# TURBO ENERGY
## SOLAR INNOVATION

# Instruction manual



## Hybrid Series 48V 5.0 (HIS 5000/48)

Read this manual before installing the inverter and follow the instructions carefully during the installation process.

# Content

# 1. SAFETY INSTRUCTIONS

- This chapter contains important safety and operating instructions. Read and keep this manual for future reference.
- Before using the inverter, please read the instructions and warning signs of the battery and corresponding sections in the instruction manual.
- Do not disassemble the inverter. If you need maintenance or repair, take it to a professional service center.
- Improper reassembly may result in electric shock or fire.
- To reduce risk of electric shock, disconnect all wires before attempting any maintenance or cleaning. Turning off the unit will not reduce this risk.
- Caution: Only qualified personnel can install this device with battery.
- Never charge a frozen battery.
- For optimum operation of this inverter, please follow required specification to select appropriate cable size. It is very important to correctly operate this inverter.
- Please strictly follow installation procedure when you want to disconnect AC or DC terminals. Please refer to "Installation" section of this manual for the details.
- Grounding instructions: This inverter must be connected to a permanent grounded wiring system. Be sure to comply with local legislation in this area.
- Never cause AC output and DC input short circuited. Do not connect to the mains when DC input short circuits.

# 2. PRODUCT INSTRUCTIONS

This is a multifunctional inverter, combining inverter, solar charger, and battery charger functions to offer uninterruptible power support with portable size. Its comprehensive LCD display offers configurable and easy access operation such as battery charging, AC/solar charging, and acceptable input voltage based on different applications.

## 2.1. Product Overview
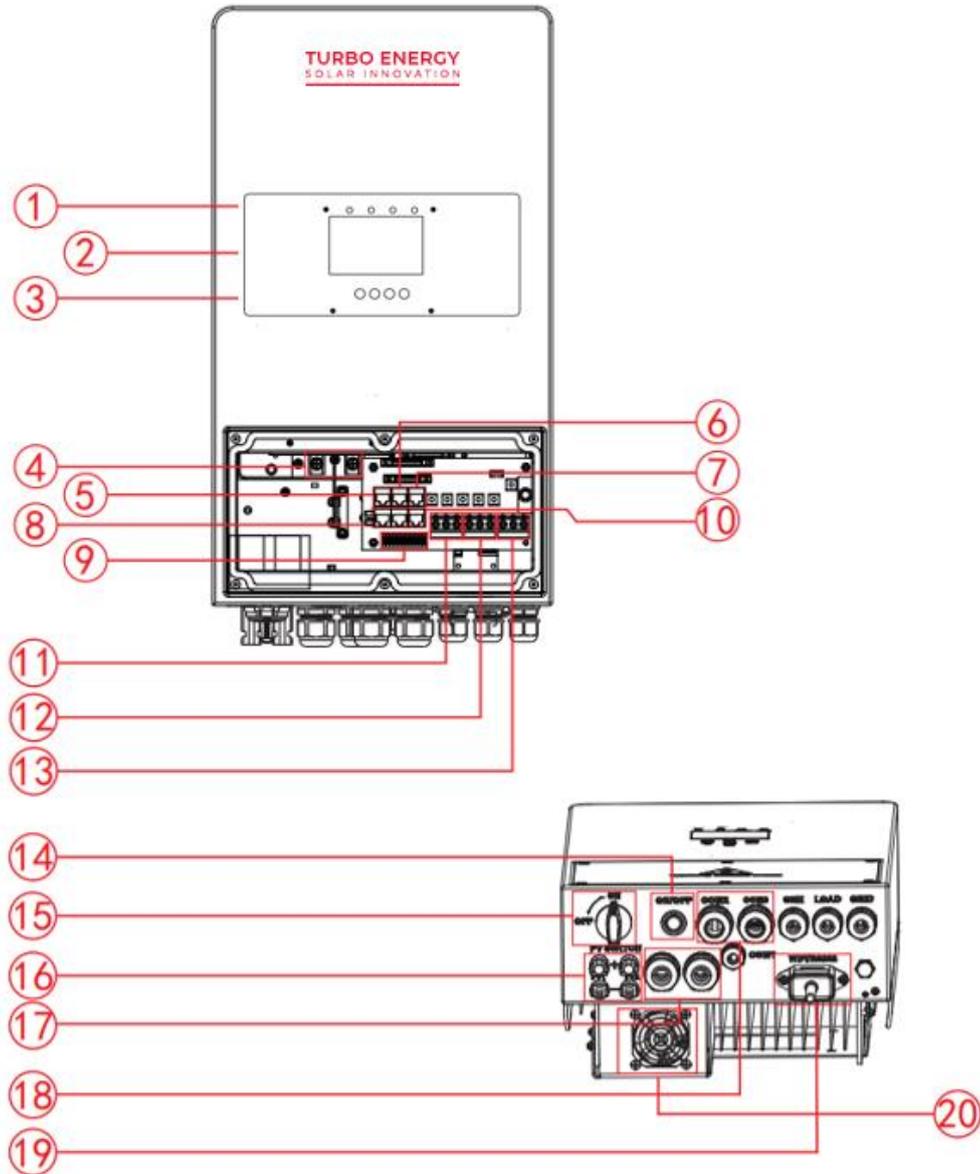


1. **Inverter operation LED indicators**
2. **LCD Display**
3. **Function Buttons**
4. **Battery input connectors**
5. **BMS 485 Port**
6. **CAN Port**
7. **DRMs Port**
8. **8A & 8B parallel connection port, 8C RS485 port for smart meter**
9. **Multifunction port**
10. **RS 485 Port**
11. **Gen Port**
12. **Back Up Port**
13. **Grid**
14. **Power On/Off button**
15. **DC Switch**
16. **2 PV inputs (2 MPPTs)**
17. **Battery**
18. **Temperature sensor**
19. **Wi-Fi interface**

## 2.2. Dimensions
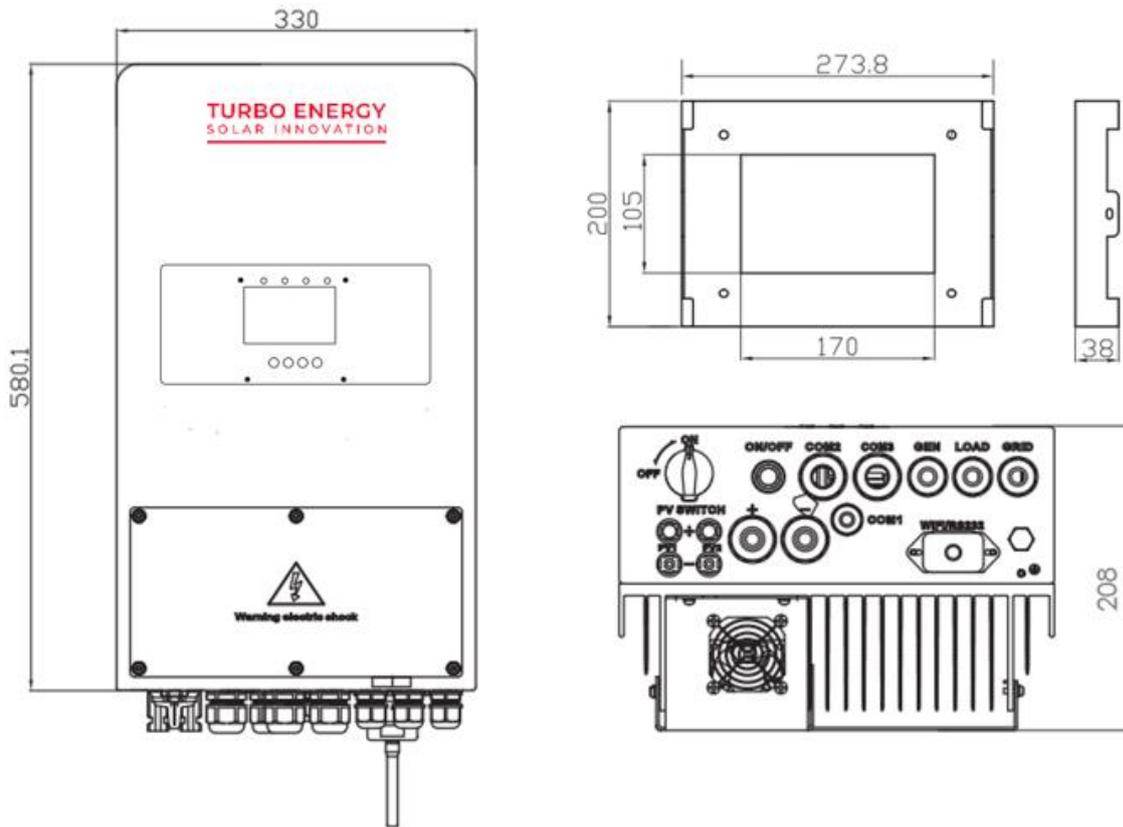


## 2.3. Inverter Features

- 220V single-phase pure sinusoidal wave inverter.
- Self-consumption and feed-in to grid.
- Programmable operation modes.
- Configurable battery charging current/voltage based on applications by LCD setting.
- Configurable AC/Solar/Generator Charger priority by LCD setting.
- Compatible with grid voltage or generator power.
- Overload/over temperature/short circuit protection.
- Smart battery charger design for optimized battery performance.
- With export 0 function, prevent excess power flow to grid.
- Wi-Fi monitoring of the inverter.
- Two photovoltaic inputs with two maximum power trackers (MPPT)
- Possibility of parallel use.
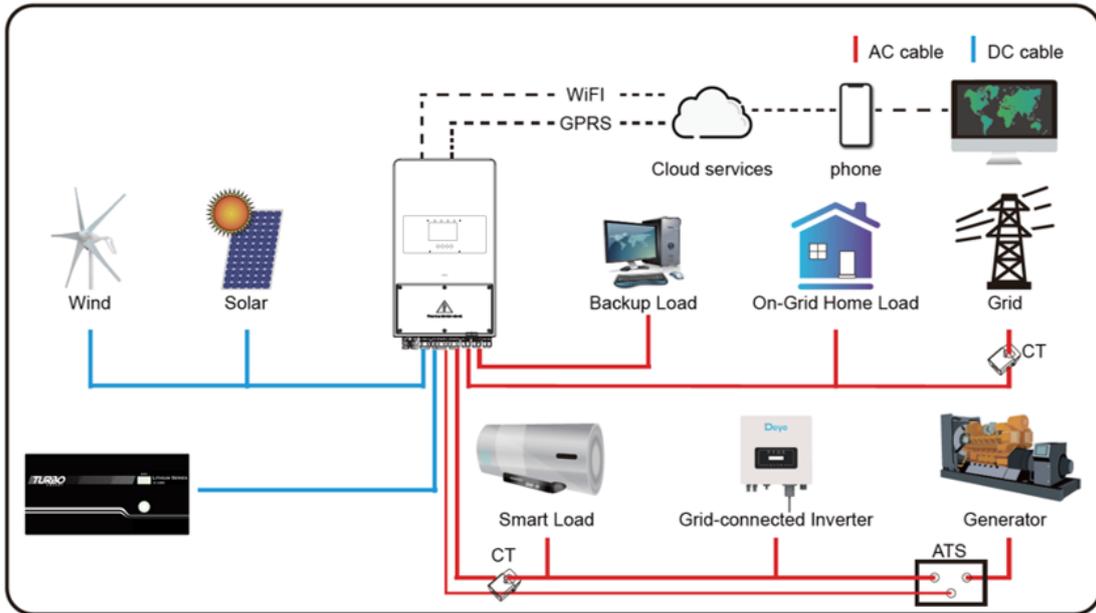
# 3. INSTALLATION

## 3.1. Component list
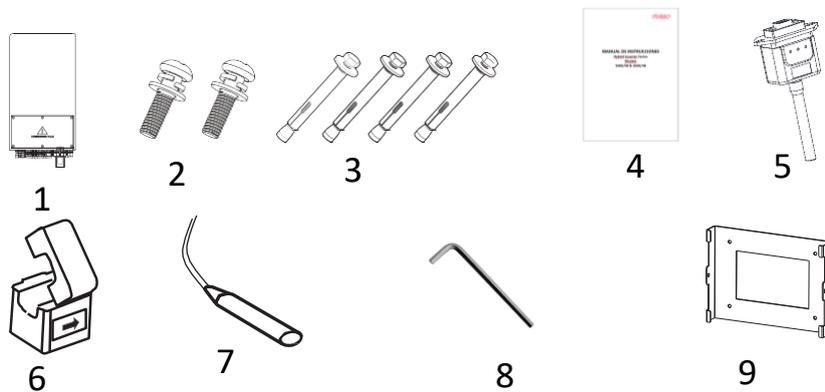


| Nº | Description | Qty |
|----|-------------|-----|
| 1 | Hibrid Inventer HIS Series | 1 |
| 2 | Stainless steel mounting screws M6*12 | 2 |
| 3 | Stainless steel expansion bolts M8*80 | 4 |
| 4 | User Manual | 1 |
| 5 | WiFi Plug | 1 |
| 6 | Current transformer (Optional) | 1 |
| 7 | Battery sensor | 1 |
| 8 | L-type Hexagon wrench | 1 |
| 9 | Wall mounting bracket | 1 |

## 3.2. Assembly instructions

Installation precaution.

This Hybrid inverter is designed for outdoor use (IP65). Please make sure the installation site meets below conditions:

- Not in direct sunlight.
- Not in areas where highly flammable materials are stored.
- Not in potential explosive areas.
- Not to expose directly to cold airflow.
- Not near the television antenna or antenna cable.
- Not higher than altitude of about 2000 meters above sea level.
- Not in environment of precipitation or humidity (>95%)

Please AVOID direct sunlight, rain exposure, snow laying up during installation and operation. Before connecting all wires, please take off the metal cover by removing screws as shown below:
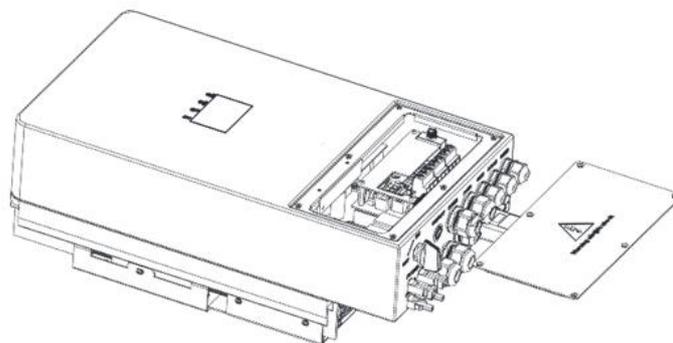


Consider the following considerations before selecting the installation location:

- Please select a vertical wall with load-bearing capacity for installation, suitable for installation on concrete or other non-flammable surfaces. Installation is shown below.
- Install this inverter at eye level in order to allow the LCD display to be read at all times.
- The ambient temperature should be between -25℃ and 60℃ to ensure optimal operation.
- Be sure to keep other objects and surfaces as shown in the diagram to guarantee sufficient heat dissipation and have enough space for removing wires.
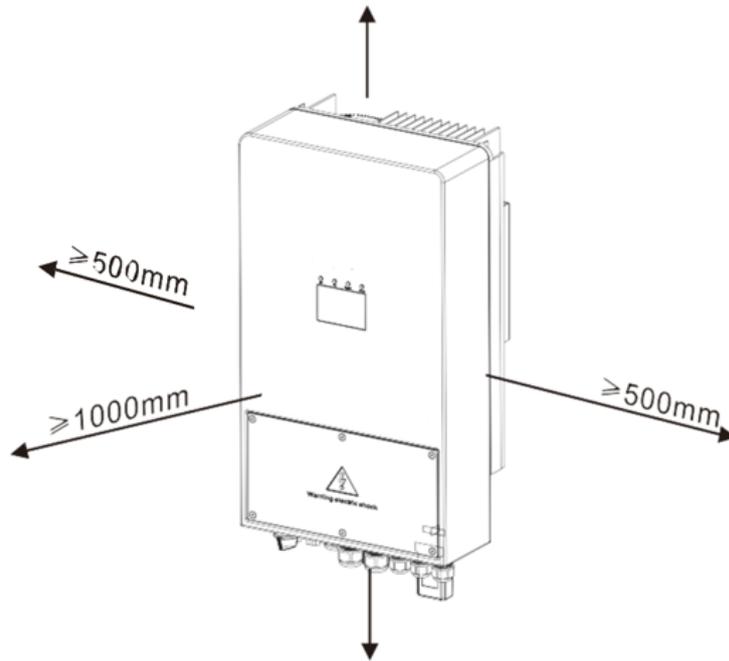
For proper air circulation to dissipate heat, allow a clearance of approx. 50cm to the side and approx. 50cm above and below the unit and 100cm to the front.

Inverter should be vertically installed, as shown in the installation procedure below:

1. Position the bolts on the appropriate wall according to the bolt positions on the mounting shelves and mark the holes. On the brick wall, the installation must be suitable for the expansion bolt installation.
2. Ensure that the position of the installation holes on the wall (A, B, C, D) are the same position of the install plate, and the mounting level is guaranteed.
3. Hang the inverter to the top of the mounting rack and then use the M4 screw in the accessory to lock E and F to ensure that the inverter does not move.
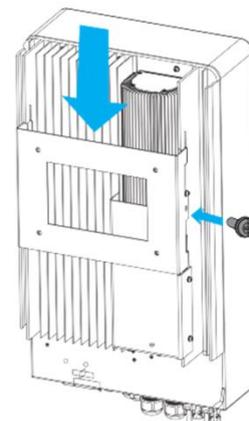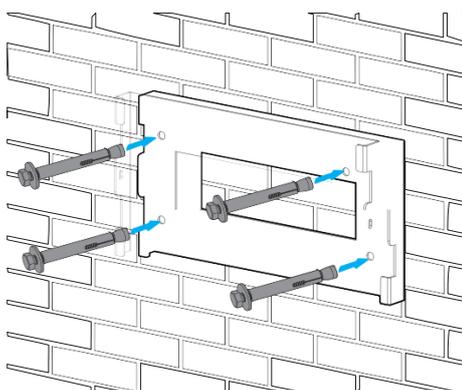
## 3.3. Battery connection

For safe operation and compliance, a separate DC over-current protector or disconnect device is required between the battery and the inverter. In some applications, switching devices may not be required but over-current protectors are still required. Refer to the typical amperage in the table below for the required fuse or circuit breaker size.

| Model | Cable | Cable (mm$^2$) | Torque value(max) |
|-------|-------|----------------|-------------------|
| 5KW | 3AWG | 25 | 5.2Nm |

Please follow the steps below to implement battery connection:

1. Please choose a suitable battery cable with correct connector which can well fit into the battery terminals.
2. Use a suitable screwdriver to unscrew the bolts and fit the battery connectors in, then fasten the bolt by the screwdriver. Make sure the bolts are tightened with torque of 5.2 N.m in clockwise direction.
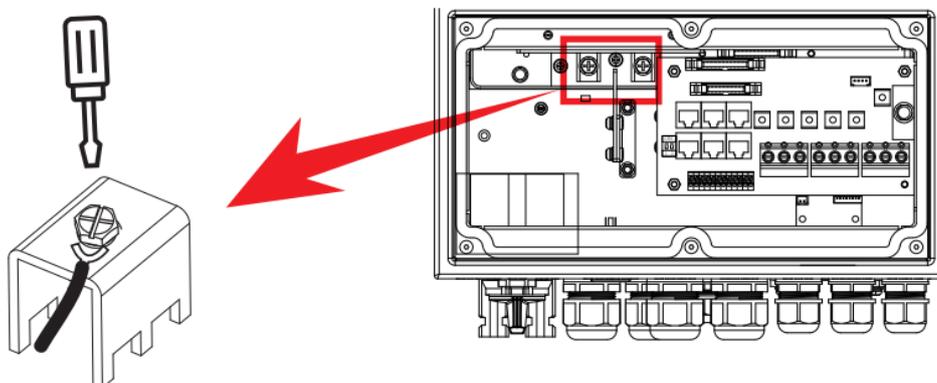


3. Make sure polarity at both the battery and inverter is correctly connected.

## 3.4. Multifunction port connection



BT: battery temperature sensor for lead acid battery.
HM: current transformer for "zero export to CT" mode.
GS: reserved.
GV: dry contact signal for startup the diesel generator.
When the "GEN signal" is active, the open contact (GV) will switch on (no voltage output).

ATS: 230V output port when inverter is on.
DIP switch: Parallel communication resistor
If the number of inverters in the parallel system is less than or equal to 6, all inverter's DIP switch (1&2) need be ON position.
If the number of inverters in parallel system exceeds 6, the main 6pcs inverter's DIP switch needs to be ON position. And the other inverter DIP switch (1&2) needs to be OFF position.

BMS 485: RS485 port for battery communication.
BMS CAN: CAN port for battery communication.
DRMs: for Australia market only.
Parallel 1: Parallel communication port 1 (CAN interface).
Parallel 2: Parallel communication port 2 (CAN interface).
*RS485: for energy meter communication.
*Some hardware versions don't have this port.

GV (diesel generator startup signal)

| ⚠️ | Do not pull or force the communication cables in a way that can bend or damage the connection ports. These ports can be easily broken if not handled properly. |
|---|---|

## 3.4.1. Temperature sensor connection
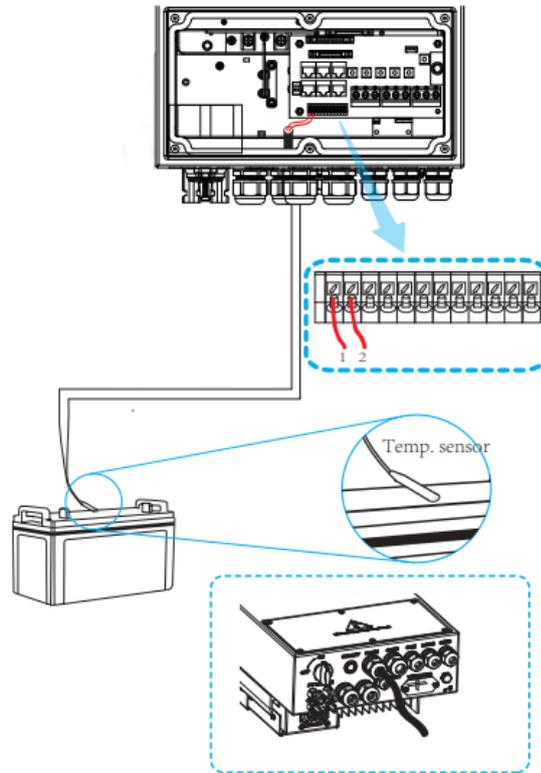


## 3.4.2. CT connection
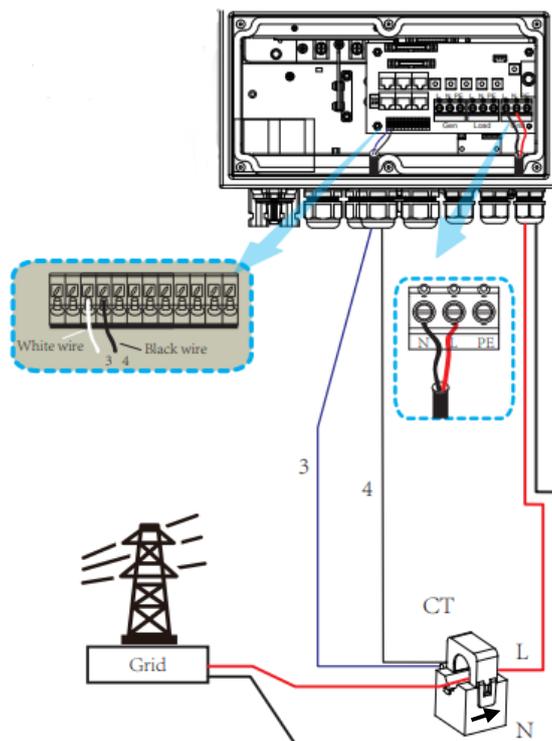
*If the distance between the CT and the inverter is greater than 20 meters, it is recommended to install the external smart meter DDSU666, as indicated in the following diagram:



Conector RJ45

Cable RS485-CAT5

Meter 7(A) – PIN 5 (B/W)
Meter 8(B) – PIN 4 (B)
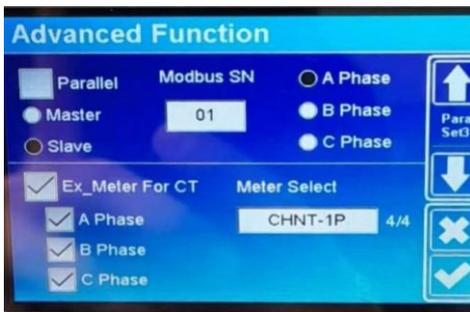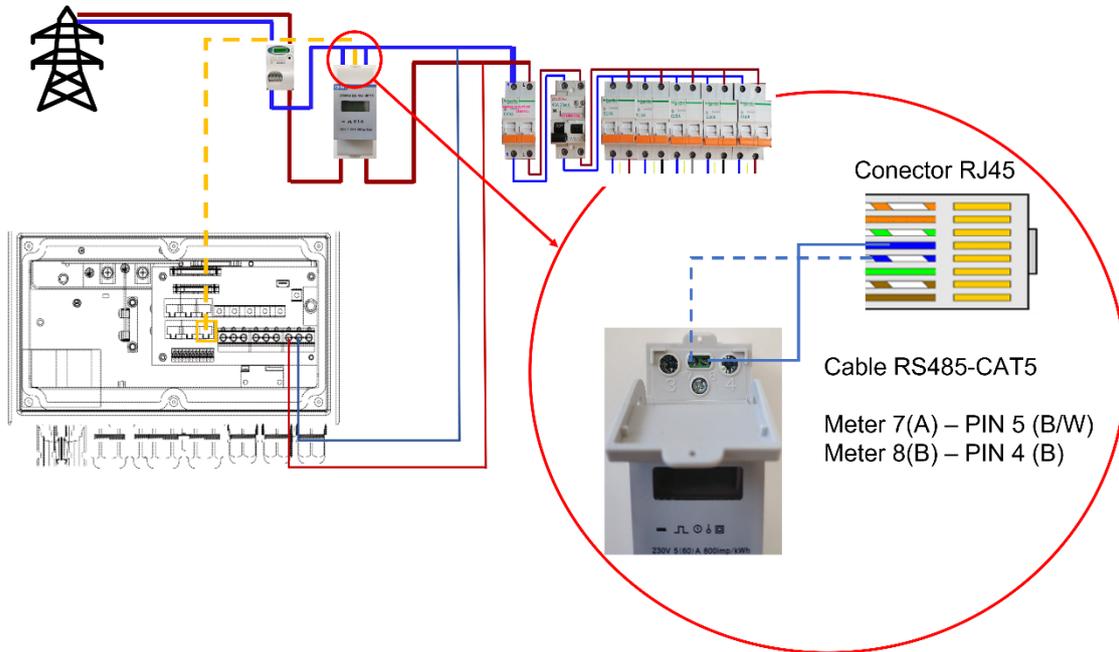


On inverter configuration, Advanced Function menu, select "Ex_Meter For CT", "A phase", "B phase" and "C phase".

Use this setting:
- **Modbus SN**: 01
- **Ex_Meter For CT**: All options activeted (4)
- **Meter Select**: CHNT-1P

Its advisable to use a 120 Ω resistance between the RS485A and the RS485B cables in order to avoid signal rebound



RS485A
METER (7)

RS485B
METER (8)

120 Ω
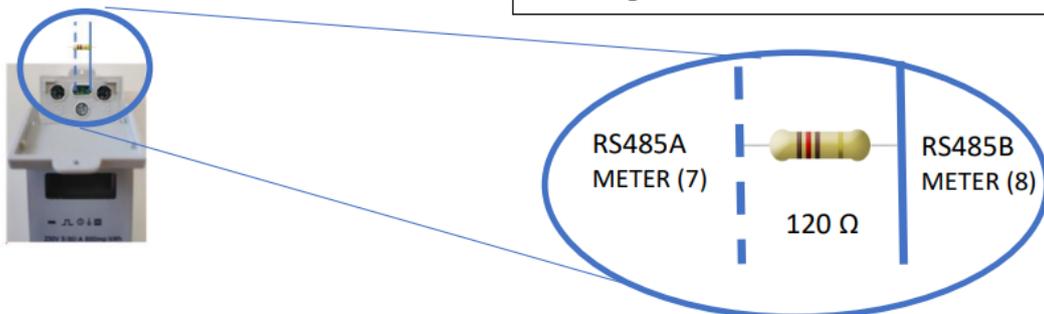
## 3.5. AC Input/Output connection

- Before connecting to AC input power source, please install a separate AC breaker between inverter and AC input power source. This will ensure the inverter can be securely disconnected during maintenance and fully protected from over current of AC input. The recommended AC breaker is 32A for 5kW.

- There are three terminal blocks with "Grid" "Load" and "GEN" markings.

- Please do not misconnect input and output connectors.

| Model | Cable size | Cable (mm$^2$) | Torque value |
|-------|-----------|---------------|--------------|
| 5kW | 10AWG | 6 | 1.2Nm |

Please follow below steps to implement AC input/output connection:

1. Before making AC input/output connection, make sure DC protector or disconnector is opened first.

2. Remove insulation sleeve 10mm length, unscrew the bolts, insert the AC input wires according to polarities indicated on the terminal block and tighten the terminal screws. Make sure the connection is complete.

3. Then, insert AC output wires according to polarities indicated on the terminal block and tighten terminal. Be sure to connect corresponding N wires and PE wires to related terminals as well.

4. Make sure the wires are securely connected.

5. Appliances such as air conditioner are required at least 2-3 minutes to restart because it is necessary to have enough time to balance refrigerant gas inside of the circuit. If a power shortage occurs and recovers in short time, it will cause damage to your connected appliances. To prevent this kind of damage please check manufacturer of your appliance if it is equipped with time-delay function before installation. Otherwise, this inverter will trigger overload fault and cut off output to protect your appliance but sometimes it still causes internal damage to the air conditioner.

## 3.6. PV connection

Before connecting to PV modules, please install a separately DC circuit breaker between inverter and PV modules. It is very important for system safety and efficient operation to use appropriate cable for PV module connection. To reduce risk of injury, please use the proper recommended cable size shown below.

| Model | Cable size | Cable (mm$^2$) |
|---|---|---|
| 5kW | 12AWG | 4 |

### 3.6.1. PV Module selection

When selecting proper PV modules, please be sure to consider below parameters:

1. Open circuit Voltage (Voc) of PV modules do not exceed max. PV array open circuit voltage of inverter.
2. Open circuit Voltage (Voc) of PV modules should be higher than min. start voltage.

| Inverter Model | 5kW |
|---|---|
| PV Input Voltage (V) | 370V (100V -500V) |
| PV Array MPPT Voltage Range | 125Vdc-425Vdc |
| No. of MPP Trackers | 2 |
| No. of strings per MPP Tracker | 1+1 |

## 3.7. Grounding connection

Ground cable shall be connected to ground plate on grid side. This prevents electric shock if the original protective conductor fails.
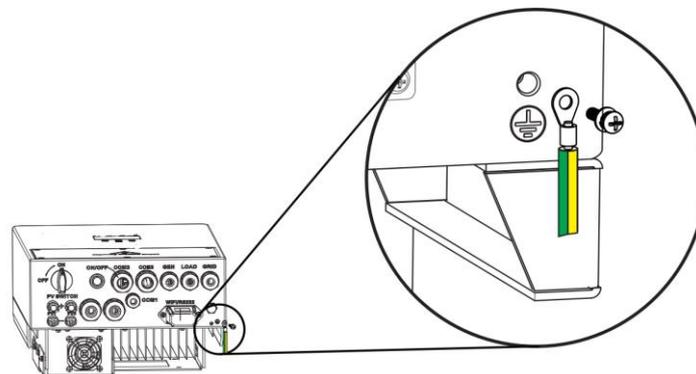
## 3.8. Wi-Fi connection

In order to upload the Inverter to the cloud and be able to see the monitoring of the system, it is essential to connect the equipment to the internet. To do this, the following steps must be followed:

Step 0: Locate the serial number of the logger

At the bottom of the inverter there is a plate with a QR code, the serial number of your logger and the logger's wifi access password.



The logger creates a Wifi network whose name is "AP_" followed by the serial number of the logger.

Step 1: Connect to the Wifi network.

With an electronic device with Wi-Fi (PC, Tablet, Smartphone...) the connection with the logger's Wi-Fi is established:

Open the wireless network connection of PC, Tablet or Smartphone

Click on view available wireless networks

Select the one corresponding to the device with which you want to connect (identified by "AP_" and the serial number of the logger)
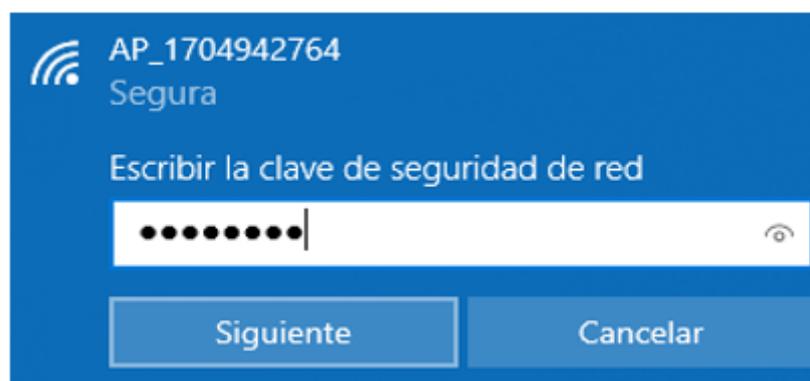
Enter the password that appears on the logger's plate together with the serial number.
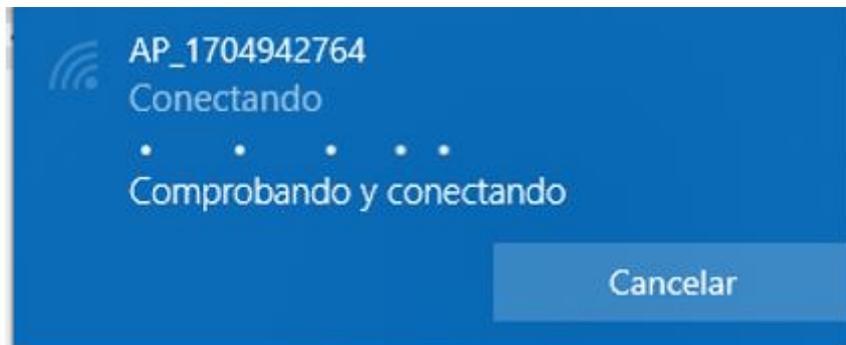


Step 2: Connect to the web portal

Once connected to the Wi-Fi network with your PC, Tablet or smartphone, you must access the logger's web portal.

To do this, open a web browser on the PC, tablet or smartphone that has been connected to the logger's Wi-Fi.

Write the text "10.10.100.254" in the address bar of the web browser.

A pop-up window will appear to login with a username and password. The default user is "admin" and the password is "admin", and then press the "Login" button.
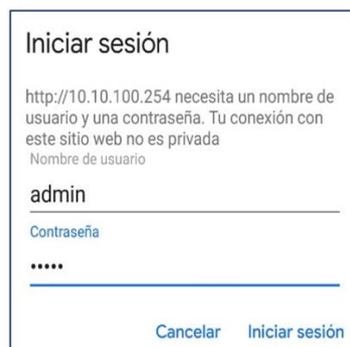


Once the logger's web portal has been accessed, the "Status" page with general information about the registrar can be seen.
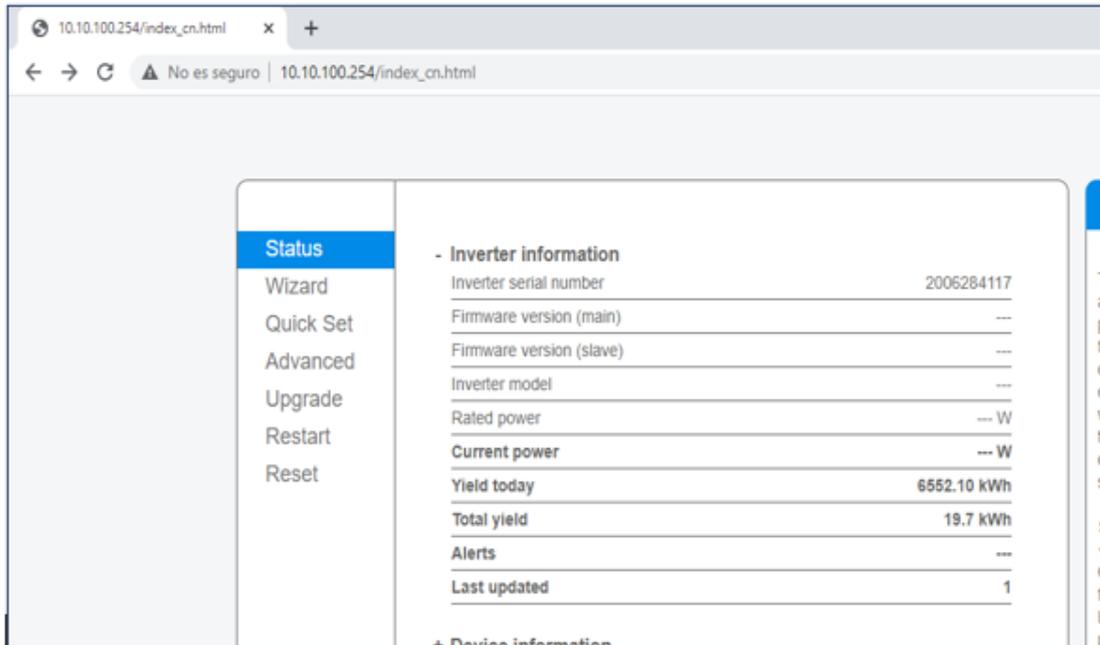
Click on the "Wizard" link under the "Status" link to connect the logger to the Wi-Fi (the Wi-Fi of your house or your plant).

Step 3: Setup logger access to the Wi-Fi

Step 3.1: select the Wi-Fi

When we run the connection wizard, the list of Wi-Fi networks to which the logger has access appears. Among them should appear our Wi-Fi. We must select it and press the "Next" button at the bottom of the screen:
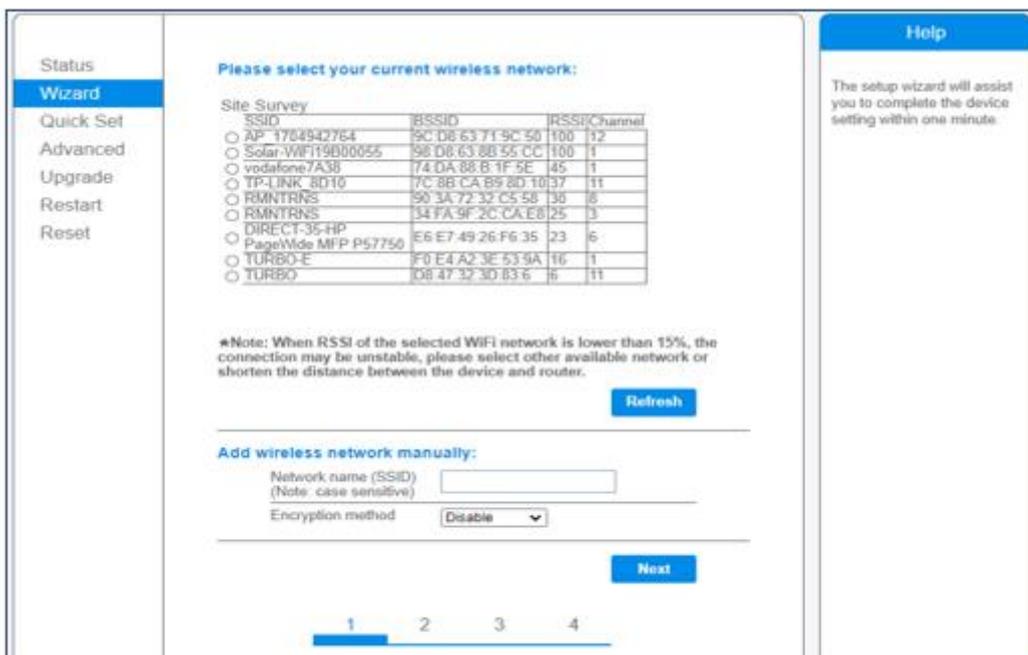
Step 3.2: enter the Wi-Fi password: in the "Password" field, enter your Wi-Fi password and press the "Next" button.



Step 3.3: In this step it is **NOT** necessary to select any option and then press the "Next" button. It is used to configure the security of the connection to the Wi-Fi. By selecting Hide AP, the Wi-Fi network will appear as a hidden network.



Step 3.4 If the adjustment has been made correctly, press the "OK" button to restart the connection.
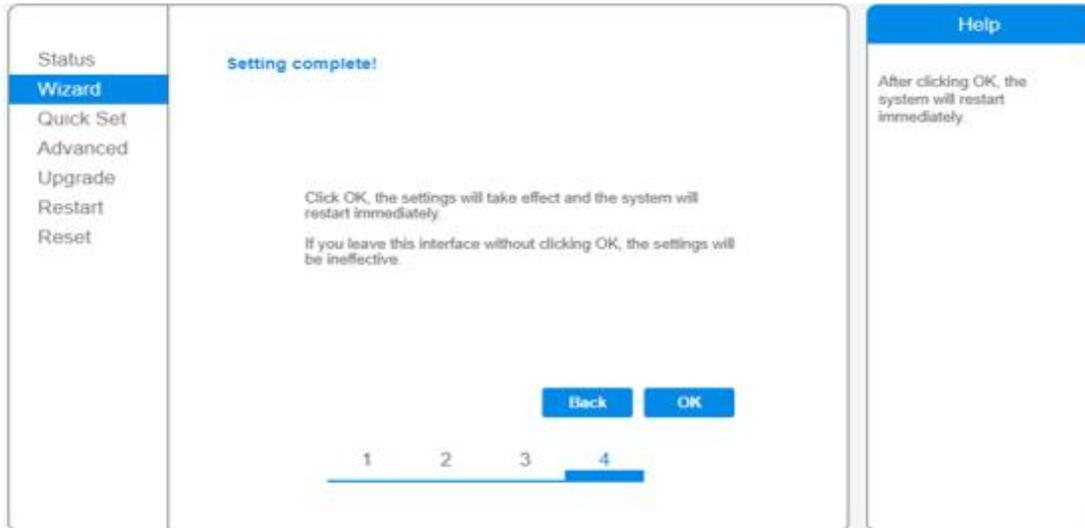
If the restart is successful, a message will appear indicating that it was successful, if it does not appear then refresh the browser page:



Step 4: Verify the logger connection to the Wi-Fi
After restarting the web page, log back in to the "Status" page and check the status of the recorder's network connection:

20

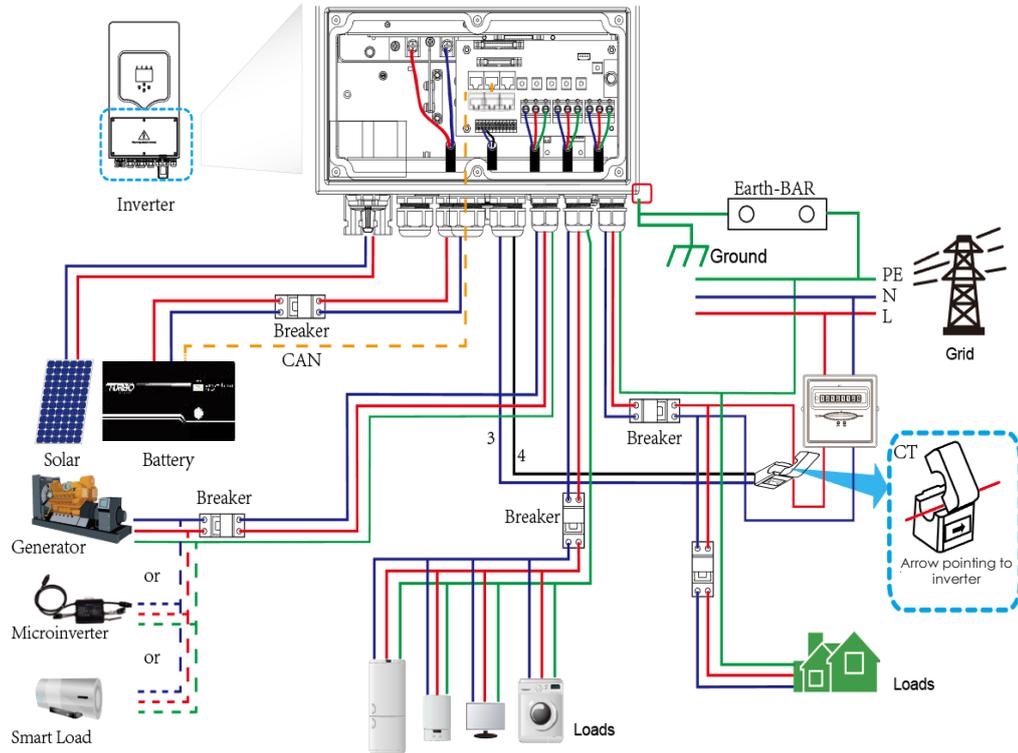| Status | | |
|---|---|---|
| Wizard | - Inverter information | |
| Quick Set | Inverter serial number | 1911294008 |
| Advanced | Firmware version (main) | --- |
| Upgrade | Firmware version (slave) | --- |
| Restart | Inverter model | --- |
| Reset | Rated power | --- W |
| | Current power | --- W |
| | Yield today | 6553.30 kWh |
| | Total yield | 1722.2 kWh |
| | Alerts | --- |
| | Last updated | 0 |
| | - Device information | |
| | Device serial number | 1704942764 |
| | Firmware version | LSW3_14_FFFF_1.0.40 |
| | Wireless AP mode | Enable |
| | SSID | AP_1704942764 |
| | IP address | 10.10.100.254 |
| | MAC address | 9C:D8:63:71:9C:50 |
| | Wireless STA mode | Enable |
| | Router SSID | TURBO-E |
| | Signal Quality | 1% |
| | IP address | 192.168.8.122 |
| | MAC address | 98:D8:63:71:9C:50 |
| | - Remote server information | |
| | Remote server A | Connected |
| | Remote server B | Not connected |

**Help**

The device can be used as a wireless access point (AP mode) to facilitate users to configure the device, or it can also be used as a wireless information terminal (STA mode) to connect the remote server via wireless router.

Status of remote server
◆Not connected: Connection to server failed last time.
If under such status, please check the issues as follows:
(1) check the device information to see whether IP address is obtained or not;
(2) check if the router is connected to internet or not;
(3) check if a firewall is set on the router or not;

◆Connected: Connection to server successful last time;

◆Unknown: No connection to server. Please check again in 5 minutes.

Once we have verified that the logger is connected to the Wi-Fi, it is possible to add the plant to the cloud platform.

| ⚠ | We recommend not to change the password of the access portal or the password of the inverter's Wi-Fi through the portal 10.10.100.254. If you forget the password, you will not be able to access the portal again to configure the WiFi. |
|---|---|

## 3.9. Inverter global connection

## 3.10. Single phase parallel connection diagram



CAN — L wire — N wire — PE wire

Inverter No.3 (slave)

BMS 485  BMS CAN  DRMs

parallel_1  parallel_2  RS485

Ground

① DC Breaker

Inverter No.2 (slave)

① ② ③   DC Breaker (150 A)

④ ⑥ ⑧   AC Grid Port Breaker (40 A)

⑤ ⑦ ⑨   AC Back Up Breaker (40 A)

⑩   AC Breaker (depends on house loads)

② DC Breaker

Inverter No.1 (master)

③ DC Breaker

Backup Load

PE N L

CT

Arrow pointing to grid

The second side of the CT only needs to connect the master inverter.

⑩ AC Breaker

Home Load

CT

Master inverter

Slave Inverter

Slave Inverter

Advanced Function
Parallel   Modbus 3N   A Phase
Master    01          B Phase
Slave                 C Phase
Paral. Set3

Advanced Function
Parallel   Modbus 3N   A Phase
Master    02          B Phase
Slave                 C Phase
Paral. Set3

Advanced Function
Parallel   Modbus 3N   A Phase
Master    03          B Phase
Slave                 C Phase
Paral. Set3

L
N
PE

Grid

## 3.11. Three phase parallel Inverter
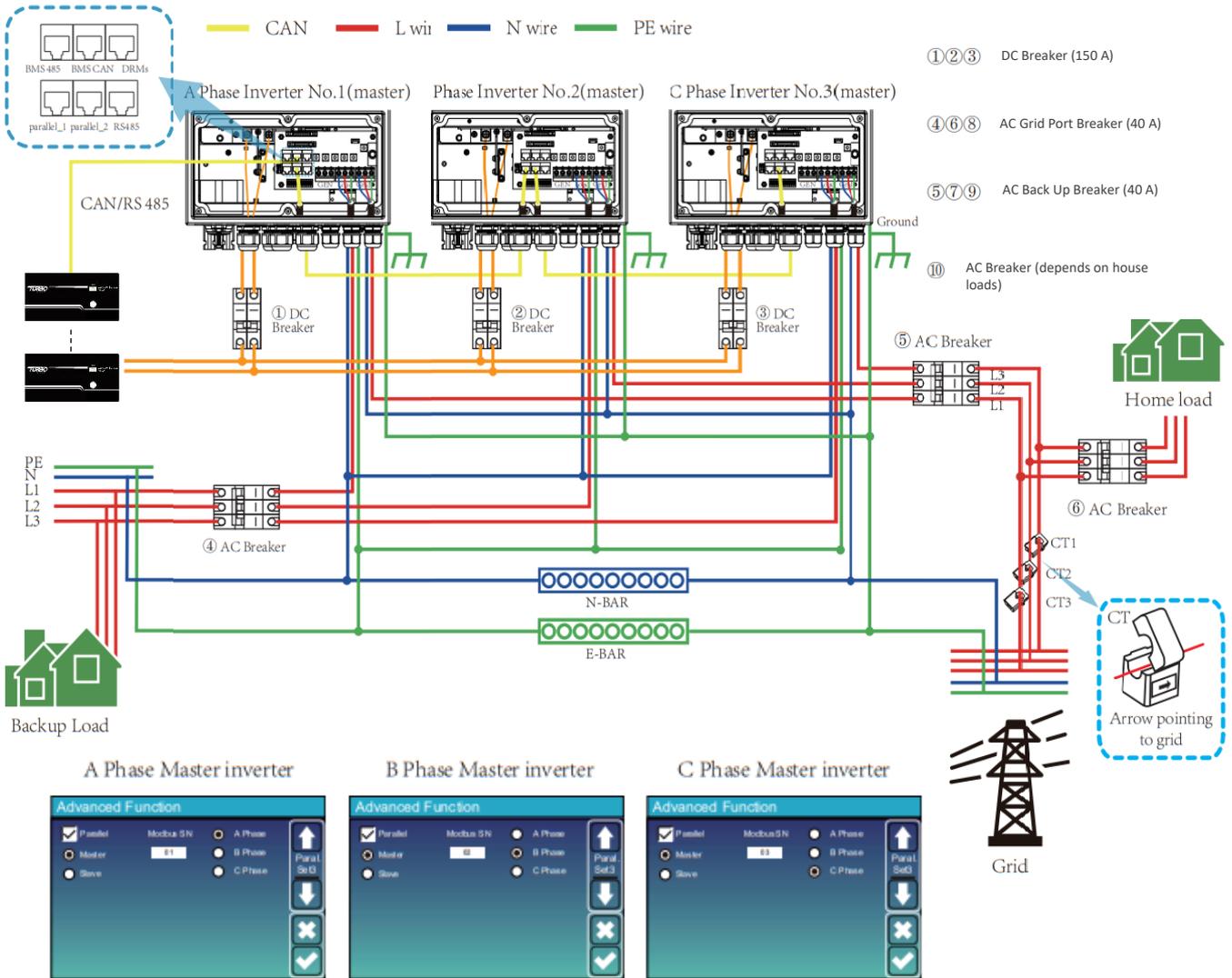


## 4. OPERATION

### 4.1. POWER ON/OFF

Once the unit has been properly installed and the batteries are well connected, press On/Off button (located on the lower left side of the case) to turn on the unit. When the system is not battery-connected but connected to either PV or grid and ON/OFF button is switched off, LCD will still light up (Display will show OFF). In these conditions, when switch on ON/OFF button and select NO battery, system can still work.

## 4.2. Operation and display panel

The operation and display panel shown below is located on the front panel of the inverter. It includes four indicators, four function keys and one LCD display, indicating the operating status and input/output power information.

| LED Indicator | | Messages |
|---|---|---|
| DC | Green led, fixed light | PV Connection normal |
| AC | Green led, fixed light | Grid connection normal |
| Normal | Green led, fixed light | Inverter operating normal |
| Alarm | Red led, fixed light | Malfunction or warning |

| Function Key | Description |
|---|---|
| Esc | To exit setting mode |
| Up | To go to previous selection |
| Down | To go to next selection |
| Enter | To confirm selection |

# 5. LCD DISPLAY

## 5.1. Main screen

The LCD is touchscreen, and the main screen shows the overall information of the inverter.
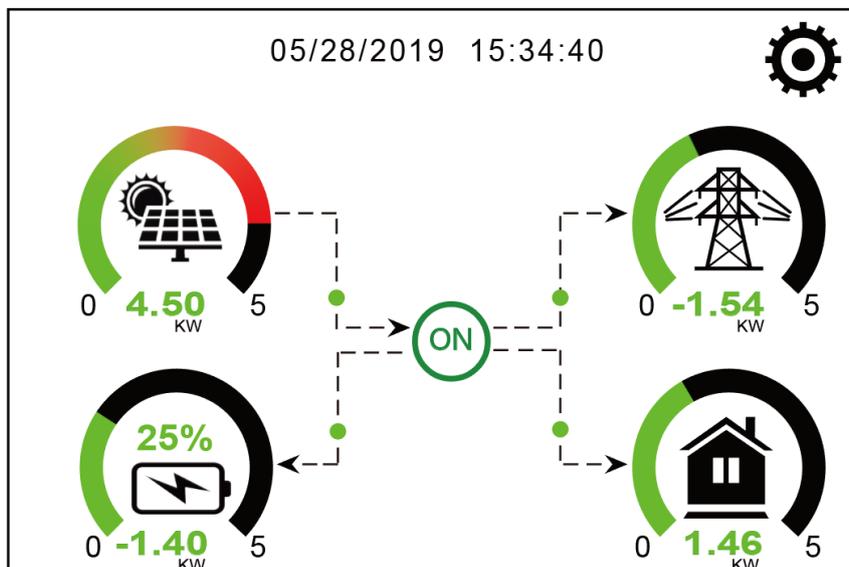
1. The icon in the center of the home screen indicates that the system is operating normally. If it turns into "comm./F01~F64", it means the inverter has communication error or other errors. The error message will display under this icon (F01-F64 errors, detail error info can be viewed in the System Alarms menu).
2. At the top of the screen is the time.
3. Pressing System Setup Icon, it is possible to enter in the system setup screen which includes Basic Setup, Battery Setup, Grid Setup, System Work Mode, Generator port use, Advanced function, and Li-Batt info.
4. The main screen shows the system information, including Solar, Grid, Load and Battery. It also displays the energy flow direction by arrows. When the power is high, the color on the panels will change from green to red.

- PV power and Load power always keep positive.
- Grid power negative means sell to grid, positive means get from grid.
- Battery power negative means charge, positive means discharge.

### 5.1.1. LCD operation flow chart
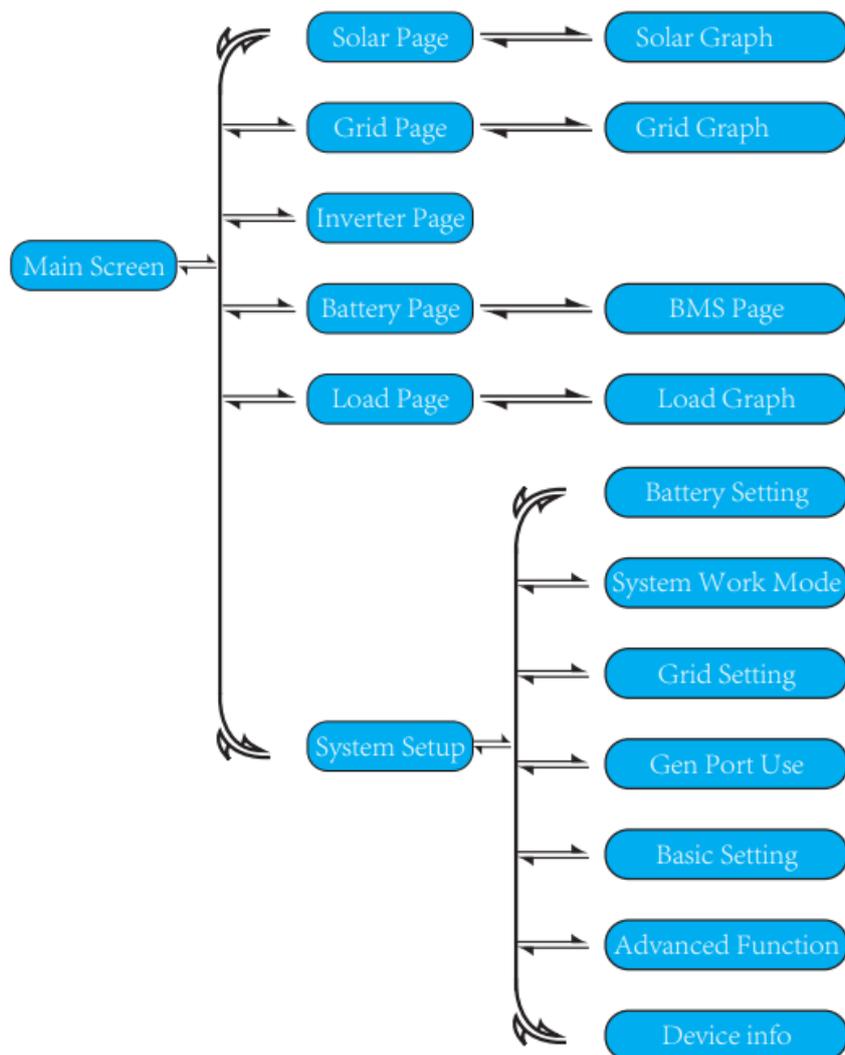
## 5.2. Information from Main Menu

**Solar**

| | |
|---|---|
| Power: 1560W ① | Today=8.0 KWH ③ |
| PV1-V: 286V  PV2-V: 45V | Total =12.00 KWH |
| PV1-I: 5.5A  PV2-I: 0.0A ② | |
| P1: 1559W  P2: 1W | |
| | Energy |
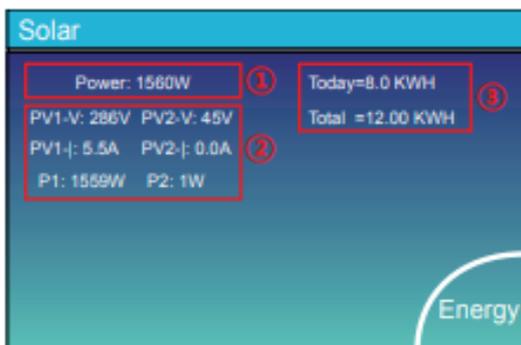
This is Solar Panel detail page.
① Solar Panel Generation.
② Voltage,Current,Power for each MPPT.
③ Solar Panel energy for Day and Total.

Press the "Energy" button will enter into the power curve page.

**Inverter**

| | |
|---|---|
| Power:  44W ① | DC-T:52.6C ③ |
| L1:  240V    L2:  0V ② | AC-T:41.0C |
| I1:0.6A    I2:0.0A | |
| Power1:  0W | |
| Power2:  0W | |
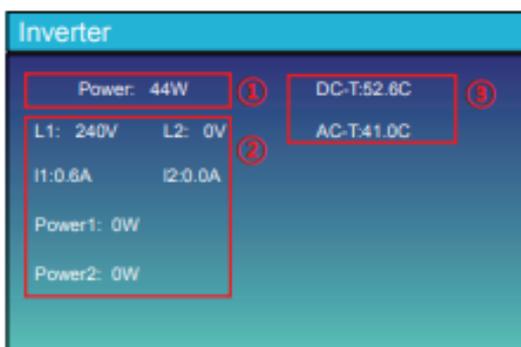
This is Inverter detail page.
① Inverter Generation.
② Voltage,Current,Power for each Phase.
③ DC-T:mean DC-DC temperature,
    AC-T:mean Heat-sink temperature.

**Load**

| | |
|---|---|
| Power:  42W ① | Today=0.0 KWH ③ |
| L1:  240V    L2:  0V ② | Total =0.80 KWH |
| P1:  0W    P2:  0W | |
| Forced | Energy |
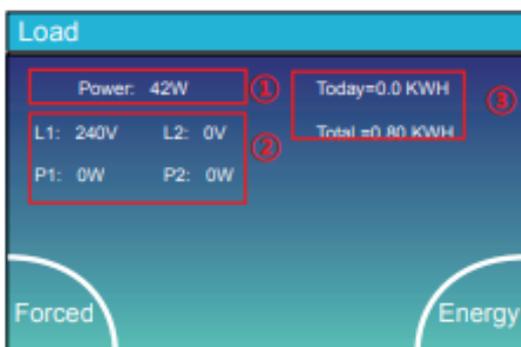
This is Back-up Load detail page.
① Back-up Power.
② Voltage,Power for each Phase.
③ Back-up consumption for Day and Total.

Press the "Energy" button will enter into the power curve page.

Press the "Forced" button will forced open the smart-load(While GEN PORT utilized as Smart-load output).

**Grid**

| | |
|---|---|
| Stand-by ① | BUY ③ |
| Power: 0W | Today=2.2KWH |
| 0.0Hz | Total =11.60 KWH |
| L1:  0V    L2:  0V ② | SELL |
| CT1:  0W    CT2:  0W | Today=0.0KWH |
| LD1:  0W    LD2:  0W | Total =8.60 KWH |
| | Energy |

This is Grid detail page.
① Status,Power,Frequency.
② L1&L2:Voltage for each Phase
    CT1&CT2:External Current Sensor Power
    LD1&LD2:Internal Current Sensor Power.
③ BUY:Energy from Grid to Inverter,
    SELL:Energy from Inverter to Load.

Press the "Energy" button will enter into the power curve page.

27

## Batt

Stand-by

SOC: 36%

U:50.50V

I:-58.02A

Power: -2930W

Temp:30.0C

Li-BMS

This is Battery detail page.

if you use Lithium Battery,you can enter BMS page.

## Li-BMS

| | |
|---|---|
| Mean Voltage:50.34V | Charging Voltage :53.2V |
| Total Current:55.00A | Discharging Voltage :47.0V |
| Mean Temp :23.5C | Charging current :50A |
| Total SOC :38% | Discharging current :25A |
| Dump Energy:57Ah | |

Sum Data

Details Data

## Li-BMS

| | Volt | Curr | Temp | SOC | Energy | Charge Volt | Charge Curr | Fault |
|---|---|---|---|---|---|---|---|---|
| 1 | 50.38V | 19.70A | 30.6C | 52.0% | 26.0Ah | 0.0V | 0.0A | 0|0|0 |
| 2 | 50.33V | 19.10A | 31.0C | 51.0% | 25.5Ah | 53.2V | 25.0A | 0|0|0 |
| 3 | 50.30V | 16.90A | 30.2C | 12.0% | 6.0Ah | 53.2V | 25.0A | 0|0|0 |
| 4 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 5 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 6 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 7 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 8 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 9 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 10 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 11 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 12 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 13 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 14 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |
| 15 | 0.00V | 0.00A | 0.0C | 0.0% | 0.0Ah | 0.0V | 0.0A | 0|0|0 |

Sum Data

Details Data

## 5.3. Curve page - Solar, Load and Grid

### Solar Power Production:Day
3000W  2019-5-28
100% 80% 60% 40% 20%
1 3 5 7 9 11 13 15 17 19 21 23
CANCEL | Day | Month | Year | Total

### System Solar Power:Month
2000Wh  5-2019
2000 1600 1200 800 400 0
05 10 15 20 25 30
CANCEL | Day | Month | Year | Total

### System Solar Power:Year
KWh  2019
200 160 120 80 40
1 2 3 4 5 6 7 8 9 10 11 12
CANCEL | Day | Month | Year | Total

### System Grid Power:Total
2000KWh  TOTAL
2000 1600 1200 800 400 0
20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
CANCEL | Day | Month | Year | Total

Solar power curve for daily, monthly, yearly and total can be roughly checked on the LCD. For more accuracy in power generation, please check on the monitoring system. Click the up and down arrow to check power curve of different period.

## 5.4. System Setup Menu

**System Setup**

| | |
|---|---|
| Battery Setting | System Work Mode |
| | Grid Setting / Gen Port Use |
| Basic Setting | Advanced Function / Device Info. |

This is System Setup page.

## 5.5. Basic Setup Menu

**Basic Setting**

☑ Time Syncs   ☑ Beep   ☑ Auto Dim

| Year | Month | Day |
|---|---|---|
| [+] 2019 [−] | [+] 03 [−] | [+] 17 [−] |

Basic Set

| | Hour | Minute |
|---|---|---|
| ☑ 24-Hour | [+] 09 [−] | [+] 15 [−] |

☐ Factory Reset   ☐ Lock out all changes

This is Basic Setup page.

## 5.6. Battery Setup Menu

**Battery Setting**

Batt Mode
- ◉ Lithium
- ○ Use Batt V
- ○ Use Batt %
- ○ No Batt

| Batt Capacity | 100Ah |
|---|---|
| Max A Charge | 50A |
| Max A Discharge | 50A |

☑ Activate Battery

Batt Mode

**Lithium Battery**

Batt Mode-------- Lithium
Max A charge-------- 0-120A
Max A Discharge-----0-120A
Activate Battery------Enable

**AGM Battery**

Batt Mode-------- Use Batt V or Use Batt V%
Batt Capacity-------- 50-2000Ah
Max A charge-------- 0-120A
Max A Discharge-----0-120A
Activate Battery ------Enable

No Batt --- No need to set other parameters, keep the default value.

## Battery Setting

| Start | 10% | | 10% ② | |
| A ① | 50A | | 50A | |
| ☑ Gen Charge | | | ☑ Grid Charge | |
| ☐ Gen Signal | | | ☑ Grid Signal | |
| Gen Max Run Time | 24.0 hours ③ | | | |
| Gen Down Time | 0.0 hours | | | |

**This is Battery Setup page. ① ③**

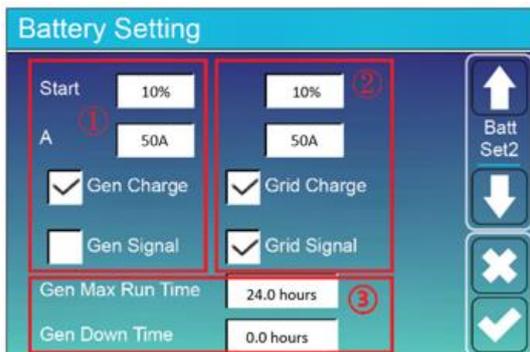Start =30%---It indicates that the Generator will start when the Battery capacity is less than 30% in Off-grid mode.

A    = 40A---It indicates the Current that the Generator charges the Battery after starting.

Gen Charge---It indicates the Switch that the Generator charges the Battery。

Gen Signal ---It indicates whether the Generator's ATS signal is on or off.

Gen Max RunTime ---It indicates the longest time Generator can run in one day,when time is up, the Generator will be turned off. 24H means that it does not shut down all the time.

Gen DownTime ---It indicates the delay time of the Generator to shut down after it has reached the running time.
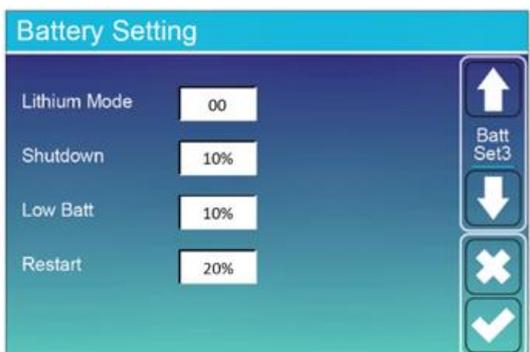
**This is Grid Charge, you need select. ②**

Start =30%---No use， Just for customization.

A    = 40A--- It indicates the Current that the Grid charges the Battery.

Grid Charge---It indicates that the grid charges the battery.
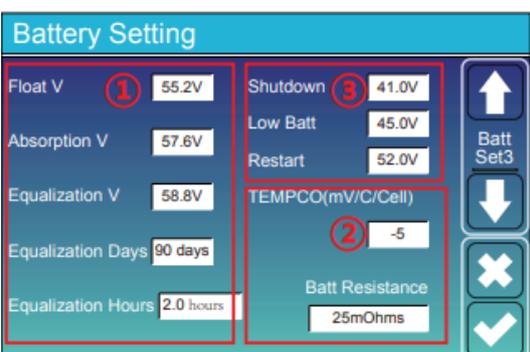
Grid Signal ---Disable.

## Battery Setting

| Lithium Mode | 00 |
| Shutdown | 10% |
| Low Batt | 10% |
| Restart | 20% |

Lithium Mode--This is BMS protocol.Please reference the document （Approved Battery）.

Shutdown 10%--It indicates the inverter will shutdown if the SOC below this value.

Low Batt 20% --It indicates the inverter will alarm if the SOC below this value.

Restart 40%    --It indicates the restart level when inverter shutdown.

## Battery Setting

| Float V ① | 55.2V | Shutdown ③ | 41.0V |
| | | Low Batt | 45.0V |
| Absorption V | 57.6V | Restart | 52.0V |
| Equalization V | 58.8V | TEMPCO(mV/C/Cell) | |
| | | ② | -5 |
| Equalization Days | 90 days | | |
| | | Batt Resistance | |
| Equalization Hours | 2.0 hours | 25mOhms | |

There are 4 stages of charging the Battery . ①

This is for professional installers,you can keep it if you do not know. ②

Shutdown 41V--The inverter will shutdown if the Voltage below this value.

Low Batt 45V   --The inverter will alarm if the Voltage below this value. ③

Restart 52V    --Restart level when inverter shutdown.

## 5.7. System Work Mode Setup Menu



### Work Mode

**Selling First** : It means that the excess energy has priority in grid connection.

**Zero Export To Load** : It means output power according to it consumed by the load.

**Zero Export To CT** : It means output power according to the CT position.

**Solar Sell** : It means that the excess solar energy can be integrated into the grid.

**Max Sell Power** 0-8000W

**Energy Pattern**

**BattFirst**--- It means solar power will charge battery first, when battery is full then feed-out power to the Load or Grid.

**LoadFirst**-- The solar energy will be used to supply the local load first,then to charge the battery.The redundant power will export to the public grid.
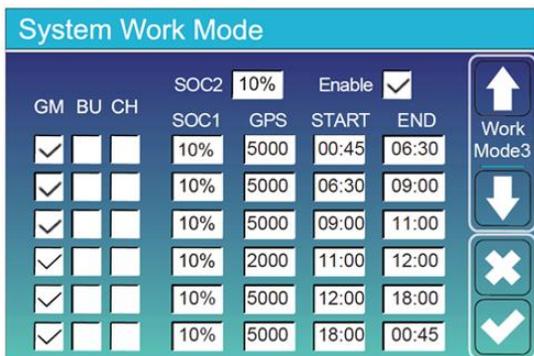


**Enable:** enables the system to work for time periods
**GPS:** Grid Peak Shaving. Sets the power limit to be taken from the grid per period.
**SOC2:** Battery reserve which is never used.
**SOC1:** Battery reserve used to guarantee the compliance of the power limit from the grid.
**Start/End:** Start and End hour of each period.
**GM(General Mode:** System tries to cover consumption with Bat+Sol.
**BU(Back-Up Mode):** Battery is not discharged to cover demand.

## 5.8. Grid Setup Menu
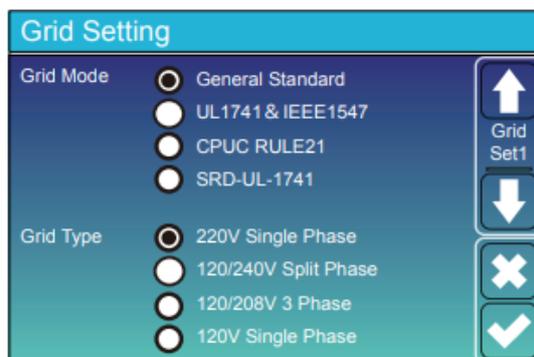


Please select the correct Grid Mode in your local area. If you are not sure, please choose General Standard.

Please select the correct Grid Type in your local area, otherwise the machine will not work or be damaged.

## Grid Setting

| | |
|---|---|
| Grid Frequency ● 50HZ ○ 60HZ | Grid Set2 |
| Reconnection Time **60S** PF **1.000** | |
| Grid HZ High **51.5Hz** Grid Vol High **265.0V** | |
| Grid HZ Low **47.5Hz** Grid Vol Low **185.0V** | |

UL1741&IEEE1547，CPUC RULE21，SRD-UL-1741

No need to set the function of this interface.

General Standard

Please select the correct Grid Frequency in your local area. You can hole this in default value。

## Grid Setting

| | | |
|---|---|---|
| □ Q(V) | □ FW | □ VW |
| V1:0.0V Q1:0.00 | Fstart:0.00Hz | Vstart:0.0V |
| V2:0.0V Q2:0.00 | Fstop:0.00Hz | Vstop:0.0V |
| V3:0.0V Q3:0.00 | Normal Ramp rate 0.0%/s | |
| V4:0.0V Q4:0.00 | Soft Start Ramp rate 0.0%/s | |

Grid Set3

For California only.

## Grid Setting

| | |
|---|---|
| □ L/HVRT | □ L/HFRT |
| HV2:0.0V 0.16S | |
| HV1:0.0V 0.16S | HF2:0.00HZ 0.16S |
| LV1:0.0V 0.16S | HF1:0.00HZ 0.16S |
| LV2:0.0V 0.16S | LF1:0.00HZ 0.16S |
| LV3:0.0V 0.16S | LF2:0.00HZ 0.16S |

Grid Set4

For California only.

## 5.9. GEN PORT use Setup Menu

## GEN PORT USE

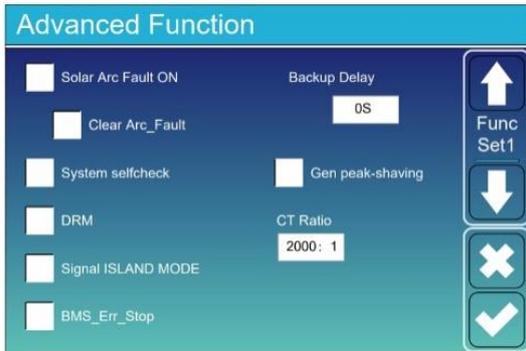| | |
|---|---|
| Mode | PORT Set1 |
| ○ Generator Input  □ Gen connect to Grid input | |
| ● SmartLoad Output  □ On Grid always on | |
| Power **1000W**  Open Delay **60Min** | |
| | OFF **95%** |
| ○ Micro Inv Input | ON **100%** |
| □ MI export to Grid cutoff | |

Generator Input:use Generator

SmartLoad Output: if the SOC is up than "ON" and solar power is high than 1000W. the inverter will open smartload.
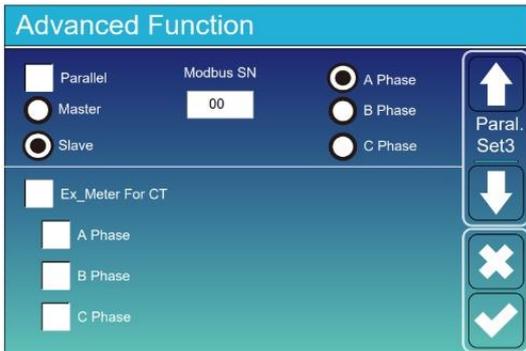
On Grid always on:mean when have Grid,the smartload will always on

Micro Inv Input:Inverter will open Microinverter.if the SOC is below the "ON" and close if the SOC is up than the "OFF"

## 5.10. Advanced Function Setup Menu

**Advanced Function**

- Solar Arc Fault ON
- Clear Arc_Fault
- System selfcheck
- DRM
- Signal ISLAND MODE
- BMS_Err_Stop

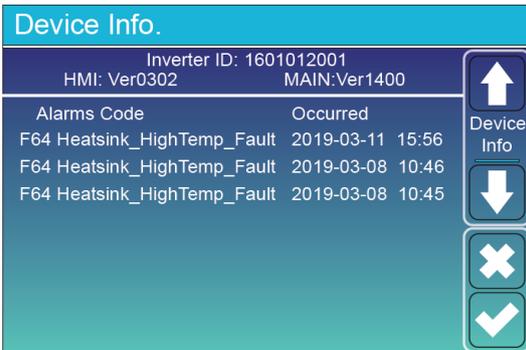Backup Delay: 0S
Gen peak-shaving
CT Ratio: 2000：1

Func Set1

Solar Arc Fault ON---This is only for US.

System selfcheck ---Disable. this is only for factory.

Gen Peak-shaving---Enable When the power of the generator exceeds the rated value of it, the inverter will provide the redundant part to ensure that the generator will not overload.

Grid Peak-shaving---Enable When the power of the grid exceeds the set value, the inverter will provide the redundant part to ensure that the grid power does not exceed the set value.

**Advanced Function**

- Parallel
- Master
- Slave
- Ex_Meter For CT
  - A Phase
  - B Phase
  - C Phase

Modbus SN: 00
- A Phase
- B Phase
- C Phase

Paral. Set3
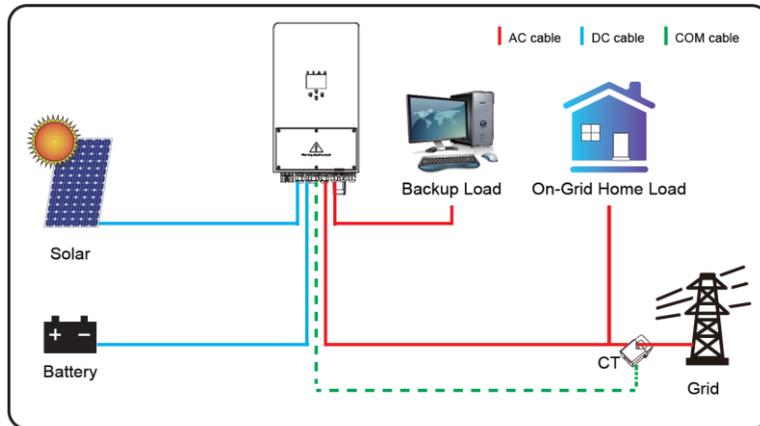
Parallel inverter connection (review section 3.10 y 3.11).

## 5.11. Device Info Setup Menu

**Device Info.**

Inverter ID: 1601012001
HMI: Ver0302          MAIN:Ver1400

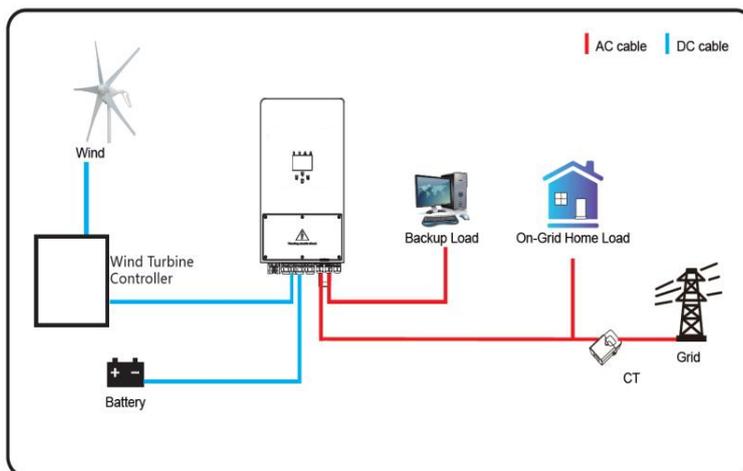| Alarms Code | Occurred |
| --- | --- |
| F64 Heatsink_HighTemp_Fault | 2019-03-11  15:56 |
| F64 Heatsink_HighTemp_Fault | 2019-03-08  10:46 |
| F64 Heatsink_HighTemp_Fault | 2019-03-08  10:45 |

Device Info
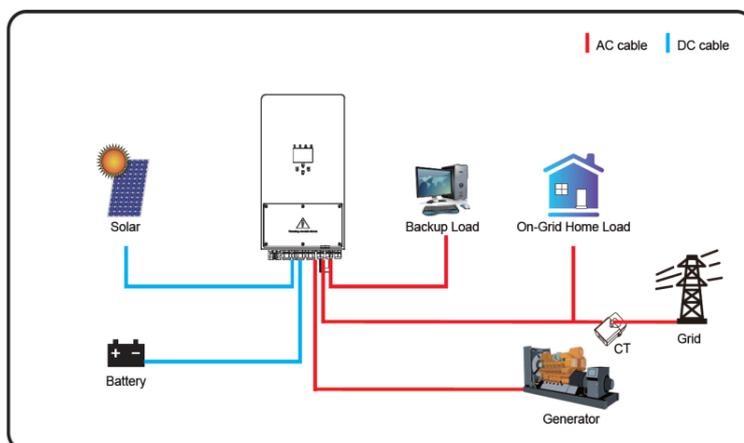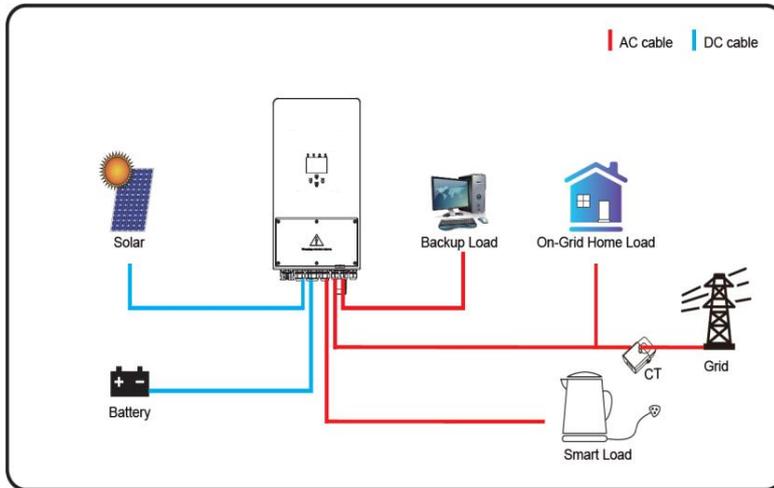
# 6. MODES

## Mode I: Basic
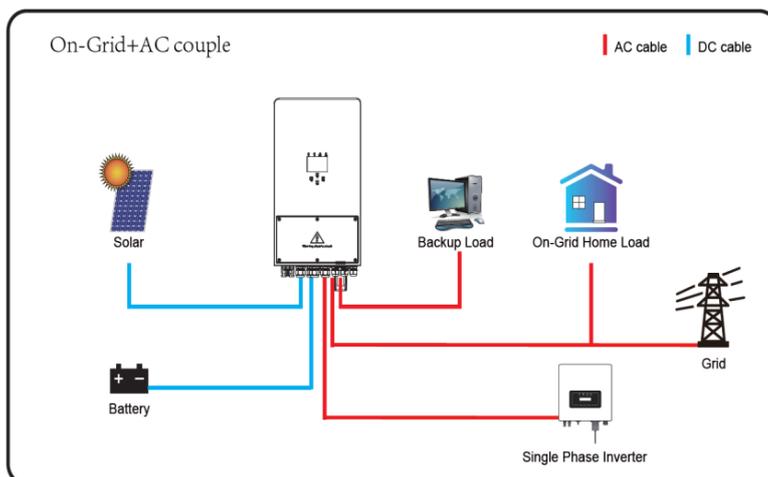


## Mode II: With Microturbine



## Mode III: With Generator

## Mode IV: With Smart Load



## Mode V: With On-Grid Inverter



| ⚠ | The 1st priority power of the system is always the PV power, then 2nd and 3rd priority power will be the battery bank or grid according to the settings. The last power backup will be the Generator if it is available. |
|---|---|

# 7. FAULT INFORMATION AND PROCESSING

The energy storage inverter is designed according to the grid-connected operation standard and meets the safety requirements and electromagnetic compatibility requirements. Before leaving the factory, the inverter undergoes several rigorous tests to ensure that the inverter can operate reliably.

| | |
|---|---|
| ⚠️ | If any of the fault messages listed in the following table appear on your inverter and the fault has not been removed after restarting, please contact your local dealer or service center. You need to have the following information. |

1. Inverter serial number.
2. Distributor or service center of the inverter.
3. On-grid power generation date.
4. The problem description (including the fault code and indicator status displayed on the LCD) is as detailed as possible.
5. Your contact information. In order to give you a clearer understanding of the inverter's fault information, we will list all possible fault codes and their descriptions when the inverter is not working properly.

To give you a clearer understanding of the inverter's fault information, we will list all possible fault codes and their descriptions when the inverter is not working properly.

| Error code | Description | Solutions |
|---|---|---|
| F07 | DC/DC_Softsart_Fault | 1. Check battery fuse.<br>2. Reset inverter. |
| F08 | GFDI _Relay_Failure | 1.When inverter is in Split phase(120/240Vac) or three-phasesystem (120/208Vac) system, the backup load port N line needs to connect ground.<br>2.If the fault still exists, please contact us for help. |
| F10 | AuxPowerBoard_Failure | 1. Wait a couple minutes.<br>2. Disconnect Wifi or any other communication type. |
| F13 | Working mode change | 1.When the grid type and frequency changed it will report F13.<br>2.When the battery mode was changed to "No battery" mode,it will report F13.<br>3.For some old FW version, it will report F13 when the systemwork mode changed.<br>4. Generally, it will disappear automatically when shows F13.<br>5. If still same, and turn off the DC switch and AC switch and wait for one minute and then turn on the DC/AC switch. |
| F18 | AC over current fault of hardware | 1.Please check whether the backup load power and commonload power are within the range. |

| | | 2.Restart and check whether it is in normal. |
|---|---|---|
| F20 | DC over current fault of the hardware | 1.Check PV module connect and battery connect.<br>2.When in the off-grid mode, the inverter startup with big powerload, it may report F20. Please reduce the load power connected.<br>3.Turn off the DC switch and AC switch and then wait oneminute,then turn on the DC/AC switch again. |
| F22 | Tz EmergStop Fault | 1.indica que el inversor está controlado de forma remota y está apagado.<br>2.Permanecerá en estado "APAGADO" hasta que llegue el comando de desbloqueo.<br>3.Cuando el número de inversores en paralelo es inferior a 5 piezas, todos los interruptores DIP del inversor (1 y 2) deben estar en la posición ON. Si el número de inversores en paralelo es mayor que 7, el interruptor DIP del inversor principal (1 y 2) debe estar en la posición ON y el interruptor DIP del resto (1 y 2) debe estar en la posición OFF. |
| F23 | AC leakage current is transient over current | 1. Check PV side cable ground connection, and check if there are are any leakage in the PV system.<br>2. Restart the system 2~3 times. |
| F24 | DC insulation impedance failure | 1.Check the connection of PV panels and inverter is firmly andcorrectly.<br>2.Check whether the PE cable of inverter is connected to ground. |
| F26 | The DC busbar is unbalanced | 1.Please wait for a while and check whether it is normal.<br>2.When the hybrid in split phase mode, and the load of L1 andload of L2 is big different, it will report the F26.<br>3.Restart the system 2~3 times. |
| F29 | Parallel CAN Bus fault | 1.When in parallel mode, check the parallel communication cableconnection and hybrid inverter communication address setting.<br>2.During the parallel system startup period, inverters will report F29.<br>when all inverters are in ON status, it will disappear automatically. |
| F34 | AC Overcurrent fault | 1. Check the backup load connected, make sure it is in allowed power range. |
| F35 | No AC grid | 1. Please confirm grid is lost or not.<br>2. Check the grid connection is good or not.<br>3. Check the switch between inverter and grid is on or not. |
| F41 | Parallel system stop | 1. Check the hybrid inverter working status. If there's 1 pcs hybrid inverter is in OFF status, the other hybrid inverters may report F41 fault in parallel system. |
| F42 | AC line low voltage | 1.Check the AC voltage is in the range of standard voltage inspecification.<br>2.Check whether grid AC cables are firmly and correctlyconnected. |
| F47 | AC over frequenc | 1. Check the frequency is in the range of specification or not.<br>2. Check whether AC cables are firmly and correctly connected. |

| F48 | AC lower frequency | 1. Check the frequency is in the range of specification or not. 2. Check whether AC cables are firmly and correctly connected. |
|---|---|---|
| F56 | DC busbar voltage is too low | 1.Check whether battery voltage is too low. 2.If the battery voltage is too low, using PV or grid to charge thebattery. |
| F58 | BMS communication fault | 1.it tells the communication between hybrid inverter and batteryBMS disconnected when"BMS_Err-Stop" is active. 2.if don't want to see this happen, you can disable"BMS_Err-Stop" item on the LCD. |
| F59 | AC Grid overcurrent | 1 Chech AC current. If there is no grid check the discharge battery current. |
| F61 | Botón manual OFF | 1. Indica que el interruptor del inversor está en posición OFF 2. Compruebe que el interruptor está desactivado y actívelo. 3. Póngase en contacto con nosotros si el problema persiste. |
| F63 | ARC fault | 1. ARC fault detection is only for US market. 2. Check PV module cable connection and clear the fault. |
| F64 | Heat sink high temperature failure | 1. Check whether the work environment temperature is too high. 2. Turn off the inverter for 10mins and restart. |

## Information.

Any replacement or repair of the product will cover the remaining warranty period of the product.

Factory warranty does not include damage due to the following reasons:

- Damage during transportation of equipment.
- Damage caused by incorrect installation or commissioning.
- Damage caused by failure to comply with operation instructions, installation instructions or maintenance instructions.
- Damage caused by attempts to modify, alter, or repair products.
- Damage caused by incorrect use or operation.
- Damage caused by insufficient ventilation of equipment.
- Damage caused by failure to comply with applicable safety standards or regulations.
- Damage caused by natural disasters or force majeure (e.g. floods, lightning, overvoltage, storms, fires, etc.).

In addition, normal wear or any other failure will not affect the basic operation of the product. Any external scratches, stains or natural mechanical wear does not represent a defect in the product.

# 8. LIMITATION OF LIABILITY

The manufacturer is not responsible for the possible loss of profit or economic losses incurred by product failures covered by the scope of the product warranty.

# 9. DATASHEET

| Technical Data | HYBRID SERIES 48V 5.0 |
|---|---|
| **Battery Input Data** | |
| Battery Type | Plomo-ácido o iones de litio |
| Battery Voltage Range (V) | 40V-60V |
| I $_{max}$ charge (A) | 120A |
| I $_{max}$ discharge (A) | 120A |
| Charging Curve | 3 stages/equalization |
| External Temperature Sensor | Optional |
| Charging Strategy for Li-Ion Battery | Self-adaption to BMS |
| **DC Input Data** | |
| P$_{max}$ DC (W) | 6500W |
| PV Input Range (V) | 370V (100V -500V) |
| MPPT Range (V) | 125-425V |
| Full Load DC Voltage Range | 240V-425V |
| Start-up Voltage (V) | 150V |
| PV Input Current (A) | 13A+13A |
| NºMPPTs | 2 |
| Strings per MPPT | 1/1 |
| **AC Output Data** | |
| Nominal Power (W) | 5000W |
| Max. Power (W) | 5500W |
| Peak Power (Offgrid) | 2 of rated power,10 S |
| Back-Up max. Power (W) | 5000W |
| Nominal Output AC Current(A) | 21.7A |
| Max. AC Current (A) | 25A |
| Peak Current (A) | 35A |
| Power Factor | 0,8-1 |
| Output Frequency and Voltage | 50/60Hz; 220/230/240VCA (single phase) |
| Grid Type | Single Phase |
| Current harmonic distortion | THD<3% (Linear load) <1,5% |
| **Efficiency** | |
| Max. Efficiency | 97.60% |

| Euro Efficiency | 96.50% |
|---|---|
| MPPT Efficiency | 99.90% |
| **Protections** | |
| PV Input Lightning Protection | Integrated |
| Anti-islanding Protection | Integrated |
| PV String Input Reverse Polarity Protection | Integrated |
| Insulation Resistor Detection | Integrated |
| Residual Current Monitoring Unit | Integrated |
| Output Over Current Protection | Integrated |
| Output Short circuit Protection | Integrated |
| Output Over Voltage Protection | Integrated |
| **Certifications** | |
| Grid Regulation | VDE 0126, AS4777, NRS2017, G98, G99, IEC61683, IEC 62116, IEC 61727 |
| Safety Regulation | IEC62109-1, IEC62109-2 |
| EMC | EN61000-6-1, EN61000-6-3 |
| **General Data** | |
| Operating Temperature Range (°C) | -25 a 60 °C, >45 °C Derating |
| Cooling | Fan |
| Noise (dB) | <30 |
| Communication with BMS | RS485; CAN |
| Weight (kg) | 20.5 |
| Size (mm) | 580 x 330 x 232 |
| Protection Degree | IP65 |
| Installation Style | Wall |
| Warranty | 5 years |