Ablerex Grid-Tied PV Inverter

EnerSolis Series

ES3000T / ES3680T

ES4000T / ES4600T

ES5000T / ES5500T

User Manual

VERSION 0.1

Table of Contents

Introduction

Thank you for purchasing EnerSolis Grid-Tied PV Inverter.

We are a specialized manufacturer of power equipment, with years of experience in development and production. We hope that this equipment will facilitate smooth and error-free operation of your solar system for years to come. However, a power system with PV inverter is a complicated system and failures may occur. If you encounter any errors or malfunctions in the PV inverter or system, please call us or the local distributor. We will provide prompt assistance to solve your problems.

Please read this user manual carefully to ensure quick and correct installation of the equipment.

Safety Instructions

- **Please read all the installation instructions in this EnerSolis user manual before installing or maintaining your system.**

- **The PV inverter should be opened by qualified electrical technicians only.**

- **When the photovoltaic array is exposed to light, it supplies a d.c. voltage to the PV Inverter.**

⚠	CAUTION:
	Maintenance of EnerSolis should be performed by qualified electrical technicians, and only after all AC and DC power are completely disconnected from EnerSolis.

- **EnerSolis must be disconnected from the utility and make sure that there is no accidental connection with the utility. The PV array must also be disconnected with EnerSolis.**
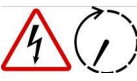
⚠	CAUTION:
	As EnerSolis has a built-in high voltage capacitor, fatal high voltage remains in the inverter for some time after it is shut down.

- **After the inverter is shut down and the utility and the PV array are disconnected from EnerSolis, please wait for the internal capacitor to discharge before opening the unit for maintenance.**

- **Warnings**

Description of warning symbols:

Symbol	Description
⚠️	Caution! Risk of electric shock!
⚠️	Caution! Danger!
⚠️	Caution! High Temperature on Surface! The enclosure surface temperature of PV inverter may exceed +70 °C.
⚠️ 10min	Caution! Risk of electric shock! Residual energy release time!
📖	Please refer to the user manual.

- **Repair and Maintenance**

PV inverter should be repaired by trained electrical technicians only.

- **PV Array**

When installing and configuring the PV array, make sure that the PV array's rated voltage parameters which provided by the manufacturer could meet the applicable specifications. Make sure the open-circuit voltage of the PV array under intensive sun, with ambient temperature of -13°F (-25°C), does not exceed maximum withstanding voltage of EnerSolis (500Vdc). Voltage exceeding 500Vdc will cause permanent damage to PV inverter.

- **Grid connection**

Only the distributor whom has a licensed electrical engineer can install the PV inverter. To install and operate to the grid require the permission from the local power company. Please contact your local distributor for installation details.
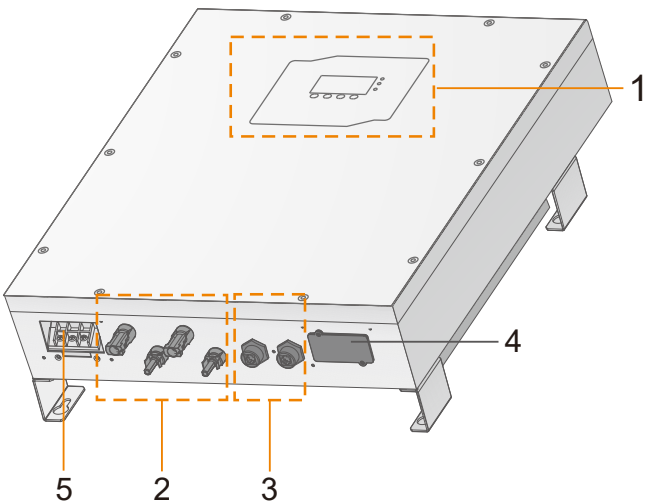
1. Introduction

1.1 External Dimensions
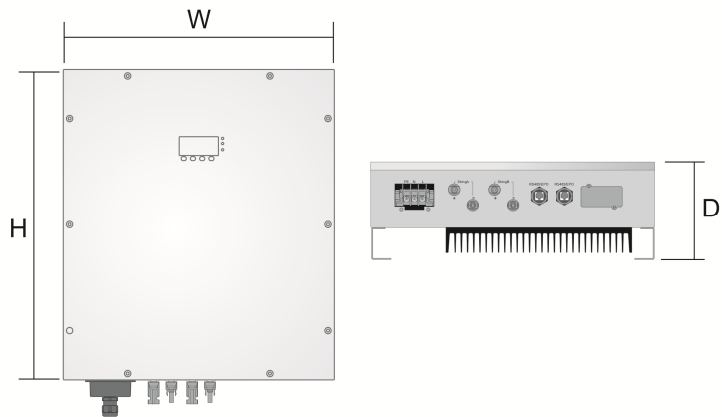
Product Model No. Dimensions (mm)	ES3000T / ES3680T ES4000T / ES4600T ES5000T / ES5500T
H	539
W	469
D	157

1.2 Equipment Description

1. LCD panel and LED indicators: Shows PV inverter operation information and status.
2. DC input terminals: The input connections of PV array.
3. Standard communicationports: RS485, EPO.
4. Optional communication expansion slots: USB, Dry contact, TCP/IP, and Wi-Fi.
5. AC output terminal: PV inverter transmit the AC power to the utility.
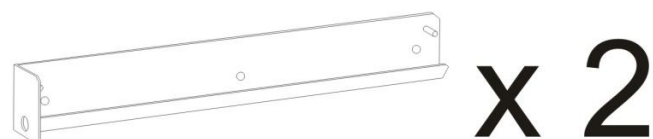
2. Installation

Please read the safety instructions carefully before the PV inverter installation.

2.1 Unpacking

Although the manufacturer has designed robust packaging for the product, still the damages may occur during the shipment. When you received your PV inverter, please check them carefully. If there is any damage, please notify your local distributor. (Packaging container can be recycled and reused.)

Take out the PV inverter from the carton and check the package content. Standard accessories include:

- ✓ Two accessory packs.
- ✓ A data disc
- ✓ A wall mount kit set (include two wall mounting brackets and a backplate position paper).
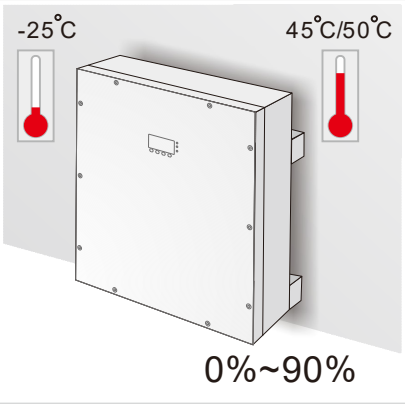
x 2

2.2 Installation site requirements

When selecting an installation location and method, be sure to take the weight of the PV inverter into account.

An appropriate installation location will optimize system performance, reduce the chances of malfunctions, and extend the product lifetime. Please follow the guidelines below for an appropriate location.

PV inverter are designed for outdoor use, with protection class IP65, and can be installed outdoors and in wet environments. Power generation capacity of the PV inverter varies due to ambient temperature, humidity, and installation location. Recommend locations shall out of direct sunlight, with ambient temperatures between the recommended operating temperatures.

| -25°C 45°C/50°C	ES3000T ES3680T ES4000T ES4600T	ES5500T
0%~90%	-25 °C ~ +50 °C	-25 °C ~ +45 °C

The PV inverter should be hung perpendicularly against the wall. Please make sure that the wall mounting location

does not cause the PV inverter to tilt forward or backward during installation.
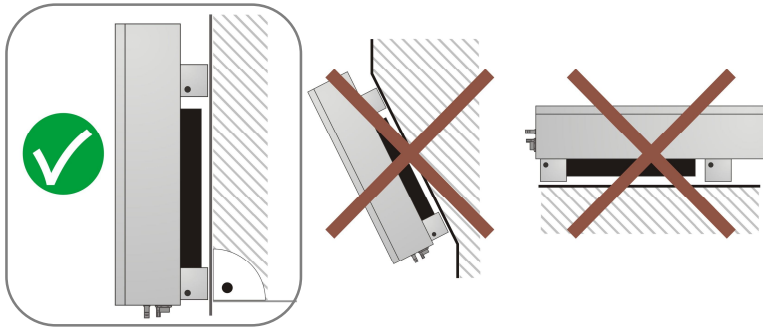

When choosing an installation site, ensure that there is enough space for the PV inverter to dissipate the heat generated during operation. Please see the diagram below for recommended heat dissipation space.
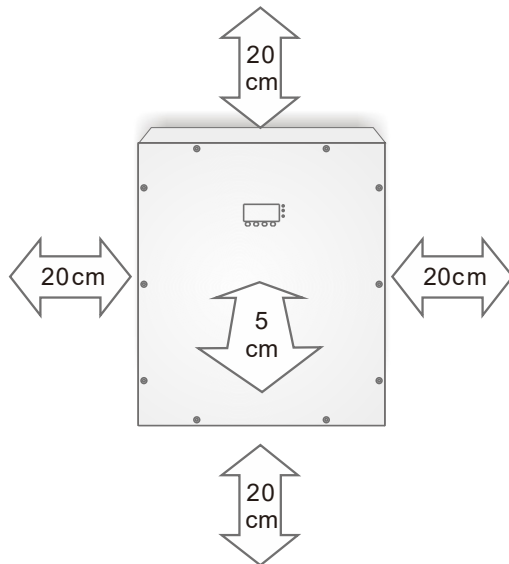

2.3 Mounting the unit

It is recommended to use the enclosed backplate to mount the PV inverter on the wall. When selecting an installation location, be sure to consider whether it can withstand the weight of PV inverter. It is recommended to install the unit vertically on a solid concrete or a brick wall.
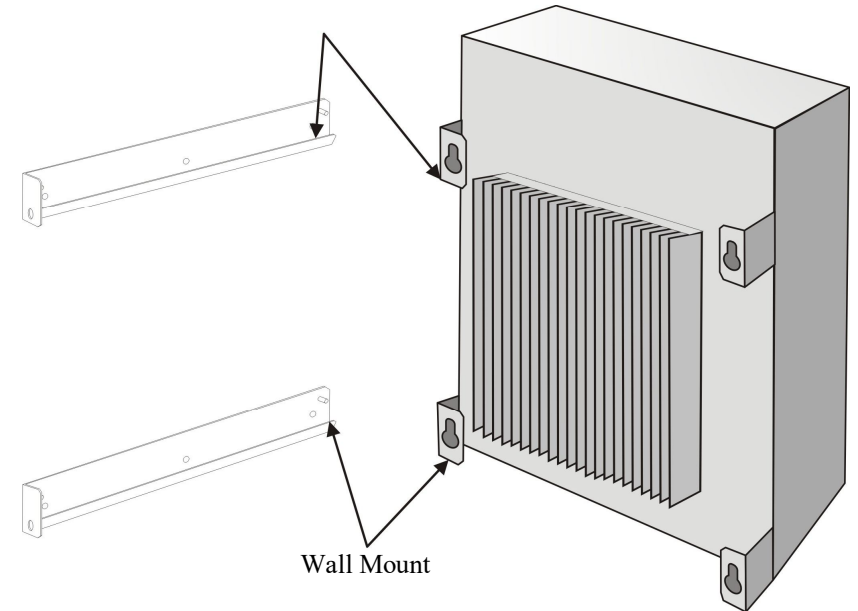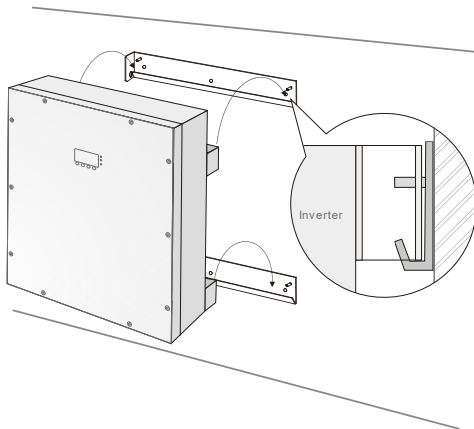

Wall Mount

2.3.1 Installation steps

Method I: Use the wall mounting brackets to fix the unit.

Step 1: Put the backplate position paper on the intended spot of the wall. Drill holes based on the diameter of the backplate to fix holes. Finally, fix the backplate on the wall.
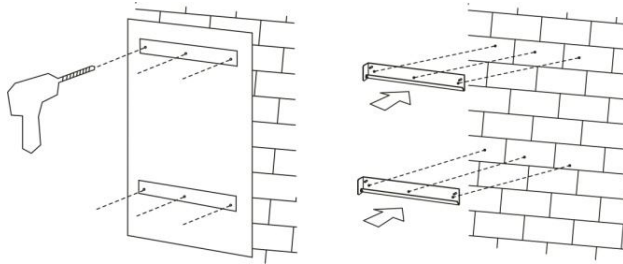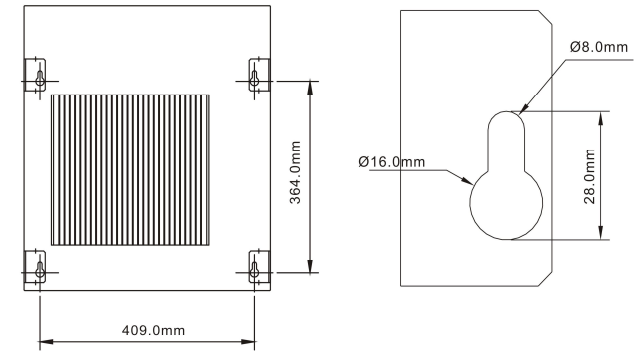

Step 2: Hang the PV inverter on the brackets. Make sure the inverter holds firm and securely.
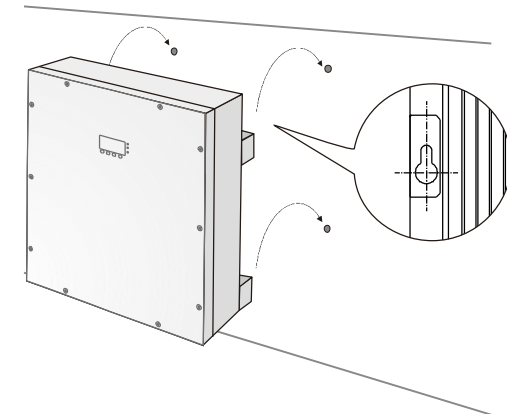

Method II: Use screws to fix the unit.

Step 1: As shown in the figure below, drill holes on the wall at the marked distances and fasten the screws to the drilled holes.

Step 2: Mount the PV inverter on the wall. Make sure the unit is installed securely and not slanted.

2.4 Electrical Installation

⚠	CAUTION:
	Maintenance of EnerSolis should be performed by qualified electrical technicians, and only after all AC and DC power are completely disconnected from EnerSolis.

- Make sure the AC circuit breaker has been installed between the PV inverter and the utility.

  Note: The Ue: 240Vac / Ie: 30A circuit breaker is recommended.

- Make sure the DC circuit breaker has been installed between the PV inverter and the PV array.

  Note: The Ue:600Vdc / Ie: 20A circuit breaker is recommended.

- The AC and DC circuit breaker must be disconnected during installation process.

- During installation, make sure that both the AC and DC circuit breakers are turned off.

The wiring of the PV inverter is shown in Figure 1.Detailed installation steps for AC output and PV array input are explained in the following sections.
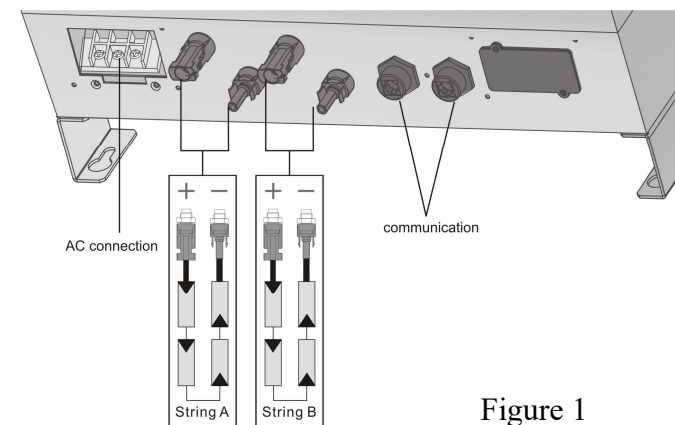

Figure 1

2.5 Connecting to the Grid (AC utility)

⚡	CAUTION:
	An AC circuit breaker should be installed between the PV inverter and the utility before wiring the unit to the utility.

Step 1: Make sure that the utility voltage and utility frequency meet the specifications of the PV inverter.

Step 2: Make sure the circuit breaker which connected to the utility is opened before installed the PV inverter's AC output. The AC circuit breaker should be closed only after completed the electrical installation of the PV inverter.

Step3: As shown in Figure 2, remove the cover of AC output. Follow the steps in Figure 3 to set the AC output wiring by using the recommended wire diameter. You can follow the instructions in Figure 4 to adopt different wiring methods for the desired output voltage.
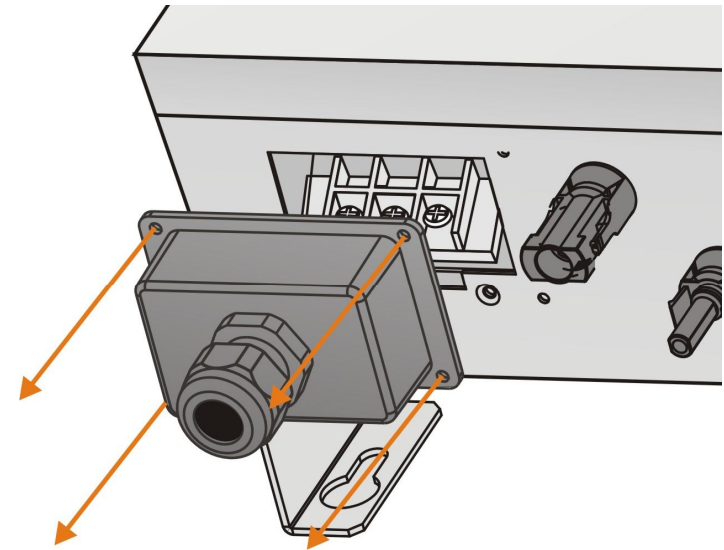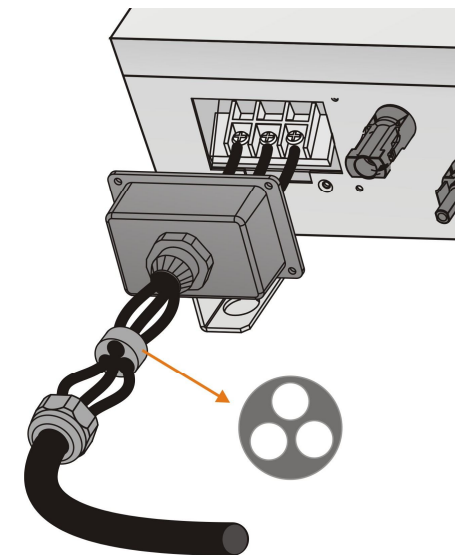
Figure 2

Figure 3

PE N L   PE L2 L1

230Vac   230Vac
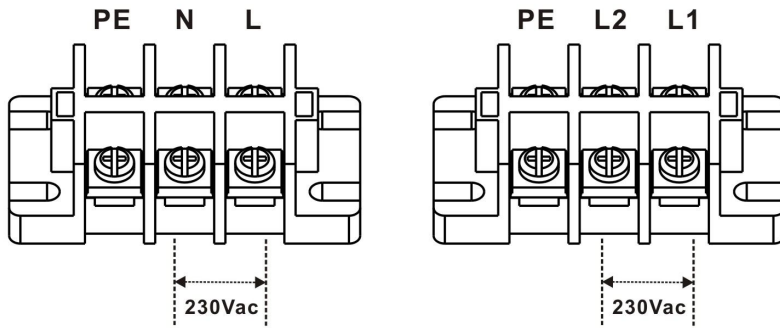
Figure 4

Step 4: Fasten the AC output water-proof cover securely, as shown in Figure 5.
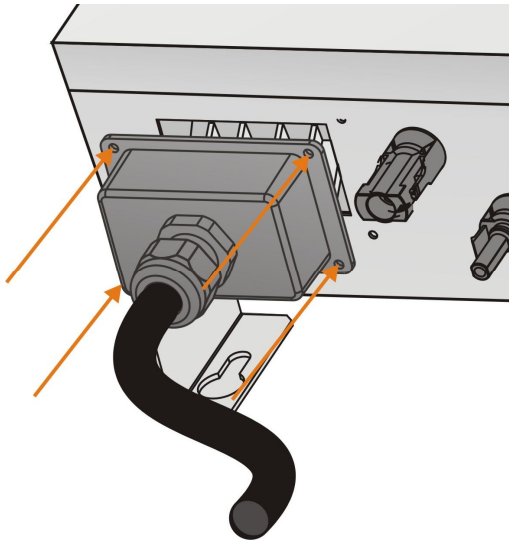

Figure 5

- To prevent electric shock hazard, make sure the ground of the PV inverter is connected to the ground properly before any operation.

- Recommended wire diameter for AC cable

Model	Diameter Φ(mm)	Area (mm^2)	AWG no.
ES3000T / ES3680T	>2.05	>3.5	>12
ES4000T / ES4600T ES5000T / ES5500T	≥2.59	≥5.5	≥ 10

2.6 PV Array Input Wiring

The PV inverter is equipped with specific quick installation terminals for PV array, as shown in Figure 6.
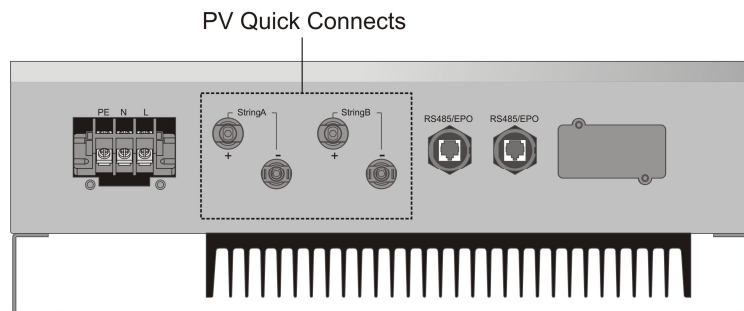

Figure 6

2.6.1 Precautions of PV Array Configuration

The number and connection of the PV modules have to meet the PV inverter specifications and the following three requirements:

1 To prevent damage to the PV inverter, make sure that the maximum open-circuit voltage (Voc) less than500Vdc in each PV array. Voltage exceeding 500Vdc will cause permanent damage to the PV inverter.

2 Maximum short circuit current (Isc) for each PV array should less than the maximum input current which specified on PV inverter.

3 The maximum power voltage for the PV array should remain within the maximum power tracking range under any kind conditions.

2.6.2 Installation steps for PV array input

> ⚠ CAUTION:
> An independent DC circuit breaker shall be installed between the inverter and the PV array before the PV inverter is connected to the PV array.

■ Follow the steps below for connecting of the PV array to the PV inverter:

Step 1: Ensure the correct polarity of the PV array, and the voltage less than the PV inverter's maximum input voltage (500Vdc).

Step 2: Connect the PV array's positive polarity to the PV inverter's positive terminal.

Step 3: Connect the PV array's negative polarity to the PV inverter's negative terminal.

Step 4: For a multi-string PV array, repeat Steps 1 to Steps 3.

Step 5: Cover up other unused terminals on the PV inverter with the protective lids to avoid potential electric shock.

■ Recommended wire diameter for PV array input

Model	Diameter Φ(mm)	Area (mm²)	AWG no.
ES3000T / ES3680T	>2.05	>3.5	>12
ES4000T / ES4600T ES5000T / ES5500T	≥2.59	≥5.5	≥ 10

3. 2.9" Panel

3.1 Functions of the 2.9" Panel

1. Standard mode: Two strings that each of them in different numbers of the array can be configured independently, as shown in Figure 7.
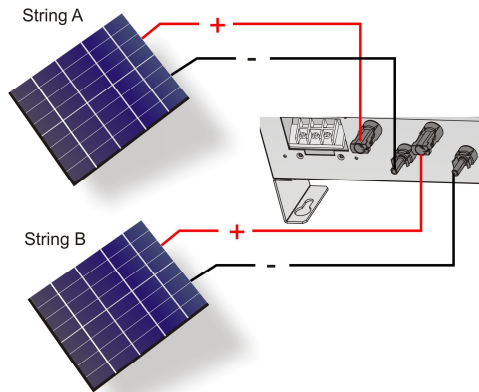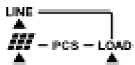

Figure 7

2. Parallel Mode: A single-string PV array is connected to String A and String B with should be configured in the

(Panel symbols are described in the table below. Please refer details of the Setup Mode.)

Figure 8

(1) LCD screen	
Symbol	Description
	The PV inverter is operating in Special Mode
	Grounding fault, or DC-input insulation impedance too low
	Utility
	PV array
PCS	PV inverter
LOAD	PV inverter power generation indication


```
⟍⚲
⏚?
LINE
▦
```
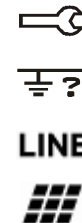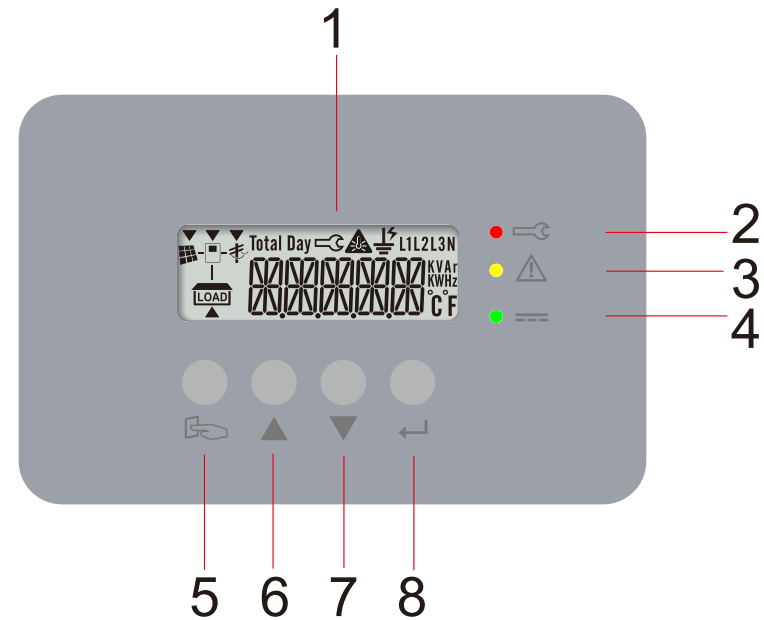
	The operation process chart, showing the relationship between the PV inverter, PV array input, and AC output power
	Measured value of the PV inverter

LED indicators		
(2)		Red LED on indicates some errors occurred in PV inverter
(3)		Yellow LED on indicates the electrical conditions exceeding the PV inverter's allowable operating range
(4)		Green LED on or flashing indicates that energy generation by the solar panel is greater or less than the value of PV inverter's sleeping power
Buttons		
(5)		Setup /Query
(6)	▲	Previous page
(7)	▼	Next page
(8)	↵	Confirm Setup changes

3.2 Display and Operation of 2.9" Panel Measurement Messages

When the PV inverter starts, all the LED indicators and all the LCD screen 's symbols are on, as shown in Figure A.

A
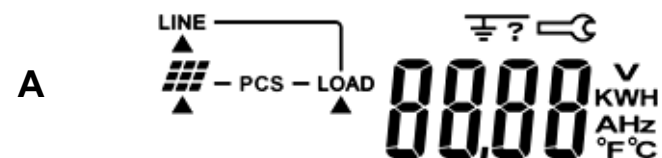
The following information describes various electrical parameters shown up on the LCD screen when the inverter is in operation. Use the ▲ and ▼ keys to navigate between the pages. The general views of displayed messages are shown as follows.

3.2.1   String A input voltage, as shown in Figure B.

B
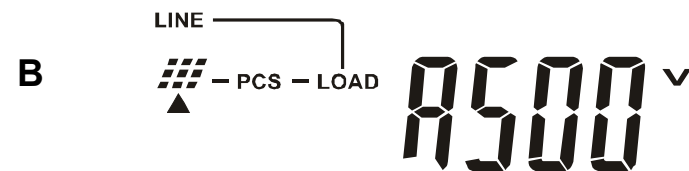
3.2.2   String B input voltage, as shown in Figure C.

C

3.2.3   String A input current, as shown in Figure D.

D   LINE ─┐
        ⊞ ─ PCS ─ LOAD   A 15 A
        ▲
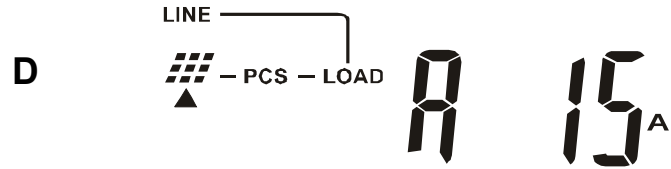
3.2.4   String B input current, as shown in Figure E.

E   LINE ─┐
        ⊞ ─ PCS ─ LOAD   b 15 A
        ▲
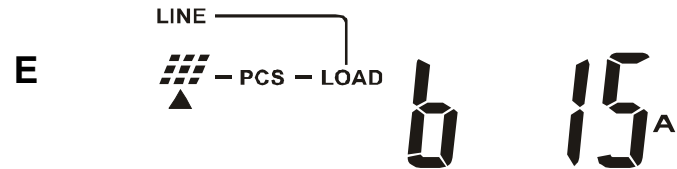
3.2.5   String A input power, as shown in Figure F.

F   LINE ─┐
        ⊞ ─ PCS ─ LOAD   A2.50 KW
        ▲
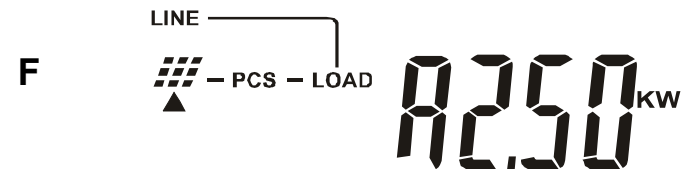
3.2.6   String B input power, as shown in Figure G.

G   LINE ─┐
        ⊞ ─ PCS ─ LOAD   b2.50 KW
        ▲
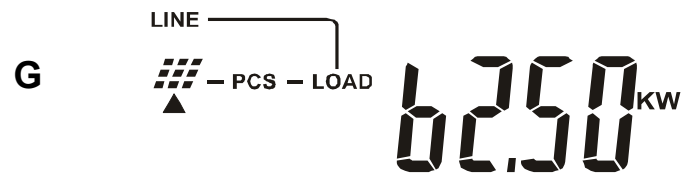
3.2.7   Output voltage, as shown in Figure H.

H   LINE ─┐
        ⊞ ─ PCS ─ LOAD   230 V
        ▲

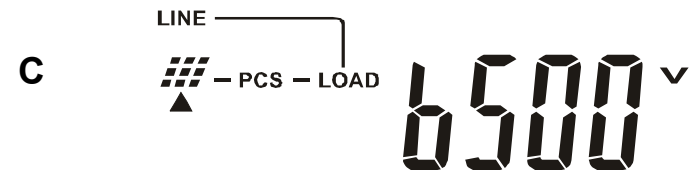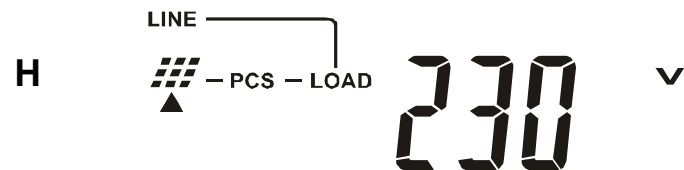3.2.8   Output frequency, as shown in Figure I.

I   LINE ─┐
        ⊞ ─ PCS ─ LOAD   50.0 Hz
        ▲
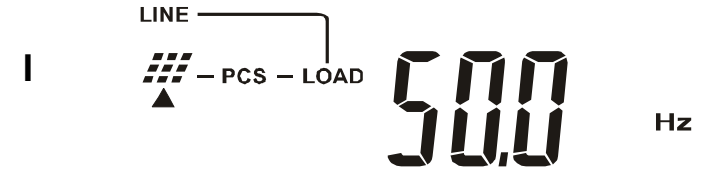
3.2.9   Output current, as shown in Figure J.

J   LINE ─┐
        ⊞ ─ PCS ─ LOAD   23.0 A
        ▲
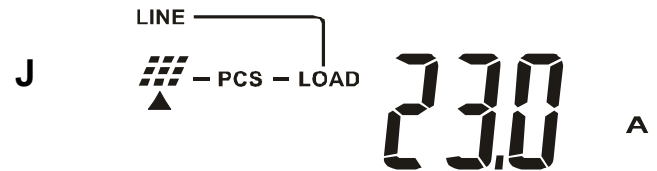
3.2.10   Output power, as shown in Figure K.

K   LINE ─┐
        ⊞ ─ PCS ─ LOAD   5.00 KW
        ▲
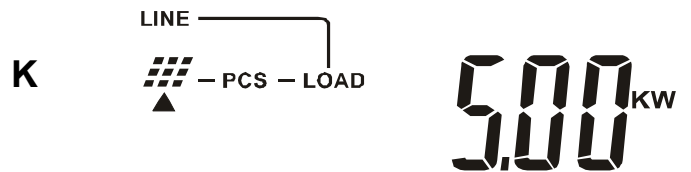
3.2.11 Total energy generation, as shown in Figure L.

L   LINE ─┐
        ⊞ ─ PCS ─ LOAD   9999 KWH
        ▲
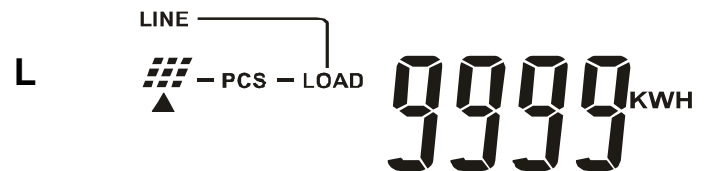
3.2.12 When the total energy generation exceeds 10,000 KWH, the information will be displayed alternately. For example, when the total energy generation was 999,999 KWH, as shown in Figures L1 and L2.

L1

LINE ⌐
⊞ – PCS – LOAD
▲
999μKWH

L2

LINE ⌐
⊞ – PCS – LOAD
▲
999KWH
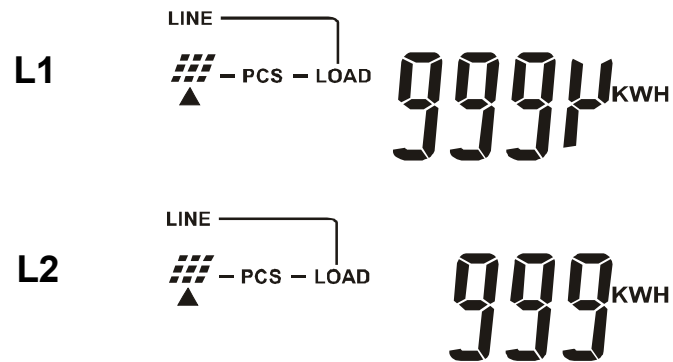
3.2.13 The enclosure surface temperature can be displayed in Celsius or Fahrenheit, as shown in Figures M1 and M2.

M1

LINE ⌐
⊞ – PCS – LOAD
▲
C 140°F

M2

LINE ⌐
⊞ – PCS – LOAD
▲
C 60 °C
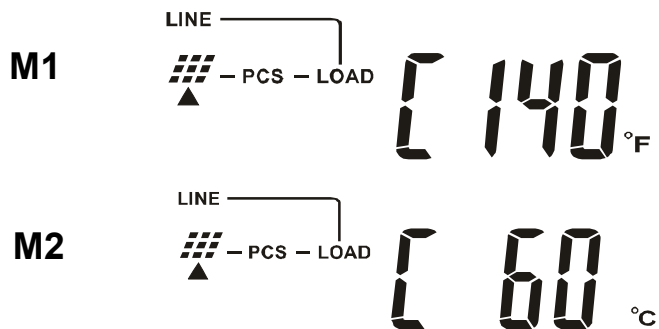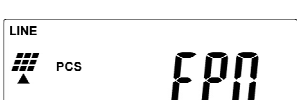
3.2.14 Heat sink temperature can be displayed in Celsius or Fahrenheit, as shown in Figures N1 and N2.

N1

LINE ⌐
⊞ – PCS – LOAD
▲
H200°F

N2

LINE ⌐
⊞ – PCS – LOAD
▲
H 93 °C
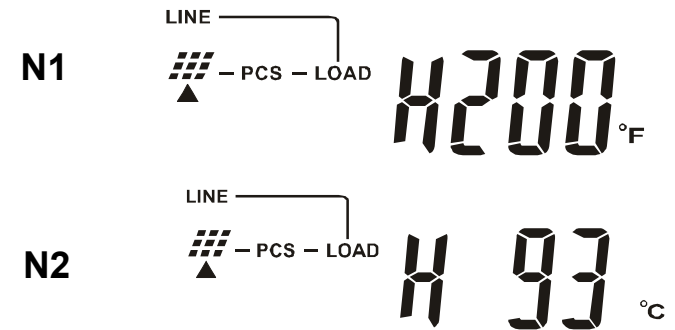
3.3 Status Display of the 2.9" Panel PV Inverter

When the voltage of the PV array exceeds 120Vdc, the PV inverter starts running automatically.

The following table describes various PV inverter's operation mode:

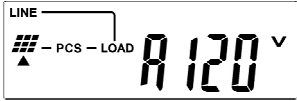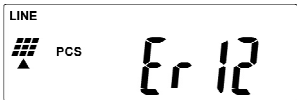| Mode	LCD screen display	Description
Power generation	LINE — PCS — LOAD **A120**	When the voltage of the PV array is between 120Vdc and 500Vdc, the PV inverter is in the power generation mode, indicated by a long light green LED.
Standby	LINE PCS **A100**	When the voltage of the PV array is below 120Vdc, the PV inverter is in standby mode, indicated by flashing green and yellow LED individually.
Fault	LINE PCS **AL00**	Electrical conditions exceeding the PV inverter's allowable operating range are indicated by the corresponding alarm codes and a flashing yellow LED.
Fault	LINE PCS **Er 12**	PV inverter failures or malfunctions are indicated by the corresponding error codes and a flashing red LED.
EPO	LINE PCS **EPO**	Emergency power off. When the user short-circuit the EPO terminal, the PV inverter will stop output immediately and remains in standby mode. It indicated by a flashing red LED.
Shutdown		When PV array cannot generate enough energy (such as at night or in rainy days), the PV inverter will automatically shutdown to stop output.

3.4 Setup Mode of the 2.9" Panel PV Inverter

Precautions of PV Inverter Setup:

a Make sure that the PV inverter is disconnected from the utility.

b Only the well trained professional electrical technicians could be allowed to manipulate the PV inverter on site..

c In Setup mode, it can change country code setting, standard or parallel mode for the PV array, and the unit ID number.

d Please change the settings as needed. Do not alter the remaining settings to avoid PV inverter malfunctioning.

Follow the steps below to make changes in Setup mode:

Step 1: To enter the Setup mode, press both the ▲ and ▼keys on the panel simultaneously for about five seconds.

Step 2: In the setup mode, set the country code first. The screen displays SET and country code alternately, as shown in Figures O1 and O2. Use the ▲ and ▼ keys to change the country code.

⚠️ CAUTION:
Do not change the country code unnecessarily, it result the PV inverter may not working properly.

inverter. The panel now shows the SET and ID setting alternately, as shown in Figures O1 and Q.

Use the ▲ and ▼ keys to set the ID number as needed.

O1 ⠿ PCS   **SEt**

Q   Id01

O2 ⠿ PCS   **dE**

Step 5: Press the ↵ key to exit the setup mode. The screen now displays SAVE, as shown in Figure R.

Step 3: Press the ↵ key to set the standard or parallel mode for the PV array. Use the ▲ and ▼ keys to switch to either standard or parallel mode, as shown in FiguresP1 and P2.

R ⠿ PCS   **SAuE**

Step 6: Wait until the changes are saved, then restart the PV inverter.

P1 ⠿ PCS   **Std**

P2 ⠿ PCS   **PAr**

4. Communication Ports

4.1 Standard Communication Ports

4.1.1 RS485 communication port definition

The RS-485 communication port setting is shown as follows:

Baud rate	9600 bps
Data length	8 bits
Stop bit	1
Parity	None

Pin definitions for RS-485:

PIN 1：Reserve

PIN 2：Reserve

PIN 3：485 GND

PIN 4：EPO GND

PIN 5：EPO

PIN6：Reserve

PIN 7：485 A/Data+

PIN 8：485 B/Data-

4.1.2 EPO (Emergency Power Off) RJ45 Connector

User can short-circuit Pin 4 and Pin 5 to force the PV inverter shutdown immediately.

Note:	
Make sure the wiring of the RJ45 connector is correct. EPO is intended for system emergency power off. The operating PV inverter can be stopped immediately and remains in standby mode. by shorting the circuit with the pins which specified in the right figure.	
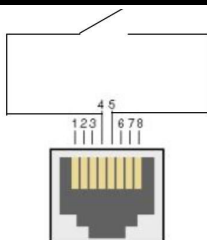
4.2 Optional Communication Interface Card

4.2.1 Hardware Installation Instructions

CAUTION:
Risk of electric shock!

Please disconnect the DC circuit breaker and AC circuit breaker first, and make sure the PV inverter is powered off. Follow the steps and the figures below to install the communication interface card.
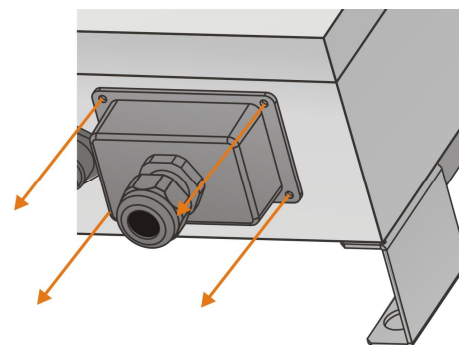
Remove the 4 screws on the waterproof lid.
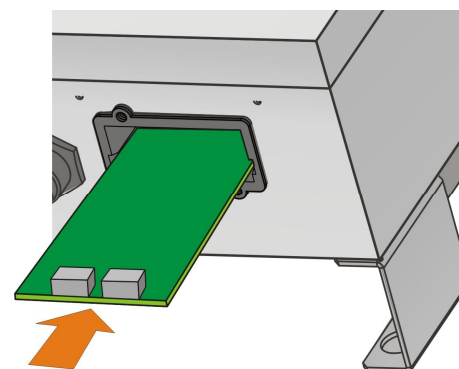
Insert the communication interface card into the slot and wiring it properly.
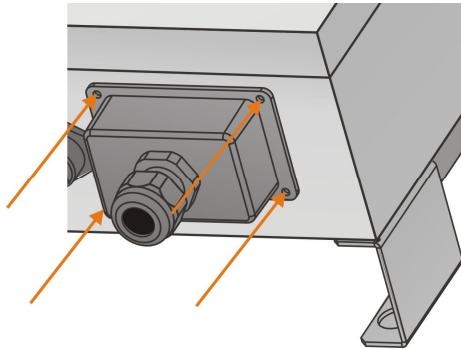
Fasten the 4 screws back to the waterproof lid.

4.2.2 USB card
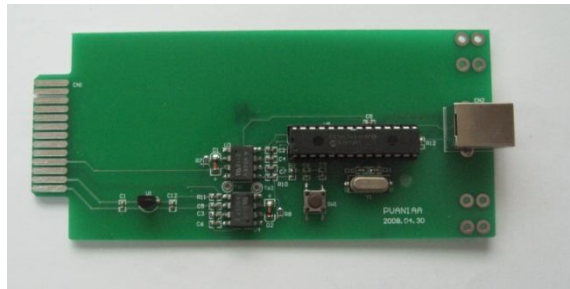
a. CN2 is for USB connectors.

b. Compliant with USB 1.0 version, which transmission rate can up to1.5Mbps.

c. Compliant with USB HID 1.0 (Human Interface Devices) version.
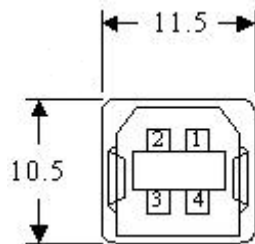
d. Pin Definitions:

PIN1：VCC (+5V)

PIN2：D−

PIN3：D＋

PIN4：Ground

4.2.3 Relay Junction Card (DCE-B)
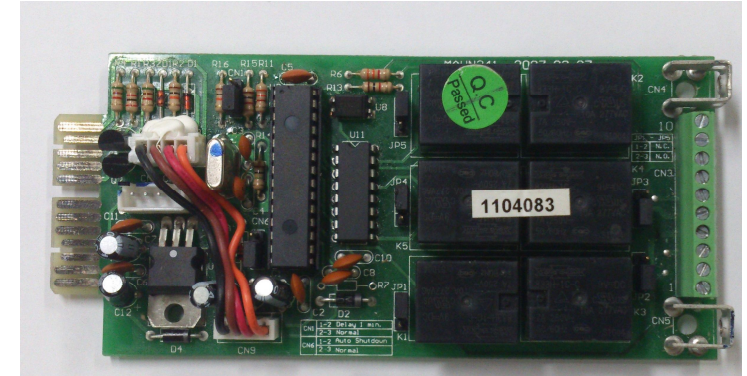
a. Pin definitions for the terminals:

1	2	3	4	5	6	7	8		

PIN 1: Utility voltage is too high or too low.

PIN 2: The input voltage for the maximum power tracker A or B is within the rated range.

PIN 3: The input voltage for the maximum power tracker A or B is too high or too low.

PIN 4: The frequency of utility voltage is too high or too low.

PIN 5: Islanding effect.

PIN 6: A over current situation in the PV inverter.

PIN 7: The heat sink temperature of the PV inverter is too high.

PIN 8: Common point.

b. Contact capacity of each relay is 40dc/25mA.

c. JP1~5 is for selection of the relay contact action:
PIN 1&2 short-circuit is for N.C. action.
PIN 2&3 short-circuit is for N.O. action.

4.2.4 TCP/IP Card
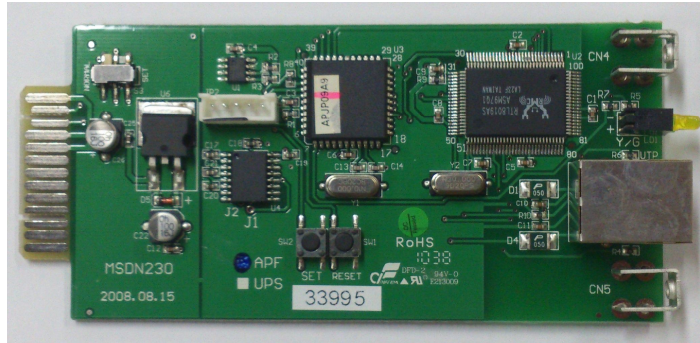
User can use the TCP/IP card to communicate and monitor the PV inverter via external devices. See TCP/IP (Ethernet) card user manual for details.

4.2.5 Wi-Fi Card

User can use the Wi-Fi card to communicate and monitor the PV inverter via external devices. See Wi-Fi card user manual for details

5. PV Inverter Troubleshooting and Solutions

Error or Alarm Codes are displayed automatically on the LCD screen of the PV inverter. See Tables 1 and 2 below for its explanations.

Table 1:Description of PV inverter error and alarm codes

LCD Display	Cause	Description	Solution
ER00	DC_BUS charging abnormal	During DC boot process, DC_BUS failed to reach the setting value.	1. Disconnect the PV array from the PV inverter.

2. Wait until the LCD monitor is completely off. Then reconnect the PV array to the PV inverter.

3. If the problems persist, please contact your local distributor. |
ER02	Slave MCU errors	Slave MCU failed to work normally.	
ER07	DC_BUS voltage too high	DC_BUS voltage is higher or lower than rated value during operation.	
ER08	DC_BUS voltage too low		
ER12	DC_BUS charging abnormal	Prior to connecting to the utility, DC_BUS fails to reach the setting value.	
ER17	EEPROM error	Unable to access EEPROM	
ER22	Output relay abnormal	PV inverter's output relay is abnormal.	
ER24	Output current detection abnormal	System detected the output current abnormal during DC boot process.	
ER25	String A input over current	Input current exceeds rated current.	
ER26	String B input over current		

LCD Display	Cause	Description	Solution
ER27	String A & B short-circuits	Short-circuits occur at the input.	
ER06	EPO	Emergency power off. PV inverter will stop output and remains in standby mode.	1. Remove the EPO device. 2. If the problem persists, please contact your local distributor
ER09	PV inverter output over current	PV inverter output current exceeds rated current.	
ER11	PV inverter over load	PV inverter output power exceeds rated power.	1. Switch the AC circuit breaker to the OFF position. Then check the system structure of the utility. 2. If the utility system is normal and the problems persist, please contact your local distributor
ER13	PV inverter output short-circuit	Short-circuit occurred at PV inverter output, or the utility side.	
ER14	PV inverter phase-lock abnormal.	PV inverter fails to synchronize with the utility during AC boot process.	
ER29	The DC portion at the PV inverter's output is too high.	DC portion in output exceeds the rated value.	
ER10	Chassis over temperature	Temperature inside the chassis is too high.	1. Try to decrease the ambient temperature of the PV inverter. 2. If the problems persist, please contact your local distributor
ER18	Heat sink over temperature	Temperature of the heat sink is too high.	

Table 2: The Utility System Troubleshooting and Solutions

LCD Display	Cause	Description	Solution
AL00	Utility voltage too high	Utility voltage is not compliant with PV inverter's specifications.	1. Disconnect the PV inverter from the utility. 2. Check the wiring and system structure of the utility. 3. Make sure that utility voltage and utility frequency complies with PV inverter's specifications. 4. Restart the PV inverter. If the problems persist, please contact your local distributor.
AL01	Utility voltage too low		
AL02	Utility frequency too high	Utility frequency is not compliant with PV inverter's specifications.	
AL03	Utility frequency too low		

LCD Display	Cause	Description	Solution
AL04	String A input voltage too high	Input voltage is not compliant with PV inverter's specifications.	1. Disconnect the PV array from the PV inverter. 2. Check the open circuit voltage of the PV array. 3. If the open-circuit voltage is within PV inverter's specifications but the problems persist, please contact your local distributor.
AL05	String A input voltage too low		
AL06	String B input voltage too high		
AL07	String B input voltage too low		
AL08	Islanding effect	No utility connected, or utility abnormal	1. Disconnect the PV array from the PV inverter, and cut off the utility from the inverter. 2. Check the wiring and system structure of the utility. 3. Check if the utility is faulty. 4. If the utility is normal and wiring is correct, but the problems persist, please contact your local distributor.
AL13	Utility voltage phase abnormal		
AL10	Leakage current too high	The leakage current to the ground is too high.	1. Disconnect the PV array from the PV inverter, and cut off the utility from the inverter. 2. Check the wiring and system structure of the utility. 3. Restart the PV inverter. If the problem persists, please contact your local distributor.
AL11	Insulation resistance abnormal	DC input insulation resistance of the PV inverter is below the required specifications.	1. Disconnect the PV array from the PV inverter, and cut off the utility from the inverter. 2. Check if PV inverter's DC input and PV array are faulty Restart the PV inverter. If the problem persists, please contact

			your local distributor.
AL21	RMS calculation abnormal	During PV inverter operation, RMS computation time is too long.	If the problem persists, please contact your local distributor.
AL23	PV inverter initialization	When the PV inverter performs DC boot-up procedures, the master controller is still in initialization.	If the problem persists, please contact your local distributor.

6. Specification Table

Item \ Model		ES3000T	ES3680T	ES4000T	ES4600T	ES5000T	ES5500T
Inverter Technology	Conversion mode	Sine-wave, Current source, High frequency PWM					
	Isolation Method	Transformer-less Design*					
DC Input Data							
Nominal DC Voltage (d.c.V)		370 VDC					
Max. Input voltage (Voc)		500VDC					
MPP Voltage Range (d.c.V)		120 VDC - 500 VDC					
MPP Voltage Range (Nominal output) (d.c.V)		200 VDC - 450 VDC					230 VDC - 450 VDC
Max. DC Input current (d.c. A)		2x7.9 Amp	2x9.7 Amp	2x10.5 Amp	2x12.1 Amp	2x13.2 Amp	2x13.2 Amp
Max. Array Short Circuit Current (Isc) (Each string) (d.c.A)		7.9 Amp	9.7 Amp	10.5 Amp	12.1 Amp	13.2 Amp	13.2 Amp
AC Output Data							
Nominal AC Power		3000 VA	3680 VA	4000 VA	4600VA	5000VA	5500VA
Nominal AC Voltage (a.c. V)		AC 230V					

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Output Connect Method	1-Phase / 2-Wire (L,N,PE) 1-Phase / 3-Wire (L1, L2, PE)					
AC Voltage Rang (a.c.A)	184V - 264.5V (Base on 230 V)					
Nominal AC Current (a.c.A)	13 Amp	16 Amp	17.4Amp	20 Amp	21.7 Amp	23.9Amp
Inrush Current (a.c.A Peak)	≦60Amp ≦1ms	≦60Amp ≦1ms	≦60Amp ≦1ms	≦60Amp ≦1ms	≦60Amp ≦1ms	≦60Amp ≦1ms
Maximum output fault current (a.c.A RMS)	15 Amp	18.4 Amp	20 Amp	23 Amp	23 Amp	25 Amp
Maximum output overcurrent protection current (a.c.A)	15.6 Amp	19.2 Amp	20.9 Amp	24 Amp	24 Amp	26 Amp
Frequency	50 / 60 Hz Auto-Selection (45.0 ~ 55.0 Hz or 57.0 ~ 63.0 Hz)					
Power Factor	Leading 0.9 - Lagging 0.9					
Current Distortion	Total Harmonic current : Less than 5%					
	Single Harmonic current : Less than 3%					
Efficiency Data						
Maximum conversion efficiency	> 97.2	> 97.2	> 97.2	> 97.2	> 97.2	> 97.2
Euro efficiency	> 95.8	> 96.3	> 96.3	> 96.4	> 96.5	> 96.5
Environmental						
Operating Temperature	-25 °C - +50 °C (-13 °F - 122 °F)					-25 °C - +45 °C (-13 °F - 113 °F)
Pollution degree classification	PD3					
Overvoltage category (IEC 60664-1)	DC side II / AC side III					
Humidity	0 to 90% (Without condensation)					
Altitude	0 ~ 2000 M / 0 ~ 6600 ft					
Mechanical						
Dimensions (H x W x D mm / inch)	539 x 469 x157 / 21.22 x 18.46 x 6.18					

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Net Weight (kg / lbs)	17 / 37.5
Gross Weight (kg / lbs)	20 / 44
Protection Class	IP65, outdoor
Cooling	Convection
AC Connection	Connector
DC Connection	Multi-contact
Communication	
Communication Interface — Standard	RS485
Communication Interface — Optional	USB, Dry contact, TCP/IP, Wi-Fi
Front Panel	
LCD — mode	2.90" LCD panel
LCD	Solar panel voltage / Solar panel current / Solar panel power / AC output voltage / AC output frequency / AC output current / AC output power / yield / Inner Temperature / Heat sink Temperature / Status message / Error messages
LED — Green	On: Energy generation by the solar panel is greater than the PV inverter's power in sleep mode Flashing: Energy generation by the solar panel is less than the PV inverter's power in sleep mode
LED — Yellow	Power system quality abnormal
LED — Red	PV inverter errors
Key Pad	UP key / Down key / Function key / Enter key
Protection	
Utility	Over /under Voltage, Over /under Frequency,
Utility	Grounding fault, DC Isolation fault
Islanding operation detection	Passive : Voltage phase jump detection

	Active : Reactive power control
Over Temperature	Derating output power
EPO	The PV inverter powers off and stops its output and remains in standby mode
Certification	
On-Grid Performance	VDE0126-1-1/A1, VDE-AR-N 4105**
Safety	IEC 62109-1,-2 , IEC 60730-1***

Item \ Model	ES3000T	ES3680T	ES4000T	ES4600T	ES5000T	ES5500T
EMI/EMC	EN 61000-6-2 EN 61000-6-3 EN 61000-3-2 EN 61000-3-3		EN 61000-6-2 EN 61000-6-3 EN 61000-3-11 EN 61000-3-12			EN 61000-6-2 EN 61000-6-4 EN 61000-3-11 EN 61000-3-12

* Optional isolation transformers can be added if required.

** Models ES5000T / ES5500T de-rating to 4600VA for approved by VDE-AR-N 4105.

*** PV modules must be have an IEC 60730-1 Class A rating.

**** According VDE-AR-N 4105 regulation, if we want to built a Power Generation Units, the maximum power for each phase can only reach to 4.6KW.