ENERGY
storage system

User Manual
I1000-RH3 Series

5.0kW / 6.0kW / 8.0kW / 10.0-A kW/ 10.0kW

Three Phase, 2 MPPTs High Voltage Hybrid Inverter

- Compatible with high power PV modules with 18A
- Support 100% unbalanced loads
- < 10ms UPS-level switching
- Support up to 10 units parallel connections
- Remote firmware upgrade & work mode setting
- Support VPP / FFR function

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Notice

This manual contains important safety instructions that must be followed during installation and maintenance of the equipment.

Save the manual!

PLEASE READ THOROUGHLY AND SAVE MANUALFOR FUTURE REFERENCE

Copyright Declaration

1. About This Manual

1.1 Applicability

Please read the product manual carefully before installation,operation or maintenance.This manual contains important safety instructions and installation instructions that must be followed during installation and maintenance of the equipment.

I1000-RH3-5K-M1 I1000-RH3-6K-M1 I1000-RH3-8K-M1 I1000-RH3-10K-M1

1.2 Target group

This manual is intended for qualified electrical technical personnel who are responsible for hybrid inverte installation and commissioning in the eneray storage system.

1.3 Symbols used

Symbols used have the following meaning:

	**DANGER!** 'Danger' indicates a hazard with a high level of risk that, if not avoided, will result in death or serious in jury.
	**WARNING!** 'Warning' indicates a hazard with a medium level of risk that, if not avoided, will result in death or serious injury.
	**CAUTION!** 'Caution' indicates a hazard with a low level of risk that, if not avoided, could result in minor or moderate injury.
NOTICE	**NOTICE!** 'Notice' indicates a situation that, if not avoided, could result in equipment or property damage.
	**NOTE!** 'Note' provides tips that are valuable for the optimal operation of your product.

2. Safety

2.1 General Safety

The hybrid inverter has been designed and tested strictly according to international safety regulations. Read all safety instructions carefully prior to any work and observe them at all times when working on or with the hybrid inverter. Incorrect operation or work may cause:

- injury or death to the operator or a third party;
- damage to the inverter or other properties.

2.2 Important safety instructions

	**DANGER!** PV strings will produce electrical power when exposed to sunlight and can cause a lethal voltage and an electric shock. Only qualified personnel can perform the wiring of the PV panels. Do not open the enclosure when the inverter is running. Unauthorized opening will void warranty and warranty claims and in most cases terminate the operating license. When the enclosure lid is removed, live components can be touched which can result in death or serious injury due to electric shock. Operating a damaged inverter can lead to hazardous situations that can result in death or serious injuries due to electric shock. Batteries deliver electric power, resulting in burns or a fire hazard when they are short circuited, or wrongly installed. Lethal voltages are present at the battery terminals and cables connecting to the inverter. Severe injuries or death may occur if the cables and terminals in the inverter are touched. PV negative (PV-) and battery negative (BAT-) on inverter side is not grounded as default design. Connecting PV- or BAT- to EARTH are strictly forbidden.
	**WARNING!** Do not disconnect PV connectors, AC connector or battery connectors while the inverter is running. De-energize from all multiple power sources. Wait 5 minutes for the internal capacitors to discharge. Verify that there is no voltage or current before disconnecting any connectors. Use personal protective equipment, including rubber gloves and protetive boots during the installation or maintenance.
	**CAUTION!** Do not touch any hot parts (such as the heat sink) during operation, The temperature of inverter surface might exceed 60℃ during working.
NOTICE	**NOTICE!** Electrical installation and maintenance must be carried out by competent electricians according to local regulations. Do not open inverter cover or change any components without GS ESS's authorization, otherwise the warranty commitment for the inverter will be invalid. Usage and operation of the inverter must follow instructions in this user manual, otherwise the protection design might be useless and warranty for the inverter will be invalid.
	**NOTE!** Electrical installation and maintenance must be carried out by competent electricians according to local regulations.The inverter built-in RCMU will exclude possibility of DC residual current to 6mA, thus in the system an external RCD (type A) can be used(≥30mA).

Anti-Islanding Effect

Islanding is a condition when grid connected PV/ batteries back feed energy into the Grid when Grid is turned off for maintenance work, putting maintenance personal at serious risk. I1000-RH3 series inverters prevent islanding through Active Frequency Drift (AFD).

2.3Explanationof symbols

Symbols on Label:

DANGER!	DANGER!
CE	CE mark. The inverter complies with the requirements of the applicable CE guidelines.
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Danger of high voltages. Danger to life due to high voltages in the inverter!
	Danger. Risk of electric shock!
	The inverter cannot be disposed of together with the household waste. Disposal information can be found in the enclosed documentation.
	Don't work on this inverter until it is isolated from battery, mains and on-site PV generation suppliers.
5 min	Danger to life due to high voltage. There is residual voltage in the inverter which needs 5 min to discharge. Wait 5 min before you open the upper lid or the DC lid.
	Please read this manual before installation

3. Introduction

3.1 Basic features

The I1000-RH3 series hybrid inverters apply to PV energy storage system with PV modules, battery, loads and grid. The energy produced by PV system shall be used to optimize self-consumption, excess power charge battery and the rest power could be fed into the grid. Battery shall be discharged to support loads when PV power is insufficient to meet self-consumption. If both PV power and battery power is insufficient, the system will take power from grid to support loads.

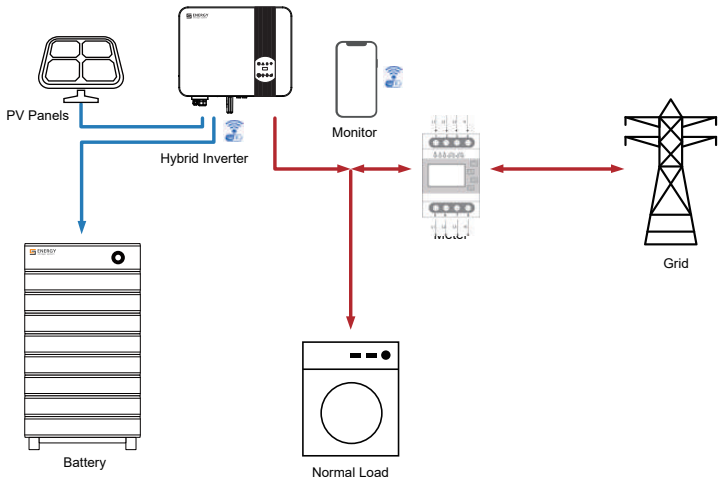


Figure 3-1 Use of Hybrid Inverters

3.2 Functional modes

The I1000-RH3 series hybrid inverter has the following work modes based on your configuration and layout conditions.

Functional mode: Self-use

Priority: PV generated energy to

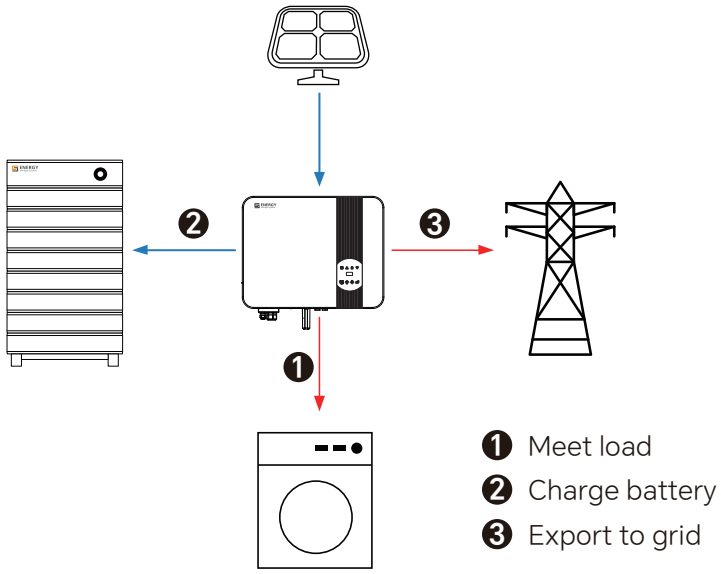


Figure 3-2 Self-use Mode

On site consumption of PV energy is the highest priority. Excess generation is used to charge batteries, and finally export to grid.

Functional mode: Feed in Pirority

Priority: PV generated energy to

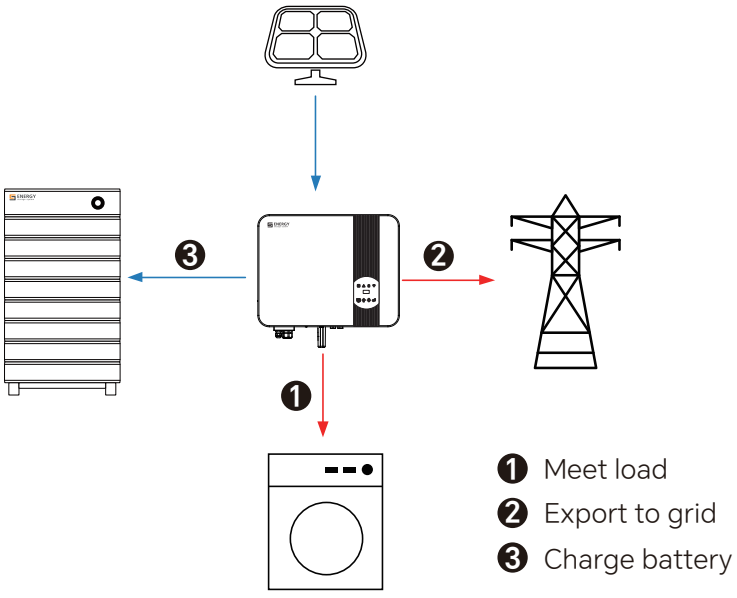


Figure 3-3 Feed in Pirority Mode

This mode is preferred for areas with Feed-in Tariff. PV energy is first used to meet load, excess exported to grid and finally to charge battery.

Functional mode:Force time use

Priority: During battery charging

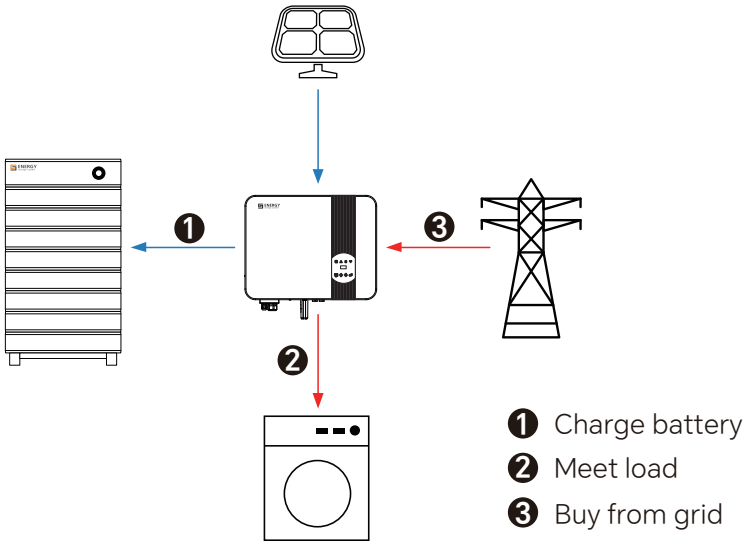


Figure 3-4 Force Time Use Mode1

Priority: During battery discharge

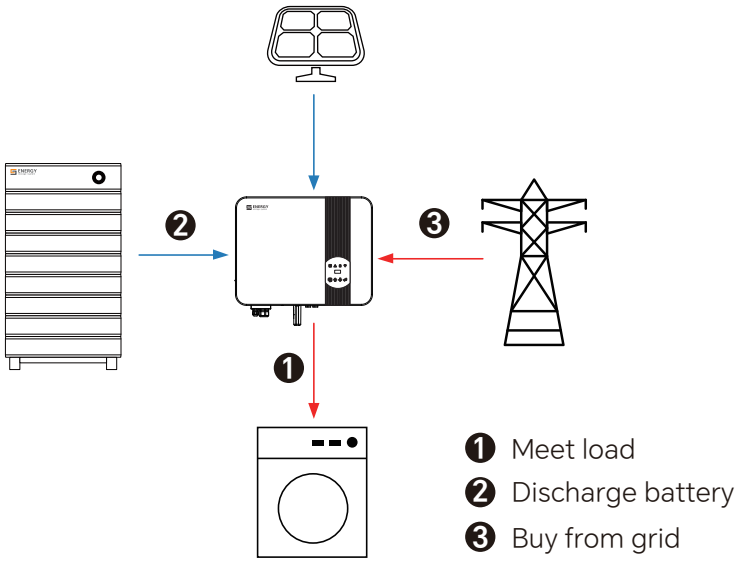


Figure 3-5 Force Time Use Mode2

This mode applies the area that has peak and economy electricity price. User can choose off-peak electricity to charge battery. Charging may be set flexibly, and the rest of time is in self-use mode.

Functional mode: Back up mode

Priority: PV generated energy to

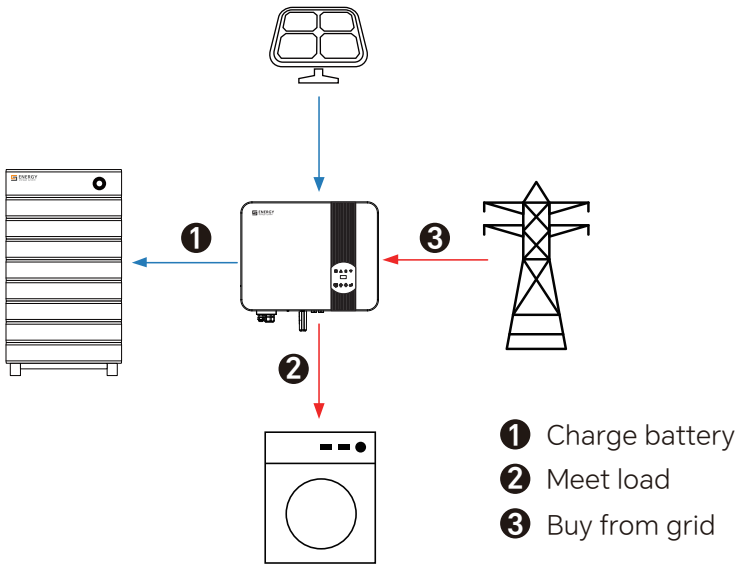


Figure 3-6 Back up Mode

This mode applies the area that has frequent power outages. And this mode ensures the battery will has enough energy to supply during a grid outage. The back up load could be supported by PV and battery in the event of a blackout.

WARNING!

Make sure the load powering rating in within the EPS's output rating. Or the inverter will shut down with an 'over load' warning.

When an 'over load' is appeared, adjust the load power make sure it is with the range of the EPS output, and turn the inverter on.

For the nonlinear load, please pay attention to the inrush power make sure it is within the range of the EPS output.

3.3 Terminals

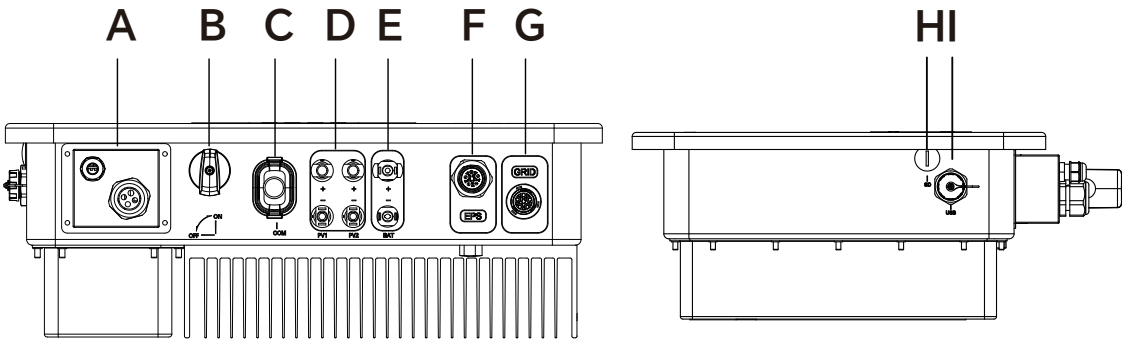


Figure 3-7 Terminals of the inverter

Object	Description	Object	Description
A	Communication port	F	EPS port
B	DC switch	G	Grid port
C	WiFi or GPRS port	H	SD port
D	PV connectors	I	USB port
E	Battery connectors		

3.4 Dimension

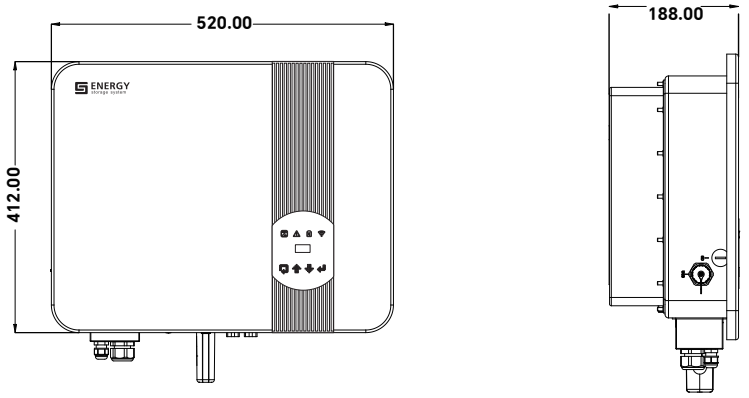


Figure 3-8 Product Size

4. Technical data

Model	I1000-RH3-5K-M1	I1000-RH3-6K-M1	I1000-RH3-8K-M1	I1000-RH3-10K-A-M1	I1000-RH3-10K-M1
PV Input Data					
Max. Recommended PV Power [Wp]	7500	9000	12000	15000	15000
Max. PV Input Voltage [V]	1000				
MPPT Voltage Range [V]	160 ~ 950				
Rated PV Input voltage [V]	600				
Start-up Voltage [V]	160				
No. of MPP Trackers	2				
No. of Input Strings per Tracker	1				
Max. PV Input Current [A]	18 / 18				
Max. Short-circuit Current [A]	23 / 23				
Backfeed Current to Array [A]	0				
DC Switch	Integrated				
AC Output Data					
Maximum Apparent Power [VA]	5500	6600	8800	10000	11000
Rated AC Power [W]	5000	6000	8000	10000	10000
Maximum AC Current [A]	7.6	9.1	12.2	14.4	15.2
Rated AC Current (A)	7.2	8.7	11.5	14.4	14.4
Rated AC Voltage / Range [V]	3 / N / PE, 220 / 380, 230 / 400				
Grid Frequency / Range [Hz]	50 / 60; ± 5				
Adjustable Power Factor [cosϕ]	0.8 leading ~ 0.8 lagging				
Output THDi (@Rated Output)	<3%				
AC Input Data					
Max .apparent AC Power(VA)	10000	12000	16000	20000	20000
Max . AC Current(A)	15.2	18.2	24.3	28.8	30.4
Rated AC Voltage / Range [V]	3 / N / PE, 220 / 380, 230 / 400				
Grid Frequency / Range [Hz]	50 / 60				
AC Inrush Current [A]	32				

Model	I1000-RH3-5K-M1	I1000-RH3-6K-M1	I1000-RH3-8K-M1	I1000-RH3-10K-A-M1	I1000-RH3-10K-M1
Max. Output Overcurrent Protection	40				
AC Max. output fault current [A]	73				
Output DC(Battery)					
Battery Type	Lithium				
Battery Voltage Range [V]	160 ~ 700				
Max. Charging / Discharging Current [A]	30				
Communication Interface	CAN				
EPS Output Data (With Battery)					
EPS Rated Power [W]	5000	6000	8000	10000	10000
EPS Rated Voltage [V]	3 / N / PE, 220 / 380, 230 / 400				
EPS Rated Frequency [Hz]	50 / 60				
EPS Rated Current [A]	7.6	9.1	12.2	14.4	15.2
Output THDi (@Rated Output)	<3%				
Automatic Switch Time [ms]	<10				
Peak Apparent Power, Duration [VA, s]	7500, 60	9000, 60	12000, 60	15000, 60	15000, 60
Efficiency					
Max. Efficiency	98.00%	98.00%	98.00%	98.00%	98.00%
Euro Efficiency	97.70%	97.70%	97.70%	97.70%	97.70%
Max. Battery Charge / Discharge Efficiency	97.60%	97.60%	97.60%	97.60%	97.60%
Protection					
DC Insulation Monitoring	Integrated				
Input Reverse Polarity Protection	Integrated				
Anti-island Protection	Integrated				
Residual Current Monitoring	Integrated				
Over-heat Protection	Integrated				
AC Overcurrent Protection	Integrated				
AC Short-circuit Protection	Integrated				
AC Overvoltage Protection	Integrated				
DC Surge Protection	Type II				
AC Surge Protection	Type II				
General Data					
Size (Width * Height * Depth) [mm)]	520 * 412 * 186				
Weight [kg]	27				
User Interface	LED + OLED				
Communication	RS485 and USB or Wifi or 4G or Ethernet(Optional)				
Operating Temperature Range [℃]	-25 ~ +60				
Relative Humidity	0 ~ 100%				
Operating Altitude [m]	≤ 2000				
Standby Self Consumption [W]	<15				
Topology	Transformerless				
Pollution degree	III				
Protective class	I				
OVC categories	DC II / AC II				
Environmental categories	Outdoor				
Cooling	Natural				
Enclosure	IP65				
Noise [dB]	<35				
Warranty [years]	5				
Certifications & Standards					
Grid Regulation	EN50549,VDE4105, CEI 0-21,UNE217002,EN50549-PL, EN50549-GR,EN50549-CZ,IEC61727,IEC62116, AS4777,TOR Erzeuger Typ A				
Safety Regulation	EN62109-1,EN62109-2				
EMC	EN61000-6-1/3				

5 Installation

5.1 Unpacking

Check the delivery for completeness. Contact your dealer at once if anything is missing.

Figure 5-1 Packaging

Object	Quantity	Description
A	1	I1000-RH3 series inverter
B	1	Mounting Bracket
C	2	Battery Connectors (1* positive, 1*negative)
D	4	PV Connectors (2* positive, 2*negative)
E	4	PV Pin contact (2* positive, 2* negative)
F	1	AC Terminal
G	1	EPS Terminal
H	1	8P Pluggable Terminal Block
I	1	Wifi or GPRS Module (Optional)
J	5	Ethernet RJ45 Connector
K	2	M5 screws
L	1	Earth Terminal
M	4	Expansion tubes & Expansion screws
N	1	Meter
O	1	User Manual
P	1	Quality Certificate

Open the package and pick the product, check that if there is any distortion or impaired during the transportation. Meanwhile, check that if the relating accessories and the materials are here, you can see the accessories list in the table.

The instruction manual is an integral part of the unit and should therefore be read and kept carefully.

It is recommended that the packaging should not be removed until the unit is located in the installation site.

5.2 Check for transport damage

Check if the I1000-RH3 series inverter has some visible external damage, such as cracks in the housing or display please contact with your dealer if you find any damage.

5.3 Installation precaution

The I1000-RH3 series inverter is designed for outdoor installation (IP65)
Make sure the installation site does not fall into one of the following conditions:
·Do not install the inverter in direct sunlight.
·Do not install the inverter on flammable construction material.
·Do not install the inverter in areas where highly flammable materials are stored.
·Do not install the inverter in potentially explosive areas.
·Do not install the inverter during periods of precipitation or high humidity (>95%); Moisture trapped within the location may cause corrosion and damage to the electric components.
·Provide adequate ventilation when using batteries, and also read the warning label on the bottom of the inverter.
·Install the inverter in a location that maintains an ambient air temperature that is less than 40℃; The inverter should be installed in a location that is not accessible for children.
·The inverter emits a slight vibrating noise when operating, which is normal and no effect on performance.
·Mounting should not tilt more than 5 degrees.
·The inverter is heavy, ensure the mounting place is strong enough to hold the weight of the inverter.
·If installed in a cabinet, closet or other small enclosed areas, sufficient air circulation must be ensured in order to dissipate heat generated by the unit.

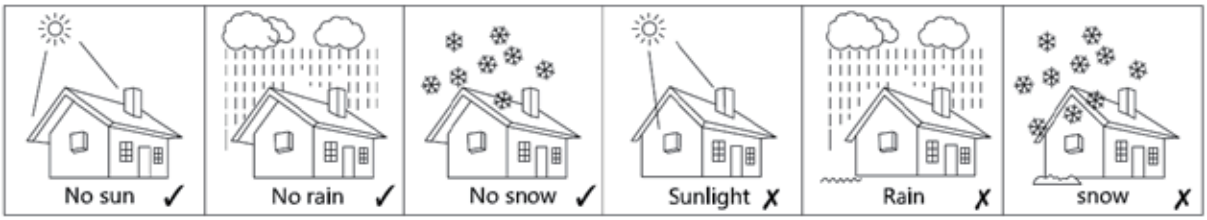


Figure 5-2 Recommended Installation Locations

5.4 Available space

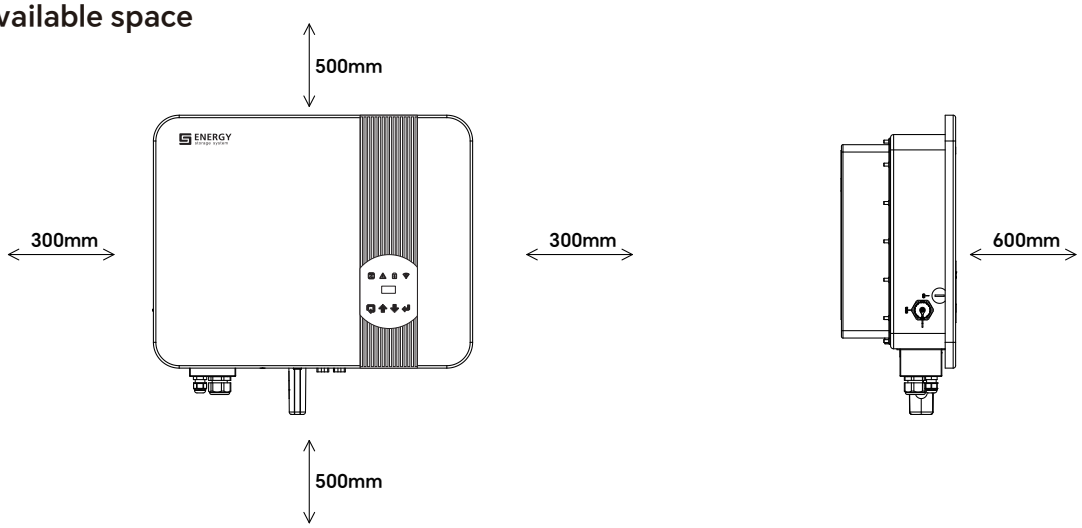


Figure 5-3 Minimum clearance required

5.5 Preparation

No.	Tool	Model	Function
1		Level	Make sure the bracket is properly installed
2		BOSCH HD18-2 Two-Speed Hammer Dril	Drill holes on the wall
3		Hammer	Hanging the bracket
4		KIM0 20V 1/2 Cordless Brushless Impact Wrench Set	Hanging the bracket
5		PV-AZM-410	Strippling plier for PV cable
6		PV-CAM-22100	Crimping plier for PV cable
7		Screwdriver	Wiring
8		RJ45 Crimping Tool	Crimping tool for RJ45 terminal
9		Crimping plier	Crimping Tool For Insulated Electrical Connectors

Lifting and Handling

The unit is heavy. Do not lift it alone.

·During lifting procedures ensure that the unit is firmly secured to avoid the risk of accidental tipping or dropping.

·Parts serving for support or immobilization of unit shall be designed and manufactured so as to minimize the risk of physical injuries and of accidental loosening of fixing.

·Ensure that the method of lifting will not allow the unit to slip from chains and slings or turn-over or slide from lifting devices.

· Transportation must be carried by specialized person (truck operators. Hook-up personal), equipped with the necessary protection equipment (overalls, safe shoes, protective gloves, helmets, goggles)
· Do not walk or stand beneath or in the proximity of the load.
· Avoid sudden movements and jolts when unloading and positioning the unit. Internal handling procedures must be conducted with care. Do not exert leverage on the components of the machine.
· If the unit is not balanced apply ballast. Any protruding parts should not be supported by hand.
· The inverter should be installed so that the operating panel shall be easily accessible- easy access to the electrical power connection point.
· Accessible for maintenance and repair work.
· Parts serving for support or immobilization of unit shall be designed and manufactured so as to minimize the risk of physical injuries and accidental loosening of fixings.
· Loading capacity and hardness of the supporting surface, load rating of mounting bracket should be at least four times the weight of the devices according to IEC62109-1. And supporting characteristics will be impaired by wear, corrosion, material fatigue or ageing, This should be calculated by inspection of the design data of supporting material and consulting construction engineer.

5.6 Installation steps

Step 1: Fix wall bracket on the wall
· Use the wall bracket as a template to mark the position of the 4 holes.

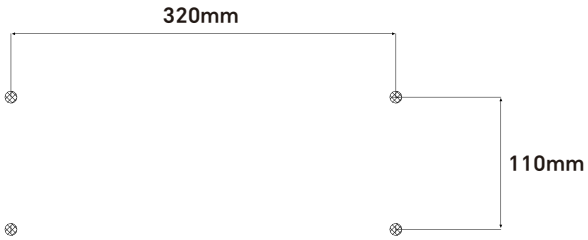


Figure 5-4 Inverter Wall Mounting

· Drill holes with ϕ10 driller carefully, make sure the holes are deep enough (at least 45mm) for install and tight the expansion tubes.
· Install the expansion tubes in the holes, and tight them. Install the wall bracket using the expansion screws in the screw package.

Step2: Hang the I1000-RH3 series inverter on the wall bracket.
· Transportation of the inverter needs at least 2 people, each one needs to use the handles at the sides of the inverter.
· Hang the inverter over the bracket, move the inverter close to it, slightly laydown the inverter make sure the 4 mounting bars on the back of the inverter is fixed well with 4 grooves on the bracket.

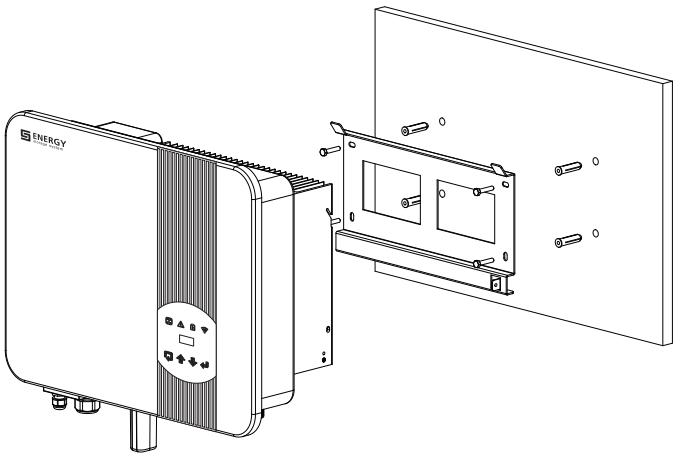


Figure 5-5 Wall Mount Bracket

5.7 Electrical WiringConnection

For an overview of the connection terminals of the inverter please refer to Figure 3-1, and for other wiring details, refer to chapter 3.

System Connection Diagrams

Note: Diagram below is for Australia, South Africa and New Zealand where neutral line can't be switched.

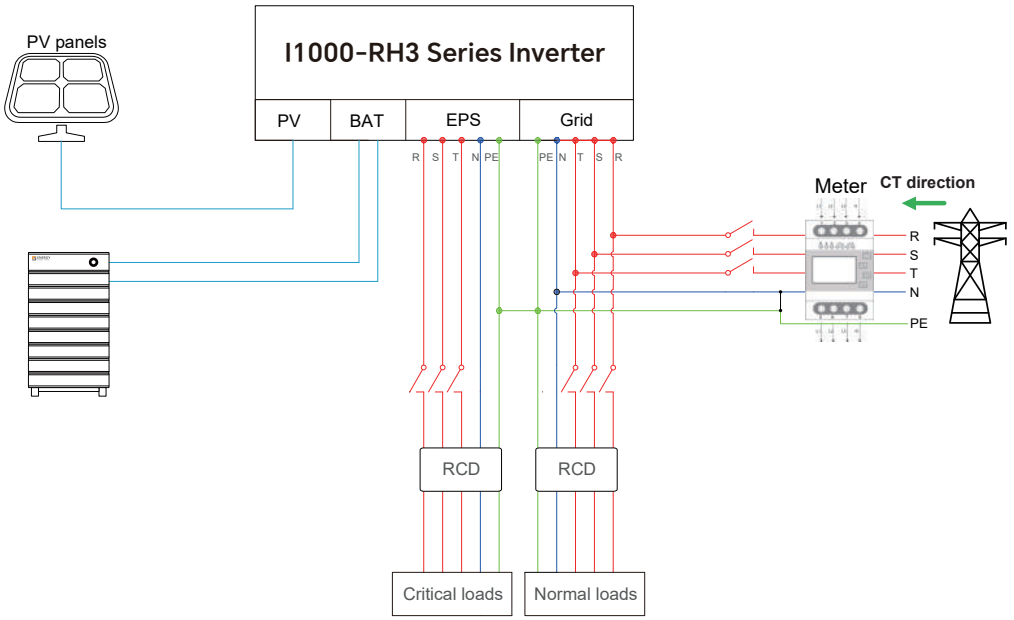


Figure 5-6

Note: This diagram is an example for grid system without special requirement on electrical wiring connection.

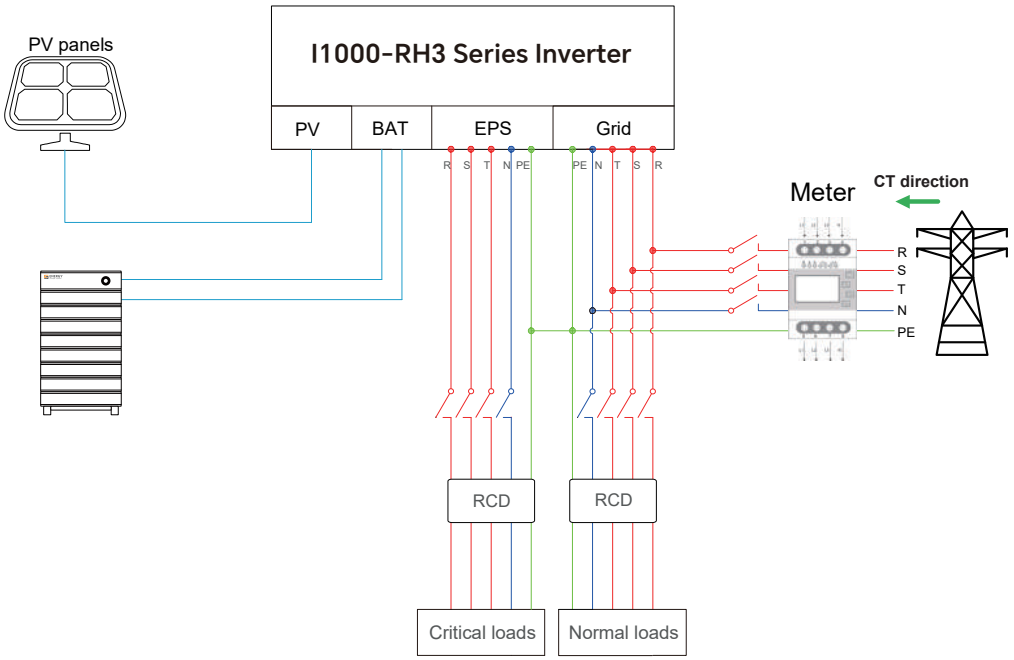


Figure 5-7

The main steps to connect the I1000-RH3 series system

·PV string connection
·AC output connection
·Battery connection
·Battery power connection
·Battery communication connection
·EPS connection
·Earth connection
·Communication connection

5.7.1 PV WiringConnection

Before connecting PV strings to I1000-RH3 series hybrid inverter, please make sure requirements are followed as below :
·The total short- circuit current of PV string must not exceed inverter's max DC current .
·Make sure open circuit voltage of PV string is less than 1000V.
·PV strings could not connect to earth/grounding conductor.
·Use the right PV plugs in the accessory box, BAT plugs are similar with PV plugs, please confirm before using.

WARNING!
The inverter must only be operated with PV strings with class II protection in accordance with IEC 61730, application class A. It is not allowed for the positive pole or the negative pole of the PV strings to be grounded. This can cause the inverter to be destroyed.

Connection Steps:

1.Turn off the DC switch.
2.Prepare 2.5-4mm2 PV cable and PV plugs as below.
3.Strip 7mm of the conductor with stripping plier. Use a suitable stripping tool for this (e.g. "PV-AZM-410 ")
4.Insert striped cable into pin contact and ensure all conductor strands are captured in the pin contact.

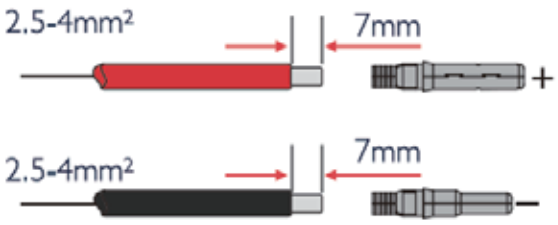


Figure 5-8

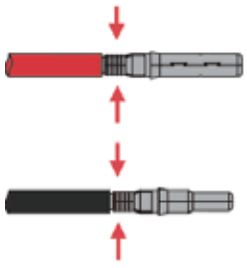


Figure 5-9

5.Crimp pin contact by using a crimping pliers(PV-CZM-22100). Put the pin contact with striped cable into the corresponding crimping pliers and crimp the contact.
6.Insert pin contact through the cable nut to assemble into back of the male or female plug. When you feel or heard a 'click' the pin contact assembly is seated correctly.
7.Tight the DC connector.
a.Slide the cable nut towards the back shell.
b.Rotate the cable nut to secure the cable.

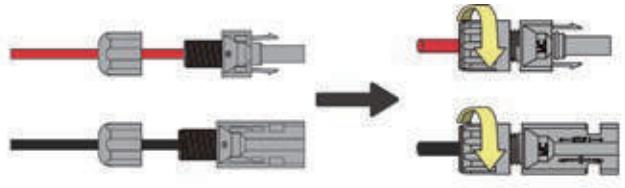


Figure 5-10

8.After securing the cable tightly, align the 2 half connectors and mate them. together by hand until a 'click' is felt or heard.
9.Separate the DC connector
a.Use the specified wrench tool.
b.When separate the DC+ connector, push the tool down from upside.
c.When separate the DC- connector, push tool down from the bottom side.
d.Separate the connectors by hands.

5.7.2 Battery Connection

When you want to build a self-use storage system, the high voltage battery is a necessary part. The I1000-RH3 series inverter provides the necessary part of the interfaces to connect the battery.

WARNING!
Make sure you select the correct specification cables fo installation. Otherwise the power will make the cable hot or burnt; it could result in death or serious injury.

1.Battery Power Cable Connection

1) Prepare the tin-plated cables with a conductor cross section of 4 to 6 mm² (AWG 10).
2) Strip 15mm off the conductor. Use a suitable stripping tool for this (e.g. "Knipex Solar 121211").
3) Open spring using a screwdriver (Figure 5-11).

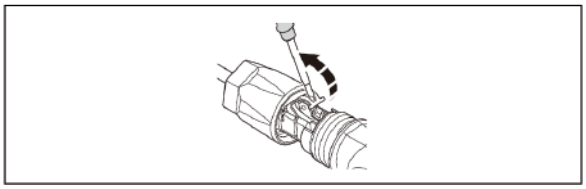


Figure 5-11

4) Carefully insert the stripped wire with twisted conductors all the way in (Figure 5-12, A). The litz wire ends have to be visible in the spring.
5) Close the spring. Make sure that the spring is snapped in (Figure 5-12, B).

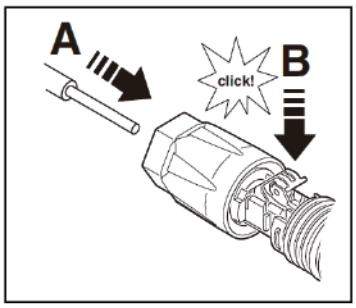


Figure 5-12

6. Push the insert into the sleeve (Figure 5-13, C)
7. Tighten the cable gland to 2 Nm (Figure 5-12, D). Use a suitable and calibrated torque wrench of size 15. Use an open-jaw wrench, size 16, to hold the connector in place.

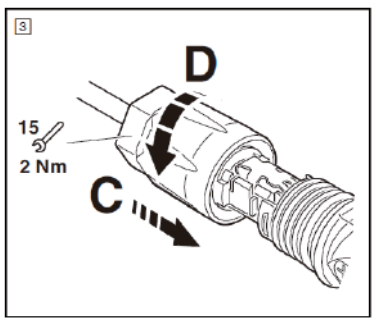


Figure 5-13

8. Fit the two connectors together until the connection audibly locks into place.
9. Check to make sure the connection is securely locked
10.Separating connectors
1). Insert the screwdriver into one of the four openings(Figure 5-14, A)
2). Leave the screwdriver in the opening. Pull the two connectors apart(Figure 5-14, B).

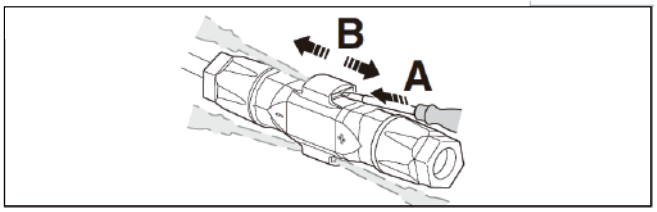


Figure 5-14

2. Battery Communication Connection

The communication interface between battery and inverter is CAN with a RJ45 connector.
The Pins definition is as below.

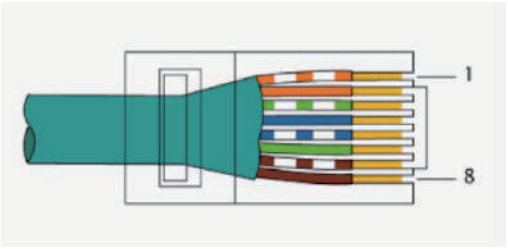


Figure 5-15

Pin	1	2	3	4	5	6	7	8
Function	NC	NC	NC	CANH	CANL	NC	485A	485B

Overview for all battery connections

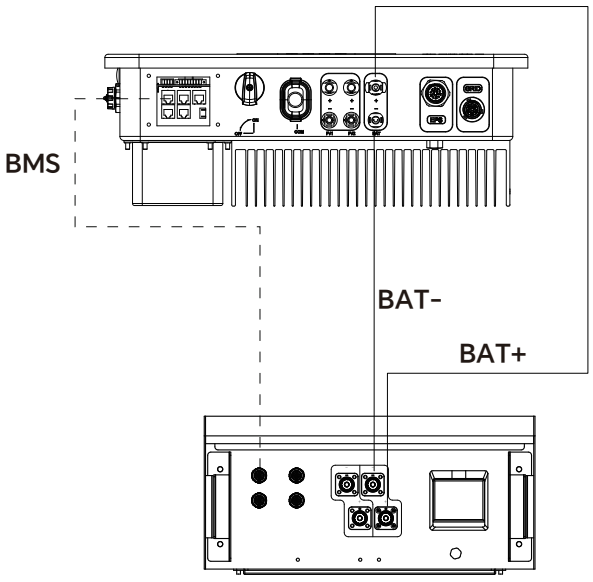


Figure 5-16

5.7.3 AC Output Connection

I1000-RH3 series inverters have already integrated RCMU (residual current monitoring unit) inside, however if an external RCD is and the groove on the housing engage perfectly until a 'Click' is heard or felt. required, a type A RCD with rated residual current of 30mA or higher is recommended.
There are two AC terminals and the assembly steps for both are the same, just need to check one for 'Grid' another for 'EPS'.
The AC cable and micro-breaker/external fuse specification for AC side of I1000-RH3 series inverter as below.

Model	I1000-RH3-5K-M1	I1000-RH3-6K-M1	I1000-RH3-8K-M1	I1000-RH3-10K-A-M1	I1000-RH3-10K-M1
Cable(Cu)	4mm²	4mm²	4mm²	4-6mm²	4-6mm²
Normal Load-Breaker or external fuse	10A	16A	16A	20A	20A
Grid-Breaker	20A	32A	32A	40A	40A

WARNING!
Select cables of the correct specifications.
Failure could result in in fire and lead to death or serious injury.
Don't connect the line/phase cable to 'PE' terminal, failure will result in improper operation of the inverter.

Connection Step:

1. Lead the AC cable through the cable gland and the housing.

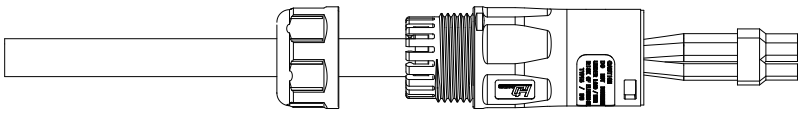


Figure 5-17

2. Remove the cable jacket by 40 mm, and strip the wire insulation by 8 mm-15 mm.

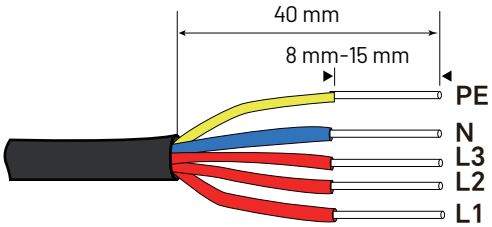


Figure 5-18

3.Fully insert the conductors to the corresponding terminal and tighten the screws with the torque 0.8 Nm. Pull cables outward to check whether they are firmly installed.

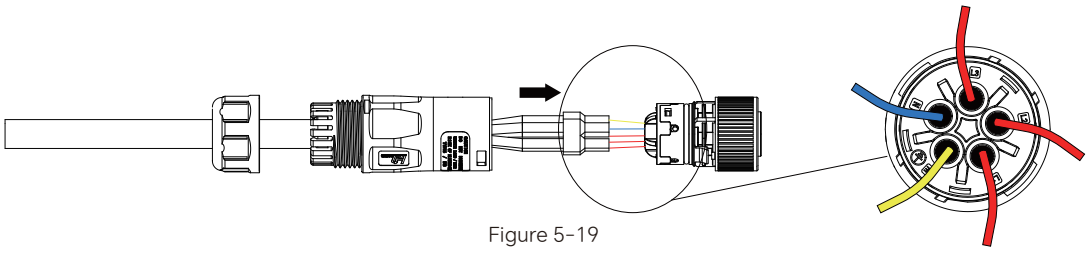


Figure 5-19

4.Assemble the housing, the terminal block and cable gland (torque 4–5 Nm). Make sure that the rib of the terminal block and the groove on the housing engage perfectly, with a click.

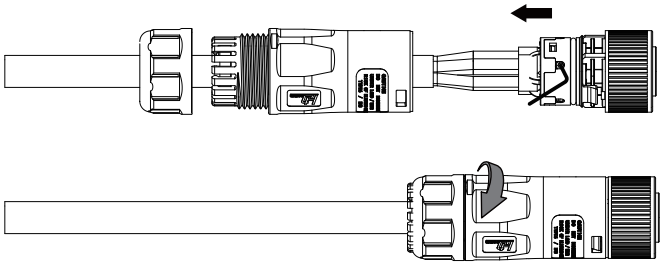


Figure 5-20

5.7.4 Earth Connection

One may earth the inverter enclosure of a second earth or equipotential bonding if required under local regulations. This inverter. prevents touch current if the original protective conductor fails.
Cable size: 12AWG

Connection step:

· Strip the earthling cable insulation.
· Insert the stripped cable into the ring terminal.
· Clamp the end of the ring terminal.
· Unscrew the screw of the earthling connector.
· Attach the ring terminal on the earthing connector. Attach the gasket on the earthing connector
· Tighten the screw of the earthing connector.

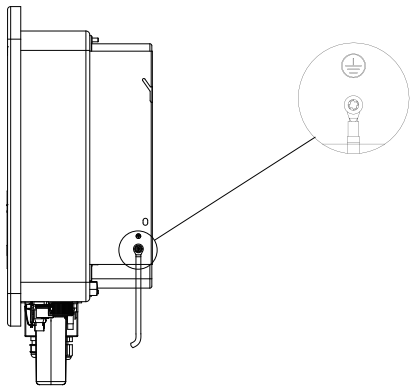


Figure 5-21

5.7.5 Communication connection

Communication interface

The inverter has a serial communication interface besides Wifi or 4G or Ethernet(Optional). Dry contact, extended port, human and machine communication, etc., can be delivered to PC or other monitoring equipment via these interfaces.

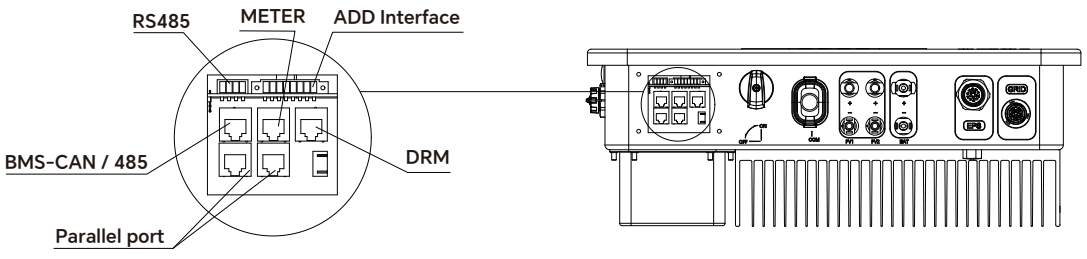


Figure 5-22 Communication interface

(1). WIFI or GPRS

The details please refer to the WIFI or GPRS module user manual.

(2). RS485 Interface

RS485 interface PINS definition:

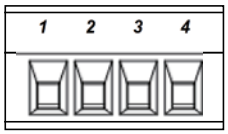


Figure 5-23

Pin	1	2	3	4
Function	+5V	GND	485A	485B

(3). ADD Interface

ADD interface PINS definition:

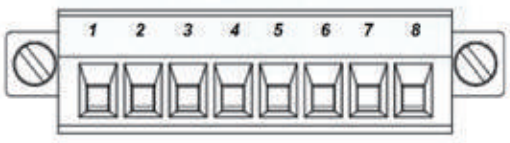


Figure 5-24

Pin	1	2	3	4	5	6	7	8
Function	METER-485A	METER-485B	GENA	GENB	+5V	SHUTOWN	Temp	GND

Meter communication: METER_485A & METER_485B----pin1 & pin2
Relay contact output for generator: GENA & GENB----pin3 & pin4
Shut down the hybrid inverter: +5V & SHUTDOWN----pin5 & pin6
EPX box Relay & GND---pin7 and pin8

(4). METER port

Meter port PINS definition:

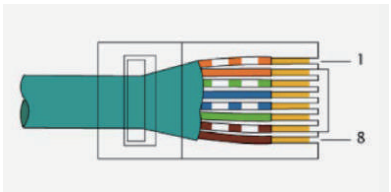


Figure 5-25

Pin	1	2	3	4	5	6	7	8
Function	METER-485A	METER-485B	NC	NC	NC	NC	NC	NC

The function of meter port same as pin1 & pin2 of ADD interface.

(4.1) Meter wiring diagram for Typical Energy Storage System

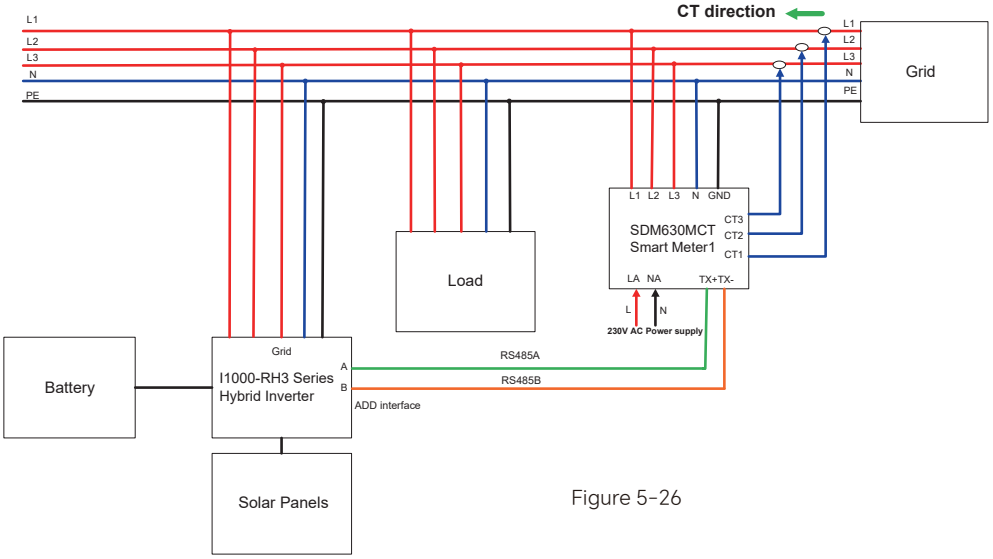


Figure 5-26

The I1000-RH3 series energy storage inverter adopts EASTRON SDM630MCT smart meter. The connect steps are as follows:

· Connect the meter output “L1, L2, L3, N” to power Grid. And connect 230V AC power supply to “LA, NA” (LA –Grid L line, NA-Grid Netral line).

· Connect the meter “TX+” “TX–” to inverter RS485 A and B of “MERER”, referring to Chapter 5.7.5 on Page 22.

· Connect “GND” of the meter to the ground.

· Connect meter CT1 to Grid L1, CT2 to Grid L2, CT3 to Grid L3. The CT direction must be facing to the load and inverter.

Note:

1) It is necessary to have the sequence of phases, CT1 must be connected to Grid phase line L1, CT2 must be connected to Grid phase line L2, CT3 must be connected to Grid phase line L3.

2) Please note that the CT direction must be facing to the load and inverter.

3) The local address and the meter address need to be set as “001” on the inverter screen. The address of the smart meter itself needs to be set to "001".

(4.2) Meter wiring diagram for AC Retrofit System

GS ESS Hybrid inverters can be used in the following situations also. If the site already has a grid tied PV system and want to increase module capacity or provide back-up power. Additional meter between the grid-connected inverters and I1000-RH3 series hybrid inverter is required. One I1000-RH3 series Hybrid inverter can be connected maximum two On-Grid three-phase inverters, and in the system, the smart meter must be the EASTRON SDM630MCT.

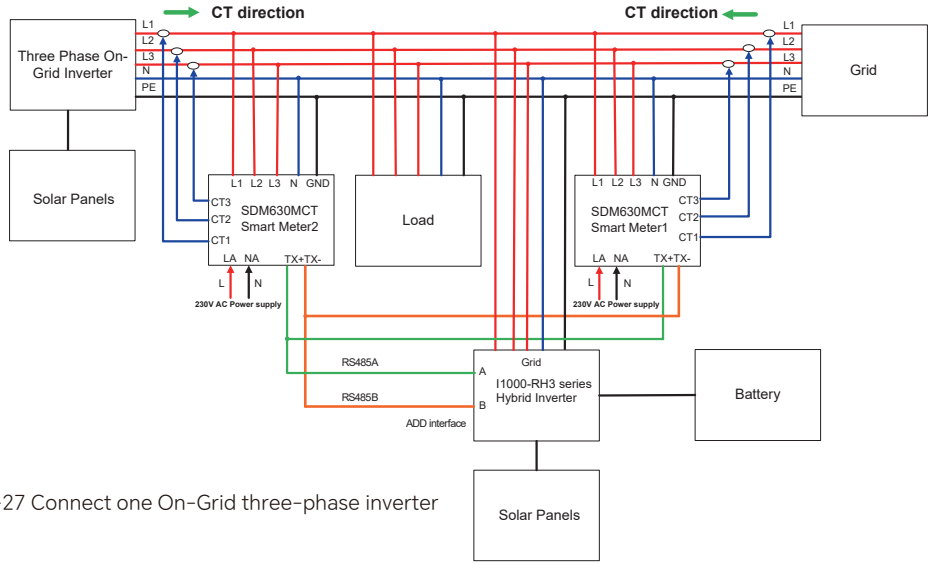


Figure 5-27 Connect one On-Grid three-phase inverter

The connect steps are the same as in the previous chapter.

Note: The mart meter communication cable “TX+ ” “TX- ” can also be connected to “ADD Interface” port of inverter.

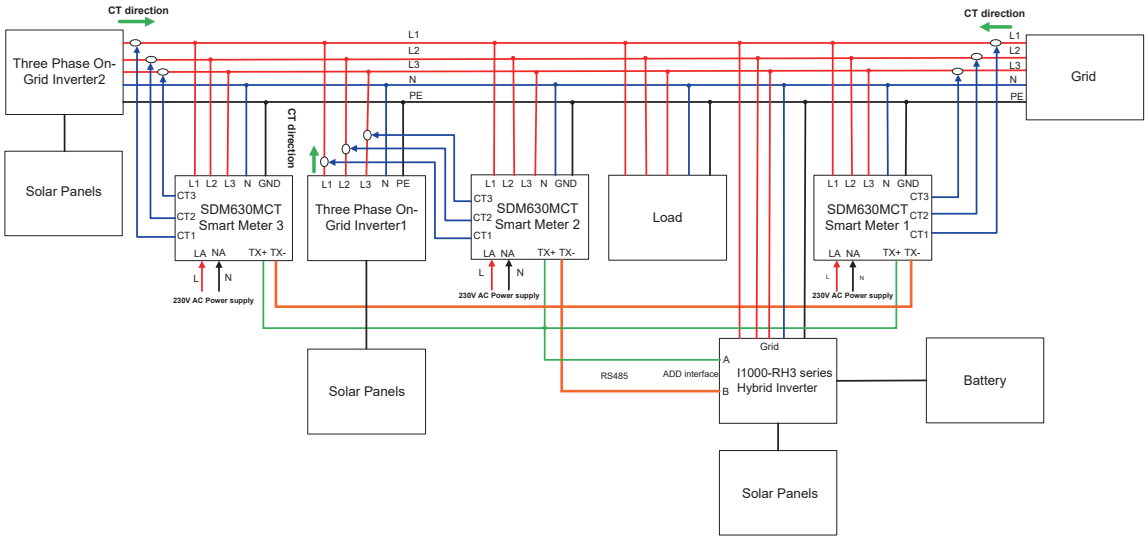


Figure 5-28 Connect two On-Grid three-phase inverters

Note:

1) It is necessary to have the sequence of phases, CT1 must be connected to Grid phase line L1, CT2 must be connected to Grid phase line L2, CT3 must be connected to Grid phase line L3.

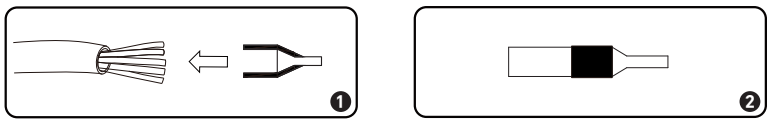
2) Please note that the CT direction must be facing to the load and inverter.

3) Connect one On-Grid three-phase inverter(Figure 5-27): The local address needs to be set as "001" on the inverter screen, and meter1 address set as "001", meter2 address set as "002". The address of meter1 itself needs to be set to "001", and meter2 needs to be set to "002".

4) Connect two On-Grid three-phase inverters(Figure 5-28): The local address needs to be set as "001" on the inverter screen, and meter1 address set as "001", meter2 address set as "002", and meter3 address set as "003". The address of meter1 itself needs to be set to "001", meter2 needs to be set to "002", and meter3 needs to be set to "003".

WARNING!

If one chooses a flexible wire, ensure the cord section is pressed on the crimping terminal before connecting it to the meter as below.



(5). DRM/Ripple Control Receiver (RCR)

PINS definition:

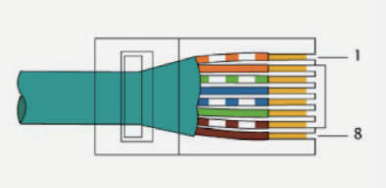


Figure 5-29

Pin	1	2	3	4	5	6	7	8
Function	DRM1/5	DRM2/6	DRM3/7	DRM4/8	+3.3V	COM/DRM0	GND	HND

This application meets the requirements of local Australian grid code (AS/NZS 4777.2) and Germany grid code (VDE-AR-N 4105).

a) In Australian grid code, requirements for connection call for compatibility with Demand Response Enabling Devices (DRED).

The DRED is controlled by a local network operator and allows to put the inverter in one of the Demand Response Modes

(DRMs) defined by the standard:

· DRM 0 Operate the disconnection device.
· DRM 1 Do not consume power.
· DRM 2 Do not consume at more than 50% of rated power.
· DRM 3 Do not consume at more than 75% of rated power and source reactive power if capable.
· DRM 4 Increase power consumption (subject to constraints from other active DRMs).
· DRM 5 Do not generate power.
· DRM 6 Do not generate at more than 50% of rated power.
· DRM 7 Do not generate at more than 75% of rated power and sink reactive power if capable.
· DRM 8 Increase power generation (subject to constraints from other active DRMs).

Currently, it is mandatory to respond to DRM0, which allows the network manager to remotely decouple the installation from the distribution network.

b) In Germany grid code, this logic interface is for controlling and/or limiting the inverter's output power. The grid company uses the Ripple Control Receiver (RCR) to convert the grid dispatching signal and send it as a dry contact signal. The wiring of the ripple control receiver dry contact cables is shown in the figure below:

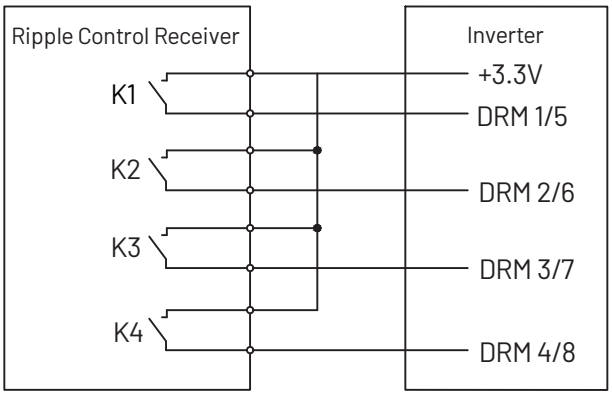


Figure 5-30

K1	K2	K3	K4	Switch Operation on External RCR	Output power (in % of the Rated AC output power)
1	0	0	0	Close K1	100 %
0	1	0	0	Close K2	60 %
0	0	1	0	Close K3	30 %
0	0	0	1	Close K4	0 %

(6). Parallel port

PINS definition:

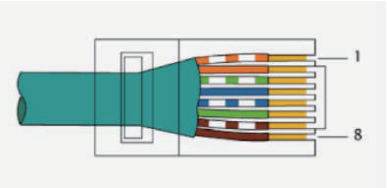


Figure 5-31

Pin	1	2	3	4	5	6	7	8
Function	RS485A	RS485B	VCC	CANH	CANL	GND	SYN1	SYN2

Note: Only 4 and 5 PIN pins are used.

5.7.6 Multiple inverters connection

In system with multiple inverters, one can connect the devices in a Master/Slave configuration. In this configuration, only one energy meter is connected to the Master inverter for the system control. Users should set up the master/slave on the screen after the inverter is connected. The setting steps are in Advanced*. For details, please refer to EPS Parallel Box User Manual.

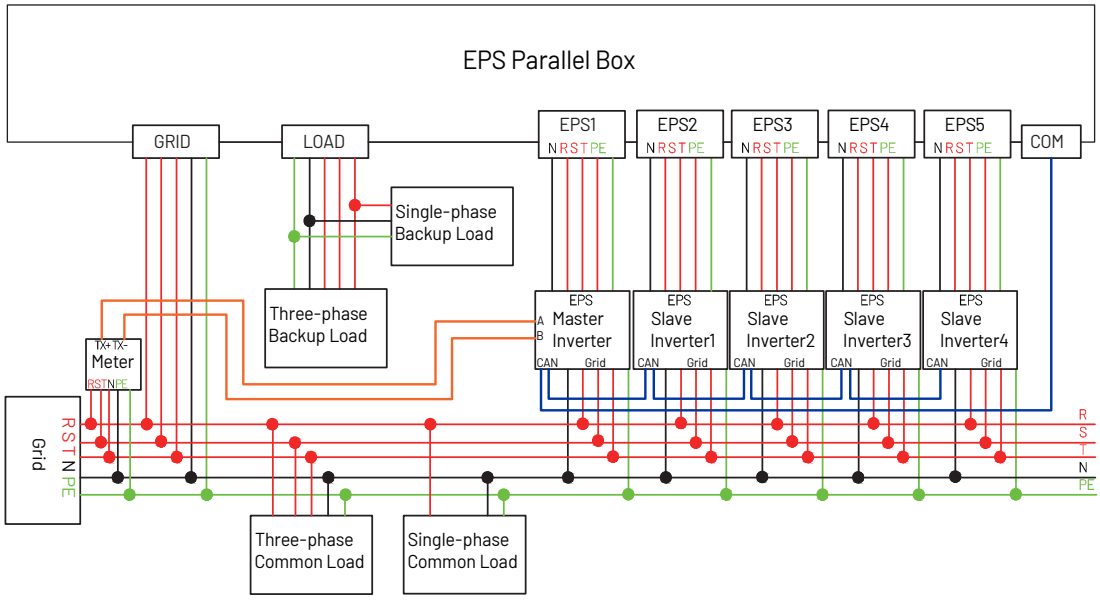


Figure 5-32

Note: Maximum number of parallel is five.
The CAN communication port is the parallel port of the hybrid inverter(Figure 5-22).

5.8 Inverter configuration

Start inverter after checking all the following:
· Check that the device is fixed well on the wall.
· Make sure all the PV wiring and the AC wiring are completed.
· Make sure the meter are connected well.
· Make sure the battery is connected correctly.
· Turn on the external AC, DC switch.
· Turn on the DC switch to the 'ON' position.
· Set sysswitch on the screen of the inverter to 'Turn on'.

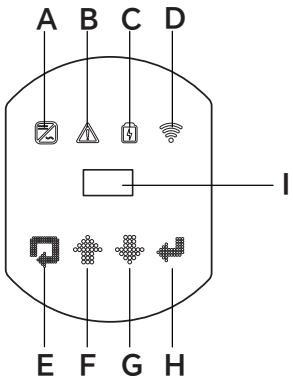
Starting inverter:

· Inverter will start automatically when the PV panel generate enough energy or the battery is charged.
· Check the status of LED and LCD screen, first LED should be green and the LCD screen should display the main interface.
· If first LED is not green 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 ' positon.
· Enter the setting interface.
· Set the safety standard as in page 33; Set the system time as in page 32; PV connection mode as in page 31; Set work mode as
in page 32; Set the communication address as in page 32; Set the EPS as in page 31; Set WIFI according to the WIFI manual.

NOTE!
Please configure the inverter first time start up.
Above steps is for the regular start-up of the inverter. If it is the first time to start up the inverter, you need to start up the inverter.

6. Operation

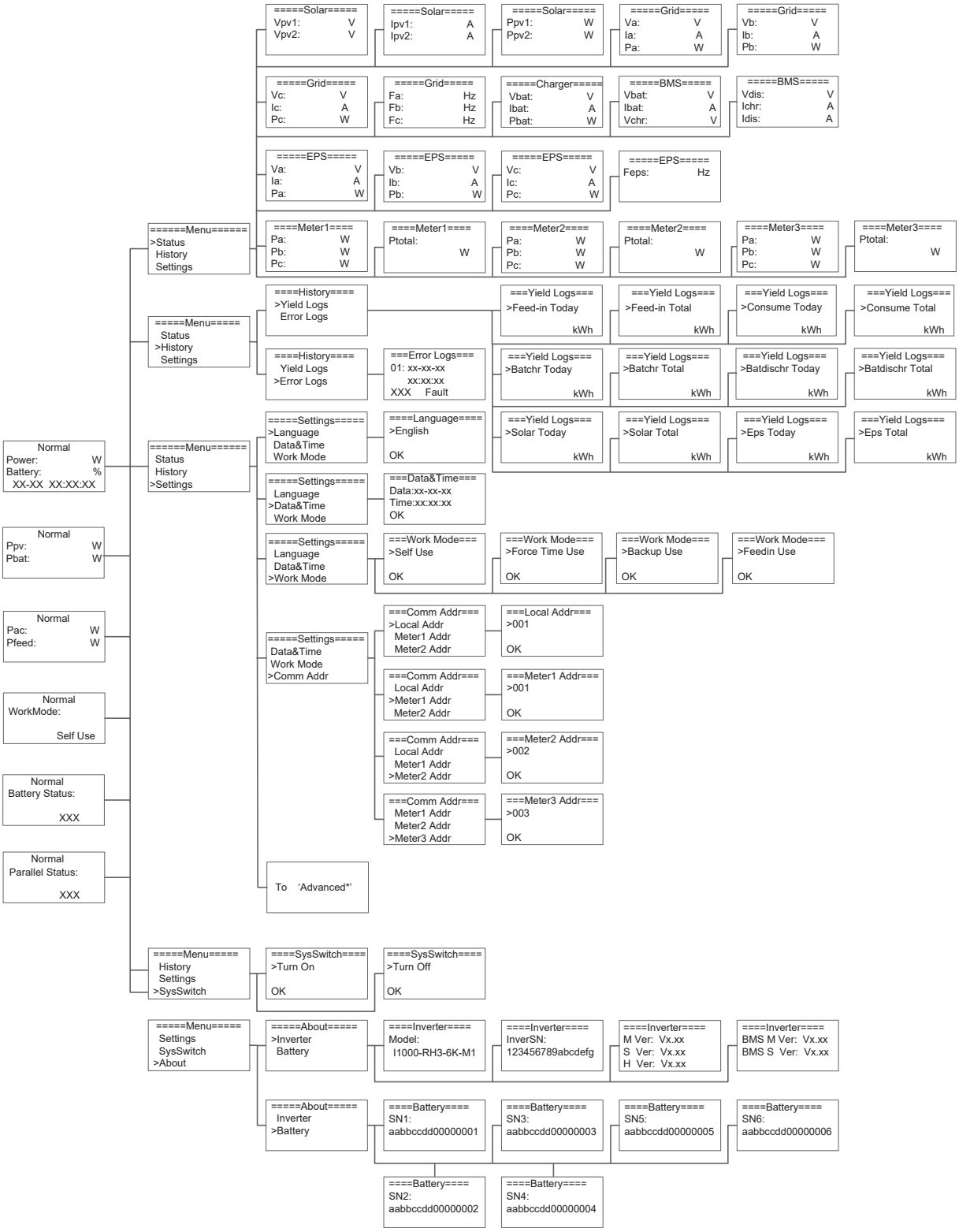
6.1 Control panel

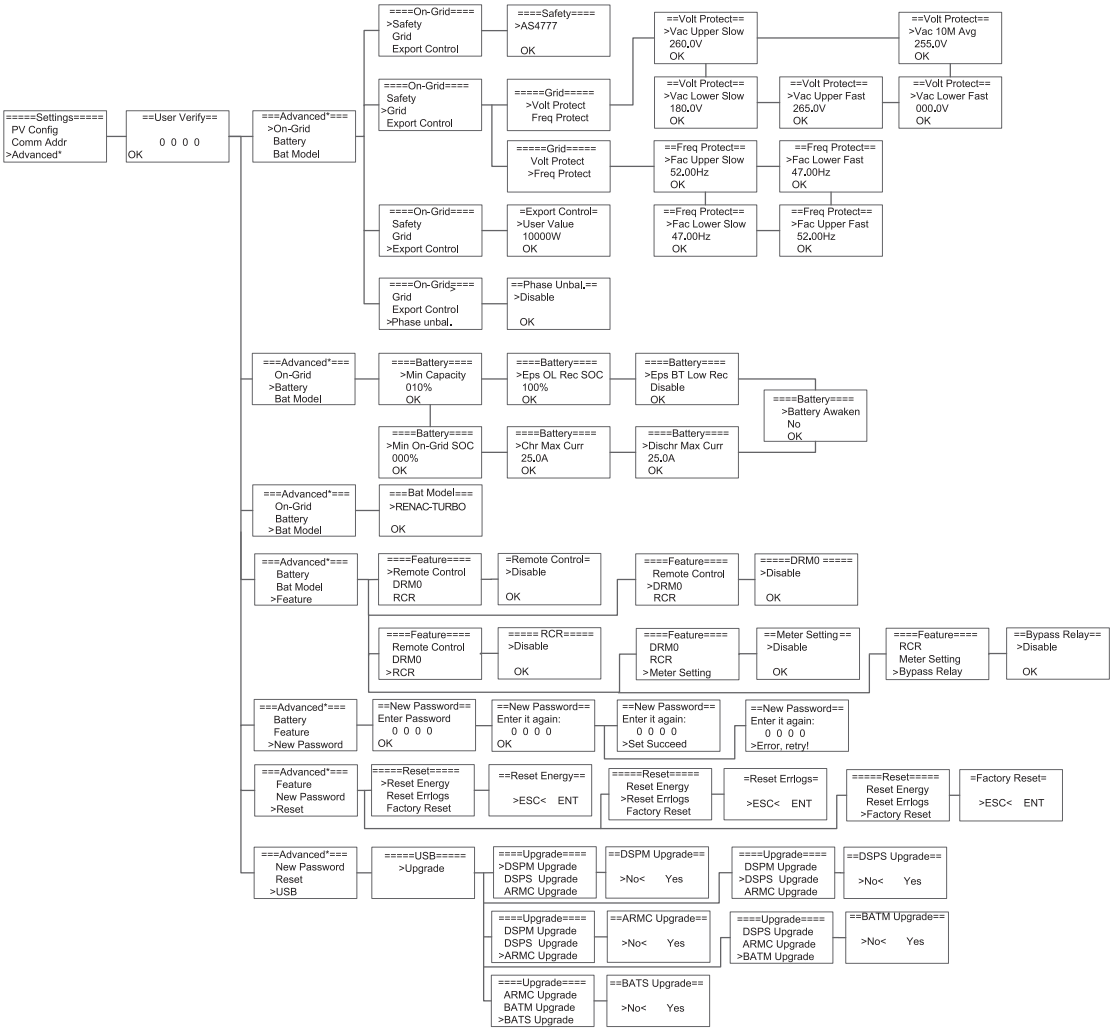


Object	Name	Description
A	Indicator LED	Green: Normal working Status.
B		Red: Fault.
C		Blue: Battery communication status.
D		Yellow: RS485 communication status.
E	Function Button	ESC button: Leave from current interface or function
F		Up button: Move cursor to upside or increase value.
G		Down button: Move cursor to downside or decrease value.
H		OK button: Confirm the selection.
I	LCD Screen	Display the information of the inverter.

6.2 LCD function

Menu structure:

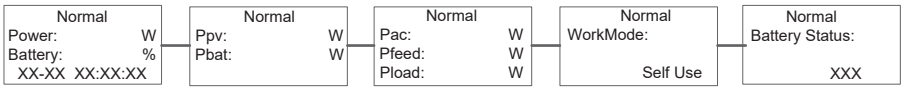




6.3 LCD operation

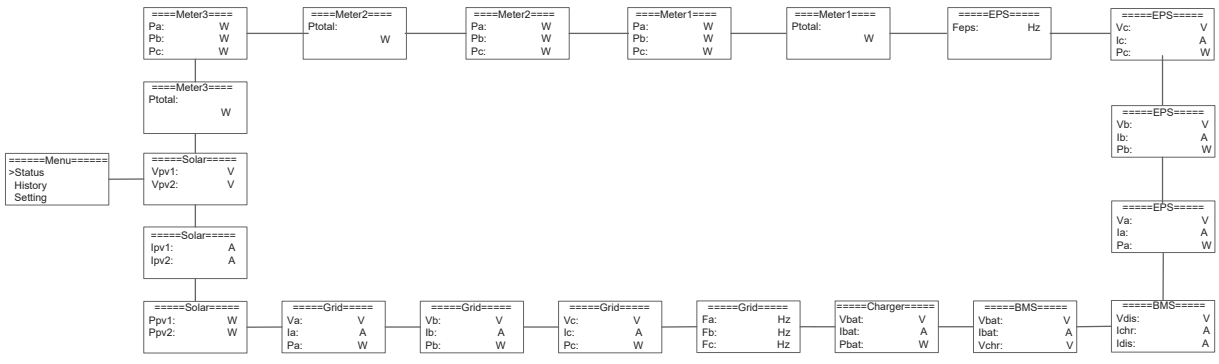
[1]. Main screen

The main screen as below. Press up or down for more information.



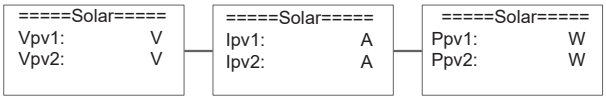
[2]. Status

Press ‘OK’ to enter the menu, check grid , solar, battery, EPS and temperature of the inverter. Press up and down to select, press ‘ESC’ to return to the Menu.



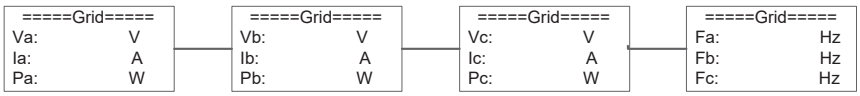
(2.1) Solar

This status shows the real time PV parameters of the system. The input voltage, current and power of each PV input. Press up and down button to review the parameter. Press 'ESC' to return to status.



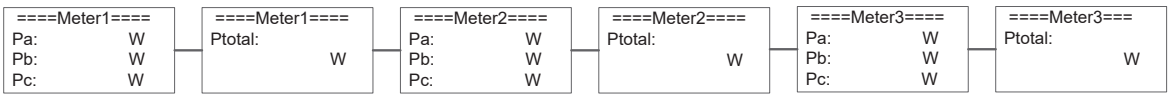
(2.2) Grid

This status shows the real time grid parameters such as voltage, current, output power and frequency. Pac measures the output of the inverter.
Press up and down button to review the parameter. Press 'ESC' to return to status.



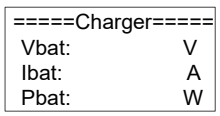
(2.3) Meter

This status shows the charger situation of the system. Include the battery voltage, charge or discharge current. Charge or discharge power. '+' means in charging; '–' means in discharging. Press up and down button to review the parameter. Press 'ESC' to return to Status.



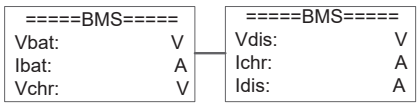
(2.4) Charger

This status shows the charger situation of the system. Include the battery voltage, charge or discharge current. Charge or discharge power. '+' means in charging; '–' means in discharging. Press up and down button to review the parameter. Press 'ESC' to return to Status.



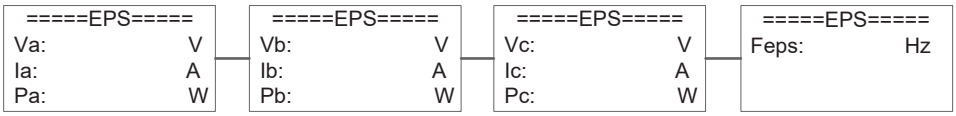
(2.5) BMS

This status shows the battery situation of the system. Include the battery voltage and current, charge and discharge voltage, charge and discharge current. '+' means in charging; '–' means in discharging. Press up and down button to review the parameter. Press 'ESC' to return to Status.



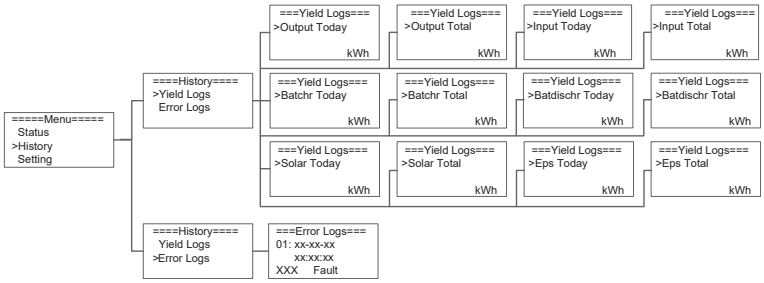
(2.6) EPS

EPS will only have data when the iverter is working in EPS mode, it will show the real time data of the EPS output. As voltage, current , power, frequency. Press up and down button to review the parameter. Press 'ESC' to return to Status.



[3]. History

The history function contains three aspects of the information: inverter yield, battery yield and error log. Press up and down to select, and review the data of system , press 'ESC' to return to the Menu.

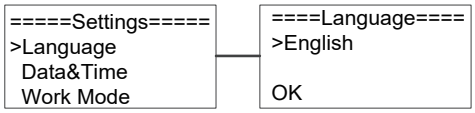


[4]. Settings

Setting function is used for set the inverter for language, date and time, work mode, communication address, advanced and so on.

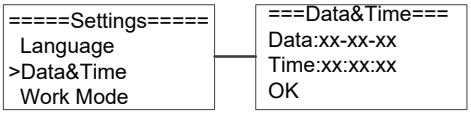
(4.1) Language

Press up or down button to change language. Press 'OK' to confirm.



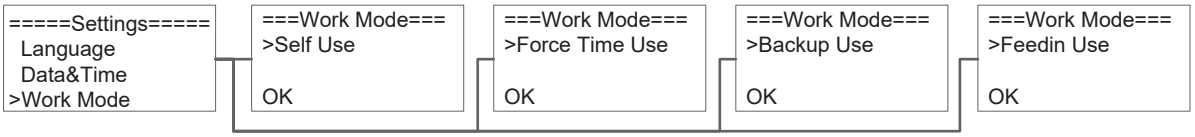
(4.2) Date Time

Press up or down button to change date and time. Press 'OK' to confirm.



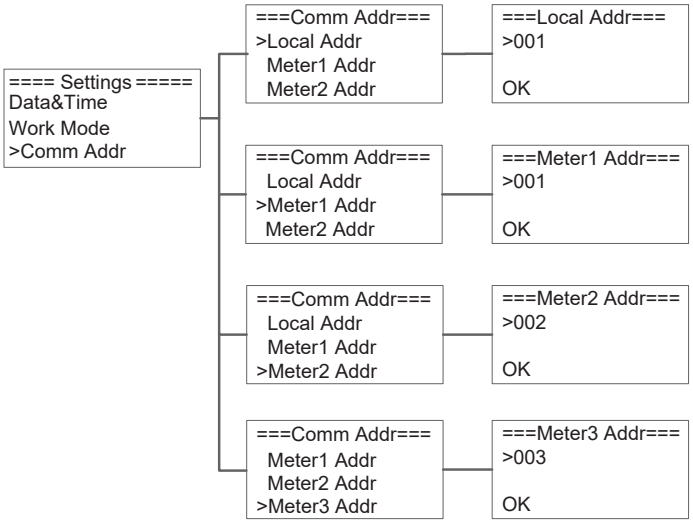
(4.3) Work Mode

Press up or down button to select different work modes. Press 'OK' to confirm.

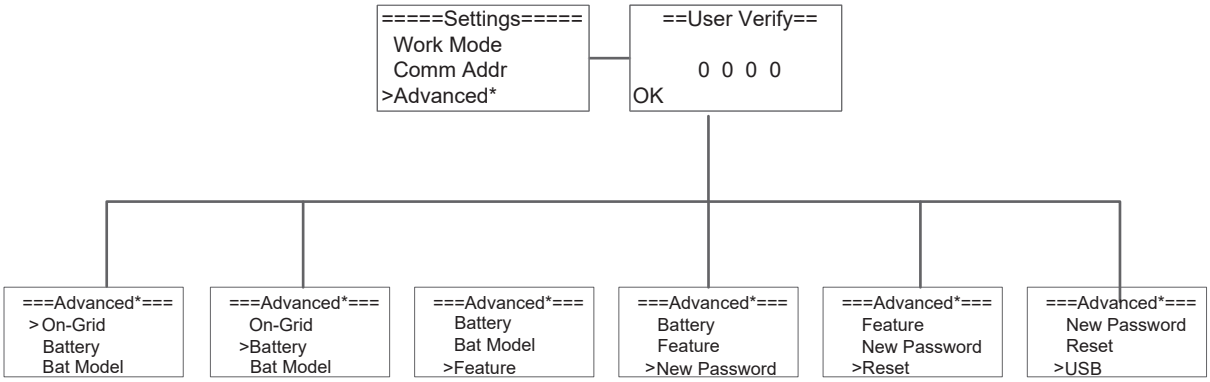


(4.4) Communication Address

Press up or down button to change address of local and meter. Press'OK'to confirm.

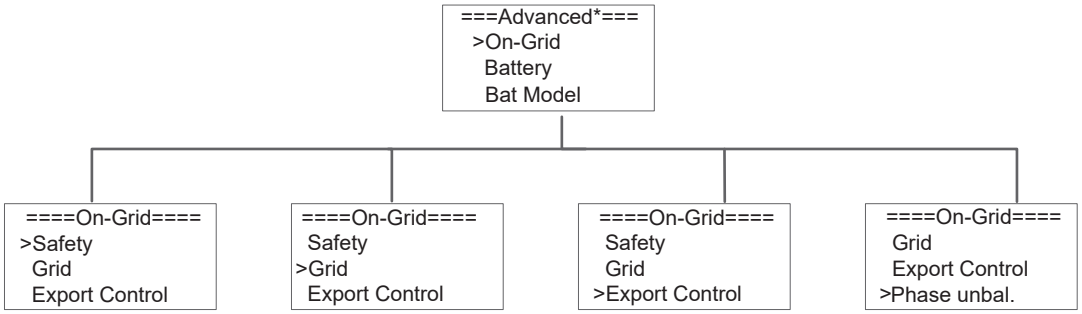


(4.5) Advanced settings require the original password '0000', Press'OK'to confirm.



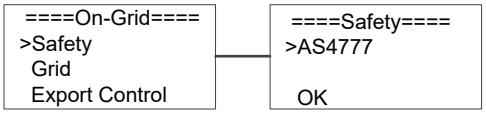
4.5.1) On-Grid

Press up or down button to change language. Press 'OK' to confirm.



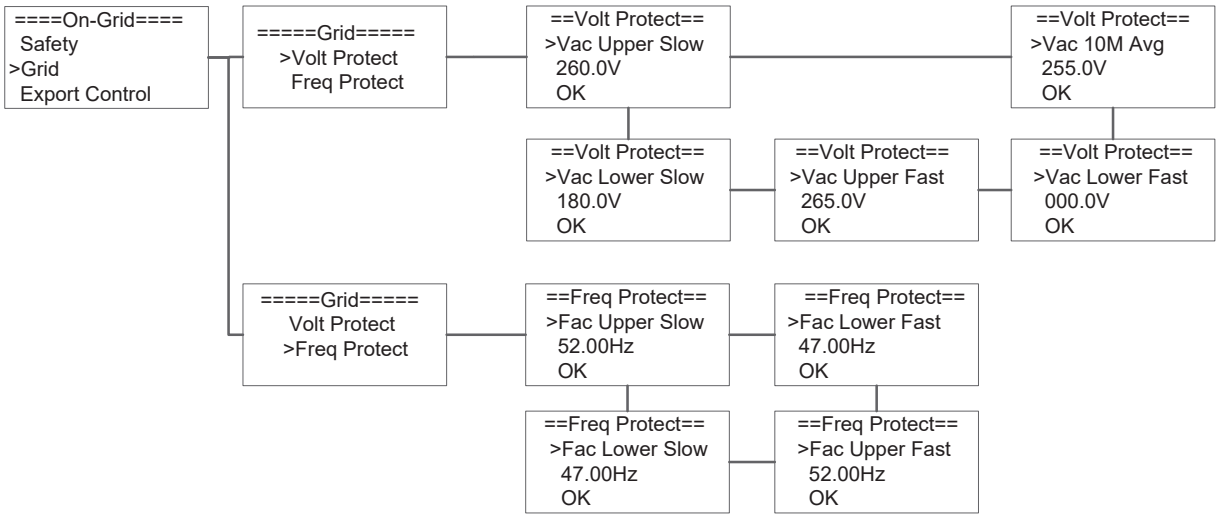
4.5.1.1 Safety

Press up or down button to change the grid code. Press 'OK' to confirm.



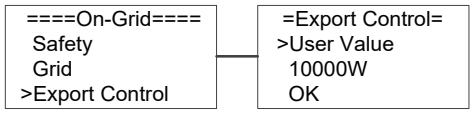
4.5.1.2 Grid

Press up or down button to change the value of grid voltage and grid frequency protect. Press 'OK' to confirm.



4.5.1.3) Export control

With this function the inverter can control the energy export to the grid. Press up or down button to change the export power. Press 'OK' to confirm.

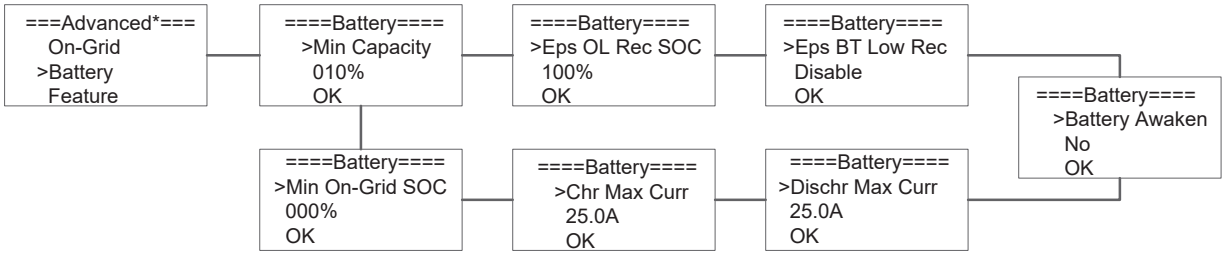


4.5.1.4) Phase unbal

When the system is connected with three-phase unbalanced load or single-phase load, customers can enable the phase unbalance function, the inverter can detect and identify the three-phase current unbalance in the system through the meter and output unbalanced power to different phase.

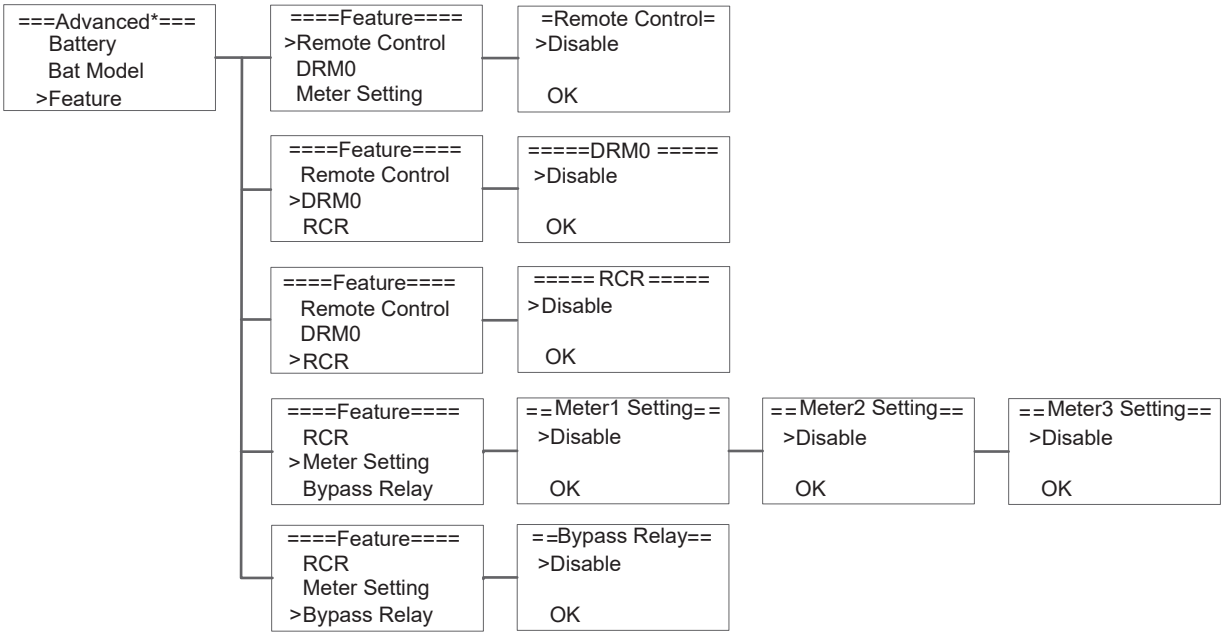
4.5.2) Battery

Press up or down button to set the parameters of battery. 'Eps BT Low Rec' means recovery enable switch when battery low capacity in EPS mode, 'Eps OL Rec SOC' means EPS overload due to low capacity for battery, if recovered, min soc. Press 'OK' to confirm.



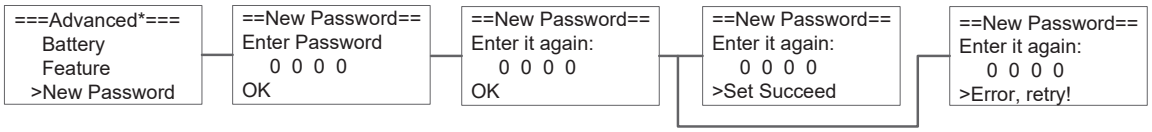
4.5.3) Feature

Press up or down button to enable or disable Remote Control, DRM0, RCR, Meter Setting, and Bypass Relay. Press 'OK' to confirm.



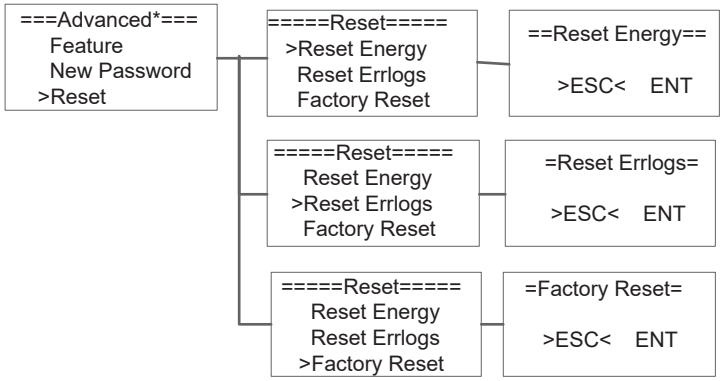
4.5.4) New Password

Press up or down button to set new password. Press 'OK' for more than 3 seconds to confirm.



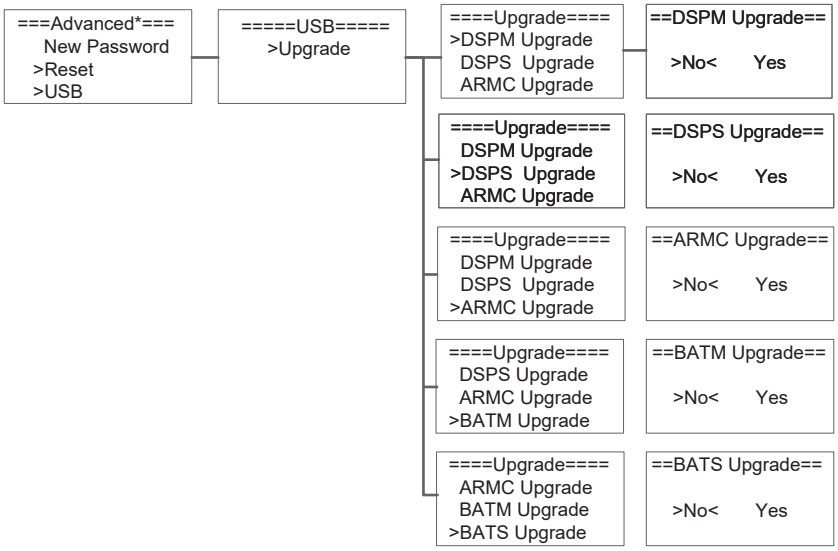
4.5.5) Reset

Press up or down button to set new password. Press 'OK' for more than 3 seconds to confirm.



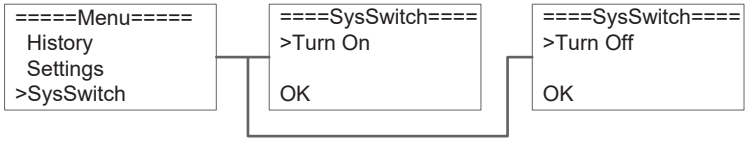
4.5.6) USB

Press up or down button to upgrade DSPM, DSPS, ARMC, BATM or BATS. Press 'OK' to confirm.



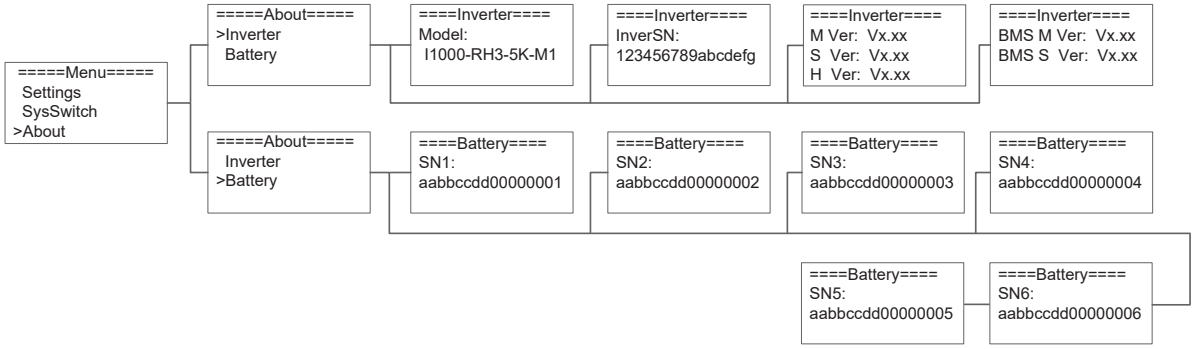
(5). System Switch

Press up or down button to turn on or turn off the inverter. Press 'OK' to confirm.



(6). About

This interface shows the information of the inverter, such as series number and software version.

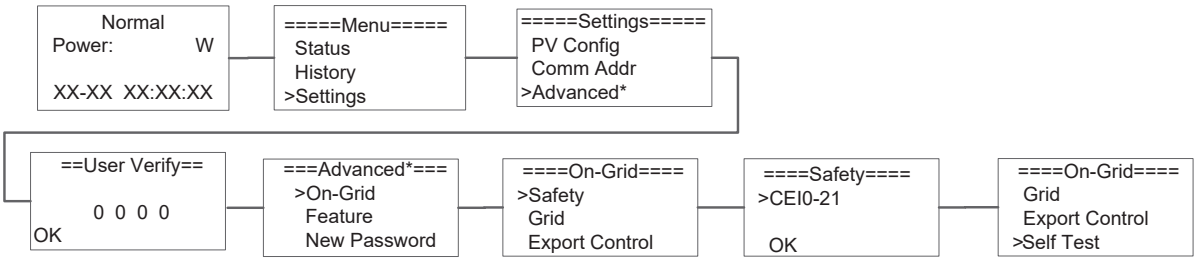


(7). Self-Test in accordance with CEI 0-21 (Applies to Italyonly)

The self-test is only required for inverters, which are commissioned in Italy. The talian standard requires that all invertersfeeding into the utility grid are equipped with a self-test function in accordance with CEI 0-21. During the self-test, theinverter will consecutively check the protection reaction times and values for overvoltage, under voltage, over frequencland under frequency.
Self-test function is available at any time. It also allows end user get test reports shown on LCD display.

Note: Users need to set the inverter country to CEI 0-21 before testing.

Auto-Test from screen:



7 Troubleshooting

This section contains information and procedures for solving possible problems with the I1000-RH3 series inverters, and provides you with trouble shooting tips to identify and solve most problems that could occur with the I1000-RH3 series inverters. This section will help you narrow down the source of any problems you may encounter. Please read the following trouble-shooting steps.

· Check the warning or fault messages on the System Control Panel or Fault codes on the inverter information panel. If a message is displayed, record it before doing anything further.
· Attempt the solution indicated in below table.

HW Protect Fault	Inverter over current or battery over current or PV over current detected by hardware. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
Grid Lost Fault	Grid is lost. · System will reconnect if the utility is back to normal. · Or seek help from us, if not go back to normal state.
Grid Volt Fault	Grid voltage out of range. · System will reconnect if the utility is back to normal. · Or seek help from us, if not go back to normal state.
Grid Freq Fault	Grid frequency out of range. · System will reconnect if the utility is back to normal. · Or seek help from us, if not go back to normal state.
PV Volt Fault	PV voltage out of range. · Please check the output voltage of PV panels. · Or seek for help from us.
Bus Volt Fault	Bus voltage out of range detected by hardware. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
Bat Volt Fault	Battery voltage fault. · Check if the battery input voltage is within the normal range. · Or seek help from us.
Vgrid 10M Fault	The grid voltage is out of range for the last 10 Minutes. · System will reconnect if the utility is back to normal. · Or seek help from us, if not go back to normal state.
DCI OCP Fault	DC component is out of limit in output current. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
DCI OVP Fault	DC component is out of limit in output voltage. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
SW OCP Fault	Output current high detected by software. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
RC OCP Fault	The residual current is high. · Please check if the insulation of electric wires is damaged. · Wait for a while to check if back to normal. · Or seek for help from us.
ISO Check Fault	The isolation is failed. · Please check if the insulation of electric wires is damaged. · Wait for a while to check if back to normal. · Or seek for help from us.
Temp Over Fault	The inverter temperature is high. · Please check if the environment temperature. · Wait for a while to check if back to normal. · Or seek for help from us.
BatConDir Fault	The battery connection is reversed. · Check if the positive pole and negative pole of battery are correctly connected. · Or seek help from us.

AD Sample Fault	The sample value between master and slave is not consistent. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
EPS Over Load	Over load in off grid mode. · Please check if the eps load power exceeds the limit. · Or seek for help from us.
Bat Low Fault	The battery power is low. · Wait the battery to be recharged. · Or seek for help from us.
ByPassRelayFault	By pass relay fault · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
SPI CommFault	The communication between master and slave fault ·Disconnect solar power PV+ , PV- and battery, reconnect them. ·Or seek help from us, if cannot go back to normal state.
BMS_Lost	The communication between BMS and Inverter is interrupted. · Check if the communication cable between BMS and Inverter is correctly and well connected.
Inter Fan Fault	Fan Device Fault · Disconnect solar power PV+ , PV- and battery, reconnect them. · Check if the fan is stopped by dust or other foreign. · Or seek help from us, if cannot go back to normal state.
AC HCT Fault	AC Current Sensor Fault · Disconnect solar power PV+ , PV- and battery, reconnect them. · Or seek help from us, if cannot go back to normal state.
Inv EEPROM Fault	The master eeprom is fault. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
GFCI HW Fault	The residual current circuit is fault. · Please check if the insulation of electric wires is damaged. · Wait for a while to check if back to normal. · Or seek for help from us.
EPS Relay Fault	The EPS relay always keep open. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
Grid Relay Fault	The grid relay always keep close. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.
Other Dev Fault	Other device fault. · Turn off the PV, battery and grid , reconnect them. · Or seek for help from us if cannot back to normal.
Mgr EEPROM Fault	The manager eeprom is fault. · Disconnect PV, grid and battery, then reconnect. · Or seek help from us, if not go back to normal state.

Meter Lost Fault	The communication between meter and Inverter is interrupted. · Check if the communication cable between meter and Inverter is correctly and well connected.
Dsp Lost Fault	SCI communication fault ·Disconnect solar power PV+ , PV- and battery, reconnect them. ·Or seek help from us, if cannot go back to normal state.
BMS Volt Fault	Battery voltage sensor error · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS Tepr Fault	Battery temperature sensor error · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS IN_COM Fault	BMS internal communication fault. · Disconnect battery, check wiring between inverter and battery， battery internal wiring then reconnect. · Or seek help from us, if not go back to normal state.
BMS Dcov Fault	Battery input over voltage error · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS RV Fault	Battery input transposition error · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS Relay Fault	The battery relay is fault. · Disconnect battery, then reconnect. · Or seek help from us, if not go back to normal state.
BMS Cell Fault	Battery cell error · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS Other Fault	Battery other error · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS Protect OV	Battery over voltage protect · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS Protect LV	Battery under voltage protect · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS Protect ChrOC	Battery over current charging protect · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS Protect DishargeOC	Battery over current discharging protect · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.
BMS Protect TemHigh	Battery temperature is high · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state.

BMS Protect TemLow	Battery temperature is low · Wait for 5 minutes,, check again. · Or seek help from us, if not go back to normal state

Remark

If your inverter's information panel is not displaying a Fault light, check the following to make sure that the present state of the installa tion 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 GS ESS 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.

8 Decommissioning

8.1 Dementling the inverter

· Disconnect the inverter from DC input and AC output.
· Disconnect battery wiring.
· Wait for 5 minutes for de-energizing.
· Disconnect communication and optional connection wiring.
· Remove the inverter from the bracket.

8.2 Packaging

If possible, please pack the inverter with the original packaging.
If it is no longer available, you can also use an equivalent carton that meets the following requirements.
· Suitable for loads more than 25kg.
· With handle.
· Can be fully closed.

8.3 Storage

Store the inverter in dry place where ambient temperatures are always between -20 °C - +60 °C.

8.4 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.

8.5 Disposal

When the inverter or other related components need to be disposed, have it carried out according to local waste handling regulations. For safe disposal, take inverter to appropriate waste recycling centre in your local area.

ENERGY
storage system

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