User Manual

SH5K

Grid-Connected Hybrid Inverter

SH5K-UEN-Ver20-201512 Version：2.0

About This Manual

Applicability

This manual is applicable to the inverter type SH5K.

Target Group

The manual is intended for:

- Qualified personnel who are responsible for the installation and commissioning
- Inverter owners who will perform daily LCD operation

How to Use The Manual

Read the manual and other related documents before any work on the inverter. Documents must be stored carefully and available at all times.

Content will be periodically updated or revised due to product development. The information in this manual is subject to change without notice. The latest manual can be acquired at www.sungrowpower.com.

Symbols

Safety instructions will be highlighted with the following symbols.

Symbol	Explanation
DANGER	Indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
WARNING	Indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates a situation which, if not avoided, could result in equipment or property damage.
	Indicates additional information, emphasized contents or tips to help you solve problems or save time.

Contents

1 Safety

1.1 General Safety

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

Incorrect operation or work may result in damage to:

- the life and well-being of the operator or a third party, or
- the inverter and other properties that belong to the operator or a third party.

PV Panels

⚠ DANGER

Lethal voltage!

- **PV strings will produce electrical power when exposed to sunlight and can cause an electrical shock.**
- **Wiring of the PV panels should be performed only by qualified personnel.**

Utility Grid

NOTICE

All electrical connections must be in accordance with local and national standards.

Only with the permission of the utility grid, the inverter can be connected to the utility grid.

1.2 Inverter

There is a warning label on the inverter body.

	Disconnect the inverter from all the external power sources before service!
	Do not touch live parts until 10 minutes after disconnection from the sources.
	Hot surface! May exceed 60°C!
	Check user manual before service!
	Only qualified personnel can open and service the inverter.

DANGER

Danger to life from electric shocks due to live voltage!

- Do not open the enclosure when the inverter is working.
- When the enclosure lid is removed, live components can be touched which can result in death or serious injury due to electric shock.

Danger to life from electric shock due to damaged inverter!

- Only operate the inverter when it is technically faultless and in a safe state.
- Operating a damaged inverter can lead to hazardous situations that can result in death or serious injuries due to electric shock.

WARNING

Risk of inverter damage or personal injury!

DO NOT pull out the PV connectors while the inverter is under AC loads! De-energize from all multiple power sources and verify that there's no voltage.

All the warning labels and nameplate on the inverter body:

- Must be clearly visible.
- Must not be removed, covered or pasted.

⚠ CAUTION

Risk of burns due to hot components!

DO NOT touch the hot parts (such as heatsink) during operation. Only LCD panel and DC switch can be touched.

NOTICE

The country setting can be changed only by qualified personnel!

Unauthorized alternation of the country setting may cause a breach of the type-certificate marking.

Inverter damage due to electrostatic discharge (ESD)!

By touching the electronic components, you may damage the inverter.

- Avoid any unnecessary touch.
- Wear a grounding wrist band before touching any connections.

1.3 Batteries

⚠ DANGER

Batteries deliver electric power, resulting in burns or fire hazard when they are shorted, or wrongly installed.

⚠ WARNING

Explosive gases!

Prevent flames and sparks. Provide sufficient ventilation.

Due to the dangers of hydrogen gas and battery electrolyte, batteries must be located in a designated area, complying with the local regulations.

- Protect the enclosure against destruction.
- Do not open or deform the battery module.
- Whenever working on the battery, wear suitable personal protective equipments such as rubber gloves, rubber boots and goggles.
- Rinse acid splashes thoroughly with clear water for a long time and consult the doctor.

NOTICE

Improper settings or maintenance can permanently damage the battery.

Incorrect parameters will lead to the premature aging of battery.

1.4 Skills of Qualified Personnel

Qualified personnel must have the following skills:

- Training in the installation and commissioning of the electrical system, as well as the dangers dealing.
- Knowledge of the manual and other related documents.
- Knowledge of the local regulations and directives.

2 Product Introduction

2.1 Intended Use

SH5K is a single-phase hybrid inverter which controls the PV power and battery power to increase the self-consumption.

The intended use is illustrated in **Fig. 2-1** and **Fig. 2-2**.

WARNING

- **Neither the positive pole nor the negative pole of the PV strings is permitted to be grounded.**
- **Any other or additional use is not permitted except the intended use.**

PV Grid-connected System

In a PV power generation system, by setting the upper limit of the export power, the output power of inverter will be always within the specified range. For example, set the export power to zero, the system would be a zero-export system.

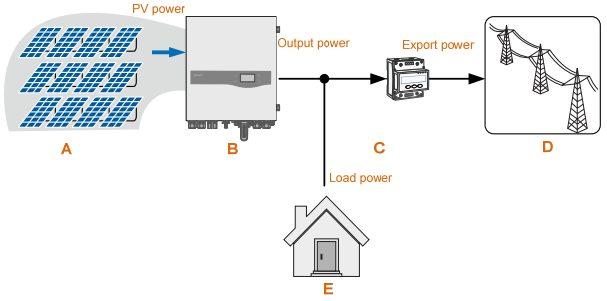


Fig. 2-1 Inverter Application in PV Power System

PV Energy Storage System (PV ESS)

The PV Energy Storage system uses batteries for the immediate storage of energy. The inverter will start to charge the battery once the output power is above zero. When the energy demand of the active loads exceeds the current power of PV system, the battery will discharge and provide the energy shortfall.

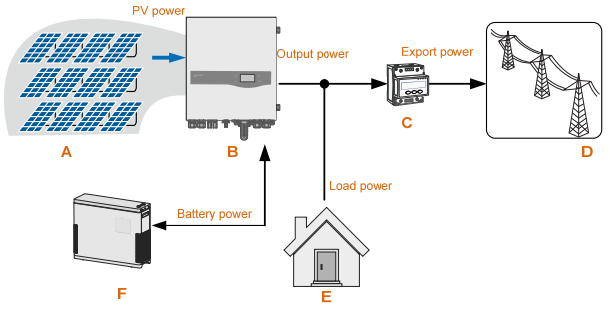


Fig. 2-2 Inverter Application in PV Energy Storage System

Item	Description	Remark
A	PV strings	Monocrystalline silicon, polycrystalline silicon, and thin-film of protection class II without grounding.
B	Inverter	SH5K.
C	Sungrow single-phase energy meter	To measure the export power. Communicate with the inverter via RS485 port.
D	Utility grid	TT , TN.
E	Household load	Appliance.
F	Battery	Li-ion battery or lead-acid battery.

NOTICE

- **For the TT utility grid, the N line voltage to ground must be less than 30 V.**
- **Inverter only accepts PV panels of Protection Class II as its input.**
- **Do not connect the local loads (such as home appliance, lights, motor loads, etc.) between the inverter and the AC circuit breaker.**

2.2 Inverter

Appearance and Dimensions

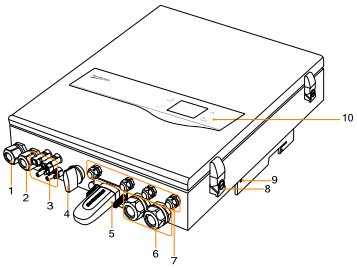


Fig. 2-3 Inverter Appearance

No.	Name	Description
1	AC-Grid	Cable gland for AC cable to the utility grid.
2	AC-Load	Reserved.
3	PV connection	PV1+ , PV1- , PV2+ and PV2-.
4	DC switch **(optional)**	To disconnect the DC current safely.
5	Wi-Fi terminal **(optional)**	To connect the Wi-Fi module.
6	Battery connection	BAT+ and BAT-.
7	Communication connection	RS485, Ethernet, CAN, AI and DO.
8	Card clasp	To open/close the enclosure lid.
9	Second PE terminal	As specified in EN 50178. Users may choose to connect the PE terminal to the ground.
10	LCD panel	Human-computer interaction interface.

The following figure shows the dimensions of inverter.

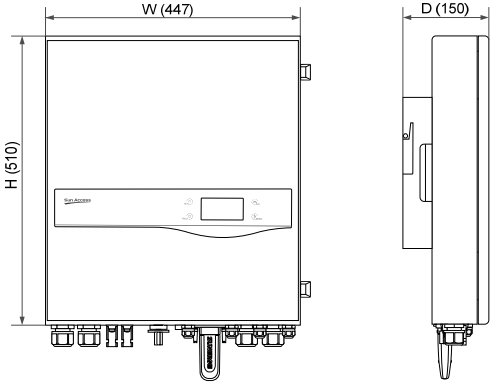


Fig. 2-4 Outline Dimensions (unit: mm)

LCD Panel

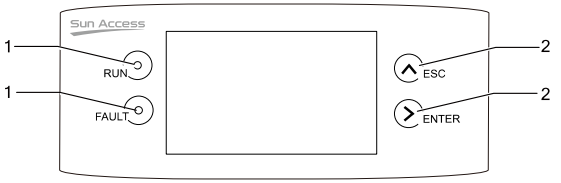


Fig. 2-5 LCD Display Panel

No.	Name	Description
1	LED indicators	"RUN" and "FAULT", from which user can know the current state. For detailed definition, see **Tab. 6-3**.
2	Buttons	User can operate the LCD menu via the two buttons. For detailed functions, see **Tab. 7-1**.

2.3 Meter

The Sungrow single-phase energy meter is installed next to the main switch. It measures the export power and communicates with the inverter through RS485 connection.

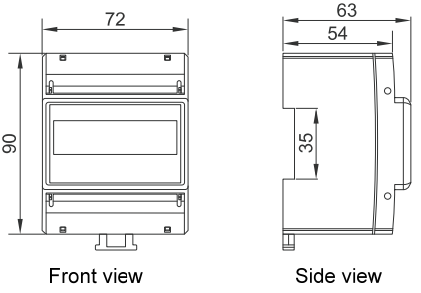


Fig. 2-6 Meter Dimensions (unit: mm)

2.4 Batteries

The following kinds of batteries are compatible with the SH5K PV ESS.

- Li-ion battery from Samsung, LG Chem, or Pylon.
- Lead-acid battery from Narada or others (selected by customer).

To maximize the battery life, the inverter will perform battery management, including state management, charge management, discharge management, and maintenance management.

State Management

In order to avoid overcharge or deep discharge of the battery, distinguish four battery status according to different voltage ranges. Batteries of different types can configure the status according to its own requirements (e.g. SOC), as shown in the following table.

Tab. 2-1 Battery Status Description

Type	Port Voltage/SOC			
	Damaged	**Empty**	**Normal**	**Full**
Samsung (BM3K)	<30 V	SOC<20%	20%~99% (by default)	SOC>99%
LG (RESU 6.4 EX(14S4P))	<30 V	SOC<15%	15%~95% (by default)	SOC>95%
Pylon (US2000A)	<30 V	SOC<20%	19%~97% (by default)	SOC>99%
Narada lead-acid	<30 V	30 V~ 40 V	40 V~56.4 V	>56.4 V
Other lead-acid	<30 V	Configured by the customer		

Charge Management

- Emergency Charge Management

To avoid the damage caused by long time excessive discharge, the inverter will enter the emergency charge management and cannot respond to the discharge during emergency charge.

For the lead-acid battery, if the battery voltage is under the battery minimum voltage, the system will enter the emergency charge management. Refer to **Tab. 8-2** for battery parameters description.

The following table describes the emergency charge of different types of batteries.

Tab. 2-2 Emergency Charge Description

Type	Trigger Condition	Function
Samsung (BM3K)	The BMS system of battery initiates the request of emergency charge.	The inverter will enter the emergency charge once it receives the request. The emergency charge will be finished if single battery voltage is higher than 42 V.
LG (RESU 6.4 EX(14S4P))	SOC<6%	The emergency charge will be finished if the SOC is higher than 8%.
Pylon (US2000A)	SOC<10%	The emergency charge will be finished if the SOC is higher than 15%.

Type	Trigger Condition	Function
Lead-acid	The battery voltage is lower than the lower limit of under-voltage. (42 V by default)	The emergency charge will be finished if the battery voltage rises to the setting value of under-voltage protection value.

- Normal Charge Management

When the battery voltage is within the normal range, the inverter could charge the battery if the PV power is higher than load power and could ensure that the battery never be over-charged.

If the PV voltage is higher than the upper limit value of MPP voltage 560 V, the battery cannot charge or discharge.

Discharge Management

The discharge management can effectively protect the battery from deeply discharging.

The maximum allowable discharge current of battery is mainly limited to the following factors:

- The maximum discharge current of the inverter: 65A.
- The maximum discharge current or the recommended discharge current from the battery manufacturer.

Maintenance Management

To maximize the lead-acid battery life, the inverter will maintain the lead-acid battery every six months.

No matter whether the PV power is sufficient or not, generally, the maintenance management is only suitable for lead-acid battery.

Follow the steps to complete the maintenance:

1. Charge the battery with a constant current (0.165C).
2. Charge the battery with a trickle current when the battery voltage is stabilized in the average charge voltage.
3. When the trickle current is decreasing to 2A, end the maintenance.

Battery Temperature Sensor (PT1000)

SH5K has integrated a PT1000 temperature sampling port for Lead-acid Battery. With the external PT1000 installed, SH5K can sample the temperatures of external environment or battery cabinet. The system uses the sensor input to perform power derating, battery over-temperature protection, and under-temperature protection.

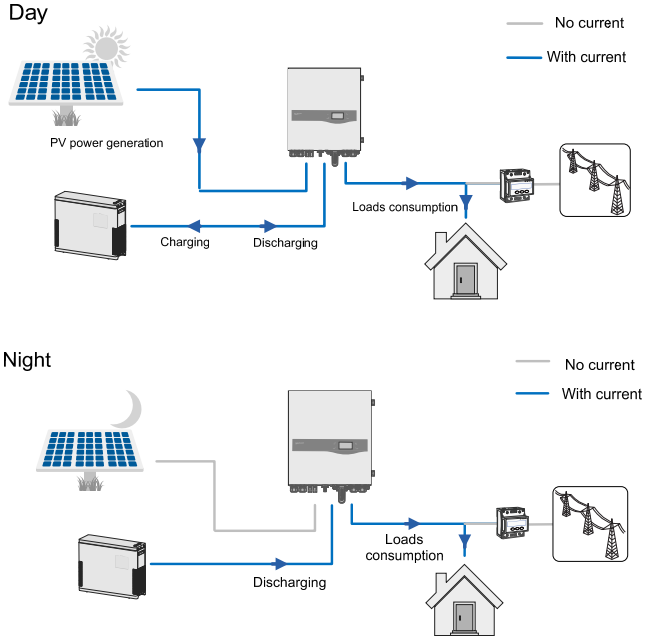
The sampling temperature of PT1000 ranges from -25°C to +60°C, with a sampling accuracy of ±2°C. The protection temperature of battery ranges from -20°C to +60°C and the protection value could be set on the Webserver.

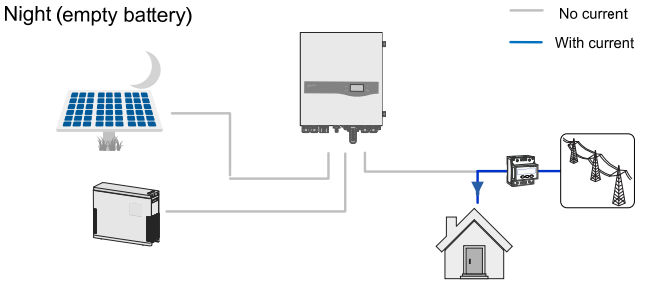
2.5 System

Energy Management

SH5K is integrated with the Energy Management System (hereinafter "EMS").

The following figures show how the EMS works in the daytime, night and night with empty battery respectively.





When the meter or battery is abnormal,

- the inverter can run normally;
- the export power monitoring will be performed by the inverter instead of the meter;
- the DO function of optimized mode will be disabled;
- the battery can be charged if it is normal, but not allowed to discharge.

Earth Fault Alarm

The inverter has integrated an earth fault dry-contact (DO2 relay). The alarm needs to be powered by the grid power.

The additional equipment required is a light indicator and/or a buzzer. The recommended cable cross-section area is 1 mm^2. If an earth fault occurs, the dry-contact will switch on automatically to signal the external alarm.

Load Control

The inverter provides a load control dry-contact (DO1 relay). The DO1 relay can control the load via a contactor. Refer to "**5.8 DO Connection"** for the cable connection.

The user may set the DO control mode flexibly according to individual demand, including timer mode, ON/OFF mode and optimized mode. The following table shows the applicable scenarios and functions.

Tab. 2-3 Load Control Modes Description

DO Mode	Applicable Scenario	Function
Timer	Turn on the load in the set time interval.	Set the starting time and end time. During the interval, DO function is enabled and the loads will run.

DO Mode	Applicable Scenario	Function
ON/OFF	Turn on the load in real-time control.	DO function is enabled and the loads will run when Load Control is set to "ON". DO function is disabled and the loads cannot run when Load Control is set to "OFF".
Optimized	The DO relay controls the load according to the export power in the set time interval.	Set the starting time, end time, and the optimized power. During the interval, when the export power reaches to the optimized power, DO function is enabled and the loads will run.

2.6 Function Description

The inverter circuit inside converts the DC power from PV arrays or battery to AC power. Or convert the DC power from PV panel to battery. Two string MPP trackers can be utilized to ensure the maximum power from PV arrays.

2.6.1 Basic Functions

The basic functions can be grouped as follows.

Function	Description
Bidirectional energy management	With the bidirectional converter integrated inside, the inverter can charge or discharge the battery.
Conversion function	Inverter converts the DC power into AC power, which conforms to the grid requirements of its installation country.
Data storage and display	Inverter stores the running information, fault records etc. and displays them on the LCD screen.
Parameters configuration	Inverter provides various parameters configuration for optimal operation.
Communication interfaces	The inverter provides various ports for device and system monitoring, including RS485, Ethernet, Wi-Fi, and CAN.
Earth fault alarm	A dry-contact (DO relay) for the local alarm of earth fault. An Ethernet communication port for the remote alarm.

Function	Description
Protection function	– Short circuit protection – Insulation resistance detection – Inverter output voltage monitoring – Inverter output frequency monitoring – Residual current monitoring – DC injection of AC output current surveillance – Anti-islanding protection – Environment temperature monitoring – DC over-voltage protection – DC over-current protection – Power module over-temperature protection

2.6.2 Derating

Power derating is a way to protect the inverter form overload or potential faults. In addition, the derating function can also be activated by the requirements of utility grid. Situations require inverter power derating are:

- Grid dispatching
- Over-temperature (including ambient temperature and module temperature)
- Grid under-voltage
- Export power limit setting
- Power factor

Grid Dispatching Derating

Adjust the output power according to the remote scheduling instructions and the inverter operates with power derating.

Over-temperature Derating

High ambient temperature or poor ventilation will lead to inverter power derating.

When the internal temperature or module temperature exceeds the upper limit, inverter will reduce power output until the temperature drops within the permissible range.

The following figures show the derating curves in the case of over-temperature in typical scenarios.

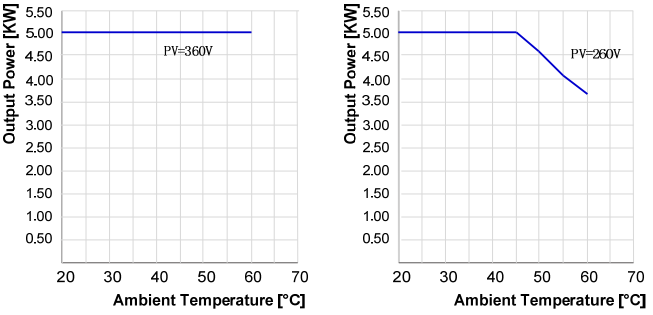


Fig. 2-7 Over-temperature Derating Curves of PV Power

Over-temperature derating of PV input and battery input during discharging:

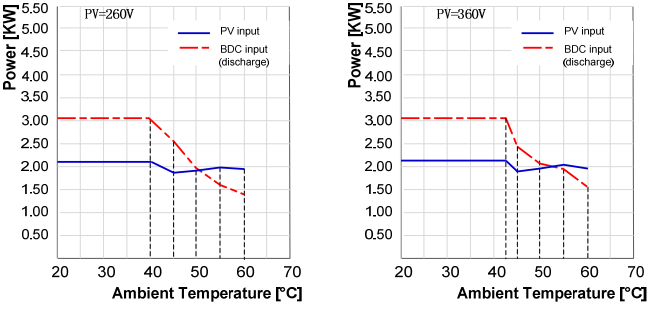


Fig. 2-8 Over-temperature Power Derating Curves (Discharging)

Over-temperature derating of PV input and battery output during charging:

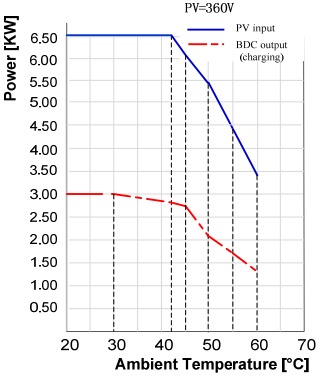


Fig. 2-9 Over-temperature Power Derating Curves (Charging)

Grid Under-voltage Derating

When the grid voltage is too low, inverter will reduce the output power to make sure that the output current is within the permissible range. The following figure shows the under-voltage derating curve.

$$P_{[Vmin...266V]} = Pn \times (Vgrid / 230V)$$

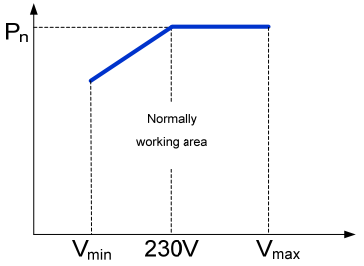


Fig. 2-10 Grid Under-voltage Derating

Export Power Limit Derating

When the meter detects that the export power is greater than limit value on the LCD, the inverter will reduce the output power within the specified range.

Power Factor Derating

When the power factor PF<1.0, the inverter will reduce the output power within a specified range. The following figure shows the power factor derating curve.

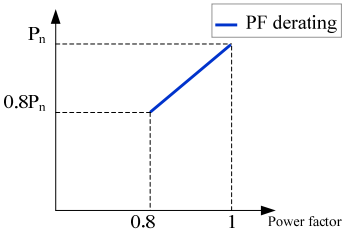


Fig. 2-11 Power Factor Derating

3 Unpacking and Storing

3.1 Unpacking and Inspecting

The inverter is thoroughly tested and strictly inspected before delivery. Damage may still occur during shipping. Therefore, the first thing you should do after receiving the device is to conduct a thorough inspection.

1. Check the packaging for any visible damage.
2. Check the delivery contents for completeness according to the packaging list.
3. Check the inner contents for any visible damage.

Contact SUNGROW or the distributor in case of any damaged or missing components.

It is the best choice to store the inverter in the original packaging. So, do not dispose of it.

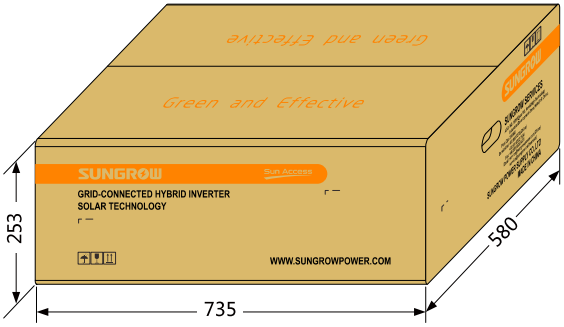


Fig. 3-1 Single Inverter in Original Packaging Carton (unit: mm)

3.2 Delivery Contents

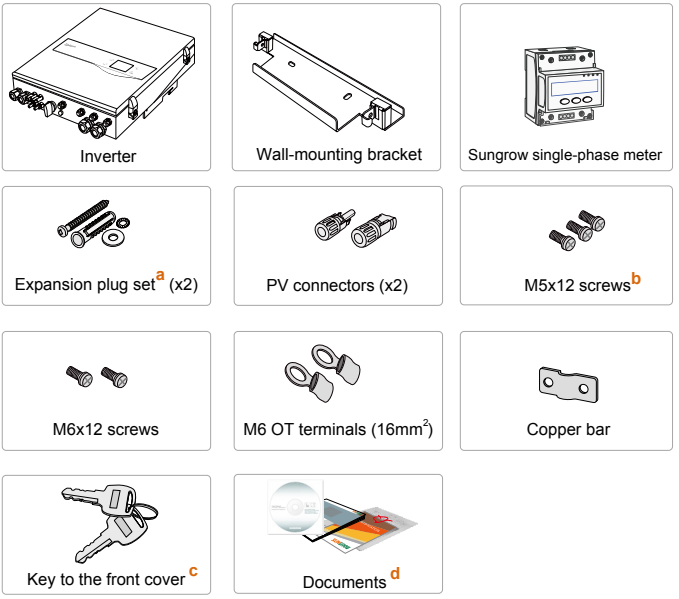


Fig. 3-2 Delivery Contents

a) Each set includes a self-tapping screw, a spring washer, a fender washer, and an expansion tube.

b) One is for external grounding and the other two are for locking the inverter.

c) Only qualified personnel are allowed to use the key.

d) The documents include the Quick User Manual, 1 CD, quality certificates, packaging list and product test reports.

3.3 Identifying the Inverter

The nameplate clearly identifies the product. It is located on the side of the enclosure.

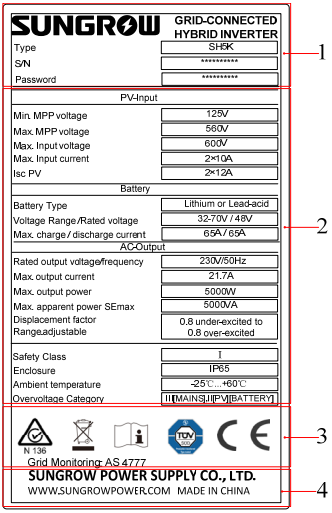


Fig. 3-3 Inverter Nameplate

Item	Description	Item	Description
1	SUNGROW logo and product type	3	Marks of certification institutions
2	Technical data	4	Company name, website and origin

Tab. 3-1 Description of Icons on Nameplate

Icon	Description
	C-tick mark of conformity.
	Do not dispose of the inverter with the household waste.
	Refer to the corresponding instructions.
	TUV mark of conformity.
	CE mark of conformity.

3.4 Storing the Inverter

If you do not install the inverter immediately, choose an appropriate location to store it.

- The device must be stored in the original packaging.
- The storage temperature should be always between -30°C and +85°C, and the storage relative humidity should be always between 0% and 100%.

The following figure shows the storage of inverter.

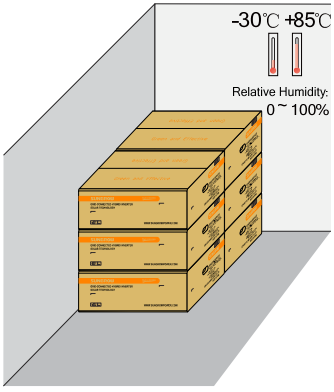


Fig. 3-4 Example of Inverter Storage

NOTICE

The packaging should be upright.

If there is more than one inverter to be stored, the maximum stacked layers are three.

4 Mechanical Mounting

4.1 Safety During Mounting

DANGER

In order to avoid electrical shock or other injury, be sure there is no electricity or plumbing installations before drilling holes.

CAUTION

Risk of injury due to improper handling!

- The weight can cause injuries, serious wounds, or bruise.
- Always follow the instructions when moving and positioning the inverter.

System performance loss due to bad ventilation!

The inverter requires good ventilation during operation. Keep it upright and nothing covering the heat sink.

NOTICE

Wear gloves to avoid scratches when mounting the inverter.

4.2 Location Requirements

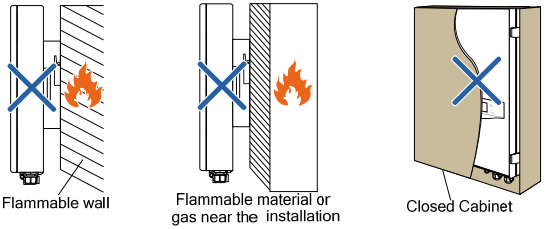
The inverter with IP65 can be installed indoors or outdoors.

Selecting an optimal location for the inverter is decisive for its operating safety as well as the expected efficiency and service life.

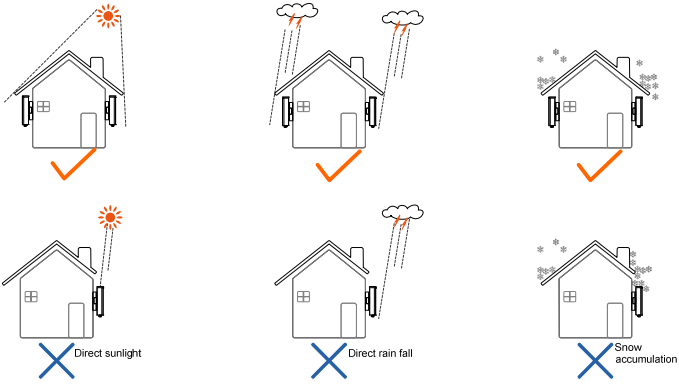
1. The concrete wall should be suitable for the weight and dimensions of the inverter.
2. Install the device where is convenient for installation, cable connection and service.
3. Do not install the inverter in the living area. The noise during its running may affect daily life.
4. The location should be not accessible to children.

5. The power output will reduce when the ambient temperature exceeds 45°C.

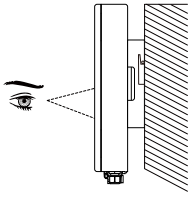
6. The location should be away from flammable materials or gas, and not enclosed.



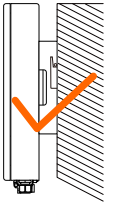
7. The shaded side of the building would be better.

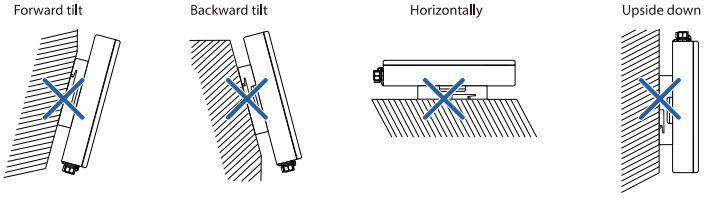


8. Place at eye level for easy operation and reading:

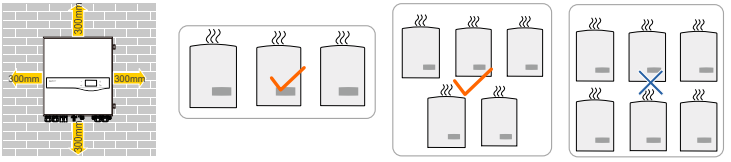


9. Install vertically for good heat dissipation.





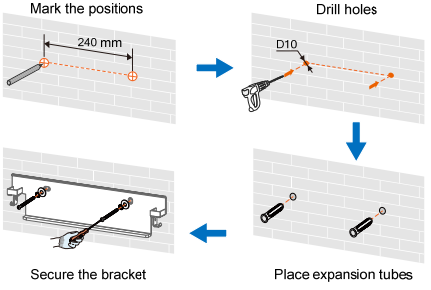
10. Clearance requirement and multiple installation:



4.3 Installing the Inverter

Install the inverter on the wall by means of the wall-mounting bracket and expansion plug sets.

1. Install the wall-mounting bracket.

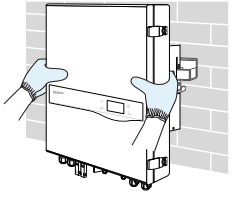


Note:

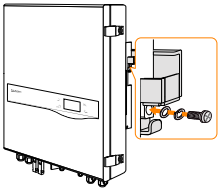
(1) The depth of the holes should be about 70 mm.

(2) Be sure to adhere to the following screw assembly sequence: self-tapping screw, spring washer, fender washer, bracket.

2. Mount inverter to the bracket.



3. Lock inverter to the bracket to protect it from theft.



4.4 Installing the Meter

The Sungrow single-phase energy meter supports a 35 mm standard rail installation, as shown in the following figure.

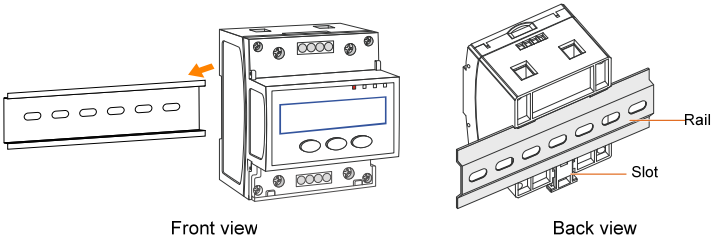


Fig. 4-1 Installing the Meter to the Rail

5 Electrical Connection

DANGER

Danger to life due to high voltage inside the inverter!

- **Make sure that cables are not live before electrical connection.**
- **Do not turn on the AC circuit breaker until all electrical connections are completed.**

WARNING

All cables must be firmly attached, undamaged, properly insulated and adequately dimensioned.

NOTICE

All electrical connections must be in accordance with local and national standards.

Before fastening the lid, be sure that:

- Seal the unused terminals with waterproof plugs;
- The rubber strip is fully filled with air.

5.1 Terminal Description

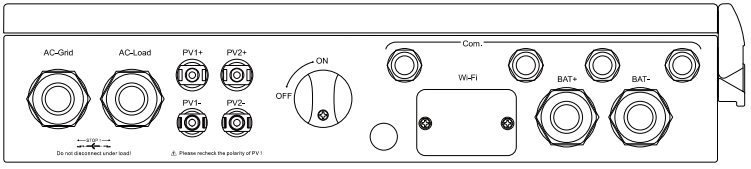


Fig. 5-1 Terminals on the Bottom of Inverter

Silkscreen	Description
AC-Grid	Cable gland for AC cable.
AC-Load	Reserved.
PV1+, PV1-, PV2+, PV2-	Terminals for DC cables.

Silkscreen	Description
ON, OFF	DC switch.
Com.	Cable glands for Ethernet, RS485, PT1000, CAN and DO.
Wi-Fi	Terminal for Wi-Fi module.
BAT+ , BAT-	Cable glands for battery power cables.

Connection terminals on the inner configuration circuit board:

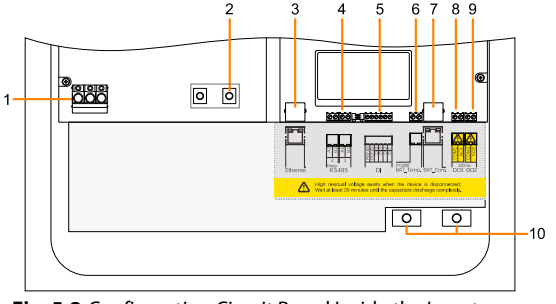
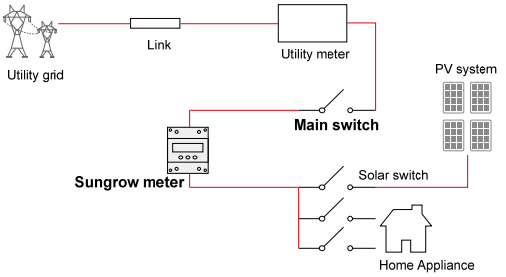


Fig. 5-2 Configuration Circuit Board Inside the Inverter

No.	Description	Connection	No.	Description	Connection
1	L, N, PE	AC	6	BAT_Temp.	Temperature sensor
2	Copper	PV (Parallel)	7	CAN	Battery
3	Ethernet	Communication	8	DO1	Power management
4	RS485 (A1, B1)	Battery	9	DO2	Earth fault alarm
	RS485 (A2, B2)	Meter			
5	DI terminals	Reserved	10	BAT+, BAT-	Battery

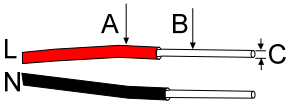
5.2 Meter Connection

The Sungrow single-phase energy meter should be installed next to the main switch.



5.2.1 Connecting the Power Cable

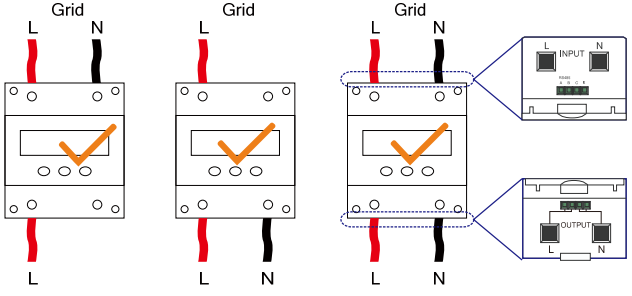
1. Strip the insulation from the cable.



Item	Description	Remarks
A	Insulation	-
B	Wire	5 mm~8 mm
C	Cross-section	16 mm² (L)

Cross-section of the conductor **N** is not specified but reliable fastening must be ensured.

2. Connect the power cables to the terminals **L** and **N**.



5.2.2 Connecting the RS485 Cable

Terminals **A** and **B** are connected to terminals **A2** and **B2** on the inverter.

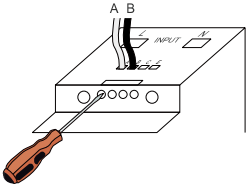
Terminals **C** and **E** are reserved.

Cable Requirements

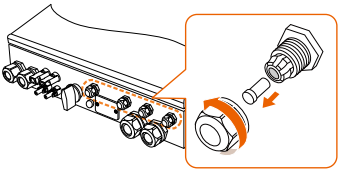
Cross-section: 2*0.5 mm², cable diameter: 3 mm to 5.3 mm

Procedure:

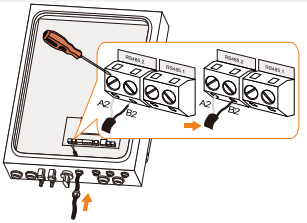
1. Tighten the wires to terminals **A** and **B** on the meter.



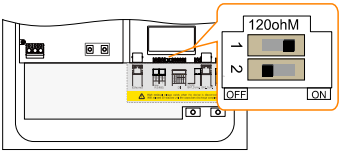
2. Unscrew the swivel nut from any **Com.** port.



3. Lead the cable through the cable gland.
4. Connect the wires to terminals **A2** and **B2** on the inverter.



5. When the length of RS485 cable is longer than 100 m, push the "**120ohM**" **(1)** switch to "**ON**" to ensure stable communication.



5.3 Grid Connection

Residual Current Device

With an integrated universal current-sensitive residual current monitoring unit inside, the inverter is able to distinguish the fault currents from normal capacitive leakage currents. The inverter will disconnect from mains as soon as a fault current with value exceeding the limit has been detected.

However if an external RCD or residual current breaker is mandatory, the switch must be triggered at a failure current of 300 mA or higher.

Cable Requirements

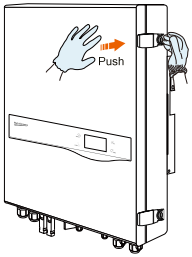
Cross-section: 4 mm² to 10 mm², cable diameter: 11 mm to 16 mm

All the AC cables should be equipped with correctly colored cables for distinguishing. Please refer to related standards about wiring color.

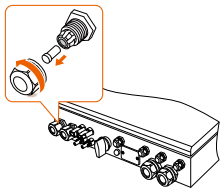
Procedure:

1. Install an AC circuit breaker (recommended specification 32 A) between the inverter and the AC grid.

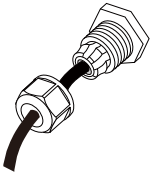
2. Open the enclosure lid.



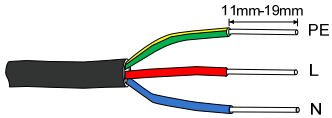
3. Unscrew the swivel nut from the **AC-Grid** port.



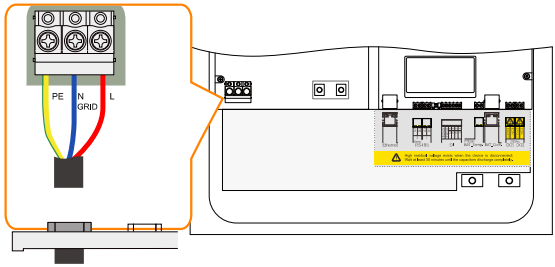
4. Lead the cable through the cable gland.



5. Remove the cable jacket by 150 mm to 160 mm, and strip the wire insulation.



6. Tighten the L, N, PE wires to the corresponding terminal (torque 1.2 N·m).



7. Fasten the swivel and connect the other end to the AC circuit breaker.

5.4 PV Connection

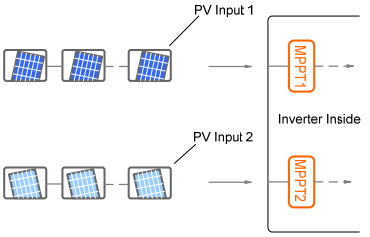
WARNING

Before connecting the PV arrays to the inverter, ensure that the impedances between the positive terminals of the PV string and Earth, and between the negative terminal of the PV string and Earth are larger than 200 Kohm.

5.4.1 PV Inputs Configuration

Independent Mode

The two PV inputs work independently, each with its own MPPT. The two PV inputs can be different from each other in PV module types, numbers of PV panels in PV strings, tilt angles and orientation angles of PV modules.



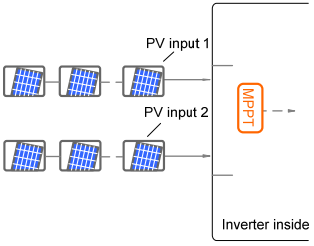
To maximize the PV string power, PV strings connected to individual input area should have a homogenous structure, i.e. the same type, the same number, the same identical tilt and identical orientation.

Prior to connecting inverter to PV inputs, the following specifications should be met:

Area	DC Power Limit for Each Input	Total DC Power Limit	Open-circuit Voltage Limit for Each Input	Short-circuit Current Limit for Each Input
DC1 DC2	5600 W	6500 W	600 V	12 A

Parallel Mode

All PV strings should have the same type, the same number of PV panels, identical tilt and identical orientation. Two trackers are configured in parallel to handle power and/or current levels higher than those a single tracker can handle.



Prior to connecting inverter to PV inputs, the following specifications should be met:

Total DC Power Limit for Inverter	Open-circuit Voltage Limit for Each Input	Short-circuit Current Limit for Total Input
6500 W	600 V	24 A

To avoid the power unbalance of two inputs or input load-restriction, ensure the two PV input cables are of the same model.

5.4.2 Connecting Inverter to PV Arrays

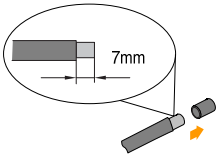
All DC cables are equipped with water-proof direct plug-in connectors, which match the DC terminals at the bottom of the inverter.

Cable Requirements

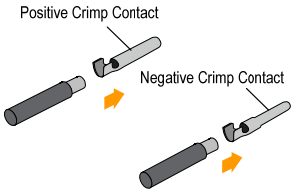
Cross-Section	Cable Diameter	Max. Withstand Voltage	Max. Withstand Current
4 mm^2 to 6 mm^2 AWG12 to AWG10	3 mm to 6 mm	600 V	Same as short-circuit current.

Assembling PV Connector

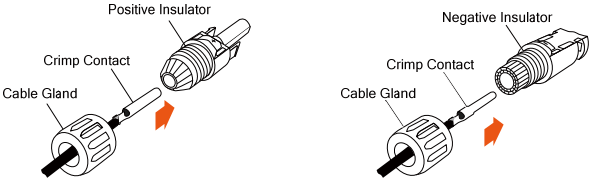
1. Strip the insulation from the cables by 7 mm to 8 mm.



2. Assemble the cable ends by crimping pliers.

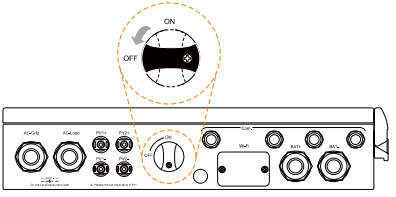


3. Lead cable through the cable gland to insert into the insulator until it snaps into place. Then tighten the cable gland (torque 2.5 N·m to 3 N·m).

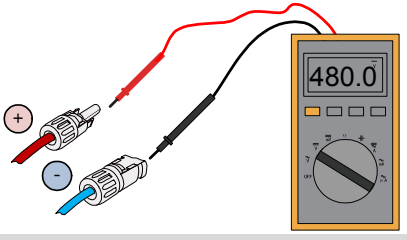


Installing PV Connector

1. **(Optional)** Rotate the DC switch at the bottom to the "OFF" position.



2. Check the cable connection of PV strings for the correct polarity and that the open circuit voltage does not exceed the inverter input limit 600 V, even under the lowest operating temperature. Refer to module specification supplied by module manufacturer for detailed information.

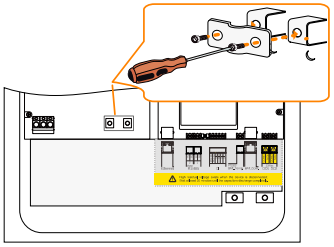


NOTICE

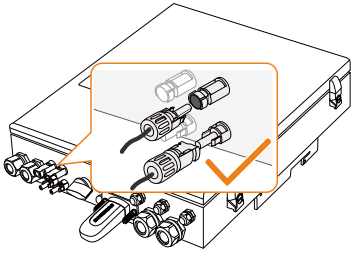
The inverter will not function properly if the DC polarities are reversed.

- **Check the positive and negative polarity of the PV cells.**
- **For the same MPPT, the reverse connection of a single string is prohibited. A permanent failure of the system or inverter may follow if otherwise.**

3. **(Optional)** Install the copper for the parallel mode.



4. Plug the connectors into corresponding terminals.



5. Seal unused DC terminals with the terminal caps.

5.5 Grounding the Inverter

Where there is only one inverter in the system, connect the grounding cable to the PE bar.

The inverters are equipped with second protective earth terminal as specified in EN 50178. Connect the PE terminal to ground if need.

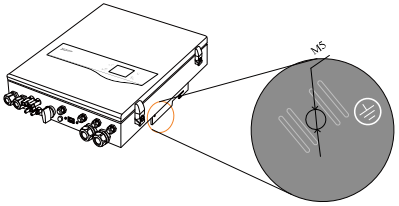
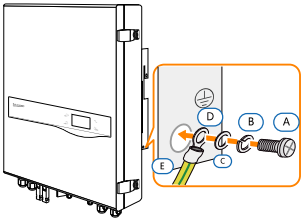


Fig. 5-3 Second PE Terminal

Second PE Connection



Item	Description	Specification
A	Screw	M5×12 mm (3.0 N·m)
B	Spring washer	-
C	Washer	-
D	Cable socket	-
E	Yellow-green cable	6-10mm^2 copper wire or 10-16mm^2 aluminum wire

5.6 Communication Connection

There are four ports and a Wi-Fi terminal on the bottom of the inverter, as shown in the following figure.

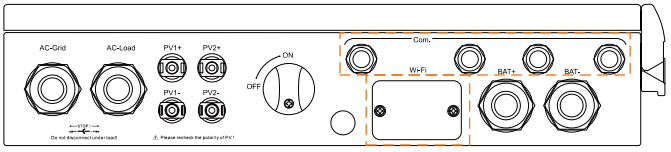


Fig. 5-4 Communication Ports and Terminal

Ethernet function:

- Through Modbus TCP/IP protocol, the EMS or Control Box from the third party can fully control the on/off, derating, charging/discharging of the inverter.
- The inverter operation information can be transferred via **Ethernet** port. Visit the Webserver and you can view the information.
- The inverter operation information can be transferred to the SolarInfo Bank server via the router.

Wi-Fi function:

With the SolarInfo Wi-Fi module installed, visit the SolarInfo Moni APP to view the inverter information.

5.6.1 Ethernet Connection

Connect the inverter to PC through the **Ethernet** port to set up the Ethernet communication.

Fig. 5-5 Ethernet Connection without a Router

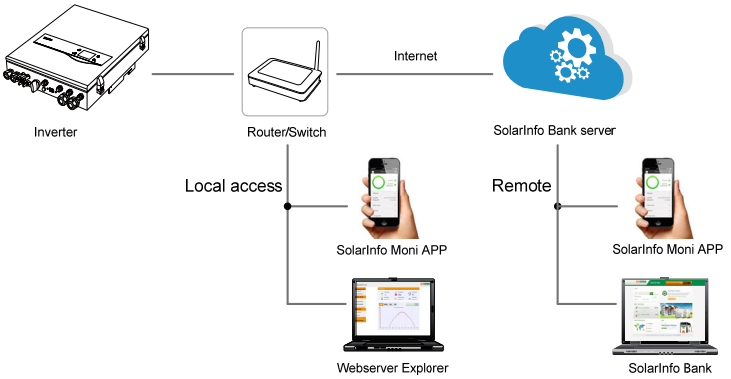


Fig. 5-6 Ethernet Connection with a Router

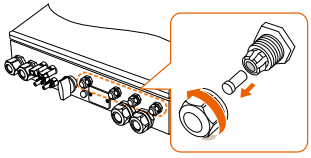
Cable Requirements

Use a TIA/EIA 568B standard network cable with a diameter of 3 mm to 5.3 mm.

Refer to the switch/router's manual for the definition of the communication port.

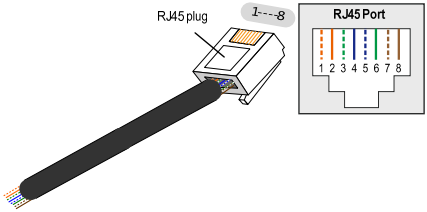
Procedure:

1. Unscrew the swivel nut from any **Com.** port.



2. Lead the cable through the cable gland and remove the cable jacket by 8 mm~15 mm.

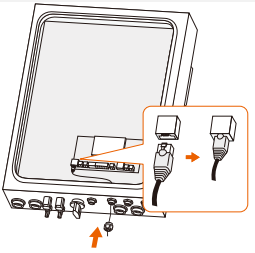
3. Use the Ethernet crimper to crimp the cable and connect the cable to RJ45 plug according to TIA/EIA 568B.



Corresponding Relationship Between Cables and Pins:

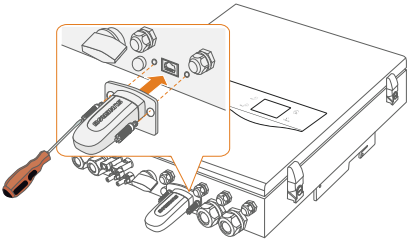
Pin 1: White-orange;	Pin 2: Orange;
Pin 3: White-green;	Pin 4: Blue;
Pin 5: White-blue;	Pin 6: Green;
Pin 7: White-brown;	Pin 8: Brown.

4. Install the RJ45 plug to the **Ethernet** port.
5. Fasten the swivel nut and connect the other end to the socket of the switch or router.



5.6.2 (Optional) Wi-Fi Connection

1. Unscrew the waterproof lid from the Wi-Fi terminal.
2. Install the Wi-Fi module. Slightly shake it by hand to determine whether it is installed firmly.



3. Refer to the **Quick User Manual** delivered with the Wi-Fi module to configure the Wi-Fi.

5.7 Battery Connection

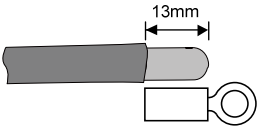
5.7.1 Connecting the Power Cable

Cable Requirements

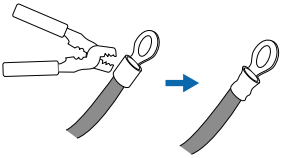
Cross-section: 10 mm^2 to 16 mm^2, OT (M6), cable diameter: 11 mm to 16 mm.

Procedure:

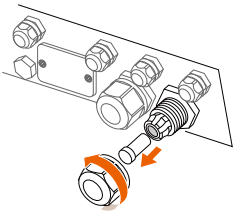
1. Remove the cable jacket.



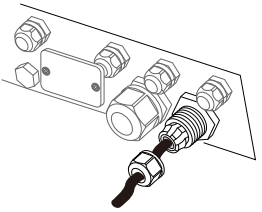
2. Crimp the OT terminal and install the heat shrinkable casing.

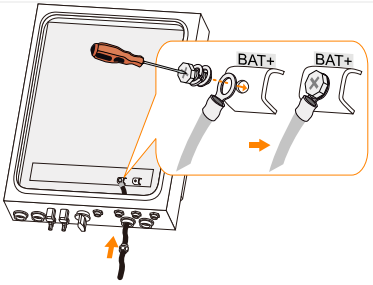


3. Unscrew the swivel nut from the **BAT+** and **BAT-** ports.



4. Lead the cable through the cable gland.





5. Fasten the cables to the corresponding terminals (torque 2.5 N·m).

   Be sure to adhere to the following screw assembly sequence: screw head, spring washer, fender washer, OT terminal.

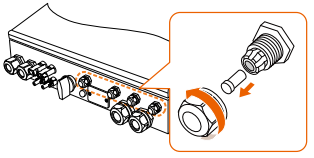
5.7.2 Connecting the CAN Cable

The CAN cable enables communication between the inverter and the Samsung Li-ion battery or LG Li-ion battery.

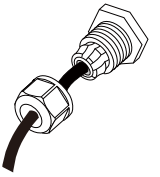
Use a TIA/EIA 568B standard network cable with a diameter of 4 mm to 5.3 mm.

Procedure:

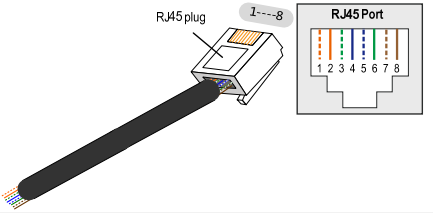
1. Unscrew the swivel nut from any **Com.** port.



2. Lead the cable through the cable gland and remove the cable jacket by 8 mm to 15 mm.



3. Use the Ethernet crimper to crimp the cable and connect the cable to RJ45 plug according to TIA/EIA 568B.

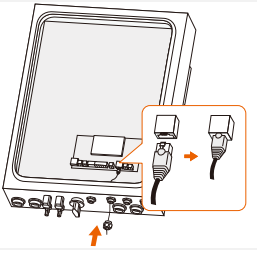


Corresponding Relationship Between Cables and Pins:

Pin 1: White-orange;	Pin 2: Orange;
Pin 3: White-green;	Pin 4: Blue;
Pin 5: White-blue;	Pin 6: Green;
Pin 7: White-brown;	Pin 8: Brown.

4. Install the RJ45 plug to the **BAT_Com.** port.

5. Fasten the swivel nut and connect the other end to the battery.



5.7.3 Connecting the RS485 Cable

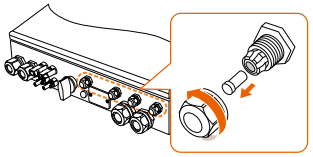
The RS485 cable connected to RS485_1 enables communication between the inverter and the Pylon Li-ion battery.

Cable Requirements

Cross-section: 2*0.5 mm², cable diameter: 3 mm to 5.3 mm

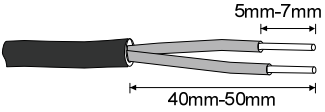
Procedure:

1. Unscrew the swivel nut from any **Com.** port.

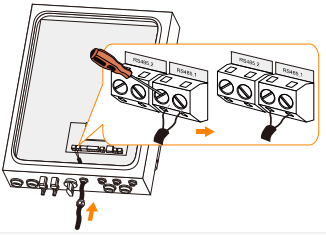


2. Lead the cable through the cable gland.

3. Remove the cable jacket and strip the wire insulation.



4. Tighten the wires to terminals **A1** and **B1**.



5. Fasten the swivel nut and connect the other end to the battery.

5.7.4 (Optional) Connecting the Temperature Sensor

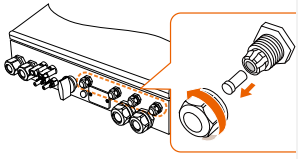
When the system is equipped with lead-acid battery, it is recommended to connect the PT1000 temperature sensor to the inverter. This is to sample the battery temperature or the external environment temperature of the battery.

Cable Requirements

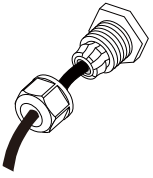
Cross-section: 1.0 mm^2, cable diameter: 3 mm to 5.3 mm

Procedure:

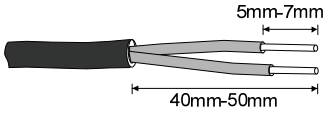
1. Unscrew the swivel nut from any **Com.** port.



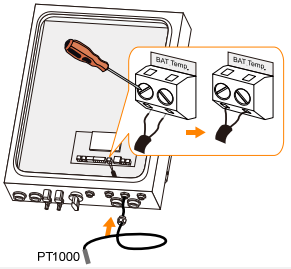
2. Lead the cable through the cable gland.



3. Remove the cable jacket and strip the wire insulation.



4. Tighten the wires to **BAT_Temp.**.



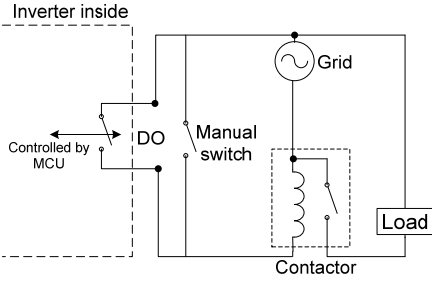
5. Fasten the swivel nut and place the temperature sensor next to the lead-acid battery.

5.8 DO Connection

The inverter has two DO relays with different functions as follows:

- DO1: Consumer load control. Please choose the appropriate contactor according to the load power, e.g. the contactor types of the 3TF30 series from SIEMENS (3TF30 01-0X).
- DO2: Earth fault alarm

Relay	Trigger condition	Description
Consumer load control	The load control mode has been set via the LCD menu.	The relay is activated once the conditions of the control mode are satisfied. See "**9 Appliance Adjusting**".
Earth fault alarm	The earth fault occurs.	Once the inverter receives the earth fault signal, the relay closes the contact. The relay remains triggered until the fault is removed.



NOTICE

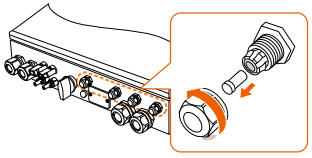
- **An AC contactor must be installed between the inverter and appliances. It is forbidden to connect the load directly to the DO port.**
- **The current of the AC loads shall not be larger than 3 A.**
- **The DO node is not controlled once the inverter is powered off. Connect the AC contactor by the manual switch, so as to control the loads.**

Cable Requirements

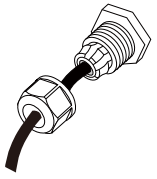
Cross-section: 1.0 mm^2, cable diameter: 3 mm to 5.3 mm

Procedure:

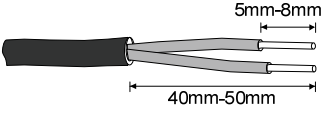
1. Unscrew the swivel nut from any **Com.** port.



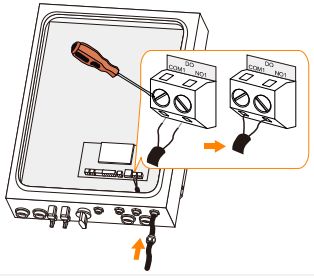
2. Lead the cable through the cable gland.



3. Remove the cable jacket and strip the wire insulation.



4. Tighten the wires to **DO** terminals.



5. Fasten the swivel nut and connect the other end of the cable to the original edge of AC contactor.

6 Commissioning

Commissioning is a critical part for the system, which can protect against fires, injury and electrical shock.

6.1 Inspection before Commissioning

Check the following items before starting the system.

1. The installation sites for all the devices are accessible for operation, maintenance and service.
2. Check and confirm that the inverter is firmly installed.
3. Space for ventilation is sufficient for one inverter or multiple inverters.
4. Nothing is left on the top of the inverter or battery module.
5. Inverter and accessories are correctly connected.
6. Cables are routed in safe place or protected against mechanical damage.
7. The selection of AC circuit breaker is optimal.
8. Terminals not used underneath the inverter are sealed.
9. Warning signs and labels are suitably affixed and durable.

6.2 Button Introduction

The inverter offers two buttons with multiple functions. Please refer to the following table before any operation of the inverter.

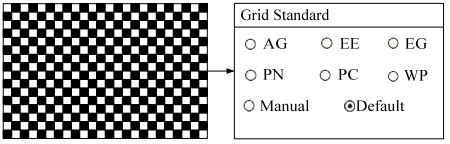
Tab. 6-1 Button Function

Button	Operation	Description
ESC	Press ≤0.5s	Move upwards, or increase the setting value. Hereinafter "**Press ▲**".
	Press ≥2s	Return to the previous menu or cancel the command. Hereinafter "**Press ESC**".
ENTER	Press ≤0.5s	Move downwards or right, or turn pages. Hereinafter "**Press ➤**".
	Press ≥2s	Enter into the submenu or confirm the command. Hereinafter "**Press ENTER**".

6.3 Commissioning Procedure

If all the items mentioned above meet the requirements, proceed as follows to start up the inverter for the first time.

1. Connect the AC circuit breaker.
2. Connect the DC circuit breaker between inverter and battery.
3. **(Optional)** When the battery equipped is LG Li-ion battery, Pylon Li-ion battery, or lead-acid battery, turn on the switch on the battery manually.
4. Rotate the DC switch to "ON". The DC switch may be integrated in SH5K or installed by the customer.
5. The LCD screen will be activated 5s later. **Press** ▲/▶ to choose the correct grid standard. **Press ENTER** to confirm.



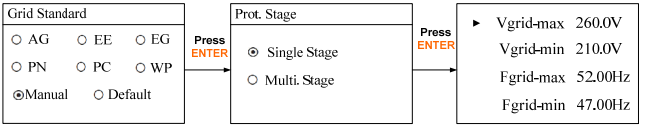
The following table describes the default parameters of every grid standard.

Tab. 6-2 Parameters of Grid Standards

Code	Company	Vgrid-max	Vgrid-min	Fgrid-max	Fgrid-min
AG	AusGrid, NSW	260.0 V	200.0 V	52.00 Hz	48.00 Hz
EE*	Ergon Energy, QLD	260.0 V	210.0 V	52.00 Hz	47.00 Hz
EG*	Energex, QLD	260.0 V	210.0 V	52.00 Hz	47.00 Hz
PN	SA Power Networks, SA	257.0 V	200.0 V	52.00 Hz	48.00 Hz
PC	Powercor, VIC	255.0 V	220.0 V	52.00 Hz	47.50 Hz
WP	Western Power, WA	270.0 V	226.0 V	52.00 Hz	47.50 Hz
Default	Australia standard	270.0 V	210.0 V	51.50 Hz	47.50 Hz

*The **10min-vol** parameters (10-minute average grid voltage) of EE and EG are 255.0 V and 257.0 V respectively.

6. When choosing "Manual", set the single-stage or multiple-stage protection parameters manually. (single stage as an example)



Press ▲ to move ▶ up or down and **Press** ➤ to enter the editing mode.
Press ▲ to set the value and **Press** ➤ to move the cursor.
Press ENTER to confirm.

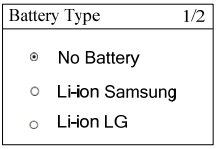
7. Configure time according to the local time. Time setting is very important, which directly affects data logging. **Press** ➤ to move cursor and **Press** ▲ to scroll up value. Confirm by **Pressing ENTER**.

DD, MM, and **YY** stand for day, month, and year respectively. **hh**, **mm**, and **ss** stand for hour, minute, and second respectively.

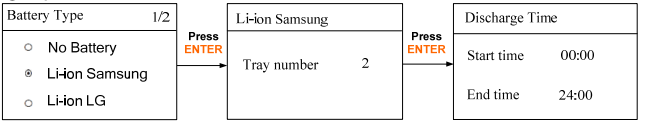
Date	DD / MM / YY 22 / 02 / 15
Time	hh : mm : ss 07 : 38 : 08

8. **Press** ➤ to choose the correct battery type. Confirm by **Pressing ENTER**.

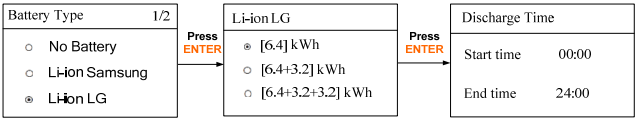
"No Battery" option:
Press ENTER to confirm.



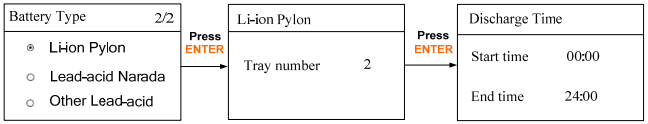
"Li-ion Samsung" option:



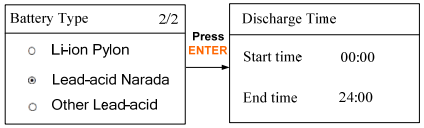
"Li-ion LG" option:



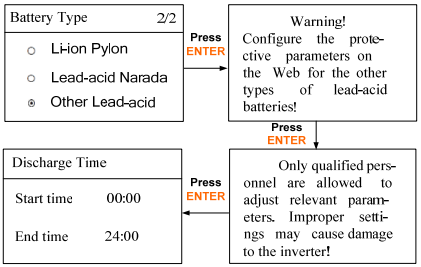
"Li-ion Pylon" option:



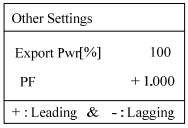
"Lead-acid Narada" option:



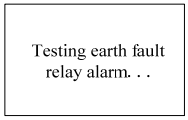
"Other Lead-acid" option:



9. **Press** ➤ to move cursor and **Press** ▲ to set the value. Confirm by **Pressing ENTER**.



10. **Press ENTER** to test the earth fault alarm function.



11. Check the state of LED indicators.

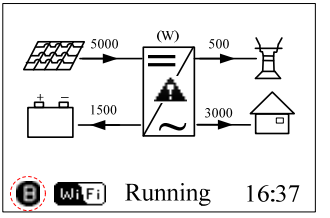
Tab. 6-3 Descriptions of LED Indicators

Name	State	Description
"RUN"	On	The inverter is running normally.
	Blinking	The inverter is in the process of starting.
	Off	Other states except Running and Starting. (Refer to **Tab. 7-3** for state descriptions.)
"FAULT"	On	Permanent fault or upgrade failure.
	Blinking	Other system faults or main alarms.
	Off	No fault occurs.

If the inverter commissioning fails, **Press** ➤ to view "current fault" information. Remove the existing malfunction and then repeat starting up the inverter according to the above procedure.

12. The icon B shows that the inverter and the SolarInfo Bank server are successfully connected.

    Visit www.solarinfobank.com or the SolarInfo Moni APP to view the inverter information. The related manuals can be acquired at www.sungrowpower.com.



NOTICE

- **Do not commission the system again until 5 minutes after the failure.**
- **The indicators will be steadily on if the enclosure lid is moved after initial commissioning. Do not operate the inverter until 30s later.**

7 Operation

7.1 Button Function

The inverter offers two buttons with multiple functions. Please refer to the following table before any operation of the inverter.

Tab. 7-1 Button Function

Button	Operation	Description
ESC	Press ≤0.5s	Move upwards, or increase the setting value. Hereinafter "**Press ▲**".
	Press ≥2s	Return to the previous menu or cancel the command. Hereinafter "**Press ESC**".
ENTER	Press ≤0.5s	Move downwards or right, or turn pages. Hereinafter "**Press ➤**".
	Press ≥2s	Enter into the submenu or confirm the command. Hereinafter "**Press ENTER**".

7.2 Main Screen

If the inverter succeeds in commissioning, the LCD screen will enter the main screen.

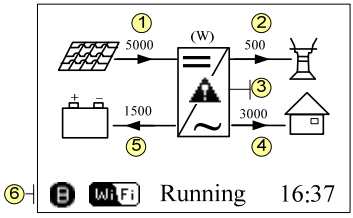


Fig. 7-1 Main Screen

*Neither the grid power nor the load power will be displayed on the main screen in case of no SUNGROW meter installed.

Tab. 7-2 Main Screen Description

No.	Description
1	Current PV input power
2	Current export power
3	Warning information
4	Total loads consumption
5	Battery charge/discharge power
6	System status bar:
	: The inverter and the SolarInfo Bank server are successfully connected.
	: Blinks if the Wi-Fi is not connected to the router's WiFi network. Steady if the Wi-Fi is successfully connected to the router's WiFi network.
	Running: The inverter is in its normal running state.
	16:37: Current system time.

- The background illumination of the LCD screen will go out if there is no button operation for 1 minute. Reactivate it by pressing any button.
- The LCD will automatically return to the main screen if there is no button operation for 2 minutes. Reactivate it by pressing any button.

Tab. 7-3 State Descriptions

State	Description
Running	After being energized, the inverter tracks the PV arrays' maximum power point (MPP) and runs with the combination of the energy management system. This mode is the normal mode.
Maintain	The system is running normally, with the battery in maintenance process. (Only for lead-acid battery)
Forced	The system is running normally, with the EMS in forced mode.
Standby	The inverter waits for sufficient sunlight or battery level, then the DC voltage recovers. Refer to **Chapter 8** for standby time setting.
Key-stop	The inverter will stop running by manual "OFF" through the LCD menu. Set to "ON" if you want to restart the inverter.
Starting	The inverter is initializing and synchronizing with the grid.
Upgrading	The DSP or LCD software is in its upgrading process.
Fault	If a fault occurs, the inverter will automatically stop operation, trigger the AC relay and show "Fault" on the LCD with the "FAULT" indicator lit. Once the fault is removed in recovery time, the inverter will automatically resume running. Refer to **Chapter 8** for recovery time setting.
Upd-fail	Master DSP program online upgrade failure.

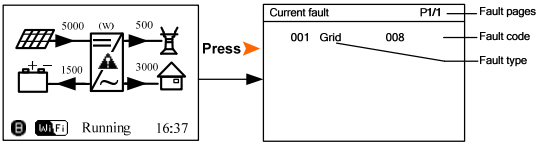
NOTICE

If the device is in standby mode for more than 10 minutes, please check:

- **Whether the insolation is sufficient and the PV connection is correct.**
- **Whether the battery level is sufficient and the cable connection is correct.**
- **If no anomaly is found, disconnect the DC switch and main switch to restart.**
- **If it still does not work, contact SUNGROW.**

Viewing Current Fault

If the ⚠ icon appears on the main screen, **Press** ➤ to view the current fault. Refer to "**10.1.2 Troubleshooting of Faults**" for fault definition.



7.3 LCD Menu Structure

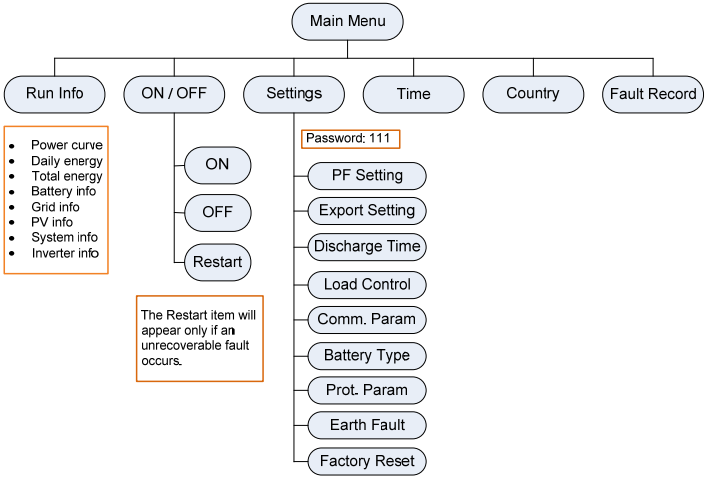


Fig. 7-2 LCD Menu Tree

- The power value indicated represents the average value during the time interval.
- The energy yields displayed are indicative only. For the actual yields, please refer to the electric energy meter.

Abbreviations

Abbreviation	Complete	Abbreviation	Complete
Comm.	Communication	Vtg	Voltage
Prot.	Protection	Curr	Current
Csmp	Consumption	Stt	State
Tot	Total	Pwr	Power
Chrg	Charge	Frq	Frequency
Bat	Battery	Cap	Capacity
Temp	Temperature	Ver.	Version
SOC	State of Charge	Multi.	Multiple
SOH	State of Health	-	-

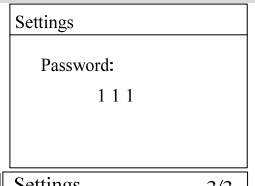
7.4 Settings

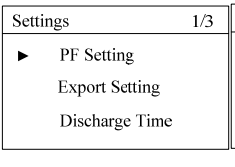
7.4.1 Inputting Password

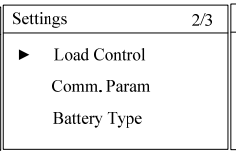
The parameter settings are protected by the password. If you want to set the inverter's parameters, you have to input the correct password.

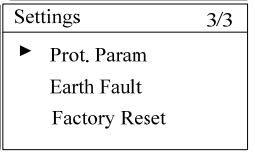
Main Screen (Press ENTER)→Menu (Press ➤×2)→Settings (Press ENTER)

A password confirmation screen will occur. **Press** ➤ to move the cursor right and **Press** ▲ to input the password **111**.
Press ENTER to confirm the password and enter the submenu





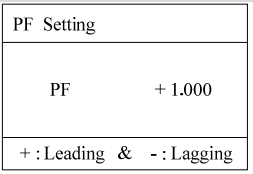




7.4.2 Setting Power Factor

Main Screen (Press ENTER)→Menu (Press ➤×2)→Settings (Press ENTER)→Input password 111 (Press ENTER)→PF Setting (Press ENTER)

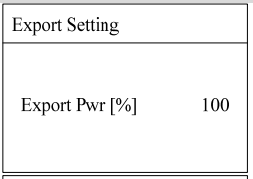
Press ➤ to move the cursor and **Press** ▲ to set the time. Confirm the settings by **Pressing ENTER**.



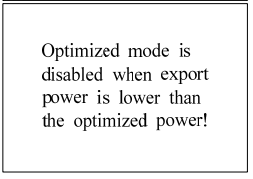
7.4.3 Setting Export Power

Main Screen (Press ENTER)→Menu (Press ➤×2)→Settings (Press ENTER)→Input password 111 (Press ENTER)→Settings (Press ➤×1)→Export Setting (Press ENTER)

Press ➤ to move the cursor and **Press** ▲ to set the time. Confirm the settings by **Pressing ENTER**.



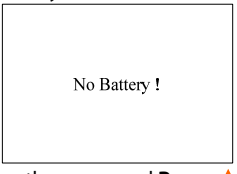
If the export power is lower than the optimized power of loads, the optimized mode will be disabled. For optimized power setting, see "**9 Appliance Adjusting**".



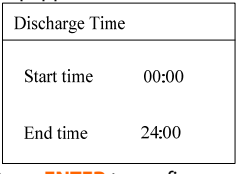
7.4.4 Setting Discharge Time

Main Screen (Press ENTER)→Menu (Press ➤×2)→Settings (Press ENTER)→Input password 111 (Press ENTER)→Settings (Press ➤×2)→Discharge Time (Press ENTER)

Prompt for no battery:



With batteries equipped:



Press ➤ to move the cursor and **Press** ▲ to set the time. **Press ENTER** to confirm.

7.4.5 Setting Load Control

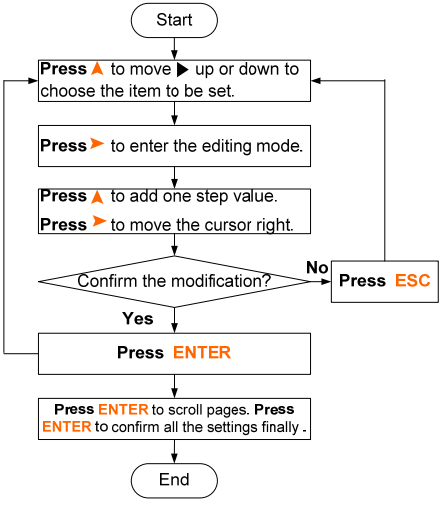
See chapter "**9 Appliance Adjusting**".

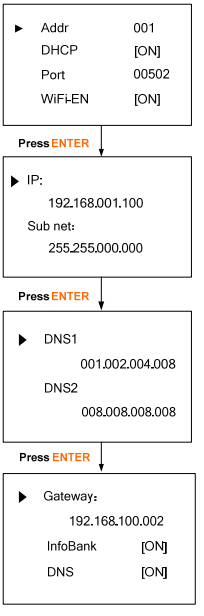
7.4.6 Setting Communication Parameters

Main Screen (Press ENTER)→Menu (Press ➤×2)→Settings (Press ENTER)→Input password 111 (Press ENTER)→Settings (Press ➤×4)→Comm. Param (Press ENTER)

Button operation:

The button function for communication settings is different from those of other menus.





- The range of communication address is 1...247.
- Acquire the IP, subnet mask, gateway, DNS1 and DNS2 from the network professional.
- Power off the system and restart it. The **WiFi-EN** setting will become effective.
  - **WiFi-EN ON:** Enable the Wi-Fi function and running data can be uploaded to the SolarInfo Bank via WiFi.
  - **WiFi-EN OFF:** Disable the Wi-Fi function and running data cannot be uploaded to the SolarInfo Bank via WiFi.

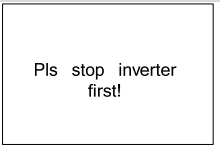
NOTICE

If there is more than one inverter and all the inverters are set to DHCP [OFF], a unique IP address should be assigned to each inverter. The configuration procedure should be performed only by qualified personnel.

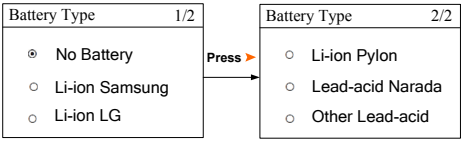
7.4.7 Setting Battery Type

Main Screen (Press ENTER)→Menu (Press ➤×2)→Settings (Press ENTER)→Input password 111 (Press ENTER)→Settings (Press ➤×5)→Battery Type (Press ENTER)

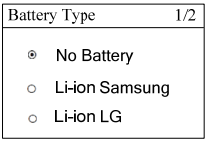
Do not change the battery type during operation. Otherwise the warning screen will prompt.



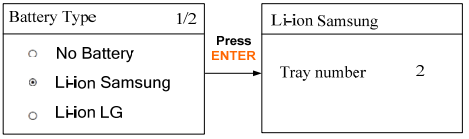
Press ➤ to choose the battery type and **Press ENTER** to confirm the choice.
No battery by default.



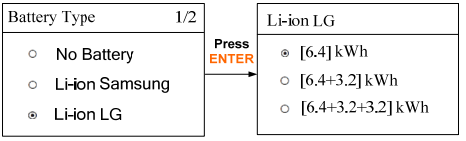
When choosing the option "No Battery" or "Lead-acid Narada", directly **Press ENTER** to confirm the choice.



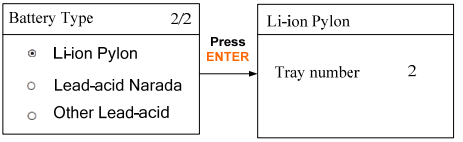
"Li-ion Samsung" option:



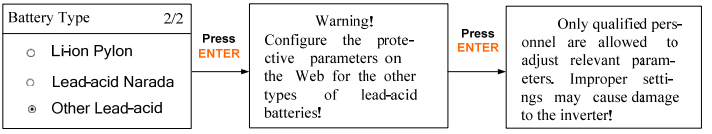
"Li-ion LG" option:



"Li-ion Pylon" option:



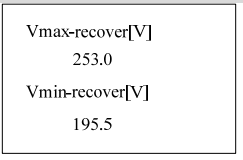
"Other Lead-acid" option:



7.4.8 Setting Protection Parameters

Main Screen (Press ENTER)→Menu (Press ➤×2)→Settings (Press ENTER)→Input password 111 (Press ENTER)→Settings (Press ➤×6)→Prot. Param (Press ENTER)

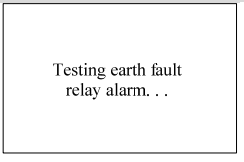
Press ➤ to move the cursor and **Press** ▲ to set the values. Confirm the settings by **Pressing ENTER**.



7.4.9 Testing Earth Fault

Main Screen (Press ENTER)→Menu (Press ➤×2)→Settings (Press ENTER)→Input password 111 (Press ENTER)→Settings (Press ➤×7)→Earth Fault (Press ENTER)

Confirm to test the earth fault alarm function by **Pressing ENTER**.



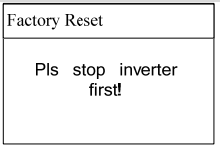
7.4.10 Factory Reset

NOTICE

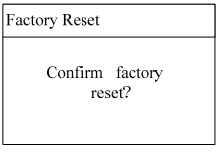
All history information will be irrecoverably cleared and all parameters will return to the default values except the protection parameters and time once the "Factory Reset" is performed.

Main Screen (Press ENTER)→Menu (Press ➤×2)→Settings (Press ENTER)→Input password 111 (Press ENTER)→Settings (Press ➤×8)→Factory Reset (Press ENTER)

Do not perform "Factory Reset" during operation. Otherwise the warning screen will prompt.



Press **ENTER** to confirm "Factory Reset".



7.5 Setting the Time

If there is deviation between the time on inverter main screen and your local time, you should perform the time setting. Otherwise the inverter data logging will fail. Clock is 24-hour format.

DD, MM, and **YY** stand for day, month, and year respectively. **hh**, **mm**, and **ss** stand for hour, minute, and second respectively.

Main Screen (Press ENTER)→Menu (Press ➤×3)→Time (Press ENTER)

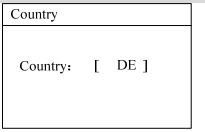
On the "Time" screen, **Press** ➤ to move the cursor right and **Press** ▲ to set the correct date and time. Confirm settings by **pressing ENTER**.

Date	DD / MM / YY 22 / 02 / 15
Time	hh : mm : ss 07 : 38 : 08

7.6 Setting Country Code

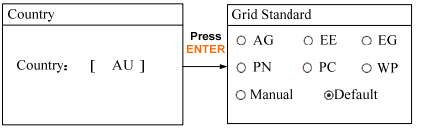
Main Screen (Press ENTER)→Menu (Press ➤×4)→Country (Press ENTER)

Choose the correct country code by **Pressing ▲.**
For country codes other than "AU", **Press ENTER** to confirm.



For country code "AU" and grids other than "Manual":

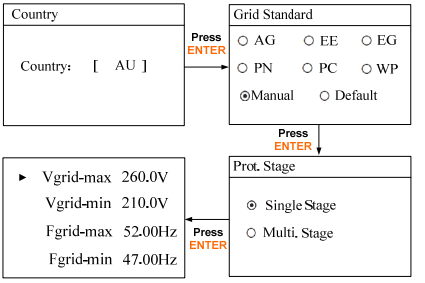
Press ➤/▲ to choose the correct grid standard.
Press ENTER to confirm.



For parameter descriptions of other grid standards, see **Tab. 6-2**.

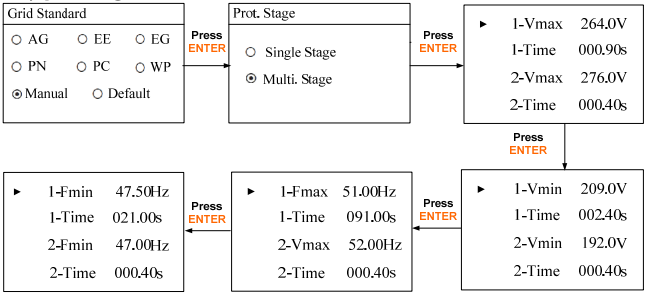
For country code "AU" and grid "Manual" (Single Stage):

Press ➤ to move the cursor right and **Press ▲** to set the value.
Press ENTER to confirm.



For country code "AU" and grid "Manual" (Multi Stage):

Press ➤ to move the cursor right and **Press ▲** to set the value.
Confirm settings by **pressing ENTER**.



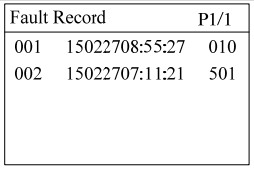
Descriptions of the country codes are as follows:

Country Code	Full Name	Language
GB	Great Britain	English
DE	Germany	German
FR	France	French
IT	Italy	Italian
ES	Spain	English
AT	Austria	German
AU	Australia	English
CZ	Czech	English
BE	Belgium	French
DK	Denmark	English
GR_L	Greece Land	English
GR_IS	Greece Island	English
NL	Netherlands	English
PT	Portugal	English
CHN	China	Chinese
SE	Sweden	English
US	America	English
Other	Country not included above	English

7.7 Viewing Fault Records

Main Screen (Press ENTER)→Menu (Press ➤×5)→Fault Record (Press ENTER)

Press ➤ to view all the fault records.



8 Visiting and Configuring the Webserver

8.1 User and Authority

The Webserver provides user permission and installer permission:

User permission (by default): Username is **user** and the password **1111**.

Installer permission: Select the username **installer** through the drop-down list. The password is **2222**.

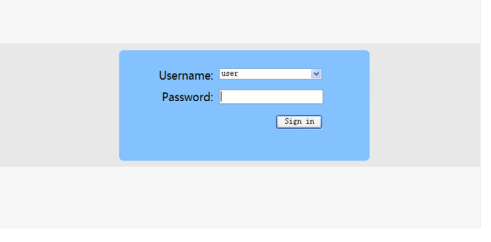
NOTICE

Abnormality may be caused if users make parameter modification with installer permission. The loss caused is out of any or all warranty rights.

Only one person can login to Webserver at a time. Log out in time if you finish the visit. Wait until 4s later to log in again.

Follow the steps to login.

1. Query the inverter IP address according to the instructions in "**7.4.6 Setting Communication Parameters**".
2. Open the browser. Input the inverter's IP address and press "Enter".
3. Select the username and input the corresponding password according to the visitor's role. Press "Sign in" or "Enter" to log in.



- If there is no operation for 10 minutes, system will automatically return to the login interface.
- User can change the password after signing in. For details, see the node "**System Information**".
- The figures in this chapter are all with the installer permission.

8.2 Main Interface

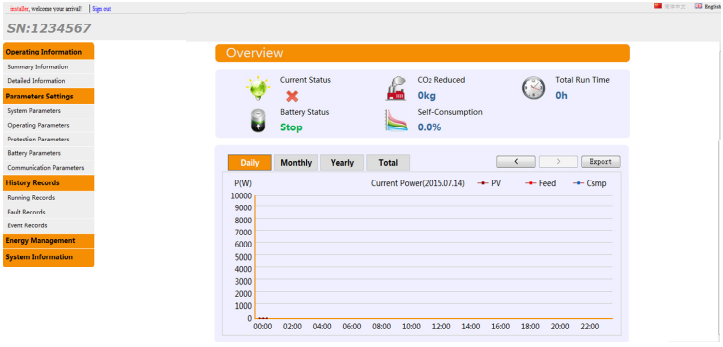


Fig. 8-1 Webserver Main Interface

The default interface after login displays the read-only information. You can use the "Export" button to export data as a csv file. The SN of the running inverter is shown.

Tab. 8-1 Icons Explanation

Icon	Name	Description
	Current status	 : Inverter is not in the fault state;  : The inverter is in fault state. (DSP and LCD communication fault, and the fault of the inverter.)
	CO_2 reduced	CO_2 reduction due to the use of the inverter.
	Total runtime	Total running time of the inverter.
	Battery status	Battery level.
	Self-consumption	The proportion of PV power generation used for load consumption.

8.3 Navigation Introduction

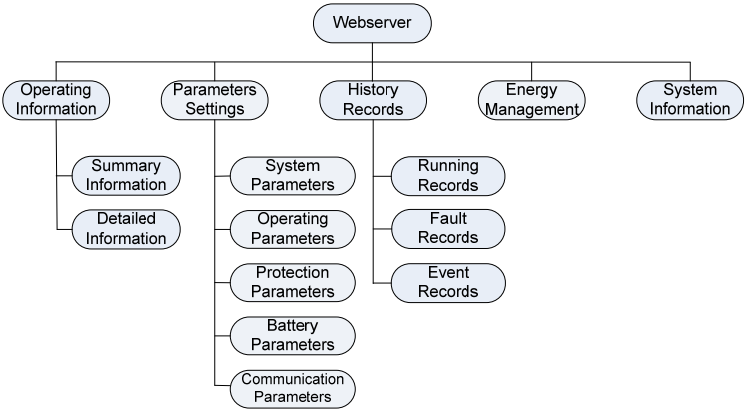
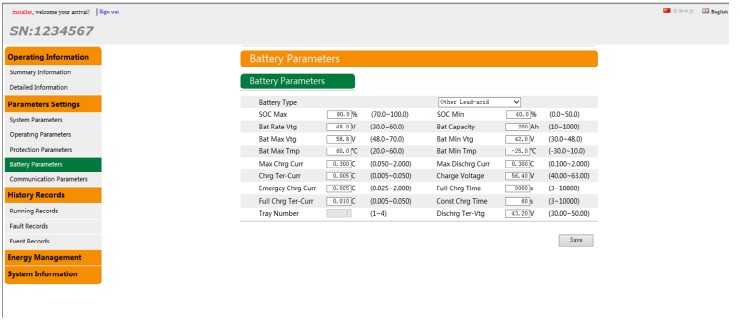


Fig. 8-2 Webserver Navigation

History records: 10 records in each page, 100 records at most.

8.4 Battery Parameters



This interface is to set the related battery parameters. The following table describes the parameters explanation of "Other Lead-acid battery".

Tab. 8-2 Battery Parameter Descriptions

Parameter	Description	Default Value	Range
Battery Type	No battery, Lead-acid Narada, Li-ion Samsung, Li-ion LG, Li-ion Pylon, Other Lead-acid.	No battery	-
SOC Max	Upper limit of battery charge when charging.	90.0%	70% to 100%
SOC Min	Lower limit of battery charge when discharging.	40.0%	0% to 50%
Bat Rate Vtg	Rated voltage of the equipped battery.	48.0 V	30 V to 60 V
Tray Capacity	Capacity of the battery tray.	200 Ah	10 Ah to1000 Ah
Bat Max Vtg	Upper limit value of battery voltage when charging.	58.8 V	48 V to 70 V
Bat Min Vtg	Lower limit value of battery voltage when discharging.	42.0 V	30 V to 48 V
Bat Max Tmp	Upper limit value of battery temperature.	60.0℃	20℃ to 60℃
Bat Min Tmp	Lower limit value of battery temperature.	-25.0℃	-30℃ to 10℃
Max Chrg Curr	Upper limit value of the charging current.	0.300C	0.05C to 2C
Max Dischrg Curr	Upper limit value of the discharging current.	0.300C	0.1C to 2C
Chrg Ter-Curr	Terminated current of constant voltage charging.	0.005C	0.005C to 0.05C
Charge Voltage	Charge voltage of constant voltage charging.	56.4 V	40 V to 63 V
Const Chrg Time	Charge time of constant voltage charging.	60s	3s to 10000s
Dischrg Ter-Vtg	Terminated voltage of discharging.	43.20 V	30 V to 50 V
Emergcy Chrg Curr	Emergency charge current of constant current charging.	0.025C	0.025C to 2C
Full Chrg Ter-Curr	Terminated current of full charging.	0.010C	0.005C to 0.05C
Full Chrg Time	Time needed for full charging.	9000s	3s to 10800s
Tray Number	Tray number of Li-ion battery.	1 (not settable)	1 ~ 4

Abbreviations

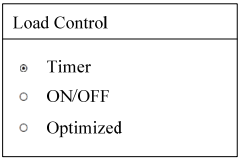
Abbreviation	Complete	Abbreviation	Complete
Vtg	Voltage	Ter-Vtg	Terminated voltage
Tmp	Temperature	Curr	Current
Chrg	Charge	Tur-Curr	Terminated current
Dischrg	Discharge	-	-

9 Appliance Adjusting

The PV hybrid system has the function of energy management. After connecting the appliance with DO port, the DO port will transmit the control signal. Users can flexibly set the control mode via the LCD menu, including timer mode, ON/OFF mode and optimized mode.

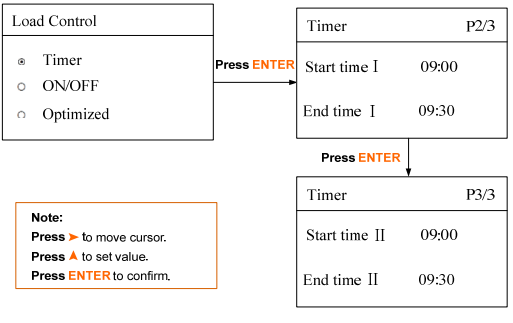
Follow the instructions to enter the submenu of Load Control.

1. Main Screen (**Press ENTER**)→Menu (**Press** ➤×2)→Set-param (**Press ENTER**)→Input password 111 (**Press ENTER**)→Settings (**Press** ➤×3)→Load Control (**Press ENTER**).
2. **Press** ➤ to choose the control mode. **Press Enter** to confirm the selection.



9.1 Timer Control

In timer mode, set the Start time and End time, then the system will control load's operation during the set time interval. Take 09:00~09:30 as an example.



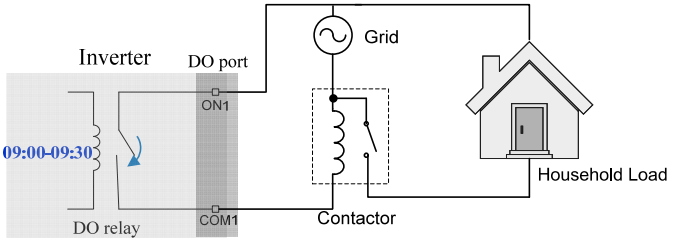
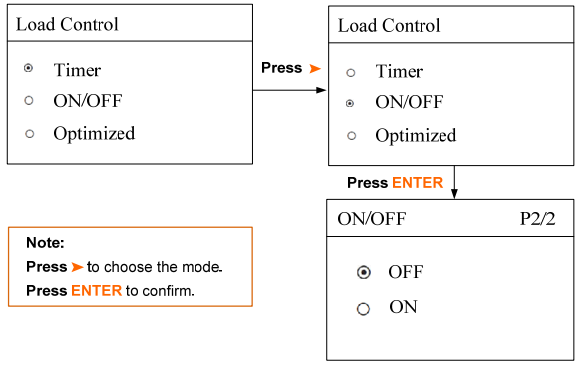


Fig. 9-1 DO Operation in Timer Control

9.2 ON/OFF Control

With the ON/OFF mode, the system will control the load's operation according to the setting. Set to OFF in the following example



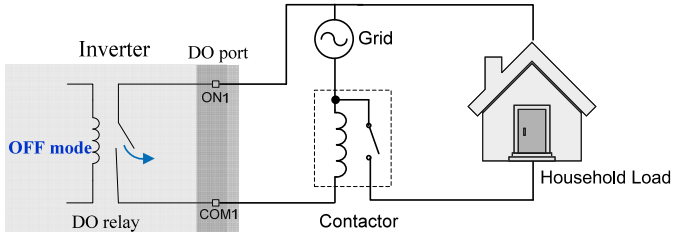
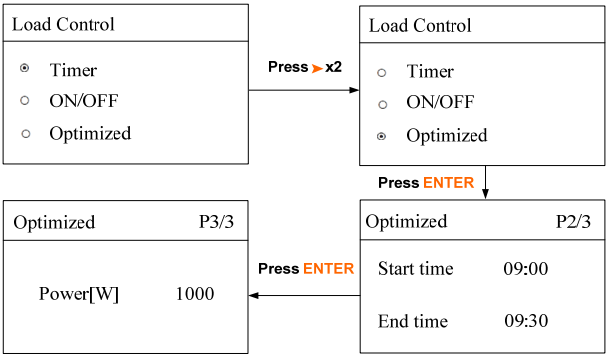


Fig. 9-2 DO Operation in ON/OFF Control

9.3 Optimized Control

In optimized mode, the system will control the load's operation in the setting time interval according to the power optimization algorithm of energy management. Take 09:00~09:30 and the optimized power of 1000 W as an example.

- The optimized power is the rated power of the load. It can be set from 0 to 5000 W.
- Once the optimized mode is enabled, the DO relay will not disconnect until 20 minutes after the DO connection.



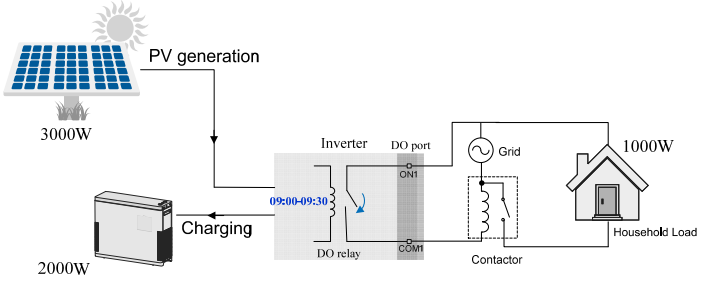


Fig. 9-3 DO Operation in Optimized Control

10 Troubleshooting and Maintenance

10.1 Troubleshooting

10.1.1 Troubleshooting of LED Indicators

See "**Tab. 6-3 Descriptions of LED Indicators**" for the definition of indicator states.

Fault Type	Troubleshooting
LED indicators and LCD screen cannot be lit	1. Disconnect the AC circuit breaker. 2. Rotate the DC Switch to "OFF". 3. Check the polarities of the DC inputs.
"RUN" indicator goes out	1. Disconnect the AC circuit breaker. 2. Rotate the DC Switch to "OFF". 3. Check the electrical connection. 4. Check whether the DC input voltage exceeds the start voltage of the inverter. 5. If all of the above are OK, please contact SUNGROW.
"Fault" indicator is lit	1. A fault is not resolved. 2. Perform troubleshooting according to the fault type on the LCD screen. See "**10.1.2 Troubleshooting of Faults**". 3. If it cannot be resolved, please contact SUNGROW.

10.1.2 Troubleshooting of Faults

When faults occur, the "Fault" state will be shown on the main screen. **Press** ➤ to view all the "current fault" information pages.

- If all the conditions of the inverter are OK but the fault still occurs, contact the SUNGROW Service Dept.
- If all the conditions of the battery are OK but the fault still occurs, contact the distributor, manufacturer, or the SUNGROW Service Dept.
- The default ranges only apply to the grid standards in Australia. Refer to **Tab. 6-2** for the specified values.
- We need the following information to provide you with the best assistance: type, serial number of inverter, fault code/name, and a brief description of the problem.

For Inverter Side

Code	Specification	Troubleshooting
002	Grid overvoltage. (default value range: 255 V to 270 V)	1. Check the grid voltage. 2. If the grid voltage exceeds the permissible range, consult the utility grid for solution.
003	Temporary Grid overvoltage. (default value: 400 V)	This is a short-term fault. Wait a moment for inverter recovery or restart the system.
004	Grid undervoltage. (default value range: 200 V to 226 V)	1. Check the grid voltage. 2. If the grid voltage exceeds the permissible range, consult the utility grid for solution.
005	Grid undervoltage. (default value: 192 V)	
007	Temporary AC overcurrent. The instantaneous AC current has exceeded the allowable upper limit.	Wait a moment for inverter recovery or restart the system.
008	Grid overfrequency. (default value range: 51.5 Hz to 52 Hz)	1. Check the grid frequency. 2. If the grid frequency exceeds the permissible range, consult the utility grid for solution.
009	Grid underfrequency. (default value range: 47 Hz to 48 Hz)	
010	Islanding. Abnormal connection between the system and the grid.	1. Check whether the AC circuit breaker is triggered. 2. Check whether all the AC cables are firmly connected. 3. Check whether the grid is in service.
011	DC component overcurrent. The DC component of the AC current exceeds the upper limit.	Wait a moment for inverter recovery or restart the system.
012	Leakage current overcurrent. The leakage current exceeds the upper limit.	Check whether there is a grounding fault in the PV strings.
014	The average grid voltage is outside the permissible range for over 10 minutes. (default value range: 255 V to 257 V)	1. Check whether the grid is operating normally. 2. Wait a moment for inverter recovery or restart the system.
015	Grid overvoltage. (default value: 276 V)	1. Check the grid voltage. 2. If the grid voltage exceeds the permissible range, consult the utility grid for solution.

Code	Specification	Troubleshooting
019	The instantaneous bus voltage exceeds the upper limit.	Wait a moment for inverter recovery or restart the system.
021	PV1 overcurrent. The input current of PV1 exceeds the upper limit.	1. Check the PV input power and configuration. 2. Wait a moment for inverter recovery or restart the system.
022	PV2 overcurrent. The input current of PV2 exceeds the upper limit.	
024	The deviation of neutral point voltage exceeds the allowable limit.	The inverter will recover once the deviation falls below the protective limit.
028	Reverse polarity of the PV1 connection.	1. Disconnect the DC switch. 2. Check the polarity of the PV inputs. 3. Reconnect the PV strings if the polarity is incorrect.
029	Reverse polarity of the PV2 connection.	
037	Enclosure over-temperature. The ambient temperature of the enclosure exceeds the upper limit.	1. Check and clean the heat sink. 2. Check whether the inverter is installed in sunlight or the ambient temperature exceeds 45℃~60℃.
038	Relay fault.	Wait 5 minutes for inverter recovery or restart the system.
041	Leakage current sampling fault.	
043	The ambient temperature is too low.	The inverter will recover once the ambient temperature rises above -30 ℃.
044	Faults detected in the DC/AC inverter circuit.	Wait 5 minutes for inverter recovery or restart the system.
045	Faults detected in the PV1 boosted circuit.	
046	Faults detected in the PV2 boosted circuit.	
048	Faults detected in the phase current sampling channel.	
083	Fan 2 abnormal speed warning.	Restart the system
100	Hardware overcurrent fault. The AC current has exceeded the protection value.	Wait 5 minutes for inverter recovery or restart the system.
101	Grid overfrequency. (default value: 52 Hz)	Check the grid voltage and frequency.
102	Grid underfrequency. (default value: 47 Hz)	
200	Bus overvoltage hardware fault. The bus voltage exceeds the protection value.	Wait 5 minutes for inverter recovery or restart the system.

Code	Specification	Troubleshooting
202	PV overcurrent hardware fault. The PV1 or PV2 current exceeds the protection value.	
203	The PV input voltage exceeds the bus voltage.	Check the functionality of the PV connection terminals.
300	The temperature of some components inside the cabinet is too high.	1. Check and clean the heat sink. 2. Check whether the inverter is installed in sunlight or the ambient temperature exceeds 45℃~60℃. 3 Restart the system.
302	PV insulation resistance fault.	1. Check whether the PV cable connection is intact. 3. Wait for a sunny day to check whether the system can run well.
308	Accessory processor fault. Redundant fault detected.	Restart the system.
309	Faults detected in the phase voltage sampling channel.	
312	Faults detected in the DC component sampling channel.	
315	Faults detected in the PV1 current sampling channel.	
316	Faults detected in the PV2 current sampling channel.	
317	Faults detected in the PV1 MPPT current sampling channel.	
318	Faults detected in the PV2 MPPT current sampling channel.	
320	Leakage current CT self-check fault.	
321	Communication faults between master DSP and slave DSP.	
322	Communication faults between master DSP and LCD.	
401-409	Permanent faults.	
501	FRAM reading warning.	1. Inverter can be connected to the grid normally. 2. Restart the system.
503-506, 511	Temperature sensor warnings.	
507	Error alarm of DO power settings.	Refer to the load power to reset the DO control power
509	Clock reset fault.	Manually reset the clock or synchronize the clock with the network time. This will clear the

Code	Specification	Troubleshooting
		fault.
510	PV over-power warning under high voltage. The PV input power exceeds the permissible range under high PV voltage.	1. Check whether the configuration of the PV array exceeds the permissible range of the inverter. 2. Wait a moment for inverter recovery or restart the system.
513	Fan 1 abnormal speed warning.	Restart the system.
514	Communication failure or reverse connection fault of the meter.	1. Inverter can be connected to the grid normally. 2. Check whether the input and output connections of the meter are correct. 3. Check whether the RS485 connection between meter and inverter is correct.
515	Boost short circuit warning. Either PV1 or PV2 has been damaged.	Restart the system.
600	The instantaneous battery charging current exceeds the upper limit.	Wait a moment for system recovery or restart the system.
601	The instantaneous battery discharging current exceeds the upper limit.	
602	Undervoltage of clamping capacitor.	1. Check the cable connection of the battery. 2. Wait a moment for system recovery or restart the system.
603	Temporary overvoltage of clamping capacitor.	Wait a moment for system recovery or restart the system.
608	Battery charge/discharge circuit self-check fault.	
612	The temperature of the battery charge/discharge circuit exceeds the protection value.	1. Check and clean the heat sink. 2. Check whether the inverter is installed in sunlight or the ambient temperature exceeds 45℃~60℃. 3 Restart the system.
616	Battery charge/discharge over-current protection.	The system will resume once the battery charge/discharge current falls below the upper limit or restart the system.
620	Faults detected in the sampling channel of the battery charge/discharge current.	Wait a moment for system recovery or restart the system.
623	Communication faults between	

Code	Specification	Troubleshooting
	slave DSP and LCD.	
624	Battery charge/discharge soft start fault.	
800,802 804,807	Battery charge/discharge inner permanent fault.	Restart the system
900,901	Battery charge/discharge inner temperature sensor warning:	1. Check and clean the heat sink. 2. Check whether the inverter is installed in sunlight or the ambient temperature exceeds 45℃~60℃. 3 Restart the system.

For Battery Side

Code	Specification	Troubleshooting
703	Battery average undervoltage fault.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Wait a moment for system recovery or restart the system.
707	Battery over-temperature fault.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Check the ambient temperature of the battery location. 3. Wait a moment for system recovery or restart the system.
708	Battery under-temperature fault.	
711	Instantaneous battery overvoltage.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Wait a moment for system recovery or restart the system.
712	Battery average overvoltage fault.	
714	Abnormal communication between BMS and the hybrid system.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Check the battery type and communication connection. 3. Wait a moment for system recovery or restart the system.
715	Battery hardware overvoltage fault.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Wait a moment for system recovery or restart the system.
732,740, 748,756	BMS overvoltage protection.	1. The inverter can be normally connected to the grid. Charge has stopped but discharge is allowed.

Code	Specification	Troubleshooting
		2. Wait a moment for system recovery.
733,741, 749,757	BMS over-temperature protection.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Check the ambient temperature of the battery location. 3. Wait a moment for system recovery or restart the system.
734,742, 750,758	BMS under-temperature protection.	
735,743, 751,759	BMS charge/discharge overcurrent protection.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Wait a moment for system recovery or restart the system.
736,744, 752,760	BMS FET over-temperature protection.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Check the ambient temperature of the battery location. 3. Wait a moment for system recovery or restart the system.
737,745, 753,761	CAN communication error between battery BMS and inverter.	1. The inverter can be normally connected to the grid but the charge has stopped. 2. Check whether the BMS cable connection is normal. 3. Power off and then restart the battery system.
738,746, 754,762	BMS FET under-temperature protection.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Check the ambient temperature of the battery location. 3. Wait a moment for system recovery or restart the system.
739,747, 755,763	BMS undervoltage protection.	1. The inverter can be normally connected to the grid. Discharge has stopped but charge is allowed. 2. Wait a moment for system recovery or restart the system.
832,840 848,856	BMS FET fault.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Check the battery port voltage and the BMS communication cable connection. 3. Force a shutdown and restart the inverter and battery system.
833,841 849,857	BMS FET over-temperature fault.	
834,842 850,858	BMS overcurrent fault.	
835,843	BMS short-circuit fault.	

Code	Specification	Troubleshooting
851,859 864,872 880,888 865,873 881,889 866,874 882,890 867,875 883,891 868,876 884,892 869,877 885,893 870,878 886,894 871,879 887,895	BMS cell overvoltage fault. BMS total voltage & tray voltage fault. BMS precharge voltage fault. BMS undervoltage fault. Cell voltage imbalance fault. BMS over-temperature fault. FET connection fault. BMS power-off signal.	4. Wait a moment for system recovery or restart the system.
836,837 838	BMS fault of LG Li-ion battery.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Check the cable connection of the battery. 3. Try to restart the inverter and battery.
906	Transformer direction recognition error.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Wait a moment for system recovery or restart the system.
909	Low SOH (State of Health) warning.	1. The inverter can be normally connected to the grid and the charge/discharge function is normal. 2. Batteries are beyond the scope of the warranty. It is recommended to contact the distributor for replacements.
910	Abnormal warning of LCD FRAM	Restart the inverter.
932,940, 948,956	BMS overvoltage warning.	1. The inverter can be normally connected to the grid. Charge has stopped but discharge is allowed. 2. The system will resume after a certain time of discharging.
933,941 949,957 934,942 950,958	BMS over-temperature warning. BMS under-temperature warning.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Check the ambient temperature of the battery location.

Code	Specification	Troubleshooting
		3. Wait a moment for system recovery or restart the system.
935,943, 951,959	BMS charge/discharge overcurrent warning.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Wait a moment for system recovery or restart the system.
936,944, 952,960	BMS FET over-temperature warning.	1. The inverter can be normally connected to the grid but charge/discharge has stopped. 2. Check the ambient temperature of the battery location. 3. Wait a moment for system recovery or restart the system.
937,945, 953,961	BMS tray voltage imbalance warning.	1. The inverter can be normally connected to the grid and the charge/discharge functions are normal. 2. Check whether the cable connection of the battery is correct.
939,947, 955,963	BMS undervoltage warning.	1. The inverter can be normally connected to the grid. Discharge has stopped but charge is allowed. 2. The system will resume after a certain time of charging.

10.2 Maintenance

10.2.1 Routine Maintenance

Item	Method	Period
General state of system	• Visual check for any damage or deformation of the inverter. • Check any abnormal noise during the operation. • Check each operation parameter. • Be sure that nothing covers the heatsink of inverter.	Every 6 months
Electrical connection	Check whether there is damage to the cables, especially the surface in contact with metal.	6 months after commissioning and then once or twice a year.

10.2.2 Replacing the Button Battery

DANGER

Disconnect the inverter from the grid first, then PV arrays and battery before any maintenance work.

Lethal voltage still exists in the inverter. Please wait at least 10 minutes and then perform maintenance work.

There is a button battery on the inner PCB board of the LCD. Contact the SUNGROW Service Dept. for replacement when the relevant fault alarm occurs.

Check the fastener, appearance, voltage, and resistance quarterly and annually.

11 System Decommissioning

11.1 Decommissioning the Inverter

NOTICE

Please strictly follow the following procedure. Otherwise it will cause lethal voltages or unrecoverable damage to the inverter.

Powering off the Inverter

1. Stop the inverter via the LCD menu. For details, see "**7 Operation**".
2. Disconnect the AC circuit breaker and secure it against reconnection.
3. Rotate the DC switch to "OFF". The DC switch may be integrated in SH5K or installed by the customer.
4. Disconnect the DC circuit breaker between the battery and the inverter.

NOTICE

Don't power on the system again until 1 minute after this disconnection.

5. Wait for about **ten** minutes until the capacitors inside the inverter have completely discharged.
6. Measure and confirm that the AC output at the AC circuit breaker is voltage free.
7. Refer to "**5.3 Grid Connection**", disconnect the AC connector from the inverter in reverse procedure.
8. Disconnect the DC connectors.
9. Use the multimeter to measure the port voltage of battery. Disconnect the power cables after the voltage is zero.

Dismantling the Inverter

Refer to **Chapter 4** and **Chapter 5**, dismantle the cables in reverse procedure. Remove the wall-mounting bracket from the wall if necessary.

⚠ CAUTION

Risk of burn injuries and electric shock!

Wait at least 10 minutes after disconnecting the inverter from the utility grid and the PV input before touching any inner live parts.

Disposing of the Inverter

Users should take the responsibility for the disposal of the inverter.

NOTICE

Some parts and devices of the inverter, such as, LCD displayer, batteries, capacitors, may cause environment pollution.

Users must comply with the related local regulations to avoid the potential pollution.

11.2 Decommissioning the Battery

Decommission the battery in the system after the inverter is decommissioned.

Decommissioning Li-ion Battery

1. Disconnect the DC circuit breaker between the battery and the inverter.
2. Disconnect the communication cable between the battery and the inverter.
3. **(Optional)** If the LG Li-ion battery or Pylon Li-ion battery is equipped, turn off the switch on the battery.
4. Wait about 1 minute and use the multimeter to measure the port voltage of the battery.
5. If the battery port voltage is zero, disconnect the power cables between the battery and the inverter.

Decommissioning Lead-acid Battery

1. Disconnect the DC switch between the battery and the inverter.
2. Turn off the switch on the battery.
3. Disconnect all the cables between the battery and the inverter.

12 Appendix

12.1 Technical Data

Inverter Technical Data

Input Side Data	
Max. PV input power	6500 W
Max. PV input voltage	600 V
Startup voltage	125 V
Nominal input voltage	345 V
MPP voltage range	125 V to 560 V
MPP voltage range for nominal power	260 V to 520 V
No. of MPPTs	2
Max. number of PV strings per MPPT (DC1/DC2)	1/1
Max. PV input current (DC1/DC2)	20 A (10 A/10 A)
Max. current for input terminals	12 A
Short-circuit current of PV input	24 A (12 A/12 A)
Max. inverter feedback current to array	0 A
Output Side Data	
Nominal AC output power	5000 W
Max. AC output apparent power	5000 VA
Max. AC output current	21.7 A
Max. output fault current	343 A a.c./3.2 ms (peak value/duration)
Nominal grid voltage	230 Vac
Grid voltage range	180 Vac to 276 Vac (May vary as per corresponding country's grid standard)
Nominal grid frequency	50 Hz
Grid frequency range	45 Hz to 55 Hz (May vary as per corresponding country's grid standard)
Total Harmonic Distortion (THD)	<3% (Nominal power)
DC current injection	<0.5% In
Power factor	>0.99 @ default value at nominal power (adj. 0.8 overexcited to 0.8 underexited)
Protection	
Anti-islanding protection	Yes
AC short circuit protection	Yes

Leakage current protection	Yes
DC switch (solar)	Optional
DC fuse	No
Overvoltage protection	III
Battery Side Data	
Battery type	Li-ion battery / Lead-acid battery
Battery voltage	48 V (32 V to 70 V)
Max. charging/discharging current	65 A/65 A
System Data	
Max. efficiency	98.0%
Max. European efficiency	97.6%
Max. efficiency from battery to grid	95.0%
Isolation method (PV terminals)	Transformerless
Isolation method (battery terminals)	HF
Degree of protection	IP65
Night power consumption	<1 W
Noise emission	<30 dB
Operating ambient temperature range	-25℃ to 60℃(> 45℃ derating)
Allowable relative humidity range	0% to 100%
Cooling method	Natural convection
Max. operating altitude	4000 m (> 2000 m derating)
Display	Graphic LCD
Communication	2 x RS485, Ethernet, CAN, Wi-Fi (optional)
Power management	4 x Digital Inputs, 1 x Digital Output
Earth fault alarm	1 x Digital Output
Analogue inputs	PT1000 (temperature sensor)
DC connection type	MC4
AC connection type	Clamping yoke connector
Certificates and approvals (planned)	AS4777, AS/NZS3100, SI4777, G59/2, G83/2, IEC62109-1, IEC62109-2, VDE-AR-N-4105, IEC 62619, IEC 61427, IEC 62040
Mechanical Data	
Dimensions (W × H × D)	447 mm × 510 mm × 150 mm
Mounting method	Wall-mounting bracket
Weight	20 kg

Meter Technical Data

Parameters	
Nominal voltage	230 Vac
Input voltage range	180 Vac to 276 Vac
Power consumption	<2 W (10 VA)
Nominal current/measuring range	10 A/80 A
Grid frequency	50 Hz/60 Hz
Measurement accuracy	Class I
Interface	RS485
Degree of protection	IP2X
Operating temperature range	-20℃ to 50℃
Storage temperature range	-40℃ to 70℃
Allowable relative humidity range	0% to 95%; no corrosive or harmful substances in the air
Certificates	CE/CB
Dimensions (W × H × D)	72 mm × 90 mm × 63 mm
Mounting method	35 mm standard rail
Weight	0.4 kg

12.2 Exclusion of Liability

The content of these documents is periodically checked and revised, please contact us or check our website www.sungrowpower.com for the latest information. Discrepancies cannot be excluded. No guarantee is made for the completeness of these documents. Please contact our company or distributors to get the latest version.

Guarantee or liability claims for damages of any kind are excluded if they are caused by one or more of the followings:

- Inappropriate use or installation of the products.
- Installing or operating the products in an unintended environment.
- Ignoring relevant safety regulations in the deployment location when installing or operating the products.
- Ignoring safety warnings and instructions contained in all documents relevant to the products.
- Installing or operating the products under incorrect safety or protection conditions.
- Altering the products or supplied software without authority.

- The product faults due to operating attached or neighboring devices beyond allowed limit values.
- Damages caused by irresistible natural environment.

The use of supplied software produced by SUNGROW Power Supply Co., Ltd. is subject to the following conditions:

- SUNGROW Power Supply Co., Ltd. rejects any liability for direct or indirect damages arising from the use of the SolarInfo software. This also applies to the provision or non-provision of support activities.
- Using the SolarInfo software for commercial purposes is prohibited.
- Decompiling, decoding or destroying the original program, including SolarInfo software and the embedded software, is prohibited.

12.3 About Us

SUNGROW power supply is a China-leading manufacturer of various power electronics products for renewable energy generation systems. Our products include converters, inverters, battery chargers and other power supplies for distributable generation system in both grid-connected and stand-alone applications. The power rating of SUNGROW products covers from hundred watt to mega-watt systems.

The vision of SUNGROW is to help our customers acquire stable and clean power with minimum cost, maximum reliability and enhanced safety.

Contact Information

Should you have any problems, please contact us through the following information. We will be more than happy to assist you!

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