Energy storage converter

User Manual

WH-TAA603\ WH-TAA503

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Copyright Statement

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Version Information

Version	Date	Content
V1.0	2024-8-1	

1 GENERAL INTRODUCTION

1.1 System Introduction

WH-TAL Series is an Energy storage converter which can convert energy between AC and DC .

This user manual applies to the following products: WH-TAA603/ WH-TAA503.

1.2 Safety Introduction

1.2.1 Warning and Safety Symbols

- **SYMBOLS EXPLANATION**


Caution!
Failing to observe warnings indicated in this manual may result in injury.


High voltage and electric shock hazard.


Hot surface.


Recyclable product components.


This side up. The package must always be transported, handled, and stored upright, with the arrows pointing upwards.


Do not dispose of the product as household waste.


Handle the package/product with care, and do not tip it over or throw it.


Refer to the operating instructions.


Keep dry! The package/product must be protected from excessive humidity and stored covered.


Wait at least 30minutes after turning off the converter before touching or using it to prevent electrical shocks or injuries.


CE Mark

● SAFETY WARNING

The energy storage converter must only be installed or operated by qualified electricians in compliance with local grid or power company standards, wiring rules, and requirements.

Disconnect storage battery and AC power source from the energy storage converter for at least 30 minutes before connecting any wires or conducting any electrical work to ensure the converter is totally isolated and to avoid electric shocks.

The surface of the energy storage converter may exceed temperatures of 60°C during operation. Please make sure the converter has cooled down before touching it, and make sure that the energy storage converter is out of the reach of children.

The energy storage converter must be used and operated as described in this user manual, or safety features may not work as intended, and the warranty for the energy storage converter will be voided.

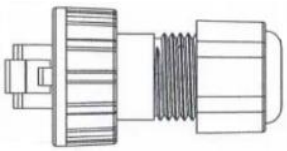
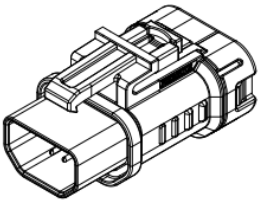
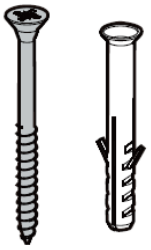
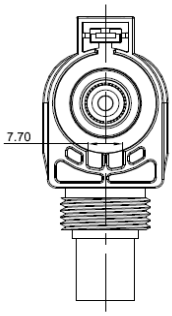
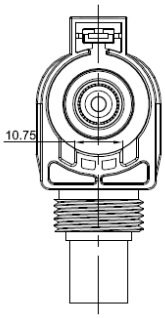
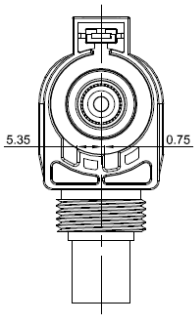
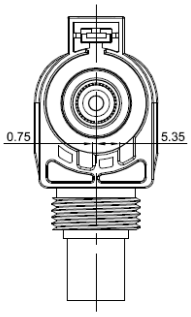
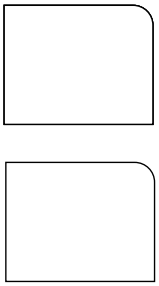
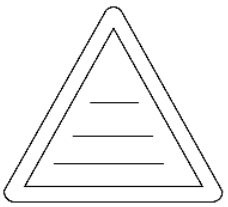
Your energy storage converter warranty will be voided if you open the energy storage converter cover or change any component without WEIHENG's authorization.

Care must be taken to protect the converter from static damage. The WEIHENG warranty does not cover any damage caused by static.

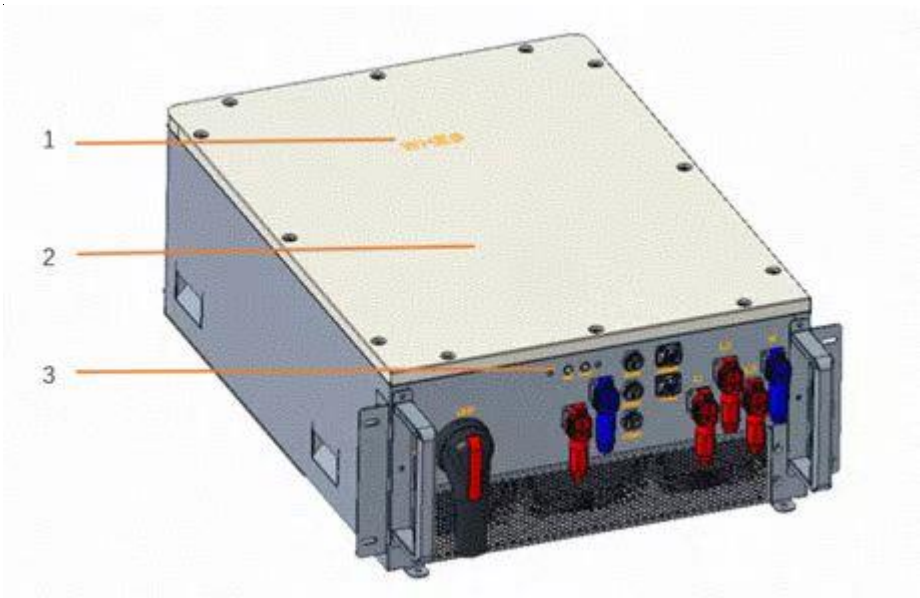
This energy storage converter features active anti-islanding protection, and converter frequency is shifted away from nominal conditions in the absence of a reference frequency (frequency shift).

This energy storage converter is a multimode converter designed to be used in unconditioned outdoor shaded environments. The maximum operating ambient temperature is 60°C.

1.3 Packing List

WH-TAA603/WH-TAA503			
			
1 × inverter	3 × Waterproof RJ45 connector	2 × 12-Pin signal connector	4 × Φ10*60 Expansion bolt
 A键位	 B键位	 C键位	 D键位
1 × Terminal Accessorie(DC+)	1 × Terminal Accessorie(DC-)	3 × Terminal Accessorie(AC)	1 × Terminal Accessorie(N)
			
1 × Quick Installation Guide	1 × Packing list and 1 × Warranty card	1 × Qualified Certificate	1 × OT5-5 terminal

1.4 Appearance

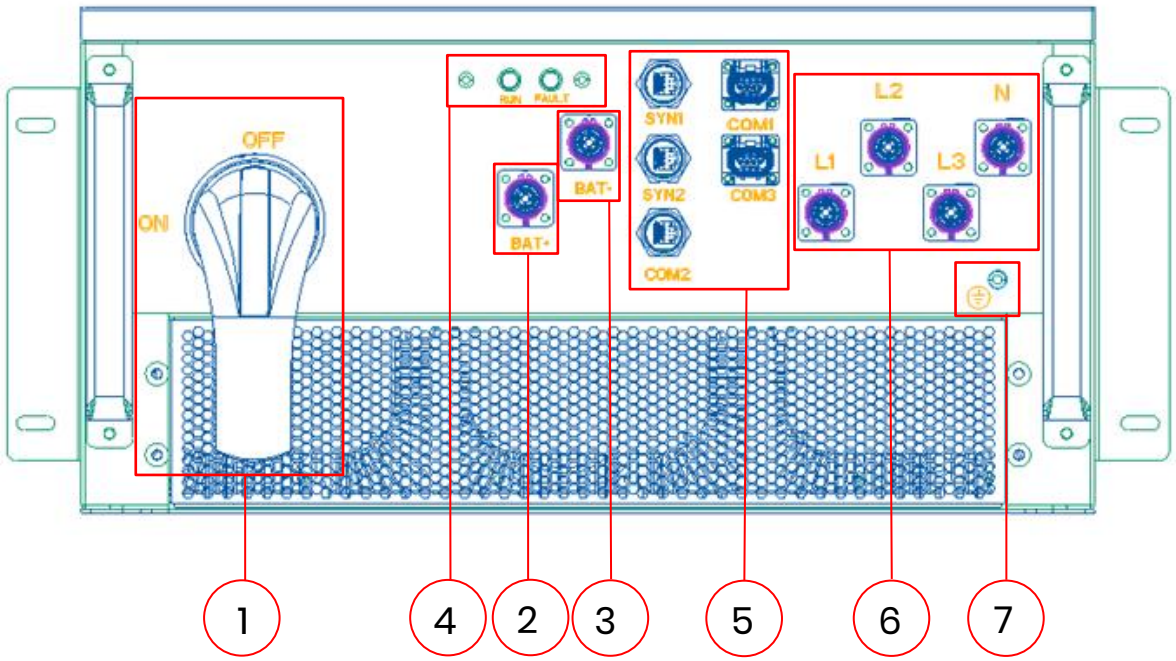


Object	Description
1	Logo
2	PCS
3	Indicator light

LED INDICATOR

STATUS	LED INDICATOR	
Standby		Flashing green LED, 2-second intervals
Checking		Flashing green LED, 0.5-second intervals
Run		Solid green LED
DSP fault		Solid red LED
Program update		Flashing red and green (alternating) LED, 1-second intervals

1.4.1 Parts:



No.	Parts	Description
1	DC Switch	Starts or stops DC input. Do not switch on load.
2	BAT+ terminal	Connects the positive battery terminal.
3	BAT- terminal	Connects the negative battery terminal.
4	Indicator light port	Indicates working status of the PCS.
5	Communication port	SYN1/SYN2: Carrier synchronization signal, used when multiple devices are in parallel. COM1_1~8Pin Reserved external IO. COM1_1~8Pin Reserved external IO. COM1_9\10Pin The short-circuit interface for the first channel termination resistor. COM1_11\12Pin The short-circuit interface for the second channel termination resistor. COM2: Reserved Ethernet ports. COM3_1\2: Reserved BMS RS485 A\B. COM3_3\4: Reserved BMS CAN A\B. COM3_5\6: Reserved EMS RS485 A\B. COM3_7\8: Reserved Debug RS485 A\B.
6	AC output terminal	Connects the AC output cable. N connects only in parallel.
7	PE terminal	Connects the grounding cable.

1.5 Limitation of Liability

WEIHENG assumes no direct or indirect liability for any product damage or property losses caused by the following.

- ◆Product modifications, design changes, or parts replaced without WEIHENG's authorization;
- ◆Modifications or attempted repairs or removal of serial numbers or seals by non-WEIHENG technicians;
- ◆System designs and installations not in compliance with standards or regulations;
- ◆Failure to comply with the local safety regulations (VDE in DE, SAA in AU, MEA and PEA in Thailand);
- ◆Damage caused during transportation (including scratched paint caused by the product rubbing against the packaging during shipping). Any claims for damage during shipping should be made directly with the shipping or insurance company as the container/packaging is unloaded and damage is identified;
- ◆Failure to follow any/all of the user manual, installation guide, or maintenance guidelines;
- ◆Improper use or misuse of the device;
- ◆Insufficient ventilation around the device;
- ◆Product maintenance not done to acceptable standards;
- ◆Force majeure (including severe or stormy weather, lightning, and fires).

2 INSTALLATION

The product supports horizontal and wall hanging, and its carrying capacity is not less than 120kg. The installation site should be well ventilated and away from flammable and explosive materials.

2.1 Installation Location and Environment

2.1.1 General

This energy storage converter is rated for outdoor installation and can be installed both indoors and outdoors. The energy storage converter is intelligent air cooling. The installation location must be clean, dry, and adequately ventilated. Enough space should be left for unrestricted access to the unit for installation and maintenance purposes, and the system panels should not be obstructed.

The energy storage converter should not be installed in the following locations:

- ◆Ceiling or wall cavities;
- ◆On roofs not suited for the purpose;
- ◆Access/exit areas or under stairs/access passages;
- ◆Places where freezing temperatures can occur, such as garages, carports, or other places such as wet rooms;
- ◆Humid or salty environments;
- ◆Seismic-prone areas—additional safety measures are needed;
- ◆Sites higher than 2000 meters above sea level;
- ◆Explosive atmospheres;
- ◆In direct sunlight or places susceptible to significant changes in ambient temperature.

2.1.2 Location Restrictions

The energy storage converter should not be installed:

(1) Within 600 mm of any heat source, such as hot water units, gas heaters, air conditioning units, or any other similar appliances;
(2) Within 600 mm of any exit;
(3) Within 600 mm of any window or ventilation opening;
(4) Within 600 mm of the side of any other device.

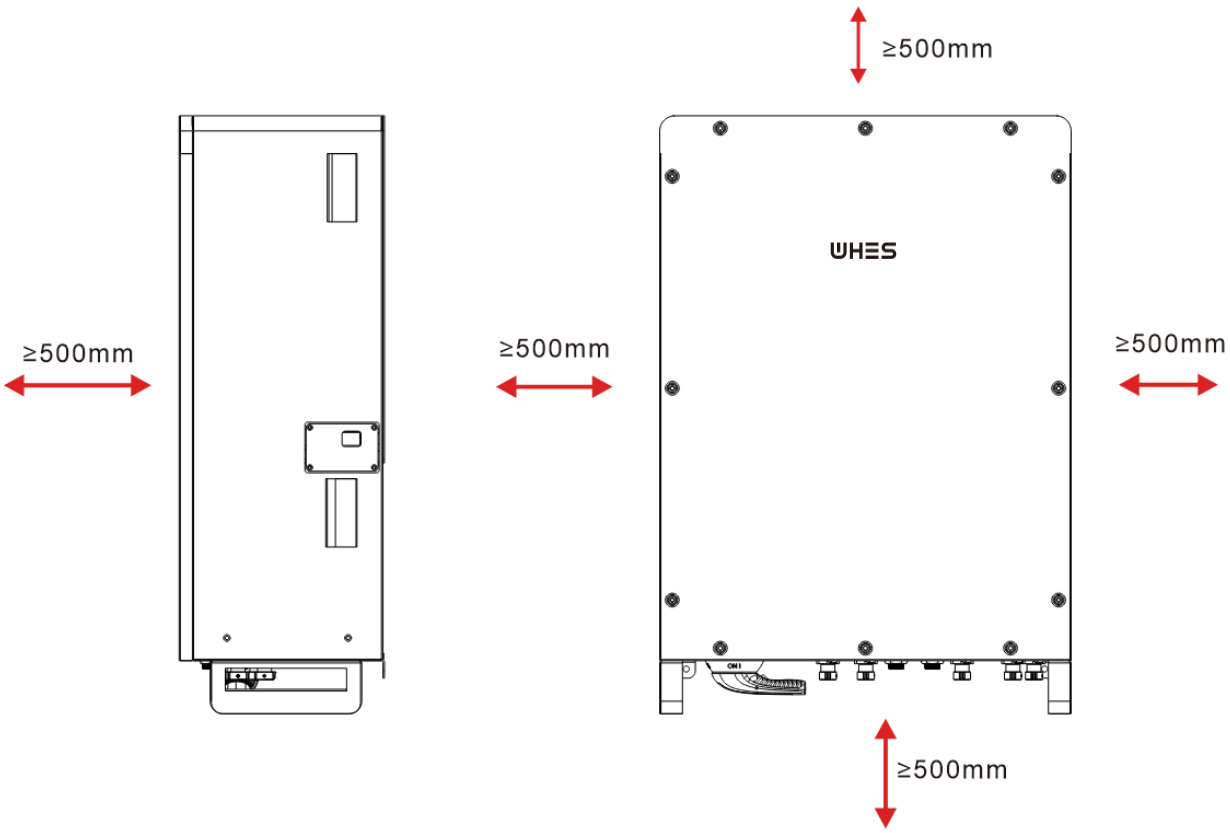
Leave at least 1 meter of clearance between the energy storage converter and any emergency exits when installing the device in corridors, lobbies, or hallways to ensure a safe exit.

2.1.3 Barriers to Habitable Rooms

Ensure a suitable non-combustible barrier is set up between the energy storage converter and any installation walls or structures when installing the energy storage converter on a wall or structure connected to a living space to protect against the spread of fire to living spaces. A non-combustible barrier should be installed between the energy storage converter and the surface of the wall or structure it is being mounted to if the surface itself is not made out of a suitable non-combustible material. Increase the distance between the energy storage converter and any other nearby structures or objects if there is less than 30 mm between the energy storage converter and the wall or structure separating it from living spaces.

The following spaces around the energy storage converter must remain empty:

Top	500 mm
Bottom	500 mm
Front	500 mm
Left and right sides	500 mm



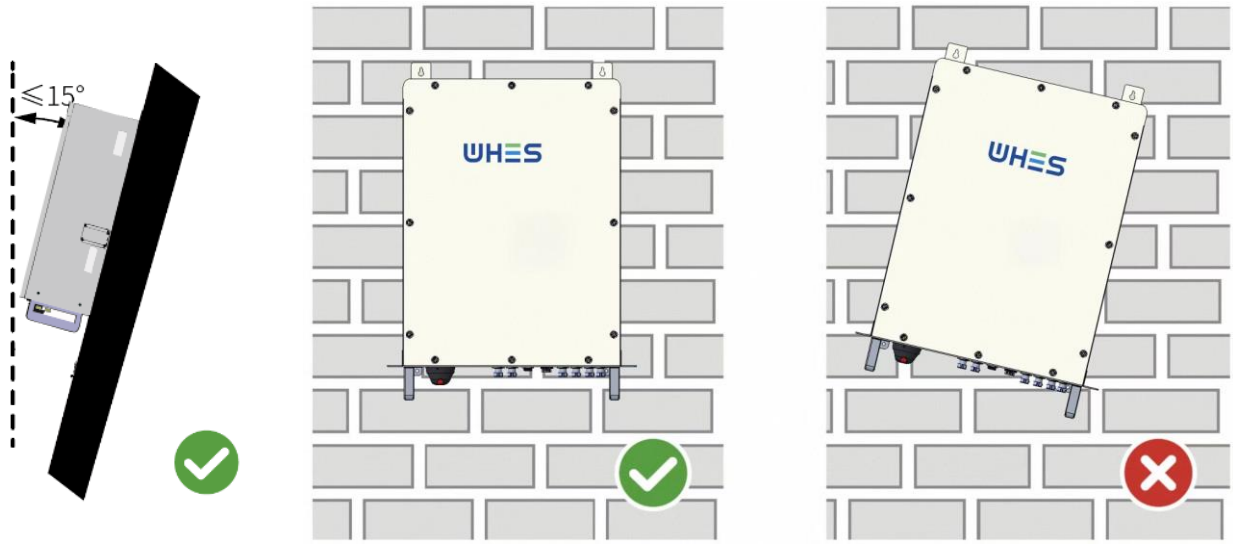
2.1.4 Choosing an Installation Location

Carefully select an appropriate installation location based on the following rules to protect the energy storage converter and facilitate maintenance.

Rule 1. The energy storage converter should be installed on a solid surface capable of supporting its size and weight.

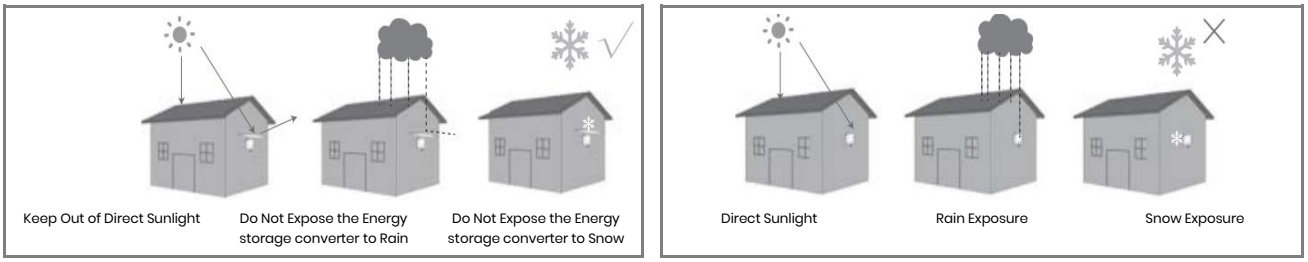
Rule 2. The energy storage converter should be installed vertically or at a maximum 2° angle (Pic 1).

Rule 3. The energy storage converter should be installed vertically or at a maximum 15° angle (Pic 1).



Rule 4. The ambient temperature should be lower than 45℃.

Rule 5. The converter installation location should be protected from direct sunlight or bad weather like snow, rain, or lightning (Pic 2).



Rule 6. Installing the energy storage converter at eye level will make maintenance more convenient.

Rule 7. The energy storage converter's product label should be clearly visible after

installation.

Rule 8. Do not install the converter in the snow or rain. If installation in the snow or rain is unavoidable, ensure the converter and distribution box are protected and kept dry.

Install the energy storage converter away from strong magnetic fields to avoid electromagnetic interference. When installing the energy storage converter next to radio or wireless communication equipment operating below 30 MHz: 1. Install the converter at least 30 m away from the wireless equipment. 2. Attach a low-pass EMI filter or a multi-winding ferrite core to the energy storage converter DC input cable or AC output cable.

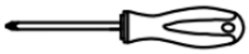
2.2 Energy Storage Converter Installation Steps



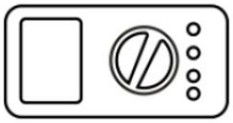
The energy storage converter must not be installed near flammable or explosive materials or near equipment with strong electromagnetic fields.

The energy storage converter should only be installed on concrete or other non-combustible surfaces.

Installation Tools:



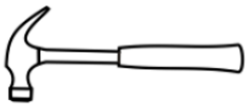
Screwdriver



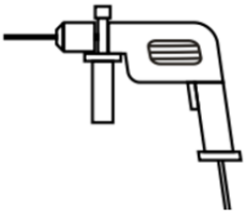
Multimeter



Wire stripper



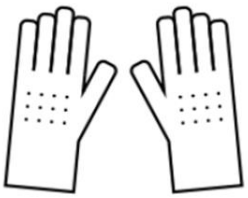
Claw hammer



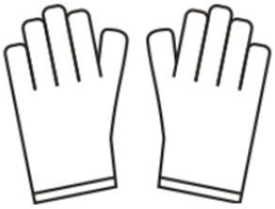
Hammer drill



Diagonal pliers



Insulating gloves



Protective gloves



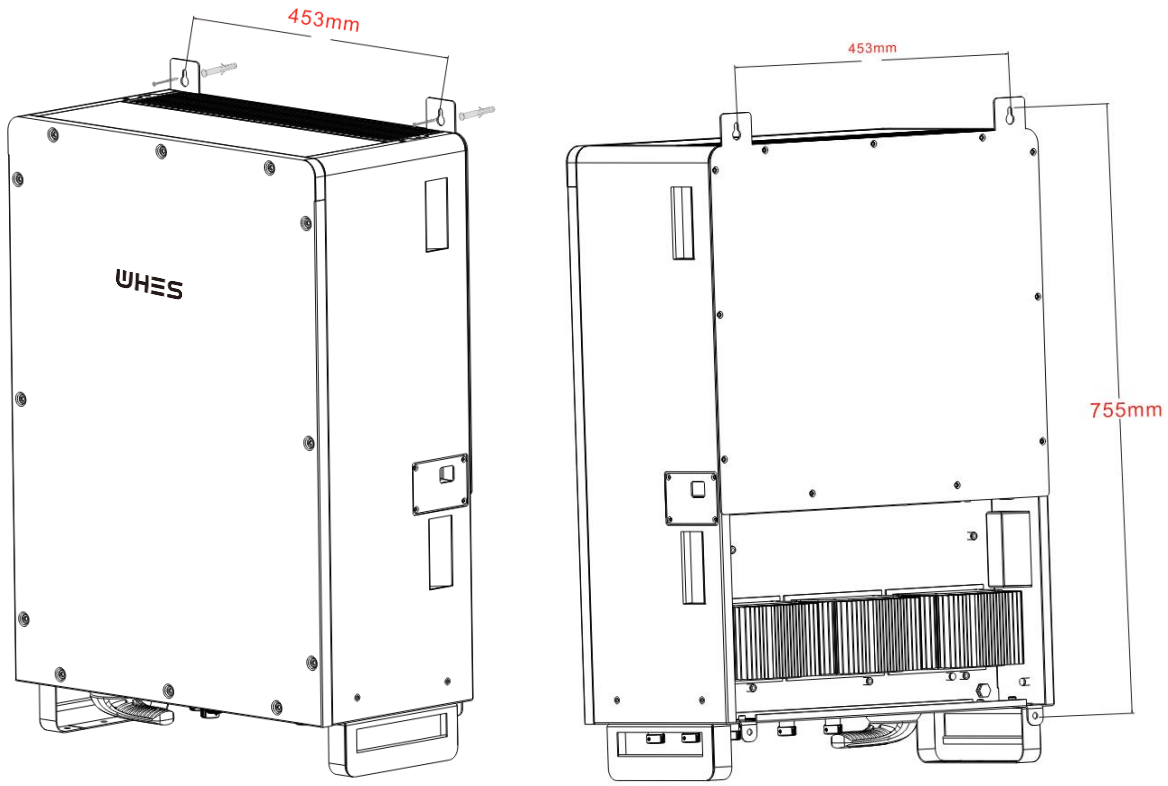
Crimping pliers

STEP 1: Choose the recommend drill head to drill 4 holes on the wall, 82-90mm deep.

STEP 2: Use a proper hammer to fit the expansion bolt into the holes.

STEP 3: Carry the inverter and holding it, make sure the hanger aim at the expansion bolt,fix the inverter on the wall. Fasten the screw head of the expansion bolt to finish the top mounting.

STEP 4: Align the two holes at the bottom of the inverter with the expansion tube, tighten the expansion screws, and complete the bottom fixation



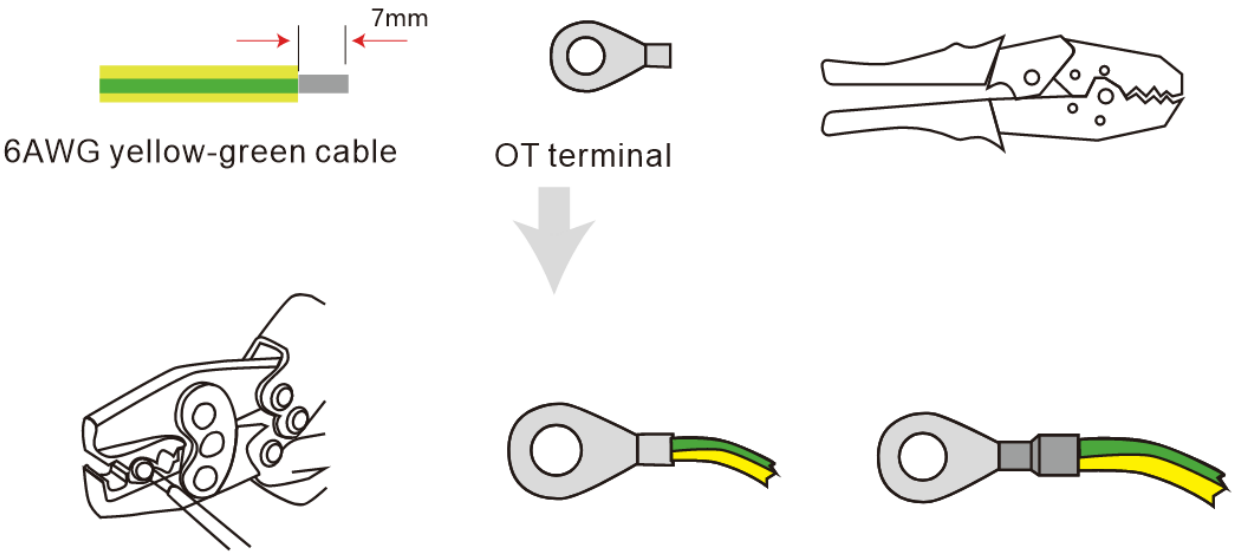
2.3 Cable Connections

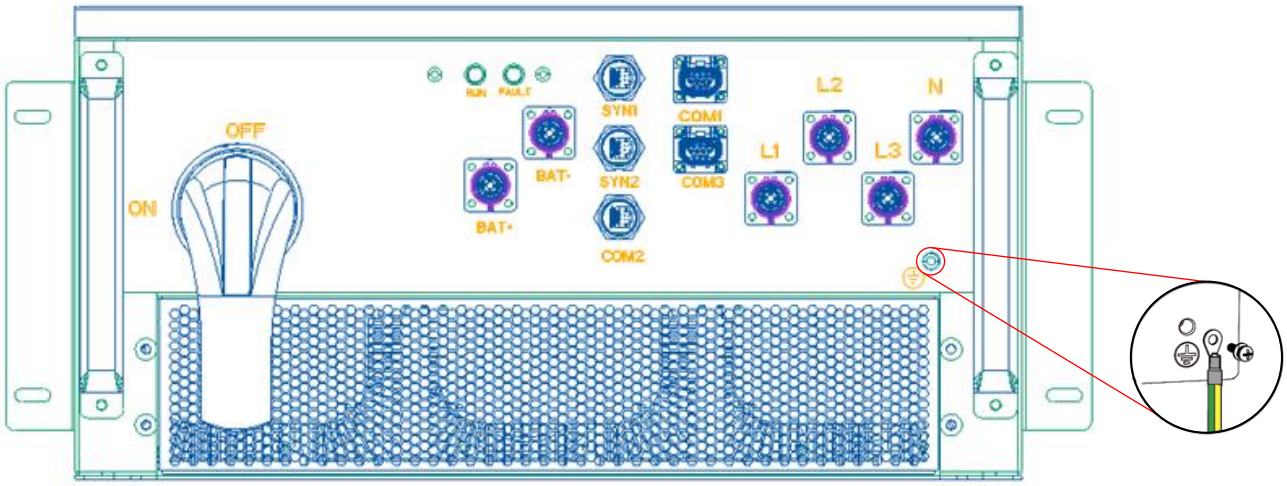
2.3.1 PE Connections

NOTE
The PE screw has been pre-installed on the energy storage converter in advance.

Specifications of cable and terminal:

- Grounding wire: the recommended cross-sectional area ≥16mm2（5AWG） outdoor copper core cable.
- Ring terminal: M5
- **PE cable** connection process is as below:





2.3.2 Battery Connections

NOTE

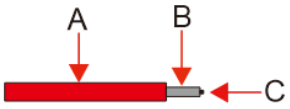
- A short circuit in the battery may cause personal injury. The instantaneous high current caused by a short circuit can release a large amount of energy and may cause a fire.
- Please be mindful of any electric shock or chemical hazards. Turn off AC and DC distribution switches and ensure that there is no dangerous voltage in the system during wiring.
- Please be mindful of any electric shock or chemical hazards. Turn off AC and DC distribution switches and ensure that there is no dangerous voltage in the

system during wiring.

- It is forbidden to connect and disconnect the battery cables when the inverter is running. Otherwise it may cause electric shock.
- It is forbidden to connect loads between the converter and batteries.
- When connecting battery cables, use insulated tools to prevent accidental electric shock or short circuit to the batteries.
- Ensure that the open circuit voltage of the battery is within the permissible range of the converter.
- Use the appropriate BAT connectors in the included accessory box.
- Connect the battery cables to the corresponding terminals such BAT+, BAT- and grounding ports correctly. Otherwise it will damage the converter.
- Ensure the DC cables are connected tightly, securely and correctly.
- Measure the DC cables using a multimeter to avoid reverse polarity connection. Also, the voltage should be under the permissible range.

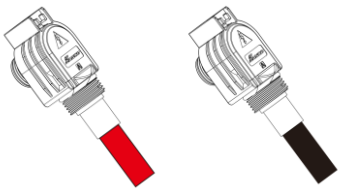
Follow the below battery cable requirements.

Legend	Description	Value
A	Outside Diameter	11.5 mm
B	Insulated Cable Length	15 mm
C	Conductor Core	2 AWG



Battery wiring connection steps:

STEP1 Thread the wire harness through the connector terminals

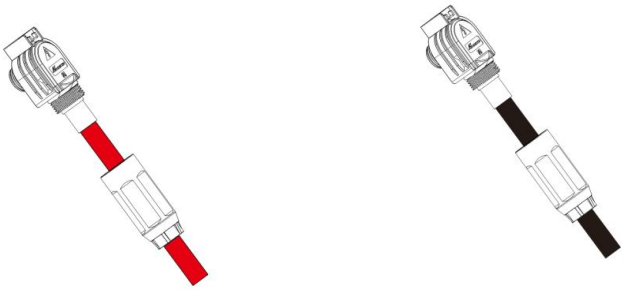


STEP2 Harness bonding

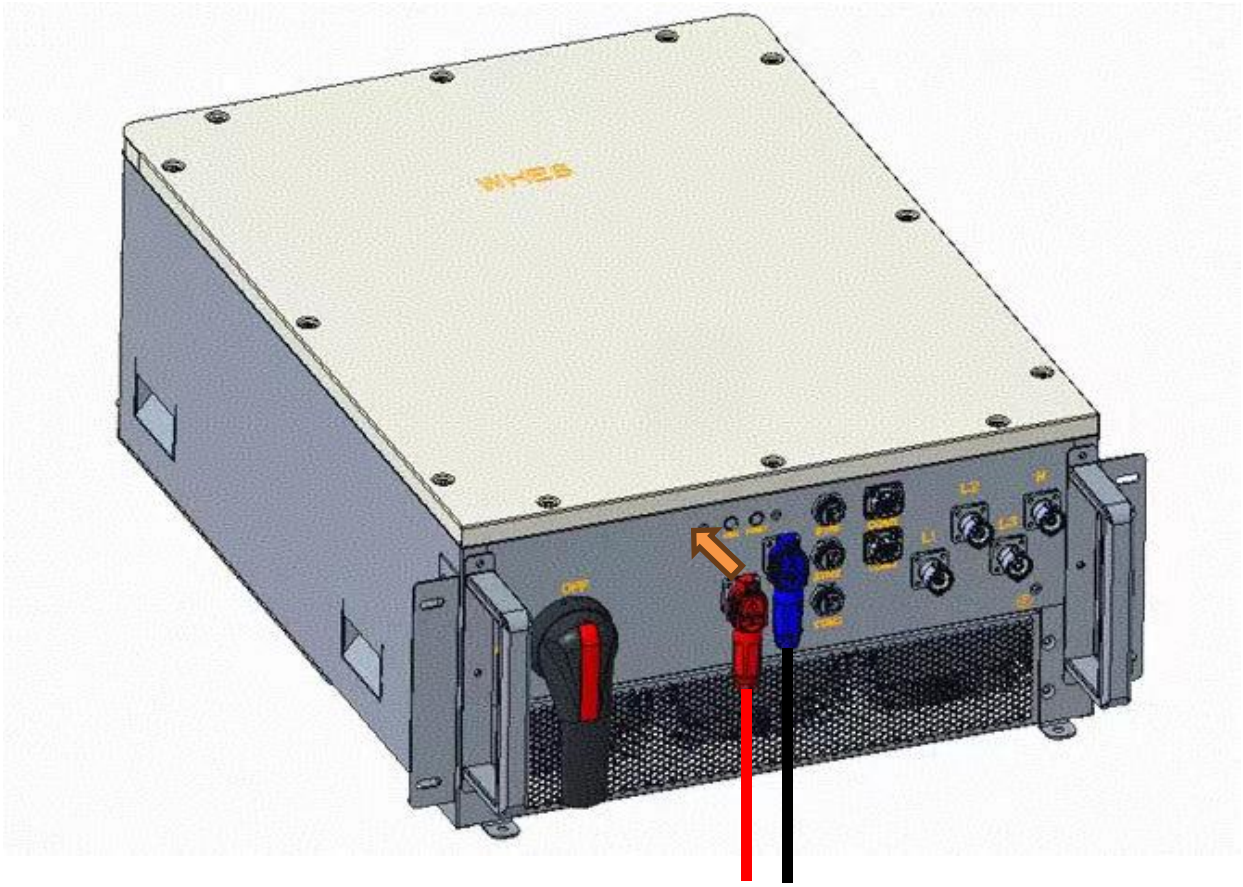


STEP3 Tighten the nut

BAT+ BAT-



STEP4 Plug in the connector



Note: The connectors will make a clicking sound when inserted correctly into the BAT plugs.

2.3.3 Grid Connections

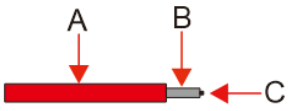
An external AC breaker is needed for On-Grid connection to isolate the energy storage converter from the utility grid when necessary.

NOTE
● Electrical short-circuits on the Back-Up side may damage the converter if an AC breaker is not installed on the Back-Up side.

- Use a blue wire to indicate the neutral conductor, a brown wire、a black wire、a grey wire for the line conductor, and a yellow-green wire for the protective earth bonding line.
- The device is a three-phase three-wire system, and the N-wire does not need to be connected to the grid.
- When multiple devices are connected in parallel, N-terminals are connected to each

- Follow the below GRID cable requirements.

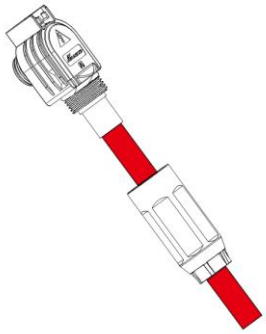
Legend	Description	Value
A	Outside Diameter	11.5 mm
B	Insulated Cable Length	15–17 mm
C	Conductor Core	2 AWG



Grid connection process is as below:

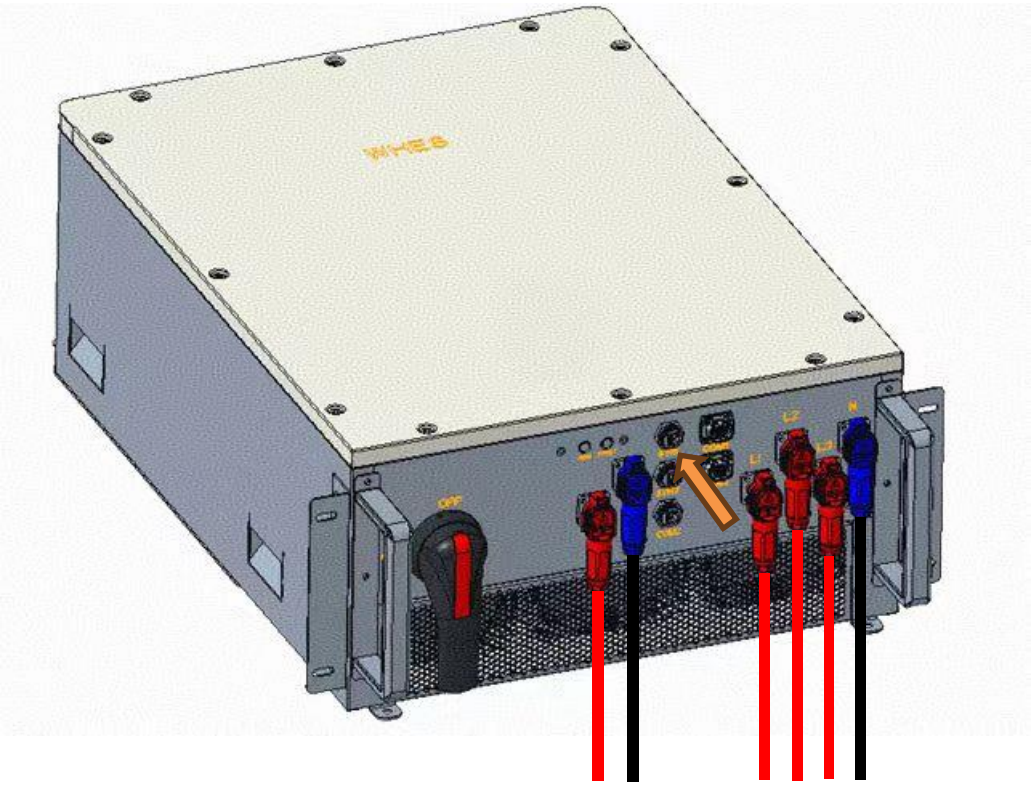
The crimping method refers to the AC side（The N lines of all devices should be connected together when multiple devices are in parallel）

L1，L2，L3



N





2.3.4 Communication Connections

The functions of the communication interface area are defined as follows:

Terminal type	Define PIN	Description
SYN1_RJ45/SYN2_RJ45	1:SYNC1 2\5\6:COM 3:SYNC2+ 4:SYNC2- 7:DSP_CANH 8:DSP_CANL	SYN1/SYN2 Synchronous signal interface (used for inverters running in parallel) 1: Hardware synchronization signal; 3/4: CAN, connect to EMS;(reserve) 7/8: synchronization CAN
COM1_12P	1:PWR 2:GND 3:DO1_1 4:DO1_2 5:DO2_1 6:O2_2 7:DI1 8:DI2 9: TR1_1 10: TR1_2 11: TR2_1 12: TR2_2	COM1_1/2: DIDO External power supply;(reserve) COM1_3/4, 5/6: DO Relay out;(reserve) COM1_7/8: DI dry contact input signal ; (reserve) COM1_9/10: The short-circuit interface for the first channel termination resistor. COM1_11/12:The short-circuit interface for the second channel termination resistor.
COM2_RJ45	1:TX_P 2:TX_N 3:RX_P 6:RX-N 8:PE 4/5/7:\	COM2:Ethernet port, connect to EMS;(reserve)
COM3_12P	1:BMS_485A 2:BMS_485B 3:BMS_CANL 4:BMS_CANH 5:WiFi_ 485A 6:WiFi _485B 7:Debug_485A 8:Debug_485B	COM3_1/2: Reserved BMS RS485 A/B. COM3_3/4: Reserved BMS CAN A/B. COM3_5/6:Reserved EMS RS485 A/B. COM3_7/8:Reserved Debug RS485 A/B.

- **SYNC1/2 connection for multiple converters communication in parallel**

SYNC1 and SYNC2 interfaces can be used in scenarios where multiple inverters

communicate in parallel with the form of Daisy chain. When multiple inverters communicate in parallel, 120ohms resistors can be connected in parallel on the communication bus of the first and the last inverters to ensure the communication quality. The definition of RJ 45 connector pin is shown in Fig.2-1

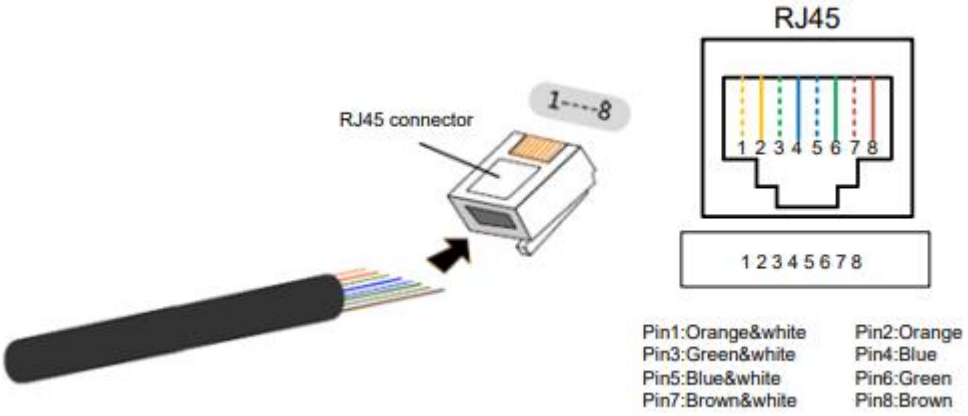


Fig.2-1 RJ45 interface

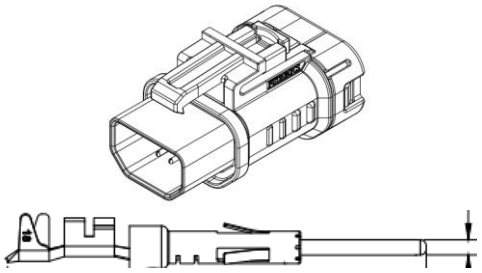
- **COM1 Cable connect**

  1)WH-TAA603 can be connected to EMS through RS-485(COM1_11\12) to accept instruction to complete automatic charging and discharging control and protection of energy storage system. Other pins are reserved.

  2) 1\2: DIDO External power supply;(reserve)

  3\4, 5\6: DO Relay out;(reserve)

  7,8: DI dry contact input signal ; (reserve)



- **Com2 connection**

  WH-TAA603 can be connected to EMS through ethernet to complete automatic charging and discharging control and protection of energy storage system. This function is reserved. The definition of RJ 45 connector pin is shown in Fig.2-1

- **Com3 connection**

  WH-TAA603 can be connected to BMS through ethernet to obtain battery information and energy dispatching command and complete automatic charging and discharging control and protection of energy storage system. This function is reserved. The definition of RJ 45 connector pin is shown in Fig.2-1

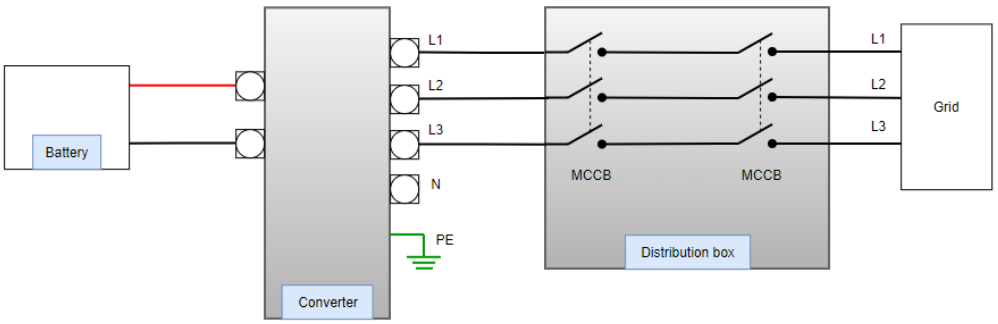
2.3.5 System Wiring Diagram

Please use an appropriate breaker based on the following specifications:

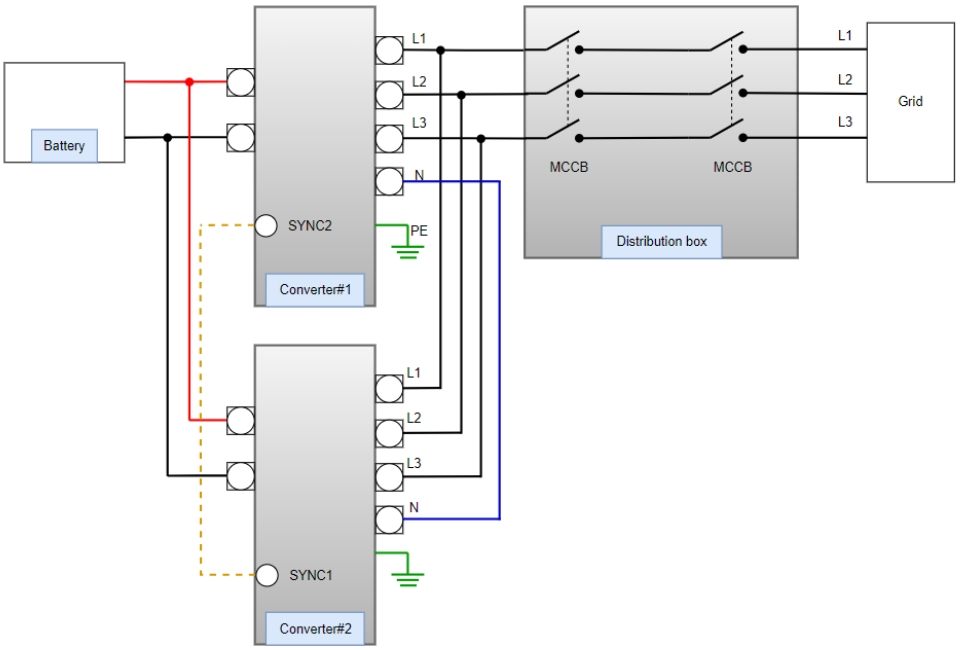
NOTE

1. Electrical short circuits on the grid side will damage the converter if an AC breaker is not installed.
2. This diagram illustrates the wiring diagram for Copia series energy storage converters, not the electrical wiring standards.
3. Please make sure that the AC line matches the "L1", "L2", "L3", "N", and the grounding port of the AC terminal completely when wiring. If the cable is connected incorrectly, the device may be damaged.

- Single grid-connected block diagram



Two parallel grid connection block diagram



3 Control Mode and Debugging Testing

3.1 Control method

3.1.1 connect with RS485

3.2 Startup and shutdown

The energy storage converter must be installed, debugged normally by the engineer, and the external power switch has been closed before the start-up steps can be performed.

3.2.1 Check before startup

Before startup, check the device according to the following steps:

1) Visually inspect and ensure that there is no damage outside the module, and DC breaker and AC breakers are in "OFF" state.
2) According to the inspection items in the third chapter after installation, check the DC input wiring of the energy storage device, whether the AC output wiring is normal and the grounding is good.
3) Check whether battery voltage is within normal voltage range.
4) Check whether the phase voltage and line voltage of the grid side are within the normal range and record the voltage value.

3.2.2 Startup steps

These startup steps are applicable to the circumstance that the energy storage converter system is in outage state and can be started. Operation steps are as follows:

1) Close DC breaker of battery cabinet, the converter will be powered-on.
2) The converter is defaulted to operate in grid-tied mode. Close AC breaker.
3) In the case of the first startup, the converter should first perform important parameter settings and confirmation. After completion, if the converter is powered on again, this step can be skipped.
4) Click the 'start' button on the host computer, and the device will automatically run in on-grid mode;
5) If the converter is required to operate in off-grid mode, set monitoring parameter to control the operation mode after Step (1) and disconnect from the power grid； Then can click the start button on the host computer, the device will automatically run in off-grid mode;

3.2.3 Shutdown steps

During normal operation of energy storage converter, the following steps shall be conducted if shutdown is required:

1) Click the 'Shutdown' button the host computer, then the device will automatically shut down.
2) To confirm whether the converter is in standby state.

3) Turn off AC breaker
4) Turn off DC breaker of PCS.

NOTE

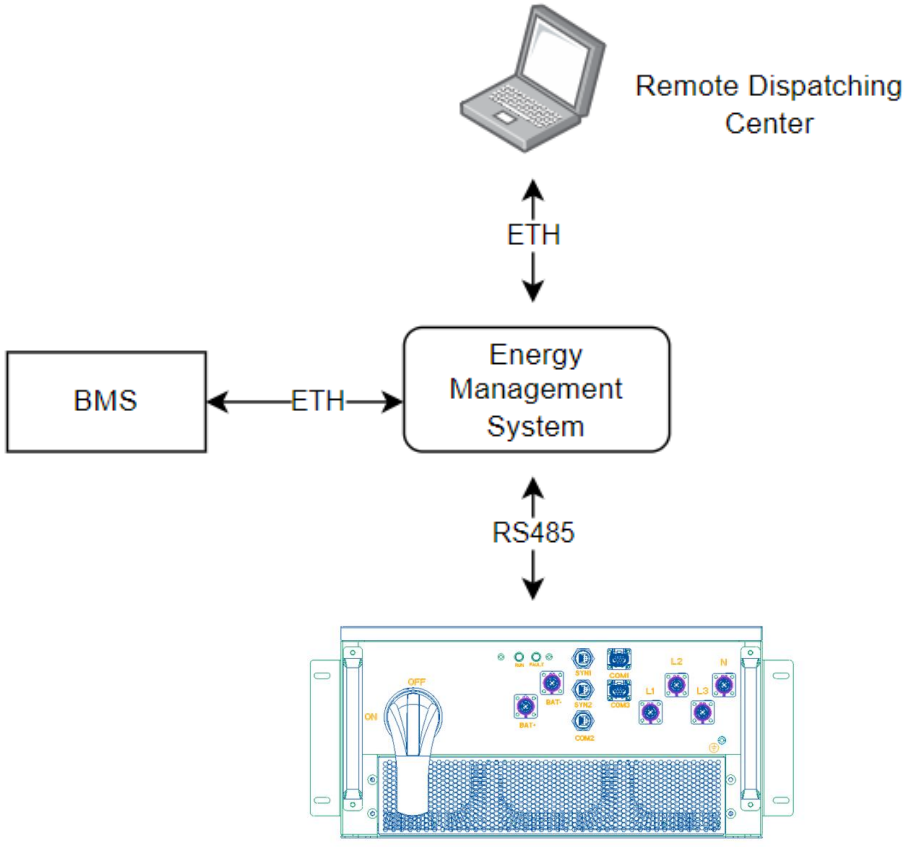
- After the electric circuits connected with the converter are turned off, the upper cover plate cannot be opened before DC capacitor in the module fully discharged after 30minutes.
- To prevent personal injury, please use a multi-meter to measure the voltage at wiring terminal if case maintenance or opening is conducted. Only after ensuring that all the parts in the converter is not electrified, relevant operation can be conducted!

4 Communtication mode

WH-TAA603 supports Modbus protocol, adopts RS485 、CAN and Ethernet communication interface and facilitates users to conduct background monitoring for energy storage converter and realize remote signaling, remote metering and remote regulating of energy storage converter.

4.1 EMS commuication

RS485 interface is used to communicate with EMS. As an energy dispatching unit for energy storage system, EMS accepts remote dispatching, receives BMS information and realizes control and protection of automatic charging and discharging of energy storage system.



Energy Storage converter

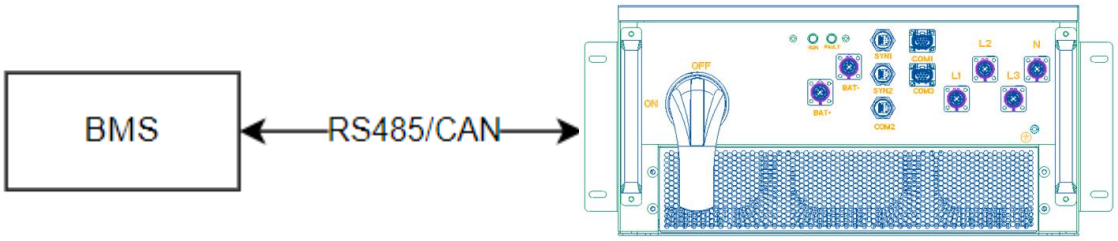
Converter connecting with EMS through RS485

NOTE
1. Please ensure the correct router password is entered.

2. Please ensure that shielded cables are used for communication and pay attention to wiring specifications to avoid electromagnetic interference.

4.2 BMS communication（reserve）

WH-TAA603 supports communication with BMS. It can obtain and detect basic state and protection information from BMS, close the energy storage converter according to the protection state of storage battery fault and improve the safety of battery pack. RS-485 is adopted for communication between energy storage converter and BMS, as shown in the following diagram.



Converter connecting with BMS through RS485\CAN

NOTE

1. Please ensure that shielded cables are used for communication and pay attention to wiring specifications to avoid electromagnetic interference.

5 TROUBLESHOOTING

	Issue	Solution
1	Red LED constant	Please check whether the power supply & communication cables are properly connected in accordance with local standards.
2	All the LEDs are off	Please check whether the voltage at each port is within the normal range.
3	Code DSP_1	Battery overvoltage. Please check whether the open circuit voltage is within the normal voltage range.
4	Code DSP_2	Battery overcurrent. Please check whether battery is correctly connected.
5	Code DSP_3	No grid power. Please check whether the gird voltage is normal.
6	Code DSP_4	Grid voltage fault. Please check whether the grid voltage is within the normal range.
7	Code DSP_5	Grid frequency fault. Please check whether the grid frequency is within the normal range.
8	Code DSP_6	Overheat fault. Please check whether the cooling system is working properly.
9	Code DSP_7	Isolation resistance fault. Please check the battery wiring system.

6 CLEANING AND MAINTENANCE

Power off the system before cleaning or performing any maintenance.

- **Shut down procedures:**

Step 1: Turn off the grid breaker.

Step 2: Turn off the DC switch.

6.1 Cleaning

Power off the system before cleaning the converter. Only clean the battery case with a soft, dry brush or vacuum cleaner to remove dirt. Do not use any solvents, abrasives, or corrosive liquids to clean the case.

6.2 Maintenance

The converter requires periodically maintenance, details as below:
NOTE: Make sure converter is totally isolated from all DC and AC power for at least 30 mins
before maintenance.

Heat sink: please use clean towel to clean up heat sink once a year.

Torque: please use torque wrench to tighten AC and battery wiring connection once a Year.

7 ANNEX

7.1 Datasheet

Model	WH-TAA603	WH-TAA503
Max. Efficiency	98.00%	98.00%
DC Side		
Max. DC Voltage	950	
DC Full Load Voltage Range	650~900V	
Max. DC current	102.3A	81.8A
AC Side		
Rated AC Active Power	62.5kW	50kW
Max. apparent AC power	62.5kVA	50kVA
Max. power	62.5kW	50kW
Nominal AC voltage	400 V	
AC voltage range	360V~440Vac	
AC power frequency (Hz)	50Hz/60Hz	
Max. output current （A)	90.21A/400V	72.2A/400V
Adjustable Power Factor Range	-1~+1	
THDi	<3%	
Grid connection type	Three-phase / PE	
Off-grid Output		
Norminal volatge (V)	400V	
Output voltage accuracy	±2%	
Voltage unbalance degree	2%，short time <4%	
Max. output current （A)	90.21A	72.2A
THDV	<3%	
Norminal frequency (Hz)	50Hz	
Protection		
Anti-islanding Protection	Yes	
AC Overcurrent Protection	Yes	
DC Reverse-polarity Protection	Yes	
Ground fault monitoring	Yes	
Residual-current monitoring unit	Yes	
DC surge protection	Type II	
AC surge protection	Type III	
Communication		
Display	LED Indicators	
Communication interface	Ethernet、485、CAN	
Communication protocol	modbus TCP/RTU	

General	
Dimensions (W/H/D)	543*271*789mm
Weight	56kg
Operating temperature range	– 25℃ ~ + 60℃
Cooling	Smart Air Cooling
Noise emission, typical	59dB
Max.Operating Altitude without Derating	2000m
Max. permissible value for relative humidity (non-condensing)	0~100%
DC connection	Quick connection terminal
AC connection	Quick connection terminal
Protection class	IP65
Technology	Transformerless