



User Manual

Hybrid Inverter



Applicable Models

NL1P-3KA2/H
NL1P-3.6KA2/H
NL1P-4KA2/H
NL1P-4.6KA2/H
NL1P-5KA2/H
NL1P-6KA2/H
NL1P-8KA2/H

Applicable System

Single Phase System

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1. Notes on this Manual

1.1 Scope of Validity

This manual is an integral part of hybrid inverter; it describes the assembly, installation, commissioning, maintenance, and failure type of the product. Please read it carefully before operating.

NL1P-3KA2/H	NL1P-3.6KA2/H	NL1P-4KA2/H	NL1P-4.6KA2/H	NL1P-5KA2/H	NL1P-6KA2/H	NL1P-8KA2/H
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Table 1.1

1.2 Target Group

This manual is for qualified electricians. The tasks described in this manual only can be performed by qualified electricians.

1.3 Symbols Used

The following types of safety instructions and general information appear in this document as described below.



Danger!

"Danger" indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Warning!

"Warning" indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Caution!

"Caution" indicates a hazardous situation which, if not avoided, could result in minor or Moderate injury.



Note!

"Note" provides tips that are valuable for the optimal operation of ours.

2. Safety

2.1 Safety Precautions

**Danger!**

- Danger to life due to high voltages in the inverter!
- All work must be carried out by qualified electrician.
- The appliance is not to be used by children or persons with reduced physical sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.
- Children should be supervised to ensure that they do not play with the appliance.

**Caution!**

- Danger of burn injuries due to hot enclosure parts!
- During operation, the upper lid of the enclosure and the enclosure body may become hot.
- During operation, only the touch screen needs to be operated.

**Caution!**

- Do not stay within 20cm of the inverter for a long time. Possible health problem from radiation effects!

**Note!**

- PV modules should have an IEC61730 class A rating.
- PV modules with IEC61730 class A can be used in systems higher than DC 50V or 240W, and these systems are potentially accessible or accessible to the public.

**Warning!**

- Ensure input DC voltage $\leq$ Max. DC voltage. Over voltage may cause damage.
- Permanent damage to inverter or other losses, which will not be included in warranty!

**Warning!**

- Authorized service personnel must disconnect both AC and DC power from inverter before attempting any maintenance or cleaning or working on any circuits connected to inverter.

**Warning!**

- Do not touch anything other than the screen during operation, there is a risk of electric shock.

2.1.1 Important Safety Instructions

- Please keep the user manual properly. When operating equipment, in addition to following the general precautions in this document, follow the specific safety instructions. We will not be liable for any consequence caused by the violation of the safety operation regulations and design, production, and usage standards.
- Accessories only together with the inverter shipment are recommended here. Other- wise may result in a risk of fire, electric shock, or injury to person.
- Make sure that existing wiring is in good condition and that wire is not undersized. Do not disassemble any parts of inverter which are not mentioned in installation guide. It contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the inverter yourself may result in a risk of electric shock or fire and will void your warranty.
- Keep away from flammable, explosive materials to avoid fire disaster.
- The installation place should be away from humid or corrosive substance.
- Authorized service personnel must use insulated tools when installing or working with this equipment.
- Never touch either the positive or negative pole of PV connecting device. Strictly prohibit touching both at the same time.
- The unit contains capacitors that remain charged to a potentially lethal voltage after the MAINS, battery and PV supply has been disconnected.
- Hazardous voltage will present for up to 5 minutes after disconnection from power supply.
- CAUTION-RISK of electric shock from energy stored in capacitor, never operate on the inverter couplers, the MAINS cables, Battery cables, PV cables or the PV generator when power is applied. After switching off the PV, battery, and Mains, always wait for 5minutes to let the intermediate circuit capacitors discharge before unplugging DC, battery in plug and MAINS couplers.
- When accessing the internal circuit of inverter, it is very important to wait 5 minutes before operating the power circuit or demounting the electrolyte capacitors inside the device. Do not open the device beforehand since the capacitors require time sufficiently discharge!

2.1.2 Install surge protection devices (SPDs) for PV

**WARNING!**

- Over-voltage protection with surge arresters should be provided when the PV power system is installed.
- The grid connected inverter is not fitted with SPDs in both PV input side and MAINS side.

-
- Lightning will cause a damage either from a direct strike or from surges due to a nearby strike.
 - Induced surges are the most likely cause of lightning damage in majority of installations, especially in rural areas where electricity is usually provided by long overhead lines. Surge may be included on both the PV array conduction and the AC cables leading to the building.
 - Specialists in lightning protection should be consulted during the end use application. Using appropriate external lightning protection, the effect of a direct lightning strike into a building can be mitigated in a controlled way, and the lightning current can be discharged into the ground.
 - Installation of SPDs to protect the inverter against mechanical damage and excessive stress include a surge arrester in case of a building with external lightning protection system (LPS) when separation distance is kept.
 - To protect the DC system, surge suppression device (SPD type2) should be fitted at the inverter end of the DC cabling and at the array located between the inverter and the PV generator, if the voltage protection level (VP) of the surge arrester is greater than 1100V, an additional SPD type 3 required for surge protection for electrical devices.
 - To protect the AC system, surge suppression devices (SPD type2) should be fitted at the main incoming point of AC supply (at the consumers cutout), located between the inverter and the meter/distribution system.
 - All DC cables should be installed to provide as short a run as possible, and positive and negative cables of the string or main DC supply should be bundled together. Avoiding the creation of loops in the system.
 - Spark gap devices are not suitable to be used in DC circuits once conducting, they won't stop conducting until the voltage across their terminals is typically more than 30 volts.

2.1.3 Anti-Islanding Effect

Islanding effect is a special phenomenon that grid-connected PV system still supply power to the nearby grid when the voltage loss is happened in the power system. It is dangerous for maintenance personnel and the public.

Hybrid series inverter provide Active Frequency Drift (AFD) to prevent islanding effect.

2.1.4 PE Connection and Leakage Current

The end-use application shall monitor the protective conductor by residual current operated protective device (RCD) with rated fault current $I_{fn} \leq 240\text{mA}$ which automatically disconnects the device in case of a fault.

The device is intended to connect to a PV generator with a capacitance limit of approx. 700nF.



WARNING!

- High leakage current!
- Earth connection essential before connecting supply.

Incorrect grounding can cause physical injury, death or equipment malfunction and increase electromagnetic.

2.1.5 Battery Safety Instructions

Hybrid Series inverter should be worked with low voltage battery, for the specific parameters such as battery type, nominal voltage and nominal capacity etc., please refer to section 4.1.

As accumulator batteries may contain potential electric shock and short-circuit current danger, to avoid accidents that might be thus resulted, the following warnings should be observed during battery replacement:

1. Do not wear watches, rings or similar metallic items.
2. Use insulated tools.
3. Put on rubber shoes and gloves.
4. Do not place metallic tools and similar metallic parts on the batteries.
5. Switch offload connected to the batteries before dismantling battery connection terminals.
6. Only personal with proper expertise can carry out the maintenance of accumulator batteries.

2.2 Explanation of Symbol

This section gives an explanation of all the symbols shown on the inverter and on the type label.

Symbols on the Type Label.

	CE mark. The inverter complies with requirements of applicable CE guidelines.
	Refer to the operating instructions.
	Products should not be disposed as household waste.
	Components of the product can be recycled.
	Danger of hot surface!
	Danger of high voltage and electric shock!
	Caution! Failure to observe a warning indicated in this manual may result in injury.

Table 2.1

2.3 Maintenance Related Information

The maintenance instructions should include the following content:

- Intervals and instructions for any Preventive maintenance required to maintain safety
(For example, periodically block terminals).
- Instructions for accessing the operator's access area (if present), including warning not to enter other areas of the equipment.
- Part number and instructions for obtaining any required operator replaceable parts.
- Safety and cleaning instructions (if recommended).
- If there are multiple power sources supplying PCE, information should be provided in the manual to indicate which or which disconnecting devices need to be operated to completely isolate the equipment.

2.4 Battery Maintenance

The Battery maintenance should include the following content:

- Battery maintenance should be carried out or supervised by knowledgeable personnel.
- When replacing batteries, please replace them with the same type and quantity of batteries or Battery pack.
- Do not throw the battery into the fire. The battery may explode.
- Do not open or damage the battery. The released electrolyte is harmful to the skin and eyes of the human body. It may be toxic.
- There may be a risk of electric shock and high short-circuit current in the battery.
- The following precautions should be observed when using batteries:
 - (1) Remove watches, rings, or other metal items.
 - (2) Using tools with insulated handle.
 - (3) Wear rubber gloves and boots.
 - (4) Do not place tools or metal parts on the battery.
 - (5) Disconnect the charging power supply before connecting or disconnecting the battery terminals.
 - (6) Ensure that the battery is not accidentally grounded. If accidentally grounded, please remove the power supply from the ground and contact any part of the grounded battery, which may cause electric shock. (Suitable for devices without grounded power circuits and remote battery power supplies). It can reduce the possibility of such electric shocks.

2.5 Low Voltage Earthing System

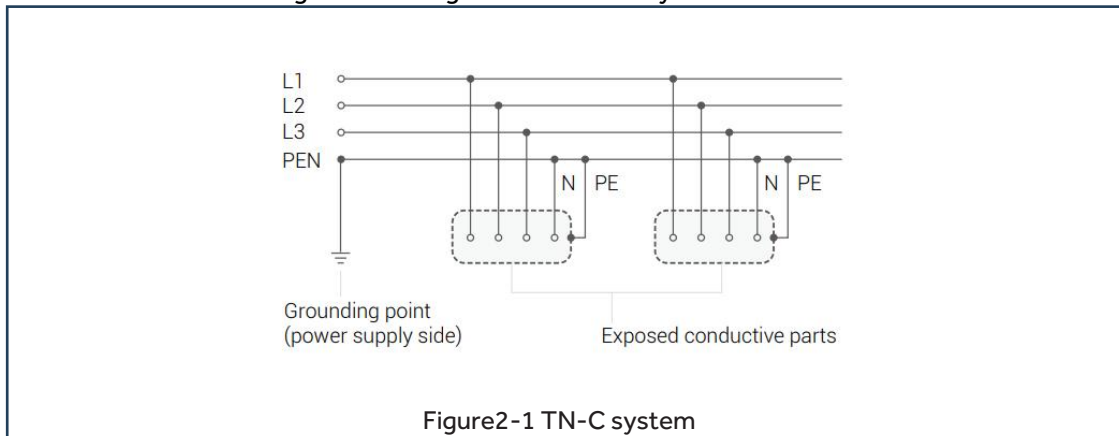
The grounding of the power system is directly related to the personal and property safety of users, as well as the normal operation of electrical and electronic equipment. According to the regulations of International Electro Technical Commission (IEC), low-voltage distribution system is called TT system, TN system and IT system according to different grounding modes. The TN system is further divided into TN-C, TN-S, and TN-C-S systems.

2.5.1 TN system

TN system, known as protective neutral connection. When a fault electrifies the metal casing of electrical equipment, it forms a short circuit between the phase and zero lines, resulting in low circuit resistance and high current, which can cause the fuse to quickly fuse or the protective device to act to cut off the power supply. In the TN system, there are three types of systems: TN-C, TN-S, and TN-C-S.

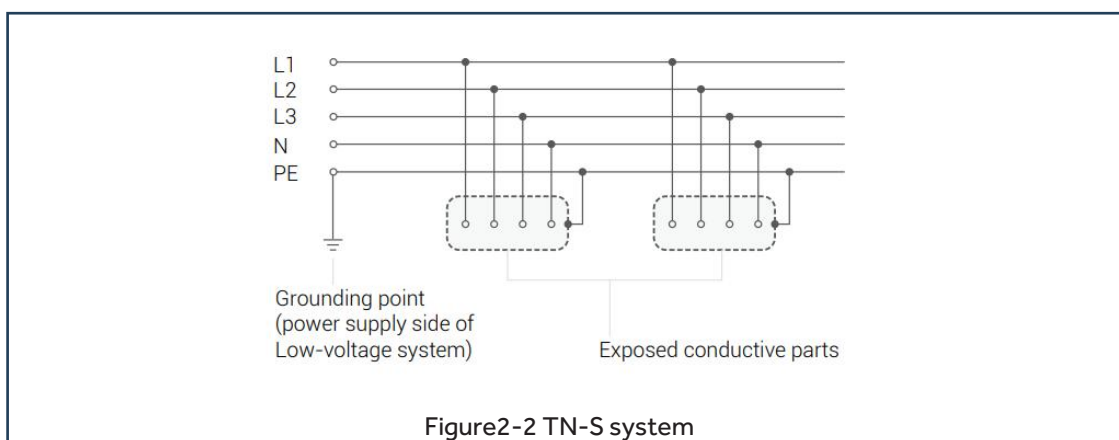
(1) TN-C system

The N line and PE line are integrated throughout the entire system.



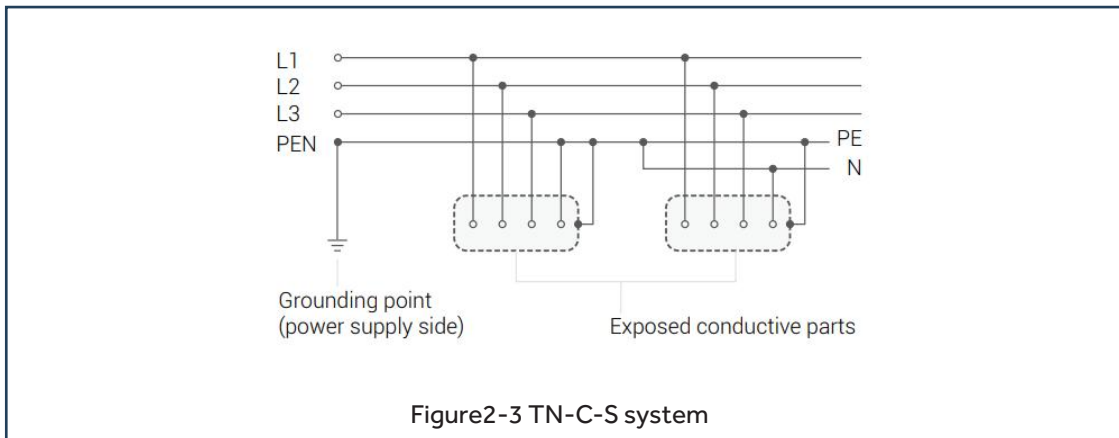
(2) TN-S system

The N line and PE line are separated throughout the system.



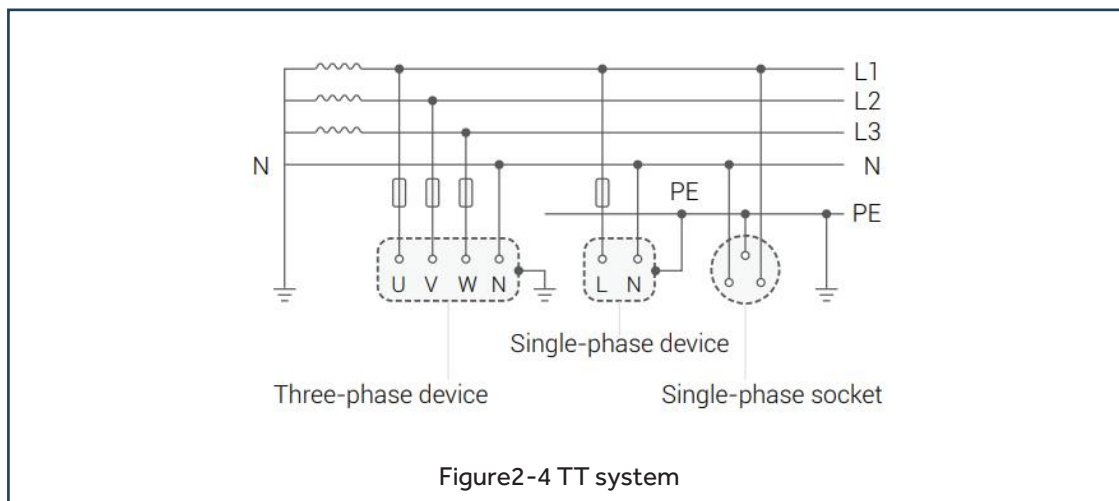
(3)TN-C-S system

In the whole system, N line and PE line are usually integrated only before the power incoming point of low-voltage electrical device, and they are divided into two lines after the power incoming point.



2.5.2 TT system

TT system is a system where the neutral point of the power supply is directly grounded, and the exposed conductive part of the electrical equipment is also directly grounded. The grounding of the neutral point of the power supply is usually called working grounding, while the grounding of the exposed conductive part of the equipment is called protective grounding. In the TT system, these two grounds must be independent of each other. Equipment grounding can refer to each device having its own independent grounding device, or multiple devices sharing a common grounding device.



2.5.3 IT system

IT system is a system where the neutral point of the power supply is not grounded, and the exposed conductive part of the electrical equipment is directly grounded. IT system can set neutral wires, but IEC does not recommend setting neutral wires. If a neutral line is set and a ground fault occurs at any point of the N line in the IT system, the system will no longer be an IT system.

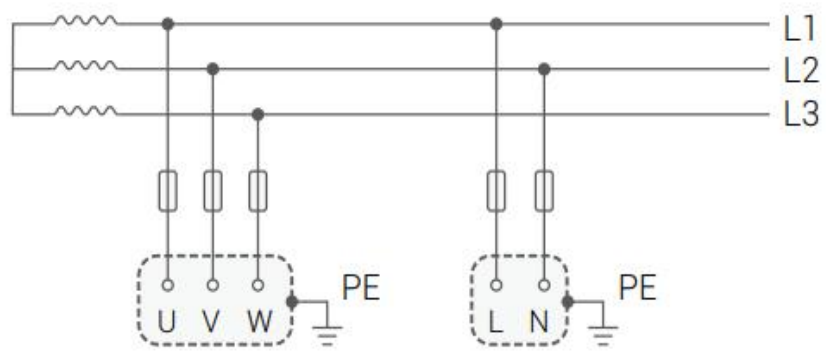


Figure2-5 IT system

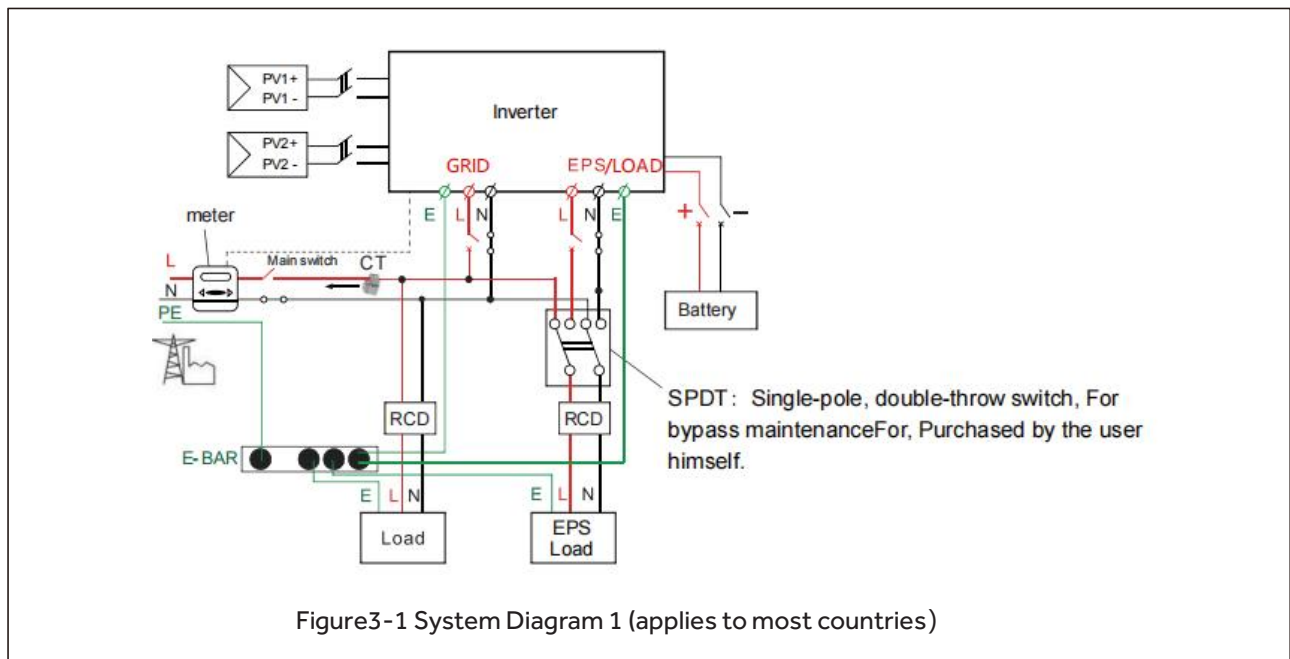
3. Introduction

3.1 Basic Features

Hybrid inverter Series is a high-quality inverter which can convert solar energy to AC energy and store energy into battery.

The inverter can be used to optimize self-consumption, store in the battery for future use or feed in to public grid. Work mode depends on PV energy and user's preference. It can provide power for emergency use during the grid lost by using the energy from battery and inverter (generated from PV).

3.2 System Diagram



All switches and RCD devices in the figure are for reference only, and the specific installation shall be subject to local regulations.



Note!

- Please control the home load and ensure that its output power is within the rated range, otherwise the inverter will shut down with an "Over load" warning.
- Please confirm with the mains grid operator whether there is any special regulations for grid connection.

3.3 Work Modes

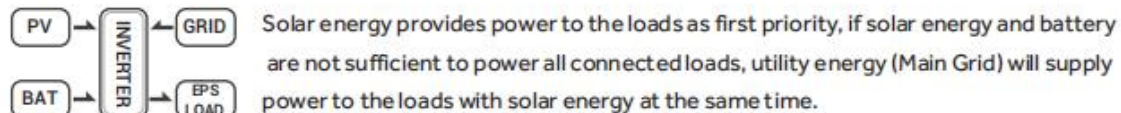
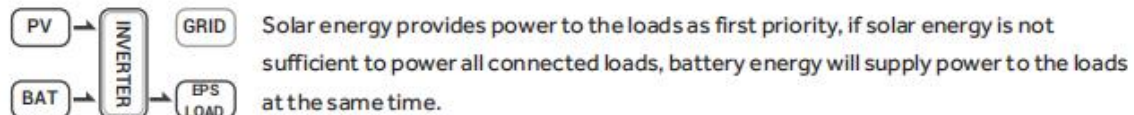
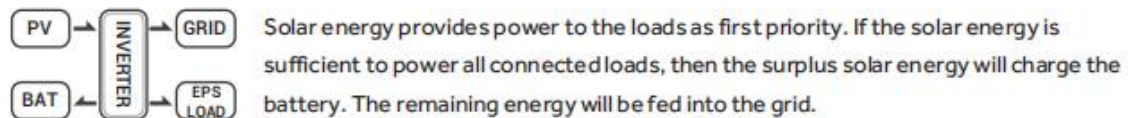
Schematic diagram

Inverter provides multiple work modes based on different requirements.

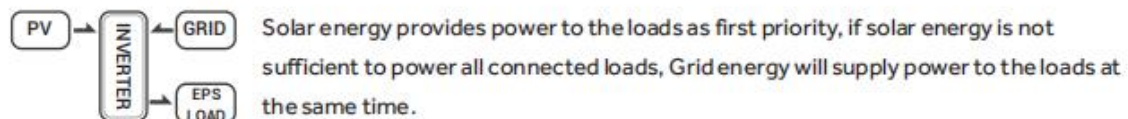
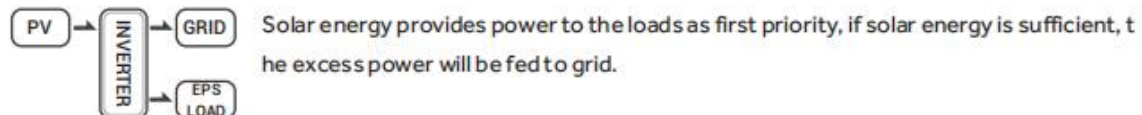
Self Consumption

Work mode: Self Consumption

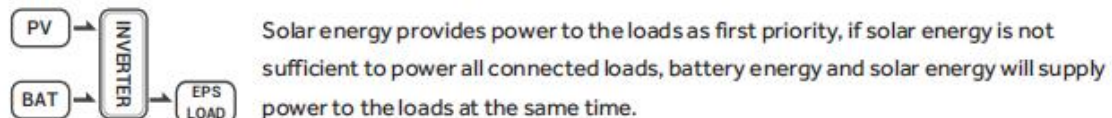
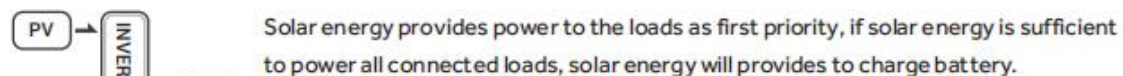
When PV, Grid, Battery is available:



II. When PV, Grid is available (without battery):



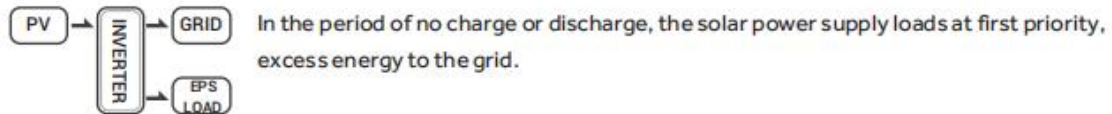
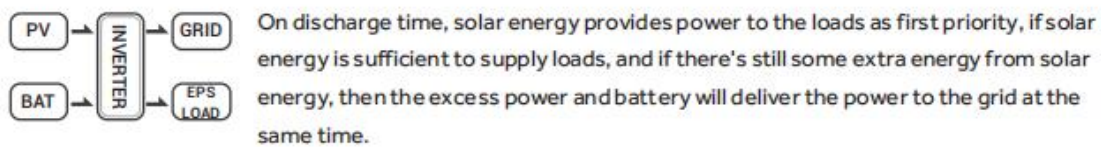
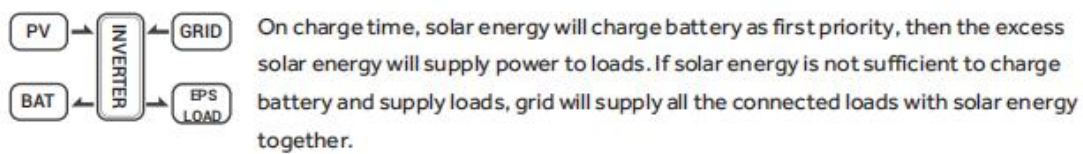
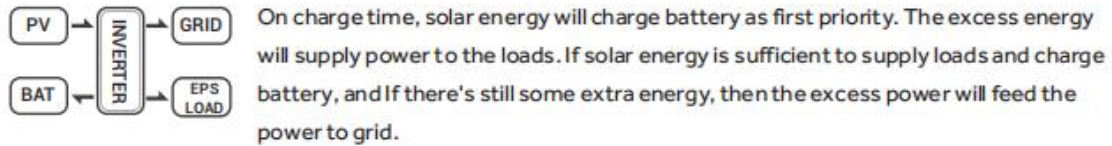
III. When PV, Battery is available (Grid is disconnected):



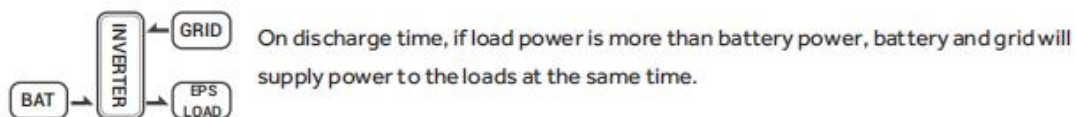
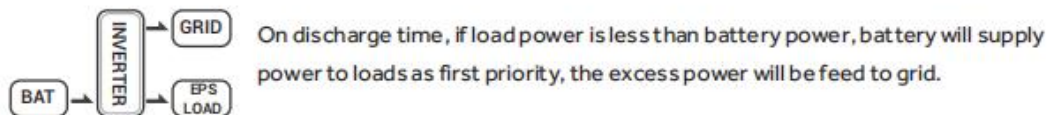
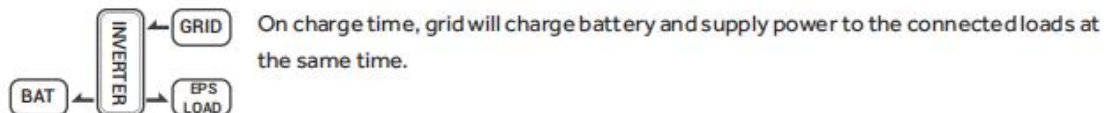
Peak shift

Work mode: Peak Shift

I. When PV, Grid, Battery is available:



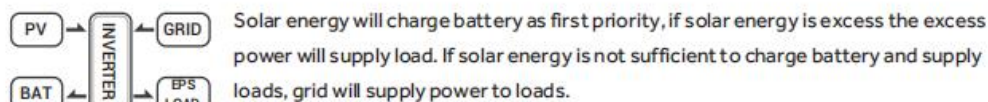
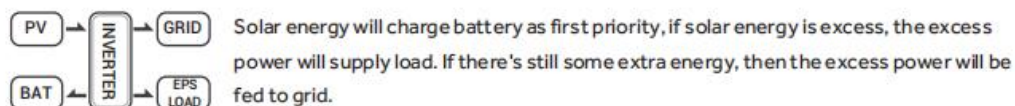
II. When Grid, Battery is available (PV is disconnected):



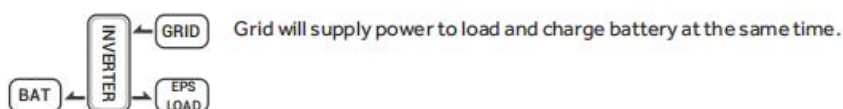
Bat priority

Work mode: Battery Priority

I. When PV, Grid, Battery is available:



II. When Grid, Battery is available (PV is disconnected):



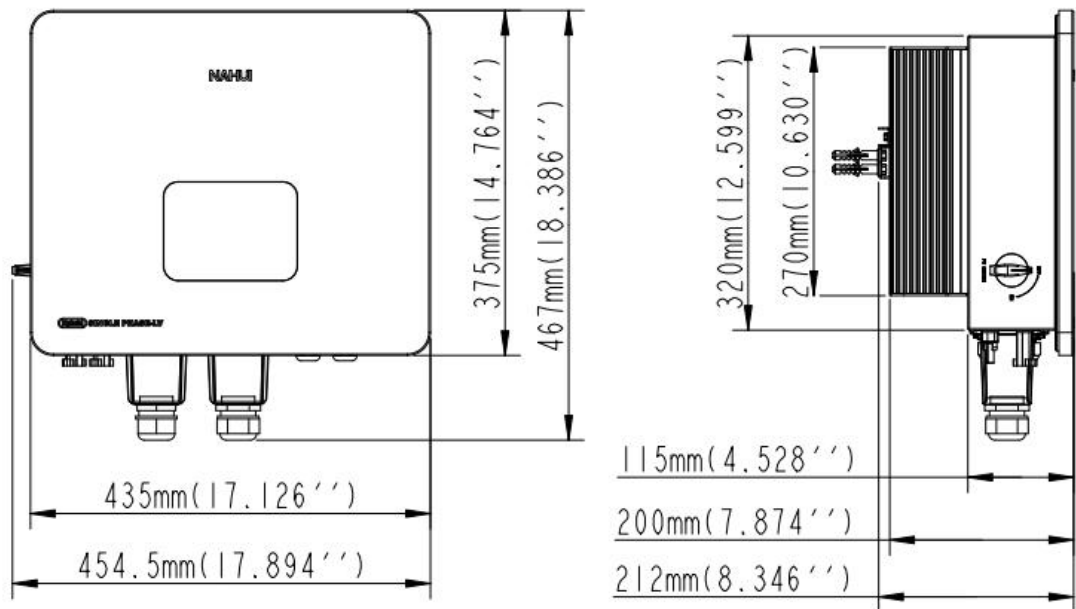
Note!

If you do not use the Sell enable function, the system will not supply power to the grid once it enters the self-use, peak shift, and battery priority modes.

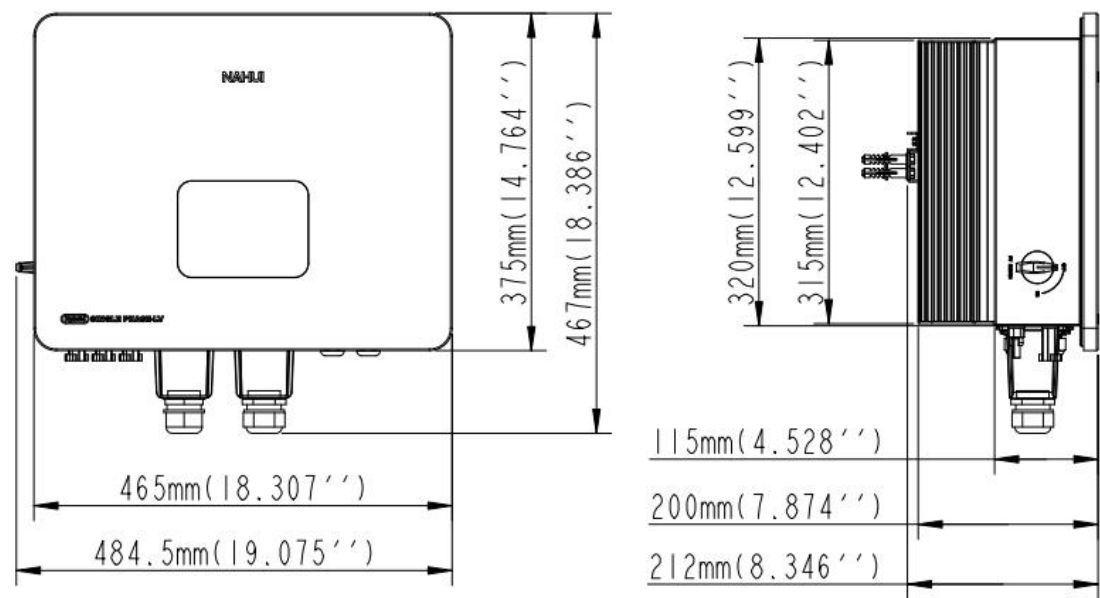
In addition to the above three basic modes, there is also an "Advanced Mode". Please refer to Chapter 8 for details.

3.4 Dimension

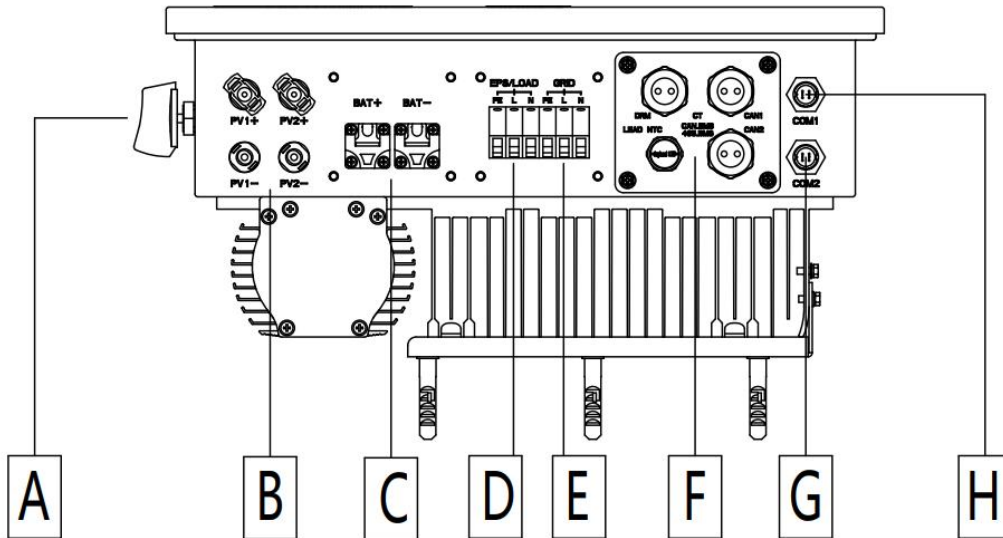
NL1P-3KA2/H-NL1P-6KA2/H:



NL1P-8KA2/H:



3.5 Terminals of PV Inverter



WARNING!

Qualified electrician will be required for the installation.

Object	Description
A	DC switch
B	PV input
C	BAT input
D	EPS/Load port
E	Grid port
F	CAN1/CAN2/CT/CAN_BMS/485_BMS/DRM/LEAD NTC
H	COM1 (For data logger)
G	COM2 (Not available for upgrade)

Table 3.1

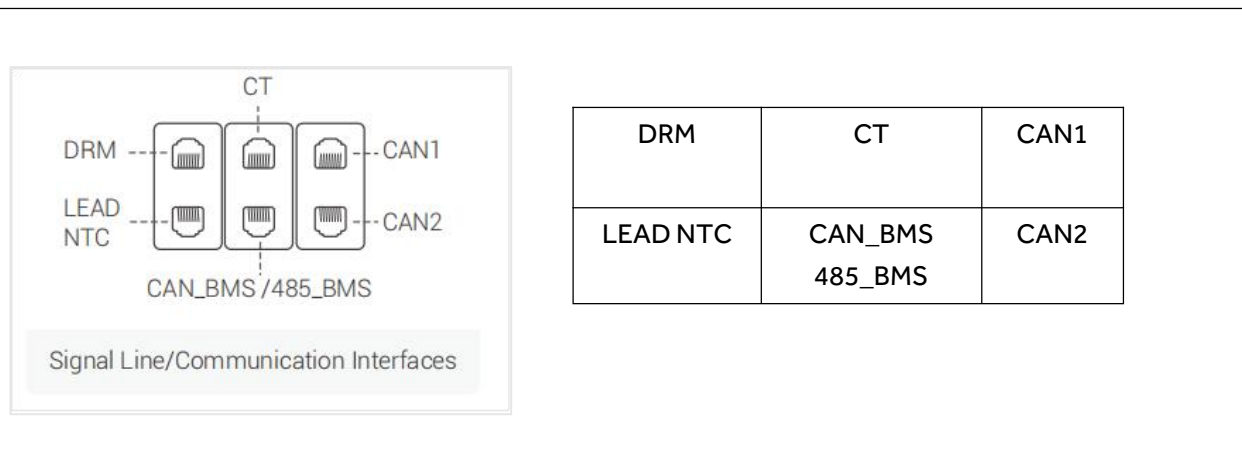


Table 3.2

*** Port Function**

- CAN1/CAN2: Parallel communication.
- CAN_BMS/ 485_BMS: BMS communication for lithium batteries.
- CT: For external grid side CT to detect current size.
- DRM: DEMAND RESPONSE MODES.
- LEAD NTC: Used for communication of battery temperature(Reserved ports).

4. Technical Parameters

4.1 Inverter Specification

Technical Data	NL1P-3 KA2/H	NL1P-3.6K A2/H	NL1P-4 KA2/H	NL1P-4.6K A2/H	NL1P-5 KA2/H	NL1P-6 KA2/H	NL1P-8K A2/H
PV Input Data							
MAX.DC Input Power	4.5kW	5.4kw	6kw	6.9kW	7.5kW	9KW	12KW
MPPT Tracker/Strings	2/1						2/1+2
MAX.PV Input Voltage	550V						
MPPT Voltage Range	80-500V						
Full Power MPPT Voltage Range	250-425V						
MAX. Input Current	16A						
OVC Categories	II						
MAX. Short-circuit Current	18.5A	18.5A	18.5A	18.5A	18.5A	18.5A	18.5A/ 37A
Battery Input Data							
Nominal Voltage (Vdc)	48V						
MAX. Charging /Discharging Current	60A/ 60A	72A/ 72A	80A/ 80A	92A/ 92A	100A/ 100A	120A/ 120A	160A/ 160A
MAX. Battery Output Power/Duration	/						8KW /20min
Battery Voltage Range	40-58V						
Battery Type	Lithium or Lead Acid Battery						
Charging Strategy for Li-Ion Battery	Self-adaption to BMS						
AC Output Data(On-Grid)							
Nominal Output Power Output to Grid	3kVA/ 3kW	3.68kVA/3. 68kW	4kVA/ 4kW	4.6kVA/ 4.6kW	5kVA/ 5kW	6kVA/ 6kW	8kVA/ 8kW
MAX. Apparent Power Output to Grid	3.3kVA	3.68kVA	4.4kVA	4.6kVA	5kVA	6.6kVA	8.8kVA
Nominal Voltage Range	230Vac						
Output Frequency	50/60Hz						
Max.AC Current Output to Grid	14.3A	16A	19.1A	20A	21.7A	28.7A	38.3A
Output Power Factor	1(0.8leading...0.8lagging)						

Output THDI	< 3%						
Maximum Feedback Current	20.5A	24.5A	27.3A	31.4A	34.1A	40.9A	45.5A
Maximum Output Overcurrent Protection	20.5A	24.5A	27.3A	31.4A	34.1A	40.9A	45.5A
OVC Categories	III						
Inrush Current	42.9A@3um	48A@3um	57.3A@3um	60A@3um	65.1A@3um	86.1A@3um	114.9A@3um
Maximum Output Fault Current	42.9A@3um	48A@3um	57.3A@3um	60A@3um	65.1A@3um	86.1A@3um	114.9A@3um
AC Output Data(LOAD)							
Output Voltage Rated	230Vac						
Nominal Output Frequency	50/60Hz						
Output THDU	< 2%						
Efficiency							
Europe Efficiency	>=97%						
MPPT Efficiency	99.9%						
Battery Charge/Discharge Efficiency	96%						
DC. Max Efficiency	98%						
Protection							
Island Protection	YES						
Insulation Resistor Detection	YES						
Residual Current Monitoring Unit	YES						
Output Over Current Protection	YES						
Load Output Short Protection	YES						
Output Over Voltage Protection	YES						
Output Under Voltage Protection	YES						
General Data							
Grid and Off Grid Switching Time	10ms						

Operating Temperature Range	-25 ~ +60℃ (-13~+140°F)	
Relative Humidity	0-95%	
Operating Altitude	0~2000m (Derating over 2000m)	
Ingress Protection	IP65	
Weight	19kg	22kg
Size (Width*Depth*Height)	454*200*467mm	484*200*467mm
Cooling	Natural Convection	
Noise Emission	<35dB	
Display	Color screen	
Communication	RS485/WIFI/CAN/DRM	
Standby Loss	< 15W	
Safety Standards	EN IEC 62109 , EN IEC 61000-6-1/3	
Grid Connection Standards	CE/EN50549-1/G98/G99/CEI 0-21:2022	
Pollution Degree	II	
Topology	Non-isolated	

5. Installation

5.1 Check for Physical Damage

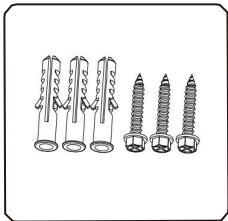
Make sure the inverter is intact during transportation. If there is any visible damage, such as cracks, please contact your dealer immediately.

5.2 Packing List

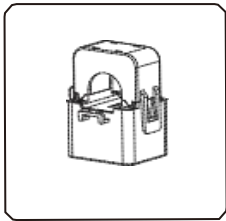
Open the package and take out the product, please check the accessories.
The packing list shown as below.



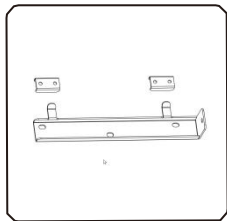
A



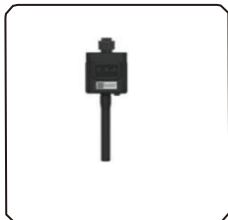
B



C



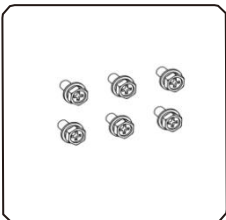
D



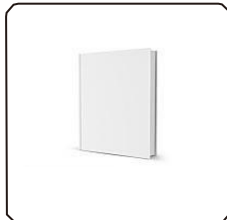
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G



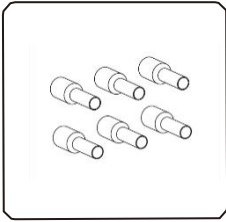
H



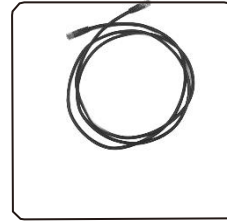
I



J



K



L

Object	Description
A	Inverter
B	Expansion Pipe and Self-tapping Screw.
C	CT (CTSA016-90A-90mA, inner radius 16mm)

D	Hanger
E	WIFI Module
F	PV Connectors (2*positive, 2*negative)
G	Hex Head Bolt
H	User Manual
I	Display Upgrade Cable
J	Certificate
K	Grid and Load Port Connectors
L	2M Parallel Machine Line

Table 5.1

5.3 Mounting

Installation Precaution

Inverter is designed for indoor and outdoor installation (IP 65) Make sure the installation site meets the following conditions:

- ◆ Not in direct sunlight.
- ◆ Not in areas where highly Flammable materials are stored.
- ◆ Not in potential explosive areas.
- ◆ Not in the cool air directly.
- ◆ Not near the television antenna or antenna cable.
- ◆ Not higher than altitude of about 2000m above sea level.
- ◆ Not in environment of precipitation or humidity (> 95%).
- ◆ Under good ventilation condition.
- ◆ The ambient temperature in the range of -25 ~ +60°C.
- ◆ The slope of the wall should be within $\pm 5^\circ$.
- ◆ The wall hanging the inverter should meet conditions below:
 1. Solid brick/concrete, or strength equivalent mounting surface.
 2. Inverter must be supported or strengthened if the wall's strength isn't enough (such as wooden wall, the wall covered by thick layer of decoration).

Please AVOIDE direct sunlight, rain exposure, snow laying up during installation and operation.

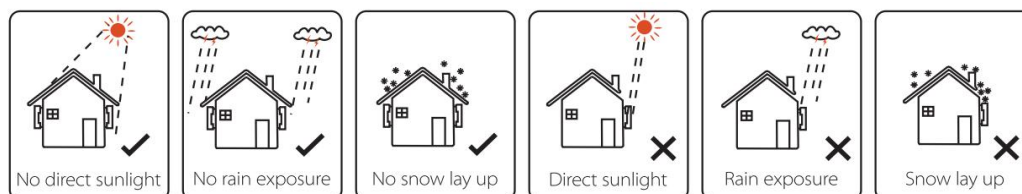
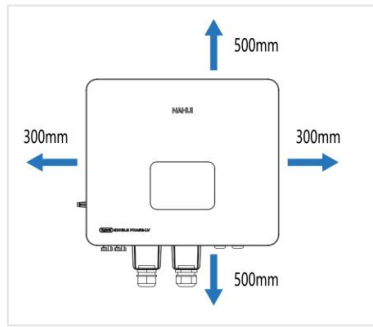


Figure5-1 Recommended Installation Locations

Space Requirement



Position	Min. size
Left	300mm(11.81")
Right	300mm(11.81")
Top	500mm(19.69")
Bottom	500mm(19.69")
Front	1000mm(39.37")

Figure5-2 Inverter Mounting Clearance

Installation

Tools required for installation.

Installation tools: crimping pliers for binding post and RJ45, screwdriver, manual wrench etc.



Figure5-3 Installation tools

Step 1: Mounting the hanging rack on the wall.

1. Place the hanging rack on the wall, mark the location of the 3 holes and then remove it.
2. Drill holes with an drill, making sure they are deep enough (about 50~60 mm) to support the inverter.
3. Then install the expansion pipes into the hole with a proper hammer, and fix the hanging rack with self-tapping screws.

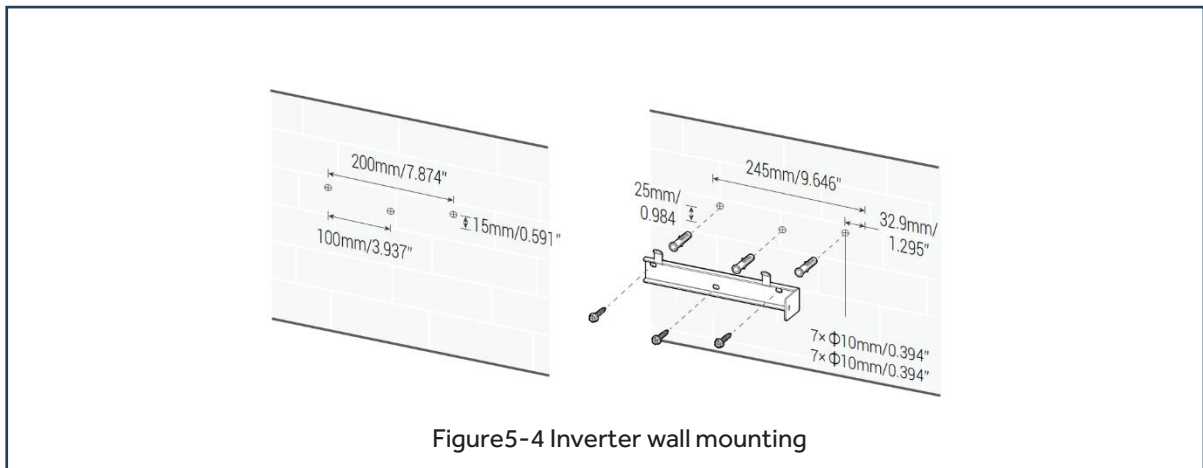


Figure5-4 Inverter wall mounting

Step 2: Lift the inverter and fix the inverter to the wall by aligning the hole of the inverter with the expansion bolt.

Step 3: Tighten the fixing screws on the right side of the inverter.

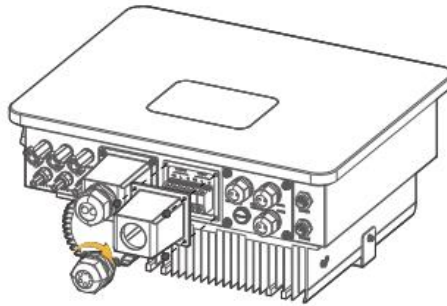


Figure5-5 Inverter Installation Instructions

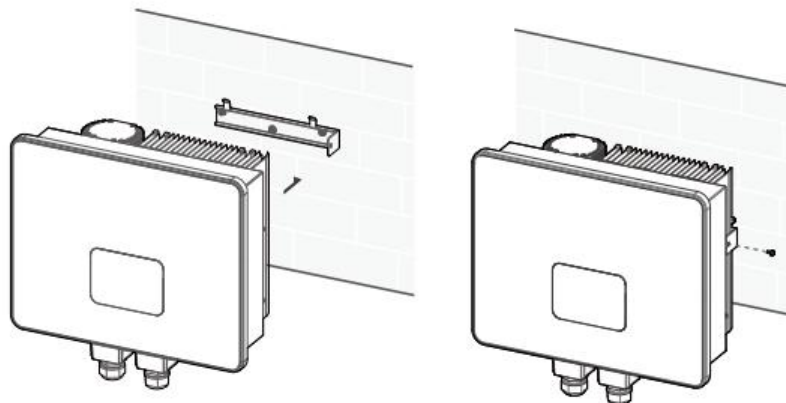


Figure5-6 Inverter Installation Instructions

Step 4: Use a screwdriver to remove the waterproof box under the lower part of the machine.

Step 5: After installation, to ensure that the machine does not fall off, please double check if the machine is fixed to the rack.

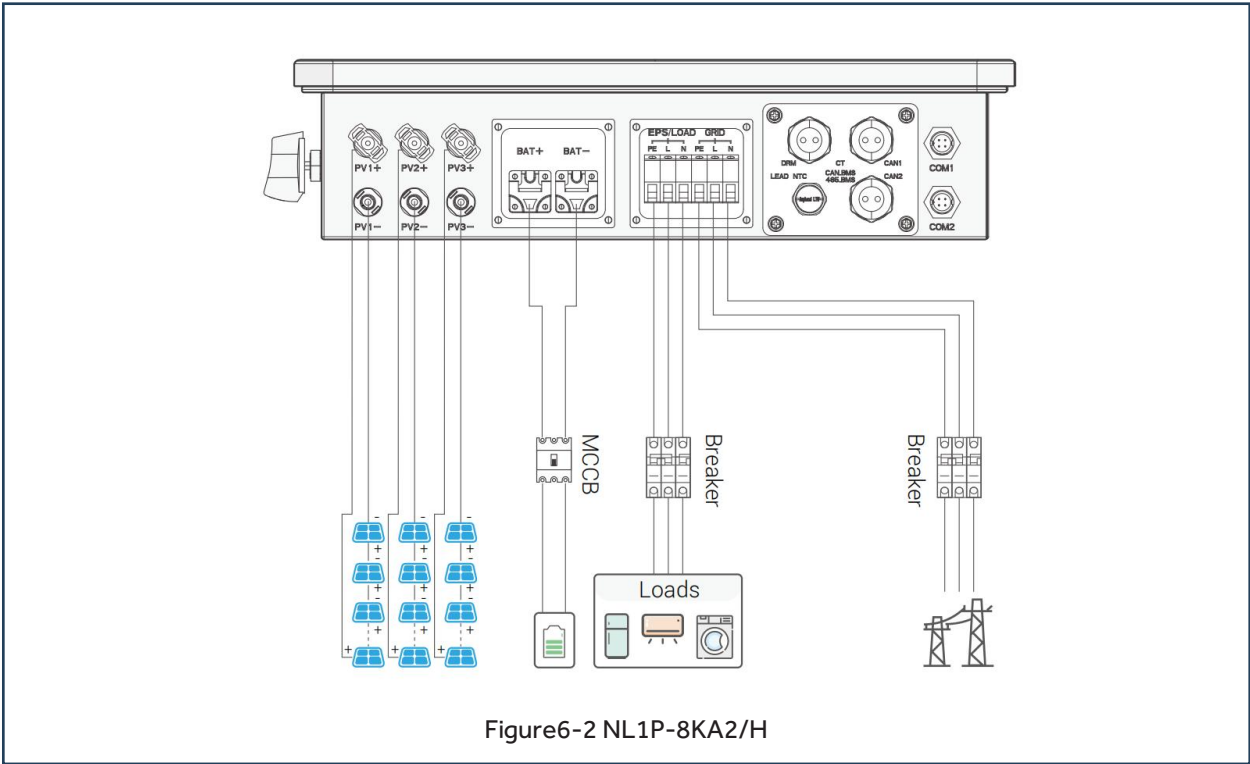
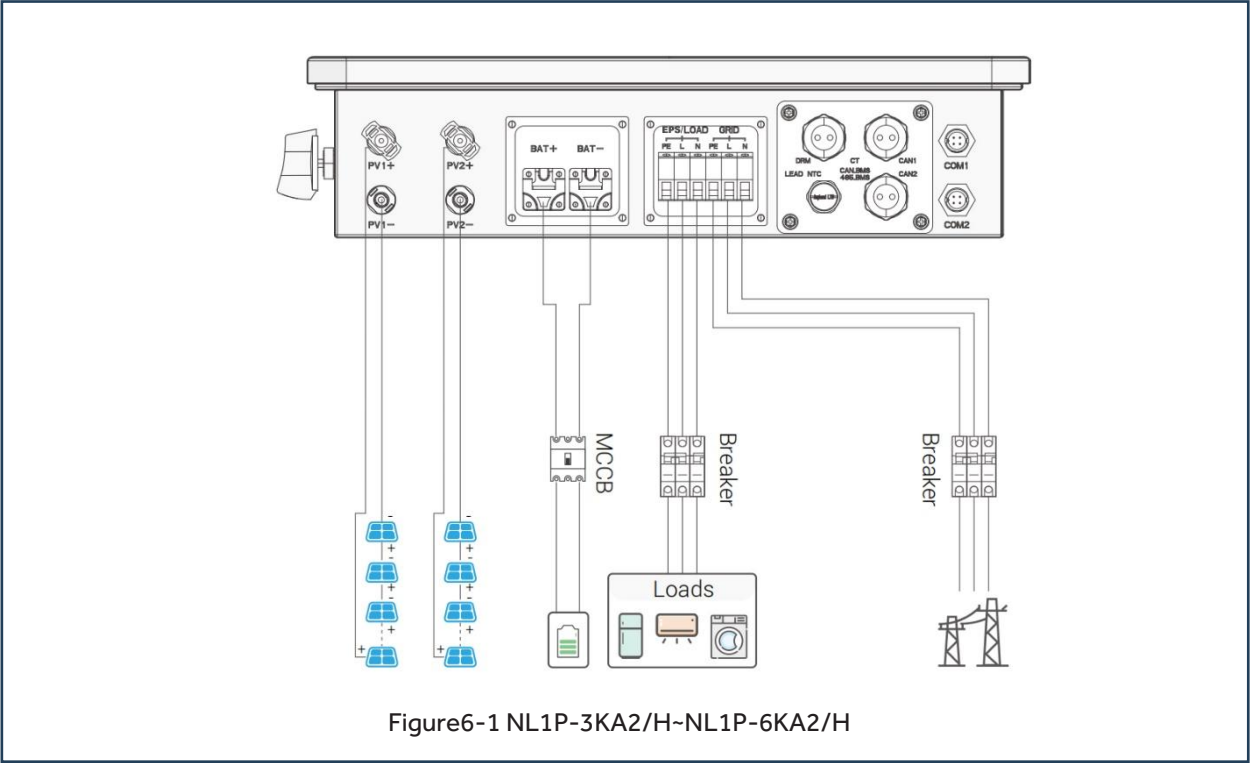


Note !

Nothing should be stored on or placed against the inverter.

6. Electrical Connection

Electrical connection diagram



6.1 PE Cable Installation

An external ground connection is provided at the right side of inverter. Prepare OT terminals: M4. Use proper tooling to crimp the lug to the terminal. Cable Size: 8AWG.

Connect the OT terminal with ground cable to the right side of inverter. The torque is 2Nm.

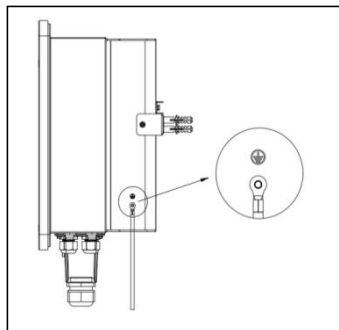


Figure6-3

6.2 PV Input Cable Installation

The hybrid inverter can be connected in series with 2/3-strings PV modules for 3kW, 3.6kW, 4kW, 4.6kW, 5Kw, 6Kw, 8kW. Select PV modules with excellent function and reliable quality. Open-circuit voltage of module arrays connected in series should be <Max. DC input voltage; operating voltage should be conformed to MPPT voltage range.

Technical Data	NL1P-3K A2/H	NL1P-3.6K A2/H	NL1P-4K A2/H	NL1P-4.6K A2/H	NL1P-5K A2/H	NL1P-6K A2/H	NL1P-8K A2/H
MAX. DC Input Voltage	550V						
MPPT Range	80V-500V/360V						

Table 6.1



Warning!

- ◆ PV module voltage is very high, which already achieve dangerous voltage range, please comply with electric safety rules when connecting.
- ◆ Please do not make PV positive or negative ground!



Note!

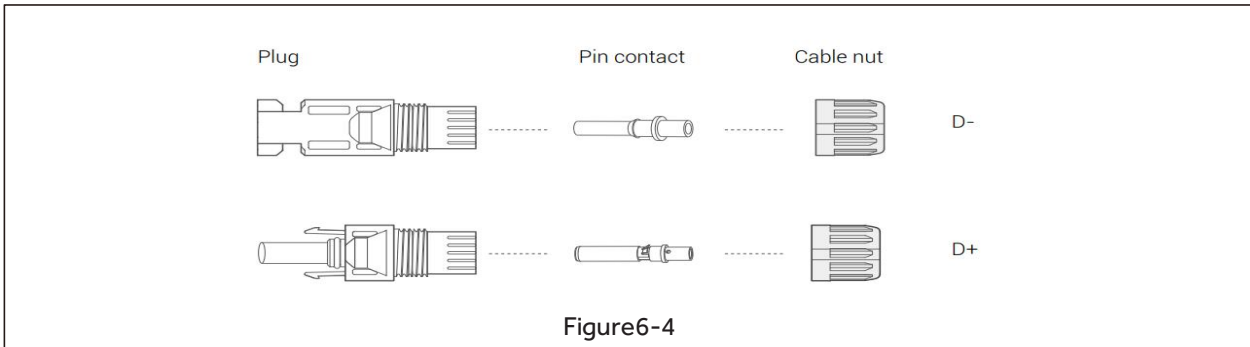
The following requirements of PV modules need to be applied for each input area. In order to save cable and reduce the DC loss, we suggest installing the inverter near PV modules.

Connection Steps:

Step1: Checking PV module

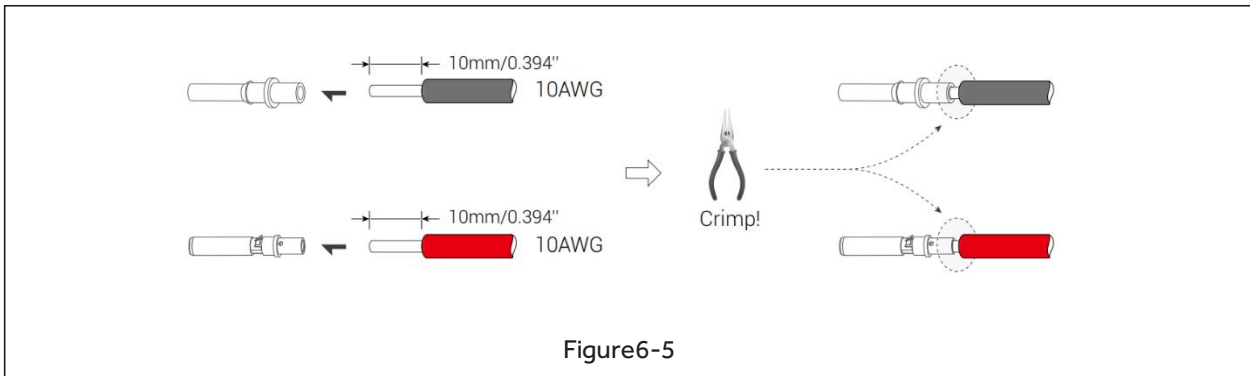
- (1) Use multimeter to measure module array voltage.
- (2) Check the PV+ and PV- from the PV string combiner box correctly.
- (3) Please make sure the impedance between the positive pole and negative pole of PV to earth(Warning: should be MΩ level).

Step2: Separating the DC connector



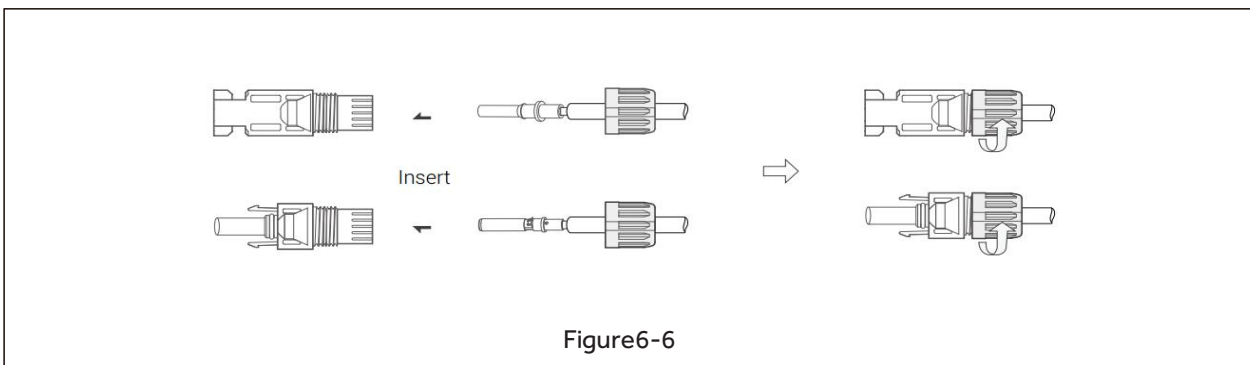
Step3: Wiring

- (1) Choose the 10 AWG wire to connect with the cold-pressed terminal.
- (2) Remove 10mm of insulation from the end of wire.
- (3) Insert the insulation into pin contact and use crimping plier to clamp it.



Step4: Insert pin contact through the cable nut to assemble into back of the male or female plug.

When you feel or heard a "click" sound the pin contact assembly is seated correctly.



Step5: Measure PV voltage of DC input with multimeter, verify DC input cable polarity.

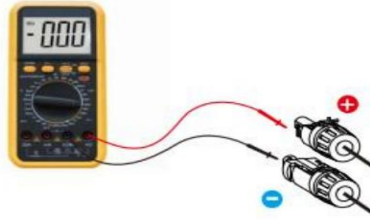


Figure6-7

Step6: Plug the PV connector into the corresponding PV connector on inverter.

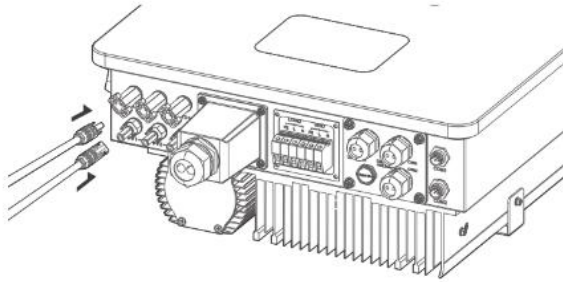


Figure6-8

Caution!

Danger of burn injuries due to hot enclosure parts! If DC inputs are accidentally reversely connected or inverter is faulty or not working properly, it is NOT allowed to turn off the DC switch. Otherwise it may cause DC arc and damage the inverter or even lead to a fire disaster. The correct actions are:



- *Use a clip-on ammeter to measure the DC string current.
- *If it is above 0.5A, please wait for the solar irradiance reduces until the current decreases to below 0.5A.
- *Only after the current is below 0.5A, you are allowed to turn off the DC switches and disconnect the PV strings.
- * In order to completely eliminate the possibility of failure, please disconnect the PV strings after turning off the DC switch to avoid secondary failures due to continuous PV energy on the next day. Please note that any damages due to wrong operations are not covered in the device warranty.

6.3 Battery Cable Installation

Charging & discharging system of hybrid inverter is designed for 51.2V lithium battery.

Before choosing battery, please note the maximum voltage of battery cannot exceed 60V and the battery communication should be compatible with hybrid inverter.

Battery Breaker

Before connecting to battery, please install a no-polarized DC breaker to make sure inverter can be securely disconnected during maintenance.

Model	NL1P-3KA2/H	NL1P-3.6KA2/H	NL1P-4KA2/H	NL1P-4.6KA2/H	NL1P-5KA2/H	NL1P-6KA2/H	NL1P-8KA2/H
Current[A]	60A	72A	80A	92A	100A	120A	160A

Battery terminal diagram

Table 6.2

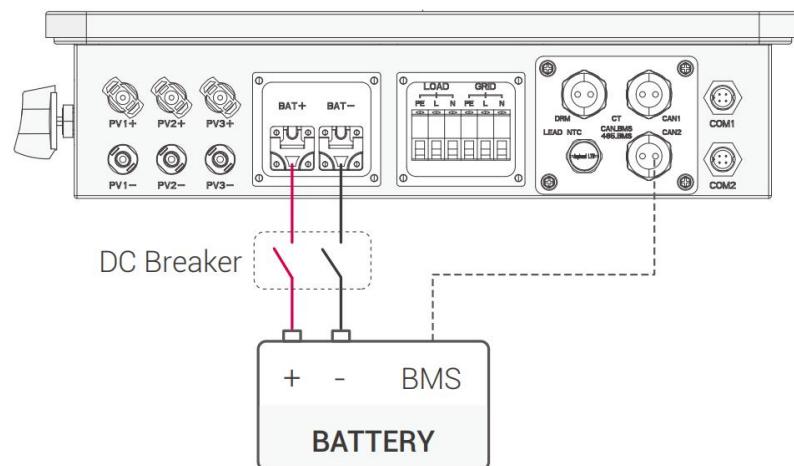


Figure6-9

BMS PIN Definition

The communication interface between inverter and battery is RS485 or CAN with a RJ45 connector.

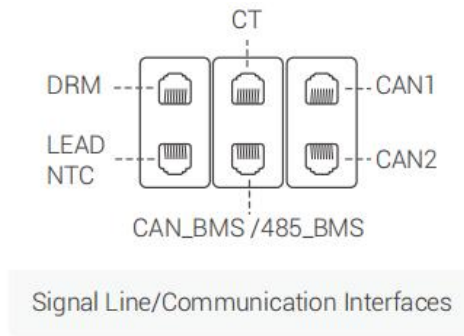
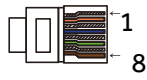


Figure6-10



	1	2	3	4	5	6	7	8
CAN	X	X	X	BMS_CANH	BMS_CANL	X	X	X
RS485	X	X	X	X	X	GND	BMS_485A	BMS_485B

Table 6.3

Note!



The battery communication can only work when the battery BMS is compatible with the inverter.

Battery connection steps:

Step1: Select the appropriate cable and O-terminal with an M6 bore.

Model	NL1P-3KA2/ H	NL1P-3.6KA2/ H	NL1P-4KA2/ H	NL1P-4.6KA2/ H	NL1P-5KA2/ H	NL1P-6KA2/ H	NL1P-8KA2/ H
Cable	≥7AWG	≥6AWG	≥6AWG	≥5AWG	≥4AWG	≥3AWG	≥2AWG

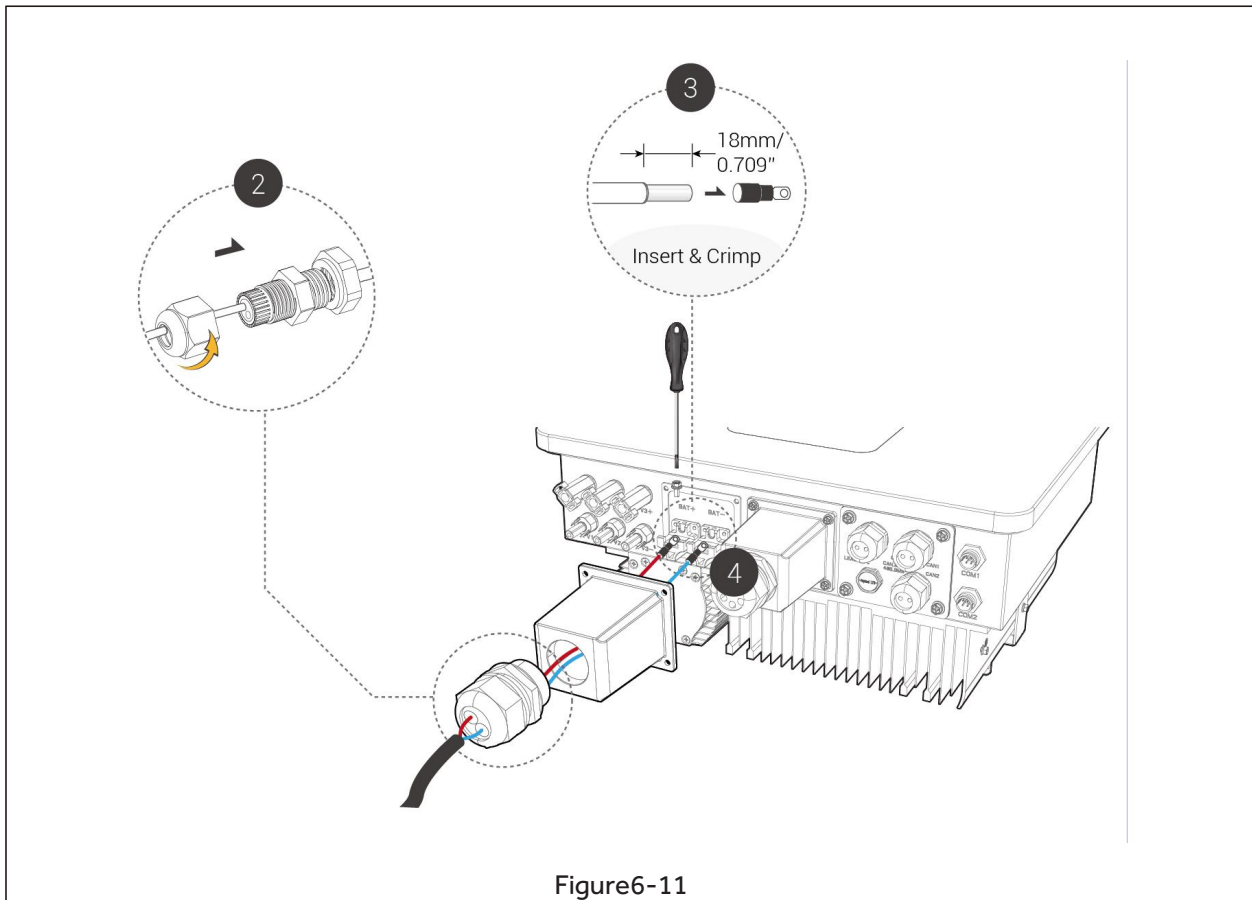
Table 6.4

Step2: Disassemble the waterproof connector and waterproof cover, and thread the cable through the waterproof connector.

Step3: Wiring

1. Connect the wire to the cold crimp terminal.
2. Remove 18mm of insulation from the end of the wire.
3. Insert the stripped end into the O-terminal with an M6 bore and clamp it with crimping pliers.

Step 4 : Insert the terminals into battery ports.(loosen or tighten the crimp terminal screws with a one-way screwdriver)



Note!

Positive and negative lines are not allowed to reverse.

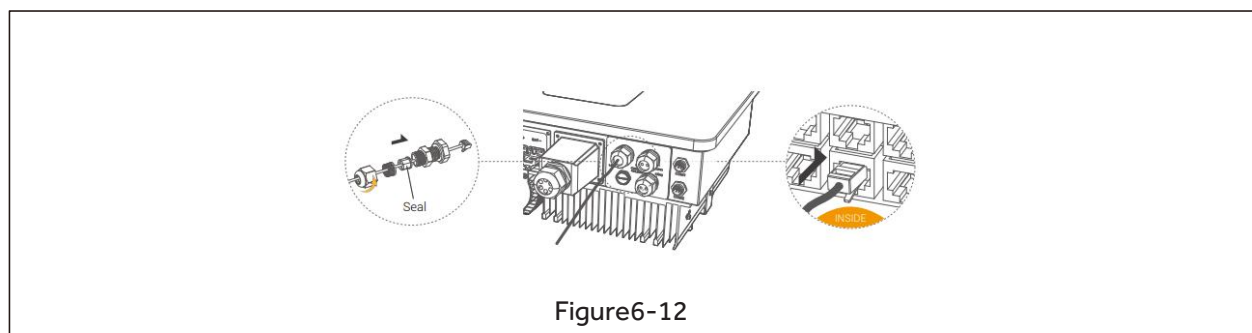
BMS connection steps:

Step 1: Disassembly of waterproof connector and waterproof cover.

Step 2: Prepare a communication cable (without sheath) and pass the cable through the waterproof connector.

Step 3: Insert the RJ45 connector into the BMS port of the inverter.

Step 4: Assemble waterproof connectors and waterproof cover.



**Note!**

The seal is for waterproofing. Please make sure it is put back in.

6.4 AC Cable Installation (on Grid)

Step1: Check the grid voltage.

- (1) Check the grid voltage and compare with the permissive voltage range (Please refer to technical data).
- (2) Disconnect the circuit board from all the phases and secure against re-connection.

Step2: Select the appropriate cable and cable lug.

Model	NL1P-3KA2/H	NL1P-3.6KA2/H	NL1P-4KA2/H	NL1P-4.6KA2/H	NL1P-5KA2/H	NL1P-6KA2/H	NL1P-8KA2/H
Cable	12AWG	10AWG				8AWG	

Table 6.5

Step3: Disassemble the waterproof connector and waterproof cover, and thread the cable through the waterproof connector.

Step4: Wiring

1. Connect the wire to the cold crimp terminal.
2. Remove 18mm of insulation from the end of the wire.
3. Insert the stripped end into the cable lug and clamp it with crimping pliers.

Step5: Insert the terminals into grid ports (loosen or tighten the crimp terminal screws with a one-way screwdriver).

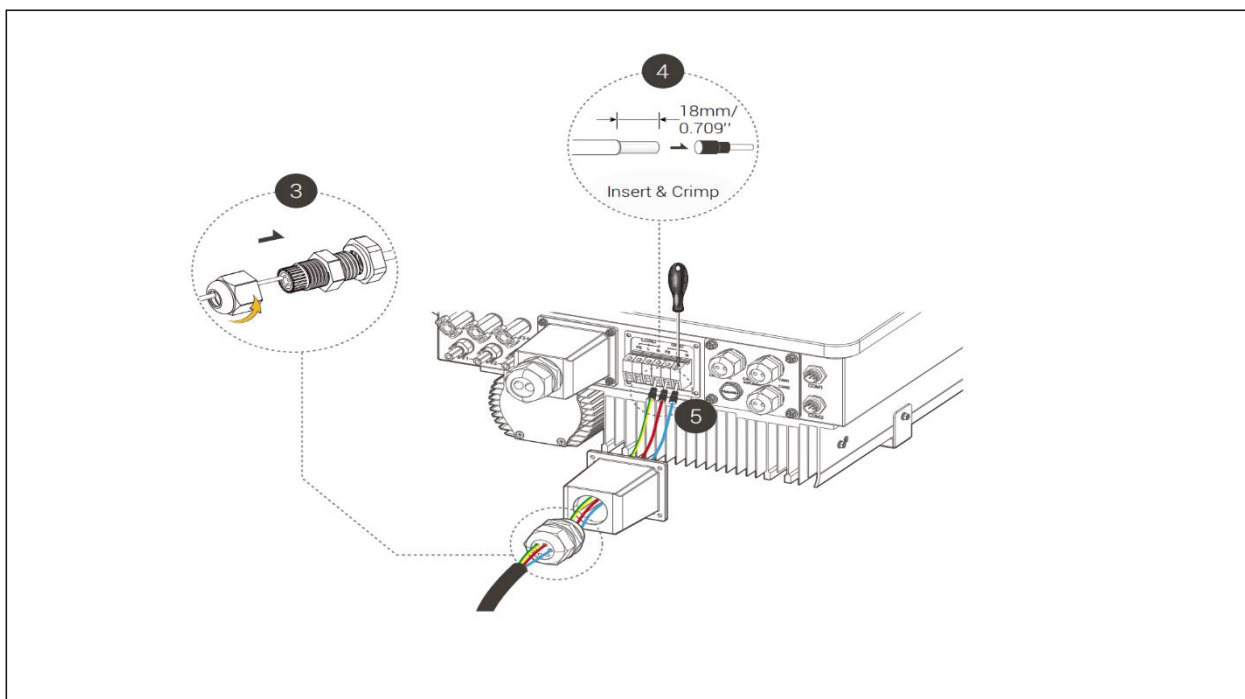


Figure6-13

6.5 AC Cable Installation (on EPS/Load)

The inverter has grid-connected and off-grid functions, and outputs power through the eps/load port. When the inverter is off the grid, users need to open "EPS enable" function, the battery supplies power to the load.

In a standard PV installation for an inverter, it typically involves connecting the inverter to both solar panels and batteries. The "EPS enable" function is not recommended for use in systems that are not connected to batteries. Failure to follow this instruction will void the standard warranty, and the user will be held liable for any related consequences.

Energy storage inverters can provide overload output, Refer to the technical parameters of the inverter for details. The inverter is equipped with self-protection against high ambient temperatures. For complex applications or special loads, please contact our aftersales support.



Note!

In case of discrepancies between wiring mode of local policy and the operation guide above, especially for the wiring of neutral line, grounding and RCD, please contact us before any operation!

EPS/Load Connection:

Install an AC circuit breaker on the load output cable for safety.

Model	NL1P-3KA2/H	NL1P-3.6KA2/H	NL1P-4KA2/H	NL1P-4.6KA2/H	NL1P-5KA2/H	NL1P-6KA2/H	NL1P-8KA2/H
Micro-breaker	19.5A	23.5A	26A	30A	32.6A	39A	43.5A



Note:

Table 6.6

The absence of an AC circuit breaker in the event of an electrical short circuit in the load measurement will cause damage to the inverter.

Step1.Make EPS/Load wires

Please match the inverter EPS/LOAD port according to the following harness specifications.

Model	NL1P-3KA2/H	NL1P-3.6KA2/H	NL1P-4KA2/H	NL1P-4.6KA2/H	NL1P-5KA2/H	NL1P-6KA2/H	NL1P-8KA2/H
Cable	≥11AWG	≥10AWG	≥10AWG	≥9AWG	≥9AWG	≥8AWG	≥8AWG

Step2: Disassemble the waterproof connector Table 6.7 and waterproof cover, and thread the cable through the waterproof connector.

Step3: Wiring

1. Connect the wire to the cold crimp terminal.
2. Remove 18mm of insulation from the end of the wire.
3. Insert the stripped end into the cable lug and clamp it with crimping pliers.

Step 4: Insert the terminals into load ports (loosen or tighten the crimp terminal screws with a one-way screwdriver).

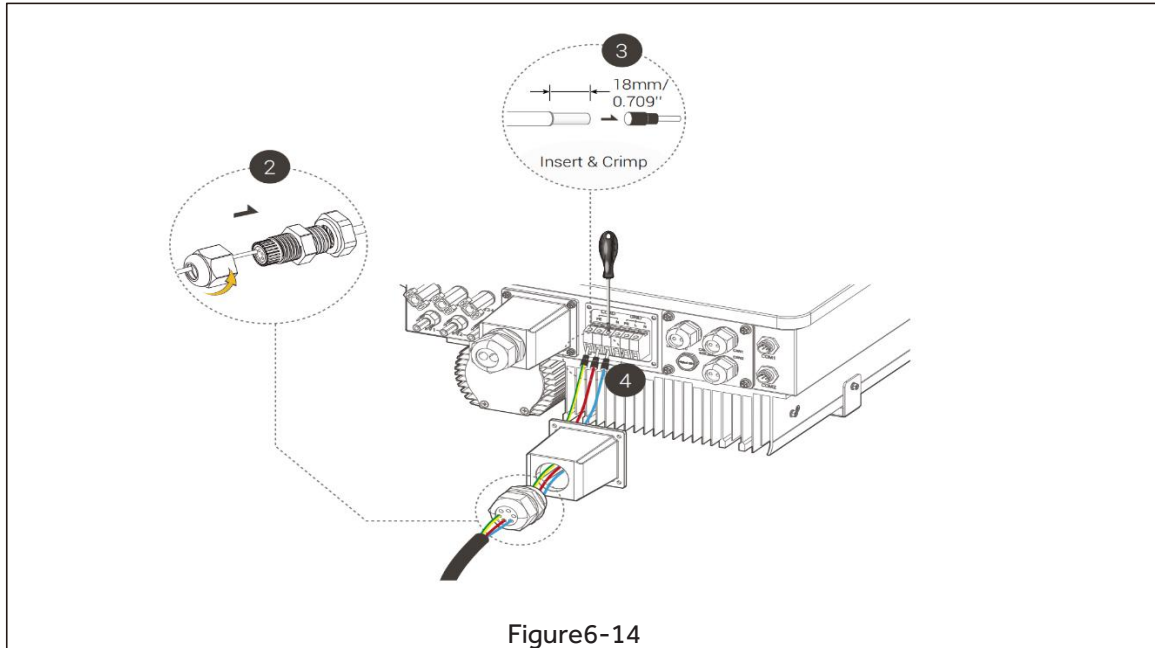


Figure6-14



Warning!

Ensure that the load output power is within its rated power, otherwise the inverter will shut down with an "over load" warning.

When "overload" occurs, adjust the load power to ensure that it is within the load output power range before turning on the inverter.

For nonlinear loads, make sure the surge power is within the load output power range.

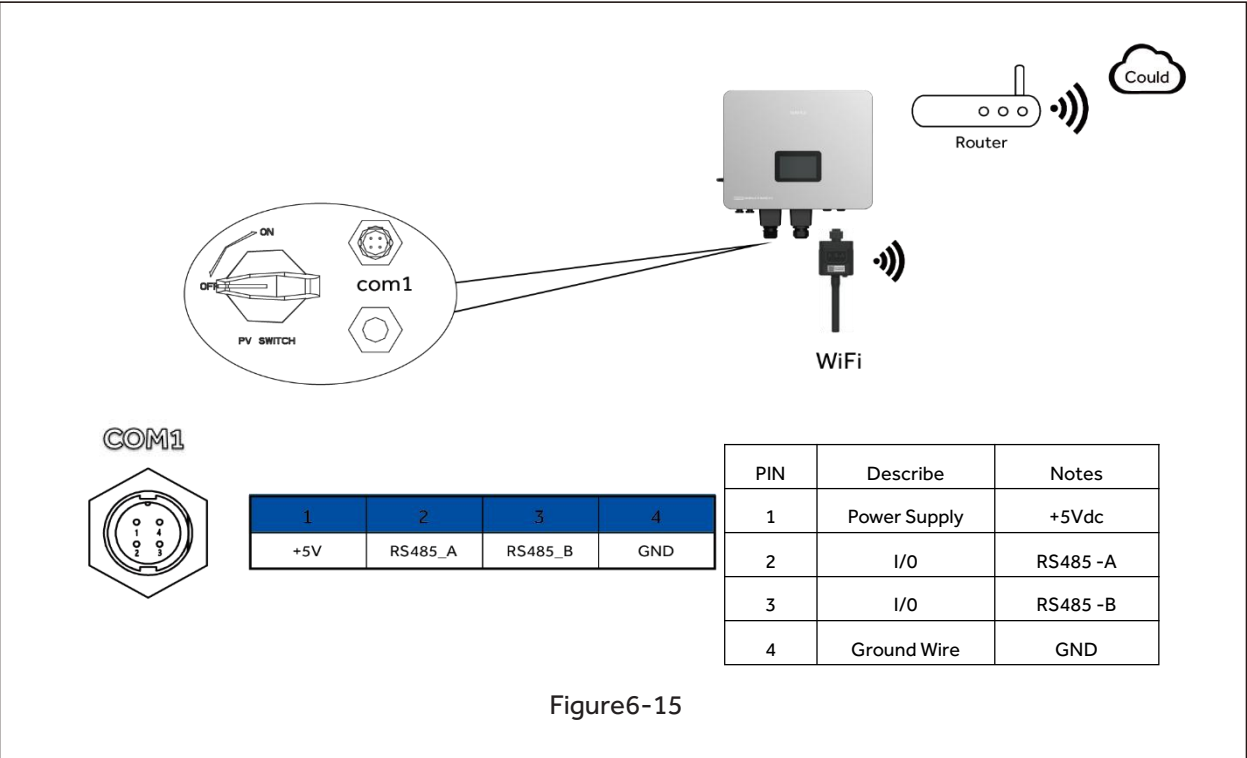
6.6 COM Port Connection

COM Port can be used for Data Logger connection. Below are the installation steps.

Step1. Plug WiFi into “COM1” port at the bottom of the inverter.

Step2. Turn on Bluetooth of mobile terminal to search for pairing connection.

Step3. Open the Nahui APP on the mobile terminal. (Please check the data logger user manual for more details).



6.7 CT Installation Instructions

CT is short for "current transform", is used to detect Grid current .

Note!



- If CT is not installed or installed reversely, the functions of "Anti-reflux", "Self-use", "Peak-shift "... will not be realized.
- The direction of the arrow on the CT points from this inverter to the GRID!
- When connected to single-phase power grid (Europe, Africa, Asia, Australia). Only one CT is provided in the accessories. The RJ45 connector of CT is connected to "CT-L1", and the CT is connected to L phase.

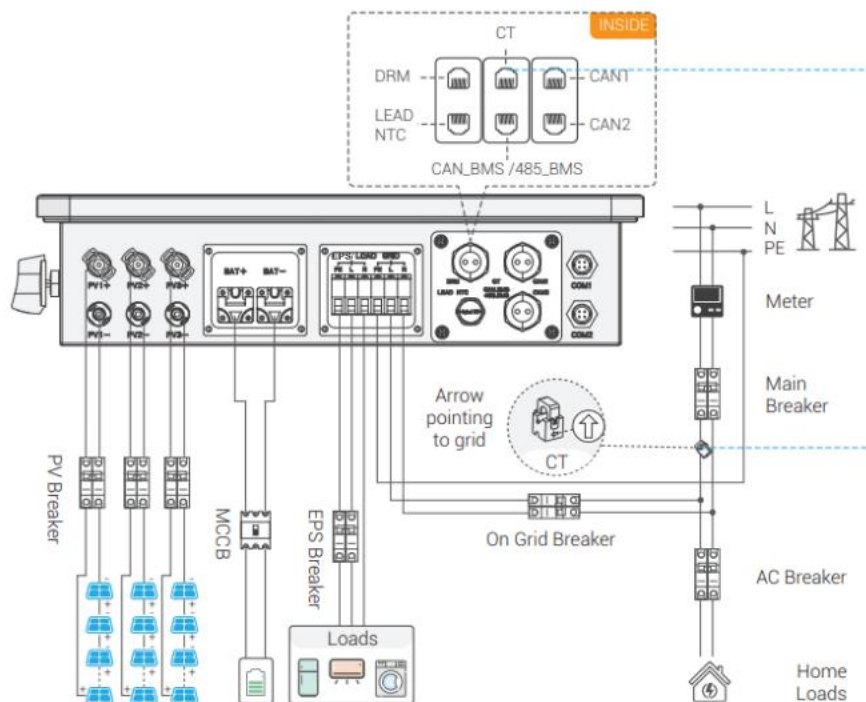


Figure6-16

CT connection steps:

Step 1: Disassembly of waterproof connector and waterproof cover.

Step 2: Prepare a communication cable (without sheath) and pass the cable through the waterproof connector.

Step 3: Insert the RJ45 connector into the CT port of the inverter.

Step 4: Assemble waterproof connectors and waterproof cover.

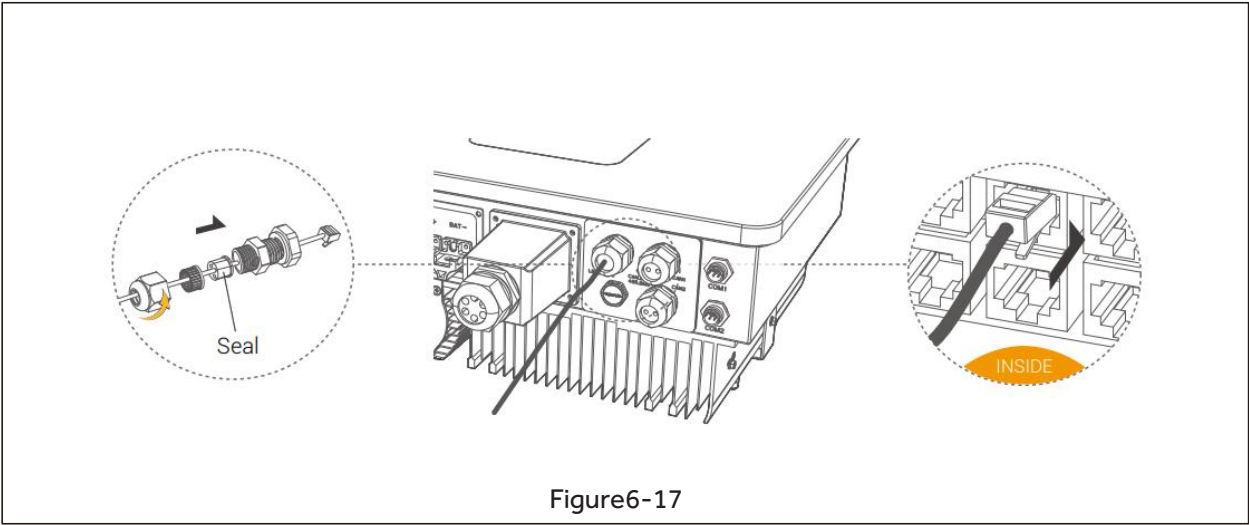
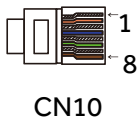


Figure6-17

CT PIN Definition



1	2	3	4	5	6	7	8
X	X	IGRID_BN_	X	X	IGRID_BP	X	X

Table 6.8



Note!

The seal is for waterproofing. Please make sure it is put back in.

6.8 Inverter Parallel Guide

6.8.1 Parallel System Diagram

Multiple inverters can be installed together to deliver more power. When AC loads are present, all units effectively share the load. Support 4 parallel machines, multiple parallel machines according to the following system block diagram effective connection.

NOTE:



If using Common CT connection Method, Please contact your dealer to purchase a larger capacity CT to ensure sampling accuracy.

- 1.The BMS port: BMS communication for lithium batteries.
- 2.The CT port: For external grid side CT to detect current size.
- 3.CAN port: parallel port.

For parallel communication, CAT 6 cables are needed. The units should be connected hand by hand. When using common batteries, BMS cable needs to be connected to the master unit. THE inverter shares the BMS information by inter -unit parallel communication cable.

For details about how to configure the parallel system, see 8.1.3 Setting Options (2) parallel setting.

6.8.2 Parallel use matters

1. Make sure all the units in parallel are with the same software version.

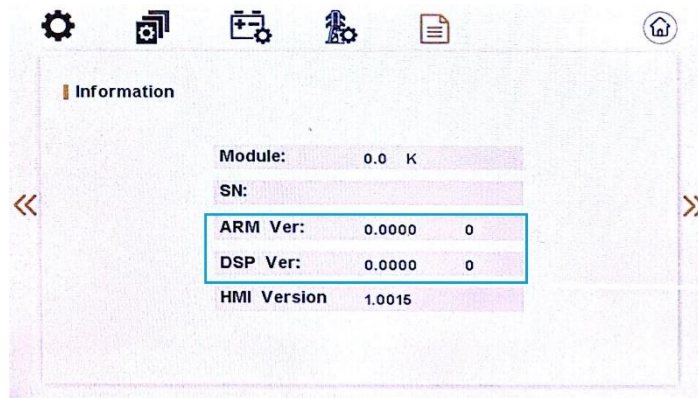


Figure6-19

2. Connect the loads of the two inverters together first. It should be noted that the grid power line and the load line of the two inverters should be roughly the same length. If user wants to add grid /load ac breaker, please make sure the lines are paralleled/jointed before connected to breaker.

3. Make sure the CT Limiter sensor is installed properly.

4. Please note that the slaver unit will be in the same work mode automatically as the master unit.

5. Only the parallel connection of shared batteries is supported. The BMS communication must be connected to the host.

6. The photovoltaic input source is independent, and the grid is shared.

6.9 Inverter Three Phase Guide

6.9.1 Three phase System Diagram

Three single-phase inverters can be combined to form a three-phase inverter. The system block diagram is as follows.



NOTE:

1. Please disable the parallel function and enable the group three phase function.
2. Set the parallel address of the 1# Master to 1, the parallel address of the 2# slave and the parallel address of the 3# slave to 3.
3. Select phase A for the 1# Master inverter and phase A for the grid interface; Select phase B for the 2# slaver inverter and phase B for the grid interface; Select phase C for the 3# slaver inverter and phase C for the grid interface.

For 3 Phase communication, CAT 6 cables are needed. The units should be connected hand by hand.

When using common batteries, BMS cable needs to be connected to the master unit. The inverter shares the BMS information by inter-unit parallel communication cable.

For details about the three-phase configuration method, see 8.1.3 Setting Option (2)parallel setting.

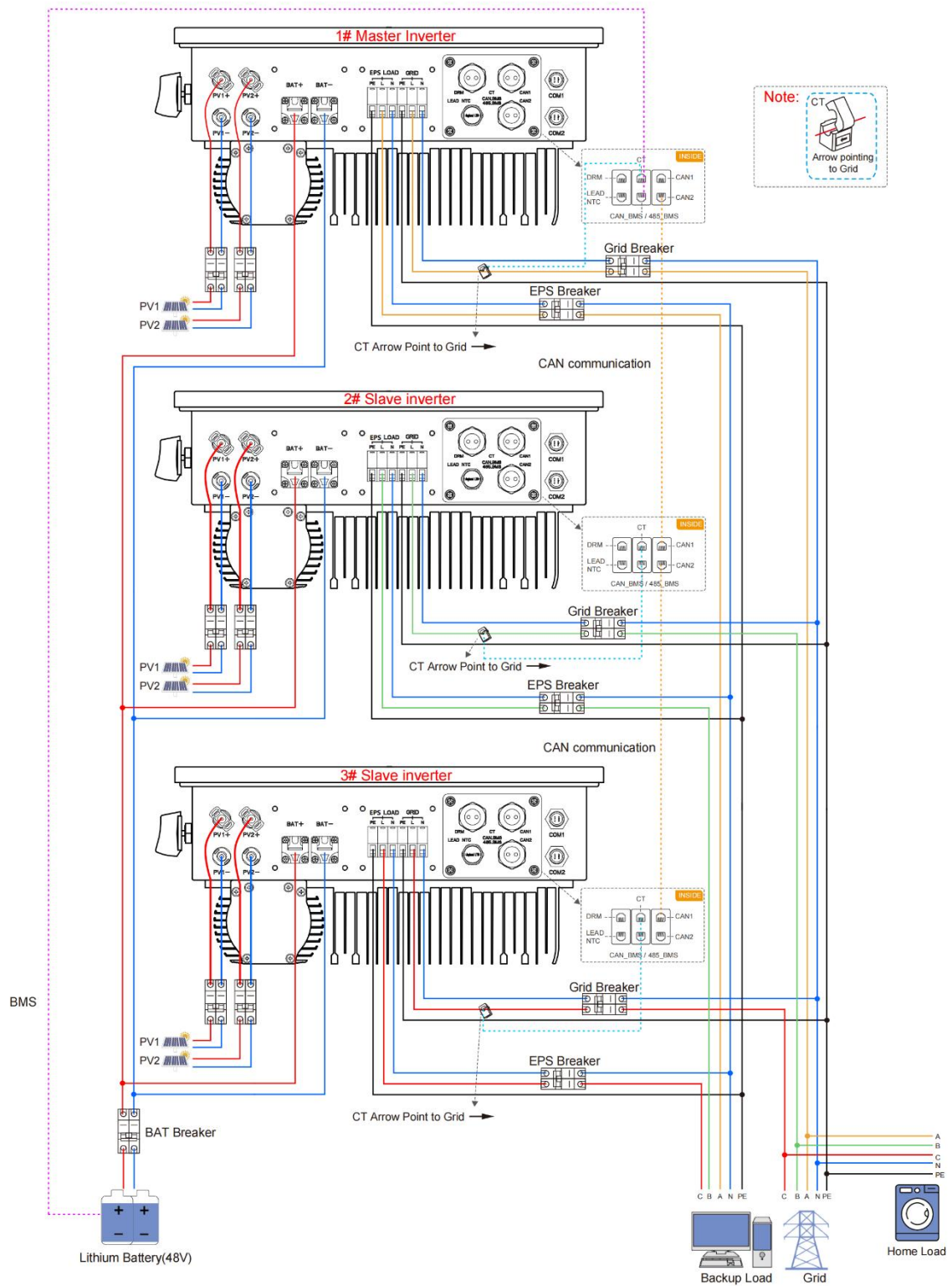


Figure6-20

6.9.2 three-phase use matters

1. Ensure that all three-phase units use the same software version.

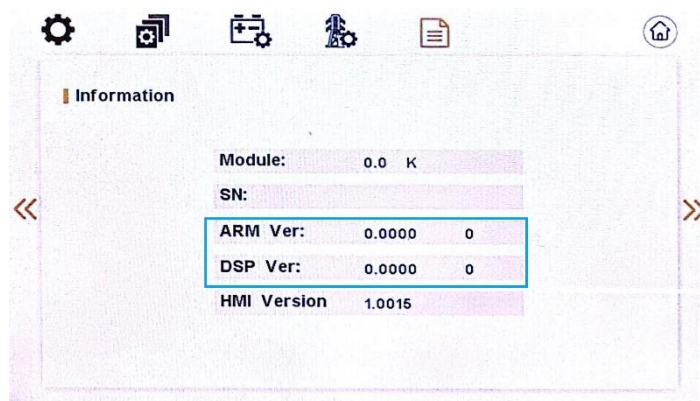


Figure6-21

2.Connect the load line and the power grid line separately, and it should be noted that the load line and the N line of the grid line need to be connected together.

3.Make sure the CT Limiter sensor is installed properly.

4.Please note that the slaver unit will be in the same work mode automatically as the master unit.

5.Only the parallel connection of shared batteries is supported. The BMS communication must be connected to the host.

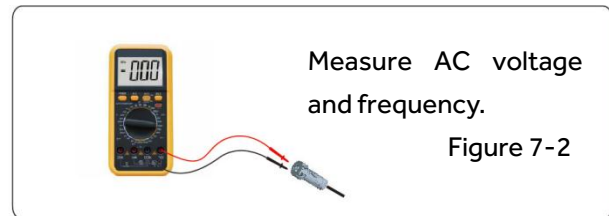
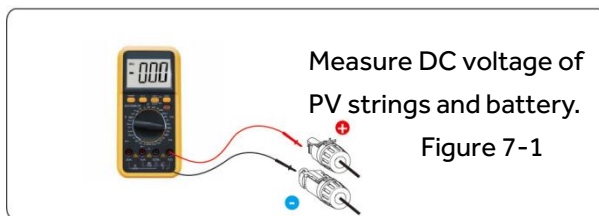
6.In the group three-phase system, the main load and the grid line must be connected as phase A, the load of 2# slave and the grid line must be connected as phase B, and the load and grid line of 3# slave must be connected as phase C.

7.When the group is three-phase, it is also necessary to set the number and address of parallel machines.

7. Inverter Configuration

Start inverter after checking all the following:

- Ensure all the devices are accessible for operation, maintenance and service.
- Check and confirm that the inverter is firmly installed.
- Space for ventilation is sufficient for one inverter or multiple inverters.
- Nothing is left on the top of the inverter or battery module.
- Inverter and accessories are correctly connected.
- Cables are routed in safe place or protected against mechanical damage.
- Warning signs and labels are suitably affixed and durable.
- Switch on the external AC breaker to power on the inverter control board.
- Measure DC voltage of PV strings and battery and ensure the polarity is correct.
- Measure AC voltage and frequency and ensure they are within local standard.



Starting inverter:

- Inverter will start automatically when the PV panel generate enough energy or the battery is charged.
- Check the status of LCD screen, the LCD screen should display the main interface.
- If the LCD screen reports a fault or alarm, please check the below:
 - All the connections are right.
 - All the external disconnect switches are closed.
 - The DC switch of the inverter is in the "ON" position.
- Enter the setting interface.
- Setting national standards, page 59; PV connection mode, see page 53; Set working mode, see page 51; To set the mailing address, see page 55; To set inverter output power, see page 55.

Shut down inverter:

- Disconnect the external AC circuit breaker and secure it against reconnection.
- Rotate the DC switch to the "OFF" position for disconnecting all of the PV string inputs.
- Wait about 10 minutes until the capacitors inside the inverter completely discharge.
- Ensure that the DC cable is current-free via a current clamp (Figure 7-3).

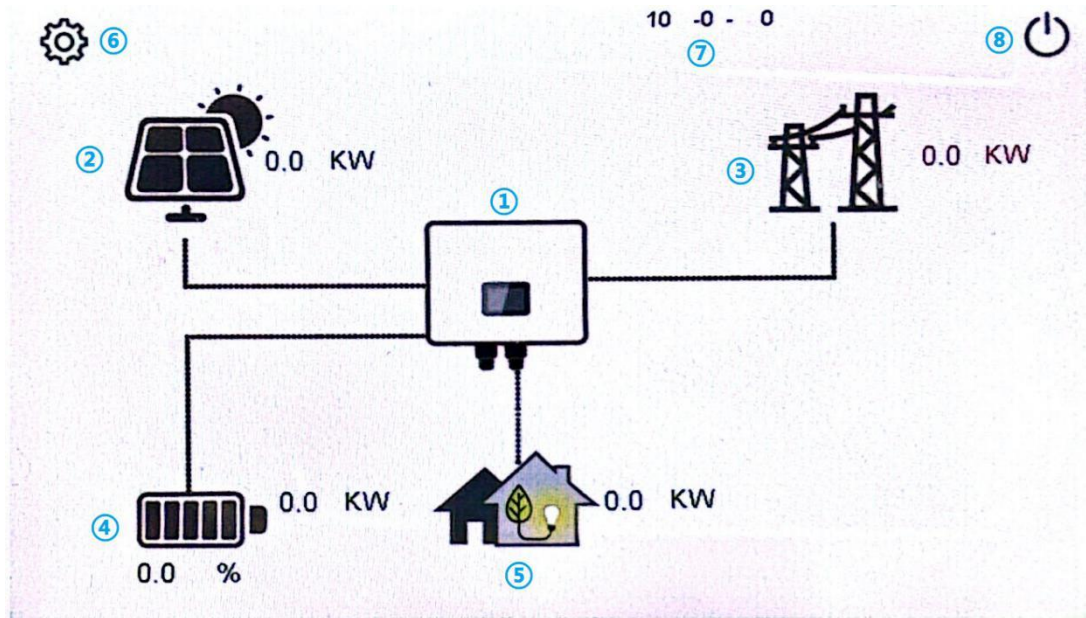


Figure 7-3

8.Operation

8.1 LCD Operation

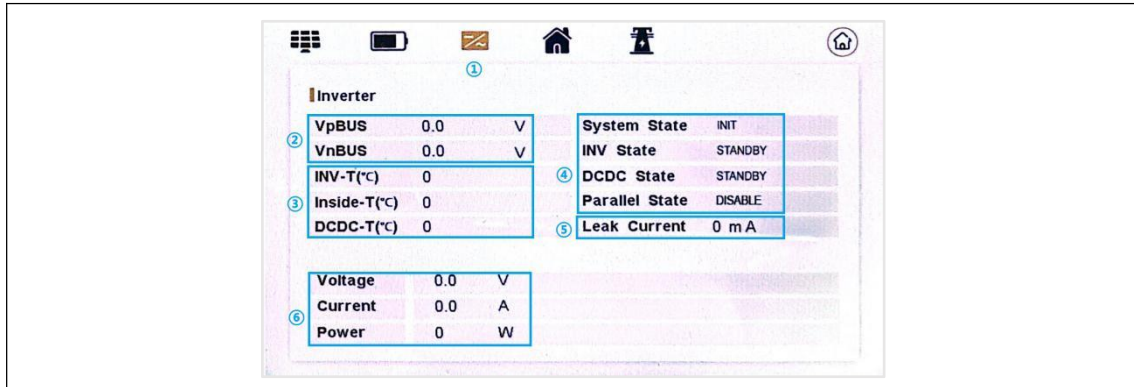
8.1.1 Home Page



Code	Name	Explanation
①	Hybrid Inverter	Click Hybrid Inverter to enter the working status interface of the hybrid inverter, see section 8.1.2(1) for details.
②	PV	Display the real-time PV power. Click PV to enter the working status interface of PV, see Hybrid Inverter section 8.1.2(2) for details.
③	Grid	Display the real-time grid power. Click Grid to enter the working status interface of grid, see section for 8.1.2(3) details.
④	Battery	Display the real-time battery power and percentage of battery surplus capacity from the BMS. Click Battery to enter the working status interface of battery, see section for 8.1.2(4) details.
⑤	Load	Display the real-time load power. Click Load to enter the working status interface of load, see section for 8.1.2(5) details.
⑥	Setting	Users can click Setting to enter the settings interface, see section 8.1.3 for details.
⑦	Time	Display time.
⑧	Switch	Click the switch to set the switch of the hybrid inverter , see section for 8.1.2(7) details.

8.1.2 Working Status

(1) Hybrid Inverter



① Users can click on the icon above to switch device status data (PV, Battery, Hybrid Inverter, Load, Grid, and return to the Home Page (not to be repeated later).

② **VpBUS**: Real-time voltage of bus capacitor of the machine.

VnBUS: Real-time voltage of bus capacitor of the machine.



NOTE:

The real-time bus voltage of this model is the sum of positive and negative buses.

③ Temperature

INV-T(°C): INV Temperature.

Inside-T(°C): Internal ambient temperature of the machine.

DCDC-T(°C): DCDC Temperature.

④ Display status information, including System status, Inverter status, DCDC status and Parallel State.

System Status: Display complete machine status information, including: INIT, STANDBY, PV GRID, BAT GRID, BYP, AC BAT CHG, HYBRID POW etc.

INV State: Displays the inverter status information, including: STANDBY, OFF GRID, GRID, OFF GRID PL, INV TO PFC.

GRID: Grid connected state.

OFF GRID PL: The PFC rectification process of the inverter from off to on.

INV TO PFC: Status of power by public grid turn into on grid working mode.

DCDC Status: Displays charging and discharging status information, including: STANDBY, CHARGE, DISCHARGE.

Parallel State: Display the parallel status of the inverter, including: DISABLE, MASTER, SLAVE.

⑤ **Leak current**: Real-time leak current of the machine.

⑥ The **voltage**, **current**, and **power** of the inverter side are displayed in real time.

(2) PV

Solar			
	Voltage	Current	Power
PV1	0.0 V	0.0 A	0 W
PV2	0.0 V	0.0 A	0 W

Energy		
	Day	Total
KWh	0.0	0.0

① Display the working parameters of the Two channels of PV (**PV1, PV2**), including **real-time voltage, current, and power** (PV input type can be set in the settings).



Note:

The 3-6kw models support up to 2 channels of PV.

The 8kw model supports up to 3 channels of PV the second and third PV channels are connected in parallel to form PV2.

② Display the cumulative charging capacity of the PV, including daily and total accumulated energy.

(3) Grid

Grid			
	Frequency	Voltage	Current
	0.00 Hz	0.0 V	0.0 A
			0 W

	Buy	Sell
Day	0.0 KWh	0.0 KWh
Total	0.0 KWh	0.0 KWh

① Display the working parameters on the grid, including **Frequency, real-time voltage, real-time current, and real-time power**.

② Accumulated energy from the power grid to the equipment(Buy) and accumulated energy from equipment to the power grid(Sell), including daily and total accumulated energy.

(4) Battery

Battery					
	Voltage	Current	SOC	Temp(°C)	Power
	0.0 V	0.0 A	0.0 %	0.0	0 W

	Charge	Discharge
Day	0.0 KWh	0.0 KWh
Total	0.0 KWh	0.0 KWh

① Display the working parameters of the battery, including **real-time voltage, real-time**

current, battery surplus capacity, battery temperature, battery power, and battery type.

② Display the maximum **charge voltage**, maximum **charge current**, and maximum **discharge current** transmitted by the battery BMS.

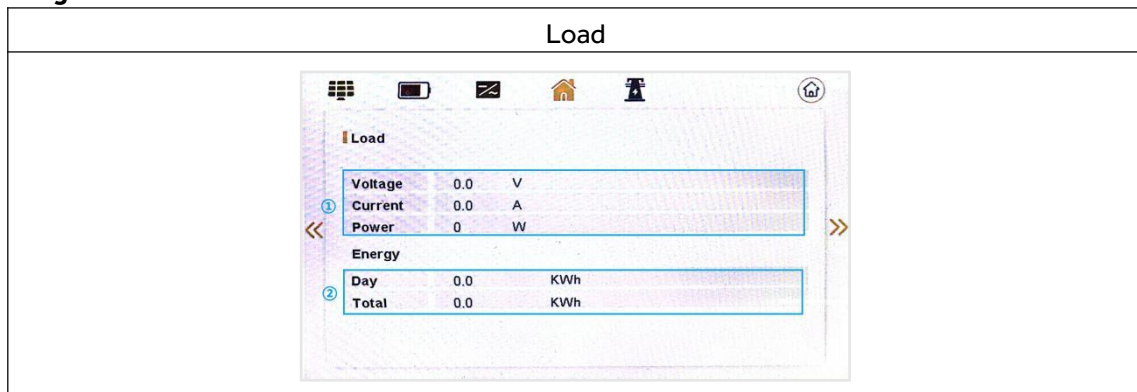
③ Three working states of batteries (from BMS) , including **charging, discharging, and forced charging.**

Charge EN: Charge Enable Discharge EN: Discharge Enable

④ Accumulated discharge and charging capacity of the battery, including daily and total accumulated energy.

(5) Load

Load/Page One

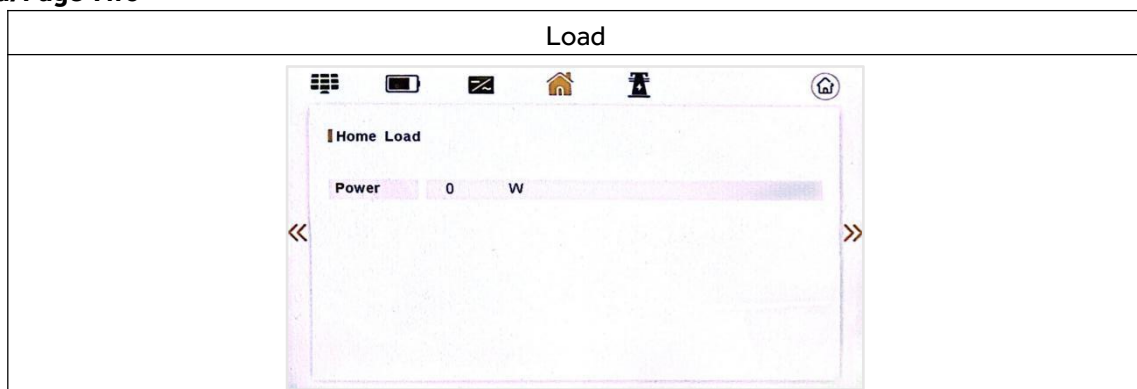


User can click << to return to the previous page, and click >> to enter the next page .(not to be repeated later)

① Display the working parameters of the load, including **real-time voltage, current, and power.**

② Accumulated usage of load, including daily and total accumulated energy.

Load/Page Two



When set Home load EN to "**ENABLE**", if you have a load connected to the mains port, you can see its Home load power.

(6) Switch

①Power on, The hybrid inverter works.

②Power off, The hybrid inverter stops working.

8.1.3 Setting

Enter Setting

(1) Input password

①Users can click on the icon above to enter device status data (**PV, Battery, Energy Storage Inverter, Load, Grid**) and return to the Home Page.

②To enter the settings, a password is required. The default password is "11111". Click OK to enter the settings interface.

(2) Enter the settings interface

Users can click on the icon above to switch between setting options, machine related information, and return to the Home Page.

⚙️ : System Setting

🔌 : Parallel Setting

🔋 : Battery Setting

🏠 : Grid Setting

📄 : Machine Information

🏠 : Return Home Page

🔍 : After modifying the parameters, the user needs to click on this icon to confirm the modification.

Setting Option

(1) System Setting

System Setting/ Page One:

⚙️ 🔌 🔋 🏠 📄 🏠

System Setting

Work Mode

① ☒ Self Consumption

☐ Peak Shift

☐ Batt Priority

② ☐ EPS Enable

③ ☐ Homeload EN

④ ☐ Insulation Detection

⑤

① Users have three working modes to choose from, Self Consumption, Peak Shift, and Battery Priority.

②**EPS Enable**: When the Grid and PV are powered off, Enable the battery to supply power to the load, default option is enable. When the Italian grid standard is selected and this option is enabled, the inverter needs a 500ms delay to work properly when it is transferred from the grid to the off-grid.

③**Homeload EN**: Enable home load statistics.

④ **Insulation Detection** : Insulation detect (The default option is enabled). When the insulation detection function is enabled in the grid connected state, the insulation detection is performed once a day when the photovoltaic energy comes in, and the inverter switches to the By-pass band load. If the inverter is off-grid, the output will be disconnected during insulation detect and the load will stop working.

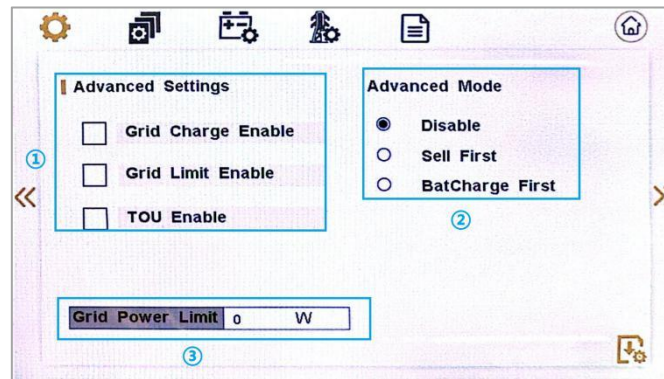
⑤Advanced Settings

Users can click to

Advanced Settings ➡

 enter the advanced settings interface.

Advanced Settings/ **Page One** :



① Users have three advanced settings to choose from, namely Grid Charge Enable, Grid Limit Enable, and TOU Enable.

Grid Charge Enable: In advanced mode, the grid will charge the battery only if this option is checked.

Grid Limit Enable: The Grid Power Limit function takes effect only when you check it.

TOU Enable: Users need to check TOU Enable to enter the work mode of Time-of-use Enable.

② Advanced Mode :

There are three options here: Disable Mode, Sell First Mode and BatCharge First Mode. The advanced mode takes effect only in automatic self Consumption mode.

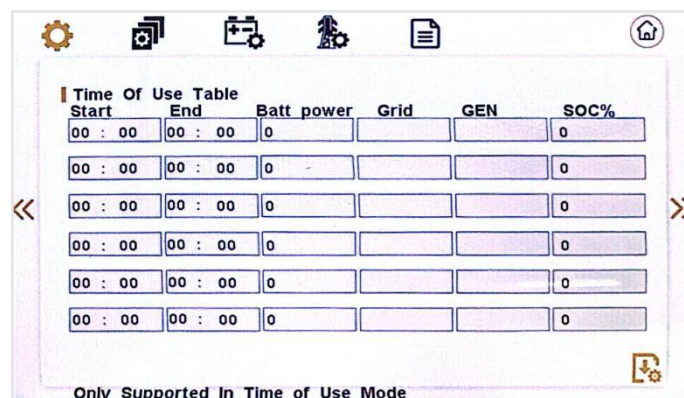
Disable: When the user selects "Disable", the two working modes are invalid. Only if the other two options are selected, the two working modes (Sell First, BatCharge First) take effect and work.

Sell First: In this mode, PV will be given priority to AC output, where the load priority is higher than the grid, and excess energy will be provided to the battery.

BatCharge First: In this mode, the PV will provide energy to the battery first, and the excess energy will be provided to the AC output, whose load is prioritized over the grid.

③ **Grid Power Limit:** When insufficient PV energy has been provided to the load, the priority is to provide energy from the grid, and the remaining energy is provided from the battery.

Advanced Settings/**Page Two:**



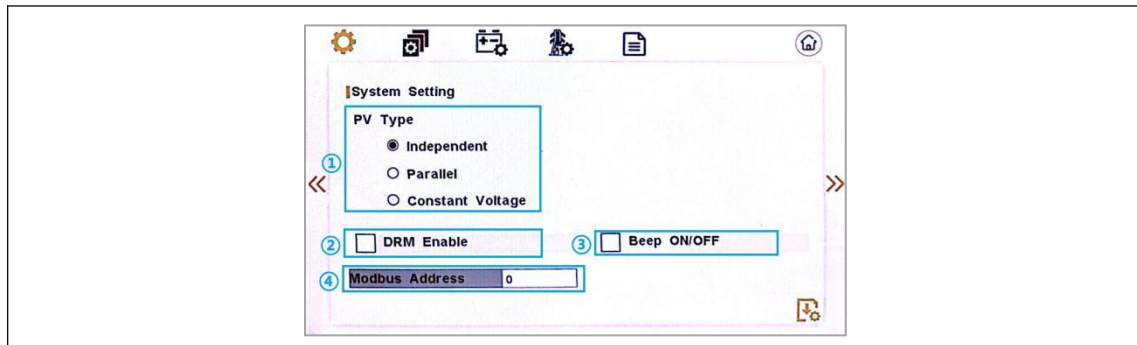
Time-of-use Table : There are 6 slots which can be programmed. If grid charge is enabled, the grid is used to power the load and charge the battery to target SOC at specific bat power attribute value.

Grid: If this parameter is selected, the battery is charged from the power grid.

GEN: Reserve function.

Batt power: Use a fixed power to charge the battery.

System Setting/Page Two:



① Users can set PV types, including **Independent**, **Parallel** and **Constant Voltage**.

Independent: The Factory default is independent. When photovoltaic parallel input is set to independent mode, photovoltaic power will be unbalanced

Parallel: Parallel is commonly used for testing, two or three photovoltaic circuits are connected in parallel.

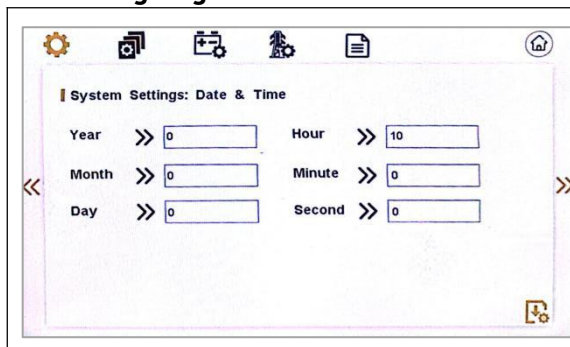
Constant Voltage: Constant voltage mode

② **DRM Enable**: Enable or Disable Demand Response Modes.

③ **Beep ON/OFF**: Users can enable or disable the beep function, which takes effect when the inverter alarms.

④ **Modbus Address**: The default Modbus address is 1. Users can change the Modbus address as required.

System Setting/Page Three:

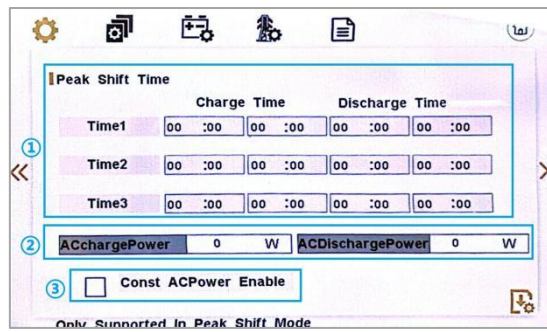


Date and Time settings

Users can manually modify the year, month, day, hour, minute and second.

The year input range should be between 2000 and 2099.

System Setting/Page Four:

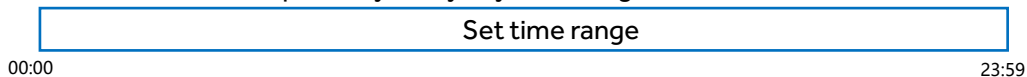


Setting of charging and discharging time for Peak Shift.

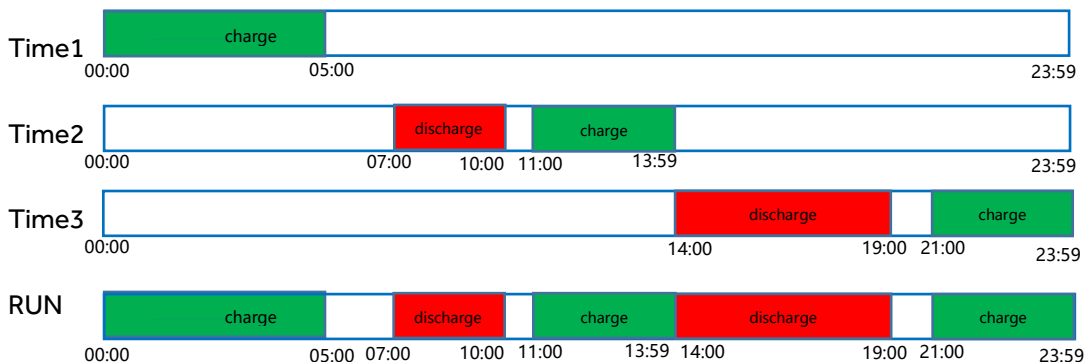
When the working mode is Peak Shift, users need to enter this interface to set the charging and discharging time. And Users need to manually input the start charge/discharge time and the end charge/discharge time.

WORKTIME*

- 1) The maximum allowable setting time is 24 hour (one day), It is allowed to set six different charging and discharging states within 24 hour (time1 twice,time2 twice,time3 twice), The inverter runs repeatedly every day according to the set time.



- 2) The inverter executes according to the settings of time1, time2 and time3 in the order of time. The following figure is an example. Different time periods do not overlap.



- 3) If you want to set a continuous charging time from the first night to the next morning. For example, you want charge battery form first day 21:00pm to next day 5:00am, divide this time period into two time periods (21:00~23:59, 00:00~05:00), and select two charging time periods from Time1, Time2 and Time3 and set them.

① **AC charge Power:** This feature only works in Peak shift mode, during the charging period, when the PV is not enough to provide energy to the battery; It will draw energy from the grid based on power Settings.

② **ACD is charge Power:** This feature only works in Peak shift mode, during the discharge period, supply energy to the grid at the set power, the actual power depends on the setting and the grid discharge power which is less.

③ **Const AC Power Enable:** The AC charge Power and ACD is charge Power functions take

effect only when this option is selected.

(2) Parallel Setting

Parallel Settings

① ☐ Parallel enable

② ☐ Common Grid CT

③ ☐ Common Battery

④ ☐ 3 Phase Parallel

● Master
○ Slave

● Phase A
○ Phase B
○ Phase C

Parallel num 0

Parallel addr 0

Charge Curr 0 A

Discharge Curr 0 A

CT Ratio 0

①**Parallel enable:** Start or disable the parallel function.

Master/Slave: This interface is used for parallel, and the inverter is selected as the master or slave.

②**Common Grid CT:** Enable or disable CT sharing.

③**Common Battery:** Enable or disable Battery sharing.

④**3 Phase Parallel:** Enable or disable group 3 phase enable.

PHASE A/B/C: This interface is used to select the output phase of the device when three phases are used.

Parallel num: This operation is used to select the number of parallel machines.

Parallel addr: This interface is used to select the parallel address, the host address is set to 1 by default, there is a slave, and the slave is set to 2; If there are two slaves, the slaves are set to 2 and 3 respectively; the address settings of each inverter cannot be the same.

CT Ratio: Set the detection ratio of CT. Set the CT ratio to 1000:1 by default.

Charge Curr: Set the charging current of parallel machine.

Discharge Curr: Set the discharge current of parallel machine.

(3) Battery Settings

Battery Settings/Page One

Battery Type and Communications

① ☐ Lead-Acid / Cust
② ☒ Lithium

Bat Com Type

③ ☒ CAN
④ ☐ RS485

Charge Current 0 A

Dischg power limit 0 %

⑤ ☐ Battery awoken

⑥ ☐ NO Battery

①Set Battery Type and Battery Communication method

Users can choose the **battery type** is lead-acid battery/lithium battery, and the **battery communication** method is CAN/485. The default option is CAN.

②Users can manually input the value of charging current and discharge power limit.

③Battery awoken :

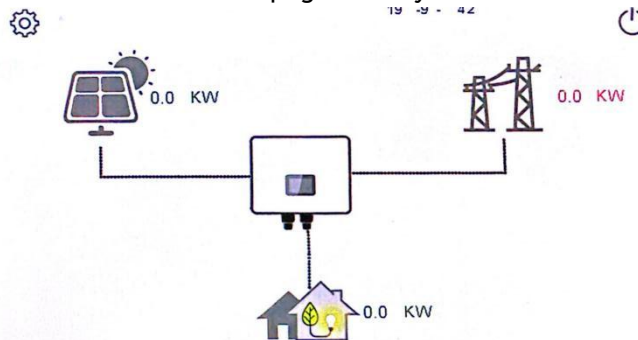
When the battery is low and the battery relay has been disconnected, the inverter will send instructions to the battery forcibly sucking relay by BMS, and the inverter will charge.

The default option is disabled. (Partial battery support)

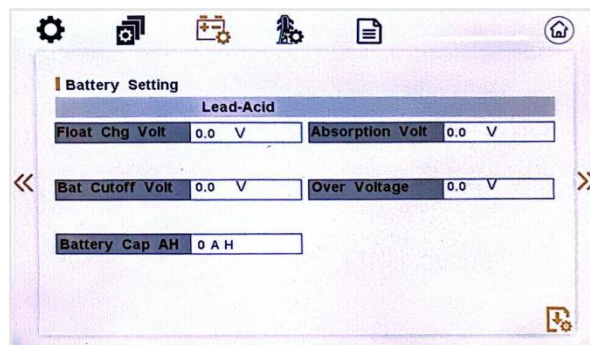
If you want to use this feature, please consult the battery brand supported by the dealer. Use it only when the battery is too low.

After the battery wakes up successfully, please turn off the function, otherwise it will affect the normal operation of the machine.

④**NO Battery**: If you select this option when the battery is not connected, no battery alarm will be generated. The battery logo on the home page will also disappear, as shown below. Deselect this option to restore the home page identity.



Battery Settings/Page Two



Settings required when using lead-acid batteries

Float Chg Volt: Charge the battery with constant voltage and small current (This interface is used to set the lead acid battery charging voltage. (The input value ranges from 40 to 59.5) Set the floating charge voltage to be less than the constant charge voltage).

Bat Cutoff Volt: Discharge protection voltage (This interface is used to set the lead acid battery discharging voltage. (The input value ranges from 40 to 51) Discharge

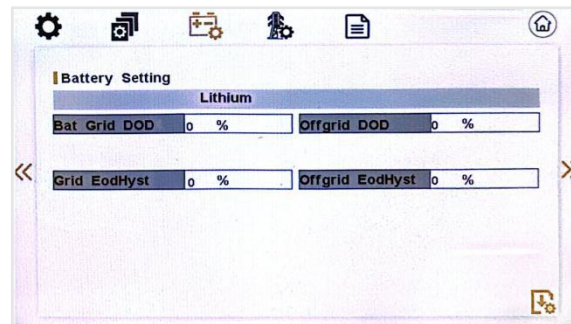
cut-off voltage, as recommended by the battery manufacturer).

Battery Cap AH: Battery capacity (This interface is used to set the lead acid Battery capacity. It is related to the input power. (The input value ranges from 50 to 1000) The battery capacity setting will affect the maximum charging current, for example, set 100Ah, the maximum charging current is $100A \times 0.2 = 20A$).

Absorption Volt: Charge the battery with constant current.

Over Voltage: Charging protection voltage (This interface is used to set the lead acid battery Charge protection voltage. (The input value ranges from 50 to 59.5) Charge protection voltage, as recommended by the battery manufacturer).

Battery Settings/Page Three



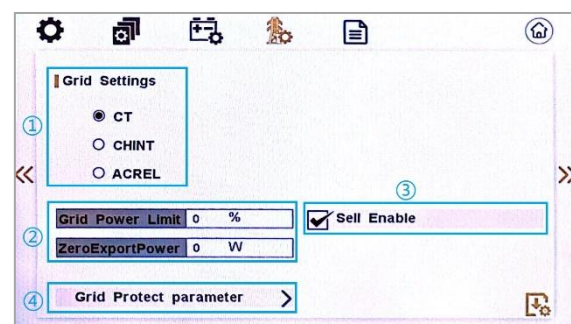
Settings required when using lithium

Bat Grid DOD/ Off-grid DOD: When the battery discharge is higher than the threshold, the inverter generates a battery low voltage alarm and stops discharging. When the device is off-grid, the PV supplies energy to the battery but not to the load until the alarm is cleared. When the device is on-grid, the inverter stops working until the alarm is cleared.

grid Eod Hyst:/Off-grid Eod Hyst: When the low voltage alarm is generated, you need to provide energy to the battery. When the battery level is higher than the set value, the alarm is cleared and the battery can continue to discharge.

(4) Grid Setting

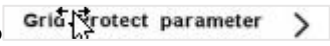
Grid Setting/Page one



①Users can choose to use **CT** or electricity meter to detect the grid current, currently supported by the grid manufacturers **CHINT** and **ACREL**.

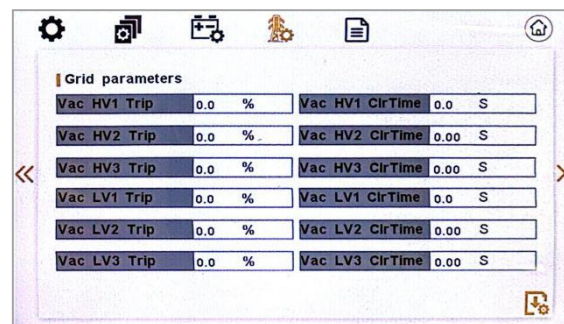
- ② **Grid Power Limit**: Users can click to enter the numerical input interface. This function is used to limit the inverter conversion power of the inverter. The default parameter is 100%.
- Zero Ex power**: If the sampling error occurs when there is no power in the grid, the user can set the corresponding value to correct it.
- ③ **Sell Enable**: Whether the inverter is allowed to sell electricity to the grid. The option is checked, which means that the inverter can generate electricity to the grid.

Grid Protect parameter

Users can click to  enter the advanced settings interface.

Grid parameters/page one:

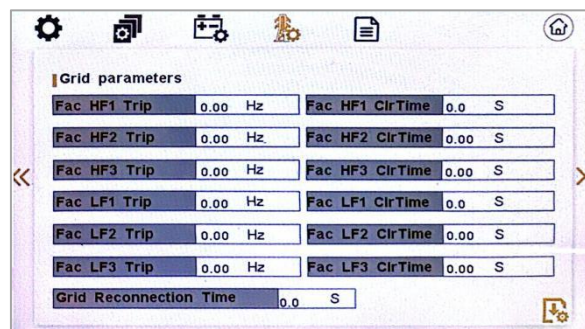
On this page, users can set over voltage protection, over voltage protection time, under voltage protection, and under voltage protection time. When grid standards are set, these values are automatically updated according to local safety regulations.



Grid parameters	
Vac HV1 Trip	0.0 %
Vac HV1 CtrTime	0.0 S
Vac HV2 Trip	0.0 %
Vac HV2 CtrTime	0.00 S
Vac HV3 Trip	0.0 %
Vac HV3 CtrTime	0.00 S
Vac LV1 Trip	0.0 %
Vac LV1 CtrTime	0.0 S
Vac LV2 Trip	0.0 %
Vac LV2 CtrTime	0.00 S
Vac LV3 Trip	0.0 %
Vac LV3 CtrTime	0.00 S

Grid parameters/page two:

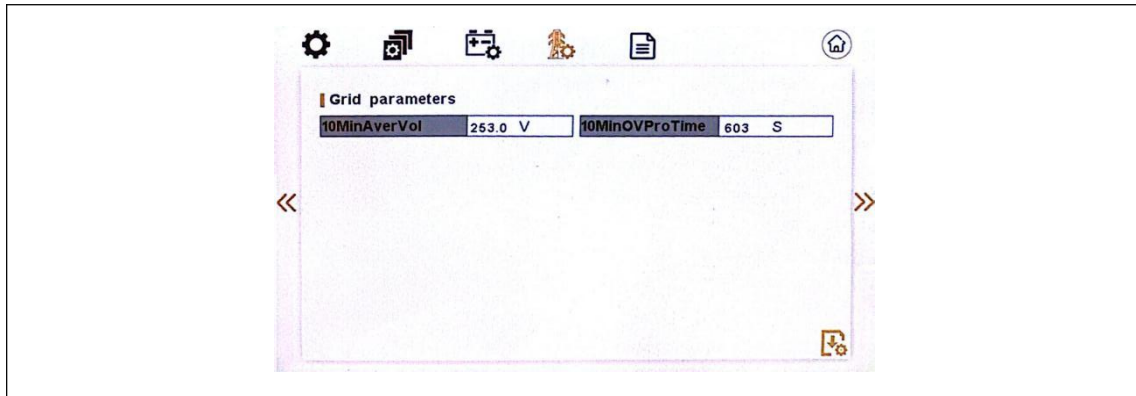
On this page, users can set over frequency protection, over frequency protection time, under frequency protection, under frequency protection time, and grid reconnection time. When grid standards are set, these values are automatically updated according to local safety regulations.



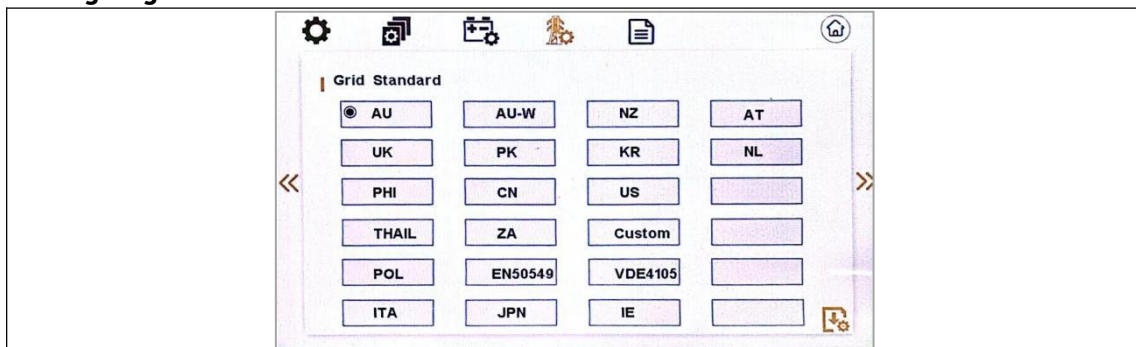
Grid parameters	
Fac HF1 Trip	0.00 Hz
Fac HF1 CtrTime	0.0 S
Fac HF2 Trip	0.00 Hz
Fac HF2 CtrTime	0.00 S
Fac HF3 Trip	0.00 Hz
Fac HF3 CtrTime	0.00 S
Fac LF1 Trip	0.00 Hz
Fac LF1 CtrTime	0.0 S
Fac LF2 Trip	0.00 Hz
Fac LF2 CtrTime	0.00 S
Fac LF3 Trip	0.00 Hz
Fac LF3 CtrTime	0.00 S
Grid Reconnection Time	0.0 S

Grid parameters/page three:

Ten ten minutes Protection voltage and ten protection time, default values are 253V and 603S. The setting value of the protection voltage cannot exceed the primary overvoltage protection value of the power grid standard. The protection time can only be changed if the Italian safety regulations are set, and the value range is 600 to 610S. Every increase of 1 means that the Italian self-test level 1 overvoltage detection time is increased by 1000ms.



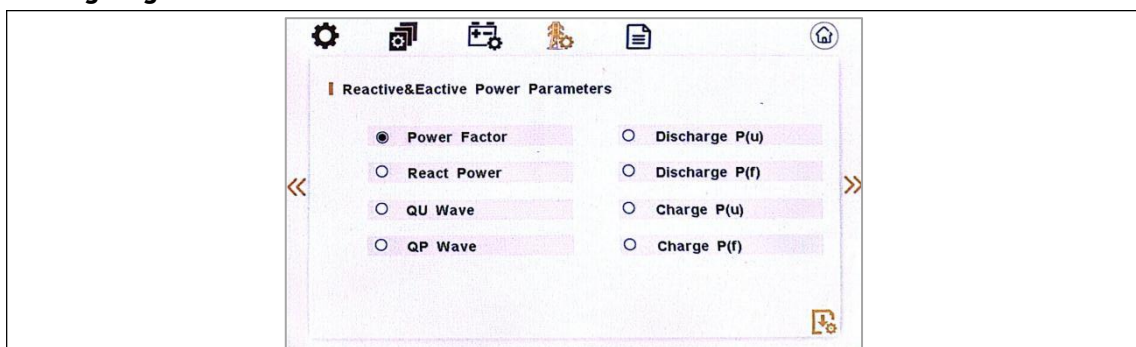
Grid Setting/Page Two



This interface is used to select Grid standard. Users can set and switch grid standards according to their needs.

AU: Australia	AU-W: Western Australia	NZ: New Zealand	AT: Austria
UK: United Kingdom	PK: PAKISTAN	KR: Korea	NL: Netherlands
PHI: Philippines	CN: China	US: America	
THAIL: THAILAND	ZA: South Africa	Custom: User defined	
POL: Poland	EN50549	VDE4105	
ITA: Italy	JPN: Japan	IE: Ireland	

Grid Setting/Page Three



REACT Power Parameter: REACT Power Parameter, including: **Power Factor, React Power, QU Wave, QP Wave.**(For specific country if required by the local grid.)

Power Factor: The input value should range between L0.80 and L0.99 or C0.8 and C1.00.

React Power: Reactive power control

The input value should range between -60% and +60%, which varies with the standard.

QU Wave: Voltage-reactive curve

QP Wave: Active power-reactive power curve

(These two functions are not available on the screen, please contact the distributor if you need to use them.)

Discharge P(u): Discharge voltage response.

When the power grid voltage is abnormal, limit the discharge active power and enable the function according to the requirements of the national power grid standard.

Discharge P(f): Discharge frequency response.

When the power grid frequency is abnormal, limit the discharge active power and enable the function according to the requirements of the national power grid standard.

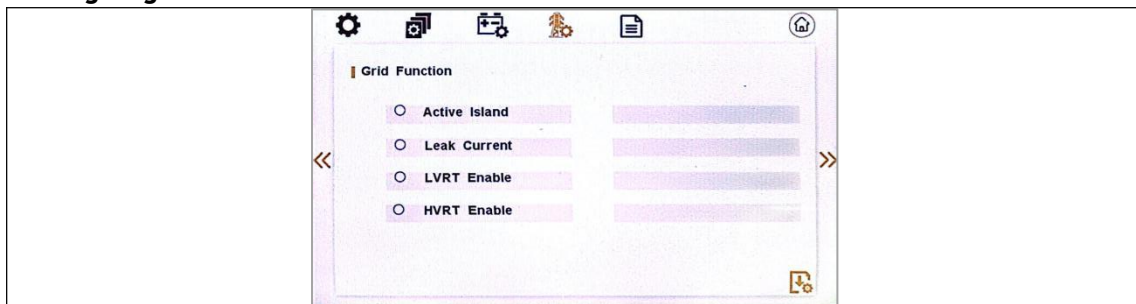
Charge P(u): Charge voltage response

When the grid voltage is abnormal, limit the charging active power and enable it according to the national grid standard.

Charge P(f): Charge frequency response.

When the power grid frequency is abnormal, the charging active power is limited and enabled according to the national grid standard requirements.

Grid Setting/Page Four



Anti-Island: Anti-Islanding(The default option is enabled)

When the grid goes down, inverter will detect the loss of power and disconnect from the grid within milliseconds. It prevents your solar panels from feeding electricity into a downed power line.

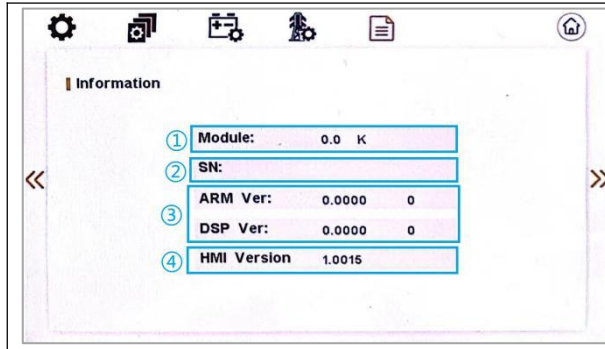
Leak Current:Leak current detect (The default option is enabled).

LVRT Enable: When the inverter is connected to the grid, the grid voltage suddenly drops, and the inverter can still be connected to the grid for a short time. To use this function, disable EPS Enable.

HVRT Enable: When the inverter is connected to the grid, the grid voltage suddenly rises, and the inverter can still be connected to the grid for a short time. To use this feature, turn off EPS Enable.

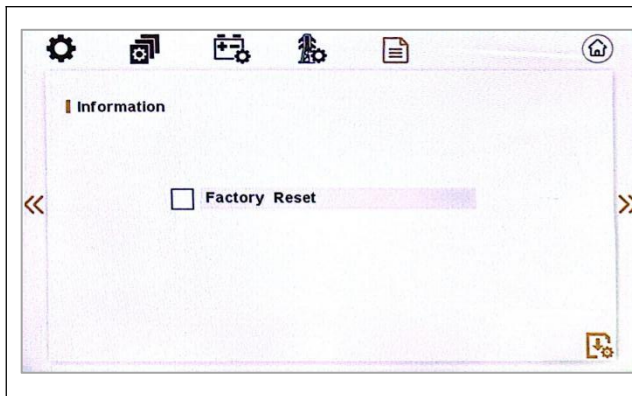
(5) Machine Information

Machine Information/Page One



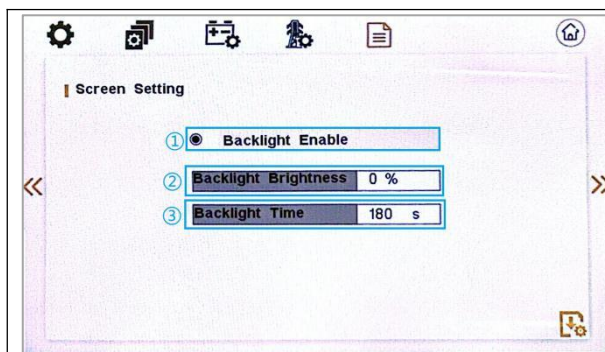
- ① Show inverter model.
- ② Hybrid inverter serial number.
- ③ Show Software version.
- ④ Display HMI version

Machine Information/Page Two



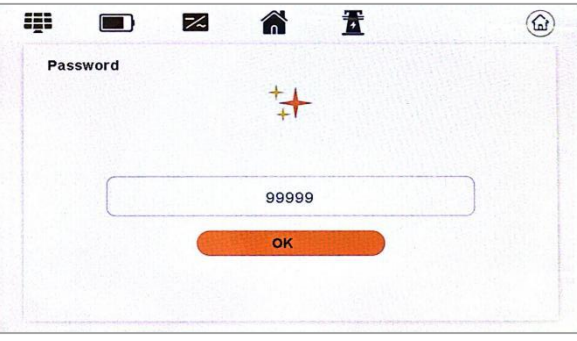
This interface is used to reset the inverter.

Machine Information/Page Three



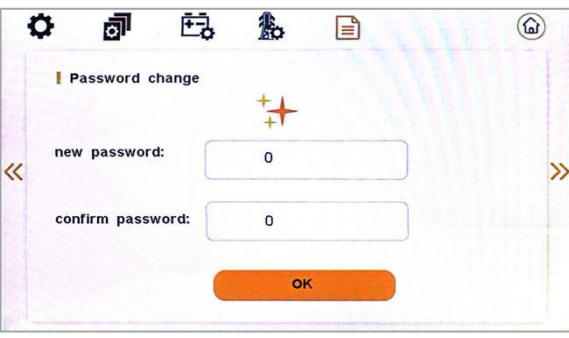
- ① LCD backlight is enabled. It is enabled by default.
- ② Backlight brightness adjustment. The default value is 0, and the value ranges from 0 to 100%.
- ③ Backlight time setting. The default value is 180s and the value ranges from 5 to 250s.

(6) Administrator account



The screenshot shows a mobile application interface with a top navigation bar containing icons for a menu, battery, mail, home, and a person. The main screen is titled "Password" and features a decorative orange starburst graphic. Below the graphic is a text input field containing the text "99999". At the bottom of the screen is an orange button labeled "OK".

Users can set "99999" to enter the administrator account, change the initial password.



The screenshot shows a mobile application interface with a top navigation bar containing icons for settings, a folder, a document, a person, and a home icon. The main screen is titled "Password change" and features a decorative orange starburst graphic. Below the graphic are two text input fields: "new password:" and "confirm password:", both containing the text "0". At the bottom of the screen is an orange button labeled "OK".

Click on Machine Information Page four, Change the default password. This page is displayed only when you enter the administrator account.

9. Italy self-testing (Auto test Fast)

1.As shown in Figure 10-1, the power grid standard is ITA. Ensure that the power grid is connected and the inverter is error-free, otherwise do not test.

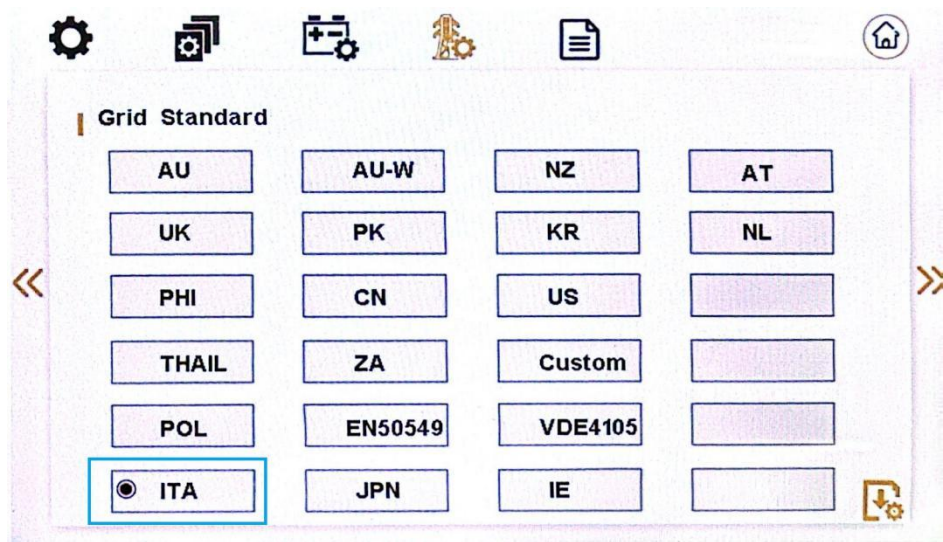


Figure 10-1

2.Click the setting icon in the upper left corner of the LCD screen to enter the password input interface, enter the password "33333", and click ok, as shown in Figure 10-2:

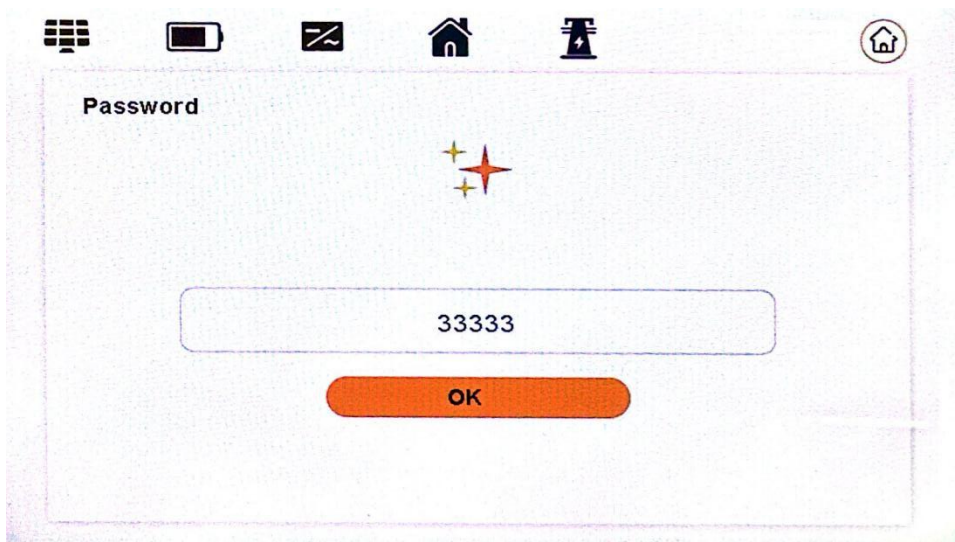


Figure 10-2

3. Enter the Italy self-test interface and click Start test, as shown in Figure 10-3:

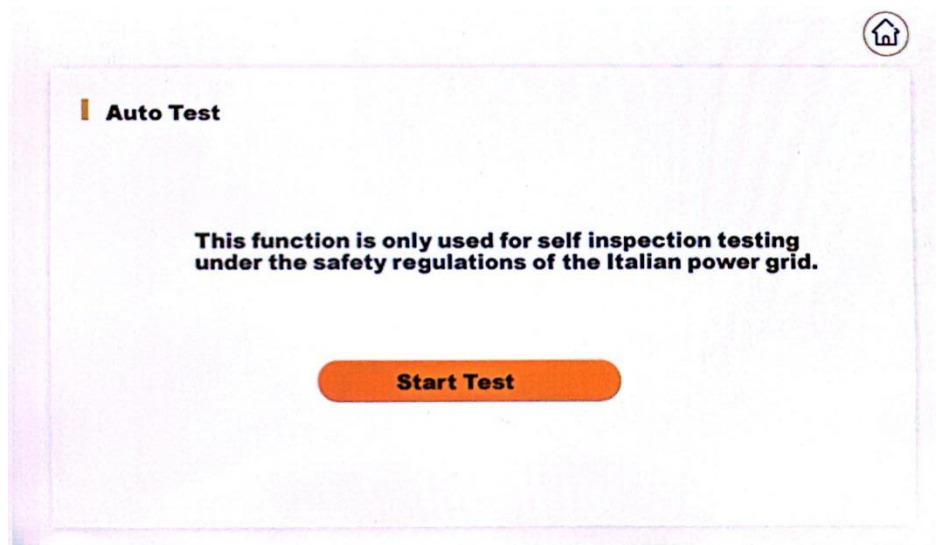


Figure 10-3

4. Wait until the test is complete, as shown in Figure 10-4, 10-5:

AUTO TEST						
test step	set value	set time	trip value	trip time	current value	result
59.S1	253.0 V	3000 ms	0.0 V	0 ms	0.0 V	testing
59.S2	264.5 V	200 ms	0.0 V	0 ms	0.0 V	
27.S1	195.5 V	1500 ms	0.0 V	0 ms	0.0 V	
27.S2	34.5 V	200 ms	0.0 V	0 ms	0.0 V	
81>S1	50.20 Hz	100 ms	0.00 Hz	0 ms	0.00 Hz	
81>S2	51.50 Hz	100 ms	0.00 Hz	0 ms	0.00 Hz	
81<S1	49.80 Hz	100 ms	0.00 Hz	0 ms	0.00 Hz	
81<S2	47.50 Hz	100 ms	0.00 Hz	0 ms	0.00 Hz	
SN: F18324D39301				Result:		

Figure 10-4

AUTO TEST						
test step	set value	set time	trip value	trip time	current value	result
59.S1	253.0 V	3000 ms	231.2 V	3000 ms	231.2 V	Pass
59.S2	264.5 V	200 ms	230.9 V	200 ms	230.9 V	Pass
27.S1	195.5 V	1500 ms	230.9 V	1498 ms	230.9 V	Pass
27.S2	34.5 V	200 ms	230.9 V	198 ms	230.9 V	Pass
81>S1	50.20 Hz	100 ms	49.98 Hz	98 ms	49.98 Hz	Pass
81>S2	51.50 Hz	100 ms	50.00 Hz	99 ms	50.00 Hz	Pass
81<S1	49.80 Hz	100 ms	50.03 Hz	100 ms	50.03 Hz	Pass
81<S2	47.50 Hz	100 ms	50.04 Hz	96 ms	50.04 Hz	Pass
SN: F18324D39301				Result: Test Pass		

Figure 10-5

Object	Description
27.S1	Under voltage protection
27.S2	Under voltage protection
59.S1	Over voltage protection
59.S2	Over voltage protection
81<S1	Under frequency protection
81<S2	Under frequency protection
81>S1	Over frequency protection
81>S2	Over frequency protection

10.APP Download

There are three ways to download and install the latest APP:

1. Search the “**Nahui Business**” APP in Google Play or App Store.
2. Scan the QR code below to download.
3. Search at www.nahui-newenergy.com.



Please note that “**Nahui Business**” is for business installers, and “**Nahui Energy**” is for end users. You can refer to the corresponding user manuals of data loggers to register Nahui APP.

11. Fault Diagnosis and Solutions

The inverter is easy to maintain. When you encounter the following problems, please refer to the Solutions below, and contact the technical support at <https://eur.nahui-newenergy.com/service.html> if the problem remains unsolved. The following table lists some of the basic problems that may occur during the actual operation as well as their corresponding basic solutions.

Fault diagnosis table

Content	Codes	Explanation	Solutions
Discharge Over Current	00	Battery discharge over current. When the battery is loaded, the load is too large.	Nothing need to do, Wait one minute for the inverter to restart. Check whether the load is in compliance with the specification. Cut off all the power and shut down all the machines; disconnect the load and plug in to restart machines, then check
Over Load	01	The load power is greater than other power(PV,BAT).	Check whether the load is in compliance with the maximum power of the machine. Cut off all the power and shut down all the machines; disconnect the load and plug in to restart machines, then check whether the load is short circuited if the fault has been eliminated. Contact customer service if error warning continues.
Bat Disconnected	02	Battery Disconnect. (Battery voltage not identified)	Check whether the battery is connected. Check if battery wiring port is open circuited. Contact customer service if error warning continues.
Bat Under Volt	03	Battery voltage low that normal range.	Checking System Settings, If so, power off and restart. Check if the grid power down. If so, waiting for the grid power up, the inverter will automatically charge. Contact customer service if error warning continues.
Bat Low Capacity	04	Bat Low capacity	Battery Low that setting capacity.(SOC<100%-DOD)

Bat Over Volt	05	The battery voltage is greater than the Inverter maximum voltage.	Checking System Settings, If so, power off and restart. Contact customer service if error warning continues.
Gird Low Volt	06	Grid voltage is abnormal	Check if the grid is abnormal. Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
Grid Over Volt	07		
Grid Low Freq	08	Grid Frequency is abnormal.	Check if the grid is abnormal. Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
Grid Over Freq	09		
Gfci Over	10	Inverter GFCI exceeds standard.	Check PV string for direct or indirect grounding phenomenon. Check peripherals of machine for current leakage. Contact the local inverter customer service if fault remains unremoved.
Parallel CAN bus failure	11	The parallel communication is abnormal.	Check the cable, crystal, line sequence. Check if the wiring is correct.
Bus Under Volt	13	BUS voltage is lower than normal.	Check the input mode setting is correct. Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
Bus Over Volt	14	BUS voltage is over maximum value..	Check the input mode setting is correct. Restart the inverter and wait until it functions normally.
INV Over Current	15	The inverter current exceeds the normal value.	Restart the inverter and wait until it functions normally.
Charge Over Current	16	Battery charge current over than the Inverter maximum voltage.	Restart the inverter and wait until it functions normally.

Meter Comm Fail	17	The meter communication is abnormal.	Check the cable , crystal, Line sequence. Check if the wiring is correct.
INV Under Volt	18	INV voltage is abnormal	Check if the INV voltage is abnormal. Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
INV Over Volt	19		
INV Freq Abnor	20	INV frequency is abnormal	Check if the INV frequency is abnormal. Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
IGBT Temp High	21	The inverter temperature is higher than the allowed value	Cut off all the power of the machine and wait one hour, then turn on the power of the machine.
Bat Over Temp	23	Battery temperature is higher than the allowed value.	Disconnect the battery and reconnect it after an hour.
Bat Under Temp	24	Battery temperature is low than the allowed value.	Check the ambient temperature near the battery to see if it meets the specifications.
BMS Comm Fail	27	Communication between lithium battery and inverter is abnormal.	Check the cable, crystal, Line sequence. Checking the Battery switch.
Fan Fault	28	Fan Fault	Check whether the Inverter temperature is abnormal. Check whether the fan runs properly.(If you can see it)
Grid Phase ERR	30	The grid fault phase.	(1) Check power grid wiring
Arc Fault	31	PV Arc Fault	Check Photovoltaic panels, PV wire. Contact customer service if error warning continues.
Bus Soft Fail	32	The inverter may be damaged	Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
INV Soft Fail	33		
Bus Short	34		
INV Short	35		

PV Iso Low	37	PV Iso Low	Check if the PE line is connected to the inverter and is connected to the ground. Contact customer service if error warning continues.
Bus Relay Fault	38	The inverter may be damaged	Restart the inverter and wait until it functions normally. Contact customer service if error warning continues.
Grid Relay Fault	39		
EPS rly Fault	40		
Gfci Fault	41		
CT Fault	43		
Selftest Fail	44		
System Fault	45		



Note!

If an error occurs that is not listed in the table, please contact customer service at <https://eur.nahui-newenergy.com/service.html>

Please keep ready with you the following information before contacting us.

- Serial number of Nahui Single Phase Inverter.
- The distributor/dealer of Nahui Single Phase Inverter (if available).
- Installation date.
- The description of the problem together with necessary information, pictures, attachment.
- The PV array configuration (e.g. number of panels, capacity of panels, number of strings, etc.).
- Your contact details.

Remark:

If your inverter's information panel is not displaying a Fault light, check the following list to make sure that the present state of the installation allows proper operation of the unit.

- Is the inverter located in a clean, dry, and adequately ventilated place?
- Have the DC input breakers been opened? · Are the cables adequately sized and short enough?
- Are the input and output connections and wiring in good condition?
- Are the configurations settings correct for your particular installation?
- Are the display panel and the communications cable properly connected and undamaged?

Contact Nahui Energy Customer Service for further assistance. Please be prepared to describe details of your system installation and provide the model and serial number of the unit.

12. Maintenance

Inverters generally do not need any daily or routine maintenance. Heat sink should not be blocked by dust, dirt or any other items. Before the cleaning, make sure that the DC SWITCH is turned OFF and the circuit breaker between inverter and electrical grid is turned OFF. Wait at least for 5 minutes before the Cleaning.

- Check that if the cooling fins on the rear are covered by dirt, if yes, fins should be cleaned. This shall be done at regular intervals.
- Check whether the indicators of the inverter are in normal state, check whether the keys of the inverter buttons are in normal state, check whether the display of the inverter is normal. These checks should be performed at least every 6 months.
- Check the input and output wires for damages or aging. This check should be performed at least every 6 months.
- You should keep the inverter panels clean and their security checked at least every 6 months.

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This manual may be updated according to user's or customer's feedback. The information in this manual is subject to change without notice. The latest user manual can be downloaded from the official website by scanning the QR code or entering website at <https://www.nahui-newenergy.com> for latest version.





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