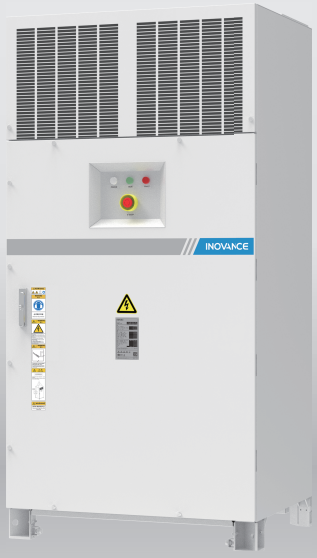
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IES900 Series 1500V Power Conversion System

User Guide (International Version)

Industrial Automation | Intelligent Elevator | New Energy Vehicle | Industrial Robot | Rail Transit

Data code PS00018114A02

Legal Information

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Disclaimer of Liability

Due to continuous updates and improvements of products and technologies, the content of this documentation may not fully match the actual products. In the event of any discrepancies, the actual products shall prevail.

The contents are subject to change without notice due to product upgrade.

Waste Disposal

The storage, use, and disposal of this product (including optional accessories) must comply with local laws and regulations.

Qualified Personnel

The product/system described in this documentation may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel can identify the risks of the product/system and prevent possible dangers.

Proper Use of the Product

Proper transportation, storage, assembly, installation, commissioning, operation, and maintenance are required to ensure the safe operation of the product without any problems. The required ambient conditions must be met. All operations must follow the guidelines provided in this documentation.

Preface

Introduction

IES900 series 1500 V power conversion system (PCS) exchanges energy between the storage battery and the grid to charge and discharge the storage battery in a controlled way.

In a grid-connected system, the PCS implements load shifting, active power reserve, and reactive power support. In addition, the PCS supports various charge and discharge modes, such as constant voltage, constant current, and constant power.

This guide describes the functions and correct use of IES900 series 1500 V PCS, including introduction, device installation, fault diagnosis, and routine maintenance and servicing.

More Information

Name	Code	Description
IES900 Series 1500 V Power Conversion System User Guide (International Version) (this guide)	PS00018114	Describes the functions and correct use of the product, including introduction, device installation, fault diagnosis, and routine maintenance and servicing.
IES900 Series 1500 V Power Conversion System Commissioning Guide (International Version)	PS00018096	Describes the software tools, processes, and specific steps of commissioning of the product, as well as troubleshooting and fault codes related to the Product.
IES900 Series 1500 V Power Conversion System Maintenance Guide (International Version)	PS00018097	Describes daily maintenance, periodic inspection, and upgrade and maintenance of the product, and replacement of its common maintainable components.

Revision History

Date	Version	Description
September 2025	A02	Made minor corrections.
September 2025	A01	Added 1725 kW model information.
March 2025	A00	Initial release.

Access to the Guide

This guide is not in the scope of delivery. If necessary, you can download the PDF file in the following ways:

- Do keyword search under Service and Support at *http://www.inovance.com*.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install **My Inovance** app, where you can search for and download user guides.



Warranty Disclaimer

If your product becomes defective under normal use conditions, we will offer guaranteed repair services within the warranty period. Maintenance will be charged after the warranty period expires.

The warranty does not cover any defect caused by:

- Damage caused by operations not following the instructions in the user guide
- Damage caused by fire, flood, or unusual voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance is charged according to the latest Price List of Inovance. If otherwise agreed upon, the terms and conditions in the agreement shall prevail.

For details, see Product Warranty Card.

1 General Safety Rules

1.1 Safety Instructions

Safety Disclaimer

- This section describes the safety precautions that help you use this product correctly. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to comply with the safety precautions may result in death, serious injury, or equipment damage.
- "Danger", "Warning", and "Caution" items in this guide do not indicate all safety precautions that need to be followed; instead, they just supplement the safety precautions.
- Use this product according to the designated environment requirements. Damage caused by improper use is not covered by warranty.
- Inovance shall take no responsibility for any personal injuries or property damage caused by violation to instructions in this manual and improper usage.

Safety Levels and Definitions



indicates that failure to comply with the notice will result in severe physical injuries or even death.



indicates that failure to comply with the notice may result in severe physical injuries or even death.



indicates that failure to comply with the notice may result in minor or moderate physical injuries or equipment damage.

Safety Warning Signs



To prevent misuse or accidents caused by approach of unrelated personnel during installation, daily maintenance, or inspection of the PCS, observe the following:

- Set up a visible sign near the upstream/downstream switch of the power conversion system to prevent accidents caused by inadvertent switch-on.
- Set up a warning sign or safety belt near the operating area.
- Always pull out the key to the cabinet door after maintanence is done.

Requirements on the evacuation passage



- During maintenance or other operations of the energy storage converter, keep the the evacuation passage clear of obstacles.
- Do not occupy the evacuation passage.

Safety Instructions

- Drawings in the guide are sometimes shown without covers or protective guards. Remember to install the covers or protective guards as specified first, and then perform operations in accordance with the instructions.
- The drawings in the guide are shown for illustration only and may be different from the product you purchased.
- Operators must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking
 • Do not install the equipment if you find damage, rust, or signs of use on the equipment or accessories upon unpacking. • Do not install the equipment if you find water seepage or missing or damaged components upon unpacking. • Do not install the equipment if you find the packing list does not conform to the equipment you received.
 • Check whether the packing is intact and whether there is damage, water seepage, dampness, and deformation before unpacking. • Unpack the package in accordance with the package sequence. Do not hit the package with force. • Check whether there is damage, rust, or signs of bumping on the surface of the equipment and equipment accessories before unpacking. • Check whether the package contents are consistent with the packing list before unpacking.
Storage and Transportation



- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in personal injuries or equipment damage.
- Before hoisting the equipment, ensure that components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may fall off and result in personal injury or equipment damage.
- Never stand or stay below the equipment when the equipment is lifted by hoisting equipment.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in personal injuries or equipment damage.



- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storing and transporting the product in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Store the product for no more than 3 months. For longer storage periods, implement stricter protective measures and conduct necessary inspections.
- Package the product strictly before transporting it, and use an enclosed container for long-distance transportation.
- Never transport the product with devices or materials that may damage or negatively impact the product.

Installation



- The equipment must be operated only by professionals with electrical knowledge. Non-professionals are not allowed to operate on the equipment.



- Before installation, read this guide, especially the safety precautions, carefully.
- Do not install this equipment in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.
- When installing the equipment in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or a fire.
- Do not retrofit the equipment.
- Do not fiddle with the bolts used to fix equipment components or the bolts marked in red.
- When installing the product in a cabinet or final assembly, make sure that the enclosure of the cabinet or final assembly provides adequate fire prevention, electrical protection, and mechanical protection conforming to relevant IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the equipment on metal or other incombustible objects. Keep the equipment away from combustible objects. Failure to comply will result in fire.



- Cover the air inlet and outlet of the equipment with a piece of cloth or paper during installation. This is to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.

Wiring



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Before wiring, disconnect all the power supplies of the equipment. Wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. Measure the DC voltage of the main circuit and make sure that it is below the safety voltage. Failure to comply will result in an electric shock.
- Do not perform wiring, remove the equipment cover, or touch the circuit board with power ON. Failure to comply will result in an electric shock.
- Make sure that the equipment is reliably grounded. Failure to comply will result in an electric shock.



- Do not connect the input power supply to the output end of the equipment. Failure to comply will result in equipment damage or even a fire.
- Wiring cables must meet diameter and shielding requirements. The shielding layer of the shielded cable must be reliably grounded at both ends.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, check that all cables are connected properly and no screws, washers or exposed cables are left inside the equipment. Failure to comply may result in electric shock or equipment damage.



- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply can result in equipment malfunction.

Power-on



- Before power-on, check that the equipment is installed and wired properly.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or fire accident.
- After power-on, do not open the cabinet door or protective cover of the equipment, touch any terminal, or disassemble any unit or component of the equipment. Failure to comply will result in electric shocks.



- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in personal injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in fire accident.

Operation



- The equipment must be operated only by professionals. Failure to comply can result in death or personal injury.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply will result in electric shocks.



- Do not touch the equipment casing, fan, or resistor with bare hands to feel the temperature. Failure to comply may result in personal injuries.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in a fire or equipment damage.

Maintenance



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment with power on. Failure to comply can result in electric shock.
- Before maintenance, disconnect all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- When maintaining the equipment, ensure that the power conversion system has been disconnected from the battery.



- Perform routine and periodic inspection and maintenance on the equipment in accordance with maintenance requirements and keep a maintenance record.

Repair



- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed only by professionals.
- Do not maintain the equipment with power on. Failure to comply can result in electric shock.
- Before inspection or repair, cut off the equipment power supply and wait for at least the time designated on the equipment warning label, and use a multimeter to check that the energy storage capacitor has no voltage.
- When maintaining the equipment, ensure that the power conversion system has been disconnected from the battery.



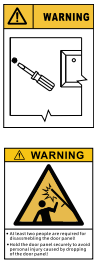
- Require for repair services according to the product warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, cut off all equipment power supplies, wait for at least the time designated on the equipment warning label before power-on or further operations. Before power-on, check for short circuits before power-on or further operations. Failure to comply may result in equipment damage, physical injuries, or even death.
- When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the equipment in according with the replacement instructions.
- Do not operate on damaged equipment. Failure to comply may result in death, personal injury, or severe equipment damage.
- After the equipment is replaced, check the wiring and set parameters again.

Disposal
WARNING • Dispose of retired equipment by following local regulations or standards. Failure to comply may result in property damage, personal injuries, or even death. • Recycle retired equipment by following industry waste disposal standards to avoid environmental pollution.

Safety Labels

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. See the following table for descriptions of the safety labels.

Safety Labels	Description
	• The equipment must be serviced by professionals only. • During power-on, connect the control power supply first, and then the main power supply. • During power-off, disconnect the main power supply first, and then the control power supply. • Before maintenance, cut off all power supplies for 60 minutes for complete discharge, and then open the cabinet door. • Do not touch the equipment when power is on. Failure to comply may result in burns. • Read the maintenance guide before maintenance.
	During hoisting, wrap the straps with some flexible materials to avoid cabinet damage.
	Wear ear protector to prevent noise during equipment running.

Safety Labels	Description
	After installation and commissioning, ensure that the door screws are installed properly during product operation. Ensure personal safety.
	This is the protective earth (PE) terminal, which must be grounded firmly to ensure personnel safety.

1.2 Industrial Information Security

This product provides an interface to connect to the network and transmit data through the network interface. To protect factories, systems, machines, and networks from cyber attacks, appropriate industrial information security protection mechanisms need to be implemented to ensure the safe operation of factories, systems, machines, and networks.

The customer is responsible for providing and continuously ensuring a secure connection between the product and the customer's network or any other network, to prevent unauthorized access to their factory, systems, machines, and networks. The system or machine may only be connected to the corporate network or the Internet when a secure connection is established and proper security measures are in place (for example, using antivirus software and installing firewalls).

INOVANCE continuously develops and improves its products and solutions to enhance safety. It is strongly recommended that you update your products promptly and always use the latest product versions.



Malware (such as viruses, Trojans, and worms) can bring the device into an unsafe operating state, resulting in death, serious injury, and property damage. Observe the following precautions strictly:

- Always use the latest software version. If the product version is no longer supported or the latest program version is not applied, customers are at increased risk of cyberattacks.
- Implement and maintain appropriate security measures (including but not limited to deploying anti-virus software, firewall, WAF, IPS/IDS, situational awareness system, ID verification, and data encryption) to prevent files in the removable storage device from being damaged by malware and to protect products, networks, systems, and interfaces from unauthorized access, disruption, intrusion, data leakage, or information theft.
- Check all safety-related interfaces and settings after commissioning.

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2 Product Information

2.1 Working Principle

Main circuit principle

There is one input on the battery side and three-phase three-wire output on the output side. The schematic for the main power is shown below (only for reference).

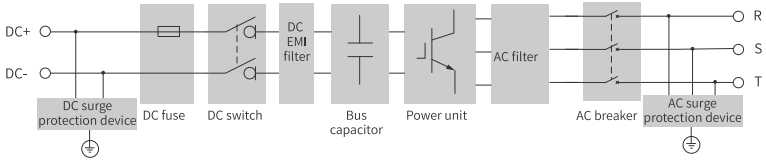


Figure 2-1 Power topology (1725 kW single-branch model and 2510 kW single-branch model)

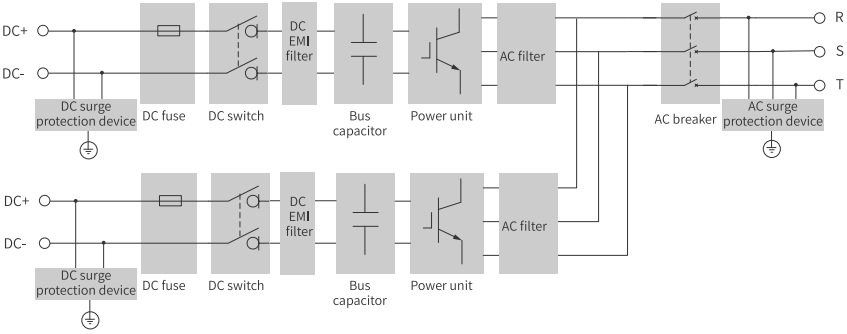


Figure 2-2 Power topology (2510 kW dual-branch model)

Operating mode

The IES900 series PCS can run in grid-connected and off-grid modes.

- When the PCS runs in grid-connected mode, its AC side is connected to the grid and its DC side is connected to the storage battery. The PCS is used with the grid scheduling system for load shifting. The PCS can charge and discharge the storage battery in constant voltage, constant current, or constant power mode, depending on the selected operation mode.
- When the PCS runs in off-grid mode, its AC side is connected to the storage battery. In this mode, the PCS can output three-phase AC voltage with a fixed frequency and an RMS value for continuous power supply to loads connected to its AC side.

2.2 Model Number and Nameplate

IES 9 00 - 07 - 2510 - C _ - S - EU
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① **Product family** IES: Inovance energy storage product	④ **Maximum DC voltage** 04: 1000 VDC 05: 1200 VDC 07: 1500 VDC	⑦ **Wiring type** Null: Three-phase three-wire N: Three-phase four-wire
② **Product series** 9: Centralized 6: Modular 3: For residential use	⑤ **Power rating** 1725: 1725 kW 2510: 2510 kW	⑧ **Wiring method** S: Single-way DC input D: Dual-way DC input
③ **Generation** 00: First generation 20: Second generation ...: ...	⑥ **Cooling method** Null: Forced air cooling C: Air and water cooling W: Water cooling	⑨ **Regional version** EU: Europe AU: Australia

The following diagrams are for illustrative purposes only. Actual product may vary.

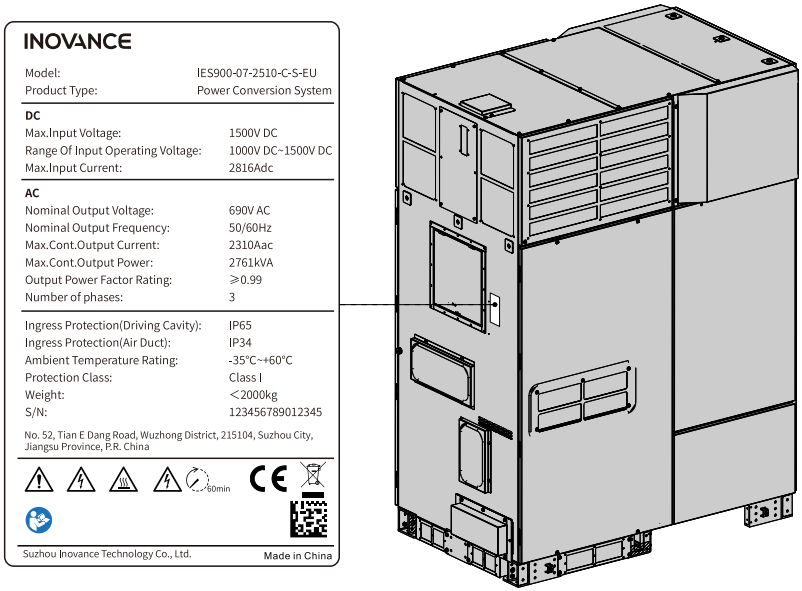


Figure 2-3 Nameplate (IES900-07-2510-C-S-EU)

2.3 Technical Specifications

Table 2–1 Technical specifications of 2510 kW model

Items		IES900-07-****-*-*-EU											
		2510-C-S	2510-C-D	2400-C-S	2400-C-D	2291-C-S	2291-C-D	2182-C-S	2182-C-D	2000-C-S	2000-C-D	1746-C-S	1746-C-D
DC side data	Maximum bus voltage (VDC)	1500											
	Maximum current (A)	2816	1408 x 2	2816	1408 x 2	2816	1408 x 2	2816	1408 x 2	2816	1408 x 2	2816	1408 x 2
	Operating voltage range (VDC)	1000 to 1500		957 to 1500		915 to 1500		875 to 1500		800 to 1500		700 to 1500	
	Number of input channels	1	2	1	2	1	2	1	2	1	2	1	2

Items		IES900-07-****-*-*-EU											
		2510-C-S	2510-C-D	2400-C-S	2400-C-D	2291-C-S	2291-C-D	2182-C-S	2182-C-D	2000-C-S	2000-C-D	1746-C-S	1746-C-D
AC grid-connected	Rated power (kW)	2510 (@50°C)		2400 (@50°C)		2291 (@50°C)		2182 (@50°C)		2000 (@50°C)		1746 (@50°C)	
	Max. output power (kW)	2761 (@40°C)		2640 (@40°C)		2520 (@40°C)		2400 (@40°C)		2200 (@40°C)		1921 (@40°C)	
	Rated output current (A)	2100 (@50°C)											
	Maximum output current (A)	2310 (@40°C)											
	AC connection mode	Three-phase three-wire, IT, angle form											
	Isolation method	No isolation											
	Reactive power range	-105% to +105%											
	Rated grid voltage (VAC)	690		660		630		600		550		480	
	Allowable grid voltage (VAC)	621 to 759		594 to 726		567 to 693		540 to 660		495 to 605		432 to 528	
	Rated grid frequency (Hz)	50											
	Allowable grid frequency deviation (Hz)	±5											
	Total harmonic distortion of the current (%)	<3% (rated power)											
	AC-side DC component	< 0.5%											
	Charge and discharge switchover time (ms)	< 30											
AC off-grid	Rated output voltage (VAC)	690		660		630		600		550		480	
	Rated output power (kW)	2510 (@50°C)		2400 (@50°C)		2291 (@50°C)		2182 (@50°C)		2000 (@50°C)		1746 (@50°C)	

Items		IES900-07-****-*-*-EU											
		2510-C-S	2510-C-D	2400-C-S	2400-C-D	2291-C-S	2291-C-D	2182-C-S	2182-C-D	2000-C-S	2000-C-D	1746-C-S	1746-C-D
AC off-grid	Voltage variation	<1% U_N (linear load balance)											
	Degree of voltage unbalance	< 2% or ≤ 4% (short-term)											
	Voltage total harmonic distortion rate	< 3% (linear balanced load)											
	Rated output frequency (Hz)	50											

Items		IES900-07-****-*-*-EU											
		2510-C-S	2510-C-D	2400-C-S	2400-C-D	2291-C-S	2291-C-D	2182-C-S	2182-C-D	2000-C-S	2000-C-D	1746-C-S	1746-C-D
System	Cable inlet mode	Bottom-in for the DC cable; rear-out for the AC cable											
	Overload capacity	Long-term operation available for 110% of rated load; 1-minute operation available for 120% of rated load (@40℃)											
	Power control accuracy	Error < 1% (after correction)											
	Standby energy consumption	≤ 0.5% x Rated power											
	No-load energy consumption	≤ 0.8% x Rated power											
	Allowable ambient temperature (℃)	-35℃ to +60℃ (derating required for temperature above +50℃)											
	Allowable relative humidity (RH)	0% to 100% (non-condensing)											
	Transportation/Storage environment temperature (℃)	-40 to +70											
	Transportation/Storage relative humidity (RH)	20% to 95%											
	Maximum operating altitude (m)	The PCS can work at an altitude no more than 5000 m. Derating is required when the PCS works at an altitude above 2000 m. The actual altitude must be set to obtain the running power curve. For details, contact our technical engineers.											
	Noise (dBA)	≤ 85											
	Dimensions (W x D x H, in mm)	1052 × 1726× 2400											
	Weight (kg)	< 2000											
	IP rating	Electrical airlock: IP 65; air filter: IP34											
	Cooling method	Air and liquid cooling											
	Coolant	Ethylene glycol											

Items		IES900-07-****-*-*-EU											
		2510-C-S	2510-C-D	2400-C-S	2400-C-D	2291-C-S	2291-C-D	2182-C-S	2182-C-D	2000-C-S	2000-C-D	1746-C-S	1746-C-D
Communication	Communication interface	RS485, CAN, Ethernet, and DIDO											
	HMI	HMI											
	Communication protocol	Standard: Modbus-RTU/CAN2.0B Optional: Modbus TC/IEC 61850/EtherCAT											

Table 2–2 Technical specifications of 1725 kW model

Items		IES900-07-****-*-*-EU					
		1725-C-S	1650-C-S	1575-C-S	1500-C-S	1375-C-S	1200-C-S
DC side	Maximum bus voltage (VDC)	1500					
	Maximum current (A)	1807					
	Operating voltage range (VDC)	1000 to 1500	957 to 1500	915 to 1500	875 to 1500	800 to 1500	700 to 1500
	Number of input channels	1					
AC grid-connected	Rated power (kW)	1725 (@45℃)	1650 (@45℃)	1575 (@45℃)	1500 (@45℃)	1375 (@45℃)	1200 (@45℃)
	Max. output power (kW)	1898 (@35℃)	1815 (@35℃)	1732 (@35℃)	1650 (@35℃)	1512 (@35℃)	1320 (@35℃)
	Rated output current (A)	1444 (@45℃)					
	Maximum output current (A)	1588 (@35℃)					
	AC connection mode	Three-phase three-wire, IT, angle form					
	Isolation method	No isolation					
	Reactive power range	-105% to +105%					
	Rated grid voltage (VAC)	690	660	630	600	550	480
	Allowable grid voltage (VAC)	621 to 759	594 to 726	567 to 693	540 to 660	495 to 605	432 to 528
	Rated grid frequency (Hz)	50					
	Allowable grid frequency deviation (Hz)	±5					
	Total harmonic distortion of the current (%)	<3% (rated power)					
	AC-side DC component	< 0.5%					
	Charge and discharge switchover time (ms)	< 30					

Items		IES900-07-****-*-*-EU					
		1725-C-S	1650-C-S	1575-C-S	1500-C-S	1375-C-S	1200-C-S
AC off-grid	Rated output voltage (VAC)	690	660	630	600	550	480
	Rated output power (kW)	1725 (@45℃)	1650 (@45℃)	1575 (@45℃)	1500 (@45℃)	1375 (@45℃)	1200 (@45℃)
AC off-grid	Voltage variation	<1% U_N (linear load balance)					
	Degree of voltage unbalance	< 2% or ≤ 4% (short-term)					
	Voltage total harmonic distortion rate	< 3% (linear balanced load)					
	Rated output frequency (Hz)	50					
System	Cable inlet mode	Bottom-in for the DC cable; rear-out for the AC cable					
	Overload capacity	110% overload for long term (35℃); 120% overload for 1 minute (35℃)					
	Power control accuracy	Error < 1% (after correction)					
	Standby energy consumption	≤ 0.5% x Rated power					
	No-load energy consumption	≤ 0.8% x Rated power					
	Allowable ambient temperature (℃)	-35℃ to +60℃ (derating required for temperature above +45℃)					
	Allowable relative humidity (RH)	0% to 100% (non-condensing)					
	Transportation/Storage environment temperature (℃)	-40 to +70					
	Transportation/Storage relative humidity (RH)	20% to 95%					
	Maximum operating altitude (m)	The PCS can work at an altitude no more than 5000 m. Derating is required when the PCS works at an altitude above 2000 m. The actual altitude must be set to obtain the running power curve. For details, contact our technical engineers.					
	Noise (dBA)	≤ 85					
	Dimensions (W x D x H, in mm)	1080 × 870× 2175					
	Weight (kg)	< 1500					
	IP rating	Electrical airlock: IP 65; air filter: IP34					
	Cooling method	Air-water cooling					
	Coolant	Ethylene glycol					
Communication	Communication interface	RS485, CAN, EtherCAT, and Ethernet					
	Communication protocols	Standard: Modbus-RTU, MODBUS-TCP, and CAN2.0B					

CAUTION

The insulation resistance test and dielectric strength test cannot be performed on field for the PCS. Otherwise, the PCS may be damaged.

2.4 Components

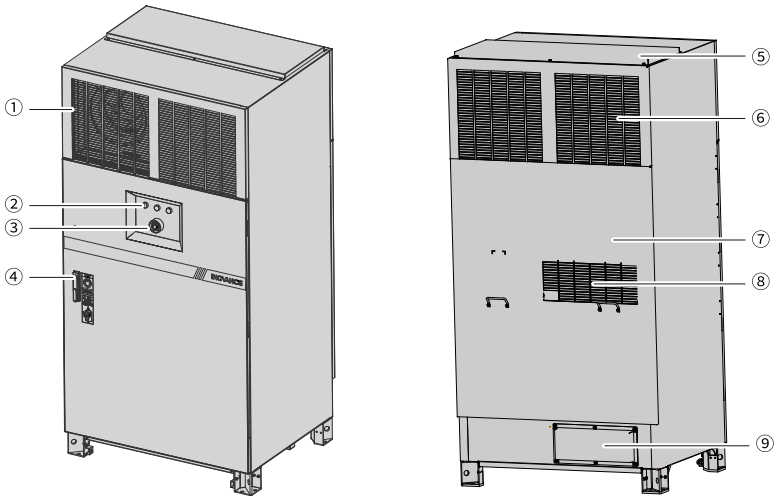


Figure 2-4 Component diagram (1725 kW model)

Table 2–3 Component description (1725 kW model)

No.	Name	Description
①	Fan front cover	Ventilate the fan and prevent incoming of foreign objects.
②	Indicator	• White: Power indicator. When any of the PCS battery voltage, bus voltage, and AC voltage is greater than 36 V, the indicator turns on, indicating that the PCS has been energized and there is an electric shock risk. • Green: Running indicator. When the PCS runs, the indicator turns on. • Red: Fault/alarm indicator. When the PCS is abnormal, the indicator turns on, indicating that the PCS is faulty and you need to locate and remove the fault according to *"8.1 Insulation detection function" on page 96*.
③	Emergency stop button (EPO)	Press this switch in case of emergency to power off the PCS. When a restart is needed after fault is cleared, rotate the switch clockwise to release the switch.

No.	Name	Description
④	Door lock	Open and close the door.
⑤	Top cover	Top outlet
⑥	Fan rear cover	Ventilate the fan and prevent incoming of foreign objects.
⑦	Reactor air outlet hole	Ventilate and prevent incoming of foreign objects.
⑧	Handle	Used for handling and moving.
⑨	AC-side cover	AC outlet

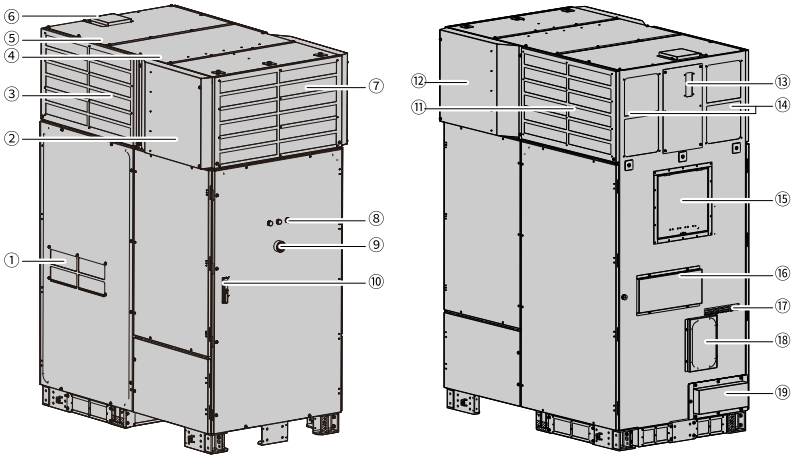


Figure 2-5 Component diagram (2510 kW model)

Table 2–4 Component description

No.	Name	Description
①	Reactor air outlet cover	Ventilate the fan and prevent incoming of foreign objects.
②	Left fan cover	Fan installation cover to form an air cabin
③	Left air outlet cover	Ventilate the fan and prevent incoming of foreign objects.
④	Top cover 2	Top outlet
⑤	Top cover 1	Top outlet
⑥	Liquid inlet cover	Fill in the coolant.
⑦	Fan front cover	Ventilate the fan and prevent incoming of foreign objects.

No.	Name	Description
⑧	Indicator	• White: Power indicator. When any of the PCS battery voltage, bus voltage, and AC voltage is greater than 36 V, the indicator turns on, indicating that the PCS has been energized and there is an electric shock risk. • Green: Running indicator. When the PCS runs, the indicator turns on. • Red: Fault/alarm indicator. When the PCS is abnormal, the indicator turns on, indicating that the PCS is faulty and you need to locate and remove the fault according to *"8.1 Insulation detection function" on page 96*.
⑨	Emergency stop button (EPO)	Press this switch in case of emergency to power off the PCS. After the fault is cleared, rotate the switch clockwise and release the emergency stop switch to power on the PCS again.
⑩	Door lock	Open and close the door.
⑪	Right air outlet cover	Ventilate the fan and prevent incoming of foreign objects.
⑫	Right fan cover	Fan installation cover to form an air cabin
⑬	Liquid level window	Check the liquid level in the water tank
⑭	Rear ventilation plate	Ventilate the fan and prevent incoming of foreign objects.
⑮	Explosive pressure release plate	Automatically opened during explosive pressure release
⑯	Installation window 1	Observe the installation position during installation.
⑰	Reactor air filter liquid overflow port	Overflow liquid entering from the air outlet plate of the reactor.
⑱	Installation window 2	Observe the installation position during installation.
⑲	AC-side cover	AC outlet

2.5 Product Dimensions

1725 kW model

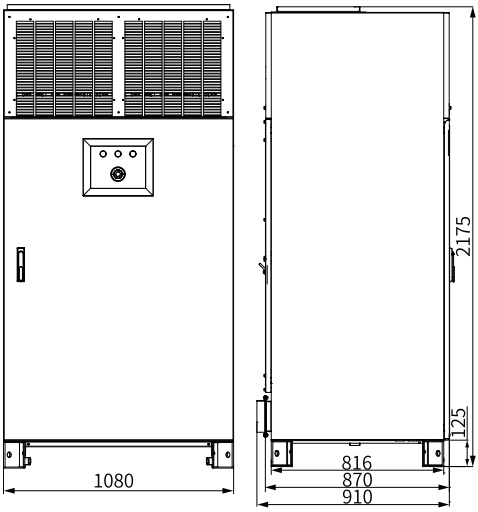
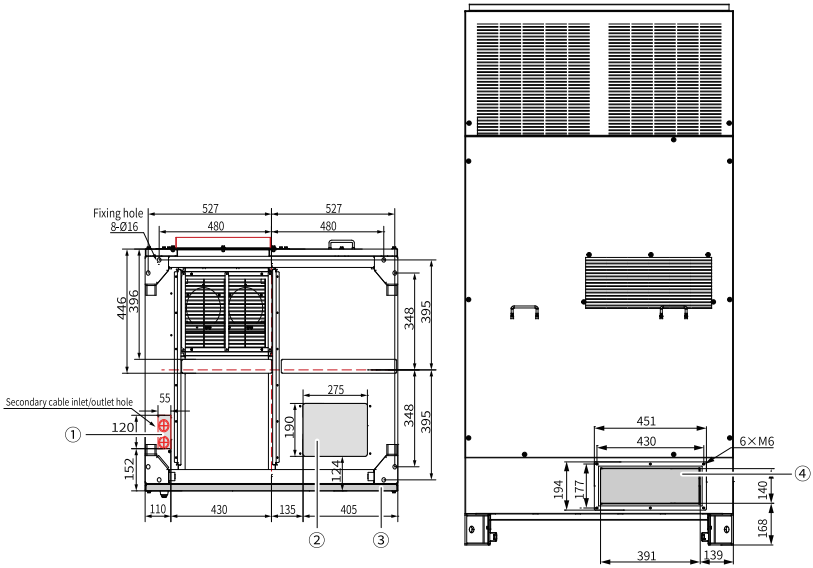


Figure 2-6 Product dimensions for 1725 kW model (unit: mm)



Top view Rear side view

Figure 2-7 Bridging busbar mounting hole of DC cable inlet hole and AC cable inlet hole (unit: mm)

Table 2–5 Bridging busbar mounting hole of DC cable inlet hole and AC cable inlet hole

No.	Name	No.	Name
①	Customer cable inlet holes	③	Front door
②	DC cable inlet hole	④	AC bridging busbar mounting hole[1]

Note

[1]: The AC outlet power cable cover must be removed.

2510 kW model

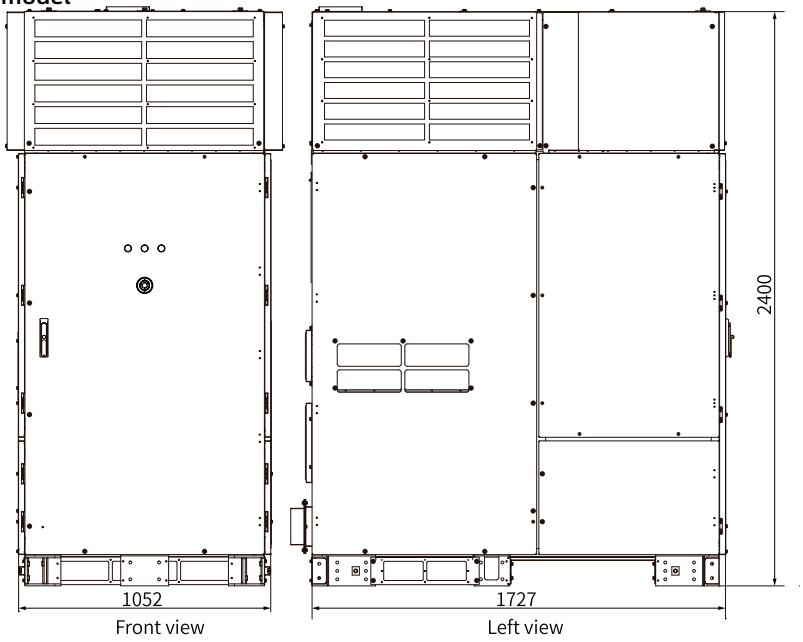


Figure 2-8 Product dimensions for 1725 kW model (unit: mm)

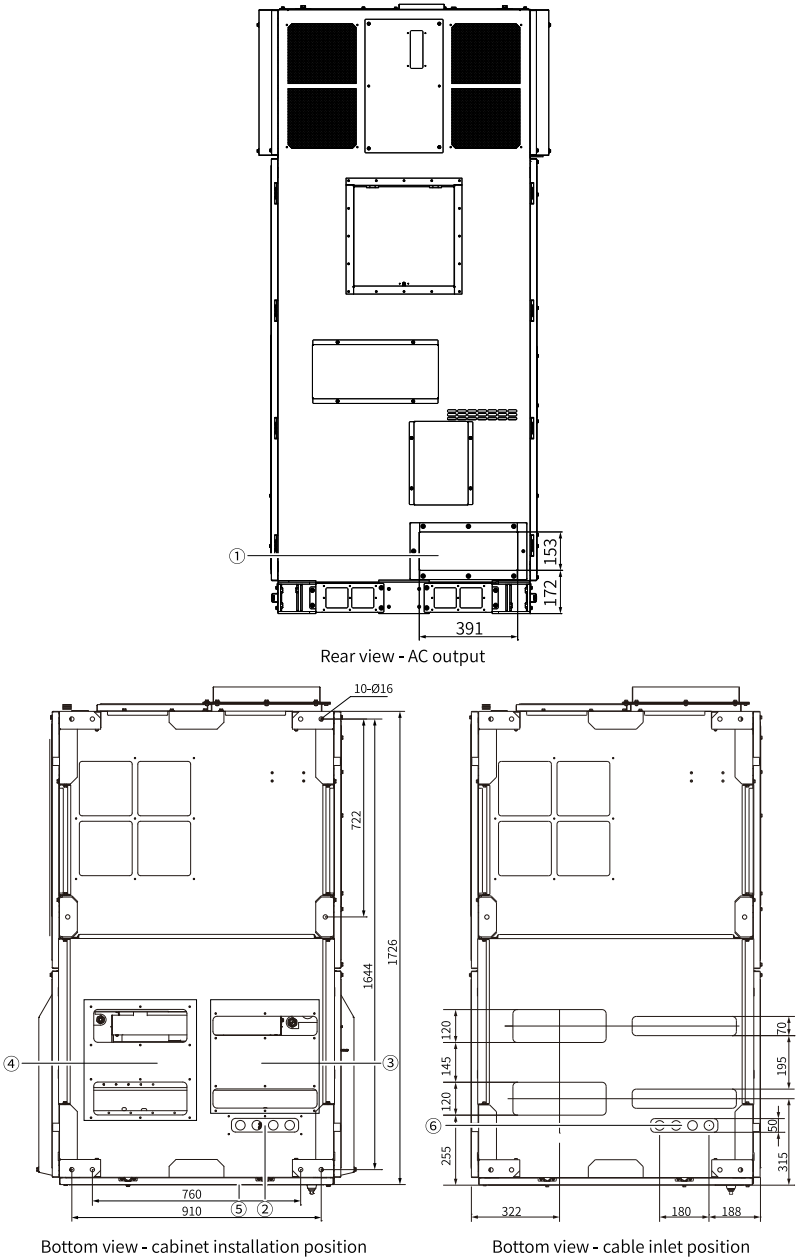


Figure 2-9 Bridging busbar mounting hole of DC cable inlet hole and AC cable inlet hole (unit: mm)

Table 2–6 Bridging busbar mounting hole of DC cable inlet hole and AC cable inlet hole

No.	Name	No.	Name
①	AC bridging busbar mounting hole[1]	④	Single-way/dual-way DC cable inlet hole
②	Secondary cable inlet/outlet hole	⑤	Front door
③	Dual-way DC cable inlet hole	⑥	Secondary cable inlet/outlet hole

Note

[1]: The AC outlet power cable cover must be removed.

2.6 System Overview

The power conversion system is mainly used for power conversion between the power grid and the energy storage battery, with the exchange process being monitored and managed. The following figure shows the system composition.

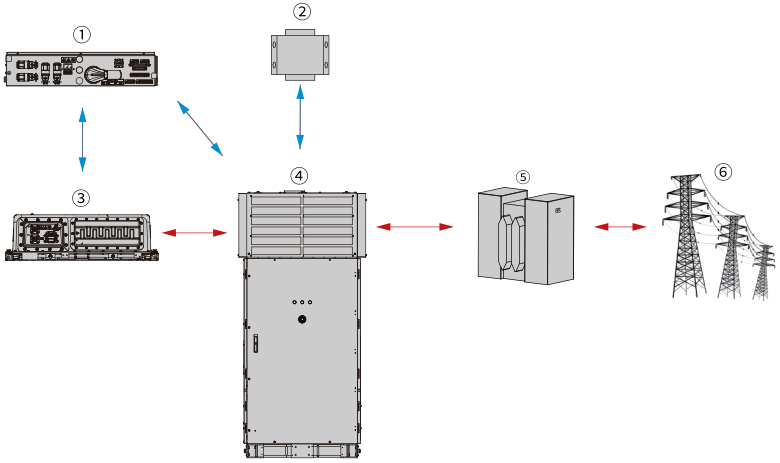


Figure 2-10 Diagram of the power conversion system

Table 2–7 Description of the power conversion system

No.	Name	Description
①	BMS	Battery management system, which is used to manage, protect and monitor the storage battery
②	EMS	Energy management system, which is used for energy dispatching and monitoring of the entire system

No.	Name	Description
③	Battery	All types of storage batteries
④	PCS	Power conversion system, used for energy exchange between the battery and power grid.
⑤	Isolation transformer	You can configure based on actual system needs.
⑥	Power grid	To run the PCS in grid-connected mode, the AC side must be connected to the grid, while the DC side can be connected to the storage battery.

Note

The red cable is the power cable and the blue cable is the communication monitoring cable.

3 Unpacking and Handling

3.1 Unpacking

3.1.1 Precautions for Unpacking



- Do not remove the packaging of the PCS during storage. Only remove the packaging before installation.
- After receiving the equipment, inspect it carefully.
- Check every item received against the delivery list. In case of any missing components or damage, notify the forwarder immediately.

3.1.2 Unpacking Procedure

1. Remove the outer package. Do not shock or vibrate the PCS.
2. Remove the internal expanded polyethylene and tape package.
3. Remove the screws that fix the PCS to the wooden pallet.

3.1.3 Check After Unpacking

Check the following items after unpacking.

Table 3–1 Post-unpacking checklist

No.	Item	Checked
1	There is no sign of damage, scratching, and bumping on the surface of the product.	□
2	Options ordered for the product are complete.	□
3	The nameplate is consistent with the ordered product model.	□
4	There is no sign of damage, scratch, and blur on the warning labels.	□

3.2 Storage

Table 3–2 Storage requirements

Item	Storage Requirement
Package Requirement	The PCS must be stored with package.
Foundation	The PCS must be placed on a level and stable floor for storage.
	The floor must be stable without shaking and capable of bearing the weight of the PCS.
Clearance	Protect the PCS during storage to prevent collision.
Time	Power on the PCS once every three months.
	Check the PCS once every three months.
	Replace the desiccant once every six months.
Storage temperature	-40℃ to +70℃
Storage humidity	20% RH to 95% RH (non-condensing)

3.3 Handling

3.3.1 Precautions for Handling

Handling with a forklift

CAUTION

- Perform trial forking and adjust the forks as necessary. Then, lift the PCS and transport it to the designated position.
- Ensure that the tilting angle of the PCS is lower than 10° during handling and the relief height is as low as possible.
- Never transport the PCS on a hydraulic vehicle for a long distance or on a slope. Failure to comply may result in damage to the hydraulic vehicle.
- Handle the equipment slowly and steadily during lifting or landing to avoid shock or oscillation. Mind your feet when the forklift is lowered down.
- Arrange some people to hold the PCS when moving it. Move the cabinet on a flat ground.
- The PCS is high and may block the driver's sight, and thus the driver should be guided if necessary.

Handling with a hoist

CAUTION

- Lift the PCS once for trial to ensure that the straps can bear the weight of the PCS and the PCS is not tilted.
- The hook must be at the center of gravity.
- Ensure that the PCS inclines less than 10° after being lifted.
- Before handling, ensure that the front door of the cabinet has been locked. Opening of the door during handling may result in physical injury.
- Handle the equipment slowly and steadily during lifting or landing to avoid shock or oscillation.

3.3.2 Handling Before Unpacking

Handling method

Packed PCS can be handled by a forklift or a crane. Tools required are as follows.

Device	Specifications
Forklift	The load bearing capacity of the forklift must be 2.5 tons or above, and the length of the forklift body must be longer than 1.2 m.
Crane	The load bearing capacity of the crane must be 2.5 tons or above.
Flexible strap or strap	The length of a single strap must be about 8 m.

Handling with a forklift

Adjust the width of the forklift feet so that the center of the forklift is in the center of the forklift feet. Insert the cabinet to the position shown in the figure below.

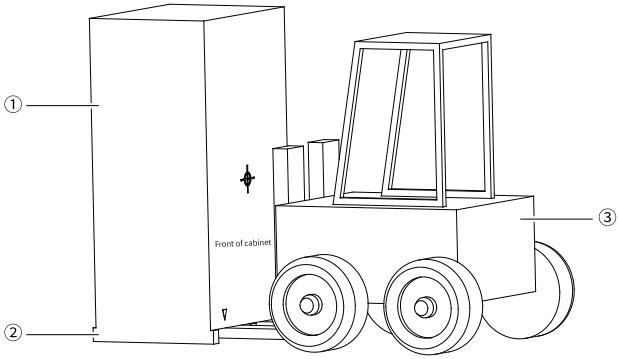


Figure 3-1 Transportation with a forklift

Table 3–3 Handling with a forklift

No.	Name
①	Packaging box
②	Crosstie
③	Forklift

For the 2510 kW model, in order to prevent the forklift from tipping when handling, the following requirements must be met for the distance and total width of the arm.

The distance between the arms is ≥ 320 mm.

The total width of the arm is ≥ 720mm.

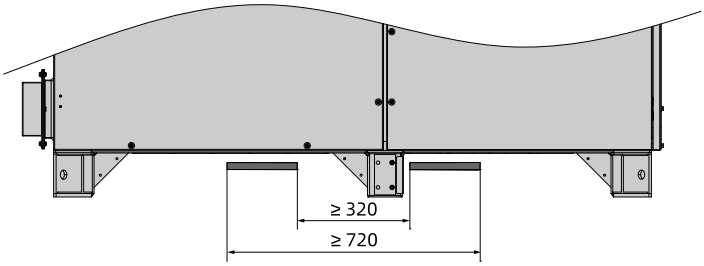


Figure 3-2 Distance between the forklift arms(unit: mm)

Handling with a hoist

Use flexible sling or strap for handling the packed PCS by a crane.

Tie the package tightly with straps, and protect the cabinet with flexible materials to avoid damage to the cabinet.

If the PCS is packed in a wooden crate, do not directly tie the slings to the bottom of the wooden crate. Instead, pass the slings through the U-shaped hooks that are fixed to the sheet metal brackets at the bottom of the cabinet.

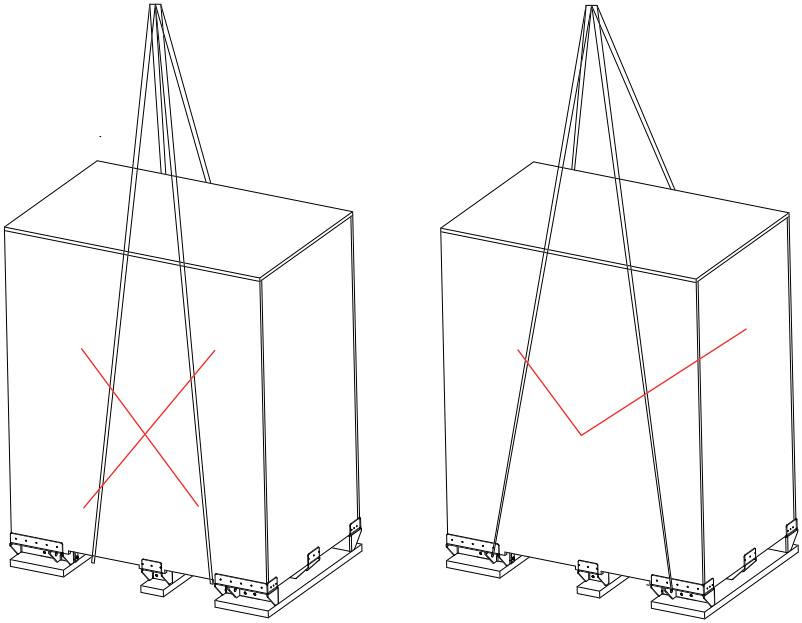


Figure 3-3 Handling packed PCS with a crane

CAUTION

The distance from the hook to the top of the cabinet must be greater than 1.5 m, and the inclination angle between the cabinet and the ground should be less than 10° during hoisting.

3.3.3 Handling After Unpacking

Handling method

An unpacked power conversion system can be handled with a forklift or a crane.

Device	Specifications
Forklift	The load bearing capacity of the forklift must be 2.5 tons or above, and the length of the forklift body must be longer than 1.2 m.
Crane	The load bearing capacity of the crane must be 2.5 tons or above.
Flexible strap or strap	The length of a single strap must be about 8 m.

Handling with a forklift

1. Adjust the width of the forklift feet.
2. Let the center of the PCS in the center of the forklift feet, as shown in the following figure.

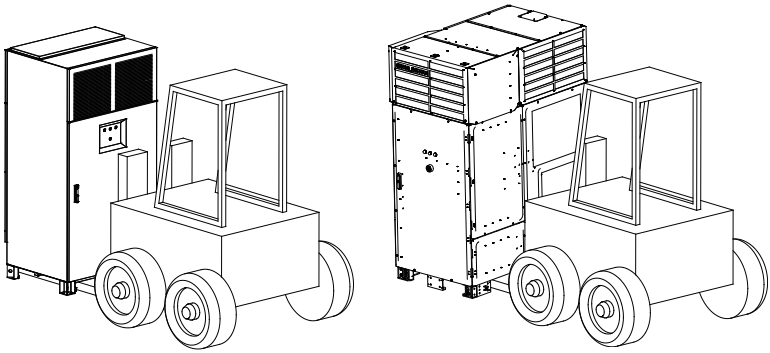


Figure 3-4 Handling unpacked PCS with a forklift

For the 2510 kW model, in order to prevent the forklift from tipping when handling, the following requirements must be met for the distance and total width of the arm.

The distance between the arms is ≥ 320 mm.

The total width of the arm is ≥ 720mm.

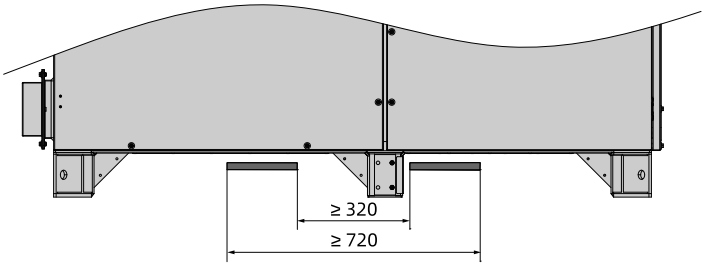


Figure 3-5 Distance between the forklift arms(unit: mm)

Handling with a hoist

Use flexible sling or strap for handling the unpacked PCS by a crane.

Tie the cabinet with straps and follow the figure below.

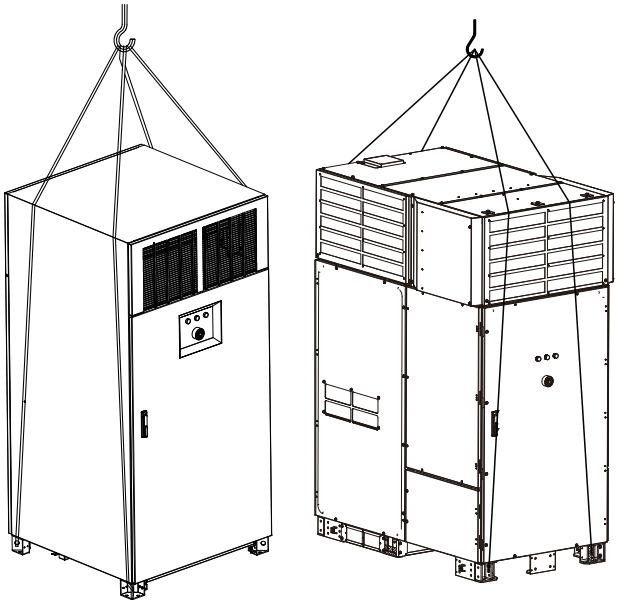


Figure 3-6 Handling unpacked PCS with a crane

CAUTION

The distance from the hook to the top of the cabinet must be greater than 1.5 m, and the inclination angle between the cabinet and the ground should be less than 10° during hoisting.

3.4 Single Device Transport

A single PCS is packed in a wooden crate and then transported through a container.

Note

- The operator must receive appropriate operation and safety training.
- Observe the operating safety regulations of the country/region where the project is located during loading, unloading, and transportation.
- The product and any tools used in the operation shall be maintained.



- During the entire transport process, necessary position limit must be applied around the wooden crate to prevent product collapsing.
- For international projects, the wooden crate and pallet must be made of Laminated Veneer Lumber or have passed fumigation treatment.
- Due to the limit of the container size, the height of transported product cannot be greater than 2.5 m.
- The standard or custom container must be used to protect the product against external environment impacts during the transport process.

3.5 Long-distance Transportation

Note

- The operator must receive appropriate operation and safety training.
- Observe the operating safety regulations of the country/region where the project is located during loading, unloading, and transportation.
- The product and any tools used in the operation shall be maintained.



- During transportation, lock all cabinet doors.
- After product integration and during long-distance transportation, use ropes to fix the cabinet and skid-mounted chassis in all directions to prevent excessive impact and tilting of the integrated device during uphill or downhill or due to sudden braking during transportation, which may cause component damage.

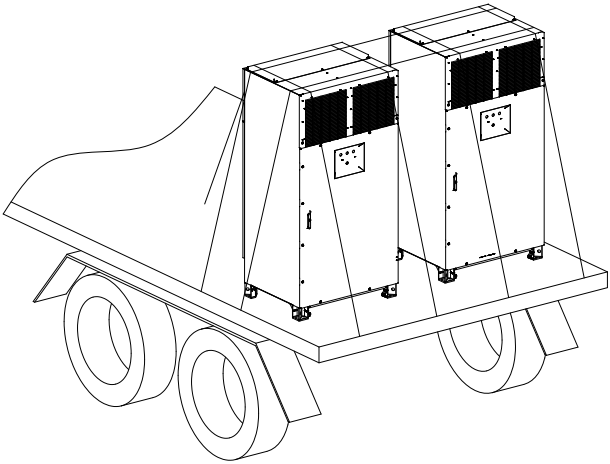


Figure 3-7 Long-distance loading diagram (1725 kW model)

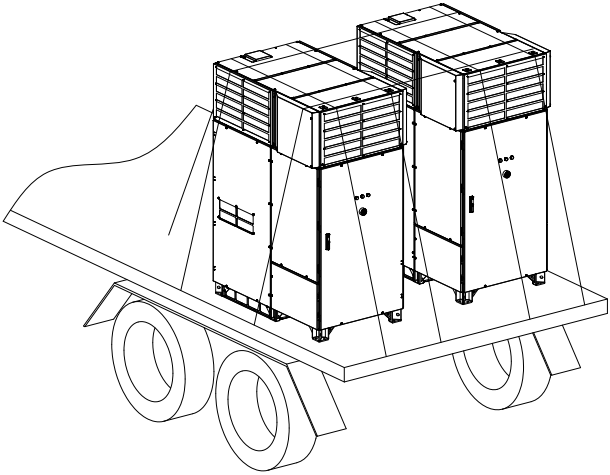


Figure 3-8 Long-distance loading diagram (2510 kW model)

4 Mechanical Installation

4.1 Safety Precautions

Neglect of the following precautions during installation may result in equipment damage, personal injury, or severe death. Observe the following precautions strictly.

Note

- The equipment must be properly installed by professionals, taking into consideration all the warning notices provided.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in an electric shock.



- The cabinet frame must be strong enough to withstand the weight of the components, control circuits and other equipment installed in it.
- The cabinet must meet the requirements for dust and humidity.
- For ease of installation and maintenance, reserve sufficient space around the equipment.

4.2 Preparations Before Installation

4.2.1 Requirements on Installation Personnel

All installation operations must be performed only by qualified technicians, who must meet the following requirements:

- Taken specialized training.
- Read this guide completely and master the safety precautions related to operation.
- Be familiar with local standards and safety regulations of electrical systems.

4.2.2 Installation Environment Requirements

Table 4–1 Environment requirements

Item	Environment Requirement
Requirements on the installation site	Install the PCS outdoors and ensure sufficient ventilation.
	Take professional rain-proof, wind-proof, and dust-proof measures in the air inlet and outlet.
	Take necessary fireproof, waterproof, and rodent-proof measures.
Foundation	The mounting surface must be flat and dry.
	The floor must be stable without shaking and capable of bearing the weight of the PCS.
Clearance requirements	Reserve sufficient clearance around the PCS for the purpose of ventilation, maintenance, and evacuation.
Altitude	The PCS can work at an altitude no more than 5000 m. Derating is required when the PCS works at an altitude above 2000 m. The actual altitude must be set to obtain the running power curve. For details, contact our technical engineers.
Temperature	See the technical specifications. *"Table 2-2 " on page 22*
Humidity	100% RH (non-condensing)



Moisture entry may damage the PCS. To ensure normal operation of the PCS:

- Do not open the cabinet door when the air humidity reaches 95% RH.
- Do not open the cabinet door for maintenance or service under rainy or humid weather conditions.

4.2.3 Requirements on the Installation Site

Install the PCS on the concrete or non-inflammable floor. Ensure that the floor is level, solid and even, capable of bearing the weight of the PCS, and free from depression or slope.

When constructing the foundation, you need to take cable outlet into consideration. The cable trench or other cable outlet holes must be reserved.

The PCS adopts bottom outlet mode for the DC cables and secondary cables through the cable trench. Therefore, a trench is required in the installation site. The trench must meet the following requirements.

- The trench must be waterproof and moisture-proof to avoid cable aging and short circuit. Failure to comply may affect the normal operation of the PCS.
- Take the cross-sectional area of the cable into consideration when designing the trench as the PCS power is high and the cables needed by the PCS are usually thick.
- The number of cable brackets needed can be determined based on customer needs. Take the equipment weight and dimensions into account when determining the number of cable brackets .
- Route the communication cables and power cables through different routes. Route the DC circuit and AC circuit separately with a distance of at least 300 mm between the routes.

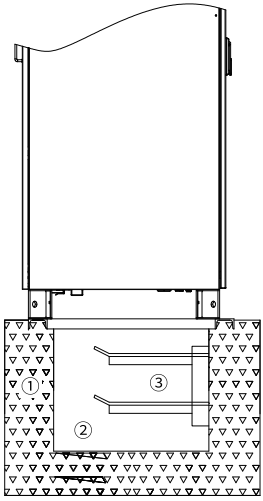


Figure 4-1 Cross-sectional area of the trench

Table 4–2 Cross-sectional area of the trench

No.	Name
①	Foundation
②	Trench
③	Cable carrier

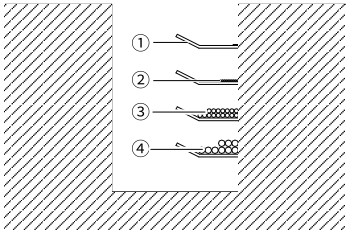


Figure 4-2 Cable bracket diagram

Table 4–3 Description of the cable bracket

No.	Name
①	Cable bracket
②	Control cable
③	DC cable
④	AC cable

4.2.4 Installation Clearance

Reserve sufficient clearance around the PCS for the purpose of installation, maintenance, dissipation, and evacuation.

The PCS supports the following two installation methods:

1725 kW model

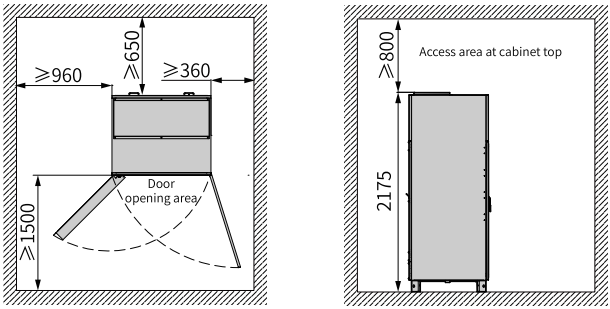


Figure 4-3 Installation clearance required for a single PCS (unit: mm)

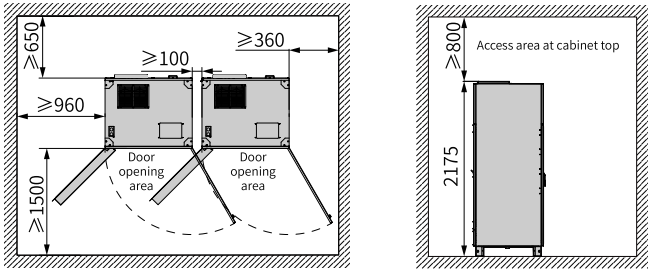


Figure 4-4 Installation clearance required for installing multiple PCSs in parallel (unit: mm)

Models of 2510 kW

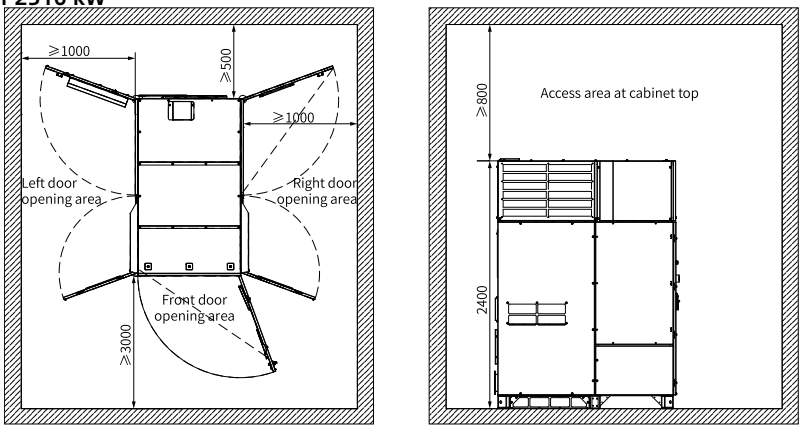


Figure 4-5 Installation clearance required for a single PCS (unit: mm)

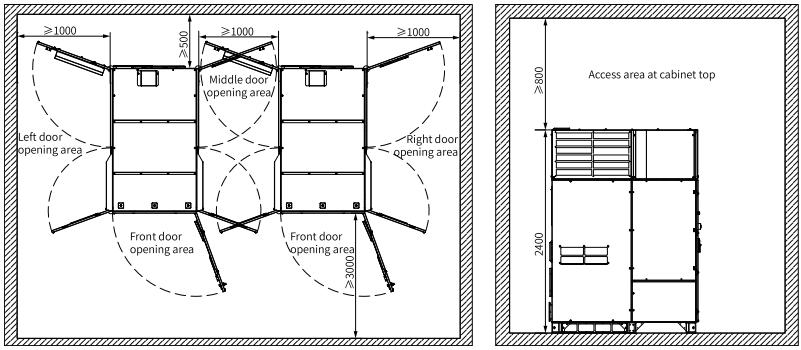


Figure 4-6 Installation clearance required for installing multiple PCSs in parallel (unit: mm)

4.2.5 Ventilation Requirements

The PCS generates a large amount of heat during operation, which may lead to over-temperature, reduce the electrical performance of the system, and damage the system. To allow proper heat dissipation, install the PCS in a place that meets the following requirements.

CAUTION

- Install the PCS in a well-ventilated environment.
- Ensure plenty of fresh air at the air inlet.
- Separate the ventilation system of the PCS from other ventilation systems in the control room.
- If overtemperature occurs on the PCS, check whether the air vent is blocked.
- Take waterproof, dustproof, and insect-proof measures for the AC outlet bridge, ensure sufficient ventilation at the outlet bridge bottom, and keep the air in the outlet bridge area from interaction with the PCS.

The system adopts front/rear-in and rear-out ventilation mode. The following figure shows the air inlet/outlet positions.

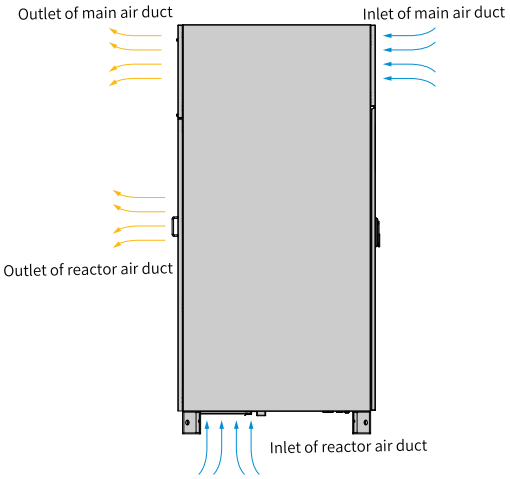


Figure 4-7 Position of the air inlet/outlet (1725 kW model)

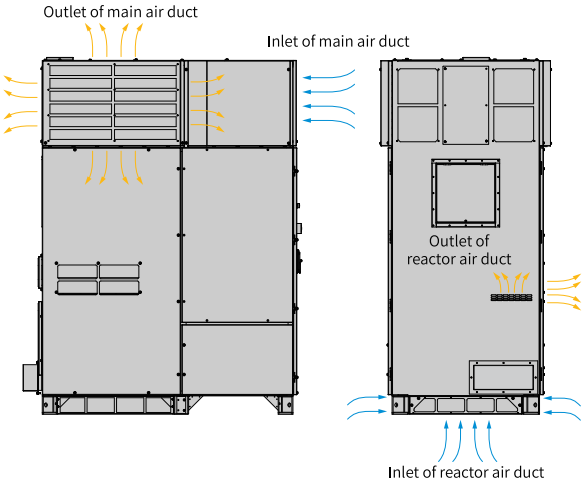


Figure 4-8 Position of the air inlet/outlet (2510 kW model)

CAUTION

To avoid abnormal temperature rise of the PCS and reactor, do not block the bottom of the PCS.

4.2.6 Installation Tool Preparations

Table 4–4 Required installation tools

Tool	Quantity	Instructions
Forklift	1	Used for transporting the PCS indoor and outdoor. The load bearing capacity of the forklift must be 2.5 tons or above, and the length of the forklift body must be longer than 1.2 m.
Crane	1	The load bearing capacity of the crane must be 2.5 tons or above.
Strap	4 m	Soft strap, steel rope or strap are required for crane lifting.
Socket and wrench	1 set	Used for fixing. The maximum torque must be greater than 70 N·m.

Note

- All the measuring instruments must have a sufficient span for operations.
- The preceding tools are for installing one PCS. It is recommended to prepare more tools to accelerate the installation process with multiple installation personnel.

4.2.7 Tightening Torque of Common Screws and Bolts

Table 4–5 Tightening torque of common screws and bolts

Screw/Bolt	Strength Grade	Maximum Torque (N·m)
M3	4.8	0.5
M4	4.8	1.2
M5	4.8	2.8
M6	4.8	4.8
M8	8.8	20
M10	8.8	40
M12	8.8	70
M16	8.8	180

4.3 Pre-installation Check

Before installation, check the following items listed in the table below and tick the checked items in the "Checked" column.

No.	Item	Checked
1	The packing box is intact and dry.	☐
2	After unpacking, the PCS module housing is intact without distortion, peeling, or crack, and there is no water stain.	☐
3	All ordered accessories and options are delivered.	☐

4.4 Installing the Power Conversion System

Note

The PCS is heavy. It is recommended that at least two people operate the PCS at the same time. Prohibit standing below the PCS during hoisting. Otherwise, module falling-off may lead to physical injuries.

1. Check whether the fixing holes on the installation plane are consistent with mounting holes at the bottom of the PCS. For the positions of these holes, see *"Figure 4-9 Cabinet installation (unit: mm)" on page 50*.
2. Move the PCS to the mounting position, align the screw holes, and secure the PCS to the steel channel or foundation with M12 bolts.
   You can also weld the PCS to the metal floor of the channel steel or prefabricated container. Take care to avoid burning during welding and take anti-rust measures.

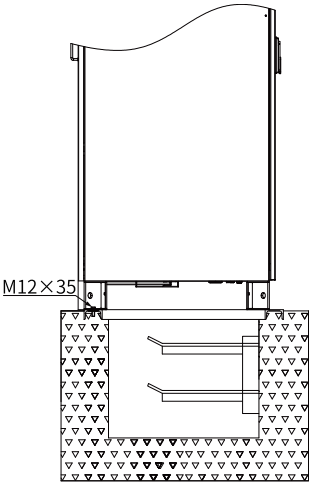


Figure 4-9 Cabinet installation (unit: mm)

Note

- Handle the PCS slowly and steadily. Check whether there is depression on the mounting plane or check for other signs that indicate insufficient bearing capacity of the mounting surface.
- The PCS needs to be fixed to the mounting plane with M12x35 bolts (with large flat washers, recommended). Reserve proper holes according to the bolts. For more information about the mounting hole positions, see *"Figure 2-9 " on page 30* .

4.5 Installing the Duckboard

1. Check that the cabinet is installed on the skid-mounted chassis or base.
2. Use four M6x16 stainless steel screws with large washers to fix the duckboard to the base support unit according to the figure.

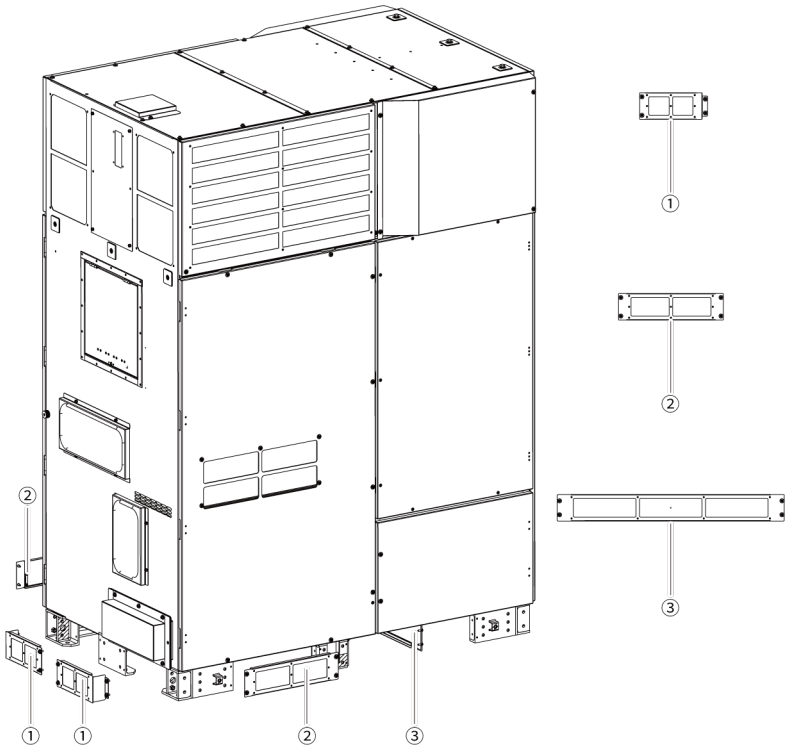


Figure 4-10 Installing the duckboard (2510kW model)

4.6 Post-installation Check

After installation, check the following items listed in the table below and tick the checked items in the "Checked" column.

Table 4–6 Post-installation checklist

No.	Item	Solution	Checked
1	The fastener is tight.	If any fastener is loose, tighten the screws again.	□
2	The installation clearance meets the requirements.	If the installation clearance is insufficient, redesign the cabinet and install it again.	□
3	Check whether the air duct is free of foreign objects.	Clear foreign objects if any and locate the cause if the air filter is blocked.	□

5 Electrical Installation

5.1 Electrical Wiring Diagram

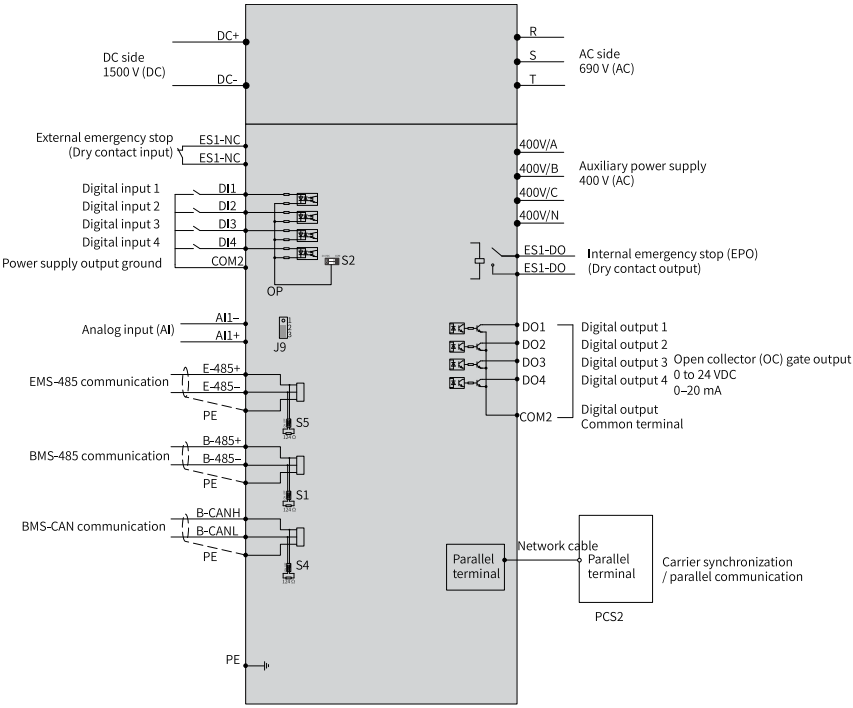


Figure 5-1 Electrical connection diagram (2510 kW and 1725 kW single-channel)

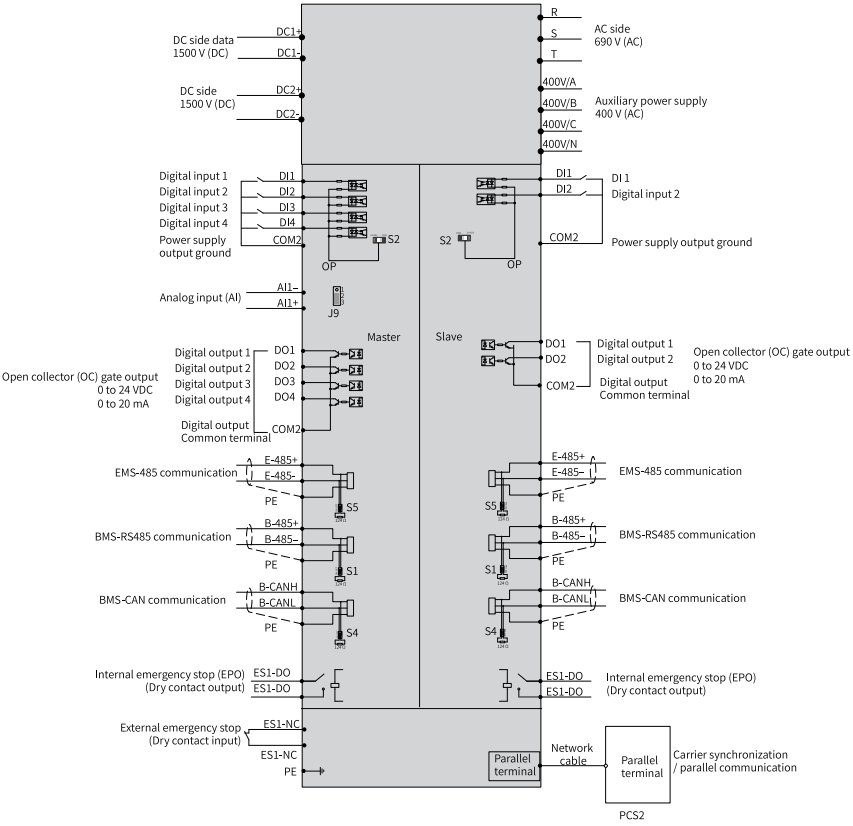


Figure 5-2 Electrical connection diagram (2510 kW dual-channel)

Note

For ease of wiring, some ports of the PCS are at the cabinet bottom. Use the correct port during wiring. For the corresponding relationship, see *"5.6.1 Communication and I/O Terminals" on page 68*.

5.2 Safety Precautions

Take necessary safety protection measures during electrical installation to protect the safety of installation personnel. Comply with the following rules when perform electrical installation.

Note

- The PCS must be installed by skilled personnel in strict accordance with the user guide.
- During installation, the installation personnel must comply with local electrical operation regulations.
- Ensure that all cables and modules are de-energized before performing any operation (when a control power supply is used, the bus capacitor has a voltage of about 60 V).
- Place a warning sign at the disconnection part to prevent power-on during installation.
- Do not install the PCS while the power is on. Failure to comply will result in an electric shock.
- Conduct grounding and short circuit connections if necessary.
- Use insulating materials to isolate live parts to prevent physical injuries.

5.3 Preparation Before Wiring

5.3.1 Wiring Personnel Requirements

All installation operations must be performed only by qualified technicians, who must meet the following requirements:

- Taken specialized training.
- Read this guide completely and master the safety precautions related to operation.
- Be familiar with local standards and safety regulations of electrical systems.

5.3.2 Tools for Wiring

Table 5–1 Installation Tools

Tool	Quantity	Instructions for use
Socket and wrench for fixing	1 set	The maximum torque must be greater than 180 N·m.
Phillips screwdriver	1	Used for fixing the M6 screws.
Straight screwdriver	1	Used to tighten M3 screws.
Wire stripper	1	Used for cable making.
Crimping tool	1	Used for cable making.
Clamp meter	1	Used to measure the current and voltage on the input and output sides.

Note

The preceding tools are for installing one PCS. It is recommended to prepare more tools to accelerate the installation process with multiple installation personnel.

5.3.3 Cable Preparations

Power cable configuration requirements

Prepare power cables in accordance with specifications in the following table.

Table 5–2 Cable configuration specifications (applicable for the 1725 kW model)

Power	Terminal	Maximum Voltage	Maximum Current	Number of Screw Holes	Screw	Recommended Specification	Cable Terminal Selection	Remarks
1725 kW	DC+, DC-	1500 VDC	1807 A	4 for each terminal	M16x50	Monopole: 185 mm^2 x 6/240 mm^2 x 5/300 mm^2 x 4	Ø16 O-type terminal	Keep the cable specification and length the same on both sides.
	(R, S, T)	690 V (AC)	1588 A	4 for each phase	M16x50	Copper busbar connection: 80 mm x 8 mm	-	
				5 for each phase	M16x50	Cable connection[1] Monopole: 185 mm^2 x 5/240 mm^2 x 5/300 mm^2 x 4	Ø16 O-type terminal	
External auxiliary power cable		400 V (AC)	8 A	1 group (3 phases+N)	-	2.5 mm^2	Tubular terminal	Match the terminal with the cable.
External auxiliary power supply cable in internal/external power supply switchover plan		400 VAC	12 A	1 group (3 phases)	-	2.5 mm^2	Tubular terminal	Match the terminal with the cable.

Table 5–3 Cable configuration specifications (applicable for the 2510 kW single-branch model)

Power	Terminal	Maximum Voltage	Maximum Current	Number of Screw Holes	Screw	Recommended Specification	Cable Terminal Selection	Remarks
2510 kW	DC+, DC-	1500 VDC	2816 A	6 for each terminal	M16x50	Monopole: 240 mm^2 x 6/300 mm^2 × 6	Φ16 O-type terminal	Keep the cable specification and length the same on both sides.
	(R, S, T)	690 V (AC) (rated voltage)	2310 A	4 for each phase	M16x50	Copper busbar connection: 100 mm x 12 mm	-	
External auxiliary power supply cable in internal/external power supply switchover plan		400 VAC	16 A	1 group (3 phases)	-	4.0 mm^2	Tubular terminal	Match the terminal with the cable.

Table 5–4 Cable configuration specifications (applicable for the 2510 kW dual-branch model)

Power	Terminal	Maximum Voltage	Maximum Current	Number of Screw Holes	Screw	Recommended Specification	Cable Terminal Selection	Remarks
2510 kW	DC+, DC-	1500 VDC	1408 A x 2	5 for each terminal	M16x50	Monopole: 185 mm^2 x 4/240 mm^2 x 3/300 mm^2 x 3	Φ16 O-type terminal	Keep the cable specification and length the same on both sides.
	(R, S, T)	690 V (AC) (rated voltage)	2310 A	4 for each phase	M16x50	Copper busbar connection: 100 mm x 12 mm	-	
External auxiliary power supply cable in internal/external power supply switchover plan		400 VAC	16 A	1 group (3 phases)	-	4.0 mm^2	Tubular terminal	Match the terminal with the cable.

CAUTION

[1]: For wiring on the AC side, use a cable-copper busbar adapter and reserve a large space at the rear of the cabinet.

Note

- The maximum cross-sectional area of the output cable on the DC side is 300 mm^2.
- Cable recommendation in the table is made assuming that 70°C thermoplastic DCC insulated copper cables are used. To use cables of other models, configure the cables by referring to the local wiring regulations and application environment (including the temperature and physical support media).
- DC cable recommendation is applicable only to unipolar input. In the case of multiple inputs, configure the cables based on the maximum input current of each input and by referring to the local wiring regulations and application environment (including the temperature and physical support media).
- Select cable terminals that match the cables. The models in the table are applicable to recommended cables. If recommended cables are not used, use other appropriate terminals.
- The integrated device is used to provide external auxiliary power to the 2510 kW PCS, and the required auxiliary power is 6.7 kW.
- If the integrated device uses an independent branch to provide external auxiliary power to each PCS, it is recommended that the branch use the 32 A miniature circuit breaker in the D curve for branch protection and the power supply branch use the 4 mm^2 cable.
- If the integrated device uses a merged branch to provide external auxiliary power to two PCSs, it is recommended that the main circuit use the 50 A miniature circuit breaker in the D curve, the main power supply uses the 6 mm^2 cable, and the power supply branch use the 4 mm^2 cable.

Communication and I/O cable configuration requirements

Prepare communication and I/O cables in accordance with specifications in the following table.

Table 5–5 Cable configuration specifications

Terminal		Installation Port	Recommended Cable	Cable Terminal Selection
Emergency stop signal port	ES1-NC, ES1-DO	Terminal block	Twisted pair	Tubular terminal
AI terminal	AI-/AI+			
Digital input and output ports	DI, ES1-NO, OP, DO, COM5, HDI, HDO	Terminal block	Single-conductor cable	Tubular terminal
	COM2, HDI, HDO	Network port	Shield LAN cable	RJ45

Terminal		Installation Port	Recommended Cable	Cable Terminal Selection
Communication port	EMS-485, BMS-485, BMS-C AN, PE, COM1	Terminal block	Shielded twisted pair	Tubular terminal
	EMS_Ethernet, BMS_ Ethernet	Network port	Shield LAN cable	RJ45

Note

You can configure the corresponding cable according to the requirements. In principle, the cross-sectional area of the cable cannot be lower than 0.5 mm^2, but cannot be greater than 2.5 mm^2 allowed by the wiring terminal.

RJ45 cable preparation

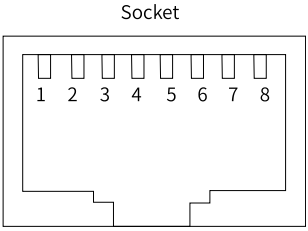


Figure 5-3 RJ45 interface

Table 5–6 RJ45 interface (carrier synchronization LAN cable)

Pin	Signal Name	Description
1	PANEL_CANH	CAN signal
2	PANEL_CANL	CAN signal
3	GND	-
4	HDO_1+	Carrier synchronization signal
5	COM2	-
6	GND	-
7	HDO_2+	Carrier synchronization signal
8	COM2	-

Table 5–7 RJ45 interface (communication expansion card LAN cable)

Pin	Signal Name	Description
1	TX+	Data sending positive
2	TX-	Data sending negative
3	RX+	Data receiving positive
4	NC	Empty
5	NC	Empty
6	RX-	Data receiving negative
7	NC	Empty
8	NC	Empty

Prepare the network cable as follows:

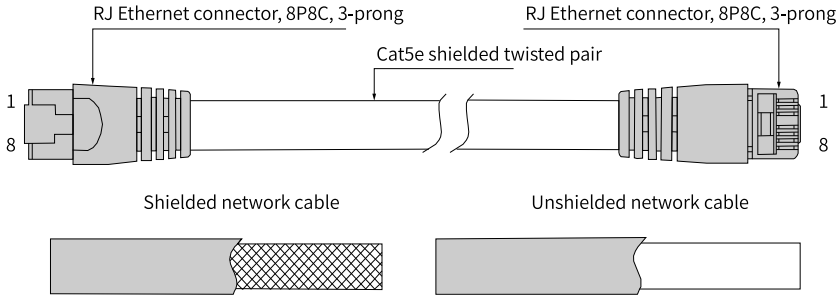


Figure 5-4 Network cable

Table 5–8 Recommended LAN cable specifications

Item	Specifications
Cable Type	Flexible crossover cable, S-FTP Use Cat 5e shielded twisted pair cables, with injection molded and iron shelled connector.
Compliance	EIA/TIA 568A, EN 50173, and ISO/IEC 11801 EIA/TI AbulletinTSB EIA/TIA SB40-A&TSB36
Number of pairs	4

5.4 Cable Outlet Holes

For details about the positions of the base mounting holes and cable outlet holes, see *"Figure 2-9 " on page 30* .

5.5 Wiring of Main Circuit Busbar

5.5.1 Ports of Main Circuit Busbar

The PCS DC-side cables take the bottom-in mode and the wiring position at the front of the cabinet. The AC-side cables take the rear-in mode and the busbar connection position is at the rear of the cabinet.

2510 kW model

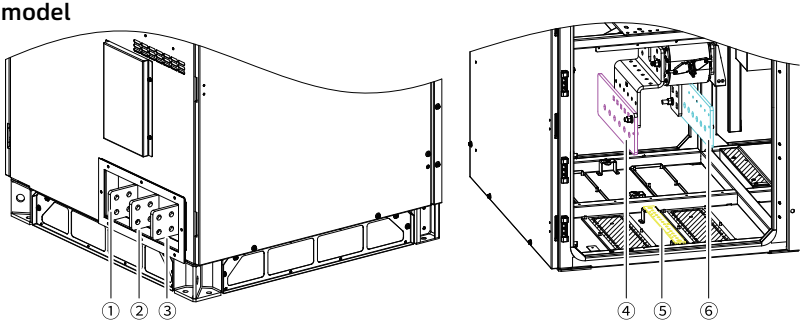


Figure 5-5 Wiring terminal and busbar layout (applicable for the 2510 kW single-input model)

No.	Name	No.	Name
①	Phase-R busbar on the AC side	④	Positive terminal busbar on DC side
②	Phase-S busbar on the AC side	⑤	Grounding busbar
③	Phase-T busbar on the AC side	⑥	Negative terminal busbar on DC side

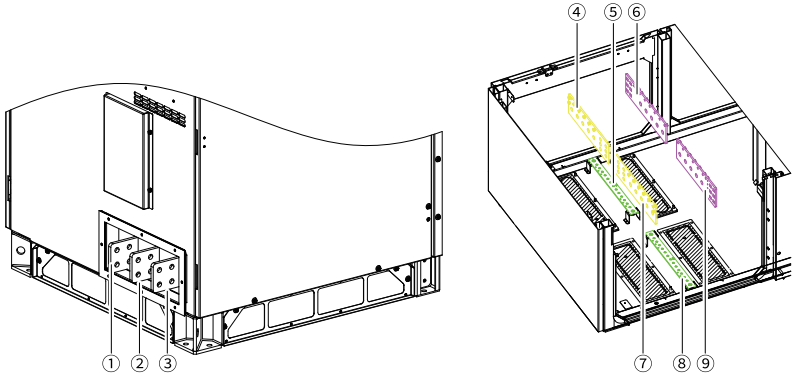


Figure 5-6 Wiring terminal and busbar layout (applicable for the 2510 kW dual-input model)

No.	Name	No.	Name
①	Phase-R busbar on the AC side	⑥	Negative terminal busbar on DC side of the main circuit
②	Phase-S busbar on the AC side	⑦	Grounding busbar of positive terminal busbar on DC side of the secondary circuit
③	Phase-T busbar on the AC side	⑧	Grounding busbar of the secondary circuit
④	Positive terminal busbar on DC side of the main circuit	⑨	Negative terminal busbar on DC side of the secondary circuit
⑤	Grounding busbar of the main circuit	-	-

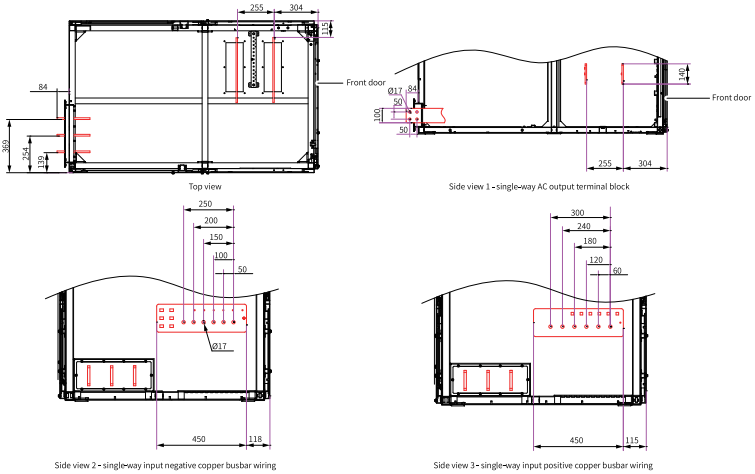


Figure 5-7 Wiring busbar dimensions (unit: mm) (applicable for the 2510kW single-input model)

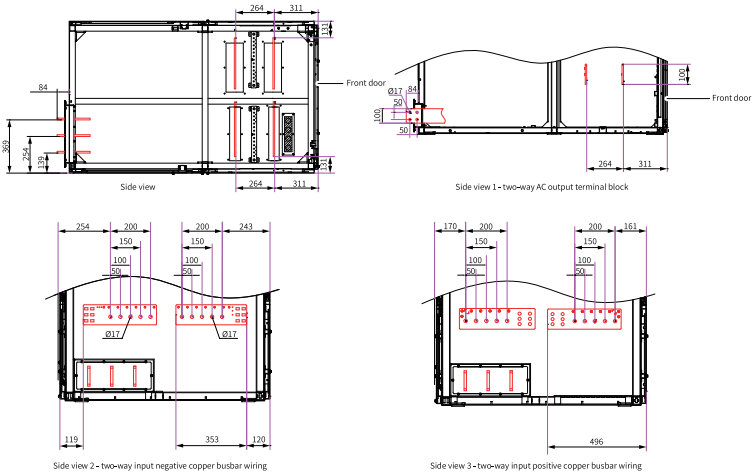


Figure 5-8 Wiring busbar dimensions (unit: mm) (applicable for the 2510 kW dual-input model)

Models of 1725 kW

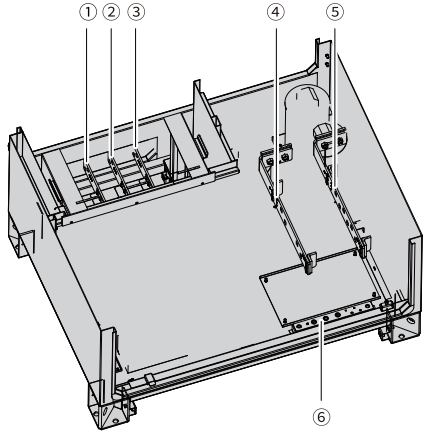


Figure 5-9 Wiring terminal and busbar layout (applicable for the 1725 kW model)

No.	Name	No.	Name
①	Phase-R busbar on the AC side	④	Positive terminal busbar on DC side
②	Phase-S busbar on the AC side	⑤	Negative terminal busbar on DC side
③	Phase-T busbar on the AC side	⑥	Grounding busbar

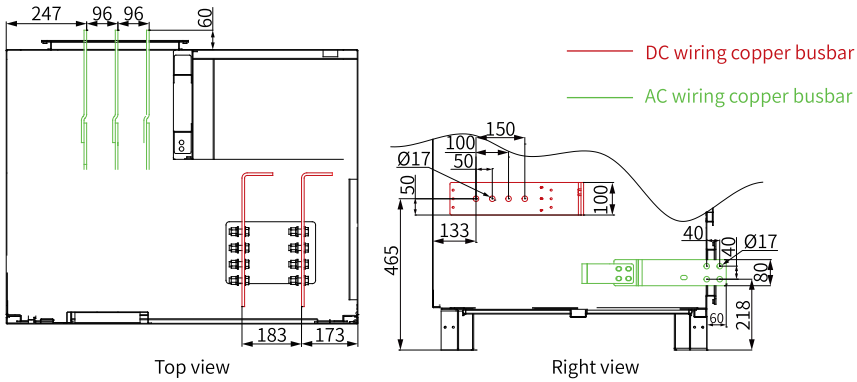


Figure 5-10 Wiring busbar dimensions (unit: mm) (applicable for the 1725 kW model)

5.5.2 Wiring of Grounding Busbar

CAUTION

- Measure the grounding resistance and ensure that it is less than 0.1 Ω.
- The cables must be compliant with the voltage insulation class and applied with necessary protections to prevent scratches on the insulation sheath.

Wiring of grounding busbar of the 1725 kW PCS

As shown in the following figure, connect the grounding cables to the corresponding busbars through the corresponding wiring holes. Tighten the bolts with torque of 70 N·m.

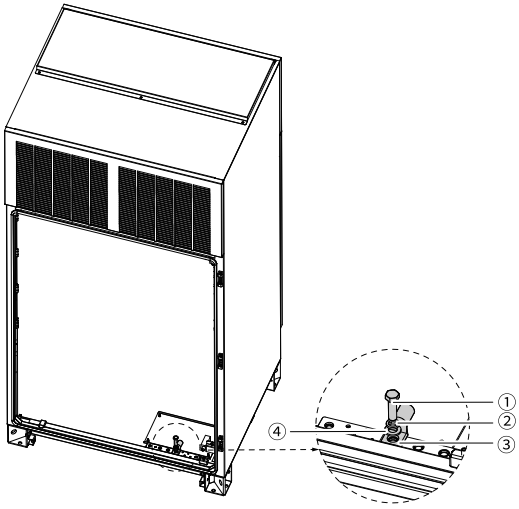


Figure 5-11 Wiring of grounding busbar

No.	Name	No.	Name
①	M12 hexagon bolt	③	Cable lug
②	Spring washer	④	Flat washer

Wiring of grounding busbar of the 2510kW PCS

As shown in the following figure, connect the grounding cables to the corresponding busbars through the corresponding wiring holes. Tighten the screws through a wrench with a tightening torque of 20 N·m.

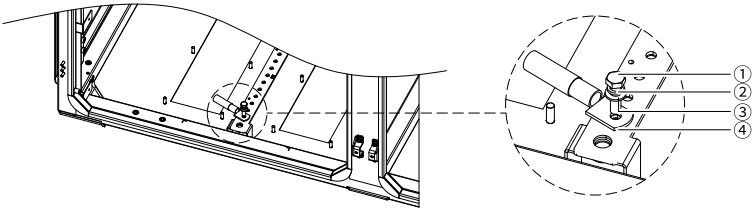


Figure 5-12 Wiring of grounding busbar

No.	Name	No.	Name
①	M8 hexagon bolt	③	Flat washer
②	Spring washer	④	Cable lug

5.5.3 Wiring of Busbar on DC Side

CAUTION

- The voltage of the battery cannot exceed the maximum DC voltage (1500 V) of the power conversion system. Failure to comply may result in damage to the PCS.
- If an grounding fault exists, eliminate the fault first and then perform cable connection.
- An incorrect wiring sequence may result in a fire.
- Cables must be connected securely. Failure to comply may result in a fire.
- Incorrect wiring may result in converter failure and even equipment burnout.
- The cables must be compliant with the voltage insulation class and applied with necessary protections to prevent scratches on the insulation sheath.

1. Ensure that the PCS and the cables are de-energized.
2. Confirm and mark the positive and negative terminals of the cable.
3. Measure the resistance between every two of the positive terminal, negative terminal, and the PE terminal. The resistance values must be megohms. Otherwise, check the circuits.
4. As shown in the following figure, connect the cables on the positive and negative terminals to the corresponding positive and negative busbars through corresponding wiring holes. Tighten the screws through a wrench with a tightening torque of 180 N·m.

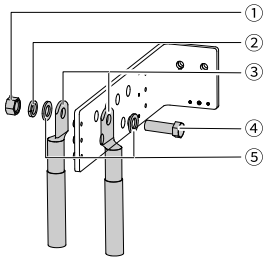


Figure 5-13 Single-cable wiring on the DC side

No.	Name	No.	Name
①	M16 hexagon nut	④	M16 standard hexagon bolt
②	Spring washer	⑤	Flat washer
③	Cable lug	-	-

5.5.4 Wiring of Busbar on AC Side

Note

- Incorrect voltage may cause damage to the PCS.
- An incorrect wiring sequence may result in poor contact and even a fire.
- Fasten the cables. Otherwise, a fire may occur.
- An incorrect phase sequence may cause PCS failure.
- The cables must meet requirements of the specified insulation class and be provided with necessary protection to avoid scratches on the insulated leather.

1. Ensure that the PCS and the cables are de-energized.
2. Mark phases R, S, and T of the cable.
3. Confirm the phase sequence of the AC output wiring busbar of the PCS. Connect the bridging busbar to the wiring busbar in the correct phase sequence.
4. As shown in the following figure, connect the bridging busbar with the AC busbar correctly.
5. Tighten the screws through a wrench with a tightening torque of 180 N·m (M16 bolt).

Copper busbar connection

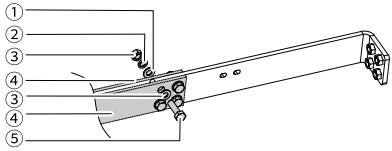


Figure 5-14 Single-cable wiring on the AC side

Table 5–9 Single-Cable Wiring on the AC Side

No.	Name	No.	Name
①	Flat washer	④	Bridging busbar
②	Spring washer	⑤	M16/M12 outer hexagon bolt
③	M16/M12 outer hexagon nut	-	-

Cable connection (applicable for the 1725 kW)

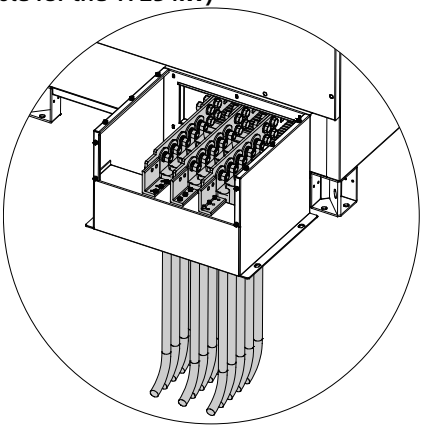


Figure 5-15 Wiring on the AC side

For wiring on the AC side, use a cable-copper busbar adapter and reserve a large space at the rear of the cabinet. For details, see the figure below.

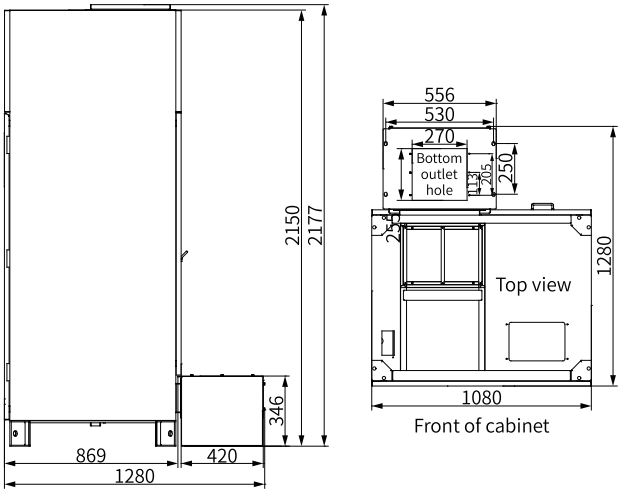


Figure 5-16 Product dimensions for cable wiring

5.6 Wiring of Communication and I/O Ports



- Communication and I/O cables are thin and must be fixed to prevent stress that may pull the cables apart.
- The cables must meet requirements of the specified insulation class and be provided with necessary protection to avoid scratches on the insulated leather.

5.6.1 Communication and I/O Terminals

Note

All external communication and I/O wiring ports of the PCS are distributed on the communication board, and some cables are connected to the control cable terminals and user adapter board at the left bottom of the device. During wiring, you need to connect relevant cables to the communication board, control cable terminal, or user adapter board as required. For the operating principles, see *"5.1 Electrical Wiring Diagram" on page 52*.

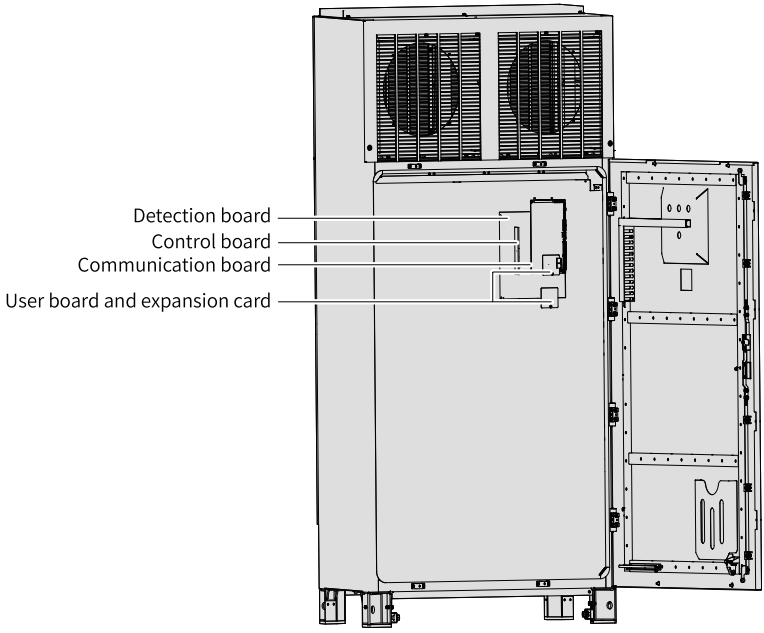


Figure 5-17 Board diagram (1725 kW model)

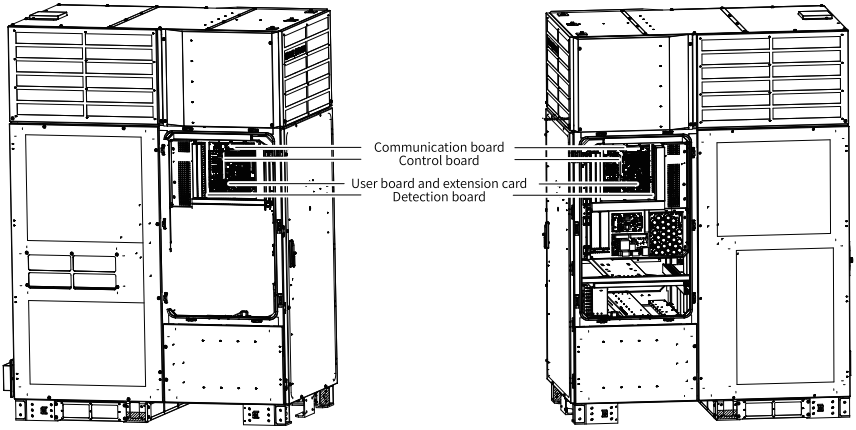


Figure 5-18 Board diagram (2510 kW model)

Note

The communication board has three slots for up to three communication expansion cards, among which, two slots are optional for Ethernet or 61850 cards and one slot is optional for the EtherCAT card. You can select a card as required for EMS or BMS communication.

Control cable terminals XT2 and XT3

The control terminals are mainly connected to the control cable terminals XT2 and XT3 and the user adapter board. For their locations, see *"5.6.2 Wiring of External Control Power Supply" on page 82*. The following table lists the wiring relationship of relevant communication boards.

Table 5–10 Mapping between control cable terminals XT2 and XT3 and the communication board (applicable for the 1725 kW model)

Control Cable Terminal			Communication Board		**Terminal Assignment**	Function
XT	Pin No.	Name	Pin No.	Name		
XT2	1	ES1-NC	J33-10	EPO_ DI1	Remote emergency stop input	Remote emergency stop switch (normally closed)
	2	ES1-NC	J33-1	user_ COM4_1	Common terminal of remote emergency stop	
	3	DI1	J11-15	DI1	Digital input 1	DI (optional functions: start, stop, standby, and discharge)
	4	DI2	J11-17	DI2	Digital input 2	
	5	DI3	J11-19	DI3	Digital input 3	
	6	DI4	J11-21	DI4	Digital input 4	
	7 to 10	DI_COM	J23-10	COM2	24 VDC battery grounding	
	11	ES1-DO	-	-	Emergency stop output signal	Emergency stop output terminal
	12	ES1-DO	-	-	Common terminal of emergency stop output signal	
	13	AI-	J12-11	AI1-	Analog input negative	AI terminal 1
	14	AI+	J12-12	AI1+	Analog input positive	
	15	E-485+	J11-9	E485_+	EMS_485+	EMS-RS485 communication
	16	E-485-	J11-11	E485_-	EMS_485-	
	17	COM1	J11-10	COM1	COM1	
	18	PE	-	-	-	
	19	B-485+	J11-5	B485_+	BMS_485+	BMS-RS485 communication
	20	B-485-	J11-7	B485_-	BMS_485-	
	21	COM1	J11-6	COM1	COM1	
	22	PE	-	-	-	
	23	B-CANH	J11-1	BCANH	BCANH	BMS-CAN communication
	24	B-CANL	J11-3	BCANL	BCANL	
	25	COM1	J11-2	COM1	COM1	
	26	PE	-	-	-	

Control Cable Terminal			Communication Board		**Terminal Assignment**	Function
XT	Pin No.	Name	Pin No.	Name		
XT3	1	DO1	J12-1	DO1	Digital output 1	DO output
	2	DO2	J12-3	DO2	Digital output 2	
	3	DO3	J12-5	DO3	Digital output 3	
	4	DO4	J12-7	DO4	Digital output 4	
	5 to 8	DO_ COM	J12-8	COM2	DO common terminal/24 VDC battery grounding	

Table 5–11 Mapping between control cable terminals XT2 and XT3 and the communication board (applicable for the 2510 kW single-branch model)

Control Cable Terminal			Communication Board		**Terminal Assignment**	Function
XT	Pin No.	Name	Pin No.	Name		
XT2	1	ES1-NC	DB1-J33-1	GND	Common terminal of remote emergency stop	Remote emergency stop switch (normally closed) Terminals 1 and 4 are shorted upon delivery.
	2	ES1-NC	DB2-J33-1	GND	-	
	3	ES1-NC	DB2-J33-10	EPO_DI1 DI1	-	
	4	ES1-NC	DB1-J33-10	EPO_DI1 DI1	Remote emergency stop input	
	5	DI1	CNB1-J11-15	DI1	Digital input 1	DI (optional functions: start, stop, standby, and discharge)
	6	DI2	CNB1-J11-17	DI2	Digital input 2	
	7	DI3	CNB1-J11-19	DI3	Digital input 3	
	8	DI4	CNB1-J11-21	DI4	Digital input 4	
	9 to 12	DI_COM	CNB1-J11-13	COM2	24 VDC battery grounding	
	13	ES1-DO	-	-	Emergency stop output signal	Emergency stop output terminal
	14	ES1-DO	-	-	Common terminal of emergency stop output signal	
	15	AI+	CNB1-J12-11	AI1+	Analog input positive	AI terminal 1
	16	AI-	CNB1-J12-12	AI1-	Analog input negative	
	17	E-485+	CNB1-J11-9	E485_+	EMS_485+	EMS-RS485 communication
	18	E-485-	CNB1-J11-11	E485_-	EMS_485-	
	19	COM1	CNB1-J11-10	COM1	COM1	
	20	PE	-	-	-	

Table 5–12 Mapping between control cable terminals XT2 and XT3 and the communication board (applicable for the 2510 kW single-branch model)

Control Cable Terminal			Communication Board		**Terminal Assignment**	Function
XT	Pin No.	Name	Pin No.	Name		
XT2	21	B-485+	CNB1-J11-5	B485_+	BMS_485+	BMS-RS485 communication
	22	B-485-	CNB1-J11-7	B485_-	BMS_485-	
	23	COM1	CNB1-J11-6	COM1	COM1	
	24	PE	-	-	-	
	25	B-CANH	CNB1-J11-1	BCANH	BCANH	BMS-CAN communication
	26	B-CANL	CNB1-J11-3	BCANL	BCANL	
	27	COM1	CNB1-J11-2	COM1	COM1	
	28	PE	-	-	-	
XT3	1	DO1	CNB1-J12-1	DO1	Digital output 1	DO output
	2	DO2	CNB1-J12-3	DO2	Digital output 2	
	3	DO3	CNB1-J12-5	DO3	Digital output 3	
	4	DO4	CNB1-J12-7	DO4	Digital output 4	
	5 to 8	DO_COM	CNB1-J12-8	COM2	DO common terminal/24 VDC battery grounding	

Table 5–13 Mapping between control cable terminals XT2 and XT3 and the communication board (applicable for the 2510 kW dual-branch model)

Control Cable Terminal			Communication Board		**Terminal Assignment**	Function
XT	Pin No.	Name	Pin No.	Name		
XT2	1	ES1-NC	DB1-J33-1	GND	Common terminal of remote emergency stop	Remote emergency stop switch (normally closed) Terminals 1 and 4 are shorted upon delivery.
	2	ES1-NC	DB2-J33-1	GND	-	
	3	ES1-NC	DB2-J33-10	EPO_DI1 DI1	-	
	4	ES1-NC	DB1-J33-10	EPO_DI1 DI1	Remote emergency stop input	
	5	DI1	CNB1-J11-15	DI1	Digital input 1	Master DI (optional functions: start, stop, standby, and discharge)
	6	DI2	CNB1-J11-17	DI2	Digital input 2	
	7	DI3	CNB1-J11-19	DI3	Digital input 3	
	8	DI4	CNB1-J11-21	DI4	Digital input 4	
	9 to 12	DI_COM	CNB1-J11-13	COM2	24 VDC battery grounding	
	13	ES1-DO	-	-	Emergency stop output signal	Master emergency stop output terminal
	14	ES1-DO	-	-	Common terminal of emergency stop output signal	
	15	AI+	CNB1-J12-11	AI1+	Analog input positive	Master AI terminal 1
	16	AI-	CNB1-J12-12	AI1-	Analog input negative	
	17	E-485+	CNB1-J11-9	E485_+	EMS_485+	Master EMS-RS485 communication
	18	E-485-	CNB1-J11-11	E485_-	EMS_485-	
	19	COM1	CNB1-J11-10	COM1	COM1	
	20	PE	-	-	-	

Control Cable Terminal			Communication Board		**Terminal Assignment**	Function
XT	Pin No.	Name	Pin No.	Name		
XT2	21	B-485+	CNB1-J11-5	B485_+	BMS_485+	Master BMS-RS485 communication
	22	B-485-	CNB1-J11-7	B485_-	BMS_485-	

Table 5–14 Mapping between control cable terminals XT2 and XT3 and the communication board (applicable for the 2510 kW dual-branch model)

Control Cable Terminal			Communication Board		**Terminal Assignment**	Function
XT	Pin No.	Name	Pin No.	Name		
XT2	23	COM1	CNB1-J11-6	COM1	COM1	Master BMS-RS485 communication
	24	PE	-	-	-	
	25	B-CANH	CNB1-J11-1	BCANH	BCANH	Master BMS-CAN communication
	26	B-CANL	CNB1-J11-3	BCANL	BCANL	
	27	COM1	CNB1-J11-2	COM1	COM1	
	28	PE	-	-	-	
	29	ES1-DO	DB2-J34-8	-	Emergency stop output signal	Slave emergency stop output terminal
	30	ES1-DO	DB2-J34-16	-	Common terminal of emergency stop output signal	
	31	E-485+	CNB2-J11-9	E485_+	EMS_485+	Slave EMS-RS485 communication
	32	E-485-	CNB2-J11-11	E485_-	EMS_485-	
	33	COM1	CNB2-J11-10	COM1	COM1	
	34	PE	-	-	-	
	35	B-485+	CNB2-J11-5	B485_+	BMS_485+	Slave BMS-RS485 communication
	36	B-485-	CNB2-J11-7	B485_-	BMS_485-	
	37	COM1	CNB2-J11-6	COM1	COM1	
	38	PE	-	-	-	

Control Cable Terminal			Communication Board		Terminal Assignment	Function
XT	Pin No.	Name	Pin No.	Name		
XT2	39	B-CANH	CNB2-J11-1	BCANH	BCANH	Slave BMS-CAN communication
	40	B-CANL	CNB2-J11-3	BCANL	BCANL	
	41	COM1	CNB2-J11-2	COM1	COM1	
	42	PE	-	-	-	
	43	DI1	CNB2-J11-15	DI1	Digital input 1	Slave DI
	44	DI2	CNB2-J11-17	DI2	Digital input 2	
	45 and 46	COM2	CNB2-J11-13	COM2	24 VDC battery grounding	
XT3	1	DO1	CNB1-J12-1	DO1	Digital output 1	Master DO
	2	DO2	CNB1-J12-3	DO2	Digital output 2	
	3	DO3	CNB1-J12-5	DO3	Digital output 3	
	4	DO4	CNB1-J12-7	DO4	Digital output 4	
	5 to 8	DO_COM	CNB1-J12-8	COM2	DO common terminal/24 VDC battery grounding	
	9	DO1	CNB2-J12-1	DO1	Digital output 1	Slave DO
	10	DO2	CNB2-J12-3	DO2	Digital output 2	
	11 and 12	DO_COM	CNB2-J12-8	COM2	DO common terminal/24 VDC battery grounding	

Terminals on the communication board

- **AI terminals**

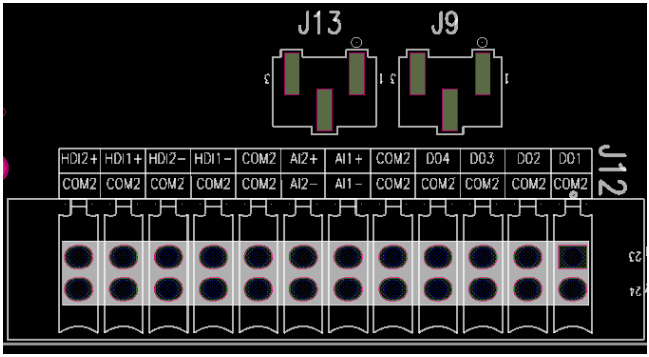


Figure 5-19 AI terminals (J12)

Table 5–15 AI terminals

Pin No.	Name	Terminal	Current/voltage signal selection terminal[1]	Function
12	AI1-	Analog input 1	J13	Wiring by twisted pair • Current input: ±20 mA; input impedance: 500 Ω • Voltage input: ± 10 VDC; input impedance: 200 kΩ
11	AI1+			
14	AI2-	Analog input 2	J9	
13	AI2+			

Note

When J13 and J9 are shorted to pins 1 and 2, the AI terminal inputs the voltage signal. No matter whether pin 2 or 3 is shorted, the AI terminal inputs the current signal.

- **DI/DO terminals**

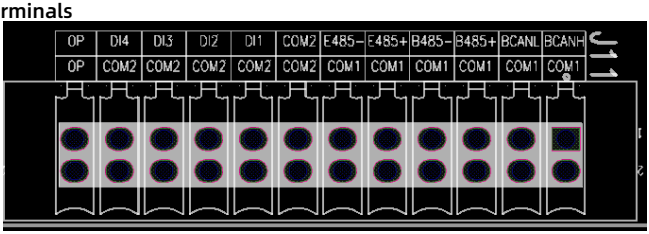


Figure 5-20 DI/DO terminals (J11)

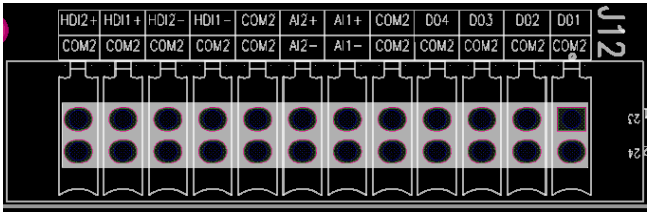


Figure 5-21 DI/DO terminals (J12)

Table 5–16 DI/DO terminals

Pin No.	Name	Terminal Assignment	Description	Function
J11-13 to J11-14	COM2	COM2	24 VDC battery grounding	-
J11-23 to J11-24	OP	OP	DI common terminal	DI interface: • Input impedance: 2.0 kΩ • Input frequency range: 0 Hz to 100 Hz • Imax: 15 mA • 24 VDC logic level: 0: < 5 V; 1: > 15 V • The S2 jumper is driven by an external or internal power supply. ON indicates it is driven by an internal power supply. OFF indicates it is driven by an external power supply. DO interface: • Output type: OC • Output frequency range: 0 Hz to 100 Hz • Maximum load: 20 mA • Output voltage range: Based on the external input 24 VDC power supply
J12-1	DO1	DO1	Digital output 1	
J11-15	DI1	DI1	Digital input 1	
J12-3	DO2	DO2	Digital output 2	
J11-17	DI2	DI2	Digital input 2	
J12-5	DO3	DO3	Digital output 3	
J11-19	DI3	DI3	Digital input 3	
J12-7	DO4	DO4	Digital output 4	
J11-21	DI4	DI4	Digital input 4	
J11-16 and J11-18	COM2	COM2	24 VDC battery grounding	-
J11-20 and J11-22	COM2	COM2	24 VDC battery grounding	-
J12-9 to J12-10	COM2	COM2	24 VDC battery grounding	They are internal control cables of the PCS and their wirings cannot be modified. Incorrect wiring may cause PCS error. These cables are connected to the user adapter board and can realize carrier synchronization and parallel CAN communication through the parallel interface J8 on the user adapter board.
J12-15 to J12-16	COM2	COM2	24 VDC battery grounding	
J12-17	HDI1	HDI_1-	-	
J12-19	HDI2	HDI_2-	-	
J12-21	HDO1	HDO_1+	-	
J12-23	HDO2	HDO_2+	-	

- **Terminals for communication with HMI**

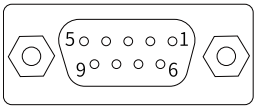


Figure 5-22 Terminals for communication with HMI (J11)

Table 5–17 Terminals for communication with HMI

Pin No.	Name	Terminal Assignment
1	HMI_485-	RS485- connecting HMI
2	HMI_485+	RS485+ connecting HMI
3 to 6, and 9	-	-
7	HMI_485-	RS485- connecting HMI
8	HMI_485+	RS485+ connecting HMI
10 to 11	PE1	Grounding terminal

Note

Pins 1 and 2 are connected to the IT6000 series touch screen of Inovance. Pins 7 and 8 are connected to the IT7000 series touch screen of Inovance.

- **Communication terminals**

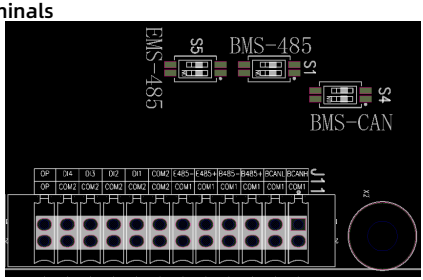


Figure 5-23 Communication terminals and DIP switch

Table 5–18 Pins of communication terminal

Pin No.	Name	Terminal	Description	Function	Termination resistor switch (turned on when the switch is set to ON)
1	BCANH	BMS_CANH_A	BMS_CANH_A bus high level	Maximum transmission distance: 1200 m Bus: CAN2.0 bus Level: 5 VDC standard level Bus termination resistor: 124 Ω Maximum communication rate: 4 Mbps Maximum number of nodes: 32 (without repeater)	S4 (twisted pair)
2 and 4	COM1	COM1	Reference ground		
3	BCANL	BMS_CANL_A	BMS_CANL_A bus low level		
5	B485+	BMS_485+	BMS RS485 bus positive	Max. transmission distance: 1200 m Bus: RS485 bus Level: 5 VDC standard level Bus termination resistor: 124 Ω Maximum communication rate: 112.5 kbps Maximum number of nodes: 32 (without repeater)	S1 (twisted pair)
6 and 8	COM1	COM1	Reference ground		
7	B485-	BMS_485-	BMS RS485 bus negative		
9	E485+	EMS_485+	EMS RS485 bus positive	Max. transmission distance: 1200 m Bus: RS485 bus Level: 5 VDC standard level Bus termination resistor: 124 Ω Maximum communication rate: 115.2 kbps Maximum number of nodes: 32 (without repeater)	S5 (twisted pair)
10 and 12	COM1	COM1	Reference ground		
11	E485-	EMS_485-	EMS RS485 bus negative		

5.6.2 Wiring of External Control Power Supply

The PCS adopts internal and external power supplies as the AC control power supply. This section describes how to wire the external control power supply.

CAUTION

- Ensure that the PCS is de-energized (when a control power supply is used, the bus capacitor has a voltage of about 60 V).
- Measure the grounding resistance and ensure that it is less than 0.1 Ω.
- The external control power supply system can only be maintained by the service and maintenance personnel, and the system must be powered off before operations.

As shown in the figure below, connect the external cable to the corresponding terminal block on the cabinet through the hole at the bottom of the cabinet. Ensure that the power cable is connected properly.

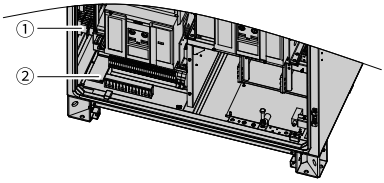


Figure 5-24 Wiring of external control power supply (1725 kW model)

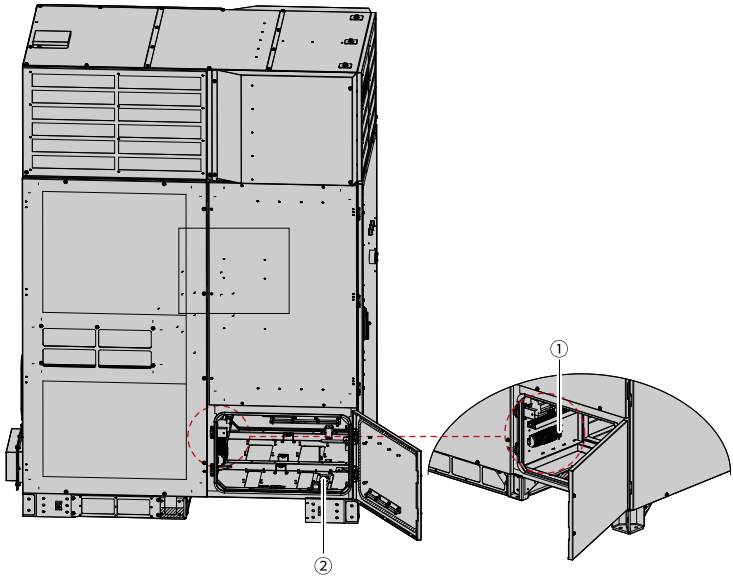


Figure 5-25 Wiring of external control power supply (2510 kW model)

Table 5–19 Wiring of external control power supply

No.	Name
①	External control power supply cable socket XT1
②	External control power supply cable hole at the bottom of the cabinet

5.6.3 Wiring of DI/DO Terminals

Note

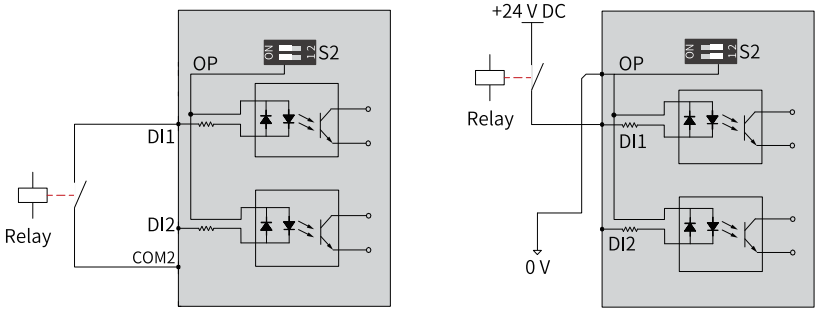
- The following takes wiring on the communication board as an example. For how to wiring on the control cable terminal, see the **mapping between control cable terminals XT2 to XT3 to terminals on the communication board** of section *"5.6.1 Communication and I/O Terminals" on page 68*, and perform wiring correctly.
- COM2 on the communication board corresponds to 5/6/7/8 (DO_COM) of the control cable terminal XT3.

Wiring of DI1 to DI4

- **Wiring of relay dry contacts**

  The relay dry contacts can be connected to the internal 24 VDC power supply of the PCS through the OUT port or to an external 24 VDC power supply.

  - The internal 24 VDC power supply of the PCS is most commonly used for wiring. In this mode, you need to turn the S2 DIP switch of the PCS to the ON position.
  - When an external 24 VDC power supply is used, the relay dry contacts need to be connected to the OP terminal on the communication board.



Using an internal 24 V power supply　　Using an external 24 V power supply

Figure 5-26 Wiring of relay dry contacts

- **Sink wiring**

In this mode, the internal 24 VDC power supply of the PCS is used for wiring. You need to turn the S2 DIP switch of the PCS to the ON position, and connect the COM2 terminal to the 0 V terminal of the external controller.

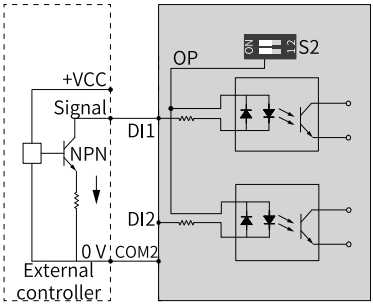
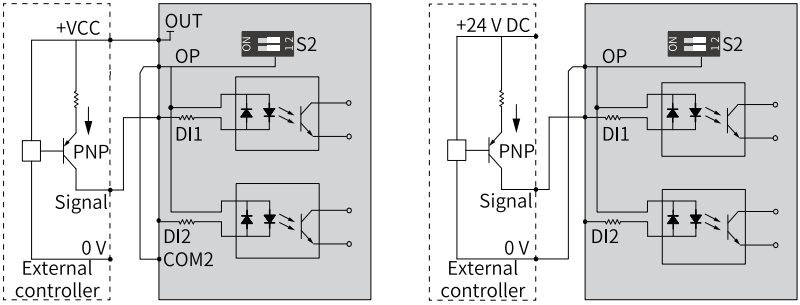


Figure 5-27 Sink wiring

- **Source wiring**

  In this mode, you need to turn the S2 DIP switch of the PCS to the OFF position. Connect the contacts to the internal 24 VDC power supply of the PCS through the OUT port or to an external 24 VDC power supply.



Using an internal 24 V power supply

Using an external 24 V power supply

Figure 5-28 Source wiring

Note

OP and OUT terminals are not connected to XT2, so the source wiring mode is used. If it is necessary to connect to the OP or OUT terminal, connect them on the communication board.

Wiring of DO terminals

- **Relay as the load**

CAUTION

To use the DO terminal to drive a relay, connect a snubber diode to both ends of the relay coil. Otherwise, the 24 VDC power supply will be damaged immediately once there is digital output. The drive voltage should be less than 24 VDC and the current should be less than 20 mA.

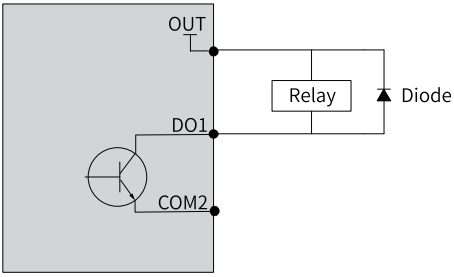


Figure 5-29 Connection between the DO terminal and relay

- **Optocoupler as the load**

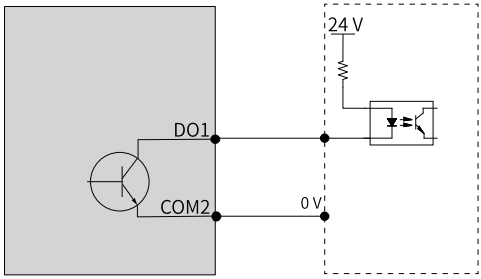


Figure 5-30 Wiring of connecting DO terminals to a photocoupler

5.6.4 Wiring of AI Terminals

Note

The following takes wiring on the communication board as an example. For how to wiring on the control cable terminal, see the **mapping between control cable terminals XT2 to XT3 to terminals on the communication board** of section *"5.6.1 Communication and I/O Terminals" on page 68*, and perform wiring correctly.

The PCS has two AIs and their wiring method is the same. The following describes how to wire the AI1 terminal.

- **Voltage signal as input**
  Short J9 to pins 2 and 3.

  Weak analog voltage signals are prone to external interference. Therefore, a shielded cable is required, and the wiring distance must be as short as possible (no longer than 5 m), as shown in *"Figure 5-32 Wiring when AI input is current signal" on page 88*. In scenarios where analog signals experience severe external interference, install a filter capacitor or a ferrite core on the analog signal source. Connect the drain wire of the AI terminal shield to the PE terminal.

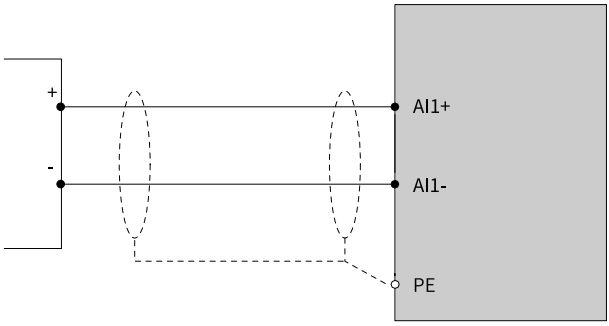


Figure 5-31 Wiring for AI terminals with voltage signal

- **Current signal as input**
  Short J19 to pins 1 and 2. AI1+ is current input and AI1- is current output.

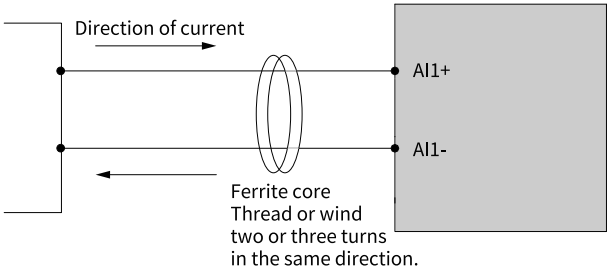


Figure 5-32 Wiring when AI input is current signal

5.6.5 Wiring of HDI and HDO Terminals

CAUTION

HDI and HDO are internal control terminals of the PCS and their wirings cannot be modified. Incorrect wiring may cause PCS error.

Wiring method in parallel mode:

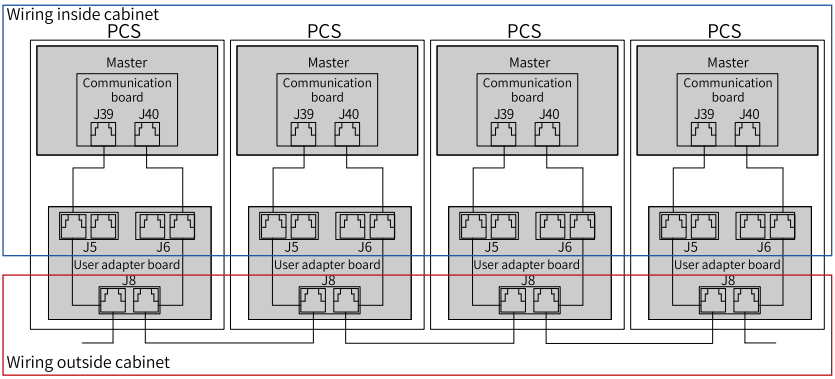


Figure 5-33 Carrier synchronization connection (1725 kW model)

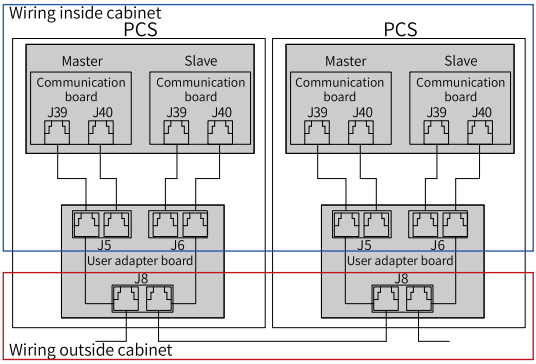


Figure 5-34 Carrier synchronization connection (2510 kW model)

5.7 Blocking Cable Outlet Holes

After the cable installation is completed, block the cable outlet holes (including secondary inlet holes and DC inlet holes) with fire-resistance mud. The fire-resistance mud is pressed tightly around the cable without any gap to prevent small animals or air from entering the cabinet to generate condensation.

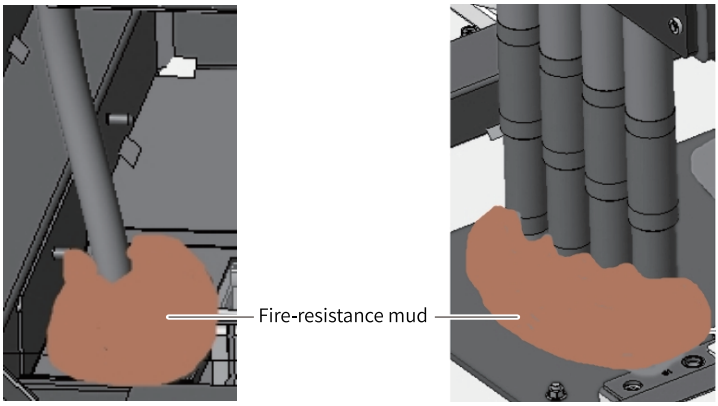


Figure 5-35 Blocking cable outlet holes

CAUTION

Check the fire-resistance mud periodically. If the mud falls off, small animals or air may enter the cabinet to generate condensation, which will damage the PCS.

5.8 Grounding

1. Use the sleeve tool and M12 screws to tighten the grounding cable to the grounding points of the PCS with a standard torque of 70 N·m.
   The following figure shows the four grounding points. When the integrator or customer performs the grounding operations, the ampacity of the grounding cable or grounding copper busbar must not be less than 1200 A.

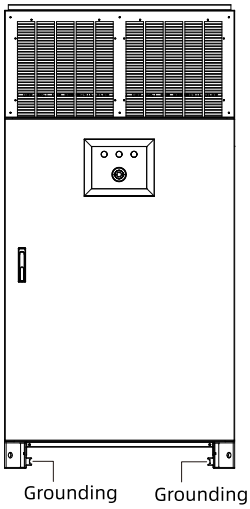


Figure 5-36 Grounding diagram (1725 kW model)

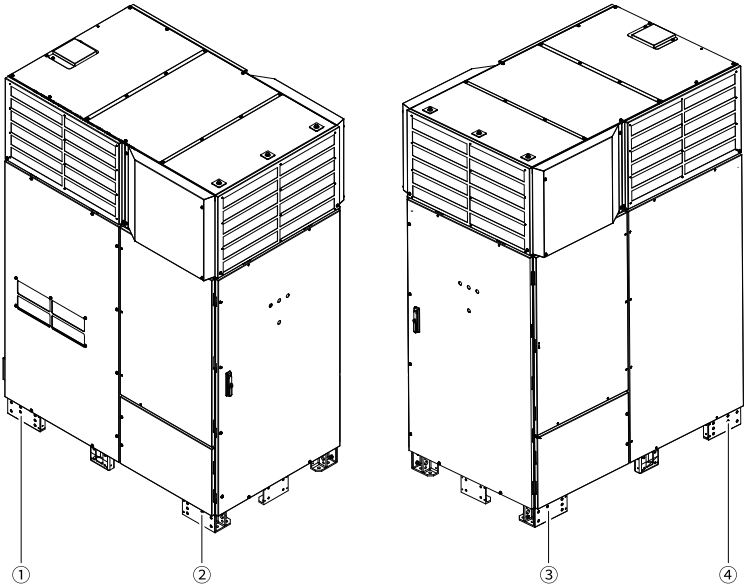


Figure 5-37 Grounding diagram (2510 kW model)

The following figure shows the M12 bolt hole positions for the grounding points.

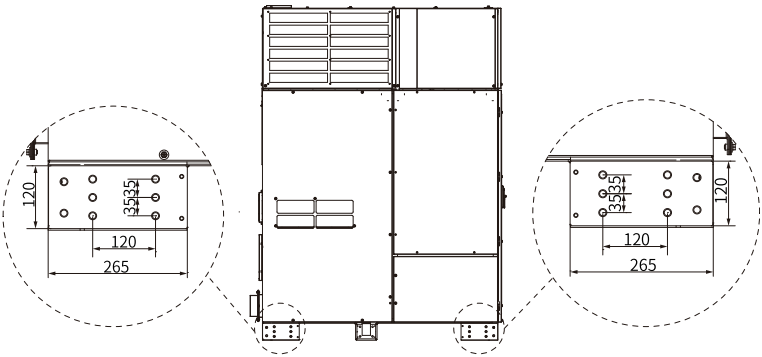


Figure 5-38 M12 bolt hole positions for the grounding points (2510 kW model)

2. Connect the other end of the grounding cable to the skid-mounted chassis of the integrated device.

5.9 Inspection After Wiring

After installation, check and measure the following items to avoid equipment damage and property loss.

Table 5–20 Post-wiring inspection checklist

No.	Item	Checked
1	Before measurement, the switches on the battery side and the grid side are turned off to ensure that the DC side and AC side of the PCS are de-energized.	□
2	The polarity of connection and the AC phase sequence between the storage battery and the PCS are correct and the wiring is secured. The inter-phase resistance must be megohms. Otherwise, check the circuits.	□
3	The external control cable, grounding cable, and communication cable are secured.	□
4	The grounding cable is intact, free of damage or crack. The grounding resistance is less than 0.1 Ω.	□
5	The installation area is free of tools or foreign matters.	□
6	The fire-resistance mud is pressed tightly around the cable without any gap to prevent small animals or air from entering the cabinet to generate condensation.	□

6 Initial Power-on and Operation

6.1 Inspection Before Initial Power-On

To ensure the PCS safety, upon initial power-on or after repair, check the following items.

Table 6–1 Installation checklist

No.	Item	Checked
1	The installation and operation environments meet the requirements. See *"4.2.2 Installation Environment Requirements" on page 43* and *"4.2.3 Requirements on the Installation Site" on page 43*.	☐
2	The PCS is fixed properly on the floor. See *"4.4 Installing the Power Conversion System" on page 49*.	☐
3	The PCS is grounded properly.	☐
4	The grounding busbar, DC positive/negative busbar, and busbar on the AC side are connected properly.	☐
5	The cable trench bracket is installed properly and the cable layout meets the requirements.	☐
6	There is no tool, foreign object, or drilling debris left inside the cabinet.	☐
7	The voltage on the both ends of the battery is lower than 1500 VDC and in the range of the corresponding model specifications. The positive and negative polarities are connected correctly.	☐
8	According to the corresponding specifications and models, the AC-side voltage is within the range. For details, see *"2.3 Technical Specifications" on page 18*.	☐
9	The cables are not damaged or scratched, and the filter screen of the air vent is in good condition.	☐
10	The emergency stop switch of the PCS is released.	☐
11	The entire path of the battery connected to the DC input side of the PCS is detected through insulation test to ensure that there is no ground fault.	☐
12	The circuit breakers on both the AC side and DC side have been disconnected, that is, they are all in the "OFF" position.	☐
13	The protection plates are already installed.	☐
14	All the covers are installed in place.	☐



- During power-on of the PCS, connect the control power supply first, check the PCS for any fault, and then connect the main power supply.
- During power-off, disconnect the main power supply first and then the control power supply; otherwise, the device may be damaged.

6.2 Power-on Procedure

The PCS can be powered by a 400 VAC power supply, a grid, or a DC battery. Connect the AC side and DC side of the PCS correctly.

1. Set PCS parameters and running mode through the EMS.
2. Power on the PCS. By default, the PCS is in the stop state and the main switches on the AC side and DC side are off. Send a "Standby" command on the EMS. Then, switches on the AC side and DC side of the PCS are automatically turned on and the PCS is powered on. Send a "Run" command on the EMS. The PCS automatically runs based on the current mode without the need of manual control.



Start the PCS in strict accordance with the preceding steps. Failure to comply may result in PCS damage or failure.

7 Stop Procedure



- Before removing the protective baffle, ensure that the PCS is de-energized (when a control power supply is used, the bus capacitor has a voltage of about 60 V).
- In normal situations, turn off the PCS in accordance with the normal stop procedure.
- In case of emergency, turn off the PCS in accordance with the emergency stop procedure to ensure rapid intervention and protect the PCS and peripheral equipment.

7.1 Normal Stop Procedure

The normal stop procedure is as follows:

1. The EMS delivers the "Stop" command and the PCS stops.
2. If the PCS is powered by an external power supply, disconnect the external power supply.

Note

Place a warning sign at the disconnection part to prevent accidental power-on.

7.2 Emergency Stop Procedure

In case of emergency, stop the PCS as follows:

1. Press the emergency stop switch on the cabinet door to switch off the PCS, with the AC switch and DC switch inside the PCS being disconnected automatically.
2. If the PCS is powered by an external power supply, disconnect the external power supply.

Note

The emergency stop switch can be used only in emergency. Use the stop command sent by the EMS during normal operation.

8 Troubleshooting

8.1 Insulation detection function

Overview

The insulation resistance value is criteria for assessing the insulation performance of electrical systems. It is also critical for the safety of electrical equipment and personnel.

Generally, active or passive insulation detection technology is adopted in the energy field. The unbalanced bridge (passive) method has been widely used because it has high detection accuracy, is easy to operate, and can measure the insulation resistance of the positive bus and negative bus in real time.

Single and dual DC models adopt the passive insulation detection method. When the battery voltage is greater than 540 V, insulation detection in single mode and mutual insulation detection of master and slave in parallel mode are supported.

Single mode

Mode selection: Set the insulation detection mode (F4.19) to 0 (single mode).

Detection enabling: Set insulation detection (FE.07) to 1 (enable).

BMS detection configuration: If the PCS is connected to the BMS that supports insulation detection, set FB.51 to 1 to enable BMS insulation detection.

Detection result: After insulation detection of the local device is complete, the insulation impedance detection completion flag (U00.82) is set to 1 and the detection result is displayed in U00.73.

Mutual insulation detection

Parallel master configuration: Set the insulation detection mode (F4.19) to 1 (mutual insulation detection), set the Local role (F8.00) to 1 (parallel master), set CAN communication for hardware parallel (F8.26) to 1 (enable), and specify the total number of slaves in parallel mode (F8.41) and the number of the local device in parallel mode (F8.42), which defaults to 0 for the master. If the PCS is connected to the BMS that supports insulation detection, set FB.51 to 1 to enable BMS insulation detection.

Parallel slave configuration: Set the insulation detection mode (F4.19) to 1 (mutual insulation detection), set the Local role (F8.00) to 0 (parallel slave), set CAN communication for hardware parallel (F8.26) to 1 (enable), and specify the number of the local device in parallel mode (F8.42), which starts from 1 for the slave. If the PCS is connected to the BMS that supports insulation detection, set FB.51 to 1 to enable BMS insulation detection.

Detection enabling: Set insulation detection (FE.07) to 1 (enable).

Detection result: After insulation detection of the local device is complete, the insulation impedance detection completion flag (U00.82) is set to 1 and the detection result is displayed in U00.73.

8.2 Common Troubleshooting

Energy storage battery polarity connected reversely

Possible causes

- The battery is connected to the power conversion system with wrong polarity.
- The battery voltage sampling circuit is abnormal.

Solution

1. Stop and power off all the devices and check whether the battery cables are correctly connected on the DC side.
2. Check whether the detection board battery sampling wires are correctly connected to the J1 (battery positive) and J2 (battery negative) terminals.

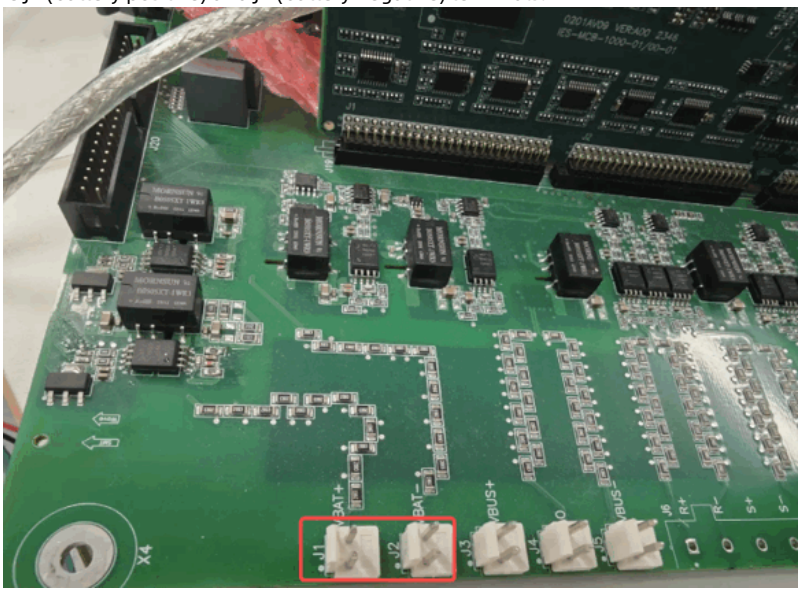


Figure 8-1 Checking the connection status

3. Remove the battery input terminal and measure the voltage of the battery input cable using the DC voltage range of the multimeter.
   Use the red lead (positive) of the multimeter to measure the positive input pole (BAT+).
   Use the black lead (negative) of the multimeter to measure the negative input pole (BAT-).

If negative voltage is measured, the polarity of the connected battery cable is incorrect. In this case, connect the BAT+ cable to the BAT+ terminal and the BAT- cable to the BAT- terminal.

4. Check whether the "Battery voltage polarity reversed protect threshold (V)" parameter in group F6 (Manufacturer) is set to the default value –100.

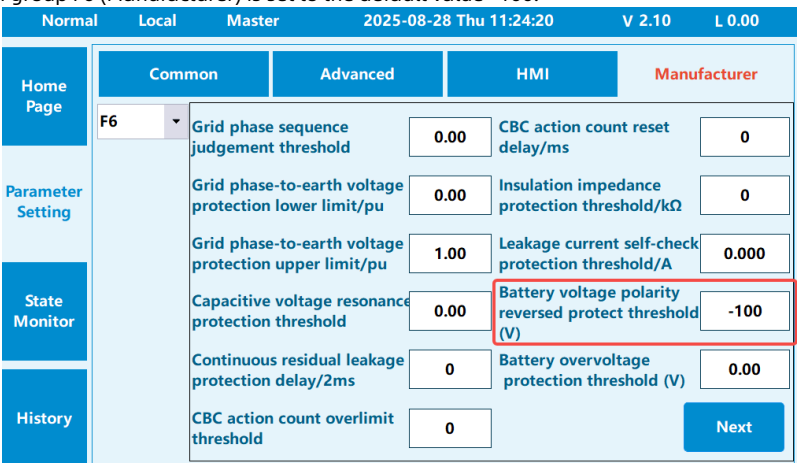


Figure 8-2 Checking manufacturer parameters

5. If the fault persists, collect the fault information (HMI history faults, history operations, and history states), take a photo of the settings of parameters in group E0, and read black box fault data.

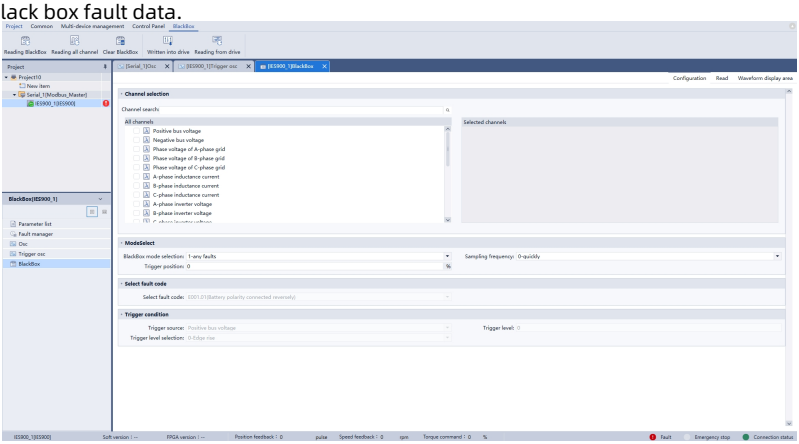


Figure 8-3 Collecting fault information

6. Contact the after-sales service engineer of Inovance to rectify the fault.

Energy storage battery voltage too high

Possible causes

- The battery voltage upon power-on is greater than the allowed value.
- The battery voltage sampling circuit is abnormal.
- The "DC full-bus software overvolt threshold / pu" parameter in group F6 is set to a too small value.

Solution

1. Check the battery cable connections on the DC side (fuse FU5/6 and detection board terminals J1 and J2).
2. Remove the battery input terminal and measure the voltage of the battery input cable using the DC voltage range of the multimeter.
   Use the red lead (positive) of the multimeter to measure the positive input pole (BAT+). Use the black lead (negative) of the multimeter to measure the negative input pole (BAT-). Measure the battery voltage sampling value.
3. Change the value of the "DC full-bus software overvoltage threshold / pu" parameter in group F6 based on the voltage of the externally connected battery.

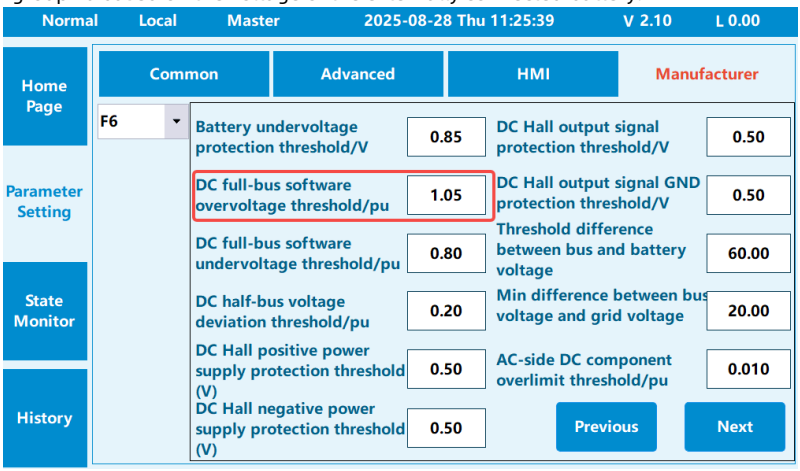


Figure 8-4 Modifying the configuration parameter

4. If the fault persists, collect the fault information (HMI history faults, history operations, and history states), take a photo of the settings of parameters in group E0, and read black box fault data.
5. Contact the after-sales service engineer of Inovance to rectify the fault.

Battery voltage too high

Possible causes

- The battery voltage is greater than the upper limit.

- The battery voltage sampling board is faulty.
- The "Battery overvoltage protection threshold (V)" parameter in group F6 is set to a too small value.

Solution

1. Check the J1 and J2 terminals in the DC voltage sampling circuit.
2. Remove the battery input terminal and measure the voltage of the battery input cable using the DC voltage range of the multimeter.
   Use the red lead (positive) of the multimeter to measure the positive input pole (BAT+). Use the black lead (negative) of the multimeter to measure the negative input pole (BAT-). Measure the battery voltage sampling value.
3. Check whether the "Battery overvoltage protection threshold (V)" parameter (DC voltage upper limit multiplied by a coefficient) in group F6 (Manufacturer parameters) is within the battery voltage range.

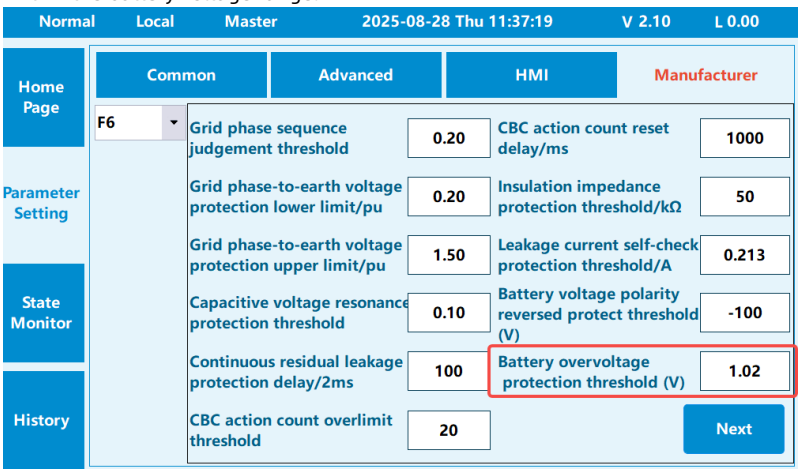


Figure 8-5 Confirming the battery voltage range

4. If the fault persists, collect the fault information (HMI history faults, history operations, and history states), take a photo of the settings of parameters in group E0, and read black box fault data.
5. Contact the after-sales service engineer of Inovance to rectify the fault.

Battery voltage too low

Possible causes

- The battery voltage is less than the battery voltage lower limit.
- The battery voltage sampling board is faulty.
- The "Battery underoltage protection threshold (V)" parameter in group F6 is set to a too large value.

Solution

1. Check the J1 and J2 terminals in the DC voltage sampling circuit.
2. Remove the battery input terminal and measure the voltage of the battery input cable using the DC voltage range of the multimeter.
   Use the red lead (positive) of the multimeter to measure the positive input pole (BAT+). Use the black lead (negative) of the multimeter to measure the negative input pole (BAT-). Measure the battery voltage sampling value.
3. Check whether the "Battery undervoltage protection threshold (V)" parameter (DC voltage lower limit multiplied by a coefficient) in group F6 (Manufacturer parameters) is within the battery voltage range.

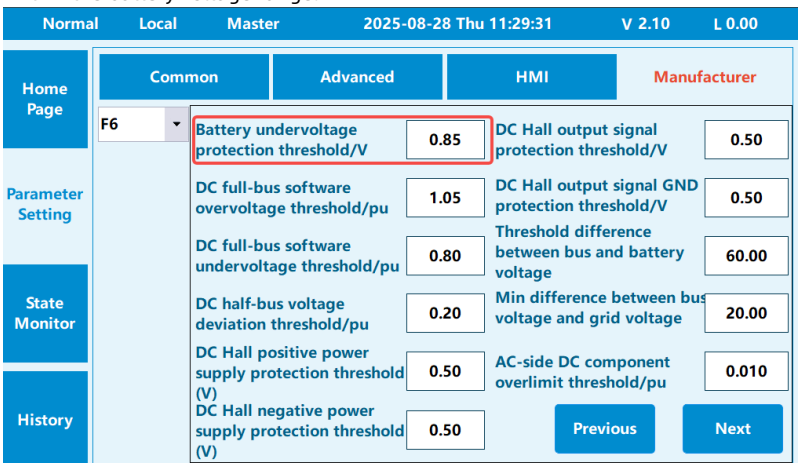


Figure 8-6 Confirming the battery voltage range

4. If the fault persists, collect the fault information (HMI history faults, history operations, and history states), take a photo of the settings of parameters in group E0, and read black box fault data.
5. Contact the after-sales service engineer of Inovance to rectify the fault.

BMS system fault

Possible causes

An exception occurs on the battery. (The fault signal is directly received from the BMS and displayed on the PCS.)

Solution

1. Check whether the "BMS state" parameter on the "Battery Parameters" page is a BMS fault.

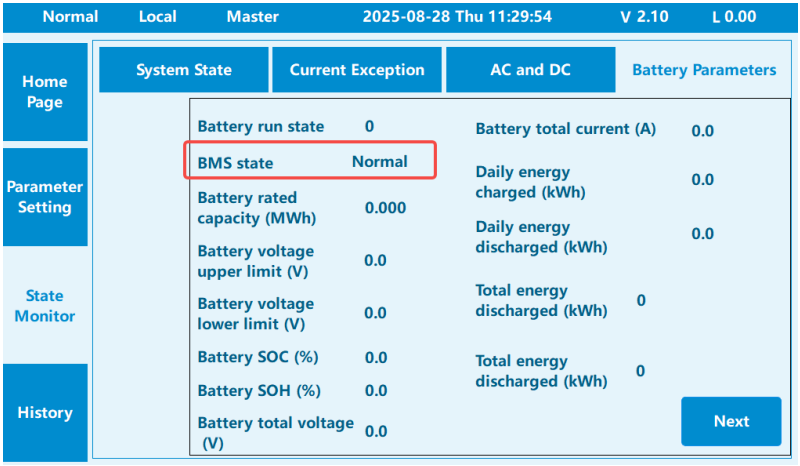


Figure 8-7 Confirming the battery parameter

2. If yes, contact the BMS manufacturer to rectify the fault.

IGBT A-phase fault

Possible causes

- The output circuit of the PCS is grounded or short-circuited.
- The IGBT module is damaged.
- The control hardware is faulty.

Solution

1. Take photos to record the HMI history faults, history operations, history states, and black box faults, and read black box data.

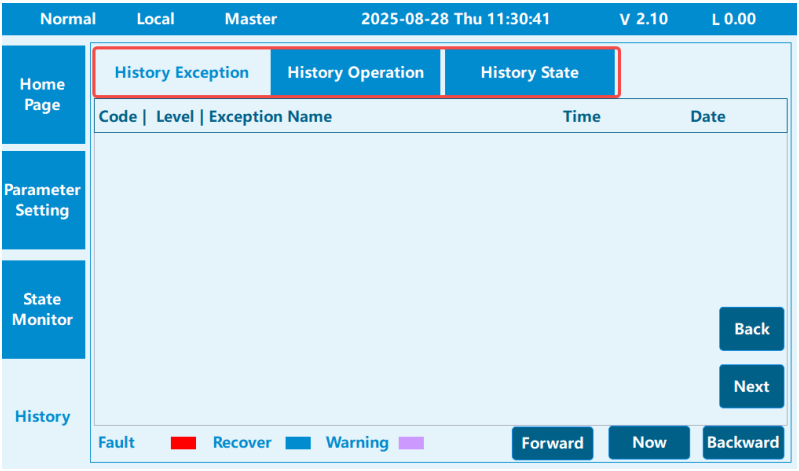


Figure 8-8 Viewing history data

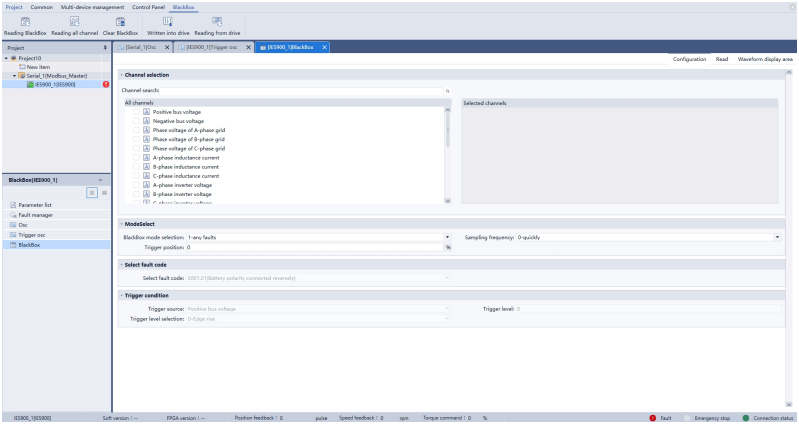


Figure 8-9 Reading black box data

2. Check whether a short circuit occurs on the AC side and whether the drive flat cable is firmly connected.
3. Check whether the three-phase IGBT module is working properly.
4. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

IGBT C-phase fault

Possible causes

IGBT-OT takes effect because the IGBT A-, B-, or C-phase temperature exceeds the temperature protection threshold.

Solution

1. Take photos to record the HMI history faults, history operations, history states, and black box faults, and read black box data.

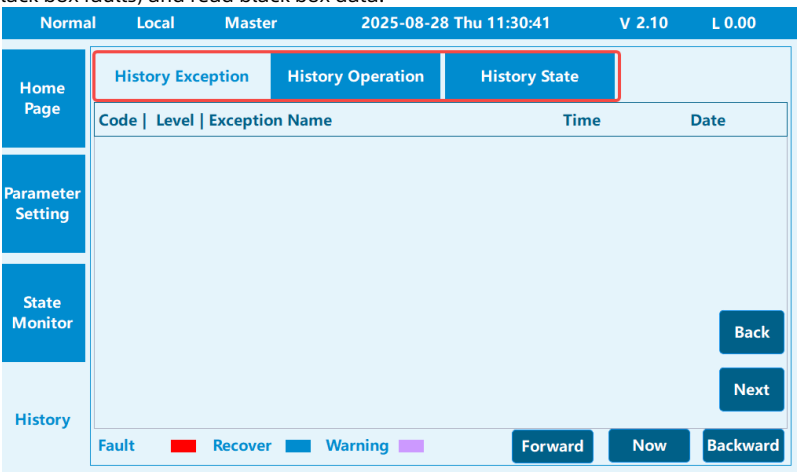


Figure 8-10 Viewing history data

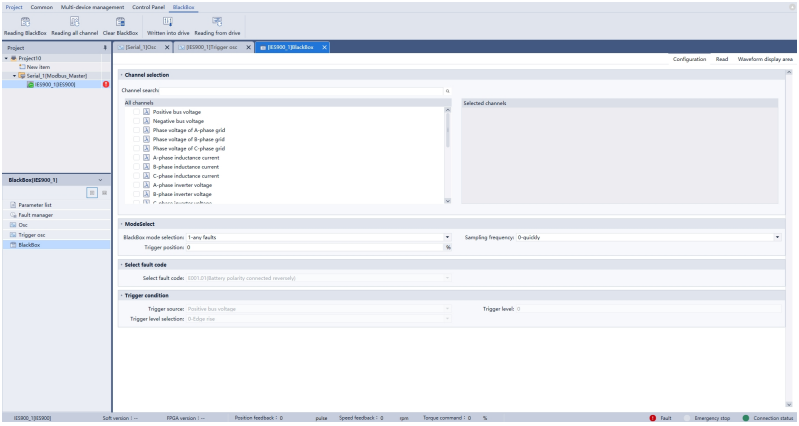


Figure 8-11 Reading black box data

2. Check whether the fan and water pump of the device are working properly.
3. Check whether the three-phase IGBT module is working properly.
4. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

CBC overcurrent

Possible causes

- The load is too large, and too many CBC actions are performed.
- A short circuit occurs on the AC side of the PCS, having an impact on the load.

Solution

1. Take photos to record the HMI history faults, history operations, history states, and black box faults, and read black box data.

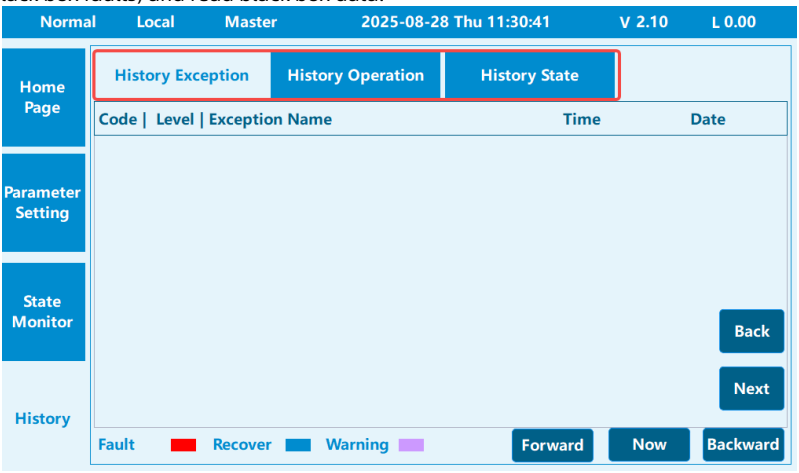


Figure 8-12 Viewing history data

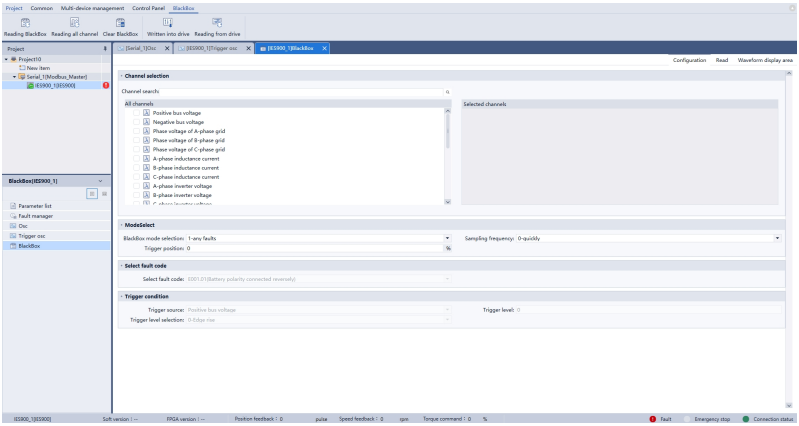


Figure 8-13 Reading black box data

2. Check whether a shirt circuit occurs on the AC side.
3. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Grid AC overvoltage

Possible causes

- The "Level-1 overvoltage coefficient/pu" parameter in group F6 is set to a too small value.
- The actual grid voltage is out of the specified range.
- The three-phase input voltage sampling circuit is abnormal.

Solution

1. Check whether the "Level-1 overvoltage coefficient/pu" parameter in group F6 (Manufacturer parameters) is set to 1.1.

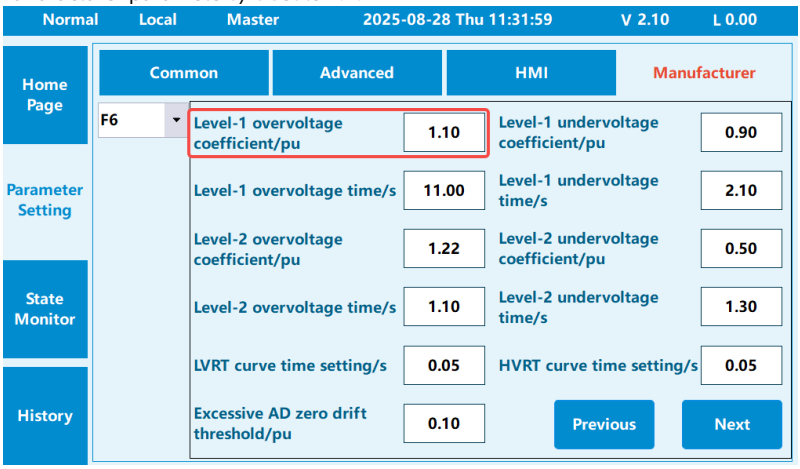


Figure 8-14 Check grid overvoltage (level 1) coefficient

2. Check whether the grid voltage range matches the that on the device nameplate.
3. Check whether the J6 and J35 terminals of the three-phase input voltage sampling circuit are properly connected and whether the three-phase voltage sampling value is correct.
4. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Grid AC undervoltage

Possible causes

- The "1-level undervolt coeff/pu" parameter in group F6 is set to a too large value.
- The actual grid voltage is out of the specified range.
- The three-phase input voltage sampling circuit is abnormal.

Solution

1. Check whether the "1-level undervolt coeff/pu" parameter in group F6 (Manufacturer parameters) is set to 0.9.

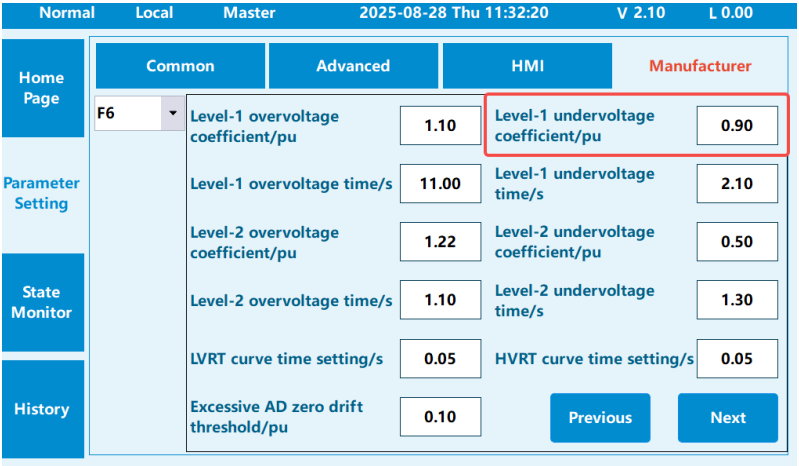


Figure 8-15 Check grid undervoltage (level 1) coefficient

2. Check whether the grid voltage range matches the that on the device nameplate.
3. Check whether the J6 and J35 terminals of the three-phase input voltage sampling circuit are properly connected and whether the three-phase voltage sampling value is correct.
4. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Grid AC overfrequency

Possible causes

- The grid voltage frequency is higher than the value of the "CN-GB level-1 over-freq protection threshold" parameter in group F6.
- The grid is powered off.

Solution

1. Check whether the "CN-GB level-1 over-freq protection threshold" parameter in group F6 (Manufacturer parameters) is set to 50.50.

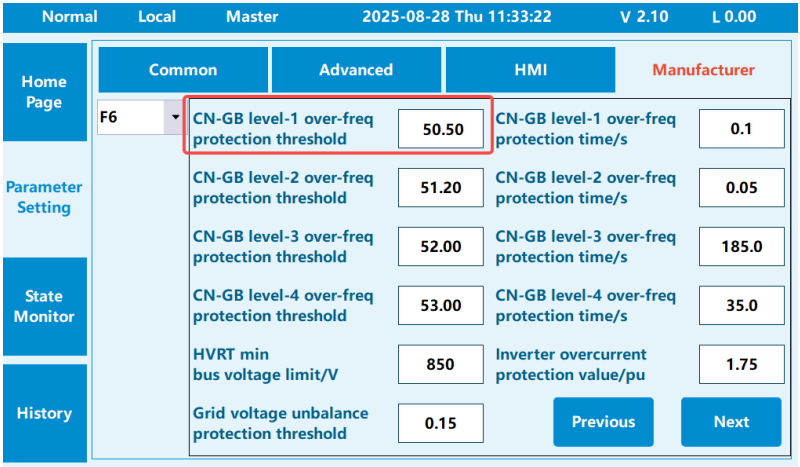


Figure 8-16 Confirming the manufacturer parameter

2. Check whether the power grid voltage is normal.
3. Check the grid record data on the MV side collected in the EMS background.
4. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Grid AC underfrequency

Possible causes

- The grid voltage frequency is lower than the value of the "CN-GB level-1 under-freq protection threshold" parameter in group F6.
- The grid is powered off.

Solution

1. Check whether the "CN-GB level-1 under-freq protection threshold" parameter in group F6 (Manufacturer parameters) is set to 48.5.

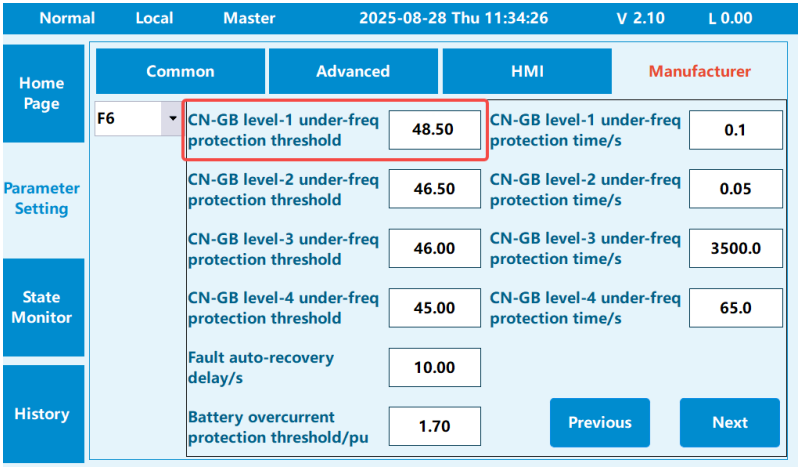


Figure 8-17 Confirming the manufacturer parameter

2. Check whether the power grid voltage is normal.
3. Check the grid record data on the MV side collected in the EMS background.
4. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Grid voltage reversed

Possible causes

The phase sequence in the three-phase grid connection is incorrect.

Solution

1. Check whether the phase sequence in the three-phase grid connection is correct.
2. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Phase lock error

Possible causes

A grid voltage phase lock error occurs.

Solution

1. Take photos to record the HMI history faults, history operations, history states, and black box faults, and read black box data.

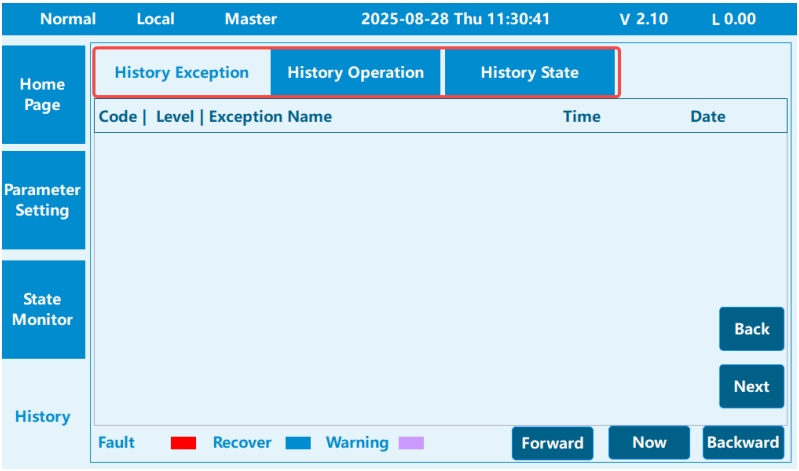


Figure 8-18 Viewing history data

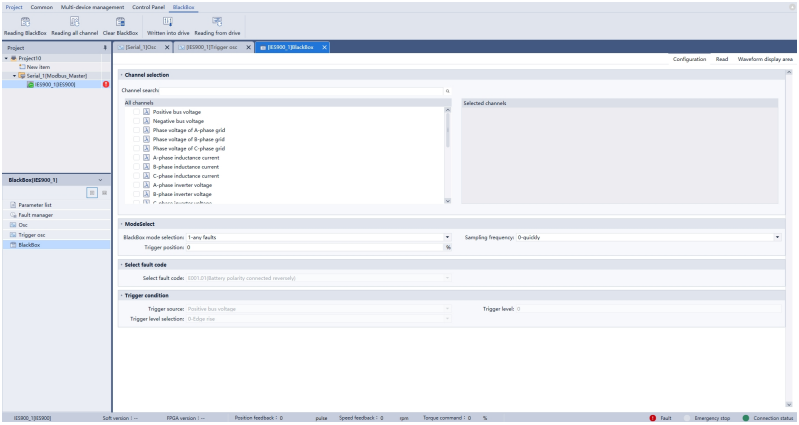


Figure 8-19 Reading black box data

2. Check whether the phase sequence in the three-phase grid connection is correct.
3. Check whether the grid voltage sampling circuit is disconnected or loosely connected.
4. Check whether the A/B/C three-phase output voltage is normal.
5. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Grid voltage imbalance

Possible causes

- The three-phase grid voltage imbalance is higher than the value of the "Grid voltage unbalance protection threshold" parameter in group F6.

- Grid input phase loss occurs.
- Grid voltage resonance occurs.

Solution

1. Take photos to record the HMI history faults, history operations, history states, and black box faults, and read black box data.

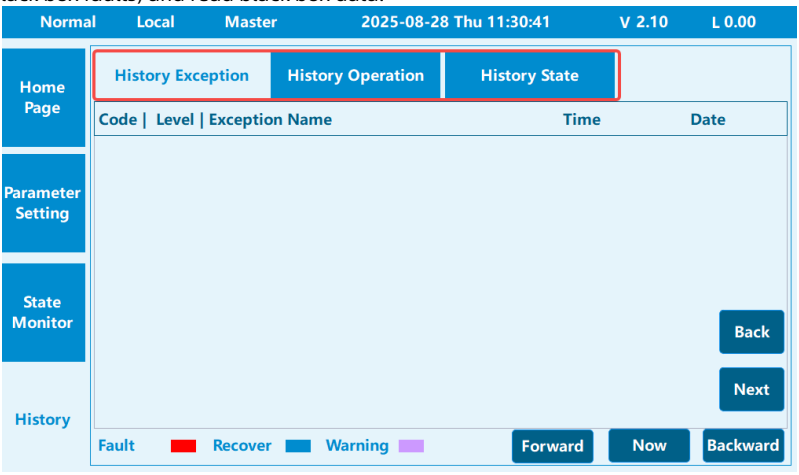


Figure 8-20 Viewing history data

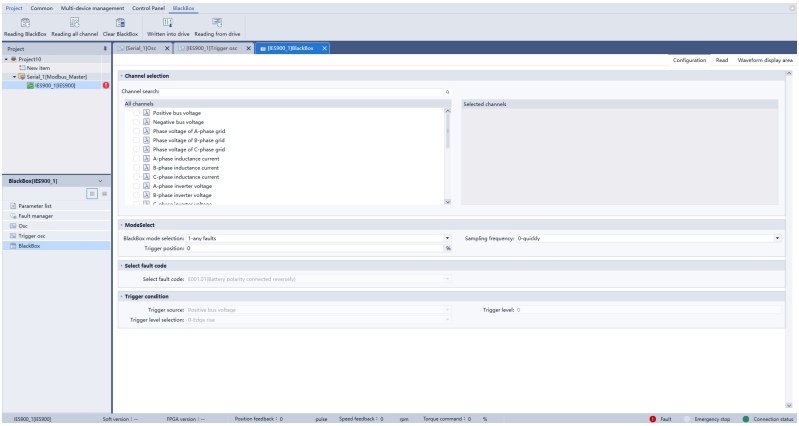


Figure 8-21 Reading black box data

2. Check whether the three-phase voltage is balanced and whether phase loss occurs.
3. Check whether the value of the "Grid voltage unbalance protection threshold" parameter in group F6 is 0.15.

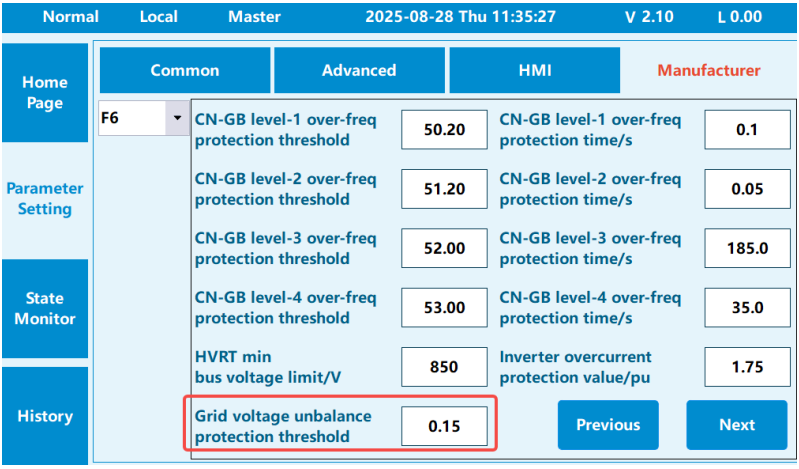


Figure 8-22 Confirming the manufacturer parameter

4. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Grid voltage mismatch

Possible causes

The amplitude or frequency of the three-phase grid voltage exceeds the allowed range before startup.

Solution

1. Check whether the amplitude of the three-phase grid voltage or frequency exceeds the allowed range of the device.
2. Check whether the grid voltage sampling circuit is disconnected or loosely connected.
3. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Islanding fault

Possible causes

- The grid is disconnected, or the device runs with load separately.
- The grid is weak, and factory defaults of the islanding parameters are not proper.

Solution

1. Take photos to record the HMI history faults, history operations, history states, and black box faults, and read black box data.

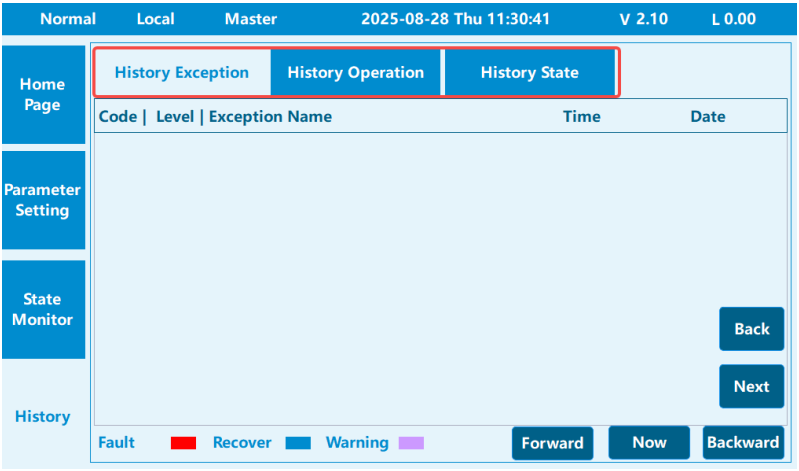


Figure 8-23 Viewing history data

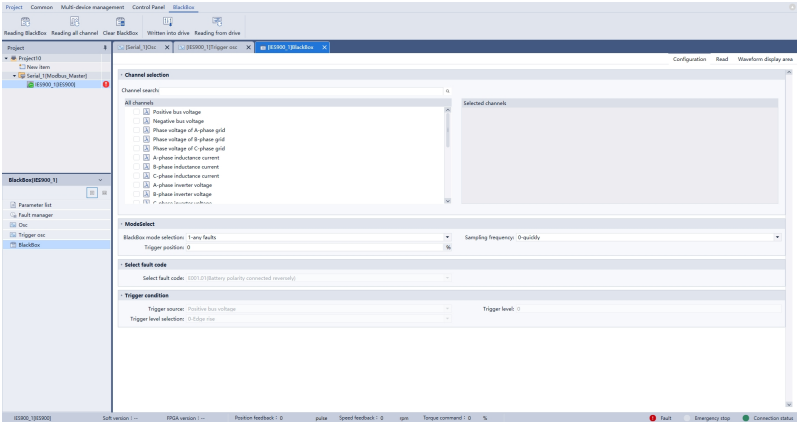


Figure 8-24 Reading black box data

2. Check whether islanding parameters F5.126 to F5.132 use factory defaults.
3. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Bus soft start fault

Possible causes

- The pre-charge contactor fails.
- The air switch of the pre-charge circuit is open.
- The battery voltage is too low.
- The bus voltage sampling cable is disconnected.

- The pre-charge resistor is faulty.

Solution

1. Take photos to record the HMI history faults, history operations, history states, and black box faults, and read black box data.

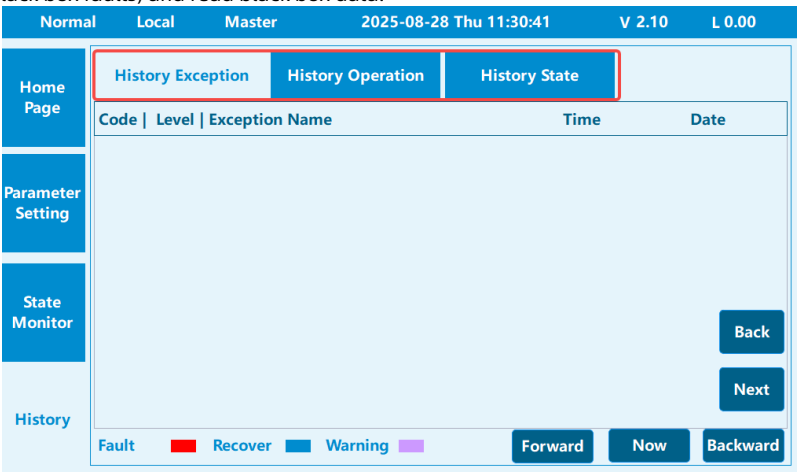


Figure 8-25 Viewing history data

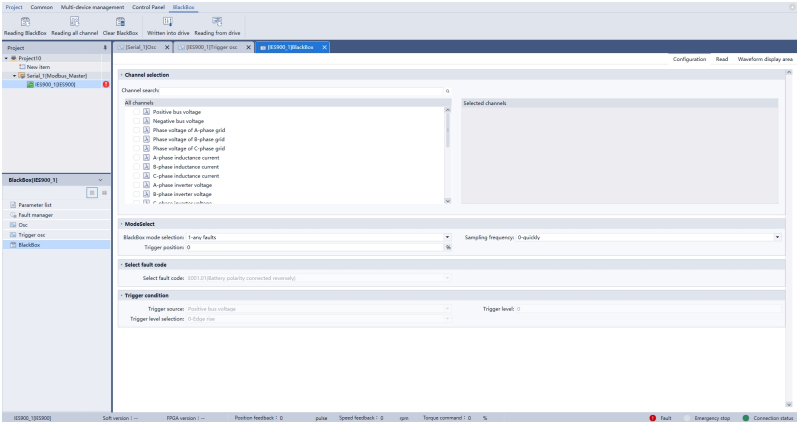


Figure 8-26 Reading black box data

2. Check whether the pre-charge contactor is working properly.
3. Check whether the battery voltage matches the model.
4. Check whether the bus voltage sampling cable is connected correctly and whether disconnection or loose connection occurs.
5. Check whether the pre-charge resistor is working properly.

6. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Low insulation resistance

Possible causes

The insulation resistance is lower than the threshold.

Solution

1. Check whether the value of the "Insulation impedance protection threshold/kΩ" parameter in group F6 (Manufacturer parameters) is lower than 50.

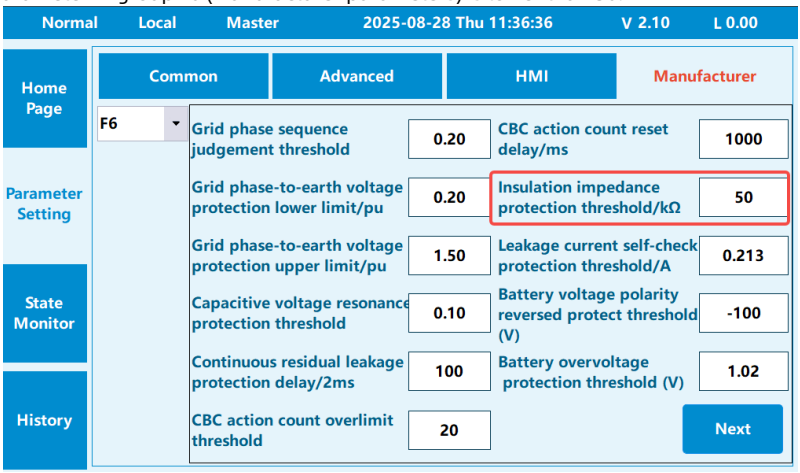


Figure 8-27 Confirming the manufacturer parameter

2. Check the grounding insulation resistance of the PCS main circuit and perform an insulation test to confirm the insulation resistance.
3. Check the master and slave relationship of the PCSs and whether insulation detection is enabled for both PCSs in parallel mode. (Insulation detection cannot be simultaneously enabled for both PCSs in parallel mode.)
4. Replace the insulation detection board.
5. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Insulation detection fault

Possible causes

The insulation detection switch command is different from the feedback.

Solution

1. Check whether the insulation resistance detection contactor can be normally switched on.

2. Check whether the feedback signal of the insulation resistance detection contactor is normal.
3. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

IGBT over-temperature

Possible causes

- The temperature of the IGBT module is too high. The over-temperature threshold varies based on the model.
- The water pump and AC fan work improperly.
- The temperature sensor is damaged.
- The load is too large during off-grid operation.

Solution

1. Check whether the filter screen on the air inlet of the device is blocked and whether there is a heat source around the air inlet.
2. Check whether all the fans and water pumps inside the device work properly.
3. Check whether the IGBT over-temperature threshold matches the device model.
4. Collect the fault information (HMI history exception, history operations, and history states), take a photo of the settings of parameters in group E0, and read black box fault data.

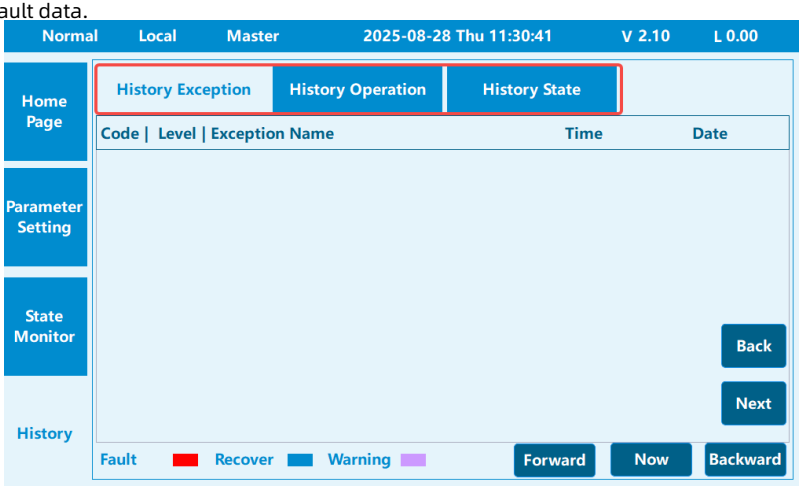


Figure 8-28 Viewing history data

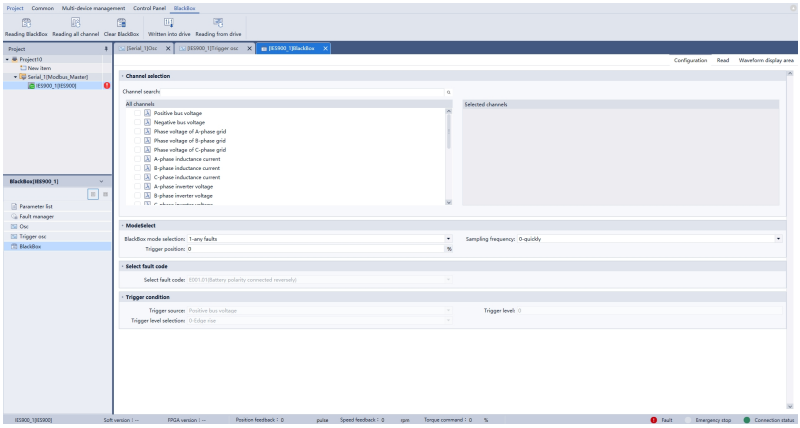


Figure 8-29 Reading black box data

5. Check whether the device load is too large during off-grid operation.
6. Measure and compare the NTC resistance of pins 1 and 10, pins 2 and 11, and pins 3 and 12 on the NTC sampling cable terminal J27 (communication board) of the IGBT module. In normal cases, the resistance of the three phases is similar.
   - Water pump port: M1 connected to pin 13, 14, 15, 16, 17, 18, 19, or 20 of X8
   - AC fan power port: FAN1 or FAN2 connected to pin 1, 2, 3, 4, 5, 6, 7, or 8 of X8
   - AC fan regulating port: FAN1 connected to pin 25 or 26 of X8 and FAN2 connected to pin 23 or 24 of X8
7. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

IGBT low-temperature

Possible causes

- The temperature of the IGBT module is too low.
- The NTC temperature sensor is damaged.
- The flat cable is not connected.

Solution

1. Check whether the ambient temperature is lower than the low temperature protection threshold.
2. Measure and compare the NTC resistance of pins 1 and 10, pins 2 and 11, and pins 3 and 12 on the NTC sampling cable terminal J27 (communication board) of the IGBT module. In normal cases, the resistance of the three phases is similar.
3. Check whether the flat cable is properly connected.
4. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Parallel communication fault

Possible causes

The communication between the control board and other PCSs fails.

Solution

1. Check the value of the "Local role" parameter in group F8 (Manufacturer parameters) on the HMI. Confirm that at least one master and one slave are available.

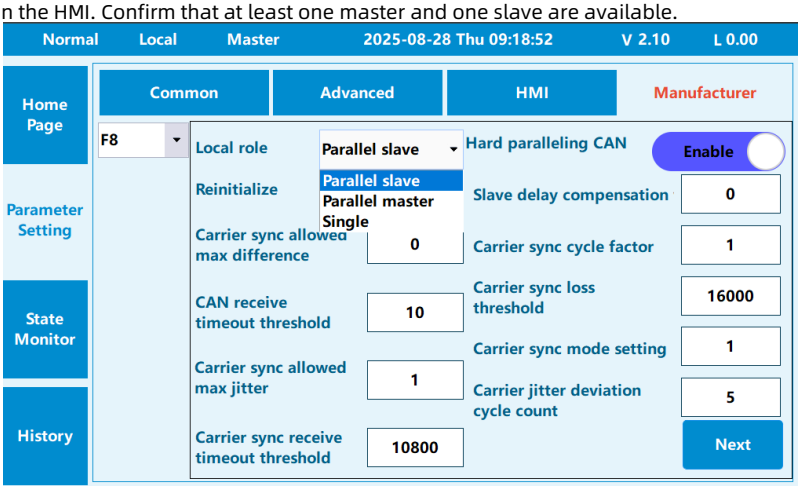


Figure 8-30 Confirming the manufacturer parameter

2. Check whether the DIP switch S6 is ON.
3. Check the CAN communication cable for the parallel system according to the electrical wiring.
4. Replace the flat cable and check whether the fault persists.
5. Replace the communication board and check whether the fault persists.
6. Replace the detection board and check whether the fault persists.
7. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Carrier synchronization fault

Possible causes

The carrier synchronization cable is incorrectly connected.

Solution

1. Check the value of the "Local role" parameter in group F8 (Manufacturer parameters) on the HMI. Confirm that at least one master and one slave are available.

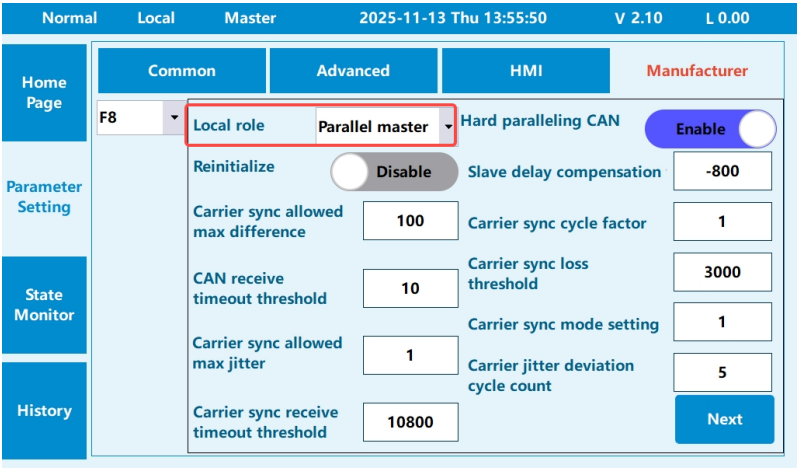


Figure 8-31 Confirming the manufacturer parameter

2. Check the sequence of the carrier synchronization cable according to the electrical wiring.
3. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

PCS association fault

Possible causes

A fault occurs in the HDI/HDO parallel system.

Solution

1. Check whether another fault except the PCS association fault occurs on the parallel device.
2. Rectify the fault and check whether the PCS association fault is automatically reset.
3. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Internal communication fault

Possible causes

The internal CAN communication is abnormal.

Solution

1. On the HMI, choose "State Monitor" > "System State> "Product Information" to check the software version of the primary and secondary ARM. Confirm that the software version of both the primary ARM and secondary ARM is read.

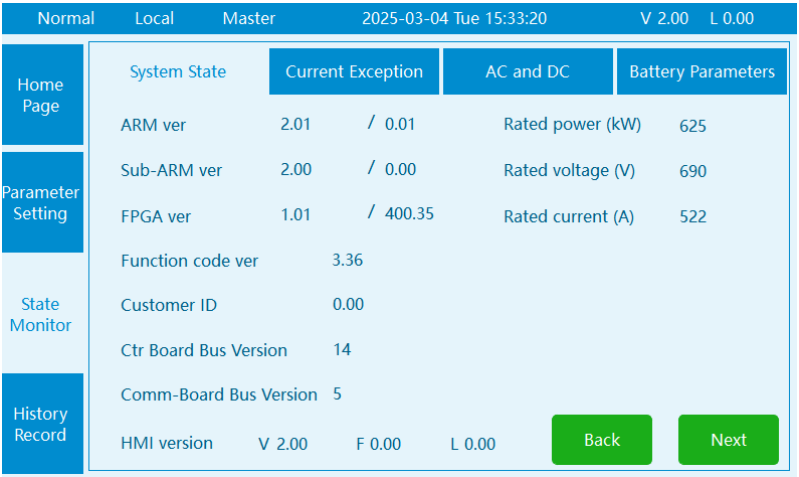


Figure 8-32 Confirming the manufacturer parameter

2. Check whether the flat cable between the detection board and communication board is properly connected.
3. Replace the flat cable and check whether the fault persists.
4. Replace the communication board and check whether the fault persists.
5. Replace the detection board and check whether the fault persists.
6. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

HMI communication fault

Possible causes

The HMI is disconnected from the user adapter board.

Solution

1. Check whether the communication cable between the HMI and user adapter board is connected properly.
2. Power on the device again and remove and insert the communication cable or replace the communication cable.
3. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

BMS communication fault

Possible causes

The BMS communication connection timed out.

Solution

1. Check whether the communication connection circuit is disconnected.

2. Check whether the DIP switches (CAN-S4 and RS485-S1) of the communication board are ON.
3. Check whether BMS communication protocol and Modbus protocol manufacturer are correctly configured.

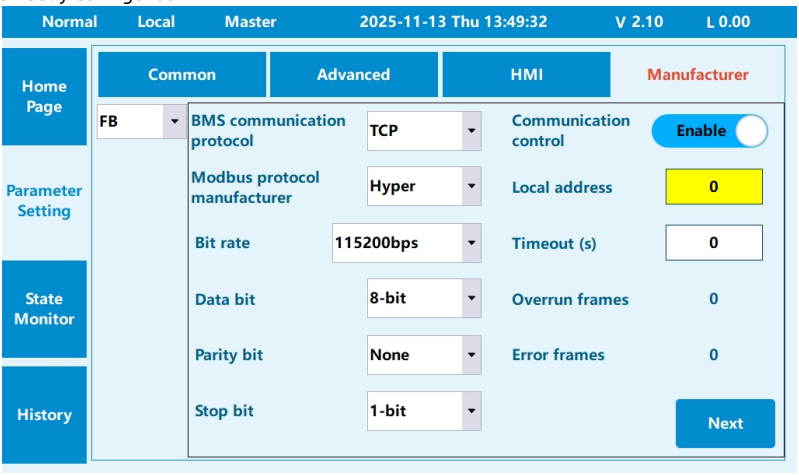


Figure 8-33 Confirming the manufacturer parameter

4. Check whether the local address is correctly configured.
5. Check whether the master and slave use the same data format.
6. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

EMS communication fault

Possible causes

EMS communication is disconnected.

Solution

1. Check whether the "EMS communication protocol" parameter in group FA is correctly configured.

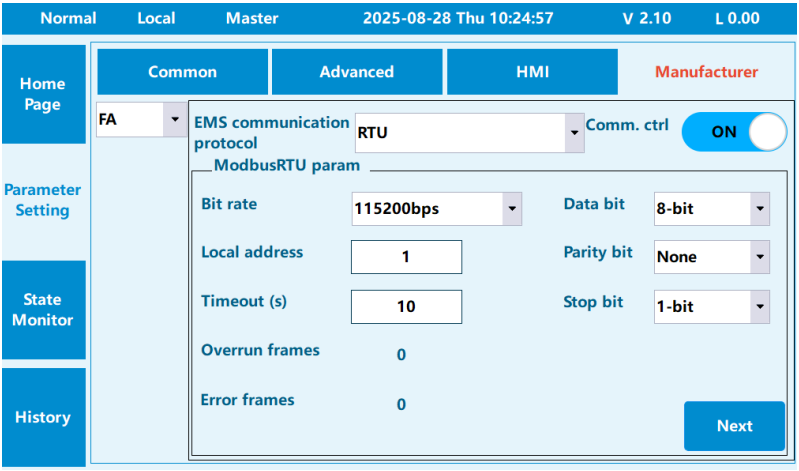


Figure 8-34 Confirming the manufacturer parameter

2. Check whether the local address is correctly configured.
3. Check whether the external EMS communication circuit is normal.
4. Turn the control power off and then on, and remove and insert the LAN cable.
5. Check whether the expansion card and main control board are connected firmly. If not, press the cable tightly.
6. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Three-phase fan fault

Possible causes

- Three-phase fan locked-rotor occurs.
- The power cable of the three-phase fan is not connected.
- A fan power phase sequence error occurs.

Solution

1. Check whether the fan power phase sequence is correct. (Check whether the fan is running in the correct direction in forced mode.)
2. Check whether a power phase loss occurs on the operating fan and whether the voltage of the three phases is 400 VAC.
3. Change the value of the "Active damping proportional coefficient" parameter in group F5 to 0.350 when external power supply is available.

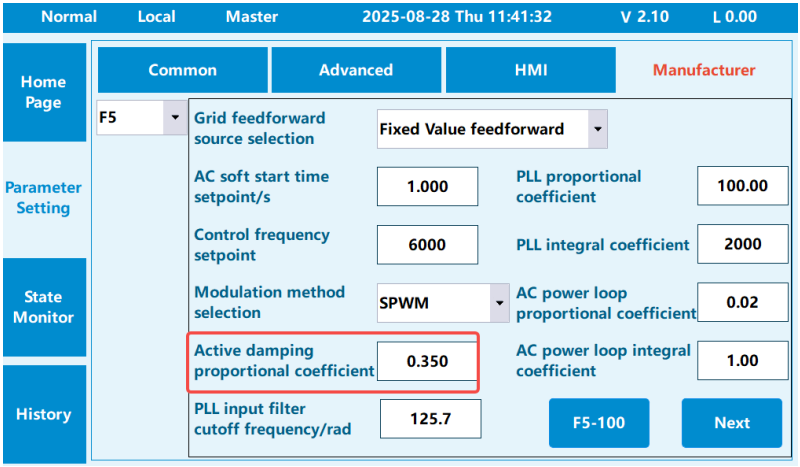


Figure 8-35 Confirming the manufacturer parameter

4. Check whether fluctuations occur in case of a grid voltage fault.
5. Check whether the total harmonics distortion (THD) of the fan's supply voltage is too large.
6. Check whether the fan power contactor KM4 is switched on.
7. Check whether the fan power circuit is disconnected.
8. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

Master-slave fault

Possible causes

- The software versions of the master and slave are inconsistent.
- Failed to identify the master and slave.
- The master and slave roles are conflicting.
- The active or reactive power or DC power of the master and salve is inconsistent.

Solution

1. Choose "State Monitor" > "System State" > "Product Information"and check the software version of the master and slave. Confirm that the software versions of the master and slave are consistent.

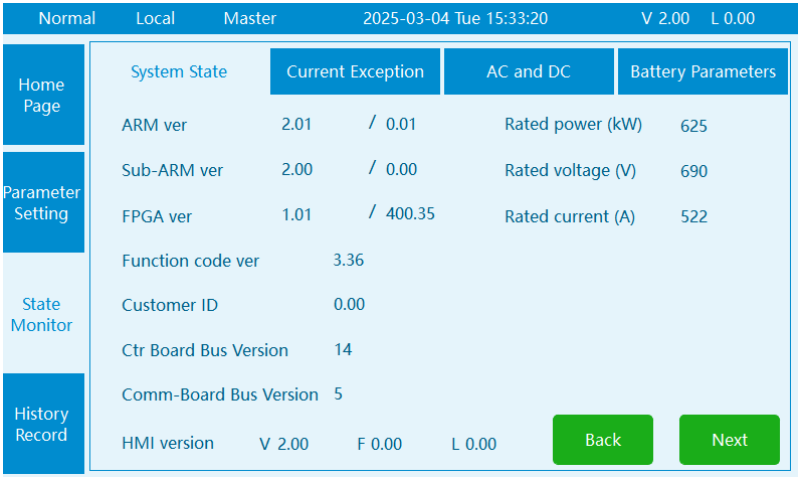


Figure 8-36 Confirming the manufacturer parameter

2. Check the value of the "Local role" parameter in group U0 (Manufacturer parameters) and confirm that the master and slave roles meet the actual situation.
3. Check whether the power delivered for the master and slave is consistent.
4. If the fault persists, contact the after-sales service engineer of Inovance to rectify the fault.

9 Maintenance

The influence of the ambient temperature, humidity, dust, and vibration will cause aging of components inside the PCS, which may result in potential faults or shorten the service life of the PCS. Therefore, it is necessary to carry out routine and periodic maintenance.

Note

- The power conversion system can be maintained by professionals only.
- Observe the related electrical operation standards in the installation country or region.
- Before maintenance, take necessary personal protection measures because the input and output of the power conversion system are both high current.
- Strictly follow correct procedures for maintenance.
- After the PCS is completely disconnected from the main power supply and the control power switch, wait at least the time specified on the warning label on the product and use a multimeter to check that the PCS is completely powered off before maintenance or repair (the bus capacitor with about 60 V when the control power is present).
- Put a warning sign or security belt after the power supplies are cut off to prompt other people not to power on the inverter during maintenance.
- During maintenance, the maintenance personnel must wear insulating protective equipment to prevent accidents.
- Perform necessary grounding and short circuit connections.
- Insulate live components with insulation materials to avoid personal injury.
- Make sure that no screws, washers, tools, etc. are left inside the device.

9.1 Daily Checklist

Check the following items during routine inspection.

Table 9–1 Daily inspection checklist

No.	Item	Checked
1	Designate observers to monitor the input and output voltage and current and operation status of the converter in real time, check the converter at specified positions, and perform maintenance in time in case of converter failure or voltage or current exception.	□
2	• The PCS does not make abnormal noise. • The PCS does not produce odor. • Use a temperature detector to detect the interior temperature of the PCS and ensure that the temperature is normal. • Check that surrounding ventilation, ambient temperature, humidity, and dust of the PCS meet the requirements.	□

No.	Item	Checked
3	Check that the surface is free of damage. Clean dirt on the surface with water or alcohol, and repaint the surface in case of paint damage. For how to repair the paint of the PCS, see *"9.4 Paint Repair Operation Instructions" on page 135*.	☐
4	• Check the insulation layer of the cable for aging, damage, or other defects. If any defect is detected, enhance the insulation or replace the cable. • Check that the wiring bolts are not aged or burnt and shake the bolts with hands to see whether the bolts are tightened properly. • Check the internal pipes for aging, cracking, and leakage, and replenish the coolant or replace it.	☐
5	Check whether the ventilation holes of air-air heat exchanger, water-air heat exchanger, and reactor are blocked, and use compressed gas or strong dust scrubber to remove dust in time.	☐
6	Check whether the PCS filter screen needs to be cleaned or replaced. For details, see *"9.3.2 Replacing (Cleaning) the Filter Screen" on page 132*.	☐
7	Check the fault mark on the surge protection device (SPD). If it is in red, the SPD is damaged and needs to be replaced immediately. If it is in green, the SPD is normal. The position of the SPD is shown in *"Figure 9-1 SPD position (1725 kW model)" on page 127*.	☐

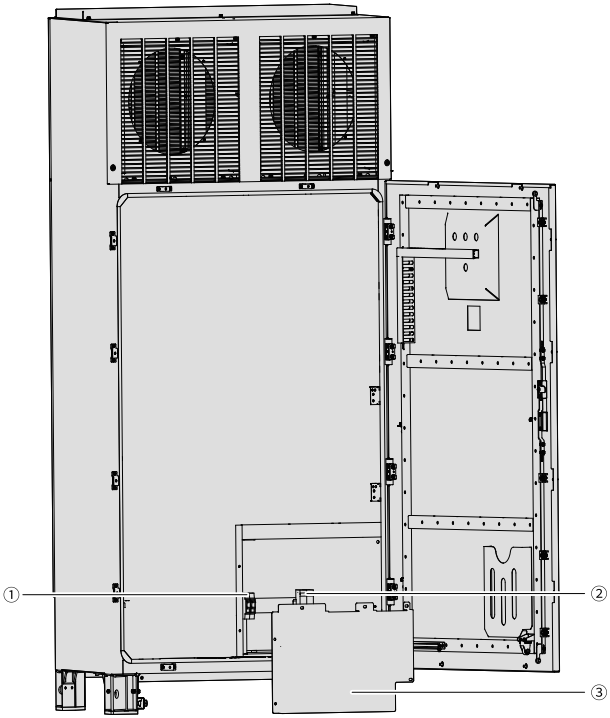


Figure 9-1 SPD position (1725 kW model)

Table 9–2 SPD position (1725 kW model)

No.	Name	No.	Name
①	DC SPD	③	PC protective plate
②	AC surge protection device	/	/

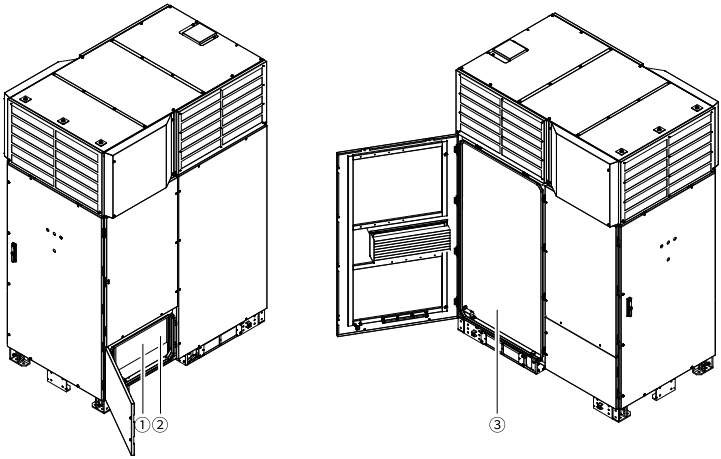


Figure 9-2 SPD position (2510 kW model)

Table 9–3 SPD position (2510 kW model)

No.	Name	No.	Name
①	DC SPD	③	AC surge protection device
②	PC protective plate	-	-

9.2 Periodic Inspection Items

The PCS has a high IP rating and can be used outdoors. However, long-term operation in harsh environment will age the PCS or damage its internal devices. Regular maintenance and inspection of the PCS and replacement of aged and damaged devices will effectively prolong the service life of the PCS and improve the performance of its internal devices.

Periodic inspection items are those that are difficult to inspect during daily inspection and operation. Check the following items, and take correction measures immediately if any item does not meet the requirements.



- The maintenance periods in the table are recommended only for the routine maintenance of the product. The actual maintenance period depends on the product installation environment. The maintenance period is also affected by the power station scale, location, and ambient environment. If the device runs in windy and dusty environments, shorten the maintenance period and increase the maintenance frequency.
- When the device runs in sandstorm and bad weather, other areas/time periods prone to flocculent pollutants or small mosquitoes, clean the filter screen and water-air heat exchanger in time to ensure normal ventilation of the device.
- When the device runs in desert or other areas with poor environment, shorten the maintenance period. Increase the frequency of exterior cleaning and corrosion and rust removal.
- In desert, check the inside and outside of the PCS carefully and clean it completely after each sandstorm.

Check Item	Item	Cycle
System cleaning	Check whether the humidity and gray scale of the PCS are within their normal ranges. Clean the PCS if necessary.	Half a year
	Check whether the PCS and its internal devices are damaged or deformed.	
	Check whether there is abnormal noise during operation of internal devices.	
	Check whether the temperature inside the PCS is too high.	
	Check whether the air inlet and outlet of the PCS are blocked.	
Internal components	Check whether the circuit board and components are clean.	
Dust removal	Check the heatsink temperature and check for dust. If necessary, use a vacuum cleaner to clean the heat dissipation module.	
Fire-resistance mud	Check whether the fire-resistance mud is pressed tightly around the cable without any gap to prevent small animals or moisture from entering the cabinet and damage the product.	

Check Item	Item	Cycle
Exterior of the cabinet	Check whether the PCS top has any flammable materials.	One year
	Check whether the welding point between the PCS and the foundation steel plate is firm and whether there is corrosion.	
	Check whether the PCS housing is damaged, de-painted or oxidized.	
	Check whether the monitoring window and cabinet door can be opened flexibly.	
	Check whether the sealing strip is fixed properly.	
Inside the cabinet	Check whether there are foreign objects, dust, dirt, and condensed water inside the PCS.	
Air inlet and outlet	Check the heatsink temperature and check for dust. If necessary, use a vacuum cleaner to clean the heat dissipation module.	
Wiring and cable layout	Check whether the cable layout meets the requirements and whether there is a short circuit. In case of any exception, correct it immediately.	
	Check whether all inlet and outlet holes of the PCS are well sealed.	
	Check whether water enters the PCS.	
	Check whether the power cable is loose, and if yes, tighten it according to the specified torque.	
	Check whether the power cable and control cable are damaged, especially whether the skin in contact with the metal surface has cut marks.	
	Check whether the insulation wrapping tape of the power cable terminal falls off.	
Grounding and equipotential bonding	Check whether the grounding connection is correct. The grounding resistance shall not be greater than 4 Ω.	
	Check whether the equipotential connection inside the PCS is correct.	
Fan	Check the running status of the fan.	
	Check whether the fan is blocked.	
	Check whether there is abnormal noise when the fan is running.	
Screw	Check whether there are screws falling inside the PCS.	
Warning sign	Check whether warning signs and labels are clearly visible and free from contamination. Replace them if necessary.	Two years
Cable shield grounding	Check whether the cable shield is in good contact with the insulation sleeve, and whether the grounding copper busbar is fixed properly.	
Corrosion	Check whether there is oxidation or corrosion in the PCS that affects the safe operation of the system.	

9.3 Parts Replacement

9.3.1 List of Maintainable Components

Table 9–4 List of maintainable components

No.	Name
1	Filter screen

9.3.2 Replacing (Cleaning) the Filter Screen

CAUTION

When the device runs in sandstorm weather, other areas/time periods prone to flocculent pollutants or small mosquitoes, clean the filter screen and water-air heat exchanger in time to ensure normal ventilation of the device.

Replacing the Filter Screen (1725 kW model)

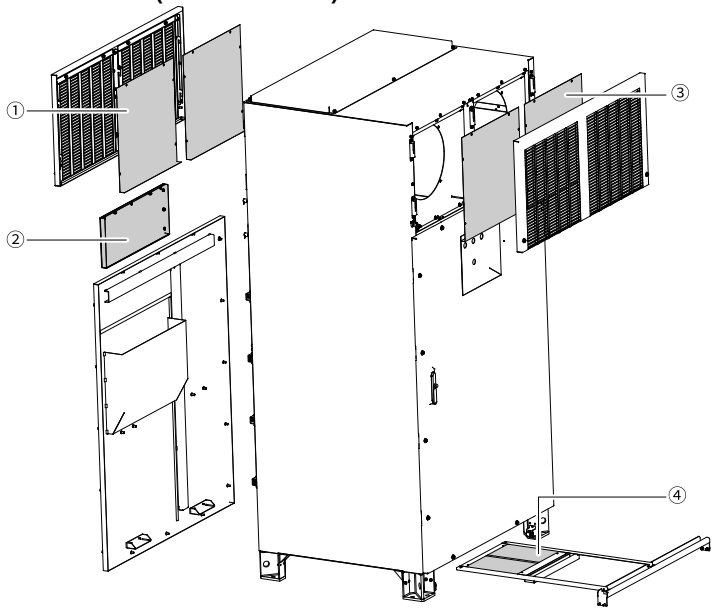


Figure 9-3 Replacing the filter screen

Table 9–5 Marks of the filter screens to be replaced

No.	Name	No.	Name
①	Fan filter screen of rear outlet	③	Fan filter screen of front inlet
②	Filter screen of reactor air outlet	④	Filter screen of reactor air inlet

Replacing the inlet and outlet filter screens of the fan

1. Remove the M6 stainless steel gasket screws from the screen cover and remove the front and rear screen cover assembly.
2. Remove the M6 nuts at the back of the filter screen assembly.
3. Replace the filter screen and restore the M6 nuts.
4. Restore the cover assembly of the cabinet and tighten the M6 stainless steel gasket screws.

Replace the filter screen of reactor air outlet

1. Remove the M6 stainless steel gasket screws from the rear door panel and remove the rear door panel.
2. Remove the M6 stainless steel gasket screws at the air inlet of the reactor duct on the rear door panel, and lift out the air inlet filter screen assembly of the reactor duct.
3. Remove the M6 nuts of the screen assembly.
4. Replace the filter screen and restore the M6 nuts.
5. Restore the filter screen assembly on the back door panel.
6. Restore the rear door plate of the cabinet.

Replacing (Cleaning) the Filter Screen

1. Remove the four M6 screws on the ground floor at the front of the cabinet and pull out the reactor air inlet filter screen assembly.
2. Remove the M6 nuts of the screen assembly.
3. Replace the filter screen and restore the M6 nuts.
4. Restore the filter screen assembly of the cabinet.
5. Restore the M6 stainless steel screws.

Replacing the Filter Screen (2510 kW model)

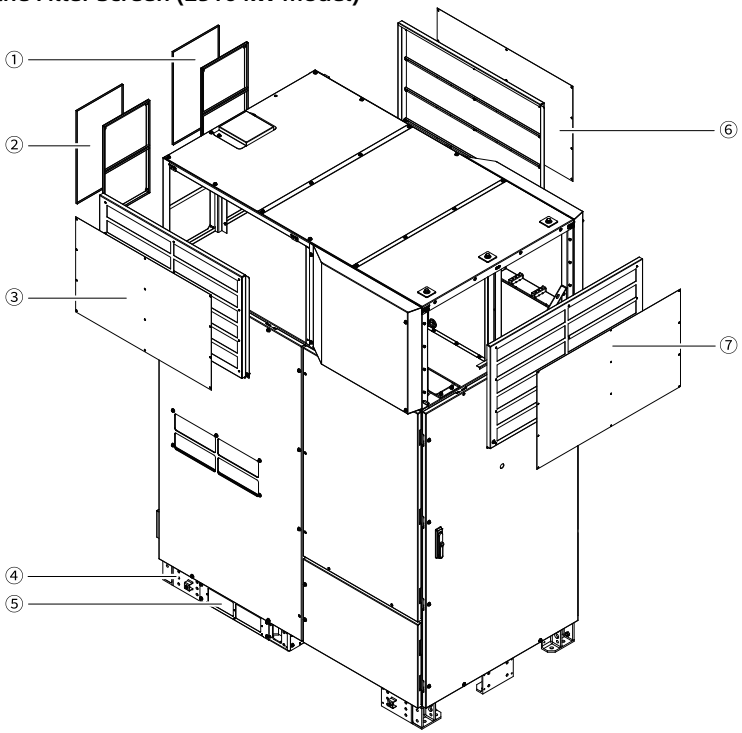


Figure 9-4 Replacing the filter screen

Table 9–6 Marks of the filter screens to be replaced

No.	Name	No.	Name
①	Filter screen 1 of rear air outlet	⑤	Insulation barrier
②	Filter screen 2 of rear air outlet	⑥	Filter screen 2 of side air outlet
③	Filter screen 1 of side air outlet	⑦	Filter screen of front inlet
④	Support unit	-	-

Replacing the filter screen of front and side air outlet

1. Remove the front and side covers.
2. Remove the filter screens to be replaced.
3. Install the new filter screen and the removed cover.

Replacing the filter screen of rear air outlet

1. Remove M5 screws from the rear cover.
2. Remove the rear cover and filter screen.
3. Install the new filter screen and the removed cover.

Replacing the filter screen of bottom air outlet

1. Remove the M6 screws from the insulation barrier and support unit.
2. Remove the insulation barrier and support unit.
3. Remove the filter screen.
4. Install the new filter screen and the removed cover.

Note

To clean the filter screen, refer to the replacing procedure.

9.4 Paint Repair Operation Instructions

- **Only when the surface is dirty**
  Clean it with a rag dipped in water or 97% alcohol.
- **When the finishing paint is damaged**

  1. Use sandpaper to smooth the surface of the damaged part.
  2. Clean the surface with 97% alcohol.
  3. Wait until the surface is dry, apply paint to the damaged part in a uniform and beautiful way.
- **When the paint surface is damaged and the substrate is exposed**

  1. Use sandpaper to smooth the surface of the damaged part.
  2. Clean the surface with 97% alcohol.
  3. After the surface is dry, spray zinc-rich primer on the damaged part.
  4. After the primer is dry, apply the finishing paint in a uniform and beautiful way.

9.5 Fluid Replacement Operation Instructions

1. Open the top cover of the PCS.
2. Unscrew the cover of the liquid inlet of the water tank.
3. Add new coolant liquid into the water tank.



When the coolant is refilled, the system can run with load after 15 minutes of running the water pump without the water tank cap.

4. Close the cover of the liquid inlet and reset the top cover.

Note

When the water pump is powered on to exhaust, it will automatically stop intermittently and speed up the exhaust. This is a normal phenomenon, and the system will run with load during this period.

10 Service and Support

Should you encounter a safety accident during the use or operation of the product, or face challenges in operating and maintaining the equipment, which remain unresolved after the relevant documentation is consulted, we provide multiple channels to ensure prompt resolution:

- Channel #1: Contact service@inovance.com.
- Channel #2: Visit https://www.inovance.com/global to access document downloads, after-sales support, spare parts ordering, repair applications, and authenticity verification services.
- Channel #3: Download My Inovance app (https://zshc-eu.inovance.com/download-pc/) where you can access products info and documentation, and query product parameters.

We are committed to providing you with quick and professional technical support, and we look forward to your satisfaction and trust.

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