User Manual

HI-5～12K-TH, HI-15～25K-TH

V1.5

INHENERGY CO., LTD.

CONTENTS

1 Notes on this manual

1.1 Validity

This manual describes the assembly, installation, commissioning and maintenance of the following Inhenergy hybird inverters model:

HI-5K-TH
HI-6K-TH
HI-8K-TH
HI-10K-TH
HI-12K-TH
HI-15K-TH
HI-20K-TH
HI-25K-TH

Target Group

This manual is for qualified personnel. Qualified personnel have received training and have demonstrated skills and knowledge in the construction and operation of this device. Qualified Personnel are trained to deal with the dangers and hazards involved in installing electric devices.

Additional information

Find further information on special topics in the download area at www.inhenergy.com. The manual and other documents must be stored in a convenient place and be available at all times. We assume no liability for any damage caused by failure to observe these instructions. For possible changes in this manual, Inhenergy Co., Ltd. accepts no responsibilities to inform the users.

1.2 Symbols in this document

Please pay close attention to all the symbols for the purpose of avoiding possible personal injury or equipment break down.

Symbol	description
	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
	NOTICE is used to address practices not related to personal injury.
	Information that you must read and know to ensure optimal operation of the system.

Markings on this product

Symbol	Explanation
	Caution, risk of electric shock.
	Caution, hot surface.
	Operation after 5 minutes.
	Read the manual.
	Point of connection for grounding protection.
	CE mark. The inverter complies with the requirements of the applicable CE guidelines.
	The inverter must not be disposed of with the household waste.
	Warning, high voltage.

2 Overview

2.1 Product Introduction

Function

HI-5/25K-TH series, also called hybrid or bidirectional solar inverters, apply to solar system with participation of PV, battery, loads and grid system for energy management. The energy produced by PV system shall be used to optimize self-consumption, excess power charge battery and the rest power could be exported to the grid. Battery shall discharge to support loads when PV power is insufficient to meet self-consumption. If battery power is not sufficient, the system will take power from grid to support loads.

Models

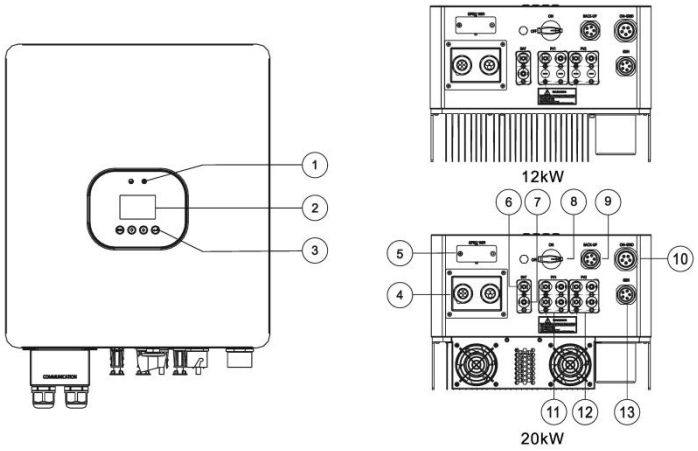
This document involves the following product models:
HI-5K-TH,HI-6K-TH,HI-8K-TH,HI-10K-TH,HI-12K-TH,HI-15K-TH,HI-20K-TH,HI-25K-TH.
Model description (HI-20K-TH is used as an example)

HI - 20K-TH
1 2 3

Model description

Icon	Meaning	Description
1	Product	Hybrid inverter.
2	Power level	20K:The rated power is 20 kW.
3	Topology	TL:Three phase low voltage battery. TH:Three phase high voltage battery.

2.2 Appearance



① LED indicator ② LCD display ③ Function button ④ Communication port ⑤ GPRS/WIFI output port ⑥ Battery Terminals (+) ⑦ Battery Terminals (-) ⑧ DC switch ⑨ Back-Up Port ⑩ On-Grid Port ⑪ DC input terminals (PV1) ⑫ DC input terminals (PV2) ⑬ GEN Port

LED indicator description

Category	Status	Meaning
	Green light on	Normal status
	Green light blinking	Alarm status
	Red light on	Fault status
	Blinking red at short intervals	Software updating

Function button description

Category	Description
ESC	ESC button: Return from current interface or function.
	Down button: Move cursor to downside or decrease value.
	Up button: Move cursor to upside or increase value.
	OK button: Confirm the selection.

3 Installation

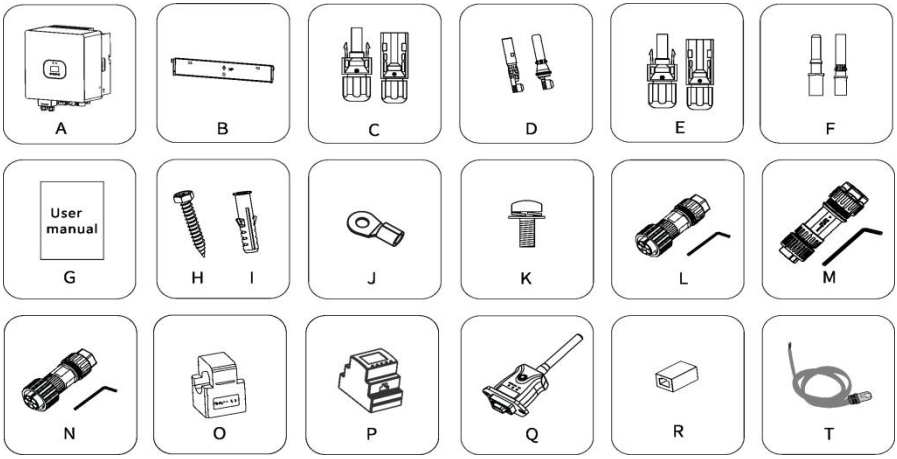
3.1 Check for Physical Damage

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

3.2 Packing List

Open the package and take out the product, please check the accessories first.

The packing list shown as below.



Object	Description	Quantity
A	Inverter	1
B	Bracket	1
C	5-12KW:PV connectors (2*positive,2*negative) 15-25KW:PV connectors (4*positive,4*negative)	2/2 4/4
D	5-12KW:PV pin connectors (2*positive, 2*negative) 15-25KW:PV pin connectors (4*positive, 4*negative)	2/2 4/4
E	Battery connectors(1*positive,1*negative)	1/1
F	Battery pin connectors(1*positive,1*negative)	1/1
G	User manual	1
H	Expansion screws	3
I	Expansion tubes	3
J	Ring terminal	1
K	Set screw(for mounting, external enclosure grounding)	3
L	Back-up connector	1
M	On-grid output connector	1
N	GEN connector(Blue)	1
O	CT	3
P	Meter	1
Q	Wi-Fi module (optional)	1
*R	RJ45 connector	1
T	Net cable	1

* R:When the length of CT wire cannot meet the use requirements, the CT communication wire can be extended through RJ45 connector.

3.3 Mounting

Installation Precaution

HI-5/25K-TH series inverter is designed for outdoor installation (IP 66).

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 in environment of precipitation or humidity (> 95%).

◆ Under good ventilation condition.

◆ The ambient temperature in the range of -20℃ to +60℃.

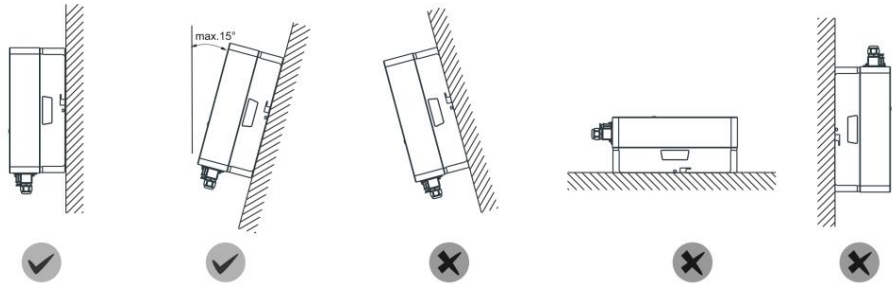
◆ The wall hanging the inverter should meet conditions below:

1.Solid brick/concrete, or strength equivalent mounting surface.

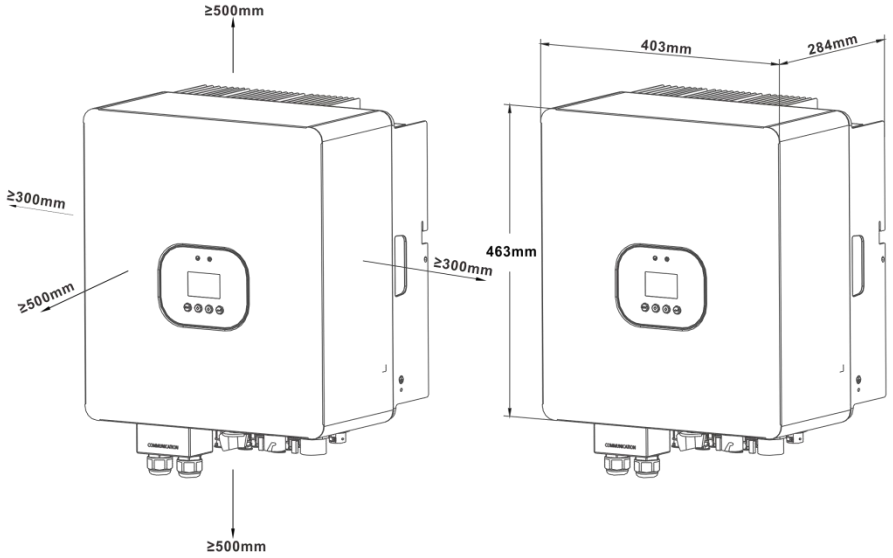
2.Inverter must be supported or strengthened if the wall's strength isn't enough(such as wooden wall, the wall covered by thick layer of decoration).

Please avoid direct sunlight, rain exposure, snow laying up during.

◆ The slope of the wall should be within 15°.



3.4 Space Requirement



3.5 Mounting Steps

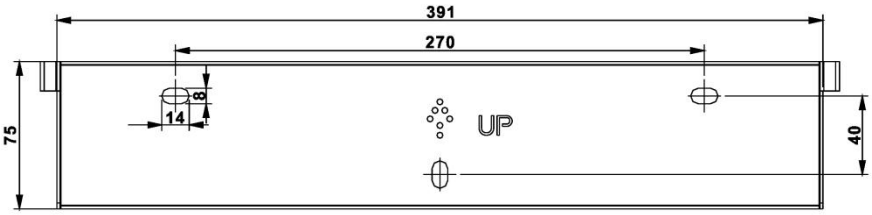
1.Use the wall bracket as a template to mark the position of the 3 holes on the wall (unit:mm).

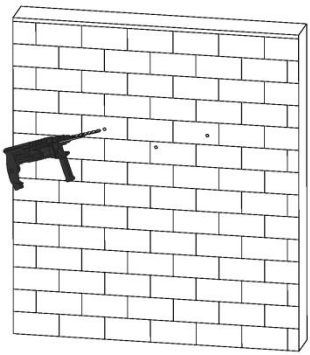
2.Drill holes with driller, make sure the holes are deep enough (at least 60mm) for installation, and then tighten the expansion tubes.

3.Install the expansion tubes in the holes, and tighten them. Then install the wall bracket by using the expansion screws. (Φ10 driller, torque: 2.5±0.2Nm).

4.Hang the inverter over the bracket, move the inverter close to it, slightly lay down the inverter, and make sure the 2 mounting bars on the back are fixed well with the 2 grooves on the bracket.

5.After confirming the inverter is fixed reliably, fasten two M5 safety-lock sockets head cap screws on the right or left side firmly to prevent the inverter from being lifted off the bracket (torque: 2.0±0.2Nm).





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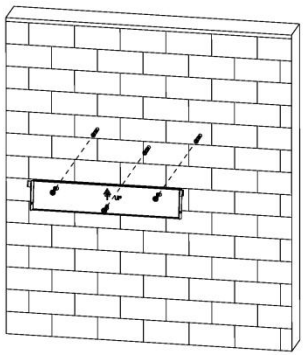

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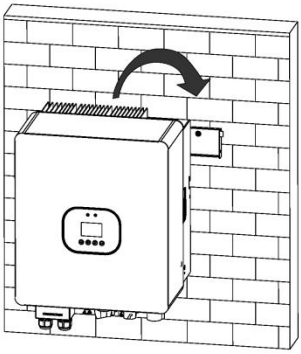

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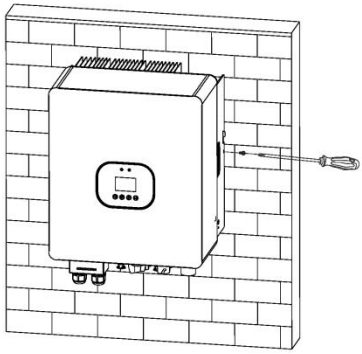


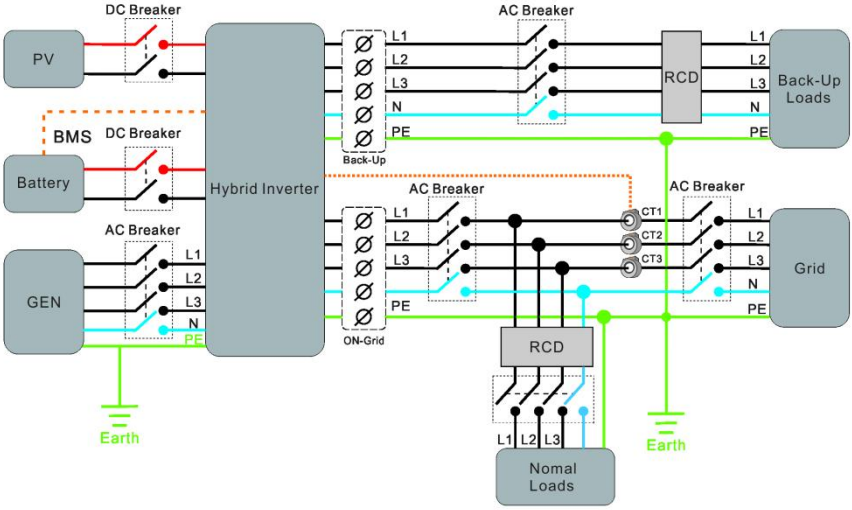
④

4 Electrical Connection

CAUTION	◆ For Australian safety country, the neutral cable of On-Grid side and Back-Up side must be connected together, otherwise Back-Up function will not work.

System connection diagrams:

This diagram is an example for grid systems without special requirementon electrical wiring connection.
For countries such as Australia, New Zealand, South Africa, etc., please follow local wiring regulations!



4.1 PV Connection

◆ Conditions for DC Connection

The inverter has 2 independent input: PV1 & PV2 Notice that the connectors are in paired (male and female connectors). The connectors for PV arrays and inverters are H4 connectors;

DANGER	The solar modules connected to the inverter must conform to the Class A requirements of the IEC 61730 standard.

<table>
<tr><td rowspan="4">CAUTION</td><td colspan="3">If the inverter is not equipped with a DC switch but this is mandatory in the country of installation, install an external DC switch. The following limit values at the DC input of the inverter must not be exceeded.</td></tr>
<tr><td>Model</td><td>Max current PV1</td><td>Max current PV2</td></tr>
<tr><td>5K-12K</td><td>20A</td><td>20A</td></tr>
<tr><td>15-25K</td><td>30A</td><td>30A</td></tr>
</table>

◆ Connecting the PV Array

DANGER	Danger to life due to lethal voltages! ◆ PV array supplies DC voltage to inverter when exposed to light, before connecting the PV array, cover some light screens above PV arrays, ensure that the DC switch and AC breaker are disconnect from the inverter. NEVER connect or disconnect the DC connectors under load. ◆ Make sure the maximum open circuit voltage(Voc) of each PV string is less than the maximum input voltage of the inverter. ◆ Check the design of the PV plant. The Max. open circuit voltage, which can occur at solar panels temperature of -10℃, must not exceed the Max. input voltage of the inverter.
CAUTION	◆ Improper operation during the wiring process can cause fatal injury to operator or unrecoverable damage to the inverter. Only qualified personnel can perform the wiring work. ◆ Please don't connect PV array positive or negative pole to the ground, it could cause serious damages to the inverter. ◆ Check the connection cables of the PV modules for correct polarity and make sure that the maximum input voltage of the inverter is not exceeded.

Connection Steps:

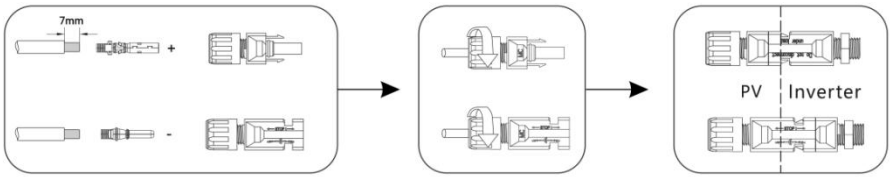
1.Choose the 12 AWG wire to connect with the cold-pressed terminal.

2.Remove 7mm of insulation from the end of wire.

3.Insert the insulation into pin contact and use crimping plier to clamp it.

4.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.

5.Plug the PV connector into the corresponding PV connector on inverter.



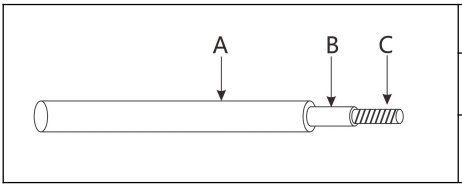
4.2 Battery Connection

◆ Lead-Acid and other similar older-technology battery types require experienced and precise design, installation and maintenance to work effectively. For lead-acid battery bank, the inconformity between battery cells might lead to battery cell over-charge or discharge, and further might damage battery cells and shorten battery bank life.

◆ For lithium battery (pack) the capacity should be 50Ah or larger. Battery cable requirement as below.

Table 1 Cable recommended

It is recommended that all cables are made of copper core. If aluminum cables are used, use copper-aluminum conversion terminals. Direct contact between copper terminal and aluminum wire will cause electrochemical corrosion and affect the reliability of electrical connection.



A	O.D	13-18mm
B	Isolation section	NA
C	Area	10mm²or 8AWG

◆ Please be careful against any electric shock or chemical hazard.

◆ Make sure there is an external DC switch connected for battery without build-in DC switch.

Battery wiring connection steps as below:

CAUTION	◆ Make sure battery switch is off and battery nominal voltage meet specification before connecting battery to inverter and make sure inverter is totally isolated from PV and AC power. ◆ Please make sure polarity (+/-) of battery are not reversed.

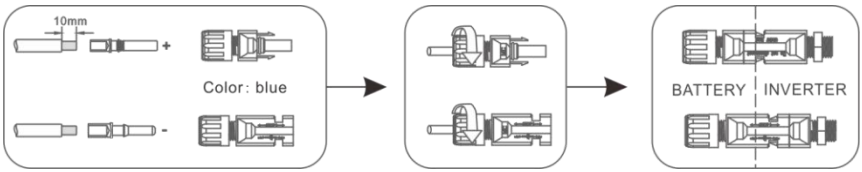
1.Choose the 12 AWG wire to connect with the cold-pressed terminal.

2.Remove 7mm of insulation from the end of wire.

3.Insert the insulation into pin contact and use crimping plier to clamp it.

4.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.

5.Plug the PV connector into the corresponding PV connector on inverter.



4.3 On-Grid& Back-UP&GEN Connection

An external AC switch is needed for on-grid connection to isolate from grid when necessary.

CAUTION	◆ Make sure inverter is totally isolated from any DC or AC power before connecting AC cable. ◆ Please connect in strict accordance with the phase sequence, otherwise the machine cannot work normally.

Connection Steps

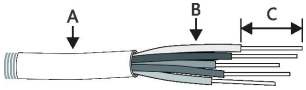
1.Choose the appropriate wire, Wire Stripping (Cable size: refer to Table).

2.Set the parts on the cable one by one.

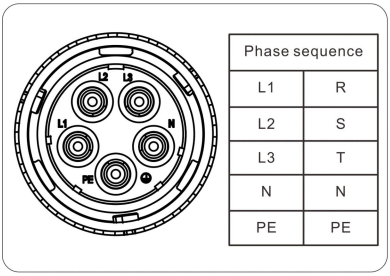
3.Wire crimping cord end terminal can be inserted into the housing quickly according to the sign.

4.Insert Seal and Clamp Finger into socket, then tighten the nut.

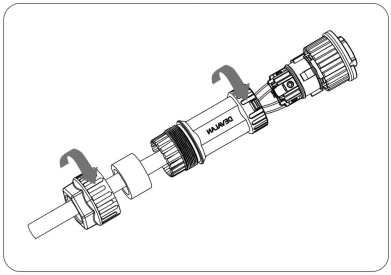
On-Grid Connection:

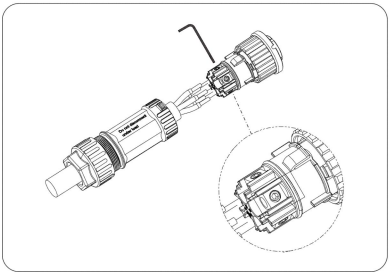


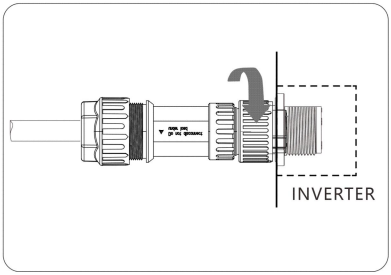
A	Diameter	21-26mm
B	Area	10mm²or 6AWG
C	Length	11mm



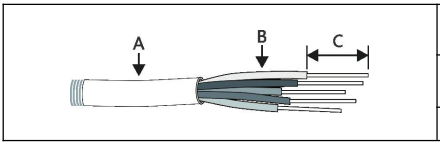
Phase sequence	
L1	R
L2	S
L3	T
N	N
PE	PE



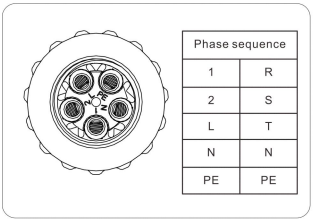




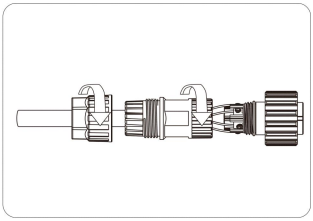
Back-UP Connection(Black):

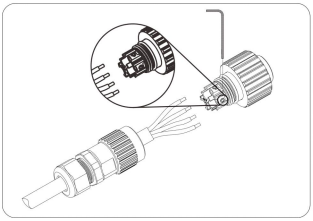


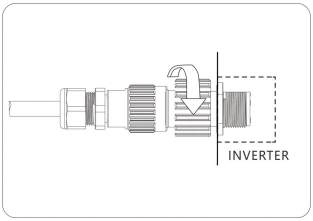
A	Diameter	10-14mm
B	Area	6mm²or 10AWG
C	Length	10mm



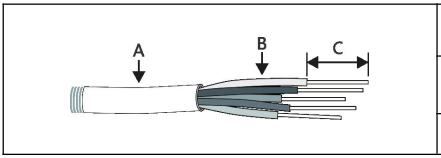
Phase sequence	
1	R
2	S
L	T
N	N
PE	PE



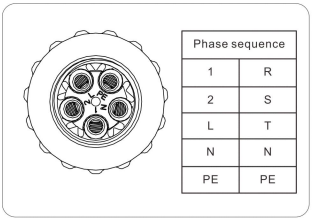


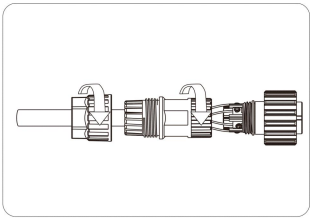


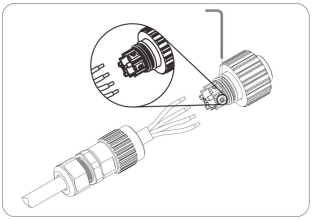
GEN Connection(BLUE)：

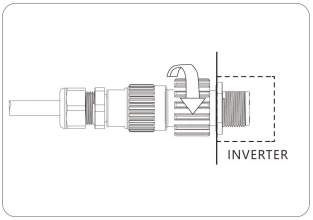


A	Diameter	10-14mm
B	Area	6mm²or 10AWG
C	Length	10mm









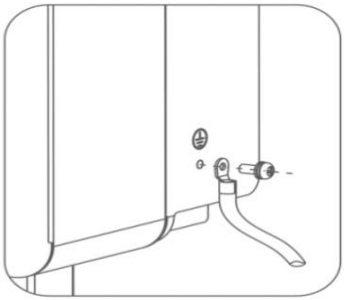
4.4 Earth Connection

Users must additionally earth the inverter to the enclosure of a second earthing or equipotential bonding. This prevents electric shock if the original protective conductor fails.

Earth Connection Steps:

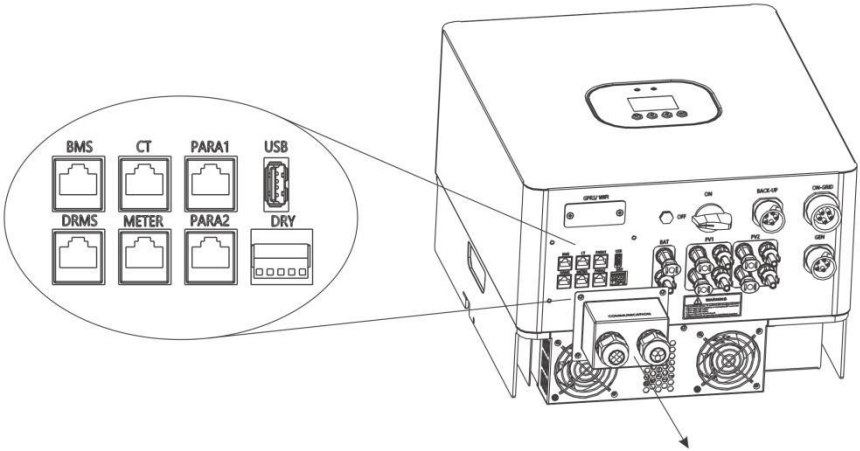
1.Strip the earthing cable insulation and insert the stripped cable into the ring terminal, then clamp it.

2.Place the ring terminal into the earthing rod and screw the earthing screw tightly.



4.5 Communication Connection

1.Function port definition



Object	Category	Description
1	BMS	RS485/CAN/NTC port for battery communication
2	DRMS	For Australia market only
3	CT	Current transformer port
4	METER	Meter communication port
5	PARA1	Parallel port 1
6	PARA2	Parallel port 2
7	USB	Upgrade firmware program port
8	DRY	External devices communication port

◆ Make sure use standard RJ45 cable and plug, as below

Pin	BMS	CT	DRMS	METER
1	RS485B	GND-S	DRM1/5	/
2	RS485A	CT3_N	DRM2/6	/

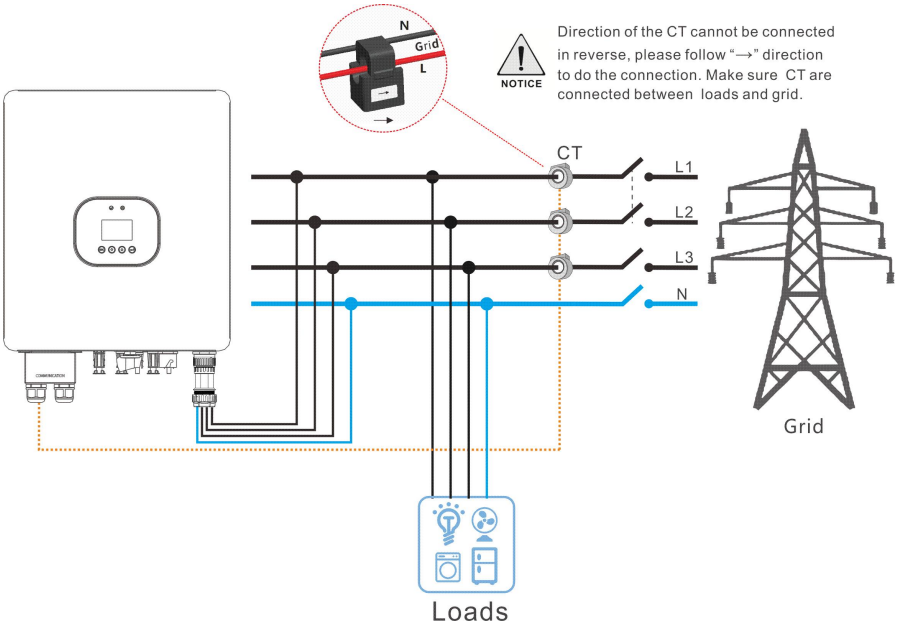
3	GND-S	CT3_P	DRM3/7	/
4	CANH	CT_ON+	DRM4/8	/
5	CANL	CT2_N	DRM_REF	METER1.485L
6	NTC.BAT	CT2_P	DRM_COM	METER1.485L
7	Wake-	CT1_N	RS485A	METER1.485H
8	Wake+	CT1_P	RS485B	METER1.485H

2.CT Connection

◆ The CT in product box is compulsory for inverter system installation, used to detect grid voltage and current direction and magnitude, further to instruct the operation condition of inverter via RS485 communication.

CAUTION	◆ Make sure inverter is totally isolated from any DC or AC power before connecting AC cable. ◆Direction of the CT cannot be connected in reverse, please follow "K→L" direction to do the connection. Make sure CT are connected between loads and grid.

CT Connection Diagram:

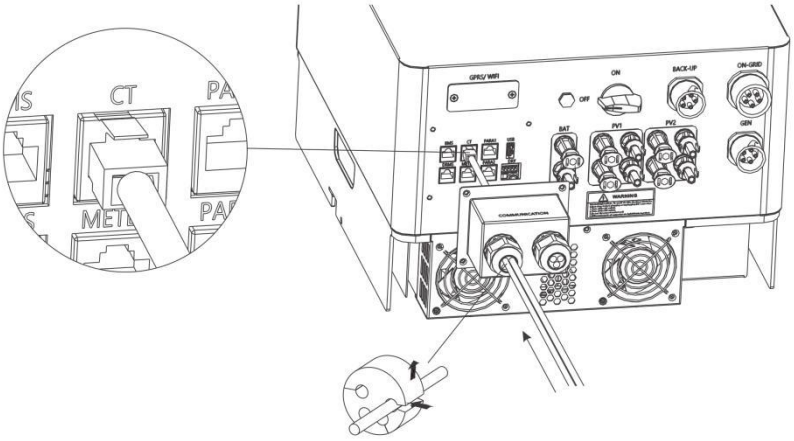


Connection Steps:

1.Uninstall the “CT” cable from the accessory bag.

2.Thread the “CT” cable through the cable gland.

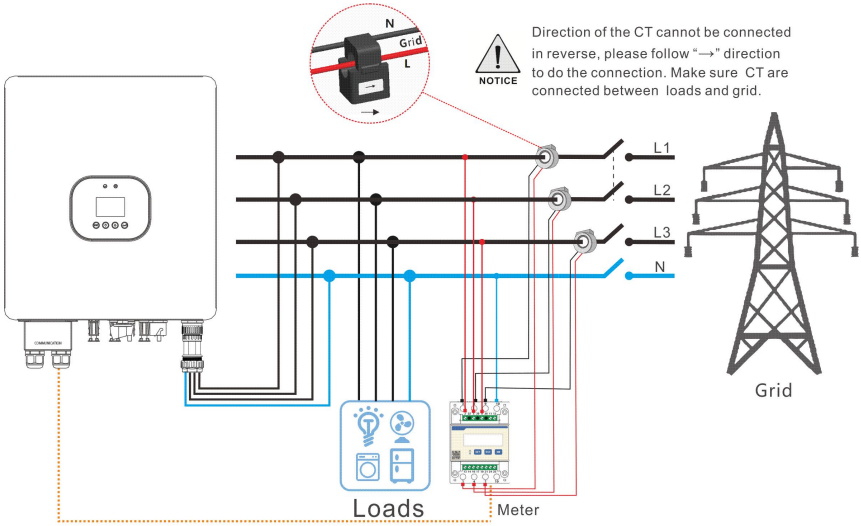
3.Insert the RJ45 plug of the network cable into the “CT” pin connector on the inverter until it snaps into place. The completed appearance is like the below figure.

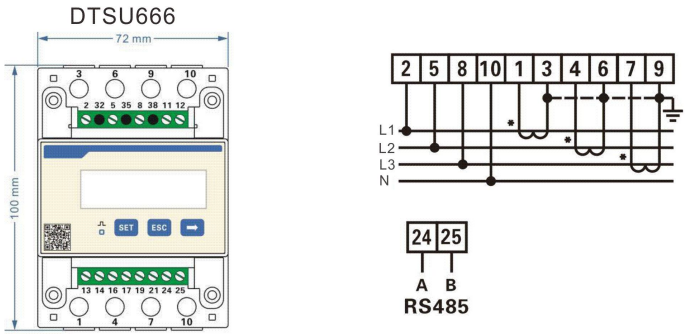


3.Meter Connection

◆ The meter is optional, used to detect grid voltage and current direction and magnitude, further to instruct the operation condition of inverter via RS485 communication.

Meter Connection Diagram:



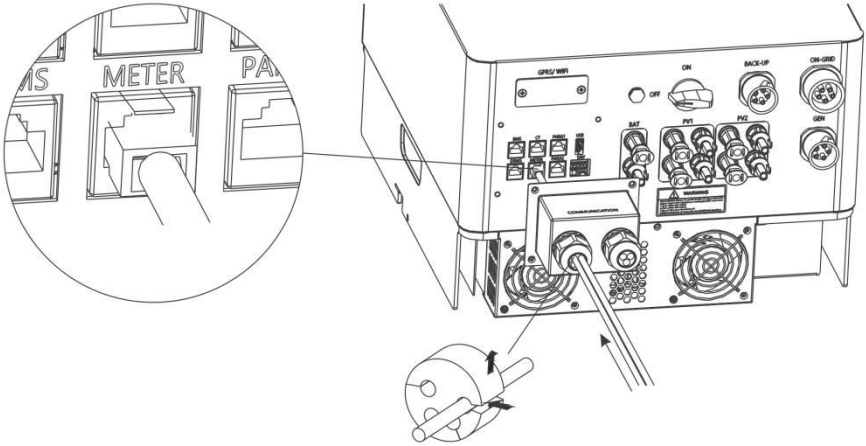


Connection Steps:

1.Uninstall the “CT” and Meter from the accessory bag.

2.Connect the wires according to the wiring diagram and clamp the CT onto the cable.

3.Crimp the RJ45 plug according to the corresponding pin position and insert it into the "METER" interface on the inverter until it clicks into place. The completed appearance is like the below figure.



RJ45-Pin	METER	Meter-Pin
1	/	/
2	/	
3	/	/
4	/	
5	METER1.485L	25
6	METER1.485L	
7	METER1.485H	24
8	METER1.485H	

4.BMS Connection

◆ Using CAN or RS485 communication with lithium batteries.

◆ Using lead-acid batteries, a temperature sensor must be connected.

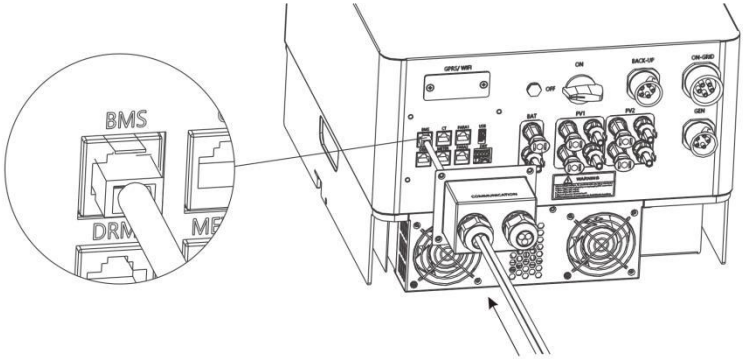
CAUTION	◆If you are using a lead-acid battery, you do not need to install CAN or RS485 communication. ◆The CAN battery communication and RS485 battery communication can't be installed at same time.

Connection Steps:

1.Prepare communication cable.

2.Thread the “BMS” cable through the cable gland.

3.Insert the RJ45 plug of the network cable into the “BMS” pin connector on the inverter until it snaps into place. the completed appearance is like the below figure.



5.DRMS Connection

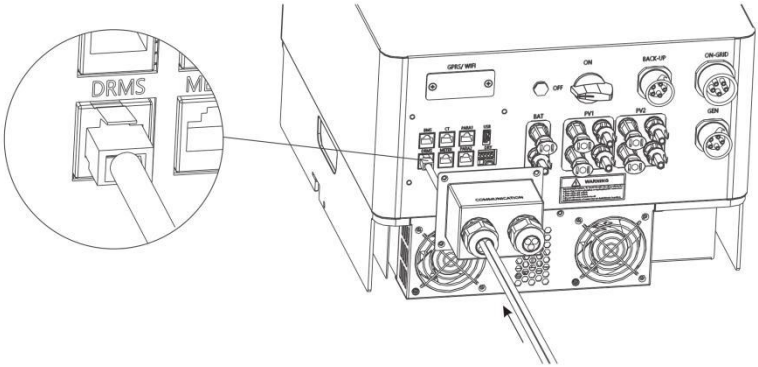
◆ DRMS is only for Australian and New Zealand installations, in compliance with Australian and New Zealand safety requirements. Detailed connection of DRMS device is shown below:

Connection Steps:

1.Prepare communication cable.

2.Thread the “DRMS” cable through the cable gland.

3.Insert the RJ45 plug of the network cable into the “DRMS” pin connector on the inverter until it snaps into place. the completed appearance is like the below figure.



5 Powering On the System

 CAUTION	Before turning on the AC switch between the inverter and the power grid, use a multimeter set to the AC position to check that the AC voltage is within the specified range.

5.1 Suggested Start-Up the inverter

1.Turn on the DC switch between the battery and the inverter.

2.Turn on the DC switch between the PV string and the inverter.

3.Turn on the DC switch at the bottom of the inverter.

4.Turn on the AC switch between the inverter and the power grid.

5. If the battery is lithium, turn on the switch on the battery.

6. Observe the LEDs to check the operating status of the inverter.

6 Powering Off the System

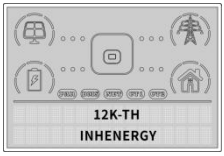
 CAUTION	Do not disconnect the DC connectors under load.

Suggested Turn-off the inverter step:

1. Press and hold the "Enter" button for 3S to enter the shutdown interface and select "OFF".
2. Turn off the AC switch between the inverter and the power grid.
3. Turn off the DC switch between the PV string and the inverter.
4. Turn off the DC switch at the bottom of the inverter.
5. Turn off the DC switch between the battery and the inverter.
6. Check the inverter operating status.
7. Waiting until LED, OLED have gone out, the inverter is shut down.

7 LCD Operation

When the system started up successfully, the startup animation of the inverter displays all patterns, models, and brand, the following figure shows the interface.



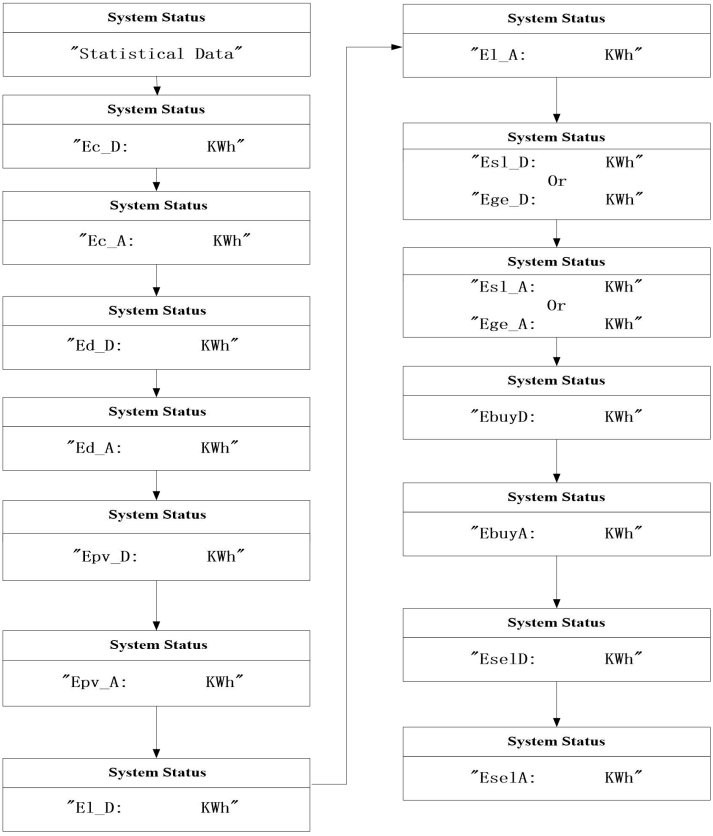
In normal, it will turn on page automatically, when pushing the button “Down”, the order of the paging information as follow:

Notes:

Display	Meaning
Vb/Cb & Vbat	Vb and Vbat represent battery voltage, while Cb represents battery SOC.
Pbat	Battery charging and discharging power.
PV1	Voltage and power of PV1.
PV2	Voltage and power of PV2.
GridR	Voltage and frequency of the R-phase of the On-grid.
GridS	Voltage and frequency of the S-phase of the On-grid.
GridT	Voltage and frequency of the T-phase of the On-grid.
IvR	Power of inverter R-phase.
IvS	Power of inverter S-phase.
IvT	Power of inverter T-phase.
EpR	Voltage and power of the R-phase of the Back-UP.
EpS	Voltage and power of the S-phase of the Back-UP.
EpT	Voltage and power of the T-phase of the Back-UP.
GeR	Voltage and power of the R-phase of the GEN.
GeS	Voltage and power of the S-phase of the GEN.
GeT	Voltage and power of the T-phase of the GEN.
CT1_R	Power of meter R-phase.
CT1_S	Power of meter S-phase.
CT1_T	Power of meter T-phase.

Statistical Data	Electricity consumption display menu entry.
FW Version	Press Enter to view DSP and ARM software versions.
Model	Mode number.
Serial Number	SN code.
Time	Before using the system, set the display time based on the local time in the Setting menu.

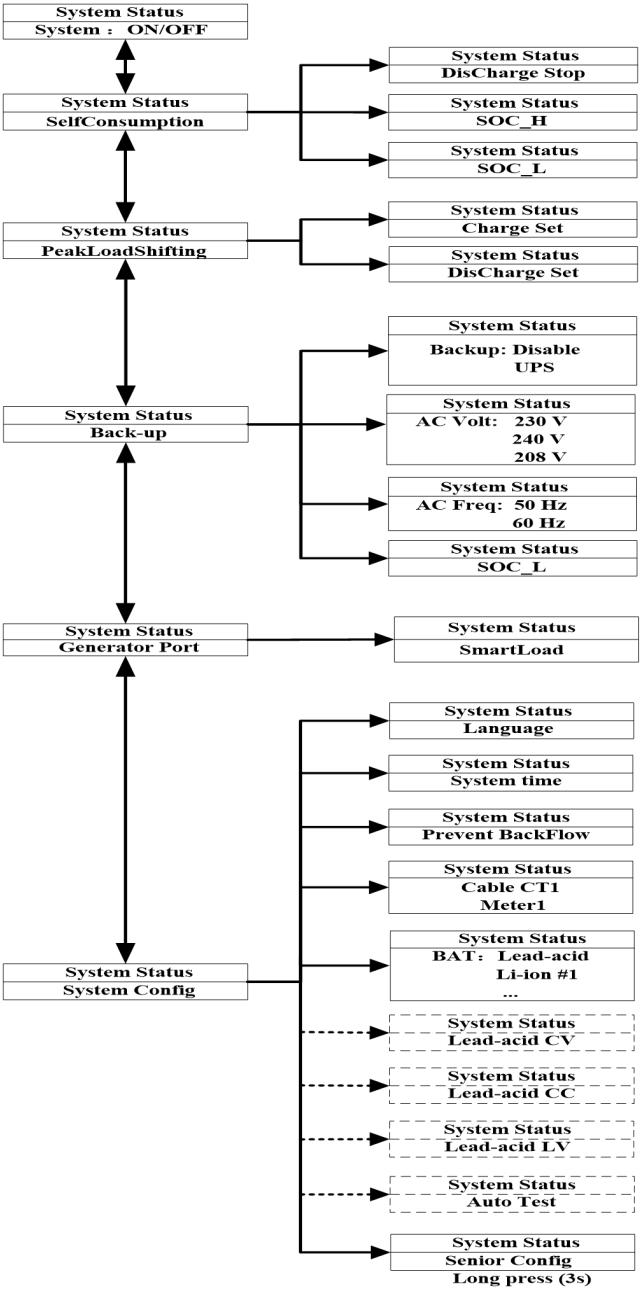
Press ENTER in the main page to enter the statistics menu, which is the value of electricity consumption statistics.



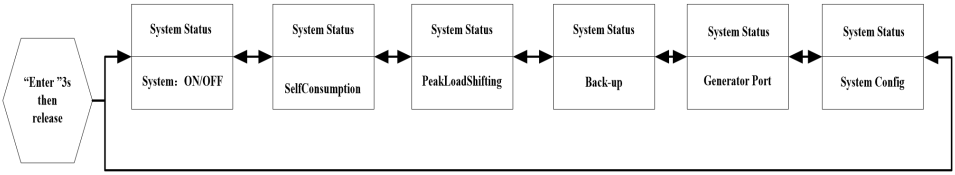
Notes:

Display	Meaning
Ec_D	The amount of battery charge that day.
Ec_A	Total battery charging capacity.
Ed_D	The amount of battery discharge that day.
Ed_A	Total battery discharging capacity.
Epv_D	PV power of the day.
Epv_A	Total PV capacity.
El_D	Electricity consumption of the day's load.
El_A	Total load electricity consumption.
Esl_D & Ege_D	When the GEN port is used as the Smart Load port, Esl_D is displayed, and the electricity consumption of the port is collected that day. When the GEN port is used as the generator port, Ege_D is displayed，and the output of the generator is collected that day.
Esl_A & Ege_A	When the GEN port is used as the Smart Load port, Esl_A is displayed, and the total electricity consumption of the port is collected. When the GEN port is used as the generator port, Ege_A is displayed, and the total generator energy output is collected.
EbuyD	Daily electricity purchase.
EbuyA	Total purchased electricity.
EselD	Daily electricity sales.
EselA	Gross electricity sales.

Setup menu


System Status
System : ON/OFF
System Status
SelfConsumption
System Status
DisCharge Stop
System Status
SOC_H
System Status
SOC_L
System Status
PeakLoadShifting
System Status
Charge Set
System Status
DisCharge Set
System Status
Back-up
System Status
Backup: Disable
UPS
System Status
AC Volt: 230 V
240 V
208 V
System Status
AC Freq: 50 Hz
60 Hz
System Status
SOC_L
System Status
Generator Port
System Status
SmartLoad
System Status
System Config
System Status
Language
System Status
System time
System Status
Prevent BackFlow
System Status
Cable CT1
Meter1
System Status
BAT: Lead-acid
Li-ion #1
...
System Status
Lead-acid CV
System Status
Lead-acid CC
System Status
Lead-acid LV
System Status
Auto Test
System Status
Senior Config
Long press (3s)

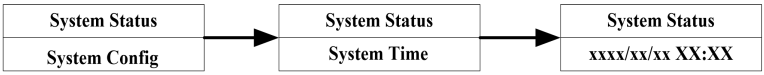
7.1 Enter Setting Interface



First Press any key to light up the LCD. Then press and hold the "Enter" button for 3 seconds and release, user can enter to above setting interface, of which includes 6 types of setting contents.

Use the "↑" or "↓" and "Enter" buttons to enter "System: ON/OFF" setting. The hybrid inverter will run automatically when it is powered on. And user can set the inverter to standby mode through this interface, "OFF" for standby mode and "ON" for operation mode.

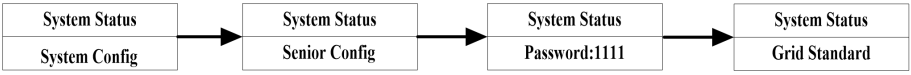
7.2 Check and Set System Time



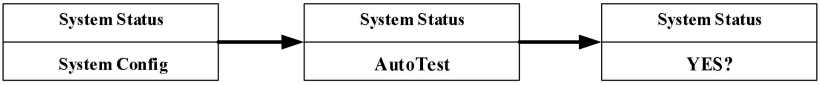
Use the "↑" or "↓" and "Enter" buttons to enter "System Config" to check or reset the system time.

If there is a data logger module connected, the server will automatically synchronize the inverter time. If the system time is not set correctly, time settings for charging and discharging will be influenced.

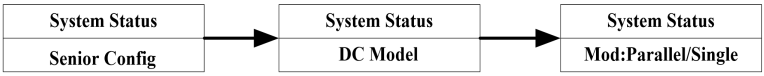
7.3 Check and Set the Standard for Grid Connection



Use the "↑" or "↓" and "Enter" buttons to enter the grid standard screen in "System Config" to check or select the required grid standard. User need to long press "Enter" button for 5 seconds and then release it to enter the password verification screen to access "Senior Config" interface.

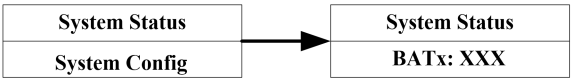


For example, if the grid connection standard is set to "CEI021", inverter will provide automatic self-test function. When the system is running, enter the "AutoTest" interface in "System Config". After setting to "YES" to confirm the selected grid connection standard, the system will automatically run tests as per standards. LCD screen will display test status. After the automatic self-test is completed, the system continues to operate normally.

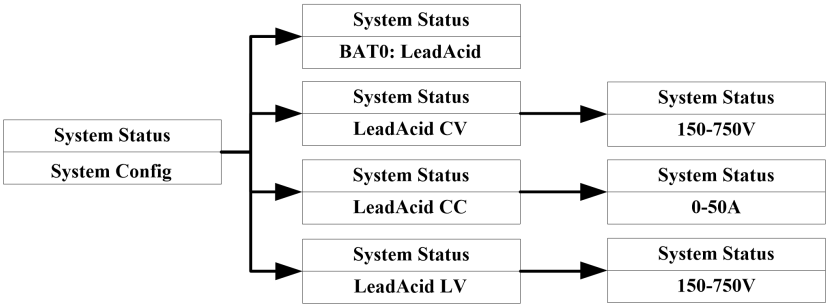


Users can choose parallel or independent input modes through the DC Model settings in advanced settings.

7.4 Check and Set the Battery Type



Use the "↑" or "↓" and "Enter" buttons to enter the "System Config " in the battery type screen. User can check and set the corresponding battery type through this page.



When using lead-acid battery, user need to connect NTC to the BMS communication port and stick the other end to the correct position of the lead-acid battery. And set the battery type to "BAT0: LeadAcid". Then set the parameters of CV constant voltage, CC constant current and LV under voltage point for the lead-acid battery.

Default parameters for CC, CV, LV, and adjustable parameter range.

CC: Default 30A, Range 0-50A, Maximum charge current of lead-acid battery.

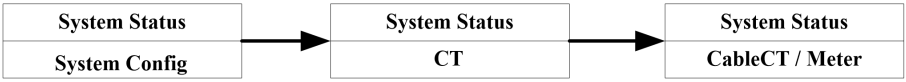
（The default CC of 5-12KW is 30A, The default CC of 15-25KW is 50A.）

CV: Default 750V, Range 150-750V, Constant voltage of lead-acid battery.

LV: Default 150V, Range 150-750V, Lead Acid Battery Stop Discharge Voltage.

Before wiring, please pay attention that neither battery power line positive or negative cannot be reversed in the inverter battery port!

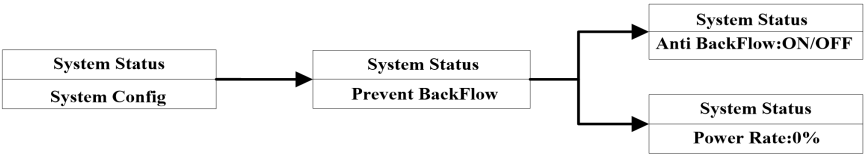
7.5 Check and Set the CT Type



When the inverter is under self-consumption mode, user need to connect CT/meter to the CT port and also make sure that the other end of the CT/meter is connected to the grid in the correct direction. If CT/meter is not connected, inverter will report error.

Press "↑" or "↓" and "Enter" buttons to enter the CT selection screen and check or set the CT option to CT or meter.

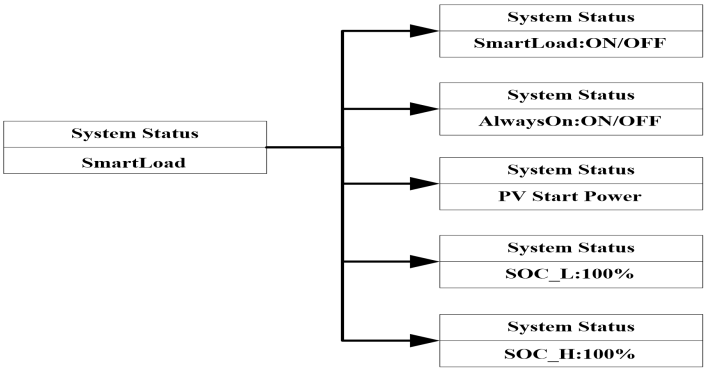
7.6 Check and Set the Prevent BackFlow Function



The hybrid inverter has an anti-backflow/0-export function. Users can use the "↑" or "↓" and "Enter" buttons to enter the "Prevent BackFlow" screen in "System Config" to set and enable the anti-backflow function. When the system has excess power to feed into the grid, the hybrid inverter limits the power output to the utility to the anti-backflow setting power (rated inverter power * backflow power percentage "Power Rate") via CT/Meter. When "Anti BackFlow" is set to ON and the power rate set to 0%, the anti-backflow function is on and inverter cannot feedback to grid; if set to OFF then the inverter can feedback to grid. The Power Rate option is only available when prevent backflow is set to ON. When set to 0%, 0 power is allowed to feed back to the grid; when set to 30%, 30% of the inverter's rated power is allowed to feed to the grid. For example, if the 20KW inverter is set to 30%, it can feed up to 6KW to the grid.

Note: When the inverter is running in forced discharge mode, prevent backflow function is not available.

7.7 Check and Set the Generator/SmartLoad Type

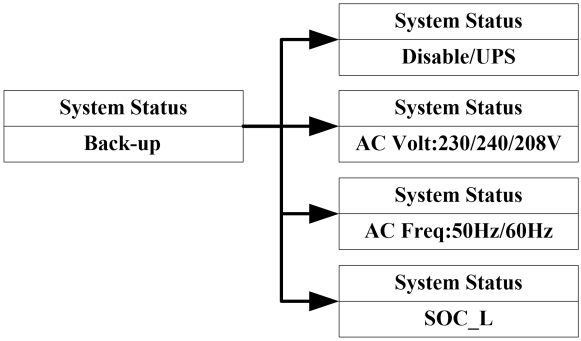


ON the "SmartLoad" port menu, set the "SmartLoad: ON/OFF" switch to enable or disable the port function.

When "Always On" is On, the Smart Load output relay is closed when there is a power grid.

When "Always On" is OFF, Smart Load outputs the relay control logic: The PV power is greater than the power set in PV Start Power, and the battery SOC is greater than the SOC_H set, and the relay is closed. When battery SOC is less than SOC_L, or PV power is less than PV Start Power, the relay is disconnected.

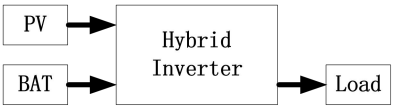
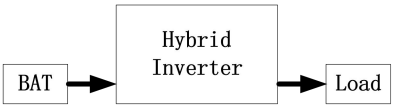
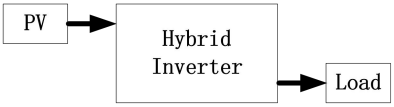
7.8 Check and Set Off-grid Parameters



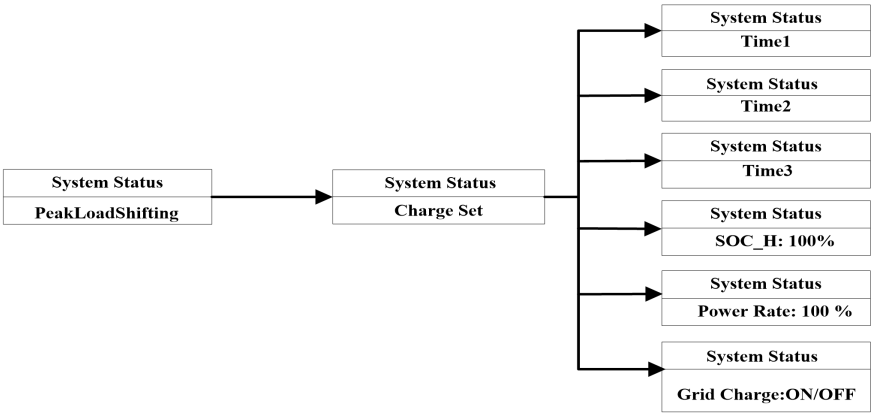
If the user needs to use the off-grid function when there is no utility power, the off-grid function should be turned on. Check and set the corresponding off-grid output voltage and frequency.

BackUp: Disable, off-grid function is not enabled. No output from the backup port when grid outage.

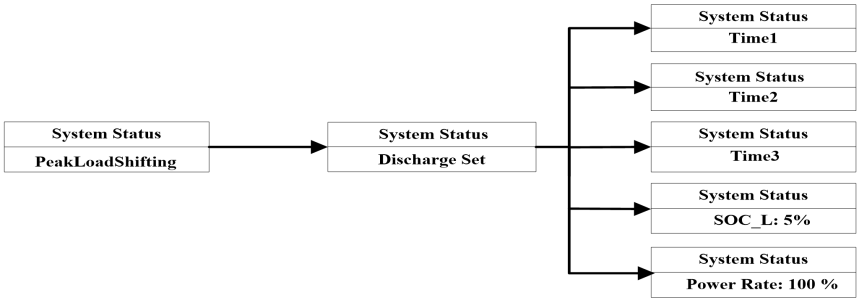
BackUp: UPS, when utility power is available, the backup port is used as a utility bypass, outputting the same voltage and frequency as per the utility voltage and frequency. After a utility power failure, the backup port switches to UPS power mode within 10ms and outputs the "pre-set off-grid voltage and frequency".

When PV or Battery is available (without Grid)	
	Solar provides energy to loads as first priority, if Ppv>Pload, extra solar energy will charge battery.
	Solar provides energy to loads as first priority, if Ppv<Pload, battery energy and solar energy will supply to the loads at the same time.
	When PV is Off, battery energy will supply to the loads.
	When there is only PV, user can enable backup to UPS then PV will supply to the loads without battery and Grid for emergent use.

7.9 Inverter Used Under Peakloadshifting Mode



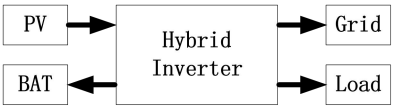
When the utility charging cost is low or the battery SOC is too low, user need to force the battery to be charged. Press "↑" or "↓" and "Enter" buttons to enter the "Charge Set" interface in "PeakLoadShifting" to set and enable the charge start time and stop time. Then inverter will charge the battery according to the set charging power (Rated Battery Power*Power Rate) and stop charging when the battery SOC reaches "SOC_H". If the Grid is connected and "Grid Charge" is set to ON, the hybrid inverter can use the grid power to charge the battery during the charging period; otherwise, the grid power will not be used for charging.

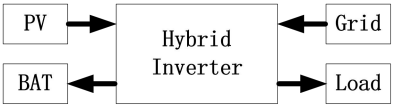
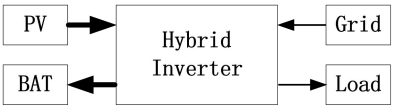
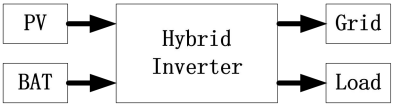
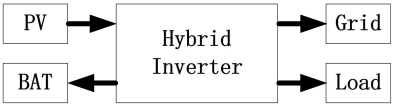
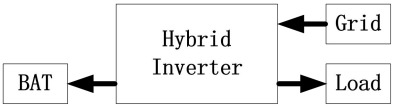
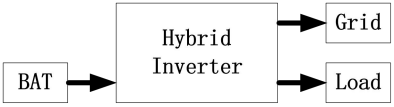
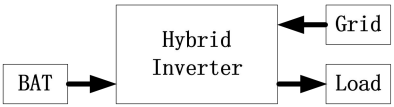


When the selling price of electricity is high or the battery needs to be discharged, user can press "↑" or "↓" and "Enter" buttons to enter the "Discharge Set" interface in "PeakLoadShifting" to set and enable the discharge start time and stop time. Then the inverter will discharge the battery according to the set discharge power (rated battery power*Power Rate) and stop discharging when the battery SOC reaches "SOC_L".

"Forced Charge or Forced Discharge Set" is provided with three separate time periods for setting. Users can force charge and force discharge the battery multiple times in one day, just make sure the force charge and force discharge times do not conflict. During the forced charging time period, the battery does not respond to the discharge demand of the load. However, during the forced discharge time period, if the PV power is greater than the rated inverter power, the excess energy of the PV automatically charges the battery.

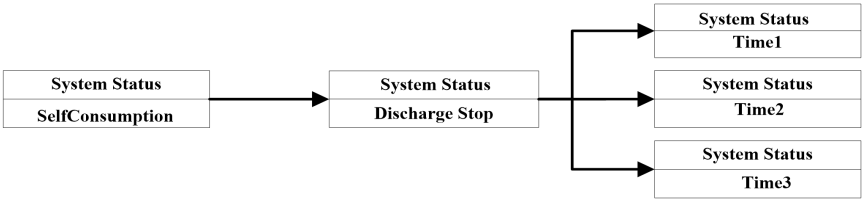
Note: When the inverter is running in forced discharge mode, prevent backflow function is not available.

When PV, Grid, Battery is available	
	During charge time, solar energy will charge battery first. If Ppv>Pbat, extra solar energy will supply to the loads, and if Ppv>(Pbat+Pload), extra solar energy will

	feed in Grid.
	During charge time, solar energy will charge battery first. If Ppv>Pbat, extra solar energy will supply to the loads, and if Ppv<(Pbat+Pload), Grid will supply energy with solar together.
	During charge time, solar energy will charge battery first. If Ppv<Pbat, Grid will supply energy with solar together. But if Ppv<Pbat and Grid Charge is OFF, the battery charging energy is only use solar energy, Grid energy will only supply for loads.
	During discharge time, solar energy and battery discharge energy provide power to the loads. If (Ppv+Pbat)>Pload, the extra energy will feed in Grid.
	During discharge time, solar energy and battery discharge energy provide power to the loads. If (Ppv+Pbat)<Pload, Grid energy will supply for loads with solar and battery.
	During discharge time, if Ppv>ACRatePower, solar energy will supply ACRatePower for loads and Grid, and the extra solar energy will charge the battery instead of battery discharge.
When Grid, Battery is available (without PV)	
	During charge time, Grid will charge battery and supply power to the loads at the same time no matter Grid Charge is On or Off.
	During discharge time, if Pbat>Pload, battery discharge energy will supply for loads and extra battery discharge energy will feed in Grid.
	During discharge time, if Pbat<Pload, Grid will supply energy with battery together for loads.

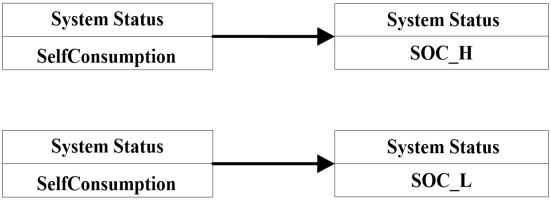
7.10 Inverter Used Under Self-consumption Mode

When the system time of the inverter is not within the forced charging and discharging time set by "PeakLoadShifting", or the forced charge/discharge time of "PeakLoadShifting" is not enabled, the hybrid inverter automatically operates in "SelfConsumption" mode. The hybrid inverter detects the power of CT/Meter, when the PV is connected and the PV power is greater than the load power, the excess PV power will be output to the grid through CT/Meter. At this time, the hybrid inverter automatically uses this excess PV power to charge the battery and reduce the backflow power to the grid. If there is no PV or the PV power is lower than the load power, the load will take power from the grid through CT/Meter. At this time, the hybrid inverter automatically controls the battery discharge to provide energy to the load and reduce the power taken from the grid.

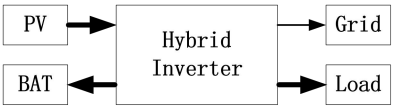
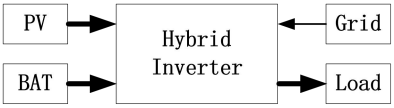
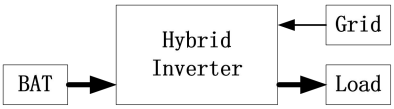
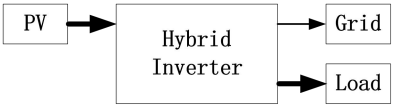


When the hybrid inverter is in "SelfConsumption" mode, if the user does not want to discharge the battery for a certain period of time, for example, If the price of utility power is relatively low during a certain period of time, it is more economic to use utility power than battery power. Users can access the "Discharge Stop" screen in "SelfConsumption" by pressing the "↑" or "↓" and "Enter" buttons, set and enable the limit battery discharge time. During this set time period, the battery is not discharged and the load is powered directly from the utility. The "SelfConsumption" mode also support three settable time periods to limit battery discharge.

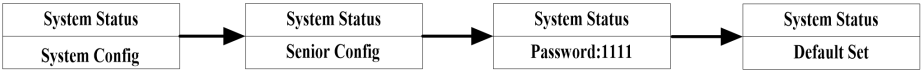
Since "SelfConsumption" and "PeakLoadShifting" use the same SOC setting item. Therefore, you can set the charging and discharging SOC in "SelfConsumption" mode in the charging and discharging SOC option of "PeakLoadShifting". Power rate is the same setting step.



Users can set SOC_H and SOC_ L of "SelfConsumption" mode to control battery charging and discharging.

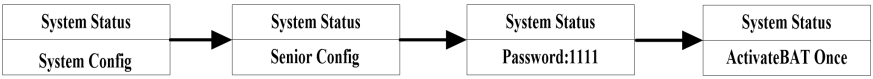
<table>
<tr><td colspan="2">When PV, Grid, Battery is available</td></tr>
<tr><td> 
</td><td>When Ppv>Pload, extra solar energy is going to feed in Grid, battery will charge to reduce feed in Grid power. If Ppv>(Pbat+Pload), extra solar energy still feed in Grid, if Anti BackFlow is On, feed in Grid power will be limited at setting power rate.</td></tr>
<tr><td> 
</td><td>When Pload>Ppv, the loads is going to use Grid power, battery will discharge to reduce Grid consume power. If Pload>(Pbat+Ppv), Grid will supply for loads with solar and battery. But during Discharge Stop time, the battery can only charge and no discharge.</td></tr>
<tr><td colspan="2">When Grid is available, without PV or Battery</td></tr>
<tr><td> 
</td><td>When Pload>0, the loads is going to use Grid power, battery will discharge to reduce Grid consume power. If Pload>Pbat, Grid will supply for loads with battery. During Discharge Stop time, the battery can only charge, loads use energy all from Grid.</td></tr>
<tr><td> 
</td><td>When Ppv<Pload, Grid will supply for loads with solar. When Ppv>Pload, extra solar energy will feed in Grid, if Anti BackFlow is On, feed in Grid power will be limited at setting power rate.</td></tr>
</table>

7.11 Restore Default Factory Settings



When user need to restore the system to factory settings, user can use the "↑" or "↓" and "Enter" buttons to enter the "System Config" interface and select the "Senior Config" option. When enter to "Senior Config" screen, user need to long press “Enter” for 5 seconds to enter the password verification screen.

7.12 Activate Battery Settings



When the lithium battery BMS enters the undervoltage protection state and the internal relay is disconnected and unable to charge normally, you can enter this interface according to the flowchart and long press button for 5 seconds to activate the battery.

8 Maintenance and Cleaning

8.1 Maintain Periodically

1.Checking Heat Dissipation

If the inverter regularly reduces its output power due to high temperature, please improve the heat dissipation condition. Maybe you need to clean the heat sink.

2.Cleaning the Inverter

If the inverter is dirty, turn-off the AC breaker and DC switch, waiting the inverter shut down, then clean the enclosure lid, the display, and the LEDs using only a wet cloth. Do not use any cleaning agents (e.g. solvents or abrasives).

3.Checking the DC switch

Check for externally visible damage and discoloration of the DC switch and the cables at regular intervals. If there is any visible damage to the DC switch, or visible discoloration or damage to the cables, contact the installer.

8.2 Trouble shooting

Our quality control program assures that every inverter is manufactured to accurate specifications and is thoroughly tested before leaving our factory. If you have difficulty in the operation of your inverter, please read through the following information to correct the problem.

Alarm ID	Alarm Name	Suggestion
W0	SelfTimeOut	Restart inverter. Please contact the manufacturer if restart can't solve the problem.
W1	BatSocLOW	Charge the battery properly.
W2	GridBaseFault	Check whether the grid port is abnormal.

W3	GridLOSSFault	Check whether the grid port is abnormal.
W4	GPortCurrHigh	Reduce the power at the generator port.
W5	Meter COM Err	1.Check whether the meter matches the inverter protocol. 2.Check the wire connection between meter and inverter is good or not.
W8	BMS COM Err	1.Check the lithium Battery is open or not. 2.Check the connection of lithium Battery and inverter is good or not.
W11	BAT NTC Open	1.Check the temperature of lead-acid battery is installed or not. 2.Check the temperature of lead-acid battery is connected well or not.
W14	Bat Temp Out	Check the environment temperature of battery is in the range of specification or not.
W15	Over Load!	Please reduce the load of UPS output.
W17	Bat Need Chg	1.Set the battery SOC_L to a higher value. 2.Charge the battery properly.
W18	BMS Warn	Check the warning information from lithium battery user manual.
W19	FanStuck	Check whether the fan is faulty.
W26	AC Volt Out	1.Check the AC voltage is in the range of standard voltage in specification. 2.Check the grid connection is good or not.
W27	DCI High	Restart inverter. Please contact the manufacturer if restart can't solve the problem.
W28	No AC Input	1.Please confirm grid is lost or not. 2.Check the grid connection is good or not. 3.Check the switches on the cable are on or not.
W29	AC Freq Out	Check the frequency is in the range of specification or not. Restart inverter. Please contact the manufacturer if restart can't solve the problem.
W30	Bat Reversed	Check the positive and negative of battery is reversed or not.
W31	Battery Open	Check the battery connection is good or not. Check the switches between the battery and inverter are all on or not.
W32	BatVolt High	Check the voltage of battery is in the range of specification or not.

		Check the battery connection is right or not If battery is really higher than 750V. (The default voltage is 750V, and the actual setting parameters shall prevail) Please disconnect the connection of battery and check inverter.
W33	Bat Volt Low	Check the real voltage of battery. Check the wire of battery and inverter is good or not.
W34	EPS Volt Low	Check the load of Back-Up. If overload occurred, reduce load. Restart inverter again.
W35	BMS Err	Check the lithium battery error information according to the error code.

Alarm ID	Alarm Name	Suggestion
E0	N-PE Fault!	Check the L line and N line is reversed or not. Check the PE is connected well or not.
E1	PV Iso Low!	Check the connection of PV panels and inverter is good or not. Check the PE of inverter is good or not.
E2	Relay Fault!	Restart inverter. Please contact the manufacturer if restart can't solve the problem.
E3	BusVolt High!	Check the PV input voltage. Do not exceed the range of specification. Restart inverter. Please contact the manufacturer if restart can't solve the problem.
E4	Inner Fault!	Restart inverter. Please contact the manufacturer if restart can't solve the problem.
E5	Firmware Err!	Read DSP and COM firmware version from LCD. Check if the firmware is correct.
E6	ARM RX Fault!	Restart inverter. Please contact the manufacturer if restart can't solve the problem.
E7	DSP RX Fault!	Restart inverter. Please contact the manufacturer if restart can't solve the problem.
E8	BackUp Short!	Check the load of BackUp. Check the output of UPS. Especial not connect to grid.
E9	AutoTest Err!	Restart inverter. Please contact the manufacturer if restart can't

		solve the problem.
E10	Model Fault!	Checking Model Settings. Please contact the manufacturer if restart can't solve the problem.
E11	NTC Open!	Restart inverter. Please contact the manufacturer if restart can't solve the problem.
E13	BDC OTP!	Please check the temperature is in the range of specification or not.
E16	PV Volt High	Please check the voltage of PV input is in the range of specification or not.
E17	Bus Unable!	Restart inverter. Please contact the manufacturer if restart can't solve the problem.
E18	BST OTP!	Please check the temperature is in the range of specification or not. Please contact the manufacturer if restart can't solve the problem.
E19	INV OTP!	Please check the temperature is in the range of specification or not. Please contact the manufacturer if restart can't solve the problem.
E22	GFCI High!	Check the cable of inverter. Restart inverter. Please contact the manufacturer if restart can't solve the problem.
E23	Phase Err！	Please check if the phase sequence is connected incorrectly.

9 Decommissioning

9.1 Remove the Inverter

- ◆ Disconnect the inverter from DC Input and AC output.
- ◆ Wait for 5 minutes for de-energizing.
- ◆ Disconnect communication and optional connection wirings.
- ◆ Remove the inverter from the bracket.
- ◆ Remove the bracket if necessary.

9.2 Packaging

- ◆ Please pack the inverter with the original packaging.
- ◆ If the original package is no longer available, you can also use an equivalent carton that meets the following requirements.

9.3 Storage and Transportation

◆ Store the inverter in a dry environment where ambient temperature keep always between -20 °C - +60 °C. Take care of the inverter during the storage and transportation, keep less than 4 cartons in one stack.

◆ When the inverter or other related components need to be disposed. Have it carried out according to local waste handling regulations. Please be sure to deliver wasted inverters and packing materials to certain site, where can assist relevant department to dispose and recycle.

10 Technical Data

Model	HI-5K-TH	HI-6K-TH	HI-8K-TH	HI-10K-TH	HI-12K-TH
PV String Input Data:					
Max.DC input power	7.5kW	9kW	12kW	15kW	18kW
Max.DC input voltage	1000V				
Nominal input voltage	600V				
MPPT operation voltage range	180~950V DC	180~950V DC	180~950V DC	180~950V DC	180~950V DC
Min start-up voltage	200VDC				
Number of independent MPPT / strings per MPPT	2/1+1				
MPPT max.current	20A/20A				
AC Output/Input Data (On-grid):					
Nominal output active power	5kW	6kW	8kW	10kW	12kW
Max.output	5.5kVA	6.6kVA	8.8kVA	11kVA	13.2kVA

apparent power					
Max.apparent power from utility grid	10kW	12kW	16kW	20kW	24kW
Nominal output voltage	400V ±20%				
Nominal ouput freqency	50Hz，60Hz/±5Hz				
Max.output current	8A	10A	13A	16A	19A
Max.AC current from utility grid	16A	20A	26A	32A	38A
Power factor	±0.8				
THDi	<3%				
Grid system pattern	3L+N+PE				
Back-up Output Data (UPS):					
Peak output apparent power	5.5kVA	6.6kVA	8.8kVA	11kVA	13.2kVA
Nominal output apparent power	5kVA	6kVA	8kVA	10kVA	12kVA
Nominal output voltage	400V ±20%				
Nominal ouput frequency	50Hz/60Hz				
Output THDV	<3%				
Automatic switch time	<10ms				
Battery Input Data:					
Battery type	Li-Ion				
Battery voltage range	150V-750V				

Max.charging current	30A
Max.discharging current	30A
Charging strategy for Li-Ion battery	Self-adaption to BMS
Efficiency:	
Max.efficiency	98%
Europe efficiency	97.5%
Max.battery to load efficiency	98%
General Data:	
Dimensions(W/L/H) in mm	403mm*463mm*284mm
Weight	30kg
Operation temperature range	–25 °C ... +60 °C
Heat dissipation mode	Natural
IP Class	IP66
Maximum altitude	3000m
Self-Consumption night	<5W
Topology	Transformerless
Display	LCD and App
Communication interface	WiFi/4G/USB/CAN/RS485

Model	**HI-15K-TH**	**HI-20K-TH**	**HI-25K-TH**
PV String Input Data:			

Max.DC input power	23kW	30kW	38kW
Max.DC input voltage	1000V		
Nominal input voltage	600V		
MPPT operation voltage range	180~950VDC	180~950VDC	180~950VDC
Min start-up voltage	200VDC		
Number of independent MPPT / strings per MPPT	2/2+2		
MPPT max.current	30A/30A		
AC Output/Input Data (On-grid):			
Nominal output active power	15kW	20kW	25kW
Max.output apparent power	16.5kVA	22kVA	25kVA
Max.apparent power from utility grid	30kW	40kW	50kW
Nominal output voltage	400V ±20%		
Nominal ouput freqency	50Hz，60Hz/±5Hz		
Max.output current	24A	32A	36.3A
Max.AC current from utility grid	48A	64A	72.6A
Power factor	±0.8		
THDi	<3%		
Grid system pattern	3L+N+PE		
Back-up Output Data (UPS):			
Peak output apparent	16.5kVA	22kVA	25kVA

power			
Nominal output apparent power	15kVA	20kVA	25kVA
Nominal output voltage	400V ±20%		
Nominal ouput frequency	50Hz/60Hz		
Output THDV	<3%		
Automatic switch time	<10ms		
Battery Input Data:			
Battery type	Li-Ion		
Battery voltage range	150V-750V		
Max.charging current	50A	50A	50A
Max.discharging current	50A	50A	50A
Charging strategy for Li-Ion battery	Self-adaption to BMS		
Efficiency:			
Max.efficiency	98%		
Europe efficiency	97.5%		
Max.battery to load efficiency	98%		
General Data:			
Dimensions(W/L/H) in mm	403mm*463mm*284mm		
Weight	32kg		
Operation temperature range	–25 °C ... +60 °C		
Heat dissipation mode	Smart cooling		

IP Class	IP66
Maximum altitude	3000m
Self-Consumption night	<5W
Topology	Transformerless
Display	LCD and App
Communication interface	WiFi/4G/USB/CAN/RS485

11 Appendix

Approved battery brand from Inhenergy.

Brand	RS485 or CAN
JOHNRAY	CAN
ZETARA	CAN
VESTWOOD	CAN

12 Manufacturer's Warranty

Please refer to the warranty card.

13 Contact

If you have technical problems concerning our products, contact your installer or manufacturer. During inquiring, please provide below information:

1.Inverter type

2.Modules information

3.Communication method

4.Serial number of Inverters

5.Error code of Inverters

6.Display of inverter LCD

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