



Energy Storage Converter 125kW-OS

User Manual

© All rights reserved. We reserve the right to investigate the responsibility for copying, transmitting and disseminating the manual without our permission. The content is subject to change without notice. To ensure the accuracy of parameters, please contact our engineer for systematic design.

Issue:

Valid version: V01.01.05

Interpretation of version number:

VXX.XX.XX - Hardware release, downward incompatibility

VXX.XX.XX - Functional version

VXX.XX.XX - Minor compatible changes

Table of Contents

1 About This Manual.....	5
1.1 Introduction.....	5
1.2 Intended Audience.....	5
1.3 Manual Usage.....	5
1.4 Symbols Used.....	5
2 Safety Instructions.....	7
2.1 Safety Precautions.....	7
2.2 Operational Precautions.....	7
2.2.1 Manual Storage.....	7
2.2.2 Personnel Requirements.....	8
2.2.3 Product Labeling.....	8
2.2.4 Other Precautions.....	8
3 Product Information.....	10
3.1 Product Overview.....	10
3.2 Product Principles.....	10
3.3 Product Models.....	11
3.4 Product Appearance and Dimensions.....	11
3.4.1 Product Appearance.....	11
3.4.2 LED Indicators.....	12
3.4.3 Product Dimension Drawings.....	12
3.5 Product Operating States.....	13
3.5.1 Standby state.....	13
3.5.2 Grid-connected operating state.....	13
3.5.3 Grid-disconnected operation state.....	13
3.5.4 Fault state.....	14
3.6 Product Parameters.....	14
4 Handling and Storage.....	16
4.1 Handling.....	16
4.2 Storage Requirements.....	16
5 Equipment Installation.....	17
5.1 Integrity Check.....	17

5.2	Installation Requirements.....	17
5.2.1	Installation Environment Requirements.....	17
5.2.2	Installation Electrical Requirements.....	17
5.2.3	Installation Space Requirements.....	18
5.2.4	Installation Cooling Requirements.....	18
5.2.5	Installation Wiring Standards.....	19
5.2.6	Fixed Equipment Installation.....	19
6	Electrical Connection.....	20
6.1	Safety Instructions.....	20
6.2	Conductor Requirements.....	20
6.3	Wiring Instructions.....	21
6.3.1	Position Distribution.....	21
6.3.2	Pre-wiring Confirmation.....	22
6.3.3	AC Side Wiring.....	22
6.3.4	DC Side Wiring.....	23
6.3.5	Grounding Wiring.....	24
6.3.6	Communication Wiring.....	24
6.4	Post-installation Inspection.....	25
7	Trial Operation.....	27
7.1	Inspection before Trial Operation.....	27
7.1.1	Energy Storage Converter Inspection.....	27
7.1.2	AC Side Voltage Inspection.....	27
7.1.3	DC Side Voltage Inspection.....	27
7.2	Startup Procedure.....	27
7.3	Shutdown Procedure.....	28
7.3.1	Normal Shutdown Procedure.....	28
7.3.2	Emergency Shutdown Procedure.....	28
8	Routine Maintenance.....	30
8.1	Regular Maintenance.....	30
8.2	Waste Disposal.....	30
9	Quality Assurance.....	31

1 About This Manual

1.1 Introduction

This manual primarily includes the following content:

Content	Brief Description
Safety instructions	Safety precautions to be observed and followed during the operation of the energy storage converter.
Product information	Description of the product's appearance and functions.
Handling, storage, and installation requirements	Requirements for handling and storage of the energy storage converter; requirements and recommendations for mechanical installation, electrical connections, etc.
Trial operation guide	Considerations for the trial operation of the energy storage converter, including operational guidance.
Routine Maintenance	Subsequent maintenance items.

1.2 Intended Audience

This manual is intended for personnel responsible for installing and performing other tasks related to this product. Readers should have a certain level of electrical, wiring, and mechanical expertise, and be familiar with electrical and mechanical schematics and electronic component characteristics.

1.3 Manual Usage

Please read this manual carefully before installing the product. Keep this manual along with other documentation provided with the product, and ensure that relevant personnel have easy access to it.

The content of the manual, including images, markings, symbols, etc., is owned by the Company. Unauthorized reproduction or disclosure of all or part of this content by individuals outside of the company is prohibited without written authorization.

1.4 Symbols Used

To ensure the safety of users and their property while using this product, and to optimize its efficient use, this manual provides important safety and operational instructions that must be accurately understood and followed during equipment installation and maintenance. The symbols used in this manual are listed below; please read them carefully to better use this manual.



Danger

Indicates a high level of potential hazard that could result in personal death or serious injury if not avoided.



Warning

Indicates a moderate level of potential hazard that could result in personal death or serious injury if not avoided.



Caution

Indicates that failure to follow instructions may result in minor physical injury or equipment damage.

Please pay attention to the safety labels on the equipment, including:

Label	Explanation
	This label indicates that there is high voltage inside the equipment, and touching it may result in electric shock hazard.
	Hot surface - beware of burns.
	The equipment contains AC and DC power terminals, therefore, the maintenance work for it shall be started at least 10 min after the disconnection of each circuit.
	Read the manual before performing any operation on the inverter.
	PCS shall not be treated as domestic garbage.
	Danger! Hazard at high risk level, which will cause death or serious injury if it is not avoided. Serious accidents and fatal injuries might be caused if failing to abide by this manual.
	This label indicates a protective earth (PE) terminal, which needs to be securely grounded to ensure operator safety.

2 Safety Instructions

2.1 Safety Precautions

This section outlines the general safety guidelines for operating the energy storage converter. For specific safety instructions related to usage and maintenance steps, please refer to the corresponding sections of this manual.



Warning

- It is strictly forbidden to modify or dismantle the equipment in any way. Unauthorized modifications may affect the working and safety performance of the equipment, and will be considered as automatic forfeiture of our quality warranty!
- If equipment damage occurs due to non-compliance with the manual, the Company reserves the right to withdraw the quality guarantee!
- The equipment may only operate within the scope of the technical agreement; using it for other purposes is strictly prohibited!



Danger

The product contains deadly high voltage!

- Use appropriate personal protective equipment (PPE) and follow electrical safety principles!
- Installation and maintenance work should only be performed by qualified electricians. Unqualified personnel are strictly prohibited from operating the equipment!
- Do not touch terminals or conductors connected to the grid circuit.
- Pay attention to all instructions or safety documentation related to the grid connection.
- Observe and adhere to the warning labels on the product.
- Follow the safety precautions listed in this manual and other relevant documents for the equipment.
- The converter contains energy storage components. After disconnecting the converter from power, wait for at least 10 min before performing any subsequent operations.
- When maintaining the equipment, ensure that the connection between the energy storage converter and the energy storage battery pack is completely disconnected.
- If onsite personnel need to report converter faults, do not restart the equipment until the fault is resolved.
- When leaving the equipment, ensure that all access panels are closed and locked.

Failure to follow these instructions may result in death or severe electric shock injury!

2.2 Operational Precautions

2.2.1 Manual Storage

This manual contains important information for operating the energy storage converter. Before operating the converter, please read this manual carefully and strictly follow all instructions, especially those related to life safety.

- Operate the energy storage converter strictly according to the descriptions in this manual; failure to do so may result in equipment damage, property loss, or even personal injury.
- Keep this manual in a safe place to ensure that maintenance and repair personnel can access it at all times.

2.2.2 Personnel Requirements

- Only qualified electricians or personnel with relevant qualifications are allowed to operate this product.
- Operators should possess skills and knowledge related to electrical equipment construction, installation, and operation.
- Operators should have received safety training and be able to recognize and avoid potential hazards.
- Operators should be thoroughly familiar with the composition and working principles of the product system.
- Operators should be thoroughly familiar with the user manual of this product.
- Operators should be thoroughly familiar with relevant standards in the country or region where the project is located.

2.2.3 Product Labeling

- The warning labels on the exterior of the energy storage converter contain important warnings and safety information. Do not tear or damage these labels.
- The nameplate on the door panel of the energy storage converter contains crucial parameter information. Do not tear or damage these labels.
- The rear air outlet of the energy storage converter is covered with a protective film. Do not remove the protective film before the equipment is powered on; it must be removed before operation to prevent overheating.

2.2.4 Other Precautions

	Warning
• All operations on the energy storage converter must comply with relevant standards in the country or region where the project is located.	
	Warning
• Maintenance or repair operations must not be performed while the equipment is energized! • When performing maintenance or repair, use temporary grounding wires for protective grounding and ensure that at least two personnel are present on-site. Maintenance can only be performed once the equipment is completely powered off and discharged.	

In addition, the following protective or emergency measures should be taken according to the needs of the site:

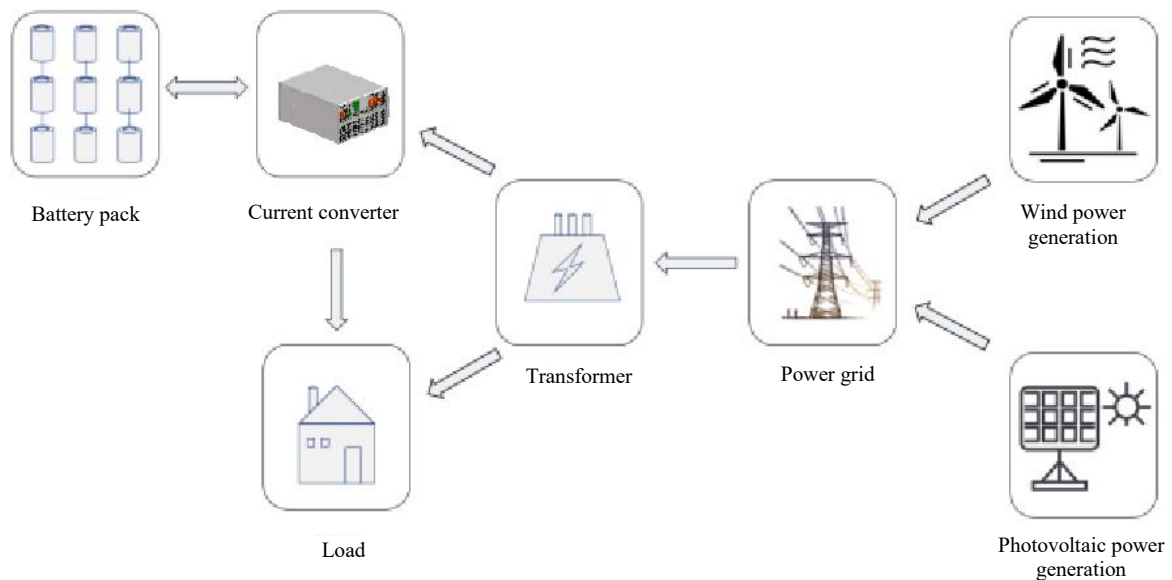
- During equipment maintenance or repair, personnel should take appropriate protective measures as needed, such as wearing noise-canceling earplugs, insulated shoes, and heat-resistant gloves.
- Avoid opening the cabinet doors for maintenance or repair during rainy or humid weather.

- The energy storage converter is typically installed in locations far from urban areas. Prepare necessary emergency rescue equipment and medical kits as needed for use in emergencies.
- Take all necessary auxiliary measures to ensure the safety of personnel and equipment.

3 Product Information

3.1 Product Overview

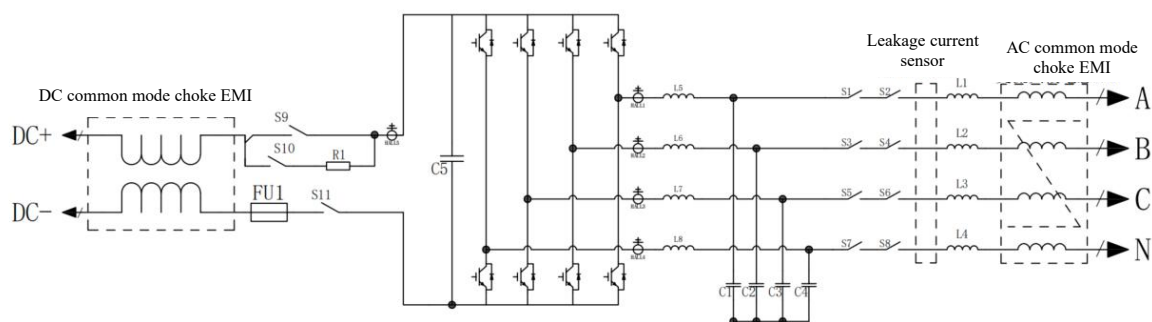
The energy storage converter is a bidirectional current-controlled conversion device that connects energy storage battery systems to the grid. It is capable of precisely and rapidly adjusting voltage, frequency, and power between the grid and the energy storage system, allowing for constant power and constant current charging and discharging, as well as smooth fluctuation power output. The converter not only meets the traditional grid-connected converter requirements for converting DC to AC but also addresses the bidirectional conversion needs brought by the "charging + discharging" function of the energy storage system. It supports both battery charging and discharging functions and can be used in various applications such as photovoltaic power generation, wind power generation smoothing, peak shaving and valley filling, and microgrids. The schematic diagram of the converter's charge and discharge system is shown below:



3.2 Product Principles

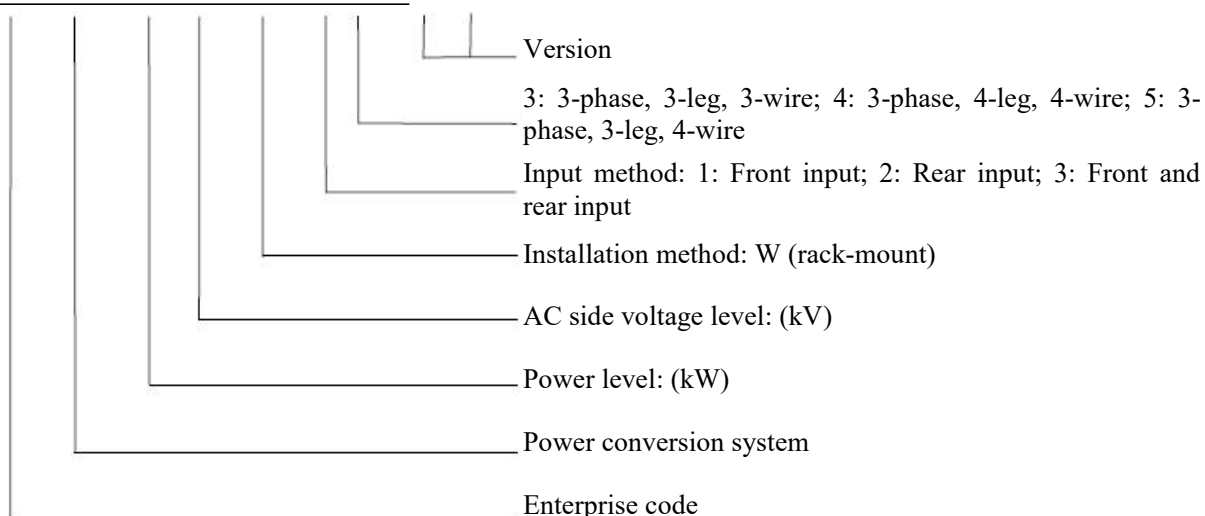
INPPCS converter can realize AC/DC conversion between power grid and battery, and complete the bidirectional energy flow between them, which is the main actuator and core component of energy storage system. Through the advanced control strategy, it can realize the charging and discharging management of the battery, the charging and discharging power control of the battery energy storage system, and two operation modes and mode switching functions of grid connection/disconnection; At the same time, it has perfect protection functions, such as islanding protection, DC overvoltage protection, AC overvoltage/undervoltage protection, etc., meeting the requirements of grid connection and disconnection.

The principle topology diagram for a three-phase, four-leg, four-wire system is as follows:



3.3 Product Models

INP PCS—□/□—□—□□—□—□



No.	Model	Voltage (kV)	Capacity (kW)	Remarks
1	INPPCS-125/0.4-W-14-A2-OS	0.4	125	Front-facing primary and secondary panels, with airflow entering from the front and exiting from the rear

3.4 Product Appearance and Dimensions

3.4.1 Product Appearance



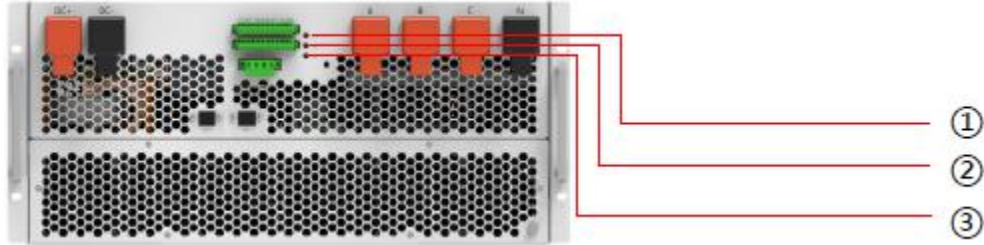
The appearance and external components of the energy storage converter are shown in the diagram below:

No.	Area Description
①	Indicates the product's appearance

- ② Indicates the external wiring area of the product, and may also display the product's operating status.

Note: The color and appearance of the product are subject to the actual item.

3.4.2 LED Indicators

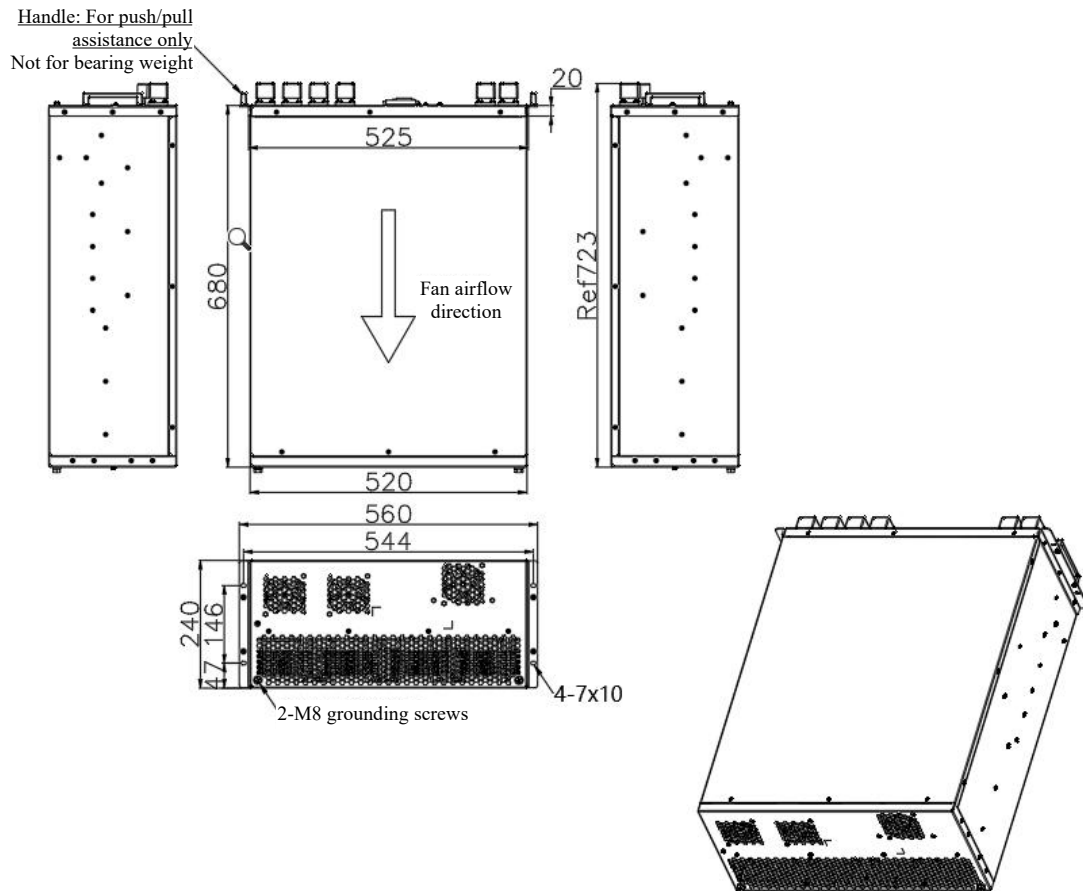


No.	Component Name	Indicator Meaning
①	Yellow LED indicator	Power indication; it will stay on when DC input is above 60V.
②	Red LED indicator	Alarm indication; it will stay on when there is a fault in the module.
③	Green LED indicator	Operation indication; it will flash during standby/shutdown, and stay on when the module is running.

Note: The color and appearance of the product are subject to the actual item.

3.4.3 Product Dimension Drawings

The dimensional information of the energy storage converter is as follows:



Product Models	Product Dimension (mm)		
	W	D	H
NPPCS-125/0.4-W-14-A2-OS	520	680	240

3.5 Product Operating States

3.5.1 Standby state

Standby state refers to waiting to receive operation instructions after grid-connected INPPCS is turned on. When the operation instruction is the charging instruction (i.e. constant voltage charging voltage value, constant current charge current value and constant power charging power value, before which it is necessary to determine whether the charge mode is constant voltage, constant current or constant power in advance), it enters the grid-connected charging state; When the operation instruction is set as the discharge instruction (i.e. the current value of constant-current discharge and the power value of constant-power discharge, before which it is necessary to determine whether the discharge mode is constant-current or constant-power), it enters the grid-connected discharge state. When the set constant current charge/discharge current value is $\leq 0.1A$, or the constant power charge/discharge power value is $\leq 0.1KVA$, the equipment will enter standby state.

3.5.2 Grid-connected operating state

Step 1: A DC input terminal of the INPPCS is connected with a DC output of battery assembly, and an AC output terminal is connected with a power grid;

Step 2: Confirm that INPPCS is in normal shutdown state (the panel fault indicator does not light up, the operation indicator flashes, and there is no fault display in the real-time fault information interface);

Step 3: INPPCS will gradually close the switch and carry out "self-test" in front of AC and DC sides to enter the "grid-connected" state;

Step 4: Fast power response, INPPCS charge/discharge conversion time is less than 100 ms. When the power grid is abnormal, it will be disconnected from the power grid immediately, and will enter the fault state immediately.

Step 5: In this mode, INPPCS can convert the direct current of the battery into alternating current and merge it into the power grid; alternatively, the alternating current of the power grid can be charged into the battery.

3.5.3 Grid-disconnected operation state

Step 1: The DC input terminal of INPPCS is connected with the DC output of the battery assembly, and the AC output terminal is connected with the load line;

Step 2: Confirm that INPPCS is in normal shutdown state (the panel fault indicator does not light up, the operation indicator flashes, and there is no fault display in the real-time fault information interface);

Step 3: INPPCS will gradually close the switch and conduct "self-test" in front of AC and

DC sides, and enter the "Grid-disconnected" state.

3.5.4 Fault state

When INPPCS fails, the energy storage converter will immediately disconnect the AC side circuit breaker and the DC side circuit breaker and enter the fault state, thus ensuring the system safety. INPPCS will continuously monitor whether the fault is eliminated or not, and if the fault is not eliminated, it will remain in a fault state. If the fault restart function is enabled, the equipment will automatically clear the fault. If the fault is resolved, the equipment will restart automatically.

3.6 Product Parameters

Model:	INPPCS-125/0.4-W-14-A2-OS	
DC Side Parameters		
DC voltage range	DC600V～1000V	
Full load DC voltage range	DC630V～950V	
Rated DC current	198A	
Rated DC power	125kW	
AC Grid-connected Parameters		
Rated AC power	125kW	
Overload capacity	1.1 times for long-term, 1.2 times for 1 min	Ambient temperature ≤40℃
Rated voltage	AC400V	
Rated AC current	180A	
AC access method	Three-phase four-wire	
Grid voltage range	400V (-15%～+15%)	
Grid frequency range	50Hz/60Hz±2.5Hz	
Total harmonic distortion rate of current	≤ 3% (full load)	
Power factor	0.99/-1～1	
Current DC component	≤0.5%	
Charge and discharge conversion time	<100ms	
AC Grid-disconnected Parameters		
AC grid-disconnected voltage	AC400V	
AC voltage range	AC400V±3%	
AC grid-disconnected frequency	50Hz/60Hz	
Grid-disconnected output THDU	≤ 3% (linear load)	
Unbalanced load capacity	100%	
Other Parameters		
Maximum conversion efficiency	≥99%	

3 Product Information

Allowable ambient temperature	-30°C~60°C	≥50°C for limited load
Allowable relative humidity	≤95%	
Noise	≤75dB	
Protection grade	IP20	
Altitude	3000 m	≥2000m for limited load
Size	W520mm×H240mm×D680mm	
Weight	≤70KG	
Cooling method	Forced air cooling	
Wiring and airflow direction	Primary and secondary panels at the front, airflow enters from the front and exits from the rear	
BMS communication interface	CAN or 485	
EMS communication interface	Network interface or 485	

4 Handling and Storage

4.1 Handling



Warning

- During loading, unloading, and handling, adhere to the occupational safety regulations of the respective country or region.
- The equipment must be handled by trained personnel, and there should be a professional present to supervise the entire process.
- Handle with care to avoid impacts or falls.

When handling the energy storage converter, observe the following:

- Ensure adherence to safety procedures during handling. Use appropriate personal protective equipment, such as anti-static gloves and safety shoes, to minimize potential injury risks.
- The energy storage converter may be relatively heavy; ensure adequate manpower or use appropriate handling equipment, such as trolleys, forklifts, or cranes, before moving.
- Keep the equipment stable and secure during handling. Use suitable securing devices or ropes to prevent sliding or tilting.
- Ensure the handling path is clear of obstructions or narrow passages. Remove any debris or obstacles to ensure smooth handling.

4.2 Storage Requirements

If the energy storage converter is not installed immediately after delivery and inspection, it should be stored according to the requirements of this section. The energy storage converter with its outer packaging should be stored in a well-ventilated, dry, and clean environment. Additionally, note the following:

- The storage surface must be flat and strong enough to support the weight of the energy storage converter.
- Ensure proper ventilation and moisture prevention; do not store in an environment with standing water.
- Storage environment temperature: -30°C to +70°C; relative humidity: 0 to 95%, with no condensation.
- Protect the energy storage converter during storage to prevent collisions.
- Check the packaging of the converter weekly to ensure it remains intact. Replace any damaged packaging immediately to prevent pest or rodent damage.



Caution

- Do not stack items on top of the equipment!
- Do not place the equipment at an angle or stack it!
- Before installing an inverter that has been stored for an extended period, thoroughly inspect the equipment. If necessary, have it tested by a professional before installation.

5 Equipment Installation

5.1 Integrity Check

Before installing the energy storage converter, check the following to ensure everything is in order before proceeding with the installation.

- Check the information on the product packaging (ensure order and product information are correct)
- Check the product appearance (ensure it is normal and undamaged)
- Check the information on the product nameplate label (ensure product information is accurate)



Warning

- Only energy storage converters that are complete and undamaged should be installed and put into operation!

5.2 Installation Requirements

5.2.1 Installation Environment Requirements

- The energy storage converter is intended for industrial environments based on EMC and noise level requirements, and the installation location should be away from residential areas.
- The surrounding environment should be well-ventilated, and the installation area should be free of flammable, explosive, or corrosive substances.
- The converter has an IP20 protection rating. As an electronic device, it must not be placed in a damp environment for an extended period.
- To ensure optimal performance of the converter, the recommended installation environment temperature is between -30°C and +60°C.
- Avoid installing the converter in areas with existing underground public facilities whenever possible.

5.2.2 Installation Electrical Requirements

- Harmonic voltage should not exceed the limits specified in GB/T 14549.
- Interharmonic voltage should not exceed the limits specified in GB/T 24337.
- Grid voltage deviation should not exceed the limits specified in GB/T 12325.
- Voltage fluctuation and flicker values should not exceed the limits specified in GB/T 12326.
- The unbalance of three-phase voltage should not exceed the limits specified in GB/T 15543.
- Grid frequency deviation should not exceed the limits specified in GB/T 15945.

5.2.3 Installation Space Requirements

When installing the converter, sufficient space must be maintained between the converter and cabinets or other equipment to meet the requirements for the narrowest maintenance passage, ventilation, and other considerations. The space requirements are illustrated as follows:



Caution

- Ensure that the equipment is installed according to the space requirements.
- The installation space and ventilation holes at the front and rear of the modules must not be obstructed.
- The equipment's air intake must not face the hot air exhaust of other equipment.
- Internal air circulation is prohibited.

5.2.4 Installation Cooling Requirements

The converter uses forced air cooling, with the module body equipped with a built-in cooling fan. The following table outlines the recommended minimum airflow, effective intake area, and door panel opening dimensions for a single module.

When designing the cabinet, it is recommended that the front and rear door panels of the cabinet increase the effective intake area while meeting the corresponding IP protection level. The ventilation holes should be no smaller than the minimum opening dimensions listed in the table below, based on the number of modules in the cabinet. To ensure the cooling requirements of the equipment, it is recommended to install fans on the rear door panel or at the top of the cabinet to enhance the cooling effect. If a dust filter is installed, the effective intake area needs to be recalculated.

Product Models	Total Air Volume at Working Point (CFM)	Actual Effective Area of Cabinet Facing INPPCS Air Intake (mm ²)	Actual Effective Area of Cabinet Facing INPPCS Air Exhaust (mm ²)
NPPCS-125/0.4-W-14-A2-OS	861	73075	116920

Notes: 1 CFM = 0.0283 m³/min;

- 2、The above-mentioned "actual effective area" refers to the through-hole area;
- 3、This parameter table is only for the air intake and exhaust areas for a single INPPCS module, and the ventilation for other devices in the cabinet is not included.



Caution

- Avoid installing in areas with poor ventilation and low airflow.

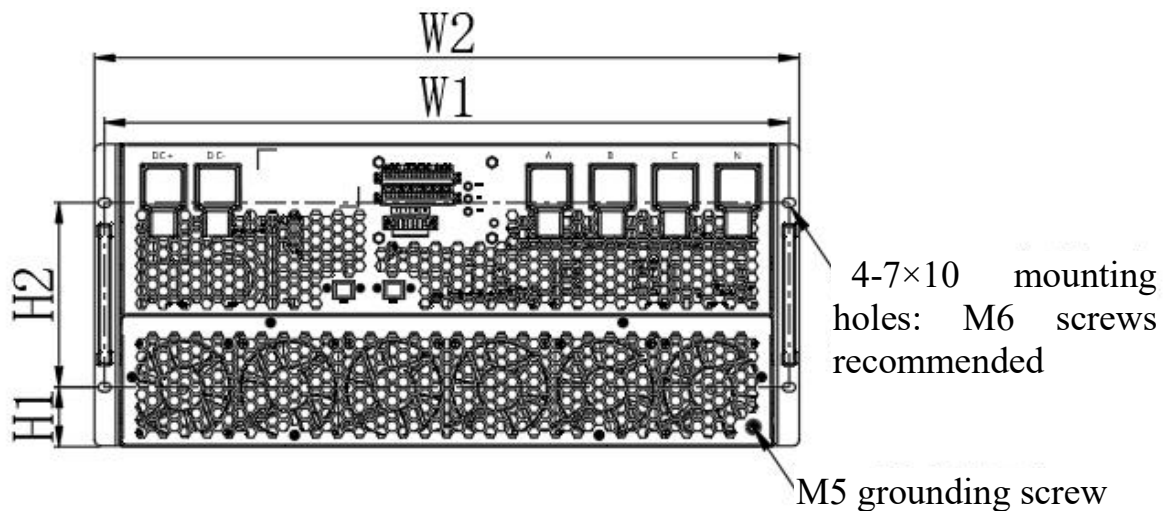
- Ensure sufficient air supply at the air intake.
- Ensure that the intake area is equivalent to the front panel area of the INPPCS, and add an exhaust fan at the air exhaust.
- Ensure that the intake and exhaust areas of the INPPCS are unobstructed, with no recirculation.

5.2.5 Installation Wiring Standards

The cables used in the system can generally be divided into power cables and communication cables. When laying communication cables, keep away from power cables, and keep the cables at right angles at intersections. When laying, try to minimize the cable length and keep a distance from the power cable. The insulation impedance of DC+ and DC- to the ground of DC terminal is recommended to be greater than 10 MΩ.

5.2.6 Fixed Equipment Installation

The screw fixed installation positions are shown in the following diagram.



Model Capacity	Hanging Ear Mounting Screw Installation Dimensions (mm)				Hanging Ear Mounting Screw Specification	Hanging Ear Mounting Screw Torque
	W1	W2	H1	H2		
125kW	544	560	47	146	M6	4~5N•m

Dimensional tolerance grade: ISO 2768-m / GB 1804-m grade



Warning

- Only qualified professionals are permitted to install the equipment.
- Due to the heavy weight of the equipment, PPE must be worn during installation.
- The installation and securing of the equipment must strictly follow the requirements outlined in this manual.
- Handles are for pulling and pushing the module only and should not be used for bearing weight.

6 Electrical Connection

6.1 Safety Instructions

To ensure the safety of personnel and equipment during the electrical connection process, it is crucial to follow the procedures below:

- All power sources connected to the converter must be disconnected to ensure the converter is in a de-energized state.
- Warning signs must be placed at the disconnection points to prevent re-energizing during installation.
- After complete power disconnection, wait at least 10 min before confirming that the internal components of the converter are fully de-energized before proceeding with any operations.
- Implement necessary grounding and short-circuit connections.
- Use insulating materials to cover any potentially live parts near the operational area.



Danger

Risk of electric shock!

- Do not touch live parts!
- Before installation, ensure that the converter and any upstream external switches are completely disconnected, confirming that both the AC and DC sides of the converter are de-energized.



Warning

- Only qualified professionals are permitted to perform the electrical connection for this product.
- Strictly adhere to the wiring labels within the equipment during connection operations.
- All electrical connections must comply with the electrical connection standards of the country or region where the project is located.

6.2 Conductor Requirements

The following requirements must be followed when selecting cables:

- All cable diameters must be chosen based on the maximum AC/DC current of the converter, with an additional safety margin included.
- Cables at the same connection point should be of the same specification and type.

Recommended conductor specifications are as follows:

INPPCS-125/0.4-W-14-A2-OS	
DC side mounting hole diameter	DC side $\phi 9$ opening, M8 connection screws, recommended tightening torque: 7-10 N•m
Battery assembly DC+	Copper core cable $\geq 70 \text{ mm}^2$ *1 or 1/0 AWG *1
Battery assembly DC-	Copper core cable $\geq 70 \text{ mm}^2$ *1 or 1/0 AWG *1

AC side mounting hole diameter	DC side $\phi 9$ opening, M8 connection screws, recommended tightening torque: 7-10 N•m
Power grid A	Copper core cable $\geq 70 \text{ mm}^2 * 1$ or 1/0 AWG *1
Power grid B	Copper core cable $\geq 70 \text{ mm}^2 * 1$ or 1/0 AWG *1
Power grid C	Copper core cable $\geq 70 \text{ mm}^2 * 1$ or 1/0 AWG *1
Power grid N	Copper core cable $\geq 70 \text{ mm}^2 * 1$ or 1/0 AWG *1
PE mounting hole diameter	M8 connection screws, recommended tightening torque: 7-10 N•m
PE grounding	Copper core cable $\geq 10 \text{ mm}^2 * 1$
RS485/CAN/SYNC cable	2-core twisted pair shielded cable
Network cable	Standard STP shielded network cable
Remarks	1. If cable temperature is a concern, consider using cables with a larger cross-sectional area. 2. Connection screws are provided with the product; customers need to purchase the cables and other accessories mentioned above.

Dimensional tolerance grade: ISO 2768-m / GB 1804-m grade



Warning

Do not allow cables to be overloaded!



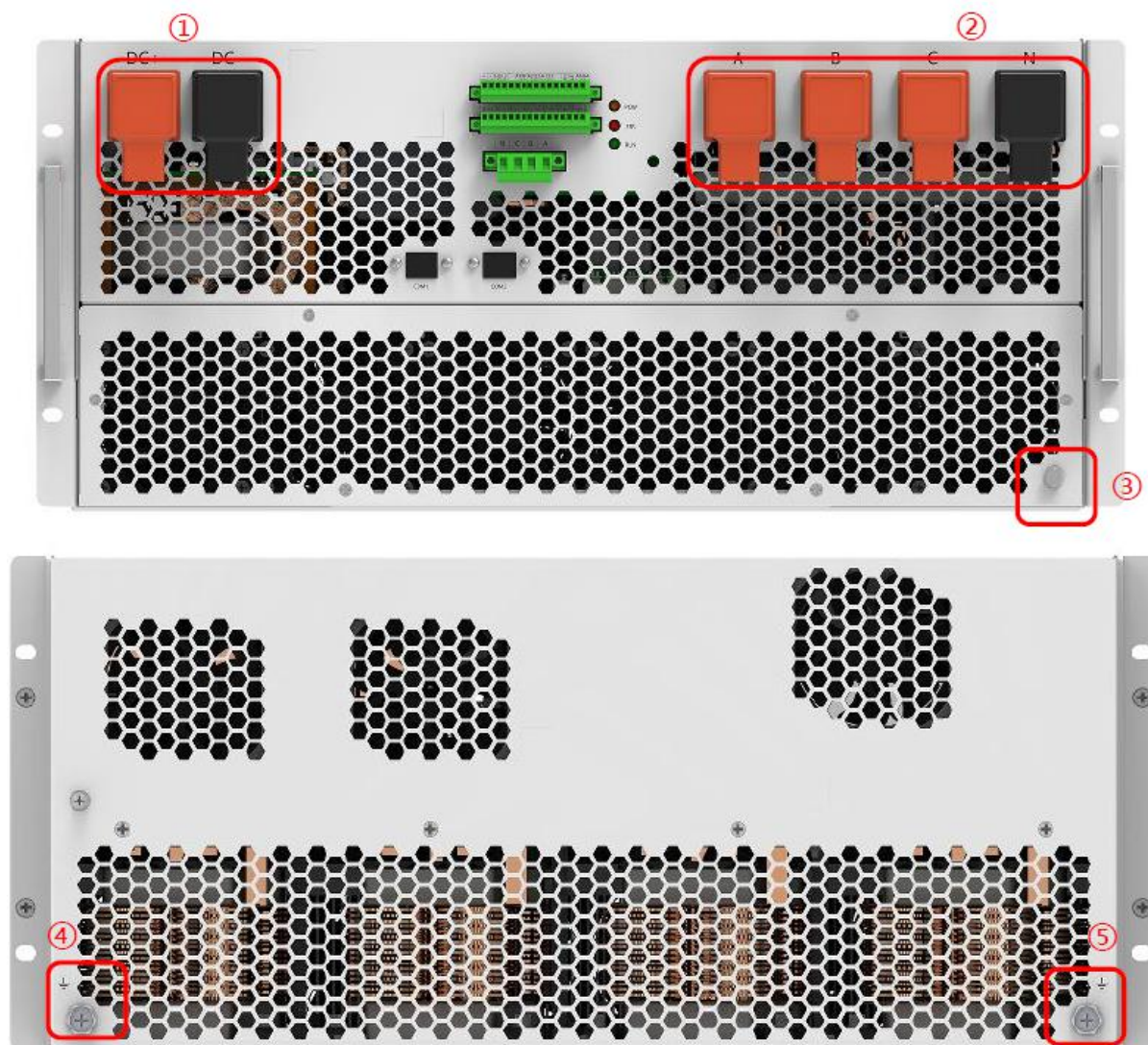
Caution

- The above cable specifications apply only to copper core cables. If aluminum cables are required on-site, select cables with an appropriate cross-sectional area.
- DC cables should be laid with the positive and negative cables separated by a safe distance to reduce the risk of short circuits.
- If AC cables are required, their load capacity must meet the maximum operating current of the converter.

6.3 Wiring Instructions

6.3.1 Position Distribution

The position distribution of the converter module is illustrated in the diagram below:



No.	Name
①	AC wiring port location
②	DC wiring port location
③/④/⑤	Grounding hole positions (connect to any one)

6.3.2 Pre-wiring Confirmation

Before wiring, follow these steps:

Step 1: Ensure that INPPCS is in shutdown state, there is no voltage on AC side and DC side, and the panel indicator is not on.

Step 2: Ensure the incoming switch at AC side is off.

Step 3: Ensure the battery side switch is off.

Step 4: Once the above steps are completed, proceed with the wiring operations.

6.3.3 AC Side Wiring



Warning

- When connecting the AC power grid, disconnect the circuit breaker of the AC power distribution cabinet to ensure that the AC line connected to the terminal is not charged.

The AC side output voltage of the INPPCS is AC400V. Follow these steps to connect the AC side:

Step 1: Measure and confirm that the wiring terminal has been powered off with a multimeter.

Step 2: Determine the phase sequence of AC connecting cables.

Step 3: Strip the insulation from the end of the cable.

Step 4: Crimp the copper lug of the connection wire, insert the stripped copper core into the lug's crimping hole and use a tool to crimp the lug tightly, ensuring at least two crimp points.

Step 5: When installing the heat shrink tubing, choose a heat shrink tubing that fits the cable size, about 5 cm long.

Slide the heat shrink tubing over the copper lug so that it completely covers the crimping hole of the lug. Use a hot air gun to shrink the tubing until it fits snugly.

Step 6: Connect the cables to the external A, B, C, N phases of the energy storage converter, ensuring correct phase sequence.

Step 7: Confirm that the connection is secure.



Danger

- Incorrect connection order may cause poor contact and result in a fire.
- Incorrect voltage can damage the converter.
- Incorrect phase sequence can cause the converter to malfunction.

6.3.4 DC Side Wiring



Warning

- The open circuit voltage of the positive and negative poles of the battery assembly should not exceed 1000V DC, otherwise the equipment will be in overvoltage protection state and cannot work normally.
- The output polarity of the battery assembly must not be reversed. Measure with a multimeter to confirm the polarity before connecting to the corresponding positive and negative input terminals of the INPPCS.

The DC side wiring method is as follows:

Step 1: Measure the open-circuit voltage of the battery assembly with a multimeter to ensure that it is within the allowable range.

Step 2: Confirm the voltage polarity with a multimeter.

Step 3: Strip the insulation from the end of the cable.

Step 4: Crimp the copper lug of the connection wire. Insert the stripped copper core into the lug's crimping hole and use a tool to crimp the lug tightly, ensuring at least two crimp points.

Step 5: When installing the heat shrink tubing, choose a heat shrink tubing that fits the cable size, about 5 cm long. Slide the heat shrink tubing over the copper lug so that it completely covers the crimping hole of the lug. Use a hot air gun to shrink the tubing until it fits snugly,

and tighten the DC terminal assembly properly.

Step 6: Connect the positive cable from the battery assembly to the DC+ on the chassis.

Step 7: Connect the "DC-" terminal of the INPPCS to the negative cable from the battery assembly following the same method as step 6.

Step 8: Confirm that the connection is secure.

6.3.5 Grounding Wiring

To ensure safety, all INPPCS units must be grounded through the PE conductor. The PE copper bar inside the INPPCS cabinet has been reliably connected with the INPPCS enclosure. When PE is connected, the PE grounding copper bar needs to be reliably connected with the equipotential connection device at the installation site or electrical control room.



Warning

The grounding location of the cabinet must be reliably grounded! Otherwise:

- There may be a fatal electric shock risk in case of a fault!
- The equipment may be damaged by a lightning strike!
- The equipment may not function properly!

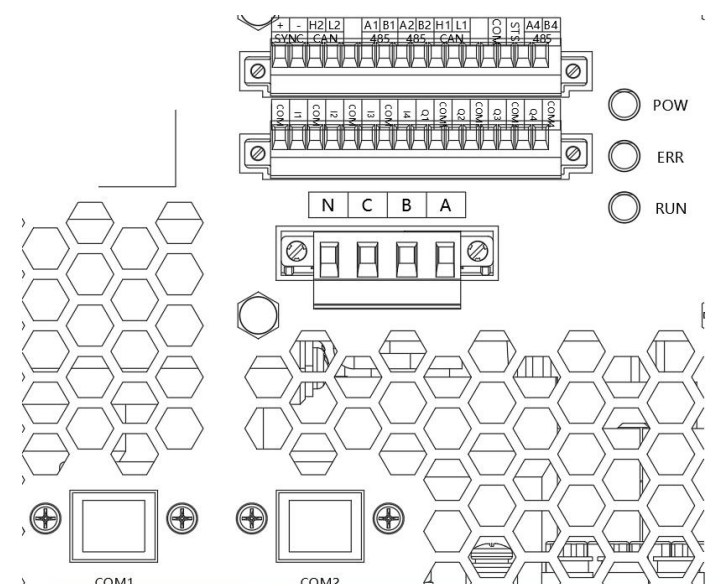


Caution

- Grounding connections must comply with the grounding standards and regulations of the country or region where the project is located.
- After grounding, measure the grounding resistance, which should not exceed 1Ω .

6.3.6 Communication Wiring

The converter supports multiple communication protocols, including 3 RS485 communication ports, 2 Ethernet interfaces, 2 CAN communication ports, and several dry contact ports. The positions and definitions of the external communication wiring terminals are as follows:



No.	Component Name	Terminal Definition
①	COM1、COM2	Reserved network ports, COM1 for debugging port (display), COM2 for EMS communication port
②	CAN1/2、485-1/2 /4	CAN1 port, 485-1 port for BMS communication, 485-2 for PCS and DCDC module communication; CAN2 port for PCS parallel communication, 485-4 for DSP debugging
③	A/B/C/N	Grid-side voltage sampling, generally used with grid-connected and grid-disconnected STS switch
④	STS、COM	Used to control the grid-connected and grid-disconnected STS switch
⑤	I1~4、Q1~4	I1-4 for DI input detection (active input, external only needs to be open or short-circuited, I1-I4 default normally open, can be set on the upper computer); Q1-4 for DO output (dry contact, only supports external 24V power input)
⑥	SYNC+、SYNC-	For multi-machine grid-disconnected parallel synchronization signals.

DI/DO predefined functions:

	1	2	3	4
Input	Emergency stop	BMS fault detection	STS over-temperature	Grid-connected and grid-disconnected switch feedback contact
Output	Cabinet fan control	Fault output dry contact	AC relay contactor or circuit breaker closing coil of grid-connected and grid-disconnected switch	Breaker opening coil of grid-connected and grid-disconnected switch

6.4 Post-installation Inspection

To ensure safe and reliable operation of the INPPCS, a comprehensive inspection must be performed after the mechanical installation and electrical connection of the energy storage

converter. During the inspection, keep detailed records, and immediately rectify any items that do not meet the requirements. The checklist includes:

Mechanical Installation Checklist

- ☐ The energy storage converter is free of deformation or damage
- ☐ The energy storage converter's hanging ears are fixed, and support is stable and reliable
- ☐ There is sufficient space around the air intake and exhaust of the energy storage converter
- ☐ The temperature, humidity, and ventilation conditions of the environment where the energy storage converter is located meet the requirements
- ☐ The cooling air circulates smoothly
- ☐ The cabinet's sealing and protection are intact and reliable

Electrical Installation Checklist

- ☐ The AC side voltage matches the rated output voltage of the energy storage converter
- ☐ The AC side phase sequence is correctly connected, and the wiring is secure
- ☐ The DC side polarity is correct, and the wiring is secure
- ☐ The energy storage converter is properly grounded and secure
- ☐ Communication cables are correctly connected and maintain a safe distance from power cables
- ☐ The cable markings are correct, clear, and easy to distinguish
- ☐ The insulation shield is complete and reliable, with clear danger warning labels

Other Inspection Items

- ☐ All unused conductive parts are securely tied with insulation tape
- ☐ No tools, parts, conductive dust from drilling, or other foreign objects remain inside
- ☐ No condensation or frost is present inside

7 Trial Operation

7.1 Inspection before Trial Operation

Before the equipment is officially put into operation, a thorough inspection of the installation should be conducted. This includes checking whether the DC and AC voltages meet the requirements of the energy storage converter, verifying correct polarity, and ensuring that all system connections comply with relevant standards and that the system is properly grounded.

7.1.1 Energy Storage Converter Inspection

Before powering up the INPPCS, follow these steps:

Step 1: Check the installation and wiring of energy storage converter according to Section 5.2;

Step 2: Ensure that the AC and DC circuit breakers are in the off state;

7.1.2 AC Side Voltage Inspection

- Check whether the three-phase connection identification of INPPCS corresponds to the three-phase identification of power grid one by one;
- Check whether the voltage of power grid lines is within the predetermined range and record the voltage value;
- Check whether the voltage of power grid frequency is within the predetermined range and record the frequency value;
- Measure THD (Total Harmonic Distortion) of power grid voltage. If the distortion is serious, the energy storage converter may not operate.

7.1.3 DC Side Voltage Inspection

The DC side shall be connected to the INPPCS from the junction box or DC distribution cabinet.

- Ensure correct polarity of DC input;
- Measure and record the voltage of each DC (open circuit) circuit. The voltage value of each channel should be almost the same and not exceed the maximum allowable DC voltage value.

7.2 Startup Procedure

The steps for starting the energy storage converter are as follows:

Step 1: After all the above inspections are confirmed to be normal, power on the DC side, and power on the DC outside the cabinet at one time; power on the AC side and manually close the circuit breaker on the AC side.

Step 2: Wait for about 1 min, and some electrical parameters of AC and DC sides can be checked through the upper computer software.

Step 3: Confirm that the device status is normal: the fault alarm light is not illuminated.

Step 4: Enter the relevant operating parameters in the backend software. If there is a touchscreen, set the relevant operating parameters according to the startup guide. After completing the parameter settings, set the equipment to "Start".

Step 5: Wait for about 2 min for the equipment to complete the startup process. During this time, there will be a sound of contactors closing, and the insulation test on the DC side will be completed. A longer waiting time is normal. If the equipment is not operated for a long time, it will enter a grid-connected "standby" state.

Step 6: After the INPPCS is running (the running indicator light is on), check for any abnormalities. If there is abnormal noise, unusual smells, or smoke, shut down the equipment immediately for inspection.



Caution

- To ensure the effectiveness of the operating parameters, set the operating mode and parameters before starting the equipment. Otherwise, the equipment will execute the default parameters.

7.3 Shutdown Procedure

7.3.1 Normal Shutdown Procedure

Step 1: Set the backend to the shutdown state, INPPCS enters the automatic shutdown process. After the IGBT power is blocked, the equipment will automatically disconnect the contactor on the AC/DC side. At this time, there will be a sound of contactor disconnection. After about 10 s, the normal shutdown will be completed (if the equipment is required not to run for a long time, the switches on the DC side and the AC side should be disconnected in turn).

Step 2: Disconnect the power of AC side and the primary power supply outside the cabinet on AC side.

Step 3: Disconnect the power of DC side and the primary power supply outside the cabinet on DC side.

Step 4: Open the cabinet door, check the electricity with an electroscope (there are energy storage devices inside the cabinet, and further operations should be carried out after the completion of discharge). When it is confirmed safe through the electricity check, hang the grounding wire, and then proceed to the next step.

Step 5: Maintenance personnel carry out maintenance and overhaul operations.

7.3.2 Emergency Shutdown Procedure

Step 1: The EMS sends a signal to the PCS via the dry contact input port I1 (closed point is valid), and the equipment automatically blocks the pulse and disconnects the contactors on the AC and DC sides. At this time, there will be a sound of contactor disconnection. After about 10 s, the shutdown will be completed.

Step 2: Disconnect the power of AC side and the primary power supply outside the cabinet

on AC side.

Step 3: Disconnect the power of DC side and the primary power supply outside the cabinet on DC side.

Step 4: Open the cabinet door, check the electricity with an electroscope (there are energy storage devices inside the cabinet, and further operations should be carried out after the completion of discharge). When it is confirmed safe through the electricity check, hang the grounding wire, and then proceed to the next step.

Step 5: Maintenance personnel carry out maintenance and overhaul operations.

8 Routine Maintenance

8.1 Regular Maintenance

Environmental factors such as temperature, humidity, dust, and vibration can lead to aging of the components inside the converter, potentially causing failures or reducing the converter's lifespan. Therefore, it is necessary to implement regular maintenance of the converter.

The regular maintenance tasks are as follows:

Maintenance Item	Maintenance Action	Maintenance Frequency
Dust removal	Remove the dust at the air intake of power module	Once a month
	Check whether there is dust, moisture or condensate vapor inside the cabinet	Once a month
Warning labels	Check warning signs and add or replace them if necessary	Once a month
Equipment	Check for abnormal noises during operation	Once a month
Power cable connection	Check for loose cable connections; tighten screws if necessary	Once every three months
	Check the cables for any signs of insulation aging or damage. If such issues are found, apply additional insulation measures or replace the cables.	Once every six months
Main switch	Conduct a routine inspection for corrosion on all metal parts of the AC/DC main switch.	Once every six months



Danger

The product contains deadly high voltage!

- The converter contains energy storage components. After disconnecting the converter from power, wait for at least 10 min before performing any subsequent operations.
- Ensure that the power supply on both the AC and DC sides of the energy storage converter is fully disconnected before performing maintenance.
- After disconnecting the power supply, set up warning labels to prevent accidental power-up during maintenance.
- To avoid accidental danger, maintenance personnel must wear insulated protective gear during maintenance.
- Only qualified personnel are permitted to perform maintenance on the converter.

Failure to follow these instructions may result in death or severe electric shock injury!

8.2 Waste Disposal

INPPCS will not cause any environmental pollution, all of its materials and components meet the environmental protection requirements. When the service life of INPPCS expires, users should operate and deal with it according to the corresponding local laws and regulations.

9 Quality Assurance

Warranty period

The warranty period for this product is one year, or as stipulated in the Contract, if any.

For IN-Power Electric's products within the warranty period, customers should show the invoice and date of purchase to IN-Power Electric's service personnel during maintenance. And the nameplate on the product should be clearly visible, otherwise the service personnel has the right to refuse the repair.

Warranty conditions

IN-POWER Electric will repair or replace the products that fail during the warranty period free of charge. The faulty equipment shall be owned by IN-POWER Electric after replacement. The customer should reserve a certain time for IN-POWER Electric to repair the faulty equipment.

Waivers

If the following situations happen, the Company is entitled to not guarantee the product quality:

- Products without IN-Power Electric logo;
- Products or components out of IN-Power Electric's warranty period;
- Failure or damage caused by failing to install, keep or use the equipment in accordance with the specification, under the working environment specified or in a wrong way (for example, too high or too low temperature, too wet or too dry, too high, unstable voltage or current, etc.);
- Failure or damage due to installation, repair, alteration or disassembly by person other than the after-sales service personnel of IN-Power Electric, except those entrusted by IN-Power Electric after-sales;
- Failure or damage caused by the use of electrical components not belonging to IN-Power Electric;
- Failure or damage caused by accident or human causes (misoperation, scratch, handling, bumping, accessing inappropriate voltage, etc.) and transportation damage;
- Failure or damage caused by the natural disasters and other force majeure (such as earthquake, lightning, fire etc.);
- Other failures or damages not caused by quality problems of IN-Power Electric's equipment (including its components).