



User manual

PV Grid-Connected Inverter

Product Model: Sunny Deer Series(3K-5KTLM) Document Version 1.0(2014.07.20)

Product Name: PV Grid-Connected Inverter

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Shenzhen SOFARSOLAR Co., Ltd

Notice

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

Save these instructions!

This manual must be considered as an integral part of the equipment, and must be available at all times to everyone who interacts with the equipment. The manual must always accompany the equipment, even when it is transferred to another user or field.

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Preface

Outline

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

• Scope

This product manual describes the installation, electrical connections, commissioning, maintenance and troubleshooting of Sunny Deer series inverters:

SOFAR 3000TLM SOFAR 3680TLM SOFAR 4000TLM SOFAR 4600TLM SOFAR 5000TLM

Keep this manual where it will be accessible at all times.

• Target Group

This manual is intended for qualified electrical technical personnel who are responsible for inverter installation and commissioning in the PV power system and the PV plant operator.

• Symbols Used

This manual provides safety operation information and uses the symbol in order to ensure personal and property security and use the inverter efficiently when operating the inverter. You must understand these emphasized information to avoid the personal injury and property loss. Please read the following symbols used in this manual carefully.

 Danger	Danger indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 Warning	Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 Caution	Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
 Attention	Attention indicated potential risks which, if not avoided, may lead to equipment fault or property damage.
 Note	Note provides tips that are valuable for the optimal operation of the product.

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Basic safety information

	<p>If you have any question or problem when reading the following information, please contact Shenzhen SOFARSOLAR Co., Ltd.</p>
Note	

Outlines of this chapter

Safety instruction

It mainly introduce the safety instruction when install and operate the equipment.

Symbols and signs

It mainly introduce the safety symbols on the inverter.

1.1 Safety instructions

- Read and understand the instructions of this manual, and be familiar with relevant safety symbols in this chapter, then start to install and troubleshoot the equipment.
- According to the national and state requirements, before connecting to the electrical grid, you must get permission from the local electrical grid operator, and the operation can only be performed by qualified electrical engineer.
- Please contact the nearest authorized service center if any maintenance or repair is needed. Contact your distributor for the information of the nearest authorized service center. Do NOT repair it by yourself, it may cause injury or property damage.
- Before installing and maintaining the equipment, you should turn the DC switch OFF to cut off the high voltage DC of the PV array. You can also turn the switch in the PV combiner box OFF to cut off the high voltage DC. Otherwise, serious injury may be caused.

Qualified persons

Make sure the operator has the necessary skill and training to do his/her job. Staff in charge of using and maintaining the equipment must be skilled, aware and mature for the described tasks and must have the reliability to correctly interpret what is described in the manual. For Safety reasons only a qualified electrician, who has received training and / or has demonstrated skills and knowledge in construction and in operation of this device, can install this inverter. Shenzhen SOFARSOLAR Co., Ltd. does not take any responsibility for the property destruction and personal injury caused by any incorrect use.

Installation requirements

Please install inverter according to the following section. Fix the inverter on an appropriate objects with enough load bearing capacity (such as walls, PV racks etc.), and ensure that inverter is vertical placed. Choose a place suitable for installing electrical devices. And assure there is enough fire exit space, convenient for maintenance. Maintain proper ventilation to ensure enough air cycle to cool the inverter.



Transport requirements

If you find packing problems that may cause the damage of the inverter, or find any visible damage, please immediately notice the responsible transportation company. You can ask your solar system installer or Shenzhen SOFARSOLAR Co., Ltd. for help if necessary. Transport of the equipment, especially by road, must be carried out with suitable means for protecting the components (in particular, the electronic components) from violent shocks, humidity, vibration, etc.

Electric connection

Please comply with all the current electrical regulations about accident prevention in dealing with the solar inverter.

 Danger	<p>Before the electrical connection, make sure to use opaque material to cover the PV modules or to disconnect PV array DC switch. Exposure to the sun, PV array will produce a dangerous voltage!</p>
 Warning	<p>All installation accomplished only by professional electrical engineer!</p> <ul style="list-style-type: none"> • must be trained; • Completely read the manual operation and understand relevant matters.
 Attention	<p>Get permission from the local electrical grid operator, complete all electrical connections by professional electrical engineer, then connect inverter to electrical grid.</p>
 Note	<p>It's forbidden to remove the tamper evident label, or open the inverter. Otherwise Sofarsolar will not provide warranty or maintenance!</p>

Operation

	<p>Touching the electrical grid or the terminal of the equipment may lead to electrocution or fire!</p> <ul style="list-style-type: none"> • Don't touch the terminal or conductor connected to the electrical grid. • Pay attention to any instructions or safety documents related to grid connection.
Danger	
	<p>Some internal components will be very hot when inverter is working. Please wear protective gloves!</p>
Attention	

Maintenance and repair

	<ul style="list-style-type: none"> • Before any repair work, turn OFF the AC circuit breaker between the inverter and electrical grid first, then turn OFF the DC switch. • After turning OFF the AC circuit breaker and DC switch, wait for 5 minutes at least before carrying out any maintenance or repair work.
Danger	
	<ul style="list-style-type: none"> • Inverter should work again after removing any faults. If you need any repair work, please contact with the local authorized service center; • Do NOT disassemble the inverter without authorization. It will void the warranty and Shenzhen SOFARSOLAR Co., Ltd. will not take any responsibility for the losses caused by that.
Attention	

EMC / noise level of inverter

Electromagnetic compatibility (EMC) refers to that one electrical equipment functions in a given electromagnetic environment without any trouble or error, and impose no unacceptable effect upon the environment. Therefore, EMC represents the quality characters of an electrical equipment.

- The inherent noise-immune character: immunity to internal electrical noise.
- External noise immunity: immunity to electromagnetic noise of external system.
- Noise emission level: influence of electromagnetic emission upon environment.

	<p>Electromagnetic radiation from inverter may be harmful to health!</p> <ul style="list-style-type: none"> • Please do not continue to stay around the inverter in less than 20 cm when inverter is working.
Danger	

1.2 Symbols and signs

Safety symbols

	<p>Caution of burn injuries due to hot enclosure!</p> <ul style="list-style-type: none"> • You can only touch the screen and pressing key of the inverter while it's working.
Caution	

	<p>PV array should be grounded in accordance to the requirements of the local electrical grid operator!</p> <ul style="list-style-type: none"> • We suggest that all PV module frames and inverter are reliably grounded to protect the PV system and personnel security.
Attention	
	<p>Ensure input DC voltage < Max. DC voltage .Over voltage may cause permanent damage to inverter or other losses, which will not be included in warranty!</p>
Warning	

Signs on the inverter

There are some symbols which are related to security on the inverter. Please read and understand the content of the symbols, and then start the installation.

	There is a residual voltage in the inverter! Before opening the equipment, operator should wait for five minutes to ensure the capacitor is discharged completely.
	Be careful of high voltage.
	Be careful of high temperature.
	Comply with the Conformance Européenne (CE) certification.
	Grounding point.
	Please read this manual before install Sunny Deer series.
	This indicates the degree of protection of the equipment according to IEC standard 70-1 (EN 60529 June 1997).
	Positive pole and negative pole of the input voltage (DC).

2 Product characteristics

Outlines of this chapter

Product dimensions

It introduces the field of use, and the overall dimensions of Sunny Deer series inverters.

Function description

It introduces how Sunny Deer series inverters work and the function modules inside.

Efficiency curves

It introduces the efficiency curves of in the inverter.

2.1 Product dimensions

Field of use

Sunny Deer series is a Dual MPPT grid-tied PV inverter which converts the DC power generated by PV arrays into sine wave single-phase AC power and feeds it to the public electrical grid, AC circuit breaker (refer to Section 4.4) and DC switch used as disconnect device, and the disconnect device shall be easily accessible.

Figure2-1 PV Grid-tied System



Sunny Deer series inverters can only be used with photovoltaic modules that do not require one of the poles to be grounded. The operating current during normal operation must not exceed the limits specified in the technical specifications. Only the photovoltaic modules can be connected to the input of the inverter (do not connect batteries or other sources of power supply).

- The choice of optional parts of inverter should be made by a qualified technician who knows the installation conditions clearly.
- Overall dimensions: L×W×H=478mm×344mm×170mm.

Figure2-2 Front view and left view dimensions

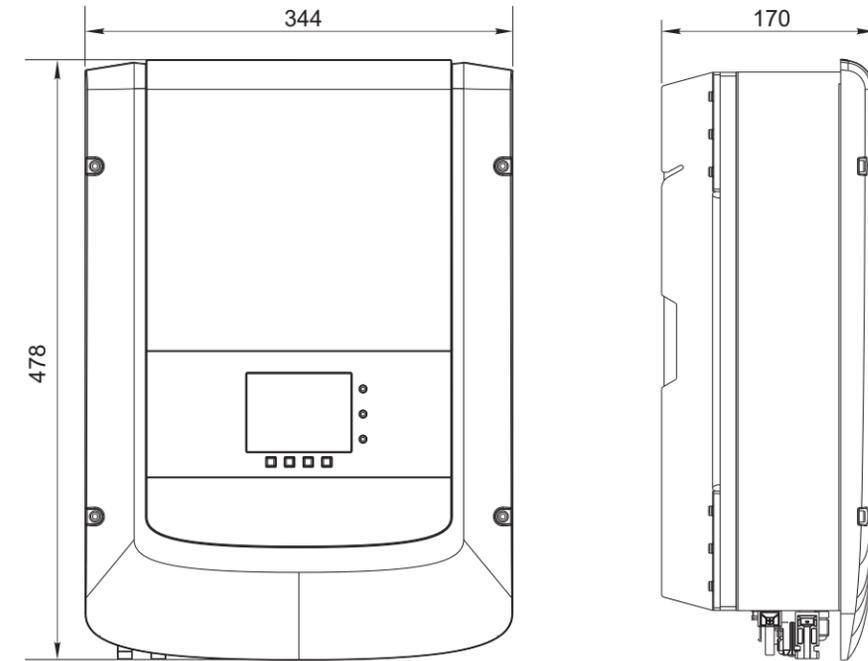
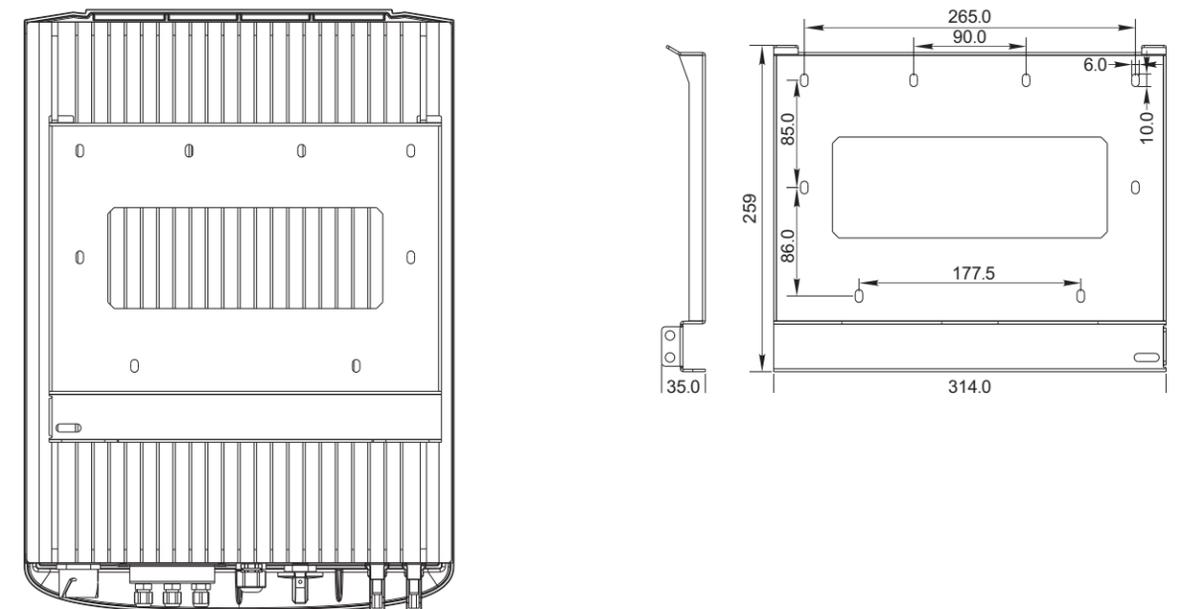


Figure2-3 Back view and Bracket dimensions



• Labels on the equipment :



The labels must NOT be hidden with objects and extraneous parts (rags, boxes, equipment, etc.); they must be cleaned regularly and kept visible at all times.



2.2 Function description

DC power generated by PV array is filtered through Input Board before entering into Power Board. Input Board also offer functions such as insulation impedance detection and input DC voltage / current detection. DC power is converted to AC power by Power Board. AC power is filtered through Output Board then AC power is fed into the grid. Output Board also offer functions such as grid voltage / output current detection, GFCI and output isolation relay. Control Board provides the auxiliary power, controls the operation state of inverter and shows the operation status by Display Board. Display Board displays fault code when inverter is in abnormal operation conditions. At the same time, Control Board can trigger the relay so as to protect the internal components.

• Function module

A. Configurable relay

The inverter has a configurable switching relay that can be used in various operating conditions (can be set in the dedicated menu). A typical application example is the closing of the normally open contacts when an alarm occurs.

B. Energy management unit

This control can be used to switch the inverter on/off through an external (remote) control.

C. Feeding reactive power into the grid

The inverter is able to produce reactive power and can therefore feed it into the grid through the setting of the phase shift factor. Feed-in management can be controlled directly by the grid company through a dedicated RS485 serial interface.

D. Limiting the active power fed into the grid

The inverter, if enabled can limit the amount of active power fed into the grid by the inverter to the desired value (Expressed as a percentage).

E. Self power reduction when grid is over frequency

When the grid frequency is higher than the limited value, inverter will reduce output power which is necessary for the grid stability.

F. Data transmission

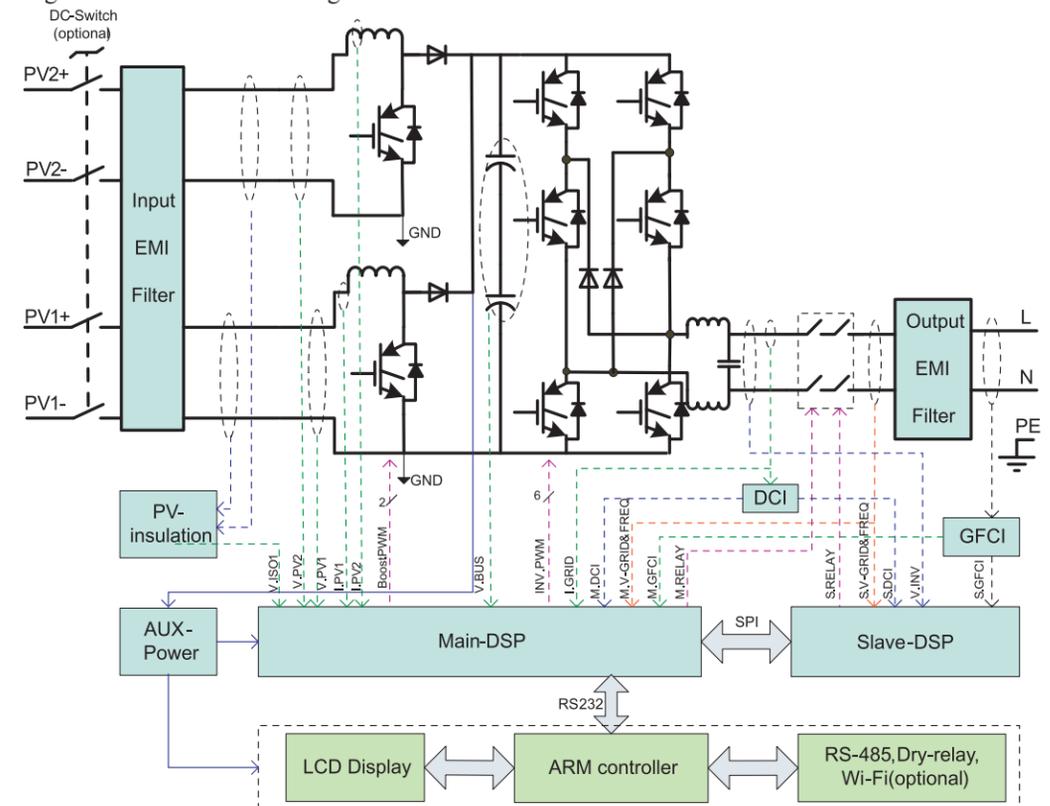
The inverter or a group of inverters may be monitored remotely through an advanced communication system based on RS-485 serial interface, or remotely via the WIFI.

G. Software update

SD card is used for updating the firmware.

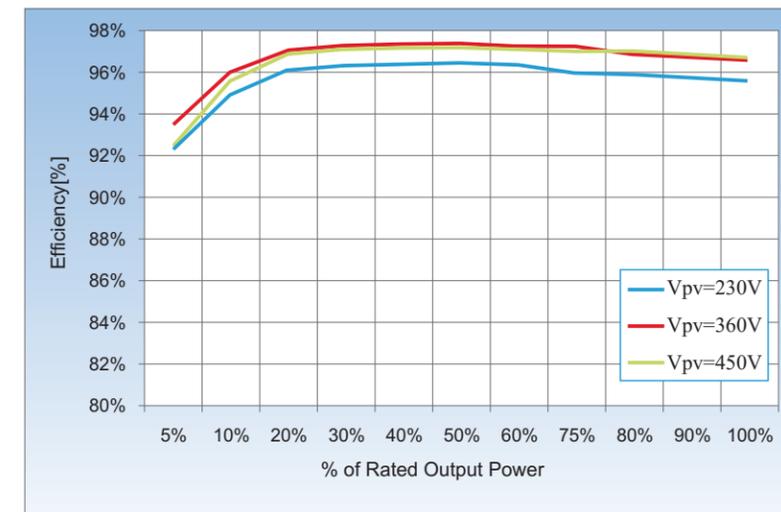
• Electrical block diagram

Figure2-4 Electrical block diagram



2.3 Efficiency curve

Efficiency curve of the SOFAR 5000TLM



3 Installation

Outlines of this chapter

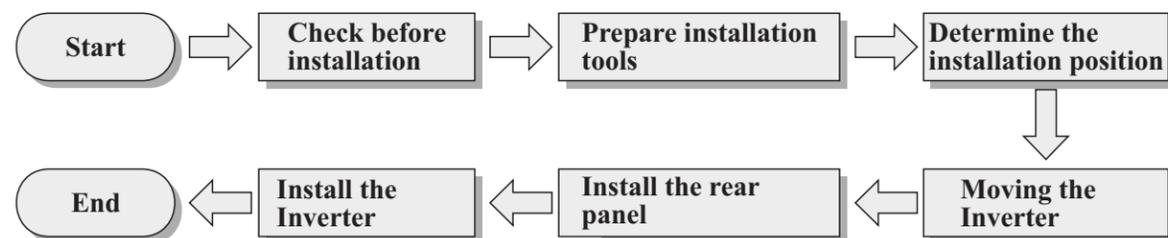
This topic describes how to install the Sunny Deer series inverter.

Installation notes

 Danger	<ul style="list-style-type: none"> Do NOT install the Sunny Deer series on a flammable material. Do NOT install the Sunny Deer series in an area used to store flammable or explosive materials.
 Caution	The enclosure and heat sink are very hot while the inverter is working, therefore do NOT install the Sunny Deer series in places where you might touch them inadvertently.
 Attention	<ul style="list-style-type: none"> Consider the weight of Sunny Deer series when transporting and moving the Sunny Deer Series inverters. Choose an appropriate mounting position and surface. Assign at least two persons to install the Sunny Deer series inverter.

3.1 Installation Process

Figure3-1 Installation flowchart



3.2 Checking Before Installation

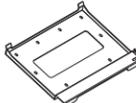
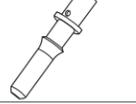
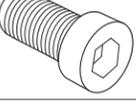
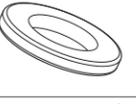
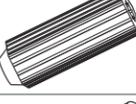
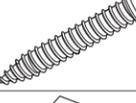
Checking Outer Packing Materials

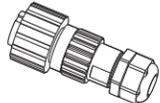
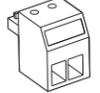
Packing materials and components may be damaged during transportation. Therefore, check the outer packing materials before installing the inverter. Check the outer packing materials for damage, such as holes and cracks. If any damage is found, do not unpack the Sunny Deer series and contact the dealer as soon as possible. You are advised to remove the packing materials within 24 hours before installing the Sunny Deer series inverter.

Checking Deliverables

After unpacking the inverter, check whether deliverables are intact and complete. If any damage is found or any component is missing, contact the dealer.

Table3-1 shows the components and mechanical parts that should be delivered

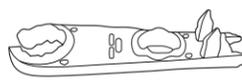
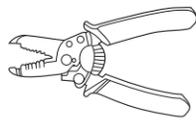
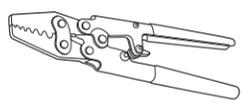
No.	Pictures	Description	Quantity
1		Sunny Deer Series	1 pcs
2		Rear panel	1 pcs
3		PV+ input terminal	2 pcs
4		PV-input terminal	2 pcs
5		Metal terminals secured to PV+ input power cables	2 pcs
6		Metal terminals secured to PV- input power cables	2 pcs
7		M5 Hexagon screws	2 pcs
8		M6 flat washer	10 pcs
9		Expansion bolts	10 pcs(spare 2pcs)
10		Self-tapping screw	8 pcs
11		Manual	1 pcs
12		The warranty card	1 pcs
13		Certificate	1 pcs

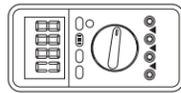
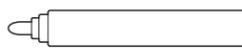
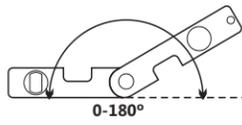
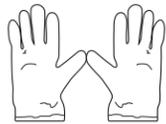
No.	Pictures	Description	Quantity
14		AC output terminal	1PCS
15		485 terminal (2pin)	1PCS
16		Dry relay terminal (3pin)	1PCS
17		I/O terminal (6pin)	1PCS
18		Stopper A	1PCS
19		Stopper B	1PCS

3.3 Tools

Prepare tools required for installation and electrical connections.

Table 3-2 shows the tools required for installation and electrical connections.

No.	Tool	Model	Function
1		Hammer drill Recommend drill dia. 6mm	Used to drill holes on the wall
2		Screwdriver	wiring
3		Removal tool	Remove PV terminal
4		Wire stripper	Strip wire
5		4mm Allen Wrench	Turn the screw to connect rear panel with inverter
6		Crimping tools	Used to crimp power cables

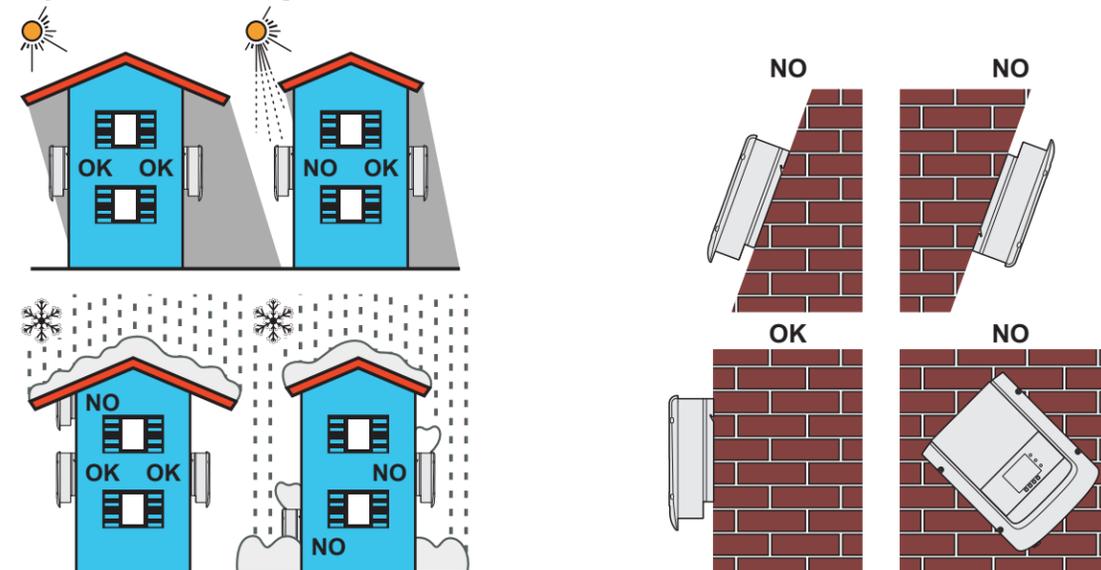
No.	Tool	Model	Function
7		Multi-meter	Used to check grounding
8		Marker	Used to mark signs
9		Measuring tape	Used to measure distances
10		Level	Used to ensure that the rear panel is properly installed
11		ESD gloves	Operators wear
12		Safety goggles	Operators wear
13		Anti-dust respirator	Operators wear

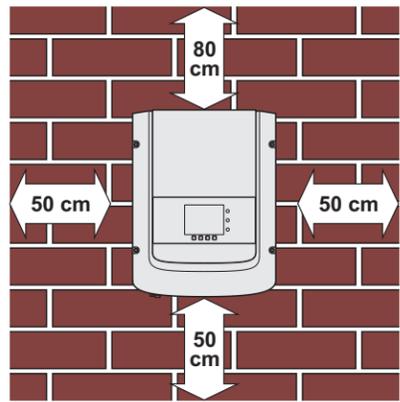
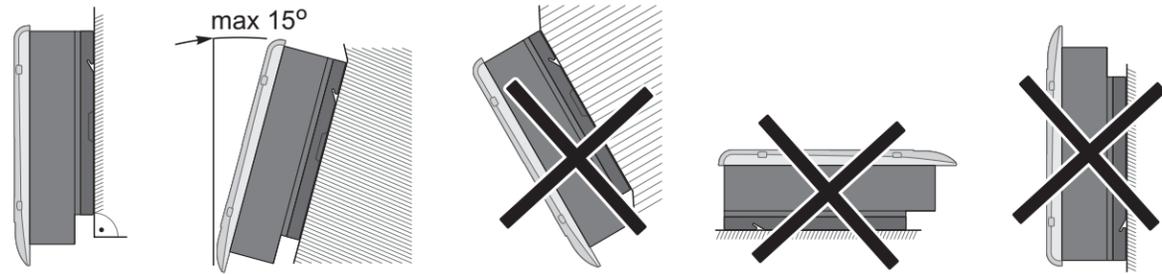
3.4 Determining the Installation Position

Determine an appropriate position for installing the Sunny Deer series inverter.

Comply with the following requirements when determining the installation position:

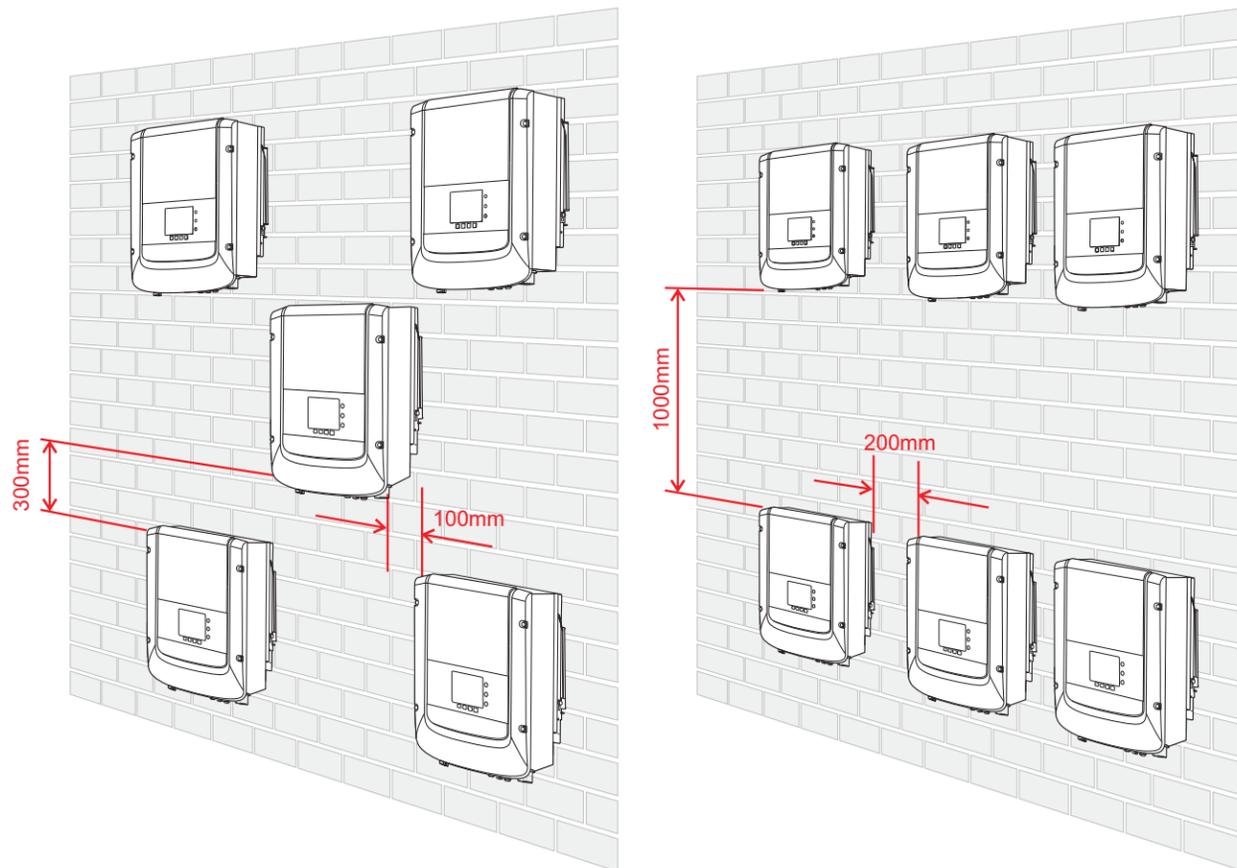
Figure3-2 Installation Requirements





clearance for single Sunny Deer series inverter

Installation of multiple Sunny Deer Series inverters



3.5 Moving the Sunny Deer series inverter

This topic describes how to move the Sunny Deer series to the installation position horizontally

Step 1 Open the packaging, insert hands into the slots on both sides of the Sunny Deer series and hold the handles, as shown in Figure 3-3 and Figure 3-4.

Figure 3-3 Moving the Sunny Deer series (1)

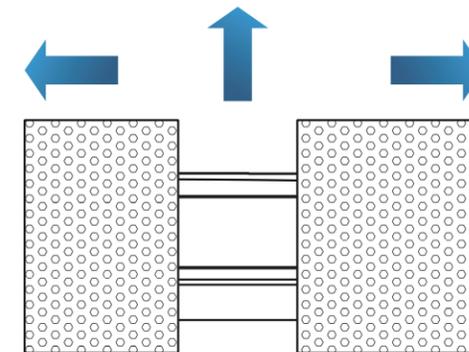
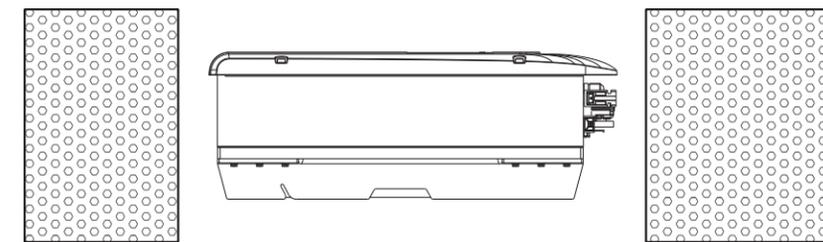


Figure 3-4 Moving the Sunny Deer series (2)



Step 2 Lift the Sunny Deer series from the packing case and move it to the installation position.

 Attention	<ul style="list-style-type: none"> • To prevent device damage and personal injury, keep balance when moving the Sunny Deer series because the Sunny Deer series is heavy. • Do not put the Sunny Deer series with its wiring terminals contacting the floor because the power ports and signal ports are not designed to support the weight of the Sunny Deer series. Place the Sunny Deer series horizontally. • When placing the Sunny Deer series on the floor, put foam or paper under the Sunny Deer series to protect its shell.
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--- End

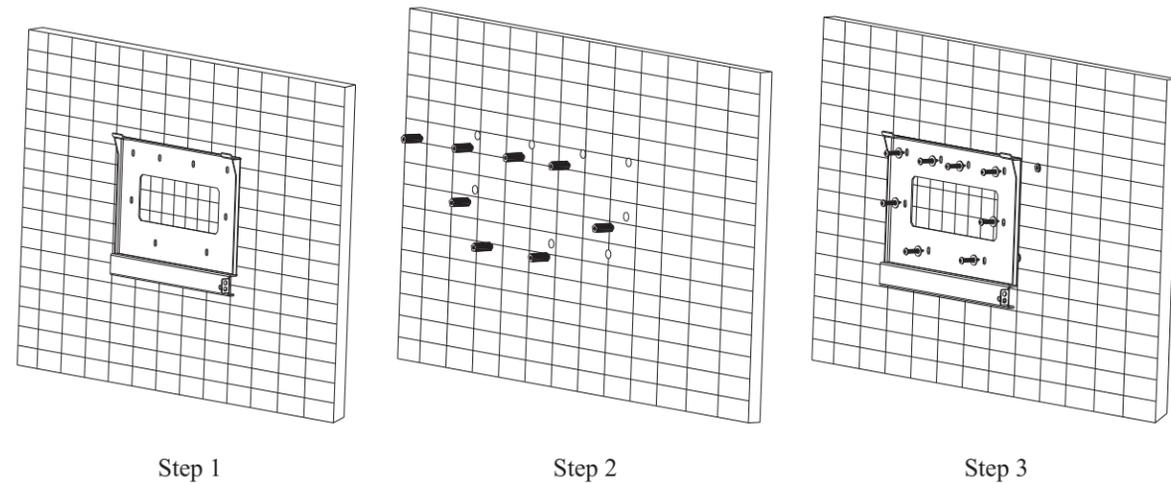
3.6 Installing Sunny Deer series inverter

Step 1 Determine the positions for drilling holes, ensure the hole positions are level, then mark the hole positions using a marker pen, use the hammer drill to drill holes on the wall. Keep the hammer drill perpendicular to the wall, do not shake when drilling, so as not to damage the wall. If the error of the hole positions is too big, you need to reposition.

Step 2 Insert the expansion bolt vertically into the hole, pay attention to the insertion depth of the expanding bolt (should be deep enough).

Step 3 Align the rear panel with hole positions, fix the rear panel on the wall by tightening the expansion bolt with the nuts.

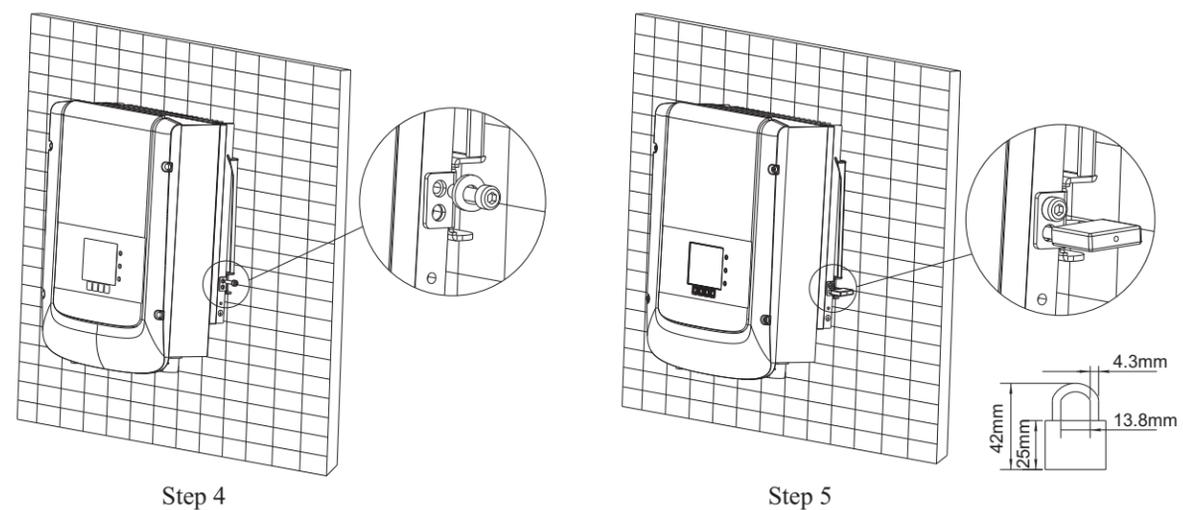
Figure 3-5



Step 4 Hook the inverter to the rear panel. Using an M5 screw to secure the inverter to the rear panel to ensure safety.

Step 5 You can secure the Sunny Deer series inverter to the rear panel and protect it from stealing by installing an anti-theft lock (this action is optional).

Figure 3-6



--- End

4 Electrical Connections

Outlines of this chapter

This topic describes the Sunny Deer series inverter electrical connections. Read this part carefully before connecting cables.

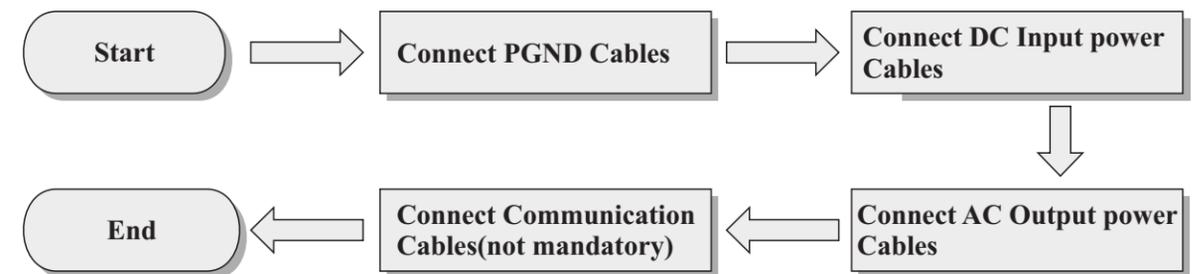
NOTE:

Before performing electrical connections, ensure that the DC switch is OFF. Since the stored electrical charge remains in a capacitor after the DC switch is turned OFF. So it's necessary to wait for at least 5 minutes for the capacitor to be electrically discharged.

	Installation and maintenance of inverter, must be operated by professional electrical engineer.
Attention	
	PV modules generate electric energy when exposed to sunlight and can create an electrical shock hazard. Therefore, before connecting DC input power cable, cover PV modules using opaque cloth.
Danger	
	<ul style="list-style-type: none"> The PV array maximum voltage must be $\leq 600V$, max output of single inverter is 4.6KVA and max output of PV system is 13.8KVA in Germany. Sunny Deer Series has 2 MPP trackers, all PV modules connected to the same MPPT should have similar rated electrical characteristics (including I_{sc}, V_{oc}, I_m, V_m, P_m and temperature coefficients), have the same number of series connected PV modules and be all in the same orientation (azimuth and tilt angle).
Note	

4.1 Electrical connection

Figure4-1 Shows the flowchart for connecting cables to the Sunny Deer series



4.2 Connecting PGND Cables

Connect the Sunny Deer series to the grounding electrode using protection ground (PGND) cables for grounding purposes.

	<p>The inverter is transformer-less, requires the positive pole and negative pole of the PV array are NOT grounded. Otherwise it will cause inverter failure. In the PV power system, all non current carrying metal parts (such as: PV module frame, PV rack, combiner box enclosure, inverter enclosure) should be connected to earth.</p>
Attention	

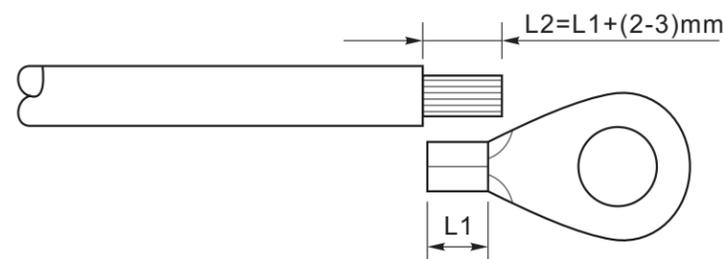
Prerequisites:

The PGND cables are prepared ($\geq 5\text{mm}^2$ outdoor power cables are recommended for grounding purposes), the color of cable should be yellow-green.

Procedure:

Step 1 Remove the insulation layer with an appropriate length using a wire stripper, as shown in Figure 4-2.

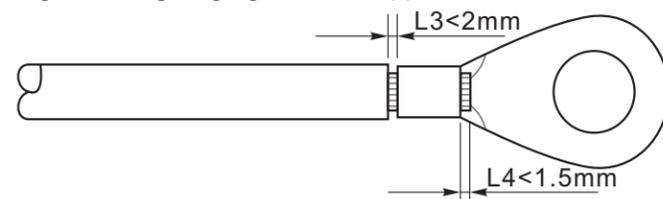
Figure4-2 Preparing a ground cable (1)



Note : L2 is 2 to 3mm longer than L1

Step 2 Insert the exposed core wires into the OT terminal and crimp them by using a crimping tool, as shown in Figure 4-3.

Figure4-3 Preparing a ground cable (2)

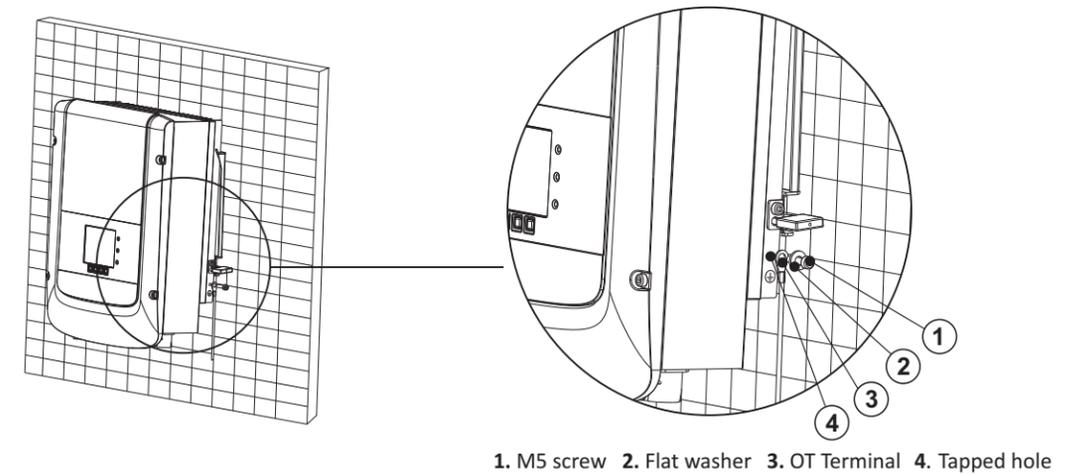


Note 1: L3 is the length between the insulation layer of the ground cable and the crimped part. L4 is the distance between the crimped part and core wires protruding from the crimped part.

Note 2: The cavity formed after crimping the conductor crimp strip shall wrap the core wires completely. The core wires shall contact the terminal closely.

Step 3 Install the crimped OT terminal, flat washer using M5 screw, and tighten the screw to a torque of 3 N.m using an Allen wrench.

Figure4-4 Ground terminal composition



4.3 Connecting DC Input Power Cables

Table 4-1 Recommended DC input cable specifications

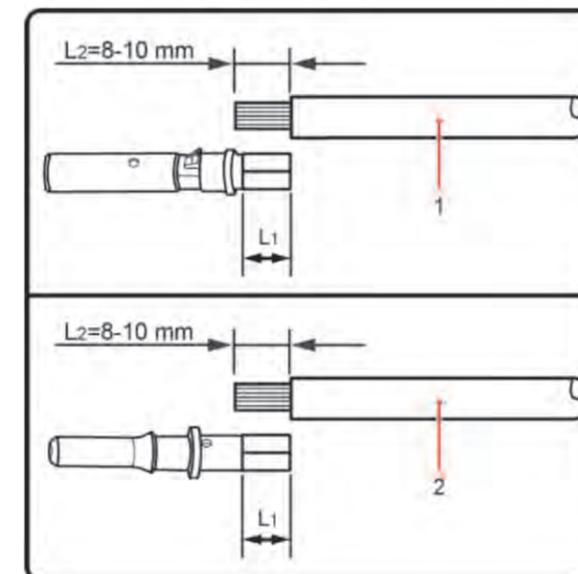
Cross-Sectional Area (mm ²)		External Cable Diameter(mm)
Range	Recommended Value	
4.0~6.0	4.0	4.5~7.8

Procedure

Step 1 Remove cable glands from the positive and negative connectors.

Step 2 Remove the insulation layer with an appropriate length from the positive and negative power cables by using a wire stripper as show in Figure 4-5.

Figure 4-5 Connecting DC input power cables



1. Positive power cable 2. Negative power cable



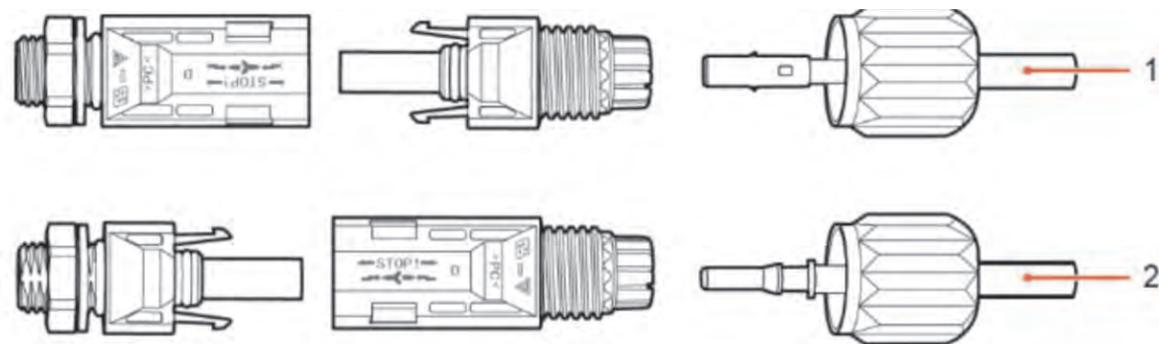
Note

L2 is 2 to 3 mm longer than L1.

Step 3 Insert the positive and negative power cables into corresponding cable glands.

Step 4 Insert the stripped positive and negative power cables into the positive and negative metal terminals respectively and crimp them using a crimping tool. Ensure that the cables are crimped until they cannot be pulled out by force less than 400 N, as shown in Figure 4-6.

Figure 4-6 Connecting DC input power cables



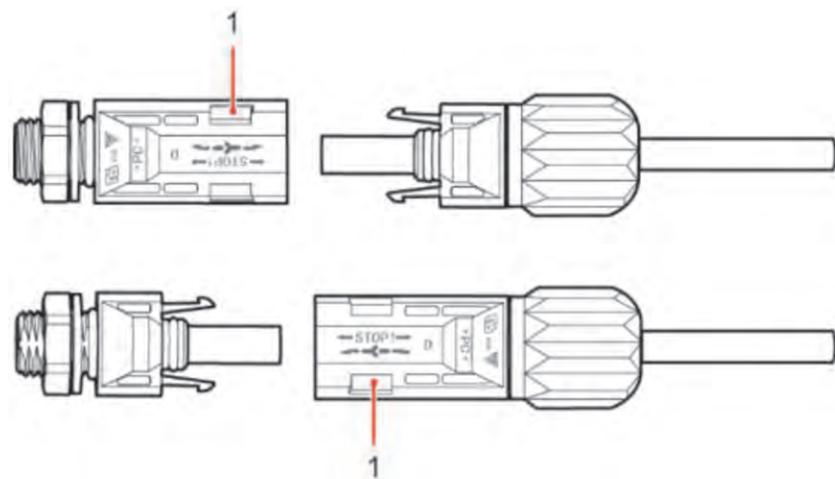
1. Positive power cable 2. Negative power cable

Step 5 Insert crimped power cables into corresponding housings until you hear a "click" sound. The power cables snap into place.

Step 6 Reinstall cable glands on positive and negative connectors and rotate them against the insulation covers.

Step 7 Insert the positive and negative connectors into corresponding DC input terminals of the Sunny Deer Series until you hear a "click" sound, as shown in Figure 4-7.

Figure 4-7 Connecting DC input power cables



1. Bayonet



Note:

Insert the stoppers into the unused DC connectors.

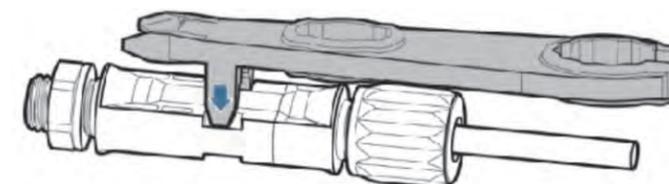
--- End

Follow-up Procedure

To remove the positive and negative connectors from the Sunny Deer Series, insert a removal wrench into the bayonet and press the wrench with an appropriate strength, as shown in Figure 4-8.

	<p>Before removing the positive and negative connectors, ensure that the DC SWITCH is OFF.</p>
<p>Caution</p>	

Figure 4-8 Removing a DC input connector



4.4 Connecting AC Output Power Cables

Connect the Sunny Deer Series to the AC power distribution frame (PDF) or power grid using AC output power cables.

	<ul style="list-style-type: none"> • It is not allowed for several inverters to use the same circuit breaker. • It is not allowed to connect loads between inverter and circuit breaker.
<p>Caution</p>	

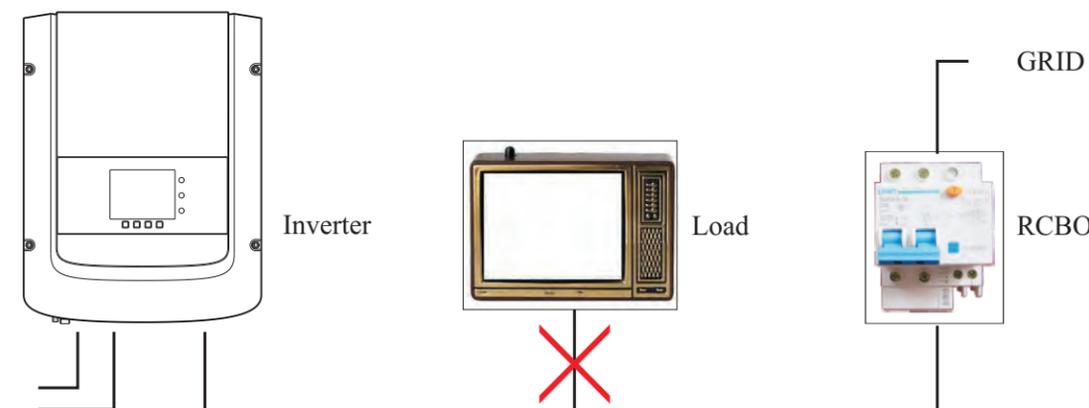
Context

All the AC output cables used for the inverters are outdoor three-core cables. To facilitate the installation, use flexible cables. Table 4-2 lists the recommended specifications for the cables.

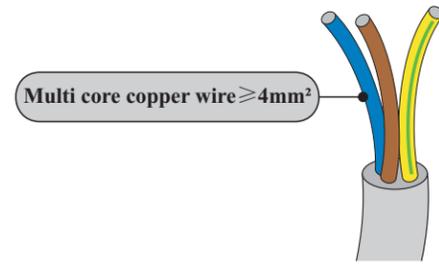
Table 4-2 Recommended AC output cable specifications

Model	Sofar 3000TLM	Sofar 3680TLM	Sofar 4000TLM	Sofar 4600TLM	Sofar 5000TLM
Cable(Copper)	≥ 4mm ²	≥ 4mm ²	≥ 4mm ²	≥ 5mm ²	≥ 5mm ²
Circuit Breaker	20A/230V/2P/0.1A	25A/230V/2P/0.1A	25A/230V/2P/0.1A	32A/230V/2P/0.1A	32A/230V/2P/0.1A

Figure 4-9 NOT allowed: connect loads between inverter and circuit breaker

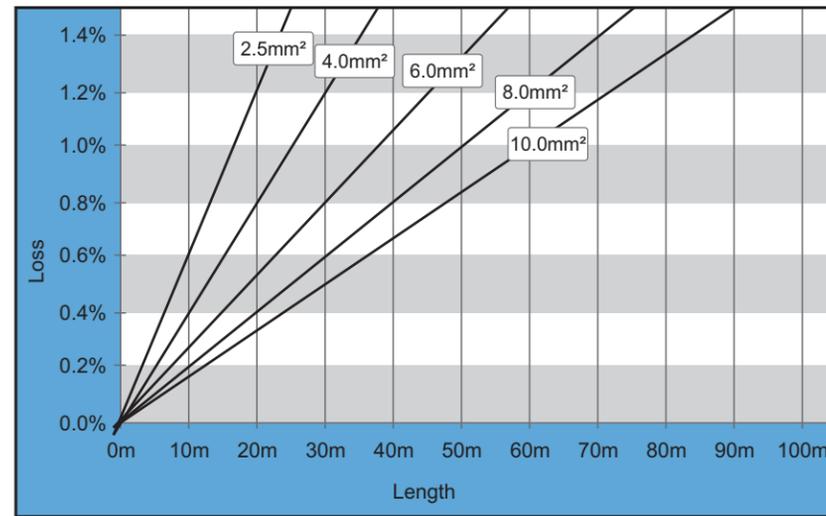


Multi core copper wire



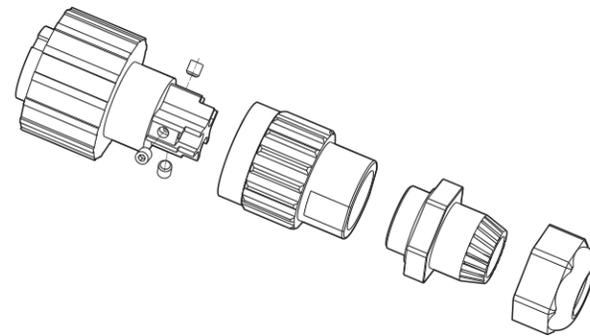
AC cable should be correctly sized to ensure the power loss in AC cable is less than 1% of the rated power. If the resistance of the AC cable is too high, it will cause a huge increase in the AC voltage, which may lead to a disconnection of the inverter from the electrical grid. The relationship between power loss in AC cable and wire length, wire cross sectional area is shown in the following figure:

Figure 4-10 wire length, wire cross sectional area and wire power loss



SOFAR inverter is equipped with IP66 AC output connector dedicated for PV inverter, customer need to make AC output cable connections by himself, and the appearance of the AC connector is shown below:

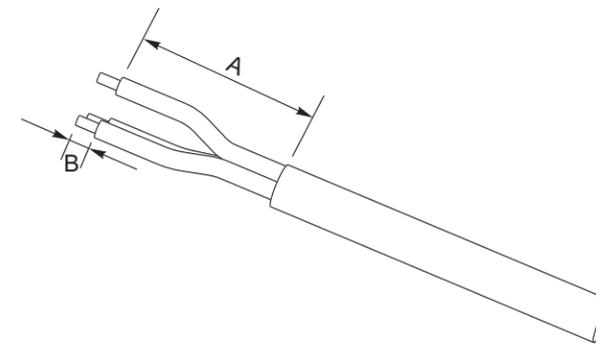
Figure 4-11 AC output connector



AC wire connections procedure:

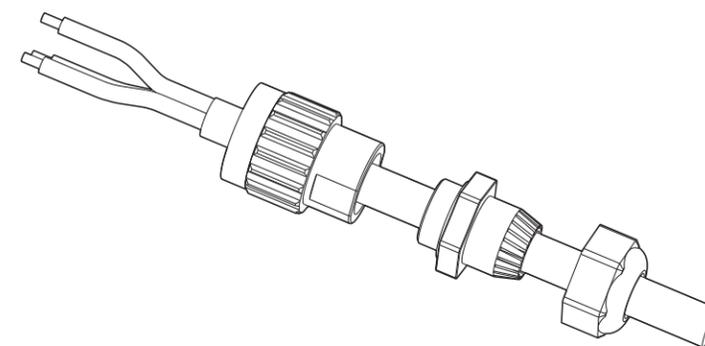
Step 1 Select appropriate cables according to Table 4-2, Remove the insulation layer of the AC output cable using a wire stripper according to the figure shown below: A: 30~50mm B: 6~8mm;

Figure 4-12



Step 2 Disassemble the AC connector according to the figure shown below: insert the AC output cable (with its insulation layer stripped according to step 1) through the waterproof locking cable gland;

Figure 4-13

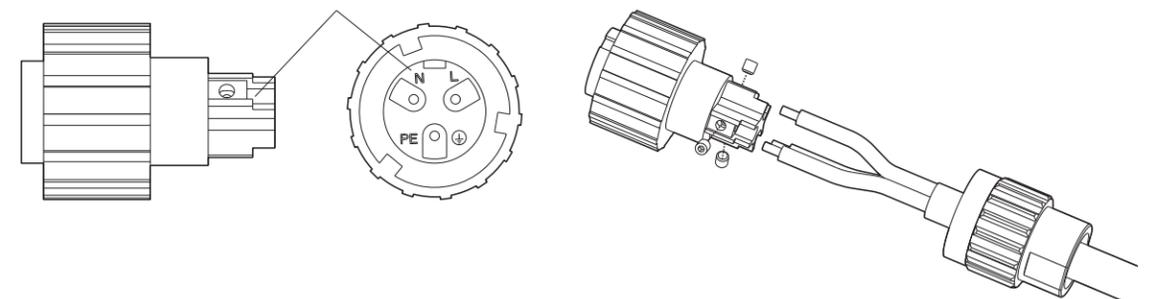


Step 3 Connect AC output cable as per the following requirements:

- Connect the yellow-green wire to the hole labeled 'PE', fasten the wire using an Allen wrench;
- Connect the brown wire to the hole labeled 'L', fasten the wire using an Allen wrench;
- Connect the blue wire to the hole labeled 'N', fasten the wire using an Allen wrench;

Figure 4-14

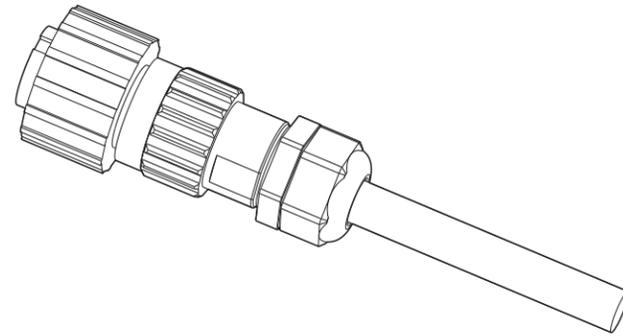
L--brown, N--blue, PE--yellow/green



Step 4 Secure the locking cable gland clockwise, shown as below: make sure that all the wires are securely connected;

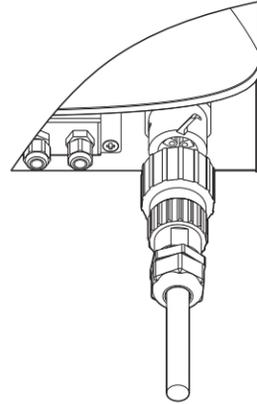
Step 5 Connect the AC output connector to the output wiring terminal of SOFAR inverter, rotate the AC connector clockwise until the fastener reaches its designated position, as shown below:

Figure 4-15



Step 4

Figure 4-16



Step 5

4.5 Connecting Communications Cables

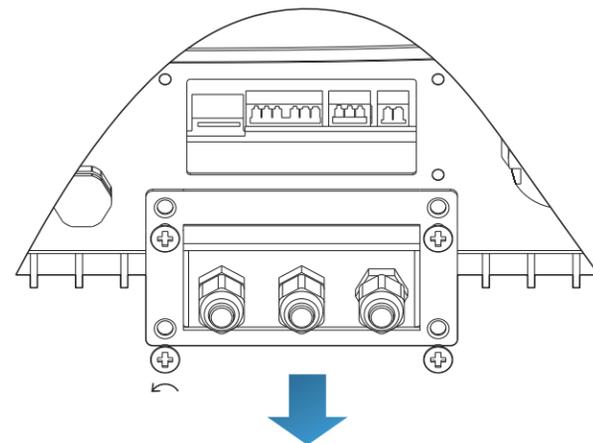
The wiring methods are the same for RS485, dry contact and I/O, this part describes their wiring methods all together:

Table4-3 Recommended communication cable sizes are shown below

Communication function	RS485	Dry contact	I/O
Cable size	0.5~1.5mm ²	0.5~1.5mm ²	0.5~1.5mm ²
Outside diameter	2.5~6mm	2.5~6mm	2.5~6mm

Step 1 Remove the communication waterproof cover using a screwdriver;

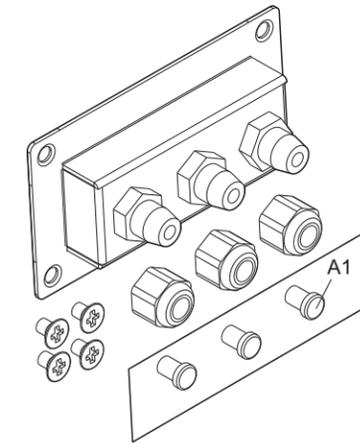
Figure 4-17



Step 2 Unlock the waterproof cable gland, remove the stopper in the waterproof connector;

Figure 4-18

A1: Waterproof stopper

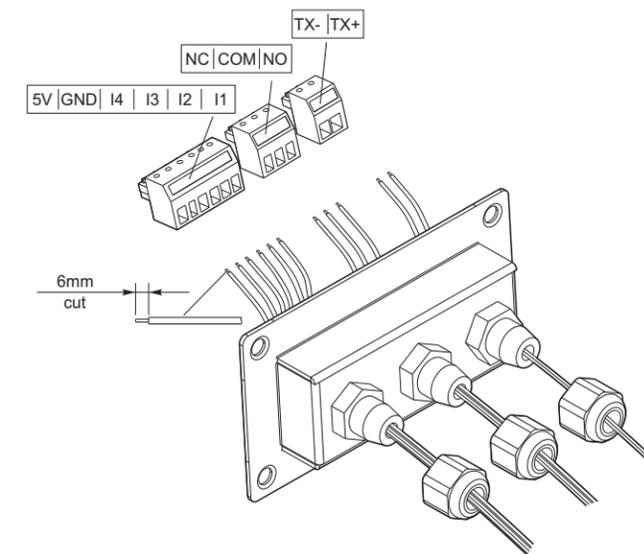


Note:

The waterproof connectors correspond to: I/O, dry contact, RS485 from left to right. Unlock the waterproof connectors according to the communication functions you are using. Do NOT unlock the unused connectors.

Step 3 Select appropriate cable according to Table 4-2, remove the insulation layer using a wire stripper, the length of the wire core is about 6mm, insert the cable through the cable gland and waterproof cover, as shown in the figure below:

Figure 4-19



Step 4 Choose the terminal according to Table 4-4, connect the wires as per the labels, and secure the wires using a slotted screwdriver.



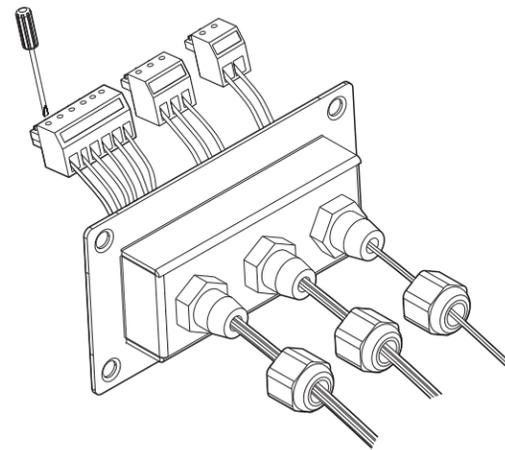
Note:

keep the unused terminals for future use.

Table4-4 functional description of the communication terminals

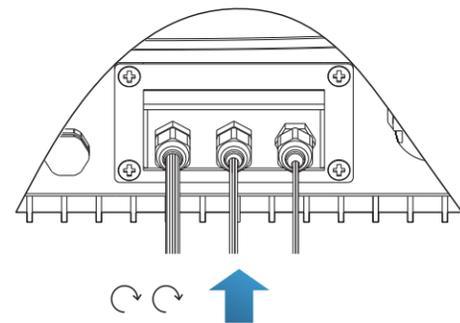
Type	I/O						Dry contact			RS485	
connector											
label	5V	GND	I4	I3	I2	I1	NC	COM	NO	TX-	TX+
function	source	ground	Input 4	Input 3	Input 2	Input 1	Normally closed	Common ground	Normally open	RS485 differential signal-	RS485 differential signal+

Figure 4-20



Step 5 Insert the terminal as per the printed label, and then tighten the screws to fix the waterproof cover, rotate the cable gland clockwise to fasten it securely.

Figure 4-21



※ If users need to connect multiple inverters via RS485 wires, refer to the figure shown below:

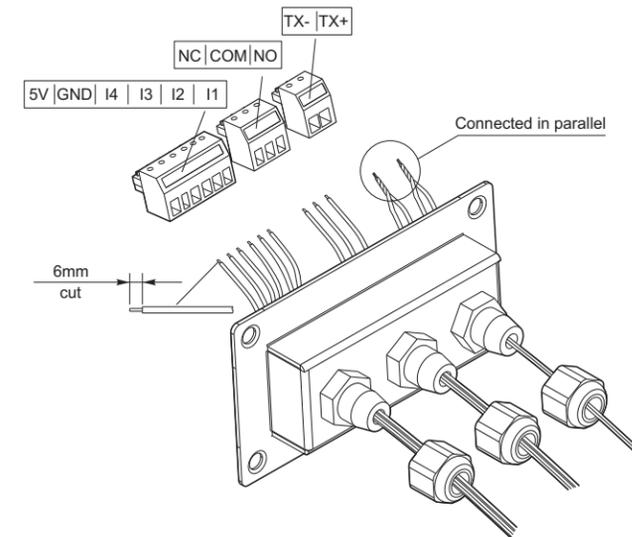
Rs485 wires are connected in parallel, so 4 wires may be required. First connect the two 485+ (TX+) wires in parallel, then connect the two 485-(TX-) wires in parallel, then insert them into the terminal and tighten the screws using a slotted screwdriver.



Note:

We recommend using two different colors of wires to connect TX-(485-) and TX+ (485+). Wires of the same color are connected together to avoid wrong wire connections.

Figure 4-22



4.6 Communication method

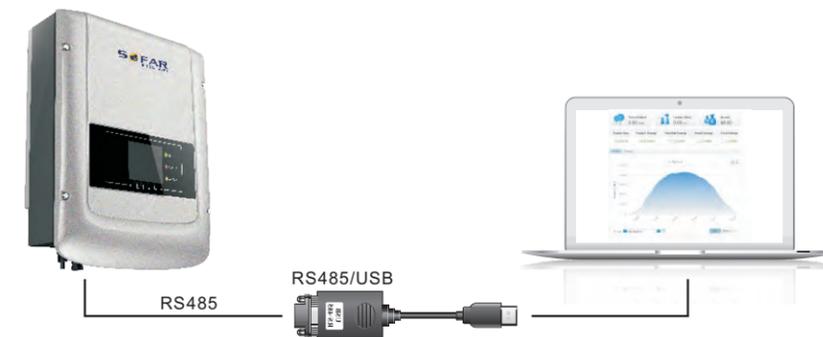
Sunny Deer Series grid-connected inverters offer RS485 (standard) and Wi-Fi (optional) communication modes:

A. Communication between one inverter and one PC:

1. RS485

Refer to the figure shown below, connect the TX+ and TX- of the inverter to the TX+ and TX- of the RS485→ USB adapter, and connect the USB port of the adapter to the computer.(NOTE1)

Figure 4-23



2. WI-FI

Refer to the figure shown below: (wireless function required for the PC).(NOTE4)

Figure 4-24



The operation information (generated energy, alert, operation status) of the inverter can be transferred to PC or uploaded to the server (e.g. via S-WE01S) via Wi-Fi. You can register on the website: (refer to Chapter 9)

http://www.solarmanpv.com/portal/Register/Regi_Pub.aspx

Using the Wi-Fi S/N number(NOTE3), then you can login the website:

<http://www.solarmanpv.com/portal/LoginPage.aspx> to remote monitors the inverter.

B. Communication between multiple inverters and one PC:

1. RS485

Refer to the following figure: RS485 wires are connected in parallel between inverters, refer to section 4.5 of this manual for wire connection methods. Connect the TX+ and TX- of the inverter to the TX+ and TX- of the RS485→USB adapter; connect the USB port of the adapter to the computer. A maximum of 31 inverters can be connected in one daisy chain.(NOTE2)

Figure 4-25



2. WI-FI

Refer to the figure shown below: (wireless function required for the PC).(NOTE4)

Figure 4-26



The operation information (generated energy, alert, operation status) of the inverter can be transferred to PC or uploaded to the server (e.g. via S-WE01S) via Wi-Fi. You can register on the website:(refer to section 9)

http://www.solarmanpv.com/portal/Register/Regi_Pub.aspx

Using the Wi-Fi S/N number(NOTE3), then you can login the website:

<http://www.solarmanpv.com/portal/LoginPage.aspx> to remote monitors the inverter.



Note1:

The length of the RS485 communication cable should be less than 1000 m.



Note2:

When multiple inverters are connected via RS485 wires, set mod-bus address to differentiate the inverters. Refer to section 6.3 for RS485 address setting, max output of single inverter is 4.6KVA and max output of PV system is 13.8KVA in Germany.



Note3:

S/N number of the Wi-Fi module is located under the label on the side of the inverter.

Figure 4-27

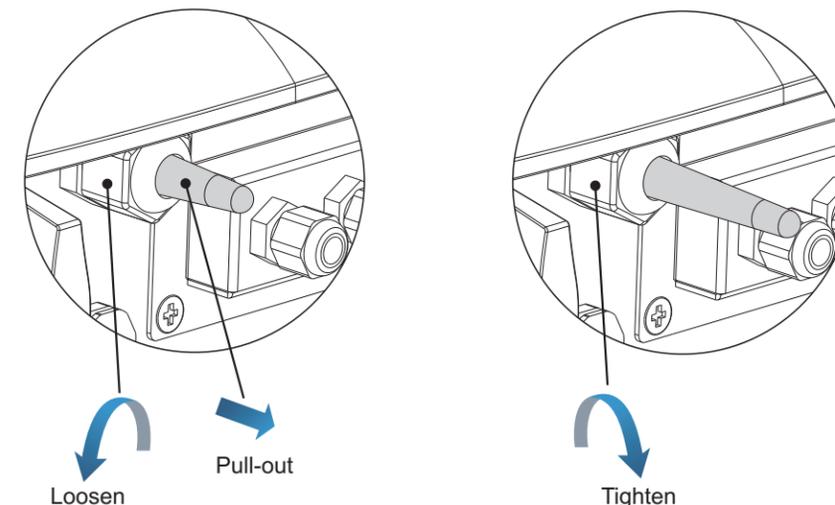


Note4:

Customer can enhance the Wi-Fi signal in order to make the data transmission more stably using the method shown below:

- Step 1** Loosen the cable gland of Wi-Fi antenna;
- Step 2** Pull the Wi-Fi antenna out for about 50~60 mm;
- Step 3** Tighten the cable gland of Wi-Fi antenna.

Figure 4-28



5 Commissioning of inverter

5.1 Safety inspection before commissioning

	<p>Ensure that DC and AC voltages are within the acceptable range of the Sunny Deer series inverter.</p>
Attention	

5.2 Start inverter

Step 1: Turn ON the DC switch.(optional)

Step 2: Turn ON the AC circuit breaker.

When the DC power generated by the solar array is adequate, the Sunny Deer series inverter will start automatically. Screen showing “normal” indicates correct operation.

If the inverter indicates any fault, please refer to Section 7.1 of this manual — trouble shooting for help.

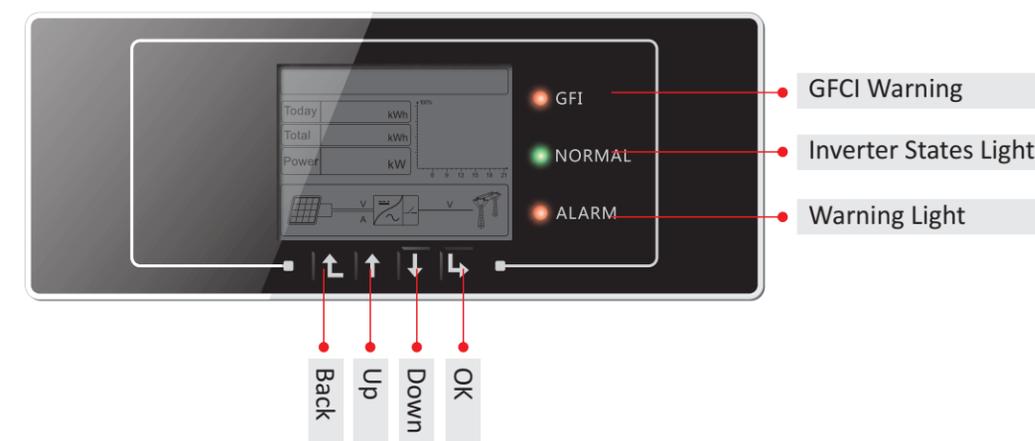
6 Operation interface

Outlines of this chapter

This section introduces the display, operation, buttons and LED indicator lights of Sunny Deer Series Inverter.

6.1 Operation and Display Panel

- Buttons and Indicator lights



Key-button:

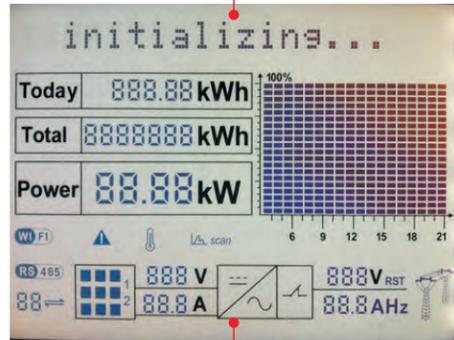
- Back : to return to previous menu or enter into main menu from the standard interface.
- Up : to move up or increase value
- Down : to move down or decrease value
- OK : to confirm selection

Indicator Lights:

- Inverter States Light(GREEN)**
 - Flashing: ‘Wait’ or ‘Check’ state
 - ON: ‘Normal’ state
 - OFF: ‘Fault’ or ‘Permanent’ state
- Warning Light (RED)**
 - ON: ‘Fault’ or ‘Permanent’ state
 - OFF: ‘Normal’ state
- GFCI Warning Light (RED)**
 - ON: ‘ID12: GFCIFault’ or ‘ID20: GFCIDeviceFault’
 - OFF: GFCI normal

6.2 Standard Interface

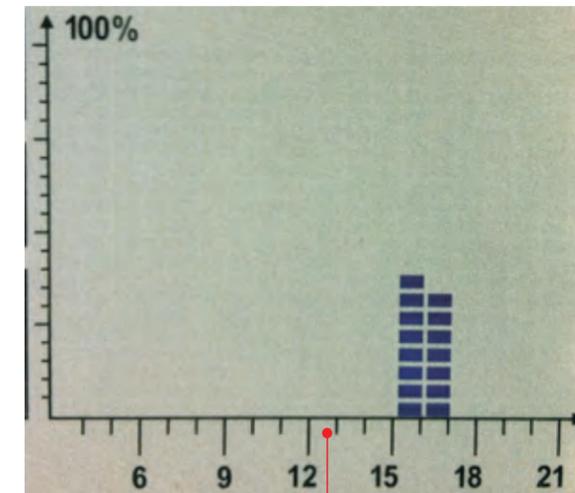
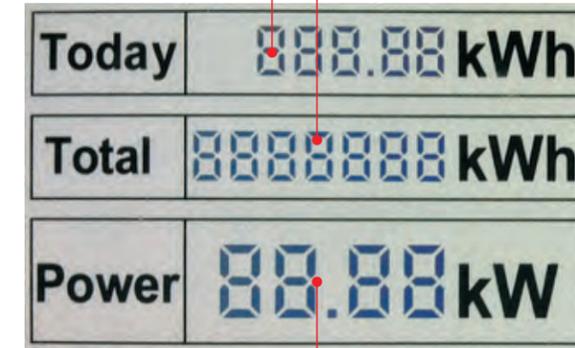
LCD standard interface is used to display inverter states, information and parameter setting etc.



LCD display refreshes the real-time data: generated energy, output power, input information, warning information etc.

- A1 - WIFI communicating
- A2 - RS485 communicating
- A3 - Light flashes to warn over frequency and power derating. Light ON to warn remote power derating
- A4 - Light ON to warn inverter over temperature
- A5 - MPPT SCAN function is activated (not available)
- A6 - Light ON when the state is 'normal'
- A7 - Indicates grid voltage
- A8 - Indicates grid current or frequency
- A9 - Indicates input voltage and current of channel 1&2 and displays in turns every three seconds
- A10 - Indicates real time input voltage and current channel
- A11 - Light ON when input voltage is over 100V
- A12 - Light ON for RS485 communicating
- A13 - Indicates modbus communication address.

- A14 - Indicates energy generated today
- A15 - Indicates the total generated energy
- A16 - Indicates real time output power



- A17 - Indicates the energy generated per hour from 3:00am-21:00pm

* When inverter is powered on, LCD interface displays 'initializing...', as shown below:



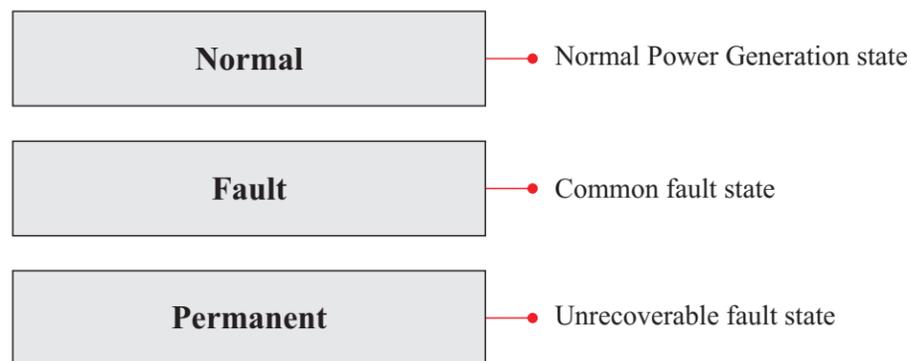
* When the inverter internal communication is successful, the LCD displays the current state of the inverter, as shown in the figure below:



'Wait' state: count down from 10s



'Check' state



Inverter states include: ‘wait’, ‘check’, ‘normal’, ‘fault’ and ‘permanent’

Wait: Inverter need to wait for a period of time before entering ‘Check’ state.
Check: Inverter is checking isolation resistance, relays, and other safety requirements. It also does self-test to ensure inverter software and hardware is functional.
Normal: Inverter is working properly, converting DC power generated by the PV array to AC power, then feed AC power into the electrical grid.
Fault: Inverter has encountered recoverable fault. It will recover by itself after the fault condition disappear. If it doesn’t recover, please refer to Chapter 7.1 trouble shooting.
Permanent: Inverter has encountered unrecoverable fault, a service engineer is needed to fix this kind of fault according to fault code.

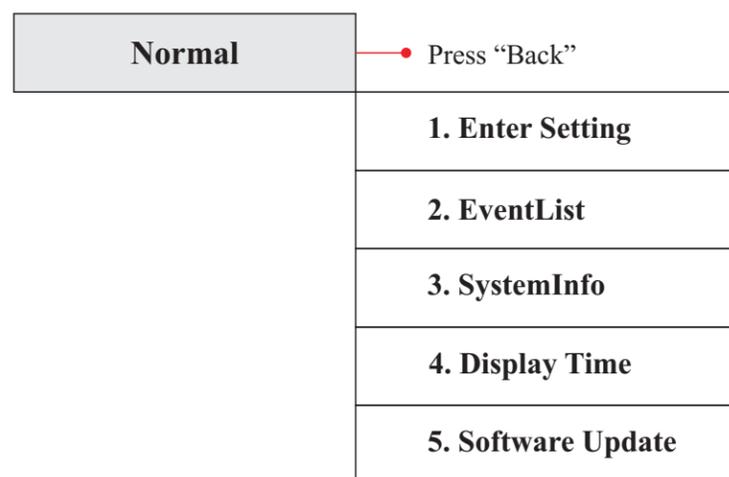
* When the inverter internal communication fails, the LCD displays the state of the inverter as shown in the figure below:



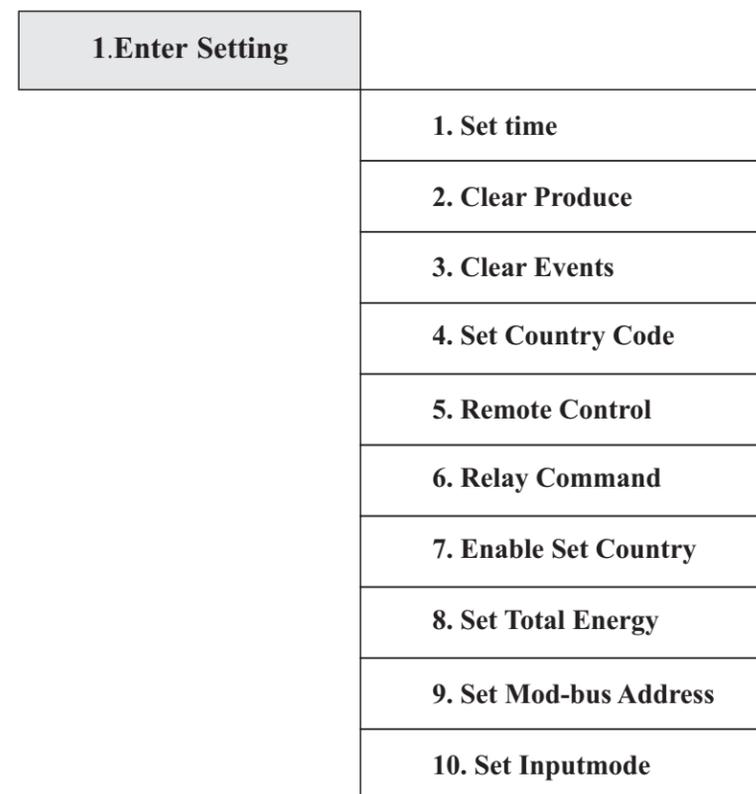
In this case, please turn OFF the “DC switch”, wait for 5 minutes, then turn ON the “DC switch”. Check whether the fault is rectified. If no, please contact SOFAR technical support.

6.3 Main Interface

Press “Back” button under standard interface to enter into main interface, including:



(A) “Enter Setting” Interface as below:



1. Set Time

Users press “Back” button to enter “1.Enter Setting” interface, Press “OK” button to enter main setting interface. Enter “1. Set Time” by pressing“Up” button or “Down” button, then press”OK“button and start to set up time.

Time set from year, month, day, minutes, and seconds in turns, “Up” button or “Down”button to choose different value to set each date. Set each value is need to press “OK” button to confirm setting. “success” is displayed if the setting time is correct, “fail” means failure settings.

2. Clear Produce

Users press “Back” button to enter “1.Enter Setting” interface, Press “OK” button to enter main setting interface. Then Enter “2.Clear Produce” by pressing “Up” button or “Down” button, press “OK” button and start to clear produce. “success” is displayed after settings.

3. Clear Events

Users press “Back” button to enter “1.Enter Setting” interface, Press “OK” button to enter main setting interface. Enter “3. Clear Events” by pressing ”Up” button or “Down” button. Press “OK ”button and start to clear events. “success” is displayed after settings.

4. Set Country Code

Users press “Back” button to enter “1.Enter setting” interface, Press OK button to enter main setting interface. Enter “4.Set Country Code” by pressing “Up” button Or “Down” button, press “OK” button and enter “Input Password” Setting interface. If it's shown "set disable" on the screen, then you can NOT choose the operating country, you should enable country setting through "7. Enable Set Country" interface. If it's shown "set Country code?" on the screen, then press Confirm button to start country setting. "Success" will be shown on the screen after a successful country setting.

Table6-1 country code setting

code	country	code	country	code	country	code	country
00	Germany VDE AR-N4105	05	Denmark	10	China	15	Italy CEI0-16
01	Italy CEI0-21	06	Greece Continent	11	France	16	UK-G83
02	Australia	07	Netherland	12	Poland	17	Greece island
03	Spain Rd1699	08	Belgium	13	Germany BDEW	18	EU EN50438
04	Turkey	09	UK-G59	14	Germany VDE 0126	19	IEC EN61727

5. Remote Control

Users press “Back” button to enter“1.Enter setting” interface, Press OK button to enter main setting interface. Enter “5. Remote Control” by pressing “Up” button or “Down” button. Press “OK” button and enter Remote Control Switch on & off interface. Choose “1.Enable”or “2.Disable” by pressing “Up” button or “Down” button, press “OK” button, then communication board start to transmit control signals to control board. “Success” is displayed after setting success; otherwise it will show “fail”.

6. Relay Command

Users press “Back” button to enter “1.Enter setting” interface, Press “OK” button to enter main setting interface. Enter “6. Relay Command” by pressing “Up” button or “Down” button, press “OK ” button and enter “Relay Command setting “interface. Choose corresponded setting items by pressing “Up” button or “Down” button, then press “OK” button. “Success” or “fail” is displayed after setting.

6.Relay Command	1.Production
	2.Alarm
	3.Alarm (alarmconfig)
	4.Relay Disable

Relay Command Definition:

Production	<p>the relay switches whenever a connection to (and therefore a disconnection from) the grid occurs.</p> <p>If the relay contractor is in normally open (close) mode, the contact will stay open (or closed) until the inverter is connected to the grid; once the inverter connects to the grid and starts to export power, the relay switches state and therefore closes (or opens).</p> <p>When the inverter disconnects from the grid, the relay contact returns to its position of rest, namely open (or closed).</p>
Alarm	<p>The relay switches whenever there is an alarm on the inverter (Error). No switching occurs when there is a Warning.</p> <p>If the relay contractor is in normally open(close)mode, the contact will stay open (or closed) until the inverter reports an error; once the inverter reports an error, the relay switches state and therefore closes (or opens).The contact remains switched from its rest condition until normal operation is restored.</p>
Alarm (alarmconfig)	<p>the relay switches whenever there is an alarm (Error) or a Warning, which have been previously selected by the user through the PC. the contact will stay open (or closed) until the inverter reports an error or a warning out of those selected from the menu; once the inverter displays an error or a warning out of those selected, the relay switches state and therefore closes (or opens) the contact. The relay remains switched from its rest condition until the alarm or warning has disappeared.</p>
Relay Disable	Control function is forbidden

7. Enable Set Country

Users press Back button to enter “1.Enter setting” interface, Press OK button to enter main setting interface. Enter “7.Enable Set Country” by pressing “Up” button Or “Down” button, press “OK” button and enter “Input Password” Setting interface. Press “Back” button to set passwords (default: 0001), increase or decrease value though pressing “Up” button or “Down” button, press “OK” button to next value setting. “Error!” Try again” will be displayed for wrong passwords. Press “Back” button and rekey in the correct passwords. “Success” will be displayed if setting successfully.

Attention: when inverter working for power generation over 24h, country setting is forbidden, it can only be set after LCD setting. Key in passwords for country setting through LCD (default: 0001), country setting can be set in 24h after keying in the correct passwords, over 24h, set through LCD again.

8. Set Total Energy

Users press Back button to enter "1.Enter setting" interface, Press OK button to enter main setting interface. Enter "8. Set Total Energy" by pressing "Up" button or "Down" button , then press "OK" button and enter "Input Password" Setting interface. Press "OK" button to set passwords (default: 0001), increase or decrease value though pressing "Up" button or "Down" button, press "OK" button to confirm the value and to next value setting. "Error! Try again" will be displayed for wrong passwords. Press "Back" button and rekey in the correct passwords then set total energy. "Success" or "fail" is displayed after setting.

9. Set mod-bus address

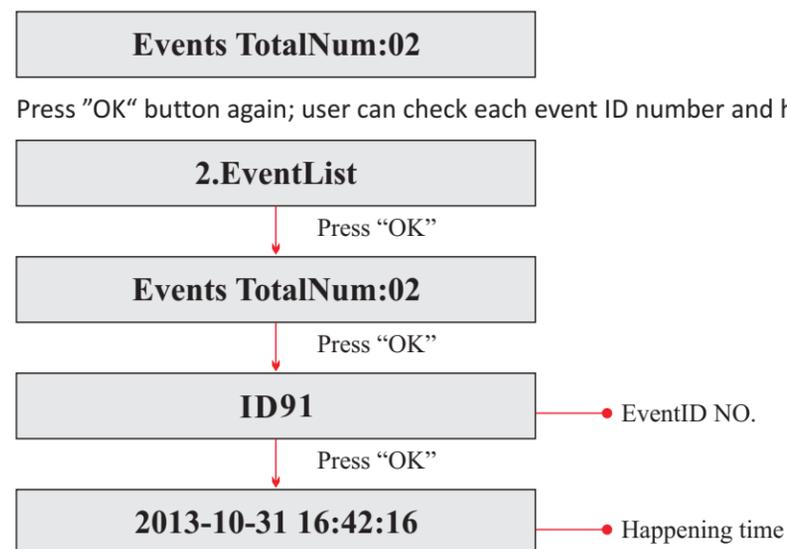
Users press "Back" button to enter "1.Enter setting" interface, Press "OK" button to enter main setting interface. Enter "9. Set mod-bus address" by pressing "Up" button or "Down" button. Press "OK" button and enter setting interface. Choose corresponded setting items by pressing "Up" button or "Down" button, then press "OK" button. "Success" or "fail" is displayed after setting.

10. Set input mode

Input mode selection: Sunny Deer Series inverter has 2 MPPT channels, the 2 MPPT can operate independently, also can operate in parallel. If the PV strings are connected in parallel outside the inverter, you should choose the "in parallel mode", otherwise use the default setting. Press "Back" button to enter "1.Enter setting" interface, press "OK" button to enter main setting interface. Enter "10. Set inputmode" by pressing "Up" or "Down" buttons. Press "OK" button to enter setting interface. Choose "In parallel Mode?" or "Independent Mode?" by pressing "Up" or "Down" buttons, then press "OK" button. "Success" or "fail" is displayed after setting.

(B) "Event List" Interface as below:

Event List is used to display the real-time event records, including the total number of events and each specific ID No. and happening time. User can enter Event List interface through main interface to check details of real-time event records, Event will be listed by the happening time, and recent events will be listed in the front. Please refer to below picture: Users press "Back" button and "Down" button in standard interface, then enter into 2.EventList" interface.



(C) "SystemInfo" Interface as below:

3.SystemInfo	1.Inverter Type
	2.Serial Number
	3.SoftVersion
	4.HardVersion
	5.Country
	6.Input Mode
	7.Relay Command

1. Inverter Type

Users press "Back" button and "Up" button or "Down" button enter "3. SystemInfo" interface, Press "OK" button to enter enter into system information checking interface,then press "Up" button or "Down" button enter into "1. Inverter Type",then press "OK" button , the Inverter Type will be displayed.

2. Serial Number

Users press "Back" button and "Up" button or "Down" button to enter "3. SystemInfo" interface, Press "OK" button to enter enter into system information checking interface,then press "Up" button or "Down" button enter into "2. Serial Number",then press "OK" button ,the serial number will be displayed.

3. SoftVersion

Users press "Back" button and "Up" button or "Down" button to enter "3. SystemInfo" interface, then Press "OK" button to enter enter into system information checking interface,then press "Up" button or "Down" button enter into "3. SoftVersion",then press "OK" button , the SoftVersion will be displayed.

4. HardVersion

Users press "Back" button and "Up" button or "Down" button to enter "3. SystemInfo" interface, then Press "OK" button to enter enter into system information checking interface,then press "Up" button or "Down" button enter into "4. HardVersion",then press "OK" button , the HardVersion will be displayed.

5. Country

Users press "Back" button and "Up" button or "Down" button to enter "3. SystemInfo" interface, then Press "OK" button to enter enter into system information checking interface,then press "Up" button or "Down" button enter into "5. Country",then press "OK" button , the Country will be displayed.

6. Input Mode

Press “Back” button and “Up” or “Down” button to enter “3. System Info” interface, then Press “OK” button to enter into system information checking interface, then press “Up” or “Down” button enter into “6. Input Mode”, then press “OK” button, the Input Mode will be displayed.

7. Relay Command

Users press “Back” button and “Up” button or “Down” button to enter “3. SystemInfo” interface, then Press “OK” button to enter enter into system information checking interface,then press “Up” button or “Down” button enter into “7. Relay Command”,then press “OK” button , the Relay Command Mode will be displayed.

(D) Display Time

Press the “Back” button and “Up” button or “Down” key in the standard user interface to enter into “4.Display Time”,then press “OK” button to display the current system time.

(E) Software Update

Press the “Back” button and “Up” button or “Down” button in the standard user interface to enter into “5. Software Update”, then press “OK” button to enter into the “ ” input password ” interface, now press the “OK” button to input the password(initial passwords is 0001),Press the “Up” and “Down” button to change the value, then press “OK” button to confirm the current value of input and enter the next set of value .when set over, if the password is wrong, the LCD will display “Error! Try again”, at this time ,you should re-enter your password .If the password is correct , then begin the update process.

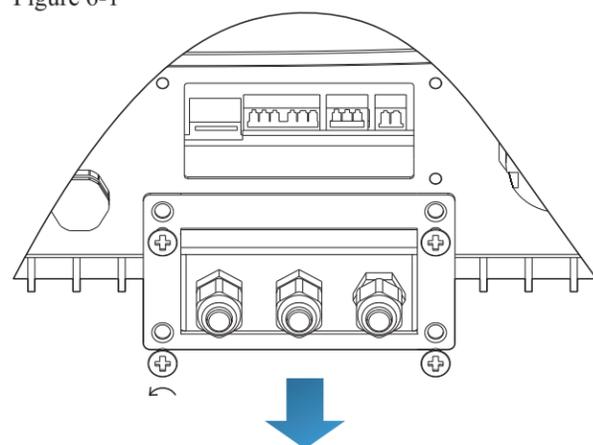
6.4 Update Software online

Sunny Deer series inverters offer software upgrade via SD card to maximize inverter performance and avoid inverter operation error caused by software bugs.

Procedure:

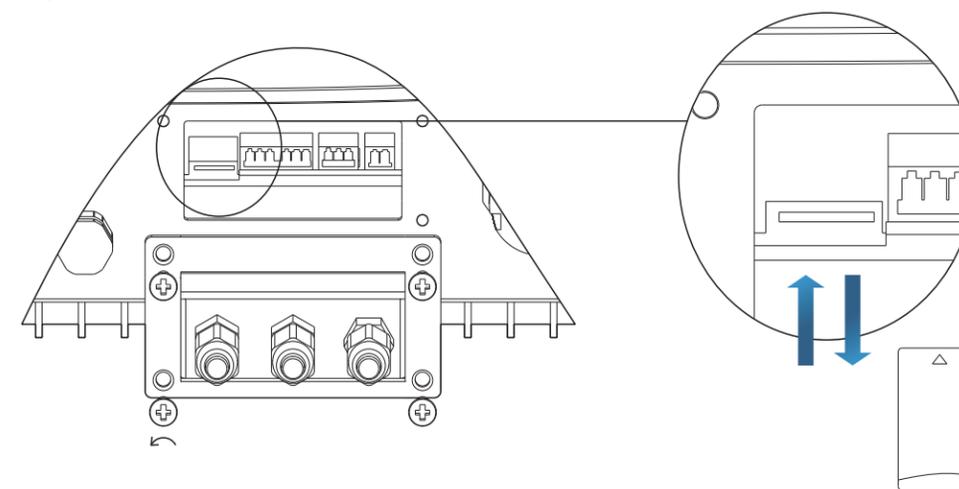
Step 1 first, turn off the DC and AC breaker, and then remove the communication waterproof cover as the following picture. If the communication lines (RS485, Relays, I/O) has been connected, Be sure to release the waterproof nut, Make sure the communication line is no longer the force. Then remove the waterproof cover, In order to avoid loosening the communication plug which has been connected.

Figure 6-1



Step 2 Remove the waterproof cover, Press SD card inside in the position marked SD card. Then the SD card will automatically pop up.

Figure 6-2



Step 3 The SD card reader must be ready by the users, so that SD card so easy to establish the connection with the computer.

Step 4 SOFAR SOLAR will send the Software code to the user who needs to update. After user receive the file, please decompressing file and cover the original file in SD card.

Step 5 Insert the SD card into the SD card slot, there will be a faint clicking sound typically, indicating that has stuck.

Step 6 Then turn on DC switch and enter into the online upgrade to the main menu “5. Software Update” in the LCD display program[6.3(E)]. The method to enter the menu can refer to operation interface of LCD.

Step 7 Input the password, if password is correct, and then begin the update process, the original password is 0001.

Step 8 System update main DSP、 slave DSP and ARM in turns. If main DSP update success ,the LCD will display “Update DSP1 Success”, otherwise display “Update DSP1 Fail”; If slave DSP update success ,the LCD will display “Update DSP2 Success”, otherwise display “Update DSP2 Fail”

Step 9 If Fail , please turn off the DC breaker, wait for the LCD screen extinguish, then turn on the DC breaker again, then Continue to update from step 6.

Step 10 After the update is completed, turn off the DC breaker, wait for the LCD screen extinguish, then recover the communication waterproof and then turn on the DC breaker and AC breaker again, the inverter will enters the running state.

Trouble shooting and maintenance

Outlines of this chapter

This topic describes how to perform daily maintenance and troubleshooting to ensure long term proper operation of the Sunny Deer series inverter.

7.1 Trouble shooting

This section contains information and procedures for solving possible problems with Sunny Deer series inverter.

☉ **This section help users to identify the inverter fault. Please read the following procedures carefully:**

- Check the warning, fault messages or fault codes shown on the inverter screen, record all the fault information.
- If there is no fault information shown on the screen, check whether the following requirements are met:
 - Is the inverter mounted in a clean, dry place with good ventilation?
 - Is the DC switch turned ON?
 - Are the cables adequately sized and short enough?
 - Are the input and output connections and wiring in good condition?
 - Are the configuration settings correct for the particular installation?
 - Are the display panel and the communication cables properly connected and undamaged?

Follow the steps below to view recorded problems:

Press “back” to enter the main menu from the standard interface. Select “2. Event List”, then press “OK” to enter event list.

☉ **EventList information**

Table 7-1 Eventlist

EventList NO.	EventList Name	EventList description	solution
ID01	GridOVP	The power grid voltage is too high	<ul style="list-style-type: none"> • If the alarm occurs occasionally, the possible cause is that the electric grid is abnormal occasionally. SOFAR inverter automatically returns to normal operating status when the electric grid's back to normal. • If the alarm occurs frequently, check whether the grid voltage/frequency is within the acceptable range. If no, contact SOFAR technical support. If yes, check the AC circuit breaker and AC wiring of the SOFAR inverter. • If the grid voltage/frequency is within the acceptable range and AC wiring is correct, while the alarm occurs repeatedly, contact SOFAR technical support to change the grid over-voltage, under-voltage, over-frequency, under-frequency protection points after obtaining approval from the local electrical grid operator.
ID02	GridUVP	The power grid voltage is too low	
ID03	GridOFP	The power grid frequency is too high	
ID04	GridUFP	The power grid frequency is too low	

ID05	PVUVP	The input voltage is too low	Check whether too few PV modules are series connected in a PV string, thus the voltage(Vmp) of the PV string is lower than the minimum operating voltage of SOFAR inverter. If yes, adjust the number of series connected PV modules to increase the voltage of the PV string to fit the input voltage range of SOFAR inverter. SOFAR inverter automatically returns to normal operating status after correct adjustments.
ID09	PvOVP	The input voltage is too high	Check whether too many PV modules are series connected in a PV string, thus the voltage(Voc) of the PV string is higher than the maximum input voltage of SOFAR inverter. If yes, adjust the number of series connected PV modules to decrease the voltage of the PV string to fit the input voltage range of SOFAR inverter. SOFAR inverter automatically returns to normal operating status after correct adjustments.
ID10	IpvUnbalance	Input current is not balanced	Check the input mode(parallel mode/ independent mode) setting of SOFAR inverter according to Section 6.3 (C) 6.Input Mode of this user manual, If it's incorrect, change it according to Section 6.3 (A) 10.Set Input mode of this manual.
ID11	PvConfigSetWrong	Incorrect input mode	
ID12	GFCIFault	GFCI Fault	<ul style="list-style-type: none"> • If the fault occurs occasionally, the possible cause is that the external circuits are abnormal occasionally. SOFAR inverter automatically returns to normal operating status after the fault is rectified. • If the fault occurs frequently and lasts a long time, check whether the insulation resistance between the PV array and earth(ground) is too low, then check the insulation conditions of PV cables.
ID14	HwBoostOCP	The input current is too high, and has happened hardware protection	Check whether the input current is higher than the maximum input current of SOFAR inverters, then check the input wiring, if both are correct, please contact SOFAR technical support.
ID15	HwAcOCP	The grid current is too high, and has happened hardware protection	ID15-ID24 are internal faults of SOFAR inverter, turn OFF the “DC switch”, wait for 5 minutes, then turn ON the “DC switch”. Check whether the fault is rectified. If no, please contact SOFAR technical support.
ID16	AcRmsOCP	The grid current is too high	
ID17	HwADFaultGrid	The grid current sampling error	
ID18	HwADFaultDCI	The DCI sampling error	
ID19	HwADFaultVGrid	The grid voltage sampling error	
ID20	GFCIDeviceFault	The GFCI sampling error	
ID21	MChip_Fault	The master chip fault	
ID22	HwAuxPowerFault	The auxiliary voltage error	
ID23	BusVoltZeroFault	The bus voltage sampling error	
ID24	IacRmsUnbalance	The Output current is not balanced	
ID25	BusUVP	The bus voltage is too low	If the PV array configuration is correct (no ID05 fault), the possible cause is that the solar irradiance is too low. SOFAR inverter automatically returns to normal operating status after the solar irradiance returns to normal level.

ID26	BusOVP	The bus voltage Is too high	ID26-ID27 are internal faults of SOFAR inverter, turn OFF the “DC switch”, wait for 5 minutes, then turn ON the “DC switch”. Check whether the fault is rectified. If no, please contact SOFAR technical support.
ID27	VbusUnbalance	The bus voltage is not balanced	
ID28	DciOCP	The Dci is too high	<ul style="list-style-type: none"> • Check the input mode(parallel mode/ independent mode) setting of SOFAR inverter according to Section 6.3 (C) 6.Input Mode of this user manual, If it's incorrect, change it according to Section 6.3 (A) 10.Set Input mode of this manual. • If the input mode is correct, turn OFF the “DC switch”, wait for 5 minutes, then turn ON the “DC switch”. Check whether the fault is rectified. If no, please contact SOFAR technical support, If it's incorrect, change it according to Section 6.3 (A) 10.Set Input mode of this manual.
ID29	SwOCPIstant	The grid current is too high	Internal faults of SOFAR inverter, turn OFF the “DC switch”, wait for 5 minutes, then turn ON the “DC switch”. Check whether the fault is rectified. If no, please contact SOFAR technical support.
ID30	SwBOCPIstant	Ihe input current is too high	Check whether the input current is higher than the maximum input current of SOFAR inverters, then check the input wiring, if both are correct, please contact SOFAR technical support.
ID49	ConsistentFault_VGrid	The grid voltage sampling value between the master DSP and slave DSP is not consistent	ID49-ID55 are internal faults of SOFAR inverter, turn OFF the “DC switch”, wait for 5 minutes, then turn ON the “DC switch”. Check whether the fault is rectified. If no, please contact SOFAR technical support.
ID50	ConsistentFault_FGrid	The grid frequency sampling value between the master DSP and slave DSP is not consistent	
ID51	ConsistentFault_DCI	The DCI sampling value between the master DSP and slave DSP is not consistent	
ID52	ConsistentFault_GFCI	The GFCI sampling value between the master DSP and slave DSP is not consistent	
ID53	SpiCommLose	The spi communication between the master DSP and slave DSP is fault	
ID54	SciCommLose	The Sci communication between the control board communication board is fault	
ID55	RelayTestFail	The relays fault	
ID56	PvIsoFault	The insulation resistance is too low	
ID57	OverTempFault_Inv	The inverter temp is too high	<ul style="list-style-type: none"> • Ensure the installation position and installation method meet the requirements of Section 3.4 of this user manual. • Check whether the ambient temperature of the installation position exceeds the upper limit. If yes, improve ventilation to decrease the temperature.
ID58	OverTempFault_Boost	The Boost temp is too high	
ID59	OverTempFault_Env	The environment temp is too high	
ID65	UnrecoverHwAcOCP	The grid current is too high,and has cause unrecoverable hardware fault	ID65-ID70 are internal faults of SOFAR inverter, turn OFF the “DC switch”, wait for 5 minutes, then turn ON the “DC switch”. Check whether the fault is rectified. If no, please contact SOFAR technical support.

ID66	UnrecoverBusOVP	The bus voltage is too high,and has cause unrecoverable fault	ID74-ID77 are internal faults of SOFAR inverter, turn OFF the “DC switch”, wait for 5 minutes, then turn ON the “DC switch”. Check whether the fault is rectified. If no, please contact SOFAR technical support.
ID67	UnrecoverIacRmsUnbalance	The grid current is unbalance,and has cause unrecoverable fault	
ID68	UnrecoverIpvUnbalance	The input current is unbalance,and has cause unrecoverable fault	
ID69	UnrecoverVbusUnbalance	The bus voltage Is unbalance,and has cause unrecoverable fault	
ID70	UnrecoverOCPIstant	The grid current is too high,and has cause unrecoverable fault	
ID74	UnrecoverIPVInstant	The input current is too high,and has happen unrecoverable fault	
ID75	UnrecoverWRITEEEPROM	The EEPROM is unrecoverable	
ID76	UnrecoverREADEEPROM	The EEPROM is unrecoverable	<ul style="list-style-type: none"> • Ensure the installation position and installation method meet the requirements of Section 3.4 of this user manual. • Check whether the ambient temperature of the installation position exceeds the upper limit. If yes, improve ventilation to decrease the temperature.
ID77	UnrecoverRelayFail	Relay has happen permanent fault	
ID81	OverTempDerating	the inverter has derated because of the temperature is too high	SOFAR inverter automatically reduce the output power when the frequency of electrical grid is too high.
ID82	OverFreqDerating	the inverter has derated because of the grid frequency too hig	
ID83	RemoteDerating	The inverter has derated by the Remote control	SOFAR inverter records ID83 in case of remote power derating operation. Check the wiring of remote input and output control signal port on the communication board according to Section 4.5 of this user manual.
ID84	RemoteOff	The inverter has shut down because by the Remote control	SOFAR inverter records ID84 in case of remote shutdown operation. Check the wiring of remote input and output control signal port on the communication board according to Section 4.5 of this user manual.
ID94	Software version is not consistent	The Software between the control board and the communication board is not consistent	Contact SOFAR technical support to upgrade software.
ID95	Communication board EEPROM fault	The Communication board EEPROM is fault	ID95~ID96 are internal faults of SOFAR inverter, turn OFF the “DC switch”, wait for 5 minutes, then turn ON the “DC switch”. Check whether the fault is rectified. If no, please contact SOFAR technical support.
ID96	RTC clock chip anomaly	RTC clock chip is fault	
ID97	Invalid Country	The Country is InValid	Check the country setting according to Section 6.3 (C) 5.Country of this user manual, If it's incorrect, change it according to Section 6.3 (A) 4.Set Country Code of this manual.
ID98	SD fault	The SD card is fault	Please replace the SD card.

7.2 Maintenance

Inverters generally do not need any daily or routine maintenance. Heat sink should not be blocked by dust, dirt or any other items.

Before the cleaning, make sure that the DC SWITCH is turned OFF and the circuit breaker between SOFAR inverter and electrical grid is turned OFF. Wait at least for 5 minutes before the cleaning.

◉ Inverter cleaning

Please clean the inverter with an air blower, a dry & soft cloth or a soft bristle brush. Do NOT clean the inverter with water, corrosive chemicals, detergent, etc.

◉ Heat sink cleaning

For the long-term proper operation of SOFAR inverters, ensure there is enough space around the heat sink for ventilation, check the heat sink for blockage (dust, snow, etc.) and clean them if they exist. Please clean the heat sink with an air blower, a dry & soft cloth or a soft bristle brush. Do NOT clean the heat sink with water, corrosive chemicals, detergent, etc.

8 Technical data

Outlines of this chapter

This topic lists the technical specifications for all Sunny Deer series inverters.

8.1 Input parameters (DC)

Technical Data	SOFAR 3000TLM	SOFAR 3680TLM	SOFAR 4000TLM	SOFAR 4600TLM	SOFAR 5000TLM
Max. input power	3100W	3800W	4160W	4800W	5200W
Max DC power for single MPPT	2000W(200V-500V)	2400W(200V-500V)	2600W(200V-500V)	3000W(200V-500V)	
Number of independent MPPT	2				
Number of DC inputs	1 for each MPPT				
Max input voltage	600V				
Start-up input voltage	100V (+/-5V)				
Rated input voltage	360V				
Operating input voltage range	100V-550V				
MPPT voltage range	160V-500V	165V-500V			175V-500V
Max input MPPT current	10A/10A	12A/12A	13A/13A	15A/15A	
Input short circuit current for each MPPT	12A	14A	16A	18A	

8.2 Output parameters (AC)

Technical Data	SOFAR 3000TLM	SOFAR 3680TLM	SOFAR 4000TLM	SOFAR 4600TLM	SOFAR 5000TLM
Rated power (@230V, 50Hz)	3000VA	3680VA	4000VA	4600VA	5000VA
Max AC power	3000VA	3680VA	4000VA	4600VA	5000VA
Nominal AC voltage	L/N/PE, 220, 230, 240				
Nominal AC voltage range	180V-270V				
Grid frequency range	44~55Hz / 54~66Hz				
Active power adjustable range	0%~100%				
Max output current	13A	16A	17.5A	20A	22A
THDi	<3%				
Power factor	1 (adjustable +/- 0.8)				

8.3 Efficiency, Protection and Communication

Technical Data	SOFAR 3000TLM	SOFAR 3680TLM	SOFAR 4000TLM	SOFAR 4600TLM	SOFAR 5000TLM
Max efficiency	97.6%				
Weighted eff. (EU/CEC)	97.1% / 97.3%				
Self-consumption at night	<1w				
Feed-in start power	50W				
MPPT efficiency	>99.5%				
DC switch	Option				
Safety protection	Anti islanding, RCMU, Ground fault monitoring				
Certification	AS4777, VDE0126-1-1, G83/2, G59/3, C10/11, RD1699, UTEC15-712-1, EN50438, VDE-AR-N4105				
Communication	Wifi + RS485+Multi-function relay+I/O				
Protective class	Class I				
External environment pollution degree	Degree 3				
Overvoltage category	PV: OVC II, AC mains: OVC III				
Max inverter Back-feed current to the array	0A				
Output short circuit current and duration	200A/1us				
Output inrush current and duration	0.8A/2us				

8.4 General Data

Technical Data	SOFAR 3000TLM	SOFAR 3680TLM	SOFAR 4000TLM	SOFAR 4600TLM	SOFAR 5000TLM
Ambient temperature range	- 25°C ~+ 60°C (above 45 °C derating)				
Topology	Transformerless				
Degree of protection	IP65				
Allowable relative humidity range	0~100%				
Max operating altitude	2000m				
Noise	<25dB				
Weight	18kg			19kg	
Cooling	Nature				
Dimension	478*344*170mm				
Warranty	5 years				

9) Sofar SolarMAN Quick_Setup Manual (Wi-Fi Optional)

Outlines of this chapter

This quick guide is intended to assist users in quick configuration and start of Embedded Wi-Fi module.

9.1 Network setting

Note

The setting hereinafter is operated with Windows7 for reference only. If other operating systems are used, please follow the corresponding procedures.

1. Prepare a computer or device, e.g. tablet PC and smart phone that enables Wi-Fi.
2. Obtain an IP address automatically.

Procedure:

Setp1: Click on ;

Setp2: Connect with your personal internet access point (AP) or WLAN.

Example: “sofarpv” in this case. See Figure 9-1

Setp3: Right click on your connected AP, click on Status > Properties to open the wireless network property setup window. See Figure 9-2

Figure 9-1

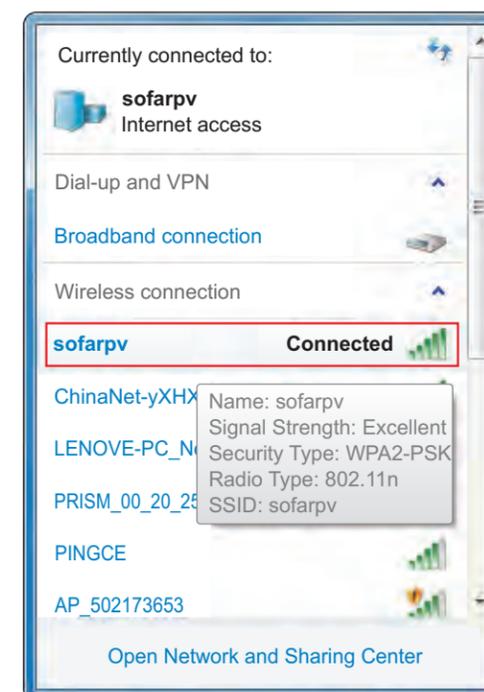
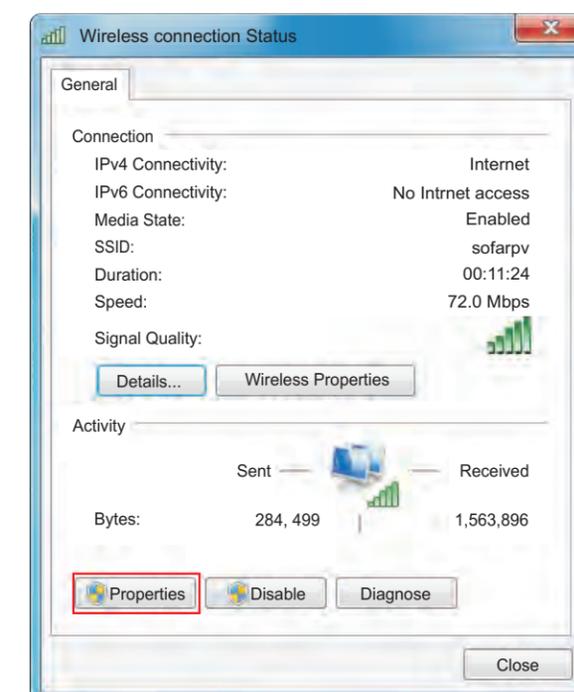


Figure 9-2



Setp4: Double click on internet Protocol Version 4 (TCP/IPv4). Click on General > Obtain an IP address automatically > OK to finish the setup. See Figure 9-3, 9-4:

Figure 9-3

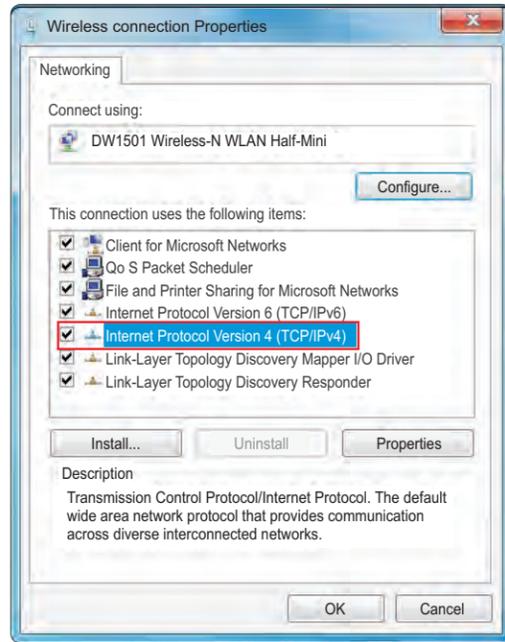
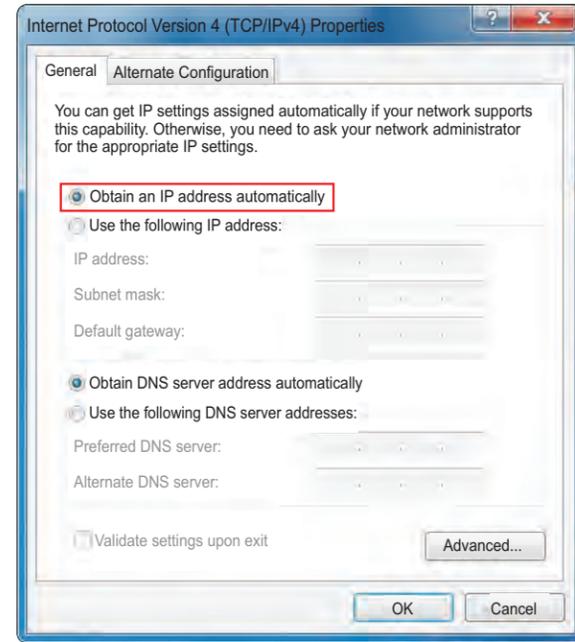


Figure 9-4



3. SOFAR inverter Wi-Fi module setup

Procedure:

Setp1: Click on ;

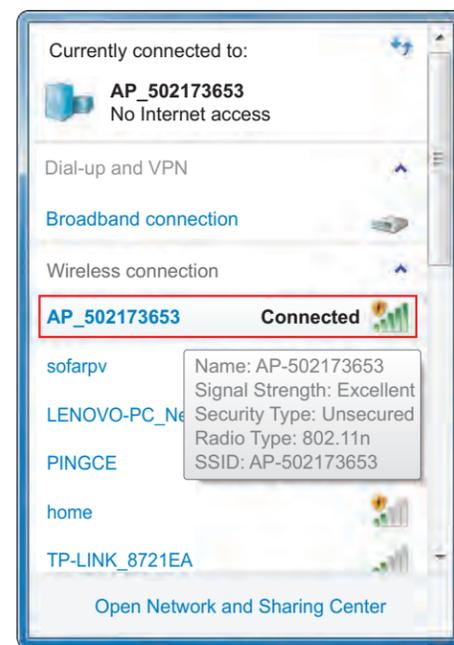
Setp2: Connect with SOFAR inverter Wi-Fi module, defaulted with no password and its name started as AP_ and a following 9-digit Wi-Fi serial number. See Figure 9-5, 9-6.

Example: AP_502173653

Figure 9-5

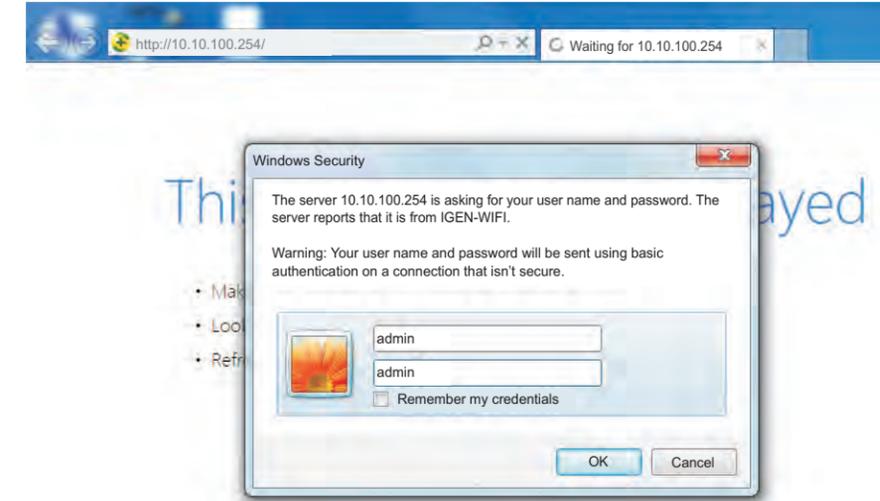


Figure 9-6



Setp3: When connected, open browser, head to <http://10.10.100.254/>, and fill in user name and password which all defaulted as admin for the first time. See Figure 9-7

Figure 9-7



Note

Browsers like internet Explorer 8+, chrome 15+ and Firefox 10+ are recommended.

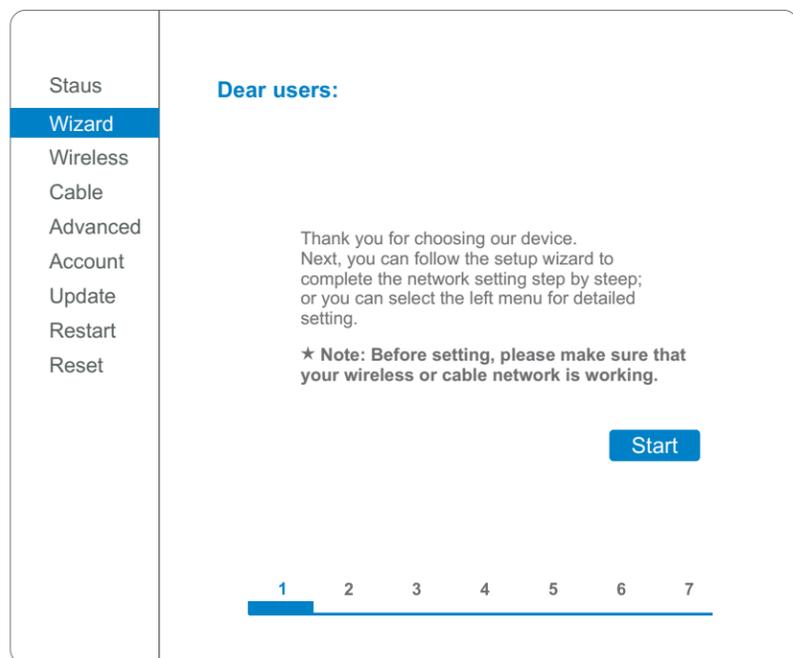
Setp4: When successfully logged in, users can find basic information on their inverter Wi-Fi module.

Figure 9-8

Status	Device information	
Wizard	Device serial number	502173653
Wireless	Firmware version	H4.01.43Y4.0.01W1.0.13(2014-07-161-S)
Cable	Wireless SP mode	Enable
Advanced	SSID	AP_502173653
Account	IP address	10.10.100.254
Update	MAC address	00:95:69:1A:33:30
Restart	Wireless STA mode	Enable
Reset	Router SSID	sofarsolar
	Signal Quality	0%
	IP address	0.0.0.0
	MAC address	00:95:69:1A:33:31
	Cable mode	Enable
	IP address	0.0.0.0
	MAC address	00:95:69:1A:33:31
	Connected Inverter	

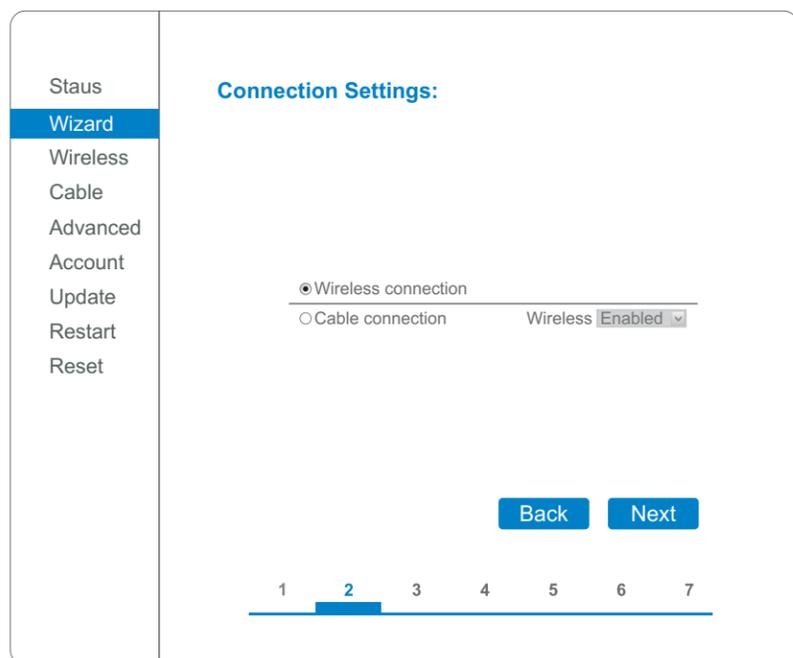
Setp5: Please click on Wizard > Start to start the detailed setup on your inverter Wi-Fi module.

Figure 9-9



Setp6: Select Wireless connection, and click Next.

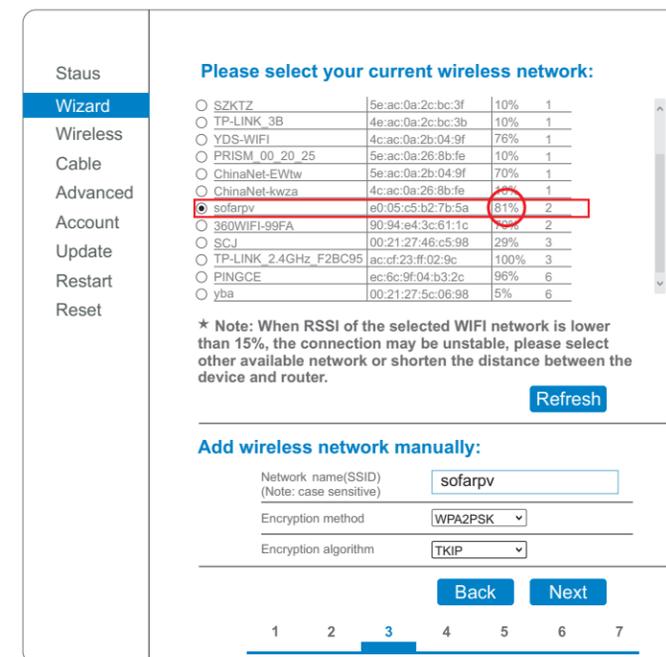
Figure 9-10



Note If the signal strength (RSSI) of your selected internet access point (AP) is lower than 15%, the connection may be unstable, please select other available network or shorten the distance between the device and the router, or reference section 4.6 Figure 4-28.

Setp7: Select your personal wireless network. This can be done by refreshing your wireless network or add it manually. See Figure 9-11

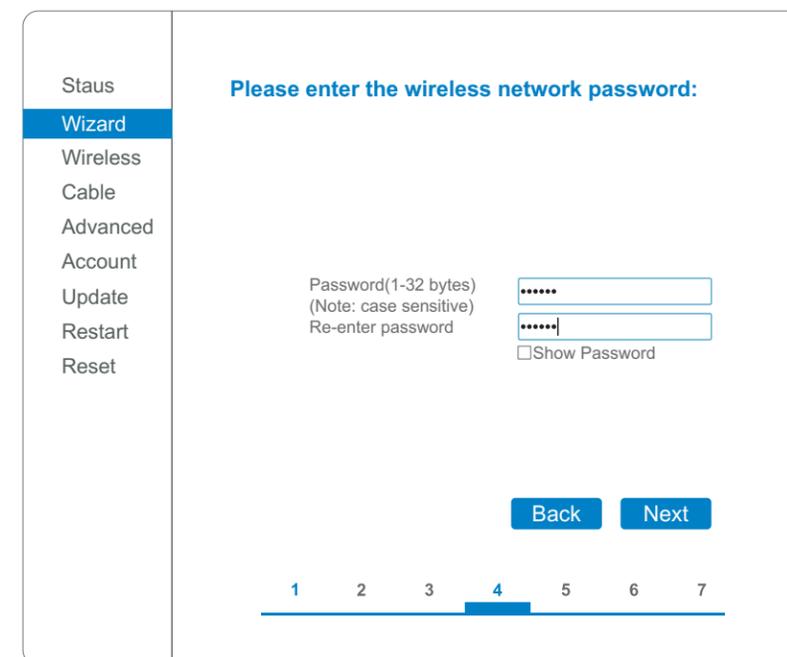
Figure 9-11



Note If you choose to add your wireless network manually, please keep encryption method and encryption algorithm the same as your home router's setup.

Setp8: Please enter your personal wireless network password. Then click Next.

Figure 9-12



Setp9: Select Enable > Next to obtain IP address automatically.

Figure 9-13

Staus

Wizard

Wireless

Cable

Advanced

Account

Update

Restart

Reset

Please fill in the following information:

Obtain an IP address automatically: Enable

IP address: 0.0.0.0

Subnet mask: 0.0.0.0

Gateway address: 0.0.0.0

DNS server address:

Back Next

1 2 3 4 5 6 7

Setp10: Click Next.

Figure 9-14

Staus

Wizard

Wireless

Cable

Advanced

Account

Update

Restart

Reset

Enhance Security

You can enhance your system security by choosing the following methods

Hide AP

Change the encryption mode for AP

Change the user name and password for Web server

Back Next

1 2 3 4 5 6 7

Setp11: Click OK to wait for setting complete.

Figure 9-15

Staus

Wizard

Wireless

Cable

Advanced

Account

Update

Restart

Reset

Setting complete!

Click OK, the settings will take effect and the system will restart immediately.

If you leave this interface without clicking OK, the settings will be ineffective.

Back OK

1 2 3 4 5 6 7

Figure 9-16

Staus

Wizard

Wireless

Cable

Advanced

Account

Update

Restart

Reset

Setting complete! Please close this page manually!

Please login our management portal to monitor and manage your PV system.(Please register an account if you do not have one.)

Re-login the configuration interface, please make sure that your computer or smart phone and our device are in the same network segment, and enter the new IP address of the device to access the interface.

Back Next

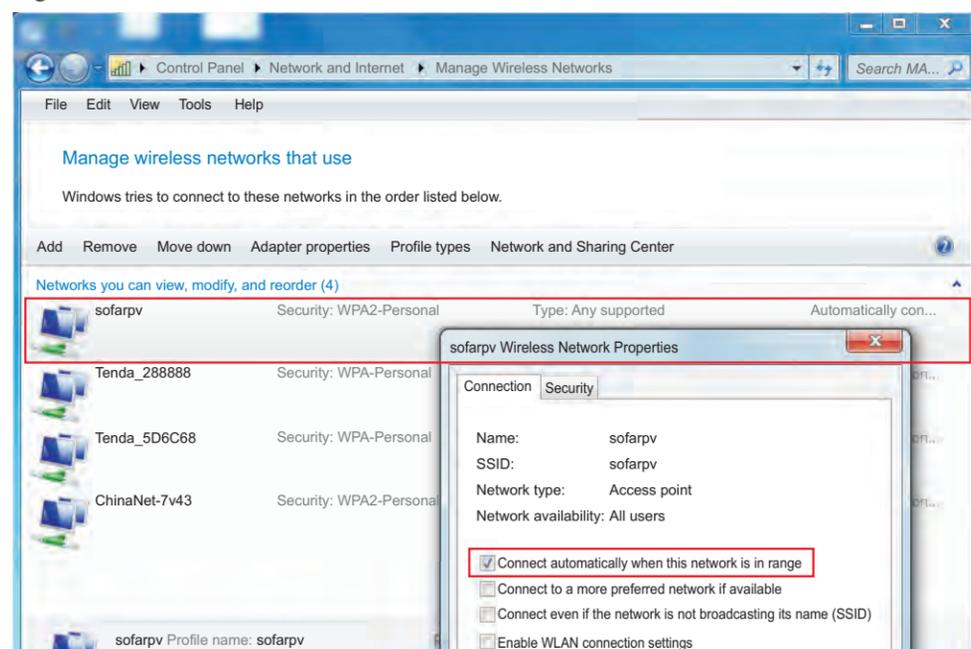
1 2 3 4 5 6 7

Setp12: Setup of wireless network connection priority and connection mode.

Open Control panel > Network and sharing center > Manage wireless networks. Set your home router's access point as default to connect with your personal computer automatically. Make sure it has the highest priority. To the device Wi-Fi module, set its AP as default to connect with your personal computer manually.

Example: make sure "sofarpv" wireless network connection priority is the highest.

Figure 9-17



Setp13: Connect with your personal wireless network or WLAN.

Figure 9-18



9.2 Register on SolarMAN Portal

Launch your browser, open SolarMAN portal website: <http://www.solarmanpv.com/portal/>

Procedure:

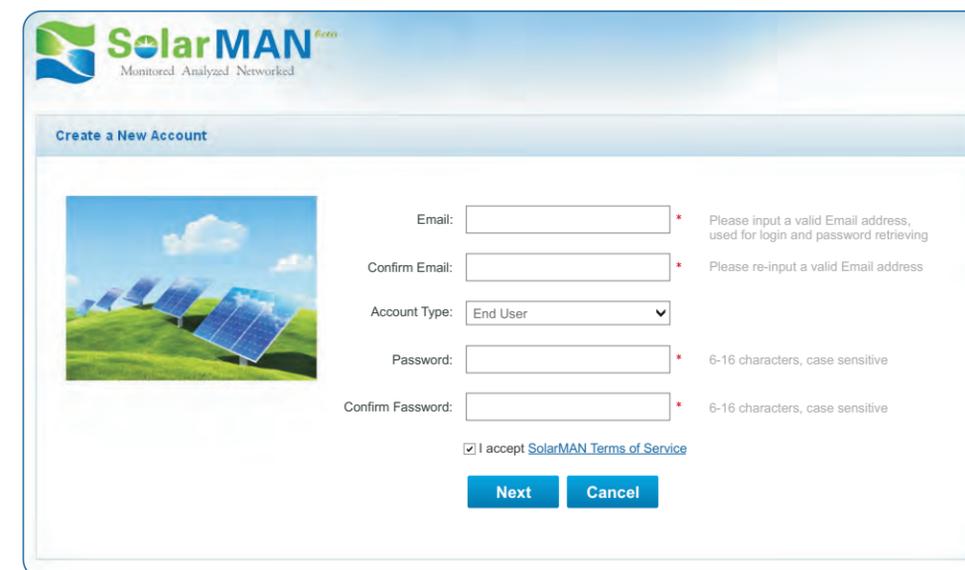
Step1: Click on Register now if you do not have an account.

Figure 9-19



Step2: Fill in basic registration information upon request.

Figure 9-20





Note

Browsers like internet Explorer 8+, chrome 15+ and Firefox 10+ are recommended.

Step3: Fill in details to complete the registration.

Figure 9-21

Step4: If registration is successful, the above page will display. Click OK to return to the homepage of the portal.

Figure 9-22



9.3 Log in SolarMAN Portal to manage power station

After successful registration, open the login page of SolarMAN Portal, and input your E-mail and password to access the monitoring system and start monitoring and management of power plants.

Figure 9-22



Note

In order to make sure your solar system is being well monitored by our SolarMAN monitoring system, please click the Real Time label to see if there is real time data within 15 minutes. If so, your SolarMAN network setup is successful. If not, please re-check the above procedure.

Figure 9-23

No.	Inverter S/N	DC Input			AC Output			Total Energy(kWh)	Temperatu
		Channel	Voltage(V)	Current(A)	Phase	Voltage(V)	Current(A)		
		PV1	352.2	1.2	L1	227.6	1.8	420	
1	SA1ES003E3Q 001	PV2	0.0	0.0	L2	0.0	0.0	0	49.98

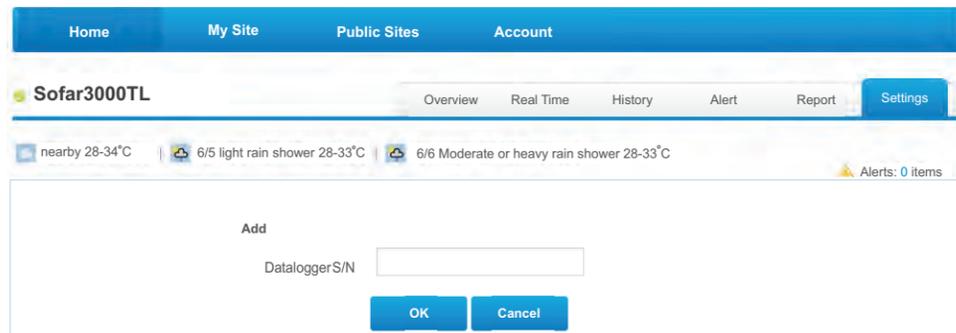
★ Add more inverters on SOFAR SolarMAN monitoring system

Click Setting > Device > Add to enter the 9-digit serial number (SN), and then click OK to complete the setting of adding a new inverter.

Figure 9-24



Figure 9-25

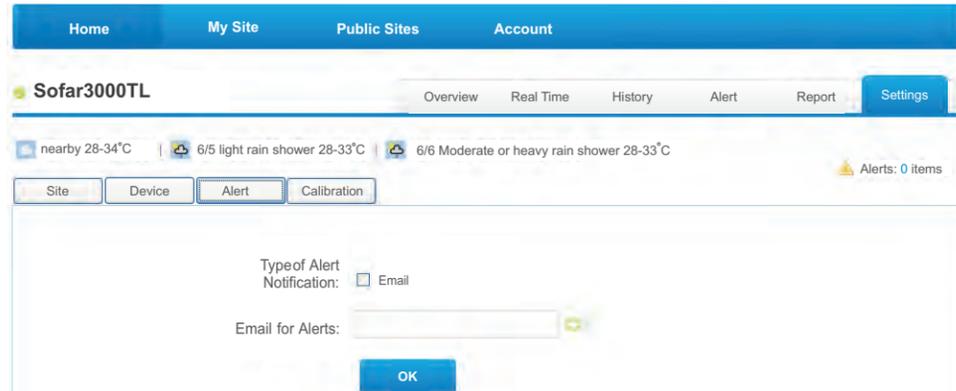


★ Alert notification setup

When any abnormal situation happened to the device, an error message would be sent automatically to your designated email account in second.

Please fill in below your personal email account to complete the setup of your alert notification.

Figure 9-26



10 Quality Assurance

Shenzhen SOFARSOLAR Co., Ltd. offers 5 years product warranty for Sunny Deer series inverters from date of installation. However the warranty period can't exceed 66 months from the date of delivery of the inverter. During the warranty period, Shenzhen SOFARSOLAR Co., Ltd. guarantees normal operation of the inverter. During the warranty period, if the inverter is defective or faulty, please contact your installation contractor or supplier. If the fault is SOFARSOLAR's responsibility, Shenzhen SOFARSOLAR Co., Ltd. will provide service and maintenance free of charge.

Disclaimer:

- Use of Sunny Deer series inverters for any other purpose than it's intended for;
- Faulty system design or installation;
- Improper operation;
- Wrong protection settings of the inverter;
- Unauthorized modification of the inverter;
- Damage caused by external factors or force majeure (violent or stormy weather, lightning, over-voltage, fire, earthquake, tsunami etc.).