

EH Series 1500V Energy Storage Converter User Manual



Applicable to:
EH-1725-HA-UD
EH-2000-HA-UD
EH-1725-HA-UD-US
EH-2000-HA-UD-US

Sineng Electric Co., Ltd.







Data version: A00
Archived Date: 2023-07-11
BOM Code: 28010151

Products to which this manual applies

This manual is applicable to the following energy storage converter models from Sineng Electric Co., Ltd.:

Product Name	Product Model	Notes
EH Series 1500V/1.725MW Energy Storage Converter	EH-1725-HA-UD	Rated power 1725kW
EH Series 1500V/2MW Energy Storage Converter	EH-2000-HA-UD	Rated power 2000kW
EH Series 1500V/1.725MW UL Version Energy Storage Converter	EH-1725-HA-UD-US	Rated power 1725kW, UL model
EH Series 1500V/2MW UL Version Energy Storage Converter	EH-2000-HA-UD-US	Rated power 2000kW, UL model

This manual uses the following symbols for danger warning statements.

Symbol	Description
	Attention please
	There is a risk of electric shock, which may cause personal injury.
	This is a highly dangerous area and special attention please.
	After disconnecting all power switches, there is still a dangerous voltage inside the device, which should be discharged for 5 minutes to below the safe voltage before carrying out maintenance operations.
	Noise may be generated, it is recommended to wear sound insulation earmuff.
	Hot surfaces – To reduce the risk of burns – Do not touch.

Instructions for upgrading this manual

This manual may be upgraded from time to time without notice due to product upgrades and other reasons.

Safety Precautions

This manual contains general operating instructions for the converter product and users must read it in detail before using the converter.



- Only authorized personnel with electrical operating qualifications are allowed to maintain the converter, no one else is allowed to operate the converter without authorization, otherwise there will be a risk of death by electric shock.
- The converter must be reliably grounded, otherwise the personal safety of the operator will be jeopardized.
- For Proper Circuit Isolation. Connect an isolation transformer between the output of the unit and the utility power line connections, and the transformer capacity is not less than the rated capacity of PCS. The converter is only applicable to IT systems.
- The converter meets the C2 limits of the EMC standard and is suitable for use in normal industrial environments. If used in residential areas, it may generate radio frequency interference, in which case the user is required to take additional measures.
- High voltage exists in the AC and DC ports of the converter. Direct contact with the ports without protection or confirmation is prohibited to avoid personal injury.
- Dangerous voltage exists inside the converter during normal operation, do not remove the internal cover of the converter without authorization to avoid equipment damage or personal injury.
- Operators should familiarize themselves with the relevant standards and operational safety regulations in their region and work in accordance with them.
- There are energy storage components inside the converter. After the converter is completely discharged, please wait for not less than 5 minutes, please use a multimeter to confirm that the internal machine is completely free of electricity before proceeding with subsequent operations.
- It is prohibited to block the air outlet below or the air inlet above the converter with foreign objects.
- Field operators must clearly understand the descriptions in the *EH Series 1500V Energy Storage Converter User Manual* and the *EH Series 1500V Energy Storage Converter Installation Manual* before performing converter operation.
- The field operator must set the system parameters in strict accordance with the manufacturer's requirements.
- Field operators must provide timely feedback to the manufacturer on converter failures and are prohibited from retrying to run the converter before troubleshooting.
- The field operator must completely discharge the converter as described in 2.2.5 when performing maintenance operations.
- The field operator must strictly use the spare parts provided by the manufacturer when performing maintenance operations.
- The field operator must ensure that all doors of the converter are intact and operation of the converter with exposed energized parts is prohibited.
- Do not move devices or components larger than 22kg manually during maintenance. If the devices or components need to be moved, Please use the tools.
- When the field operator leaves the machine, make sure that all the doors of the converter are closed and locked, Tighten the screws on the door panel.
- For DC side branch circuit that is not connected, the inlet at the bottom of the converter must be sealed with fireproof mud.
- Malfunction of the converter due to operational errors of site personnel is not covered by our warranty.

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Chapter 1 Brief Introduction

This chapter introduces the main features of EH series 1500V energy storage converter, energy storage system composition and main circuit structure.

1.1 Introduction of Energy Storage System

EH series energy storage converter is a transformer-free energy storage converter, which can convert the DC energy from the energy storage battery into AC energy, and then send it to the grid or load through the external transformer, or convert the AC energy into DC energy to be deposited into the energy storage battery.

The schematic diagram of the energy storage system is shown below:

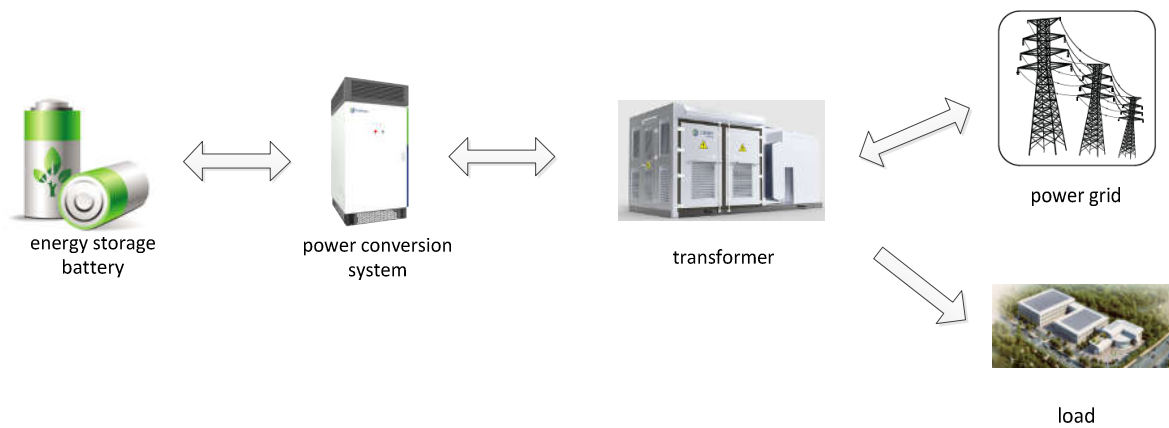


Figure 1-1 Energy Storage System Composition

EH series energy storage converter supports the grid form of IT system (IT system refers to the power neutral unearthened system, the exposed conductive part of all the equipment are directly grounded through the respective protection line PE), as shown in Figure 1-2, EH series converter itself is not connected to the N line.

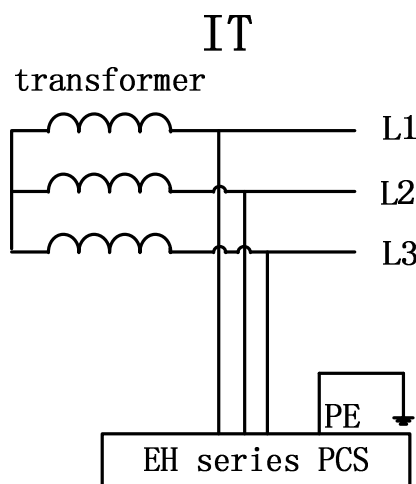


Figure 1-2 EH series energy storage converter support grid form

1.2 Product Main Features

EH series 1500V energy storage converter adopts the latest generation of semiconductor power conversion devices and is based on a powerful all-digital control platform, which makes this energy storage converter reach the industry leading level in terms of both product performance and product functions. The main features of this series of products are as follows:

- With completely independent intellectual property rights;
- Adopting industrialized design concepts, adapting to the requirements of harsh operating environments;
- Based on DSP+FPGA digitalization platform, with redundancy control function;
- Advanced control algorithms. System work with wide adaptability and high stability;
- High power quality and high system efficiency, no "pollution" to the power grid;
- With perfect communication interface and support for a wealth of communication protocols, can be seamlessly connected with the superior monitoring system;
- Adopting of fully-frontal maintenance design and power module modular design. With excellent system maintainability, reducing system space requirements;
- DC bus capacitor adopts long-life metal film capacitor;
- Fault monitoring and automatic diagnostic function of fans and other wearing parts to realize rapid fault location;
- With redundant auxiliary power supply to improve the stability of the converter system.

1.3 Main circuit structure

The main circuit of the converter is shown in 0. A single energy storage converter system consists of DC fuses, DC switches, DC lightning protection, DC/AC converters, AC filters, AC circuit breakers, AC lightning protection and other components.

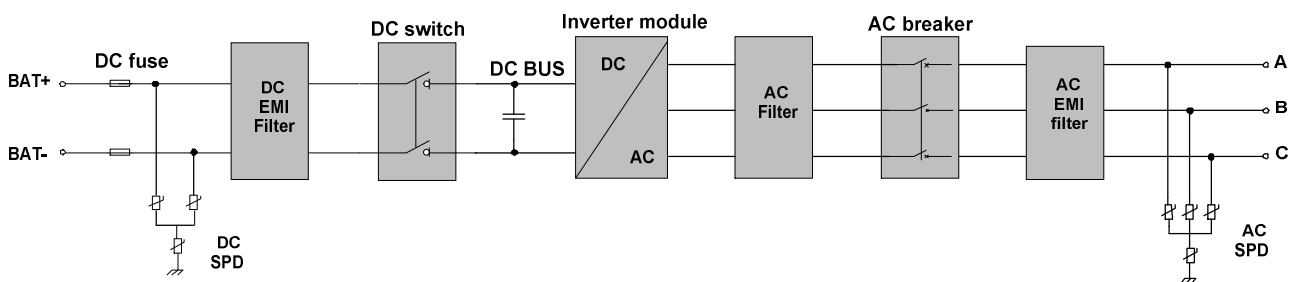


Figure 1-3 EH Series 1500V Energy Storage Converter Main Circuit Schematic1

Note 1: Non-UL model Negative fuse is optional, please contact Sineng in advance if needed.

Chapter 2 Converter Operation

This chapter explains the main components of the converter, and the routine operation.



- Only personnel with electrical operating qualifications are allowed to operate the converter, and no one else is allowed to operate the converter without authorization.
- When the converter is in normal operation and it is not operated in accordance with the requirements specified in this manual, the converter protection measures may fail.

2.1 Brief description of the main operating components and functions of the converter

2.1.1 Product Appearance

The appearance of the converter is shown in 0, and a brief description of the functions of the external components is shown in 0.



Figure 2-1 Appearance of the converter

Table 2-1 Functional description of external components of the converter

No.	Device Name	Description
1	LED	The power indicator is green. When it is on, the converter is in charged state. The operation indicator is blue. When it is on, the converter is working normally. The fault indicator is red. When it is on, the converter is in trouble. The Bluetooth indicator is yellow. When it is on, the converter is connected to Bluetooth.
2	Emergency Stop Button	When this button is pressed, the converter stops working immediately and disconnects the AC and DC switches, while the system control board is still energized. This switch is a self-locking switch. After pressing this switch, please release the button in the direction indicated

No.	Device Name	Description
3	Power-on Enable Knob	<p>on the button.</p> <p>ON: The converter is in the allowed power-on state. When the converter meets the power-on condition, the converter can accept remote and local power-on commands to perform power-on operation.</p> <p>OFF: The energy storage converter is prohibited from powering up. A converter that has been turned on will immediately shut down and disconnect the AC and DC switches. At this point, the converter will no longer accept remote and local power-on commands.</p>

2.1.2 Key Component Locations and Functions

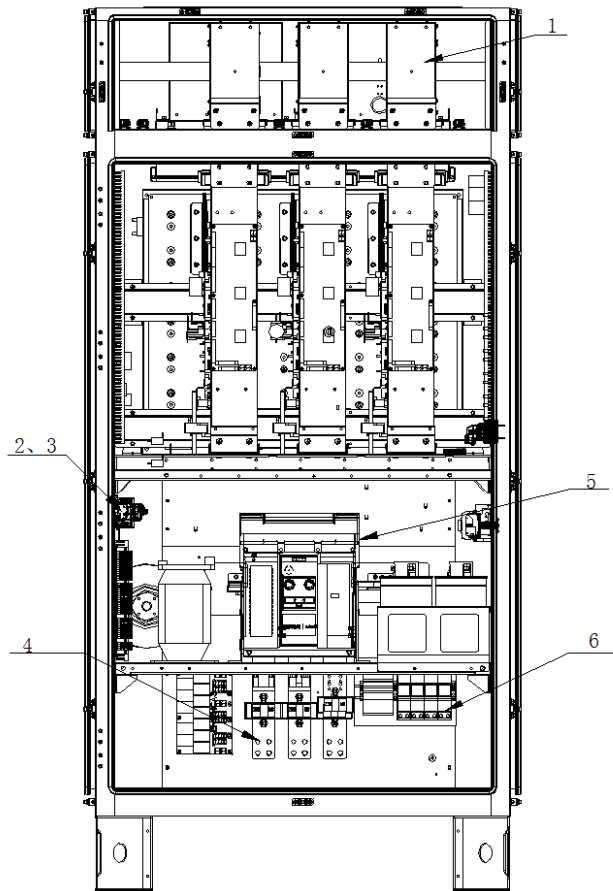


Figure 2-2 Location of key components on the front side of the converter

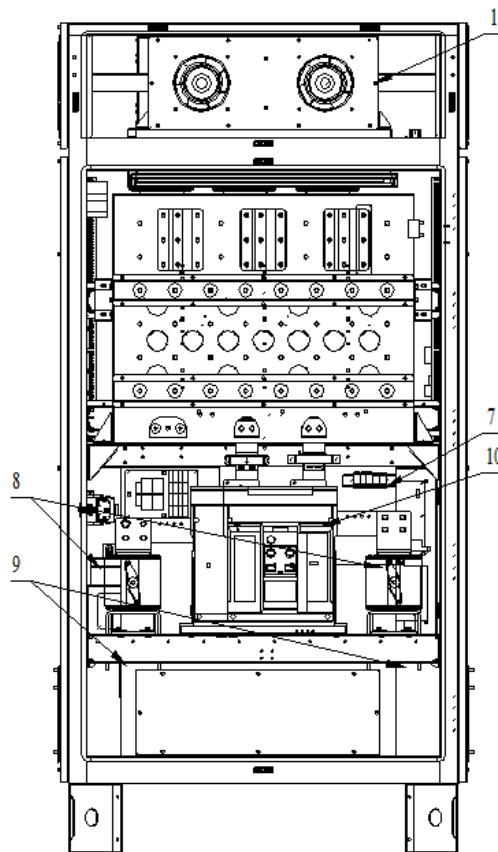


Figure 2-3 Location of key components on the back of the converter

The main components of the converter are shown in 0 and 0, and a brief description of the functions of each component is shown in 0.

Table 2-2 Brief description of main components and functions of the converter

No.	Device Name	Description
1	FAN	Realizes the heat exchange between the converter and the outside world
2	QF7	Converter pickup switch for self-generation power
3	QF9	Converter pickup switch for external power supply
4	AC Wiring Copper bar	AC wiring copper bar
5	CB3	AC circuit breaker to control the AC side of the converter
6	SPD2	Lightning overvoltage protection on AC side
7	SPD1	DC side lightning overvoltage protection
8	F1~F2	DC side short circuit protection
9	DC Wiring Copper Bar	DC wiring copper bar
10	QS1	DC side load switch controls the DC side of the converter on/off

2.1.3 Bluetooth interface and operation method

Power Insight 2 software is an app for IOS/Android cell phones to interface with energy storage converters. According to different models, it realizes standard functions such as issuing commands, setting operation parameters, viewing data and extends some auxiliary functions.

It can be downloaded and installed through the application market, scanning the QR code or enter the following link in the mobile browser.



IOS



Android

Figure 2-4 Download QR code of Power Insight2

IOS system: <https://apps.apple.com/us/app/power-insight-2/id6443889542>

Android system: <https://enjoysolar.si-neng.com/powerInsight/android/PowerInsight.apk>

How to use:

- (1) Open the Power Insight2, select the role "Owner" and enter the password "123456" to log in, as shown in 0.

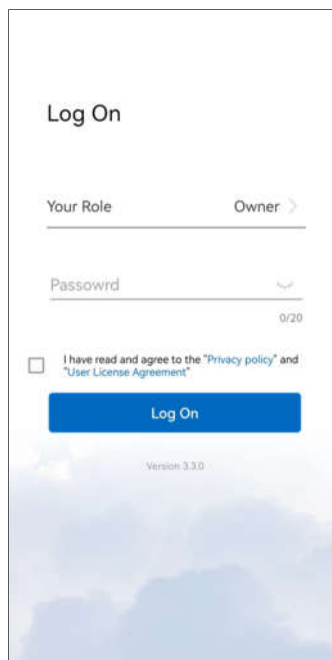


Figure 2-5 Login Home

- (2) Turn on the mobile phone Bluetooth and click "Bluetooth Scan", as shown in 0. Power Insight2 begins to search the device, as shown in 0 (If you do not turn on Bluetooth, you will be prompted "Allow Powerlight2 to enable Bluetooth" Please select "Allow".)

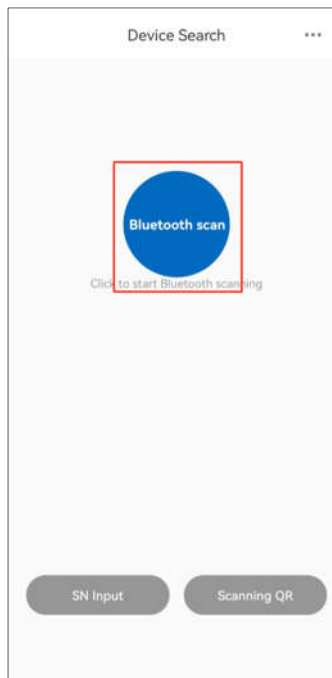


Figure 2-6 Bluetooth scanning page

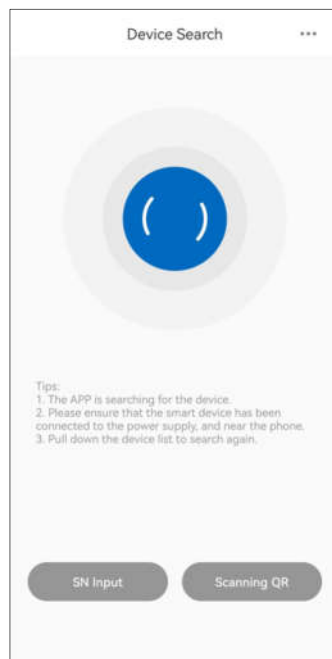


Figure 2-7 Automatically search for devices page

- (3) After searching nearby device, you can select the corresponding device according to the product serial number to view its details, as shown in 0.

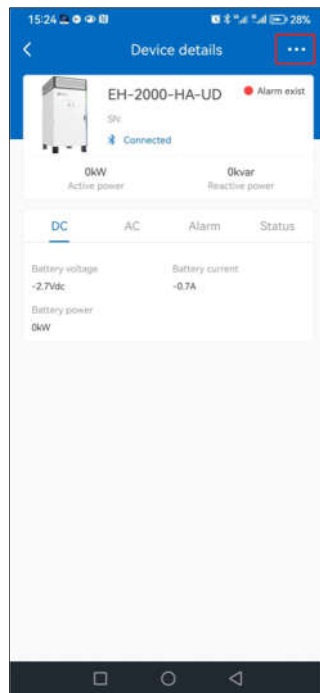


Figure 2-8 Device Login Display Page

Note: In the above figure, the equipment contains the following information: DC volume, AC volume, current status indication of the equipment (red: serious alarm, yellow: general alarm, green: no alarm while grid-connected power generation, gray: no alarm without grid-connected power generation), and status volume.

- (4) Click  on the upper right corner of the display page. You can choose to view a certain detailed information of the device and issue relevant commands. As shown in 0.

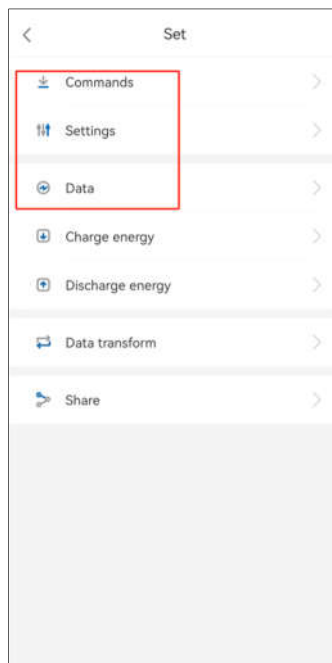


Figure 2-9 Menu list

- (5) Such as clicking on "Commands", there will be a confirmation button. To send command click "Ensure", or click "Cancel". After sending the command, the converter will respond to the operation, as shown in 0, 0. The following is similar.

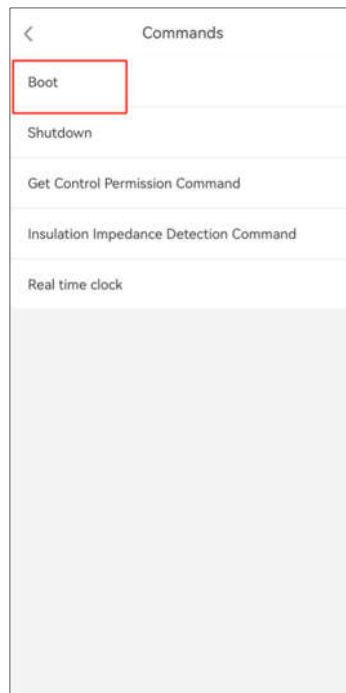


Figure 2-10 Command menu for switching machine

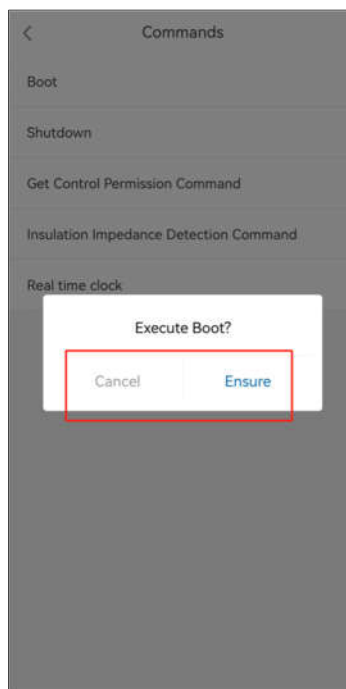


Figure 2-11 Send switching command

- (6) Click "Settings" on 0 to set battery parameters, power dispatch configuration parameter-mode configuration, dispatch parameter, etc. As shown in 0.

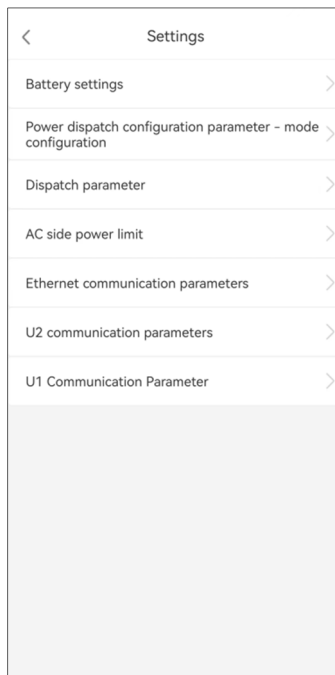


Figure 2-12 Settings Menu

- (7) Click "Data" on 0, the relevant converter data information will appear, such as clicking "manufacturer information" to view the software and hardware version number, the environmental amount to observe temperature of IGBT. As shown in 0.

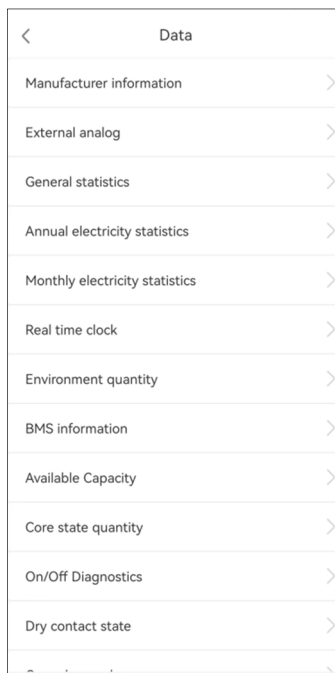


Figure 2-13 Data menu

2.2 Turn Converter On/Off

This subsection describes how to turn on and off the converter. PCS control logic working condition flow. As shown in Figure 2-14.

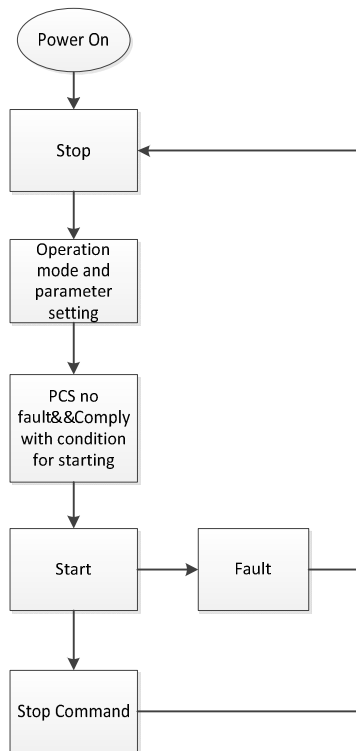


Figure 2-14 PCS control logic working condition flow

2.2.1 Steps for the first power-on operation

The first-time switching on, and the first-time switching on after maintenance, are both considered to be the first power-up.

Before the converter is powered up for the first time, the following items are checked.

- Verify that the converter protective film has been removed. As shown in 05 converter air inlet protective film will block the air inlet if not removed.

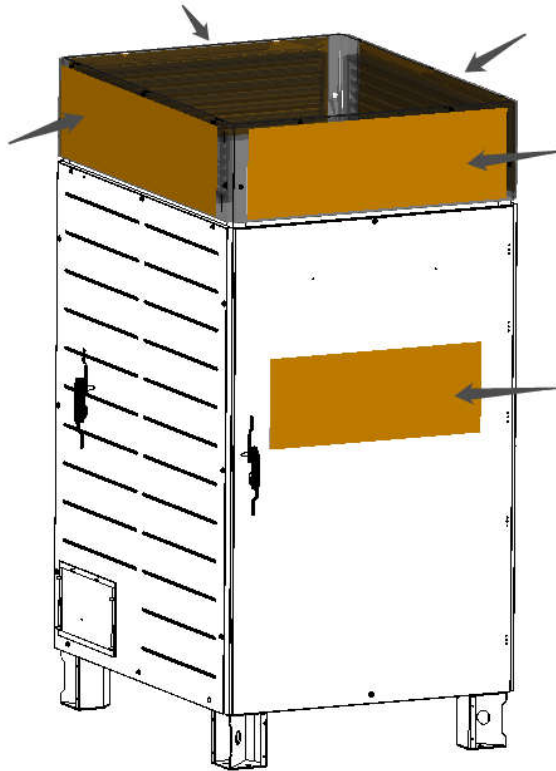


Figure 2-15 Converter protective film

- The environment of the converter installation site meets the relevant requirements of the installation manual.
- The converter power cable, ground cable, and signal cable connections comply with the relevant requirements of the installation manual.
- Make sure that the converter EPO button is in the released position and the power on knob is in the "OFF" state.
- Verify that QS1 and CB3 in the converter are disconnected.
- Confirm that the converter door and cover are complete and properly installed.

After checking, complete the first power-up operation of the converter in the following order.

- Control power up: Close the control power pickup switch for self-generation QF7.



- The control power is supplied by default from the power pickup switch for self-generation QF7, or from the pickup switch for external power supply QF9 according to the customer's demand. If the control power is supplied from QF9, the inlet end of QF9 should be connected to 220VAC power supply, which is required to have a capacity of not less than 3kVA, and the diameter of the access cable should not be less than 2.5mm².
- QF9 and QF7 have an interlocking mechanism that does not allow simultaneous closure, please make sure the interlocking mechanism is normal before powering up.

- After about 40 seconds, the converter power indicator will be on.
- Observe that the converter, having no red light alarm and the bus voltage meets the minimum power-on condition.

- Turn the power-on enable knob to "ON" and send the power-on command via Bluetooth or host computer.

The converter is connected to the grid after power on. If any abnormal phenomenon occurs during the above process, please press the EPO button immediately to stop the power-on operation and contact our customer service immediately.

2.2.2 Emergency shutdown of the converter

In emergency circumstances, the converter is disconnected from the battery pack and the power grid by pressing the EPO button.

When the EPO button is pressed, the DC load switch QS1 and AC circuit breaker CB3 in the converter are disconnected, and at this time the AC and DC cable ports and control board of the converter are still energized.



- Dangerous voltages are still there inside the system when the EPO button is pressed.

2.2.3 Power on

When the power-on enable knob is "ON" and the grid-connection conditions are met, the converter can accept remote and local (Bluetooth) power-on commands and perform power-on operation.



- After powering on, the converter starts to work normally, and there are dangerous voltages on the converter ports and all internal boards.

2.2.4 Manual shutdown

The converter is automatically shut down by turning the knob to "OFF".



- After manual shutdown of the converter, the converter DC load switch QS1 and AC circuit breaker CB3 will be disconnected, and dangerous voltages are still there inside the converter.

2.2.5 Complete discharge operation of the converter

After manual shutdown, dangerous voltage still exists inside the converter, follow the steps below to finish converter complete discharge operation.

- Press the EPO emergency stop button.
- Disconnect the battery side switch.
- Disconnect the main box transformer circuit breaker or high voltage side load switch.

Wait at least 5 minutes while using a multimeter to confirm that the internal capacitance of the converter is completely discharged. After the converter is completely discharged, use a multimeter to confirm that there is no dangerous voltage at the DC and AC ports before proceeding with subsequent operations.



- After disconnecting all power switches, there is still dangerous voltage inside the device, which needs to be discharged for 5 minutes to below the safe voltage before maintenance operations can be carried out.

Chapter 3 Converter Fault Alarms and Handling Methods

This chapter describes common converter fault alarms and handling methods.

3.1 Table of converter fault alarms

The common fault alarms and recommended handling methods during converter operation are shown in 0.

Table 3-1 Fault Alarm Table

Alarm	Interpretation	Event Handling
AC undervoltage	AC voltage is lower than the set lower limit	/
AC overvoltage	AC voltage higher than set upper limit	/
AC underfrequency	AC frequency lower than the set lower limit	/
AC overfrequency	AC frequency above set upper limit	/
AC voltage unbalance	AC voltage unbalance above set limit	/
AC current unbalance	AC current unbalance above set limit	/
Low voltage ride-through	Low voltage ride-through in AC voltage	/
AC Reverse Sequence	AC Phase Sequence Reverse	Check and change the cable wiring sequence on the AC side of the converter
AC phase loss	AC phase failure	Check whether the AC voltage is normal, make sure the AC side cable wiring is correct.
Anti-islanding effect	Grid islanding	/
Battery undervoltage	Battery voltage is lower than the undervoltage protection point	Check if the battery voltage is normal and the undervoltage protection point is set reasonably.
Battery overvoltage	Battery voltage is higher than overvoltage protection point	Check whether the battery voltage is normal and whether the over-voltage protection point is set reasonably.
Reverse battery connection	Battery positive and negative poles are reversed	Check whether the positive and negative terminals of the battery are reversed
Insulation impedance is abnormal	Low insulation impedance to ground	Check if the insulation impedance on the battery side is normal, check if the converter wiring has a lap chassis
AC lightning protector failure	Damaged AC lightning protector	Check and replace damaged AC surge arresters
DC lightning protector failure	Damaged DC lightning protector	Check and replace damaged DC surge arresters.
Fan failure	Fan not working normally or blocked	Replacing the fan with a new one
Failure of 2-phase flow fan	2-phase flow fan not functioning properly or blocking rotation	Replace with new 2-phase flow fan
Scrambler fan failure	Scrambler fan not working properly or blocking rotation	Replace the scrambler fan with a new one
Abnormal drive cable connection	Abnormal connection of the driver cable from the control board to the driver board.	Check whether the drive cable is tightly plugged, replace the corresponding drive cable
Converter overheat protection	The collected temperature is greater than the permissible temperature limit	Check whether the inlet and outlet of the converter are blocked, clean and replace the new insect screen.

Alarm	Interpretation	Event Handling
Over-temperature operation of the converter	The collected temperature is greater than the permissible temperature limit	Check whether the inlet and outlet of the converter are blocked, clean and replace the new insect screen.
Soft start failure	Bus voltage soft start failure	Contact our customer service to deal with
OCP Failure	Overcurrent protection of external tube of inverter module	Contact our customer service to deal with
IGBT VCE abnormal	Inverter module inner tube overcurrent protection	Contact our customer service to deal with

Chapter 4 Product Specification

This section gives product specifications for the EH series 1500V energy storage converters.

4.1 Applicable standards

EH-1725-HA-UD and EH-2000-HA-UD comply with relevant domestic and foreign related standards:

GB/T 34120-2017 Technical Specification for Energy Storage Converters for Electrochemical Energy Storage Systems

GB/T 34133-2017 Technical Specification for Testing Energy Storage Converters

IEC 62477-1-2012 Safety Requirements for Power Electronic Converter Systems and Equipment Part 1: General Provisions

IEC 61000-6-2-2016 Electromagnetic Compatibility (EMC) Part 6-2: General Standard. Immunity Standards for Industrial Environments

IEC 61000-6-4-2011 Electromagnetic compatibility (EMC) Part 6-4: General Standard. Emission Standards for Industrial Environments

EH-1725-HA-UD-US and EH-2000-HA-UD-US comply with relevant domestic and foreign related standards:

1. UL 1741 Standard for safety Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources
2. IEEE 1547.1-2020 Standard for Interconnecting Distributed Resources with Electric Power Systems
3. UL 1741 Supplement SB GRID SUPPORT UTILITY-INTERACTIVE INVERTERS AND CONVERTERS BASED UPON IEEE 1547-2018 and IEEE 1547.1-2020
4. FCC PART 15B

4.2 Environmental conditions

Please refer to the EH series converter installation manual for environmental parameters.

4.3 Mechanical Characteristics

Table 4-1 Converter Mechanical Characteristics

Product Model	Overall dimensions W×H×D (unit: mm)	Weight	
		Net weight (kg)	Gross weight (kg)
EH-1725-HA-UD	Bare machine dimensions: 1150*2350*1450	1400	1450
EH-2000-HA-UD			
EH-1725-HA-UD-US	With package dimensions: 1200*2400*1500		
EH-2000-HA-UD-US			

Note 1: The center of gravity of the converter is not at its geometric center, please note the center of gravity markings on the converter cabinet and packaging.
 Note 2: Due to differences in the configuration of the converter, the weight of the whole machine may vary, the data given in the table are standard values. Note 3: If the dimensions and weight of the product are changed, the latest information of this product shall prevail without prior notice.

4.4 Electrical Characteristics (DC Side)

Table 4-2 DC Side

Model		EH-1725-HA-UD	EH-2000-HA-UD	EH-1725-HA-UD-US	EH-2000-HA-UD-US
DC Parameters	Full load voltage range	1000~1500V			
	Maximum withstand voltage	1520V			
	Number of battery group	1 group			
	Maximum steady state DC current	1936A	2245A	1936A	2245A
	Maximum short-time overload current (1.2 times)	2112A	2449A	/	/
	Maximum steady state DC power	1936kW	2245kW	1936kW	2245kW

4.5 Electrical Characteristics (AC Side)

Table 4-3 AC Side

Model		EH-1725-HA-UD	EH-2000-HA-UD	EH-1725-HA-UD-US	EH-2000-HA-UD-US
AC parameters	Rated capacity	1725kVA	2000kVA	1725kVA	2000kVA
	Voltage system	3-phase 3-wire + ground wire			
	Rated Voltage	690Vac			
	Voltage Range	-15%~+10% (settable)			
	Rated Current	1443A	1674A	1443A	1674A
	Maximum steady state current	1588A	1841A	1588A	1841A
Maximum short-time overload current (1.2 times)	1732A	2008A	/	/	
Rated frequency	50/60Hz		60Hz		
Current waveform distortion	<3% (at full load)				
Power factor	>0.99 (at full load), >0.98 (at half load)				
Power factor adjustable range	-1 to +1				
DC component	<current rating × 0.5 %				
Load capacity	110% long term, 120% Not less than 1 min.		110% long term.		

4.6 Electrical Characteristics (System Characteristics)

Table 4-4 System Characteristics

Model		EH-1725-HA-UD	EH-2000-HA-UD	EH-1725-HA-UD-US	EH-2000-HA-UD-US
System Characteristics	Inlet method	Downward inward and downward outward			
	Isolation type	Non-isolated type (transformer external)			
	Maximum conversion efficiency	≥99%			
	Protection grade	IP65			
	Cooling method	Temperature-controlled forced air cooling			
	Communication interface	RS485/CAN/Ethernet/Bluetooth			

Chapter 5 Product Maintenance

This chapter describes the routine maintenance of the converter. Please read the instructions in this chapter before carrying out maintenance on the converter.



- Only qualified and authorized electrical operators are allowed to maintain the converter, no one else is allowed to operate it without authorization.
- Failure of the converter due to the use of spare parts not supplied by our company is not covered by our warranty.

5.1 Periodic inspection and maintenance

The converter requires periodic inspection and maintenance to ensure reliable operation over a long period of time. Periodic maintenance increases the reliability of the converter.

5.2 Preparation before maintenance

Before performing any maintenance work, the converter must be completely discharged in accordance with the instructions in this manual, and a "No Closing" sign must be placed on the AC side, DC side and switch position of main circuit breaker of the box transformer of the converter.



- After the complete discharge, wait at least 5 minutes to confirm that the converter system is completely discharged before proceeding with subsequent operations.

5.3 Replacement of the DC side surge arresters

The DC side arrester is identified as SPD1 and its location is shown in 0.

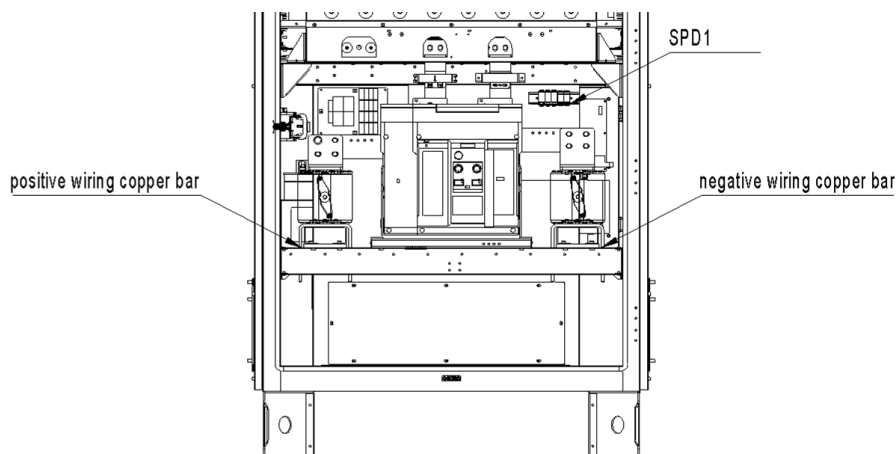


Figure 5-1 DC Side Lightning Protector

The DC side lightning arrester needs to be replaced when the following events are detected.

- The converter reports a DC lightning arrester failure.
- The SPD1 module status indicator window turns red during routine inspection.

- The SPD1 module has been in operation for more than 10 years.

Follow the steps below to conduct SPD1 replacement.

- Completely discharge the converter as described in this manual and wait at least 5 minutes.
- Open the cabinet door and identify the surge protector module in SPD1 that needs to be replaced.
- Replace the new surge protector module using the relevant tools.
- Restore the site after replacement.

Refer to section 2.2.1 for instructions on powering up the converter after the maintenance operation.

5.4 Replacement of the AC side surge arrester

The AC side lightning arrester is identified as SPD2. Open the rear door panel and refer to 0 below for its location schematic.

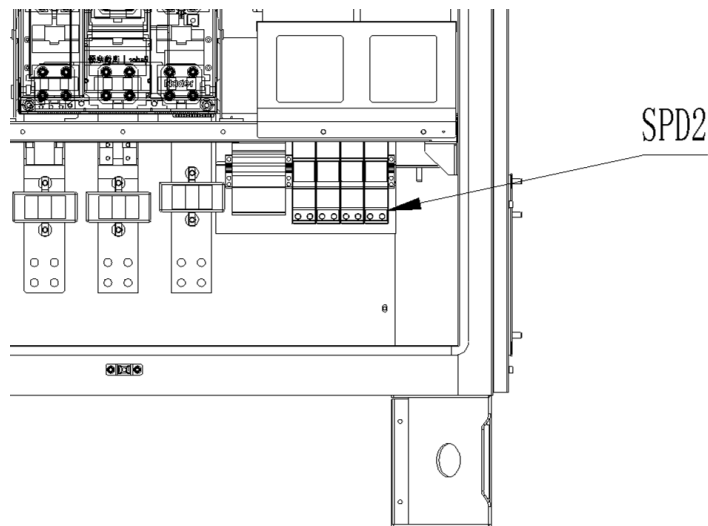


Figure 5-2 AC Side Surge Protector

The AC side surge protector needs to be replaced when the following events are detected.

- The converter reports a fault in the AC side lightning arrester.
- The SPD2 module status indicator window turns red during routine inspection.
- The SPD2 module has been in operation for more than 10 years.

Follow the steps below to conduct SPD2 replacement.

- Completely discharge the converter as described in this manual and wait at least 5 minutes.
- Open the cabinet door and identify the surge protector module in SPD2 that needs to be replaced.
- Replace the new surge protector module using the relevant tools.
- Restore the site after replacement.

5.5 Bottom Insect Screen Cleaning

Bottom insect screen acts as main power radiator outlet. Clogging is likely to lead to over-temperature or even overheating protection of the storage converter, the user needs to regularly clean the bottom insect screen according to the operating environment. The bottom of the dust net is shown in 0.



- When cleaning the insect screen, please wear gloves, glasses and other personal protective equipment.
- Avoid cleaning the insect screen in sandy or humid weather events.
- After complete discharge, you must wait at least 5 minutes to confirm that the converter system is completely discharged before cleaning the insect screen.

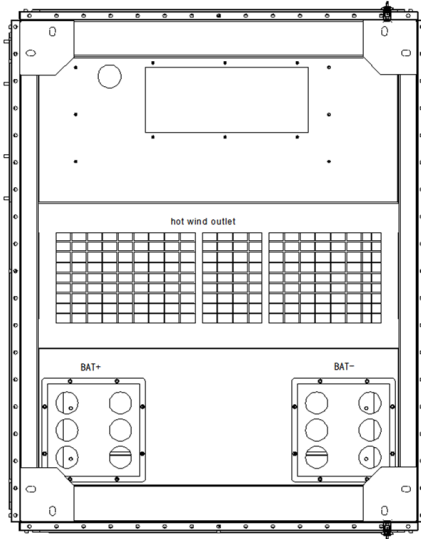


Figure 5-3 Bottom Dust Screen

Follow the steps below to clean the bottom of insect screen.

- Remove the inductor compartment sealing plate in 0 from behind the DC side fuse.

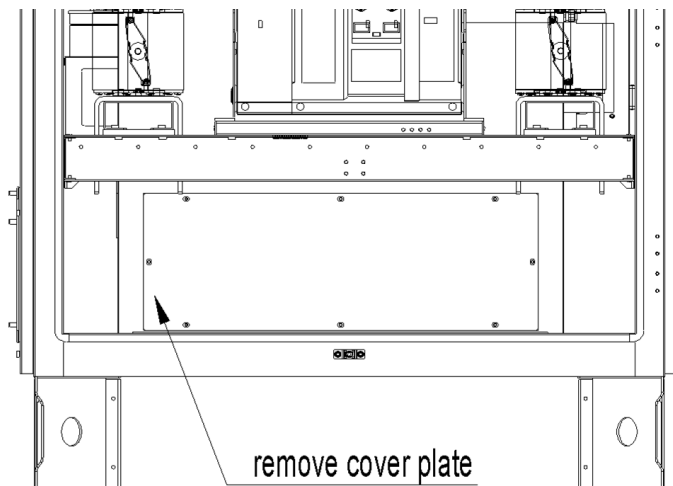


Figure 5-4 Removing the inductor compartment sealing plate

- Clean foreign material from the insect screen on the bottom of the inductor.

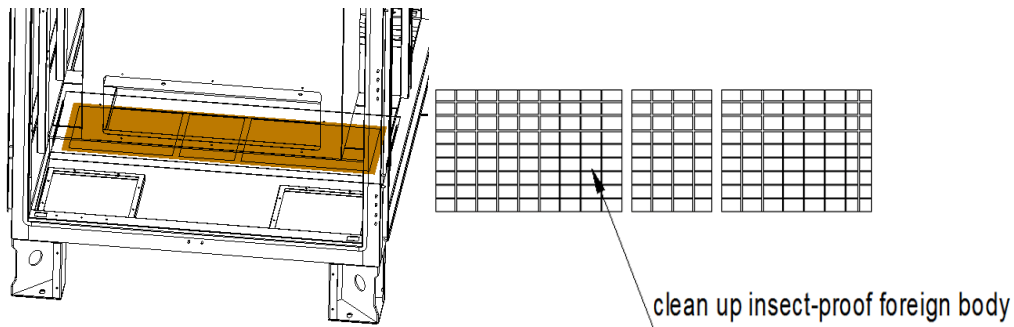


Figure 5-5 Removing the Dust Screen Locating Bolts

5.6 Replacing the main power cooling fan

The main power cooling fan of the converter is located on the top of the front compartment, and from left to right are the main power cooling fans of phases A, B, and C respectively, with two fans for each phase. 0 shows the distribution of fans in the visible area of the front compartment. When the following problems are found, replace the corresponding phase main power cooling fans.

- The converter detects a fan failure.
- There is a noticeable sound abnormality when the fan is running.
- There is obvious damage to the appearance of the fan.

Follow the steps below to conduct cooling fan replacement.

- Completely discharge the converter according to the instructions in this manual and wait at least 5 minutes.
- Remove the insect screen directly in front of the top.
- Remove both fan power terminals for the phase corresponding to the faulty fan.
- Remove the faulty phase fan assembly to chassis mounting bolts and remove the entire fan assembly.
- Remove the faulty fan by removing the faulty fan and fan assembly fixing bolts.
- Install the spare fan and install the fan assembly back into the chassis.
- Connect the fan power cable and secure the fan bolts.
- Resume installation of the insect screen.

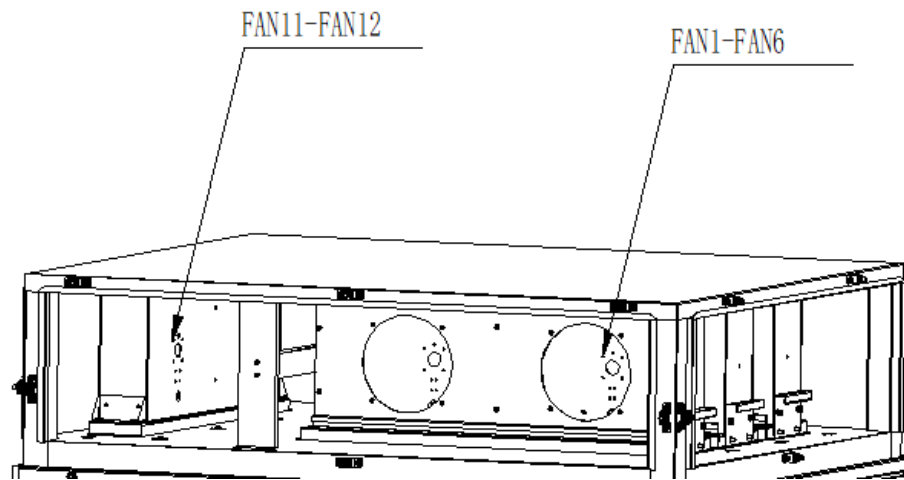


Figure 5-6 Main Power Cooling Fan Location

5.7 Other Components Maintenance

The converter is equipped with a power-on intelligent diagnostic function, which automatically monitors the status of each internal component. When the converter suggests that there is a serious fault, can not be turned on or suggests other device maintenance information inside the machine, please contact our customer service to deal with.



- Dangerous voltage exists inside the converter, please do not disassemble the internal cover of the converter without authorization or permission to avoid equipment damage or personal injury.
- Unauthorized or unpermitted disassembly of the converter may cause equipment damage, and such equipment damage is not covered by our warranty.

Product Warranty Card

Thank you for choosing our energy storage converter.

Product Model:

Factory No.:

Please refer to the instructions in the *EH Series 1500V Energy Storage Converter User Manual* for specifications, implementation standards, and technical conditions of this product.

This product is guaranteed for year(s). During the warranty period, Sineng will provide free component maintenance or replacement services for failures caused by non-human reasons and non-force majeure (including but not limited to earthquakes, mudslides, floods, typhoons, and wars).

User name:

User address:

Contact person:

Phone number of user:

Email:

Sineng Electric Co., Ltd.

Address: No.6, Hehui Road, Wind Power Technology Industrial Park, Huishan Economic
Development Zone, Wuxi, Jiangsu Province, China

Postal code: 214174

Service hotline: 400-928-6988

Fax: 0510-85161899

Appendix I Description of converter connection to MV transformer

This appendix describes the electrical and connection method of the MV transformer connected to the MV grid on the converter side. Before wiring the MV transformer, please read the precautions in the DESCRIPTION carefully.

Damage to the equipment and other losses caused by failure to follow these instructions are not covered by the warranty.

Connection method of the converter to the transformer

The converter and the external MV transformer can be connected to the grid in the way shown in Table 1 below.

Attached table 1 Explanation of the connection method between converter and transformer

Connection method	Connection description
Integral grid connection of both converters	Two converters connected to the grid with double-winding transformers
Individual grid connection of both converters	Two converters connected to the grid with double-split transformers

Transformer connection groups and impedance requirements

Requirements for a double-winding transformer for grid connection:

- If a double-winding transformer is selected, the short-circuit impedance should be between 5% and 7%.
- When using a double-winding transformer, the transformer connection group can be either Dy11 or YNd11. The capital letters indicate the group of windings on the high voltage side of the transformer and the small letters indicate the group of windings connected to the low voltage side of the transformer.

Dual Split Grid-Connected Transformer Requirements:

- If a bifurcated transformer is selected, the crossing impedance should be between 5% and 8%.
- If a double split transformer is selected, the half crossing impedance shall be between 10% and 12%.
- If a bifurcated transformer is selected, the splitting factor shall be greater than 3.
- When two converters are connected to the dual-split transformer, the transformer wiring group can be selected as Dy11y11 or YNd11d11. The capital letters indicate the group of windings on the high voltage side of the transformer and the small letters indicate the group of windings connected to the low voltage side of the transformer.

General requirements for medium voltage transformers used in conjunction

- EH series converter voltage is sinusoidal voltage, but AC voltage to ground contains a certain proportion of harmonics, transformer low voltage side winding should be able to withstand 500V/us gradient voltage to ground.

- The line voltage on the low-voltage side of the MV transformer must meet the requirements of the AC side voltage of the converter.
- When converter is in normal operation, its phase line to ground can generate up to +1500V peak voltage. Transformer low-voltage side winding insulation strength to ground should be able to meet this peak voltage requirements.
- The voltage level of the high-voltage side of the MV transformer should be consistent with the grid voltage at the place of installation of the equipment.
- It must be ensured that there is good insulation between the low voltage side windings and the high voltage side windings of the MV transformer.
- Different winding methods are recommended for the low voltage side and high voltage side windings of the transformer.
- The transformer capacity should be able to meet the long-term overload power requirements of the converter.
- Transformer working life should be not less than 30 years.
- For oil-cooled transformer, it is recommended that the transformer heat-resistant insulation class should not be less than class A. For air-cooled transformer, it is recommended that the transformer heat-resistant insulation class should not be less than class F, and it is recommended that it should be class H. For the heat-resistant class, please refer to attached table 2.

Attached table 2: Corresponding temperature of heat-resistant grade

Insulation class	A	E	B	F	H
Maximum permissible temperature (°C)	105	120	130	155	180
Winding temperature rise limit value (°C)	60	75	80	100	125
Performance reference temperature (°C)	80	95	100	120	145

- DC bias current the transformer can withstand should not be less than 1% of the rated current.
- The three-phase current imbalance capacity the transformer can withstand should not be less than 5% of the rated current.
- The transformer's no-load loss and load loss should meet the user's needs.
- The transformer fault characteristics shall meet the specific requirements of the region/country and project in which the equipment is to be installed.
- When the transformer is placed indoors, the protection level should not be less than IP20; when the transformer is placed outdoors, the protection level should not be less than IP54.
- Ensure that the transformer shell is reliably earthed.
- Ensure that the transformer iron core is reliably grounded at only one point.

