USER
MANUAL

# HYBRID INVERTER USER MANUAL

30kVA~500kVA

VER: V2.00

# CONTENT

# 1 About the manual

## 1.1 Preface

Dear customer:

Thank you very much for using the hybrid inverter. We sincerely hope that our products can meet your demands. We look forward valuable comments on the performance and function of our product, we will continue to improve.

## 1.2 Applicable product

The manual is applicable to hybrid inverter. The product models are shown as follows:

Table 1-1 Product model

| Model | Power | Split type | Integrated model |
|---|---|---|---|
| 30kVA | 30 kW | | √ |
| 50kVA | 50 kW | | √ |
| 100kVA | 100 kW | | √ |
| 150kVA | 150 kW | | √ |
| 250kVA | 250 kW | √ | |
| 500kVA | 500 kW | √ | |

## 1.3 Content abstract

- This manual is exclusive instruction manual for hybrid inverter. The manual details the product information, installation instructions, operations, maintenance and troubleshooting. Before installation and debug, the users are supposed to read all information in the manual and be familiar with relevant safety symbols.
- Readers are required to have a certain degree of electrical theory, electrical wiring and professional mechanical knowledge. Before installation, please read this manual carefully and ensure that the relevant personnel can easily access and use manual.
- The contents, pictures, logos, symbols, etc. used in this manual are owned by us. Non-company personnel are not allowed to publicly reproduce all or part of the contents without written authorization.

## 1.4 Symbols

For user's personal and property safety and better use of product, the manual provides relevant information and highlights it with appropriate symbols.

The following list of symbolic hints may be used in this manual, please read them carefully.


- "Danger" indicates a high potential hazard which will result in death or serious injury if not avoided.


- "Warning" indicates a medium potential hazard that could result in death or serious injury if not avoided.


- "Caution" indicates a low level of potential hazard that could result in moderate or minor injury if not avoided.

- "Note" Indicates a potentially hazardous situation which may result in device failure or a fault if not avoided.

- "Instruction" is additional information to contents or optimized use skills of product.

**Please pay attention to the danger warning signs on device which includes:**

Table 1-2 Symbols on the product

| Sign | Sign description |
|---|---|
|  | The sign indicates there is a high voltage within the machine, and touch may result in electric shock. |
|  | The sign indicates that the temperature is higher than the acceptable range of human body, touch may result in injuries. |
|  | The sign indicates here is the protective earthing (PE), and solid grounding is needed to ensure the safety of operators. |

# 2 Safety instructions

## 2.1 Personnel requirements

- Only professional electricians or qualified personnel are allowed to carry out all operations on this product.
- Operators should be fully familiar with the structure and working principle of the entire energy storage system.
- Operators should be fully familiar with the manual hybrid inverter user manual.
- Operators should be fully familiar with the relevant standards in the country/area where the project located.


- It is strictly prohibited to perform maintenance or overhaul when the equipment is live.
- Ensure that at least two operators are present during the maintenance or overhaul of equipment. After the device is disconnected, wait for 15mins until the hybrid inverter complete discharge then operate maintenance or overhaul.

## 2.2 Safety warning operation

When installing, maintaining, or servicing the hybrid inverter, please observe the following to prevent accidents from occurring due to misuse by non-professional personnel:

- Set up a marked sign at the front and rear switches of the hybrid inverter to prevent mis-switching.
- Set up warning signs or caution tape near the operation area.
- After the completion of maintenance or overhaul, be sure to pull out the key of the cabinet door and keep it stored safely.

## 2.3 Device sign protection

- The warning signs on hybrid inverter or in the cabinet contain important information about safety operation of hybrid inverter. It is strictly forbidden to tear or damage!
- A nameplate is fitted inside the front door of the hybrid inverter, and the nameplate contains important parameter information related to the product. It is strictly forbidden to tear or damage!

- Once the device sign is damaged or blurred, please contact us.

- Make sure the device sign is legible and readable at all times.
- Once the device sign is damaged or blurred, replace it immediately.

## 2.4 Safety of using electricity

### 2.4.1 Electrical safety


Lethal high voltage is present inside the product!

- Do not touch terminals or conductors connected to power grid circuits.
- Pay attention to all safety documentation or instructions regarding connection to the grid, and follow the warning signs on the product.
- Observe the safety precautions listed in the manual and other documents related to the equipment.


Damaged equipment or system malfunctions may cause electric shock or fire!

- Preliminary visual inspection of equipment for damage or other hazards prior to operation.
- Check the safety of other external equipment or circuit connections.
- Confirm the safety of equipment before operation.

### 2.4.2 ESD

Electrostatic sensitive components on the circuit board or elsewhere may be damaged by improper operation or contact by the operator.

- Please avoid unnecessary contact with the circuit board.
- Please observe electrostatic discharge (ESD) prevention regulations, such as wearing anti-static wrist strap.

### 2.4.3 Notes for energy storage batteries


- There is a lethal high voltage between the positive and negative terminals of the energy storage battery pack connected with the hybrid inverter.
- Ensure disconnection between hybrid inverter and battery pack before maintenance to equipment.

## 2.5 Environmental requirements

### 2.5.1 Escape way

To ensure prompt evacuation of staff from the scene in case of accidents, please observe the following:

- Do not place flammable and explosive materials around the hybrid inverter.
- It is strictly forbidden to pile up sundries in the escape way or occupy the escape way in any form.

### 2.5.2 Moisture protection

Do not use the hybrid inverter in a humid environment that exceeds the specified limits!

The hybrid inverter is likely to be damaged in humid environment.

In order to guarantee the normal use of the hybrid inverter, please observe the following:

- Do not open the cabinet door when the air humidity is over 95%.
- Do not open the cabinet door in rainy or humid conditions to maintain or overhaul the hybrid inverter.

## 2.6 Energized test specification

### 2.6.1 Energized test


High voltage exists in the equipment and accidental touching may result in a risk of lethal electric shock, so please observe the following:

- Take precautions (e.g. wear insulated gloves, insulated shoes, etc).
- At least two personnel must be on site to ensure personal safety.

### 2.6.2 Measuring equipment

To ensure conformance to requirements of electrical parameters, it is necessary to use relevant electrical measuring equipment when conducting electrical connection and trial operation of hybrid inverter.


- The selection of high-quality measuring equipment with measuring range and available conditions in line with site requirements.
- Ensure that the connection and use of the measuring equipment is correct and standardized to avoid arcing and other hazards.

## 2.7 Touch screen setting

The parameters in the touch screen are closely related to the operation of the hybrid inverter. These parameters can be modified and set only after reliable analysis and evaluation of the operating status of the system and hybrid inverter.


- Inappropriate parameter settings may affect the normal function of the hybrid inverter.
- Only authorized professionals can set the parameters of the hybrid inverter.

## 2.8 Maintenance and overhaul specification

The following should be observed when performing maintenance or overhaul operations on the equipment:

- Set the inspection mark and ensure that the hybrid inverter is not accidentally re-powered.
- After the hybrid inverter is powered off and disconnected from the AC and DC power supplies, wait at least 15 minutes before open the front door to maintain or overhaul the hybrid inverter.
- Use a multimeter to measure inside the hybrid inverter and ensure that the discharge is complete.
- Ensure that the device is properly grounded.
- Energized parts must be covered with insulation materials.
- Ensure that the escape ways are completely unblocked during maintenance and overhaul.

## 2.9 Product obsolescence

- When an hybrid inverter is to be discarded, it must not be disposed of as regular scrap.
- Contact local authorized professional recycling agency.

## 2.10 Other matters needing attention

The following protective or emergency measures should be taken according to the needs of the site:

- When maintaining or inspecting the equipment, operators should take proper protective measures, such as wearing anti-noise earplugs, insulating shoes and insulating gloves.
- The installation sites of hybrid inverter are usually far away from urban areas. Therefore first-aid facility should be prepared in case of need.
- Take all necessary auxiliary measures to ensure the safety of personnel and equipment.

- All operations on the hybrid inverter must comply with the relevant standards of the country/region.

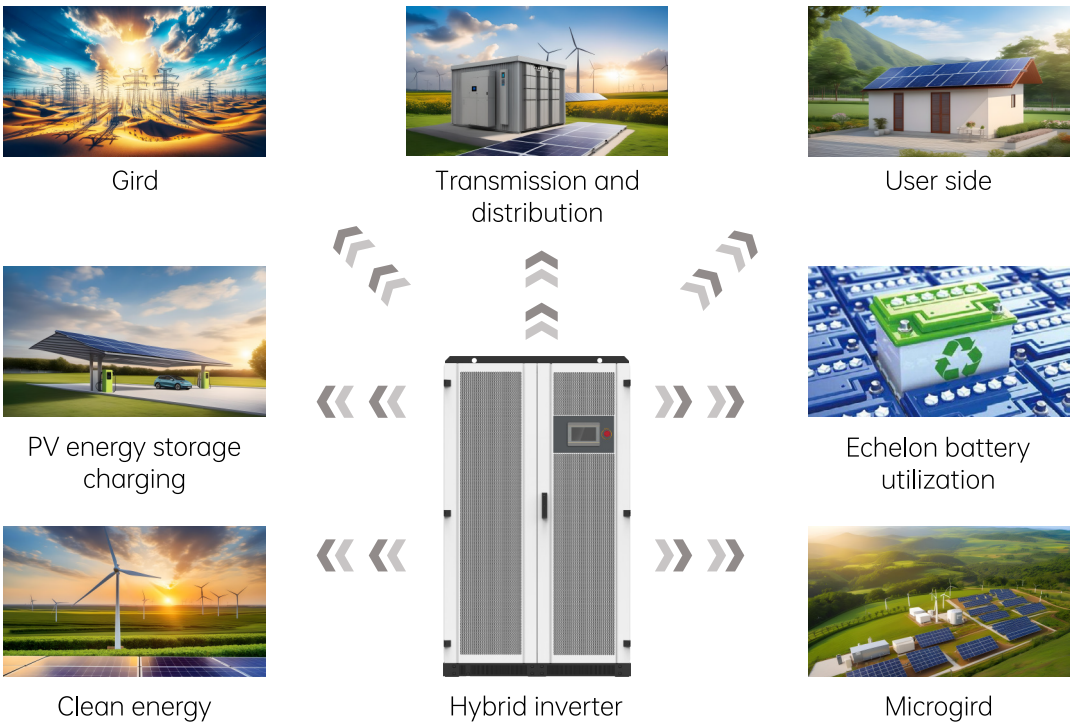
- All descriptions in this manual apply to standard hybrid inverter. If you have special demands, please ask the staff when ordering. Subject to the actual product received.
- The manual cannot take into account all possible situations during operation, maintenance, and overhaul. If you encounter a situation that is not addressed in this manual, please contact us.

# 3 Product introduction

## 3.1 Introduction of energy storage system

- Energy storage system (ESS) refers to the cycle process of storing the same form of energy or converting it into another form of energy through a medium or device, and releasing it in a specific form of energy based on future applications. Energy storage system is an important part of the power grid link: "power-transmission-convert-distribution-use", is an essential part of the energy internet and smart energy.
- Generation: The energy storage system can participate in the rapid response frequency modulation service, improve the reserve capacity of the power grid, provide continuous power supply to the end users with wind energy, solar energy and other renewable energy. Furthermore, it makes use of the advantages of renewable energy, and also effectively overcome its shortcomings such as volatility and intermittency.
- Transmission and distribution: Energy storage system can effectively improve the reliability of transmission system and improve the quality of electric energy.
- User: The distributed energy storage system optimizes electricity consumption, reduces electricity costs and maintains the high quality of electric energy under the coordinated control of the intelligent microgrid energy management system.
- In the ESS, the energy conversion is mainly realized by the power conversion system (Hybrid inverter for short), as shown in figure 3-1:

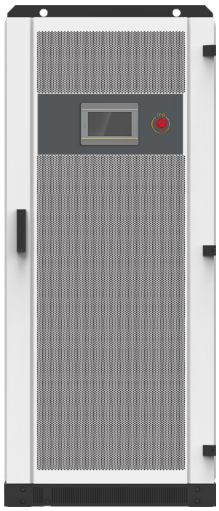
Figure 3-1 Application scenarios of hybrid inverter in ESS



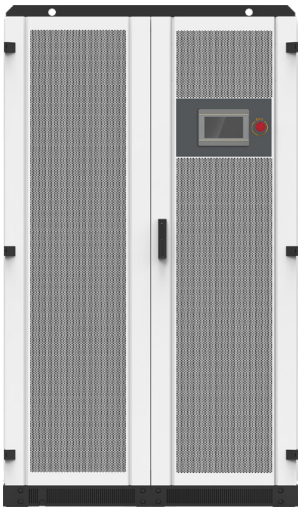
## 3.2 Product appearance

The appearance and external components of hybrid inverter as shown below:

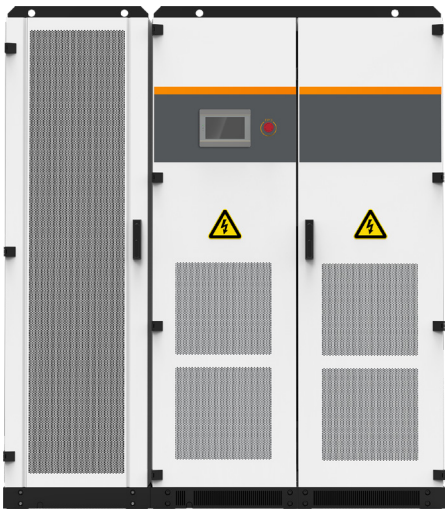
Figure 3-2 Product appearance



30kVA/50kVA



100kVA/150kVA



250kVA

500kVA


Emergency power off button

250kVA and 500kVA are split-type. 250kVA consists of one photo-voltaic controller and one hybrid inverter. 500kVA consists of two photo-voltaic controller and one hybrid inverter.

WARNING

High voltage danger!

- After press EPO button, the AC/DC terminal in the energy storge hybrid inverter still energized.
- There is lethal high voltage inside the hybrid inverter.

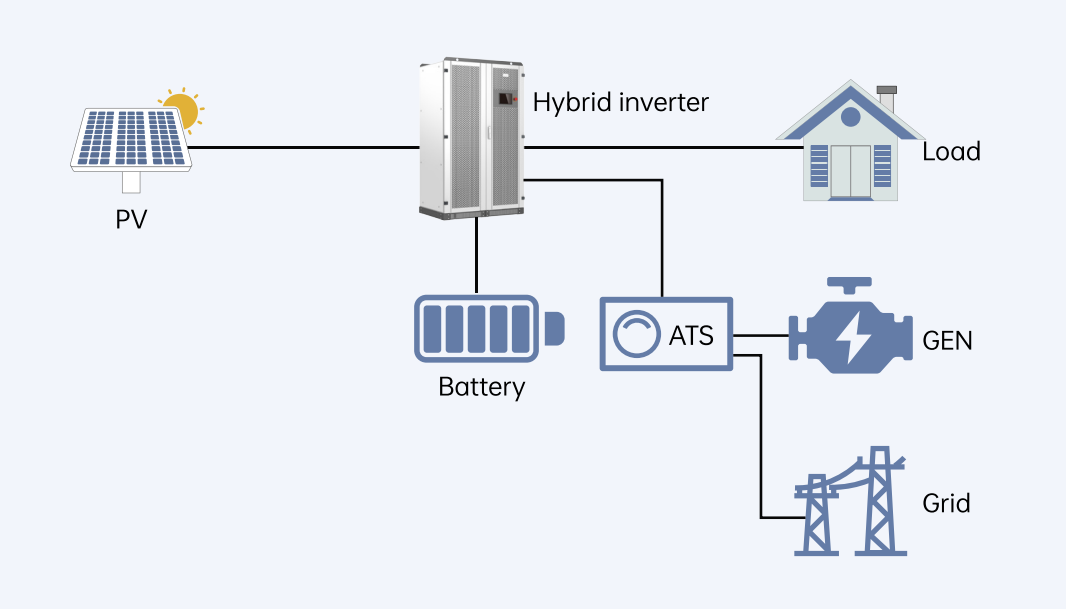
WARNING

- Press EPO button to turn off the hybrid inverter only under the emergency.
- Improper use of EPO button will result in the damage of hybrid inverter.
- Pressing EPO button when on-load will cause greater stresses exposed to related components of energy storge hybrid inverter.

## 3.3 Main circuit topology

Hybrid inverter is suitable for mine off-grid, island off-grid, no power (power shortage) area villages and towns, rural off-grid, Hybrid inverter product application is shown in the following figure 3-3:

Figure 3-3 Product application




## 3.4 Product features

Hybrid inverter optimize the control performance and improve system reliability adopting advanced digital control technology. It meets the demands of different battery charging and discharging, and its main performance characteristics are as follows:

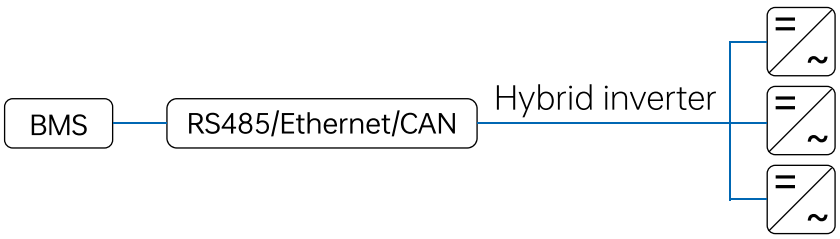
- Integrated solution support simultaneous access of load, battery, grid or diesel generator and photovoltaic.
- Support five operating modes, including self-use, battery priority, optimal mode, mixed mode, manual mode.
- BMS system communication supports RS485/Ethernet/CAN.
- Accept EMS schedule, communication modes include RS485/Ethernet/CAN.
- The integrated EMS function provides safe and stable power supply and maximizes the utilization of new energy.
- Support flexible use of lithium batteries and lead-acid batteries, battery capacity display.
- Photovoltaic controller can be expanded to facilitate flexible configuration of photovoltaic capacity.
- Strong ability to carry three-phase unbalanced loads under off-grid conditions.
- Industrial frequency design scheme with high impact resistance.
- The system uses dual auxiliary power supply, redundant design, improve reliability.
- Independent air duct-excellent heat dissipation design.

## 3.5 Communication scheme

### 3.5.1 BMS communication scheme

Through the RS485/Ethernet/CAN communication line, the hybrid inverter communicates with the BMS to achieve data transmission.

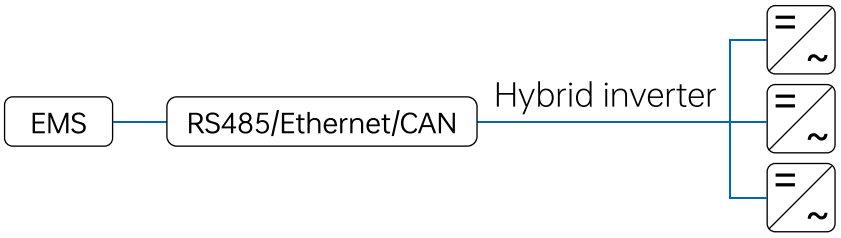
Figure 3-4 BMS transmits data through RS485/Ethernet/CAN




### 3.5.2 EMS communication scheme

Through the RS485/Ethernet/CAN communication line, the hybrid inverter communicates with the BMS and monitor the hybrid inverter in real time by self-designed monitoring software.

Figure 3-5 EMS transmits data through RS485/Ethernet/CAN




## 3.6 Technical parameter

Table 3-1 Technical parameter

### AC (on-grid)

| Model | 30kVA | 50kVA | 100kVA | 150kVA | 250kVA | 500kVA |
|---|---|---|---|---|---|---|
| Max output power (kVA) | 33 | 55 | 110 | 165 | 275 | 550 |
| Rated power (kW) | 30 | 50 | 100 | 150 | 250 | 500 |
| Rated voltage (V) | 400 | | | | | |
| Maximum current (A) | 48 | 80 | 158 | 238 | 397 | 794 |
| Rated current (A) | 43 | 72 | 144 | 216 | 361 | 722 |
| Voltage range (V) | 400 (80%~115%) | | | | | |
| Rated frequency (Hz) | 50/60 | | | | | |
| Frequency range (Hz) | 45-55/55-65 | | | | | |
| THDI | <3% | | | | | |
| Power factor | 1.0 (0.8leading-0.8lagging (settable)) | | | | | |
| AC connection | 3W+N+PE | | | | | |
| Isolation transfomer | 100/400 | 200/400 | 270/400 | 270/400 | 270/400 | 315/400 |

### AC (off-grid)

| Model | 30kVA | 50kVA | 100kVA | 150kVA | 250kVA | 500kVA |
|---|---|---|---|---|---|---|
| Max output power (kVA) | 33 | 55 | 110 | 165 | 275 | 550 |
| Rated power (kW) | 30 | 50 | 100 | 150 | 250 | 500 |
| Rated voltage (V) | 400 | | | | | |
| Maximum current (A) | 48 | 80 | 158 | 238 | 397 | 794 |
| Rated current (A) | 43 | 72 | 144 | 216 | 361 | 722 |

| Model | 30kVA | 50kVA | 100kVA | 150kVA | 250kVA | 500kVA |
|---|---|---|---|---|---|---|
| THDU | < 2% Linear | | | | | |
| Rated frequency (Hz) | 50/60 | | | | | |
| Overload capacity | 110% long-term | | | | | |

### PV input

| Model | 30kVA | 50kVA | 100kVA | 150kVA | 250kVA | 500kVA |
|---|---|---|---|---|---|---|
| Max photovoltaic input voltage (V) | 1000 | | | | | |
| Max photovoltaic power (kW) | 82.5 | 82.5 | 165/247.5 | 165/247.5 /330 | 330/412.5 | 660/742.5 /825 |
| MPPT voltage range (Vdc) | 250-1000 | | | | | |

### Battery

| Model | 30kVA | 50kVA | 100kVA | 150kVA | 250kVA | 500kVA |
|---|---|---|---|---|---|---|
| Battery voltage range (V) | 250-850 | 320-850 | 420-950 | 420-950 | 420-950 | 500-950 |
| Max charging power (kW) | 33 | 55 | 110 | 165 | 275 | 550 |

### System parameter

| Model | 30kVA | 50kVA | 100kVA | 150kVA | 250kVA | 500kVA |
|---|---|---|---|---|---|---|
| Dimension (W/D/H) (mm) | 800x800 x1900 | 800x800 x1900 | 1200x800 x2050 | 1200x800 x2050 | 1800x800 x2050 | 2800x1050 x2050 |
| Net weight (kg) | 620 | 720 | 1120/1150 | 1250/1280 /1310 | 1950/1980 | 3205/3235 /3265 |
| Ambient temperature (℃ ) | -30 ~ +55 | | | | | |
| Relative humidity | 0 ~ 95% non-condencing | | | | | |
| Protection grade | IP20 | | | | | |
| Noise level (dB) | <80 | | | | | |
| Altitude | > 3000m derating | | | | | |
| Cooling mode | Air cooling | | | | | |
| Display | LCD touch screen | | | | | |
| BMS communication interface | RS485/Ethernet/CAN | | | | | |

| Model | 30kVA | 50kVA | 100kVA | 150kVA | 250kVA | 500kVA |
|---|---|---|---|---|---|---|
| Local communication | RS485/Ethernet | | | | | |

*Postscript:

- 1. 250kVA and 500kVA are split-type. 250kVA consists of one photovoltaic controller (600×720×2050mm) and one hybrid inverter (1200×800×2050mm). 500kVA consists of two photovoltaic controller (600×720×2050mm) and one hybrid inverter (1600×1050×2050mm).
- 2. Special models require custom development.
- 3. In the absence of the VFD/VSD, the motor power cannot exceed one-eighth of the rated power of hybrid inverter; In the case of the VFD, the motor power cannot exceed half of the rated power of hybrid inverter (the motor is the most severe inductive load; other inductive loads can refer to the above).
- 4. Derating in parallel:
  For a system consisting of 2 to 4 parallel machines, the machine capacity reduction coefficient is 0.95.
  4 parallel machines and more, the machine capacity reduction coefficient is 0.9.

  Parallel system configuration:
  The specifications and power of PV components must be consistent.
  Storage battery specifications must be consistent.

  Parallel line impedance:
  The length error between the grid port and the PCC point of the grid should be within 5%, and the specifications and number of cables must be consistent.
  The length error between the load port and the load PCC point must be within 5%, and the specifications and number of cables must be consistent.

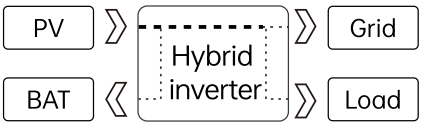
  Parallel system black start:
  For a low-voltage microgrid system without medium voltage transformer, the parallel system needs to be started one by one. When the system starts with a load, the load power cannot exceed the capacity of a single device. After the parallel system is fully started, the system's load is gradually increased.
  For the microgrid system with medium voltage transformer, the parallel system needs to be started one by one. The system should be started with the medium voltage transformer, and the load cannot be connected to the parallel system until it is fully started. After the parallel system is fully started, the medium voltage transformer side can be gradually loaded.

# 4 Mode and function

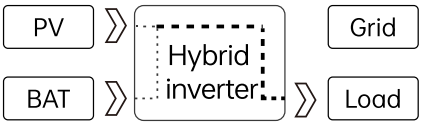
## 4.1 Work pattern

The work pattern of hybrid inverter is set on the touch screen. User select work pattern according to different demands (for reference) by clinking the "Menu" → "System" .

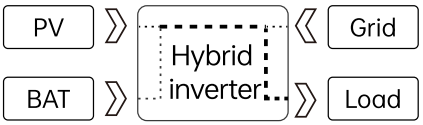
### Work pattern: self-use




1.PV power > the load power, the residual power charge the battery. If the battery is fully charged, the residual power will connect to the power grid or the PV controller will limit the power.

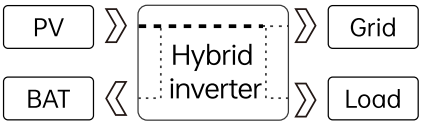



2.Photovoltaics prioritize power to loads. When the PV power < the load power, the photovoltaic and the battery jointly supply power to the load.

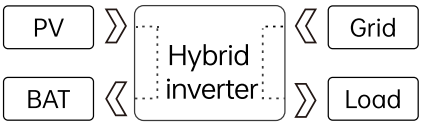



3.Photovoltaics prioritize power to loads. When (PV + battery) power < the load power, the grid, photovoltaic and battery will simultaneously supply power to the load.

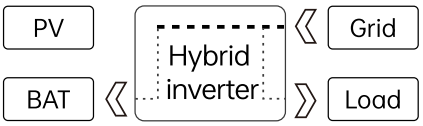
### Work pattern: battery priority




1.Photovoltaics prioritize charge the battery, the residual energy supplies power to the load. When there is still energy left, it will be fed to the power grid.

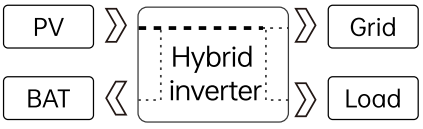



2.In the case of insufficient photovoltaic energy to power the battery and load, the grid provides the rest of the energy required for the load.

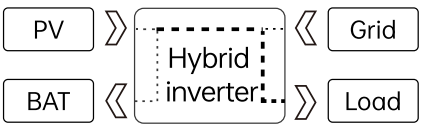



3.In the absence of photovoltaic energy, the grid will supply energy to the load.

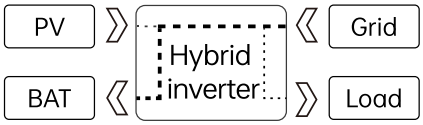
### Work pattern: optimal mode



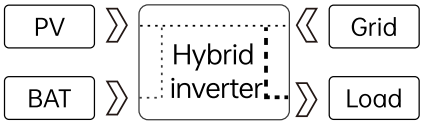

1.If there is enough photovoltaic energy, the photovoltaic will charge the battery and power the load at the same time, and if there is any surplus, it will be sent to the grid.



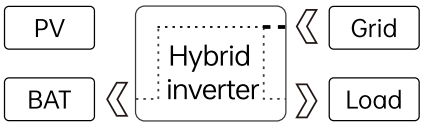

2.When the photovoltaic energy is insufficient, the photovoltaic will charge the battery and power the load at the same time, and the grid will make up the remaining energy required for the load.



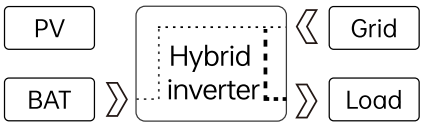

3.When the photovoltaic energy is insufficient, the photovoltaic will charge the battery: if the power of the load is less than the power value set by the AC power, the AC side will provide energy for the load, and the remaining energy will charge the battery.




4.When the energy of photovoltaic is insufficient, and the power of the load is greater than the value set by the AC power, the available power of the AC side will all supply the load, and the photovoltaic will supplement the remaining insufficient energy, If the photovoltaic energy supply is insufficient, the battery will supplement the remaining energy.

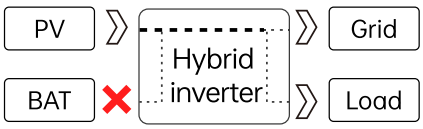



5.When the photovoltaic is not available and the load power is less than the power value set by the AC power, the AC side will supply power to the load, and the remaining power will charge the battery.




6.When the photovoltaic is not available and the load power is greater than the power value set by the AC power, the AC side and the battery supply power to the load.

## Work pattern: Distributed inverter




### 1. Application scenarios

When a customer purchases an MPS product without a battery, we recommend using the "Distributed central inverter" function. This function allows the photovoltaic power generation system to generate electricity during the daytime and supply it to the loads. Meanwhile, if the generated electricity exceeds the load demand, the excess power can be fed back to the grid, achieving efficient energy utilization and conservation. If the customer does not need surplus electricity to be fed into the grid, this can be achieved by setting "Non-reverse power flow".

### 2. Application requirements

a. The distributed central inverter function can only be applied in grid-connected situations.

b. No battery can be connected when operating the "Distributed central inverter" function.

c. When multiple MPS units operate with the "Distributed central inverter" function, there is no need to set the parallel operation enable.

## Work pattern: mixed mode

### Peak-load shifting

| Check | Start time | End time | Features | Grid power | DG charge power | SOC2 | SOC1 | Grid capacity | Grid charge | Gen charge | Meter control |
|---|---|---|---|---|---|---|---|---|---|---|---|
| √ | 00:00 | 05:00 | Peak-load shifting | 10 | 20 | 20 | 90 | 30 | | | |

**1. Meter control disabled**

Charge or discharge is performed based on the grid power (positive value for discharging, negative value for charging) in the corresponding time period.

| Check | Start time | End time | Features | Grid power | DG charge power | SOC2 | SOC1 | Grid capacity | Grid charge | Gen charge | Meter control |
|---|---|---|---|---|---|---|---|---|---|---|---|
| √ | 00:00 | 05:00 | Peak-load shifting | 10 | 20 | 20 | 90 | 30 | | | √ |

**2. Meter control enabled**

a. When grid power < 0

Charge according to the grid power in the corresponding time period.

b. When grid power > 0

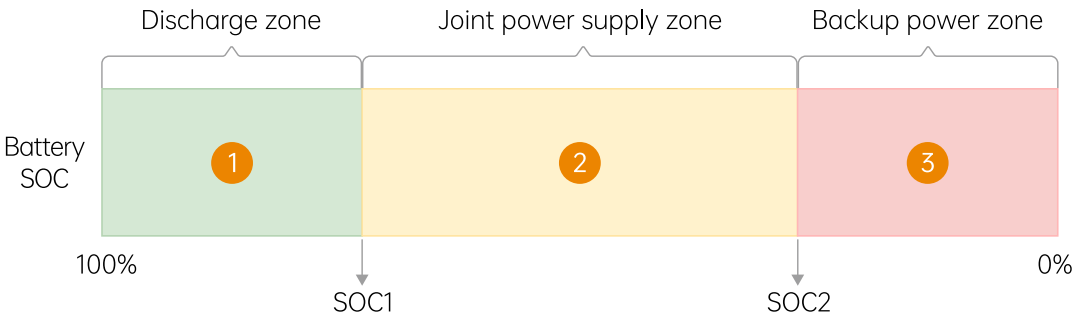
(1) Actively discharge to the AC side based on the meter power, so that the meter power is maintained within the range of [0, Power tolerance].

(2) The maximum discharge power shall not exceed the grid power. When the grid-side load is large (grid-side load > grid power + power tolerance), the maximum discharge power is equal to the grid power, and the remaining energy required by the load shall be supplied by the grid.

(3) When the battery is discharged to SOC2, the DCAC will be automatically turned off, and the DCDC will charge the battery. When the current SOC ≥ SOC1 during charging, the DCAC will be automatically turned on (switched to economic mode; the function of automatically turning on DCAC will be restored when meter control is disabled).

### Economic mode

| Check | Start time | End time | Features | Grid power | DG charge power | SOC2 | SOC1 | Grid capacity | Grid charge | Gen charge | Meter control |
|---|---|---|---|---|---|---|---|---|---|---|---|
| √ | 00:00 | 05:00 | Economic mode | 10 | 20 | 20 | 90 | 30 | √ | √ | √ |




**1. Discharge zone**

a. Meter control enabled, No ATS signal

(1) Discharge actively to the AC side based on the meter power, so that the meter power is maintained within the range of [0, Power tolerance].

(2) The maximum discharge power shall not exceed the grid capacity. When the grid-side load is large (grid-side load > grid capacity + power tolerance), the maximum discharge power is equal to the grid capacity, and the remaining energy required by the load shall be supplied by the grid.

b. Meter control disabled / Meter control enabled with ATS signal

Execute the self-consumption mode.

**2. Joint power supply zone**

Execute battery priority + Grid capacity expansion.

a. Load ≤ Grid capacity (Diesel generator capacity)

The PV (photovoltaic) system charges the battery; the grid (diesel generator) supplies power to the load; the remaining capacity of the grid (diesel generator) charges the battery according to the grid (diesel generator) charging power.

Note: When grid charging (diesel generator charging) is disabled, the grid (diesel generator) charging power is deemed to be 0.

b. Grid capacity (Diesel generator capacity) < Load < Grid capacity (Diesel generator capacity) + PV.

The grid (diesel generator) supplies full power to the load; the PV system provides the remaining required energy; surplus energy from the PV system charges the battery.

c. Grid capacity (Diesel generator capacity) + PV < Load < Grid capacity (Diesel generator capacity) + PV + Battery.

Note: The grid (diesel generator) and PV system supply full power to the load; the battery provides the remaining required energy.

**3. Current SOC ≤ SOC2 (Backup power zone)**

Trigger grid-connected DOD (Depth of discharge).

The PV (photovoltaic) system charges the battery; the grid (diesel generator) supplies power to the load; the remaining capacity of the grid (diesel generator) charges the battery according to the grid (diesel generator) charging power.

Note: When grid charging (diesel generator charging) is disabled, the grid (diesel generator) charging power is deemed to be 0.

- Note: If the anti-reverse function is set to enable, the system will not supply power to the grid in all working modes.
- The hybrid mode is subject to practical application.

## 4.2 Hybrid inverter status

There are four states of hybrid inverter, as shown in table below:

Table 4-1 Status and description

| Status | Description |
|---|---|
| Operation | Hybrid inverter works normally. |
| Fault | When the energy storage system malfunctions, the hybrid inverter will stop working and automatically disconnect the AC-DC contactor, then the main circuit is separated from the battery, the power grid or the load. In the fault state, the system keeps monitoring whether the fault is rectified. If the fault is not rectified, the system keeps the fault state. If the fault is rectified, the system shuts down after 30 seconds by default. |
| Halt | When the hybrid inverter is in the operation state, the user stops the hybrid inverter by issuing a stop command through the upper computer, or shut down the hybrid inverter through the shutdown button on the LCD screen switching page. |
| Energency halt | In case of failure or emergency, press the EPO button to stop the hybrid inverter. |


- When the hybrid inverter is faulty or the power module is faulty, do not turn on the power again through the touch screen.
- Confirm the system works normally by power off inspection, and then power on again, otherwise it will cause damage to the machine.

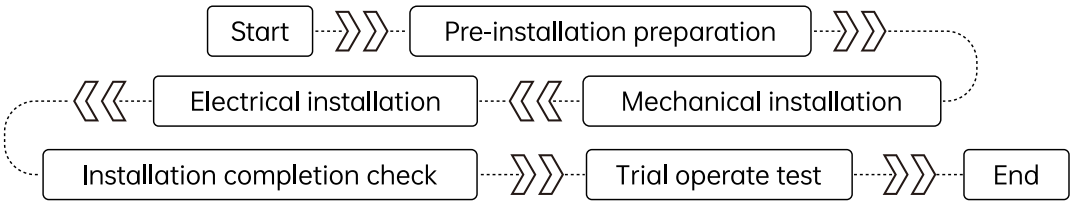
# 5 Mechanical installation guidance

## 5.1 Precautions

- The installation of hybrid inverter must be operated by at least two qualified persons at the same time, and all electrical installation must comply with local electrical installation standards.
- Do not touch other parts of the cabinet except wiring terminals during installation.
- Safety signs: "Do not close under construction" must be set at all upstream switches.

## 5.2 Installation procedure

Figure 5-1 Installation process




## 5.3 Installation preparation

### 5.3.1 Packaging inspection

Check equipment before installation. If any transportation damage is found, please contact us and provide the images of damaged place.

### 5.3.2 Delivery checklist

According to the checklist in the packing box, check that all the delivered accessories are complete or not:

Table 5-1 Checklist

| Item | Number |
|---|---|
| Hybrid inverter | 1 |
| Key | 2 |
| Certificate | 1 |
| Warranty card | 1 |
| Product user manual | 1 |
| Factory inspection report | 1 |

### 5.3.3 Installation tools and parts

The tools and parts needed to install the hybrid inverter are as follows:

Table 5-2 Tool list

| Tool | Number |
|---|---|
| Forklift or crane | 1 |
| Wire stripper | 1 |
| Crimping plier | 1 |
| Screwdriver | 1 |
| Sleeve | 1 |
| Multimeter | 1 |
| Screws, nuts, gaskets | Some |

### 5.3.4 Installation environmental requirements

Before installing the hybrid inverter, ensure that the environment meets the following requirements:

Table 5-3 Environmental requirements

| Item | Requirements |
|---|---|
| Temperature (℃ ) | -30℃ ~ 55 |
| Humidity | < 95% (non-condensing) |
| Altitude (m) | > 3000 derating |

- Places away from sources of electromagnetic radiation; Places free from oil mist, corrosive gas, flammable gas, etc.; In the place of metal powder, dust, oil, water and other foreign matter will not enter the hybrid inverter inside (please do not install the hybrid inverter on wood and other flammable materials); Places free of radioactive and flammable substances; The place free of harmful gases and liquids.

## 5.4 Machine transportation

### 5.4.1 Transportation instructions

- In order to make the hybrid inverter in a better state of protection, as far as possible to use packaging transport.
- When using forklifts or cranes for transportation, it is necessary to pay attention to the weight of the hybrid inverter, ensure that the transportation equipment has sufficient carrying capacity, and rationally arrange the support or lifting points.

- The hybrid inverter's outer package is marked with detailed product parameters and transportation requirements. Please transport according to the various marks on the package. The graphic description of the hybrid inverter's packaging marks is shown in table 5-4 and table 5-5:

Table 5-4 Description of parameter

| Item | Description |
|---|---|
| MODEL | Hybrid inverter model |
| SIZE | Out packing size |
| NW | Net weight of hybrid inverter |
| GW | Gross weight: Hybrid inverter includes outer packing box |

Table 5-5 Graphical description of packing marks

| Mark | Description |
|---|---|
|  | Front-up, no transverse, tilt or inversion of hybrid inverter. |
|  | Care should be taken to avoid damage to hybrid inverter caused by excessive collision and friction in transportation. |
|  | Pay attention to damp-proof, avoid the hybrid inverter being rained or damped. |

## 5.4.2 Forklift transportation

The following diagram shows the use of forklift for transport with and without packaging.

- When transporting without packing, be sure to unload the lower coaming for transporting.
- In the course of transportation, the center of gravity of the box device should fall between the two forks of the forklift truck.
- Forklift trucks are forbidden to carry long distances or take sloping roads.
- Take-off and landing should be handled lightly to avoid impact or vibration.
- When transporting, the larger size of the hybrid inverter may block the operator's sight. Please arrange the assistant personnel.

Figure 5-2 Carry with packaging

Figure 5-3 Carry without packaging

- Note: When handling without packing, remove the bottom enclosure before using forklift!

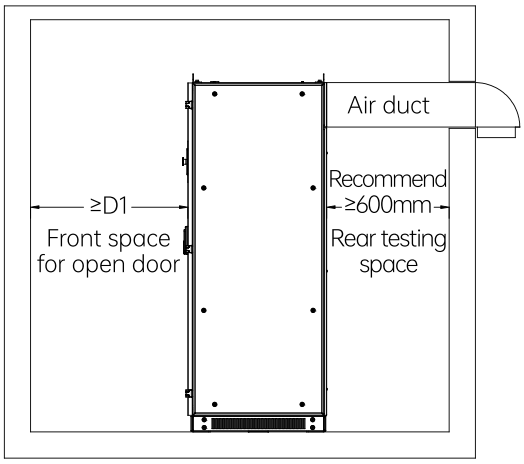
## 5.5 Location and fixation

### 5.5.1 Space requirments

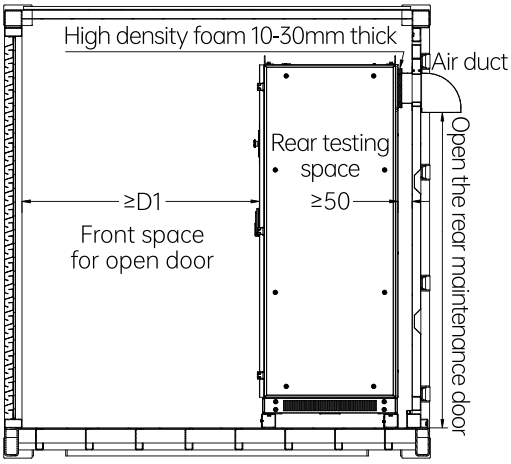
- Installed indoors with good ventilation. Not in high humidity and high temperature source, no corrosive gas.
- Avoid direct sunlight or rain.
- Ensure that the grounding cable in the power distribution room is properly grounded, and that the grounding resistance in a dry environment is less than 4Ω.
- The hybrid inverter mounting surface must have sufficient bearing capacity.
- Avoid placing together with inflammable and explosive materials, meeting fire protection requirements.

**The reserved space size is shown as follows:**

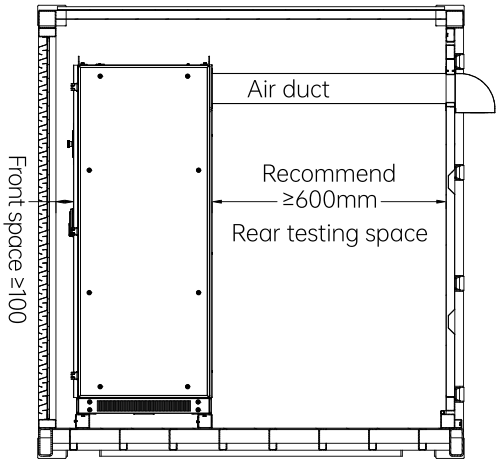
Figure 5-4 Installation space requirements




Civil construction install




Contianer install (operates inside cabinet)




Contianer install (operates outside cabinet)

**Introduction of space for open door**

1.Cabinet width 800mm, sigle leaf designed front door, D1≥900.

2.Cabinet width 1200mm, double leaf designed front door, D1≥700.

3.Cabinet width 1600mm, double leaf designed front door, D1≥900.

4.PV module cabinet width 600mm, sigle leaf designed front door, D1≥700.

### 5.5.2 Dimensions of models

The mechanical dimensions of various models of hybrid inverter are shown in table 5-6 below. Users can design and install them according to the data.

Table 5-6 Hybrid inverter series dimensions

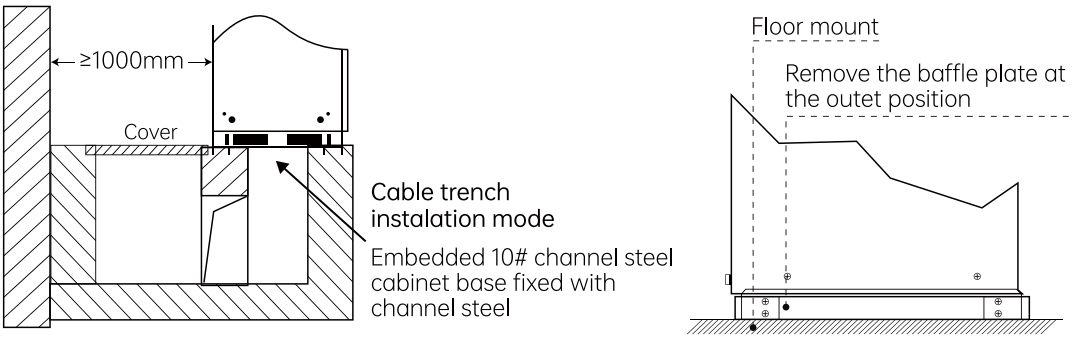
| Model | Dimension (W×D×H) (mm) |
|---|---|
| 30kVA | 800×800×1900 |
| 50kVA | 800×800×1900 |
| 100kVA | 1200×800×2050 |
| 150kVA | 1200×800×2050 |
| 250kVA | (600×720×2050)×1+1200×800×2050 |
| 500kVA | (600×720×2050)×2+1600×1050×2050 |

*** 250kVA is split-type which consists of one photo-voltaic controller (600×720×2050) and one hybrid inverter (1200×800×2050) . 500kVA is split-type which consists of two photo-voltaic controller (600×720×2050) and one hybrid inverter (1600×1050×2050) .**

### 5.5.3 Base mounting

The bottom of the hybrid inverter must be connected to the base surface. The bottom of the hybrid inverter has a fixing hole for fixation, which is used to fix the hybrid inverter on the bottom support channel or the ground. As shown in the following picture:

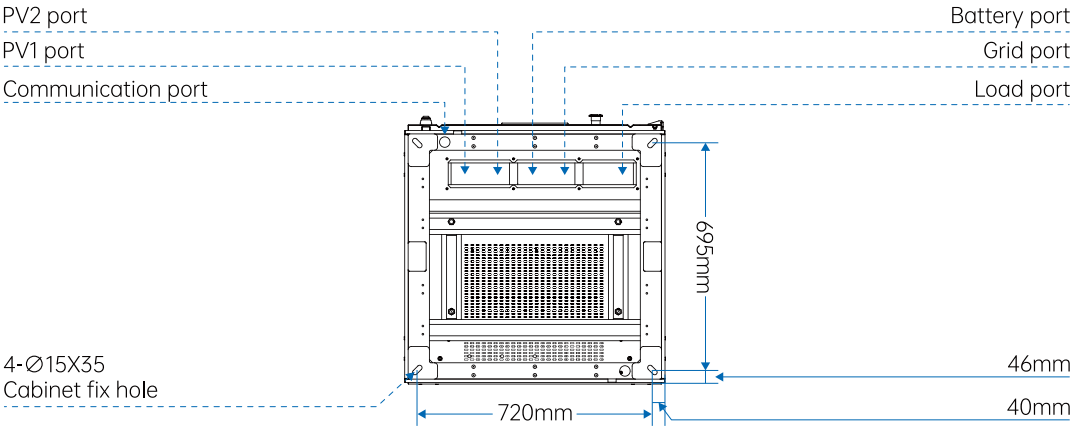
Figure 5-5 Base mounting and fixing



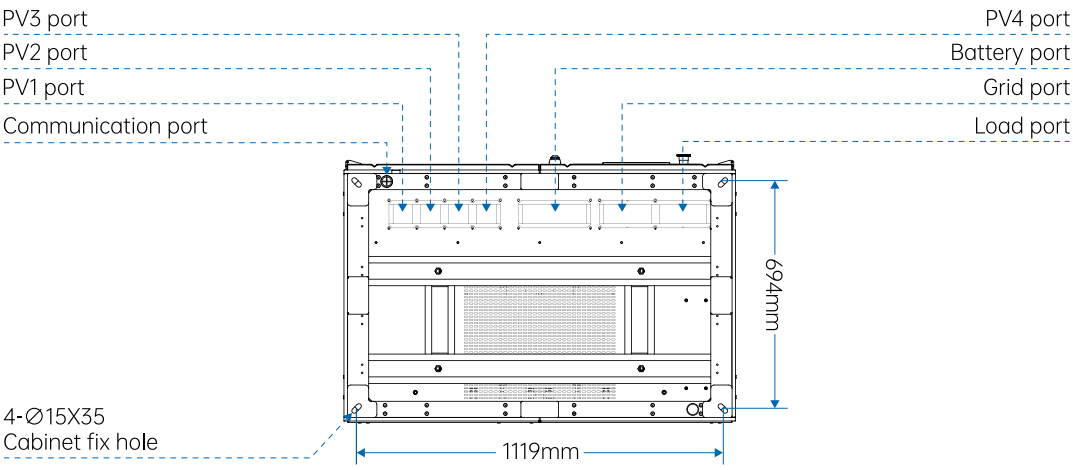

- The channel steel should be designed according to the positioning hole at the bottom of the hybrid inverter equipped with a base.
- The bottom section of each model is shown in the following figures (mm).
- Cooling air enter from the front and bottom, and cables from the bottom. In front of the hybrid inverter, there are DC and AC inlet and outlet holes.

Figure 5-6 Bottom section

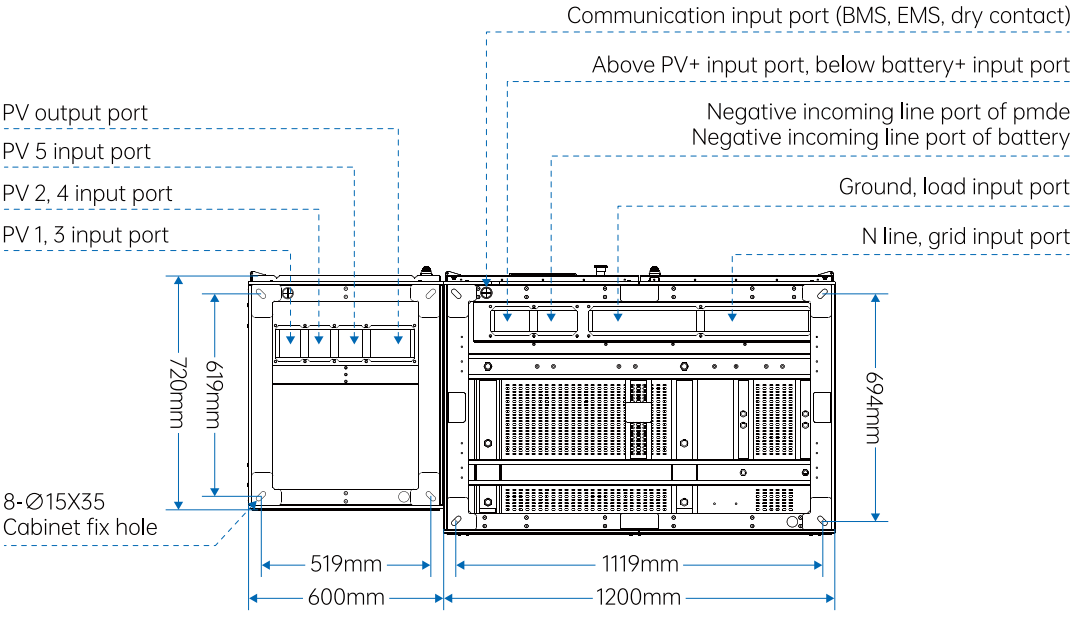
30kVA/50kVA



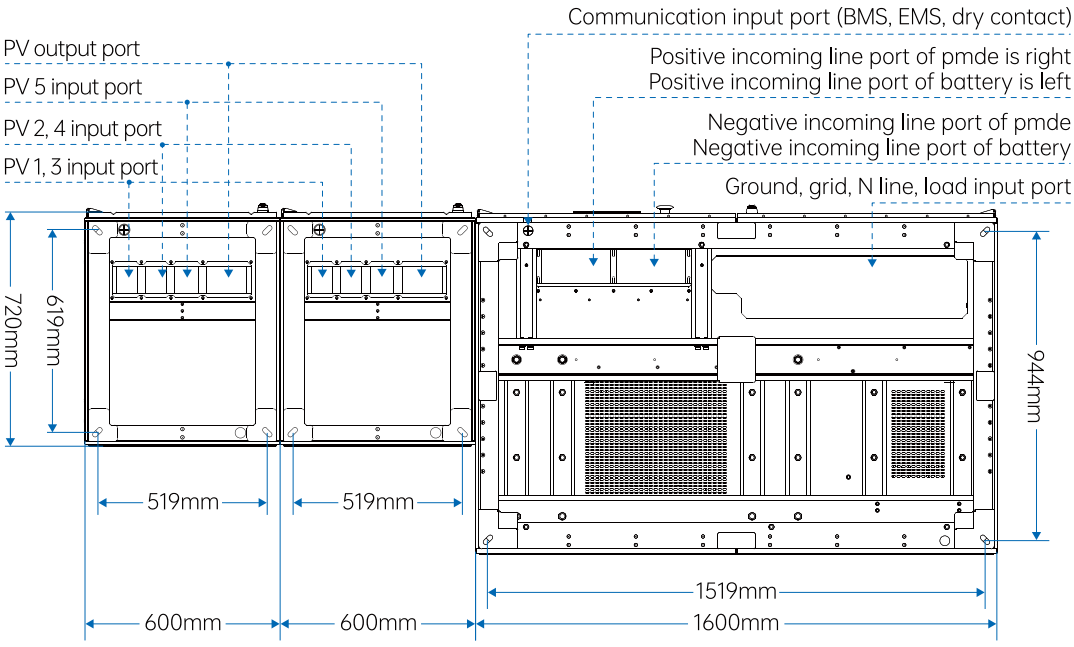

100kVA/150kVA




250kVA



500kVA




## 5.6 Air duct

### 5.6.1 Forced air cooling system

The hybrid inverter use forced air cooling for heat dissipation and are require to maintain sufficient air intake.

Table 5-7 Forced air cooling system

| Model | Min. area of shutters for air intake ($m^2$) |
|---|---|
| 30kVA/50kVA | 0.543858 |
| 100kVA/150kVA | 0.8068668 |
| 250kVA | 0.9715392 |
| 500kVA | 1.6123272 |
| PMDE0250 | 0.536526 |
| PMDE0300 | 0. 536526 |

### 5.6.2 Ventilated environment

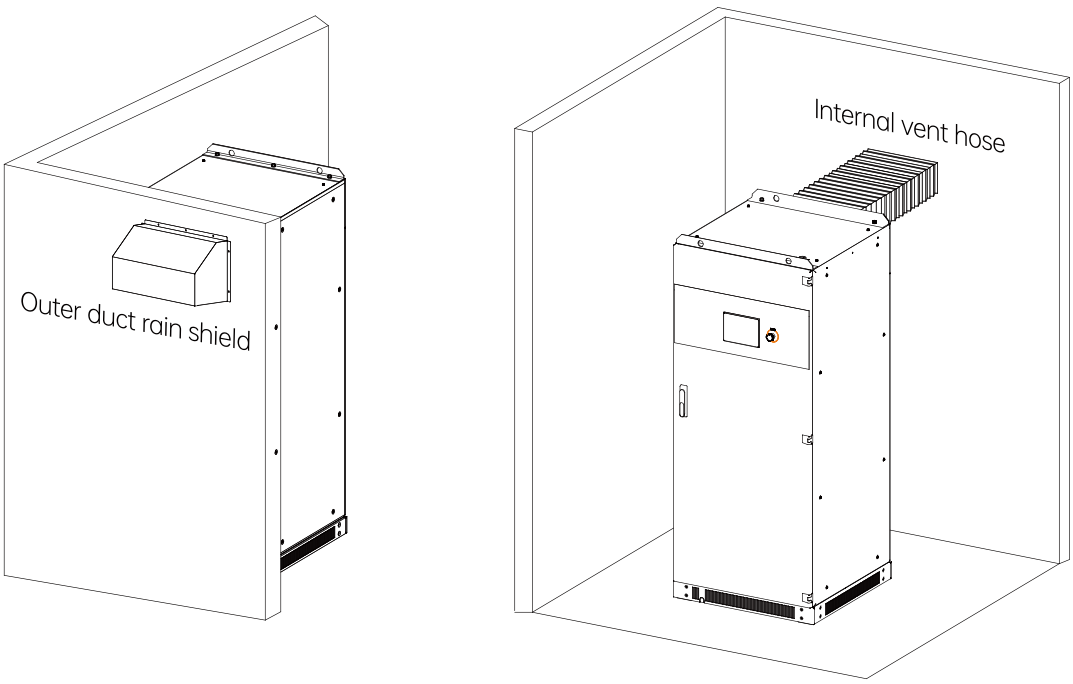
For ventilated environment, the installation environment must meet the following requirements:

- Avoid installation in the situation of poor ventilation and low air flow. More ventilation can be obtained by adding construction measures such as air supply grid or fan.
- The air inlet should have sufficient air intake volume and ample air intake area.
- Air quality must be guaranteed. If the suspended matter concentration (sand wind and dust) is too high, taking some construction measures to realize the air quality requirements (such as installing filters at the air supply grille of the building).

### 5.6.3 Air duct setup

For pressure balance, add a fan that exhausts air outward on the outlet of the air duct. The size of the air duct depends on the air output volume, designed by professionals. The design and installation of air duct take into consideration preventing the air flow backward of the hybrid inverter cabinet.

Figure 5-7 External duct of hybrid inverter




* The air duct should be reasonably designed according to different models and site environment.

Specific requirements for adding air ducts to hybrid inverters are as follows:

- The increase of air ducts does not reduce the ventilation volume of the cabinet.
- The interface between air duct and hybrid inverter cabinet is well sealed.
- The air duct outlet should be tilted downward (rain proof).
- Add barbed wire to the air duct outlet (to prevent rodents, birds, etc.).

**The air required by the hybrid inverter is inhaled through the vents at the bottom and the dustproof mesh at the front door. The hot air is discharged through the exhaust vents at the top of the hybrid inverter.**

# 6 Electrical installation guidance

## 6.1 Cable requirements

According to the capacity allocation requirement of single hybrid inverter, it is suggested that the current passing through 1mm$^2$ conductor should be no more than 3A, and the same size and type of conductor should be selected for the connection on the same side. The reference requirements for various types of interface cables are given by us. Users can design relevant cables according to the table below. Cables shall be designed in accordance with the instructions in this section and local wiring regulations, taking into account environmental conditions.

Table 6-1 Specifications of power cables for the hybrid inverter (copper wire)

| Capacity | AC output (each phase) | Neutral wire | Ground wire | Battery wire | Photovoltaic |
|---|---|---|---|---|---|
| 30kVA | ≥ 25mm$^2$ | ≥ 25mm$^2$ | ≥ 16mm$^2$ | input 50mm$^2$ | 50mm$^2$/group |
| 50kVA | ≥ 35mm$^2$ | ≥ 35mm$^2$ | ≥ 16mm$^2$ | input 70mm$^2$ | 50mm$^2$/group |
| 100kVA | ≥ 70mm$^2$ | ≥ 70mm$^2$ | ≥ 35mm$^2$ | input 95mm$^2$ | 50mm$^2$/group |
| 150kVA | ≥ 50mm$^2$×2 | ≥ 50mm$^2$×2 | ≥ 50mm$^2$ | input 95mm$^2$ | 50mm$^2$/group |
| 250kVA | ≥ 120mm$^2$×2 | ≥ 120mm$^2$×2 | ≥ 95mm$^2$ | 2 Input channel 120mm$^2$/channel | 50mm$^2$/group |
| 500kVA | ≥ 120mm$^2$×4 | ≥ 120mm$^2$×4 | ≥ 95mm$^2$×2 | 4 Input channel 120mm$^2$/channel | 50mm$^2$/group |


- Before wiring operation, confirm that both the grid input and BAT input switches are disconnected, and affix warning signs to prevent others from operating the switches.


- Power cables must be routed through trenches or metal wiring channel to avoid mechanical damage to the cables or electromagnetic interference to peripheral devices.

- The cable dimensions provided in this table are for reference only. The actual selection should be based on the working environment temperature, laying method, heat dissipation conditions and so on.


- The equipment does not have external cables. The above cable recommendation table is not provided by hybrid inverters. Users are requested to provide their own cables according to relevant needs.

CAUTION

- All external cables are connected to the corresponding position after entering the equipment through the bottom entry and exit holes.
- The terminals and fixing screw used in power cable wiring of hybrid inverters have been installed at the corresponding wiring terminals when the equipment is delivered.

## 6.2 Terminal

Installation indication of terminal and fixed screw used in power cable wiring of hybrid inverter:

Figure 6-1 Connection terminal

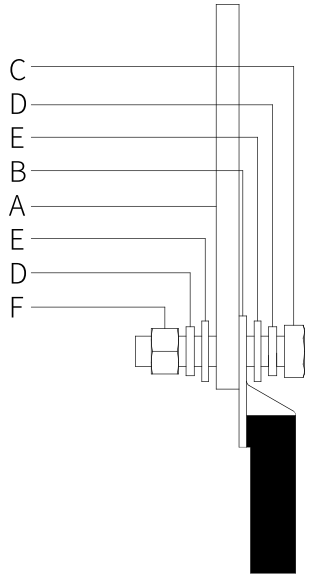



Table 6-2 Names of wiring terminals

| Number | Name |
|---|---|
| A | Copper bar |
| B | Connection terminal |
| C | Screw |
| D | Spring washer |
| E | Large pad |
| F | Nut |

## 6.3 Wiring specification

- The recommended minimum space distance between parallel shielded data lines and power cables corresponds to the field.

- When laying cables, communication lines and power lines should be laid separately. DC and AC circuits need to be laid separately, and the distance between different cables should be more than 300mm. When the control cable must pass through the power cable, the angle between the two cables should be kept as high as 90 degrees.

Table 6-3 Distance between signal lines and power cables

| Parallel line length (m) | Minimum spatial distance (m) |
|---|---|
| 200 | 0.3 |
| 300 | 0.5 |
| 500 | 1.2 |

*** The data line should be as close as possible to the supporting line of the surface ring, such as supporting beams, steel troughs, metal guideways, etc.**

## 6.4 Fixation and protection of cables

### 6.4.1 Cable fixation

In order to prevent loosening of the copper wiring nose, causing poor contact, or increasing contact resistance leading to fever or even fire, it is necessary to ensure that the screw fastening the terminal meets the torque requirements listed in table 6-4:

Table 6-4 Screw dimensions and required torques

| Screw dimensions | M4 | M5 | M6 | M8 | M10 | M12 | M14 | M16 |
|---|---|---|---|---|---|---|---|---|
| Torques (N·m) | 2 | 3.2 | 7 | 16 | 34 | 46 | 58 | 68 |

### 6.4.2 Cable protection

The protection of cables includes communication cables and power cables. The protective methods are as follows:

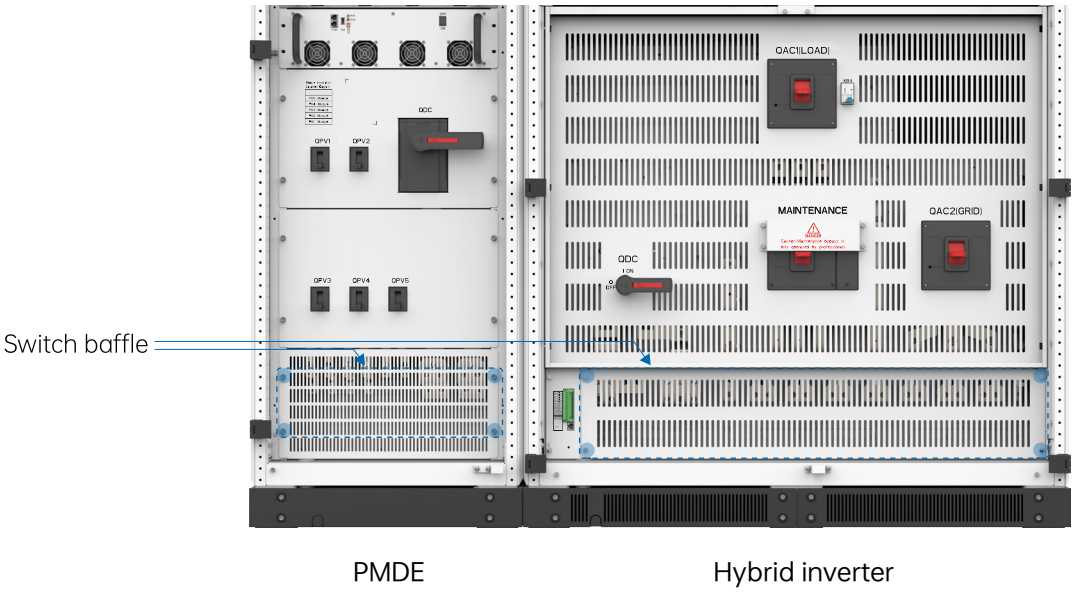
- Protection of communication cable: Because communication cable is thin, it is easy to break or fall off from the terminal during construction. Therefore, it is suggested that the power circuit should be connected first, and then the connection should be made. When connecting, the cable should be grooved as far as possible. Where there is no groove, the cable should be fastened with tie-in belt. When traveling, the development of thermal elements and strong electric field circuit cables should be avoided.
- Protection of power cables: Therefore, the scratch and breakage of cable insulation skin should be avoided when installing connection, because this may lead to short circuit. Power cables must also be properly fixed.

## 6.5 Remove the switch baffle and lower coaming

### 6.5.1 Remove baffle

With a screwdriver, loosen the four screws of the lower baffle of the switch, remove the screw and the lower baffle of the switch, and the wiring operation can be carried out. Open the front door as shown in figure 6-2.

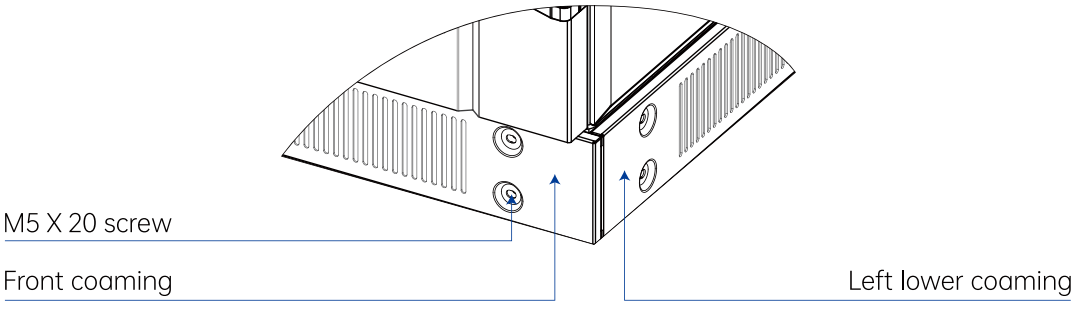
Figure 6-2 Switch baffle




### 6.5.2 Installation of lower coaming

The hybrid inverter have lower coaming at the bottom of front, back, left and right. They are packaged and placed at the bottom of the packaging box. Before installation, all lower fencing boards of the hybrid inverter must be removed and put out. After the hybrid inverter is positioned and the screw is locked, the lower fencing boards shall be installed. Dust-proof cotton is installed in the lower fencing board, which cannot be lost during installation.

Figure 6-3 Installation of lower coaming

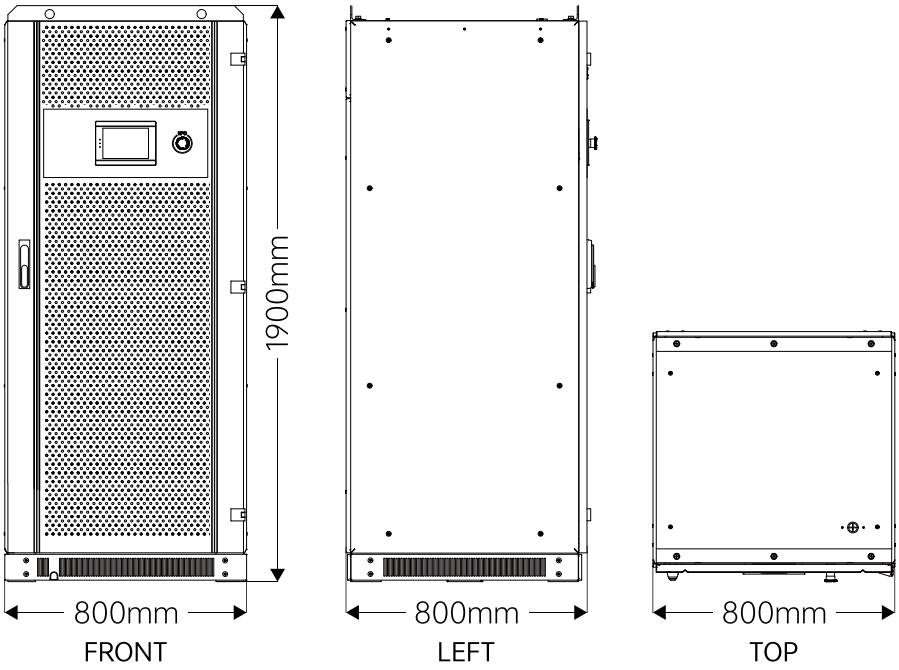


## 6.6 Dimension figure

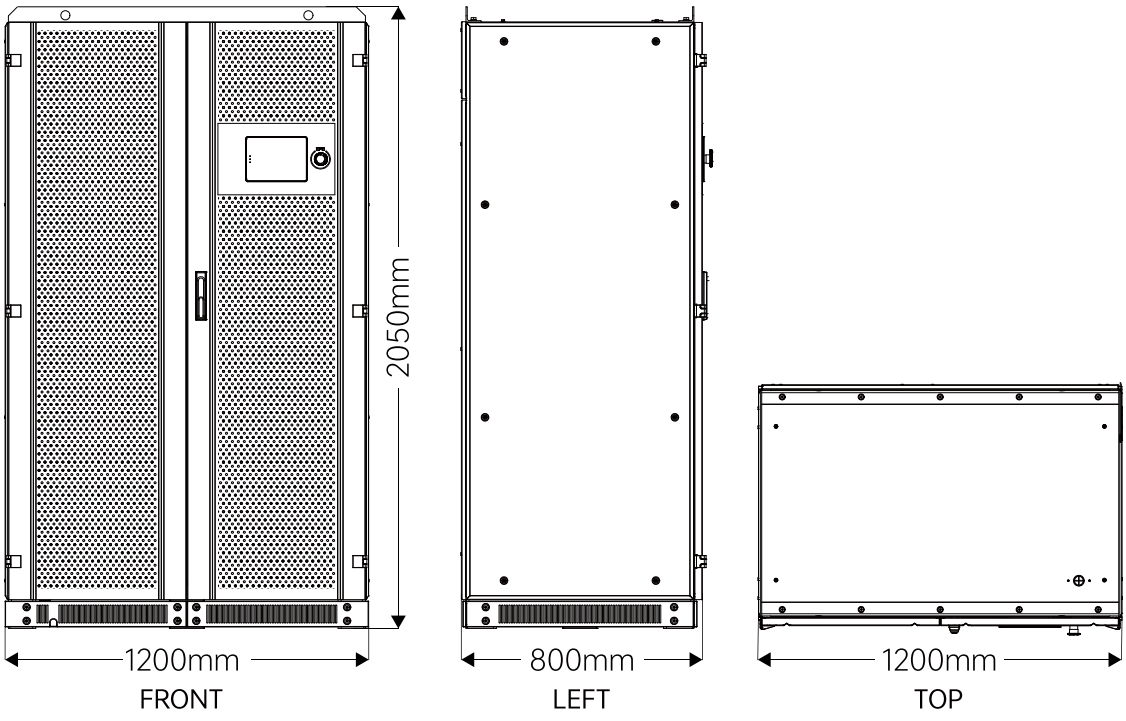
- The hybrid inverter are in and out of line mode, the power terminal can be seen after the switch baffle is removed, available in three screw sizes M8/M10/M12, the internal wiring terminals are shown in figure 6-4.

Figure 6-4 Dimension figure

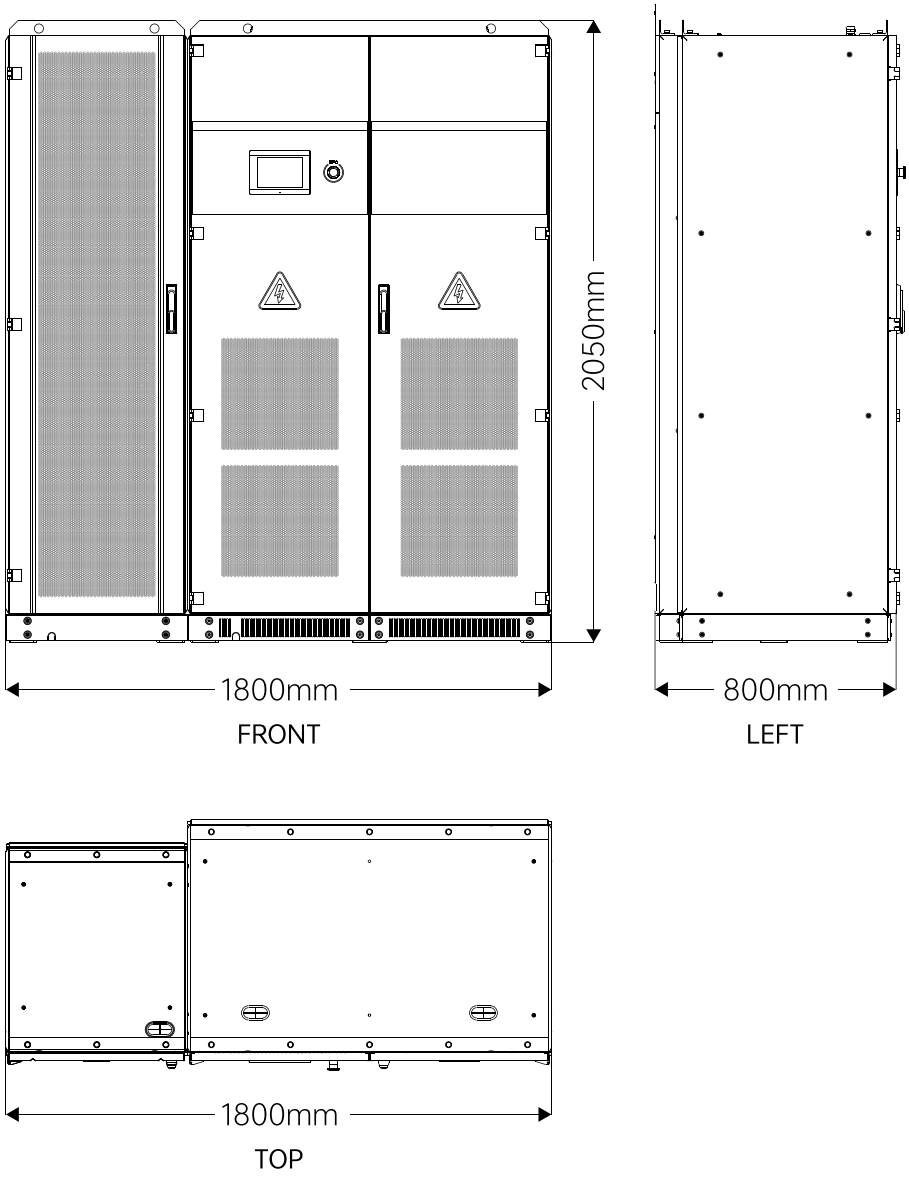
30kVA/50kVA



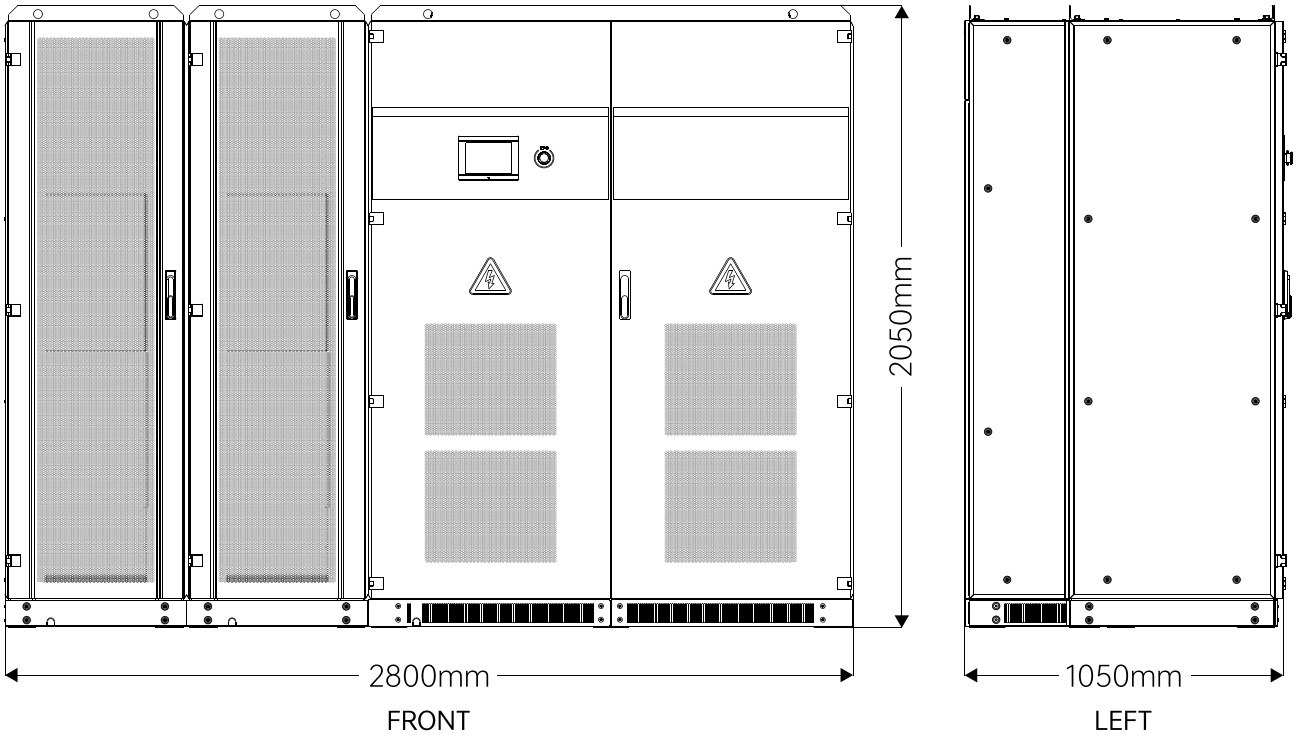

100kVA/150kVA

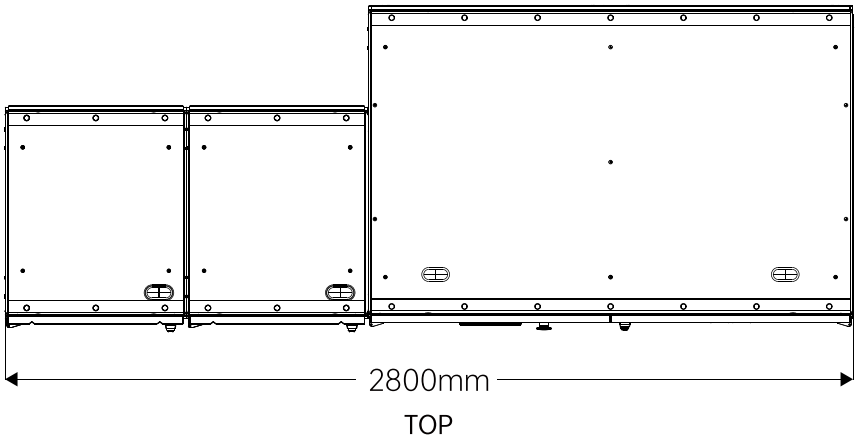


250kVA



500kVA



## 6.7 DC side wiring

- Step 1: Verify that all terminals of the hybrid inverter have been powered off with a multimeter.
- Step 2: Identify the positive and negative poles of the cable and mark them well.
- Step 3: Connect the positive and negative poles of the battery pack to the "BAT+" and "BAT- " terminals. Connect the positive and negative poles of the PV to "PV+" and "PV-" terminals.

**Connect the positive and negative photovoltaic input terminals to the PV+ and PV- on the PMDE cabinet, and connect the DC+OUT and DC-OUT of the PMDE cabinet to the PV+ and BAT- on the hybrid inverter respectively.**


In order to avoid personal and equipment injury, wiring must be carried out without electricity.

- DC switch is off.
- Multimeter is used to measure that the DC side wiring row is not live.


DC input voltage limit. Confirm that the DC input voltage should not exceed 950VDC!

- Any DC input voltage exceeding this limit may cause damage to the hybrid inverter.
- Damage and loss of equipment caused in this case do not fall within the scope of quality.

- Fixed screw and other parts used for wiring have been installed at the corresponding wiring terminals when the equipment is delivered. Need to check the material of the external terminal connection point. If copper and aluminum materials are interconnected, special copper and aluminum connectors should be used. Do not connect directly!

## 6.8 AC side wiring

### 6.8.1 AC side wiring

- All models of this series hybrid inverter have grid connection. Only those with bypass need to consider bypass connection. Their corresponding relations are shown in the table below. Refer to section 7.2 for the access location of copper bars.

Table 6-5 GRID

| GRID | |
|---|---|
| A | Phase A or U connected to power grid |
| B | Phase B or V connected to power grid |
| C | Phase C or W connected to power grid |
| N | Phase N connecting to power grid |

### 6.8.2 AC side line steps

- Step 1: Measure with a multimeter to confirm that all terminals have been powered off.
- Step 2: Confirm the phase sequence of the cables and mark them well. Three-phase AC output cable A,B,C, N should be added yellow, green, red and black insulating bushing respectively in order to distinguish the phase sequence.
- Step 3: Connect three phases A, B, C, and N connected to the grid to the grid according to table 6-5. Connect the three phases A, B, C, and N connected to the load to the load correctly according to table 6-6.

Table 6-6 LOAD

| LOAD | |
|---|---|
| A | Phase A connected to load |
| B | Phase B connected to load |
| C | Phase C connected to load |
| N | Phase N connected to load |

## 6.9 Communication wiring

### 6.9.1 External communication wiring

- The communication cable of external interface is reserved at the bottom of the device. Connect the communication cable to the terminal of the device. Figure 6-5 shows the silkscreen description of external communication ports.

* **Communication lines can be fine-tuned according to technical protocols.**

Figure 6-5 TF6 skillscreen

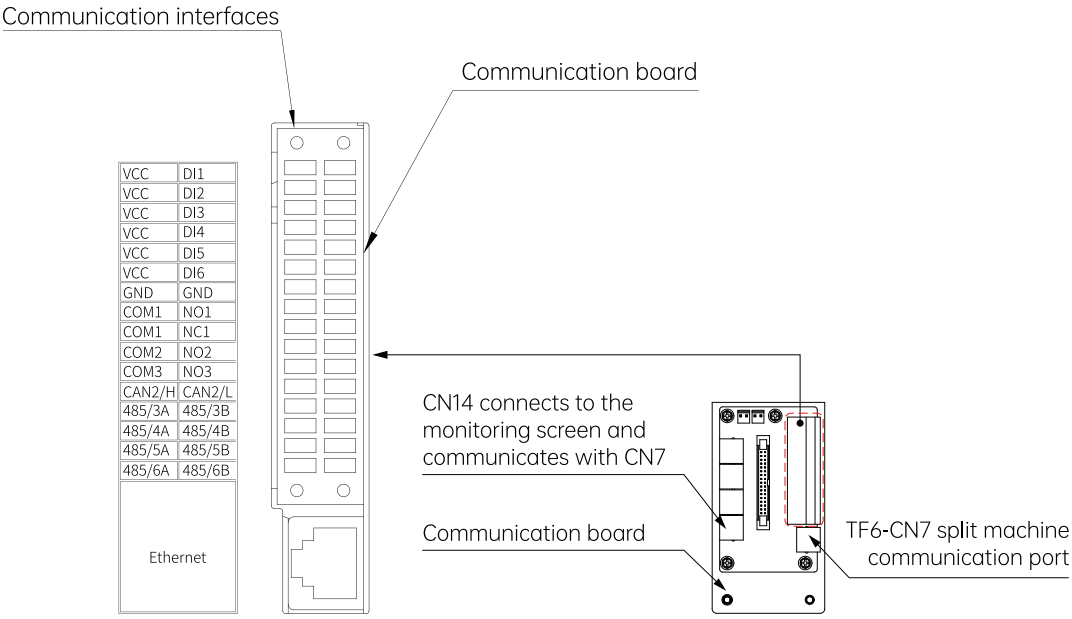



Table 6-7 TF6 definition of interface

| TF6-terminal item | Function |
|---|---|
| DI1 | EPO (default) |
| | Shutdown |
| | Switch |
| | ATS signal |
| | Water logging |
| | Fire protection |
| DI2 | EPO |
| | Shutdown (default) |
| | Switch |
| | ATS signal |
| | Water logging |
| | Fire protection |
| DI3 | EPO |
| | Shutdown |
| | Switch (default) |
| | ATS signal |
| | Water logging |
| | Fire protection |
| | 0%active power |

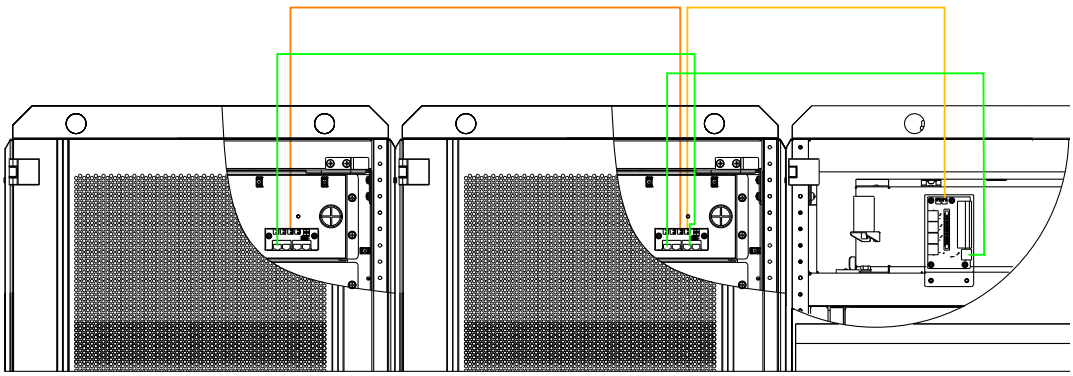
| TF6-terminal item | Function |
|---|---|
| DI4 | EPO |
| | Shutdown |
| | Switch |
| | ATS signal (default) |
| | Water logging |
| | Fire protection |
| | 30%active power |
| DI5 | EPO |
| | Shutdown |
| | Switch |
| | ATS signal |
| | Water logging (default) |
| | Fire protection |
| | 60%active power |
| DI6 | EPO |
| | Shutdown |
| | Switch |
| | ATS signal |
| | Water logging |
| | Fire protection (default) |
| | 100%active power |
| GND | / |
| NC1 | Generator |
| COM1 | |
| NO1 | |
| NO2 | Warning signal |
| COM2 | |
| NO3 | Operation signal |
| COM3 | |
| CAN2/H | Battery BMS communication (default) |
| CAN2/L | |
| 485/3A | Battery BMS communication (default) |
| 485/3B | |
| 485/4A | / |
| 485/4B | |
| 485/5A | Electricity meter |
| 485/5B | |
| 485/6A | Hybrid inverter to EMS communication |
| 485/6B | |

| TF6-terminal item | Function |
|---|---|
| Ethernet | Hybrid inverter to EMS communication (default) |

### 6.9.2 Parallel communication connection

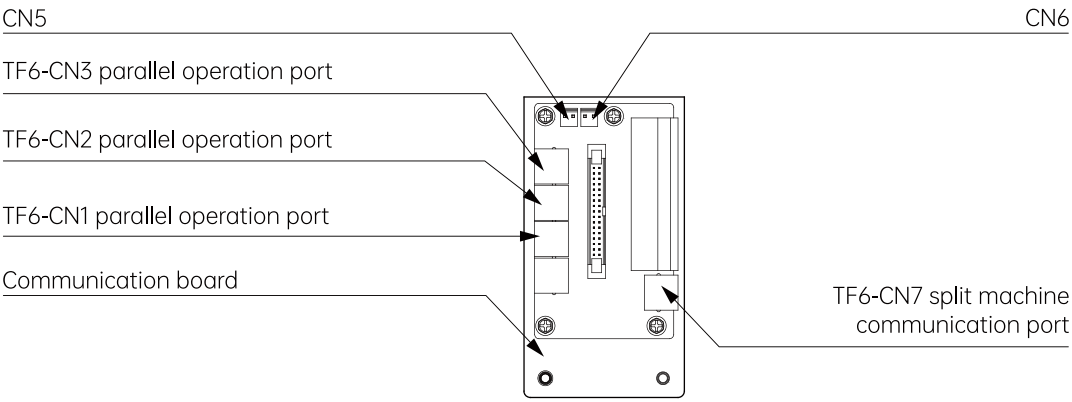
- For the communication problem of 250kVA and 500kVA split machine, Hybrid inverter is equipped with TF6 communication interface board located at the top of the device. A TF1 communication board is installed on the top of the DCDC multi-module cabinet. Connect the power cord and network cable in parallel between the machines when in use. Details are shown in figure 6-6:

Figure 6-6 Split machine communication wiring



- For the convenience of customers with parallel requirements, all models of hybrid inverter have the function of multi-machine parallel use, supporting up to four devices for parallel operation. The TF6 communication board and wire hole are arranged on the top of the equipment. When multiple devices are used in parallel, connect the parallel ports between the devices using network cables, as illustrated in figure 6-7.

Figure 6-7 The function of external communication board port



- When connecting cables, pay attention to network port selection. The communication on the split machine is connected to network port CN7. When multiple devices are used in parallel, network ports CN1-CN3 are used.
- At the same time, the distance between devices should not be too long. The length of the network cable is crucial to the communication. If the network cable is too long, the communication fault may occur.

Figure 6-8 250kVA dial switch

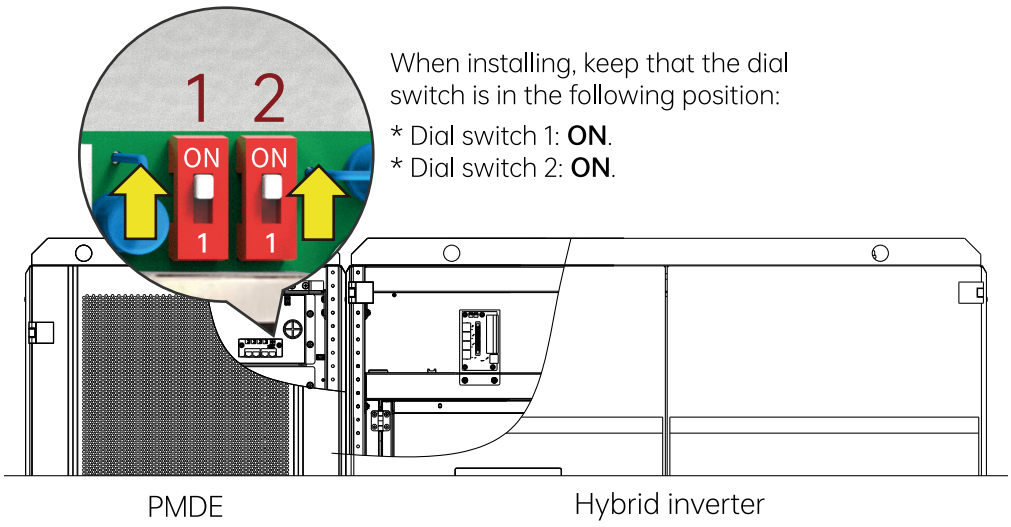
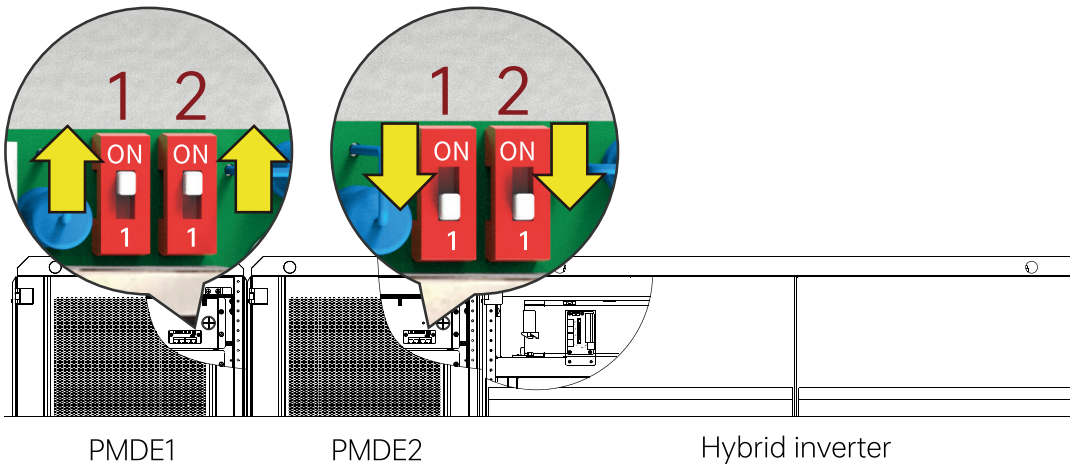



Figure 6-9 500kVA dial switch




When installing, keep that the dial switch is in the following position:

**PMDE1**

- Dial switch 1: "On", Dial switch 2: "On".

**PMDE2**

- Dial switch 1: "1", Dial switch 2: "1".

## 6.10 Grounding

- The grounding copper bars in this series hybrid inverter need to be connected reliably by grounding cables. Grounding copper bars have been reliably connected with the outer shell of the hybrid inverter in the cabinet. When connecting, it is necessary to connect the grounding copper bars with equipotential connection devices of the installation site or the electrical control room. The resistance shall not be higher than 4Ω, the diameter of grounding cable shall not be less than 16 mm², and the position of the copper bars shall refer to the internal terminal of 7.2 section.

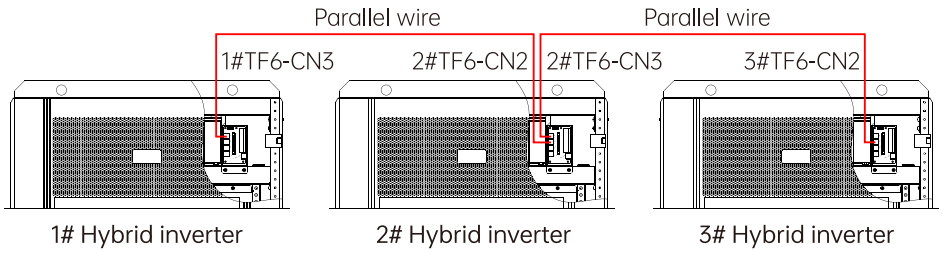
- When connecting ground cables for hybrid inverter models, the ground cables of hybrid inverter and PMDE are connected to the ground terminal of the power distribution cabinet. Therefore, connect the ground terminal of PMDE1 to the ground terminal of the power distribution cabinetand and connect the ground terminal of PMDE2 to the ground terminal of the power distribution cabinet.

*** The ground terminal of the PMDE is connected to the ground copper bar of the power distribution cabinet, but not to the ground copper bar of the hybrid inverter.**

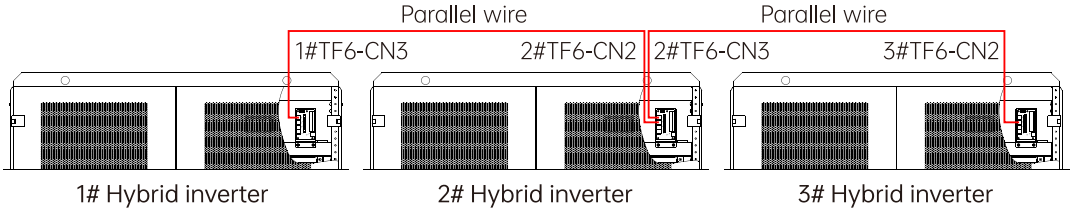
## 6.11 Parallel wiring

Figure 6-10 Three parallel machine wiring diagram

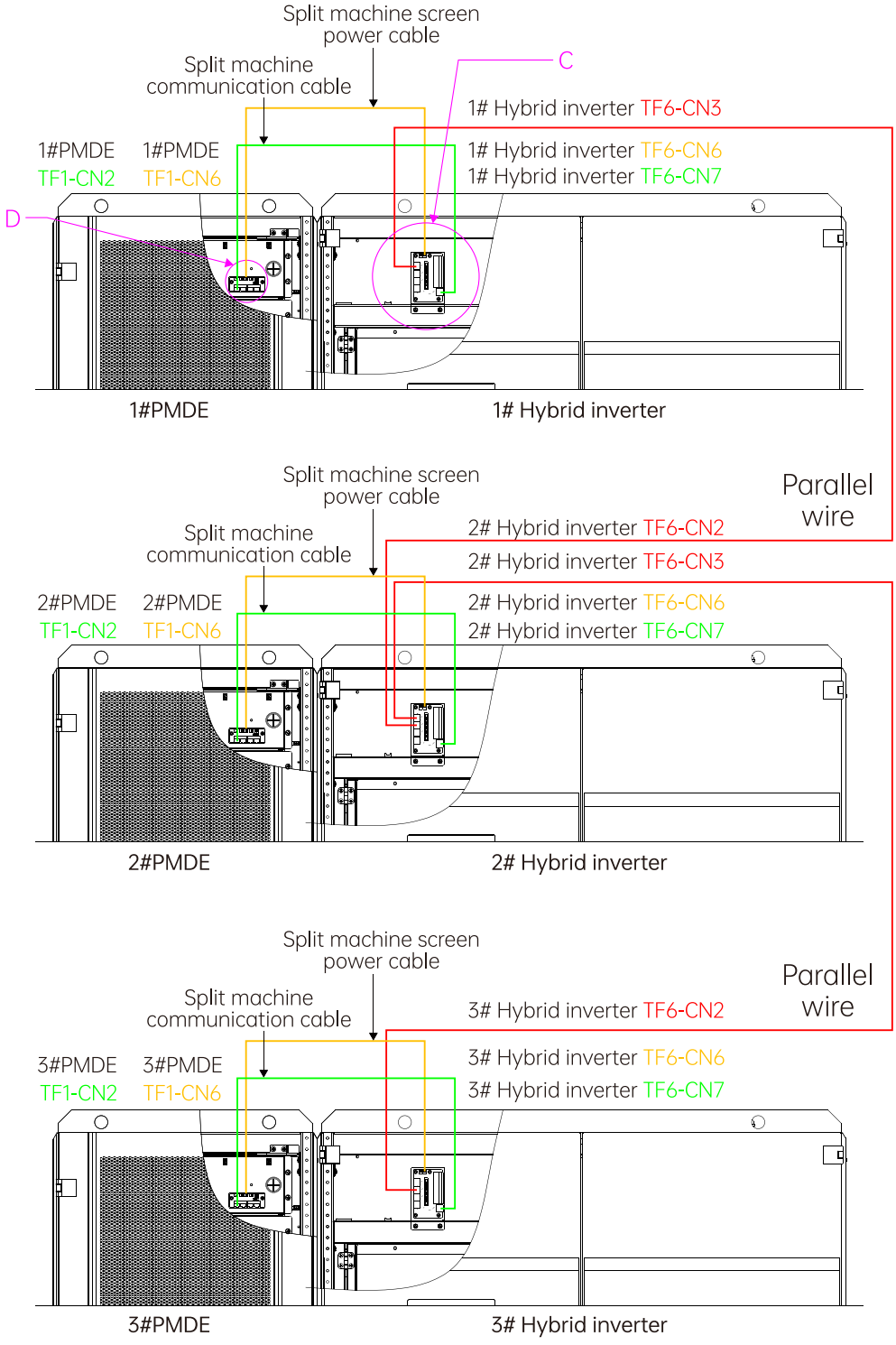
30kVA/50kVA




100kVA/150kVA



250kVA


Split machine screen power cable
Split machine communication cable
C
D
1# Hybrid inverter TF6-CN3
1#PMDE TF1-CN2
1#PMDE TF1-CN6
1# Hybrid inverter TF6-CN6
1# Hybrid inverter TF6-CN7
1#PMDE
1# Hybrid inverter
Parallel wire
Split machine screen power cable
Split machine communication cable
2# Hybrid inverter TF6-CN2
2# Hybrid inverter TF6-CN3
2#PMDE TF1-CN2
2#PMDE TF1-CN6
2# Hybrid inverter TF6-CN6
2# Hybrid inverter TF6-CN7
2#PMDE
2# Hybrid inverter
Parallel wire
Split machine screen power cable
Split machine communication cable
3# Hybrid inverter TF6-CN2
3#PMDE TF1-CN2
3#PMDE TF1-CN6
3# Hybrid inverter TF6-CN6
3# Hybrid inverter TF6-CN7
3#PMDE
3# Hybrid inverter

500kVA

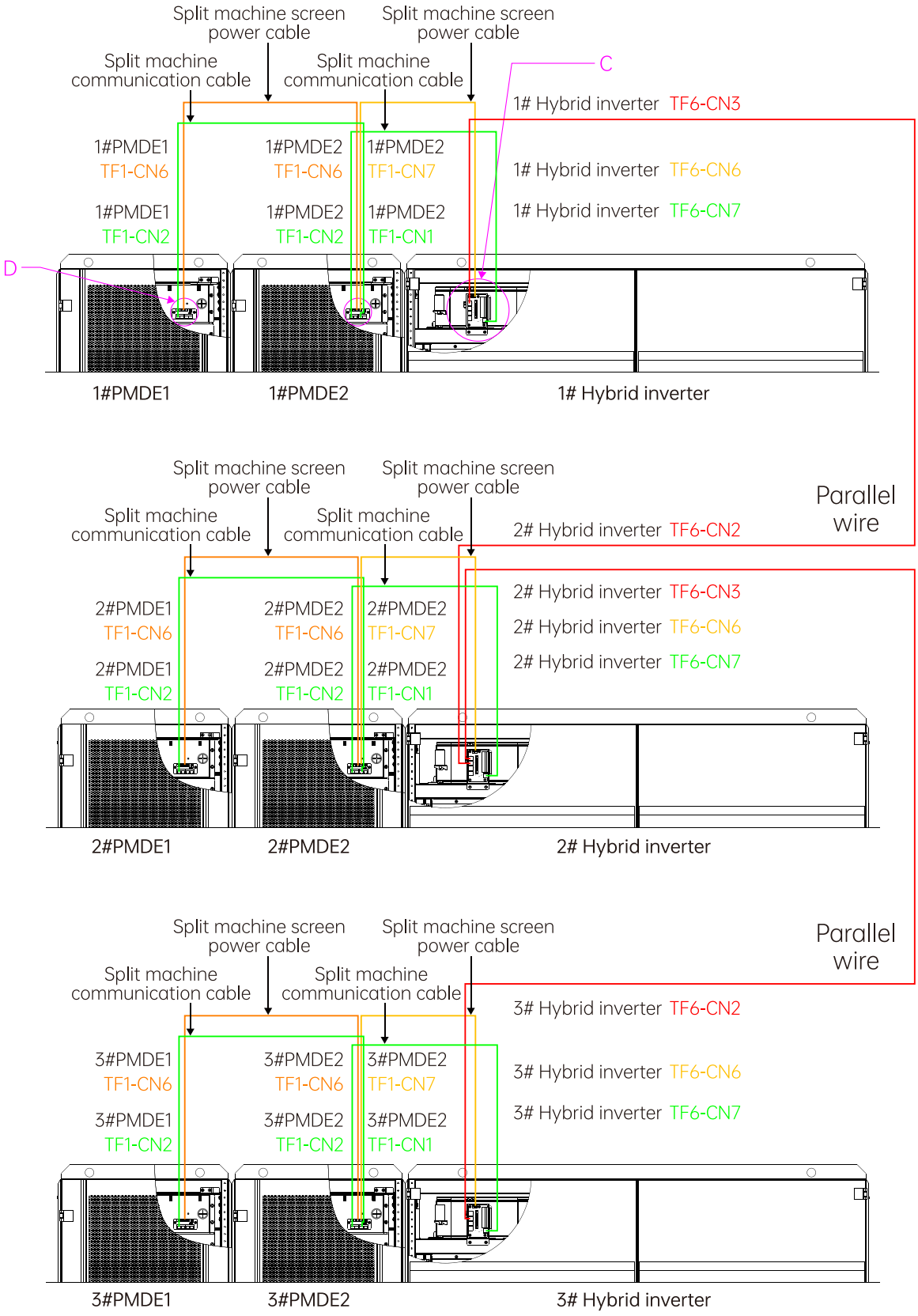
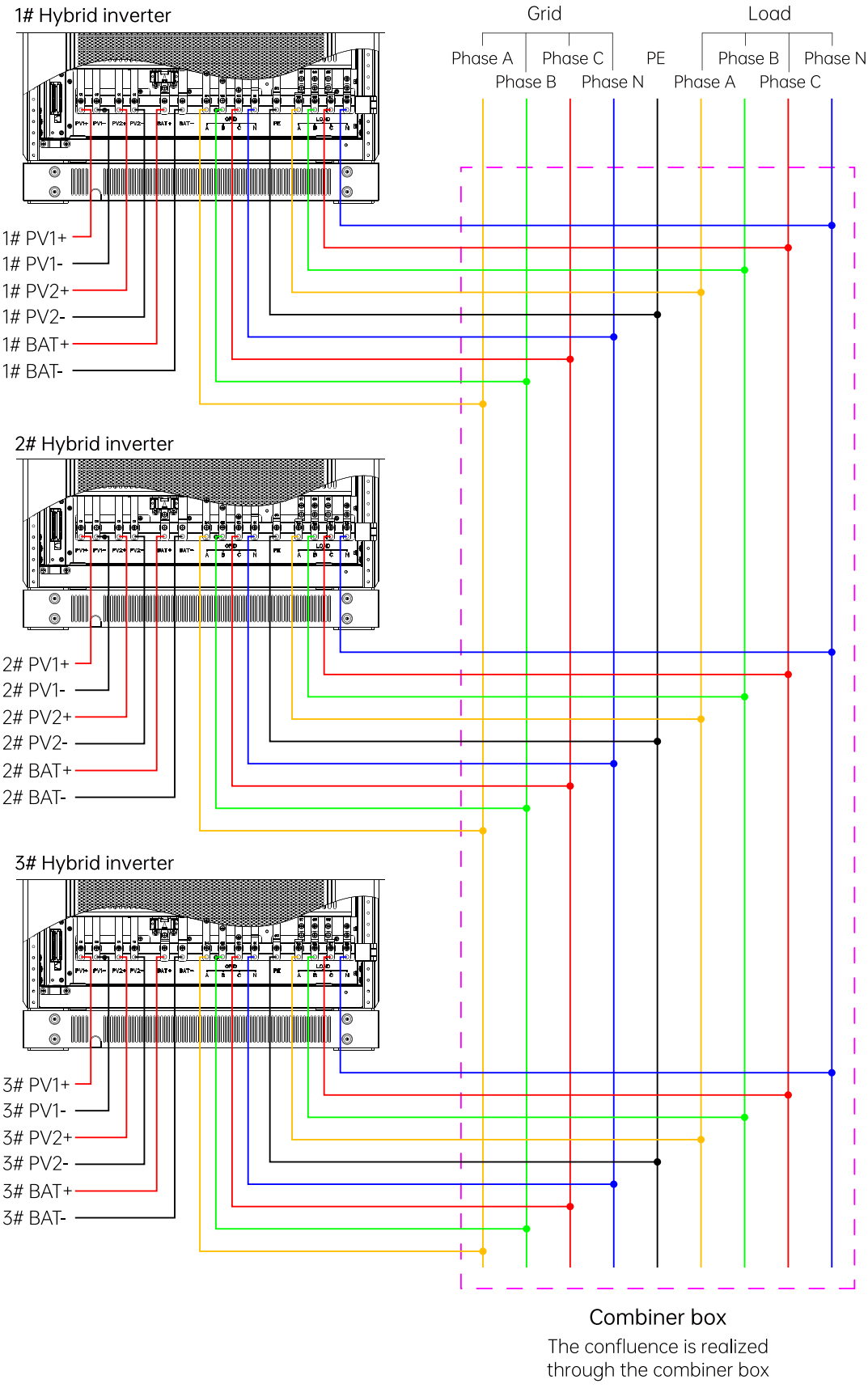
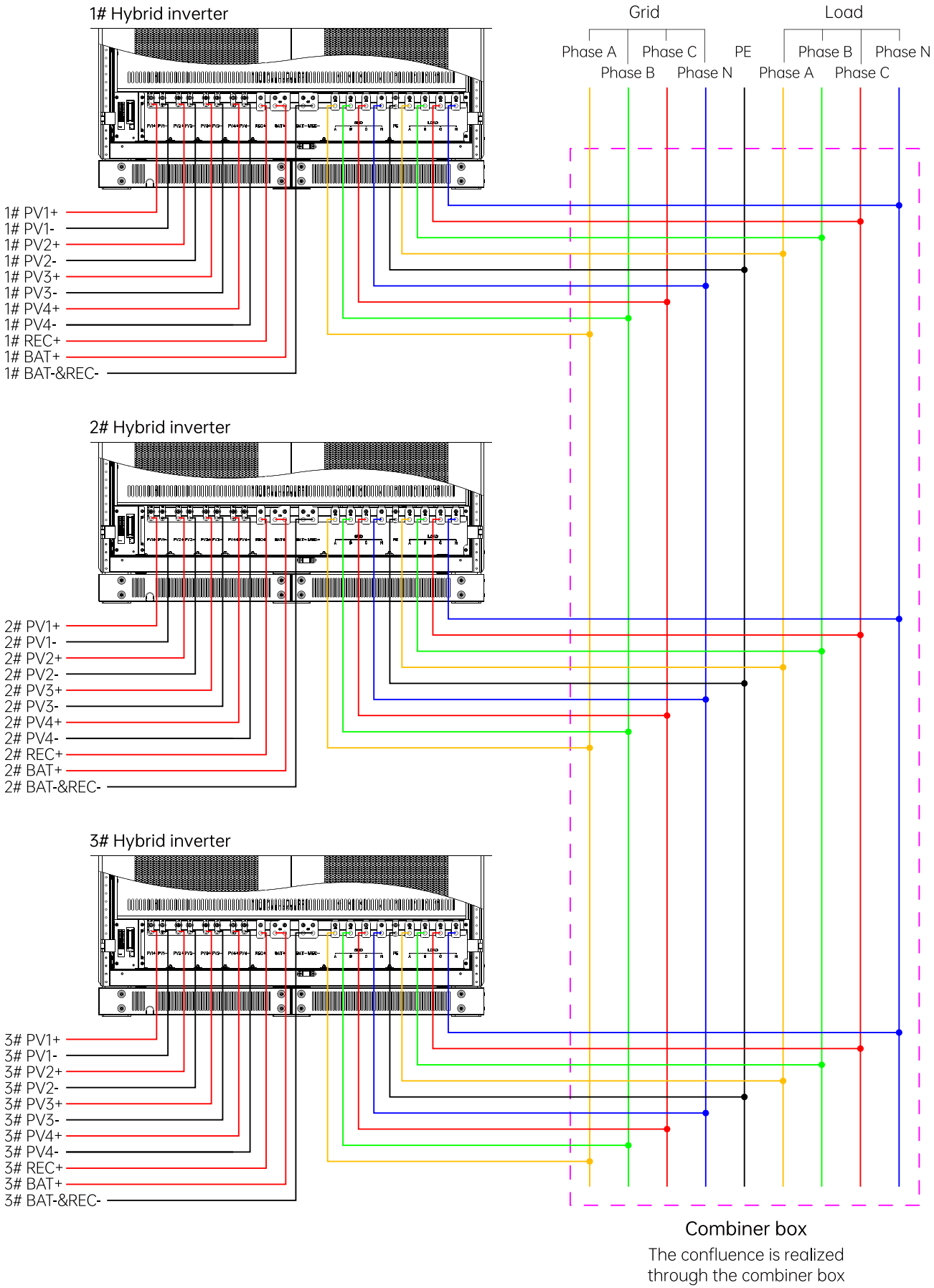

Split machine screen power cable
Split machine screen power cable
Split machine communication cable
Split machine communication cable
C
1# Hybrid inverter TF6-CN3
1#PMDE1 TF1-CN6
1#PMDE2 TF1-CN6
1#PMDE2 TF1-CN7
1# Hybrid inverter TF6-CN6
1#PMDE1 TF1-CN2
1#PMDE2 TF1-CN2
1#PMDE2 TF1-CN1
1# Hybrid inverter TF6-CN7
D
1#PMDE1
1#PMDE2
1# Hybrid inverter
Split machine screen power cable
Split machine screen power cable
Split machine communication cable
Split machine communication cable
Parallel wire
2# Hybrid inverter TF6-CN2
2#PMDE1 TF1-CN6
2#PMDE2 TF1-CN6
2#PMDE2 TF1-CN7
2# Hybrid inverter TF6-CN3
2# Hybrid inverter TF6-CN6
2#PMDE1 TF1-CN2
2#PMDE2 TF1-CN2
2#PMDE2 TF1-CN1
2# Hybrid inverter TF6-CN7
2#PMDE1
2#PMDE2
2# Hybrid inverter
Split machine screen power cable
Split machine screen power cable
Split machine communication cable
Split machine communication cable
Parallel wire
3# Hybrid inverter TF6-CN2
3#PMDE1 TF1-CN6
3#PMDE2 TF1-CN6
3#PMDE2 TF1-CN7
3# Hybrid inverter TF6-CN6
3#PMDE1 TF1-CN2
3#PMDE2 TF1-CN2
3#PMDE2 TF1-CN1
3# Hybrid inverter TF6-CN7
3#PMDE1
3#PMDE2
3# Hybrid inverter

Figure 6-11 Three parallel machine power cable wiring diagram

30kVA/50kVA



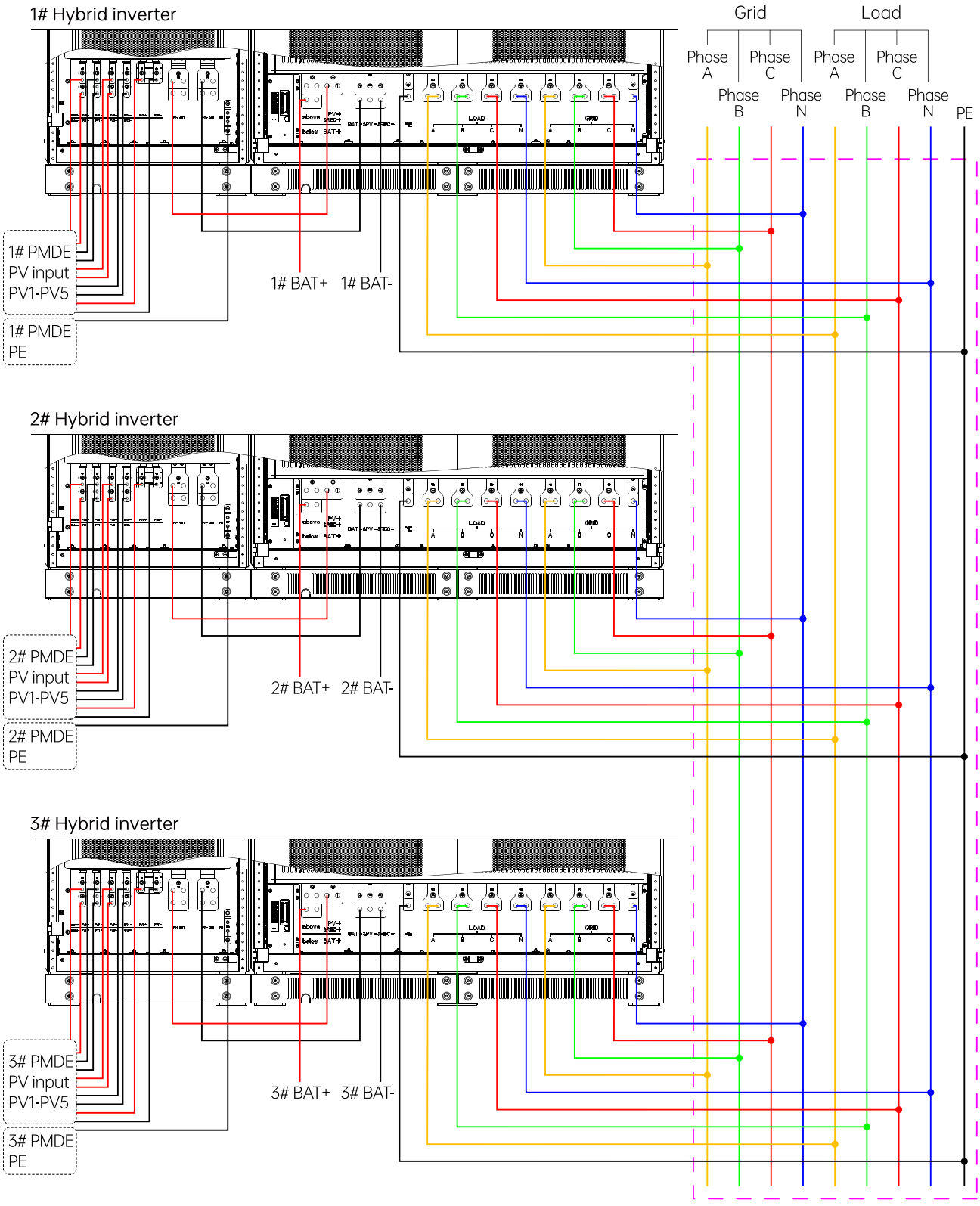
100kVA/150kVA




**Combiner box**

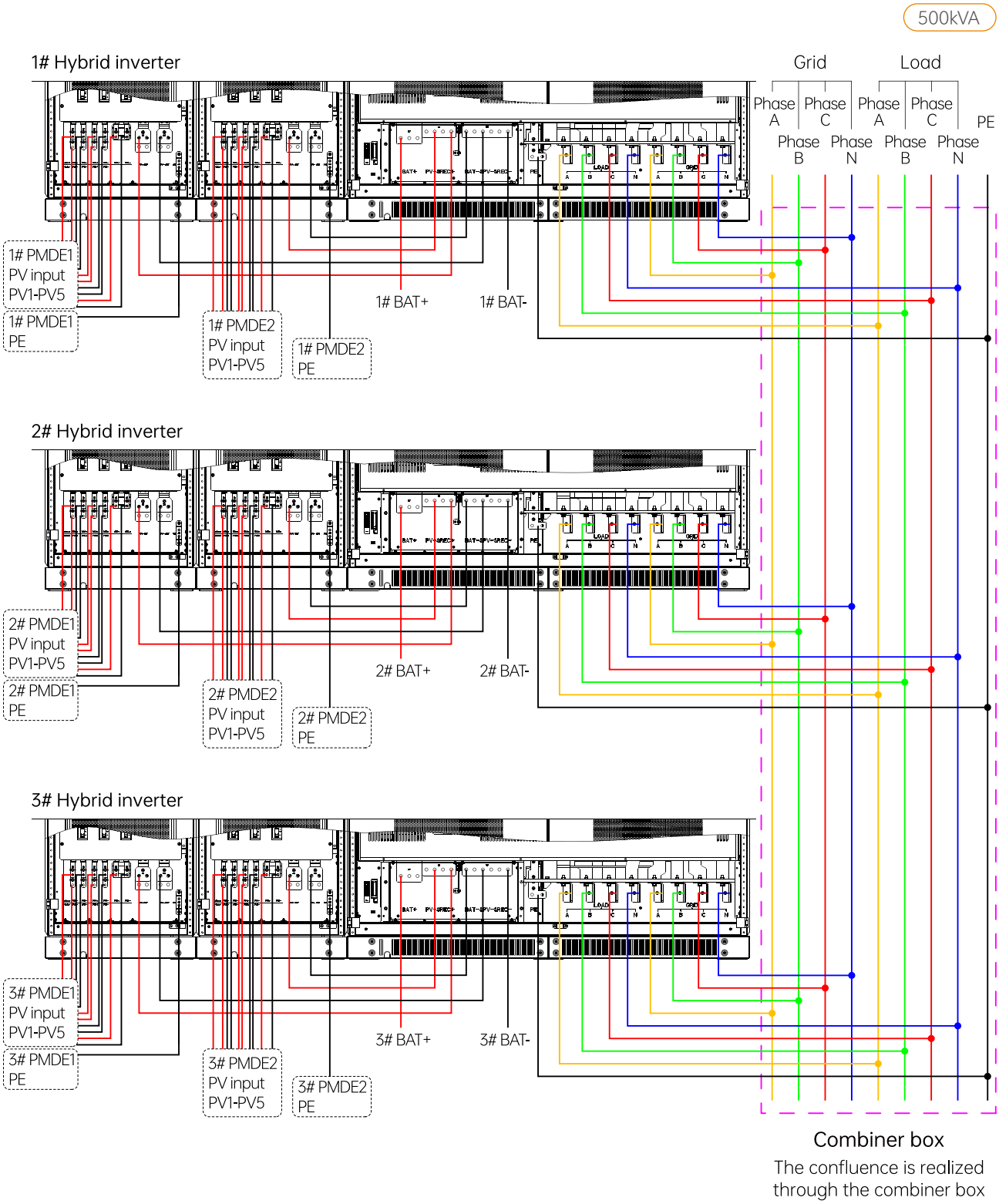
The confluence is realized through the combiner box

250kVA




**Combiner box**

The confluence is realized through the combiner box




## 6.12 Installation complete

- After all mechanical and electrical installations have been completed, the removed switch baffles and lower fences need to be reinstalled on the hybrid inverter. After installation, power-on operation is only allowed after confirmation that it is correct.

# 7 Trial operation

## 7.1 Check before starting

- Before commissioning, a thorough inspection of the installation of the equipment should be carried out, especially to check whether the DC and AC voltages meet the requirements of the hybrid inverter, as well as whether the polarity and phase sequence are correct.
- Check that all connections have met the requirements of the relevant standards and specifications. And whether the system is well grounded. Grounding resistance is of great importance to the safety of the whole system. It must be determined that the grounding resistance meets the requirements before the first trial operation.


CAUTION

- Before commissioning, it is necessary to ensure that all switches on the AC side are open.

**Step 1: Check the hybrid inverter**

The hybrid inverter needs to be checked before it is turned on.

- Check the installation and wiring of the hybrid inverter according to chapters 5 and 6.
- Ensure that all AC and DC circuit breakers are disconnected.

**Step 2: Check AC side voltage**

- Check whether the three phases of the hybrid inverter are connected correctly to the three phases of the power grid.
- Check whether the phase voltage and line voltage are within the predetermined range and record the voltage value.
- If possible, measure the total harmonic distortion (THD) and view the curve. If the distortion is serious, the hybrid inverter may not work.

**Step 3: Check DC side voltage**

- The DC side should be connected to the hybrid inverter from the battery pack to ensure that the input polarity of each battery pack is correct.
- The PV side should be connected to the hybrid inverter from the PV to ensure that the input polarity of each PV group is correct.


WARNING

- The battery side voltage shall not exceed 950V.
- The PV side- not exceed 1000V.
- If the voltage deviation is greater than 3%, it may be caused by load fluctuation, cable damage or cable loosening on site.

**Step 4: Check other content after completing the above check before starting, the following items need to be carefully checked to ensure that they are correct.**

- All links are made in accordance with chapter 6 of this manual.
- The protective shield inside the equipment has been firmly installed.
- The emergency shutdown button is released.
- The AC side and DC side circuit breakers have been disconnected, they are in the "OFF" position.
- The multimeter is used to detect whether the AC and DC side voltages meet the starting conditions of the hybrid inverter, and there is no danger of overvoltage.
- The door of the cabinet has been closed and the key of the cabinet door has been pulled out and handed over to a special person for safekeeping.


- For the long downtime hybrid inverter, before starting, the equipment must be thoroughly and meticulously checked to ensure that all indicators meet the requirements before starting.

## 7.2 Start-up operation

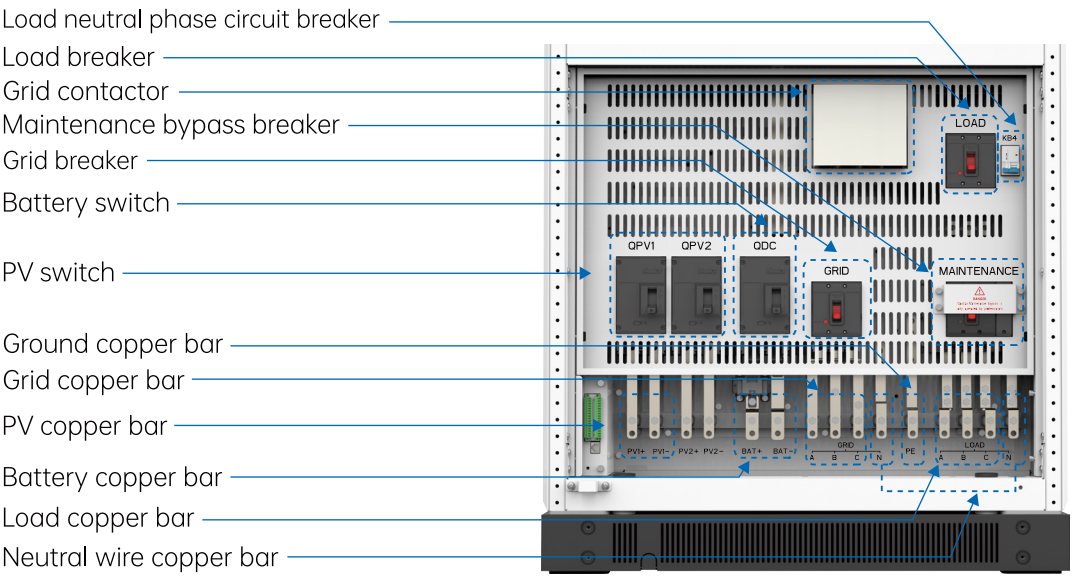
After all the above conditions are met, the hybrid inverter can be turned on. The operational steps are as follows:

- Step 1: Make sure that the DC side and AC side are connected correctly and the DC side voltage is lower than 950V.
- Step 2: Close AC and DC circuit breaker switches.
- Step 3: Close the lightning protection switch KS (applicable to split models), close KB1, KB2, KB3, KB4.
- Step 4: After completing the above steps, go through the switch menu on the touch screen, click "DC/DC converter on" until the bottom right of the screen displays from standby to MPPT, click "DC/AC converter on" until the screen displays right below the switch from the hybrid inverter Turn off the hybrid inverter to charge or discharge the hybrid inverter. After the machine is turned on normally, you can check the running status of the machine through the touch screen.
- Step 5: After the machine is running normally, close the cabinet door and hand over the key to a special person for safekeeping. The detailed startup steps are as follows:
- (1) Confirm the photovoltaic input, and close the photovoltaic input switches QPV1 and QPV2 in figure 7-1. After closing the PV input switch, if the monitor screen was black before, the monitor screen will start running at this time. (When photovoltaic power is transmitted, each photovoltaic channel must be measured to prevent short circuit).
- (2) The battery system is powered on.

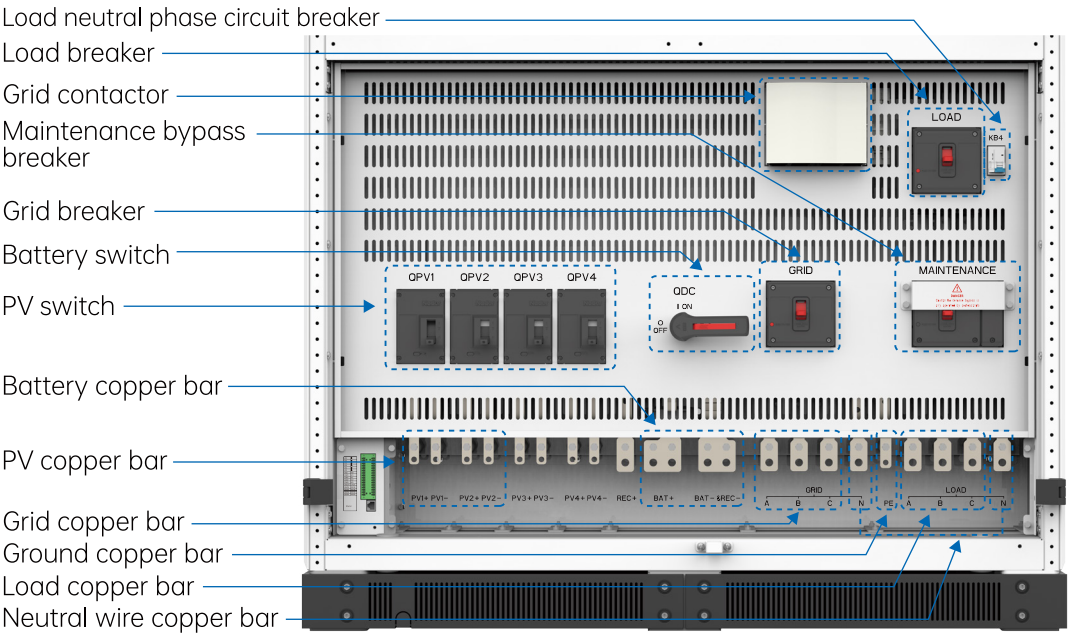
- (3) After the photovoltaic input and the battery are turned on, you will hear the sound of the DC contactor closing inside the photovoltaic controller (the closing sound of the DC contactor after the bus is softly lifted), and then the photovoltaic controller displayed in the lower right corner of the monitoring main interface will be heard. The status will change from "off" to "Hybrid inverter x standby".
- (4) Open the cabinet door, close KB1, KB2, KB3 and KB4, wait about 30 seconds, and the battery voltage data can be displayed on the monitoring interface.

Figure 7-1 Hybrid inverter input and output

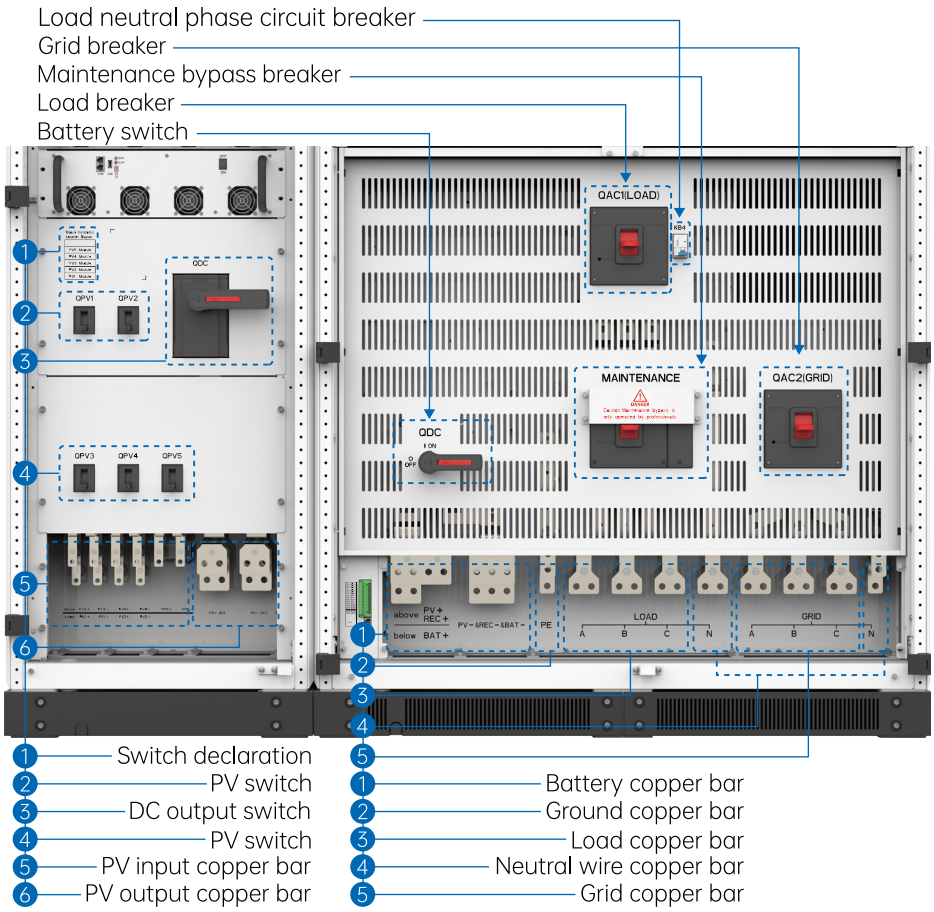
30kVA/50kVA



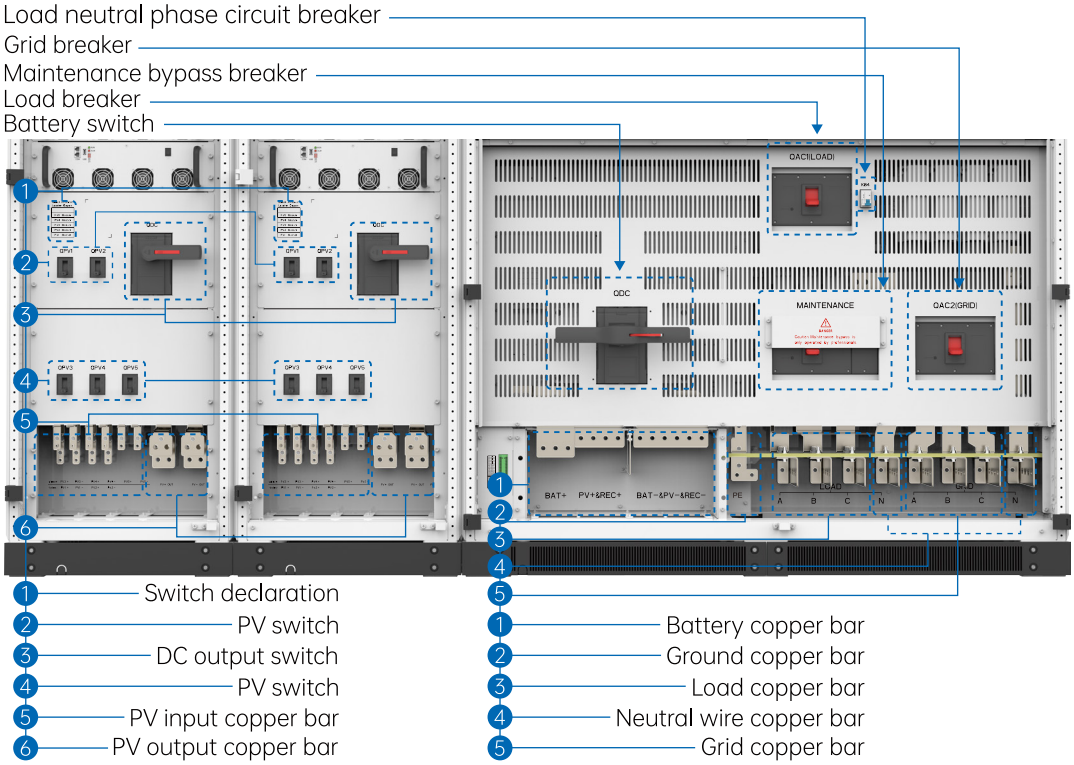

100kVA/150kVA

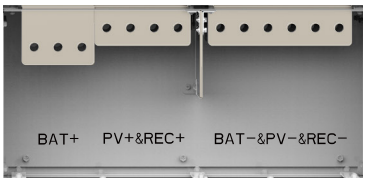


250kVA




500kVA

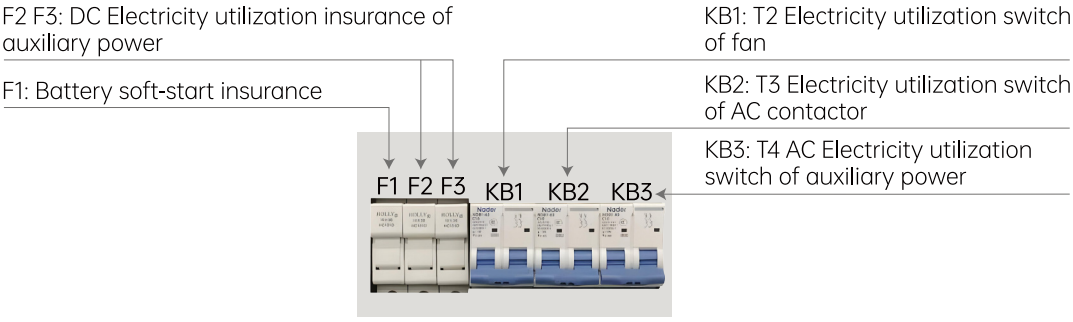





REC is a reserved interface that can be externally connected to the power conversion system to form an uninterruptible power supply system.

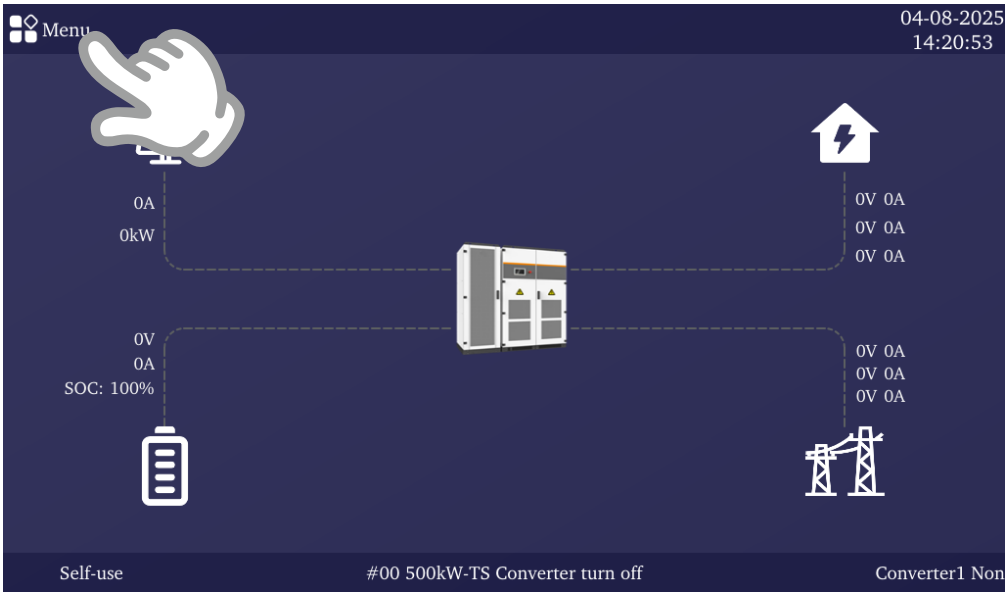
- NEB(Neutral to earth bonding) is an internal component of the inverter. Safety disconnect unit open and island operation, NEB will connect to earth within 200ms. After reconnects the inverter to the utility supply, NEB will open within 200 ms.

Figure 7-2 Internal MCB

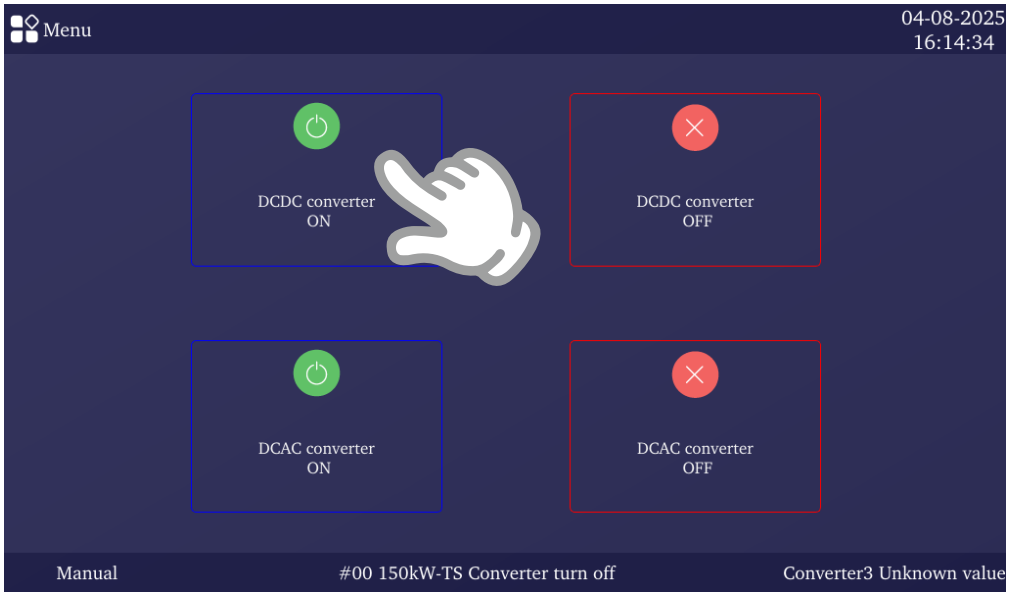



- (5) Take 150kVA as an example, check whether there is a red alarm signal in the upper right corner of the monitor, and it can be turned on if there is no red alarm signal.

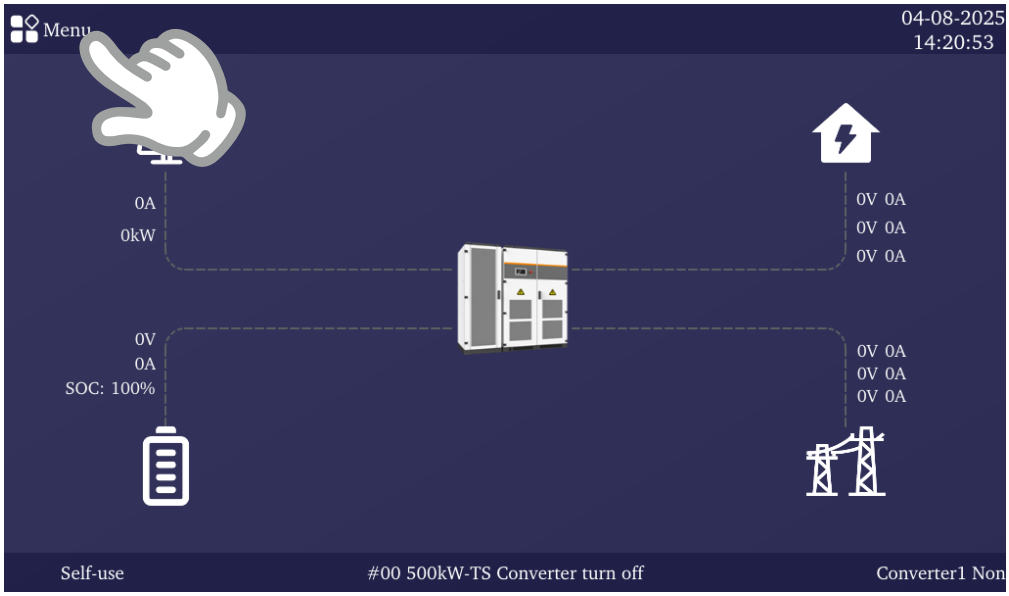
Step 1: The photovoltaic controller is turned on. Click "Menu" → "Turn On/Off" → "DCDC converter ON" in the lower left corner of the monitor.



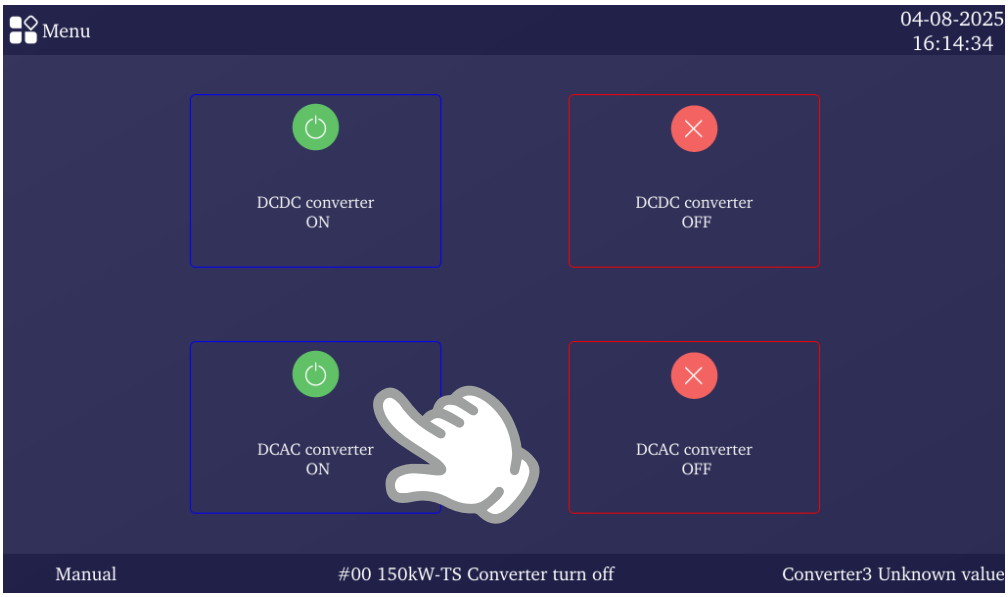
Step 2: After clicking "DCDC converter ON", the PV controller status displayed in the lower right corner of the monitoring main interface will change from "Standby" to " Hybrid inverter xMPPT", the PV controller is running normally.




Step 3: The hybrid inverter starts. Click "Menu" → "Turn On/Off" → "DCAC converter ON" in the lower left corner of the monitoring.




Step 4: After clicking "DCAC converter ON", you will hear the DC contact suction sound, and then the hybrid inverter will soft up. After soft up, you will hear the AC contactor suction sound. At this time, the hybrid inverter state displayed at the positive lower angle of the monitoring main interface will change to "Hybrid inverter off-grid discharge" or "Hybrid inverter grid-connected charging" or "Hybrid inverter grid-connected discharge". At this time, the hybrid inverter runs normally.




At this point, the hybrid inverter is powered on.

## 7.3 Shutdown operation

### 7.3.1 Normal shutdown

During normal maintenance or overhaul, shutdown operation should be carried out according to the following procedures:

- Step 1: Through the switch menu on the touch screen, click "DCDC converter off", and then click "DCAC converter off" after the DCDC converter is off.
- Step 2: After the AC contactor is disconnected and the touch screen displays "host-00 hybrid inverter OFF" and "Hybrid inverter x Off", manually disconnect the DC circuit breaker or load switch and make the switch "off".
- Step 3: Switch off the hybrid inverter fan switch, switch off KB1, KB2, KB3, KB4 switches.
- Step 4: Disconnect the AC side circuit breaker of the hybrid inverter so that the switch is in the "OFF" position.
- Step 5: Wait until the bus capacitor discharge is finished, the touch screen is off, and the hybrid inverter is off.

WARNING

- When the machine is working normally, it is strictly forbidden to disconnect the circuit breaker directly, so as to avoid dangerous arc damage to the circuit breaker.
- In severe cases, it may also lead to damage of hybrid inverter.

The detailed steps for shutting down the hybrid inverter:

- (1) Shutdown of the photovoltaic controller. Click "Menu" → "Turn On/Off" → "DCDC converter Off" in the lower left corner of the monitor. After click "DCDC converter Off", the PV controller status displayed in the lower right corner of the monitoring interface will have "Hybrid inverter xMPPT" " becomes "standby". At this time, the PV controller stops working.
- (2) The hybrid inverter is turned off. Click "Menu" → "Turn On/Off" → "DCAC converter Off" in the lower left corner of the monitor. After clicking "DCAC converter Off", you will hear the AC contactor disconnecting sound. At this time, the hybrid inverter status displayed at the bottom of the main monitoring interface will change to "Host-00 hybrid inverter off". At this point the hybrid inverter stops working.

### 7.3.2 Shut down in case of malfunction or emergency

In case of emergency or malfunction, follow the following procedure:

- Step 1: Press the EPO button.
- Step 2: Disconnect the machine DC side circuit breaker or load switch, AC side circuit breaker.
- Step 3: Reset the EPO button after confirming that the danger or fault has been removed and needs to be operated working.


- EPO button is only used in case of machine failure or emergency. When shutdown is normal, shutdown operation should be carried out through the button on touch panel according to the shutdown instruction on touch panel.
- In case of crisis, press the EPO button directly to ensure prompt response.

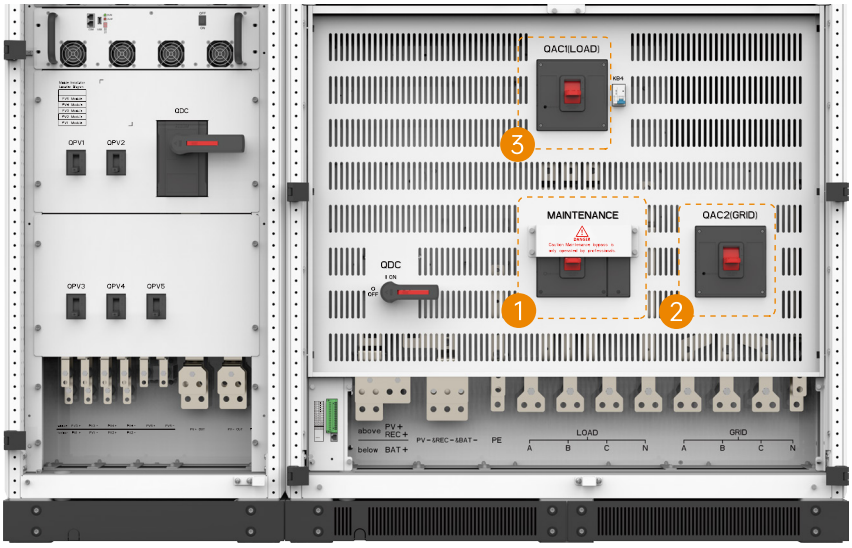
### 7.3.3 Use of maintenance bypass

The maintenance bypass circuit breaker (MAINTENANCE) in figure 7-1 is normally in the off state. The maintenance bypass is to ensure that the load is not powered off when the hybrid inverter is overhauled or faulty (provided that the grid is powered). After the maintenance bypass is closed, connect the diesel generator or grid to the load.

The specific operation steps are:

- (1) Confirm that the diesel generator is operating normally or that the power grid is energized.
- (2) Close the DCAC and DCDC (refer to section 7.3.1).
- (3) Turn off the photovoltaic switch and the DC switch (QDC).

- (4) After the converter is turned off, use a screwdriver to remove the small baffle from the maintenance bypass. Then, turn on maintenance bypass 1 → Turn off power grid switch 2 → Turn off load switch 3 .



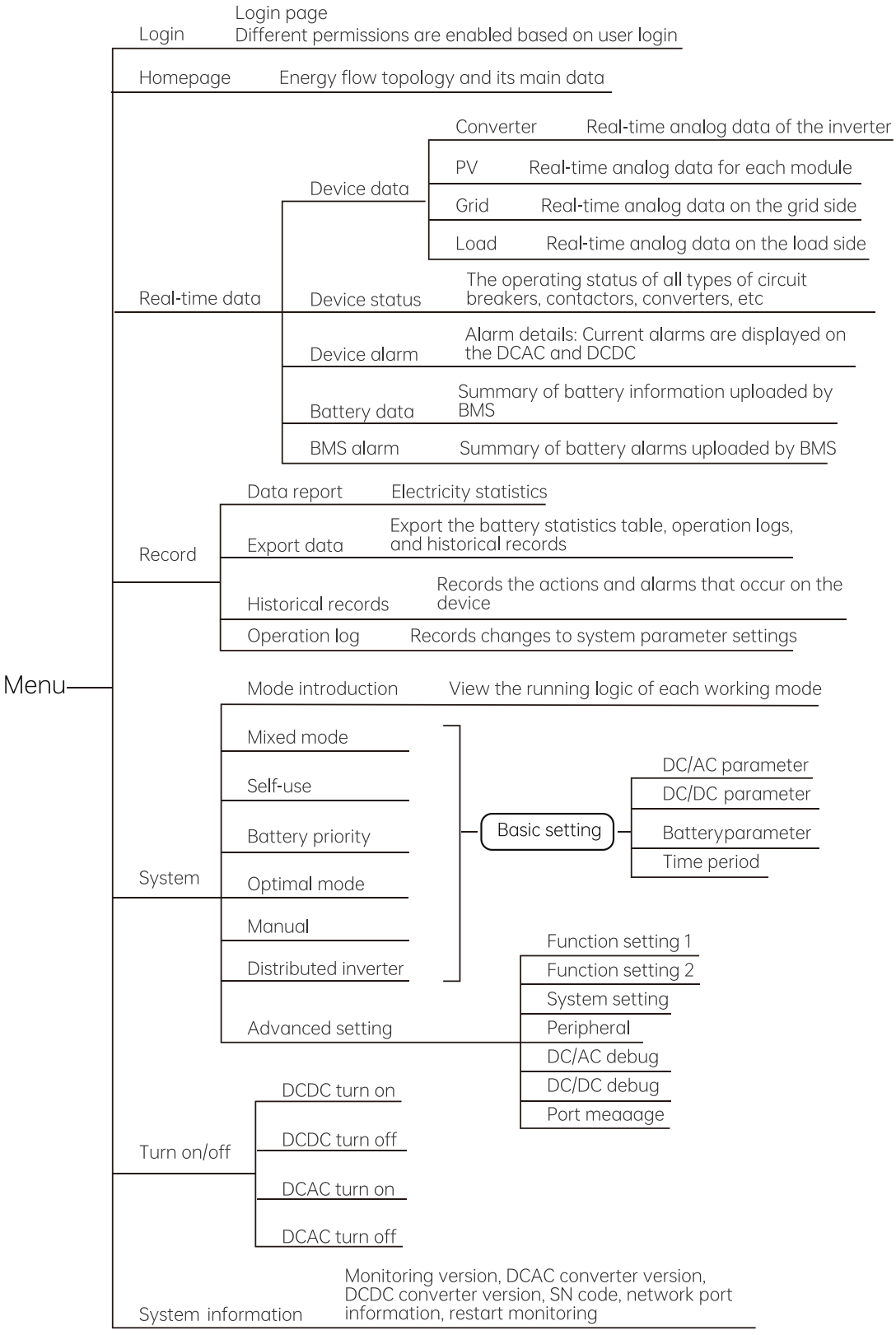

**Note: After repairing equipment or recovering from the fault, the hybrid inverter must be restored.**

- First, turn on "Grid circuit breaker 2 , then turn on "Load switch 3 ". If the screen indicates a successful connection to the grid, the maintenance bypass switch can be disconnected. Install the maintenance bypass small baffle to ensure that the hybrid inverter operates normally.

# 8 Touch screen operation guidance

## 8.1 Monitoring logic diagram

Figure 8-1 Monitoring menu logic diagram



## 8.2 Homepage

The homepage is divided into three parts:

- Basic information bar: Includes machine model, alarm status, and a time setting button. Clicking the time button will open the time setting interface, as shown in figure 8-4. Users can directly input hours, minutes, and seconds or use buttons to adjust the year, month, and day.
- Homepage content: Displays real-time data and power data for inverters, photovoltaics, loads, batteries, and the power grid. Users can click on the corresponding icon buttons to view more detailed real-time data information.
- Menu bar: Includes the menu button, current status information of the DCAC converter, and the current status of the DCDC module. Clicking the menu button will jump to the system menu interface, with the menu page shown in figure 8-5.

Figure 8-2 Home logic diagram

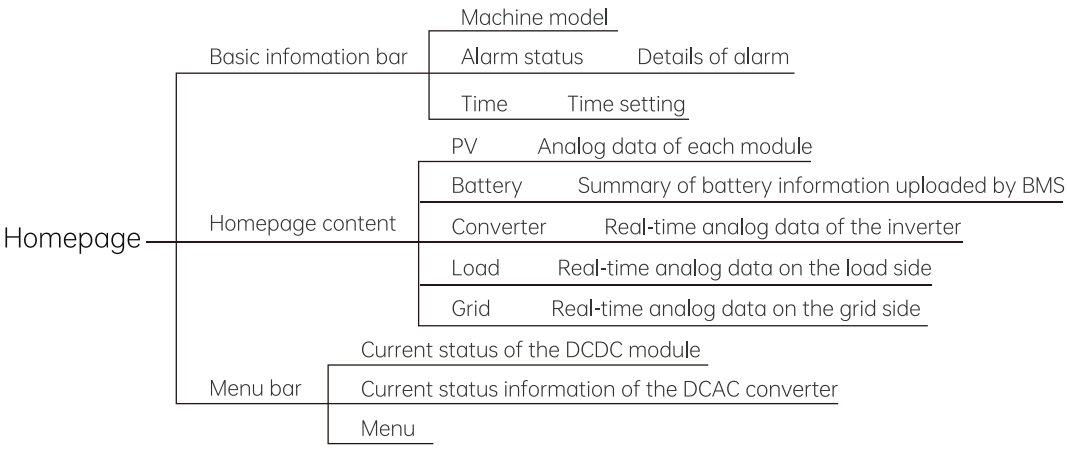
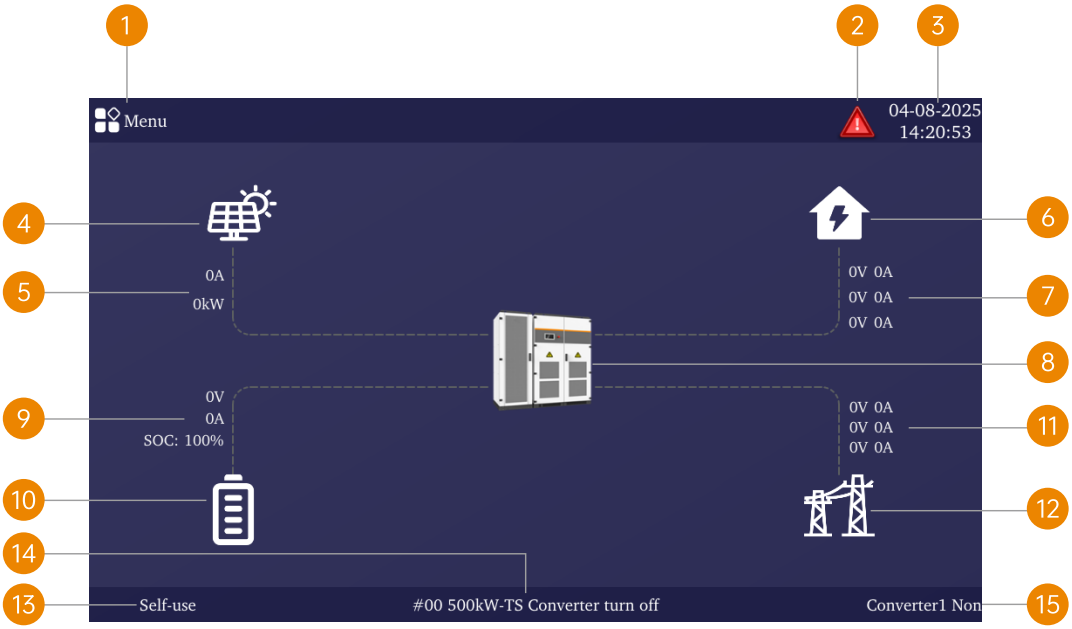



Figure 8-3 Homepage introduction



| Homepage introduction |
| --- |
| 1. Menu - Click to navigate to the menu page. |
| 2. Alarm status - Click to view current alarms. |
| 3. Time - Click to configure the time. (Figure 8-4) |
| 4. Photovoltaic (PV) - Click to navigate to the real-time data interface, where real-time analog data of each module can be monitored. |
| 5. Voltage, current, and power values of the PV. |
| 6. Load - Click to navigate to the real-time data interface, where real-time analog data of the load can be monitored. |
| 7. Voltage, current, and power values of the load. |
| 8. Inverter - Click to navigate to the real-time data interface, where real-time analog data of the inverter can be monitored. |
| 9. Battery voltage and current values collected by the Power Conversion System (PCS), and State of Charge (SOC) value transmitted by the Battery Management System (BMS). |
| 10. Battery - Click to navigate to the real-time data interface, where a summary of battery data transmitted by the BMS can be viewed. |
| 11. Three-phase (Phase A, Phase B, Phase C) voltage and current values of the grid. |
| 12. Grid - Click to navigate to the real-time data interface, where real-time analog data of the power grid can be monitored. |
| 13. Currently active working mode. |
| 14. Machine model and current status of the DC-AC converter. |
| 15. Current status of the DC-DC converter. |

Figure 8-4 Time setting

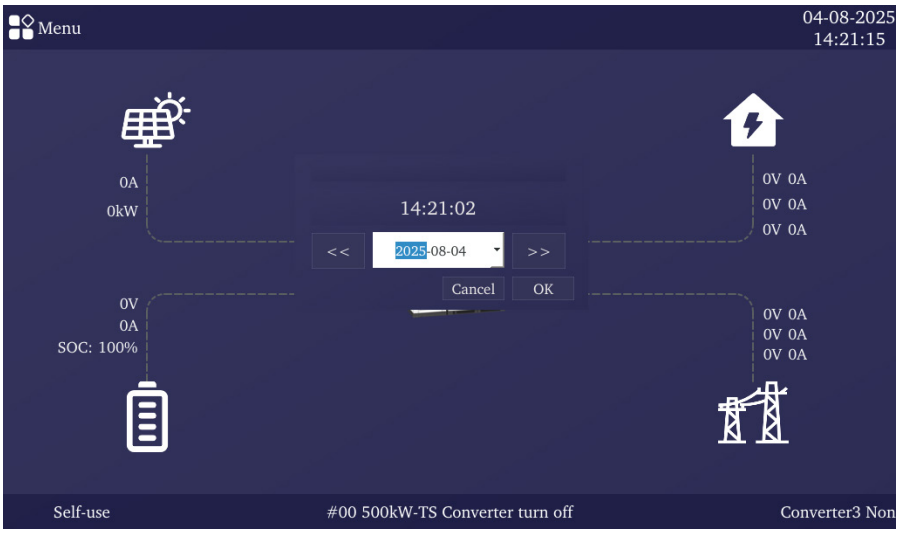
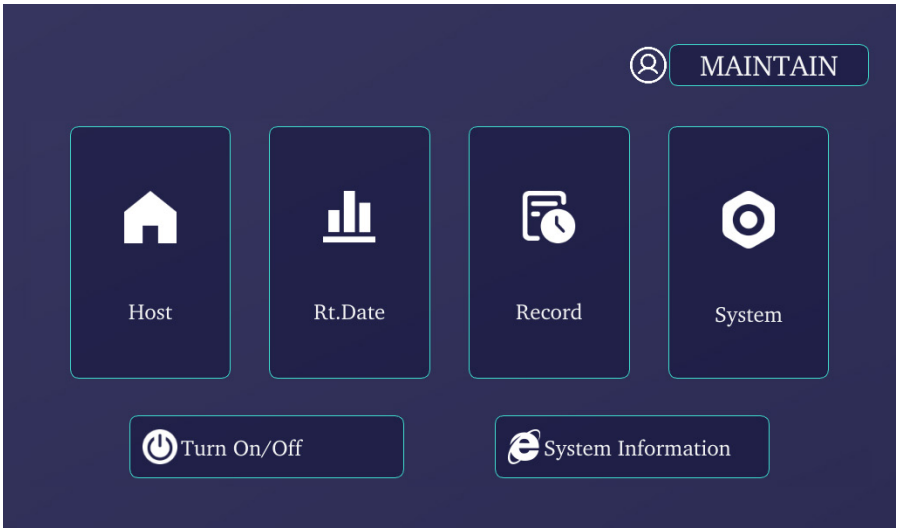


Figure 8-5 Menu




## 8.3 Menu

- The menu interface comprises seven buttons, namely User Login, Host, Real-Time Data, Records, System, Turn On/Off, and System Information. Clicking each button in the menu will navigate to the corresponding interface, as illustrated in figures 8-6 and 8-7.

Figure 8-6 Menu logic diagram

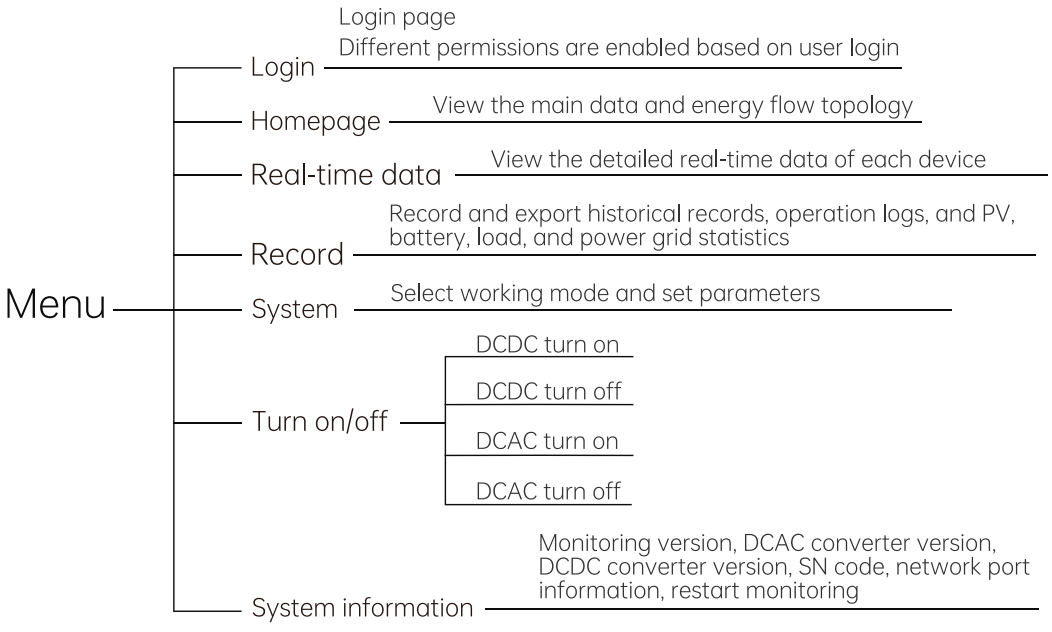


Figure 8-7 Menu page introduction


## Menu page introduction

1. User login: Click to navigate to the login page, where differentiated permissions are granted based on user roles upon authentication.

2. Host: Click to navigate to the host.

3. Real-Time Data: Navigate to the real-time data page to access the following information: (1)analog data (including voltage, current, and power) of the hybrid inverter, PV array, power grid, and electrical load; (2)operating states of critical equipment components such as circuit breakers, contactors, and the hybrid inverter; (3) battery-related data and alarms transmitted by the Battery Management System (BMS); (4) global equipment alarms.

4. Record: Supports the recording and export of historical data, operation logs, and energy statistics (including PV energy generation, battery charge-discharge capacity, and load energy consumption) associated with the PV system, energy storage battery, electrical load, and power grid.

5. System: This interface enables the selection of operating modes and configuration of relevant parameters in line with application scenarios.

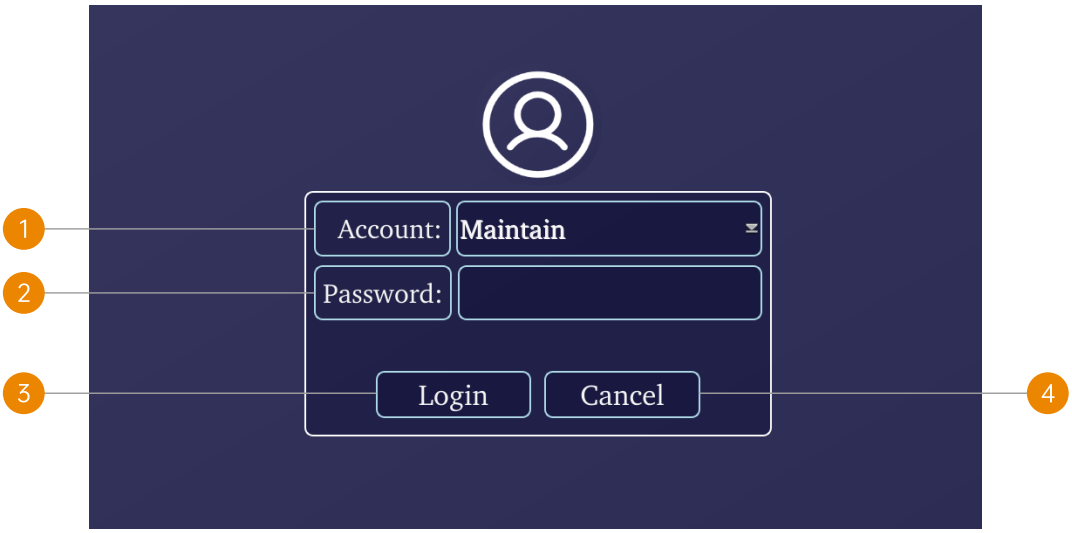
6. Turn On/Off: Access the power control interface to independently regulate the activation and deactivation of the DC-AC converter and DC-DC converter.

7. System information: View the following system-related details: monitoring system version, DC-AC converter version, DC-DC converter version, serial number (SN), and Ethernet port information.

## 8.4 Log in

- When not logged in, access to the system page to change work modes and settings is not available, and the system will automatically log out one hour after logging in; users will need to log in again.
- To log in, select the required account in the "Account" section, enter the password, and click "Login". After a successful login, you will be redirected to the homepage.
- The default password for the "User" account is 123456. In this user mode, you can modify work modes and set basic parameters, but you can only view and not set advanced parameters.

Figure 8-8 Login interface introduction




**Login interface introduction**

1. Account: The login account is automatically matched based on the entered password.

2. Password: Each account corresponds to a unique password, and the password can be modified in the advanced settings.

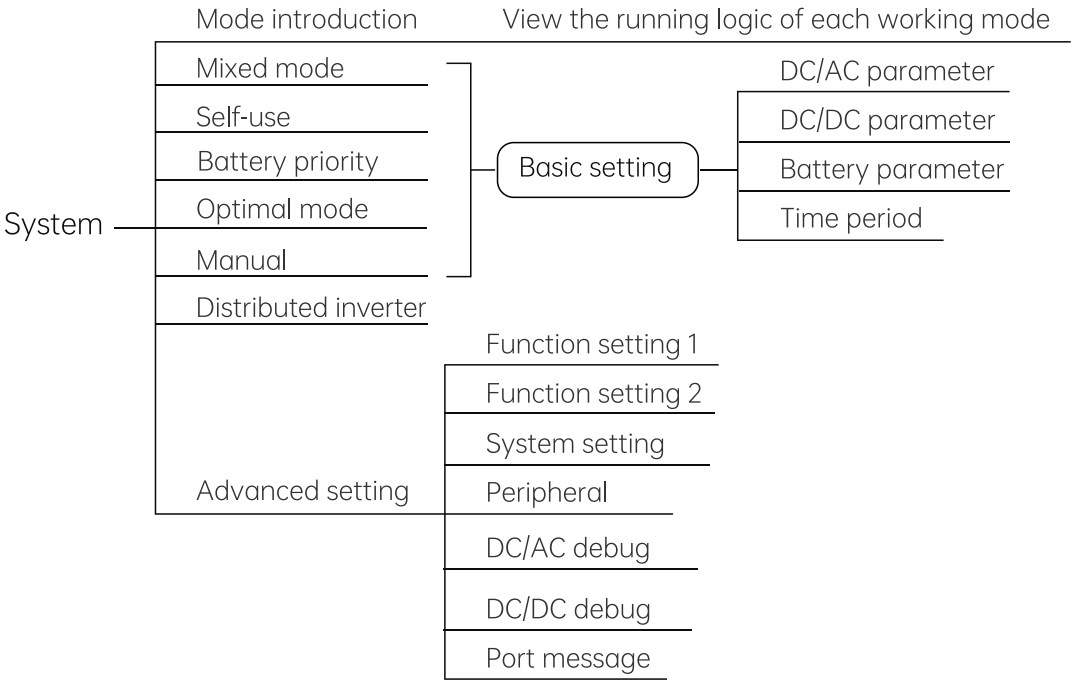
3. Login: Clicking the Login button will trigger automatic account matching based on the entered password. If the matching is successful, the login process is completed, and the system will navigate to the menu interface upon successful login.

4. Cancel: Clicking the cancel button will return to the menu interface.

## 8.5 System

- When not logged in, access to the system is restricted. Within the system, you can view introductions to various work modes, switch work modes, and view/set basic and advanced setting.
- Basic settings includes DC/AC parameter, DC/DC parameters, Battery setting parameters, Time period.
- Advanced settings consists of function settings, System settings, Peripherals, DC/AC debug, DC/DC debug, Port message.

Figure 8-9 System logic diagram




- On the system interface, the button of the currently applied and active operating mode is colored sky blue, while the buttons of inactive operating modes match the background color. As shown in figure 8-10, the self-use mode is the currently active operating mode.

**Introduction of system interface**

1. Mixed mode: Click to access the basic settings interface under mixed mode. Within this interface, the current operating mode can be switched to mixed mode, and the basic setting parameters related to Mixed mode can be configured.

2. Self-use: Click to access the basic settings interface under self-use. Within this interface, the current operating mode can be switched to self-use, and the basic setting parameters related to self-use can be configured.

3. Battery priority: Click to access the basic settings interface under battery priority. Within this interface, the current operating mode can be switched to battery priority, and the basic setting parameters related to battery priority can be configured.

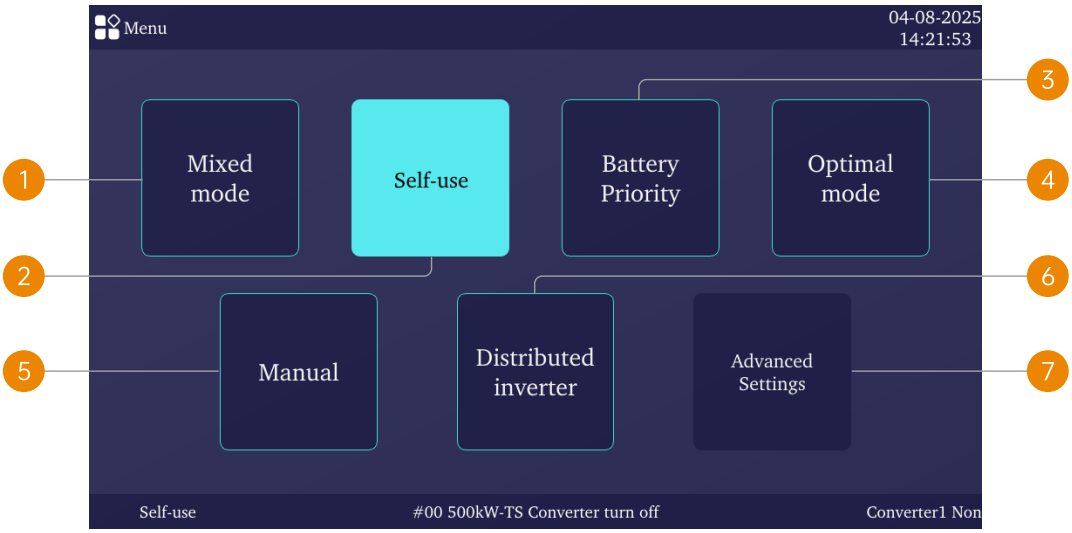
4. Optimal: Click to access the basic settings interface under optimal mode. Within this interface, the current operating mode can be switched to optimal mode, and the basic setting parameters related to optimal mode can be configured.

5. Manual: Click to access the basic settings interface under manual. Within this interface, the current operating mode can be switched to manual, and the basic setting parameters related to manual can be configured.

6. Distributed inverter: Click to access the basic settings interface under distributed inverter. Within this interface, the current operating mode can be switched to distributed inverter, and the basic setting parameters related to distributed inverter can be configured.

7. Advanced settings: Click to access the advanced settings interface.

Figure 8-10 Introduction of system interface




(1) Basic setting

- On the basic settings interface, you can switch to the previous page or next page using the page-turning buttons. Click "Mode enable" to activate the currently selected mode, and exit the basic settings interface to return to the system interface.
- Basic settings includes four pages: DC/AC parameters, DC/DC parameters, Battery setting parameters, and time period settings. On the basic settings interface, some parameters that are grayed out and unconfigurable are invalid under the currently selected operating mode.

Figure 8-11 Introduction to the basic settings interface


## Introduction to the basic settings interface

1. The title name of the currently displayed page.
2. Previous page.
3. The name of the currently selected working mode.
4. Next page.
5. The current page number and the total number of pages.
6. Mode enable: Click to apply and activate the currently selected operating mode.
7. Exit: Return to the system interface.
8. The setting parameters of the currently displayed page are displayed in this table.

(2) Advanced setting

## Introduction to the advanced settings interface

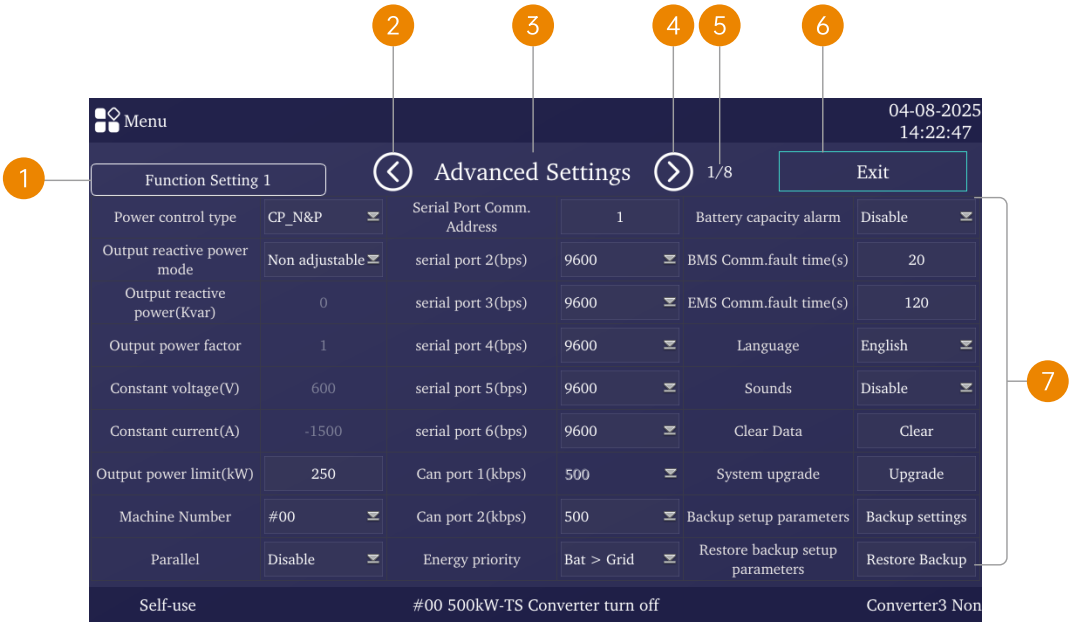
1. The title of the currently displayed page.
2. Previous page.
3. The name of the currently active interface.
4. Next page.

5. The current page number and the total number of pages.

6. Exit: Return to the system interface.

7. The setting parameters of the currently displayed page are presented in this table.

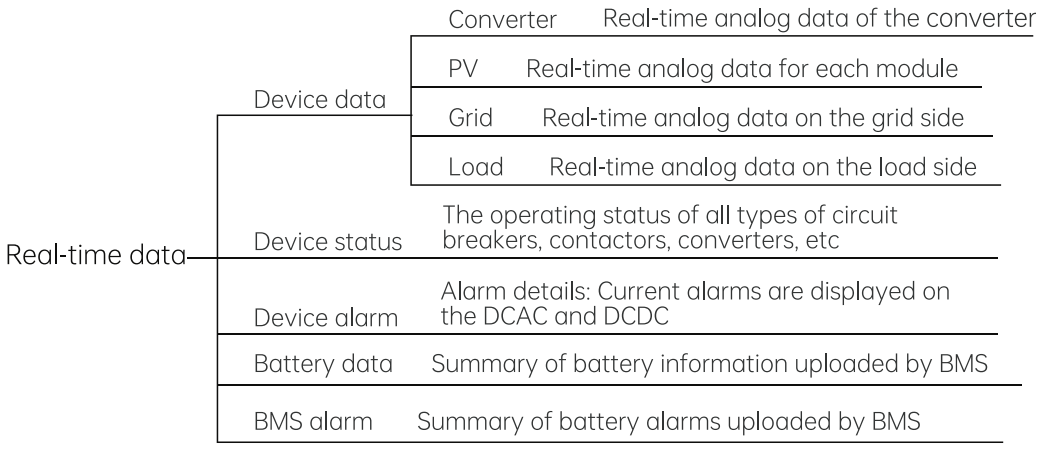
Figure 8-12 Introduction to the advanced settings interface




## 8.6 Real-time data

- Real-time data is divided into five sections: Device data, Device status, Device alarms, Battery data, and BMS alarms. Each of these sections displays real-time status data of the machine.

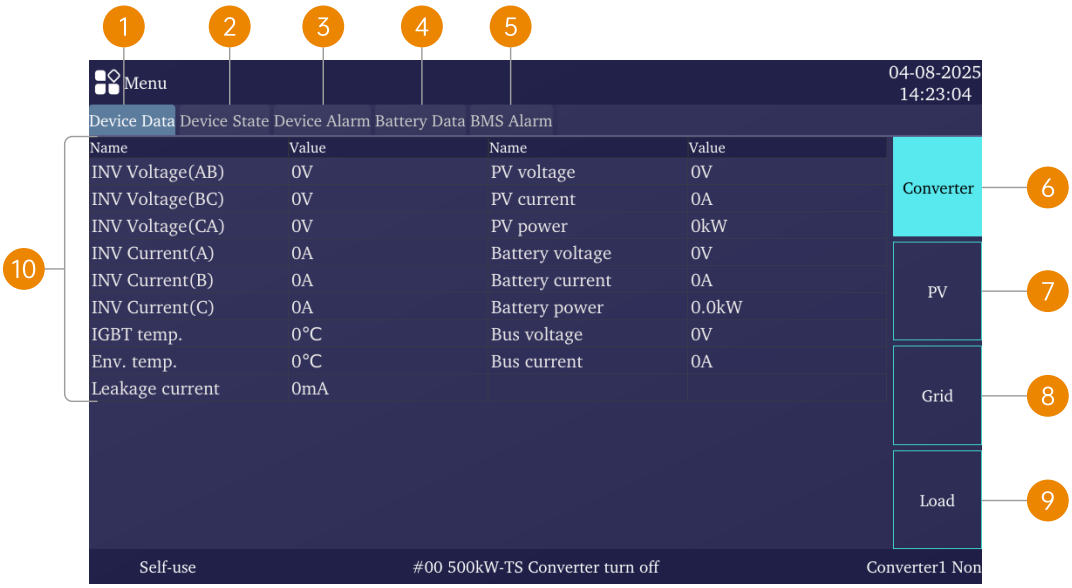
Figure 8-13 Real-time data logic diagram



(1) Device data

- This interface displays real-time data of the machine's operation, including the inverter, PV (photovoltaics), the grid, and load. By clicking the four buttons on the right, detailed data for each functional unit of the hybrid inverter device is shown. After clicking the inverter button, the interface appears as shown in the diagram.

Figure 8-14 Introduction to the real-time data interface




## Introduction to the real-time data interface

1. Device data: Detailed real-time analog data of the hybrid inverter, photovoltaic (PV) system, grid, and electrical load can be viewed here.

2. Device state: The operating status of various components such as circuit breakers, contactors, and the hybrid inverter can be viewed here.

3. Device alarms: Current alarms of the DC-AC converter and DC-DC converter can be viewed here.

4. Battery data: A summary of battery data transmitted by the Battery Management System (BMS) can be viewed here.

5. BMS alarms: Alarms transmitted by the Battery Management System (BMS) can be viewed here.

6. Inverter button: Click to view the analog data related to the hybrid inverter.

7. PV button: Click to view the analog data related to the photovoltaic (PV) system.

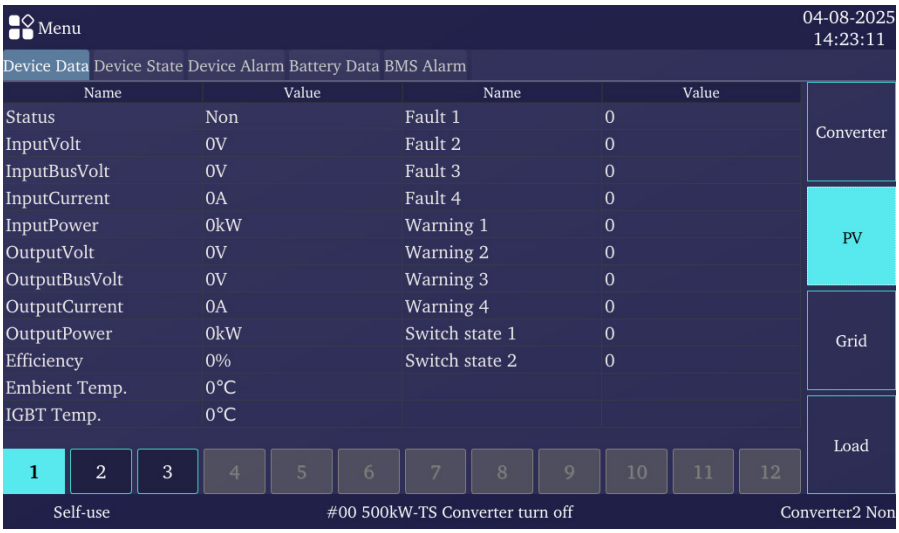
8. Grid button: Click to view the analog data related to the power grid.

9. Load button: Click to view the analog data related to the electrical load.

10. Real-time analog data is displayed in this table.

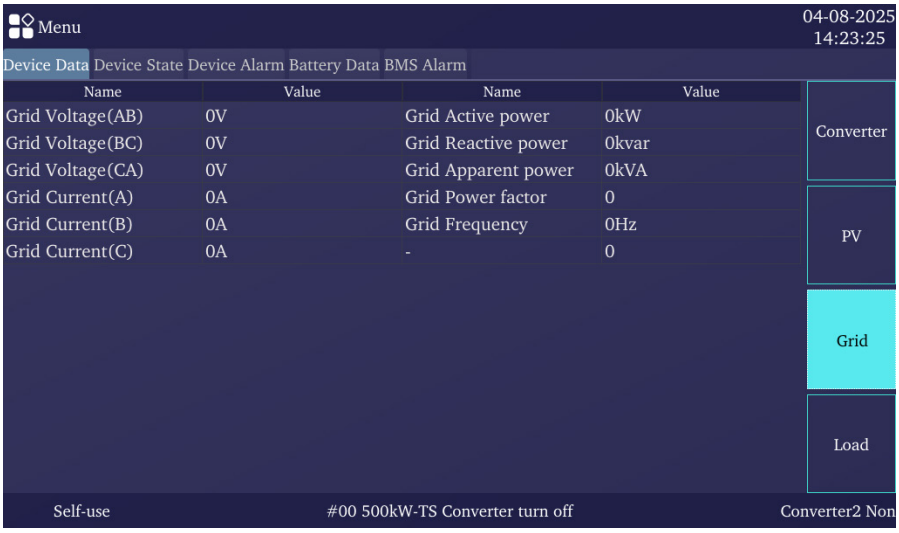
- After clicking the PV button, the interface will switch to the PV data interface. The data list on this interface includes 12 buttons representing the number of modules. Modules that are not online will appear dimmed. The interface is shown as in figure 8-15.

Figure 8-15 PV data



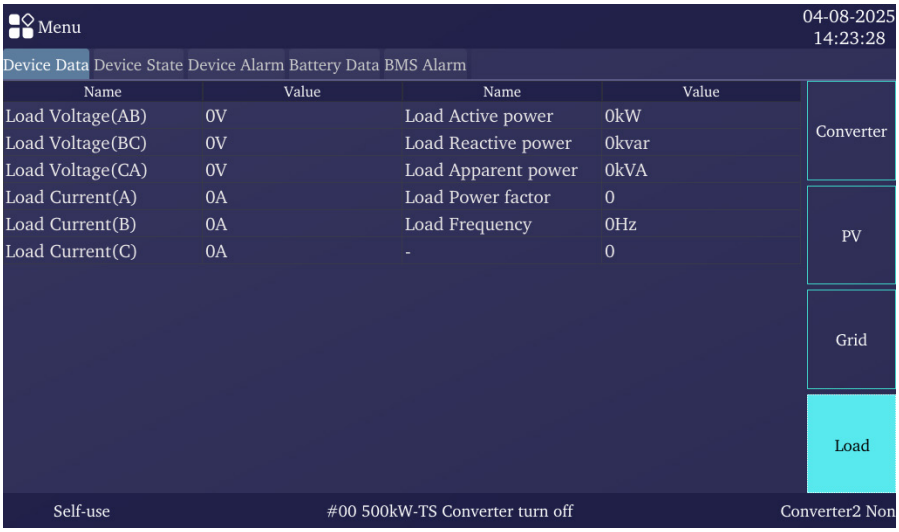

- After clicking the grid button, the interface appears as shown in figure 8-16.

Figure 8-16 Grid data




- After clicking the load button, the interface appears as shown in figure 8-17.

Figure 8-17 Load data




(2) Device status

- This interface primarily displays the operational status of various components within the hybrid inverter, such as circuit breakers, contactors, and inverters. Its purpose is to provide a more convenient and intuitive way to understand the operational status of the hybrid inverter.
- The data on this interface is organized into three columns, each entry corresponding to a specific status. The first two columns represent the real-time status of the DCAC module, and the third column represents the status of the DCDC module.
- Below the data list, there are 12 buttons representing the number of modules. Buttons for modules that are not online will appear dimmed. Clicking on a module number will update and display the real-time status for that specific module.

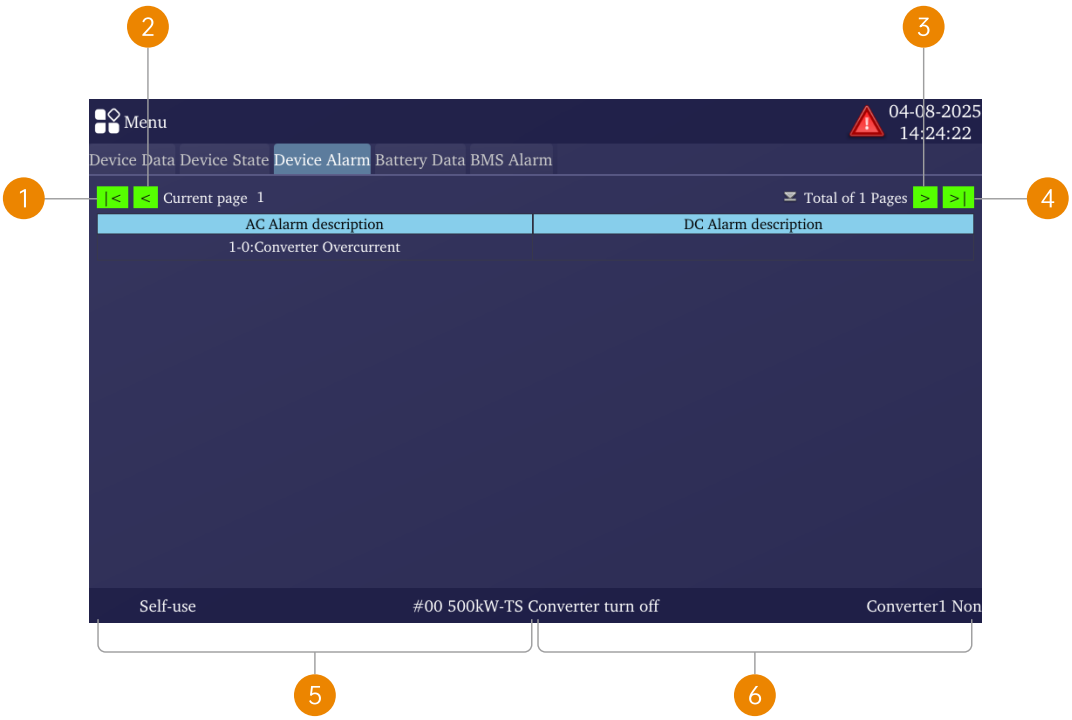
Figure 8-18 Device status interface introduction

| Device status interface introduction |
| --- |
| 1. Display the status of the DC-AC converter. |
| 2. Display the status of the DC-DC converter. |
| 3. Select a module number, and the PV (Photovoltaic) status corresponding to the selected module number will be updated in the interface referred to in Item 2. |

(3) Device alarm

- This interface is designed to display faults and alarms that occur during the operation of the machine, including descriptions of alarms related to DCAC and DCDC components.
- Users can view the total number of alarm pages as well as the current page number. By clicking on the page number box, users can select a specific page, or they can navigate through the pages using the "<" and ">" buttons for previous and next pages, respectively. The "|<" and ">|" symbols represent the first and last pages. When faults occur during machine operation, this interface allows users to understand the causes of these faults, facilitating effective troubleshooting.

Figure 8-19 Device alarm interface introduction




| Device alarm interface introduction |
| --- |
| 1. \|<: Click to navigate the alarm description page to the first page. |
| 2. <: Previous page. |
| 3. >: Next page. |

4. >|: Click to navigate the alarm description page to the last page.

5. DC-AC alarm description: Displays the currently triggered DC-AC converter alarms.

6. DC-DC alarm description: Displays the currently triggered DC-DC converter alarms.

(4) Battery data (Lithium battery)

- This interface displays battery data uploaded by the Battery Management System (BMS).

Figure 8-20 Lithium battery data interface introduction


## Lithium battery data interface introduction

1. Battery voltage: Total voltage of the battery pack transmitted by the Battery Management System (BMS).

2. Battery current: Total current of the battery pack transmitted by the Battery Management System (BMS).

3. SOC: State of charge of the battery pack transmitted by the Battery Management System (BMS), defined as the percentage of the battery's current remaining capacity relative to its rated capacity.

4. SOH: State of health of the battery pack transmitted by the Battery Management System (BMS), defined as the percentage of the battery pack's available capacity (when fully charged) relative to its initial factory capacity.

5. Cell voltage (max): Maximum voltage of individual battery cells transmitted by the Battery Management System (BMS).

6. Cell voltage (min): Minimum voltage of individual battery cells transmitted by the Battery Management System (BMS).

7. Cell temp. (max): Maximum temperature of individual battery cells transmitted by the Battery Management System (BMS).

8. Cell temp. (min): Minimum temperature of individual battery cells transmitted by the Battery Management System (BMS).

9. Charging current limite: Charging current limit transmitted by the Battery Management System (BMS).

10. Discharging current limite: Discharging current limit transmitted by the Battery Management System (BMS).

11. Allowable charging power: Permissible charging power transmitted by the Battery Management System (BMS).

12. Allowable discharging power: Permissible discharging power transmitted by the Battery Management System (BMS).

13. Alarm level: Alarm level transmitted by the Battery Management System (BMS). Specifically, Level 1 alarm is indicated in yellow, Level 2 in orange, and Level 3 in red; by default, the hybrid inverter does not respond to Level 1 and Level 2 alarms, while it shuts down upon the occurrence of Level 3 alarms.

14. Charging enable: Battery status transmitted by the Battery Management System (BMS). "Enable" indicates that the battery is permitted to charge, while "Disable" indicates that charging is prohibited for the battery.

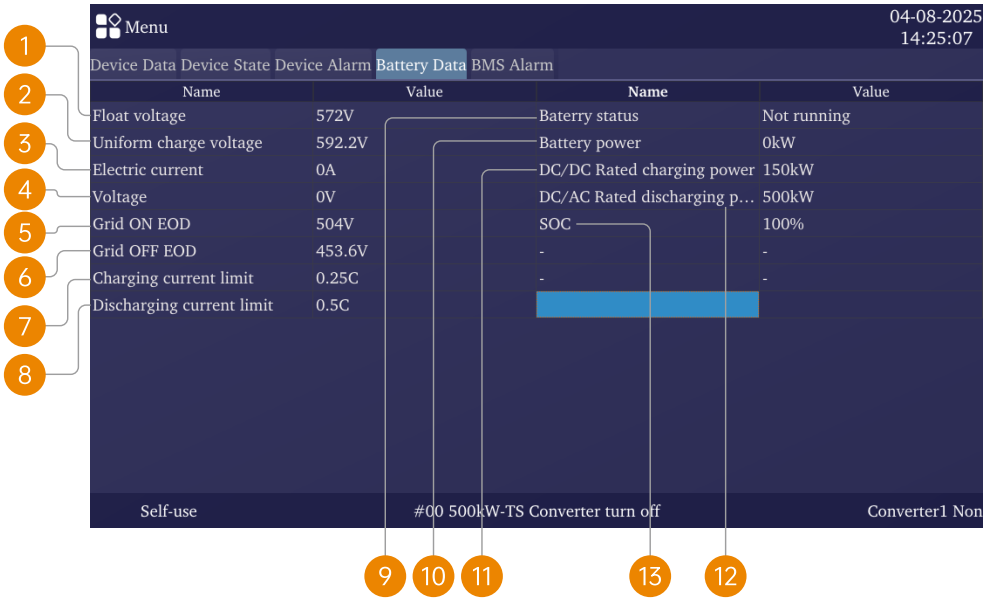
15. Discharging enable: Battery status transmitted by the Battery Management System (BMS). "Enable" indicates that the battery is permitted to discharge, while "Disable" indicates that discharging is prohibited for the battery.

16. Alarm level color indication: Color indication example corresponding to the current alarm level.

(5) Battery data (lead-acid battery)

- This interface is for lead-acid battery data.

Figure 8-21 Lead-acid battery interface introduction



## Lead-acid battery interface introduction

1. Float voltage: Calculated as the product of the set float charge voltage per battery cell and the number of battery cells.

2. Uniform charge voltage: Calculated as the product of the set equalizing charge voltage per battery cell and the number of battery cells.

3. Electric current: DC-side current of the hybrid inverter.

4. Voltage: DC-side voltage of the hybrid inverter.

5. Grid ON EOD: End-of-Discharge (EOD) voltage in grid-connected mode.

6. Grid OFF EOD: End-of-Discharge (EOD) voltage in off-grid mode.

7. Charging current limit: Maximum allowable current on the battery side to prevent overcurrent during charging (upper limit: 0.25C).

8. Discharging current limit: Maximum allowable current on the battery side to prevent overcurrent during discharging (upper limit: 0.5C).

9. Battery status:  Monitors the operating status of the battery.

10. Battery power: Current charge-discharge power of the battery.

11. DC/DC rated charging power: Total rated power of the DC/DC module on the DC side.

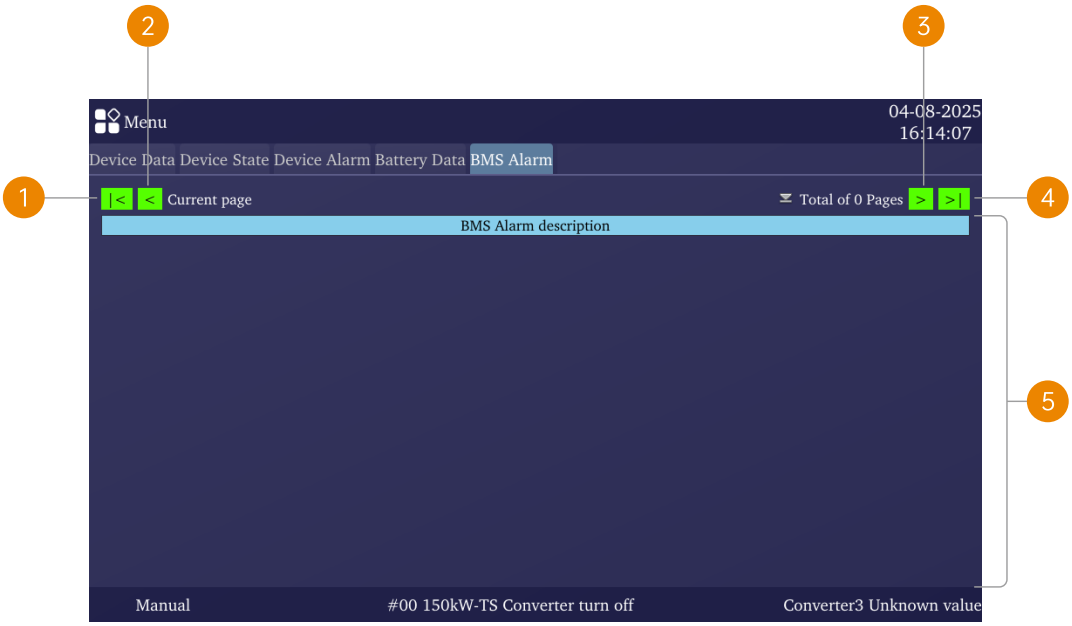
12. DC/AC rated charging power: Rated power of the DC/AC converter on the AC side, consistent with the rated power of the inverter model.

13. SOC (State of Charge): Current SOC of the battery calculated based on the total battery voltage, defined as the percentage of the battery's current remaining capacity relative to its rated capacity.

(6) BMS alarm

- This interface is designed to display fault and alarm information uploaded by the battery management system (BMS).
- Users can view the total number of alarm pages as well as the current page number. By clicking the page number box, users can select a specific page, or they can navigate through the pages using the "<" and ">" buttons for moving backward and forward, respectively. The "|<" and ">|" symbols represent the first and last pages respectively. When the BMS detects and uploads an alarm or fault, users can view this interface to understand the cause of the fault, facilitating effective troubleshooting.

Figure 8-22 BMS alarm interface introduction



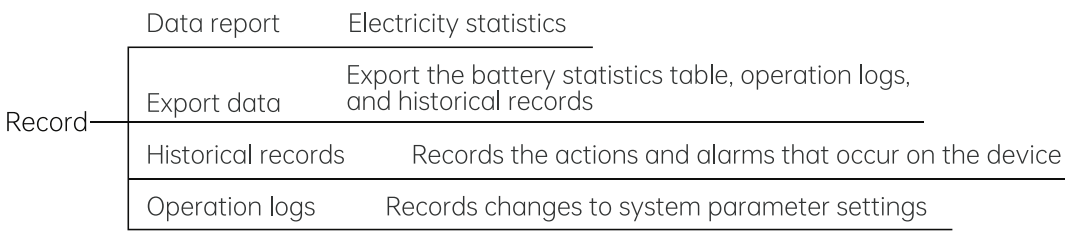

**BMS alarm interface introduction**

1. |<: Click to navigate the BMS alarm description page to the first page.
2. <: Previous page.
3. >: Next page.
4. >|: Click to navigate the BMS alarm description page to the last page.
5. BMS alarm description: Displays the currently triggered alarms from the Battery Management System (BMS).

## 8.7 Record

- This section includes four functional areas: Data reports, Export data, Historical records, and operation logs. These features are designed to track the charging and discharging amounts of the equipment, record the system's operational history and logs, facilitating easy querying and tracing.

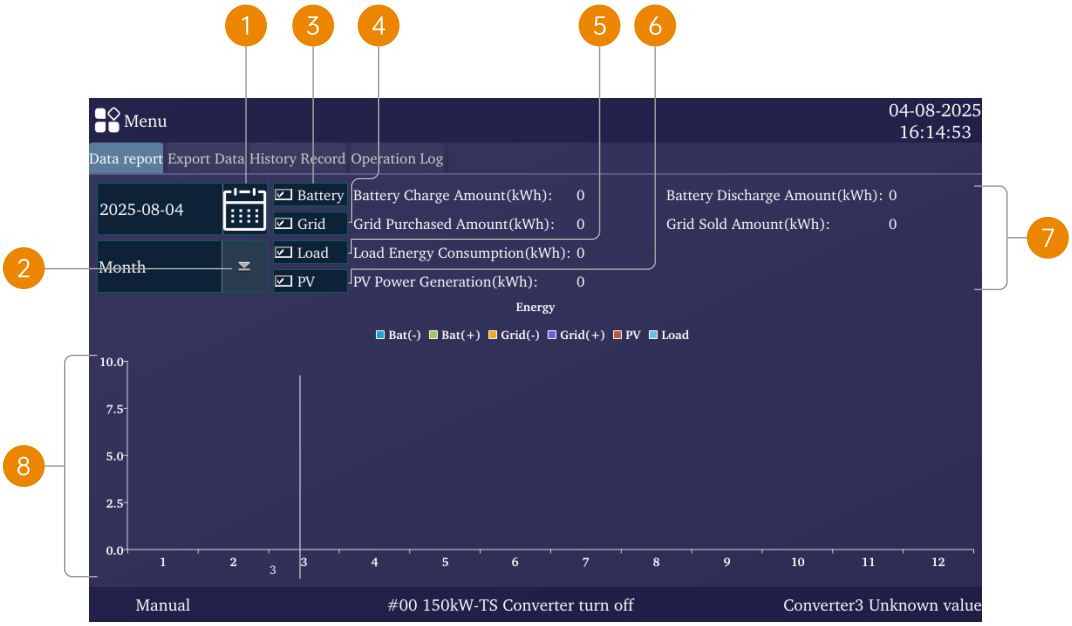
Figure 8-23 Record logic diagram



(1) Data reports

- This section logs the charging and discharging data for PV (photovoltaics), load, battery, and the grid, including daily, monthly, yearly, and total electricity amounts.
- There is a time query button on the right side, which allows users to search for electricity data on specific dates.
- Users can set the year by clicking the "Year+" or "Year-" buttons, with each click increasing or decreasing the year by one. The month and day can also be adjusted in a similar manner to view reports for specific dates.

Figure 8-24 Data reports interface introduction




## Data reports interface introduction

1. Calendar: Click to open the calendar and select the corresponding date for viewing the energy statistics of that date.

2. Bar chart display: Switch the bar chart to display in daily, monthly, or annual formats.

3. Battery: After checking this option, the bar chart data of the battery's charge-discharge energy will be displayed in the bar chart.

4. Grid: After checking this option, the bar chart data of the grid's charge-discharge energy will be displayed in the bar chart.

5. Load: After checking this option, the bar chart data of the load's energy consumption will be displayed in the bar chart.

6. PV: After checking this option, the bar chart data of the PV system's energy generation will be displayed in the bar chart.

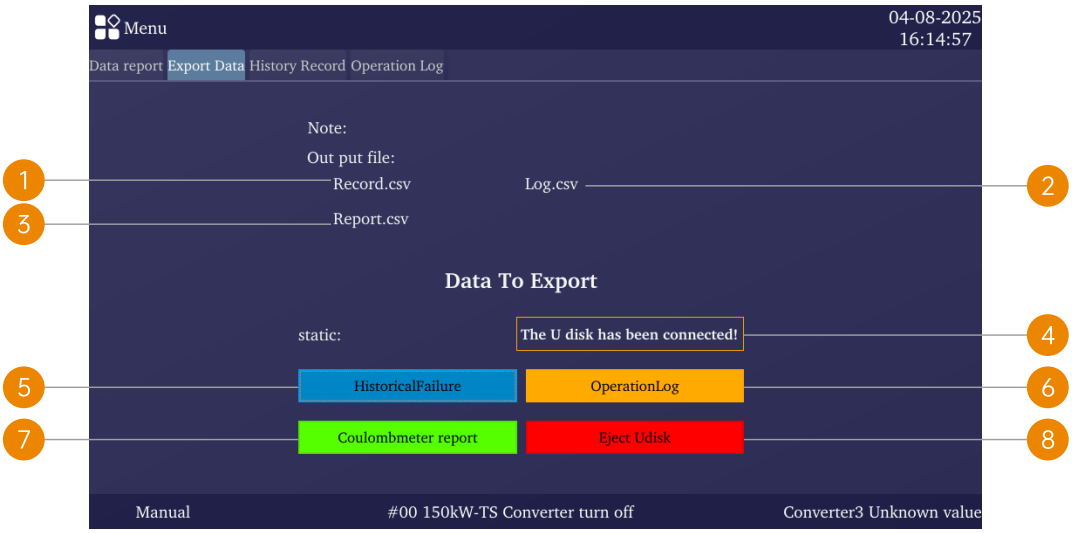
7. Energy statistics of the currently viewed time period.

8. Bar chart: You can slide the cursor to view the electricity statistics for the corresponding period.

(2) Export data

- This interface is used for data export. Initially, it requires that the USB drive be formatted in FAT32. Users should check the status bar to see if the USB drive is inserted. If the interface indicates that the U disk has been connected, users can select the type of data they wish to export and click on the export data button. Once the data export is complete, clicking the 'Eject udisk' button will finalize the data export process.

Figure 8-25 Data export interface introduction




## Data export interface introduction

1. The file name of the exported historical records to the USB flash drive is Record.csv.

2. The file name of the exported operation logs to the USB flash drive is Log.csv.

3. The file name of the exported energy statistics table to the USB flash drive is Report.csv.

4. USB flash drive status display: The connection status of the USB flash drive can be viewed here.

5. HistoricalFailure export button: Used to export historical records. Clicking this button will export the historical records to the USB flash drive; the exported file is Record.csv, which needs to be opened with excel.

6. OperationLog export button: Used to export operation logs. Clicking this button will export the operation logs to the USB flash drive.

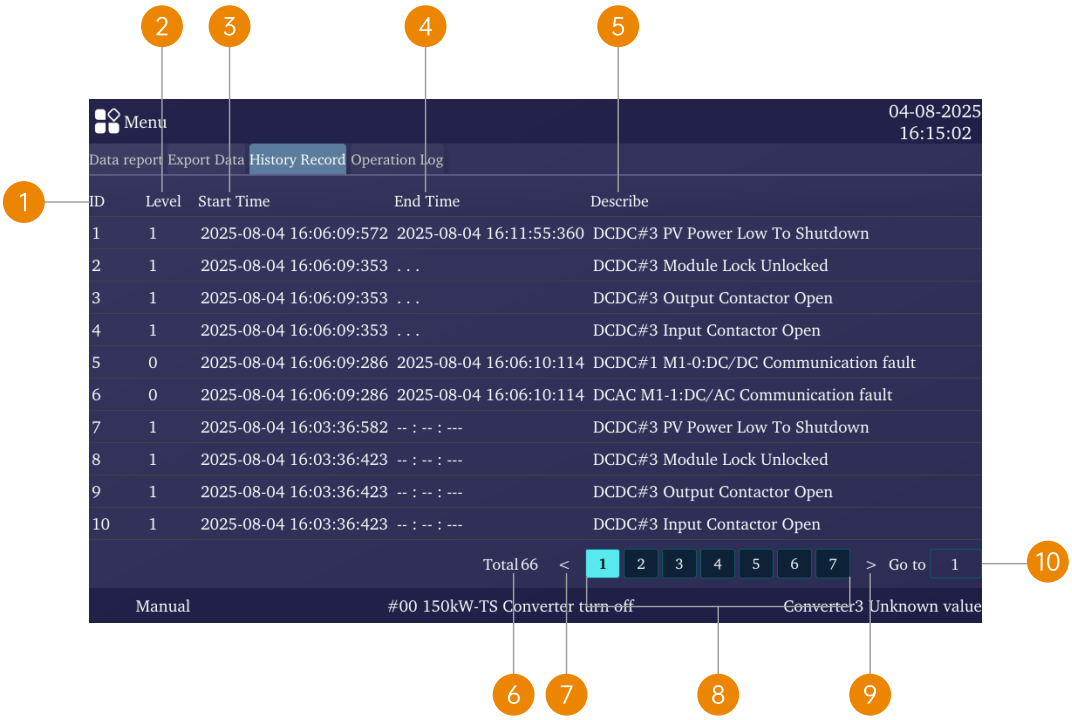
7. Coulombmeter report export button: Used to export the energy statistics table. Clicking this button will export the energy statistics table to the USB flash drive.

8. Eject udisk.

(3) Historical records

- This interface is designed to log the start and end times of status records and fault records that occur during the operation of the equipment.

Figure 8-26 Historical records interface introduction




## Historical records interface introduction

1. Event serial number: Serial number of events counted starting from the latest alarm.

2. Level: A value of "0" indicates an alarm event (this item will turn red), while a value of "1" indicates a status event.

3. Event start time.

4. Event end time.

5. Event description.

6. Total number of events: Total number of event entries in the historical records.

7. <: Previous page.

8. Quick page navigation: Allows viewing of the currently displayed page and adjacent pages, with direct navigation to the corresponding page via click.

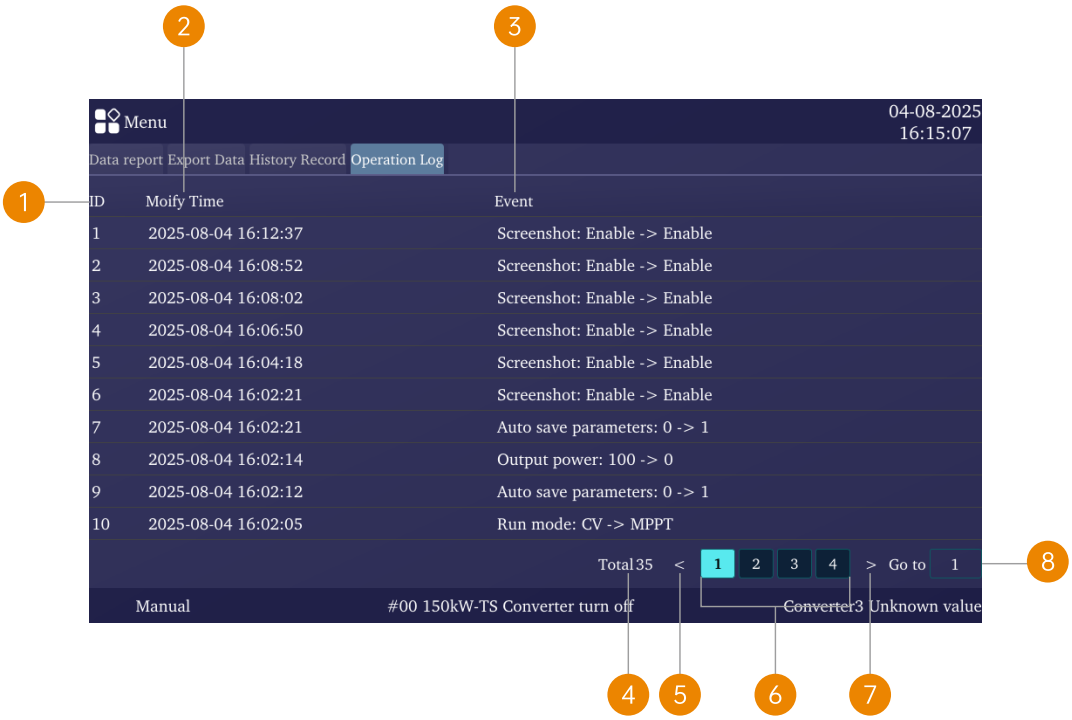
9. >: Next page.

10. Page number navigation: Navigates to the corresponding page based on the entered page number.

(4) Operation logs

- This interface is used to record the modifications made to some of the system's important parameters.

Figure 8-27 Operation log interface introduction




## Operation log interface introduction

1. Log serial number: Serial number of operation logs counted starting from the latest operation log.

2. Event start time.

3. Description of changes during the operation process.

4. Total number of logs: Total number of entries in the operation logs.

5. <: Previous page.

6. Quick page navigation: Enables viewing of the currently displayed page and adjacent pages, with direct navigation to the target page via clicking.

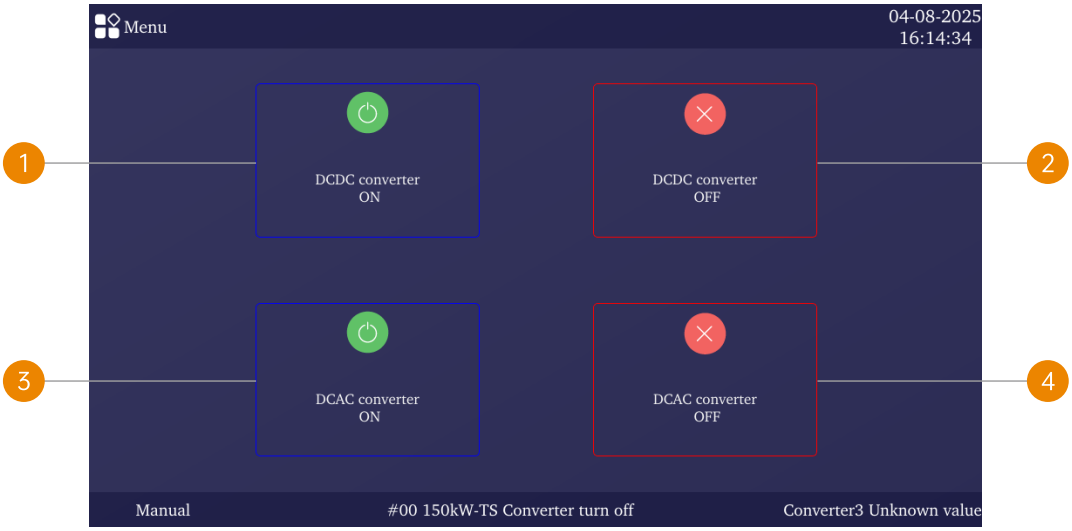
7. >: Next page.

8. Page number navigation: Navigates to the corresponding page based on the entered page number.

## 8.8 Turn on/off

- The opening and closing of DCAC converter and DCDC converter can be controlled by the interface.

Figure 8-28 Turn on/off interface introduction




| Turn on/off interface introduction |
|---|
| 1. Click to activate the DC-DC converter. |
| 2. Click to deactivate the DC-DC converter. |
| 3. Click to activate the DC-AC converter. |
| 4. Click to deactivate the DC-AC converter. |

## 8.9 System information

- The system information interface displays the version information of the current running system, such as the monitoring version, the DCAC converter version, the DCDC converter version and the network port information.

| System information interface introduction |
|---|
| 1. Display version information of each component in the current system. |
| 2. Ethernet port: Switch to display the port information of the currently monitored ethernet port. |

3. Server port: The port number of the server address; clicking this option will restart the monitoring device.

4. Auto-obtain: Switch the IP address type of the current ethernet port to DHCP.

5. Static: Switch the IP address type of the current ethernet port to a static IP address.

6. Display the information of the currently monitored ethernet port.

7. Clicking this option will restart the monitoring device.

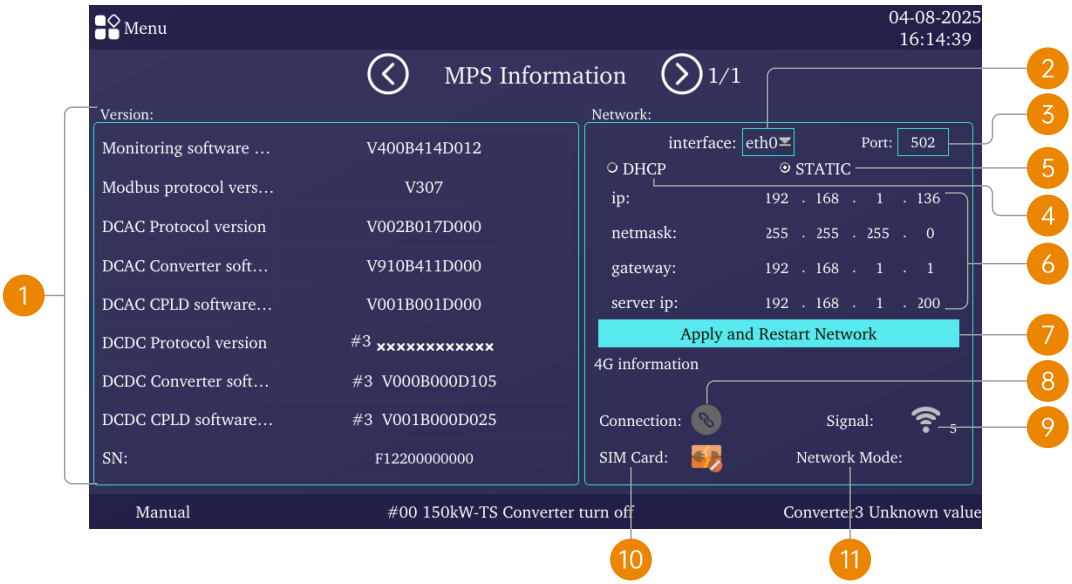
8. Display the current network connection status, which is used to determine whether the monitoring system is currently connected to the server for data upload.

9. Current signal strength of the SIM card.

10. Current insertion status of the SIM card.

11. SIM network connection mode.

Figure 8-29 System information interface introduction




## 8.10 Wireless frequency band and maximum transmission power

- Manufacturer: Shenzhen Megarevo Technology Co., Ltd.
- Manufacturer's address: Building 2, Winlead, Shutianpu Community, Matian Street, Guangming District, Shenzhen City, Guangdong Province, P.R.China.

- The ES series products mainly realize the monitoring of energy storage devices and have the function of integrated display and control. The main interfaces include HMI, 485, network port, CAN, DIO and USB. It has the function of 4G cellular network communication.

- The 4G communication module (model: Quectel EG25-G Mini PCIe) used in this product supports the following 4G LTE frequency bands in hardware:

  LTE-FDD: B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B25, B26, B28.

  LTE-TDD: B38, B39, B40, B41.

  WCDMA: B1/B2/B4/B5/B6/B8/B19.

- Which frequency bands are specifically enabled in actual use of the product depends on the software configuration and the network environment of the local operator.

- Maximum radio-frequency power:

  Class 4 (33dBm ± 2dB) for GSM850

  Class 4 (33dBm ± 2dB) for EGSM900

  Class 1 (30dBm ± 2dB) for DCS1800

  Class 1 (30dBm ± 2dB) for PCS1900

  Class E2 (27dBm ± 3dB) for GSM850 8-PSK

  Class E2 (27dBm ± 3dB) for EGSM900 8-PSK

  Class E2 (26dBm ± 3dB) for DCS1800 8-PSK

  Class E2 (26dBm ± 3dB) for PCS1900 8-PSK

  Class 3 (24dBm +1/-3dB) for WCDMA bands

  Class 3 (23dBm ± 2dB) for LTE-FDD bands

  Class 3 (23dBm ± 2dB) for LTE-TDD bands

# 9 Maintenance and trouble shooting

## 9.1 Description

Due to the influence of ambient temperature, humidity, dust and vibration, the internal devices of hybrid inverter will be aging, which will affect the performance of hybrid inverter and can even lead to failure.

Therefore, it is necessary to carry out routine and regular maintenance of hybrid inverter to ensure its normal operation and service life. All measures and methods to help the hybrid inverter in good working condition belong to the scope of maintenance work.

If there is a malfunction, with the help of this manual, you still can't solve the problem. Please contact us. At the same time, provide some information in order to provide you with better service:

- Photographs of fault site.
- Type and serial number of hybrid inverter.
- Information on components connected to hybrid inverter, configuration of energy storage batteries and network parameters.
- Communication connection scheme of hybrid inverter.
- Fault information and brief description.

## 9.2 Matters needing attention

### 9.2.1 General safety rules

In order to ensure the safety of the operators, the following five safety rules must be observed when maintaining or overhauling the hybrid inverter:

- Disconnect all external connections of the hybrid inverter and the internal power supply of the equipment.
- Ensure that the hybrid inverter is not accidentally re-energized.
- Use the multimeter to ensure that the internal of the hybrid inverter is completely uncharged.
- Ensure that the hybrid inverter is well grounded.
- The operating part is close to the parts that may be electrified. It needs to be covered with insulation material.


- Only qualified and authorized personnel can maintain the hybrid inverter and other operations.
- In the maintenance work, do not leave screw, washer and other metal parts in the hybrid inverter to avoid damage to the hybrid inverter!


- If only the circuit breaker is disconnected, the cable connection terminals in the AC/DC cabinet of the hybrid inverter are still live!
- Before opening the cabinet door and starting the formal maintenance work, it is necessary to disconnect not only the circuit breaker, but also the front and back stage circuit breakers of the hybrid inverter.


- After the hybrid inverter is out of operation, please wait at least 15 minutes before operating it.

### 9.2.2 Maintenance work

Table 9-1 Maintenance work item sheet

| Maintenance item | Description | Recommended time |
|---|---|---|
| Save record | Export data with USB and save backup. | 1 month |
| Hybrid inverter inspection | Observe whether the appearance of hybrid inverter is damaged, deformed or rusted.<br>Listen to the abnormal sound of the hybrid inverter.<br>LCD was used to observe the running parameters.<br>Use thermal imager and other detection systems to detect the heating status.<br>Check whether the ventilation, ambient temperature, humidity and dust around the hybrid inverter meet the requirements. | Half a year |
| Duct cleaning | Check duct dust.<br>Listen to if there is any abnormal vibration when the fan is running.<br>Use compressed air and turn on the fan for cleaning.<br>Clean or replace the air filter. | Half a year (If the environment is harsh, shorten the time as appropriate) |
| Security function | Check whether the EPO button is invalid.<br>Check whether the LCD closed hybrid inverter function is invalid. | Half a year |
| Circuit connection | Check all electrical connections for loose or poor contact.<br>Check the surface of all cables and metal surfaces for damage or scratch.<br>Check that the insulation bandage of all terminals is off.<br>Check screw position for signs of overheating.<br>Check the color change of the copper bars and bolts. | 1 year |
| Breaker maintenance | Check all circuit breakers for failure.<br>Check whether the circuit breaker or load switch is damaged. | 1 year |
| Signs check | Check device warning signs and other equipment labels.<br>If signs are blurred or damaged, please replace it in time. | 1 year |


- Due to the capacitance of DC bus, it will take at least 15 minutes to wait until the hybrid inverter is completely cut off. Before removing the dust, please use the multimeter measurement to confirm that there is no electricity in the machine, so as to avoid electric shock.


- The majority of maintenance work can only be carried out by removing the protective net cover inside the machine. At the end of all maintenance work, it is necessary to restore all dismantled maintenance covers to their original state. Make sure all screws are tightened in place.

- Only the recommended product routine maintenance cycle is included in the table. The actual maintenance cycle should be determined according to the specific installation environment of the product. The maintenance cycle of the product will be affected by factors such as the scale of the power plant, the location of the plant and the on-site environment. It is necessary to shorten the maintenance cycle and increase the maintenance frequency if the wind and sand in the operation environment are larger or the dust is thicker.

### 9.2.3 Check and replace the air filter

- Read the safety instructions carefully.
- Open the cabinet door.
- Check the air filter and remove it with a screwdriver if necessary.
- Check the cleanliness of cabinet. If necessary, use a soft cloth or vacuum cleaner for cleaning.
- Close the cabinet door.

### 9.2.4 Replacement of electronic components

- When replacing the electronic and electrical components in the hybrid inverter, be sure to replace the same type of components from the same manufacturer! The type of components can be obtained by identifying the hybrid inverter or the product itself. If not, please contact us.
- If it is necessary to replace the products of other manufacturers or different models of the same manufacturer, it must be confirmed by our engineers in advance. Otherwise, we will not be liable for casualties or property losses that may result from this.

## 9.3 Fault handling

### 9.3.1 Troubleshooting

When the hybrid inverter can't output as expected or the charge and discharge quantity changes abnormally, please pay attention to the following items:

- Open-circuit voltage of energy storage battery.
- Whether the machine is in the state off ailure.
- Whether the power grid is connected correctly and powered on.
- Check whether the communication of measuring equipment is normal.


- Under the condition of failure, there may still be fatal high voltage inside the hybrid inverter! Only technicians who meet the requirements can perform the operations described in this chapter. "Compliance with requirements" means that operators have participated in professional training on equipment troubleshooting operations in the early stage. Please perform only the troubleshooting operations described in this manual. When operating, please observe all safety operation specifications.

### 9.3.2 Non-alarm inducing failure

Machine working noise is high:

- Check whether the power is in the normal range; Measure whether the grid-connected current and voltage waveforms are normal; Check the replacement of cooling fans.

Network communication mode:

- Please check whether the IP address, subnet mask and gateway are set correctly.
- Check whether the communication line is through and whether it is well connected.
- If all the above tests are normal and correct, try to replace the LCD monitoring board.

Serial communication mode:

- Check the wiring, check all wiring is good, A/B has no connection.
- Communication adapter does not match. Replace communication adapter and try again.
- Check whether the local address and baud rate are consistent with the upper computer.

LCD screen cannot be switched on and off:

- Check the communication connection between LCD screen and DSP board.

### 9.3.3 Alarm malfunction and handling method

LCD can display alarms, and the corresponding solutions are shown in table 9-2 below.

Table 9-2 DCAC alarm fault handling method

| Fault type | Handling method |
|---|---|
| Converter overcurrent | Shutdown to check whether the input and output of the hybrid inverter are short-circuited or overloaded. |
| The converter limits current wave by wave | Shutdown, troubleshoot the fault, and turn on the machine after the fault is rectified. |
| Converter fault | Shutdown, repeat the hybrid inverter before starting the check operation. |
| Low battery voltage | Disconnect DC load switch and check DC side voltage and battery configuration. |
| Battery charging is not allowed | Shutdown, check battery parameters, and start the battery. |
| Parallel communication fault | Check parallel wire connection and screen parallel settings. |
| Bus overvoltage fault | Shutdown check the DC voltage. |
| DC bus short circuit fault | Shutdown checks the DC bus cables. |
| Open output contactor | Shutdown to check whether the AC contactor is damaged. |
| Output contactor short circuit | Shutdown to check whether the AC contactor is damaged. |
| Converter is overheated | Shutdown: Check whether the hybrid inverter fan is faulty and whether the air duct is unobstructed. |
| Overload | Shutdown, check the load size. |
| Battery connection is reversed | Shutdown: Switches the DC input bus. |

| Fault type | Handling method |
|---|---|
| DC contactor fault | Shutdown, check whether the DC contactor is damaged. |
| Battery overcurrent | Shutdown, check BMS data and battery current. |
| Converter phase fault | Shutdown: Check the AC line. |
| Leakage current alarm | Shutdown, check cables and devices for electrical leakage. |
| Low battery capacity | Shutdown, check BMS data and battery current. |
| Network overvoltage | Shutdown: Check the voltage of the node. |
| Grid undervoltage | Shutdown: Check the voltage of the node. |
| Power grid voltage reverse sequence | Turn off the power supply switch and shut down the power grid to check the three-phase cables. |
| Power grid frequency anomaly | Shutdown Check the power grid voltage and frequency. |
| Island protection | Shutdown. |
| Drive line fault | Shutdown, check whether the internal drive cable is loose. |
| Arrester fault | Shutdown, check the lightning protection of the hybrid inverter. |
| Insulation impedance anomaly | Shutdown, check whether the hybrid inverter is grounded and whether the cables are aged or damaged. |
| Battery discharge is not allowed | Shutdown, check battery parameters, and start the battery. |
| Inversion overvoltage fault | Shutdown: Check whether the input and output voltage of the hybrid inverter is overloaded. |
| 15V power supply fault | Shutdown, check the AC and DC auxiliary power modules. |
| Ac fan fault | Shutdown,  check the AC fan. |
| Battery failure | Shutdown, check the battery. |
| Emergency shutdown | Shutdown. |
| Output short circuit | Shutdown, check the hybrid inverter settings. |
| CT or hall open circuit fault | Shutdown, check the CT or hall cables. |

Table 9-3 DCDC alarm fault handling method

| Fault type | Handling method |
|---|---|
| Converter overcurrent | Shut down, check whether the input and output are short-circuited or the hybrid inverter is overloaded. |
| Input bus overvoltage | Shut down, disconnect the input and output switches, check the voltage on the input side, and restart after the fault is cleared. |
| Output bus overvoltage | Shut down, disconnect the input and output switches, check the voltage on the output side, and restart after the fault is cleared. |
| Input overload | Shut down and detect the load power. |
| Output overload | Shut down and detect the load power. |
| Battery overvoltage | Shut down and check the battery voltage. |
| Battery undervoltage | Shut down and check the battery voltage. |
| Battery overcurrent | Shut down, disconnect the input and output switches, troubleshoot the fault, and restart after the fault is cleared. |
| Output voltage reverse connection | Shut down, disconnect the input and output switches, check the output side, and restart after the fault is cleared. |
| IGBT overtemperature | Shut down,check whether the IGBT is overheated, and restart after the fault is cleared. |
| Ambient overtemperature | Shut down,check whether the ambient temperature is excessively high, and restart after the fault is cleared. |
| Input voltage reverse connection | Shut down, disconnect the input and output switches, check the input side, and restart after the fault is cleared. |
| Input bus soft start timeout | Shut down, troubleshoot the fault, and restart after the fault is cleared. |
| Output bus soft start timeout | Shut down, troubleshoot the fault, and restart after the fault is cleared. |
| Bus hardware overvoltage | Shut down, check the bus voltage, and restart after the fault is cleared. |
| Duplicate module address | Shut down, check the DIP switch for the address bit, and restart after the fault is cleared. |
| Fan fault | Shut down, check the air duct and power supply of the fan. |
| Auxiliary power failure | Shut down, check the auxiliary power board. |
| EPO | Shut down, check the EPO button. |
| Input contactor open-circuit fault | Shut down, disconnect the input and output switches, and replace the input contactor. |

| Fault type | Handling method |
|---|---|
| Output contactor open-circuit fault | Shut down, disconnect the input and output switches, and replace the output contactor. |
| Surge protector fault | Shut down, disconnect the input and output switches, and replace the lightning protection module in the cabinet. |
| Input bus undervoltage | Shut down, disconnect the input and output switches, check the voltage on the input side, and restart after the fault is cleared. |
| Output bus undervoltage | Shut down, disconnect the input and output switches, check the voltage on the output side, and restart after the fault is cleared. |
| Input contactor short-circuit fault | Shut down, disconnect the input and output switches, and replace the input contactor. |
| Output contactor short-circuit fault | Shut down, disconnect the input and output switches, and replace the output contactor. |
| Input undervoltage | Shut down, check the voltage on the input side, and restart after the fault is cleared. |
| Output undervoltage | Shut down, check the voltage on the output side, and restart after the fault is cleared. |
| Abnormal insulation impedance | Shut down, disconnect the input and output switches, and check the impedance to ground. |
| PV reverse current fault | Shut down, troubleshoot and eliminate the fault, then restart after the fault is resolved. |
| Carrier synchronization failed | Shut down, check the parallel operation line, and restart after the fault is cleared. |
| DCAC communication failure | Shut down, check the DC-AC communication line, and restart after the fault is cleared. |
| Parallel communication failure | Shut down, check the parallel line, and restart after the fault is cleared. |
| BMS communication failure | Shut down, check the BMS communication line, and restart after the fault is cleared. |
| EMS communication failure | Shut down, check the EMS communication line, and restart after the fault is cleared. |
| Backend system communication failure | Shut down, check the backend communication line, and restart after the fault is cleared. |
| HMI communication failure | Shut down, check the communication line of the HMI, and restart after the fault is cleared. |

### 9.3.4 Alarm malfunction and handling method

- Hybrid inverter has perfect protection function and warning function. When the input voltage or abnormal situation of power grid occurs, it can operate effectively to protect the safe operation of hybrid inverter and continue to operate the set mode until the abnormal situation disappears.

Table 9-4 Hybrid inverter warning and protection functions

| Function | Description |
|---|---|
| DC over/under voltage protection | When the DC voltage of the energy storage battery exceeds the allowable voltage range, the hybrid inverter will stop working and send out warning signals, and display the fault type on the LCD screen. Hybrid inverter can detect abnormal voltage quickly and react. |
| Overvoltage/undervoltage protection of power grid | When the hybrid inverter detects that the grid voltage exceeds the allowable voltage range, the hybrid inverter will stop working and send out warning signals, and display the fault type on the LCD screen. Hybrid inverter can detect abnormal voltage quickly and react. |
| Over/under frequency protection of power grid | When the hybrid inverter detects that the frequency fluctuation of the power grid exceeds the allowable range, the hybrid inverter will stop working and send out warning signals. The fault type is displayed on the LCD screen. Hybrid inverter can detect abnormal frequency quickly and respond to it. |
| Isolated island protection | When the hybrid inverter detects that the grid voltage is 0, the hybrid inverter will stop working and send out warning signals, and display the fault type on the LCD screen. Hybrid inverter can detect abnormal voltage quickly and react. |
| AC overcurrent protection | When the output power of the energy storage battery exceeds the maximum DC input power allowed by the hybrid inverter, the hybrid inverter will work at the allowable maximum AC output power. When the AC current is detected to be greater than 1.2 times the rated current, the hybrid inverter will stop working. After restoring to normal, the hybrid inverter should be able to work normally. |
| AC leakage current protection | The hybrid inverter has the function of grounding protection. A leakage current sensor is installed in the grounding cable. When the leakage current exceeds 2A, the machine will stop immediately. When the current is less than 1.5A, the protection can be eliminated. The fault is displayed on the LCD screen. |

| Function | Description |
|---|---|
| IGBT overtemperature protection | IGBT module of hybrid inverter uses high precision temperature sensor, which can monitor module temperature in real time. When the temperature is too high, the DSP will issue instructions to stop the operation of hybrid inverter to protect the stable operation of equipment. |
| IGBT fault protection | The IGBT module of the hybrid inverter has self-protection function. When the module detects that the module has over-current, it can send fault information to the DSP quickly. The DSP will issue instructions to stop the hybrid inverter running, and send warning signals, and display the fault type on the LCD. |
| Polarity reverse connection fault protection | When the hybrid inverter detects that the DC voltage is negative, the hybrid inverter will send a warning signal and display the fault type on the liquid crystal. |
| Environmental overtemperature protection | High precision temperature sensor is used in the hybrid inverter, which can monitor the temperature inside the machine in real time. When the temperature is too high, the DSP will issue instructions to stop the operation of the hybrid inverter to protect the stable operation of the equipment. |
| DC overcurrent protection | When the hybrid inverter detects that the DC current is greater than 1.2 times the rated current, the hybrid inverter will stop working and send out warning signals, and display the fault type on the LCD. After restoring to normal, the hybrid inverter should be able to work normally. |
| Independent hybrid inverter overvoltage protection | When the hybrid inverter operates in the independent converting mode and detects that the three-phase output voltage exceeds the allowable voltage range, the hybrid inverter will stop working and send out warning signals, and display the fault type on the liquid crystal. |
| Phase sequence reverse connection protection | When the hybrid inverter self-checks and finds that the three-phase voltage phase of the connected power grid is wrong, the hybrid inverter will send out warning signals and display the fault type on the LCD. After returning to normal, the hybrid inverter should be re-energized and self-checked to work normally. |
| AC voltage unbalance protection | When the hybrid inverter detects that the difference of three-phase AC voltage exceeds the allowable range, the hybrid inverter will stop working and send out warning signals, and display the fault type on the LCD. Hybrid inverter can detect abnormal voltage quickly and react. |

| Function | Description |
| --- | --- |
| AC current unbalance protection | When the hybrid inverter detects that the difference of three-phase AC voltage exceeds the allowable range, the hybrid inverter will stop working and send out warning signals, and display the fault type on the LCD. Hybrid inverter can detect abnormal voltage quickly and react. |
| Transformer overtemperature protection | The transformer of hybrid inverter uses high precision temperature sensor, which can monitor module temperature in real time. When the temperature is too high, the DSP will issue instructions to stop the operation of hybrid inverter to protect the stable operation of equipment. |
| Fan fault protection | The fan of the hybrid inverter has the function of automatic detection. When the fan is not turned, it can send fault information to the DSP quickly. The DSP will issue instructions to stop the hybrid inverter, and send warning signals, and display the fault type on the LCD. |
| AC/DC contactor fault protection | When the operating state of the hybrid inverter is standby, on-grid or off-grid operation, once the status of the main AC-DC contactor is detected to be disconnected, the hybrid inverter will stop working, send a warning signal, and display the fault type on the liquid crystal. |

Hybrid
Inverter