

SG1K5TL

PV Grid-Connected Inverter

User Manual

SG1K5TLV21-UEN-Ver11-201012 Version: 1.1

About This Manual

Thank you for purchasing inverter SG1K5TL from Sungrow**.** We hope that the device will meet your satisfaction when you use it with your PV plant system.

Aim

The purpose of this manual is to provide detailed product information and instructions for use of SG1K5TL PV grid-connected inverter.

Target Readers

The manual is provided to people who need to install and operate the grid-connected inverter.

How to Use This Manual

Read this manual and other document before installation and operation with inverter.

The document must be stored with other documents and must be available at all times.

The contents of this manual will be periodically updated or revised if necessary. However discrepancies cannot be excluded. Please make the object as the standard or download the latest version of this manual via www.sungrowpower.com.

Symbols Explanation

Important instructions contained in this manual should be followed during installation, operation and maintenance of the inverter. And they will be highlighted by these symbols.



DANGER indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.



WARNING indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



CAUTION indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



NOTICE indicates a situation which, if not avoided, could result in equipment or property damage.



NOTE indicates additional information, emphasized contents or tips to help you solve problems or save time.

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SAFETY AND PRODUCT INFORMATION

For Installer and User

1 Safety Instructions

About This Chapter

This chapter provides crucial safety instructions about SG1K5TL. Please read this chapter carefully before any work with the inverter.

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

SG1K5TL inverter is designed and tested according to international safety requirements. But as all electrical and electronic equipments, certain precautions should be observed during installing, operating and maintaining.

Incorrect operation or work performed incorrectly can result in damage to:

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

Before Installation

WARNING

The first thing after receiving unit is to check for any visible damage to the package or to the inverter. If there is something you suspect, contact the shipping company and Sungrow before installing.

CAUTION

When choosing the installation site, ensure that there is no electromagnetic interference with other electrical and electronic equipments.

During Installation

DANGER

Lethal voltage exists! Do cover the PV arrays with lighttight materials or make sure that DC circuit breaker is disconnected. Exposed to sunlight, PV arrays will output lethal voltage.

WARNING

All tasks of installation must only be performed by qualified personnel.

- **They are trained specially.**
- **They have read this manual and comprehended all operation regulations and related safety instructions.**

WARNING

Only after receiving prior approval from the utility company and qualified personnel installing the inverter, you can connect the inverter to the utility grid.

WARNING

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

CAUTION

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

Maintenance and Modification

NOTICE

Any malfunction that can impair inverter safety must be repaired immediately before the inverter restart again. Please contact your local authorized personnel if any maintenance is required.

NOTICE

Risk of damage to the inverter due to improper modification.

Never modify the inverter or other components of the inverter. Otherwise it will lead to loss of any and all warranty rights.

DANGER

- **First disconnect the inverter from utility grid before any maintenance work and then DC side.**
- **Even when the inverter is disconnected, lethal voltages still exists within the inverter.**
- **Before any maintenance work, you should wait for at least fifteen minutes and then perform work.**

NOTICE

Electrostatic discharge can damage the inverter.

During replacing or installing the inner components, the technical personnel should take appropriate protective measures such as electrostatic bracelet.

Others

WARNING

All safety instructions, warning labels and nameplate on the inverter body:

- **Must be clearly visible**
- **Must not be removed, covered and pasted**

WARNING

These regulations should also be followed:

- **The regulations related to the electricity fed into grid**
- **The safety instructions related to the PV arrays**

2 Product Introduction

About This Chapter

This chapter provides basic information about inverter SG1K5TL.

2.1 Intended Usage

SG1K5TL serial inverters are robust, grid-connected, transformer-less and of high conversion efficiency.

SG1K5TL inverter transforms the direct current generated by PV arrays into stable alternating current and outputs the AC power into the utility grid. This inverter is a crucial unit in the small-scaled PV power system.

If PV arrays need earthing of the positive or negative terminal, they cannot collaborate with SG1K5TL inverter.

An example about intended usage of the inverter is shown in Fig 2-1.

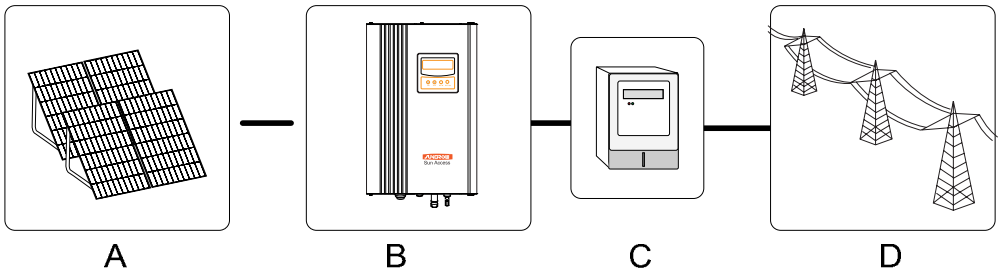


Fig 2-1 Inverter Applied in the PV Power System

Item	Description
A	PV arrays
B	Inverter
C	Metering device
D	Utility grid

NOTICE

Any other or additional use is not permitted except the intended use.

The inverter must only be connected to public utility grid. If output of inverter is connected to local loads (household appliance, lights, motor loads, etc.), the inverter can not start.

2.2 Circuit Description

Fig 2-2 shows the main circuit of SG1K5TL-a transformer-less and grid-connected inverter.

Boost circuit raises input DC voltage. And there is a MPP tracker to ensure that maximum power from PV arrays can be utilized. Then a full bridge inverter circuit converts DC power to AC power. Meanwhile inverter is equipped with protective circuit to guarantee itself safely operation that can trigger AC relay if required.

However, the difference between two inverters is the number of DC input. Detailed information will be introduced in the following contents.

Additionally, inverter provides standard interface RS485 for communication. User can look up running date and set parameters through human-computer interaction interface –LCD display panel.

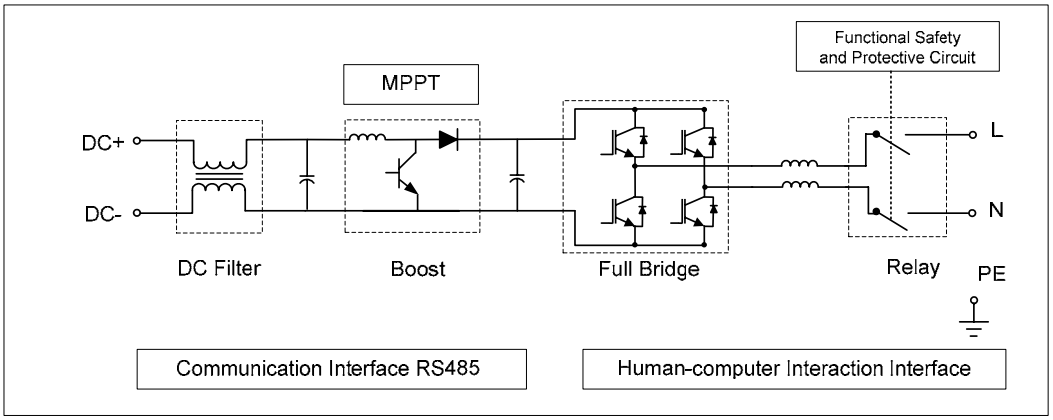


Fig 2-2 Main Circuit Diagram of SG1K5TL

2.3 Product Description

2.3.1 Product Appearance



Fig 2-3 Product Description

Item	Name	Description
1	LCD display panel	A friendly human-computer interaction interface. Running data and configuration parameters are displayed in the LCD screen.
2	Waist-shape holes	The four waist-shape holes are used for mounting the inverter against the wall.
3	DC terminal	Interface between inverter and PV arrays. SG1K5TL: 2 pair
4	Heat sink	Cool down the temperature due to heat inside the inverter.
5	AC terminal	Standard communication interface.
6	RS485 terminal	Inverter feeds power via this terminal.

2.3.2 Dimensions and Weight of Inverter

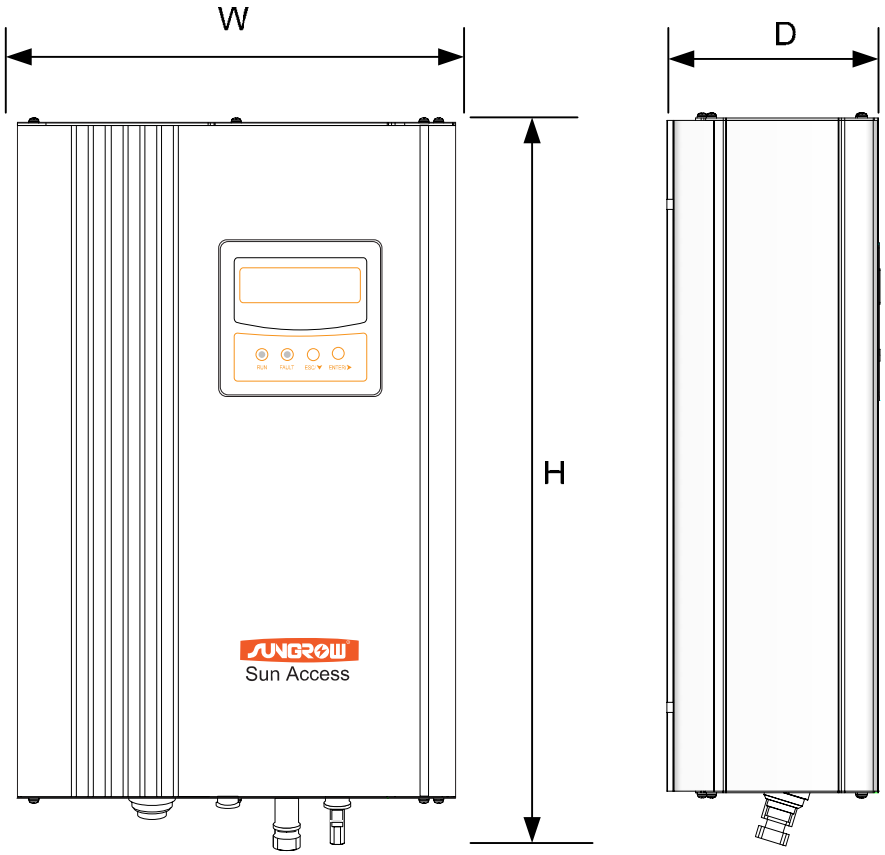


Fig 2-4 Dimensions of Inverter

Table 2-1 Dimensions Value

Type	W(mm)	H(mm)	D(mm)	Net weight(kg)
SG1K5TL	288	438	126	10.54

2.3.3 LCD Display Panel

LCD display panel comprises LED indicators, buttons and LCD screen. Leds indicate the current state of the inverter. The current running information and history information can be shown in the LCD screen via operating the buttons.

LCD display panel provides a friendly human-computer interaction interface.

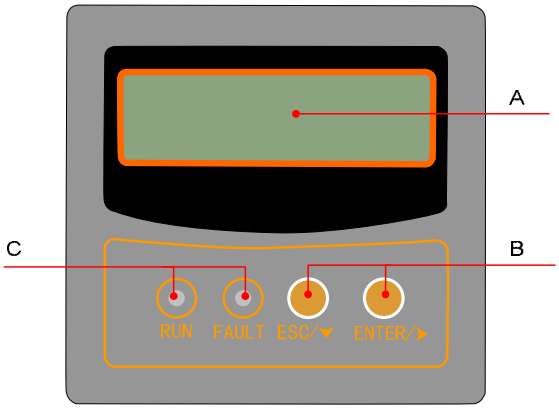


Fig 2-5 LCD Display Panel

Item	Name	Description
A	LED indicators	They are “RUN” and “FAULT”. User can observe two indicators to get the current state of inverter. Detailed definition is shown in Table 2-2.
B	Buttons	User can operate the LCD menu of the inverter via the two buttons. Detailed function is shown in Table 8-1.
C	LCD screen	LCD screen can display the current state of inverter, current running information, history information and parameters to be set.

Table 2-2 Description of LED Indicators

Name	State	Description
“RUN”	On	Inverter is running.
	Off	Inverter is not running.
“FAULT”	On	A malfunction occurs.
	Off	A malfunction doesn’t occur.

INSTALLATION AND MAINTENANCE INFORMATION

Only for Installer

3 Installation Flow

About This Chapter

This chapter demonstrates installation flow from unpacking to successful commissioning.

The following diagram shows the installation flow of inverter for installer. Please follow these procedures.

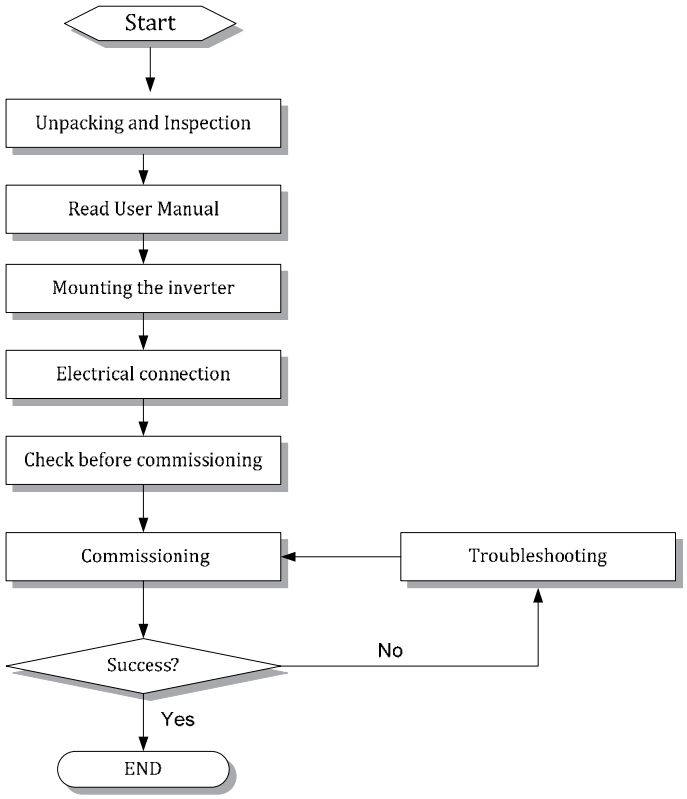


Fig 3-1 Installation Flow Chart

Table 3-1 Description of Installation Flow

Order	Description	Remark
1	Unpacking the inverter and inspection	Section 4.1
2	Read this manual, especially the section on “safety instruction”	Chapter 1
3	Choose the best installation site	Section 4.4
4	Install the inverter against the chosen wall	Section 4.5
5	Connect inverter to PV arrays	Section 5.5
6	Connect inverter to utility grid	Section 5.6
7	Connect the PV system to ground	Section 5.7
8	Connect communication cable for inverter(optional)	Section 5.8
9	Examine before commissioning.	Section 6.1
10	Start up the inverter for the first time	Section 6.2

4 Installing Inverter onto Wall

About This Chapter

This chapter provide information about choose installation site and gives step-by-step procedures to install the inverter onto the wall. And related safety instructions are also included.

4.1 Unpacking and Inspection

The unit is thoroughly tested and inspected strictly before delivery. Although sturdy package is adopted, damage may still happen during shipping.

The first thing you should do is to check the packing box when receiving the inverter unit. Meanwhile please check the completeness of the delivery contents according to the packing list.

If damage to the packing box is visible, or if you find that the inverter unit is damaged after unpacking, please notify the shipping company and Sungrow. If a related photo is supplied, you will get faster and better service.

4.2 Nameplate

You can identify the inverter via the nameplate which is located at the left side of inverter and on the package box.

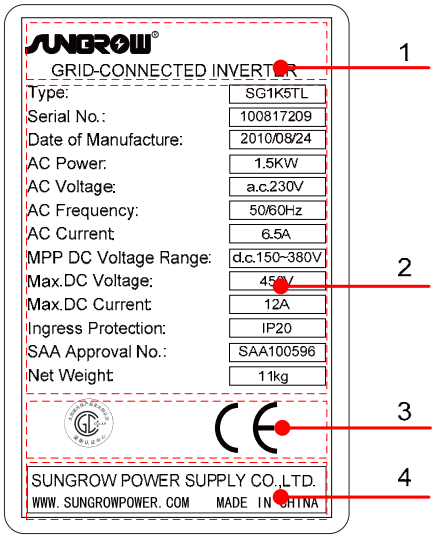


Fig 4-1 Nameplate of Inverter SG1K5TL

* Image shown here is indicative only. Actual product you receive may differ.

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

4.3 Moving Inverter

In order to avoid damage to the inverter during moving, it is better to move inverter in original carton. Pay attention to the weight of the inverter. Proper device that can bear the weight is needed or with the help of other people to avoid damage to the inverter when moving.

NOTICE

When moving the inverter, please follow the symbol instructions on the package box.

4.4 Requirements of Installation Site

This section provides guidelines to help you choose the best installation site, suggestions to make sure the unit optimal operation, the warnings to avoid damage to the unit or the operator.

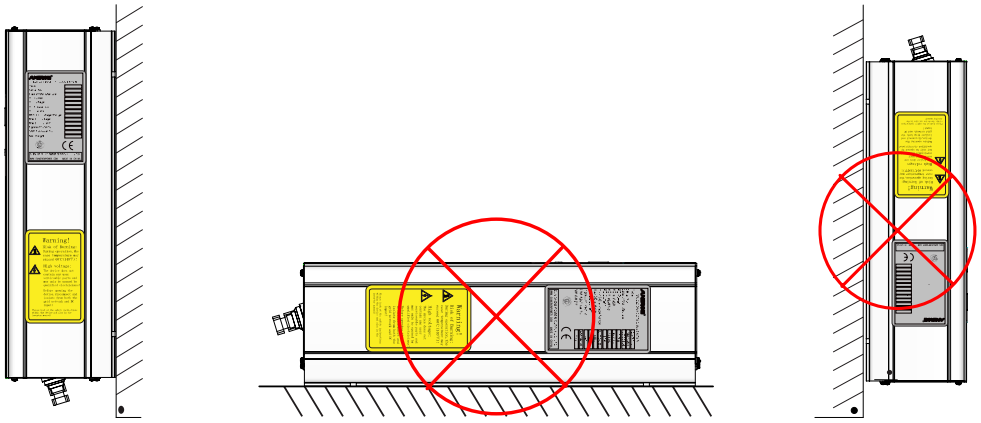
DANGER

Do not install the inverter unit on flammable construction materials or on the building that contains flammable materials.

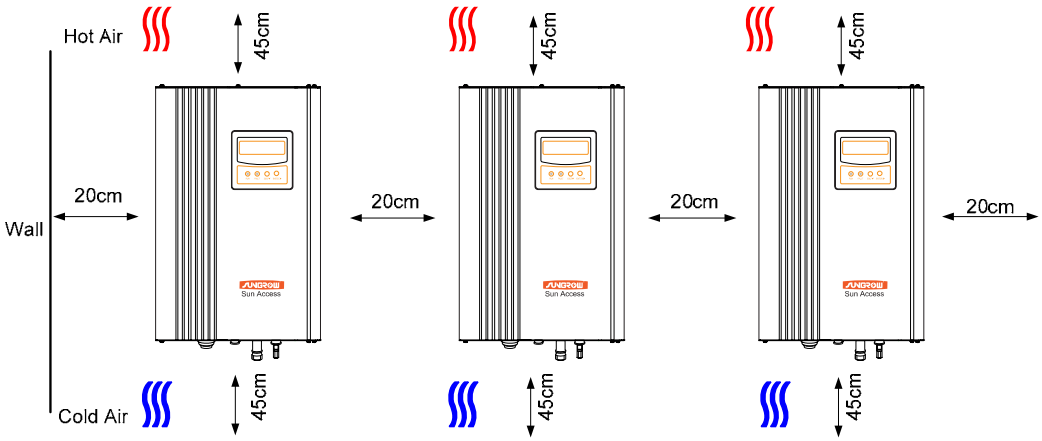
NOTICE

When choosing the installation site, ensure that there is no electromagnetic interference with other electrical and electronic equipments.

- The inverter unit SG1K5TL can only be installed indoors.
- The wall selected should be strong enough to hold the weight of the inverter over a long period of time.
- It is suggested that the inverter be installed vertically and upside up.



- The ambient temperature of chosen installation site ranges from -25°C to 50°C.
- Do not install the unit in an enclosure exposed to the direct sunlight. Exposure to the sun may cause additional internal heating, which will result in derating.
- The humidity of chosen installation site should never exceed 95%. Moisture may result in corrosion to the lid and damage to the inner electronic components.
- Take enough space for heat dissipation into consideration when choosing the site. The following suggestive value for the space to keep clear around the inverter



- Install the inverter at eye level. Meanwhile some space at the bottom needs to be kept for electrical connection.
- Do not install the inverter where the children can reach. There is a risk of burning because the housing of the inverter will be very hot.
- Do not install the inverter in living area. Noise can be produced during running of the inverter, which may affect your daily life.

4.5 Installation Procedure

The four waist-shape holes on the heat sink are used as the mounting holes to install the inverter onto the wall. You can drill holes according to its dimensions.

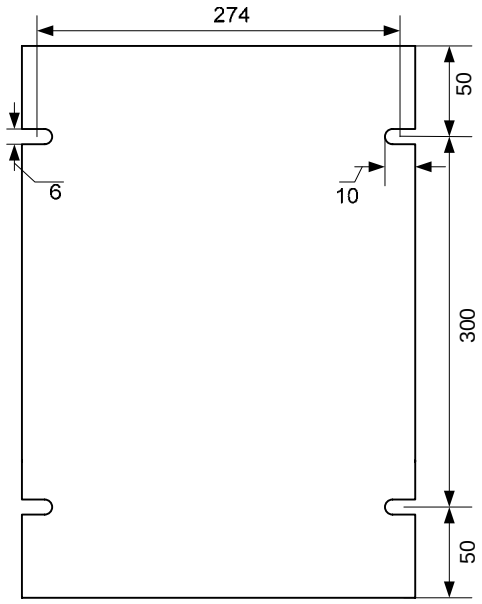


Fig 4-2 Dimensions of Heat Sink (unit: mm)

In the following pages we will introduce how to install the inverter onto wall via following fasteners.

The specification of plastic expansion pipe is Φ10*48mm. And the specification of tapping screw is Φ4.8*38mm.

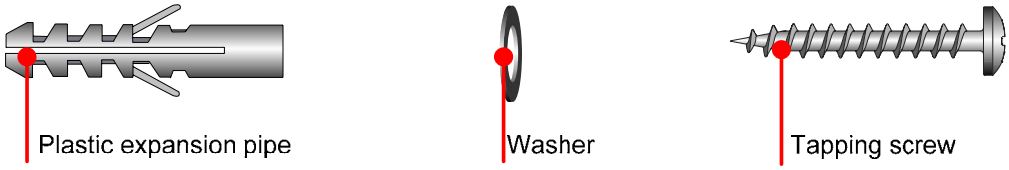


Fig 4-3 Fasteners Used to Install the Inverter

INSTALLATION PROCEDURE:

DANGER

In order to avoid electrical shock or other injury, inspect existing electronic or plumbing installations before drilling holes.

Step 1: Drill four holes according to dimensions of inverter's heat sink.

Step 2: Clean holes and then insert plastic expansion pipes into the holes.

Step 3: Fasten the inverter against to the wall via washer and tapping screw with other people holding the inverter.

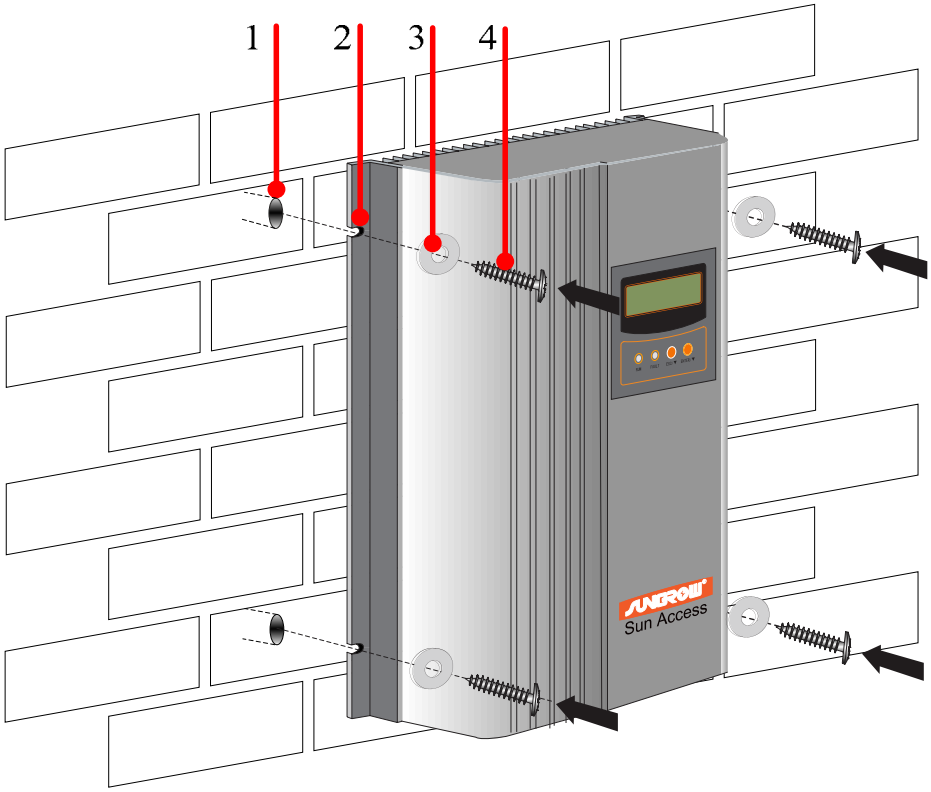


Fig 4-4 Attach the Inverter against the Wall

Item	Description
1	Wall
2	Inverter
3	Washer
4	Tapping screw

5 Electrical Connection

About This Chapter

This chapter proposes step-by-step procedures to perform electrical connection and related safety instructions.

5.1 General Safety Instruction

WARNING

Improper operation during the wiring process can cause fatal injury to operator or unrecoverable damage to the inverter.

Only qualified personnel can perform the wiring work.

WARNING

All electrical installations must be in accordance with local and national electrical codes.

WARNING

Only after receiving prior approval from the utility company and qualified personnel installing the inverter, you can connect the inverter to the utility grid.

WARNING

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

CAUTION

These regulations should also be followed:

- **The regulations related to the electricity fed into the grid**
- **The safety instructions related to the PV arrays**

5.2 Terminals Description

All electrical terminals are located at the bottom of unit. Fig 5-1 shows the connection area.

NOTE

Enough space should be kept for electrical connection at the bottom of the inverter when choosing the installation site.

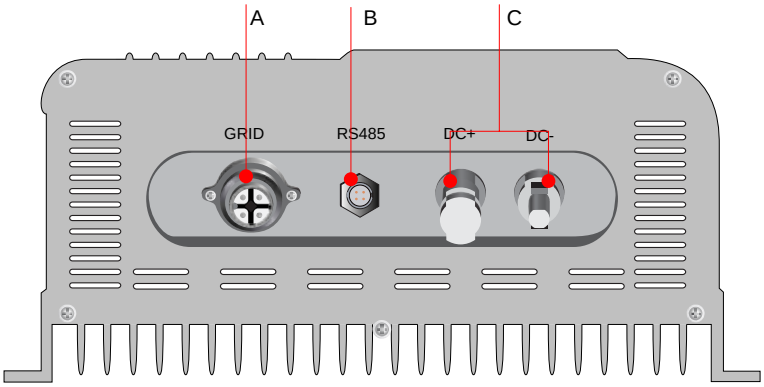


Fig 5-1 Terminals Description of SG1K5TL

Item	Description
A	AC terminal
B	RS485 terminal
C	DC terminals

5.3 Overview of Electrical Connection

Electrical connections of the inverter include DC connection, AC connection and communication connection.

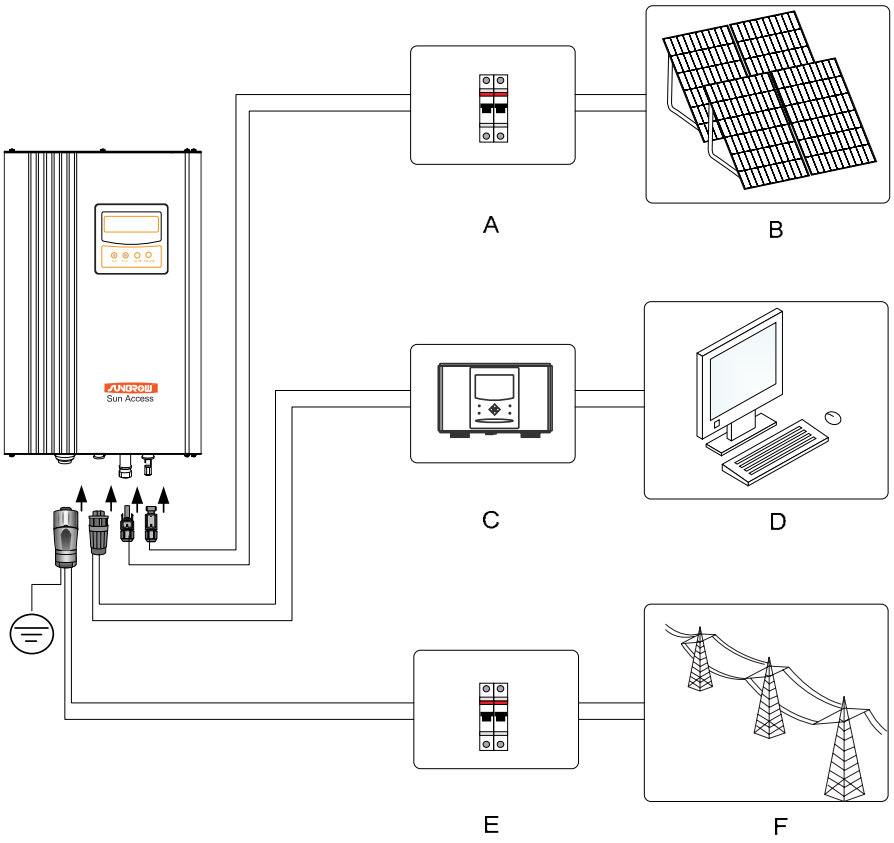


Fig 5-2 Electrical Connection Diagram

Item	Description	Remark
A	DC circuit breaker	Used as a protective device during electrical connection. User equips this device according to maximum input voltage and current.
B	PV arrays	There is two pair of input terminals for inverter SG1K5TL. The allowable maximum open-circuit voltage of PV arrays is 450V.
C	SunInfo logger	User can order it from Sungrow.
D	Remote PC	User equips this device to monitor the state of the inverter.
E	AC circuit breaker	Used as a protective device during electrical connection. User equips this device according to maximum output voltage and current.
F	Utility grid	Rated phase voltage of the utility grid is 230V.

5.4 Specifications of Cables

All cables for PV power system are equipped with water-proof direct plug-in connectors. You'll find these connectors in the package.

For electrical connection in PV power system, specification of all cables used should meet following requirements. And user should equip these appropriately sized cables.

Table 5-1 Specifications of Cables

Items		No.	Min. cross area (mm^2)	Max. cross area (mm^2)	Recommended value (mm^2)
DC positive cable		1	2.5	6	4
DC negative cable		1	2.5	6	4
AC cable	L	1	2.5	4	2.5
	N	1	2.5	4	2.5
	GND	1	2.5	4	2.5
RS485 cable		2	0.5	1.5	0.75

5.5 Connecting Inverter to PV Arrays

5.5.1 Safety

As input of the inverter in the PV power system, PV Arrays' features should be paid attention to. Please refer to PV module's data sheet.

When designing PV arrays, following requirements should be met.



Lethal voltage exists!

Do cover the PV arrays with lighttight materials or disconnect the DC circuit breaker. Exposed to sunlight, PV arrays will output lethal voltage.



Risk of damage to the inverter.

Make sure that the maximum open voltage of each string is within DC input voltage range of the inverter. Voltage over 450V can damage to the inverter.



Risk of damage to the inverter.

Make sure that the maximum short current of each string is less than maximum input current. Please refer to chapter "APPENDIX".



Due to only one MPP tracker for all DC inputs, Each PV string should have a homogenous structure, including the same type, the same number, identical tilt and identical orientation.

5.5.2 Assembling DC Cable to Connector

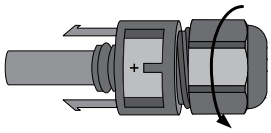
All DC cables are equipped with water-proof direct plug-in connectors, which mate with DC terminals at the bottom of the inverter.

NOTE

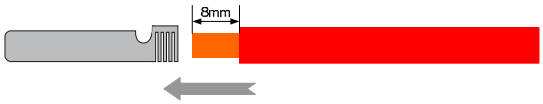
The positive and negative connectors are marked with polarity symbols and should be equipped with correctly colored cable. Red cable represents DC positive connector and blue one represents negative.

DC Positive Connector Assembling Procedure:

Step 1: Unscrew the water-proof terminal in the following direction.

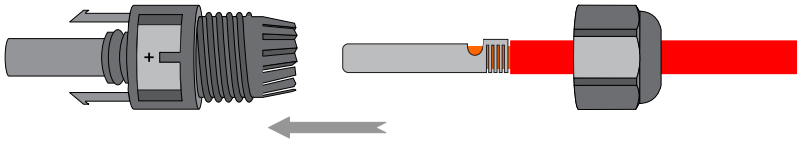


Step 2: Strip off insulation layer of DC cable and crimp cable core with hand crimping pliers. The length of strip insulation is approximate 8mm.

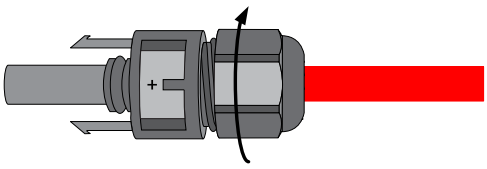


Step 3: Insert appropriately sized DC cable through water-proof terminal.

Step 4: Plug cable gland into connector housing until it makes a click sound.

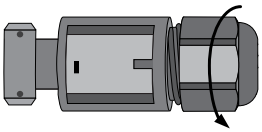


Step 5: Tighten the water-proof terminal in opposite direction.

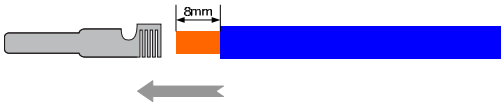


DC Negative Connector Assembling Procedure:

Step 1: Unscrew the water-proof terminal in the following direction.

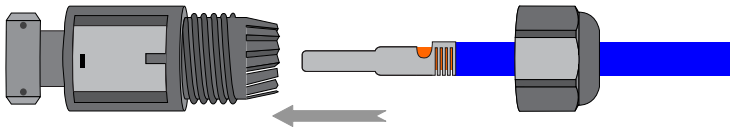


Step 2: Strip off insulation layer of DC cable and crimp cable core with hand crimping pliers. The length of strip insulation is approximate 8mm.

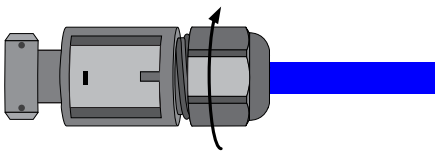


Step 3: Insert appropriately sized DC cable through water-proof terminal.

Step 4: Plug cable gland into connector housing until it makes a click sound.



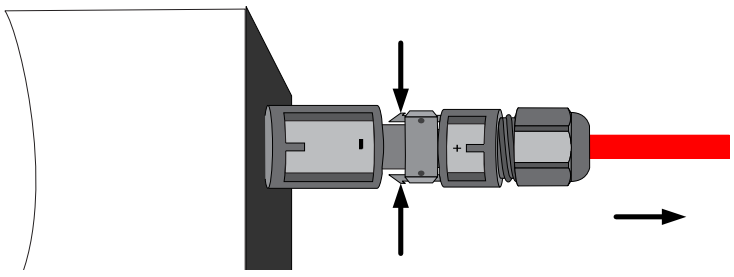
Step 5: Tighten the water-proof terminal in opposite direction.



When connecting connectors, they will be correctly locked in the mating place.

NOTE

Release the locking part by pressing on the ribbing of the locking hooks and pull them outwards.



5.5.3 DC Wiring Procedure

Wiring Procedure

Step 1: Assemble DC cable to connector at the inverter side. See “5.5.2 Assembling DC Cable to Connector”.

Step 2: Disconnect DC and AC circuit breakers.

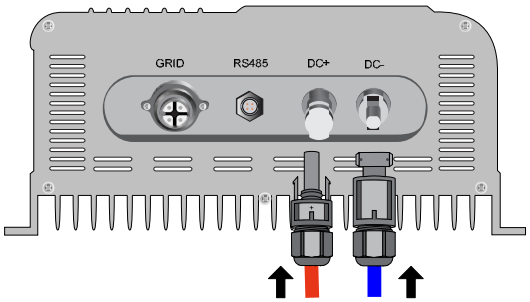
Step 3: Check connection cable of one PV array string for correct polarity and that the maximum input voltage does not exceed 450V.

Step 4: Measure DC voltage between positive terminal of the PV string and Earth and DC voltage between negative terminal of the PV string and Earth. If the two voltages are constant and not zero, there is an insulation failure somewhere in this PV string.

Step 5: Plug DC positive and negative connector into corresponding terminals.

If it makes a click sound, it means DC connector has attached to terminals.

For inverter SG1K5TL, the acceptable number of PV strings is one.



5.6 Connecting Inverter to AC Grid

5.6.1 Safety

WARNING

Only after receiving prior approval from the utility company you can connect the inverter to local utility grid.

NOTICE

The grid should meet these following requirements. Otherwise the inverter will not work.

- **Grid Line Voltage** **310V~450V**
- **Grid Frequency** **47~51.5Hz/57~61.5Hz**

The grid connection of inverter SG1K5TL is made via 3 wires (L, N and GND). Feeding power is always single-phase via AC terminal at the bottom of the unit.

An appropriately sized AC circuit breaker is suggested as a protection equipment in AC connection, as shown in Fig 5-2.

5.6.2 Assembling AC Cables to Connector

Inverter is equipped with water-proof direct plug-in connectors for AC connection, which mate with AC terminals at the bottom of the inverter.

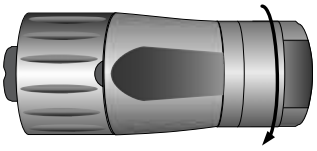
NOTE

"L", "N" and "GND" should be equipped with correctly colored cables for distinguishing. Please refer to related standards about wiring color.

Assembling Procedure

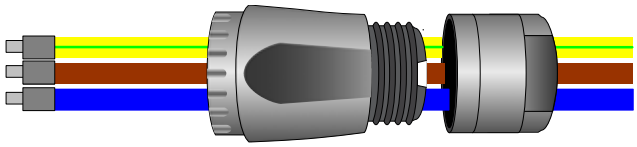
In order to assemble AC connector, please follow the procedures below:

Step 1: Unscrew the cable gland in the following direction.

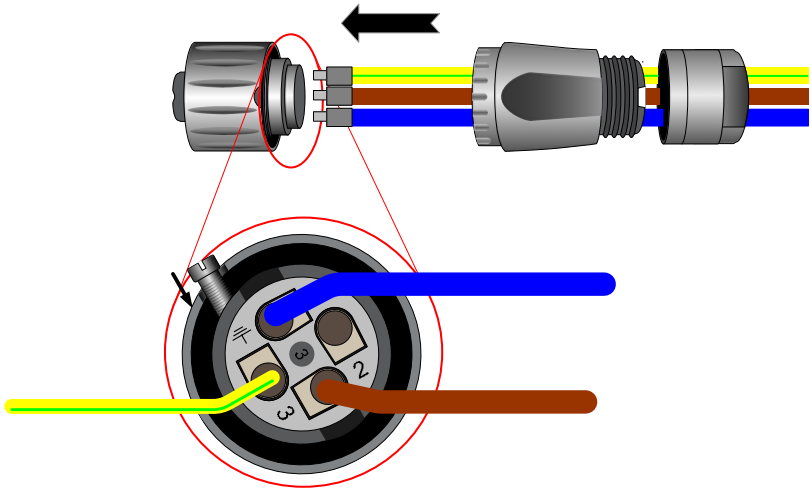


Step 2: Insert stripped AC cables of appropriate size into AC connector.

Step 3: Clamp all cables with twin core end terminals.

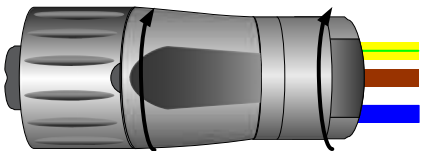


Step 4: Fix phase cables into terminals 1 and terminal 3 with screwdriver according to marks. Fix ground cable into the Ground terminal. If a phase wire is connected to the "GND" terminal, it may permanently destroy the inverter.



Step 5: Pull cables outwards to confirm whether they are installed firmly.

Step 6: Tighten the cable gland in opposite direction.



NOTE

If the recess on the front-end part of AC connector to match perfectly with the AC terminal of the inverter, the connection of all AC cables is correct.

5.6.3 AC Wiring Procedure

NOTICE

Assignment of AC cables should be paid attention to, especially “GND” wire.

Step 1: Assembling AC cables to connector supplied, see “5.6.2 Assembling AC Cables to Connector”.

Step 2: Make sure that AC and DC circuit breaker are disconnected.

Step 3: Connect L and N to AC circuit breaker.

- Plug AC connector to corresponding AC terminals.
- Screw AC cables to AC circuit breaker.

Step 4: Connect AC circuit breaker to utility grid.

Step 5: Make sure that all AC cables are firmly installed.

5.7 Grounding of Inverter

WARNING

Because of the transform-less design of the inverter, DC positive pole and DC negative pole are not permitted to be grounded. Otherwise the inverter can stop running.

All non-current carrying exposed metal parts of equipment and other enclosure in the PV power system should be grounded (e.g., PV arrays, DC circuit breaker and inverter). For AC side, it is better to use a continuous irreversibly appropriately sized conductor bare to ground inverter.

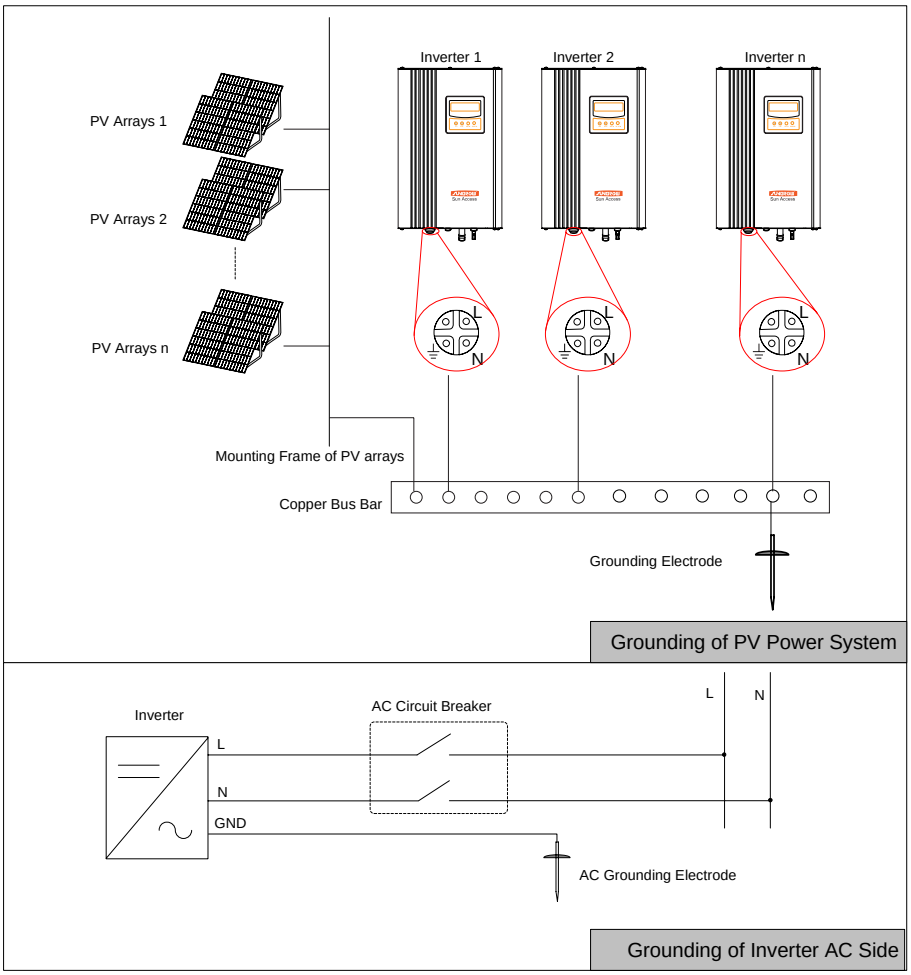


Fig 5-3 AC Side of Inverter Grounding

5.8 Connecting Communication Cable

5.8.1 Monitoring System

The inverter provides RS485 interface to communicate with remote PC or logger. User can monitor the state of the inverter and observe current running information and history record via this interface.

There are three methods provided to install the monitoring system.

- Data logger

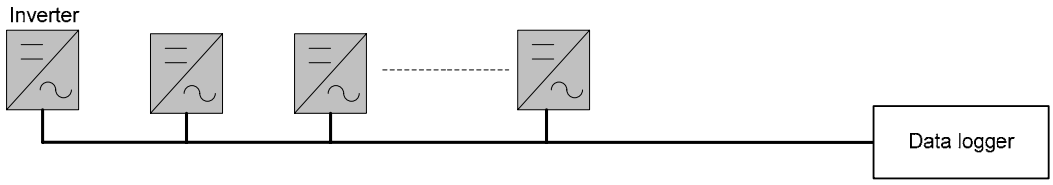


Fig 5-4 Collecting Data with Data Logger

- Data logger+ PC

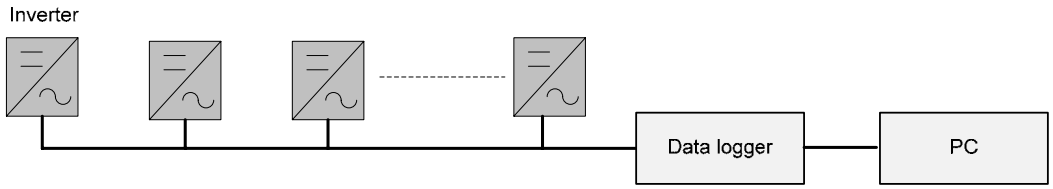


Fig 5-5 Collecting Data with Data Logger and PC

- PC

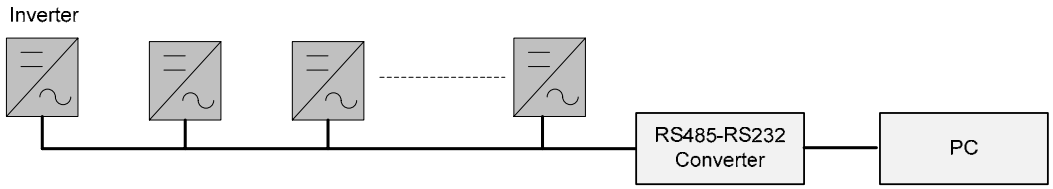


Fig 5-6 Collecting Data with PC and RS485-232 Converter

5.8.2 Connecting RS485 Cable

RS485 is communication standard for bidirectional transmission of data between one or more inverters and a PC or a data logger.

If there is more than one inverter to communicate with a PC or a data logger, it is crucial to configure communication parameters of each inverter. See “8.10.8 Set Communication Parameters”.

NOTICE

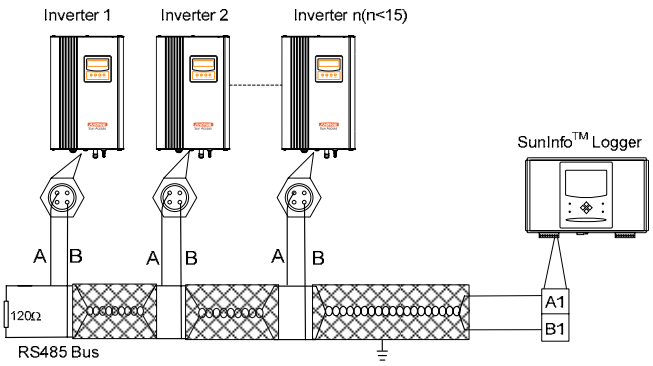
RS485 bus’ requirements to ensure quality of communication:

- **Shielding twist-pair type**
- **Shielding layer of RS485 bus should be single-point grounding**

NOTE

SunInfo^{TM} logger and RS485-232 converter are optional devices and can be ordered from Sungrow.

- Data logger



Wiring procedure:

Step 1: A resistance with 120Ω is connected at the initiating terminal of RS485 bus.

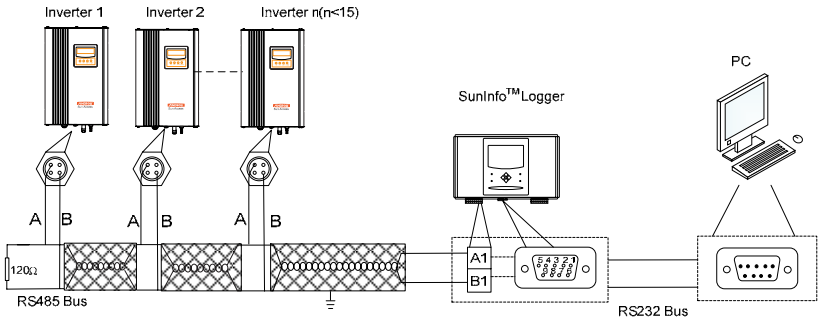
Step 2: Plug the connector of RS485 cable into corresponding RS485 terminal of Inverter 1.

Step 3: The two wires of the other end of RS485 cable, marked A and B, are connected to corresponding lines of RS485 bus, as the above diagram.

Step 4: Connect other inverters to RS485 bus in the same way.

Step 5: Connect the end of RS485 bus to A1 port and B1 port of SunInfo^{TM} logger.

- Data logger+ PC



Wiring procedure:

Step 1: A resistance with 120Ω is connected at the initiating terminal of RS485 bus.

Step 2: Plug the connector of RS485 cable into corresponding RS485 terminal of Inverter 1.

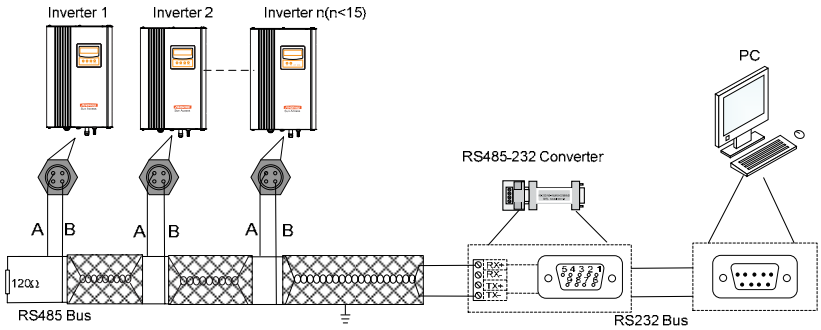
Step 3: The two lines of the other end of RS485 cable, labeled A and B, are connected to corresponding lines of RS485 bus, as the above diagram.

Step 4: Connect other inverters to RS485 bus in the same way.

Step 5: Connect the end of RS485 bus to A1 port and B1 port of SunInfo™ logger.

Step 6: Connect RS232 port of SunInfo™ logger to RS232 port of PC.

- PC



Wiring procedure:

Step 1: A resistance with 120Ω is connected at the initiating terminal of RS485 bus.

Step 2: Plug the connector of RS485 cable into corresponding RS485 terminal of Inverter 1.

Step 3: The two lines of the other end of RS485 cable, labeled A and B, are connected to corresponding lines of RS485 bus, as the above diagram.

Step 4: Connect other inverters to RS485 bus in the same way.

Step 5: At the end of RS485 bus, connect RS485 A cable to “RX+” port of RS232-RS485 converter and connect RS485 B cable to “TX-” port of RS232-RS485 converter.

Step 6: Connect RS232 port of RS485-232 converter to RS232 port of PC.

6 Commissioning

About This Chapter

This chapter demonstrates how to check before commissioning and operation procedures.

6.1 Verify before Commissioning

Num	Item	Remark
1	Verify whether inverter is fastened onto the wall.	See “4 Installing Inverter onto Wall”.
2	Check whether all cables are undamaged, properly insulated and adequately dimensioned.	See” 5.4 Specifications of Cables”.
3	Check whether all cables are firmly attached and correctly.	See “5.5 Connecting Inverter to PV Arrays” to “5.8 Connecting Communication Cable”

6.2 Commissioning Procedure

Step 1: Make sure all items above meet demands.

Step 2: Close external AC air-switch.

Step 3: Close external DC air-switch.

NOTE

After external air-switch is closed in the PV power system:

- PV arrays initialize and supply DC power to inverter;
- Inverter verify whether grid conditions are OK;
- If the conditions are OK, inverter feeds AC power to grid and enters into the running state.

Step 4: Observe state of LED indicators and LCD screen.

NOTICE

If inverter’s commissioning fails, “FAULT” indicator will be lit. And “state” in the LCD screen will display type of malfunction.

In this case malfunction must be removed and then repeat step1 to step 4.

NOTE

If inverter‘s commissioning succeeds, “RUN” indicator will be lit.

If inverter‘s commissioning succeeds, “state” in the LCD screen will display “RUN”.

7 Troubleshooting

About This Chapter

This chapter illustrates troubleshooting of LED indicator and malfunction displayed in LCD screen.

7.1 Troubleshooting of LED Indicator

See “2.3.3 LCD Display Panel” to know definition of LED’s state.

Type of fault	Troubleshooting
LED indicators and LCD cannot be lit	1. Disconnect AC circuit breaker. 2. Disconnect DC circuit breaker. 3. Check the polarity of DC input.
“RUN” indicator goes out	1. Disconnect AC circuit breaker. 2. Disconnect DC circuit breaker. 3. Check the correctness of electrical connection of inverter. See “5 Electrical Connection”. 4. Check whether the voltage of DC input exceeds start-up voltage of inverter. 5. If all above conditions are OK, please contact Sungrow.
“Fault” indicator is lit	1. There is a fault which is not removed yet. 2. Perform troubleshooting in according to fault type in LCD screen. See “7.2 Troubleshooting of Faults in LCD Screen”. 3. If it can not be solved, please contact Sungrow.

7.2 Troubleshooting of Faults in LCD Screen

Type of fault	Troubleshooting
Vdc-high	1. Disconnect AC circuit breaker. 2. Disconnect DC circuit breaker. 3. Check the voltage of DC side. 4. Restart the inverter until the DC voltage returns to allowable range.
Vac-low Vac-high	1. Disconnect AC circuit breaker. 2. Disconnect DC circuit breaker. 3. Check the voltage of grid side. 4. If local grid condition exceeds AC requirements of inverter, reset the protecting parameters. See “8.10.7 Set Protective Parameters”. And if local grid voltage exceeds the upper limit value of “Vgrid-max”, or if local grid voltage is under the lower limit value of “Vgrid-min”, please contact your local electricity company to adjust the grid voltage. 5. If the fault still exists, please contact Sungrow.
F-fault	1. Disconnect AC circuit breaker. 2. Disconnect DC circuit breaker. 3. Check the frequency of grid side. 4. If local grid condition exceeds AC demands of inverter, reset the protective parameters. See “8.10.7 Set Protective Parameters”. And if local grid frequency exceeds the upper limit value of “Fgrid-max”, or if local grid frequency is under the lower limit value of “Vgrid-min”, please contact your local electricity company to adjust the grid frequency. 5. Close DC circuit breaker. 6. Close AC circuit breaker. 7. If the fault can not be solved, please contact Sungrow.
PM-FAULT	If this malfunction occurs, the reasons are very complicated. 1. Disconnect AC circuit breaker. 2. Disconnect DC circuit breaker. 3. Check the temperature of heat sink. If its temperature exceeds 80°C, restart the inverter until it recovers to environment temperature. 5. Close DC circuit breaker. 6. Close AC circuit breaker. 7. If this malfunction happens again, please contact Sungrow.

Type of fault	Troubleshooting
No-grid	1. Check whether AC circuit breaker is off. 2. Check whether AC cables are all firmly connected. 3. Check whether grid is cut off. 4. If all conditions are OK and this malfunction still occurs in the LCD screen, please contact Sungrow.
Tem-flt	1. Check whether AC output power exceeds rated power too much. 2. Check the state of the fans. 3. Check whether there is some foreign body blocking the air inlet and outlet. Clean air grills of air vent.
Com-flt	1. If this malfunction happens, wait for a while and observe whether fault can be cleared by the inverter itself. 2. Otherwise perform the command “Stop”. 3. Perform the command “Start” to restart the inverter. 4. If this malfunction still exists, please contact Sungrow.

NOTE

If you have any problems in operating on the inverter, please contact us:

Telephone: +86 551 532 7834/532 7845

Email: info@sungrow.cn

service@sungrow.cn

We need the following information to provide you the best assistance:

- Type of the inverter
- Serial number of the inverter
- Fault name
- Simple description of the fault phenomenon

OPERATION INFORMATION

For User and Installer

8 Operation of LCD Menu

About This Chapter

This chapter shows operation of LCD menu via button to check the record in the inverter and configure the parameters of the inverter.

8.1 Button Function

Inverter offers two buttons for user to look up running information and configure parameters. And the two buttons are reusing ones. User should know the button operation and function before any operation onto inverter.

Table 8-1 Description of Button Function

Name	Operation	Description
"ESC/▼"	Press less than two seconds	Move cursor upwards and downwards in the screen or increase and decrease the setting value. In the following text, it is called "short press "ESC/▼".
	Press more than two seconds	Return to parent screen or cancel the command. In the following text, it is called "long press "ESC/▼".
"ENTER/▶"	Press less than two seconds	Move cursor left or right in the screen. In the following text, it is called "short press "ENTER/▶".
	Press more than two seconds	Enter into sub-screen or confirm the command. In the following text, it is called "long press "ENTER/▶".

NOTE

When the two buttons are pressed over three seconds simultaneously, inverter will stop running and enter into the "stop" state.

NOTE

The background illumination of LCD screen will go out to save power if there is not button operation in one minute. You can activate it by pressing any button.

8.2 Operation Mode of Inverter

There are three modes for inverter SG1K5TL.

- Run

  After being energized, the inverter tracks the PV arrays' maximum power point (MPP) and converts DC power to AC power.

- Fault

  If a fault occurs during operation, the inverter will automatically stop operation, trigger AC relay and display the fault type in the LCD panel with the "Fault" LED lit meanwhile.

  Once the fault is removed in 5 minutes, the inverter will automatically resume running.

- Stop

  The inverter will stop operation by manually stop through LCD menu; this condition needs manual restart through LCD menu.

  During the "Stop" mode, the inverter will block the driving signals that control the switching PM and disconnect the inverter from the grid by switching off the AC relay.

8.3 Overview of LCD Menu

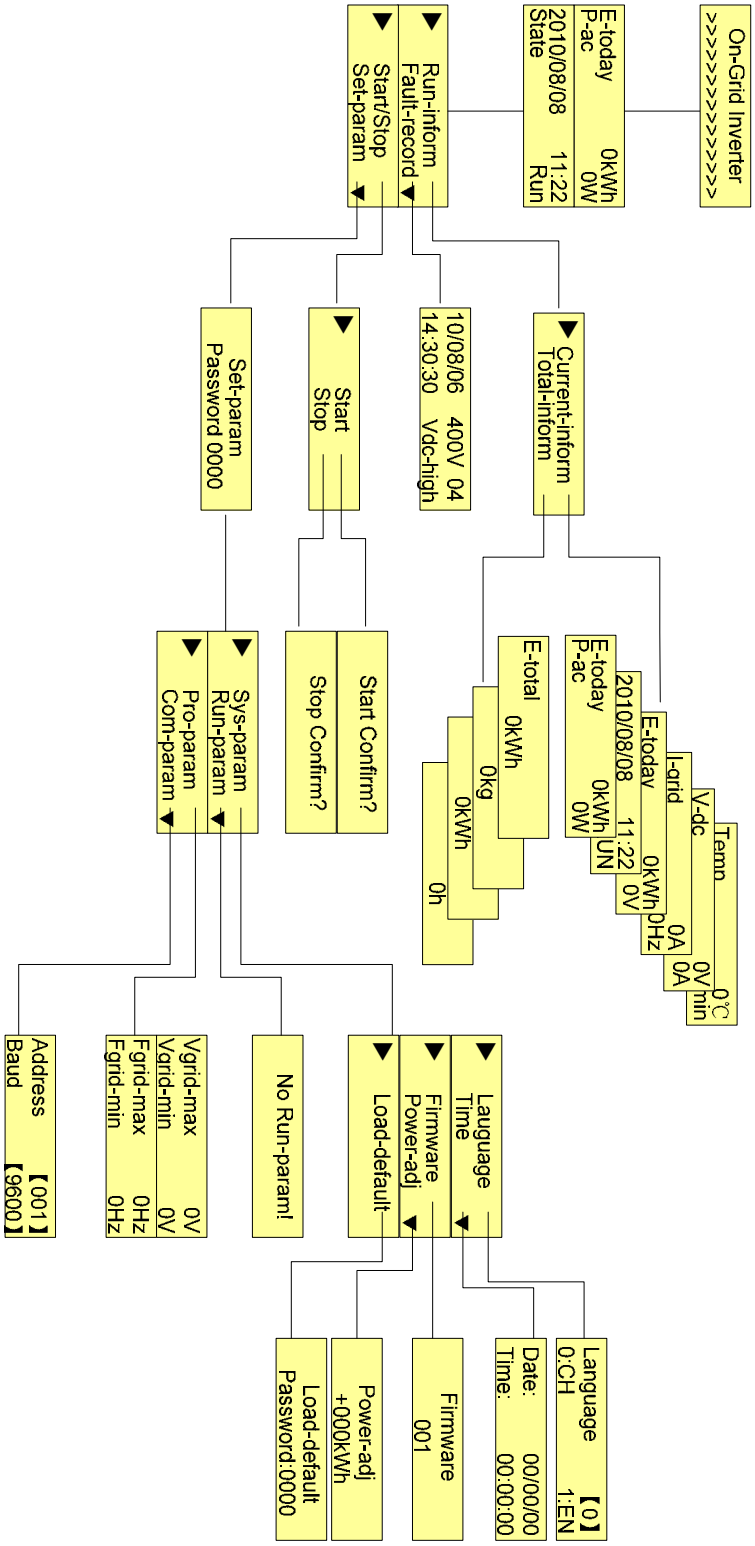
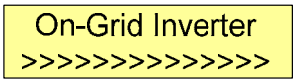


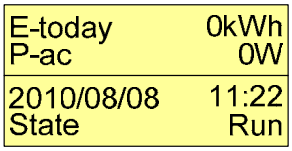
Fig 8-1 Menu Tree-English

8.4 Start-up Menu

This screen only appears once after being energized. LCD will automatically enter into the default menu after about 7 seconds.



8.5 Default Menu



This menu includes 2 separate pages.

The first screen includes parameters of “E-today” and “P-ac”. “E-today” indicates the daily output energy generated by SG1K5TL in the unit of kWh. “P-ac” indicates the real time output power of SG1K5TL in the unit of kW.

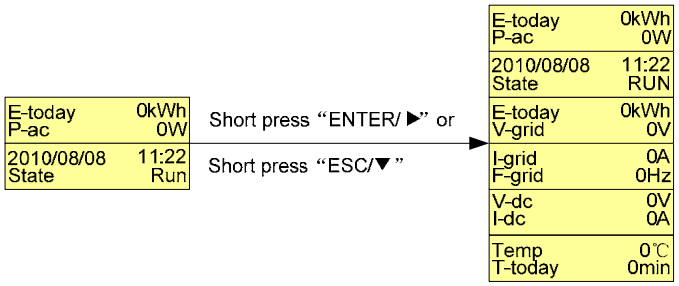
The second screen includes parameters of date/time and “state”. “Date/Time” displays the current time and can be adjusted. The “State” shows the inverter’s working state according to Table 8-2.

Table 8-2 State of the Inverter

Data name	Explanation
RUN	The inverter in normal （function）operation
Stand-by	The inverter in stand-by state
Stop	The inverter stops working
Com-fault	Fault of LCD-inverter communication

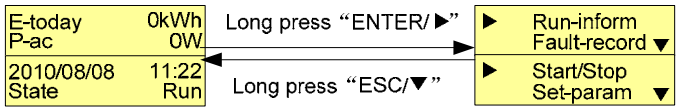
NOTE

Short press “ESC/▼” button or “ENTER/►” when in default menu, you can quickly access the system running parameters, as shown in the figure below.



8.6 Main Control Menu

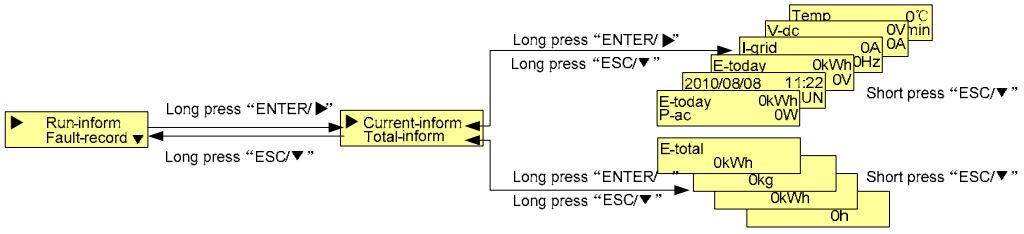
This menu contains running information-"Run-inform", fault record-"Fault-record", start/stop command of the inverter-"Start/Stop" and parameters setting-"Set-param". Users can short press "ESC/▼" button to make the arrow pointed to selected menu.



8.7 Check Run-inform

In order to check run information of inverter, you can access "Current-inform" and "Total-inform" following instructions in the picture below.

There is a direct way to access "Current-inform" from default menu via short pressing "ESC/▼" button or "ENTER/►" button.



The "Run-inform" menu contains the "Total-inform" and "Current-inform" menu.

The "Total-inform" includes history logged data such as: total generated energy-"E-total", monthly generated energy-"E-month", total running hour-"h-total" and reduced CO2 weight -"CO2-total".

The "Current-inform" includes real time system data. All the data are explained in the Table 8-3 and Table 8-4.

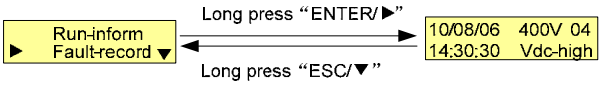
Table 8-3 Electrical Real Time Data (Current-inform)

Data name	Explanation	Unit
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
E-today	Energy generated today	kWh
E-month	Energy generated this month	kWh
E-total	The whole generated Energy	kWh

Table 8-4 Non-electrical Real Time Data (Total-inform)

Data name	Explanation	Unit
Temp	Temperature within the enclosure	℃
T-today	The Operation time of today	min
T-total	Total hours of operation time	h
CO2-total	Reduced CO2 weight	kg
2006/11/22 11:44	The current date/time	

8.8 Check Fault-record



The "Fault-record" menu displays the latest fault records, which includes fault type (see Table 8-5), fault occurring time, fault parameter and fault record number.

NOTE

Inverter SG1K5TL can store at most 20 fault records.

The latest fault record number is always 01. The oldest fault record number is always 20(suppose there are 20 fault records).

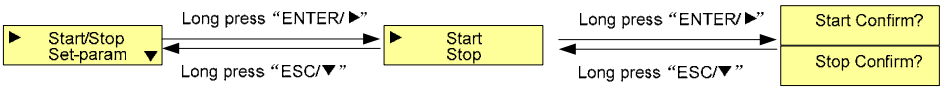
Table 8-5 Fault Type with Simple Explanation

Fault name	Explanation
Vdc-high	DC voltage exceeds maximum DC voltage of inverter.
Vac-high	AC voltage exceeds the upper limit value of grid voltage range.
Vac-low	AC voltage is less than the lower limit value of grid voltage range.
F-fault	Grid frequency exceeds range.
Island	Grid is unavailable or grid malfunction occurs.
PM-FAULT	PM fault occurs.

8.9 Start and Stop Inverter

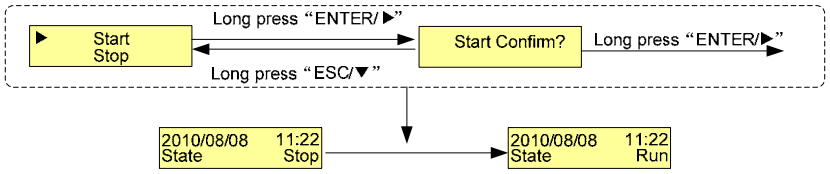
If input and output conditions meet the related requests, inverter will work automatically. And if input and output conditions fail, inverter will stop automatically.

If you want start and stop inverter manually, you can operate as the following picture.



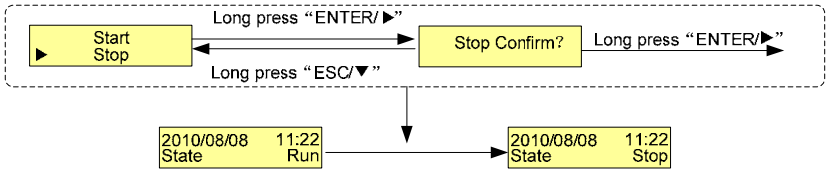
Start through LCD

If you want to restart inverter after LCD "stop" operation, you can perform "Start" operation. And state shown in the default menu will change after "start" operation.



Stop through LCD

If you perform "Stop" operation through LCD, the inverter will stop work immediately. And state shown in the default menu will change after "stop" operation.





If you want to stop the inverter in emergency, you should first disconnect AC circuit breaker and then DC circuit breaker. Otherwise it can lead to damage to inverter and operator.

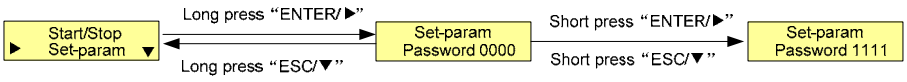
8.10 Set Parameters for Inverter

NOTE

If you want to set inverter's parameters, you have to input correct password.

The default password is 1111.

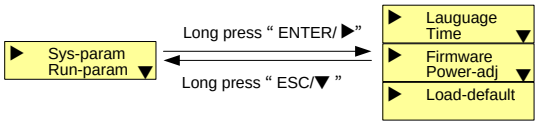
The process of input password is indicated in the following picture.



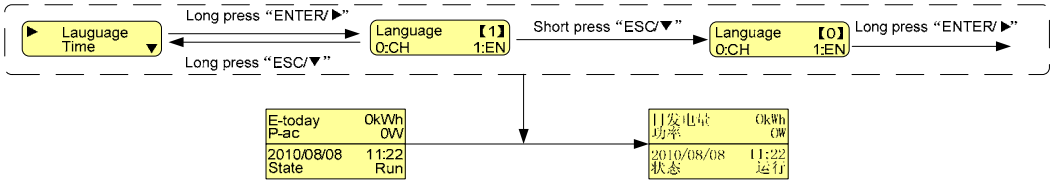
There are "Sys-param", "Run-param", "Pro-param" and "Com-param" that can be set.

System parameter contains language, time, firmware, power-adj and load default.

8.10.1 Set Language

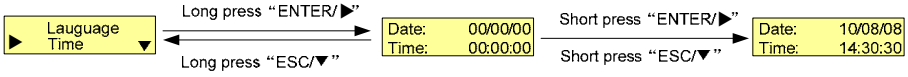


Inverter SG1K5TL supports two languages: Chinese and English. You can select your language as the following picture.



8.10.2 Adjust Time Displayed in Inverter

If "time" displayed in inverter is not in accordance with your local time, you should perform the following operation.



NOTE

The date format is year/month/date. The time format is hour/minute/second.

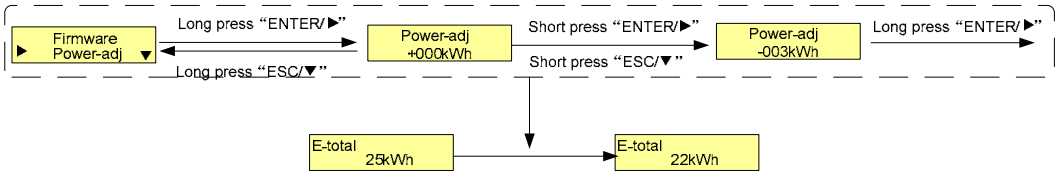
Clock is 24-hour format.

8.10.3 Firmware

User can not set this parameter.

8.10.4 Set Power-adj

If “E-total” value deviates from the value in metering device, you should set the parameter “power-adj”.



NOTE

The value of “Power-adj” is the difference between value in metering device and “E-total” value in LCD.

Adjustable range: -999kWh~+999kWh

8.10.5 Load Default

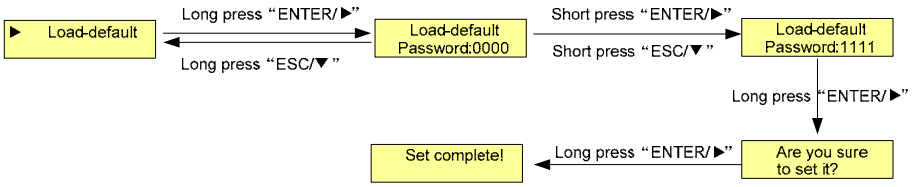
NOTICE

If you perform “Load-default” operation, all non-real time data will be reset to zero, including “E-today”, “T-today”, “E-total”, “CO2-total”, “E-month” and “H-total”.

This operation is irreversible.

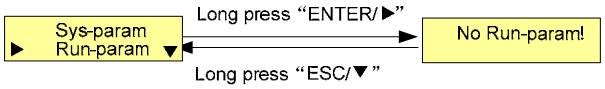
NOTE

If language of inverter is Chinese, it will change into English after operation of “Load-default”.



8.10.6 Set Run Parameter

There is not run parameter for setting. If you perform "Run-param" operation, LCD just displays "No Run-param".



8.10.7 Set Protective Parameters

Protective parameters include "Vgrid-max", "Vgrid-min", "Fgrid-max" and "Fgrid-min".

If actual condition exceeds these setting value, inverter will stop running and display corresponding fault.

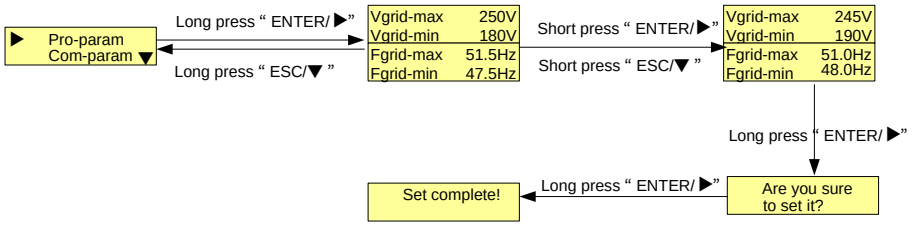
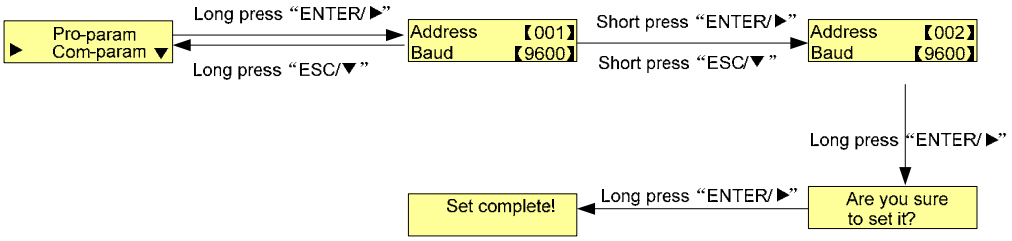


Table 8-6 Protective Parameters Range

Data name	Simple explanation	Adjustable range	Default value
Vgrid-max	Maximum AC phase voltage	240V-260V	250V
Vgrid-min	Minimum AC phase voltage	180V-215V	180V
Fgrid-max	Maximum AC frequency	50.5Hz-51.5Hz	51.5Hz
		60.5Hz-61.5Hz	61.5Hz
Fgrid-min	Minimum AC frequency	47.0Hz-49.5Hz	47.5Hz
		57.0Hz-59.5Hz	57.5Hz

8.10.8 Set Communication Parameters

If there is more than one inverter to be monitored, you should set appropriate address and baud rate for each inverter.



NOTICE

Each inverter should have different address and have same baud rate to ensure good communication.

Address range: **1~247**

Baud rate: **1200,2400,4800,9600**

APPENDIX

Technical Data

Input Data	
Max. DC Voltage	450Vdc
Start Voltage	170V
MPP Voltage Range	150V~380V
Min. DC Voltage	150V
Max. DC Power	1700W
Max. Input Current	12A
Number of MPPT Trackers/Strings Per MPP Tracker	1/2
Output Data	
Rated output power	1500W
Max. AC Output Current	7A
Rated Grid Voltage	230V
Grid Voltage Range	180V~260V
Rated Grid Frequency	50Hz/60Hz
Grid Frequency Range	47Hz~51.5Hz/57Hz~61.5Hz
Output Current THD	<3%(at nominal power)
DC Current Injection	<0.5% of rated inverter output current
Power Factor	≥0.99(at nominal power)
System	
Max. Efficiency	95%
Euro. Efficiency	94.5%

Protection Degree	IP20(indoor)
Power Comsumption at Night	0W
Operating Temperature	-25℃~+50℃
Relative Humidity	0~95%，non-condensing
Cooling method	natural cooling
Max. Altitude	2000m
Display and Communication	
Display	LCD
Standard Communication Interface	RS485
Optional Communication Interface	Ethernet
Mechanical Data	
Dimensions（W*H*D）	288mm*438mm*126mm
Net weight	10.54kg

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Contact Information

If you have any questions about this product, our hotline will be happy to assist you. Please keep the following data when contacting Sungrow.

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