

Installation Manual

Energy Management System

EMS3000



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About This Manual

This manual describes the transportation and storage, electrical connection, and maintenance of the product.

Target Group

This manual is intended for persons who carry out operations such as mechanical installation and electrical connection of product. The operator must be a suitably qualified electrical technician.

All installation operations must and will only be carried out by qualified personnel. Qualified personnel should have the following skills:

- Training for installation and commissioning of electrical system, as well as dealing with hazards
- Knowledge of the manual and other related documents
- Knowledge of the local regulations and directives

How to Use This Manual

Read the manual and other related documents before performing any work on the product.

Documents must be stored carefully and be available at all times.

Contents may be periodically updated or revised due to the product development. The manual content of subsequent versions of the product may be subject to change. The latest manual can be found at support.sungrowpower.com .

Symbols

Important instructions contained in this manual should be followed during installation, operation and maintenance of the product. They will be highlighted by the following symbols. The symbols listed below may be used in this manual. Please read carefully to make better use of this manual.

DANGER

"Danger" indicates that there is a serious potential danger, which can lead to death or serious injury if not avoided.

WARNING

"Warning" indicates that there is a moderate potential danger, which may lead to death or serious injury if not avoided.

CAUTION

"Caution" indicates that there is a mild potential danger, which may lead to moderate or mild personal injury if not avoided.

NOTICE

"Attention" means that there is a potential risk, which may cause the equipment to fail to operate normally or cause property damage if not avoided.



"Notes" are the additional information in the manual, which emphasize and supplement the contents, and may also provide skills or tips for optimizing the use of the product, and help the user solve a problem or save time.

Symbol on Products

Please pay attention to the danger and warning signs on the product, including the following:

Marks	Mark description
	This mark indicates that the body contains high voltage, and touching it may cause electric shock.
	This symbol indicates a protective ground terminal which needs to be firmly grounded to ensure the safety of operators.

Note

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

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

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1 Safety Instructions

The product is designed and tested in accordance with international safety requirements. However, it is a power electronic product, relevant safety instructions should be strictly followed in the process of installation, operation and maintenance.

Incorrect use or misoperation may harm:

- Life and personal safety of the operator or third parties
- The product, other property of the operator or third parties

Please read the descriptions of the "danger", "warning", "caution", "attention" and "notes" carefully, which will provide certain protection for the personal safety of users and help prolong the service life of the product.

1.1 Before Installation

NOTICE

- When receiving the product, please first check whether the product was damaged during transportation. If you find any problems, please contact Sungrow Power Supply Co., Ltd. or the carrier immediately.
- Relevant operators must be familiar with all safety instructions and rules on installation, operation and maintenance in the manual before using the product.
- Correct handling, in-place installation, operation and maintenance are reliable guarantees for safe and reasonable use of the product.

1.2 During Installation

NOTICE

The product can only be used for the purposes specified in the manual. Unauthorized modification or use of spare parts not sold or recommended by Sungrow may lead to fire, electric shock and other damage or injuries.

1.3 Maintenance and Replacement

WARNING

- Maintenance of the product can only be carried out by Sungrow's service department or qualified professionals.
- Users are prohibited from repairing and maintaining the equipment, or replacing modules by themselves. If users request for repair, maintenance or module replacement, analysis and confirmation by Sungrow Power Supply Co., Ltd. are required.

NOTICE

If relevant parts need to be replaced during maintenance, please use the components and parts recommended and approved by Sungrow, otherwise the user should bear the losses caused thereby!

2 Product Description

2.1 System Introduction

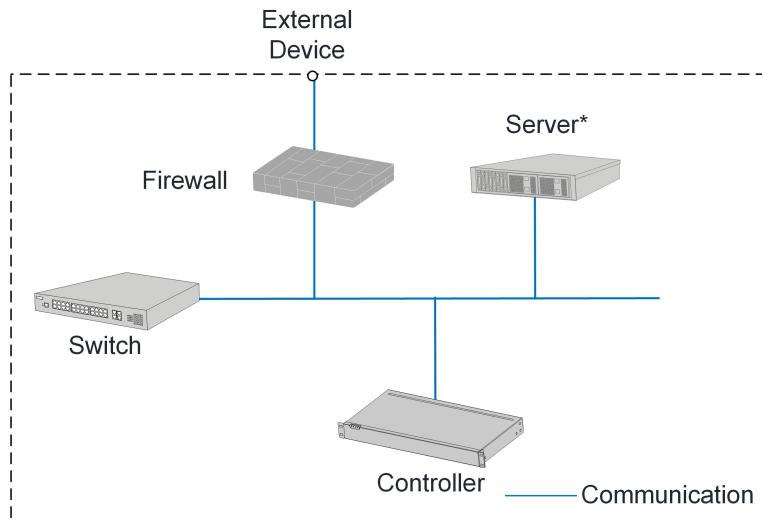
2.1.1 Function introduction

EMS3000 is a web-based local monitoring system, which can realize the functions of power plant data collection, monitoring, alarm, energy management, intelligent analysis, etc. Addressing the problems of unused surplus wind and PV power, unstable loads, and different electric prices between peak and off-peak hours, it balances power supplies and demands economically and efficiently under different application scenarios and operation modes by optimizing energy storage control and distributed power output and coordinating the commissioning and ceasing of loads. It can also realize functions such as station-level energy storage battery life analysis and IV curve online diagnosis of PV strings.

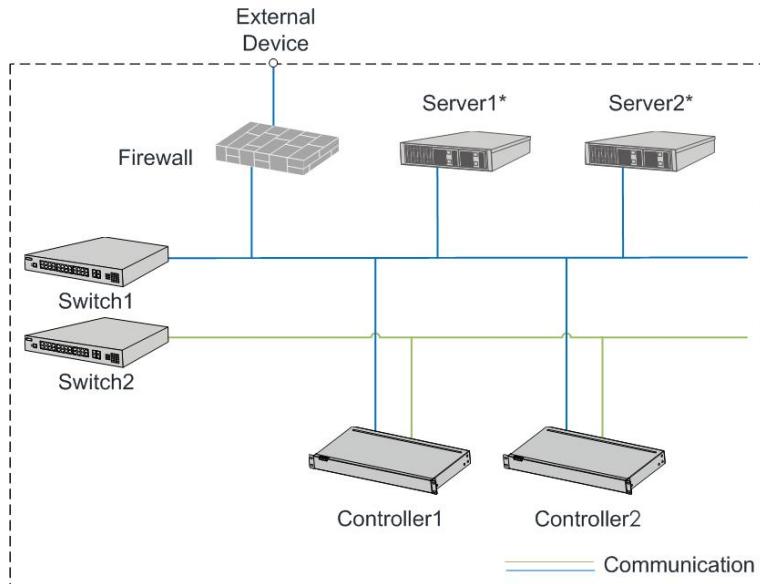
2.1.2 Communication Schematic Diagram

The product integrates firewall, switch, controller, etc.

Communication schematic diagram of a single machine with a single network:



Communication schematic diagram of double machines with double networks:



*Indicated as optional.



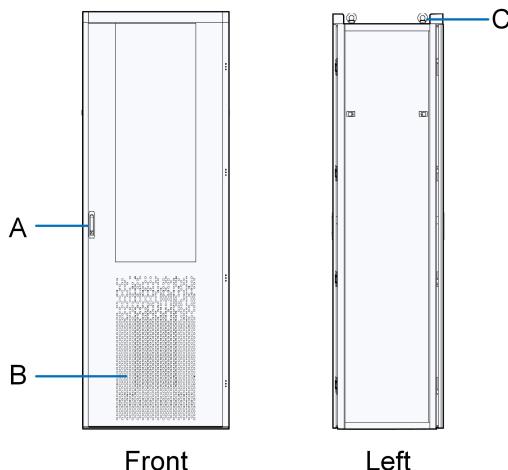
The above pictures are for reference only, please refer to the actual product for details.

2.1.3 Performance characteristics

- Flexible networking
 - EMS and Insight integrated (monitoring software), unified monitoring of utility hybrid plant with devices such as power conversion systems, inverters, combiner boxes, transformers, batteries.
 - Integrated fiber switch, support of single or dual network, convenient and flexible.
 - Support of IEC 61850, DNP3.0, IEC 104, modbus, flexible interface to different protocol.
- Power control
 - Fast power control within 100ms
 - Support of active/reactive power control, voltage control, frequency regulation , and SVC/SVG/STATCOMS control, fully matching requirements in ancillary services, time shifting, ramp rate control, renewable smoothing scenarios, etc.
- Intelligent and safe
 - Intelligent SOC balance and operating temperature diagnosis.
 - Sophisticated diagnosis and health check for batteries.
 - IEC 62443 certificated.

2.2 Appearance and Structure

The product appearance is shown in the following pictures.

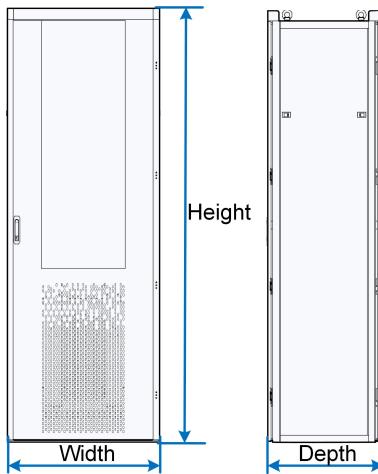


No.	Name
A	Door lock*
B	Air inlet
C	Top ring

*The door lock position is for reference only, please refer to the actual product.

2.3 Overall Dimensions

The external dimensions of the product are shown below.



Width	Height	Depth	Weight
800±10mm	2260±15mm	600±10mm	246±5kg

*The value here are for the standard configuration, and the weight of the actual product shall prevail.

3 Transport and Storage

3.1 Scope of Supply

Check the delivery completeness against the packing list in the cabinet:

- EMS3000 (1)
- Certificate of conformity (1)
- Warranty card (1)
- Installation Manual (1)
- Delivery inspection report (1)
- Other parts specified in the order



Damage may occur during transportation, so be sure to check carefully before installation. If there is any damage, please contact the carrier or directly contact Sungrow Power Supply Co., Ltd.

3.2 Transport

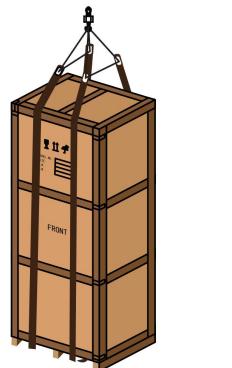
When transporting the device, manual or mechanical means of transport can be chosen depending on the site conditions.

⚠ CAUTION

When hoisting and transporting, please consider the size and weight of the device and take care to balance it to prevent it from tipping over or falling.

3.2.1 Mechanical Transport

Transport the device by the method described in the following table:

Transport method	Notices
Transport the packed device by forklift	<p>The central of gravity of the cabinet should be placed between the two prongs. A trial transport is recommended.</p> <p>Safety Operation Rules of Forklift should be observed at all times.</p>
	
Move the packed device by crane	<p>The transport, move and put down of the device must be slow and stable.</p> <p>Tie two flexible straps to the external crate through the crane marks. The lifting hook should be vertical to the central of gravity of the device. Tilting transport is strictly forbidden.</p> <p>Safety Operation Rules of Forklift should be observed at all times.</p>
	
Move the unpacked device by crane	<p>The transport, move and put down of the device must be slow and stable. Tilting transport is strictly forbidden.</p> <p>Place the hook to position from inside to outside and screw the lateral pin.</p> <p>Safety Operation Rules of Crane should be observed at all times.</p>

3.2.2 Manual Transport

⚠ CAUTION

Improper handling may cause personal injury!

- Arrange an appropriate number of personnel to carry the device according to its weight, and installation personnel should wear protective equipment such as anti-impact shoes and gloves.
- Attention must be paid to the center of gravity of the device to avoid tilting during handling.

3.3 Storage

If the product is not installed immediately after the delivery acceptance is completed, the equipment needs to be stored. Pay attention to the following matters when storing:

- Restore the package to the state it was in when it was delivered.
- Retain the desiccant in the package.
- Pay attention to ventilation and moisture prevention when storing equipment. Accumulated water is strictly prohibited in the storage environment.
- Pay attention to the surrounding harsh environment, such as sudden cold, sudden heating, collision, etc., so as to avoid damage to the equipment.
- Conduct regular inspection, check whether the package is intact and avoid insect and rat bites. If the packaging is damaged, replace it immediately.
- If the storage time exceeds half a year, open the package for inspection, repackage the equipment and replace desiccant.
- Temperature range of storage environment: -25°C~55°C , Ambient humidity: 5%~80% (non-condensing), Elevation: ≤4000m.

4 Mechanical Mounting

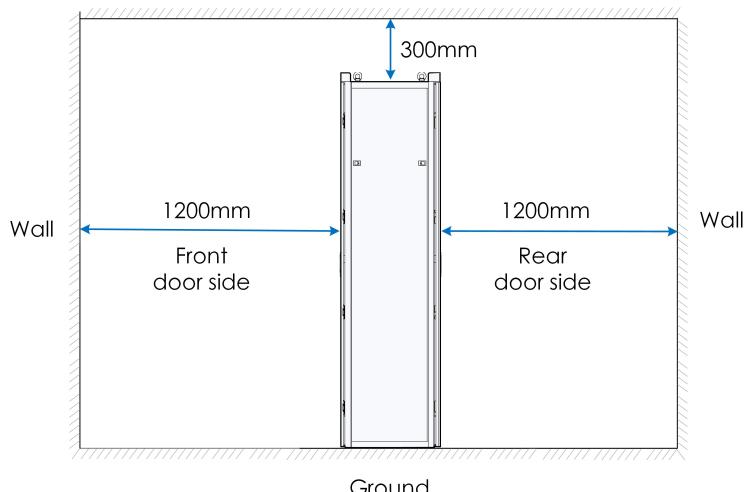
⚠ WARNING

Respect all local standards and requirements during mechanical installation.

4.1 Requirements for installation environment

The protection level of the product is IP20, and the installation site shall meet the following requirements:

- It should be installed in a shaded indoor location.
- The installation position of the product shall be determined after full consideration of its overall dimensions and weight.
- Ambient temperature: 10°C-35°C , Ambient humidity: 10% ~80% (non-condensing), Elevation: $\leq 4000\text{m}$.
- It should be installed in a dry, well-ventilated and dustproof place.
- The installation site is free from explosive hazards and the surrounding media should not contain media that can corrode metals, damage insulation and surface plating and coating layers.
- The installation site should have no visible water vapour and no significant mould should be present.
- The installation site does not exceed the vibration with severity class I as specified in GB/T 11287-2000.
- In order to facilitate heat dissipation and daily maintenance, sufficient space should be reserved around the product.



The above dimensions are all recommended values.



If the reserved space is small due to site constraints, the maintenance area must be taken into account.

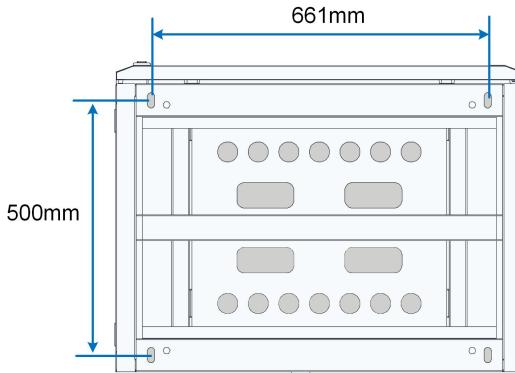
4.2 Floor Requirements

The device should be installed on cement foundation with flame resistance material or steel channel support. The foundation must be solid and safe enough to position the device. It must be able to provide the load-carrying capacity necessary to cope with the weight of the device.

During foundation construction, lay cable trench according to the whole situation of the site and the cable routing method on the device bottom.

Drill holes on the ground. The positions of the holes should be exactly the same with the holes on the device base to connect the device firmly to the foundation.

There are 4 positioning holes on the bottom of the device as shown in the following figure. M12 bolts are recommended to fix the device pedestal to the ground.



4.3 Installation Methods

NOTICE

- **Do not perform any other operations inside or on top of the device that are not related to the installation.**
- **Make sure the environment around and inside the device is clean and tidy.**
- **The relevant safety precautions in this manual should be observed during installation.**

The device should be installed in a location that is easy to maintain and operate on a daily basis.

Checking before fixing

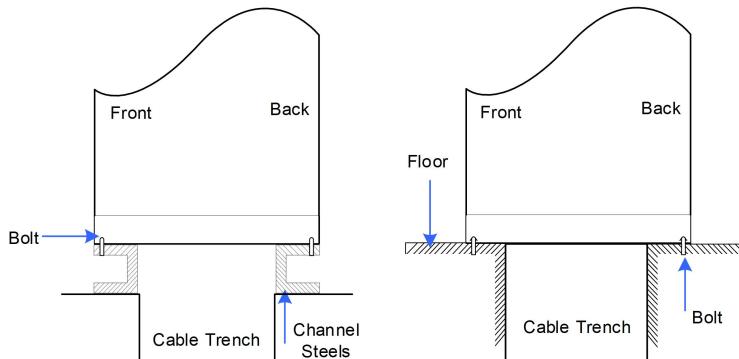
It is advisable to fix the device to the steel channel. Before fixing the device, please make sure:

- The built of cable trench meets the requirements of the device.
- The installation and holes of the steel channel meets the requirements of the device.

The device can also be fixed to the ground by foot screws. Drill holes on the ground and make sure the dimensions of the holes are exactly the same with the holes of the device.

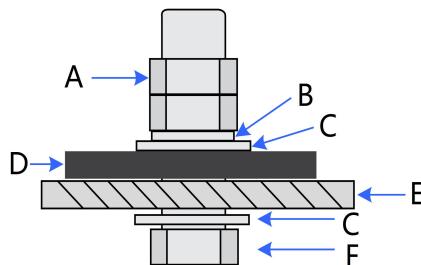
To fix the device, proceed as follows:

- step 1 Drill holes on the steel channel or the ground according to the installation holes' dimension identified on the installation dimension diagram.
- step 2 Place the device to the steel channel or the ground; make sure the bottom installation holes matches the drilled holes.
- step 3 Fix the device to the steel channel or ground by M12 bolts, tightening torque: 60~70 N.m.



*The above pictures are for reference only, please refer to the actual product for details.

Connection sequence between the device base and channel steel is described below.



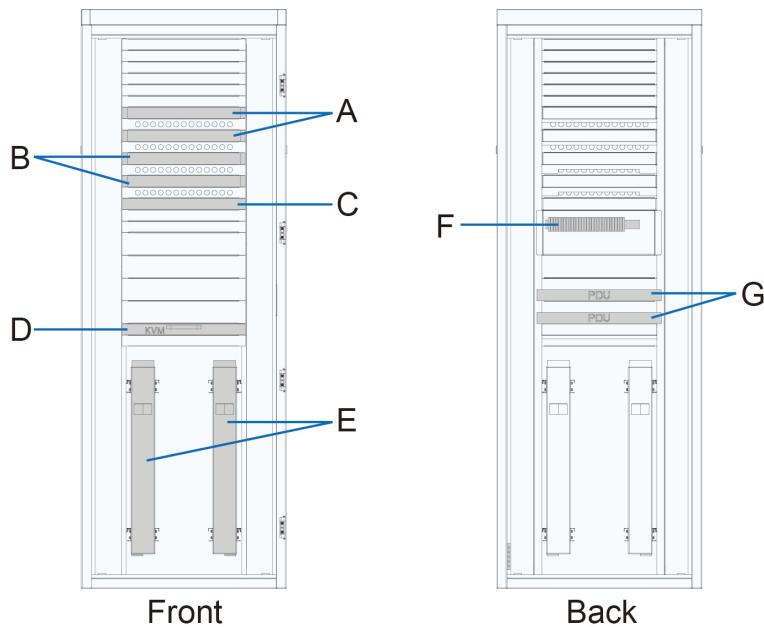
No.	Specification	No.	Specification
A	Nut	D	Base of the device
B	Spring washer	E	Channel steel
C	Flat washer	F	M12 x 45 Bolt

-- End

5 Electrical Connection

5.1 Internal Layout

The equipment in cabinet are shown in the following figure.



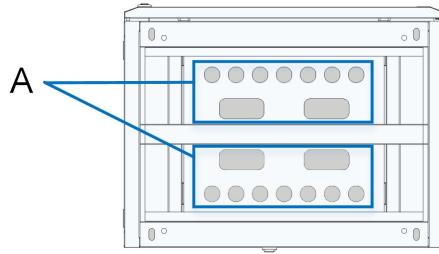
The figure above is indicative only.

No.	Port type
A	Controller
B	Switch
C	Firewall
D	KVM
E	Server (optional)
F	Terminal block
G	Power distribution unit (PDU)

5.2 Preparation before Wiring

The connecting cables between the product and external equipment are inserted through the threading holes at the bottom of the cabinet.

The threading holes at the bottom of the cabinet are shown in the following figure A.



5.3 Electrical Wiring

5.3.1 Grounding Connection

There are three grounding methods for the cabinet: grounding terminal block, grounding point and grounding copper bar.

5.3.1.1 Connection by Grounding Terminal Block

Brief Introduction

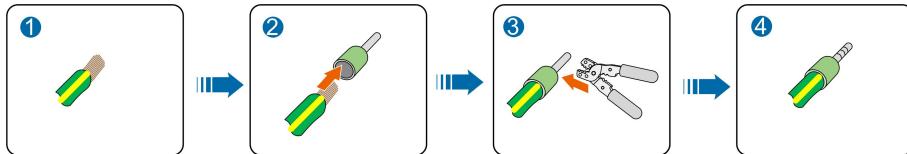
The grounding terminal block of the cabinet is at the position of the XZ3 terminal block.

Wiring Requirements

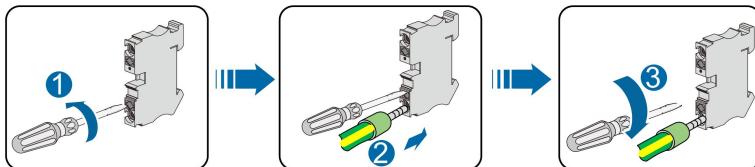
0.75 mm² grounding cables are recommended.

Wiring Steps

- step 1 Draw the grounding cable through the inlet hole at the bottom of the cabinet.
- step 2 Strip off the protective layer and insulating layer of the grounding cable to expose the copper core part, and select the appropriate cold-pressed terminal for crimping.



- step 3 Connect the cold-pressed terminal to the grounding terminal block.



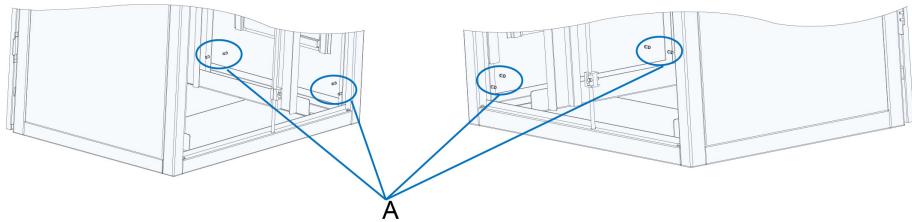
- step 4 Tighten with a screwdriver with a torque of 0.6 ~ 0.8 N.m.

-- End

5.3.1.2 Connection by Internal Grounding Point

Brief Introduction

Grounding points are reserved inside the cabinet, and the positions are shown in the following figure.



Before the combiner box leaves the factory, M6 grounding screws and flange nuts are pre-installed on the grounding points.

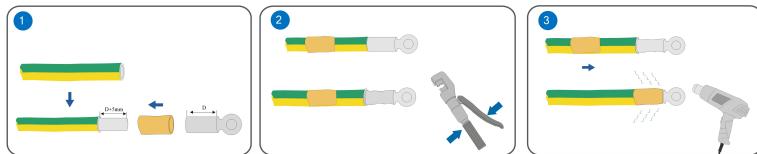
Wiring Requirements

Unscrew the flange nuts on the grounding points and keep them properly for wiring.

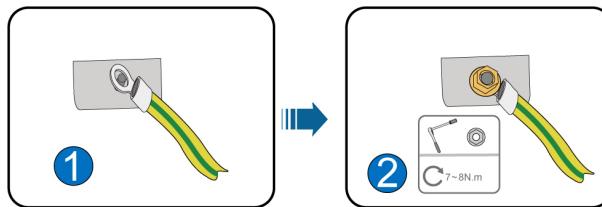
6 mm² grounding cables are recommended.

Wiring Steps

- step 1 Draw the external grounding cable through the inlet hole at the bottom of the cabinet.
- step 2 Strip off the protective layer and insulating layer of the grounding cable to expose the copper core part, and select the appropriate DT/OT terminal for crimping.



- step 3 Place the screws, DT/OT terminals and flange nuts on the grounding points in sequence.



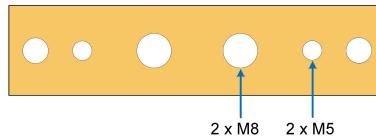
- step 4 Tighten the nut using a socket wrench. The tightening torque is 7 ~ 8N.m.

-- End

5.3.1.3 Connection by Internal Grounding Copper Bar

Brief introduction

Grounding copper bars are reserved inside the cabinet, and their positions are shown in the following figure.

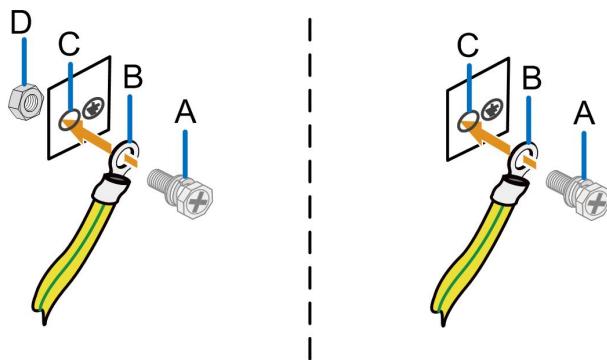


Wiring requirements

Unscrew the screws and nuts on the grounding holes and keep them properly for wiring. 6 mm² grounding cables are recommended.

Wiring steps

- step 1 Draw the external grounding cable through the inlet hole at the bottom of the cabinet.
- step 2 Strip off the protective layer and insulating layer of the grounding cable to expose the copper core part, and select the appropriate DT/OT terminal for crimping. Refer to "Wiring Steps".
- step 3 Connect the grounding terminal into the grounding hole.
 - When connecting to a M8 grounding hole, the recommended fixing method is as shown in the following figure on the left, and the tightening torque is 18 ~ 23N.m.
 - When connecting to a M5 grounding hole, the recommended fixing method is as shown in the following figure on the right, and the tightening torque is 4 ~ 4.8N.m.



No.	Name
A	Screw assembly
B	Grounding terminal
C	Grounding hole
D	Nut

-- End

5.3.2 Ethernet Port Connection

Brief introduction

Ethernet ports are reserved on both the firewall and the switch.

Wiring steps

- step 1 Connect the Ethernet ports of switch to the controllers with CAT-5e cable.

step 2 Connect the Ethernet ports of firewall to external devices with CAT-5e cable.

-- End

5.3.3 Optical Fibre (Optional)

step 1 Thread the fibre optic cable through the inlet hole at the bottom of the cabinet.

step 2 Splice the optical fibre inside the splice box.



For details, contact SUNGROW.

-- End

5.3.4 Connection to External Power Supply

Brief introduction

The cabinet is designed with an external power supply terminal block, which supports connection to power supply of 100 ~ 240Vac.

5.3.4.1 Connect to a Mains Power Supply

Overview

The device is connected to a mains power supply by default, that is, the mains power is connected to the XZ2 terminal block.

Ports	Definition	Recommended specifications
XZ2-1	Connect to L phase of external power supply	2.5mm ²
XZ2-3	Connect to N phase of external power supply	2.5mm ²

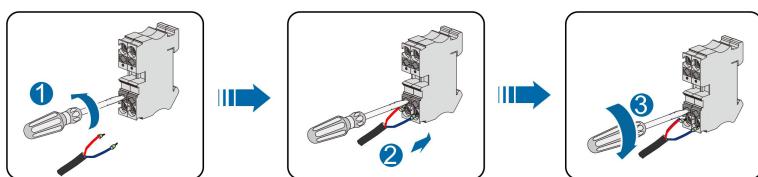
Wiring Steps

step 1 Draw the external power supply cable through the inlet hole at the bottom of the cabinet.

step 2 Strip off the protective layer and insulating layer of the cable to expose the copper core part, and select the appropriate cold-pressed terminal for crimping.



step 3 Connect the cold-pressed terminal to the power supply terminal block.



step 4 Tighten with a screwdriver with a torque of 0.6 ~ 0.8 N.m.

-- End

5.3.4.2 Connect to Two Mains Power Supply

Prerequisites

- When connected to two mains, the wiring between XZ2-6 and Q1-1, and between XZ2-8 and Q1-3 should be disconnected.
- Connect one end of the cable to XZ1-17 and the other end to Q1-1; connect one end of the other cable to XZ1-19 and the other end to Q1-3.

Wiring Steps

step 1 Draw the external power supply cable through the inlet hole at the bottom of the cabinet.

step 2 Strip off the protective layer and insulating layer of the cable to expose the copper core part, and select the appropriate cold-pressed terminal for crimping. Refer to "[Wiring Steps](#)"

step 3 The first line of city power is connected to the corresponding terminal of the XZ1 terminal block; the second line of city power is connected to the corresponding terminal of the XZ2 terminal block.

Ports	Definition	Recommended specifications
XZ1-1	Connect to L phase of external power supply	2.5mm ²
XZ1-3	Connect to N phase of external power supply	2.5mm ²
XZ2-1	Connect to L phase of external power supply	2.5mm ²
XZ2-3	Connect to N phase of external power supply	2.5mm ²

step 4 Tighten with a screwdriver with a torque of 0.6 ~ 0.8 N.m.

-- End

5.3.5 UPS Wiring (optional)

Prerequisites

- When select the UPS, the voltage range of the UPS should be taken into account.
- When connect to the UPS, wiring between XZ2-5 and Q1-5, XZ2-6 and Q1-1, XZ2-7 and Q1-7, and XZ2-8 and Q1-3 should be removed.

Wiring requirements

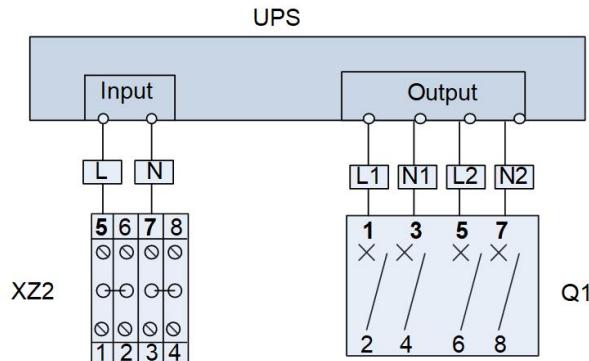
2.5mm² power cables are recommended.

Wiring Steps

step 1 Strip off the protective layer and insulating layer of the input and output cables to expose the copper core parts. Refer to "[Wiring Steps](#)".

step 2 Connect the UPS input cable L phase to XZ2-5, and the input cable N phase to XZ2-7.

Connect the L phase of the UPS output cable to Q1–1, Q1–5, and the N phase of the output cable to Q1–3, Q1–7.



-- End

5.4 Closing the Cable Entry

After finishing wiring, perform a thorough check, and seal the cable entries after ensuring that all cables are correctly in place. Use fireproof mud to seal the gap around the cable entry to prevent rodents from entering.

6 Routine Maintenance

table 6-1 Maintenance List

Item	Method
Operation environment	<ul style="list-style-type: none">Check to ensure that there is no strong EMI device around the device.Check to ensure that there is no hot source around the device.Check to ensure that there is no corrosive materials around the device.
Hardware maintenance	<ul style="list-style-type: none">Check to ensure that the power supply voltage is normal.Check to ensure that the cables are connected firmly.Check to ensure that the cable is grounded well.
System cleaning	<ul style="list-style-type: none">Clean the enclosure and components.Check that all heat dissipation channels of the cabinet are unblocked and free from blockage. If there is any blockage, please clean it up in time.
Terminal and cable connection	<ul style="list-style-type: none">Check if the screws of the terminals are loose, and refasten them with screwdriver if necessary.Check if the connection copper bar or screws are discolored.Check the wiring layout and the device terminal connections.
Software maintenance	<ul style="list-style-type: none">Log into the WEB to check the device communication status.Log into the WEB to check parameter settings of the device.Log into the WEB to check the software version of the device.

7 Appendix

7.1 Basic parameters

System	
Controller	EMS300
Workstation	Desktop computer
Ports	
RS485 interface	7
DI / DO	16 / 4
Fiber port	4 * 100 Mbps
Ethernet port	20 * 10 / 100 Mbps
AI	2 * (4 - 20 mA), 2 * (0 - 10 Vdc)
CAN	1
PT100 / PT1000	2
Time Code Format B	1
Power supply	
Power supply	100 - 240 Vac, 50 / 60 Hz, 1700W
Ambient parameters	
Operating temperature	10°C~35°C
Operating humidity	10%~80% (non-condensing)
Elevation	≤ 4000 m
Protection class	IP20
General parameters	
Dimensions (W*H*D)	800mm x 2260mm x600mm

Scan the QR code below for the EMS300 WEB interface operation manual.



(Optional) Scan the QR code below for the Insight user manual.



7.2 Quality Assurance

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

Evidence

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

Conditions

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

Exclusion of Liability

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

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

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

7.3 Contact Information

In case of questions about this product, please contact us.

We need the following information to provide you the best assistance:

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

For detailed contact information, please visit: <https://en.sungrowpower.com/contactUS>.

SUNGROW

Sungrow Power Supply Co., Ltd.
www.sungrowpower.com

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