated water, ice, snow or other debris on the top must be cleared first.
- When installing the equipment, ensure that the installation surface is solid and meets the load-bearing requirements.
- After installing the equipment, empty packaging materials such as cartons, foam, plastic, and binding straps should be removed from the equipment area.

1.5 Machinery Safety



Warning

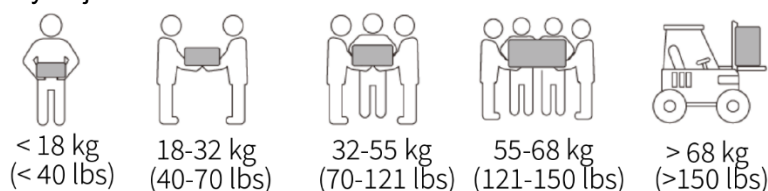
- Tools must be fully prepared and have passed inspection by professional institutions. It is prohibited to use tools that are damaged or have failed the inspections or have exceeded the validity period. Ensure that the tools are firm and non-overloaded.
- It is prohibited to drill holes in the equipment. Drilling will destroy the sealing, electromagnetic shielding performance, internal components and cables of the equipment. Metal shavings generated by drilling will enter the equipment, which will cause a short circuit on the circuit board.

1.5.1 General Requirements

- Paint scratches that occur during equipment transportation and installation must be repaired in a timely manner. It is prohibited to expose the scratched part for a long time.
- Arc welding, cutting and other operations on the equipment are prohibited without evaluation by Sineng.
- It is prohibited to install other devices on the top of the equipment without evaluation by Sineng.
- When working in the space above the top of the equipment, add protection on the top of the equipment to avoid damage to the equipment.
- Please use correct tools and master correct use methods.

1.5.2 Carrying Heavy Objects

- When carrying heavy objects, prepare to bear the weight to avoid being crushed or sprained by the heavy objects.



- When multiple people are carrying heavy objects together, height and other conditions must be considered. Reasonably arrange the people and work to ensure balanced weight distribution.
- When two or more people are carrying heavy objects together, one person should direct them to lift or put down the equipment at the same time to ensure uniform steps.

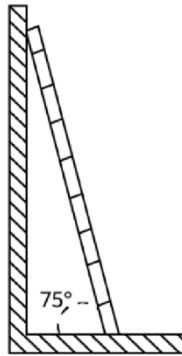
- When handling equipment by hand, wear protective gloves, protective shoes and other safety equipment to avoid injuries.
- When handling equipment by hand, approach the object, squat down, and use the power of straightening your legs instead of your back to lift the object slowly and steadily. It is prohibited to suddenly lift the object or twist your trunk.
- Do not quickly lift the heavy object above waist. Place the heavy object on a workbench at half waist height or a suitable place, adjust the position of your palms, and then lift it up.
- Handle the heavy object with balanced and steady force. Move or place it stably and slowly to avoid any impact or drop from scratching the surface of the equipment or damaging the components and cables of the equipment.
- When handling the heavy object, exercise caution at workbenches, slopes, stairs and other places where there are slippery. When carrying the heavy object through the doorsill, make sure the door is wide enough to allow the equipment to pass through, so as to prevent injuries or scratches on your fingers.
- When transferring the heavy object, move your feet rather than twisting your waist. When you need to lift and transfer the heavy object at the same time, point your feet in the direction to move, and then carry the heavy object.
- When using a forklift to handle the equipment, ensure that the forklift is in the middle position to prevent it from tipping over. Before moving the equipment, fasten the equipment to the forklift using ropes. When moving the equipment, special personnel are required to supervise the process.
- Transport the equipment by sea, highway with good road conditions, or air. Railway transportation is not supported. Bumps and tilts should be minimized during transportation.

1.5.3 Ladder Use Safety

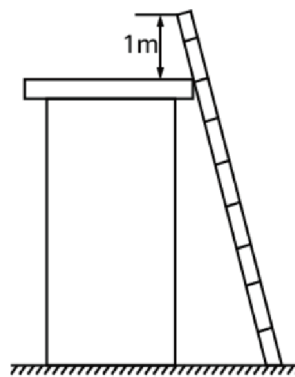
- When performing live operations at heights, use wooden ladders or insulated ladders.
- It is preferred to use platform ladders with guardrails. Trestle ladders are not recommended.
- Before using the ladder, ensure that it is in good conditions and meets the load-bearing requirements. It is prohibited to use it in the overloaded state.
- The ladder must be placed in a stable place and someone must hold the ladder when you are working on the ladder.



- When climbing a ladder, keep your body steady and ensure that your body's center of gravity does not deviate from the edge of the ladder frame to ensure your safety.
- The drawstring must be secure when using a ladder.
- If a trestle ladder is used, the inclination of the ladder should be 75° , which can be measured using a steel square, as shown in the following figure.

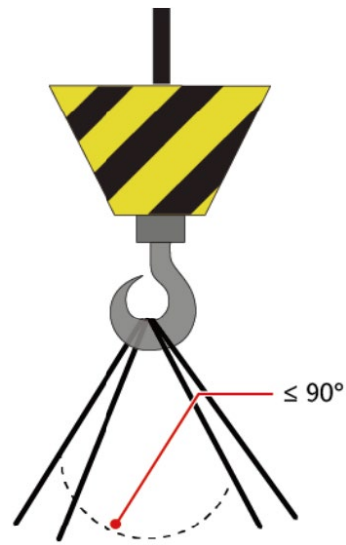


- If a trestle ladder is used, place the wide ladder legs downward or use protective measures at the bottom of the ladder to prevent slipping.
- If a trestle ladder is used, the maximum height of the feet should not exceed the fourth step from the top to the bottom of the ladder.
- If a trestle ladder is used to climb up to the platform, the vertical height of the ladder beyond the platform must be at least 1 meter.



1.5.4 Lifting Safety

- Personnel performing lifting operations must undergo relevant training and be qualified before taking up their posts.
- Temporary warning signs or fences must be set up in the lifting area to isolate the area.
- The foundation for lifting operations must meet the load-bearing requirements of the crane.
- Before lifting, ensure that the lifting tools are firmly secured to a fixed object or wall that meets the load-bearing requirements.
- During lifting, it is prohibited to walk under the boom or lifted object.
- During lifting, it is prohibited to drag the wire rope or lifting tools, or use hard objects to hit.
- During lifting, ensure that the angle between the two cables is no greater than 90°, as shown in the figure below.



Chapter 2 Transportation and Storage

Transportation Requirements

- Choose the appropriate transportation tool based on the dimensions and weight of the equipment.
- Keep the equipment level during transportation.
- During transportation, collisions and severe vibrations are prohibited.
- The equipment must be transported in compliance with relevant local regulations and standards.

Storage Requirements

If the energy storage converter will not be put into use immediately, abide by the following storage requirements:

- Do not remove the outer packaging and inspect it regularly (it is recommended to inspect it every three months). If you find any insect bites or damage to the packaging, replace the packaging in a timely manner. If the energy storage converter has been unpacked but will not be put into use immediately, put the energy storage converter into its original packaging, keep the desiccant, and seal it with tape.
- Ensure that the ground of the storage site has sufficient load-bearing capacity ($\geq 1100 \text{ kg/m}^2$).
- Storage ambient temperature: -40°C to $+70^\circ\text{C}$; storage ambient relative humidity: 0 to 95% (non-condensing). The ambient air must not contain corrosive or flammable gases.
- Store the equipment in a clean and dry place and prevent corrosion from dust and moisture. Protect the equipment from erosion by rain or ground water.
- Do not tilt the packaging box or turn it upside down.
- It is prohibited to store the energy storage converter in a stacked, vertical or upside-down manner.

Chapter 3 Product Overview

3.1 System elements

Without a transformer equipped, EH series energy storage converter can convert DC energy of the energy storage battery into AC energy and send it to the power grid or load through an external transformer, or convert AC energy into DC energy and store it in the energy storage battery.

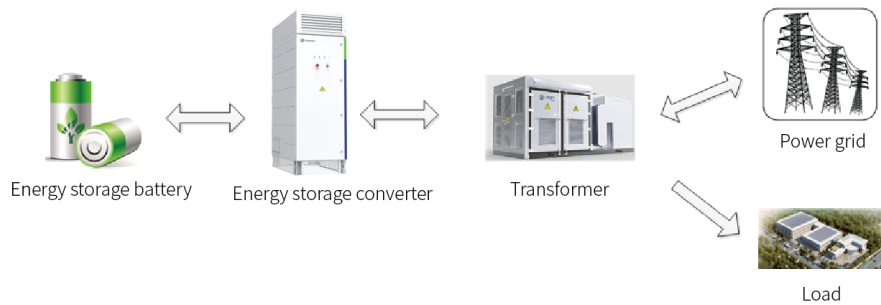


Figure 3-1 Energy storage system elements

3.2 Overview

EH series energy storage converters are mainly used for frequency regulation and peak regulation on the power generation side, as well as peak clipping and valley filling on the user side, to solve the solar curtailment and wind curtailment issues in photovoltaic and wind energy applications.

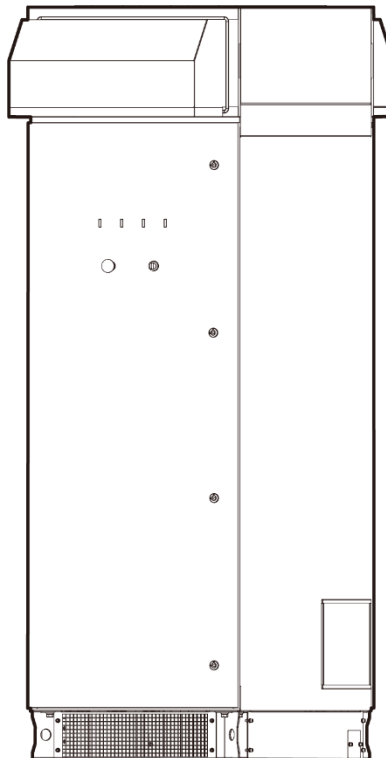


Figure 3-2 Product Appearance

3.3 Product Model Description

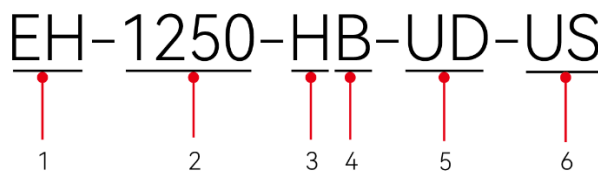


Figure 3-3 Model

Table 3-1 Product Model Description

| Sign | Description | Value |
|------|----------------------|--|
| 1 | Product series | AC energy storage converter |
| 2 | Power class | 1250 kW |
| 3 | Voltage level | 1500V system |
| 4 | Design code | Increases from A to Z to distinguish models. |
| 5 | Applicable scenarios | Outdoor |
| 6 | Product standard | US: UL compliant None: Not UL-compliant |

3.4 Product Features

EH series 1500V energy storage converter adopts the latest-generation semiconductor power conversion devices and operates based on a powerful full-digital control platform, making it reach the industry-leading level in terms of product performance and features. The major features of the EH series 1500V energy storage converter are as follows:

- Own completely independent intellectual property rights.
- Adopt the industrialized design concept and adapt to harsh operating environments.
- Operate based on DSP+FPGA digital platform and provide the redundant control function.
- Adopt advanced control algorithms to achieve wide adaptability and high stability.
- Support high power quality and high system efficiency, causing no "pollution" to the power grid.
- Provide a complete set of communication interfaces and support diversified communication protocols, so that it can seamlessly connect to the superior monitoring system.
- Adopt a full front maintenance and modular power modules design to facilitate system maintenance and lower system space requirements.
- Adopt a long-lifetime metal film capacitor as the DC busbar capacitor.
- Support fault monitoring and automatic diagnosis of wearing parts such as fans, so as to quickly locate faults.
- Provide redundant power supplies to improve the stability of the converter system.

The power grid supported by EH series energy storage converter is in the form of IT system. EH series converter is not connected to the N line.

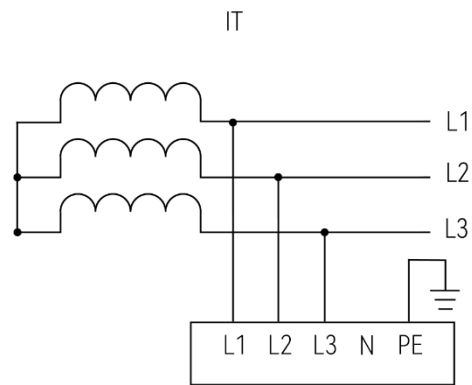


Figure 3-4 Power grid type

3.5 Major Components

3.5.1 Product Appearance

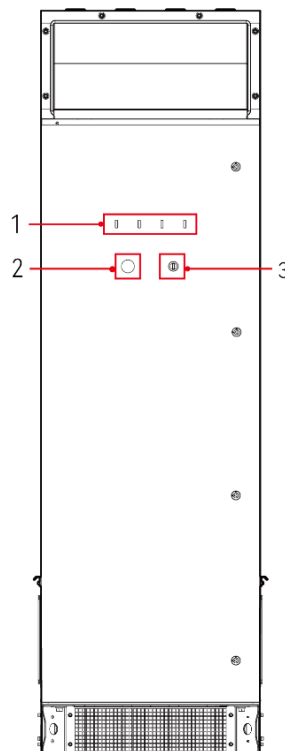


Figure 3-5 Outer appearance (front view)

Table 3-2 Description of components

| SN | Name | Description |
|----|---------------------|---|
| 1 | Indicator | Status indicator |
| 2 | EMERGENCY STOP knob | In case of emergency, press the knob to force the equipment to enter forced shutdown state and disconnect the AC and DC switches. |
| 3 | Startup knob | ON: The converter is ready to start up. When the startup conditions are met, the converter can start up in accordance with the remote and local startup commands. |

Dimensions

Table 3-3 Weight and dimensions

| Model | Scenario | External Dimensions/H×W×D (mm) | Net Weight (kg) |
|-----------------------------------|--------------------------------|---|-----------------|
| EH-1250-HB-UD EH-1250-HB-UD-US | Stand-alone equipment | 2300 mm×675 mm×2000 mm (without base, with air duct elbow) | 900 |
| | | 2300 mm×675 mm×1300mm (without base and air duct elbow) | |
| | 2 units in parallel connection | 2450 mm×1400 mm×2000 mm (with base and air duct elbow) | 2000 |
| | | 2450 mm×1400 mm×1300 mm (with base, without air duct elbow) | |
| | 4 units in parallel connection | 2450 mm×2800 mm×2000 mm (with base and air duct elbow) | 4000 |
| | | 2450 mm×2800 mm×1300 mm (with base, without air duct elbow) | |








Note:

- Due to differences in converter configurations, the weight of the whole equipment may vary. The specifications given in the table are standard values.
- If there are any changes in product dimensions and weight, the latest information of the product shall prevail without further notice.

3.5.1.1 Product Sign Description

The following table describes hazard warning signs on the equipment.

Table 3-4 Product Sign Description

| Sign | Description |
|---|--|
|  | This sign indicates that it shall be noted. |
|  | This sign indicates that there is high voltage inside the equipment. Touching the equipment may cause electric shock. |
|  | This sign indicates a highly dangerous risk, which must be especially noticed. |
|  | Maintenance, inspection and other operations can only be carried out after the energy storage converter is powered off for 5 minutes. |
|  | This sign indicates that the temperature here is beyond the acceptable range of the human body. Please do not touch it to avoid personal injuries. |
|  | The equipment may generate noise during operation. Therefore, it is recommended to wear noise-canceling earplugs. |
|  | This sign indicates the protective earth terminal, which needs to be reliably grounded to ensure the safety of operators. |

3.5.1.2 Indicator

Table 3-5 Description

| Indicator | Color | State | Description |
|-------------------------------|--------|---------------|--|
| Power indicator (POWER) | Green | Steady on | The converter control power supply is in a normal state. |
| | | Off | The converter control power supply is in an abnormal state. |
| Operating indicator (RUNNING) | Blue | Steady on | The converter is connected to the power grid and started to operate. |
| | | Blinking (1s) | The converter enters the debugging mode. |
| | | Off | The converter is not connected to the power grid. |
| Fault indicator (FAULT) | Red | Steady on | The converter is faulty. |
| | | Off | The converter is not faulty. |
| Bluetooth indicator (BT) | Yellow | Steady on | The converter is connected to Bluetooth. |
| | | Off | The converter is not connected to Bluetooth. |

3.5.2 Product Component Introduction

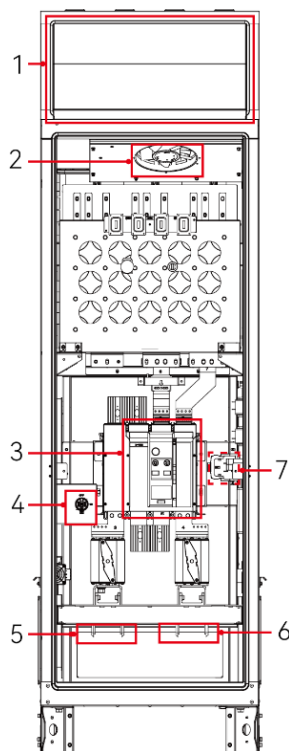


Figure 3-6 Key components of the converter (front view)

Table 3-6 Description of key components of the converter

| SN | Name | Description |
|----|----------------------------|--|
| 1 | Air duct elbow | External cooling duct |
| 2 | Fan | internal spoiler fan |
| 3 | Main switch on the DC side | Main switch for trip control on the DC side, used to control the on and off of the DC side |
| 4 | QF51 switch knob | Upper-level switch of DC auxiliary power supply |
| 5 | BAT+ copper bar | Connected to the positive terminal of the battery |
| 6 | BAT- copper bar | Connected to the negative terminal of the battery |
| 7 | DC surge protection device | Lightning and overvoltage protection on the DC side |

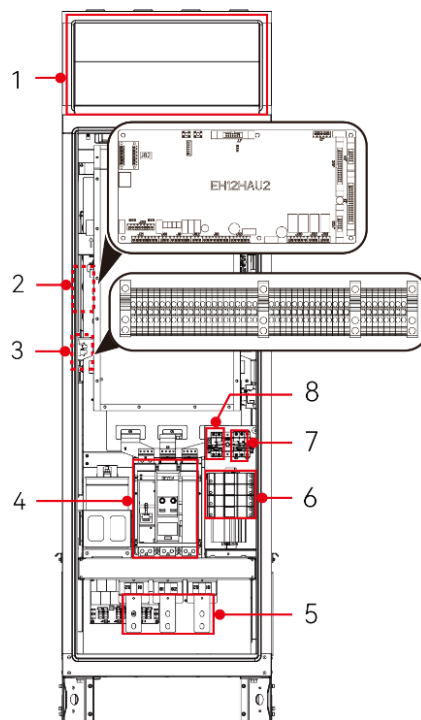


Figure 3-7 Key components of the converter (rear view)

Table 3-7 Description of key components of the converter

| SN | Name | Description |
|----|----------------------------|--|
| 1 | Air duct elbow | External cooling duct |
| 2 | U2 board | Parallel signal wiring board |
| 3 | Secondary terminal block | Host computer connection communication, signal port option |
| 4 | Main switch on the AC side | Main switch for trip control on the AC side, used to control the on and off of the AC side |
| 5 | AC copper bar | AC wiring copper bar |
| 6 | AC surge protection device | Lightning and overvoltage protection on the AC side |
| 7 | QF7 | Switch used by the converter to obtain self-generation power |
| 8 | QF9 | Switch used by the converter to obtain external power |

3.5.2.1 U2 board

When multiple converters are connected in parallel, the parallel synchronization cable connects the parallel signal connection terminals of each converter in parallel. The parallel signal connection terminal is at the J82 pin on the EH12HAU2 board.

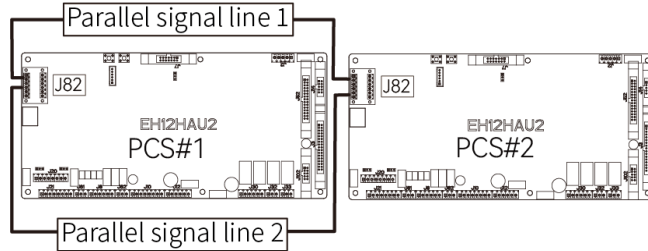


Figure 3-8 Parallel signal cable connection (2 units connected in parallel)

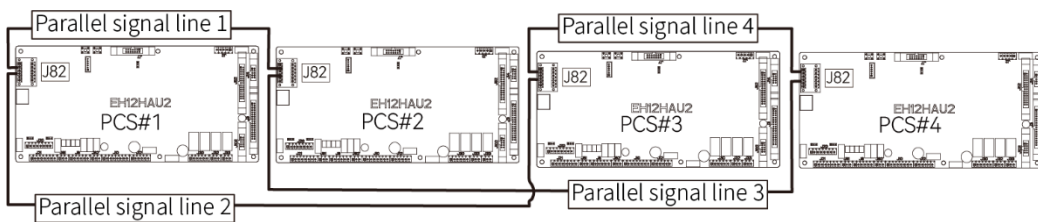


Figure 3-9 Parallel signal cable connection (4 units connected in parallel)

3.5.2.2 Secondary terminal block

The secondary terminal block provides RS485 communication interfaces and dry contact signals. The following figure shows the terminal numbering convention.

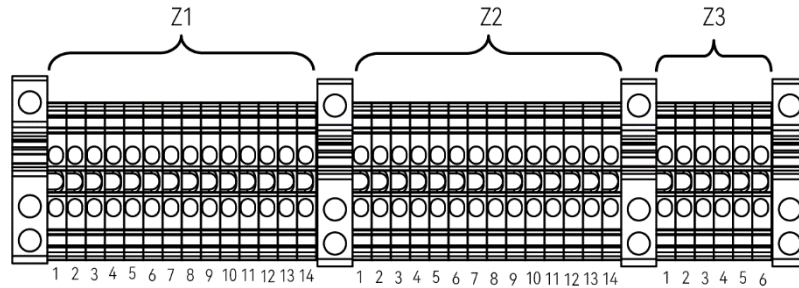


Figure 3-10 Secondary terminal block

Table 3-8 Description of secondary terminal block

| Area | Terminal No. | Meaning | Description |
|------|--------------|------------|---|
| Z1 | 1 | +15VS | +15VS (connected to EMU_inner power supply) |
| | 2 | GNDS | |
| | 3 | 485C+ | RS485_C (debugging, connected to EMU) |
| | 4 | 485C- | |
| | 5 | GNDS4 | |
| | 6 | DSP_CAN1_H | Dispatch CAN (connected to EMU and EMU_inner) |
| | 7 | DSP_CAN1_L | |
| | 8 | GNDS1 | |
| | | 9 | 485F+ |

| Area | Terminal No. | Meaning | Description |
|------|--------------|--------------------|--|
| | 10 | 485F- | MCU_CAN2 (reserved, connected to BMS) |
| | 11 | GNDS3 | |
| | 12 | MCU_CAN2_H | |
| | 13 | MCU_CAN2_L | |
| | 14 | GNDS2 | |
| Z2 | 1 | DI1_A | Input dry contact 1 (fast switching to discharge) |
| | 2 | DI1_B | |
| | 3 | DI2_A | Input dry contact 2 (secondary terminal block used for shutdown) |
| | 4 | DI2_B | |
| | 5 | DI3_A | Input dry contact 3 (remote EPO) |
| | 6 | DI3_B | |
| | 7 | DI4_A | Input dry contact 4 (reserved) |
| | 8 | DI4_B | |
| | 9 | DO1_NC | Output dry contact 1 (general PCS fault) |
| | 10 | DO1_COM | |
| | 11 | DO1_NO | |
| | 12 | DO2_NC | Output dry contact 2 (reserved) |
| | 13 | DO2_COM | |
| | 14 | DO2_NO | |
| Z3 | 1 | EPO_NC_A | External emergency stop of PCS (normally closed) If the interface is used for emergency stop of PCS, the short-circuit wire connected in the factory needs to be removed and replaced with a normally closed contact. |
| | 2 | EPO_NC_B | |
| | 3 | EMG_ToExternal_H | EPO state (normally closed), passive signal |
| | 4 | EMG_ToExternal_COM | |
| | 5 | CB3_NO1 | Normally closed signal of AC frame, passive signal |
| | 6 | CB3_NO1_COM | |

3.6 Main Circuit Structure

A single energy storage converter system consists of DC fuses, DC disconnectors, DC surge protection devices, DC/AC inverter modules, AC filters, AC circuit breakers, AC surge protection devices and other components.

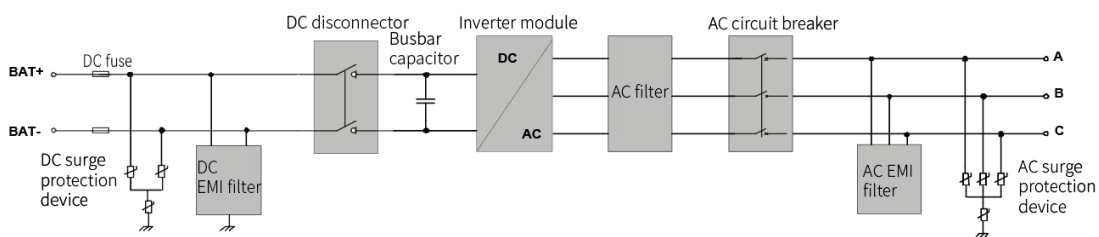


Figure 3-11 Circuit structure



Note

- The negative fuse for non-UL models is optional. If you need it, please contact Sineng in advance.

3.7 Ventilation Design

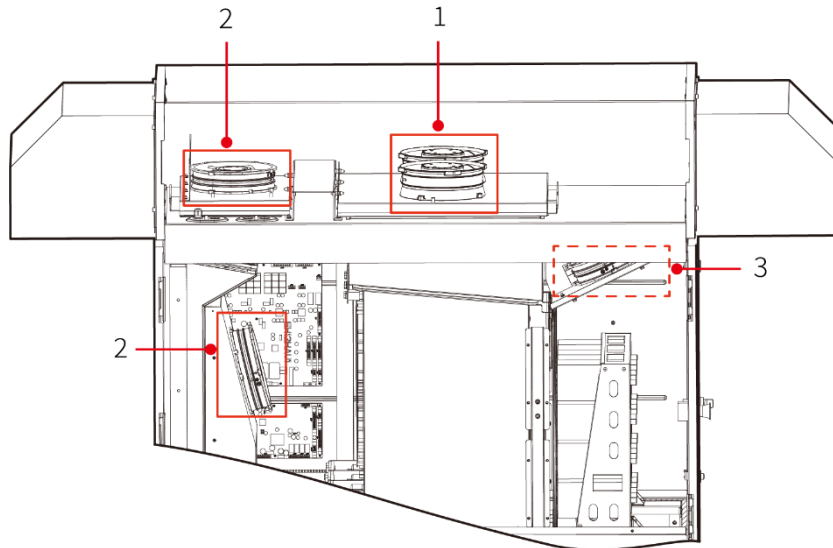


Figure 3-12 Fan layout

| | | | | | |
|---|--------------------|---|------------------------|---|---------------|
| 1 | Main power fan 1,2 | 2 | Two-phase flow fan 3,4 | 3 | Spoiler fan 5 |
|---|--------------------|---|------------------------|---|---------------|

Main power cooling and ventilation design: The main power cooling of the converter adopts an air duct design of top air inlet and bottom air outlet. Cold air enters from the front and back of the top of the converter, and hot air exits from the front and back of the bottom.

If the equipment is close to a wall or surrounded by heat sources, or if you have other air outlet requirements, please contact Sineng customer service personnel.

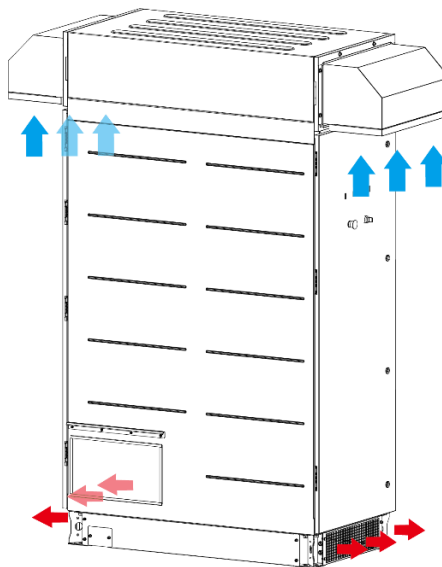


Figure 3-13 Schematic diagram of main power cooling air duct (default)

Two-phase flow cooling and ventilation design: The heat generated by the internal components of the converter is dissipated through phase-change radiator. The converter adopts an air duct design of top air inlet and bottom air outlet. Cold air enters from the front and back of the top of the converter, and hot air exits from the center of the rear side of the converter.

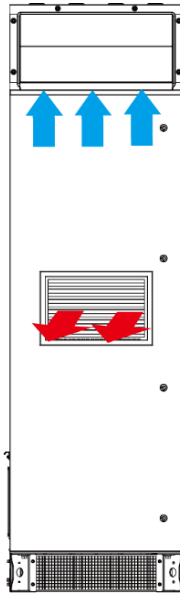


Figure 3-14 Schematic diagram of two-phase flow cooling air duct

Chapter 4 Inspection Before Installation

4.1 Outer Packaging Inspection

Before unpacking the energy storage converter, check the outer packaging for visible damage, such as holes, cracks, or other signs of possible internal damage, and check the energy storage converter model number. If there is any anomaly in the packaging or the energy storage converter model number does not match, do not open it and contact customer service personnel as soon as possible.

After unpacking the energy storage converter, check whether the deliverables are complete and whether there is any obvious external damage. If anything is missing or damaged, please contact customer service personnel.

4.2 Delivery Inspection

Table 4-1 List of deliverables (stand-alone equipment)

| SN | Item | Quantity |
|----|-------------------------------|----------|
| 1 | Energy storage converter | 1 set |
| 2 | Converter product certificate | 1 PCS |
| 3 | Factory inspection report | 1 PCS |
| 4 | User Manual of the converter | 1 PCS |
| 5 | Power cable fastening bolts | 1 set |
| 6 | Key | 1 set |

Table 4-2 List of deliverables (2 units in parallel connection)

| SN | Item | Quantity |
|----|-------------------------------|----------|
| 1 | Energy storage converter | 2 sets |
| 2 | Converter product certificate | 2 PCS |
| 3 | Factory inspection report | 2 PCS |
| 4 | User Manual of the converter | 1 PCS |
| 5 | Power cable fastening bolts | 1 set |
| 6 | Key | 2 sets |

Table 4-3 List of deliverables (4 units in parallel connection)

| SN | Item | Quantity |
|----|-------------------------------|----------|
| 1 | Energy storage converter | 4 sets |
| 2 | Converter product certificate | 4 PCS |
| 3 | Factory inspection report | 4 PCS |
| 4 | User Manual of the converter | 1 PCS |
| 5 | Power cable fastening bolts | 1 set |
| 6 | Key | 4 sets |

Chapter 5 Product Installation

5.1 Installation Position Requirements



Warning

- The foundation of energy storage converter must be constructed in strict accordance with the drawings provided by Sineng. Otherwise, it may affect the installation and reliable operating of the energy storage converter.
- The design of the foundation platform of the energy storage converter and the effective air outlet area of the air duct must be completed in strict accordance with Sineng requirements. Otherwise, the energy storage converter cannot operate normally for a long term.
- The relative position of the energy storage converter on the foundation platform must be set in strict accordance with Sineng requirements. Otherwise, the energy storage converter cannot operate normally for a long term.
- The whole energy storage converter must be firmly connected to the foundation platform by welding or bolts.
- The foundation of the converter must remain flat and made of flame-retardant materials. The bottom of the converter must be evenly loaded, and there must be no risk of unloading a certain suspended point or excessive stress on a certain point.
- Drainage systems should be constructed and foundations should be above water level to prevent the bottom or interior of the product from being immersed in water.
- To avoid the impact caused by noise, the product should be installed as far away from residential areas as possible.
- Do not install the product in rainy weather.

To meet the requirements of ventilation and cooling, subsequent maintenance and safe passages, sufficient space must be reserved for cooling when installing the converter. If there are no other heat sources around the energy storage converter, refer to Figure 5-1 to reserve space. If there are other heat sources around the energy storage converter, refer to Figure 5-2 to reserve space.

The requirements for 2 units in parallel connection are the same as those for 4 units in parallel connection. This section takes the scenario in which 4 units are connected in parallel as an example to describe the spacing requirements.

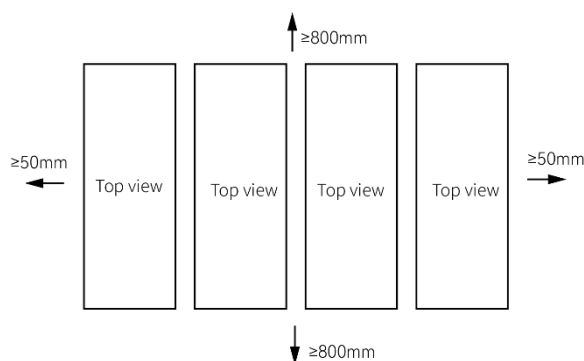


Figure 5-1 Spacing requirements for installing the converter without heat sources around (Unit: mm)

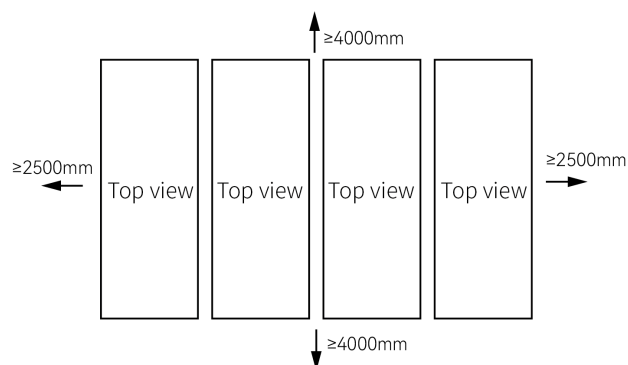


Figure 5-2 Spacing requirements for installing the converter with heat sources around (Unit: mm)



Note

- The above describes the minimum spacing requirements. If there are other installation scenarios, such as the converter installed against the wall, non-standard placement direction, etc., please contact Sineng customer service personnel.

5.2 Handling the Energy Storage Converter

5.2.1 Lifting the Energy Storage Converter

See Figure 5-3 for lifting the energy storage converter on site.

When lifting the energy storage converter, slowly lift it about 10 cm above the ground. After confirming that the energy storage converter is balanced, evacuate the lifting assistance personnel 5 m away from the crane operation area before moving.



Caution

- The lifting rope must have a load-bearing capacity of 3000 kg or above.
- Only the stand-alone equipment supports lifting operations. 2 or 4 units in parallel connection do not support lifting operations.

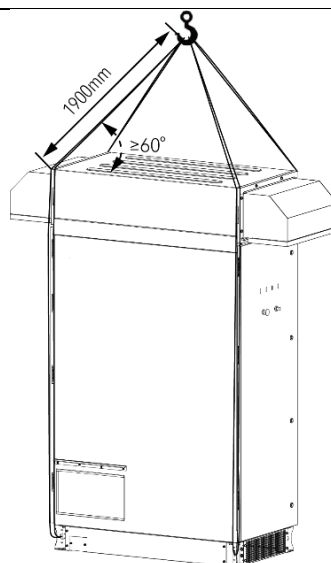


Figure 5-3 Lifting the Energy Storage Converter

5.2.2 Handling the Energy Storage Converter with Forklift



Caution

- When a forklift is used to handle the energy storage converter, the front end of the forklift teeth should extend at least 200 mm beyond the front end of the energy storage converter. During handling, ensure that no one is walking within 3 m around the energy storage converter.
- Lift the energy storage converter slightly using the forklift. After the energy storage converter becomes balanced, move it to the target installation position.
- The handling methods for 2 units in parallel connection are the same as those for 4 units in parallel connection. This section takes the scenario in which 4 units are connected in parallel as an example to describe the handling methods.

Procedure

Step 1 Use a hex key to remove the front and rear baffles in the middle of the base.

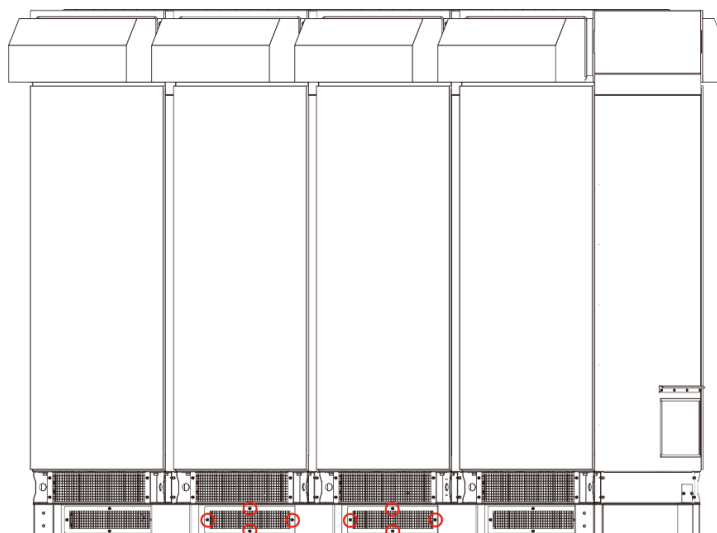


Figure 5-4 Removing the baffles (parallel connection)

Step 2 (Stand-alone equipment scenario) Use a hex key to remove the baffles on the left and right sides of the converter.

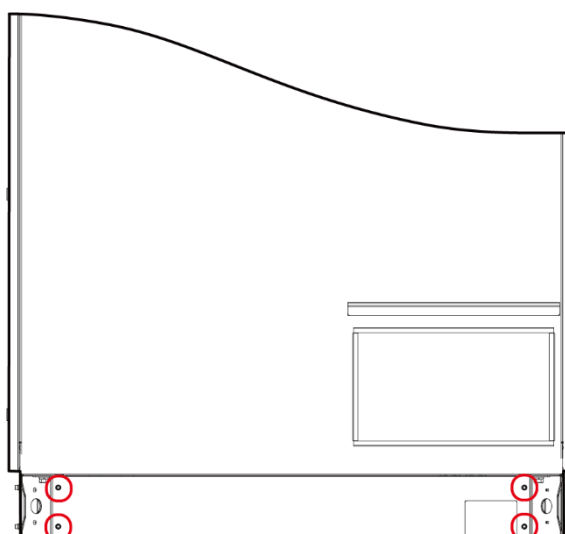


Figure 5-5 Removing the baffles (stand-alone equipment)

Step 3 Use a forklift to move the converter to the installation location.

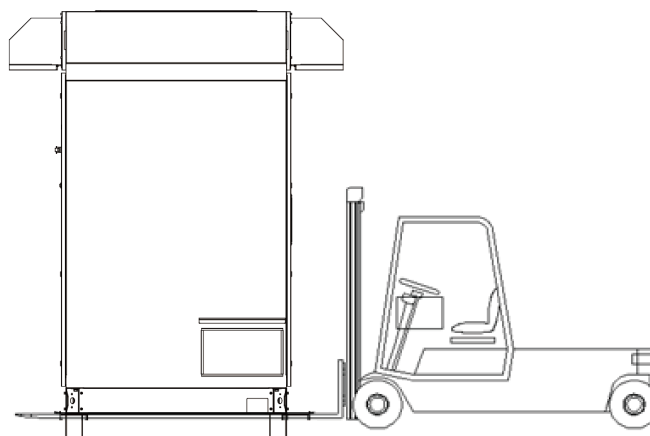


Figure 5-6 Moving the energy storage converter with a forklift (parallel connection)

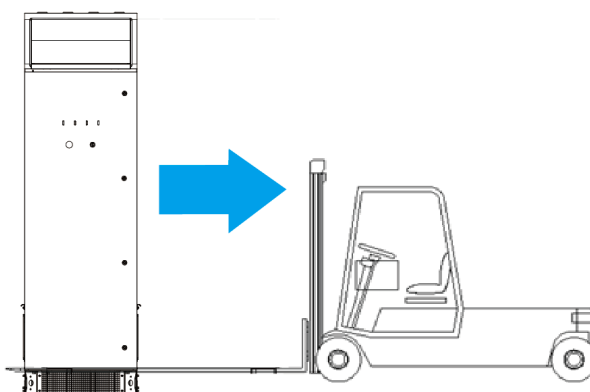


Figure 5-7 Moving the energy storage converter with a forklift (stand-alone equipment)

5.3 Installing the Energy Storage Converter

Procedure

Step 1 Mark the mounting holes according to the base dimensions.

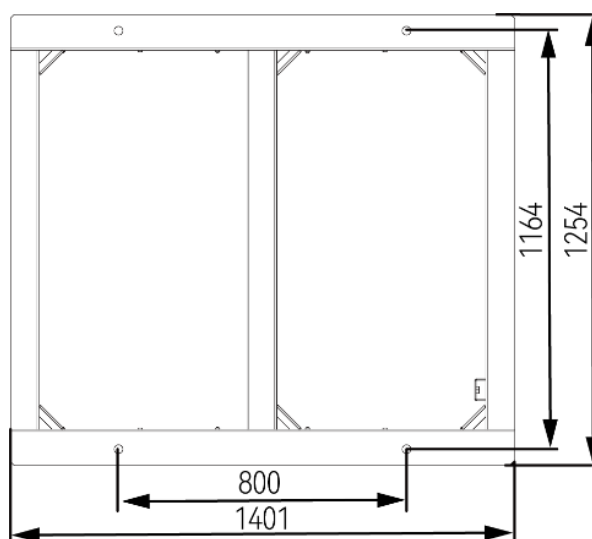


Figure 5-8 Fixed dimensions of the base of 2 units in parallel connection (Unit: mm)

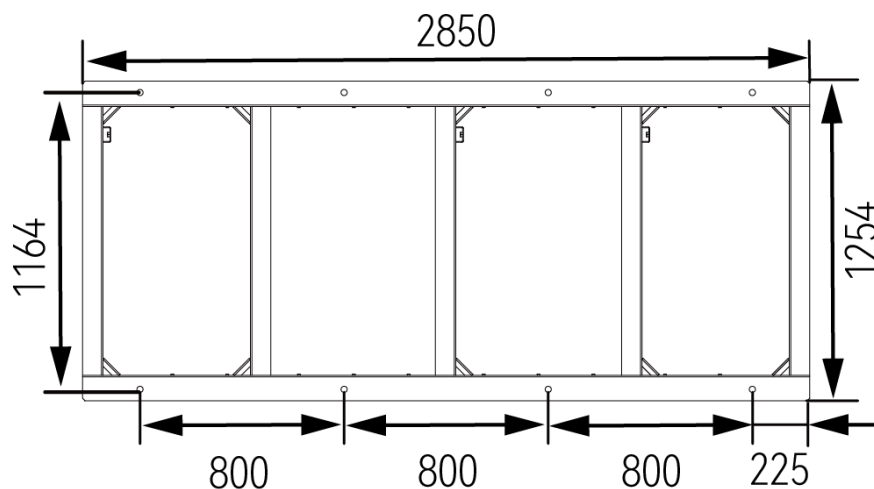


Figure 5-9 Fixed dimensions of the base of 4 units in parallel connection (Unit: mm)

Step 2 Place the energy storage converter in the installation location and secure it with bolts or welding.

5.4 Installing the Cables



Warning

- Before wiring the energy storage converter, check and confirm that all connection cables of the equipment have no dangerous voltage. Obvious warning signs must be set for the external power distribution switches of the equipment to avoid misoperation of the external switches, which will endanger the personal safety of the operator.
- Before wiring the energy storage converter, confirm that the DC input and AC circuit breakers in the energy storage converter cabinet are in the disconnected state.
- Strictly follow the indications on the labels inside the energy storage converter to connect the cables. Otherwise, it will cause damage to the equipment.

Table 5-1 List of cables

| Cable Category | Cable Function |
|---|---|
| Power cable of converter on the DC side | Main power cable on the DC side |
| Cable of converter on the AC side | Main power cable of converter on the AC side, three-phase three-wire, connected by copper bar |
| Ground cable of converter | PE ground cable |
| Power cable of converter | Working power cable of the converter |
| Communication cable of converter | RS485/CAN/Secondary terminal block signal cable |

Table 5-2 DC cable specifications

| Scenario | Copper Wire (mm ²) | Fastening Bolt | Torque (N.m) |
|--------------------------------|---|----------------|--------------|
| Stand-alone equipment | 185/240/300 (4 positive cables and 4 negative cables, 8 cables in total) | M16 | 80 to 100 |
| 2 units in parallel connection | 185/240/300 (8 positive cables and 8 negative cables, 16 cables in total) | | |
| 4 units in parallel connection | 185/240/300 (16 positive cables and 16 negative cables, 32 cables in total) | | |

Note:

Above is the cable configuration using the standard wiring method. Different DC interface configurations can be customized according to customer needs. If you have any requirements, please contact Sineng customer service personnel.

Table 5-3 Ground requirements

| Scenario | Cable (mm ²) | Cross-sectional Area of Copper Bar (mm ²) | Fastening Bolt | Torque (N.m) |
|--------------------------------|--------------------------|---|----------------|--------------|
| Stand-alone equipment | 70-120 | ≥70 | M12 | 60 to 70 |
| 2 units in parallel connection | 70-120 | ≥70 | | |
| 4 units in parallel connection | 2*70-120 | 2*≥70 | | |

The specifications of the wiring copper bar are as follows:

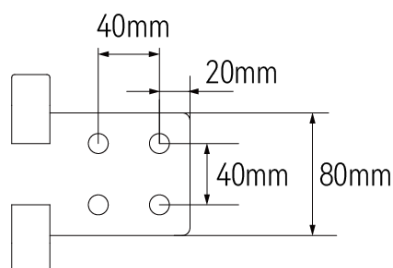


Figure 5-10 Specifications of AC wiring copper bar Unit: mm)

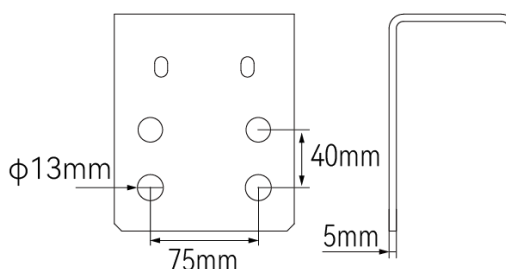


Figure 5-11 Specifications of DC wiring copper bar (Unit: mm)

If an aluminum wire is used, it is recommended to use a copper-aluminum transition terminal block to avoid direct contact between the copper bar and the aluminum wire.

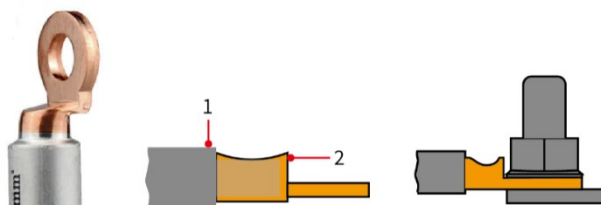


Figure 5-12 Copper terminal block

| | | | |
|---|-------|---|-----------------------|
| 1 | Cable | 2 | Copper terminal block |
|---|-------|---|-----------------------|

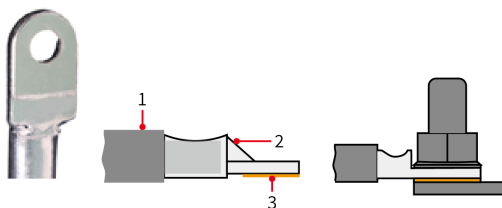


Figure 5-13 Copper-aluminum transition terminal block

| | | | | | |
|---|-------|---|---|---|----------------------|
| 1 | Cable | 2 | Copper-aluminum transition terminal block | 3 | Copper adapter piece |
|---|-------|---|---|---|----------------------|

It is not recommended to use copper-aluminum stir welding process for terminal blocks. See the figure below.



Figure 5-14 Terminal blocks not recommended

5.4.1 Connecting the Ground Cable



Caution

- The ground resistance should be less than 4 Ω.

Procedure

Step 1 Install the ground cable to the ground bar on the cabinet base through the OT terminal or by welding the ground bar.

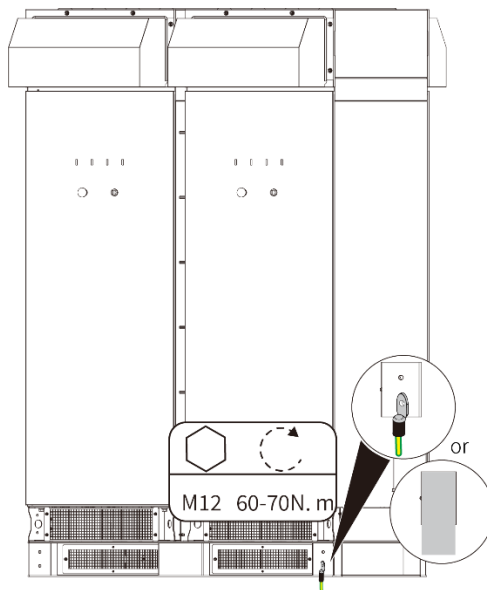


Figure 5-15 Ground (2 units in parallel connection)

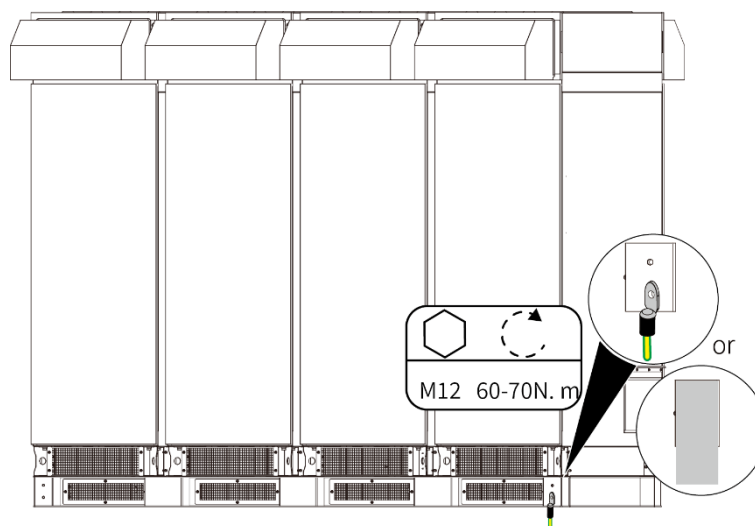


Figure 5-16 Ground (4 units in parallel connection)

5.4.2 Connecting the DC Power Cable



Warning

- Ensure that the contact surface between the DC cable and the input copper bar of the energy storage converter is smooth and the cable tightening torque meets the requirements in Table 5-2. Otherwise, the energy storage converter may catch a fire.
- The number of power cables connected on both sides of the copper bar with the same polarity on the DC side should be as consistent as possible, and the difference in the number of cables should not be greater than 1.
- When connecting the power cable of the converter to the wiring copper bar, ensure that the bending radius of the cable is not less than the recommended bending radius of the power cable used by the current converter model.
- Cable routing should avoid the line cutting position of the platform, and all installed cables must be tied to the supports.
- Be sure to use the screws delivered with the equipment to connect the power cables or copper bars. Otherwise, it may cause abnormal connections and affect the normal operating of the energy storage converter.

Procedure

Step 1 Open the front door with a key and cut the cable hole at the bottom of the energy storage converter with a box cutter.

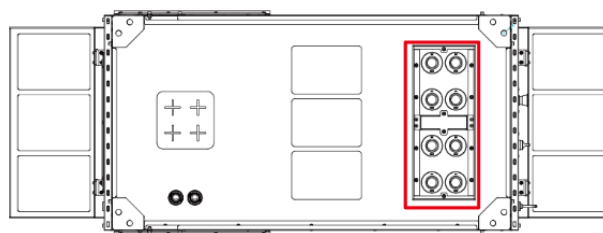


Figure 5-17 Cable holes

Step 2 Use a hex key to remove the front baffle of the converter.

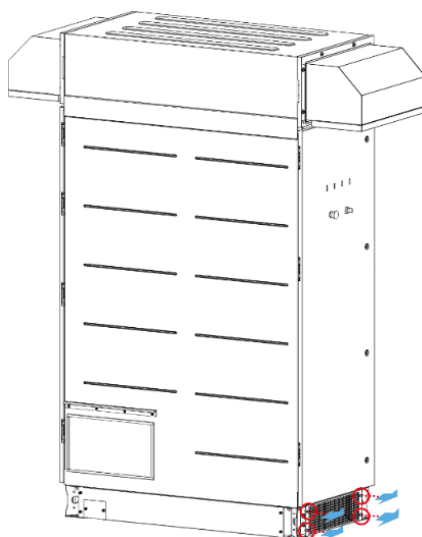


Figure 5-18 Removing the front baffle of the converter

- Step 3 Insert one end of the cable into the energy storage converter through the cable hole and install it on the "BAT+" and "BAT-" copper bar as indicated.
- Step 4 Install the other end of the cable to the positive or negative terminal on the battery.

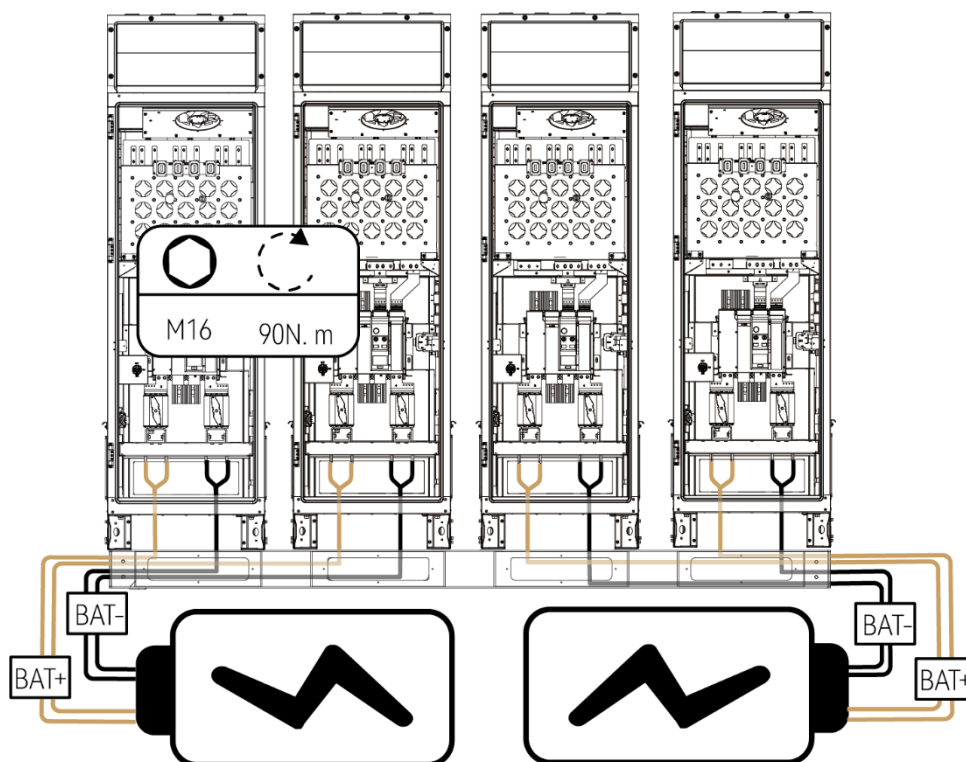


Figure 5-19 Connecting the DC power cable (2 sets of batteries)

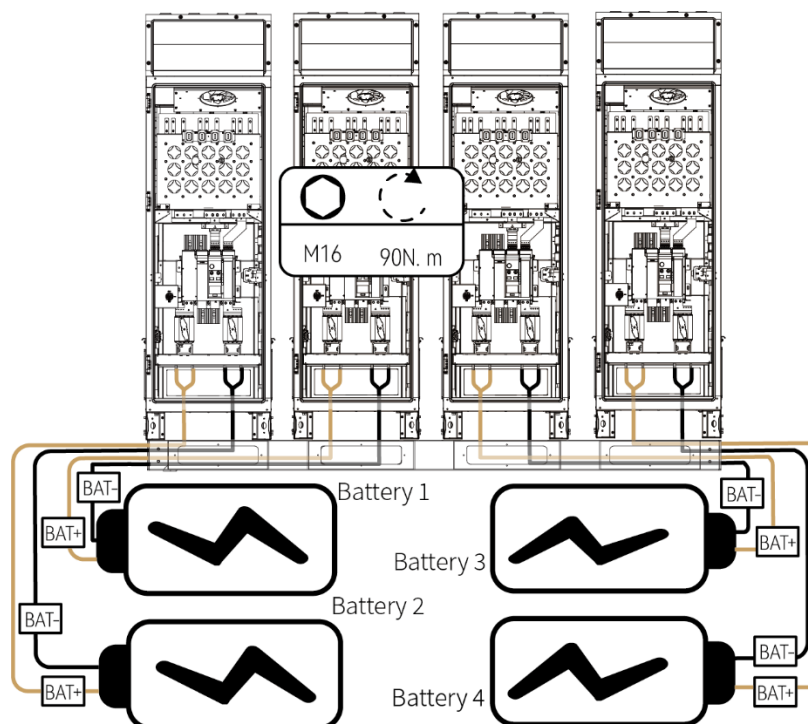


Figure 5-20 Connecting the DC power cable (4 sets of batteries)

Step 5 (Optional) Install positive and negative DC ground cables.

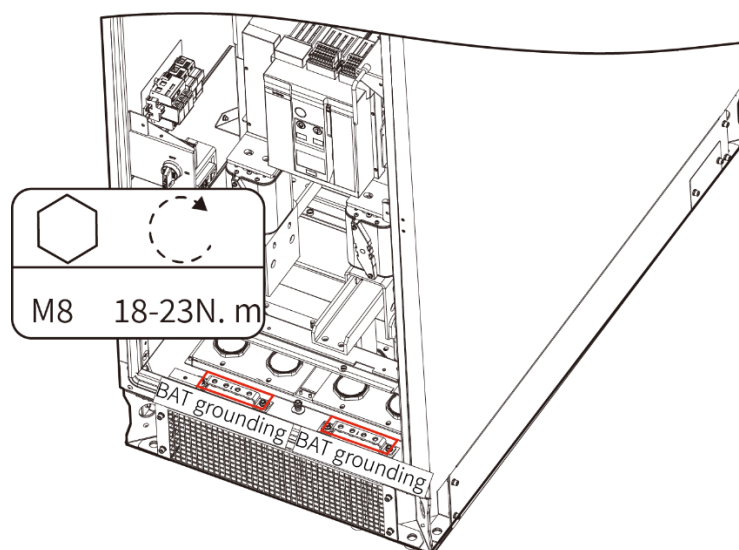


Figure 5-21 DC ground cable

Step 6 Install the front baffle of the converter.



Caution

- The effective distance between the firestop putty and the lower edge of the cable terminal should not be less than 20 mm. The gaps in each cabling hole need to be sealed individually with firestop putty.
- Before wiring, confirm whether the parallel connection scheme is adopted on the DC side. Due to the differences in software and hardware design, parallel wiring and non-parallel wiring schemes cannot be mixed on the DC side.

5.4.3 Connecting the Copper Bar on the AC Side

Procedure

Step 1 Open the rear door of the energy storage converter and remove the AC side cover.

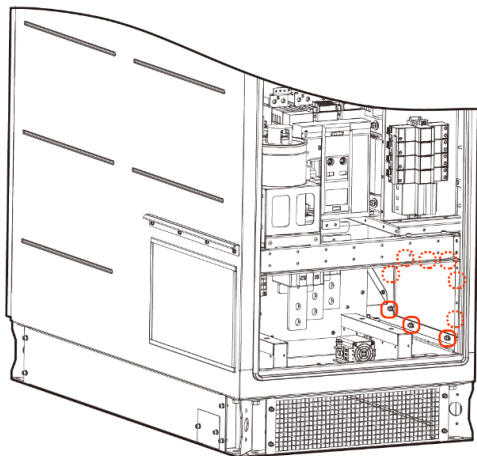


Figure 5-22 Removing the AC side cover

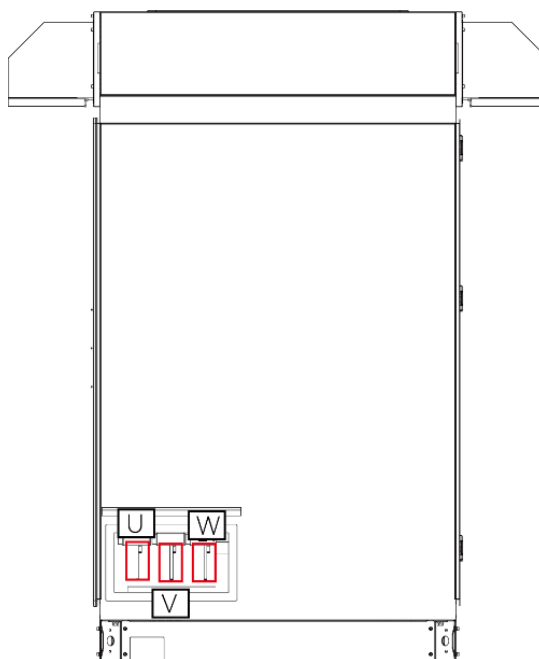


Figure 5-23 AC copper bar

Step 2 Install one end of the AC copper bar onto the AC wiring copper bar of the energy storage converter.

Step 3 Install the other end of the AC copper bar onto the transformer.

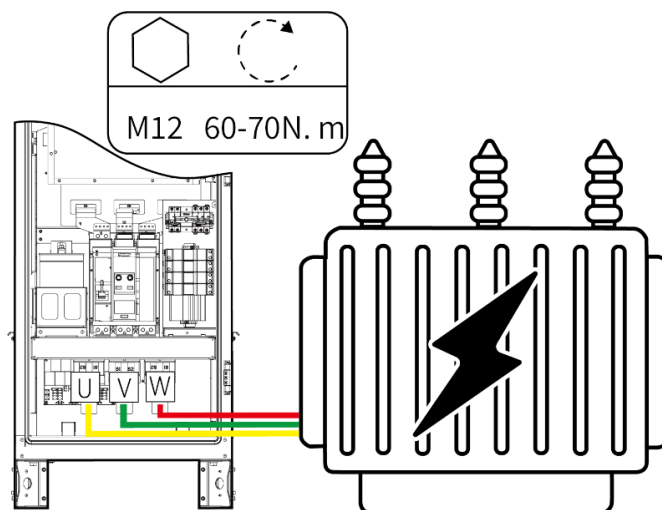


Figure 5-24 Installing the AC Power Cable

**Caution**

- When cables go out from the AC side, the current imbalance output by each phase must not exceed 20%.

5.4.4 Connecting the External Power Cable (Optional)

**Caution**

- The control power is internally controlled by QF7 by default, and you can also use an external power supply as needed. With QF9 access control, if you choose to use an external power supply, the QF9 input terminal needs to be connected to a 220 V AC power supply, the power supply capacity of which is required to be no less than 2.5 kVA, and the access cable diameter is required to be no less than 2.5 mm².
- In scenarios where multiple cabinets are connected in parallel, each cabinet needs to be connected to an external power cable.

Procedure

Step 1 Connect one end of the external power cable to the QF9 circuit breaker.

Step 2 Connect the other end of the cable to the external AC power supply through the cable gland at the bottom of the cabinet.

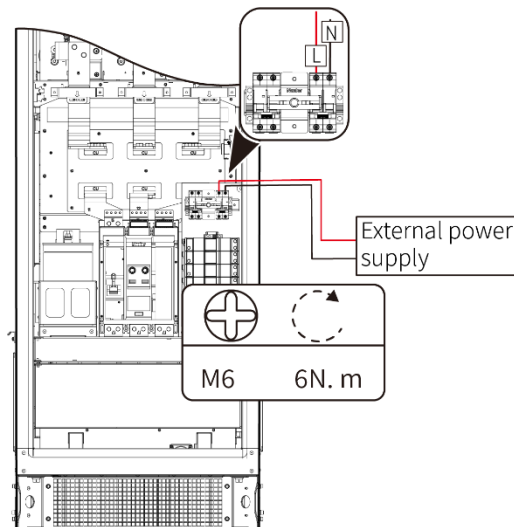


Figure 5-25 Connecting the External Power Cable

5.4.5 Connecting the Signal Cable



Caution

- Signal cables should be routed separately from power cables to ensure that the distance between signal cables and power cables is greater than 50 mm.
- It is recommended to use two-core reinforced insulation cables with shielding layers as communication cables. The cross-sectional area of the cables should not be greater than 12 AWG. It is recommended to use tin-plated passivated tubular copper terminals.

Procedure

- Step 1 Connect one end of the signal cable to the wiring port in the Z1 area of the secondary terminal block. For wiring port descriptions, see section 3.5.2.2 "Secondary terminal block".
- Step 2 Connect the other end of the signal cable to the host computer.

Chapter 6 Inspection Before Powering On the Equipment

6.1 Prerequisites

Before powering on the equipment, thoroughly inspect the installation of the equipment again.

- Ensure that all cables are connected securely and all screws are tightened in place.
- Ensure that the DC voltage meets the requirements of the energy storage converter and the polarity is correct.
- Ensure that the AC voltage meets the requirements of the energy storage converter.
- Ensure that all connections in the system comply with the requirements of relevant standards and specifications.
- Ensure that the system is well grounded. Before powering-on the equipment for the first time, ensure that the ground resistance meets the requirements (Ground resistance should not be higher than 4 Ω).



Warning

- All operations during the power-on process must be performed by professional electricians. No individual is allowed to operate the equipment without authorization.
-

6.2 Inspection Before Powering On the Equipment

6.2.1 Inspecting the Cable Connection

Check all cables for damage or cracks and ensure that all cables are intact.

- Check again that all cables are connected correctly against the system wiring schematic. If necessary, adjust the connections immediately.
- Ensure that all cables are connected securely. If necessary, tighten the corresponding mounting screws immediately.

6.2.2 Inspecting the Energy Storage Converter

- Ensure that both DC and AC switches are turned off.
- Check whether the film at the air inlet has been removed.
- Check whether the EMERGENCY STOP knob is in the released position.
- Check and ensure that various electrical switches and buttons of the energy storage converter and its upper and lower levels operate flexibly and meet regulatory requirements.

6.2.3 Checking the Power Grid

Accurately measure three sets of linear voltages on the AC grid side, namely, U-V, U-W, and V-W. The measured values should not exceed the allowable voltage range of the power grid on the AC side of the energy storage converter and the three phases should be balanced.

- If the grid-side voltage deviation is too large, the transformer's transfer ratio should be adjusted by professionals.
- Check various electrical switches and buttons of the product to ensure that they are smooth and meet the specifications.

Chapter 7 Power-On/Off



Note

- For specific steps of powering on/off the equipment through Bluetooth in the app, see section 8.4.1.
-

7.1 Power-On Preparations

- Clean the site to ensure it is clean and free of flammable, explosive and other items.
 - Ensure that the installation site is properly ventilated.
 - Check various electrical switches and buttons of the equipment again to ensure that they are smooth and meets the specifications.
 - All connections are made according to the product manual and circuit diagram.
 - The protective cover inside the equipment is securely installed.
 - Use a multimeter to check whether the AC and DC voltages meet the startup conditions of the energy storage converter and whether there is no hazard of overvoltage.
 - Use a multimeter to measure the DC voltage and check whether the polarity is correct.
 - Ensure that QF9 and QF7 interlocking mechanism is normal.
-



Warning

- For energy storage converters that have been shut down for a long period of time, comprehensively and carefully inspect the equipment before powering on the equipment to ensure that all indicators meet the requirements.
-

7.2 Powering On the Equipment



Warning

- QF9 and QF7 have an interlocking mechanism and are not allowed to be closed at the same time. Please check whether the interlocking mechanism is normal before powering on the equipment.
 - In the power-on process, if an anomaly occurs, press the EMERGENCY STOP knob immediately to stop the operation, and immediately contact Sineng customer service personnel.
-

Procedure

- Step 1 Open the rear door of the cabinet and connect QF7 circuit breaker on the AC side.
- Step 2 (Optional) If an external power supply is used, connect QF9 circuit breaker on the AC side.
- Step 3 Open the front door of the cabinet and turn QF51 switch to the connected position.
- Step 4 Connect the switch on the front battery side.
- Step 5 Connect the main circuit breaker of the rear box-type transformer or high-voltage load switch.
- Step 6 After about 40s, check that the power indicator is on and the fault indicator is off.

Step 7 Turn the startup knob on the panel to "ON". Log in to the Bluetooth app or send a power-on command from the host computer. For details, see section 8.4.1 "Remote Power-On/Off".

7.3 Powering Off the Equipment



Warning

- After the converter is manually powered off, dangerous voltages still exist inside the converter. Discharge for 5 minutes to drop the voltage below the safe level before carrying out maintenance operations.
-

Procedure

Step 1 Log in to the Bluetooth app or send a power-off command from the host computer. For details, see section 8.4.1 "Remote Power-On/Off".

Step 2 Turn the startup knob on the panel to "OFF". The converter will automatically shut down.

Step 3 Disconnect the switch on the front battery side.

Step 4 Disconnect the main circuit breaker of the rear box-type transformer or the high-voltage load switch.

Step 5 Open the front door of the cabinet and turn QF51 switch on the DC side to the disconnected position.

Step 6 Open the rear door of the cabinet and disconnect QF7 circuit breaker on the AC side.

Step 7 (Optional) If an external power supply is used, disconnect QF9 circuit breaker on the AC side.

7.4 Emergency Power-Off



Danger

- In case of emergency, press the EMERGENCY STOP button to disconnect the converter from the battery pack and the power grid.
 - After you press the EMERGENCY STOP button, dangerous voltages still exist inside the system. Discharge for 5 minutes to drop the voltage below the safe level before carrying out maintenance operations.
-

Procedure

Step 1 Press the EMERGENCY STOP button.

Step 2 If you turn the startup knob to "OFF", the converter will automatically shut down.

Step 3 Disconnect the switch on the front battery side.

Step 4 Disconnect the main circuit breaker of the rear box-type transformer or the high-voltage load switch.

Step 5 Open the front door of the cabinet and turn QF51 switch on the DC side to the disconnected position.

Step 6 Open the rear door of the cabinet and disconnect QF7 circuit breaker on the AC side.

Step 7 (Optional) If an external power supply is used, disconnect QF9 circuit breaker on the AC side.

7.5 Emergency Power-Off Restoration

Procedure

Step 1 Turn the EMERGENCY STOP knob clockwise.

Step 2 Open the rear door of the cabinet and connect QF7 circuit breaker on the AC side.

Step 3 (Optional) If an external power supply is used, connect QF9 circuit breaker on the AC side.

Step 4 Open the front door of the cabinet and turn QF51 switch to the connected position.

Step 5 Connect the switch on the front battery side.

Step 6 Connect the main circuit breaker of the rear box-type transformer or high-voltage load switch.

Step 7 Turn the startup knob on the panel to "ON". Log in to the Bluetooth app or send a power-on command from the host computer. For details, see section 8.4.1 "Remote Power-On/Off".

Chapter 8 Power Insight 2 App

8.1 Downloading the App

- China: The app is available in Huawei, Xiaomi, OPPO, Vivo, 360 and Apple App Stores.
- Other regions and countries: The app is available in Google Play and App Store.
- iOS system: You can download the app from <https://apps.apple.com/us/app/power-insight-2/id6443889542>.
- Android system: You can download the app from <https://enjoysolar.sineng.com/powerInsight/android/PowerInsight.apk>.
- The app supports Android 6.0 and later versions or iOS 12 and later versions.



IOS



Android

Figure 8-1 QR code for downloading Power Insight 2 App

8.2 App Login

Procedure

- Step 1 Open the app, select the corresponding role to log in, enter the password, and enter the equipment search page.



Caution

- The initial password of the app is 123456 (owner) or agent (installer).

Log On

Your Role Owner >

Passowrd 👁
0/20

I have read and agree to the "Privacy policy" and "User License Agreement"

Log On

Version 3.6.0 Test

Figure 8-2 App Login

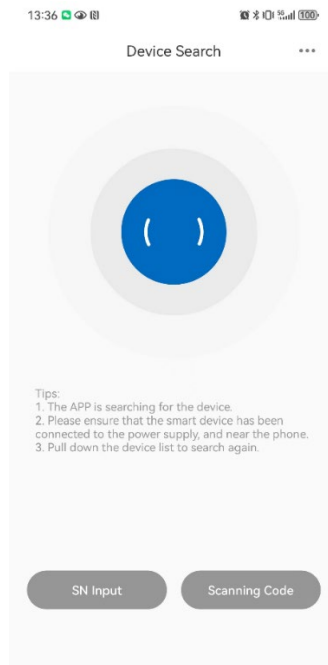


Figure 8-3 Equipment search



Figure 8-4 Nameplate

Step 2 Log in to the equipment.

- Method 1

1. After waiting for 1 minute for the app to search for the equipment, select the corresponding equipment to connect according to the serial number on the nameplate on the rear door of the converter.

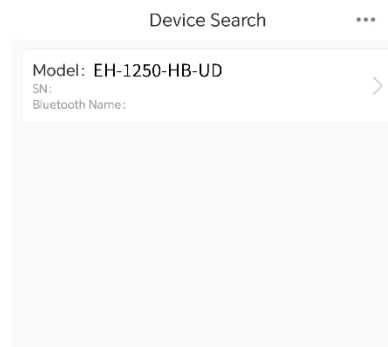


Figure 8-5 App screen

- Method 2

2. Click the **SN Input** button on the equipment search page and enter the serial number on the nameplate on the rear door of the converter to establish the connection.

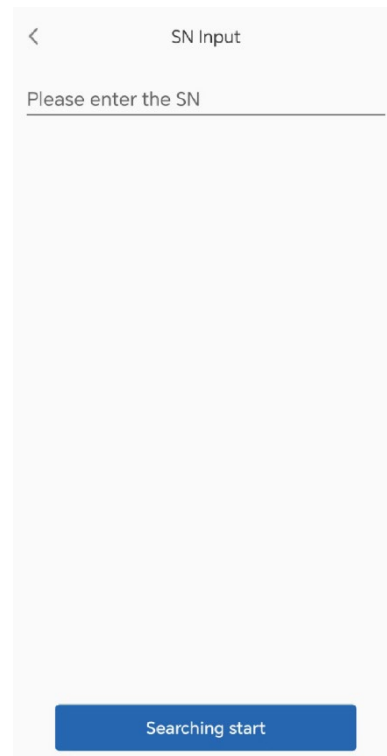



Figure 8-6 Entering the serial number

- Method 3

3. Click the **Scanning Code** button on the equipment search page and scan the barcode on the nameplate on the rear door of the converter to establish the connection.

Step 3 You can view the operating information of the equipment by selecting the **DC**, **AC**, **Alarm**, **Status**, and other menus.

Step 4 Click  in the upper right corner on the homepage to enter the parameter settings page.

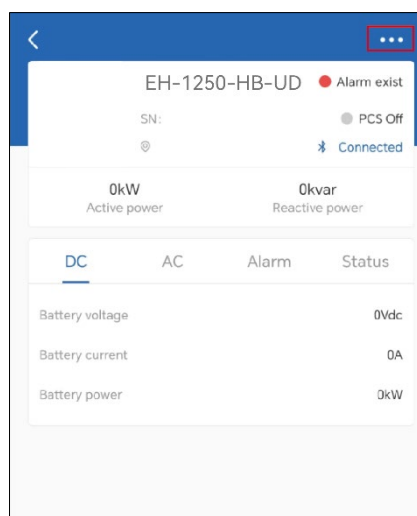


Figure 8-7 Viewing the operating information

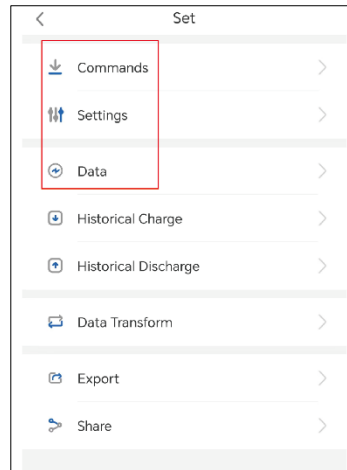


Figure 8-8 App settings page

8.3 App Menu Introduction

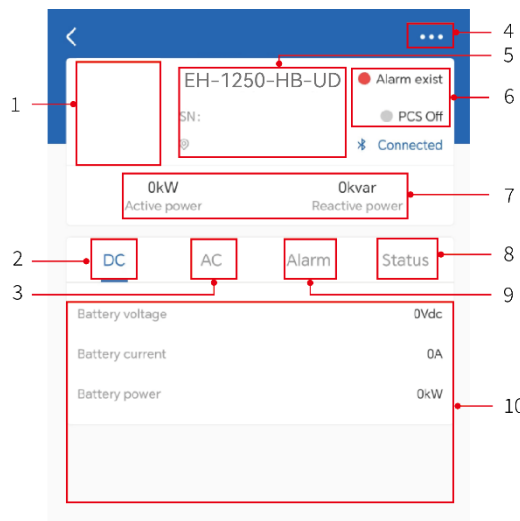



Figure 8-9 Homepage

| | | | | | |
|----|-----------------------------|---|---|---|---|
| 1 | Product appearance | 2 | Button for viewing the DC operating information | 3 | Button for viewing the AC operating information |
| 4 | Parameter settings button | 5 | Product model and SN | 6 | Button for viewing alarms |
| 7 | Active power/reactive power | 8 | Button for viewing product operating status | 9 | Button for viewing product alarm information |
| 10 | Information display area | | | | |

8.4 App Operations

8.4.1 Remote Power-On/Off

Procedure

Step 1 Click  in the upper right corner on the homepage to enter the parameter settings page.

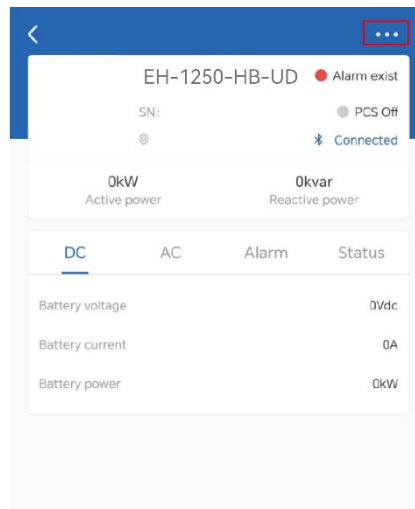


Figure 8-10 Entering the settings page

Step 2 Select the **Commands** menu.

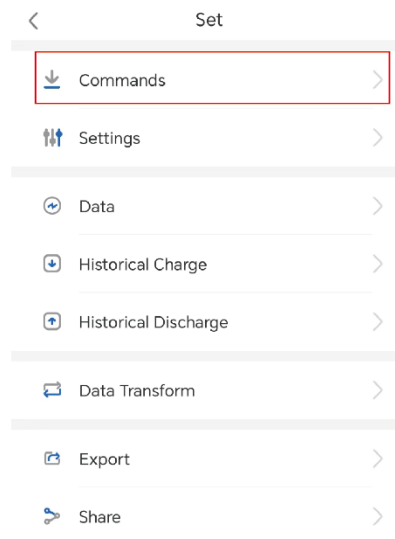


Figure 8-11 Issuing commands

Step 3 Issue the "PCS ON" or " PCS OFF" command and click **OK**. The command is successfully issued.

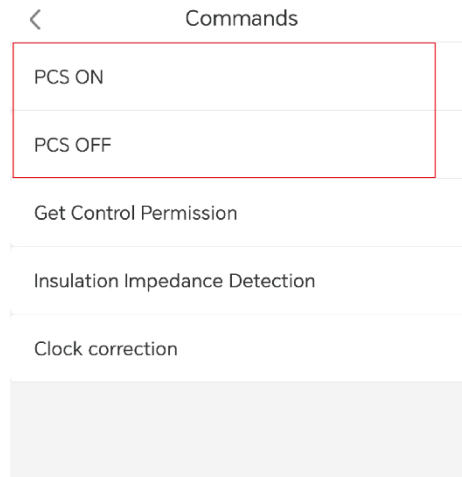



Figure 8-12 Power-On

8.4.2 Viewing Manufacturer Information

Procedure

Step 1 Click  in the upper right corner on the homepage to enter the parameter settings page.

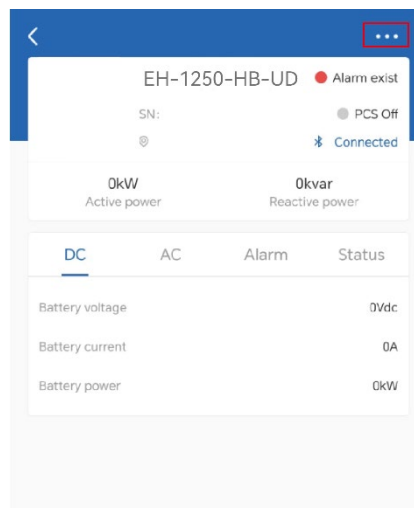


Figure 8-13 Entering the settings page

Step 2 Choose **Data > Manufacturer Information**, and view information such as product model, serial number and software version.

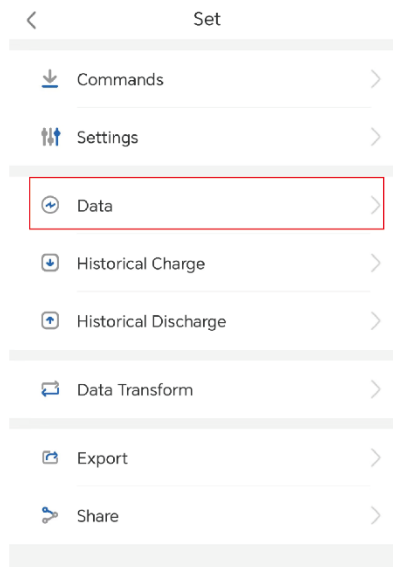


Figure 8-14 Viewing data

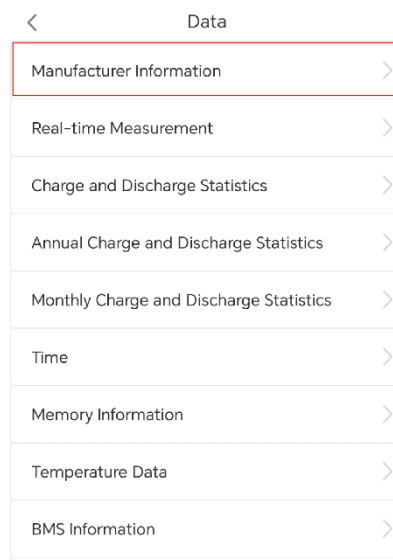


Figure 8-15 Viewing manufacturer information

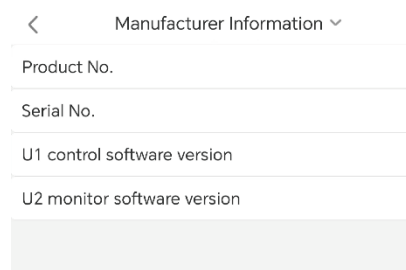



Figure 8-16 Viewing information

8.4.3 Setting Communication Parameters

Procedure

Step 1 Click  in the upper right corner on the homepage to enter the parameter settings page.

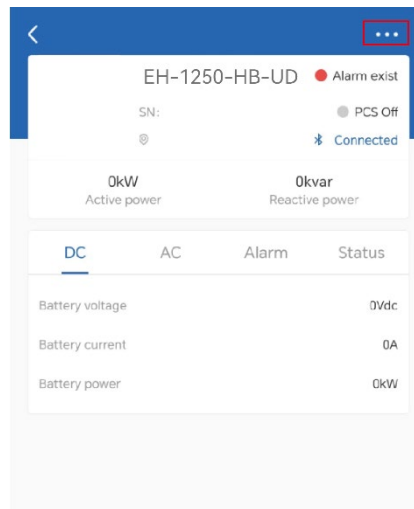


Figure 8-17 Entering the settings page

Step 2 Choose **Settings > Ethernet Communication Parameters** to enter the communication parameter settings page.

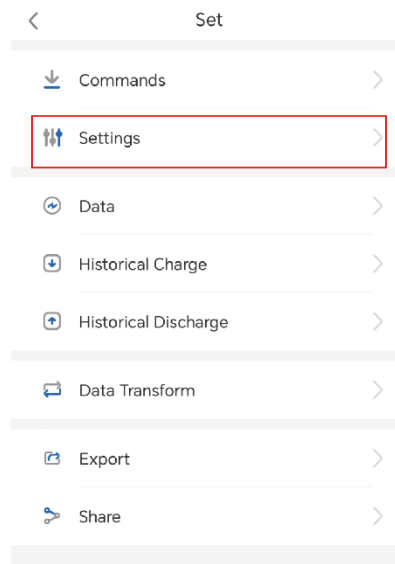


Figure 8-18 Parameter settings menu

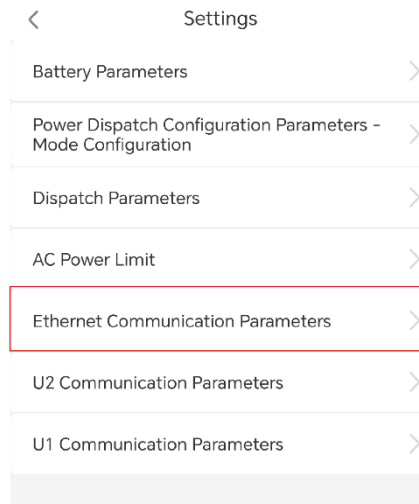


Figure 8-19 Ethernet communication menu

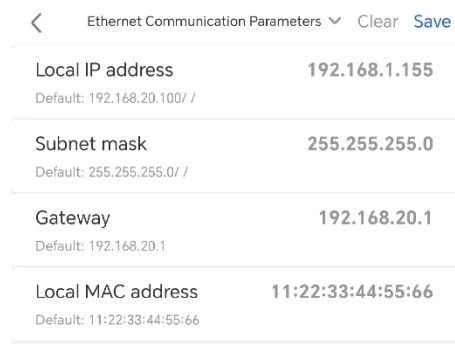


Figure 8-20 Setting communication parameters

Chapter 9 List of Alarms



Danger

- The energy storage converter provides the power-on intelligent diagnosis function and automatically monitors the status of various internal components. When the energy storage converter prompts for critical faults, unable to power on, or maintenance information of other internal components, please contact Sineng customer service personnel.

This chapter describes common fault alarms and parameter thresholds of the energy storage converter.

Table 9-1 List of faults

| Alarm | Description |
|----------------------------------|--|
| AC undervoltage | The AC voltage is lower than the preset lower limit. |
| AC overvoltage | The AC voltage is higher than the preset upper limit. |
| AC underfrequency | The AC frequency is lower than the preset lower limit. |
| AC overfrequency | The AC frequency is higher than the preset upper limit. |
| AC voltage imbalance | The AC voltage unbalance is higher than the preset limit. |
| AC current imbalance | The AC current unbalance is higher than the preset limit. |
| Low voltage ride-through | The AC voltage encounters low voltage ride-through and dropout. |
| AC reverse order | AC phase sequence is reversed. |
| AC phase loss | AC phase is lost. |
| Anti-island | The power grid encounters the islanding effect. |
| Battery undervoltage | The battery voltage is lower than the undervoltage protection threshold. |
| Battery overvoltage | The battery voltage is higher than the overvoltage protection threshold. |
| Battery reverse | The battery polarity is reversed. |
| Insulation resistance exception | The insulation resistance to ground is low. |
| AC lightning protector faulty | The AC surge protection device is faulty. |
| DC lightning protector faulty | The DC surge protection device is faulty. |
| Main power fan failure | The main power fan works abnormally or is stalled. |
| Two-phase flow fan failure | The two-phase flow fan works abnormally or is stalled. |
| Spoiler fan failure | The spoiler fan works abnormally or is stalled. |
| Driver cable connection abnormal | The drive cable from the control board to the drive board is abnormal. |
| Overtemperature protection | The collected temperature is higher than the allowable upper limit of the temperature. |
| Overtemperature operation | The collected temperature is higher than the normal operating temperature |
| DC soft start failure | The soft start of busbar voltage fails. |
| OCP faulty | Overcurrent protection for the external tube of the inverter module. |
| IGBT VCE exception | Overcurrent protection for the internal tube of the inverter module. |

Chapter 10 Product Maintenance



Warning

- There is a fatal high voltage inside the energy storage converter cabinet. Please do not remove the cover plate of the energy storage converter without authorization. If accidentally touched, there is a risk of fatal electric shock.
- Unauthorized disassembly of the energy storage converter may cause damage to the equipment. Such equipment damage is not covered by the product warranty.
- After shutting down the equipment, please wait at least 5 minutes before opening the cabinet door to perform maintenance work. Ensure that the inside of the equipment is completely de-energized.
- Only qualified and authorized personnel can perform maintenance and other operations on the energy storage converter.
- When performing the maintenance work, do not leave screws, washers and other metal parts in the energy storage converter. Otherwise, the equipment may be damaged.
- The energy storage converter failures due to the use of spare parts not provided by Sineng are not covered by product warranty.
- The entry of sand and moisture may damage the electrical devices inside the energy storage converter or affect the operating performance of the equipment.
 - Do not open the energy storage converter cabinet door during sandstorm season or when the relative humidity in the environment is greater than 95%.
 - Maintenance can only be carried out when there is no sandstorm and the weather is clear and dry.
- To avoid the risk of electric shock, before maintenance, inspection and other operations, perform the following steps:
 - Disconnect the switches on the DC side.
 - Disconnect the upper and lower-level circuit breakers of the energy storage converter.

10.1 Periodic Maintenance

The maintenance cycles provided in this section are reference values. The actual maintenance cycles should be reasonably determined based on the actual environmental conditions on site.

Table 10-1 Maintenance item (annual)

| Maintenance Item | Inspection Method |
|------------------------------|---|
| Exterior of the cabinet | Check the following items. If any item does not meet the requirements, correct it immediately: <ul style="list-style-type: none"> ● Check whether there are flammable materials around the energy storage converter. ● Check whether the ground point is loose or corroded. ● Check whether the enclosure of the energy storage converter is damaged or has paint peeling off. |
| Interior of internal cabinet | Check whether there are foreign objects, dust, dirt and condensation inside the energy storage converter. |
| Air inlet and outlet | Check the radiator temperature and dust. If necessary, use a vacuum cleaner to clean the cooling module, etc. |
| Warning Signs | Check whether the energy storage converter labels and signs are clear and not defaced. |

| Maintenance Item | Inspection Method |
|--------------------------------|---|
| Energy storage converter state | <p>Check the following items. If any item does not meet the requirements, correct it immediately:</p> <ul style="list-style-type: none"> ● Check whether there are any abnormal noises when the internal devices are running. ● Check whether the temperature and humidity inside the energy storage converter are normal. ● Check the air inlet and outlet of the energy storage converter. |
| Wiring and cable layout | <p>Wait until the internal devices of the energy storage converter are completely powered off before starting the inspection! During the inspection, if any non-conformity is found, correct it immediately.</p> <ul style="list-style-type: none"> ● Check whether the cable layout is standard and whether there is a short circuit. For example: If there is any anomaly, correct it immediately. ● Check whether all inlet and outlet holes of the energy storage converter are well sealed. ● Check whether there is water seepage inside the energy storage converter. ● Check all cables for loose connections. ● Check all cable surfaces for damage. ● Check whether the cable insulation layer is peeled off. |
| Ground | <p>Check whether the ground connection is correct. The ground resistance should not be greater than 4 Ω.</p> |
| Circuit breaker | <ul style="list-style-type: none"> ● Visually inspect the enclosure, secondary terminals and insulating base for cracks, damage or deformation. ● Check the circuit connection screws for dust and foreign objects. ● Check whether the circuit breaker functions normally, such as manual opening and closing. |

Table 10-2 Maintenance item (quarterly)

| Maintenance Item | Inspection Method |
|---|---|
| Human-machine interface (HCI) information | <p>Check whether there are any alarms on the HCI. If there are alarms, clear the alarms in a timely manner or contact the manufacturer.</p> |
| Component maintenance | <ul style="list-style-type: none"> ● Conduct routine inspections on metal components for oxidation and corrosion. ● Check that the product components (switches, fuses, fans, etc.) are in good mechanical operation. |
| Screws | <p>Check whether the internal screws are loose or fallen off.</p> |
| Software maintenance | <p>Simulate emergency stop, power-off and other operations to check whether the functions can be implemented normally.</p> |

10.2 Replacing the AC and DC Surge Protection Devices



Warning

- Do not replace surge protection devices during a thunderstorm.

Procedure

- Step 1 Connect the ground cable of the ESD wrist strap and put on the ESD wrist strap and ESD gloves.
- Step 2 Power off the energy storage converter according to the instructions in section 7.3 "Powering Off the Equipment", and wait for more than 5 minutes before operations.
- Step 3 Press the faulty surge protection device with your hand and pull it out at the same time, as shown in the following figure.

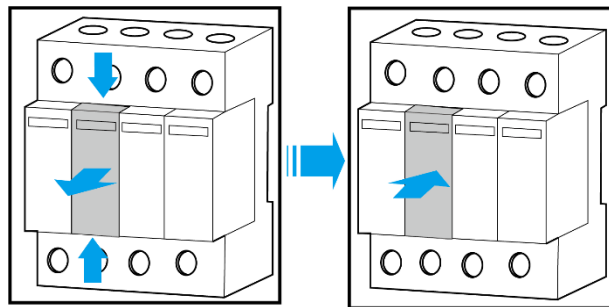


Figure 10-1 Replacing the Surge Protection Device

- Step 4 Install the new surge protection device, as shown in Figure 10-1.
- Step 5 Remove the ground cable of the ESD wrist strap and take off the ESD wrist strap and ESD gloves.

10.3 Replacing the Dust Filter of the Air Duct Elbow

Procedure

- Step 1 Remove the screws that secure the dust filter in the air duct elbow.

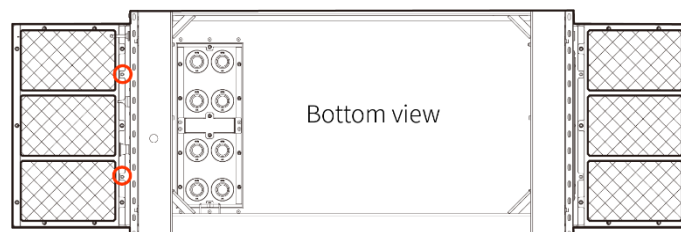


Figure 10-2 Removing fastening screws of the dust filter

- Step 2 Remove the barrier strip and pull out the dust filter downwards.

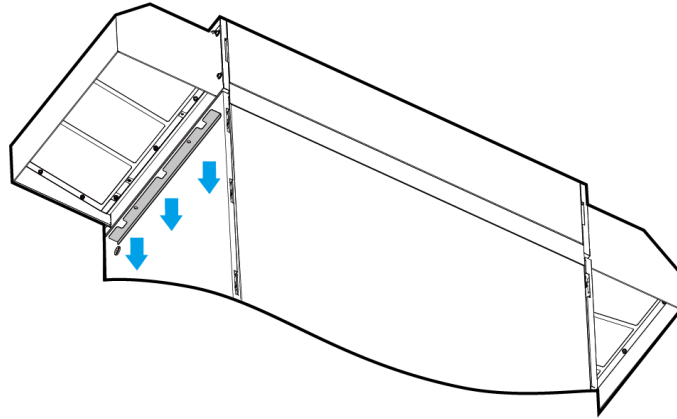


Figure 10-3 Removing the barrier strip

Step 3 Install a new dust filter and fasten the screws.

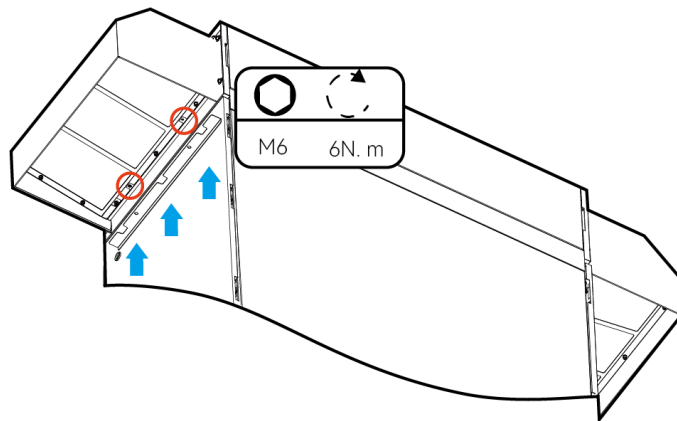


Figure 10-4 Replacing the dust filter

10.4 Replacing the Fly Net of the Air Duct Elbow

Procedure

Step 1 Remove the screws that secure the fly net in the air duct elbow.

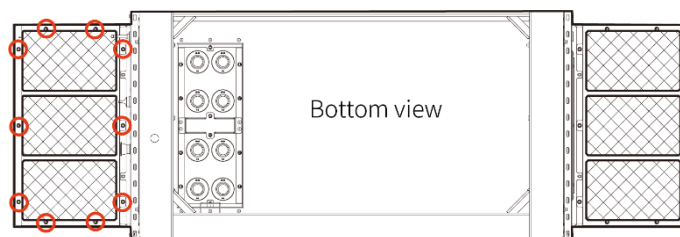


Figure 10-5 Removing fastening screws of the fly net

Step 2 Remove the old fly net.

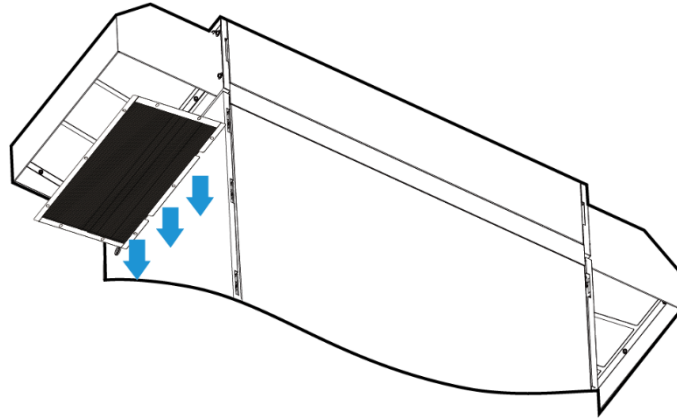


Figure 10-6 Removing the fly net

Step 3 Install a new fly net.

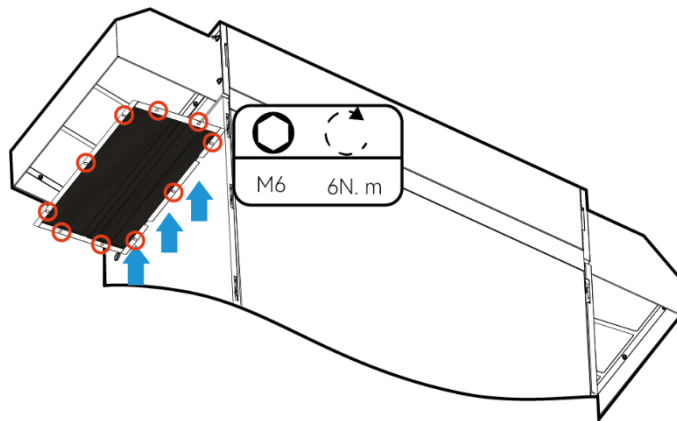


Figure 10-7 Replacing the fly net

10.5 Primer Maintenance

Procedure

- Step 1 Power off the energy storage converter completely according to the instructions in section 7.3 "Powering Off the Equipment", and wait for more than 20 minutes before operations.
- Step 2 Use sandpaper to polish the damaged areas of the paint to remove damaged paint and rust.
- Step 3 Use a rag, alcohol or water to clean the sanded area.
- Step 4 After the sanded area is dry, paint or spray paint the sanded area.
- Step 5 After the replacement is completed, power on the energy storage converter according to the instructions in section 7.2 "Powering On the Equipment".
- Step 6 After checking that the energy storage converter is operating normally, clean up the site.

Appendix A Crimping Terminals

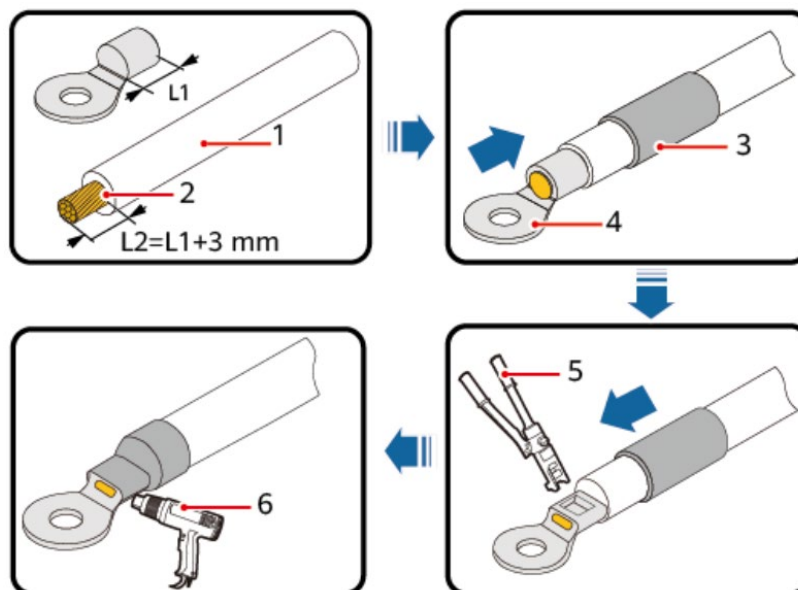


Figure A-1 Crimping the OT terminal

| | | | | | |
|---|-------------|---|------------------|---|----------------------|
| 1 | Cable | 2 | Core | 3 | Heat shrinkable tube |
| 4 | OT terminal | 5 | Hydraulic pliers | 6 | Heat gun |

Appendix B System Specifications

Table B-1 Basic Specifications

| Item | EH-1250-HB-UD | EH-1250-HB-UD-US |
|-------------------------------|--|------------------|
| Dimensions (H x W x D) | 2300 mm×675 mm×2000 mm (stand-alone equipment without base, with air duct elbow) 2450 mm×1400 mm×2000 mm (2 units in parallel connection with base and air duct elbow) 2450 mm×2800 mm×2000 mm (4 units in parallel connection with base and air duct elbow) | |
| Weight | 900 kg (stand-alone equipment without base) 2000 kg (2 units in parallel connection with base) 4000 kg (4 units in parallel connection with base) | |
| Cable entry method | Lower cable entry and lower cable exit | |
| Isolated mode | Non-isolated mode (external transformer) | |
| Maximum conversion efficiency | ≥99% | |
| IP rating | IP65 | |
| Cooling method | Temperature-control forced air cooling | |
| Communication interface | RS485/CAN/Ethernet/Bluetooth | |

Table B-2 DC parameters

| Item | EH-1250-HB-UD | EH-1250-HB-UD-US |
|---|------------------|------------------|
| Range of voltage in full load configuration | 1000 V to 1500 V | |
| Maximum voltage | 1520 V | |
| Number of battery packs | 1 set | |
| Maximum stability DC voltage | 1403 A | |
| Maximum short-time overload current (1.2 times) | 1531 A | |
| Maximum stability DC power | 1403 kW | |
| Maximum number of DC parallel units | 2 sets | |
| Voltage stabilization accuracy | $\leq\pm 2\%$ | |

Table B-3 Grid-connected AC parameters

| Item | EH-1250-HB-UD | EH-1250-HB-UD-US |
|-----------------------------|--|---|
| Voltage system | Three-phase, three-wire+ground cable (IT systems) It is connected to the power grid or load through a dedicated external isolation transformer, and the N line is reserved in the stand-alone equipment for DC parallel connection. | |
| Rated voltage | 690 V AC | |
| Rated current | 1046 A@45°C 1151 A@30°C | |
| Voltage range | 85% to 110% (configurable) for stable operating; 110%~120% for no less than 20s; 130% for no less than 500 ms | 88% to 110% (configurable) for stable operating; 110% to 120% for no less than 20s |
| Rated frequency | 50/60 Hz | |
| Frequency range | 45–55 Hz/55–65 Hz (configurable) for stable operating | 57–63 Hz (configurable) for stable operating |
| Current unbalance | The three-phase current unbalance should not exceed 1.3% and should not exceed 2.6% in a short period of time. | |
| Number of AC parallel units | 4 sets | |

Table B-4 Off-grid AC parameters

| Item | EH-1250-HB-UD | EH-1250-HB-UD-US |
|-------------------|--|------------------|
| Voltage deviation | Under no-load and rated resistive load (balanced load) conditions, the AC voltage amplitude deviation is $\leq\pm 3\%$, and the phase | |

| Item | EH-1250-HB-UD | EH-1250-HB-UD-US |
|--|--|------------------|
| | deviation is <math><3^\circ</math>. | |
| Voltage total harmonic distortion (THDu) | Under no-load and rated resistive load (balanced load) conditions, the total harmonic distortion rate of the voltage at the AC port should not be greater than 3%. | |
| Voltage unbalance | <math><2\%</math>, not exceeding 4% for a short period of time | |
| DC component of voltage | 0.5% | |
| Dynamic voltage transient range | <math><10\%</math>, recovery time <math><100\text{ ms}</math> | |
| Unbalanced load capacity | 100% unbalanced load | |
| Maximum number of parallel units | <ul style="list-style-type: none"> ● 2 DC parallel units ● 4 AC parallel units | |
| Parallel uneven flow | <math><5\%</math> of the rated Current | |

Table B-5 Environment specifications

| Item | EH-1250-HB-UD | EH-1250-HB-UD-US |
|-----------------------|--|------------------|
| Operating temperature | -40°C to $+60^\circ\text{C}$ | |
| Relative humidity | 0–100%, non-condensing | |
| Altitude | 3000 m. The power decreases by 1% for every 100 m increase. The maximum altitude is 5000 m | |
| IP rating | IP65 | |