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Chapter 1 General

This manual provides a comprehensive guide on the single-phase hybrid energy storage inverter, covering product details, installation, wiring, configuration and debugging, as well as troubleshooting and maintenance. Before engaging with the product, kindly ensure to thoroughly review this manual to grasp the safety measures, capabilities, and distinctive features of the inverter. VEICHI is committed to the ongoing refinement of our products to surpass the expectations of our esteemed users, so it will maintain the prerogative to enhance the product continuously, with the corresponding manual content being updated in tandem to reflect the latest improvements. VEICHI possesses the ultimate authority to interpret the contents of this manual and reserves the right to make any necessary revisions. Should you encounter any uncertainties regarding the functions or performance of the inverter, our support team is always at your disposal for consultation and assistance.

1.1 Product

This document applies to the following inverter models:




Model	Rated Output Power	Rated Output Voltage
VHS-5K-L01-K	5000W	220V/230V/240V, L/N/PE

1.2 Operator

This product is intended for only professionals who are familiar with local codes and standards, electrical systems around this product.

1.3 Sign

Please review the symbols and their descriptions attentively, as these symbols are utilized to emphasize crucial information throughout the usage process.

 DANGER
High level of potential hazard that, if not avoided, could result in death or serious injury to persons.
 WARNING
Medium level of potential hazard that, if not avoided, could result in death or serious injury to persons.
 CAUTION
Low level of potential hazard that, if not avoided, could result in moderate or minor injury to persons.
ATTENTION
Emphasis and additions to the content may provide tips or tricks for optimal use of the product that can help the user solve a problem or save time.

Chapter 2 Safety Precaution

The safety guidelines outlined in this manual must always be strictly adhered to when the equipment is in operation.

WARNING

The inverter has been designed and tested in accordance with strict safety regulations, while it is still very important to follow the relevant safety instructions before carrying out any operation on the equipment, as improper operation may result in serious injury or property damage.

2.1 General Safety

ATTENTION

Please read this document carefully to understand the product and precautions before installation.

- All equipment operations should be performed exclusively by certified electrical professionals who are well-versed in the local standards and safety regulations relevant to the project.
- Be sure to operate the inverter with insulated tools and personal protective gears. Wear anti-static gloves, wrist strap and clothes to avoid possible damage to the devices.
- VEICHI shall not be held liable for any damage to the equipment or personal injury resulting from the improper installation, use, or configuration of the inverter not in compliance with the instructions provided in this document.

2.2 PV String Safety

DANGER

Use the DC terminals shipped with the product to connect the inverter DC cables. Any damage to the equipment may result from the use of other types of DC terminal blocks, or any resulting consequences therefrom, is not covered by VEICHI.

WARNING

- Be sure the module frame and bracket system are well grounded.
- Double check the DC cable connection after wiring.
- Use a multimeter to verify the continuity and correct polarity of the DC cable connections and if the voltage is within the allowable range.
- Do not connect the same PV string to more than one inverter, as this may cause equipment damage.

2.3 Inverter Safety







⚠ WARNING



- Be sure that the voltage and frequency at the grid-tied point meet the corresponding specifications.
- Better to add protection devices such as circuit breakers or fuses on the AC side of the inverter, both greater than 1.25 times the rated AC output current of the inverter.
- This inverter shall be connected to a permanently grounding system well. Always comply with local requirements and regulations when installing this inverter. And in the case of multiple inverters, ensure that all inverter housings are properly grounded.
- If the inverter triggers alarms fewer than 5 times in 24 hours, the alarms can be cleared automatically. But when a fifth one comes out again, the inverter will be shut down for protection, and the alarm must be cleared manually to resume normal operation.
- The BACK-UP function is not recommended for solar systems that are not configured with batteries. Electrical risks to the system resulting from this will be beyond the scope of the VEICHI's warranty.
- Please don't disassemble the inverter by yourself. If maintenance or repair is required, please resort to a specialized service center.
- Please disconnect all wires before performing any maintenance or cleaning to avoid electric shock. Turning off the device does not reduce the risk of electric shock.

⚠ DANGER

The labels and warning signs on the box must be clear after the inverter is installed, and obscuring, altering, or damaging them is prohibited.

The markings on the inverter case are as follows:

	High voltage: There is high voltage during operation, make sure that the inverter is disconnected from the power supply for certain operations.		Discharge delay: After powering down the unit, wait at least 5 minutes until the unit is fully discharged.
	Manual review: Please read the product manual in detail before operating the equipment.		Danger: The equipment is potentially hazardous during operation. Exercise all necessary precautions to mitigate any risks.
	High temperatures: Do not touch it while the unit is in operation as this may result in scalds.		Proper disposal: The equipment should not be disposed of as household garbage. Please follow local laws and regulations or send it back to the manufacturer.

	CE mark		Grounding point
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2.4 Battery Safety

DANGER

When working with or around batteries, handle metal tools with the utmost care. The inadvertent dropping of these tools can lead to sparks or short-circuits, potentially causing explosions and extensive damage to the battery or other electrical components. Be aware that any damage therefrom is not covered by VEICHI's warranty.

WARNING

- Batteries used with the inverter shall be approved by VEICHI, and a list of approved batteries is available through the official website.
- Read the battery manual to understand the product and precautions before installing the equipment, and operate strictly according to the requirements within.
- If the battery is completely drained, recharge it following the guidelines specific to its model.
- Battery performance can be affected by several factors, such as: temperature, humidity, weather conditions, etc., which may result in current limitation and load capacity fluctuation.
- Should the battery fail to function, promptly reach out to the after-sales service center for assistance, to avoid further damage.
- Use a multimeter to verify the DC cable connections at both the positive and negative ends, and that the voltage is within the allowable range.
- Do not connect the same PV string to more than one inverter, as this may cause equipment damage.

2.5 Personnel Requirements

ATTENTION

During operation, certain components of the inverter may carry electrical current or generate heat. But there are inherent risks even though it's not working. Improper use, installation or operation can result in serious injury to persons or property.

- Therefore, only individuals who are qualified and have undergone rigorous training should be entrusted with the responsibility of installing and maintaining the equipment. They must be well-versed in various safety precautions and the correct operational methods to ensure safe and effective use.
- Installation, maintenance, and replacement of equipment or parts must be performed by professionals or qualified personnel.

Chapter 3 Inspection and Preservation

3.1 Inspection before Acceptance

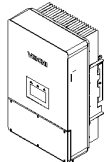
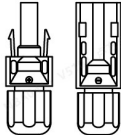


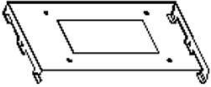
Please check the following items carefully before acceptance, and contact the local dealer at once if there are any abnormalities and try to keep the package as intact as possible.

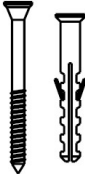

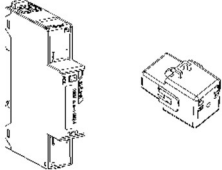
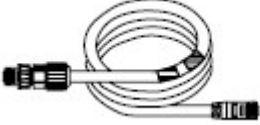
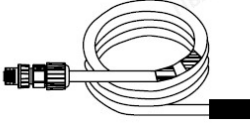
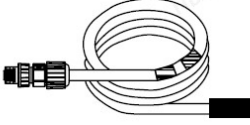



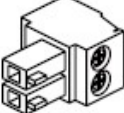
1. Check the outer package for damage, such as deformation, openings, cracks or other signs that may cause damage to the equipment inside the box.
2. Check if the inverter model is what you have ordered.
3. Check deliverables for correct type, quantity, and appearance damage.



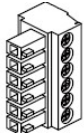

3.2 Deliverables

⚠ WARNING	
For electrical connections, please use the terminal blocks shipped in the box. Damage to the unit caused by an incompatible connector will not be covered in the warranty.	
<ul style="list-style-type: none"> ● DC connectors: 2 × PV+/PV-. ● Temperature sensor cable for lead-acid battery: Check if your inverter supports the connection of lead-acid battery, 1pc included. 	

Table3-1 Deliverables

No.	Name	Qty	Diagram
1	Inverter	1PCS	
2	DC connector (with pins)	2 pairs	
3	Back plate	1PCS	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  Left </div> <div style="text-align: center;">  Right </div> <div style="text-align: center;">  Rack </div> </div>

4	Expansion screw	4PCS	
5	Battery connecting terminal	2PCS	
6	Smart meter (Option)	1PCS	
7	Lithium-ion battery BMS cable	1PCS	
8	Lead-acid battery temperature sensor cable	1PCS	
9	Meter cable (Option)	1PCS	
10	Screwdriver	1PCS	
11	Communication module	1PCS	
12	Manual	1PCS	
13	2PIN terminal	7PCS	

14	On/off grid and diesel generator terminal	9PCS	
15	Grounding terminal	1PCS	
16	6PIN terminal	1PCS	
17	Sensor Clamp	1PCS	

3.3 Product Preservation

If the inverter is not to be put into service immediately, please keep it according to the following requirements:

1. Keep the original packaging intact.
2. Ensure a clean environment with proper temperature and humidity and no condensation.
3. Follow the box label for stacking height and direction.
4. Prevent any risk of dumping after stacking.
5. Have a professional inspect the inverter after long-term storage.

Chapter 4 Product Introduction

4.1 Brief

The VHS-5K-L01-K inverter is a multifunctional single-phase hybrid inverter designed for PV systems, offering precise control and optimization of energy flow through an integrated energy management system. This system ensures that the power generated by the PV system is efficiently allocated to meet loads, stored in batteries for later use, or exported to the grid.

Its main advantages include:

- **Versatility:** Combined functions of inverter, solar charger and battery charger facilitate flexible management and use of energy.
- **Energy management:** An integrated energy management system allows control and optimization of the energy flow for efficient use of energy.
- **Portability:** Portable UPS are available for situations where a mobile or temporary power solution is required.
- **LCD display:** The inclusion of an LCD display with touch-screen operation enhances user experience by allowing for intuitive configuration and access.
- **Battery and solar charging:** The capability to perform both battery and solar charging adds to the system's flexibility in storing and utilizing energy.

4.2 Function Characteristics

The VHS-5K-L01-K inverter offers a suite of advanced features as follows:

- **On-grid capability:** It can export excess solar power to the grid, providing an opportunity for users to sell or feed back surplus energy.
- **Power supply priority:** Users can prioritize between battery and grid power to optimize energy consumption according to their needs.
- **Multiple work modes:**
 - **On-grid mode:** The inverter outputs power to the grid.
 - **Off-grid mode:** The inverter provides power independently without the grid.
 - **UPS mode:** It automatically switches to battery power during grid failures to ensure continuous operation of critical equipment.
- **Battery charging current/voltage setting:** Through the LCD display, users can customize the charging parameters to suit different types and states of batteries.
- **AC/Solar/Generator charger priority:** Users can set the priority of different energy inputs to optimize energy flow.
- **Mains voltage or generator power compatibility:** The inverter can adapt to different power inputs for flexible use.
- **Overload/overheat/short-circuit protection:** The inverter is equipped with protection mechanisms to safeguard against equipment damage and safety hazards.

- Intelligent charging: Built-in intelligent charger can adjust the charging strategy according to the state of the battery to prolong its service life.
- Limit function: It prevents excessive power output to the grid and avoids burdening the grid or violating relevant regulations.
- Built-in 2-way of MPPT (Max. Power Point) tracker: It improves the energy conversion efficiency of solar panels.
- MPPT 2-stage charging: It optimizes the battery charging process through two-stage charging strategy to improve efficiency and battery life.
- Intelligent load: The inverter can dynamically adjust the output based on load demands to ensure efficient energy distribution.

4.3 Application

Household energy storage single-phase hybrid inverters are mainly used in places with high or changing electricity prices, areas without grids at all or places requiring uninterrupted power supply and emergency power supply. Please check the following items for applications in different scenarios:

WARNING

- Do not use this product for equipment that needs stable power supply such as life-sustaining medical equipment.
- Do not use the BACK-UP function for PV systems that are not configured with batteries. Any electrical risks arising from this misuse are not covered by VEICHI's warranty.
- Battery current may be affected by several factors, such as: temperature, humidity, weather conditions, etc., which may result in current limitation and load capacity fluctuation.
- The inverter can be restarted automatically when overload protection occurs for a single time; But repeated overloads may extend the restart time. For quicker restarts in such cases, use the inverter's APP.
- If the off-grid load exceeds the inverter's rated power during a grid outage, the off-grid function will shut down automatically. To reactivate it, reduce the load to below the inverter's rated power.
- The BACK-UP output port of the inverter is equipped with overload characteristic and UPS function (switching time <10ms), suitable for typical household loads during power grid failures. For stable UPS switching and power supply to connected loads, minimize the use of high-start-current devices, such as powerful pumps.
- Inductive load: Maximum support for one set of 1.5P fixed-frequency air conditioners. Access to two or more may lead to the standby mode failure.
- Capacitive load: The total power of capacitive loads should not exceed 66% of the inverter's rated output power.

4.4 Work Modes

4.4.1 Load Mode

- The PV prioritize powering the loads, with excess energy charging the batteries and then to the grid.
- When the PV are not enough to power the loads, the batteries and the mains supply will power the loads (batteries>mains supply).

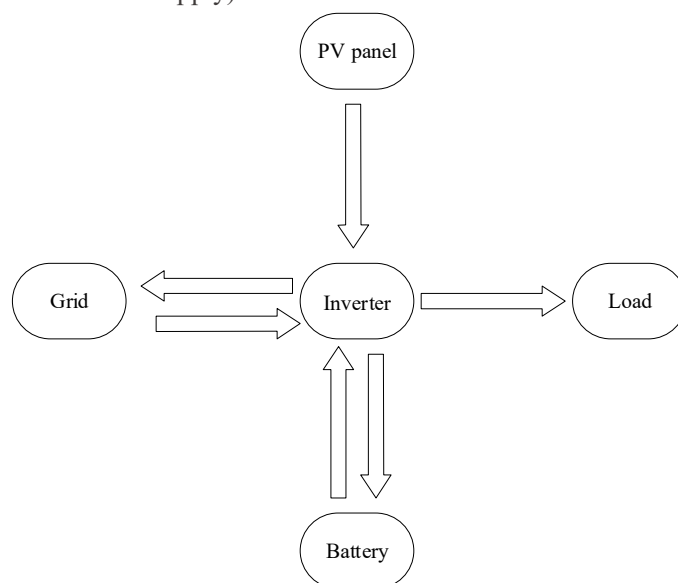


Figure 4-1 Load Mode

4.4.2 Cost Mode

- During charging, the PV panels prioritize the battery, serves excess energy to the load, if there are energy left, return them to the grid; When the PV is disconnected, the grid will charge the battery and provide energy to the load.
- During discharging, the PV prioritize the loads, and return the excess energy to the grid along with the batteries. When the PV is disconnected, the battery prioritizes the load and return the excess energy to the grid.

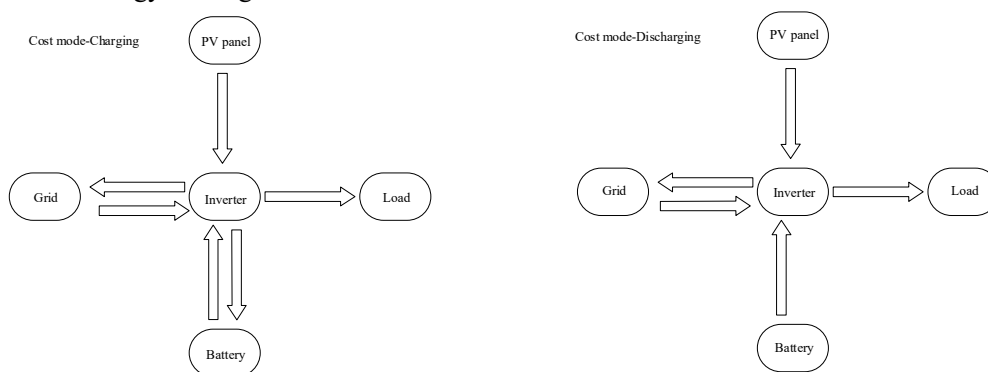


Figure 4-2 Cost Mode

4.4.3 Battery Mode

- The PV prioritize the battery, with excess energy to load and then to the grid.
- When the PV are not enough to charge the battery, then the mains power is used to charge the battery and power the load.

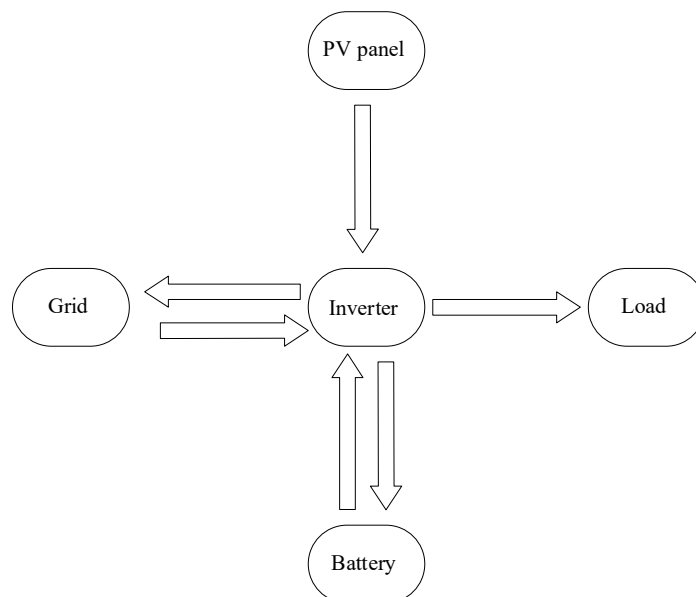


Figure 4-3 Battery Mode

4.5 Technical Data

Table 4-1 Technical Data

Model	VHS-5K-L01-K
Battery Input	
Type	Lead-acid/lithium
Voltage range (V)	48(40~60)
Max. charge current (A)	100
Max. discharge current (A)	120
Max. charge/discharge power (W)	5000
PV Input	
Max. power (W)	6500
Max. voltage(V)	550
Voltage range (V)	125~500
MPPT voltage range (V)	150~500
Startup voltage (V)	54
Rated voltage (V)	370, 370V for the PV rated voltage
Max. input current per MPPT (A)	16
Max. short circuit current per MPPT(A)	20
MPPT qty	2

AC Output	
Rated active power (W)	5000
Max. active power (W)	5500
Rated voltage (V)	220/230/240
Grid frequency (Hz)	50/60
Rated current (A)	22.7/21.7/20.8, for 220V, 230V, and 240V respectively
Power factor	0.8 leading~0.8 lagging (adjustable)
THDi	<3%
EPS switch time (ms)	≤10
THDu (@Linear load)	<3%
Efficiency	
Max. efficiency	97.60%
European efficiency	96.50%
MPPT efficiency	99.90%
Protection	
Insulation resistance detection	Yes
Residual current monitoring	Yes
Anti-reverse detection	Yes
Anti-islanding	Yes
Anti-AC overcurrent	Yes
Anti-short circuit	Yes
Anti-AC overvoltage	Yes
DC switch	Yes
DC surge arrester	Type II
AC surge arrester	Type III
Basic Parameters	
Working temperature (°C)	-25~+60
Max. altitude (m)	3,000 (derate above 2,000m)
Cooling method	Natural air circulation
Noise (dB)	<30
HMI	LCD, WLAN+ APP
BMS communication	CAN/RS485
Meter communication	RS485
Monitoring	WIFI/WIFI+LAN/4G
Weight (kg)	24.5
Size (W*D*H) (mm)	370×595×222
Topology	Not isolated
Night standby power (W)	<10
IP	IP65
Installation method	Wall-mounting
Warranty period	5 years

4.6 Appearance

4.6.1 Port Introduction

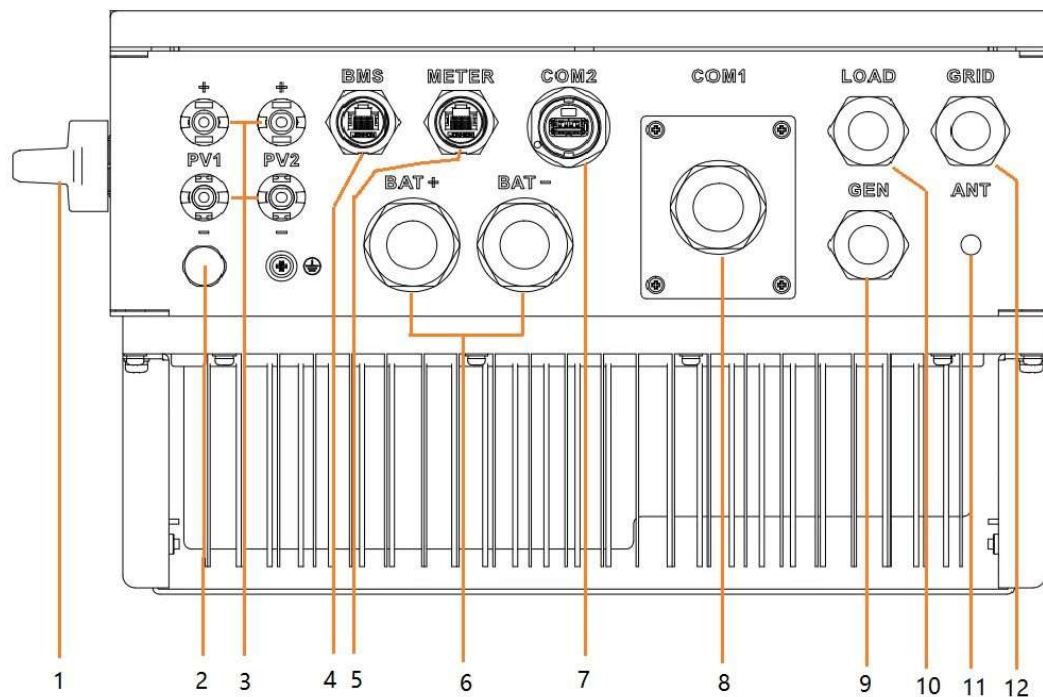


Figure 4-4 Port Introduction

Table 4-2 Port Description

No.	Description	No.	Description
1	PV input switch	2	Explosion-proof device
3	PV input (PV1+/-, PV2+/-)	4	BMS communication (BMS)
5	Meter communication (METER)	6	Battery input (BATTERY+/-)
7	Communication module	8	Multi-function communication
9	GEN input	10	Load AC output
11	Antenna	12	GRID AC output

4.6.2 Product Dimension

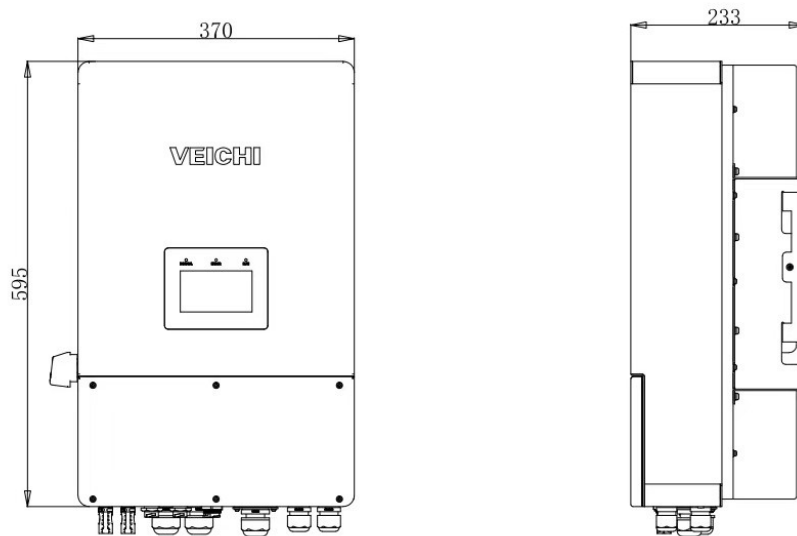


Figure 4-5 General Dimension

Wall-mounting dimension

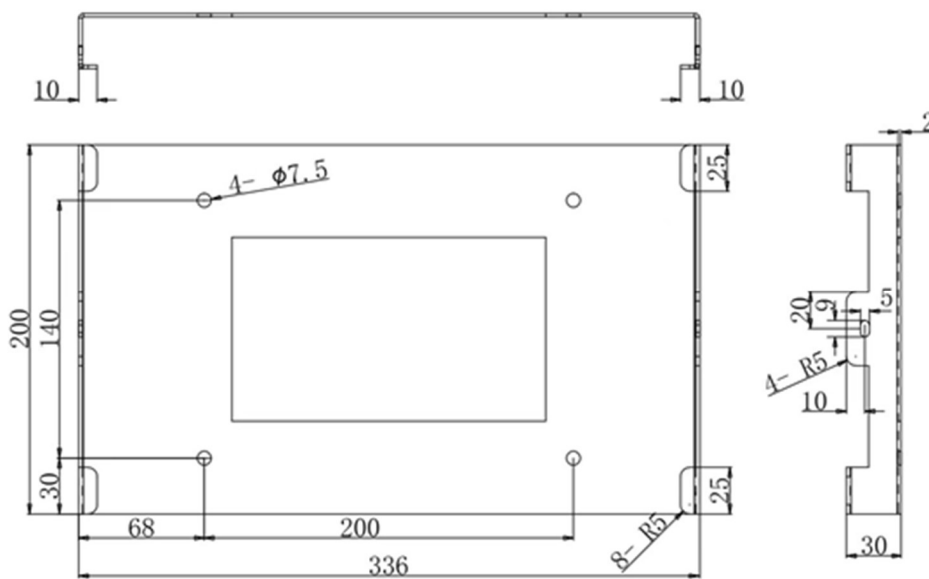


Figure 4-6 Wall-mounting Dimension

4.6.3 Nameplate

VEICHI	
Model: VHS-5K-L01-K	
Product Type	Hybrid Inverter
Enclosure	IP65
Ambient Temperature	-25~60°C (>45°C derating)
Protection Level	Class I
Over Voltage Category	III(AC), II(DC)
Inverter Topology	Non-isolated
Charge Mode	
Battery Voltage Range	48Vd.c.(40~60Vd.c.)
Max. Battery Charge Current	100Ad.c.
AC Input Voltage	L/N/PE 220/230/240Va.c.
AC Input Frequency	50/60Hz
AC Input Rated Current	21.7Aa.c.
Rated AC Input Power	5000W
PV Input Voltage	370Vd.c.(125~500Vd.c.)
MPPT Input Range	150~425Vd.c.
PV Input Current	13Ad.c.+13Ad.c.
Max. PV Input Power	6500W
Max. PV Isc	17Ad.c.+17Ad.c.
Utility-interactive	
AC Output Voltage	L/N/PE 220/230/240Va.c.
AC Output Frequency	50/60Hz
AC Output Rated Current	21.7Aa.c.
Max. AC Output Current	23.9Aa.c.
AC Output Rated Power	5000W
Max. Output Apparent Power	5500VA
AC Output Power Factor	0.8 leading to 0.8 lagging
Max.AC Isc	90Aa.c.
Battery Discharge Voltage Range	40~60Vd.c.
Max. Battery Discharge Current	120Ad.c.
Battery Discharge Power	5000W
Stand Alone	
AC Output Voltage	L/N/PE 220/230/240Va.c.
AC Output Frequency	50/60Hz
AC Output Rated Current	21.7Aa.c.
Max. AC Output Current	23.9Aa.c.
AC Output Rated Power	5000W
Max. Output Apparent Power	5500VA
Battery Discharge Voltage Range	40~60Vd.c.
Max. Discharge Current	120Ad.c.
CAUTION: -High voltage, warning electric shock! -The capacitors store hazardous energy. Do not touch the terminal or remove the shell within 5 minutes after all power is disconnected. -Keep the equipment well ventilated. -To avoid electric shock and warranty void, do not remove covers. -No operator serviceable component inside.	
Add: No.1000, Songjia Road, Guoxiang Subdistrict, Wuzhong Economic and Technological Development Zone, Suzhou City, China	

Figure 4-7 Nameplate Description

Note: This is just for your information, please check the real nameplate.

Chapter 5 Installation

5.1 Installation Requirements

5.1.1 Environmental Requirements

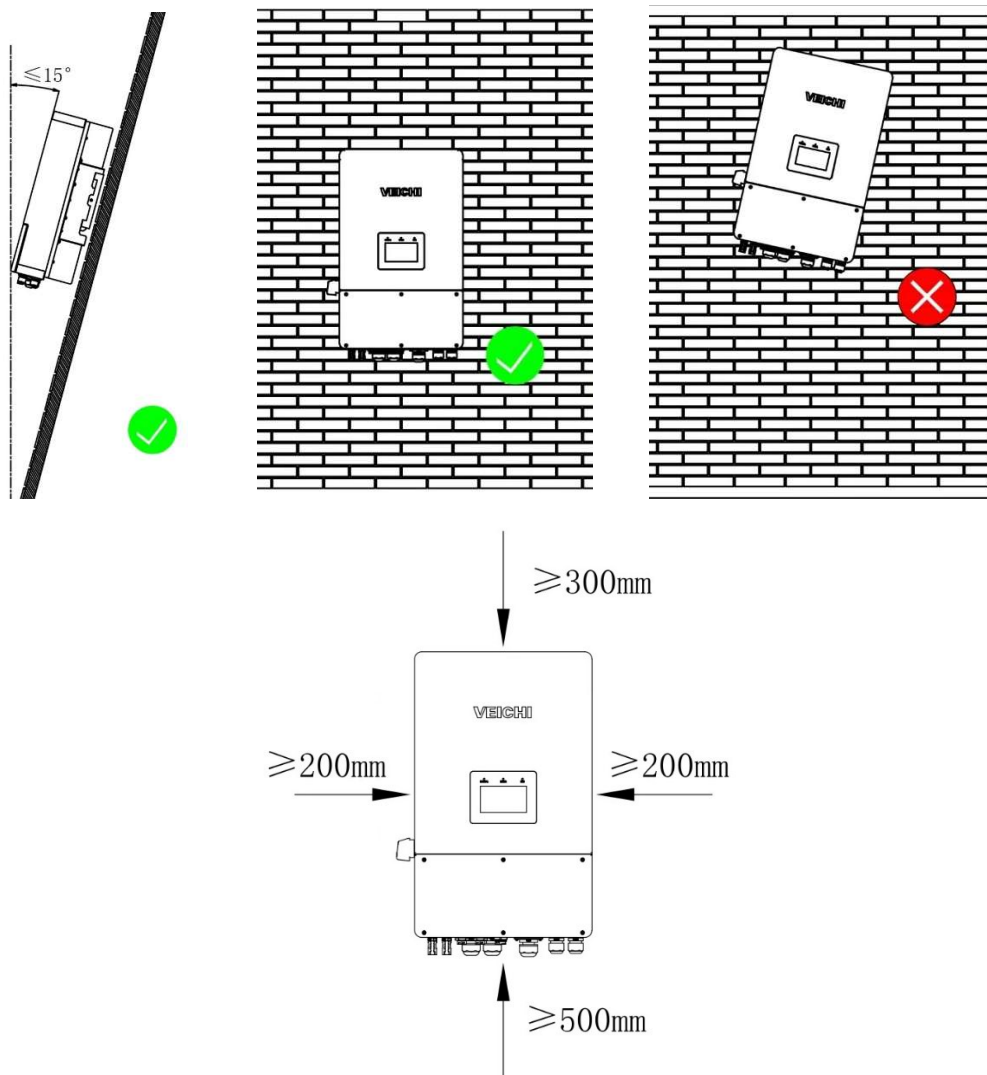
1. Do not install it in flammable, explosive, or corrosive places.
2. Maintain a safe distance away from people, children especially. Refrain from touching the surface during operation to avoid scalds.
3. Refrain from drilling to the water pipes, cables, etc. in the wall around the inverter.
4. Protect it away from sun, rain, snow and such. Use a shelter or awning if necessary
5. Reserve adequate space for ventilation, dissipation and operation.
6. Keep indoor and outdoor temperature and humidity within the specified range.
7. The height of the equipment shall be convenient for operation and maintenance, viewing of indicator lights and labels, and wiring operations.
8. Do not install the inverter at altitudes higher than 3000 meters.
9. Keep it away from strong magnetic field environment to avoid electromagnetic interference. If there is a radio station or wireless communication equipment below 30MHz nearby, install the equipment in the following way:
 - a) Add ferrite cores with multi-turn windings or low-pass EMI filters to the DC input or AC output lines of the inverter.
 - b) Keep the inverter at least 30 meters away from such equipment.

5.1.2 Base Requirements

1. It is not be flammable and fire resistant.
2. It is firm and solid for the inverter's weight.
3. It is sound-proof to minimizes noise disturbance to nearby residents






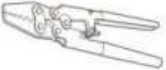



5.1.3 Angle Requirements







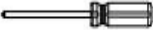

1. Install the inverter vertically or with a maximum tilt back of 15°.
2. Do not install it upside down, tilted forward, excessively backward, or lying flat.



5.2 Installation Tools

Here is a list of recommended tools:

Tool	Diagram	Tool	Diagram	Tool	Diagram
Safety goggles		Safety shoes		Safety gloves	
Dust mask		Registered jack crimping tool		Crimping tool	
Diagonal plier		Wire stripper		Drilling tool	

Heat gun		Vacuum cleaner		Marker pen	
Leveling instrument		Heat shrink tubing		Rubber mallet	
Screwdriver		Multimeter		-	-

5.3 Handling and Installation

5.3.1 Handling

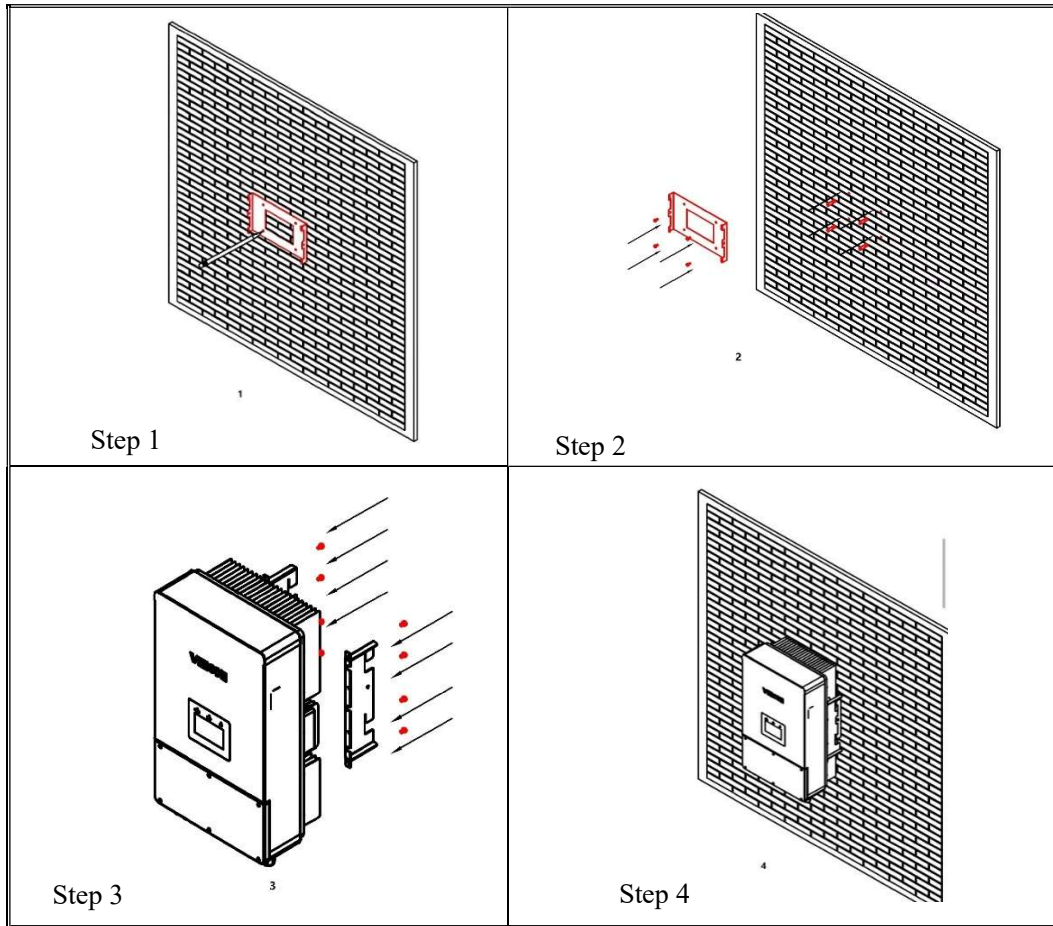
1. Ensure all transportation, handling, and installation procedures comply with the laws, regulations, and relevant standards of the country or region where the inverter is being used.
2. To avoid injury to operators or damage to the equipment during transportation, please pay attention to the following points:
 - Two operators are required to work together to remove the inverter from the package and carry it carefully to the installation site, taking care to keep it steady.
 - Wear safety gloves.

5.3.2 Installation

ATTENTION
<ul style="list-style-type: none"> ● Check the water pipes, cables, etc. in the wall around the inverter to avoid danger due to hole drilling. ● Wear goggles and a dust mask when drilling holes to avoid dust being inhaled into the respiratory tract or falling into the eyes. ● Mount it firmly to avoid toppling over.

Steps

1. Select a wall with enough load-bearing capacity, place the backplate horizontally on the wall, and use a marker to mark the holes.
2. Use a driller with a 10mm drill bit, depth about 80mm. Use expansion screws to secure the inverter backplate to the wall.
3. Install the left and right hangers on both sides of the rear of the inverter firmly.
4. Hook up the inverter to the back plate, fix the back plate and the left and right hanging screws firmly.



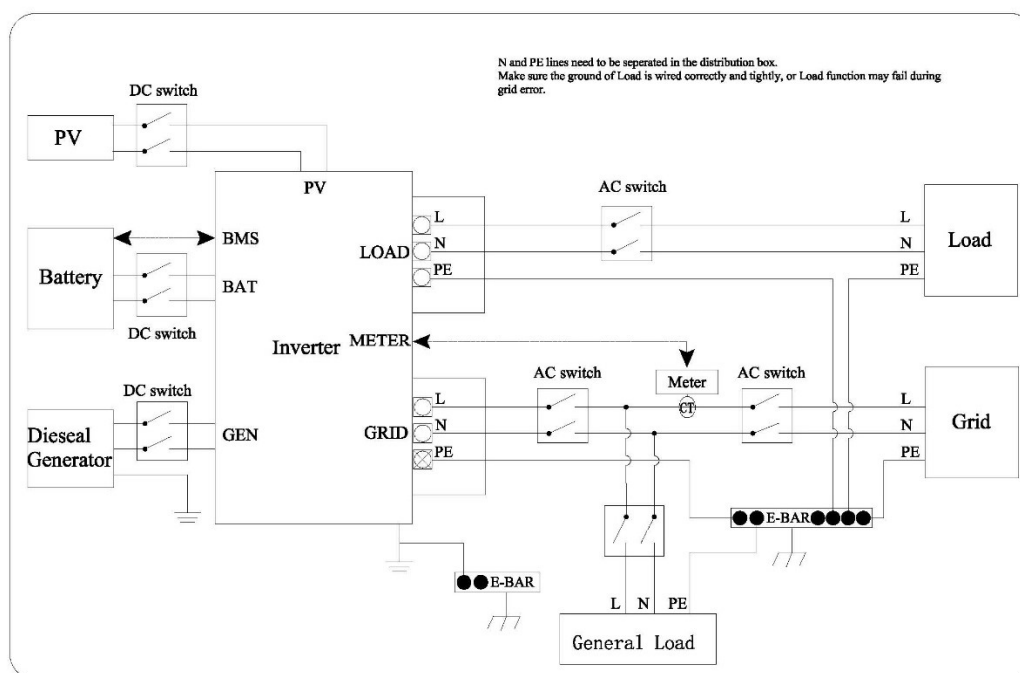
Chapter 6 Electrical Connection

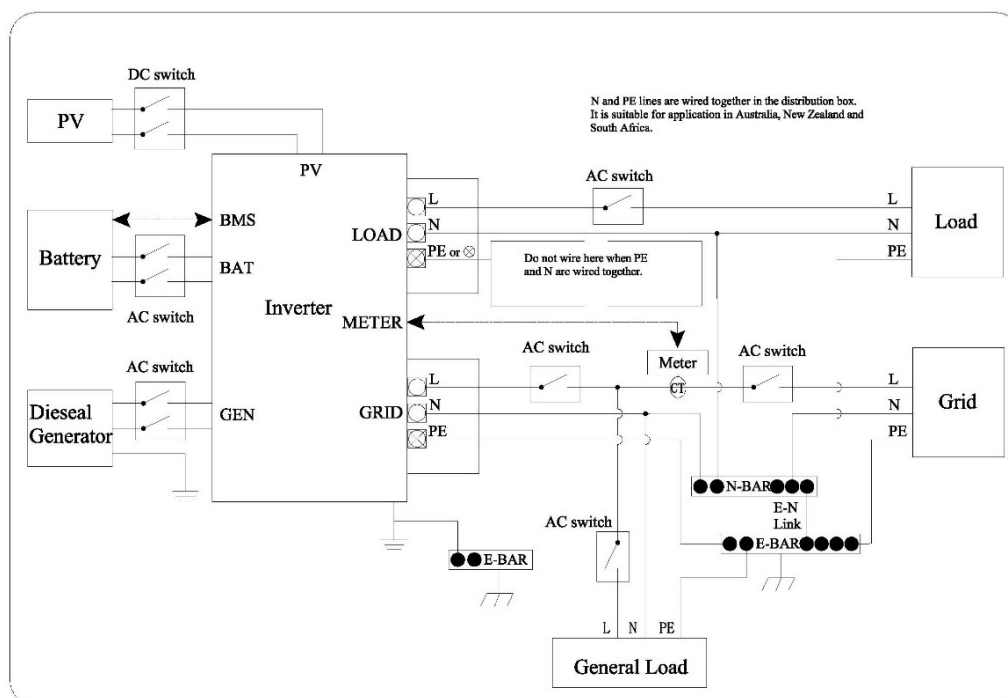
Make sure that the AC and DC sides are not electrified before installation and maintenance and wait for at least 5 minutes until it is fully discharged since the capacitor still carries electricity after power cut. Household energy storage single-phase inverters are designed for PV systems with batteries. Equipment may be damaged if not used as specified.

6.1 Wiring Diagram

ATTENTION

1. The N and PE wiring of the AC-GRID and AC-LOAD ports of the inverter are different according to the regulatory requirements of different region. Please refer to your local regulatory requirements.
2. The inverter AC-GRID and AC-LOAD AC ports have built-in relays. In the off-grid mode, the AC-GRID relay opens; while in on-grid mode, it closes.
3. When the inverter is powered up, the AC-LOAD AC port is electrified. Disconnect the power supply to perform maintenance to AC-LOAD, otherwise it may result in electric shock.





Recommended circuit breaker specifications are battery DC circuit breaker 120A, PV DC circuit breaker 40A, and AC circuit breaker 40A.

6.2 Safety Precaution

⚠ DANGER

- All operations, cables and components during wiring must comply with local laws and regulations.
- Disconnect the inverter's DC switch, AC output switch, and make sure the unit is powered off before wiring. Do not perform any operation with power on, or there is risk of electric shock.
- Cables of the same type should be tied together and arranged separately from other types. It is prohibited to twist or cross-wire wires with each other.
- Excessive tension on the cable may result in poor wiring. Please reserve a certain length of cable before connecting it to the inverter.
- When crimping the terminals, make sure that the conductor part of the cable is in full contact with the terminals. Do not crimp the cable insulation together with the terminals, as this may result in operation failure, or damage to the terminal block due to heat from operation.

ATTENTION

- Wear safety shoes, protective gloves, insulated gloves and other personal protective equipment as required for operation.
- Only specialized personnel shall perform operations related to electrical connections.
- The cable colors shown in this document are for reference only. Please check local codes for actual cable specifications.

6.3 Grounding Lines

ATTENTION

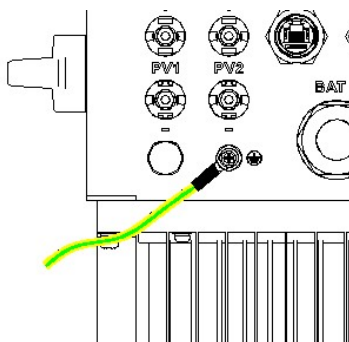
- Grounding of the housing won't work as a substitute for the ground of the AC output port, please make sure that the ground of both places is reliably done.
- Make sure that the grounding points of all inverter housings are connected firmly when there are multiple inverters.
- Prepare grounding cables with conductor cross-sectional area: $4\text{mm}^2\sim 6\text{mm}^2$ (12awg ~10awg).

Wiring steps

1. Strip the corresponding ground cable off about 8mm, and crimp it to the OT terminal.



2. Fix this OT terminals to the inverter case with M6 screws, with recommended torque $3\text{N}\cdot\text{m}\sim 5\text{N}\cdot\text{m}$.



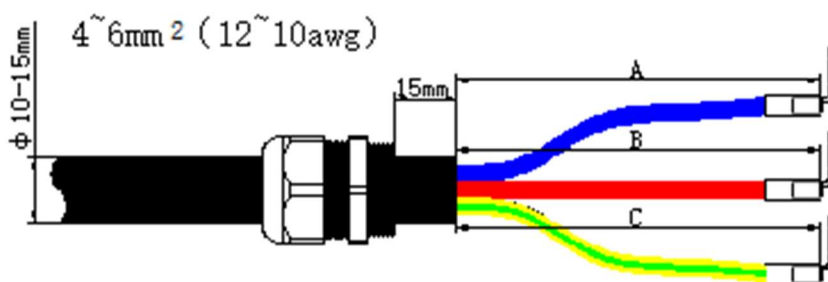
6.4 AC Input Wiring

⚠ WARNING

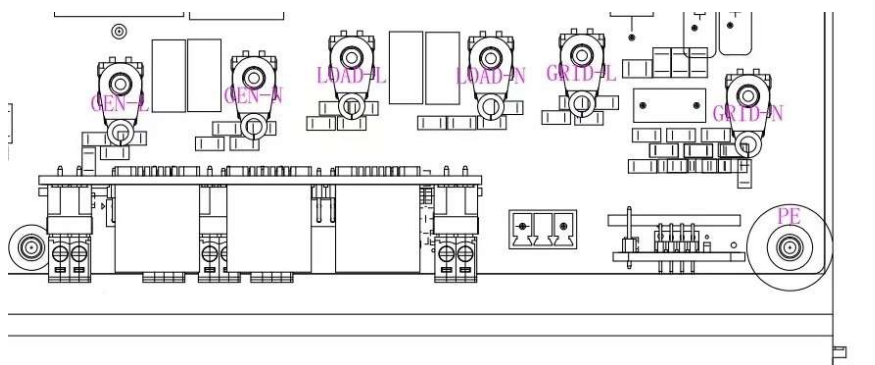
- Connect the AC cable to the "L", "N" terminal, and all the ground ports properly, or it may cause damage to the device.
- Pass the outer sleeve of the cable completely through the waterproof connector, or it may cause insufficient water proof protection.
- Make sure the waterproof connector at the AC inlet is tight.
- Ensure that the cables are connected tightly, as it may cause damage to the machines due to terminal overheat.

Wiring steps

1. Select the appropriate cable, strip off the outer coating to an appropriate length (A, B, C), pass the LOAD/GRID/GEN through the corresponding waterproof connector on the bottom of the inverter and crimp the terminals.



2. Fasten the waterproof connector, and connect the corresponding LOAD/GRID/GEN lines according to the label on the PCB board correctly and tightly.



6.5 DC Input Wiring

⚠ DANGER

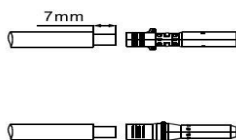
- Do not connect the same PV string to more than one inverter, as this may cause equipment damage.
- Do not parallel several strings of PV panels and then divert them to two PV interfaces.
- Confirm the following information before connecting the PV string to the inverter, otherwise it may lead to permanent damage to the inverter, and in serious cases, it may cause a fire.
 - The maximum short-circuit current and maximum input voltage of each MPPT are within the allowable range of the inverter.
 - The positive terminal of the PV string is connected to PV+ of the inverter and the negative terminal of the PV string is connected to PV- of the inverter.

⚠ WARNING

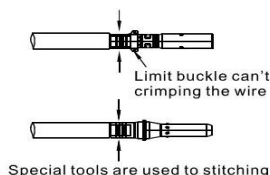
The PV string output does not support grounding, so before connecting the PV string to the inverter, make sure that the minimum insulation resistance to ground of the PV string meets the corresponding requirement. ($R = \text{Maximum Input Voltage} / 30\text{mA}$). If it is lower than the limit, the inverter will trigger an alarm.

Wiring steps

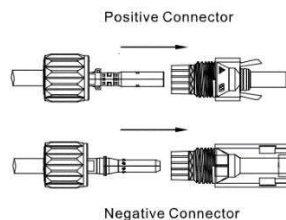
1. Make the PV knob switch to the "OFF" position.
2. Select the appropriate cable and specification ($4\text{mm}^2\text{-}6\text{mm}^2$ or $12\text{awg} \sim 10\text{awg}$), and strip the insulation layer to the length shown below.



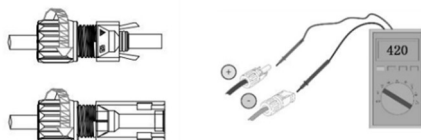
3. And insert the positive and negative wires into the positive and negative metal terminals respectively, press them against the metal cores of the terminals tightly with a crimping plier.



4. Pass the crimped positive and negative cable wires through the lock nut and insert them into the corresponding plastic housing until a "click" sound, it means the metal core is seated in place, and then tighten the lock nut.



5. Use a multimeter to check the positive and negative terminals before inserting them to the PV input of the inverter.



6.6 Battery Wiring

⚠ DANGER

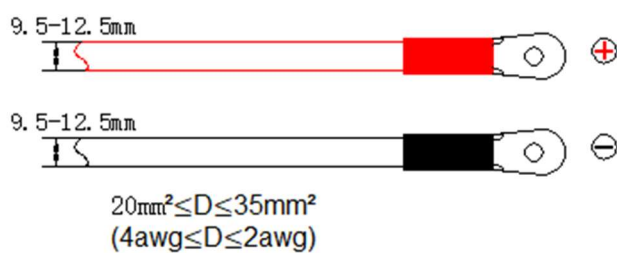
- The instantaneous high current caused by short circuit may cause personal injury or even fire accidents.
- Cut the power supply to the inverter and battery and turn off all the switches before connecting the battery cables.
- Do not connect or disconnect the battery cables while the inverter is running, as it may cause electric shock.
- Do not connect the same PV string to more than one inverter, as this may cause equipment damage.
- Do not connect load between the inverter and the batteries.
- Use insulated tools when connecting battery cables, as this may cause accidental electric shock or short circuit of the battery.
- Make sure that the maximum short circuit voltage is within the allowable range of the inverter.

⚠ WARNING

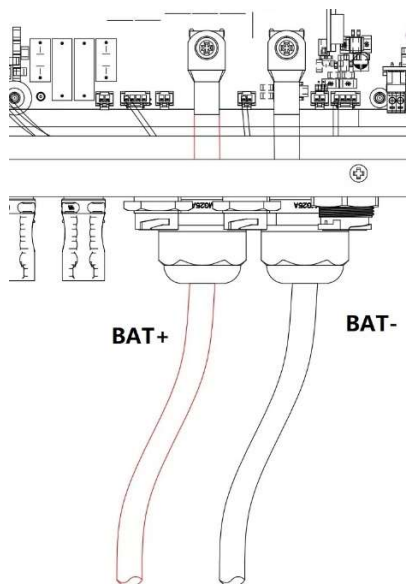
- Properly connect the battery cables to the "BAT+" and "BAT-" terminals, or it may cause damage to the machines.
- Insert the wire cores fully into the terminal holes, and no segment is exposed in the air.
- Fasten the cables, or it may cause damage to the machines due to terminal overheating.

Wiring steps

1. Strip the wire skin (10mm) and crimp the OT terminals, and then pass the positive and negative wires through the corresponding waterproof plugs.
2. Connect the positive wire to the BAT+ and the negative wire to the BAT-, and then tighten the screws (5N·m).



3. Lock the corresponding water-proof fitting.



6.7 Communication Wiring

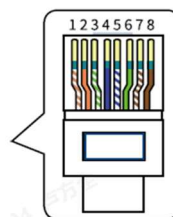
6.7.1 BMS or Meter Communication Wiring

ATTENTION

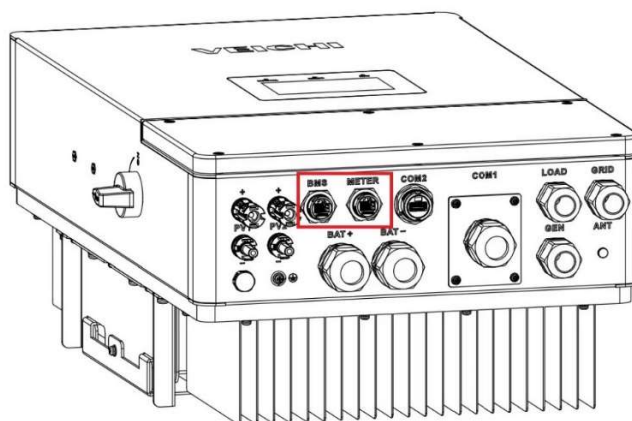
- The inverter comes with BMS battery communication cable and communication cable between meter and inverter, both default to 2m. Please install the meter and CT in a reasonable manner according to the actual situation.
 - The meter and CT are shipped with the inverter, and the related parameters have been preset at the factory, so please do not modify them.
 - Arrange one meter for each inverter. Do not connect multiple inverters to the same meter.
- To ensure that the meter and CT can be used properly, check the following items:
1. CT is connected to the phase line and CT1 is connected to L.
 2. CT is connected according to where the meter is pointing and if reversed, there will be an alarm.

BMS and Meter communication adopts standard RJ45 crystal heads, their definitions are as follows:

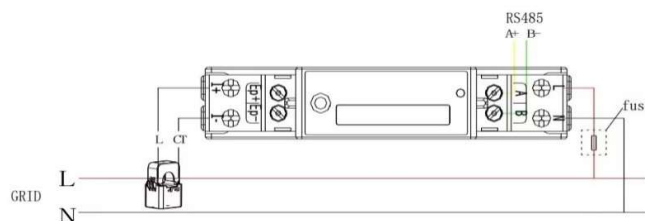
No.	Color	BMS-CAN/485
1	Orange/White	NC
2	Orange	NC
3	Green/White	NC
4	Blue	CAN H
5	Blue/White	CAN L
6	Green	NC
7	Brown/White	485 B1
8	Brown	485 A1



The BMS and Meter interfaces are distributed as follows:

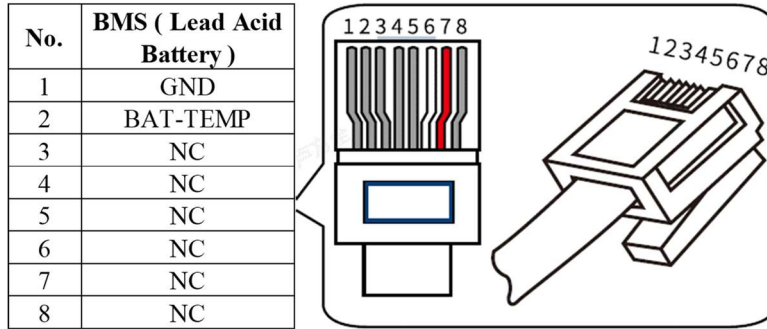


The meter is wired as follows:

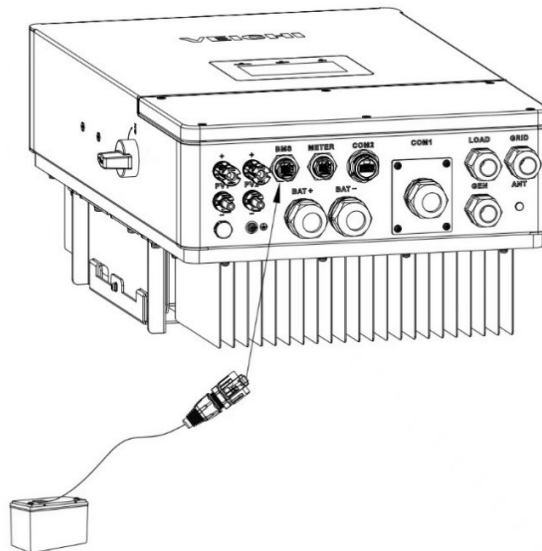


6.7.2 Lead-acid Battery Temperature Sensor

ATTENTION	
●	A lead-acid battery temperature sensor cable is included in the box, 2m.
●	The sensor cable with RJ45 crystal head is connected to the inverter BMS port and the metal temperature sensor terminal is fixed to the surface of the lead-acid battery.



Temperature sensor connection:



6.8 Communication Module

6.8.1 Indicator Definitions

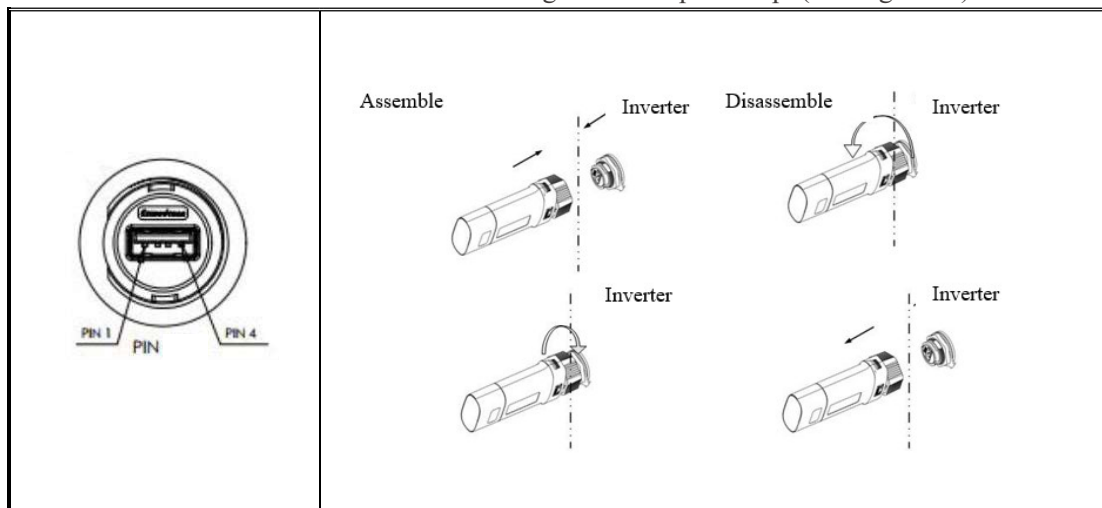
No.	Mark	Description
1	PWR	ON: External power input
2	COM	ON: Response from subordinate equipment
3	NET	ON: Connected to router
4	SRV	ON: Connected to designated server

6.8.2 Installation

Access the collector via WIFI or Bluetooth module by default for remote monitoring and control.

Steps

1. Plug the USB port of the digitizer into the COM2 of the inverter.
2. Tighten the nut of the digitizer.
3. Check the status of each indicator of the digitizer after power-up. (four lights on).



Chapter 7 Trial Operation

7.1 Inspection before Power-up

ATTENTION

1. Check if the inverter is firmly installed on the position that is convenient for operation and maintenance, and ventilation and heat dissipation and if the environment is clean and tidy.
2. Check if ground, DC input, AC output, and communication wires are connected correctly and tightly.
3. Check if the cable ties are well distributed, and are not damaged according to the wiring requirements.
4. Check if the unused crossing holes are fitted with a waterproof cover.
5. Check if the used crossing holes are sealed.
6. Check if the voltage and frequency at the grid access point meet the corresponding specifications.

7.2 Power-up

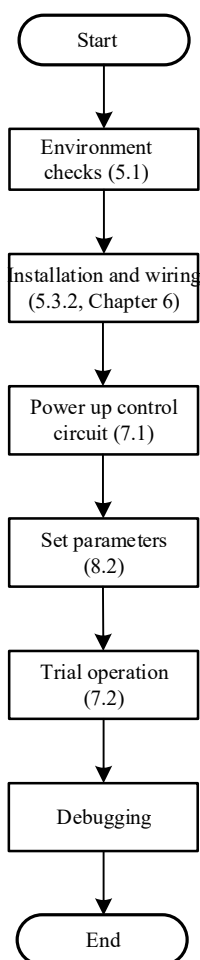
Steps

1. Close the GRID AC circuit breaker.
2. Close the LOAD AC circuit breaker.
3. Close the energy storage circuit breaker between the inverter and the battery.
4. Close the DC switch of the inverter.

Chapter 8 Debugging

This chapter mainly introduces the basic debugging steps, including power-up, trial operation and parameter description.

System debugging process



8.1 Indicator Introduction

There are 3 LEDs on the display panel, and their meanings are as follows:

Indicator	Status
Green	It flashes when the inverter is powered up while stays on when the inverter is running.
Red	It flashes under alarms while stays on under faults.
Yellow	It flashes when inverter is under communication with the upper computer via Wi-fi or GPRS.

8.2 Basic Parameter Setting

1. To set the system time on the LCD screen, see 10.7.1.
2. To set the grid voltage type, grid frequency, anti-reverse installation on the LCD screen, see 10.7.3.
3. To set the battery on the LCD screen, see 10.7.2.
4. To set the operation mode on the LCD screen, see 10.4.

8.3 Parameter Setting with APP

Please use APP to complete the inverter parameter setting first to ensure proper operation. This mobile application can communicate with the inverter via Bluetooth, WIFI module or GPRS module. The following are the commonly used functions:

1. View the inverter's operating data, software version, alarm messages, and more.
2. Set the grid parameters, communication parameters, etc. of the inverter.
3. Maintain the equipment.
4. Update the software version.

APP Download



Chapter 9 Maintenance

9.1 Cut the Power

DANGER

- When operating and maintaining the inverter, disconnect the inverter from the power supply first; operation with electricity may result in damage to the inverter or risk of electric shock.
- After the inverter is powered off, please wait until the internal components are fully discharged according to the time on the label.

Steps

1. Open the ON-GRID AC circuit breaker.
2. Open the BACK-UP AC circuit breaker.
3. Open the energy storage circuit breaker between the inverter and the battery.
4. Open the DC switch of the inverter.

9.2 Remove the Inverter

WARNING

- Power down the inverter.
- Wear personal protective gears.

Steps

1. Take down all the cables to the inverter, including: DC lines, AC lines, communication lines, communication modules, and ground lines.
2. Remove the inverter from the backplate.
3. Remove the backplate.
4. Keep the inverter in a safe place according to requirements if the it will be put into service later.

9.3 Disposal the Inverter

If the inverter can no longer be used and needs to be disposed of, follow the local electrical waste handling requirements. Do not dispose of the inverter as household waste.

9.4 Troubleshooting

Please perform troubleshooting according to the following methods and contact the after-sales service center if these methods fail. The following information are needed for the after-sales service center to identify the problems.

1. Inverter information: serial number, software version, device installation time, fault occurrence time, and fault frequency.
2. Operation environment: weather, whether the components are obscured, shaded, etc. It's better if photos and videos can be provided.
3. Grid, battery, and PV panel

9.4.1 Operation Failure

No.	Type	Solution
0	Bus overvoltage	Please contact the after-sales service center at once.
1	Bus soft error	Please contact the after-sales service center at once.
2	Output overvoltage	Please contact the after-sales service center at once.
3	Output overcurrent	Please contact the after-sales service center at once.
4	Output overload	Check the output load
5	Output overload timeout	Check the output load. This fault is cleared automatically after 1 minute.
6	Mains overload	Check the mains power.
7	Mains overload timeout	Check the mains power. This fault is cleared automatically after 1 minute.
8	PV1 overvoltage	Check if PV1 series voltage is higher than the max. PV input voltage of the inverter.
9	PV2 overvoltage	Check if PV2 series voltage is higher than the max. PV input voltage of the inverter.
10	PV1 overcurrent	Please contact the after-sales service center at once.
11	PV2 Overcurrent	Please contact the after-sales service center at once.
12	PV disconnection	Check if PV1/PV2 are connected correctly or if the voltage is normal.
13	Mains power error	Check whether the mains power is properly connected or whether the voltage/frequency of the power grid is normal.
14	Leakage current error	a. Check the machines and wiring b. Please contact the after-sales service center at once.

15	Anti-islanding error	A. Check if grid is disconnected.
16	Insulation resistance error	Check whether the PV main string impedance to ground is lower than 20k Ω or there is short circuit.
17	Inverter output short circuit	Check the load output.
18	Mains power short circuit	a. Check the grid input. b. Please contact the after-sales service center at once.
24	PV connection error	Check if the PV type is correctly selected.
25	AC overheat	a. Check if the ambient temperature is higher than the upper limit of inverter. b. Please contact the after-sales service center at once.
26	Relay failure	Please contact the after-sales service center at once.
27	PV overcurrent	Please contact the after-sales service center at once.
28	Fan error	Please contact the after-sales service center at once.
29	Fault No. over limit	Please contact the after-sales service center at once.
30	AC monitoring communication error	Please contact the after-sales service center at once.
31	ACDC communication error	Please contact the after-sales service center at once.

9.4.2 System Fault

No.	Type	Solution
2	Operating mode error	Check if grid frequency and PV type parameters are correct.
4	No SD card	Check if the SD card is loose or not inserted.
5	Low battery SOC	Check the battery status.
6	AC communication error	Check the power to inverter.
7	BMS communication error	Check BMS or if the battery is started.
9	Meter communication error	Check meter connection.
10	System AC communication error	Check system FDCAN1 communication connection
11	System DC communication error	Check system FDCAN1 communication connection

9.5 Routine Maintenance

⚠ WARNING

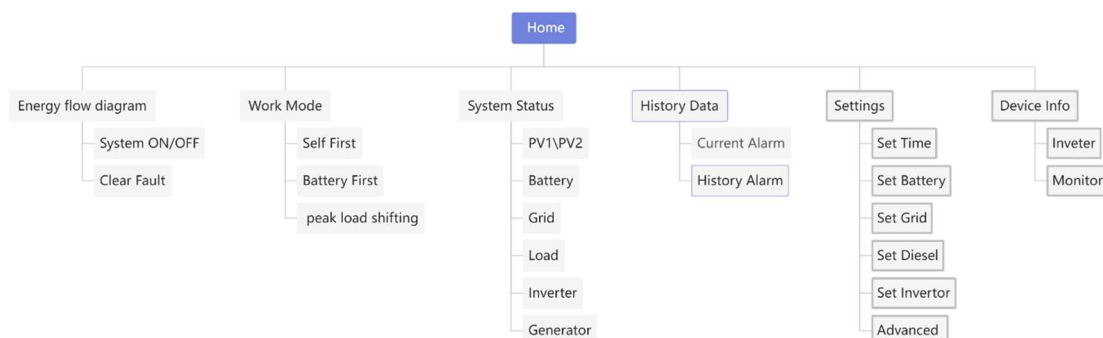
- Power down the inverter.
- Wear personal protective gears.

Item	Method	Cycle
Cleanness	Check heat sinks, air inlet/outlet vents for foreign matter and dust.	1 time/half year~1 time/year
Electrical connections	Check for loose electrical connections, broken cables and copper leakage.	1 time/half year~1 time/year
Sealing	Check whether the sealing of the equipment inlet hole meets the requirements, and reseal them if there are any gaps.	1 time/year

Chapter 10 LCD Touch Screen

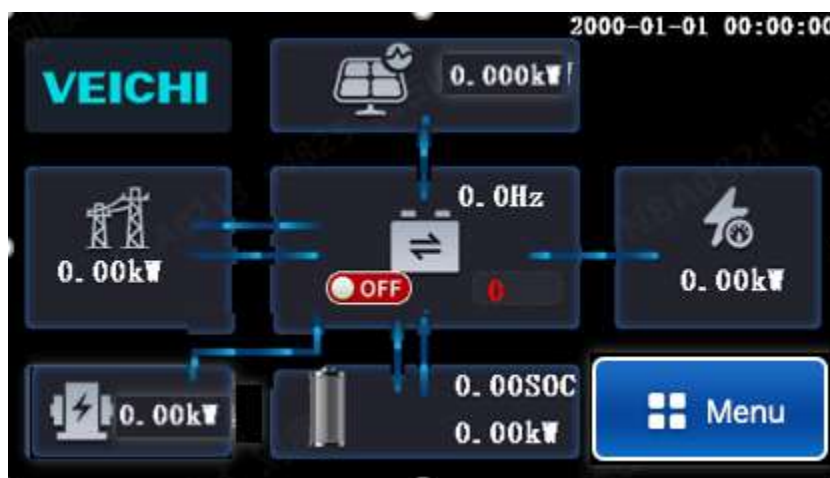
10.1 Main Frame

Here is the main frame of the touch screen functions.

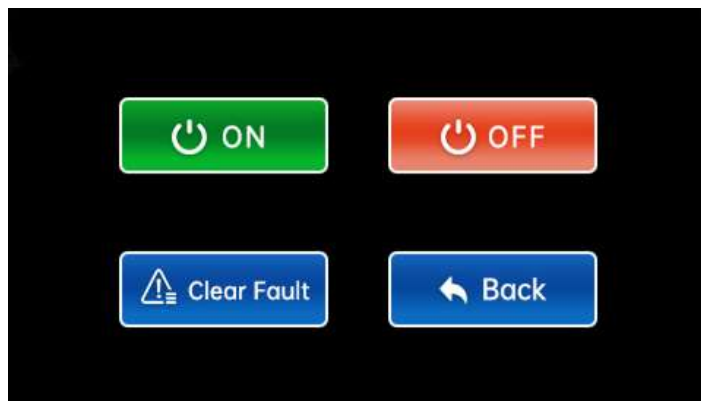


10.2 Home

It is a touch screen and here is the summary information of this inverter.



- Middle shows the status of the inverter. If the inverter fails, the fault code is displayed here.
- The upper right corner shows the current time.
- The whole page shows the status of PV panel, grid, battery, load and diesel generator, and the curve flow also indicates the energy flow.
- PV power and load power always flow in the positive direction.
- Negative direction indicates returning electricity to the grid, and positive direction indicates obtaining energy from the grid.
- Negative battery power indicates charging and positive, discharging.
- Click on Grid, PV panel, load, battery, or diesel generator to enter the detailed data page.
- Tap the center area of the screen to enter the switching settings page.



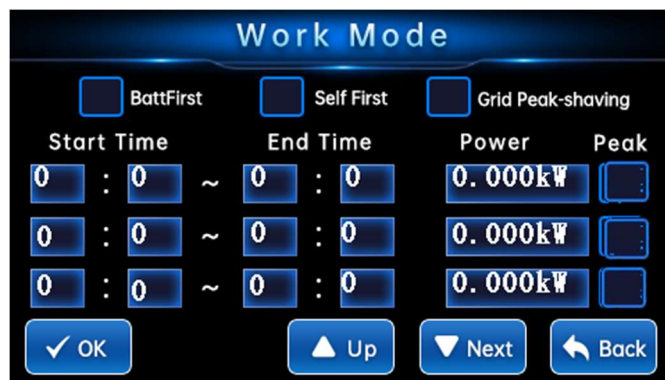
10.3 Menu



Main page: Click "HOME" to quickly return to the main page, which contains the following functions:

1. Work Mode: Configure the desired working mode;
2. System Status: Provide an overview of system status;
3. History Data: Provide alarm logs and operation records;
4. Settings: Provide comprehensive parameter configuration options;
5. Device Info: Show the detailed information of the device.

10.4 Operating Mode



In this area, users can set the working mode of the system to battery mode, load mode and cost mode. In the cost mode, users need to set the time segments, and currently three time segments in total can be set up. Check "PEAK" to mark down the it is now peak electricity period, and then the battery will be discharged to the grid. Discharging power can be modified according to actual needs. "POWER" values here only work when the battery is discharging.

10.5 System Status



System status information includes PV, battery, grid, load, inverter, and diesel generator.

10.5.1 PV

The PV page shows real-time voltage, current, and power information for each circuit.



10.5.2 Battery



This page shows real-time status of the battery, including battery voltage, current, and power. The "+" sign indicates charging and the "-" sign indicates discharging. Click the BMS button on Battery to display the BMS information for the lithium battery, including voltage, current, power, SOC, and temperature parameters.



Click NEXT to see more BMS information, including the max charging voltage, max discharging voltage, max charging current, max discharging current, BMS alarm code, etc.



10.5.3 Grid



This page shows the grid status, including voltage, current, power and energy.



This page displays the values of the external CT and the external meter.

- CT: Current detected by external CT.
- Meter: Power detected by external meter.

10.5.4 Load



This page shows the load status, including voltage, current and power parameters.

10.5.5 Inverter



This page shows the grid status, including voltage, current, power and energy.

10.5.6 Diesel generator



This page shows the diesel generator status including voltage, current, power and frequency.

10.6 History

View the current alarm, historical alarm information and operation logs, and the first shows the information of the current alarms and the second for the alarms that have been removed.

Click UP\NEXT button to page up and down, 5 entries on each page, 10 pages max.



10.7.1 Monitoring Setting

Click Monitor to enter the monitor setting interface, here users can set the system time.



After setting the system time, click OK to confirm. It defaults to 24-hour display, and it is the only option so far. Auto time synchronization is not available now.

10.7.2 Battery Setting



- NoBatt: Battery or no battery mode
- Batt Type: Lead-acid or lithium battery
- Activate Battery: Check it to send the command to activate the battery. Reserved.
- Batt Protocol: Select built-in battery protocols, displayed in numbers. 0 indicates PYLON CAN communication.
- DBC: Users can edit the battery protocol according to the specified format, and import it into the monitoring software through our PC debugging software. Check DBC to use the customized battery protocol, and the battery protocol type selection is invalid. Unchecked DBC to use the built-in battery protocol of the inverter and the battery protocol type selection is valid.
- Batt Capacity: Set the battery capacity.

Click on NEXT to enter the battery setting page 2, where users can set charging voltage upper limit, current upper limit, voltage upper limit, power upper limit and battery protection

upper and lower limit.



- Voltage UP: Battery voltage upper limit
- Voltage Down: Battery voltage lower limit
- Current Up: Current upper limit
- Power Up: Reserved for power limit
- Bms V Up: Battery protection upper limit
- BMS V Down: Battery protection lower limit

In the Battery Settings page 2, users can set the battery charging voltage and charging current; When the battery SOC is lower than ShutDown level, it will turn off the inverter to discharge, and when the battery SOC is lower than Low Batt level it will report alarm. Or when the battery SOC is greater than Restart level, the inverter will resume the previous work.



- Max V Charge: Battery charging voltage
- MAX A Charge: Battery charging current
- Restart: SOC when battery resumes power supply
- Low Batt: When the battery SOC is lower than the set value, the inverter will prompt the low battery alarm, but it still works normally
- Shut Down: When the battery SOC falls below this setting or falls below 5%, the battery stops supplying power.

Click on NEXT button to enter Battery Setting Page 4 where users can set the lead-acid batteries-related parameters like the equivalent voltage, float voltage, battery internal resistance,

initial capacity, temperature compensation coefficient, etc.



- Equalization V: Equivalent voltage, a must-setting for lead-acid battery, it is also the rated voltage of the battery
- Float V: Float voltage when the battery is nearly full
- Battery R: Battery internal resistance, reserved
- TEMPCO: Temperature compensation for the lead-acid battery
- Starting Capacity: Initial capacity, reserved

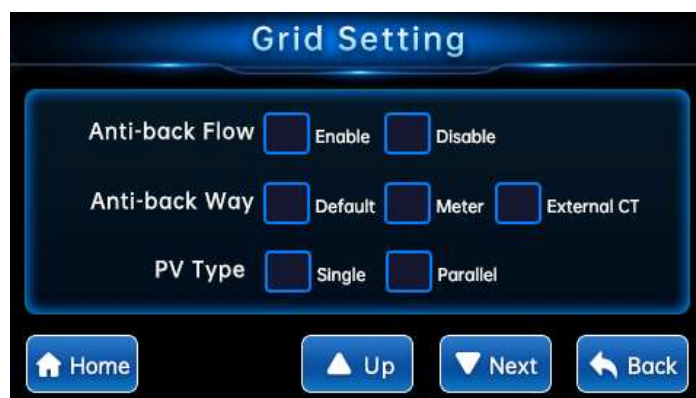
10.7.3 Grid Setting



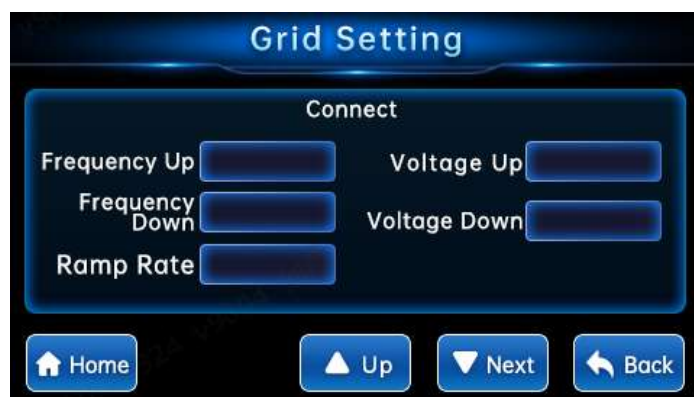
This page allows users to set the grid voltage level, grid frequency, PV type, battery type, and anti-reverse protection.

- Grid voltage: 220V/230V/240V
- Grid frequency: 50Hz/60Hz

This page allows users to set the grid voltage level, grid, PV type, battery type, and anti-reverse protection.



- Battery type: lithium/lead acid
- PV input type: independent/parallel
- Anti-reverse protection: disable/enable



- Upper Frequency Limit: Upper frequency limit of grid-connected energy storage inverters
- Lower Frequency Limit: Lower frequency limit of grid-connected energy storage inverters
- Upper Voltage Limit: Upper grid-connected inverter voltage limit
- Lower Voltage Limit: Lower grid-connected inverter voltage limit



- HV1: Set the overvoltage level 1 and detection time;
- LV1: Set the low-voltage level 1 and detection time;

- HV3: Set the overvoltage level 3 for protection triggering;
- LV3: Set the low-voltage level 3 for protection triggering.



Grid frequency for protection can be set here, too.

- Over F\Over delay T: Set the over-frequency protection level and protection delay time. If the former is set to 65Hz, and the latter 1s, the inverter triggers protection when the power frequency is higher than 65Hz for 1s. No protection if it's shorter than 1s.
- Over stop F\Ostop delay T: Set the over-frequency stop level and detection time. If the former is set to 75Hz, and the latter 1s, the inverter triggers protection when the power frequency is higher than 75Hz for 1s. No protection if it's shorter than 1s.

10.7.4 Diesel Generator Setting

Here you can set the operating conditions of the diesel generator.

- Start: When the SOC of the battery drops to the Start value, the system will automatically start the generator to charge the battery.
- Current: The generator charges the battery at peak current.
- Gen Charge: When this option is checked, the battery is charged via the generator.
- Gen Signal: When the start signal is active, it will open the relay that controls the generator.
- Gen Force: When checked, it will force the generator to start when there is one connected, regardless of other conditions



10.7.5 Inverter Setting

On page 1 users can set the inverter parallel function and parallel parameters, the inverter address and the number of inverters for parallel operation.



10.7.6 Advanced Setting

Set to restore the factory settings and set the ratio of external CTs on this page.



- **Factory reset:** Check it to reset the inverter to factory defaults. After clicking this button, the input password box will pop up. Enter the confirmation code “6677” to go on the reset. If the confirmation code is wrong, then the reset will not be performed.
- **CT Ration:** If the storage inverter is connected to an external CT, sets the ratio of the external CT here.

10.8 Device Information

Users can view the information of each software version of the device for convenient after-sale maintenance.



- DSP Version: DSP software version
- Monitor Version: Software version information for Monitor Board H5
- MAC: Reserved

10.9 Fault Log List

Fault Log(English)	Description
BusOvVolt	Bus overvoltage
BusSoftFail	Bus not established in software
OutOvVolt	Output overvoltage
OutOvCurr	Output overcurrent
OutOvLoad	Output overload
OutOvLoadTO	Output overload timeout
GridOvLoad	Grid overload
GridOvLoadTO	Grid overload timeout
PV1OvVolt	PV1 overvoltage
PV2OvVolt	PV2 overvoltage
PV1OvCurr	PV1 overcurrent
PV2OvCurr	PV2 overcurrent
PvLoss	PV loss
GridAbnormal	Grid abnormality
LeakCurrFault	Leakage current abnormality
IslandFault	Islanding failure
IsoFault	Insulation impedance detection failure
InvOutShort	Inverter output short circuit failure
GridShort	Grid side short circuit failure
InvDcVoltFault	Inverter DC component failure
ParaCommFault	Parallel communication failure
ACOVTempDerate	AC overheat derating
BusLowVOff	Bus low voltage shutdown
PvSetErr	PV setting error

EnvTempOv	AC ambient overheat 1
RelayFault	Relay failure
PvFastOvCurr	PV fast overcurrent
FanError	Fan failure
FaultTimesEx	AC continuous failure exceeding count
ACMoniCommFail	AC monitoring communication abnormality
ACDCCommFail	ACDC communication abnormality
BatOverV	Battery overvoltage protection
BatOverC	Battery overcurrent protection
BatUnderV	Battery low voltage protection
NoBat	Battery missing
BatReverse	Battery reversed
BatFastOvCurr	Battery fast overcurrent protection
BusFastOvV	Bus rapid overvoltage protection
DcEnvOvTemp	DC ambient overheat 2
DcOvTemp	Heat sink overheat
BatFastOverV	Battery rapid overvoltage protection
BatFastUnderV	Battery rapid undervoltage protection
DCFaultTimeEx	DC continuous failure exceeding count
DCOvTempDerate	DC overheat derating
DCMCommFail	DC monitoring communication abnormality
DCACCommFail	DCAC communication abnormality
CellOverV	Battery undervoltage (BMS)
CellUnderV	Battery overvoltage (BMS)
CellOverT	Battery high temperature (BMS)
CellUnderT	Battery low temperature (BMS)
DisOC	Discharging overcurrent (BMS)
ChargeOC	Charging overcurrent (BMS)
BmsSysErr	Failure (BMS, reboot required)
BattLowSoc	Battery low SOC

10.10 Fault Code List

Fault Code	Description
0	Normal
3	Operating status error
4	SD card loss
5	Battery SOC low
7	AC communication failure
7	DC communication failure
8	BMS communication failure
9	Meter communication failure
10	System AC communication failure
14	BMS protection
15	8563 failure
16	CAN failure

Version Change Log

Date	Version	Content
2024.11	V1.0	First version issued