Green and Effective

SG10K3 PV Grid-Connected Inverter

User Manual

SG10K3-UEN-Ver31-201106

Version: 3.1

Table of contents

1. Symbols Explanation

Please note the following explanation of the symbols used in this manual.

WARNING!

This indicates a condition that can cause fatal injury or death.

NOTICE!

This indicates a condition that will help to achieve optimal system operation.

Caution!

This indicates a condition that may cause minor or moderate injury.

2. Introduction

Thank you for buying the SG10K3 from our company**.** We hope that the device will meet with your satisfaction when you use it with your PV plant system.

2.1 Grid-connected PV inverter

A SG10K3 grid-connected PV system is shown in Fig.1. SG10K3 transforms the direct current generated by the PV array into stable alternating current and output to the utility grid.

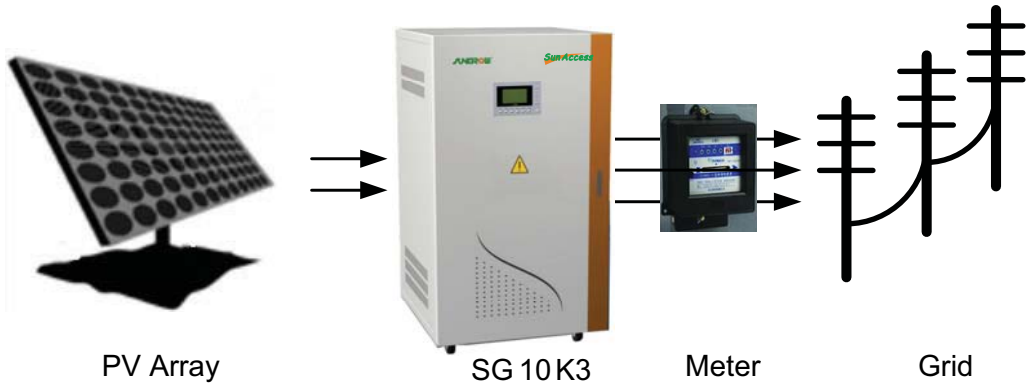


Fig.1 Grid-connected Inverter for PV power application

2.2 How to use this manual

The purpose of this manual is to provide users with detailed product information and instructions for the use of the SG10K3 PV grid-connected inverter.

3. Safety Instructions

Please read the instructions in this manual carefully before installing and operating the SG10K3.

- Always disconnect the inverter from the grid first.
- **ALL CONNECTIONS SHOULD ONLY BE UNDERTAKEN BY QUALIFIED PERSONNEL.**
- All electrical installations shall be done in accordance with local and national electrical codes.
- Please contact your authorized system installer if any maintenance is required.
- **Connection of the SG10K3 to the utility grid must be done only after receiving prior approval from the utility company and performed by qualified personnel.**
- Completely disconnect the output from the PV array before connecting to the SG10K3 or use other methods to prevent electrical shock hazards. This is important because if the PV array keeps connecting during the connection process may produce dangerous voltages.

WARNING!

Make sure that the DC input voltage never exceeds 450V. Higher input voltages will damage the SG10K3 and will lead to the loss of any and all warranty rights.

4. General Descriptions of SG10K3

4.1 Circuit Description

Fig.2 shows the main circuit of SG10K3 -a transformer grid-connected inverter. An IGBT full-bridge converts the DC power to AC voltage and current. The AC power is then fed to the grid after being processed by a filter and a transformer.

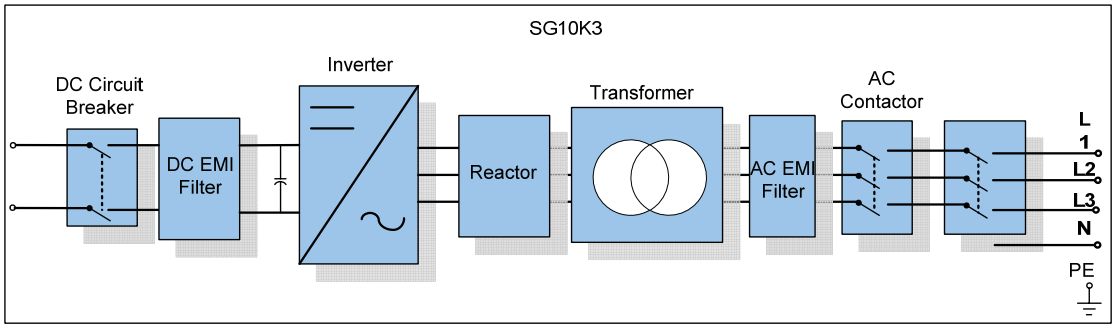


Fig.2 Circuit diagram of SG10K3

4.2 Features of SG10K3

The following are the technical features of SG10K3:

1. The latest power module improves the system efficiency.
2. MPPT auto-optimizing technique makes the most of the PV generation capacity.
3. Multilingual LCD display.
4. Simple parameters settings.
5. Multi communication interface.
6. High reliability due to complete protection functions.
7. Wide DC input voltage range **(up to 450V DC)**.

4.3 The Wiring Interface

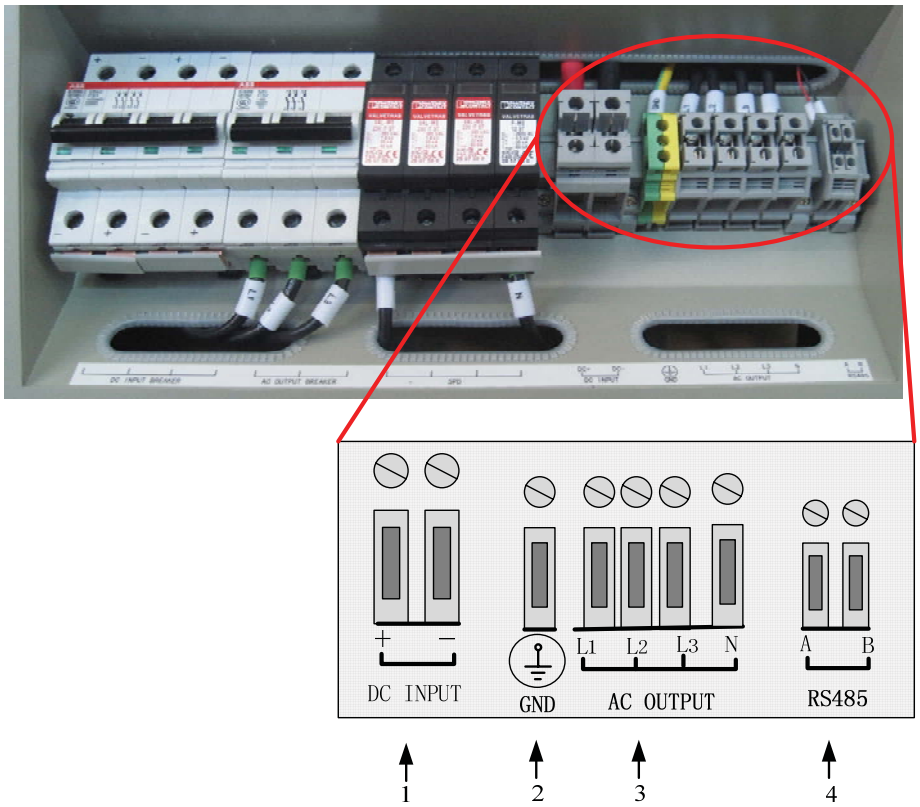


Fig.3 The wiring interface of SG10K3

Table4-1 Terminal descriptions

Terminal of inverter	**Description**
DC INPUT	Connected to the PV array
GND	Earth connection
AC OUTPUT	To the gird L1,L2,L3,and N
RS485	RS485 A/B serial communication port

5. Operation Description

5.1 Operation Modes

This chapter illustrates the operation modes of the SG10K3.

- **Stand-by mode:**

Standby-mode is entered due to fault or insufficient input power, at stand-by mode the inverter is ready to switch into Grid mode provided all the specified conditions are met, otherwise the inverter will keeps at stand-by mode.

- **Connecting to the grid:**

After all system tests have been performed and all connection conditions are met, the inverter switches from stand-by mode to connecting mode. In this mode the inverter delivers power to the grid. This mode is the normal operational mode.

- **Fault**

When faults occur, the inverter will switch off the AC side relay and go into fault or stop mode to protect the PV power system, when the fault is solved, the inverter will wait and test whether all the grid connection conditions are met again, if everything is satisfied, the inverter will start to generate power.

5.2 Commissioning

The inverter works as follows when connecting to the grid:

- The PV modules are activated and start producing power.
- The SG10K3 inverter starts charging the DC bus.
- If the DC input voltage exceeds 240 V, the inverter is ready for grid connection.
- The inverter checks that grid conditions are OK.
- The SG10K3 starts feeding power to the grid.

5.3 Required Grid Conditions

- **GRID Conditions necessary for SG10K3 operation:**

- Grid voltage

The grid voltage must be within 310~450V. Once the grid voltage exceeds this range the SG10K3 is disconnected from the grid within 0.2s.

- Grid frequency

The grid frequency must be 47~51.5Hz/57~61.5Hz (self adaptation to local grid frequency).Once the grid frequency exceeds this range the SG10K3 is disconnected from the grid with 0.2s.

6. Monitoring and Diagnosis

6.1 Basic Communications

The inverter normally operates automatically, without user interaction and any maintenance.

To enable our customers to gain a thorough comprehension about the operation of the inverter, we have provided various data-collection approaches to monitor system data.

Data logger

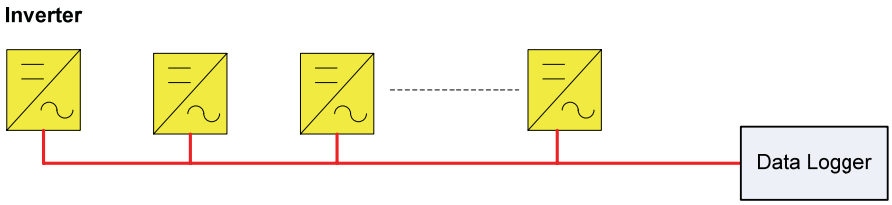


Fig.4 Data logger collects data through RS485 bus

PC

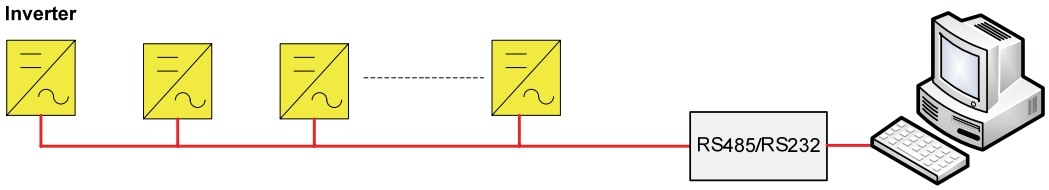


Fig.5 PC collects data through RS485 bus

Data logger+ PC

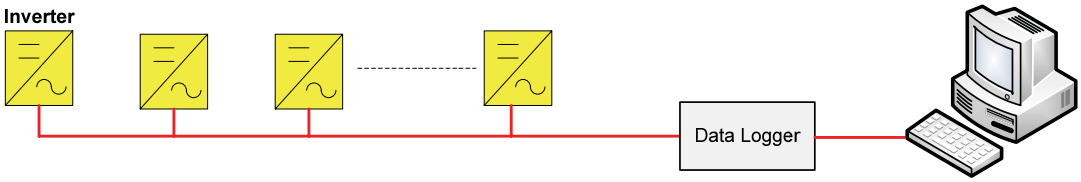


Fig.6 Data logger & PC collects data through RS485 bus

6.2 LCD Control Panel

The SG10K3 has a four line LCD display. The LCD control panel has 5 LEDs and 6 buttons below to check or set parameters, see Figure 7.

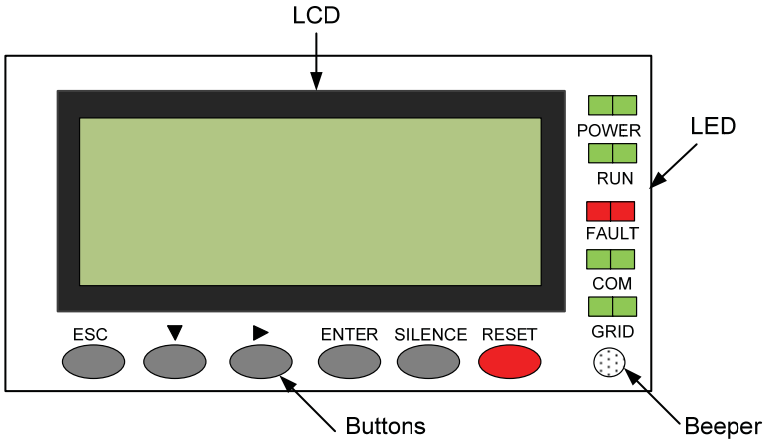


Fig.7 the LCD panel

Table 6-1 LED color and meaning

LED	Color/Meaning
POWER	Green/The control circuit power supply working state
RUN	Green/Inverter is in operation mode
FAULT	Red/A fault occurs in the inverter
COM	Green/Communication state between inverter and PC
GRID	Green/The grid parameters(voltage/frequency) are OK

Table 6-2 Function of keys

Key	Function
ESC	Return/finish function /Answer questions with a "no"
▼	Select menu/Reduce/increase value
►	Move left or right to set value
ENTER	Select menu item/Confirm changes/Answer questions with a "YES"
SILENCE	Stop the beeper when it makes a sound after a fault occurs .
RESET	Resets the LCD display

Activation of the Background Illumination

The background illumination is activated by slightly press any key on the panel. The background illumination is automatically deactivated after 2 minutes to save energy.

6.3 Total Display Menu

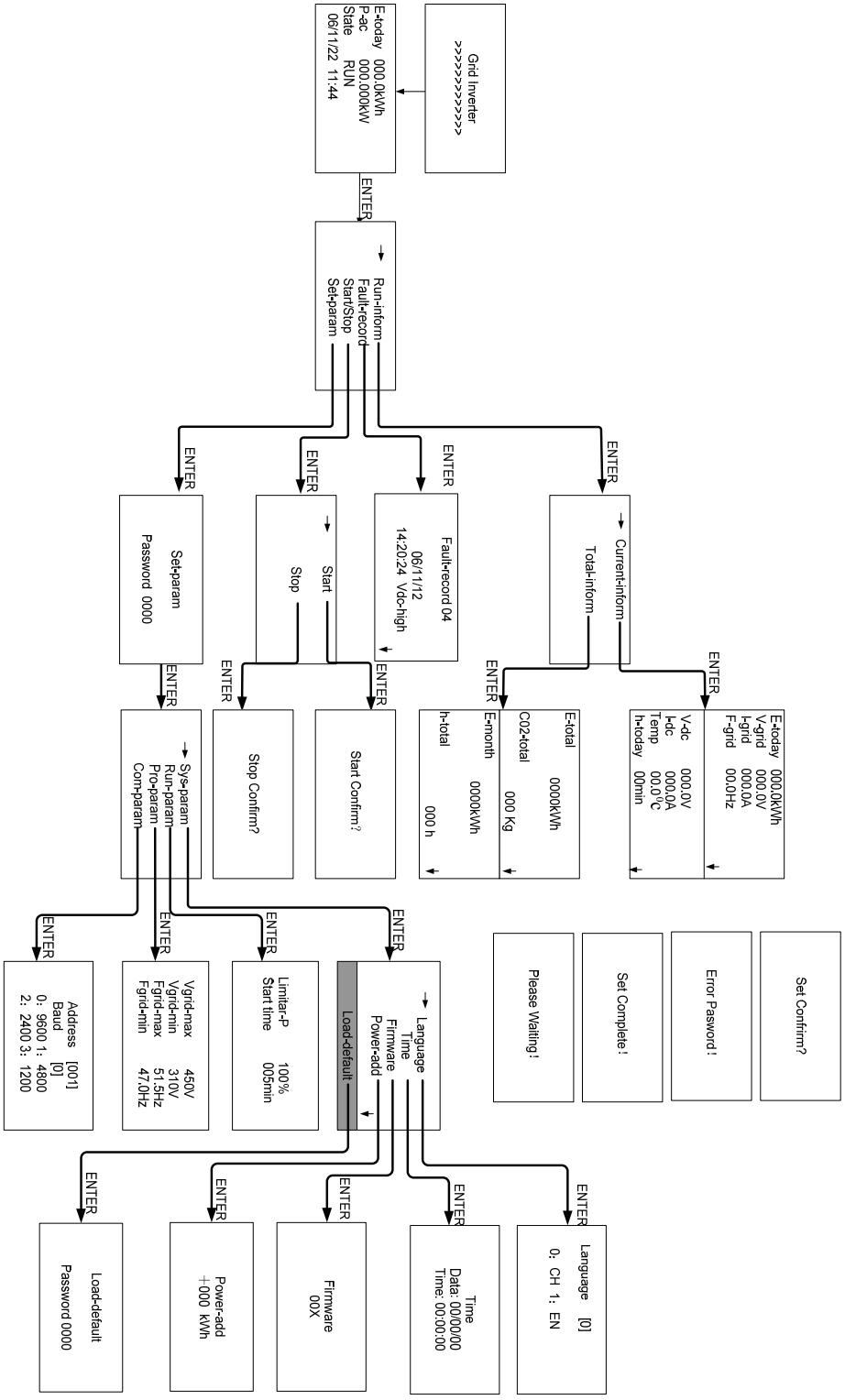


Fig.8 The total LCD menu

6.4 The Default Menu

The LCD is initialized upon energized of the SG10K3. A starting menu will be displayed during initialization.

Grid Inverter >>>>>>>>>>	1. The initialization menu, only appear once after the activation;
E-today 000.0kWh P-ac 000.0kW State RUN 06/11/22 11:44	2. The default menu, displays basic running parameters.

NOTICE !

"E-today" means today's energy generated;

The "P-ac" means the output power of inverter;

The "State" shows the inverter's operation mode;

The menu also display the real-time date and time.

6.5 Start or Stop the Inverter

E-today 000.0kWh P-ac 000.0kW State RUN 06/11/22 11:44	1. In the default menu; 2. Press "ENTER" or "▶" to enter the general control menu;
Run-inform Fault-record → Start/Stop Set-param	3. Navigate the arrow-pointer to the "**Start/Stop**" and press "ENTER" button;
→ Start Stop	4. Navigate the arrow-pointer to the "**Start**" or **"Stop"** and press "ENTER" button;
Start Confirm?	5. Press "ENTER" button to confirm the command.

NOTICE!

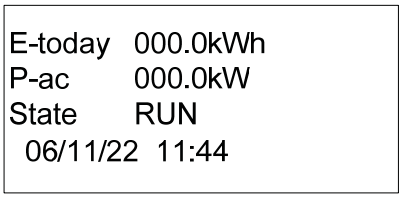
Normally the inverter will auto start when conditions are met or faults are removed.

The start command of the control menu is provided in case the inverter needs a restart after being stopped by performing stop command in the LCD menu.

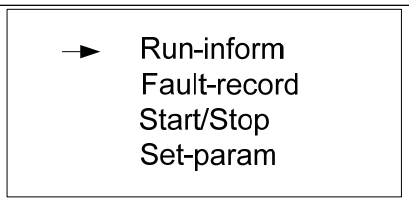
NOTICE !

The stop command will let the inverter disconnect the AC contactor and need menu start in the LCD menu.

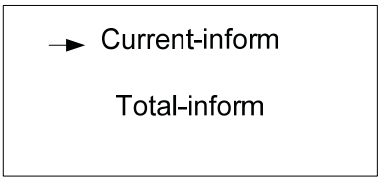
6.6 Check Running Data



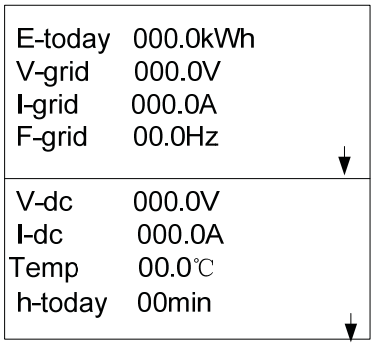
1. In the default menu;
2. Press "ENTER" or "►" to enter the general control menu;



3. Navigate the arrow-pointer to the "**Run-inform**";
4. Press "ENTER" button to access the sub-menus of running parameters;



5. Navigate the arrow-pointer to the "**Current-inform**";
6. Press "ENTER" button to access the sub-menus of running parameters;

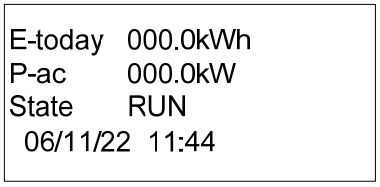


7. Use "▼" to move to next page to check the all the data in 2 pages;

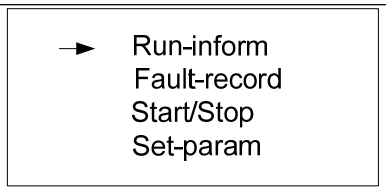
Table 6-3 the explanation of the real-time data

Data name	Explanation	Unit
E-today	Energy generated today	kWh
V-grid	Grid voltage	V
I-grid	Output AC current	A
F-grid	Grid frequency	Hz
V-dc	DC Voltage (of PV array)	V
I-dc	DC Current (of PV array)	A
P-ac	Output ac power	W
Temp	Temperature within the enclosure	℃
h-today	Operation time of today	min

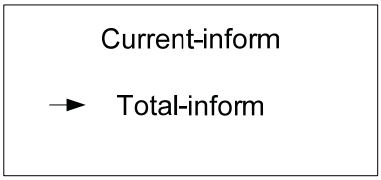
6.7 Check History Data



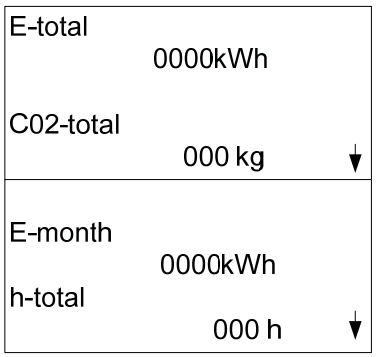
1. In the default menu;
2. Press "ENTER" or "►" to enter the general control menu;



3. Navigate the arrow-pointer to the "**Run-inform**";
4. Press "ENTER" button to access the sub-menus of running parameters;



5. Navigate the arrow-pointer to the "**Total-inform**";
6. Press "ENTER" button to access the sub-menus of history parameters;

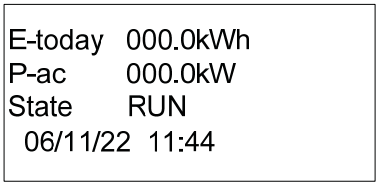


7. Use "▼" to move to next page to check the logged history data in 2 pages.

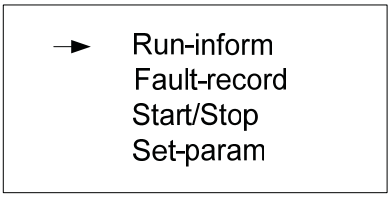
Table 6-4 the explanation of the history data

Data name	Explanation	Unit
E-total	The total generated power	kWh
h-today	The Operation time of today	min
h-total	Total hours of Operation time	h
CO2-total	Total CO2 weight reduced	Kg

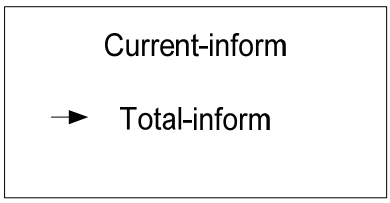
6.8 Check History Data



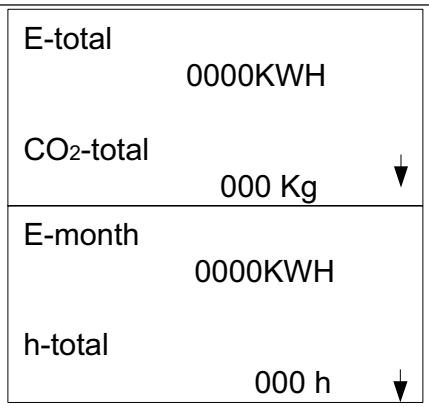
1. In the default menu;
2. Press "ENTER" or "►" to enter the general control menu;



3. Navigate the arrow-pointer to the "**Run-inform**";
4. Press "ENTER" button to access the sub-menus of running parameters;



5. Navigate the arrow-pointer to the "**Total-inform**";
6. Press "ENTER" button to access the sub-menus of history parameters;

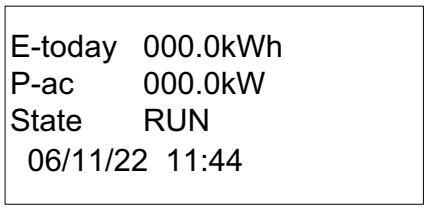


7. Use "▼" to move to next page to check the logged history data in 2 pages.

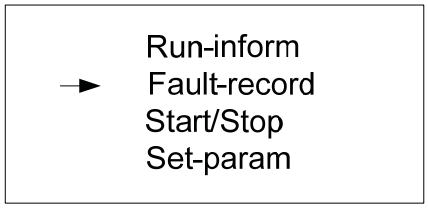
Table 6-4 the explanation of the history data

Data name	explanation	Unit
E-total	The total generated power	KWH
h-today	The Operation time of today	Min
h-total	Total hours of Operation time	H
CO2-total	Total CO2 weight reduced	Kg

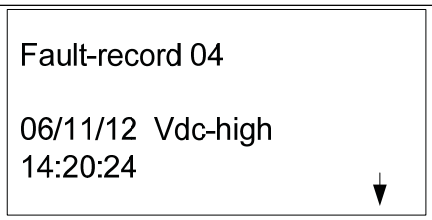
6.9 Check Fault Record



1. In the default menu
2. Press "ENTER" or "►" to enter the general control menu



3. Navigate the arrow-pointer to the "**Fault-record**" and press "ENTER" button.



4. Press "▼" button to move to next fault records.

Table 6-5 the explanation of faults

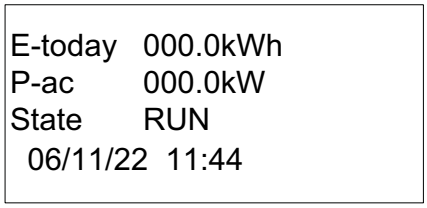
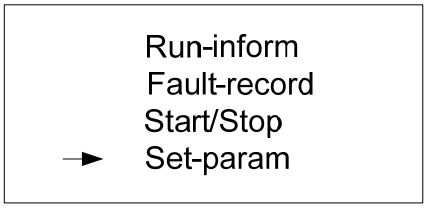
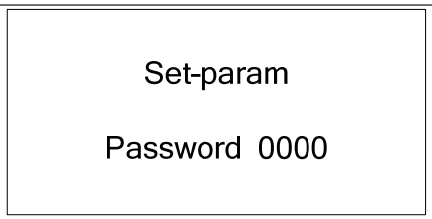
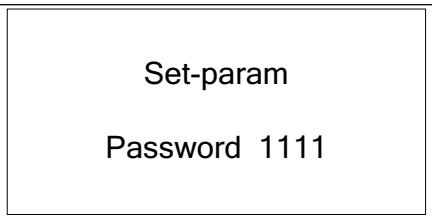
Fault type	**Explanations**
Vdc-high	DC voltage is too high
Vac-high	Grid voltage is too high
Vac-low	Grid voltage is too low
F-fault	Grid frequency is abnormal
Island	Island(grid in unavailable)
Dsp-flt	The control DSP malfunctions
PM-flt	The IPM power module malfunctions
Temp-flt	Temperature inside the enclosure is too high
Com-flt	Communication fault between LCD and DSP

NOTICE !

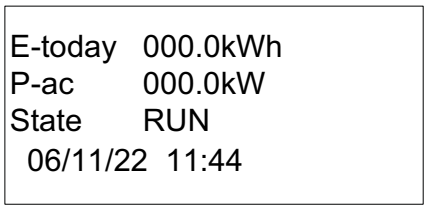
The "**Fault-record**" can log the latest 20 fault records, which includes the fault name and occurred time.
Note that one screen can only display 1 fault records, press "▼" button to move to next fault records if necessary.

6.10 Enter the Password

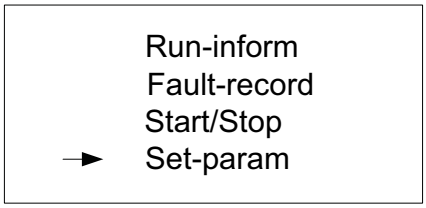
SG10K3 parameters are password protected, which means they can only be adjusted upon entry of a password. To enter the password, proceed as follows:

	1. In the default menu; 2. Press "ENTER" or "►" to enter the general control menu;
	3. Navigate the arrow-pointer to the "**Set-param**" and press "ENTER" button;
	4. Use "►"to choose digits, employ "▼" to increase or decrease number;
	5. Press "ENTER" button to confirm the password input. Note that the default password is **1111**.

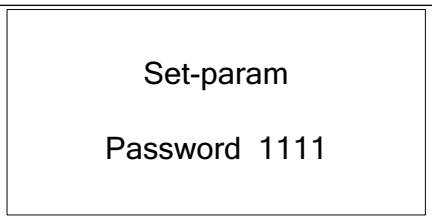
6.11 Change Display Language



1. In the default menu;
2. Press “ENTER” or “⊠” to enter the general control menu;

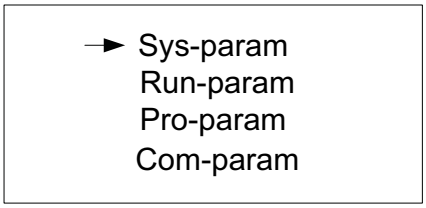


3. Navigate the arrow-pointer to the “Set-param” and press “ENTER” button;

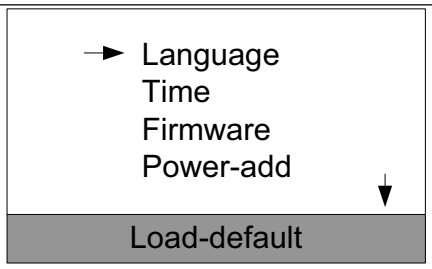


4. Press “ENTER” button to confirm the password input;

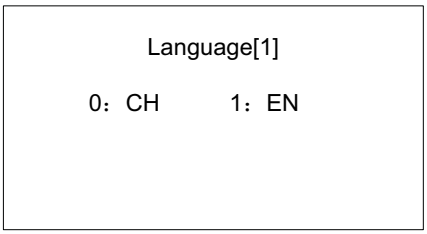
Note that the default password is 1111;



5. Navigate the arrow-pointer to the “**Sys-param**” and press “ENTER” button;



6. Move the arrow-pointer to the “**Language**” and press “ENTER” button;

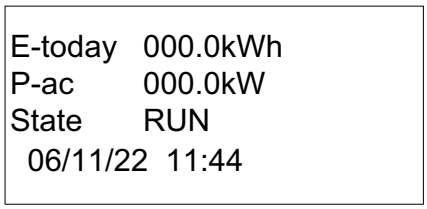


7. Use“▼” to change number between 0 and 1.

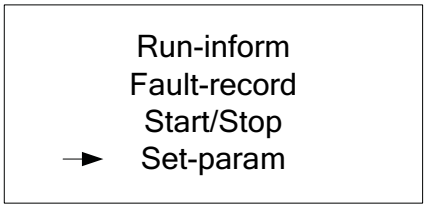
0 represents Chinese and 1 for English;

8. Choose the number you want and press “Enter” to confirm your choice;

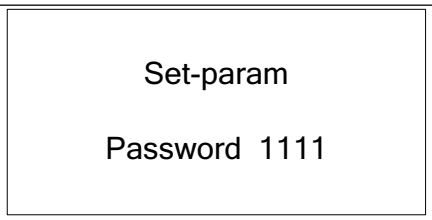
6.12 Change Date and Time



1. In the default menu;
2. Press "ENTER" or "►" to enter the general control menu;

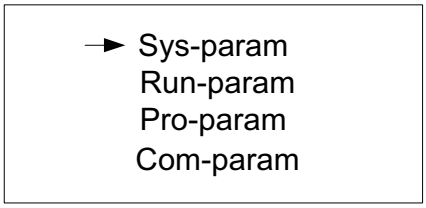


3. Navigate the arrow-pointer to the "**Set-param**" and press "ENTER" button;

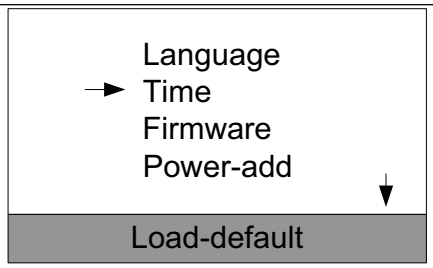


4. Press "ENTER" button to confirm the password input;

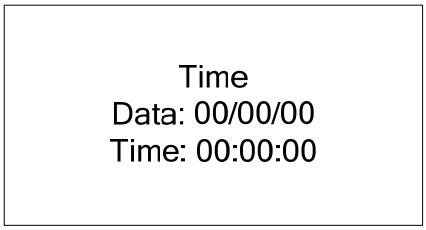
Note that the default password is 1111;



5. Navigate the arrow-pointer to the "**Sys-param**" and press "ENTER" button;

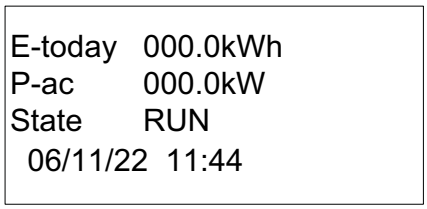


6. Move the arrow-pointer to the "**Time**" and press "ENTER" button;

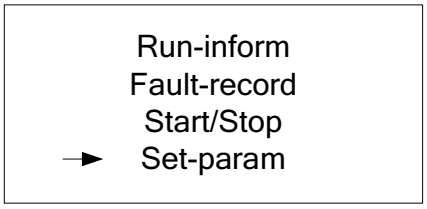


7. Use "►"to choose digits, employ "▼" to increase or decrease number;
8. Input the time you want according to your local time and press "Enter" to confirm it;

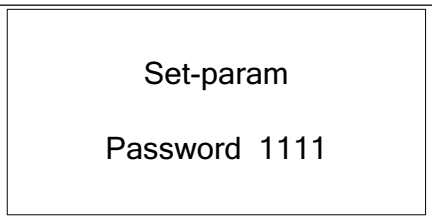
6.13 Checking Firmware



1. In the default menu;
2. Press "ENTER" or "►" to enter the general control menu;

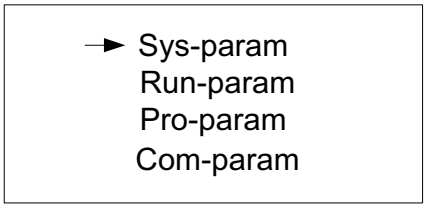


3. Navigate the arrow-pointer to the "**Set-param**" and press "ENTER" button;

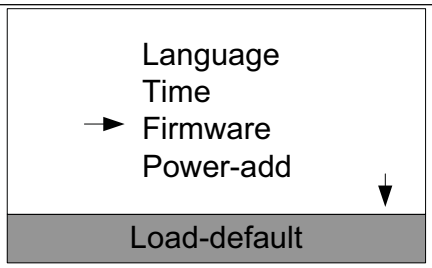


4. Press "ENTER" button to confirm the password input;

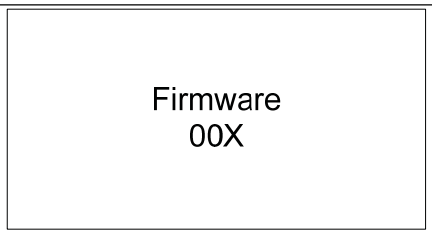
Note that the default password is 1111;



5. 5. Navigate the arrow-pointer to the "**Sys-param**" and press "ENTER" button;



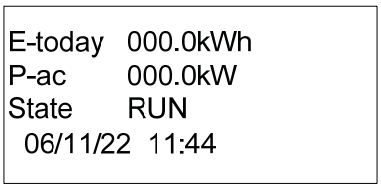
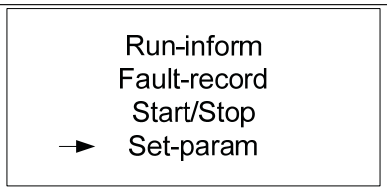
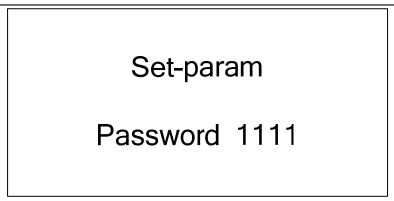
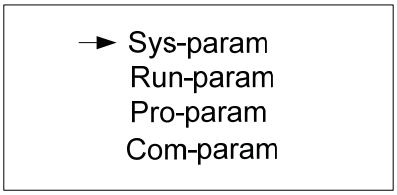
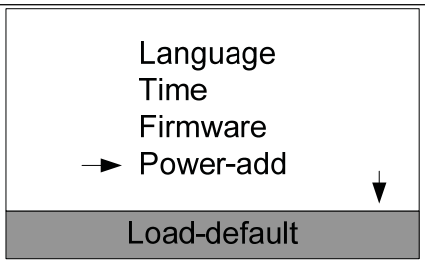
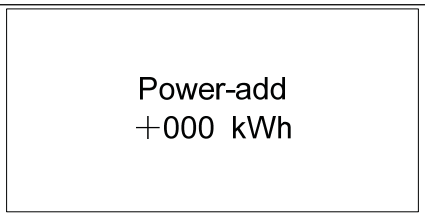
6. Move the arrow-pointer to the "**Firmware**" and press "ENTER" button;



7. The firmware is shown on the LCD.

   Refer to the actual firmware version.

6.14 Total Power Adjustment

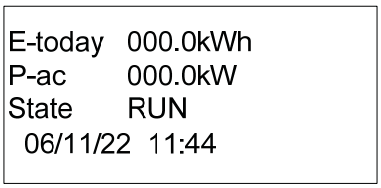
	1. In the default menu; 2. Press "ENTER" or "►" to enter the general control menu;
	3. Navigate the arrow-pointer to the "**Set-param**" and press "ENTER" button;
	4. Press "ENTER" button to confirm the password input; Note that the default password is 1111;
	5. Navigate the arrow-pointer to the "**Sys-param**" and press "ENTER" button;
	6. Move the arrow-pointer to the **"Power-add"** and press "ENTER" button;
	7. Use "►"to choose digits, employ "▼" to increase or decrease number.

Note that the positive symbol "+" can also be changed to negative symbol "-".

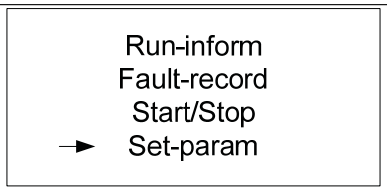
This generated power adjustment screen is useful in case the total-power displayed by LCD (**E-total**) has difference with reading value from the external power measuring device (like an electrical meter). The adjustable range is from **-999-+999 kWh**.

(Power-adj value)= (Real measured value)-(E-total reading value)

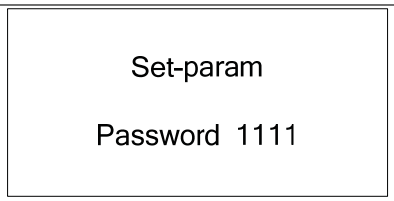
6.15 Setting Run Parameters



1. In the default menu;
2. Press "ENTER" or "►" to enter the general control menu;

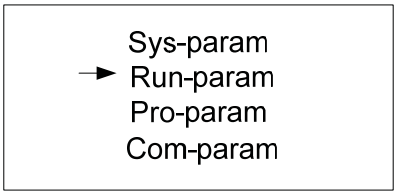


3. Navigate the arrow-pointer to the "**Set-param**" and press "ENTER" button;

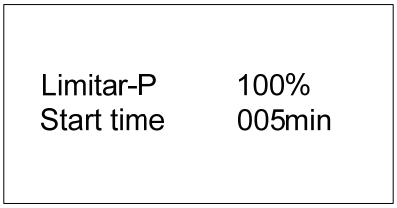


4. Press "ENTER" button to confirm the password input;

Note that the default password is 1111;



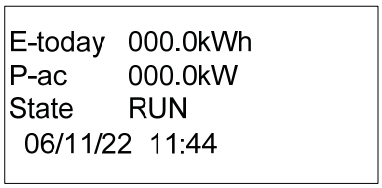
5. Navigate the arrow-pointer to the "**Run-param**" and press "ENTER" button;



6. Use "►"to choose digits, employ "▼" to increase or decrease number;
7. Input values you want to set and press "ENTER" to confirm them.

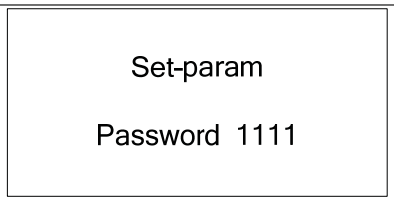
Parm Name	Parm Value	Default
Power limitation	0~100%	100%
Start time	0~10min	5min

6.16 Setting Production Parameters



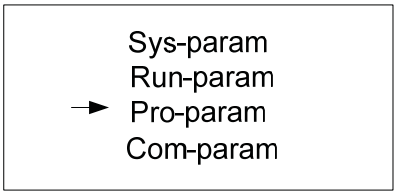
1. In the default menu;
2. Press "ENTER" or "►" to enter the general control menu;

3. Navigate the arrow-pointer to the "**Set-param**" and press "ENTER" button;

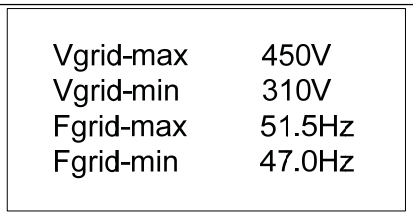


4. Press "ENTER" button to confirm the password input;

Note that the default password is 1111;



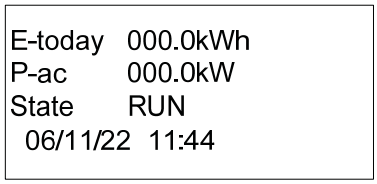
5. Navigate the arrow-pointer to the "**Pro-param**" and press "ENTER" button;



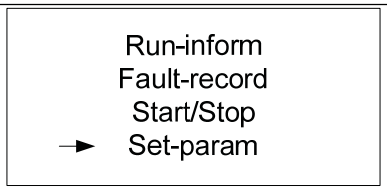
6. Use "►"to choose digits, employ "▼" to increase or decrease number;
7. Input values you want to set and press "ENTER" to confirm them.

Parm Name	**Parm Value**	**Default**
Vgrid-max	410~460V	450V
Vgrid-min	310~360V	310V
50Hz Grid		
Fgrid-max	50.5~52Hz	51.5Hz
Fgrid-min	47~49.5Hz	47Hz
60Hz Grid		
Fgrid-max	60.5~62Hz	61.5Hz
Fgrid-min	57~59.5Hz	57Hz

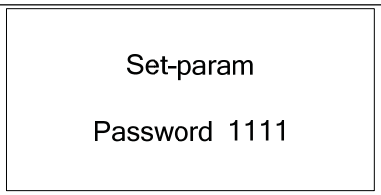
6.17 Communication Parameters Setting



1. In the default menu;
2. Press "ENTER" or "►" to enter the general control menu;

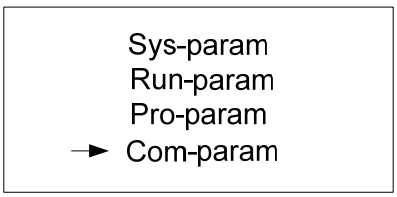


3. Navigate the arrow-pointer to the "**Set-param**" and press "ENTER" button;

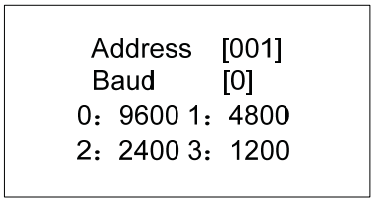


4. Press "ENTER" button to confirm the password input;

Note that the default password is 1111;



5. Navigate the arrow-pointer to the "**Com-param**" and press "ENTER" button;



6. Use "►"to choose digits, employ "▼" to increase or decrease number.
7. Input the **address** and **baud rate** you want.

"**Com-param**" menu contains some basic communication parameters of the inverter when connected to external monitoring device through RS485 serial communication protocol.

The inverter communication address can be in the first line.

The range of the address is 0-247.

The serial communication baud rate can be adjusted through entering 0, 1, 2 or 3. 0 represents 9600 bps, 1 for 4800 bps, 2 for 2400 bps and 3 for 1200 bps.

7. Installation

This chapter gives installation instructions for SG10K3.

7.1 Checking for Shipping Damage

The SG10K3 inverters are thoroughly checked and tested rigorously before they are shipped. Even though they are delivered in a rugged, heavy cardboard box, the inverters can be damaged in shipping which typically is the shipping company's fault. So you should check the inverter before installation.

Please inspect the inverter thoroughly after it is delivered. If any damage is seen please immediately notify the shipping company. If there is any question about potential shipping damage, contact us. A photo of the damage may be helpful.

Do not accept unit if visibly damaged or note visible damage when signing shipping company receipt. Please report the damage immediately to the shipping company. Do not remove the unit from packaging.

7.2 Basic Installation Requirements

The IP level of SG10K3 is **IP20**, so it can only be installed **indoors**.

A list of these requirements is shown below:

- It is advised not to install the inverter in living quarters, since the inverter may produce some operating noise (< 40 dB).
- Avoid installing the inverter in a location subject to vibrations.
- The LED and display should always be legible for users.
- The ambient temperature should remain from –25°C to 55°C.
- It is important to have air freely circulating around the inverter; therefore keep the area within 30 centimeters of the inverter free from obstacles.
- The inverter should be mounted in a well-ventilated area.
- Avoid mounting the inverter in a dusty area

7.3 Mechanical Mounting

7.3.1 Safety Mounting Instructions

As with any electrical system, touching live components can be hazardous to life. This device contains DC voltage of up to **450V** and the grid voltage up to **450V**.

WARNING!

Only qualified personnel can work on this equipment. This work is only permissible if the AC and DC power supplies are safely disconnected from the SG10K3.

WARNING!

Before any maintenance, always wait for at least 10 min., so that the capacitors in the SG10K3 can discharge. Only then may the cover be opened.

7.3.2 Device Dimensions and Weight

The external dimensions and weight of the SG10K3 is in fig 9.

Fig.9 Dimensions of SG10K3

7.3.3 Mounting Requirements

- **Mounting Place**

The SG10K3 has a relatively high weight of **175kg**. Please keep this in mind when selecting the place where and how to mount the SG10K3.

NOTICE!

The ambient temperature should be within-25°C to +55°C.The SG10K3 should be installed in a place where it is not exposed to direct sunlight.

WARNING!

Some parts of the SG10K3 can reach temperature over 80°C. Keep a suitable distance to flammable materials!

WARNING!

Never install the SG10K3 in areas that likely contain explosive atmospheres (battery rooms, fuel storage rooms etc.)!

NOTICE!

Since the AC and DC connections are wired to the breakers and or junction box only, there is no need to open the inverter enclosure during installation.

7.4 Electrical Connection

7.4.1 Electrical Connection Requirements

- **Grid 230V AC**

The SG10K3 is designed for 400V grid (three phase).The voltage should be within 310V to 450V and the frequency should be the frequency should be 47-51.5/57-61.5Hz.

Grid Voltage Range:	310V-450V
Grid Frequency Range:	47-51.5/57-61.5Hz

- **PV array limit**

Max. PV Power:	11 KW
Max. PV Voltage :	450V

- **Ground**

The inverter must be grounded in compliance with local safety codes using appropriately sized protective conductors.

Notice!

All electrical installations must comply with all local and national electrical codes.

WARNING!

Make sure that the DC input voltage never exceeds 450V.Higher input voltages will damage the SG10K3.

7.4.2 Wires connection

The complete wiring for a SG10K3 is shown schematically in the Fig.10.

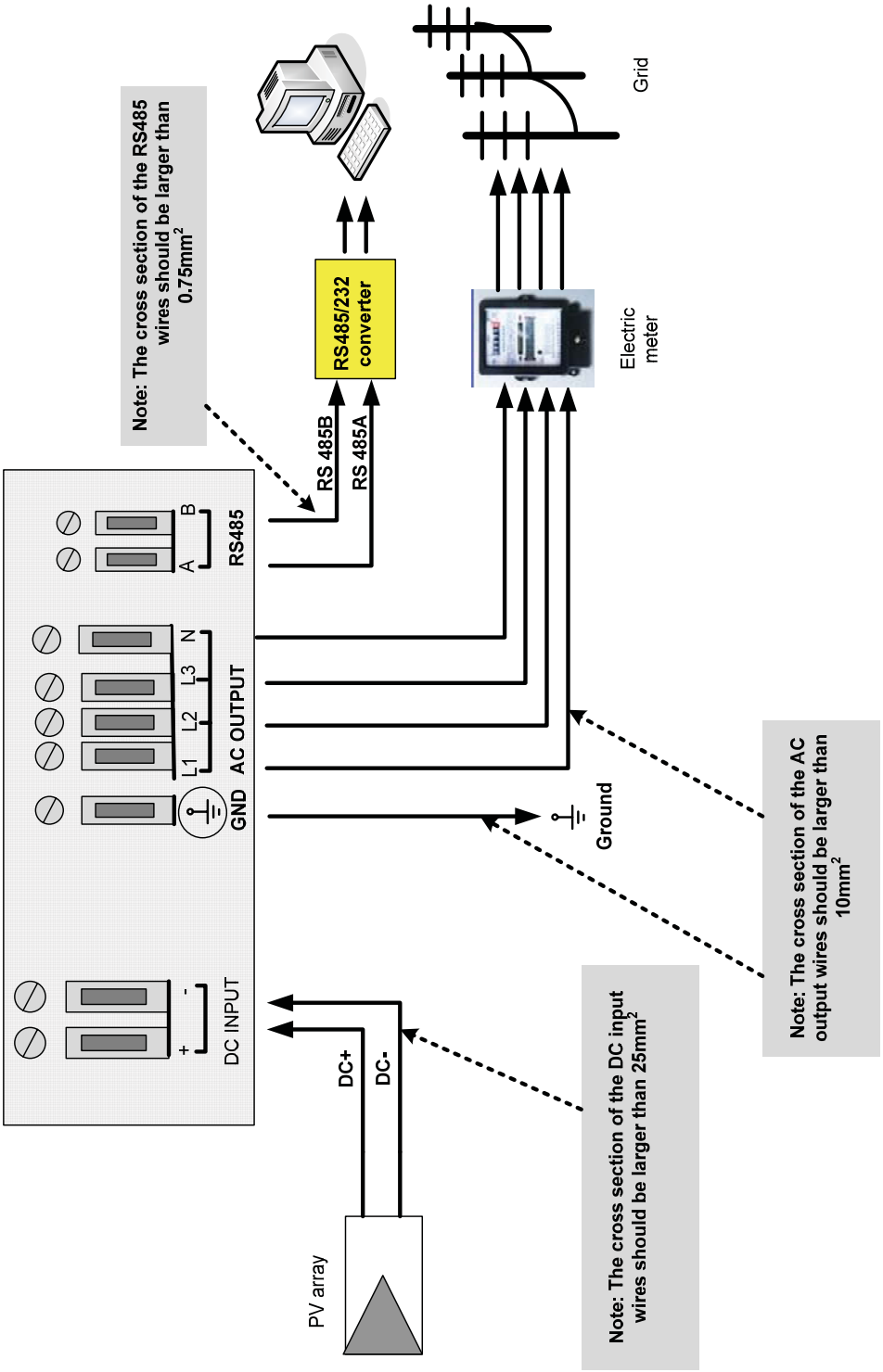


Fig. 10 Simplified electrical connection diagram

Caution!

The wiring of the inverter's AC and DC cables must only be done with the DC and AC circuit breakers are in the off state.

Please follow the steps below:

- Isolate the grid (switch off the circuit breaker), and secure it against accidental reactivation.
- Connect the wires of the AC cable as follows(through circuit breaker):
  - ✧ Grid L1 wire to the terminal marked "L1".
  - ✧ Grid L2 wire to the terminal marked "L2".
  - ✧ Grid L3 wire to the terminal marked "L3".
  - ✧ Grid Neutral wire to the terminal marked "N".
- Connect the DC terminals
  - ✧ PV array DC+ wire to the inverter DC+.
  - ✧ PV array DC - wire to the inverter DC -.
  - ✧ Connect the ground wire
- Connecting the RS485A/B wires **only if users have purchase our RS485/232 Converter and monitoring software.**
- Please make sure that all wires are firmly connected.

Caution!

Make sure tall the wires are firmly tightened.

7.5 Communication Installation

Fig.11 shows the communication installation of the SG10K3 with the PC by RS485 serial communication port.

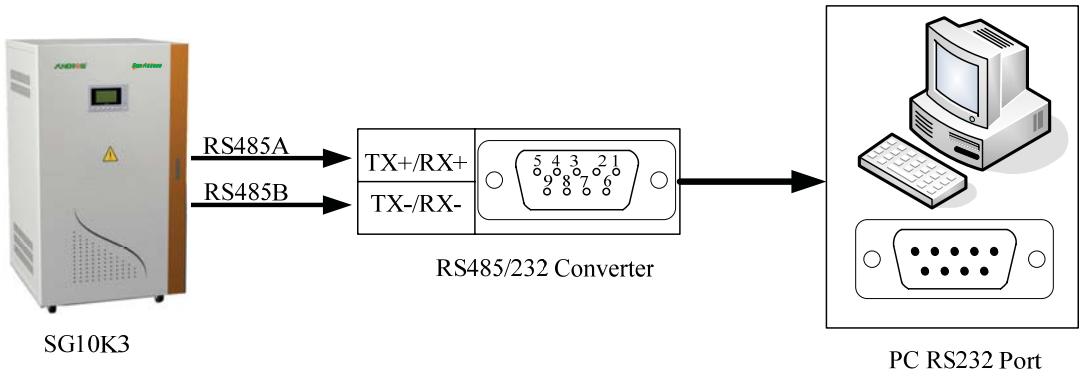


Fig.11 Communication network

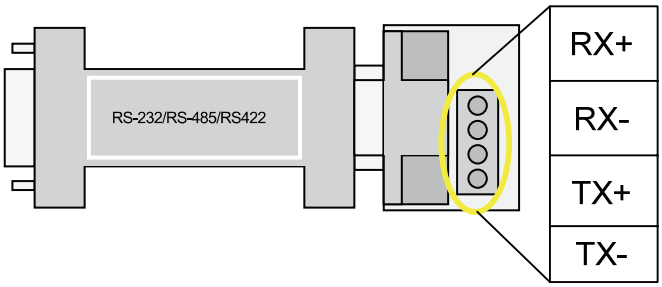


Fig.12 RS485/RS232 converter

7.6 Start and close

7.6.1 Start the Inverter

To turn on the inverter, please follow the steps below.

1) Switch on the DC side circuit breaker
2) Switch on the AC side breaker
3) The inverter will to check whether that voltage, impedance and frequency parameters are within operating range.
4) If the parameters check is correct, then the LCD will display the normal working screen.
5) Then the inverter will export to the grid and the green Power LED will continuously light (provided there is enough PV power).

7.6.2 Close the Inverter

1) If users want to shut down the inverter, please refer to stop command in the LCD menu in chapter 6.
2) If users want to shut down the inverter immediately, first switch off the AC side breaker then switch off the DC side breaker, incorrect switch off order may cause danger to the personnel and damage to the inverter.

8. Technical Data

8.1 Electrical Specifications

■ Input Data

Max. PV Power	11kW
Max. Input Current	50A
MPP Voltage Range	220V~380V
Maximum DC Voltage	450V

■ Output Data

Nominal AC output power	10kW
AC Voltage Range	310 ~ 450 V AC
AC Frequency Range	47-51.5Hz/57-61.5Hz
Power Factor	>0.99 at nominal power
Peak Efficiency	94.5 %
European Efficiency	93.5 %
THD of Output Current	< 3 % at nominal power

8.2 Mechanical Specifications

Dimensions(W x H x D)	530x900 x500 mm
Weight	175 kg
Ingress Class	IP20（indoor）
Operating Temperature	－25℃～＋55℃

8.3 Features

Cooling	Forced air fan cooling
Display	LCD
Communication	RS485/Ethernet(Optional)
EMC	EN61000-6-2 EN61000-6-4
Safety	EN 50178

9. Appendixes

9.1 Exclusion of Liability

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

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

.Improper or inappropriate use of the product

.Operating the product in an unintended environment

.Operating the product when ignoring relevant safety regulations in the deployment location

.Ignoring safety warnings and instructions contained in all documents relevant to the product

.Operating the product under incorrect safety or protection conditions

.Altering the product or supplied software without authority

.The product malfunctions due to operating attached or neighboring devices beyond allowed limit values.

In case of unforeseen calamity or force majeure.

9.2 Contact Us

If you have any questions about this product, our hotline will be happy to assist you. Please note the following contact information.

Company:	Sungrow Power Supply Co., Ltd.
Website:	www.sungrowpower.com
Contact:	Mr. Henry (Director of International Trade)
Email:	info@sungrow.cn, service@sungrow.cn
Address:	No.2 Tianhu Rd. New & Hight Technology Industrial Development Zone, Hefei, Anhui, P.R.China.
Zip:	230088
Telephone:	+86 551 532 7834, +86 551 532 7845
Fax:	+86 551 532 7856