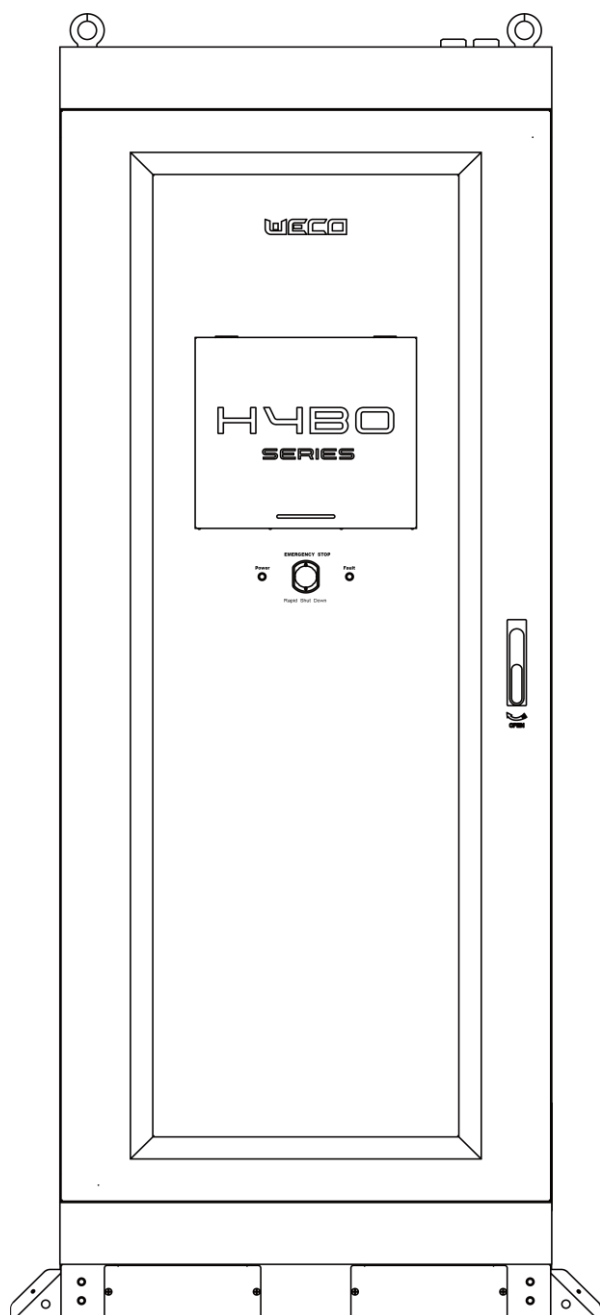




HYBO TL Single Door Series

Outdoor Series
Installation maintenance
and User manual

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Overview

This document mainly introduces the methods of installation, electrical connection, commissioning, maintenance and troubleshooting of the HYBO series inverters.

Please read this manual carefully before installation and operation to understand the safety information and to familiarise yourself with the functions and features of the HYBO series inverters.

Personnel requirements

All details in the manual, instructions for installation, operation, maintenance and troubleshooting are intended for authorised installers.

This manual is intended primarily for:

- Hardware Installer.
- Installing and Commissioning Engineer.
- On-site maintenance engineer.
- System maintenance engineer.
- Sales engineer.
- Users.

The end user (inexperienced person) may only use this product after receiving appropriate training from the installer.

Conventional Symbols Used in the Manual and on the Product.

To ensure the safety of people, equipment and everything related to the installation or use of the product, the following warning symbols are included in the manual to remind operators of the safety issues to be followed. Please learn and understand these symbols carefully.

Meaning of symbols in the manual or on the device:

Warning symbol	Meaning of the label
Danger! 	It is used to signal situations of imminent danger which, if not avoided, could result in death or serious physical injury.
Attention! 	Used to warn of potentially dangerous situations that, if not avoided, could result in death or serious physical injury.
Attention! 	Used to warn of potentially dangerous situations that, if not avoided, could cause moderate or minor personal injury.
Note ! 	Used to convey equipment or environmental safety warning information that, if not avoided, could result in equipment damage, loss of data, reduced equipment performance or other unpredictable results.
Leggere istruzioni 	Read the manual for important critical information, best practices, tips, etc. The 'information you will read' is not safety warning information to be understood as absolute, it must always be interpreted in relation to the environment, the type of installation, the skills of the installer, and the circumstances. Although these warnings contain information about people, equipment or environmental damage, they must always be evaluated in relation to the laws in force and the regulations in force at that location. The principle of maximum safety applies, and if you find any partial information to be incorrect or contrary to local laws, you must not install the inverter/system.
High Voltage 	This label indicates the presence of high voltage inside the product, contact with which may cause an electric shock.
15 minutes waiting time Capacitors present 	This label indicates the presence of capacitors inside the inverter capable of storing energy even after shutdown. Wait 15 minutes after switching off the inverter before performing any work on it.
Hot surfaces 	This symbol indicates that the temperature here is above the acceptable range for the human body and that it must not be touched to avoid personal injury.
Ground connection 	This symbol indicates that this is the protective earth (PE) terminal and that a solid earth is required to ensure the safety of operators.



OPERATIONAL SAFETY PREMISES

Read this manual carefully. Do not install in case of doubt or discrepancy

Hybrid solar inverters and batteries are designed to be safe and reliable when used properly and maintained consistently and diligently. By following these safety and maintenance guidelines, the efficient and safe operation of the system can be ensured, protecting people and property from possible hazards and/or damage. However, to ensure the safety and proper operation of the system, it is essential to follow the safety and maintenance guidelines.

If you have any questions or problems, do not hesitate to contact a qualified technician for assistance.

This inverter should only be installed, maintained and repaired by professional operators.

Safety and Maintenance

1. Proper Use and Regular Maintenance:

- The inverter and the batteries connected to it must be used in accordance with the manufacturer's instructions.

Proper use and constant maintenance are essential to ensure the safety and durability of the system, as well as to maintain the warranty of the various devices connected to it.

- Carry out periodic checks to ensure that all components function correctly and show no signs of wear or damage.

2. Fault Management:

- In the event of a fault, activate all safety procedures immediately. This may include completely disconnecting the inverter from both AC and DC power lines.

- Use external circuit breakers and/or disconnectors, installed and sized according to local standards, to completely isolate the inverter if necessary.

- Never attempt to repair the inverter or batteries yourself. Always contact a qualified technician for any work.

3. Constant Monitoring:

- Constantly monitor the system to ensure that it functions properly. This includes checking the quality of the electricity grid (voltage and frequency) and the status of the solar panels and batteries.

- Variations in the voltage and frequency parameters of the electricity grid, as well as changes in the status of the solar panels and batteries, can affect the inverter's operation, causing standby or idle conditions.

Safety Procedures

1. Disconnection of the Inverter:

- In the event of an emergency or breakdown, follow these procedures:
 - Isolate the inverter using the external circuit breakers to disconnect it from the AC and DC power lines.
 - Avoid touching electrical parts or internal components of the inverter without first checking for voltage with a voltage tester.
 - Disconnect and switch off the inverter when a persistent fault is present.
 - Report the fault immediately to a qualified technician or to WeCo.

2. Inspection and Maintenance:

- Carry out periodic checks of the fans, connectors and surfaces to prevent dust accumulation and ensure proper system operation.
- Ensure that the electrical protections are working properly and that the connectors are well tightened.
- Check the grounding of the system annually.

3. Grid Quality Monitoring:

- Check that the grid voltage and frequency are within the expected ranges to prevent the inverter from entering standby or idle conditions.
- Use the inverter monitoring app to receive notifications and alarms in the event of faults or anomalies.
- In case of no voltage or out-of-range grid values, the inverter will necessarily disconnect from the AC grid and this may contribute to the failure to recharge the battery from the grid when necessary.
- Always monitor the inverter and keep it connected to the internet at all times so that you can receive alarm notifications and emails in time to mitigate the problem.
- Ensure that the inverter's internet connection is always active to ensure constant monitoring.



SAFETY INSTRUCTIONS AND GENERAL PRECAUTIONS

General Precautions:

1. LOTO (Lockout-Tagout): Always apply the LOTO procedure to ensure that the inverter is disconnected from all power sources during installation, maintenance or repair. Follow the following steps scrupulously:

- a) Identify all energy sources.
- b) Isolate the energy by physical disconnection.
- c) Lock the isolating devices with safety locks.
- d) Attach warning labels.
- e) Check that there is no residual energy before starting work.

2. Residual Voltage Measurement: Use a certified tester to check that there is no residual voltage on the terminals before proceeding with any operation.

3. Use of PPE (Personal Protective Equipment): Always wear insulating gloves, safety goggles, protective helmet and clothing suitable for electrical work.

4. Grounding: Ensure that the system is correctly earthed and have the earthing check performed at least once a year by a qualified technician, check for certificates and measurements of the earthing before operating, take new measurements anyway.



SCHEDULED MAINTENANCE PROCEDURES

Scheduled activity to ensure the safety and reliability of the System:

Before starting any activities, ensure that you have the appropriate safety measures in place as mandated by local regulations and your company's safety supervisor.

This includes having portable firefighting systems, such as CO2 and powder extinguishers, readily available.

Additionally, verify that all personal protective equipment (PPE) and tools comply with your country's electrical codes and the safety procedure of your company

1. Emergency and Safety Breakers

- a. Frequency: every 6 months and after any event that trigger the protections, or after an electrical event that might have impacted on the reliability of the systems
- b. Ensure that all emergency and safety interrupters are easily accessible and in proper working condition. Regularly test their functionality to guarantee they can be activated quickly in case of an emergency.
- c. Test the function of the emergency buttons across all the connected devices
- d. Ensure that all personnel are familiar with their locations and operation procedures by making regular training

2. External Parts cleaning

Checking and Cleaning Fans

- a. Frequency: every 6 months, (every three months if the area is in a dusty location)
- b. Procedure: Isolate the inverter, remove the protective grids and clean the fans with compressed air and a vacuum to extract the dust, do not compress the dust towards the inner parts of the inverter.
- c. Check that the fans rotate freely and replace any defective components in consultation with the manufacturer in order not to lose the warranty claim and to avoid damaging the inverter parts.

Cleaning Dissipation Surfaces and Parts and Exteriors:

- d. Frequency: every 6 months. (every three months if the area is in a dusty location)
- e. Procedure: Isolate the inverter from active connections, power grid, batteries, solar panels, loads on EPS line.
- f. Remove dust and dirt from internal and external surfaces using antistatic cloths and a Hoover suitable for electronic components.
- g. Do not use water, oils, aggressive products or acids to clean system parts.
- h. Use a soft brush to clean the corners and the surfaces.

3. Inspection of the fixing bolts and mechanical parts of the cabinet

- a. Frequency: Every 3-6 month or after any natural expectational events such as storm earthquake, typhoon, extreme wind heavy rain
- b. Inspect the fixing bolts in the concrete slabs to ensure the torque is adequate.
- c. Check that the metal parts are free from rust.
- d. Ensure there are no obstructions, rust, or cracks on any of the doors or access points of the cabinets.

4. Checking Connector Tightness (All terminals) :

- a. Frequency: every 6 months.
- b. Procedure: Isolate the inverter, check and tighten the AC and DC cable connectors using a torque spanner where possible.
- c. Ensure that the connectors are securely fastened to prevent overheating or loss of contact.
- d. A loosen conductor can lead to fire due to the high resistance.

4. Checking Tightening of Screws on Battery LV Terminals:

- a. Frequency: every 6 months.
- b. Procedure: Isolate the inverter, use a torque spanner to tighten the screws on the low voltage (LV) battery terminals on both sides.
- c. Check for corrosion or signe of over heating and replace any defective components.

5. Checking Protections on AC Line Input and EPS Side:

- a. Frequency: every 6 months or after any relevant event
- b. Procedure: Isolate the inverter, visually inspect the protections, check the ratings and correct operation by means of appropriate tests. Replace any defective components.

6. Checking the Release Circuit (Remote Emergency Button):

- a. Frequency: every 6 months or after any relevant event
- b. Procedure: Test the correct operation of the trip circuit by simulating an emergency condition and verify that the inverter disconnects as expected.

7. Internet connection and App:

- a. Frequency: daily.
- b. Procedure: Check the inverter's internet connection, ensure it is up and running. Check the associated App daily to receive notifications and emails in the event of faults or alarms. If there is no internet connection, carry out a daily manual supervision of the system.



GENERAL PRECAUTIONS FOR USERS

General Safety Precautions

Security for End-Users to carry out maintenance and supervision procedures of their plant.

General Precautions:

- a) Do Not Touch Damaged Parts: Do not operate or touch visibly damaged parts of the inverter or solar system. Immediately report any damage to a qualified technician.
- b) Do not touch the rear or side openings of the inverter as they may be very hot.
- c) Earthing: Have the earthing of the system checked annually by a qualified technician.
- d) Cleaning and Maintenance: Do not carry out cleaning or maintenance without authorisation and supervision by a qualified technician.
- e) Daily Supervision: In the absence of an Internet connection, supervise the system on a daily basis to prevent any faults from affecting the functionality of the system.

Permitted and Required Activities:

- a) Check App Connection: Check the inverter's App daily for updates on faults or alarms.
- b) Notification Monitoring: Ensure that you receive notifications and emails from the App in case of faults or alarms.
- c) Reporting Problems: Immediately report any problems or anomalies encountered to the professional installer and await his intervention.

Prohibited Activities:

- a) Work on Electrical Parts: Do not carry out any work on electrical parts or internal components of the inverter, solar panels or batteries.
- b) Self-maintenance: Do not attempt repairs without the supervision of a qualified technician.
- c) Do not alter wiring or the arrangement of wiring, inverters or batteries.
- d) Handling of Components: Do not manipulate or disconnect components of the solar system or inverter.



SUPERVISORY PROCEDURE FOR A SOLAR INVERTER or PCS

Daily Cadence

1. **System Status Monitoring:**
 - a) Check the general operation of the inverter via the monitoring app.
 - b) Check for alarms or notifications in the app.
 - c) Ensure that the inverter is running and not in standby or idle mode.
2. **Checking the Internet Connection:**
 - a) Check that the inverter's internet connection is active to ensure remote monitoring and notification in the event of faults.
3. **Verification of Production Parameters:**
 - a) Check solar energy production data and battery charge status.
 - b) Compare data with expected data to identify any anomalies.

Weekly cadence

1. **Visual Inspection of Inverter and Batteries:**
 - a) Carry out a visual inspection of the inverter and batteries to identify any signs of wear, damage or overheating.
 - b) Ensure that there are no objects or debris obstructing the inverter's ventilation.
2. **Checking Cables and Connectors:**
 - a) Check that cables and connectors are securely connected and show no signs of damage.
3. **Ventilation System Control:**
 - a) Check that the inverter fans are working properly and that the air intakes are not obstructed.

Monthly cadence

1. **Verification of System Performance:**
 - a) Analysing monthly energy production data to ensure that the inverter is operating correctly.
 - b) Compare the data with those of previous months to identify any negative trends.
2. **Checking the Batteries:**
 - a) Check the state of charge and capacity of the batteries.
 - b) Check for signs of battery degradation, such as swelling or leakage.
3. **Inspection of Electrical Connections:**
 - a) Check the tightness of the connectors and screws on the battery and solar panel terminals.
 - b) Ensure that there are no signs of corrosion or overheating.
4. **Testing of Protection Systems:**
 - a) Verify the functioning of protective devices (circuit breakers, fuses, overload relief systems).
 - b) Test the operation of the emergency release circuit if present.



PLANNED ACTIVITY TO ENSURE THE SAFETY AND RELIABILITY OF THE BATTERY SYSTEM WITH HEAT PUMP CONDITIONER CABINET CONNECTED TO AN POWER CONVERSION SYSTEM

Before starting any activities, ensure that you have the appropriate safety measures in place as mandated by local regulations and your company's safety supervisor.

This includes having portable firefighting systems, such as CO2 and powder extinguishers, readily available.

Additionally, verify that all personal protective equipment (PPE) and tools comply with your country's electrical codes and the safety procedure of your company.

1. Emergency and Safety Breakers

- a) Frequency: Every 6 months, after any event that triggers the protections, or after an electrical event that might have impacted the reliability of the system.
- b) Procedure: a. Ensure that all emergency and safety breakers are easily accessible and in proper working condition. Test their functionality regularly to guarantee they can be activated quickly in case of an emergency.
- c) Test the emergency buttons across all connected devices to verify they function properly. c. Conduct regular training to ensure all personnel are familiar with the location and operation of these breakers.

2. Cleaning and Maintenance of External Components

Checking and Cleaning Fans of the Battery Module:

- a) Frequency: Every 6 months (or every 3 months if the area is in a dusty location).
- b) Procedure: Isolate the battery system, remove protective grids, and clean the fans using compressed air and a vacuum to extract the dust without pushing it into the internal parts of the system.
- c) Ensure the fans rotate freely and consult the manufacturer for replacement of any defective components to avoid warranty issues.

Cleaning Dissipation Surfaces, Parts, and Exteriors:

- a) Frequency: Every 6 months (or every 3 months in dusty environments).
- b) Procedure:
- c) Isolate the battery system from active connections, including the power grid, battery, heat pump, and any other connected systems.
- d) Use antistatic cloths and a Hoover suitable for electronic components to remove dust from both internal and external surfaces.
- e) Do not use water, oils, aggressive products, or acids. A soft brush can be used for cleaning tight corners and surfaces.

3. Inspection of Fixing Bolts and Mechanical Parts of the Cabinet

- a) Frequency: Every 3-6 months or after significant natural events such as storms, earthquakes, typhoons, or heavy rain.
- b) Procedure: Inspect the fixing bolts to ensure proper torque.
- c) Check for rust or damage on metal components.
- d) Ensure there are no cracks, rust, or obstructions on any doors or access points to the cabinet.

4. Checking Connector Tightness (All Terminals)

- a) Frequency: Every 6 months.
- b) Procedure: Isolate the battery system and open the DC circuit on both side , breaker and maintenance manual cartridge switch.
- c) Check and tighten all cable connectors using a torque spanner to ensure proper contact.
- d) Ensure all connectors are securely fastened to prevent overheating and potential fire hazards.

5. Tightening of Screws on Battery Terminals

- a) Frequency: Every 6 months.
- b) Procedure:
- c) Isolate the battery system.
- d) Use a torque spanner to check and tighten screws of the battery terminals and bus bars
- e) Inspect for signs of corrosion or overheating and replace defective components as necessary.

6. Checking Protections on the AC Line Input for AUX services of the cabinet

- a) Frequency: Every 6 months or after any relevant event.
- b) Procedure: Isolate the battery system.
- c) Visually inspect the protections and verify the correct ratings.
- d) Conduct appropriate tests to ensure correct operation and replace any defective components.

7. Checking the Release Circuit (Remote Emergency Button)

- a) Frequency: Every 6 months or after any relevant event.
- b) Procedure: Simulate an emergency condition to test the trip circuit and ensure the battery system disconnects as expected.
- c) Verify proper functionality by conducting an actual test.
- d) Internet Connection and Monitoring App

9. Checking the Communication between Batteries and Inverter (CAN/BMS)

- a) Frequency: Every 6 months or after any relevant event (e.g., communication loss, system malfunction, or component replacement).
- b) Procedure: Verify Connection Stability
- c) Ensure the physical CAN/BMS connections between the batteries and the inverter are secure and free from any damage.
- d) Inspect the communication cables and connectors for signs of wear, damage, or loose connections.

Monitor Communication Status:

- a) Use the system's monitoring software or app to check the status of the CAN communication. Look for any warning messages or alarms indicating communication issues between the batteries and the inverter.

- b) Ensure the BMS (Battery Management System) is properly communicating with the inverter, exchanging vital information such as state of charge (SoC), voltage, temperature, and current.

Perform CAN Communication Test:

- a) Perform a communication test to ensure that the CAN bus is transmitting data correctly between the batteries and the inverter.
- b) Use diagnostic tools to verify the integrity of the data being transferred (e.g., using a CAN bus analyzer or other testing devices).

Firmware Compatibility Check:

- a) Ensure that the firmware of both the batteries' BMS and the inverter is up-to-date and compatible with each other.
- b) Check with the manufacturer for any required updates or patches that address communication issues.

Check for Fault Codes or Errors locally and via Cloud:

- a) Review the system's log for any fault codes or error messages related to communication.
- b) If any errors are found, follow the troubleshooting procedure outlined in the manufacturer's guide, which may involve restarting the system, replacing faulty cables, or recalibrating the communication protocols.

Inspect Communication Latency:

- a) Ensure the communication between the batteries and the inverter is responsive, with minimal delay.
- b) Slow communication can indicate issues within the CAN bus network or interference that may affect the performance of the energy system.

Re-establish Communication After Event:

- a) After any maintenance, electrical event, or system reset, recheck the communication between the batteries and inverter to ensure the system is working as intended.
- b) Test multiple restart of the system to ensure the self-addressing of the battery module and the data communication is consistent and reliable
- c) Check the Communication data alert by disconnecting and plugging again the CAN BMS line from battery cabinet and inverter

Internet Data and Cloud Service

- a) Frequency: Daily.
- b) Procedure: Check the battery system's internet connection daily to ensure proper monitoring.
- c) Use the associated app to receive notifications and alarms for system faults.
- d) In case of internet disconnection, manually supervise the system daily to monitor performance and safety conditions.

Documentation:

Record the results of the communication check in the maintenance log for future reference, including any repairs, replacements, or recalibrations performed.



SAFETY MANAGEMENT AND SUPERVISION OF LITHIUM BATTERY

Lithium batteries, commonly used in solar energy storage systems, require specific precautions due to their potential risk of fire, explosion and toxic gas release. The following are additional safety measures and best practices for handling lithium batteries.

Specific Risks of Lithium Batteries

Risk of Overheating and Burning of Lithium Batteries due to Thermal Runaway.

Excessive discharge and low temperatures contribute to dendrite formation and subsequent cell damage.

Safety Measures

Preface:

Lithium batteries can overheat and catch fire if damaged, overcharged or exposed to very high temperatures.

Install the batteries in a well-ventilated room capable of maintaining controlled and, if possible, constant temperatures throughout the year.

A correct installation carried out according to the requirements of the manual contributes to improving the overall safety of the storage system.

Although both inverter and batteries are equipped with active and passive safety systems, residual risks that could cause damage to persons or property cannot be excluded if not well understood and assessed during the design phase.

It is essential to ensure that the site chosen for the installation meets the minimum safety requirements, that it is easily accessible, that it allows agile maneuvering in case of an emergency, that it protects against flooding, and that it is away from combustibles, gases or flammable substances.

Constantly monitor battery temperature using battery management systems (BMS). Avoid overloading by using appropriate chargers and overload protection devices.

Risk of Explosion:

Lithium batteries can ventilate if subjected to physical damage or short circuits.

Safety Measures:

- Protect batteries from shocks and physical damage by using robust housings, marking locations and providing adequate lighting and passive protection against both vertical and horizontal shocks.
- Carry out periodic checks for signs of damage or deformation.
- Use short-circuits protection devices and follow the manufacturer's instructions for installation and use.

Risk of Toxic Gas Release:

In the event of overheating, overcharging, misuse or fire (induced or generated), lithium batteries may release gas from electrolytic gasification.

Normally, the cells ventilate by opening the upper cell valve when the internal pressure exceeds about 150 bar, which allows the release of gas and prevents high internal cell temperatures.

Battery sensors managed by the BMS interrupt charging when the temperature is too high, but still far below the thermal runaway trigger.

Risk of Excessive Battery Discharge

Over-discharge of batteries can irreversibly damage the cells and compromise the safety and efficiency of the system.

Excessive discharge can cause dendrites to form inside the cells, increasing the risk of internal short-circuits and fires.

Actions to Take in the Event of Excessive Discharge:

Monitoring: Ensure that the charge levels are above the minimum permissible level, check that the inverter is connected to the AC grid.

Isolation: If a battery becomes excessively discharged, isolate it immediately from the rest of the system to prevent further damage.

Inspection and Replacement: Have a qualified technician carry out a thorough inspection. If the battery is damaged, replace it with a new one.

Preventive Maintenance:

Schedule regular maintenance to check the state of the batteries and prevent excessive discharges.

Set up the APP to notify important events.

Monitor AC-side inverter power switches to ensure emergency charging of batteries in case of low voltage and/or lack of sufficient solar production to charge batteries.

Monitor photovoltaic fuses or breakers to ensure energy production from photovoltaic panels.

Safety Measures:

- Install gas detectors and adequate ventilation systems in battery installation areas for increased safety.
- Evacuate the area immediately if gas or a burning smell is detected.
- Use respiratory masks and other personal protective equipment in case of emergency.

Best Practice for Emergency Management of Storage Plants with Inverters, Solar Panels and Lithium Batteries.

In Case of Overheating or Smoke:

- Immediately isolate the inverter and batteries by operating an emergency button that acts universally on the circuits.
- Evacuate the area and call the emergency services.
- Do not attempt to extinguish the fire with water; use CO2 or powder extinguishers if available.
- Inform the fire brigade that these are lithium batteries.

In Case of Fire:

- Use CO2 or powder extinguishers specifically designed for lithium batteries.
- Evacuate the area and call the emergency services.
- Do not attempt to extinguish the fire with water.

Maintenance and Prevention:

Carry out regular checks of the system internally including the condition of the batteries.

Ensure that the batteries are installed in a suitable environment and protected from physical damage. Strictly follow the manufacturer's guidelines for the installation, use and maintenance of lithium batteries.

Important Notes:

The direct current supplied by solar panels and batteries can be extremely dangerous. It is essential that only qualified personnel carry out operations involving the installation, maintenance and repair of the inverter and associated system.

1 Safety Instructions

1.1 General safety considerations



Note!

- This manual is an integral part of the inverter and describes the assembly, installation, commissioning and maintenance of the product. Please read it carefully before beginning any operation.
- Personnel responsible for inverter operation, product installation, electrical connection, commissioning, maintenance and troubleshooting must be qualified electricians and must be trained to use the correct operating methods in accordance with the laws of the state in which the inverter is used.
- Any person involved in the operation, installation and maintenance of the inverter must be trained and supervised by a company safety officer regarding the interaction between the inverter and the local electrical system and possible interference with other existing infrastructure.
- WECO is not responsible for the installation process or the selection of installers, who must be qualified according to local regulations. WECO assumes no responsibility for violations of general operational safety requirements or safety standards for the installation and use of the equipment.

All information and advice contained in this documentation does not constitute an express or implied action contrary to local regulations or standards. The safety guidelines included in this document may not include or consider all applicable regulations in the area of installation/operation. Always review and consider applicable federal, state, and local laws and regulations in accordance with product industry standards.

WECO cannot be held liable for malfunctions or damage caused in such circumstances:

- Shipping damages occurred during operations managed by WeCo
- Damage caused by storage conditions that do not comply with the requirements of the product documentation.
- Improper storage, installation and use of the equipment.
- Unqualified personnel using and operating the equipment.
- Damage caused by third parties during improper installation or maintenance.
- Damage caused by non-compliant installation of devices connected to the inverter
- Failure to observe the operating instructions and safety warnings contained in the product and documentation.
- Operating in harsh environments beyond what is described in the product and documentation.
- Operations and settings that go beyond the parameters specified in the applicable technical specifications.
- Unauthorised disassembly and/or repair, alteration of the product or modification of the software code, installation of inappropriate firmware.
- Equipment damage caused by abnormal natural environments (such as lightning, earthquakes, fire, storms, etc.).
- The warranty period has expired, and the warranty service has not been extended.
- Any installation and operating environment outside of those specified by relevant standards.

1.2 Statement

Personnel capable of installation, cabling, commissioning, maintenance, troubleshooting and replacement must meet the following criteria:

- Operators must receive professional training from their employer before operating devices for the first time.
- Operators must read this manual in its entirety and master safety issues related to operation.
- Operators must be familiar with the relevant safety specifications of electrical installations.
- The operator must know the operating principle and composition of photovoltaic storage systems and be familiar with the user manual for this product.
- During operation, do not wear metal objects such as rings, watches, key rings, etc., and always wear personal protective equipment (such as insulating gloves, insulating shoes, etc.).
- Installers or company managers must train and inform the end customer in the ordinary use of the inverter and train them on emergency management, how to interact with safety devices and how to interpret alarms or warnings indicated in the APP.
- The markings on the inverter contain important information for safe operation. It is strictly forbidden to alter or damage the casing and/or the safety markings on the frame.
- The inverter is equipped with a nameplate on the side which contains important information on product parameters. Alteration is strictly forbidden.

1.3 System Installation



Danger!

It is strictly forbidden to use the inverter connected to any source of electricity during installation at first start-up and in any case during maintenance or troubleshooting, the inverter must first be switched off and then switched on in sequence to exclude injury or damage. Ensure that all power sources are disconnected when installing the inverter. Lock and label all power sources so that they cannot be switched on before installation is complete.

- The process of lifting and positioning the inverter must be performed slowly and safely, the product could be damaged and operators could be injured.
- When installing the inverter, ensure that it is not electrically connected to any power source.
- There must be at least the distance specified in the manual between the inverter and surrounding objects to ensure sufficient space for installation and heat dissipation. If you have any questions about the installation distance, please consult a service technician.
- During installation, avoid liquids, debris or conductive particles entering the system, which could cause internal short circuits or system failure.
- Do not install on rainy or particularly humid days as waterproof connectors, once opened, may retain moisture and then once closed may oxidise internally and become dangerous.

1.4 Electrical connections



Danger!

Before making any electrical connections, ensure that the inverter is undamaged and carry out installation only under safe conditions.

Avoid installing the inverter where there is visible damage to prevent electric shock, fire and personal injury.

Do not install the inverter if there is any damage to the inverter housing or metal casing.

- All electrical connections must comply with national electrical regulations. If the procedures in this manual or the information contained herein conflict with local laws, do not install the product and consult your technician and/or supplier.
- The equipment must be permanently connected to a protective earth. When installing equipment that must be earthed, the earthing cable must be installed first. When disassembling the equipment, the earth cable must be removed last.
- External cables must be protected in cable ducts or pipes and reliably secured with cable clamps and brackets. Buried cables must be marked with special burying markers and then backfilled ensuring that no deformation or damage caused by stresses on the cables occurs during backfilling or later.
- The inverter may only be connected to the grid with the permission of the local energy authority in accordance with the regulations in force at the time.
- The cables used in the system must be securely connected, well insulated and of adequate specification.
- The use of cables in high-temperature environments can cause the insulating layer to age and damage the cables. The distance between cables and heating devices or heat sources must be at least 30 mm.
- When the temperature is too low, shocks and vibrations can cause the cable's plastic outer jacket to break. All cables must be laid and installed at a temperature above zero, especially in low-temperature environments.
- Cable specifications are different for grid, battery and photovoltaic connection. These requirements must be strictly adhered to.
- All DC cables must be installed in such a way as to provide as short a path as possible, and the positive and negative cables of the string or main DC supply must be bundled together. Avoid creating loops in the system.

1.5 Procedures



Danger!

High-voltage inputs to the inverter are dangerous. Please strictly follow the safety precautions listed in this manual and other relevant documents.

Always follow LOTO procedure to avoid serious safety risks.

- When the HYBO is switched on for the first time, it must be configured by a professional electrician.
- Incorrect settings can impair the proper functioning of the inverter and result in the inverter not conforming to the country's certification.
- Some inverter components, such as copper bars, inductors, etc., take some time to cool down after being switched off. Do not touch them immediately after a power failure and beware of burns.
- Use the equipment in accordance with local rules and regulations.
- Capacitors in the inverter are subject to slow discharge, so wait 15 minutes before working inside the inverter and ensure that all terminals have 0V by checking with a voltmeter.

1.6 Maintenance and Replacement



Danger!

When using the inverter, be aware that the DC and AC inputs and outputs are "high voltage" and can cause electric shock, resulting in death, serious injury or property damage.

Therefore, before performing any maintenance work, you must turn off the power, wait 15 minutes and work in strict accordance with the safety precautions listed in this manual and other relevant documents.

- Only service the Inverter if you are familiar with the contents of this manual and have the appropriate training, tools and test equipment.
- Before maintenance, turn off the inverter, input and output switches, and wait at least 15 minutes before performing any operations on the inverter.
- During maintenance sessions, avoid access of unrelated personnel to the maintenance site and place temporary warning signs or fencing to isolate.
- The inverter may only be re-powered after the fault has been resolved, otherwise the fault may expand or the equipment may be damaged.
- During maintenance, follow ESD protection specifications and wear antistatic equipment.
- Avoid opening cabinet doors in wet or rainy weather for maintenance or repair of products.
- When carrying out various operations such as maintenance and inspection of equipment, competent personnel must take appropriate protective measures, such as wearing noise-reducing earplugs, insulating shoes and anti-scald gloves.

2 Product Introduction

2.1 Product Introduction

Applicable product models

This manual is applicable to Hybo TL Hybrid Single Door models for outdoor installation:

HYBO-TL-OD 120/120 series:

- HYBO-TL 120/120-OD
- HYBO-TL 120/120-OD-S (w/ STS)
- HYBO-TL 120/120-OD-S-AS (w/ STS and ATS)

HYBO-TL-OD 120/180 series:

- HYBO-TL 120/180-OD
- HYBO-TL 120/180-OD-S (w/ STS)
- HYBO-TL 120/180-OD-S-AS (w/STS and ATS)

Function

The HYBO single door inverter series consists of 120 kW inverter systems integrating MPPT module, PCS module, lithium battery input, grid/AC generator input, touchscreen display, and can also support STS (for EPS load support) and ATS dual power switch (for Generator + Grid input support) as optional accessories; its function is to convert solar power into three-phase AC power to supply loads or to store DC power in the battery for use when needed. The user can use the app or the built-in Display to flexibly choose the most advantageous operation mode according to the actual usage scenario with different situations of PV, grid, battery, load and so on.

Model name rules

The model name on the nameplate reflect the name of the inverter cabinet series, the AC input/solar power, the topology of the inverter, such as TL or TT (TL = transform less and TT = Isolation Transformer Built In), and the presence of any STS or ATS accessories.

Model description: (HYBO-TL 240/180-OD-S-AS for reference):

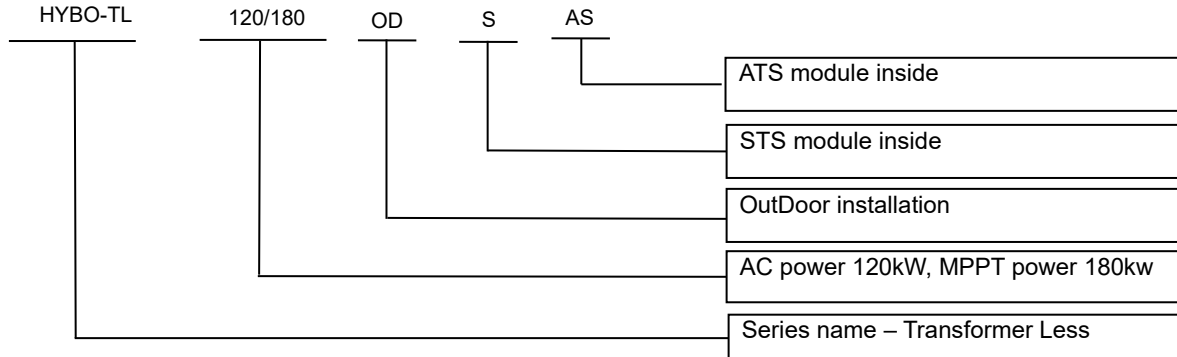


Fig. 1.1-1 Model description

2.2 System composition

The block diagram of the Hybo cabinet is shown below:

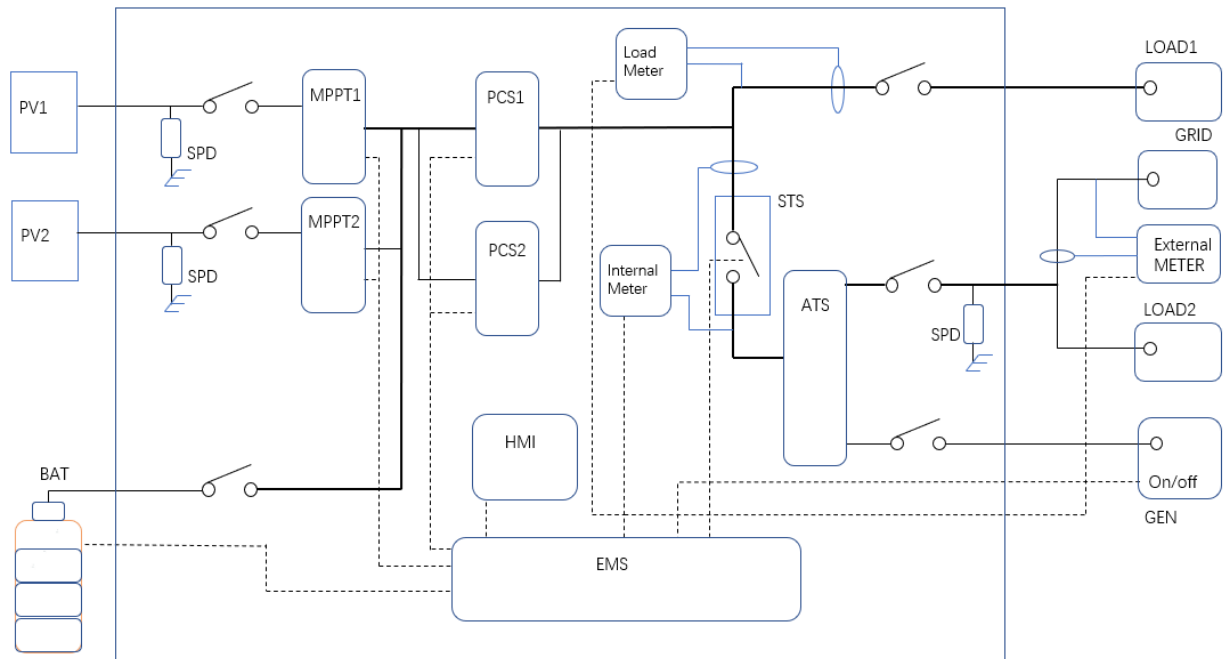


Fig. 2.2-1 System Block Diagram

2.3 Description of appearance

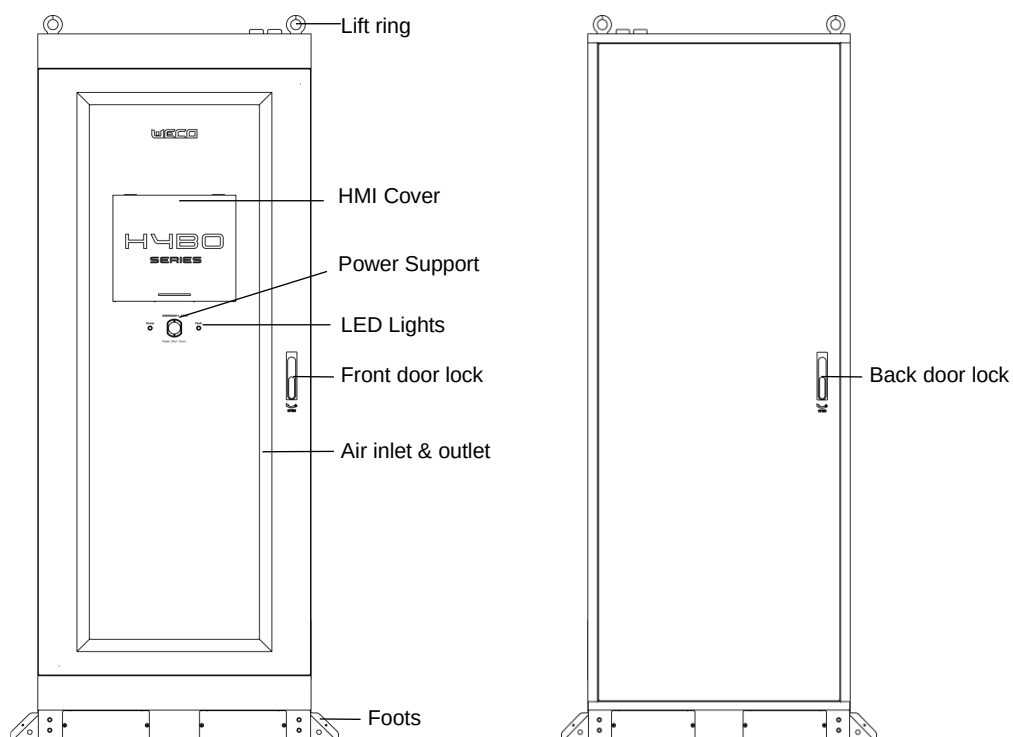


Fig. 2.3-1 Front & Back exterior drawing

Six-sided view of the shape

1081mm(W)*2366mm(H)*1100mm(D), height with lifting ring: 2162mm.

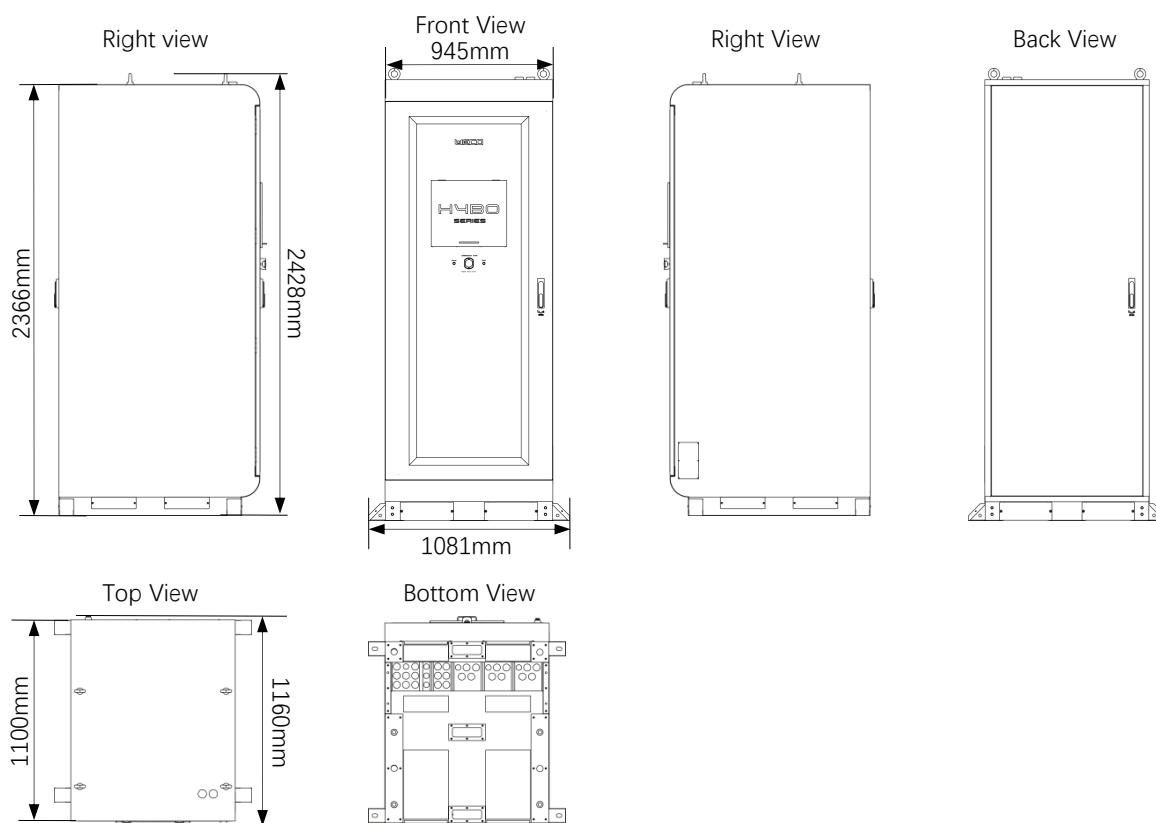


Fig. 2.3-3 Six-sided view of the shape

Internal structure (HYBO-TL 120/180-S-AS for reference)

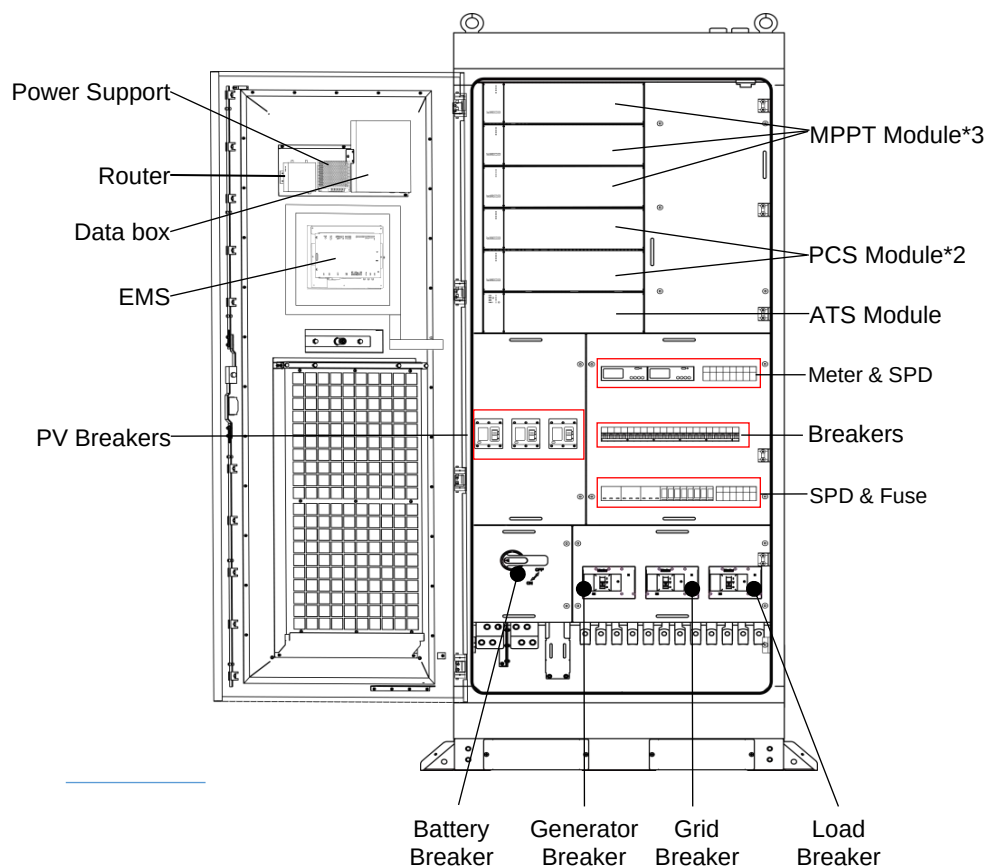


Fig. 2.3-4 Internal structure diagram (front door open).

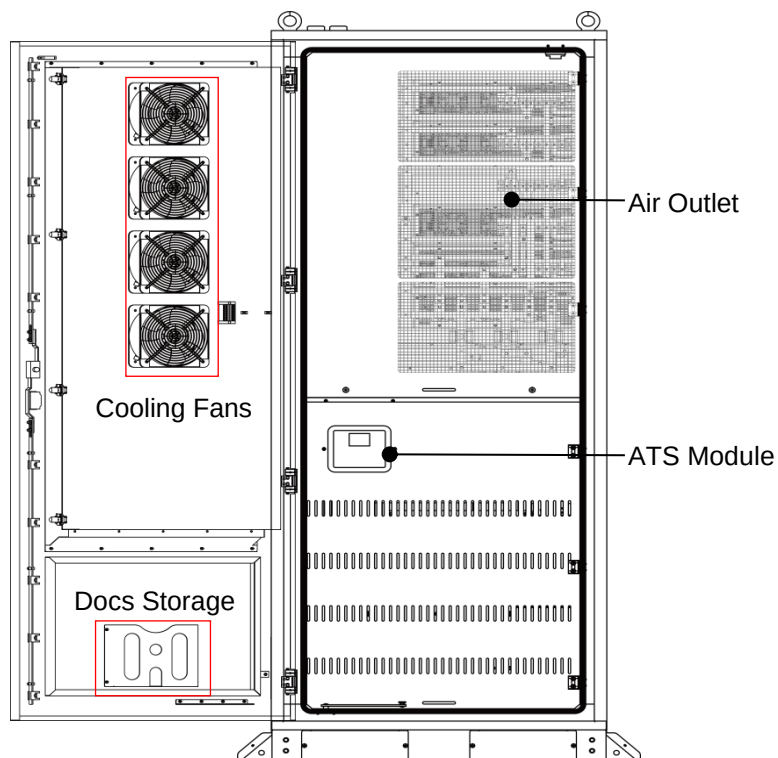
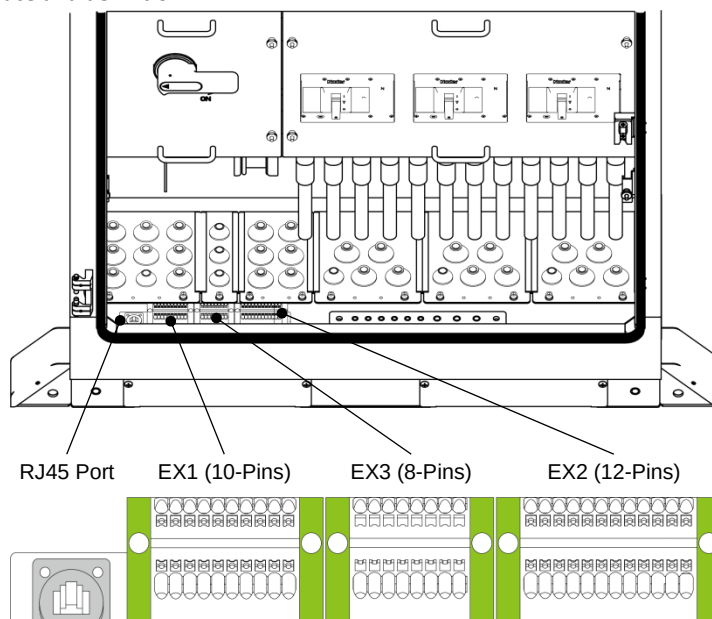


Fig.2.3-5 Internal structure diagram (rear door open)

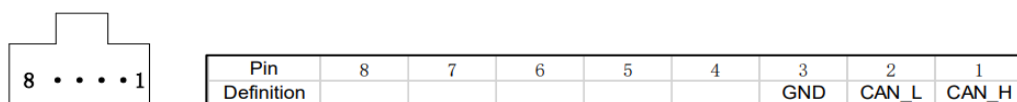
HYBO communication interface and definition:



RJ45 port definition

BMS-CAN	Connect to Battery BMS CAN communication
---------	--

The sequence of the wires of the CANH, CANL, GND communication signals with the battery system is as follows:

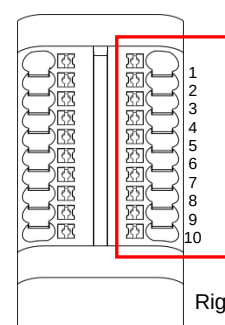


EX1 terminal definition

(the left ports for internal connection, Right ports for external connection)

NO.	Mark	Description
1	M-RS485A	External meter communication
2	M-RS485B	External meter communication
3		N/A
4	Generator-1	Dry contact.Diesel Generator start signal
5	Generator-2	Dry contact.Diesel Generator start signal
6		N/A
7	HVBOX-P24V+	Battery cabinet 24V+ input
8	HVBOX-P24V-	Battery cabinet 24V- input
9	PV-RS485A	Connect to PV Combiner box RS485A
10	PV-RS485B	Connect to PV Combiner box RS485B

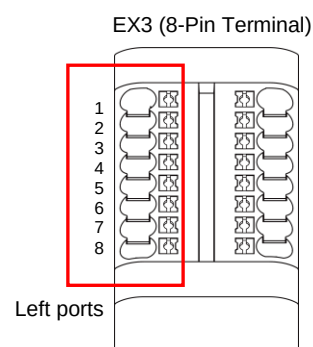
EXT (10-Pin Terminal)



Right ports

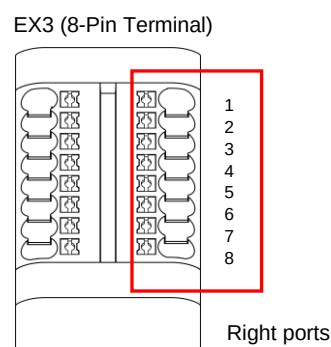
EX3 terminal definition (Left ports)

Description	Mark	NO.
N/A		1
Battery cabinet NO.1 E-Stop Single 24V-	E-BAT1-24-	2
Battery cabinet NO.2 E-Stop Single 24V-	E-BAT2-24-	3
Battery cabinet NO.3 E-Stop Single 24V-	E-BAT3-24-	4
Battery cabinet NO.4 E-Stop Single 24V-	E-BAT4-24-	5
N/A		6
Connect to 1 end of E-Stop button		7
Connect to another end of E-Stop button		8



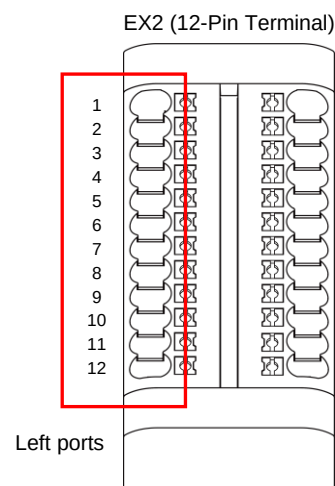
EX3 terminal definition (Right ports)

Description	Mark	NO.
BAT Combiner E-stop 24V- in	E-Combiner-24-	1
PV Combiner NO.1 E-stop 24V- in	E-PV1-24-	1
PV Combiner NO.2 E-stop 24V- in	E-PV2-24-	2
PV Combiner NO.3 E-stop 24V- in	E-PV3-24-	3
PV Combiner NO.4 E-stop 24V- in	E-PV4-24-	4
N/A		6
Remote Emergency stop connection 1	E-STOP-1	7
Remote Emergency stop connection 2	E-STOP-2	8



EX2 terminal definition (Left ports)

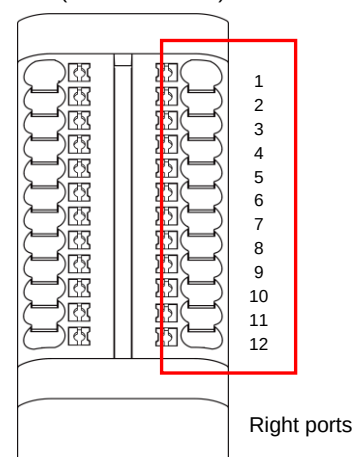
Description	Mark	NO.
N/A		1
PV Combiner NO.1 E-stop	E-PV1	2
PV Combiner NO.2 E-stop	E-PV2	3
N/A		4
Battery Combiner E-stop	E-Combiner	5
Battery Cabinet NO.1 E-stop	E-BAT1	6
N/A		7
PV Combiner E-Stop 24V+	E-Combiner-24+	8
Battery NO.1 E-Stop 24V+	E-BAT1-24+	9
Battery NO.2 E-Stop 24V+	E-BAT2-24+	10
Battery NO.3 E-Stop 24V+	E-BAT3-24+	11
Battery NO.4 E-Stop 24V+	E-BAT4-24+	12



EX2 terminal definition (Right ports)

Description	Mark	NO.
N/A		1
PV Combiner NO.3 E-stop	E-PV3	2
PV Combiner NO.4 E-stop	E-PV4	3
Battery Cabinet NO.2 E-stop	E-BAT2	4
Battery Cabinet NO.3 E-stop	E-BAT3	5
Battery Cabinet NO.4 E-stop	E-BAT4	6
N/A		7
N/A		8
PV Combiner NO.1 E-Stop 24V+ in	E-PV1-24+	9
PV Combiner NO.2 E-Stop 24V+ in	E-PV2-24+	10
PV Combiner NO.3 E-Stop 24V+ in	E-PV3-24+	11
PV Combiner NO.4 E-Stop 24V+ in	E-PV4-24+	12

EX2 (12-Pin Terminal)



2.4 Electrical devices list

HYBO-TL 120-OD series					
Application	Role	Spec	Manufacturer	Model	Specification
PV Input Breaker	Input circuit breaker Protection	Automatic Breaker	PROJOY	PEMC-250/2340 250A DC1000V MX+0F	1000V /250A Breaking capacity 20kA
PV SPD protection	Surge Protection	Automatic	DEHN	DCB YPV 1200 FM	1200V/20kA (8/20uS) Maximum discharge current 40kA
Battery Breaker	Input circuit breaker Protection	Automatic Breaker	Nader	NDM3Z-630V/2341 400A DC24V	1000V/400A Breaking capacity 40kA
Grid Breaker	Input circuit breaker Protection	Automatic Breaker	Nader	NDM3-400M/4341-250A DC24V	690V/250A Breaking capacity 70kA
Grid SPD protection	Surge Protection	Automatic	DEHN	DG M TT 385 FM)	385V/20kA (8/20uS) Maximum discharge current 40kA
Generator Breaker	Input circuit breaker Protection	Automatic Breaker	Nader	NDM3-250M/4341-250A DC24V	690V/250A Breaking capacity 70kA
Loads Breaker	Output Protection	Automatic Breaker	Nader	NDM3-250M/4341-250A DC24V	690V/250A Breaking capacity 70kA
ATS	Dual power switch	Automatic switching	AISIKAI	SKT1-400A/4P/N	400V/400A

2.5 Label description

Icons on the product

Note: The icon is for reference only, please refer to the actual product.

Icon	Name	Meaning
	Hot Surface warning sign	The temperature of the cabinet could reach high temperatures when working, inner surfaces could be extremely hot, and it is strictly forbidden to touch it
	Delayed discharge identification	After switching on the cabinet, there is a risk of high voltage. All work on inverters must be carried out by qualified electrical personnel. Due to the high voltage inputs, a residual high voltage occurs after switching off the cabinet and takes 5 to 15 minutes to discharge to a safe voltage. Always measure live terminals before operation.
	Read instructions always before operating the HYBO	Remind the operator to pay attention to check the instruction manual of the cabinet
	Cabinet grounding label	Protect the ground wire connection location
	Cabinet warning label	When working, do not unplug the antenna directly
	Cabinet cabinet serial number label	Serial number information
	Cabinet login QR code label	Scan the code to connect to the cabinet APP to obtain the login password

Description of the LED

Light	name	LED definition
	On-grid work indicator	Green light: grid-connected work Green light off: Not connected to the grid
	Off-grid work indicator	Green light: Off-grid work Green light off: Not working off-grid
	Power-on LED	Green light: The system is powered on Green off: The system is not powered on
	Fault indicator	Red light: The system is faulty Red light off: The system is trouble-free

Nameplate

The nameplate is for reference only, please refer to the actual product.

WECO ESS	Model: HYBO-TL 120-120-OD (EUROPEAN STANDARD) Hybrid Inverter	WECO ESS	Model: HYBO-TL 120-180-OD (EUROPEAN STANDARD) Hybrid Inverter
PV Input Port		PV Input Port	
Max. PV Input Voltage	680Vdc	Max. PV Input Voltage	680Vdc
MPPT Operative Voltage Range	200-650Vdc	MPPT Operative Voltage Range	200-650Vdc
PV Input Channels	2	PV Input Channels	3
PV Input Power	120kW	PV Input Power	180kW
Max. PV Isc	250A	Max. PV Isc	250A
Battery Input		Battery Input	
Battery Voltage Range	680-1000Vdc	Battery Voltage Range	680-1000Vdc
Battery Max. Charging Current	176A	Battery Max. Charging Current	264A
Battery Max. Discharging Current	176A	Battery Max. Discharging Current	176A
Battery Input Terminals	4	Battery Input Terminals	4
Battery Type	Lithium-ion (WECO CAN Protocol)	Battery Type	Lithium-ion (WECO CAN Protocol)
Grid Input/Output Port		Grid Input/Output Port	
Grid Wiring Type	Five Wires (3P + N + PE)	Grid Wiring Type	Five Wires (3P + N + PE)
Rated Grid Voltage	400Vac	Rated Grid Voltage	400Vac
Rated Grid Frequency	50/60Hz	Rated Grid Frequency	50/60Hz
Rated Grid Power	120kW	Rated Grid Power	120kW
Max. Grid Current	172A	Max. Grid Current	172A
Power Factor	0.8(lagging) - 0.8(leading)	Power Factor	0.8(lagging) - 0.8(leading)
Back-up Output Port		Back-up Output Port	
Rated Back-Up Voltage	400Vac	Rated Back-Up Voltage	400Vac
Rated Back-Up Frequency	50/60Hz	Rated Back-Up Frequency	50/60Hz
Max. Back-Up Output Power	120kW (no overload)	Max. Back-Up Output Power	120kW (no overload)
Max. Back-Up Output Current	172A	Max. Back-Up Output Current	172A
General Information		General Information	
Maximum Efficiency	97%	Maximum Efficiency	97%
Power Factor	0.8(lagging) - 0.8(leading)	Power Factor	0.8(lagging) - 0.8(leading)
Operative Temperature Range	-20 ~ +50°C	Operative Temperature Range	-20 ~ +50°C
Inverter Topology	Transformerless	Inverter Topology	Transformerless
IP Rating	IP55	IP Rating	IP55
Size (WxDxH)	1081x1100x2366mm	Size (WxDxH)	1081x1100x2366mm
Weight	670 kg	Weight	700 kg
WeCo Srl Viale Kennedy 113-121 Scarperia e San Piero CAP 50038 (FI) E-mail:service@wecobatteries.com		WeCo Srl Viale Kennedy 113-121 Scarperia e San Piero CAP 50038 (FI) E-mail:service@wecobatteries.com	
CE    		CE    	
MADE IN CHINA BY WECO		MADE IN CHINA BY WECO	
S/N:		S/N:	

Certification mark

Icon	Name	Meaning
	EU CE certification mark CE Déclaration	The product complies with the basic requirements of the EU's New Method for Technical Coordination and Standardization
	EU WEEE logo	It is not possible to dispose of the cabinet as household waste

2.6 Working principle

- HYBO-TL single door can have up to 3 MPPT, each MPPT connect to one PV combiner to support 12 PV strings connection.
- The photovoltaic combiner box output is connected to the MPPT circuit, each MPPT circuit can track the maximum power point of one photovoltaic bus independently.
- The conversion of DC to three-phase AC power is realized by two internal inverter circuits.
- The surge protection function is supported on the DC side and the AC side.
- HYBO Cabinet can manage the energy storage function through the preset logic interface, but the user can also select a personalized working pattern using the HMI functions and the remote APP setting features.
- The PV energy generated can be supplied to the AC load as direct conversion.
- The excess energy is stored in the energy storage cluster via DC integrated Chargers.
- The DC energy stored can be released to the grid prior AC conversion, according to the user's load settings and/or based on the energy management rules to maximize the energy marketing benefits.
- HYBO-TL can be equipped with STS or ATS module (according with the customer transition time requirements).
- It can also be equipped with a generator programmable interface

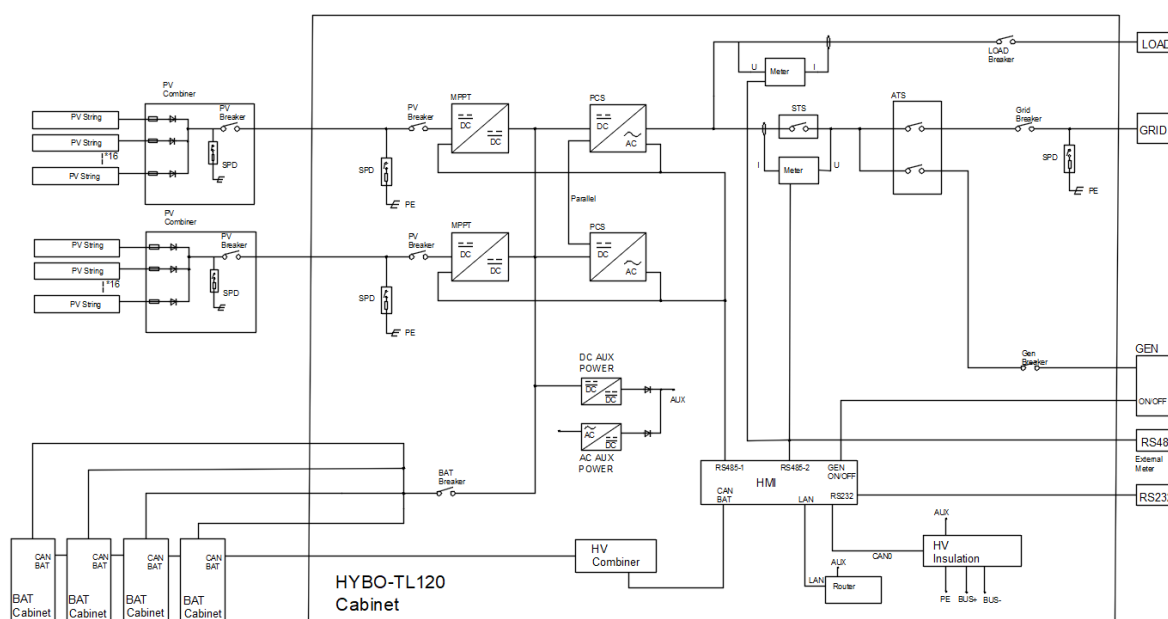


Fig. 2.6-1 Working principle diagram of the 120/120 version

2.7 Working mode

The HYBO-TL can be set with working mode as: Load prioritized, Remote mode, Planning mode, or Local mode. Check the detailed setting page on the article **“7 HMI Setting”**.

Load prioritized: All energy from the photovoltaics and batteries supports load utilisation to minimise grid withdrawal.

(An example for daily use:)

Period 1: No PV generation, No loads consumption.

Period 2: PV start to generate power and charge the battery, No loads consumption.

Period 3: Loads turned on, PV is too weak to support loads consumption. So the battery starts charging the loads.

Period 4: PV support load consumption and PV charge the battery.

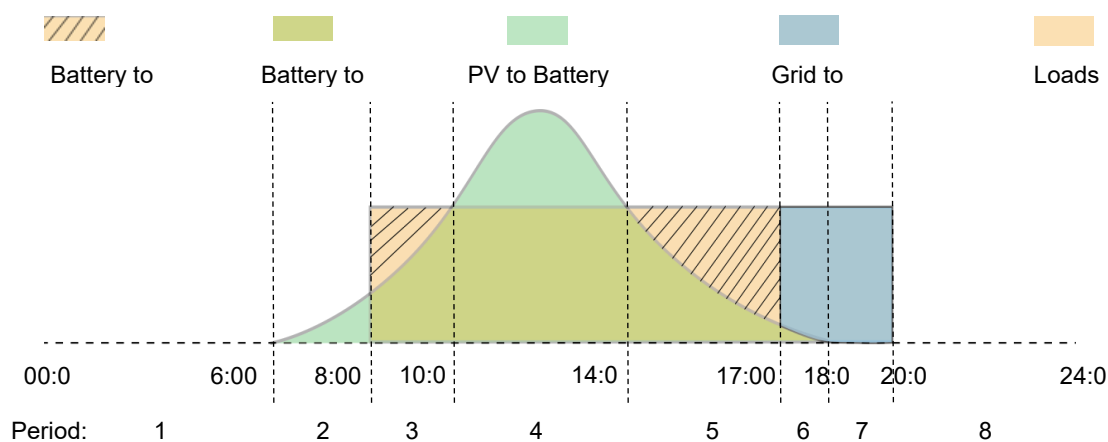
Period 5: PV too short the support loads, Battery and PV support loads consumption.

Period 6: Battery energy runs out. PV and grid power support loads.

Period 7: The sun set. Grid support loads consumption.

Period 8: No energy consumption.

Energy combination diagram:



Planning model: Customer decide when AC charging and AC discharging, and customer decide the power rate.

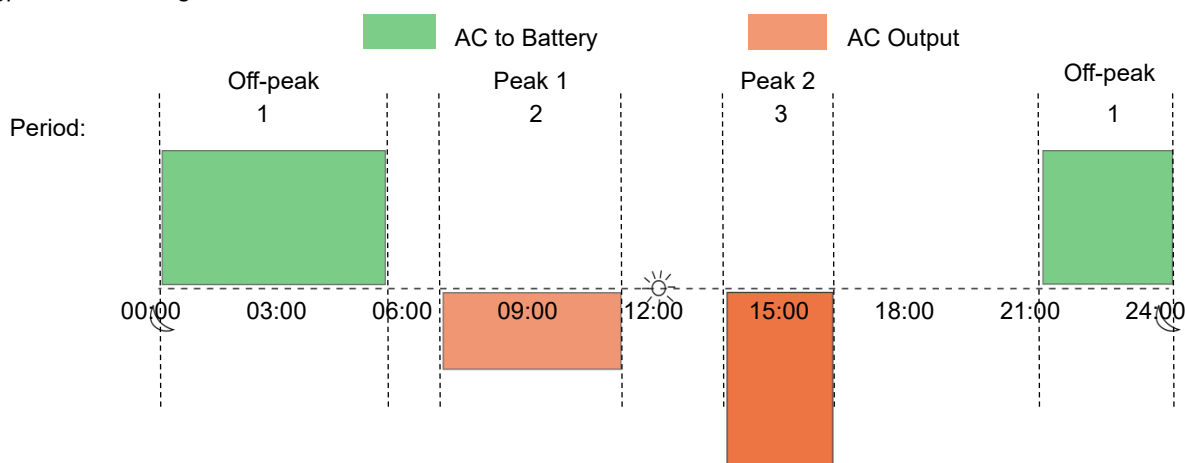
(An example for daily use:)

Period 1: During the periods **“21:00 to 24:00”** & **“00:00 to 6:00”**, utility price is low, set 50kW AC power to charge the battery.

Period 2: During **“Peak 1”**, utility price is high, set 30kW AC output to support loads.

Period 3: During **“Peak 2”**, utility price is higher, set 80kW AC output to support loads.

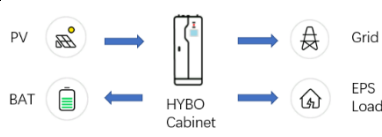
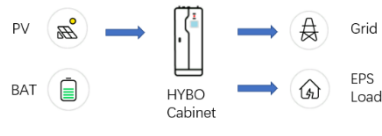
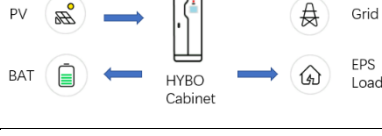
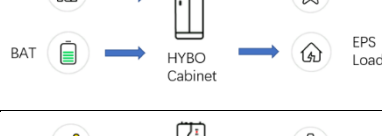
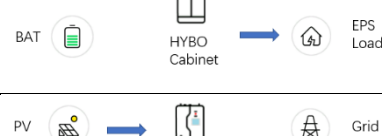
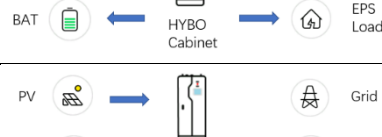
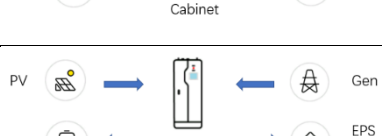
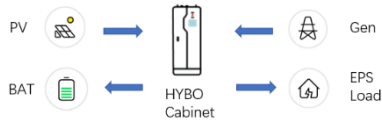
Energy combination diagram:

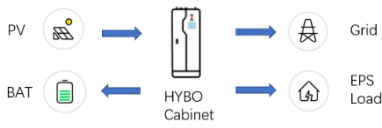
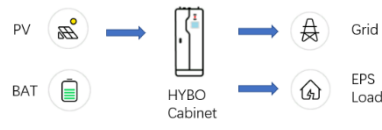
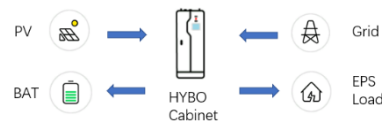
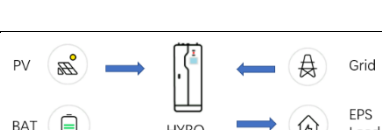
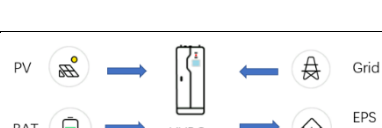
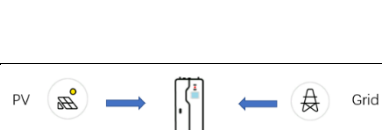
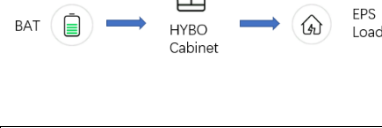
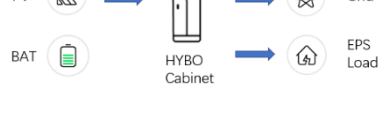
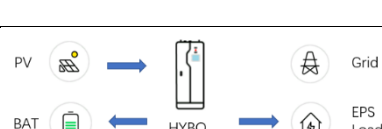


Remote mode: For engineering only. Use for PC, Mobile phone, monitor platform only. Please contact Weco service team for more details.

Load mode: For onsite manually control. Set the AC active and reactive power for to control the AC output power.

Description of the mode of operation

Working mode	scenario	Description
Load prioritized mode		Photovoltaic, battery, mains power available: $PV > EPS \text{ Load} + \text{Battery Charge}$ If $BAT \text{ SOC} < \text{Max SOC}$ Then $\text{Feedback Grid} = PV - (\text{Battery Charge} + EPS \text{ Load})$ $BAT \text{ Charge} = \text{Maximum allowable charging current of BMS}$
		Photovoltaic, battery, mains power available: $PV > EPS \text{ Load}$ If $BAT \text{ SOC} > \text{Max SOC}$ Then $\text{Feedback Grid} = PV - EPS \text{ Load}$ $BAT \text{ Charge} = 0$
		Photovoltaic, battery, mains power available: $\text{Battery Charge} + \text{Load1} > PV > \text{Load1}$ If $BAT \text{ SOC} < \text{Max SOC}$ Then $\text{Feedback Grid} = 0$ $BAT \text{ Charge} = \min(PV - \text{load1}, \text{BMS allow})$
		Photovoltaic, battery, mains power available: $\text{Load1} > PV$ If $BAT \text{ SOC} > \text{On-Grid SOC Discharge Limit}$ Then $\text{Feedback Grid} = 0$ $BAT \text{ DisCharge} = \text{load1} - PV$
		Photovoltaic, battery, mains power available: $\text{Load1} > PV$ If $BAT \text{ SOC} < \text{On-Grid SOC Discharge Limit}$ Then $BAT \text{ DisCharge} = 0$ $\text{Grid} = \text{Load1} - PV$
		PV, battery are available, Grid shut down $PV > \text{Battery Charge} + \text{Load1}$ If $BAT \text{ SOC} < \text{Max SOC}$ Then $BAT \text{ Charge} = \text{Maximum allowable charging current of BMS}$
		PV, battery are available, Grid shut down $PV > \text{Battery Charge} + \text{Load1}$ If $BAT \text{ SOC} > \text{Max SOC}$ Then $BAT \text{ Charge} = 0$ $PV \text{ deviate MPPT point; } PV = \text{Load1}$
		PV, battery are available, Grid shut down, Generator Start If $BAT \text{ SOC} < \text{On-Grid SOC Discharge Limit}$, Then $BAT \text{ DisCharge} = \text{load1} - PV$; The generator is wakened up and started by HMI If Generator started successfully, Then The generator supplies power to the load, $BAT \text{ Charge} = \min(\text{Gen Capacity} - \text{MAX Eps Load} + PV, \text{Maximum allowable charging current of BMS})$
Working mode	scenario	Description
Planning mode		PV, battery and power grid are available : Charge Time If $\text{SOC} < \text{max SOC}$ Then $PV + \text{Plan Power} = BAT \text{ Charge}$ (Less than the maximum charging power, PCS quantity * 60KW, Less than Maximum allowable charging current of BMS) If $BAT \text{ allow Charge} < (PV + \text{Plan power})$, Reduce PCS power, then $PV \text{ deviate MPPT}$ $\text{Make } (PV + \text{Plan power}) = BAT \text{ charge}$ $\text{Load1 is provided by the Grid}$

	PV, battery and power grid are available : DisCharge Time If $(PV > \text{Plan Power}) \& (\text{Plan Power} > \text{Load1})$, $\text{SOC} < \text{max SOC}$, BAT Charging Then BAT Charge = PV - Plan power Feedin Grid = Plan power - Load1
	PV, battery and power grid are available : DisCharge Time If $(PV > \text{Plan Power}) \& (\text{Plan Power} > \text{EPS Load})$, $\text{SOC} > \text{max SOC}$ Then BAT Charge = 0, PV deviate MPPT point; PV = Plan power Feedin Grid = Plan power - EPS Load
	PV, battery and power grid are available : DisCharge Time If $(PV < \text{Plan Power}) \& (\text{Plan Power} < \text{EPS Load})$, $\text{SOC} < \text{max SOC}$, BAT Charging Then BAT Charge = PV - Plan power Withdraw Grid = EPS Load - Plan power
	PV, battery and power grid are available : DisCharge Time If $(PV > \text{Plan Power}) \& (\text{Plan Power} < \text{EPS Load})$, $\text{SOC} > \text{max SOC}$ Then BAT Charge = 0, PV deviate MPPT point; PV = Plan power Withdraw Grid = EPS Load - Plan power
	PV, battery and power grid are available : DisCharge Time If $(PV < \text{Plan Power}) \& (\text{Plan Power} < \text{EPS Load})$, $\text{SOC} > \text{On-Grid SOC Discharge Limit}$, BAT DisCharging Then BAT DisCharge = Plan power - PV Withdraw Grid = EPS Load - Plan power
	PV, battery and power grid are available : DisCharge Time If $(PV < \text{Plan Power}) \& (\text{Plan Power} < \text{EPS Load})$, $\text{SOC} < \text{On-Grid SOC Discharge Limit}$ Then BAT DisCharge = 0 Withdraw Grid = EPS Load - PV
	PV, battery and power grid are available : DisCharge Time If $(PV < \text{Plan Power}) \& (\text{Plan Power} > \text{EPS Load})$, $\text{SOC} > \text{On-Grid SOC Discharge Limit}$, BAT DisCharging Then BAT DisCharge = Plan power - PV Feedin Grid = Plan power - EPS Load
	PV, battery and power grid are available : DisCharge Time If $(PV < \text{Plan Power}) \& (\text{Plan Power} > \text{EPS Load})$, $\text{SOC} < \text{On-Grid SOC Discharge Limit}$ Then BAT DisCharge = 0 If $PV > \text{EPS Load}$, Then Feedin Grid = PV - Load1 If $PV < \text{EPS Load}$, Then Withdraw Grid = Load1 - PV
	PV, battery are available, Grid shut down $PV > \text{EPS Load} + \text{Battery Charge}$ If BAT SOC < Max SOC Then BAT Charge = Maximum allowable charging current of BMS
	PV, battery are available, Grid shut down $PV > \text{EPS Load} + \text{Battery Charge}$ If BAT SOC > Max SOC Then BAT Charge = 0 PV deviate MPPT point; PV = EPS Load

	 PV → HYBO Cabinet → Grid BAT → HYBO Cabinet → EPS Load	PV, battery are available, Grid shut down PV < EPS Load If BAT SOC > On-Grid SOC Discharge Limit, Then BAT DisCharge = EPS Load - PV
	 PV → HYBO Cabinet ← Gen BAT ← HYBO Cabinet → EPS Load	PV, battery are available, Grid shut down PV < EPS Load If BAT SOC < On-Grid SOC Discharge Limit, Generator Start Then BAT Charge = min (Gen Capacity - MAX Eps Load + PV, Maximum allowable charging current of BMS) Generator provides EPS Load usage

3 Cabinet Storage

If the cabinet is not put into operation immediately, it must be stored in accordance with the following conditions:

- Do not remove the outer packaging of the appliance.
- The storage temperature must be maintained at $-20^{\circ}\text{C}\sim+70^{\circ}\text{C}$;
- The cabinet may only be switched on when the temperature is above 10°C , after all switches have been opened and closed to ensure that they are not blocked by ice or freezing conditions (continuity test on the poles of each switch).
- Relative humidity should be kept at $5\% \text{ RH}\sim95\% \text{ RH}$.
- Store in a clean, dry place, away from dust and moisture.
- Place the cabinet carefully to avoid personal injury or damage to the equipment from tipping over.
- During storage, regular checks must be carried out. If a moth bite is found and the packaging is damaged, the packaging material must be replaced.
- After long-term storage (more than 3 months), the cabinet must be inspected and tested by professionals before it can be put into operation.

4 Pre-Installation

4.1 Pre-installation inspection

Check the outer packaging

Before unpacking the cabinet, check the outer packaging for visible damage, such as holes, cracks or other signs of possible damage inside, and check the model of the cabinet. If there is any abnormal packaging or the model of the cabinet does not match, do not open it and contact your dealer as soon as possible.



Note!

It is recommended to remove the outer packaging of the cabinet before preparing to install it to ensure no damages are discovered.

Check deliverables

After unpacking the cabinet, check that the deliverables are complete and complete and free of any obvious external damage. If any items are missing or there is any damage, please contact your dealer.



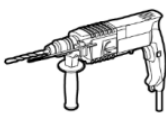
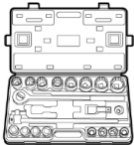
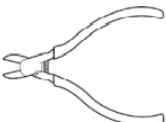
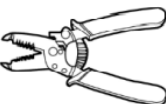
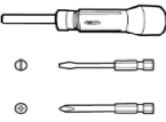
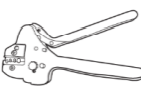
Read info

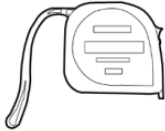
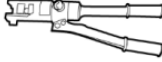
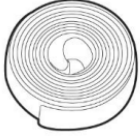
For the number of deliverables shipped with the box, please refer to the Packing List inside the box.

Lifting Precautions

When the lifting operation is involved, strictly adhere to the lifting operation regulations of your country.

4.2 Tools

class	Tools and gauges		
Installation	 Impact drill (drill bit $\Phi 12\text{mm}$).	 Torque socket wrench (sleeve opening: 13mm, for M8 bolts; Torque range: $0\text{N}\cdot\text{m} \sim 15\text{N}\cdot\text{m}$).	 Torque wrench (opening size: 13mm; Torque range: $0\text{N}\cdot\text{m} \sim 1.5\text{N}\cdot\text{m}$).
	 Diagonal pliers	 Wire strippers	 Torque screwdriver (head: M4, M6; Torque range: $0\text{N}\cdot\text{m} \sim 5\text{N}\cdot\text{m}$).
	 Rubber hammer	 Tool knife	 Wire cutters
	 Crimping pliers	 Open Wrench for MC4 connectors	 Cable ties

	 vacuum cleaner	 Multi-meter (DC voltage range $\geq$ 600V DC).	 Markers
	 Steel tape measure	 Horizontal ruler	 Hydraulic pliers
	 Heat shrink tubing	 Heat guns	
Personal protective equipment	 Safety gloves	 Protective goggles	 Dust masks
	 Safety shoes		

4.3 Select the installation location

Basic requirements

- The cabinet that has a protection class of IP55 and can be installed outdoors, although it is recommended to install it in a protected environment to prolong its service life and performance.
- The distance between the front and rear doors with any wall must be approximately one meter to ensure that the door can be opened.
- During the operation of the cabinet, the outlet air temperature will be relatively high; it is recommended to maintain a ventilation distance of at least 30 cm from the wall.
- Do not install the cabinets in areas where flammable and explosive materials are stored.
- Do not install the cabinet in a location that can be reached by children or non-authorized persons.
- The installation of the cabinet must be protected by corrosive or salty atmosphere as some parts could be corroded and may cause fire, please do not install the cabinet in salty areas.
- Ensure extra safety when the installation site is exposed to extreme meteorological conditions (e.g. typhoons, seasonal winds).

Installation environment requirements

- The cabinet should be installed in a well-ventilated environment to ensure good heat dissipation.
- If the cabinet is installed in a place exposed to direct sunlight, it may cause a decrease in power as the temperature rises.
- It is recommended to choose a sheltered installation site.

Installation carrier requirements

- The cabinet installation carrier must have fire performance.
- Do not install integrated cabinets on flammable building materials.
- Ensure that the installation surface is solid and meets the load-bearing requirements of the installation cabinet.

Installation floor support and angle requirements

- The cabinet must be installed on a site with a good load-bearing capacity.
- Install vertically or backwards by $\leq 5^\circ$ to facilitate device stability.
- Do not tilt the cabinet forward, horizontally or upside down, do not tilt it too much and do not roll it.

Installation space requirements

When installing the cabinet, there must be a space distance of not less than 900mm before and after the cabinet to ensure sufficient maintenance and heat dissipation space.

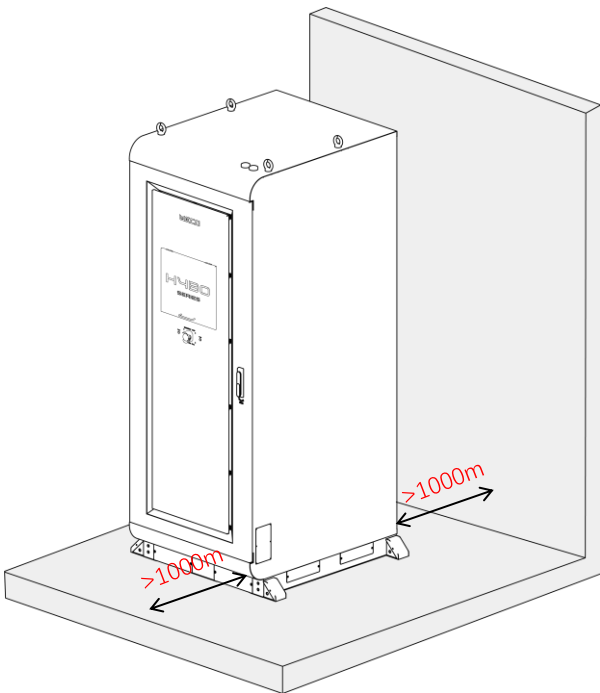


Fig. 4.3-1 Installation space requirements

4.4 Electrical Connections



Danger!

Before making the electrical connection, make sure that all switches in the cabinet are in the "OFF" state, otherwise the high voltage of the cabinet may cause a risk of electric shock.



Warning!

- Damage to the device caused by incorrect wiring is not covered by the equipment warranty.
- Operations related to electrical connections must be carried out by professional electrical technicians.
- When making electrical connections, operators must wear personal protective equipment.



Read info

The color of the cable involved in all electrical connection diagrams in this section is for reference only, and the cable selection should comply with the local cable standards (yellow and green two-color wires can only be used for protective earthing).

Cable connection torque requirements

When using screw (bolt) crimping, all connecting fasteners must meet the tightening torque or tightening force and must not undergo any plastic deformation, cracks or breakage.

Screw torque recommendation table

Screw size	M3	M4	M5	M6	M8	M10	M12	M16
(N*m)	0.7-1	1.8-2.4	4-4.8	7-8	17-20	34-40	60-70	119-140

4.5 Cabling requirements



Note!

- External AC switch 3 single-phase circuit breaker or other AC load circuit breaker to ensure safe disconnection of the cabinet from the grid.
- If the external AC switch has leakage protection, its rated leakage operating current is required to be $\geq 100\text{mA}$.
- The AC switch prohibits the use of knife gate switches.

Conductor diagram (copper core)

NO.	Cables	Type	Conductor cross-sectional area	Outside diameter	Provide by
1	PV input line	Industry-wide outdoor photovoltaic cable (recommended model: PV1-F).	70mm ²	16mm-17mm	Installer
2	Energy storage input line	Industry-wide outdoor photovoltaic cable (recommended model: PV1-F).	120mm ²	20mm-21mm	Installer
3	Grid-side input line	Industry-wide three-phase AC cable (U, V, W, N, PE).	120 mm ²	20mm-21mm	Installer
4	Generator input line	Industry-wide three-phase AC cable (U, V, W, N, PE).	120 mm ²	20mm-21mm	Installer
5	Load output line	Industry-wide three-phase AC cable (U, V, W, N, PE).	120mm ²	20mm-21mm	Installer
6	Protective grounding wire	Single-core outdoor copper cable and M12 OT terminals	50mm ²	14mm-15mm	Installer



Note!

The PE of the AC output interface is only used as an equipotential connection point for the protective ground and cannot replace the protective grounding point of the chassis housing.

5 Installation Steps

Note: Please read this manual carefully before install HYBO system.

Personnel requirement:

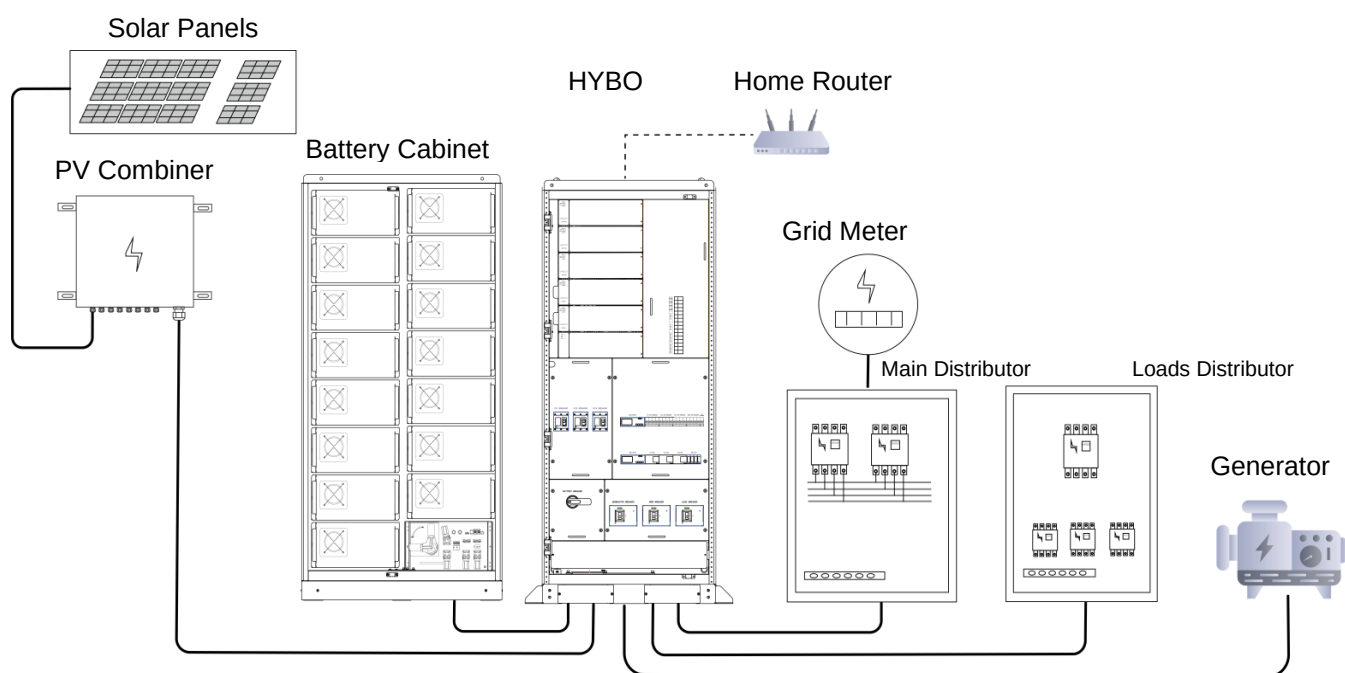
Only qualified professionals may install this product. Wiring may only be carried out by professional electricians certified by the local power company.

At least two installers are required for the installation of this product.

Steps instructions

To better guide installation personnel, this chapter explains step by step how to install a HYBO system. Referring to the following image, divide the installation steps into:

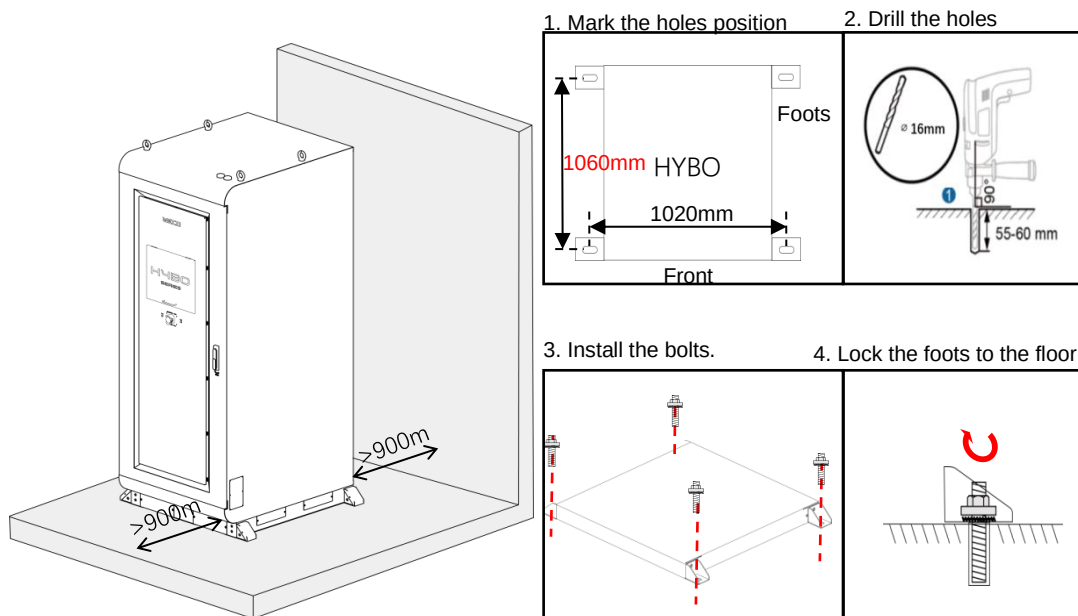
One HYBO System for example



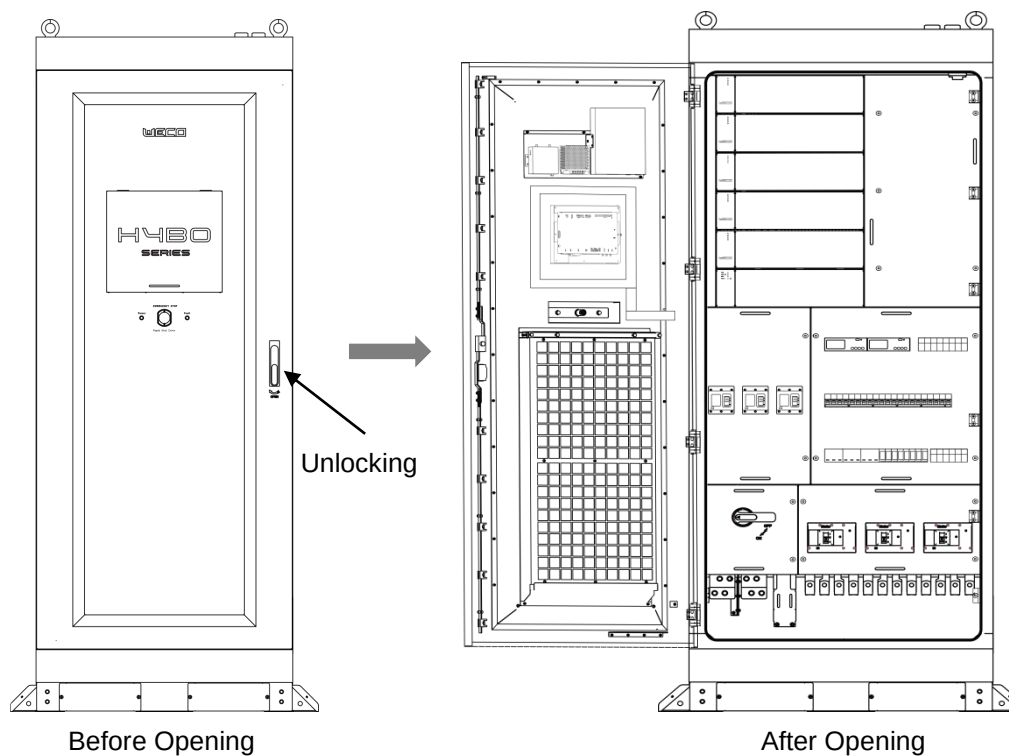
- Step 1: Install the HYBO on the floor.
- Step 2: Connect Solar panels to PV combiner, then connect to HYBO.
- Step 3: Connect Battery Cabinet to HYBO.
- Step 4: Connect the battery communication cable to HYBO.
- Step 5: Connect the Battery 24 V power to the HYBO.
- Step 6: Connect the Grid to the HYBO.
- Step 7: Connect the Loads to the HYBO.
- Step 8: Connect the Generator to the HYBO
- Step 9: Connect the network to the HYBO

Step 1. Install the HYBO on a floor.

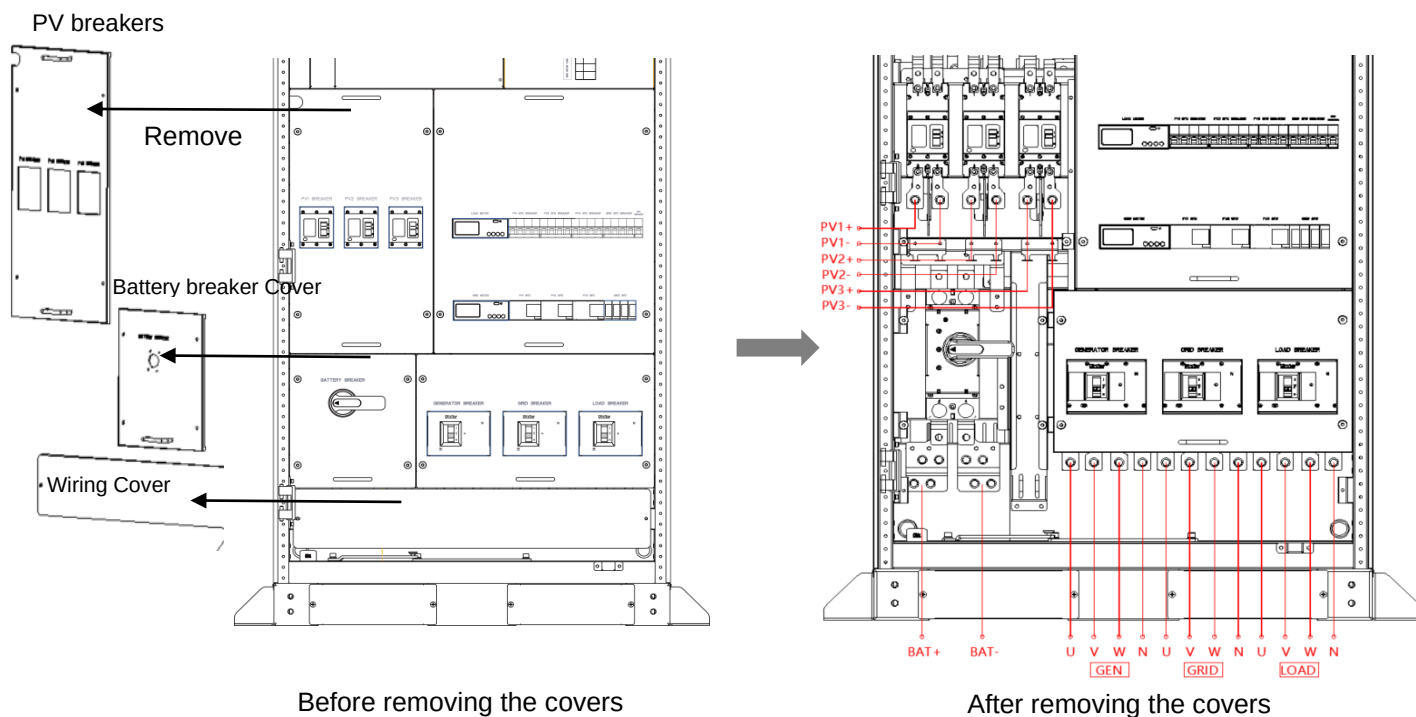
- (1) Mark the position of the holes on a solid, flat floor for HYBO installation.
- (2) Use a 16 mm² drill bit to drill 4 holes, with a depth of at least 60 mm.
- (3) Place the HYBO in position, aligning the feet with the holes.
- (4) Fasten the four 10 mm² bolts to secure the feet of the HYBO to the floor.



- (5) Unlock the front door and open the door.

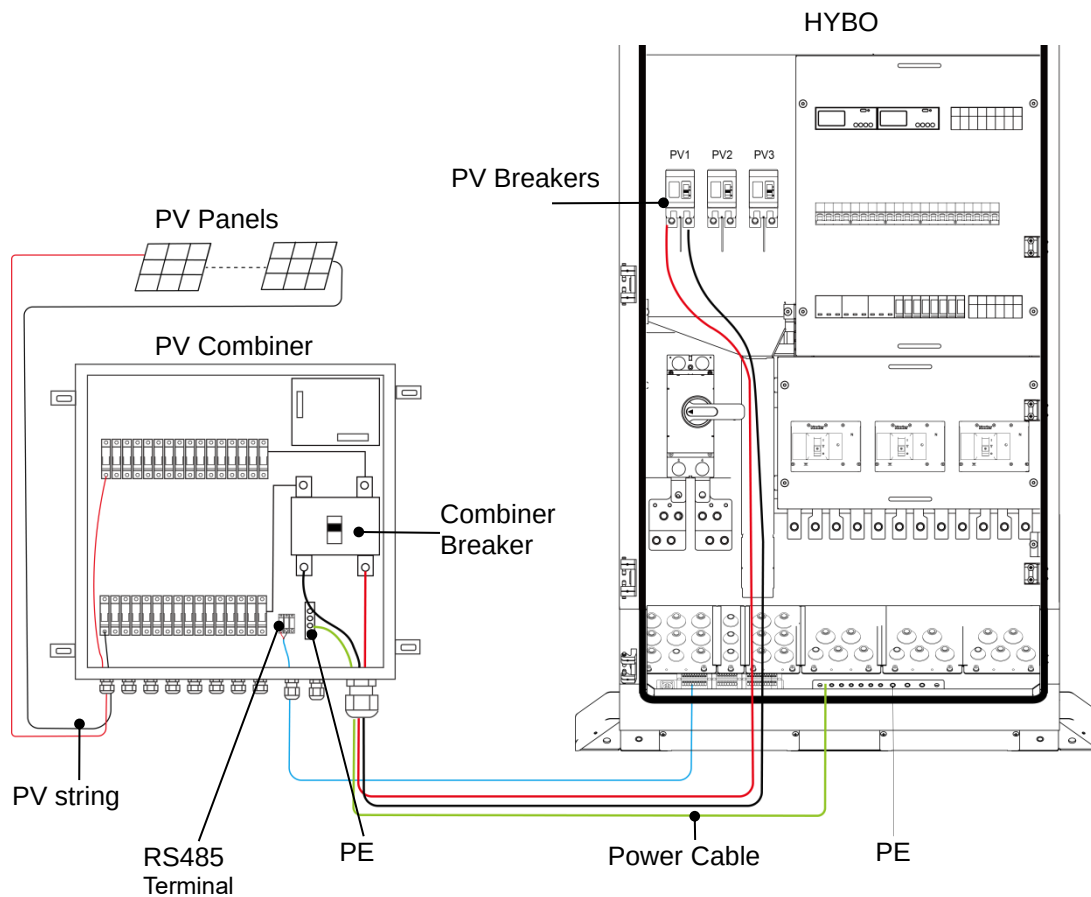


(6) Remove the PV breakers cover, battery breaker cover, and wiring cover.

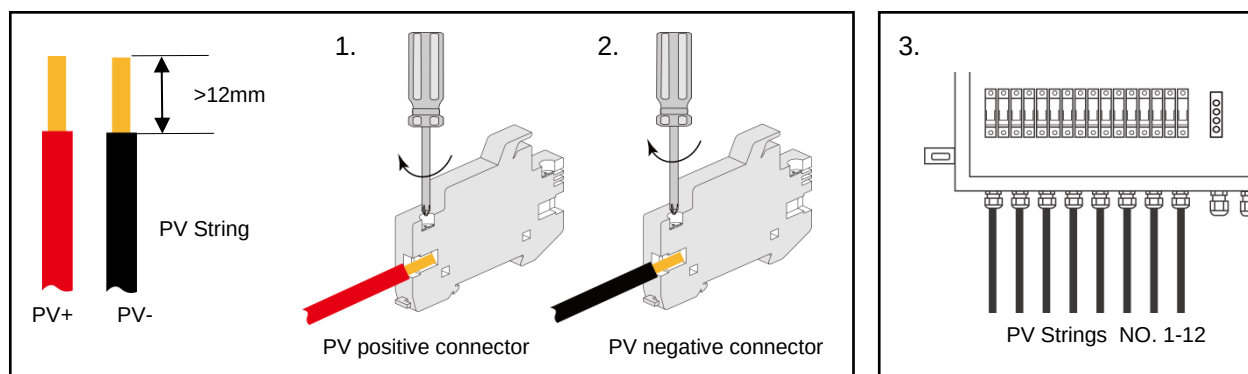


Step 2: Connect Solar panels to PV combiner, then connect to HYBO.

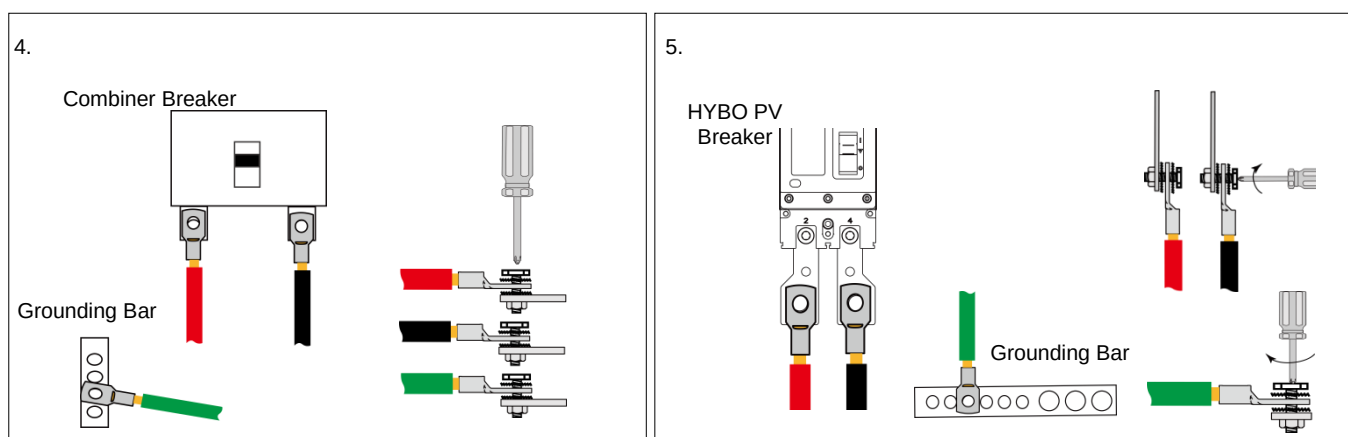
PV wiring diagram



- (1) Connect the PV+ to the Positive Connector in PV combiner.
- (2) Connect the PV- to the Negative Connector in PV combiner.



- (3) Connect the rest PV strings to the PV combiner.
- (4) Connect one end of power cable (Positive, negative and PE) to combiner breaker and ground bar in PV combiner. Fasten the cables.
- (5) Connect the other end of power cable (Positive, negative and PE) to the PV breaker and ground bar in HYBO. Fasten the cables.



Step 3: Connect Battery Cabinet to HYBO.

Guide the power+ cable through the screw of the high-voltage connector and connect the cable to the connection pin.

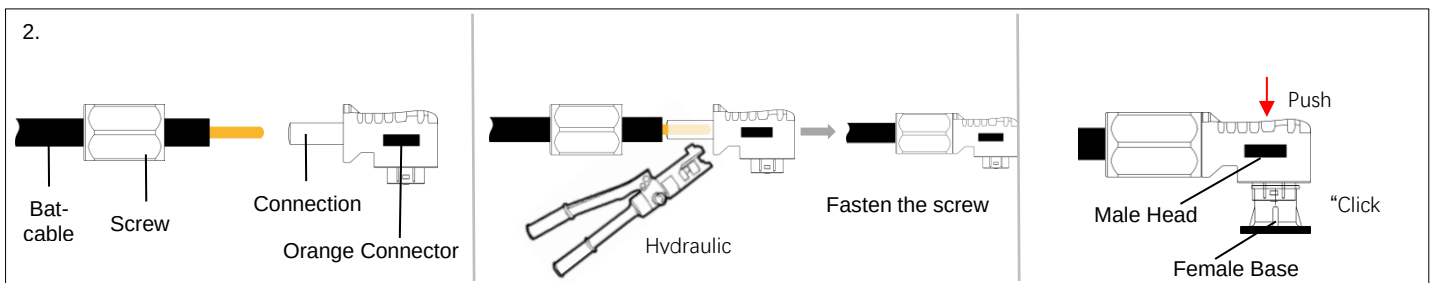
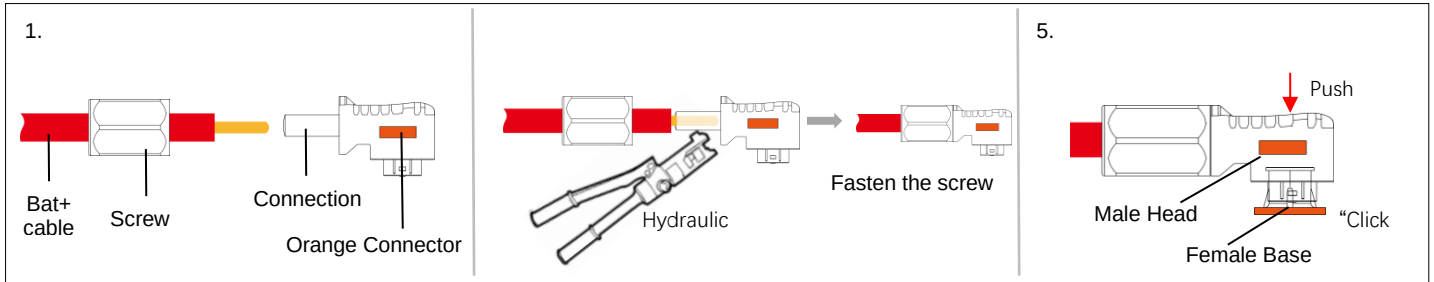
Feed the power cable through the screw of the high-voltage connector. And connect the cable to the connection pin.

Use a Hydraulic tool to crimp the connection pins.

Battery Wiring diagram

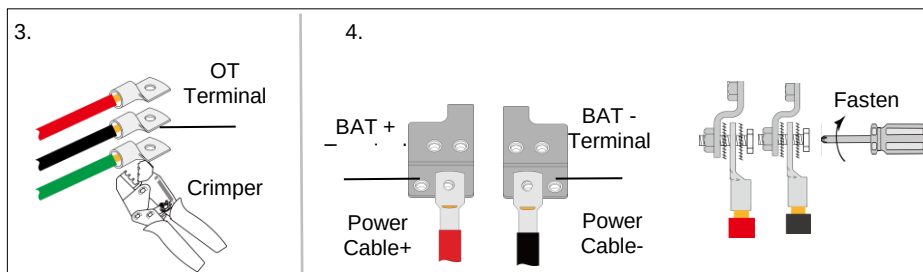
(1) Connect the orange connector to the female positive socket of the HV box. Push the head onto the base until you hear a slight "click".

(2) Connect the Black connector to the female negative socket of the HV box . Push the Head to the Base until sound a slight "Click".

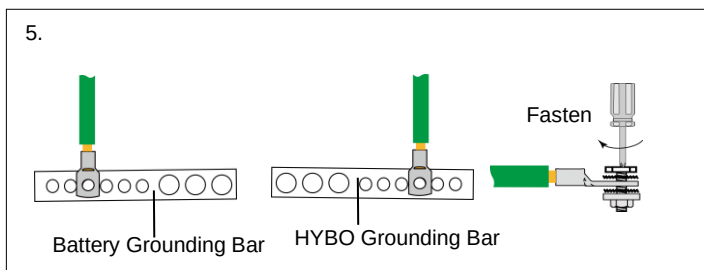


(3) Crimp the Power cables at the HYBO end with crimping tool.

(4) Connect power cable+/cable- to the HYBO battery Breaker's BAT+/BAT-.



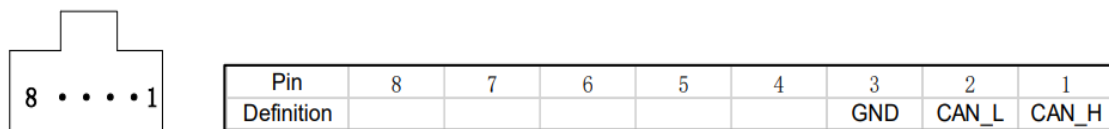
(5) Connect the Battery Grounding Bar with the HYBO Grounding Bar by the PE cable.



Step 4: Connect the battery communication cable to HYBO.

Connect the CAN 2A of Battery HV Box to the RJ45/CAN of HYBO Data Box through the LAN Cable.

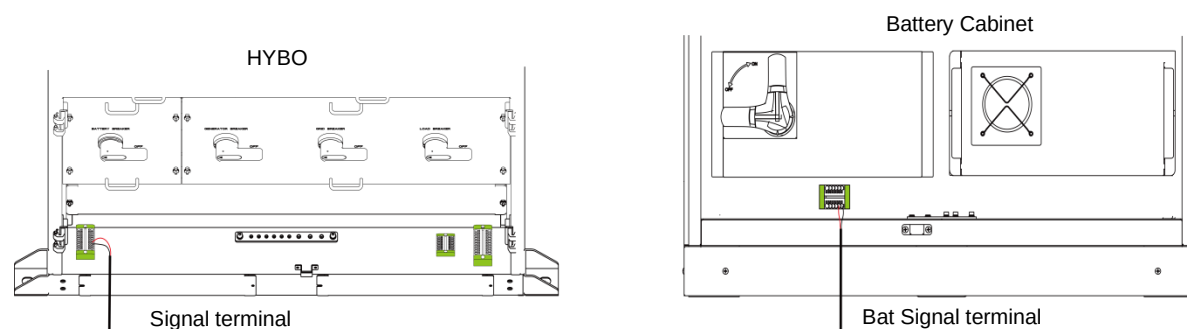
The wire sequence of the CANH, CANL, GND communication signals with the energy storage system is as follows:



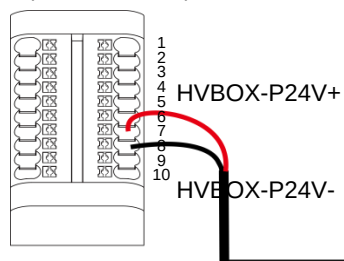
Step 5: Connect the Battery 24 V power to the HYBO (if present).

Connect the 24V + of battery XT4 (6-Pin terminal) to the HVBOX-P24V+.

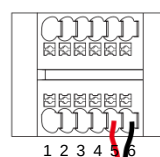
Connect the 24V - of battery XT4 (6-Pin terminal) to the HVBOX-P24V-.



EXT (10-Pin Terminal)



XT4 (6-Pin Terminal)

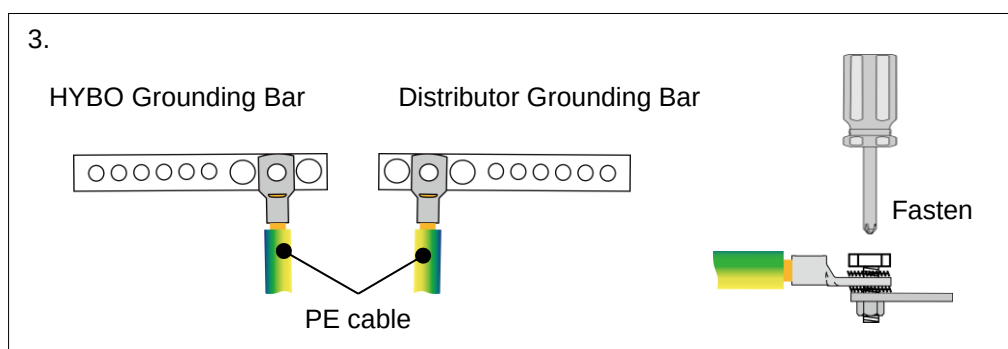


XT4					
1	2	3	4	5	6
E-BAT1-24V+	E-BAT1	E-BAT1-24V-		OUT-24V+	OUT-24V-

Grid Connection Diagram

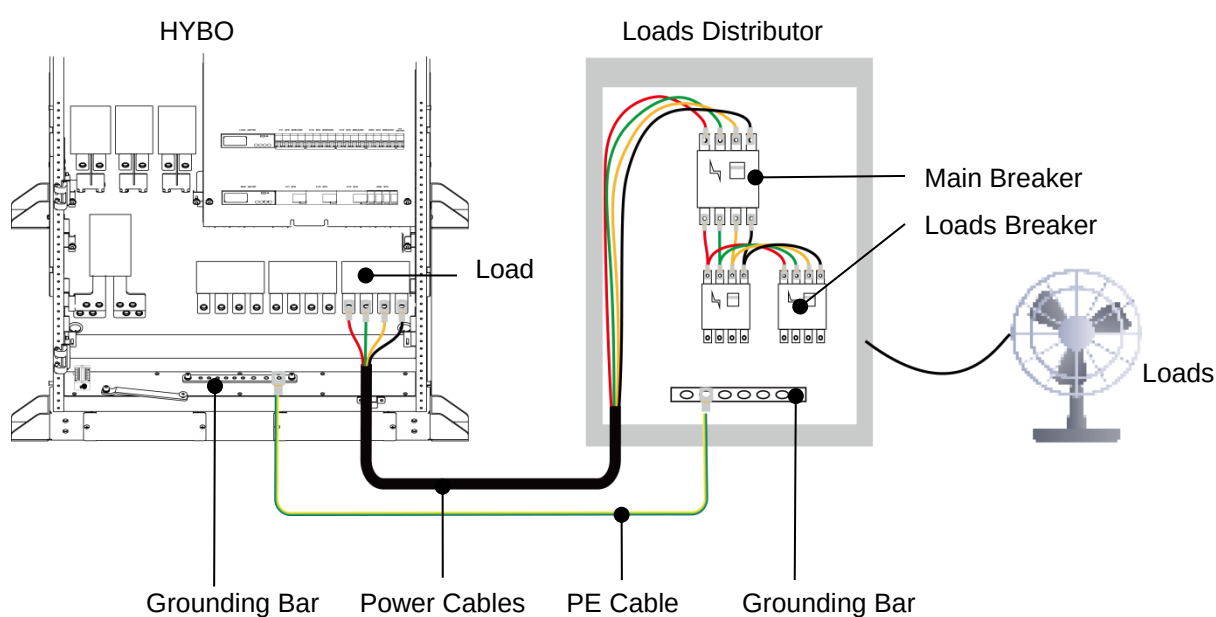


(3) Connect the Grounding bar of HYBO to the Grounding Bar of Distributor. (The grounding bar in distributor should be grounded!)

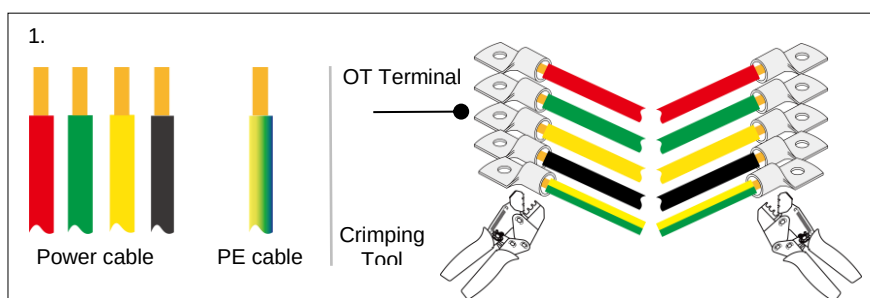


Step 7: Connect the Loads to the HYBO.

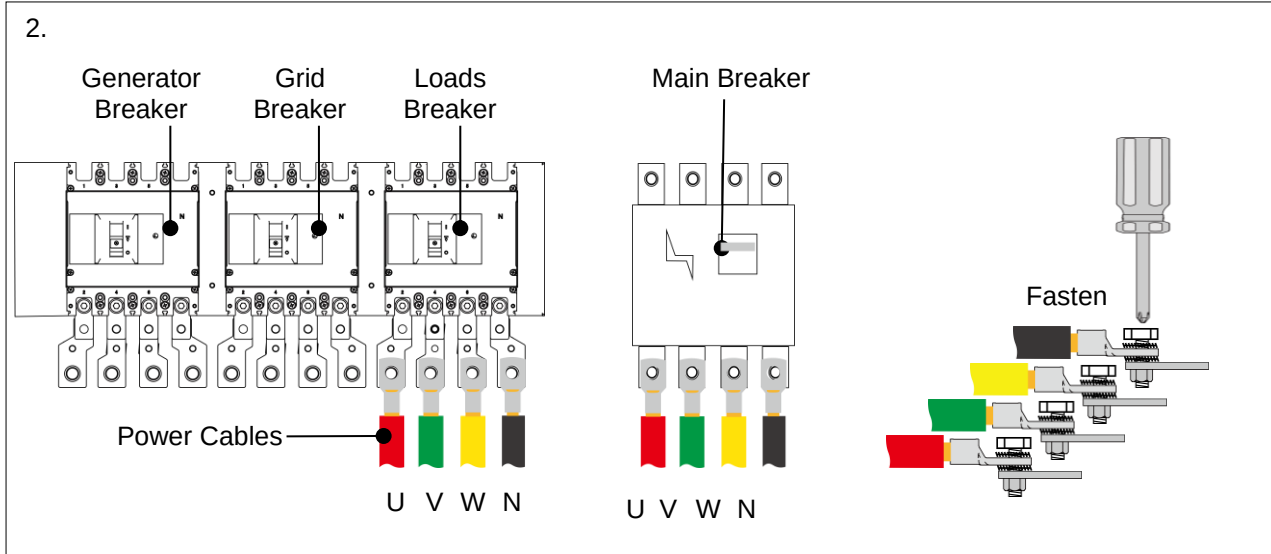
Loads Connection Diagram



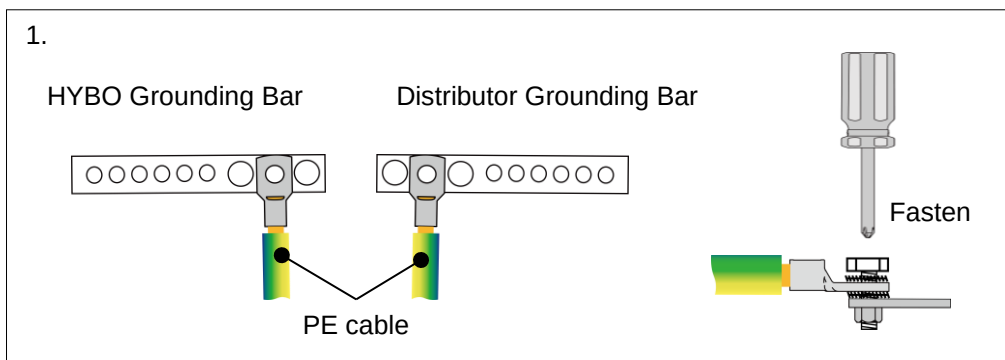
(1) Crimp the Power cables and PE cable through the crimping tool.



(2) Connect the Loads Breaker of HYBO to the Main Breaker of Loads Distributor through the Power cables. Then fasten the cables.

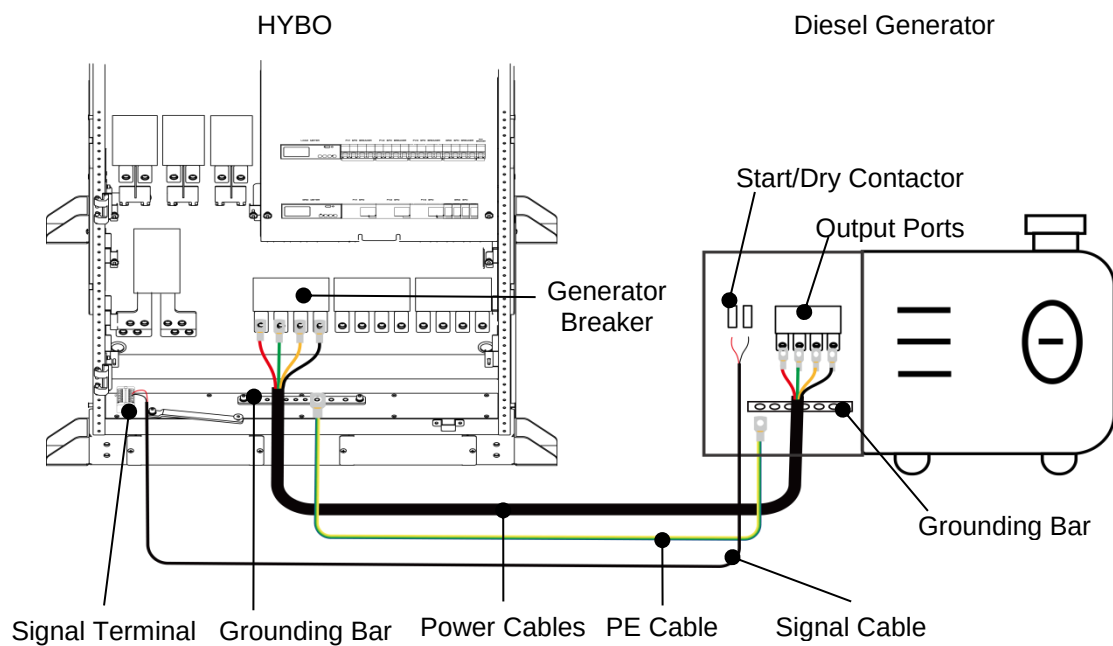


(3) Connect the Grounding bar of HYBO to the Grounding Bar of Loads Distributor.

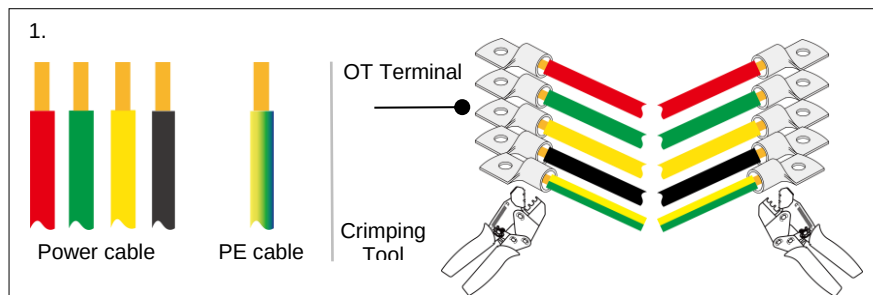


Step 8: Connect the Generator to the HYBO

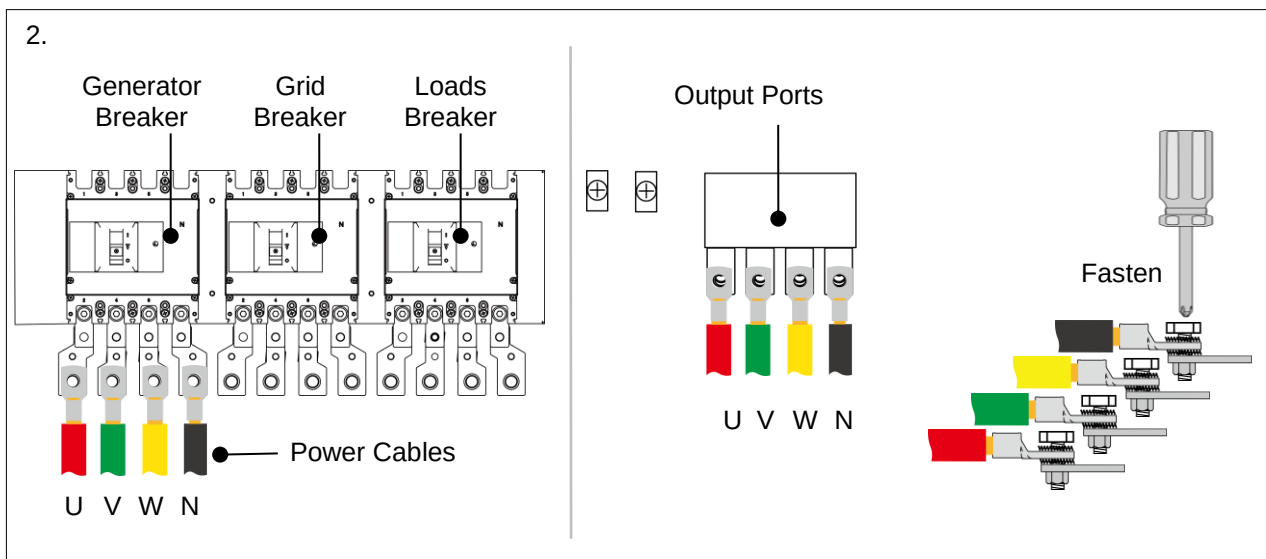
Generator Connection Diagram



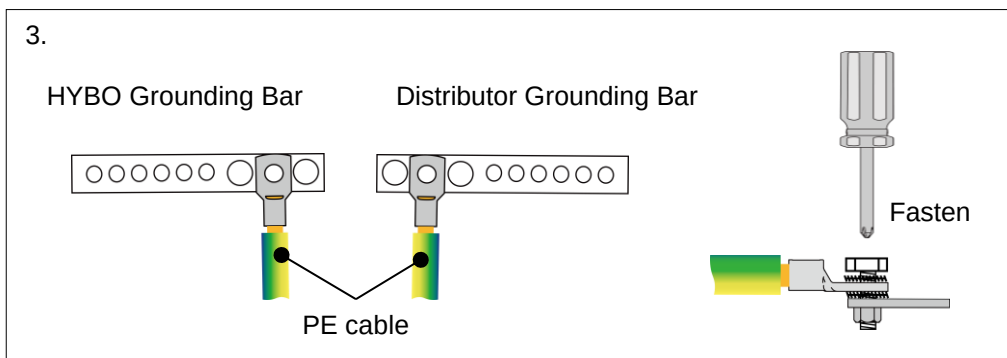
(1) Crimp the Power cables and PE cable through the crimping tool.



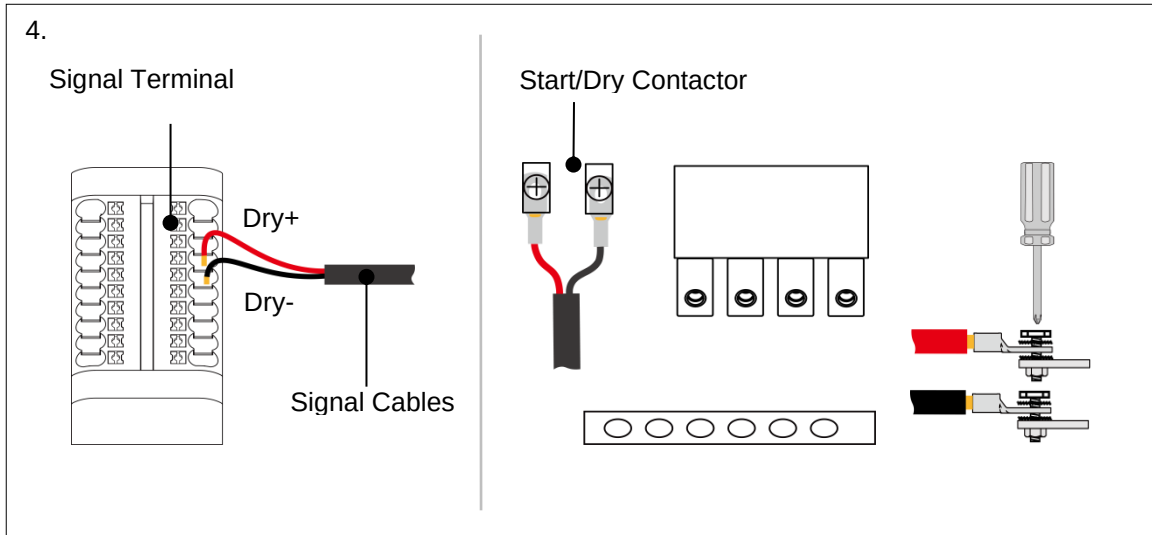
(2) Connect the Generator Breaker of HYBO to the Output Ports of Diesel Generator. Then fasten the cables.



(3) Connect the Grounding bar of HYBO to the Grounding Bar of Generator.



(4) Connect the Grounding bar of HYBO to the Grounding Bar of Generator.



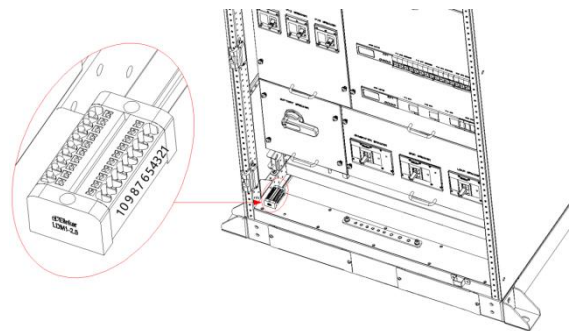
Signal Terminal BLOCK

Terminals 1 and 2 are connected to RS485+ and RS485- signal respectively.

Terminals 4 and 5 are for Dry Contact signals used for Start and Stop a Diesel Generator .

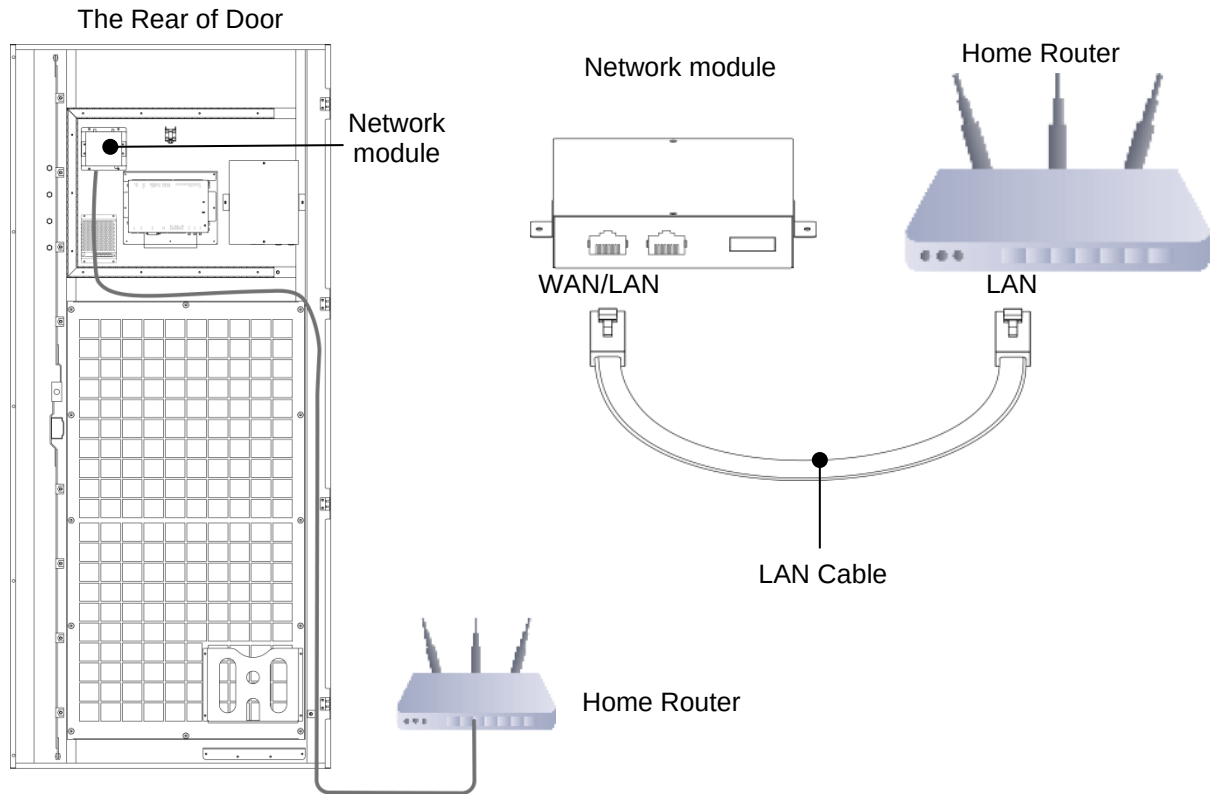
Terminals 7 and 8 are for 24Vdc power supply used for the HUB can Combiner or others AUX.

PIN NO.	Mark	Description
1	M-RS485A	External meter communication
2	M-RS485B	External meter communication
3		N/A
4	Generator-1	Dry contact.Diesel Generator start signal
5	Generator-2	Dry contact.Diesel Generator start signal
6		N/A
7	HVBOX-P24V+	Battery cabinet 24V+ input
8	HVBOX-P24V-	Battery cabinet 24V- input
9	PV-RS485A	PV combiner RS485 connection
10	PV-RS485B	PV combiner RS485 connection



Step 9: Connect the network to HYBO

- (1) Connect the Network module of HYBO with the Router through a LAN cable.
- (2) Connect one end of the LAN cable to the WAN/LAN port of Network Module.
- (3) Connect the other end of the LAN cable to the Home Router.



Optional: External meter installation

Precondition:

Install external 3phase meter & CTs when users have EPS loads and non-EPS loads to track all the power usage. Shows as below:
(Meters and CTs provided installed by WECO when a new cabinet is delivered).

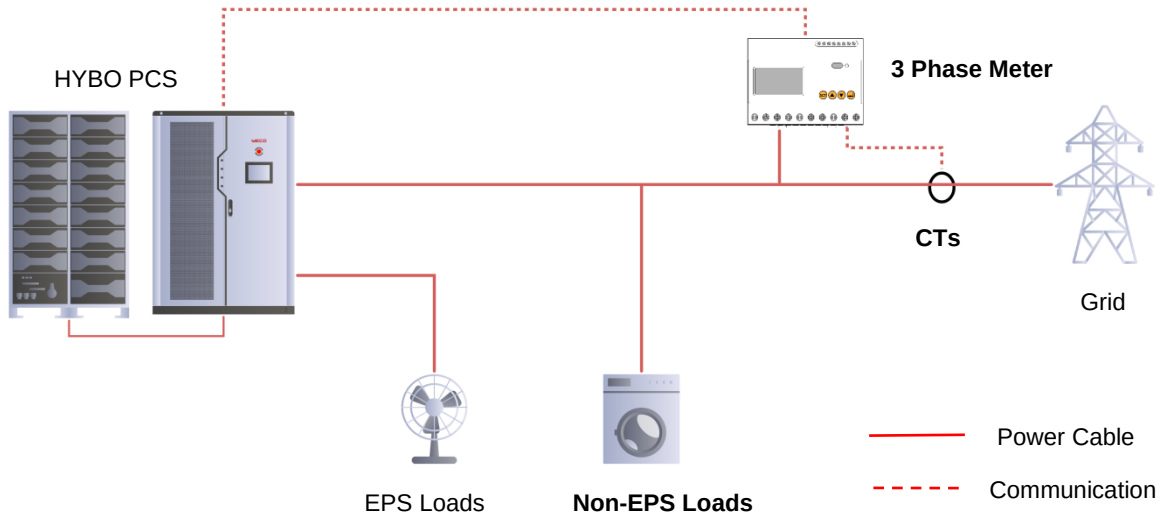


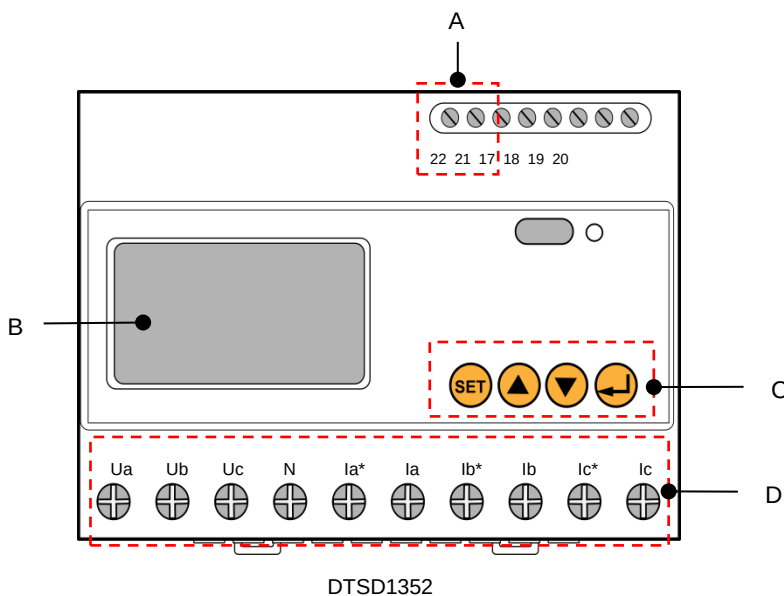
Fig. 4.6-1 External meter connection

Overview

Compatible device products models as below: (Other product may cannot be used for HYBO Ess system)

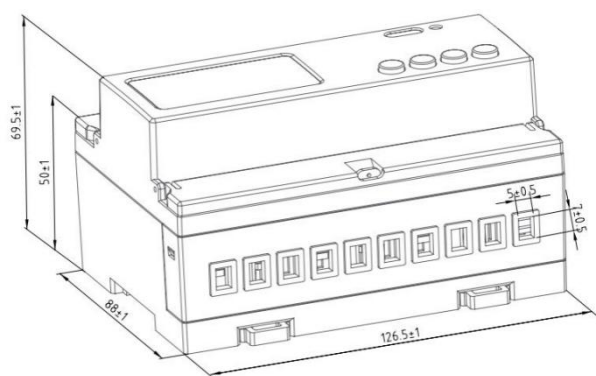
Acrel DTSD1352 meter,
Acrel AKH-0.66-60II-1500/5 CT.

The Acrel DTSD1352 meter:

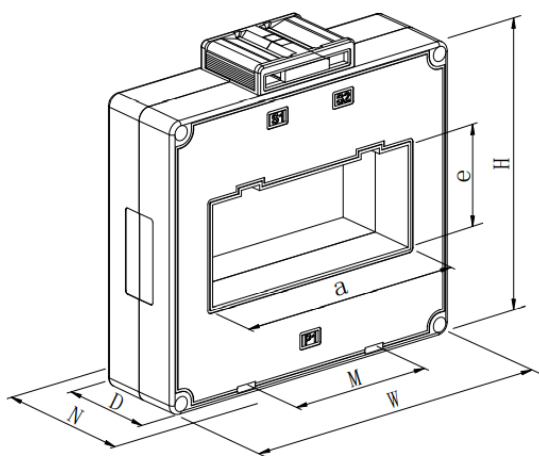


A	RS 485 communication
B	Display screen
C	Setting buttons
D	Voltage and CTs inputs

Acrel DTSD1352 meter dimension:



AKH-0.66-60II-1500/5 CT Dimension:



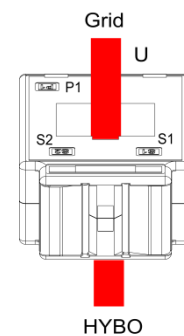
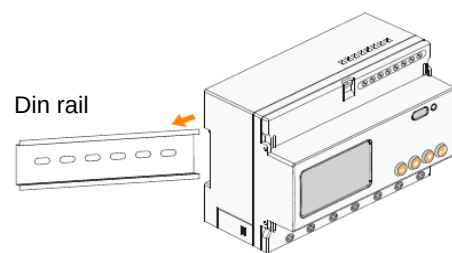
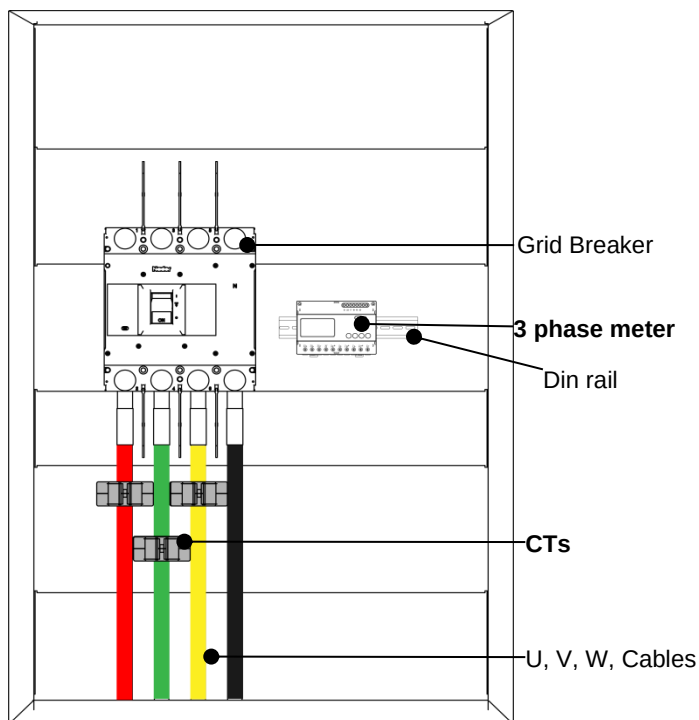
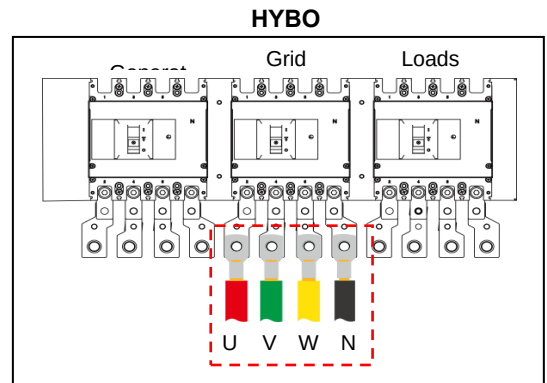
model	Overall dimension(mm)			Hole size(mm)		Installation dimension (mm)		Tolerance (mm)
	W	H	D	a	e	M	N	
AKH-0.66-60II-1500/5	102	125	45	61	33	42	57.5	1

Physical installation

Step1: Install the fixed guide rail on the bottom plate beside the front circuit breaker and fix the meter on the guide rail.

Step2: Respectively install the CTs on the "U cable", "V cable", and "W cable".

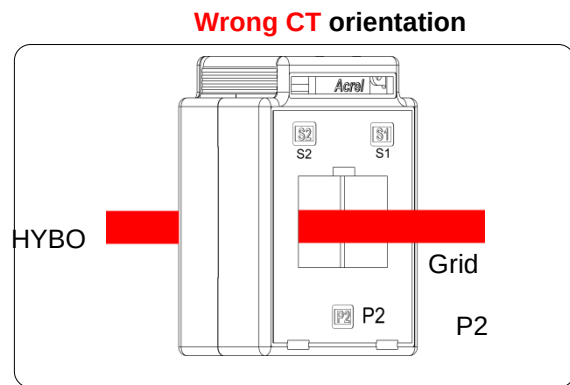
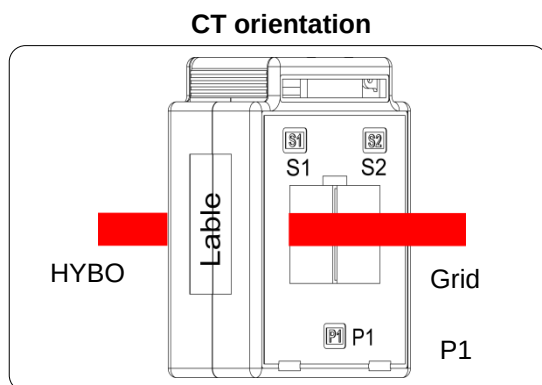
"U, V, W cables": The cables which connected to the "U, V, W terminal" of HYBO Grid breaker.



CT orientation:

The transformer CT sensor shall be installed as the same orientation, P1 face to the Grid side, or P2 face to the HYBO side.

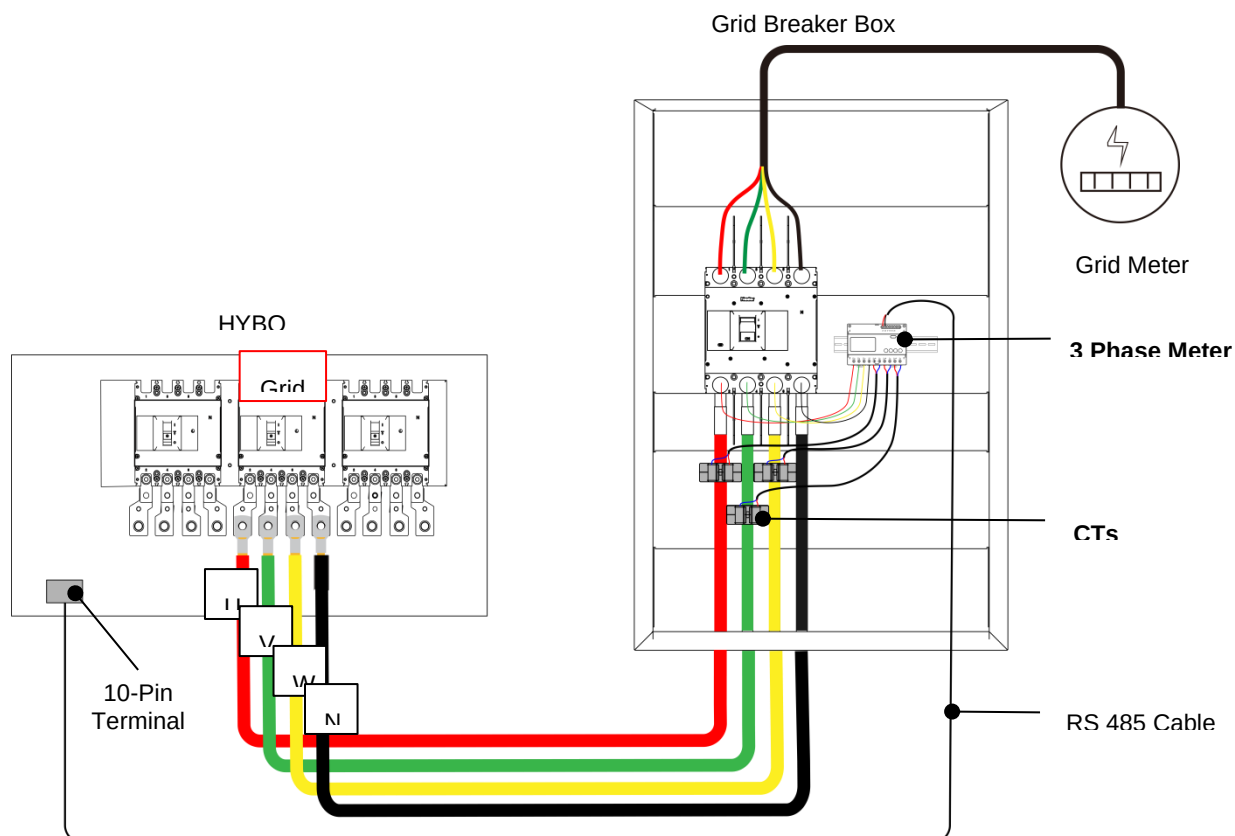
Note: P2 facing the grid is the wrong orientation.



Electric Wiring Overview

Connect the voltage sampling cables to the 3phase meter.
Connect the CTs communication cable to the 3phase meter.
Connect the RS485 of 3phase meter to HYBO PCS.

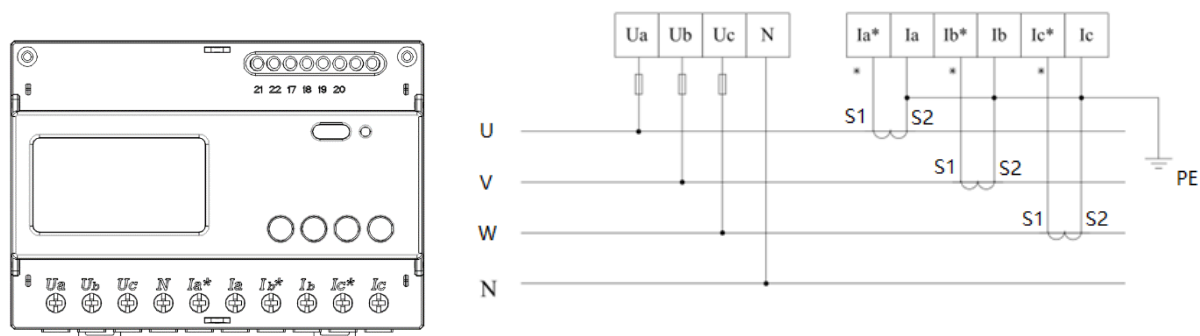
Wiring Diagram



The meter voltage sampling and CTs connection electric diagram:

Connect according to the following electrical schematic diagram:

Make 3 phase voltage sampling cables and CTs signal cables according to the figure below:



The voltage sampling wire uses 1mm² AC cable, UL1569 conductor, withstand voltage of 600V or equivalent, with two ends stripped, one end crimped to E1012 tubular terminal, and the other end crimped to OT1-8 terminal.

Voltage sampling & CT connection:

Connect the U-phase voltage Sampling and CT1 signal.

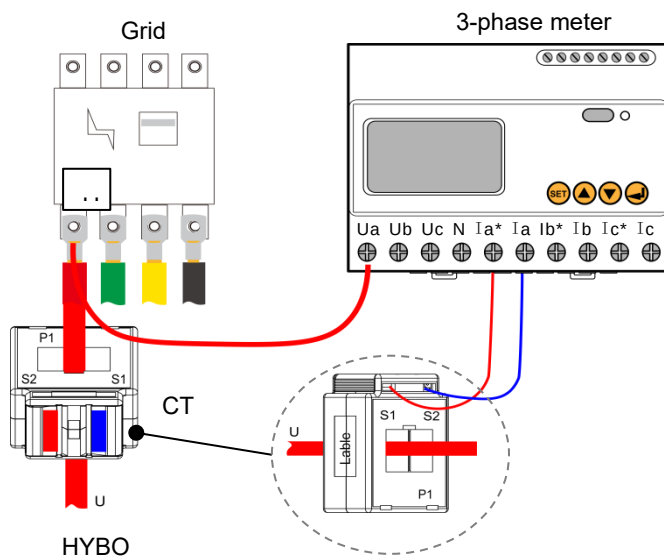
(The voltage sampling wire uses 1mm² AC cable, UL1569 conductor, withstand voltage of 600V or equivalent, with two ends stripped, one end crimped to E1012 tubular terminal, and the other end crimped to OT1-8 terminal.)

Connect the “Ua” to “U” phase.

Install the CT1 at the “U” cable, “P1” face to Grid.

Connect the “S1” to the “Ia*”.

Connect the “S2” to the “Ia”.



Connect the V-phase voltage Sampling and CT2 signal.

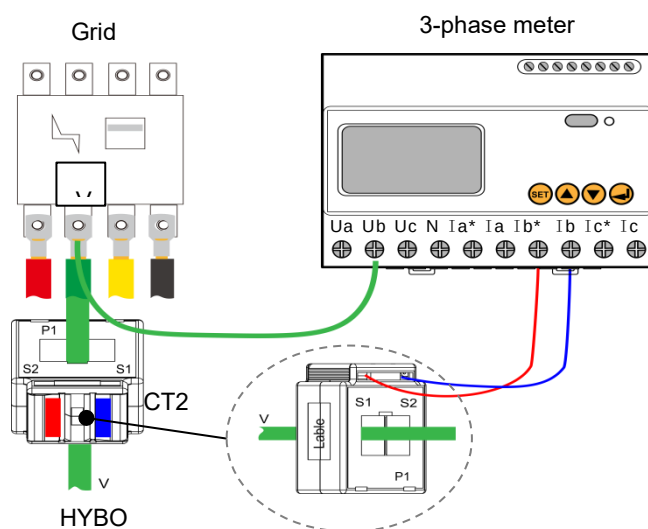
(The voltage sampling wire uses 1mm² AC cable, UL1569 conductor, withstand voltage of 600V or equivalent, with two ends stripped, one end crimped to E1012 tubular terminal, and the other end crimped to OT1-8 terminal.)

Connect the “Ub” to “V” phase.

Install the CT2 at the “V” cable, “P1” face to Grid.

Connect the “S1” to the “Ib*”.

Connect the “S2” to the “Ib”.



Connect the W-phase voltage Sampling and CT3 signal.

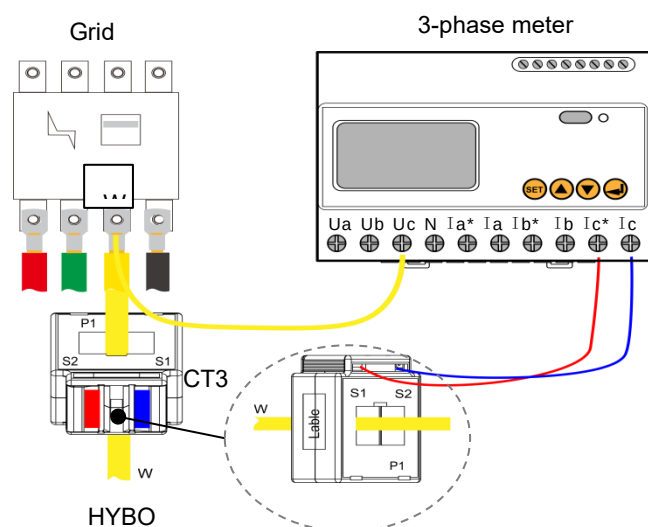
(The voltage sampling wire uses 1mm² AC cable, UL1569 conductor, withstand voltage of 600V or equivalent, with two ends stripped, one end crimped to E1012 tubular terminal, and the other end crimped to OT1-8 terminal.)

Connect the “Uc” to “W” phase.

Install the CT3 at the “W” cable, “P1” face to Grid.

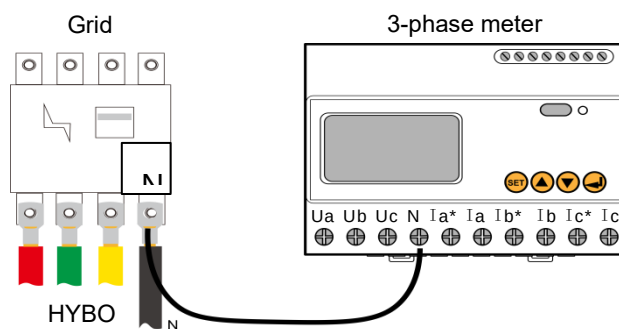
Connect the “S1” to the “Ic*”.

Connect the “S2” to the “Ic”.



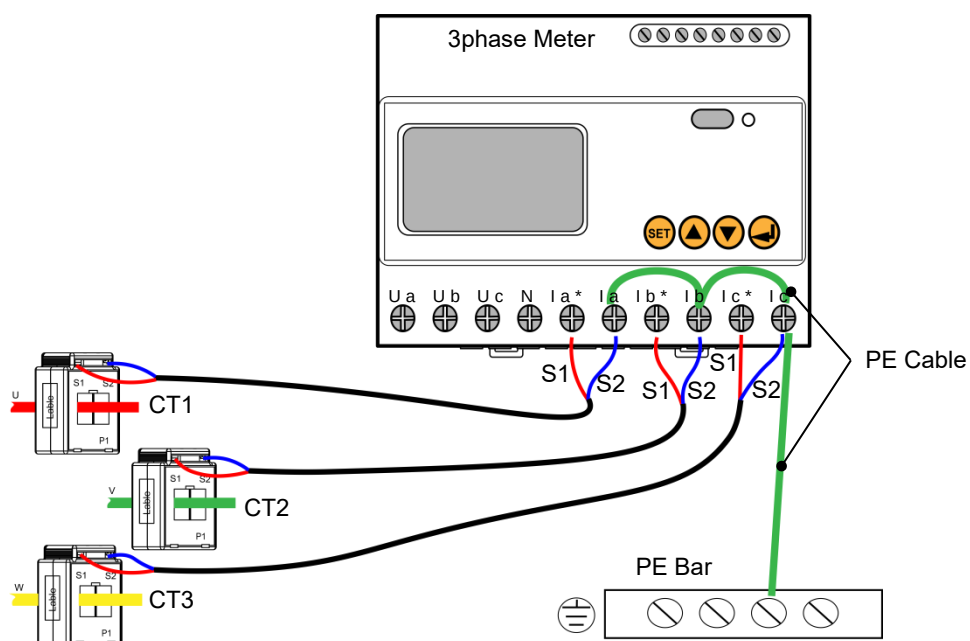
Connect the N () point voltage Sampling.

Connect the "N" of 3phase meter to "N" of grid.



Connect the all "S2" of CT1 & CT2 & CT3 to PE.

Connect all "S2" together then connect to the PE Bar which grounded.



RS485 communication connection:

(RS485 uses 0.5mm² wire, UL1569 wire, withstand voltage 300V or equivalent voltage, strip wire, and crimp E0512 tube terminals at both ends.)

Connect the 3phase meter **RS485 A1 / B1** to HYBO 10-pin terminal **M-RS485A / M-RS485B**.

Meter setting

Buttons Function Description

Buttons icon	Buttons name	Buttons functions
	Menu key	Enter/Exit Menu
	Voltage and current Up key	Check the voltage and current in the viewing interface Left shift and flashing shift in programming interface
	Power class Down key	View the power in the view interface Move right and modify flashing bit in programming interface
	Electric energy Programming OK key	View electric energy in the viewing interface Confirm to save the settings in the programming interface

Interface Settings

Under any display item in the measurement display menu, press “” to enter the "PASS" interface, then press  to display "0000", and press  after prompting to enter the password. If the password is entered incorrectly, return to "0000" to re-enter; If the password is entered correctly, the parameter can be set. After setting, press  to enter the "SAVE" interface, press  under "YES" to save and exit, and press  under "no" to not save.

Item	Primary menu		Secondary menu		
	mark	meaning	mark	meaning	Setting value
Press set	BUS	Communication address	ADDR	Communication address setting	0002
			Baud	Baud rate selection	9600
	SyS	System settings	PL	Mode selection	3P4L: Three phase four wire 3P4L:
			CoDE	Password Settings	0001 *Note 1
			LED	Backlight time setting	10* Note 2
	In	Transformation ratio setting	Pt	Voltage transformation ratio	1
			Ct	Current transformation ratio	300* Note 3



Read info

Note1: Default password 0001

Note2: Time can be set as required

Note3: If other transformers are used, set the value according to the transformer ratio

6 System Commissioning

6.1 Power-up checklist

- Please check the following checklist before turning on the system for the first time; otherwise, the device may be dangerous or damaged.
- Always consult local regulations, wear appropriate personal protective equipment during operations for your own safety.
- Before checking or starting, make sure the power is off and there is no electricity, to avoid damage and risk to people.
- The operation can only be performed by authorized persons or licensed electricians.

First Power on - Preparation Checking items and acceptance criteria

Check the item	Judging criteria
Mechanical installation	Products and equipment are not deformed or damaged.
	Ensure that the cabinet installation is vertical and stable and that the bottom support is stable and reliable.
	The necessary space is reserved around the installation of the product.
	The equipment air duct was designed and installed according to requirements and the air volume complies with the requirements.
	No excess material in the device.
	Mounting plates and other materials removed during installation are installed.
Electrical connection	The temperature and humidity of the product installation environment comply with the requirements.
	Check that the AC and DC output terminals are reliably connected and that the tightening torque meets requirements.
	Check that the PE is reliably earthed and that it meets the earthing requirements stated in the manual.
	Photovoltaic DC circuit breakers, DC circuit breakers for energy storage equipment, grid-side AC circuit breakers, generator-side AC circuit breakers and load-side AC circuit breakers are all in the 'OFF' state.
	Verify that the type and specifications of the system input cable meet the requirements.
	The mains-side voltage corresponds to the nominal voltage required by the product.
	The sequence of steps of the grid connection complies with the product requirements.
	The phase sequence of the generator-side connection complies with the product requirements.
Other	Battery voltage meets product requirements.
	The safety protection is complete and reliable, and the warning label is clear and reliable.
	The connection cables are securely tied with an insulation band.
	The cable arrangement is reasonable to meet the user's needs.
	The clamp must be uniform and must not have sharp edges at the cut.
	There are no tools, parts, conductors or other foreign objects in the cabinet.
	There is no condensation or ice formation in the cabinet.

6.2 System power-up

Precondition

- Before closing the AC switch between the cabinet and the grid, it is necessary to measure whether the AC voltage on the grid side of the AC switch is within the permissible range of the cabinet.
- Before closing the cabinet and the photovoltaic DC input switch, it is necessary to measure whether the DC voltage on the side of the photovoltaic DC switch is within the permissible range of the cabinet.
- Before closing the DC input switch of the cabinet and the battery system, it is necessary to measure whether the DC voltage of the batteries is within the permissible range of the cabinet.

Procedure

- Step 1: Close the AC-side circuit breaker.
- Step 2: Close the PV side circuit breaker.
- Step 3: Close the battery switch of the Hybo cabinet, then turn on the battery system.
- Step 4: Close the cabinet grid AC input circuit breaker.
- Step 5: Close the 4 cabinet PV input circuit breakers one by one.
- Step 6: Set the parameters of the cabinet through the HMI, see 7 HMI Settings for detailed operation.
- Step 7: Check whether the screen sampling data is abnormal and whether it meets the actual situation.
- Step 8: Check if the battery parameter settings are consistent, verify that the cluster(s) are balanced, all batteries at the same voltage level and updated to the latest firmware.
- Step 9: If an external meter is connected, check that the parameter setting of the external meter is correct and that the data display is normal. If no external meter is connected, skip to this point.
- Step 10: When the check is complete, set the system parameters, click on 'On-Grid Start' in the operation check on the configuration page, and the system starts to run.
- Step 11: (optional) Use an infrared thermometer to detect the connection temperature between the PV input terminal and the connection terminal of the energy storage device. The connection temperature is detected after the cabinet has operated for a certain period of time to confirm that the terminal contact is good. Ensure that the temperature rise does not exceed 30°C.

Before the system can start running, the system needs to set the following parameters in the HMI, see 7 HMI Settings

Parameter	Note
System time setting and confirmation	If you are connected to a host such as a mobile app, the time should have been calibrated to the local time.
Set the electricity price parameters	Click on the settings menu, click on the electricity price button on the settings page, switch to the electricity price parameter setting page and set it according to the local electricity price.
Set the action policy	Set the working mode as required. The default mode is load priority mode.
Set system parameters	Click on the settings menu, click on the system settings page to set the time and password. The EMS IP, SN, HMI IP and HMI gateway are set when the device leaves the factory.
Set the grid parameters	Set grid capacity, grid code, grid-connected power
Set the battery parameters	Set battery parameters, including SOC upper and lower limits, battery voltage upper limit
Set up operational controls	Click on On Grid Start in the control page, and the system will start working.

6.3 Power down the system

Background information



Warning!

After switching off the cabinet, residual energy and heat are still present in the frame, which can cause electric shocks or burns. Therefore, after 15 minutes of switching off the system, wear protective gloves and operate the cabinet.

Make sure to use the HMI or APP to issue shutdown instructions and, after switching off the cabinet, perform shutdown operations. If the user does not use the HMI or APP to issue the shutdown command, the cabinet will switch to the off-grid working mode after being switched off.

Procedure

- Step 1 Use the HMI or APP to issue shutdown commands, see 7 HMI settings shutdown operation; For more information about APP operation, see 8 APP Settings.
- Step 2 Disconnect the AC circuit breaker input from the cabinet and the grid side.
- Step 3 Disconnect the PV DC circuit breaker between the cabinet and the PV string.
- Step 4 If the energy storage port of the cabinet is connected to the energy storage device, disconnect the energy storage input circuit breaker.
- Step 5 If the generator input port of the cabinet is connected to the generator, disconnect the generator input circuit breaker.

7 HMI Setting

7.1 Introduction to HMI

This chapter describes the contents and operating methods of the HMI.

The main menu bar of the HMI display is located below the display and the sub-menu is located on the right side of the display. Through the HMI it is possible to fully monitor the operation of the entire system and it is also possible to issue all commands and display real time and historical alarms.

When turning on the cabinet, the touch screen starts itself and simultaneously displays the start-up page.

7.2 System Boot

This is the start-up interface shown as soon as the cabinet is powered on.

This page appears every time you boot up. The touch screen will automatically enter the home page after 3 seconds.



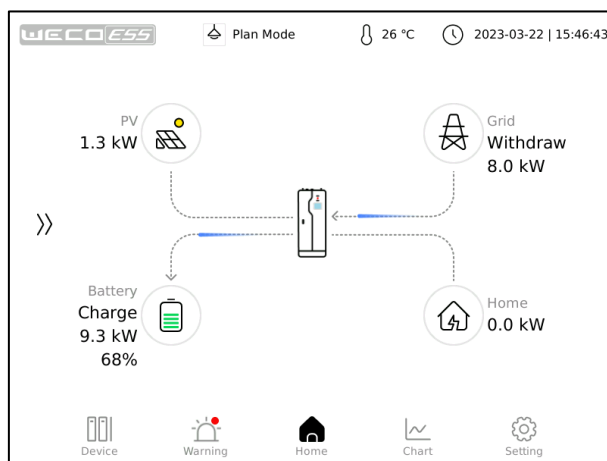
7.3 Home Page

As shown in the figure, the home page display interface is divided into three parts:

Status bar: At the top of the page, the display includes: operating mode, incoming air temperature and system time.

Topology map: In the centre of the page, data on PV, battery, AC power, load direction and power are displayed.

The menu bar at the bottom of the page, from left to right: Device, Warning, Home, Graph, Setting.



7.4 Device Page

Click 'device' to go to the device data page, as shown in the figure. The page uses the device type as a submenu to display the main parameters and device data for PCS, MPPT, battery and meters, etc

 Plan Mode 26 °C 2023-03-22 | 15:50:43

PCS1			
U Phase Voltage	235.9 V	U Phase Current	3.6 A
V Phase Voltage	235.7 V	V Phase Current	3.7 A
W Phase Voltage	238.0 V	W Phase Current	3.9 A
Active Power	-2.0 kW	Reactive Power	-0.2 kVar
Frequency	50.00 Hz	Work Mode	AC Power
Status	Power On	Comm. Status	Normal

PCS

MPPT

Bat.

AMM

Device

Warning

Home

Chart

Setting

PCS data

 Plan Mode 26 °C 2023-03-22 | 15:50:53

MPPT1			
High Side Voltage	791.4 V	DC Access Type	PV
Input Voltage	8.8 V	DC Run Status	Power Off
Input Current	0.8 A	DC Alarm Status	Alarm
Input Power	0.0 kW	DC Fault Status	Normal
Inlet Temp.	25.0 °C	Work Mode	MPPT
Outlet Temp.	25.6 °C	Comm. Status	Normal

PCS

MPPT

Bat.

AMM

Device

Warning

Home

Chart

Setting

MPPT data

 Plan Mode 26 °C 2023-03-22 | 15:51:05

BMS1			
AH Number	100 AH	Run Status	Charge
Voltage	793.4 V	Current	-11.3 A
SOC	68.0 %	SOH	100.0 %
Max Charge Current	10.0 A	Max Discharge Current	100.0 A
Max Cell Voltage	3.357 V	Min Cell Voltage	3.282 V
Max Cell Temp.	30 °C	Min Cell Temp	28 °C
Forbid Charge	No	Forbid Discharge	No

PCS

MPPT

Bat.

AMM

Device

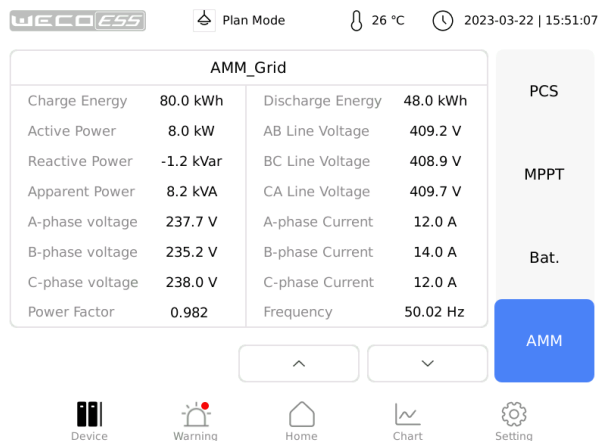
Warning

Home

Chart

Setting

Battery data

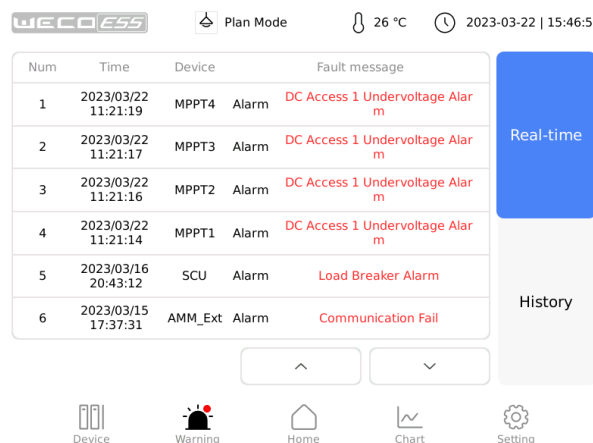


AMM data

7.5 Warning page

Real-time alerts

Click on 'Warnings' and 'Real Time' on the warnings page to switch to real-time warning information, as shown in the figure.

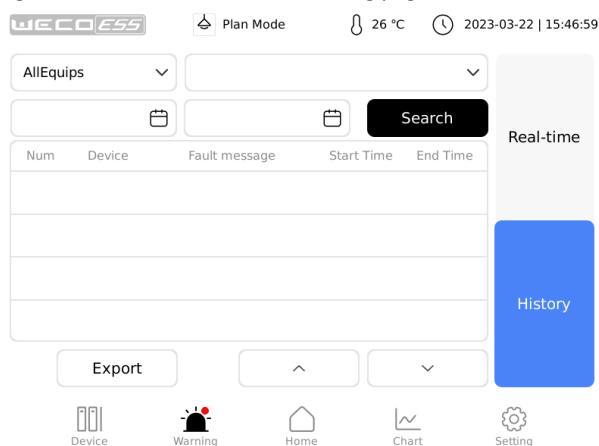


Real-time alert page

This page displays all critical warning information of the current system in real time. It includes the time, device and failure message. When other real-time warning information is present, you can change the display using the previous/next buttons. When there is an active alarm in the system, a red dot is displayed in the upper right corner of the warning menu button, as shown in the figure above.

Historical alerts

Click the "History" on the warning page to switch to the Historical warning page, as shown in the figure.



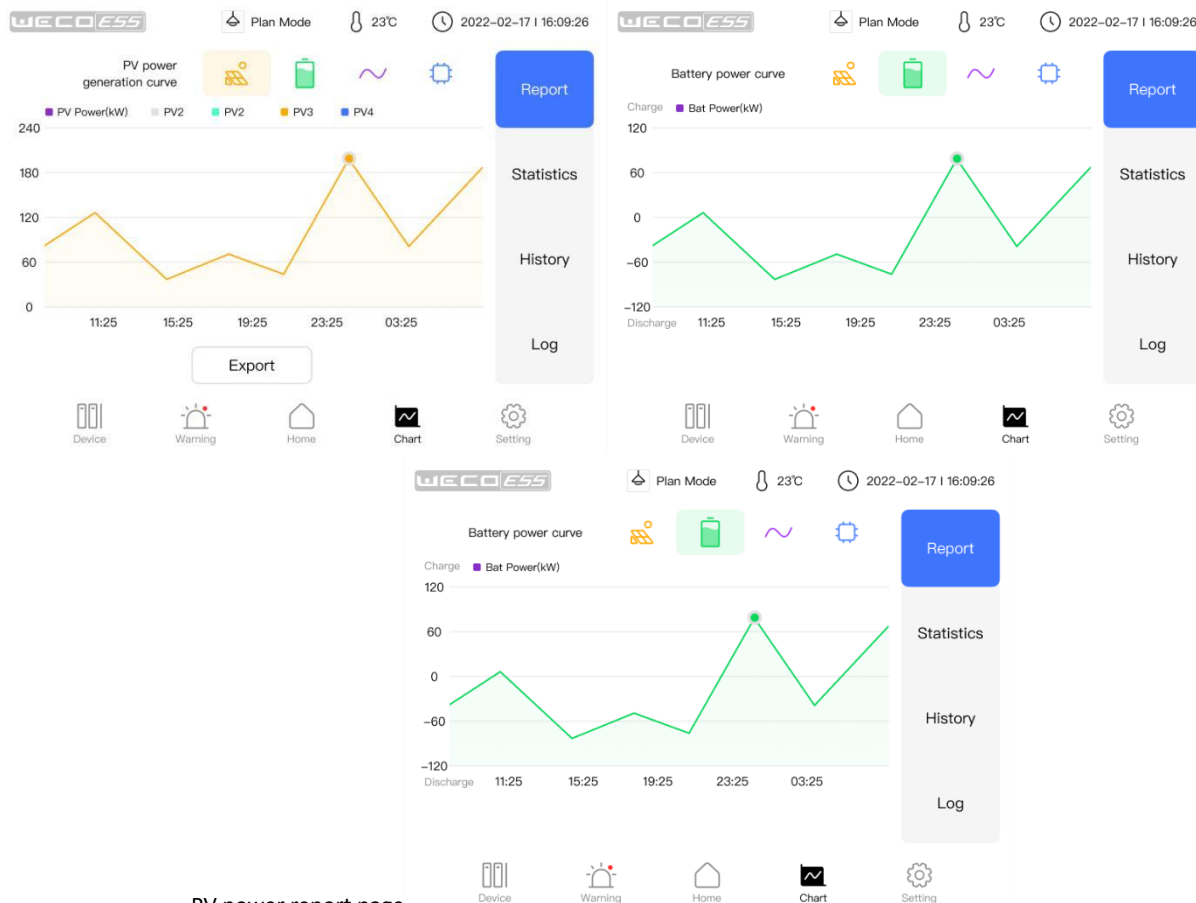
Historical alerts page

The historical alarm information on this page must be actively searched for. Select the device and alarm signal as shown in the figure, select the start and end time of alarm generation, click the 'Search' button; you can search for historical alarm information once and the results are displayed in the table above, which includes device, error message, start time and end time. When there is a lot of historical alarm information, you can change the display using the previous/next buttons. Insert the USB stick to export the query results as a csv file and save them in the Alarm folder in the main part of the USB stick.

7.6 Chart Pages

Report data page

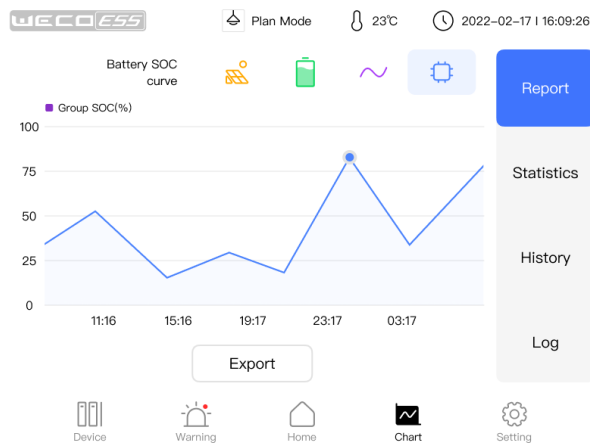
Click the report button on the chart page to switch to the report data page, which contains 4 subpages, as shown in the figure:



PV power report page

Battery Power Report Page

AC Power Report Page



Battery SOC report page

PV power generation curve: In minutes, displays the power curve of the PV side for the last 24 hours.

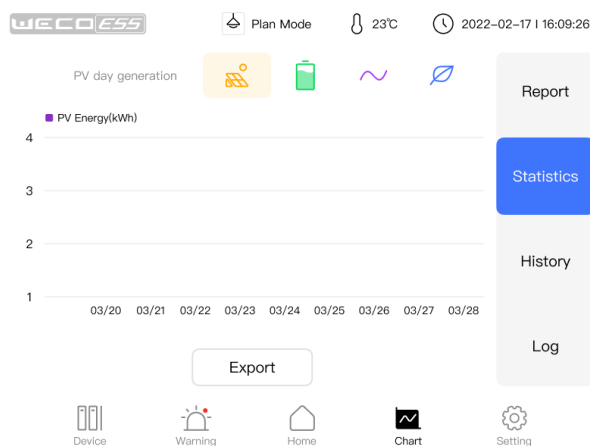
Battery power curve: Displays the power graph of the battery side for the last 24 hours, in minutes.

AC power curve: In minutes, displays the active/reactive power curve of the AC side for the last 24 hours.

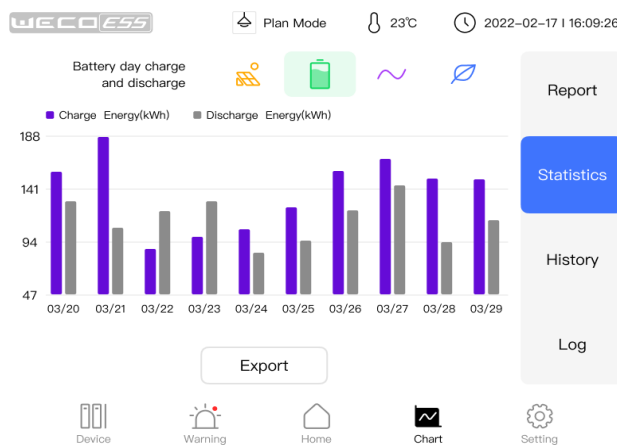
Battery SOC curve: Displays the battery SOC curve for the last 24 hours, in minutes.

Statistics page

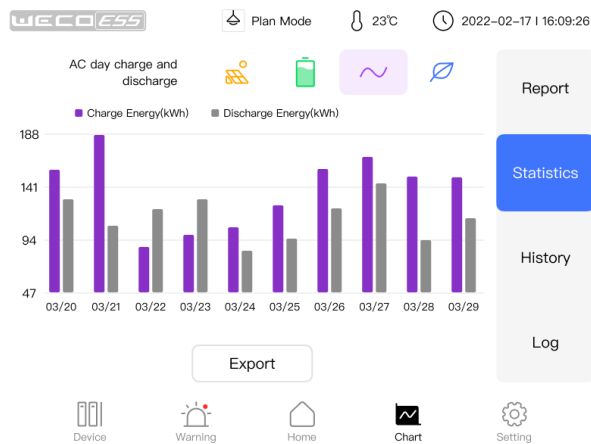
Click the Statistics button on the chart page to switch to the Statistics page, as shown in the figure.



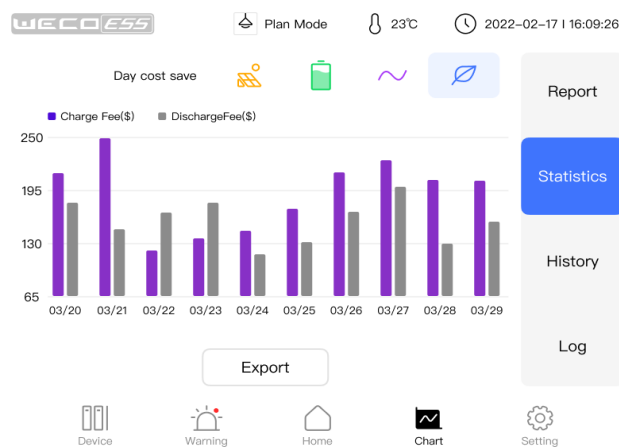
Photovoltaic power generation daily report page



Battery charge and discharge daily report page



AC Charge and Discharge Daily Report Page



Energy Saving Expense Daily Report page

As shown in the image, the statistics contain four subpages:

PV day generation: in daily units, displays the histogram of the PV energy generated over the last 10 days.

Daily battery charge and discharge: in daily units, displays the histogram of the battery charge/discharge energy over the last 10 days.

Daily AC charge and discharge: in daily units, displays the histogram of AC charge/discharge energy over the last 10 days.

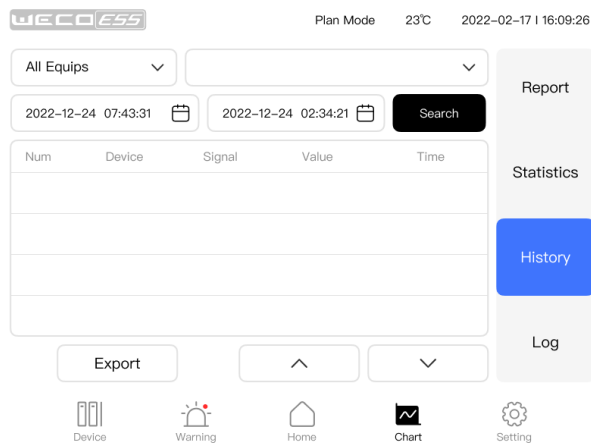
Daily charge/discharge displays a histogram of the charge/discharge energy of the last 10 days, in daily units.

Note:

1. The cost report needs to set the utility electricity price on the Electricity Price Parameters page of the Settings menu.
2. Report data and statistics can be exported to CSV format data files; the export file is stored in the root directory of the USB flash drive.

Historical data page

Click the History button on the chart page to switch to the historical data page, as shown in the figure.



Historical data page

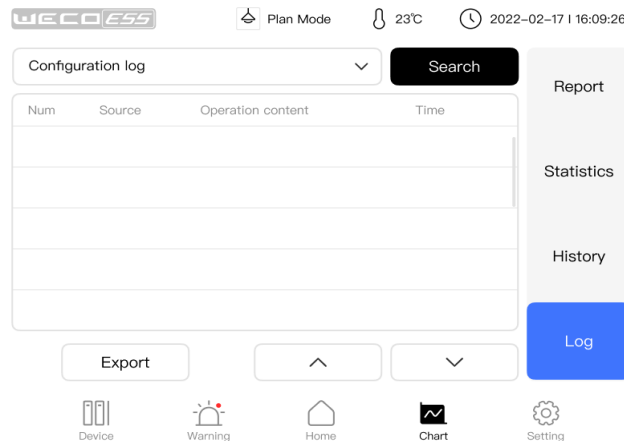
The historical data on this page must be actively queried. Select the device and signal as shown in the figure, select the start/end time period of the historical data, click the 'Search' button; this allows you to search the historical data information once and the results are displayed in the table above, including device, signal, value and time.

When there is a lot of historical data, you can change the display with the previous/next buttons.

Insert the USB drive to export the search results as a csv file and save them to a HisData file in the root directory of the USB drive.

Log page

Click the Log button on the chart page to switch to the log page, as shown in the figure.



As shown in the figure, there is a drop-down box on the registers page that allows you to select three types of registers:

Configuration register: records configuration information stored in the central control SCU database, such as electricity price and operation policy.

Control log: records data sent to specific module devices, such as power on/off, module power, module operating status, etc;

Fault log: exports all historical and alarm data to a USB stick.

Configuration and control logs can be viewed via the HMI display. Click the 'Search' button to perform a search. The fault log can only be exported to a USB flash drive for viewing; the export path is the Alarm Record folder in the main part of the USB flash drive

USB drive

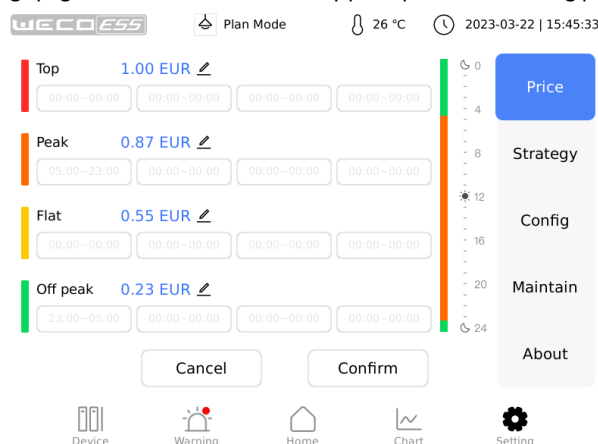
These types of graphic data can be exported via USB 3.0 with a lifetime of no more than three years. The format of the USB stick must be FAT32 and the memory must be less than 32 GB..

7.7 Settings page

Before the system runs, the following steps need to be set:

Step1: Set the electricity price parameters

Click the "Price" button on the settings page to switch to the electricity price parameter setting page, as shown in the figure.



Electricity price parameter setting page

As shown in the figure, the page displays the peak valley period and the current peak valley electricity price.

If you need to change the peak valley electricity price, you can click directly on the electricity price to change it and click on the corresponding period button to change the same peak valley period.

If you wish to change the unit price of electricity, you can select it from the 'Config-System - Currency Unit' drop-down menu. After completing the entry, click the confirm button and a password check box will appear. Enter the operating password and verify that it is correct before completing the change.

The specific setting time is displayed in the corresponding colour on the right timeline.

Note: All time periods cannot overlap and must be continuous.

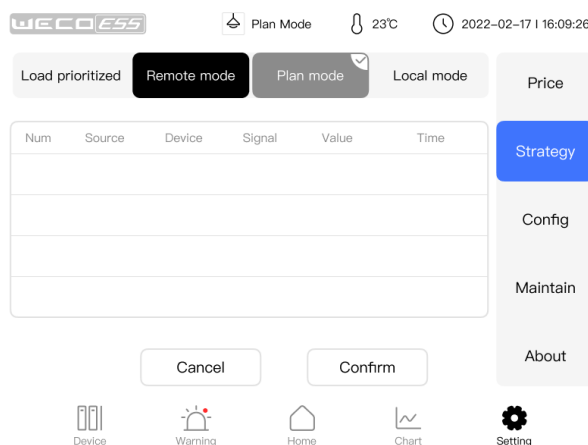
Step 3: Set a running strategy

Introduction to running the strategy:

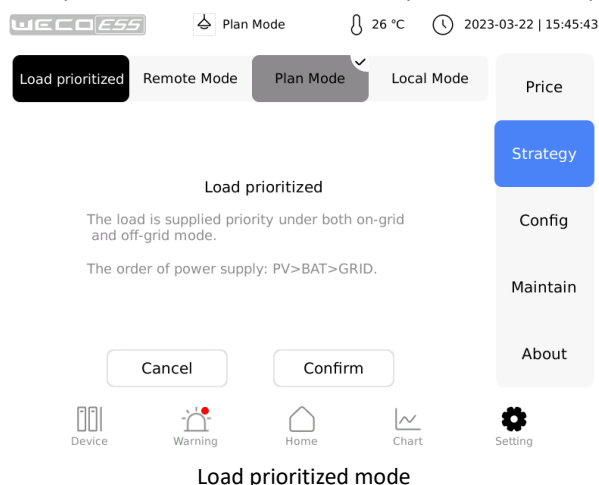
- (1) Load prioritized: i.e. in spontaneous self-consumption mode, the system is used as reserve energy, the photovoltaic energy is prioritised to meet the load, followed by battery charging, and the excess energy is fed back into the grid once the battery is full.
- (2) Plan mode: i.e. peak-saving and valley-filling mode, the charging and discharging time of the battery is set in a scheduled manner, charging the battery when the electricity price is low and discharging it when the electricity price is high.
- (3) Remote mode: Setting the operating mode and power output of the MPPT module and PCS module in the device in the cloud to meet the needs of more complex application scenarios.
- (4) Local mode: A debug mode that is used during system maintenance and troubleshooting.

To set the load prioritized mode:

Click the strategy button on the Settings page to switch to the run strategy settings page, as shown in the figure.



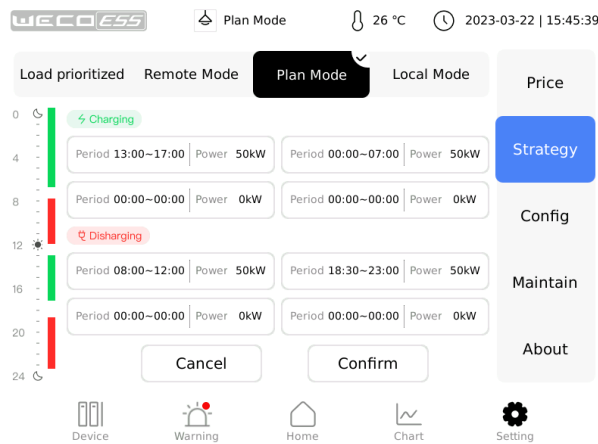
Click Load prioritized, click Confirm, enter password authentication, and the system runs in load priority mode.



Set the Plan mode:

Click the strategy button on the Settings page to switch to the Run strategy Settings page.

Click the Plan mode, enter the charging and discharge period and power, click Confirm, enter the password verification, and the system runs in the Plan mode



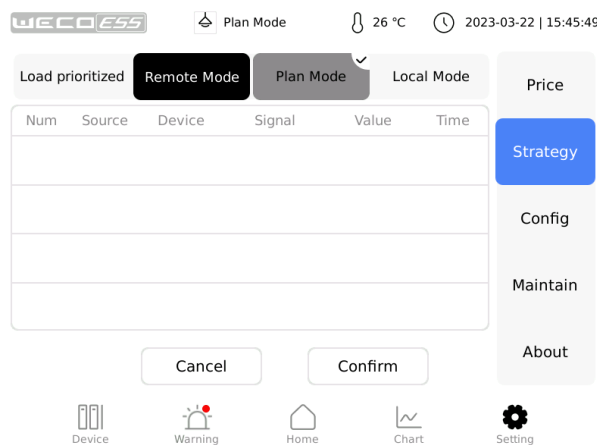
Plan mode

Note: The charging and discharging periods cannot coincide.

Set the remote mode:

Click the strategy button on the Settings page to switch to the Run Strategy Settings page.

Click Remote Mode, click Confirm, enter password authentication, and the system runs according to the instructions issued by the superior EMS.

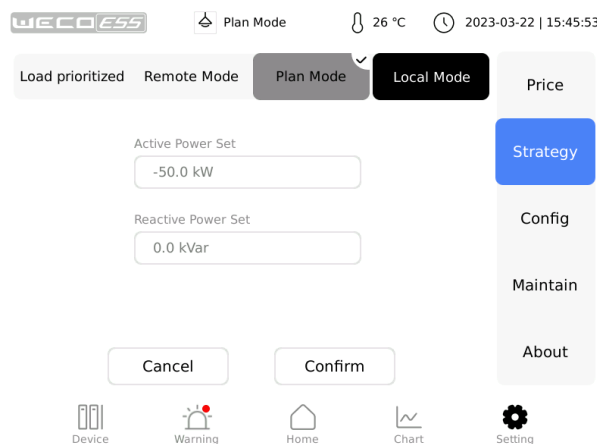


Remote mode

Set the local mode:

Click the strategy button on the Settings page to switch to the Run Strategy Settings page, as shown in the figure.

Click Local Mode, click Confirm, enter password authentication, and the system runs according to local manual instructions



Local mode

Note: To switch the operation strategy, click the "Confirm" button to store it in the centralized control system database, which takes effect in real time. Otherwise, failing to set CONFIRM will result in not functional setting.

b. Click the Cancel button to restore the currently running policy and settings.

Step 3: Set system parameters

In the main interface, click the 'Setting' menu to enter the settings page, click the 'config' button in the settings page, switch to the system configuration settings page and click 'System' to set the parameters. Click the 'Sys Time' setting, enter the date and time of day in the pop-up window, if the system is connected to the cloud, the system time will be calibrated automatically.

PCS ID: Give this device a code name, which is a string of numbers.

HMI IP: is the IP address of the equipment in the cabinet. The default is to use the router in the cabinet. If an external network is used, it needs to be configured as an external matching network address.

HMI GW: it is the gateway of the equipment in the cabinet. The default is to use the router in the cabinet. If an external network is used, it needs to be configured as an external network gateway.

Sys Time: Set the system time for this cabinet. If the device is connected to the cloud, it will be synchronized once every 3 hours with the cloud.

Password: Password settings. The default password is "123456". Entering a new password will modify it. If you make any changes, please remember it and confirm when changing the settings.

EMS IP: The IP address of the remote cloud server, which does not need to be modified.

EMS Port: Set the port number of the remote EMS.

Currency Unit: The unit in which the current electricity price is set.

Step 4: Set the grid parameters

Click the "Config" button on the Settings page to switch to the System Configuration Settings page, as shown in the figure.

Click "Grid" to enter the power grid parameter settings page:

Grid parameter settings page

Grid capacity refers to the maximum value of energy that this device can obtain from the power grid, and the set value should be less or equal than the rated value.

On Grid maximum: The maximum power value that allows devices to feedback to the power grid, which needs to be set in conjunction with local regulations and load usage.

DG capacity: The rated power value of the generator connected to the equipment should not be less than the maximum value connected to the EPS load.

Maximum load power: The maximum EPS load value connected to the device should be less than 240kw

Grid code: The current code of the State Grid, which determines the output voltage and frequency.

Step 5: Set the battery parameters

Click the “Config” button on the Settings page to switch to the System Configuration Settings page, as shown in the figure.

Click “Protect” to enter the Battery Parameter Settings page and set the battery SOC threshold for starting inverter output, turning off system inverter output, and shutting down

The screenshot shows the 'Protect' tab of the Battery Parameters Settings page. The page has a top bar with 'Plan Mode', temperature '26 °C', and date/time '2023-03-22 | 15:46:17'. Below the top bar are tabs for 'System', 'Grid', 'Protect' (selected), 'Control', and 'Price'. The 'Protect' tab contains several input fields for SOC settings: 'Charging Target SOC' (95 %), 'SOC Threshold Hysteresis' (5 %), 'On Grid SOC Discharge Limit' (30 %), 'Off Grid SOC Discharge Limit' (25 %), 'Battery Cut Off SOC Level' (15 %), 'Black Out Back-Up Discharge Level' (0 %), and 'Manual Forced Charge Power' (0 kW). On the right side of the settings area is a vertical menu with buttons for 'Price', 'Strategy', 'Config' (highlighted in blue), 'Maintain', and 'About'. At the bottom of the page are icons for 'Device', 'Warning', 'Home', 'Chart', and 'Setting'.

Battery Parameters Settings page

Charging Target SOC: Set the SOC limit for the maximum battery charge.

SOC Threshold Hysteresis: Set the return difference between SOC limits, such as setting a maximum SOC of 95% and a hysteresis of 5%. After reaching a SOC of 95%, the device must be discharged until the SOC is less than 90% before it can start charging again. The purpose is to prevent the device from frequently switching between charging and discharging.

On grid SOC Discharge Limit: Set the lower limit of discharge SOC in On-grid mode. In On-grid mode, if the battery SOC falls below this value, discharge to the grid will be stopped

Off grid SOC Discharge Limit: Set the lower limit of discharge SOC in Off-grid mode. In Off-grid mode, if the battery SOC falls below this value, discharge to the load will be stopped.

Battery Cut Off SOC Level: Set the battery shutdown SOC value. In grid connection mode, if the battery SOC is lower than this value, power will be taken from the grid and a fixed 10kW strong charge will be applied until the SOC is greater than the shutdown SOC offline+SOC difference; In off grid mode, if the battery SOC is lower than this value, the system shuts down when the photovoltaic power is out.

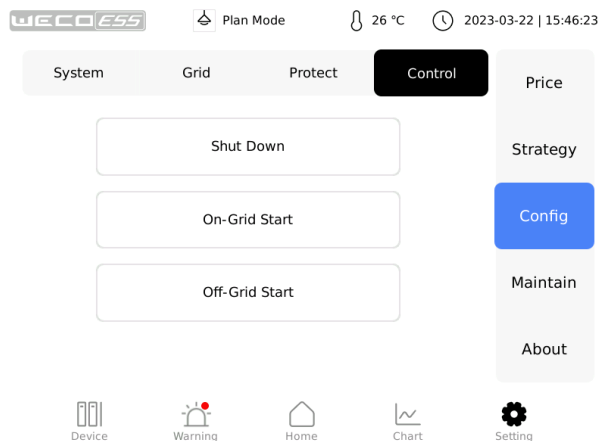
Black Out Back-Up Discharge Level: Set the upper limit of charging SOC during Backup mode.

Manual Forced Charge Power: Set the power to manually charge the battery to the upper limit of the battery SOC.

Step 6: Set the running parameters

Click the “Config” button on the Settings page to switch to the System Configuration Settings page, as shown in the figure.

Click the “control” to set up, the operation control includes Shutdown, On-Grid Start, Off-Grid Start.



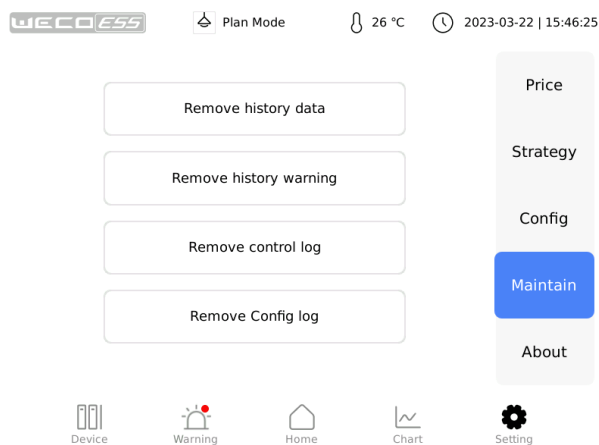
Run Control Settings page

If the device is connected normally to the power grid, click “on grid start”, the device starts and works in on-grid mode.
If the device is not properly connected to the power grid, click ‘off grid start’ to start the device and work in off-grid mode.

7.8 Other Settings

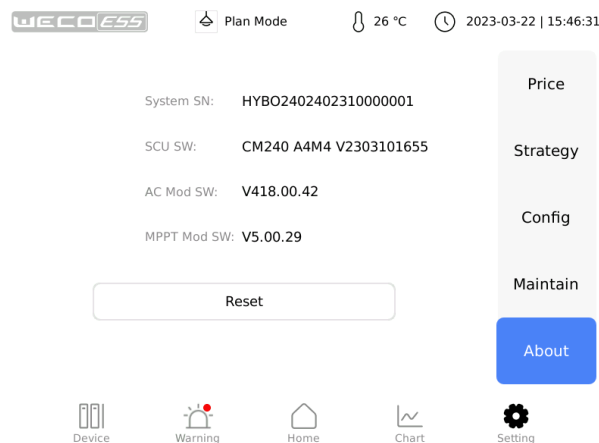
Maintenance

Click the “Maintain” button on the Settings page to switch to the Settings page of the Maintenance page, which is used to delete historical data and logs, as shown in the figure.



Maintenance page

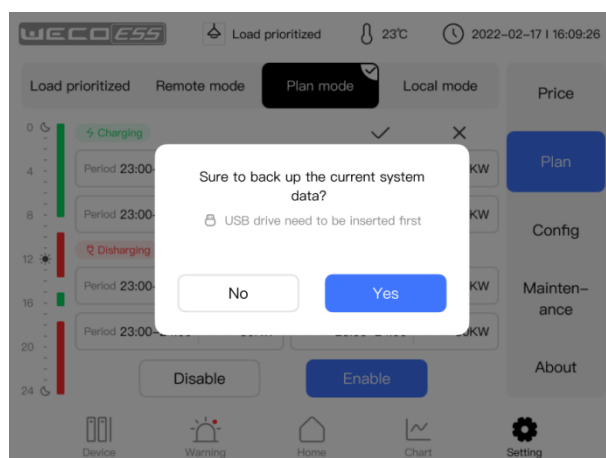
The device SN number, software version information, and factory reset are described as shown in the figure.



About page

As shown in the figure, this page displays the system and module hardware and software version numbers, as well as factory reset.

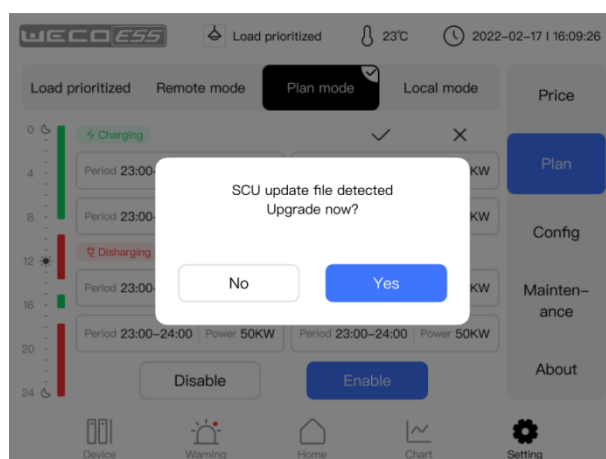
Click the restore factory data button, display the password check box, after the password verification is correct, the system data backup dialogue box will be displayed, as shown in the figure below, if you need to back up, insert the U disk, wait for the system to recognize the U disk (about 3 seconds) and click the Yes button, the current system database will be backed up to U The root directory of the disk is SCUBakxxx directory, where xxx is the backup time, after the backup is completed, delete the system running data, restart the system automatically and complete the factory data recovery.



Data backup dialog box

System upgrade

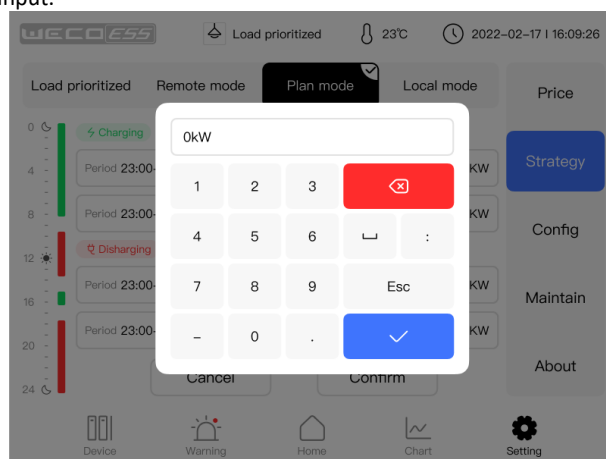
Place the update file in the root directory of the USB stick and insert it into any USB port on the central screen; the dialogue box shown in the following figure will appear, asking whether to perform the update. Follow the directions in the dialogue box to complete the update.



System Upgrade dialog box

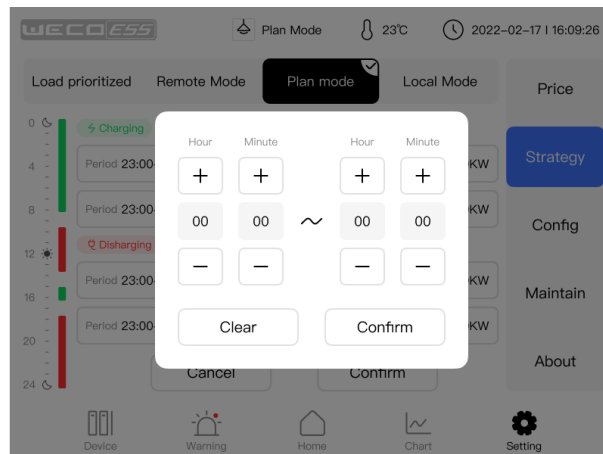
Pop-ups

Keyboard: for numbers, password input.



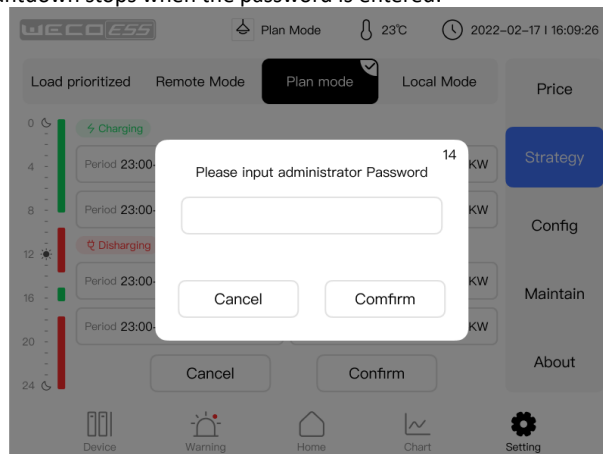
Keyboard pop-up

Time period selection pop-up window: Used to select the time period on the electricity peak and valley price page and on the operation strategy page.



Select the pop-up window for the time period

Password verification pop-up window: used to verify the control configuration for authorisation, click on the input box to display the keyboard, enter the password. In the top right corner is the countdown of the pop-up window, time automatically hides the pop-up and the countdown stops when the password is entered.



Password verification pop-up window

8 Noor Mobile APP (iOS and Android)

8.1 App Introduction

Function

NOOR Cloud App (abbreviated to app) is a mobile application software that can perform alarm querying, parameter configuration, daily maintenance, debugging and other functions, and is a convenient maintenance platform.

Statement

The interface shown in this app is NOOR V1.0.0 The picture is for reference only, and the specific application interface shall prevail. The company has the right of final interpretation of this document and all related documents of this product. Subject to update, revision or discontinuation without notice, please visit our official website for the latest product information.

8.2 Download and install the app

Download method: Search for "Noor" in the Google Play or App Store application market.

Mobile phone system requirements: It supports use on IOS 12.0 and Android 8.1.0 or above.

After the installation is complete, the "Noor" icon can be displayed

8.3 Cabinet connection app

Precondition

The DC or AC side of the cabinet is powered on.

The phone is connected to the network.

Procedure

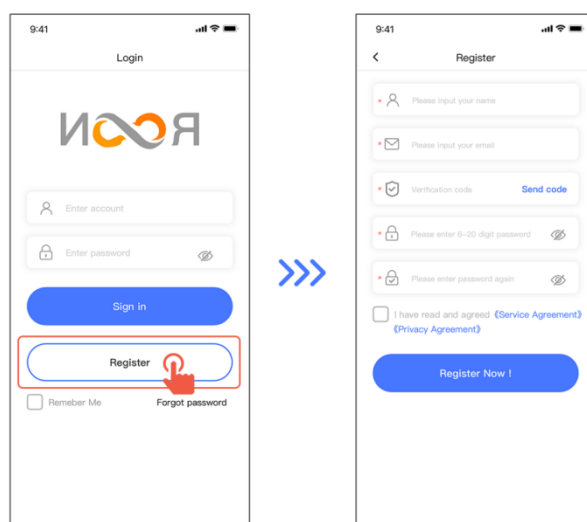
If you haven't a Noor App user account, please register according to the following steps:

Steps:

Go to the Noor App login page, click "Register Now!" at the bottom.

Complete the user account registration according to the prompts on the page, fill in the registration information: country (required), email number (required), verification code (required), password (required), re-enter password (required), and finally check the user agreement and privacy registration to register.

After account registration, users can log in to the Noor App with the account name and password.



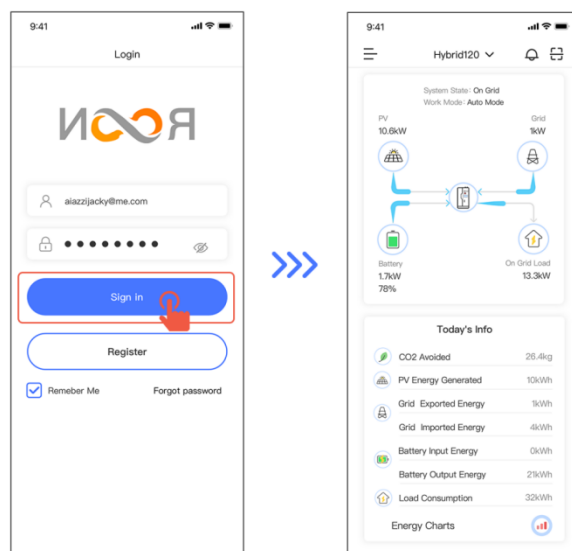
8.4 Login and Logout of the APP

8.4.1 Login APP

After correctly installing the app on your mobile phone, you can use it by logging into the app.

Step 1: On the mobile desktop, use the Noor App application icon to login.

Step 2: On the app login page, enter your account and password, then click "Sign in".

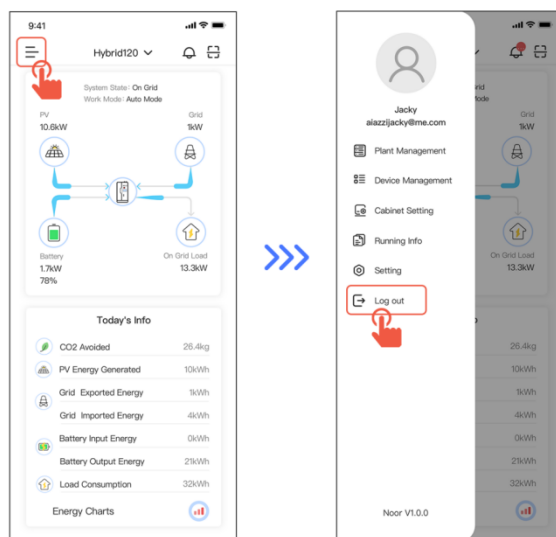


8.4.2 Logout APP

Steps:

Click "☰" in the upper left corner of the main page, and a pop-up page will appear on the left side.

On the pop-up page that slides out, click the "🚪" Log Out" icon to log out.



8.5 App functions

WECO is constantly updating the app functions. For detailed operation and use, please refer to the latest *App user manual*.

9 System Maintenance

9.1 Routine Maintenance

In order to ensure the long-term good operation of the cabinet, it is recommended to maintain it routinely as described in this section.



Caution!

Caution, high voltage is present inside the cabinet, which can cause electric shocks. Before performing any maintenance work inside the cabinet, the cabinet must be switched off and isolated. Always wait 15 minutes before any operation to discharge the capacitors.

Maintain lists

Content	Method	Maintenance cycles
System cleaning	Regularly check the cabinet for dirt, clean MPPT and PCS modules and cabinet dust screen. Clean any dust or debris from fan blades and vents. Check and clean all modules and door's air intake filters to ensure optimal airflow. WARNING Failure to clean the filters can lead to overheating and system failure. Inspect the condition of the filters and replace if necessary. Check that there is also no dust inside the cabinet. Check non water, condensation, rust is found into the inverter or battery cabinets.	Every six months to 1 time in a year
System operating status	Observe whether the appearance of the cabinet is damaged or deformed. Listen to whether there is an abnormal sound during the operation of the cabinet. When the cabinet is running, check whether the parameters of the cabinet are set correctly. Verify that all cooling fans are operational.	1 time every three months
Electrical connection	Ensure that all cables are properly tagged and seated in their terminals. Inspect all AC and DC cable connections for any signs of wear or damage. Use a torque wrench to check whether the cable and copper bar connections are separated and loose. The torque shall be determined according to the torque table. Check the cable for damage, focusing on whether the skin of the cable in contact with the metal surface has any traces of cuts. Perform an insulation resistance test to ensure that there are no leaks or deteriorations in insulation. Test all breakers to ensure they are functioning correctly and can reliably disconnect and reconnect the power supply.	Every six months to 1 time in a year
Grounding reliability	Check that the grounding cable is reliably grounded, the GND must properly dimensioned according with the system Fault Protection Limits	Every six months to 1 time in a year
Battery system	Check that the electrical connections to the battery system are solid and reliable. Check that the earth connection is reliable. Check that there are no signs of rust or moisture on the battery system. Check that the batteries are all balanced, at the same voltage and that they are updated to the latest available firmware.	Every three months to six months

9.2 Troubleshooting

Alarm levels are defined as follows:

3: Important alarm: The cabinet fails, enters shutdown mode, and stops running.

2: Minor alarm: Some components of the cabinet have malfunctioned but are still functioning properly and may experience reduced power.

1: Prompt alarm: The cabinet functions normally, because external factors cause its output power to decrease

List of common fault alerts

Equip	alarm name	level	cause	Handling opinions
PCS1~4	Communication failed	2	PCS failed to communicate with SCU	Check the communication cable, the power supply of the device
	Overload Warning	2	Off-grid load greater than 110% of rated power	Power down and restart
	Uneven Bus Midpoint Alarm	2	The positive and negative bus deviation is greater than 150V	Contact after-sales repair
	DC Side Main Relay Alarm	2	After the main relay on the DC side is closed, the voltage difference between the two ends of the main relay is greater than 40V	Contact after-sales repair
	AC Voltage Sampling Abnormal Alarm	2	The sampling voltage error of the upper and lower plates of the grid voltage is large (only 60kw has this fault)	Contact after-sales repair
	DC Voltage Sampling Failure Alarm	2	The DC sampling error is greater than 20V	Contact after-sales repair
	Module Address Abnormal Fault	2	When the parallel is reached, the parallel address is less than 1 or greater than the number of parallel machines	Check whether the device communication address conflicts with other modules
	Host Address Conflict Fault	2	The two modules in the parallel system are the hosts	Check whether the device communication address conflicts with other modules
	Address Conflict Fault	2	The addresses of the two modules in the parallel system are the same	Check whether the device communication address conflicts with other modules
	Grid Resonance Fault	2	The module output is abnormal	Power down and restart
	DC SW Soft Start Failure	2	During the start-up process, the error between the bus voltage and the given value is greater than 10V	Power down and restart
	AC HW Soft Start Failure	2	After AC power-on, the bus voltage does not reach the corresponding uncontrolled rectification value	Power down and restart
	Phase Lock Alarm	2	Grid phase tracking failed	Power down and restart
	EPO Fault	2	External EPO dry contact input failed	Check whether the module emergency stop DI1 is disconnected
	Inverter Overvoltage Alarm	2	The voltage of any one of the inverter three-phase voltages exceeds 270V	Power down and restart
	Fan 3 Failure	2	The fan is stalled or damaged	Contact after-sales repair
	Fan 2 Failure	2	The fan is stalled or damaged	Contact after-sales repair
	Fan 1 Failure	2	The fan is stalled or damaged	Contact after-sales repair
	Parallel CAN Comm. Failure	2	CAN communication termination resistors do not match	Parallel communication dialing code
	Auxiliary Power Failure	2	The 12V voltage drops below 10V	Contact after-sales repair

Module C2 Phase Overcurrent Alarm	2	The 12V voltage drops below 10V	Power down and restart
Module B2 Phase Overcurrent Alarm	2	The current of phase B on the upper board exceeds 120A many times	Power down and restart
Module A2 Phase Overcurrent Alarm	2	The current of phase B on the upper board exceeds 120A many times	Power down and restart
Module C1 Phase Overcurrent Alarm	2	The current of phase B on the upper board exceeds 120A many times	Power down and restart
Module B1 Phase Overcurrent Alarm	2	The current of phase B on the upper board exceeds 120A many times	Power down and restart
Module A1 Phase Overcurrent Alarm	2	The current of phase B on the upper board exceeds 120A many times	Power down and restart
Negative Bus Second Level Overvoltage Alarm	2	The negative bus voltage exceeds 530V	Power down and restart
Positive Bus Second Level Overvoltage Alarm	2	The positive bus voltage exceeds 530V	Power down and restart
AC Current Sampling Failure Fault	2	The AC side current sampling is abnormal	Contact after-sales repair
AC Output Short Circuit Fault	2	The AC side current sampling is abnormal	Contact after-sales repair
Inverter Amplitude Lock Alarm	2	The AC voltage does not reach the given value during the start-up process	Power down and restart
Inverter Phase Sequence Alarm	2	The order is reversed	Swap the two live wires at will
Grid Phase Sequence Alarm	2	The order is reversed	Swap the two live wires at will
DC Undervoltage Alarm	2	The battery voltage is less than 675V	Power down and restart/contact after-sales repair
DC Overvoltage Alarm	2	The battery voltage is higher than 995V	Power down and restart/contact after-sales repair
Negative Bus First Level Overvoltage Alarm	2	The negative bus voltage is greater than 510	Power down and restart/contact after-sales repair
Positive Bus First Level Overvoltage Alarm	2	The positive bus voltage is greater than 510	Power down and restart/contact after-sales repair
Bus Voltage Low Alarm	2	The bus voltage is less than 300V or the single-side bus is less than 150V	Power down and restart/contact after-sales repair
Bus Voltage High Alarm	2	The bus voltage is 1100V or the single-side bus is greater than 550V	Power down and restart/contact after-sales repair
Low Grid Frequency Alarm	2	The grid frequency is below the limit, and the frequency limit is different in different countries	Contact after-sales repair
High Grid Frequency Alarm	2	The grid frequency is above the limit, and the frequency limit is different in different countries	Contact after-sales repair
Low Grid Voltage Alarm	2	The grid grid is below the limit, and the frequency limit is different in different countries	Contact after-sales repair

	High Grid Voltage Alarm	2	The grid grid is above the limit, and the frequency limit is different in different countries	Contact after-sales repair
	DSP SW Version Not Match Fault	2	The two DSP software versions in the module are inconsistent, which generally occurs during the upgrade process	Upgrade the matching DSP software
	AC Constant Voltage Grid Access Fault	2	In off-grid mode, grid connection is detected	Disconnect from the grid, or switch to grid-tied mode
	Module C1 Temp. Sensor Failure	2	The temperature sensor is damaged	Contact after-sales repair
	Module B1 Temp. Sensor Failure	2	The temperature sensor is damaged	Contact after-sales repair
	Module A1 Temp. Sensor Failure	2	The temperature sensor is damaged	Contact after-sales repair
	Module C2 Temp. Sensor Failure	2	The temperature sensor is damaged	Contact after-sales repair
	Module B2 Temp. Sensor Failure	2	The temperature sensor is damaged	Contact after-sales repair
	Module A2 Temp. Sensor Failure	2	The temperature sensor is damaged	Contact after-sales repair
	Module C1 Temp. High Alarm	2	IGBT temperature reaches 85°	Check the air duct and fan
	Module B1 Temp. High Alarm	2	IGBT temperature reaches 85°	Check the air duct and fan
	Module A1 Temp. High Alarm	2	IGBT temperature reaches 85°	Check the air duct and fan
	Module C2 Temp. High Alarm	2	IGBT temperature reaches 85°	Check the air duct and fan
	Module B2 Temp. High Alarm	2	IGBT temperature reaches 85°	Check the air duct and fan
	Module A2 Temp. High Alarm	2	IGBT temperature reaches 85°	Check the air duct and fan
	Air Outlet Temp. High Alarm	2	The temperature of the air outlet reaches 60°	Check the air duct and fan
	Air Inlet Temp. High Alarm	2	The temperature of the air outlet reaches 60°	Check the external fan and external air duct
MPPT1~4	Communication failed	2	The device failed to communicate with the SCU	Check the communication cable, the power supply of the device
	Parallel Address Over Fault	3	The parallel address is greater than the number of parallel units	Check whether the address of the device is matched with the number of devices
	Parallel Address Conflict Fault	3	The addresses of the two modules in the parallel system are the same	Check whether the parallel address of the device conflicts with other modules
	Parallel Line Fault	3	The parallel cable is not connected	Check that the device is connected to the machine
	Parallel Host Conflict Fault	3	The two modules in the parallel system are the hosts	Check whether the parallel address of the device conflicts with other modules
	CAN Comm. Alarm	2	When CAN heartbeat is enabled, there is no CAN communication	Check the communication cable
	EPO Alarm	2	Module emergency stop DI1 is disconnected	Check whether the module emergency stop DI1 is disconnected
	485 Comm. Alarm	2	When the 485 heartbeat is enabled, there is no 485 communication	Check the communication cable

	CAN Comm. Address Conflict Fault	3	The CAN address of both modules is the same	Check whether the parallel address of the device conflicts with other modules
	High And Low Voltage Set Not Match Alarm	2	The high-side and low-side voltages are set incorrectly	Contact after-sales repair
	Temp. Sensor Fault	3	The temperature sensor is damaged	Power down and restart
	Fan 3 Alarm	2	The fan stalls	Contact after-sales repair
	Fan 2 Alarm	2	The fan stalls	Contact after-sales repair
	Fan 1 Alarm	2	The fan stalls	Contact after-sales repair
	DC Soft Start Fault	3	During the start-up process, the error between the high-side voltage and the given value is greater than 10V	Power down and restart
	DC Bus Voltage Asymmetry Alarm	2	The DC link voltage is asymmetrical	Power down and restart
	DC Bus Voltage Low Alarm	2	The bus voltage is less than the set lower voltage limit	Modify the lower bus voltage limit
	DC Bus Voltage High Alarm	2	The bus voltage is greater than the set upper voltage limit	Modify the lower bus voltage limit
	Radiator Temp. High Alarm	2	The temperature exceeds 86 degrees	Check the air duct
	Auxiliary Power Fault	3	The internal auxiliary source voltage is abnormal	Power down and restart
	DC Access 1 Overcurrent Alarm	2	The module detects module overcurrent internally	No need to deal with it, do not recover contact after-sales repair for a long time
	DC Access 1 Overload Alarm	2	The module detects the module power inside	No need to deal with it, do not recover contact after-sales repair for a long time
	DC Access 1 Soft Start Fault	3	During the start-up process, the error between the low-side voltage and the given value is greater than 10V	Power down and restart
	DC Access 1 Undervoltage Alarm	2	The low-side voltage is less than the set lower voltage limit	Modify the lower voltage value of the low-side access 1
	DC Access 1 Overvoltage Alarm	2	The low-side voltage is greater than the set upper voltage limit	Modify the lower voltage value of the low-side access 1
HVU	Communication failed	2	HVU failed to communicate with SCU	Check the HVU communication cable
	Insulation Alarm Level 2	2	Insulation detection low insulation value	Power down and restart
	Insulation Alarm Level 1	2	Insulation detection low insulation value	Power down and restart
	Wiring Fault	2	Loose wiring	Contact after-sales repair
	Positive And Ground Insulation Fault	2	The positive insulation is detected abnormally	Power down and restart, still abnormal, contact after-sales maintenance
	Negative And Ground Insulation Fault	2	The negative insulation is detected abnormally	Power down and restart, still abnormal, contact after-sales maintenance
	Equipment Fault	2	The HVU module test failed or was corrupted	Power down and restart, still abnormal, contact after-sales maintenance
BMS Combiner	Communication failed	2	The combiner device failed to communicate with the SCU	Check the combiner communication cable, power supply

Voltage Sensor Error	3	Voltage sensor failure	Contact after-sales repair
Temperature Sensor Error	3	Temperature sensor failure	Contact after-sales repair
Internal Communication Error	3	BMS internal communication failure	Check whether the communication cable of the battery system is loose and still abnormal, contact after-sales maintenance
Input Over Voltage Error	3	Input overvoltage fault	Check that the voltage at the battery input is not out of range
Input transposition Error	3	Input reverse fault	Check whether the positive and negative terminals of the battery power input plug are reversed
Relay Check Error	3	Relay failure failure	Contact after-sales repair
Battery cell Error	3	Battery cell failure	Contact after-sales repair
Other Error	3	Other serious battery failures	Contact after-sales repair
Single Cell Low Voltage Alarm	2	Battery cell low voltage alarm	Alert prompts, no processing is required
Single Cell High Voltage Alarm	2	Battery cell high voltage alarm	Alert prompts, no processing is required
Discharge system Low Voltage Alarm	2	Battery pack discharge low voltage alarm	Alert prompts, no processing is required
Charge system High Voltage Alarm	2	Battery pack charging high voltage alarm	Alert prompts, no processing is required
Charge Cell Low Temperature Alarm	2	Charging low temperature alarm	Alert prompts, no processing is required
Charge Cell High Temperature Alarm	2	Charging high temperature alarm	Alert prompts, no processing is required
Discharge Cell Low Temperature Alarm	2	Discharge low temperature alarm	Alert prompts, no processing is required
Discharge Cell High Temperature Alarm	2	Discharge high temperature alarm	Alert prompts, no processing is required
Charge Over Current Alarm	2	Battery pack charge overcurrent alarm	Alert prompts, no processing is required
Discharge Over Current Alarm	2	Battery pack discharge overcurrent alarm	Alert prompts, no processing is required
Module Low Voltage Alarm	2	Battery module low voltage alarm	Alert prompts, no processing is required
Module High Voltage Alarm	2	Battery module high voltage alarm	Alert prompts, no processing is required
Single Cell Under Voltage Protect	1	Battery cell low voltage protection	Power down and restart, charge in time, if you cannot charge, please contact after-sales maintenance
Single Cell Over Voltage Protect	1	Battery cell high voltage protection	Power down and restart, still abnormal, contact after-sales maintenance
Discharge system Under Voltage Protect	1	Battery pack discharge low voltage protection	Power down and restart, charge in time, if you cannot charge, please contact after-sales maintenance
Charge system Over Voltage Protect	1	Battery pack charging high voltage protection	Power down and restart, still abnormal, contact after-sales maintenance
Charge Cell Under Temperature Protect	1	Charging low temperature protection	After half an hour of power and standing, restart it, still abnormal, please contact after-sales maintenance

	Charge Cell Over Temperature Protect	1	High temperature protection for charging	After half an hour of power and standing, restart it, still abnormal, please contact after-sales maintenance
	Discharge Cell Under Temperature Protect	1	Discharge low temperature protection	After half an hour of power and standing, restart it, still abnormal, please contact after-sales maintenance
	Discharge Cell Over Temperature Protect	1	Discharge high temperature protection	After half an hour of power and standing, restart it, still abnormal, please contact after-sales maintenance
	Charge Over Current Protect	1	Battery pack charge overcurrent protection	Power down and restart, still abnormal, contact after-sales maintenance
	Discharge Over Current Protect	1	Battery pack discharge overcurrent protection	Power down and restart, still abnormal, contact after-sales maintenance
	Module Under Voltage Protect	1	Battery module low voltage protection	Power down to restart, charge in time, if you cannot charge, please contact after-sales maintenance
	Module Over Voltage Protect	1	Battery module high voltage protection	Power down and restart, still abnormal, contact after-sales maintenance
SCU	PV Breaker Alarm	2	The PV circuit breaker is open	Close the PV circuit breaker
	Grid Breaker Alarm	2	The grid circuit breaker is disconnected	Closed grid-side circuit breaker
	Bat Breaker Alarm	2	The battery circuit breaker is disconnected	Close the battery circuit breaker
	AC Contactor Alarm	2	The PV circuit breaker is open	Close the PV circuit breaker
	Load Breaker Alarm	2	The load circuit breaker is open	Close the load circuit breaker
	SPD Alarm	2	The lightning protector circuit breaker is disconnected and/or damaged	Check if the lightning protector has been damaged
	EMS Cloud Comm. Fault	2	The cloud platform connection is lost, or the communication from the cloud platform is not received in 150s	Check whether the network and cloud platform are unblocked
AMM_Grid	Communication failed	2	The device failed to communicate with the SCU	Check the communication cable, the power supply of the device
AMM_Ext	Communication failed	2	The device failed to communicate with the SCU	Check the communication cable, the power supply of the device

10 Cabinet disposal

10.1 Disassemble the cabinet

Procedure

Step 1 Perform a system power-down operation (see 6.3 System Power-down).

Step 2 Disconnect all electrical connections of the cabinet, including signal wires, photovoltaic input wires, energy storage input wires, AC output wires and protective ground wires.

Step 3 Remove the cabinet cabinet fixing screws.

10.2 Integrated Packaging Cabinet

If you also have the original packaging of the cabinet, pack it in the original packaging and seal the package securely with tape. If you can't find the original packaging of the cabinet, seal it securely with a wooden box that fits the weight and dimensions of the cabinet.

10.3 Dismission Integrated Cabinet

At the end of the service life of the cabinet, it should be disposed of in accordance with the applicable electrical waste disposal law of the installation location.

Appendix A Abbreviations

A	
AC	Alternating Current
D	
DC	Direct Current
I	
ID	Identifier
L	
LED	Light Emitting Diode
LVRT	Low Voltage Ride-Through
M	
MAC	Media Access Control
MPPT	Maximum Power Point Tracking
P	
PC	Personal Computer
PE	Protective Earthing
PV	Photovoltaic
R	
RCD	Residual Current Device
RCMU	Residual Current Monitoring Unit
RH	Relative Humidity
S	
SN	Serial Number
T	
THDI	Total Harmonic Current Distortion
WEEE	Waste Electrical and Electronic Equipment
WiFi	Wireless Fidelity