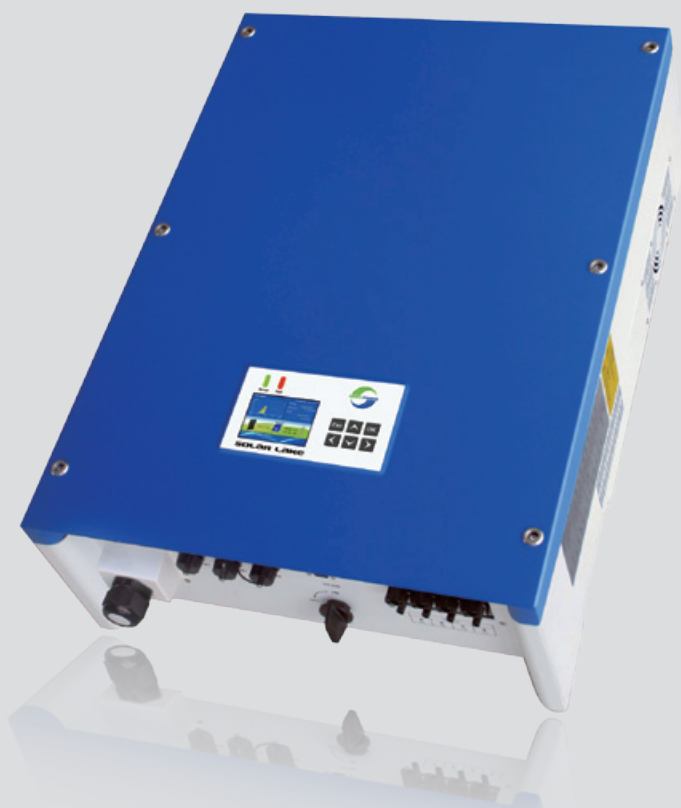




SAMIL POWER

Expert for PV Grid-tied Inverters



SolarLake Grid Connected Inverter

Product Manual

SP-SL-V5.3-EN



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- **Notes on this Manual**

This manual is an integral part of the inverter. Please read the manual carefully before installation, operation or maintenance. Keep this product manual for future reference. Please note that all pictures are edited by Samil Power.

- **Scope of Validity**

This product manual describes the assembly, installation, commissioning, and maintenance of the following Samil Power SolarLake Series inverters.

SolarLake 10000TL

SolarLake 12000TL

SolarLake 15000TL

SolarLake 17000TL

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

- **Target Group**

This manual is for qualified persons installing and operating the inverters. The tasks described in this manual must only be performed by qualified persons.

- **Symbols Used**

This manual provides safety and operation information and uses symbols in order to ensure personal and property security and efficient operation of inverters. User must understand and observe instructions in the manual to avoid personal injury and property loss. Please read and understand the following symbols which are used in this manual.



Danger

Danger indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Warning

Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Caution

Caution indicates a hazardous situation, if not avoided, could result in minor or moderate injury.



Note

Note provides tips that are valuable for the optimal operation of the product.

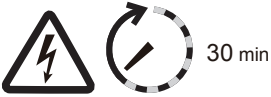





Attention

Attention indicates potential risks, if ignored prevent may lead to equipment malfunction or damage.

- **Symbols on the Inverter**

These are some symbols which are related to safety and security. Please read and fully understand these symbols before installing the equipment.

Symbol	Explanation
	<p>There will be residual voltage in the inverter! Ensure that AC and DC sides are not charged before installation or maintenance. Capacitors in the inverter are likely to be charged, hence it is necessary to wait for about 30 minutes before opening the inverter cover.</p>
	<p>Be careful of high voltage.</p>
	<p>Be careful of high temperature.</p>
	<p>Symbol of European Community Inverter meets CE safety certification standard.</p>

In the event of any property destruction or personal injury due to failure to follow instructions in this manual, Samil Power Co., Ltd does not take any responsibility for the same.

1 Basic safety information



Note!

If you have any questions or concerns when reading this manual, please contact Samil Power Co., Ltd.

1.1 Preface

Installation of SolarLake inverter must completely meet with national and local grid connection standards and regulations.

- Please contact Samil Power authorized repair center if you have any maintenance or repair services for the inverter. Your dealer should be able to provide details of your nearest authorized service centre. Please do not attempt any maintenance yourself as it may cause property destruction and personal injury.
- Read and understand the instruction in this manual and familiarize with the relevant safety symbols before installing or maintaining the equipment.
- National and State regulations may require prior approval before connecting on site power generation systems to the local grid.
- Before installing or maintaining the inverter, PV array and grid supply must be disconnected to avoid injury.

1.2 General information

When the inverter is operating, some of the parts will be electrically charged and/or very hot. Property destruction and personal injury can be caused if the inverter is installed or operated wrongly. The inverter must be installed and maintained by qualified and trained engineers and must meet all regulations in the Country.

Samil Power Co., Ltd does not take any responsibility for the property destruction and/or personal injury because of incorrect use of inverters.

1.3 Safety instruction



Danger!

Danger to life due to high voltages in the inverter!

- All work on the inverter must be carried out by qualified person only;
- The appliance is not to be used by children or persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge.
- Children should be supervised to ensure that they do not play with the appliance.



Caution!

Danger of burn injuries due to hot parts!

During inverter operation, should only touch the display and keys on the inverter.



Attention!

PV array should be connected to the ground in accordance with requirements of local regulations

To protect system and avoid personnel injury, Samil Power suggests that PV array frame and inverter should be properly grounded.



Warning!

Ensure that the input DC voltage is less than the Max.DC voltage rating of the inverter under all operating conditions. Over voltage may cause permanent damage to the inverter or lead to other losses, which are not covered by product warranty.



Warning!

Disconnect both AC and DC power from the inverter before opening the inverter. All maintenance work should only be carried out by qualified and trained Electrical Engineers.

1.4 Pre installation checks

Mount the inverter vertically on appropriate load bearing areas like walls or frames. Ensure that the location selected for installing inverter has good air circulation, adequate room for undertaking maintenance tasks and proper fire exit facilities.

1.5 Transport

All SolarLake inverters leaving the factory are thoroughly are tested and inspected to ensure the high quality of our products. Our products are packed safely to ensure that these are not damage during transportation. However, damage in transport do happen and in such cases the responsibility lies with the transportation company.

While taking delivery of the goods, please check inverter and if packing or transit damages are found, please inform transportation company immediately. If you need assistance please contact your supplier or Samil Power Co. Ltd.

If the inverter is to be returned the original packing materials or suitable alternative must be used to avoid damage during transport.

1.6 Electric connection

Please comply with all the local electrical regulations to prevent accident and damage.



Danger!

Before making electrical connection, use opaque materials to cover the PV modules or disconnect PV panel DC switch. Beware that PV modules produce dangerously high voltages when exposed to sun.



Warning!

All installation work must be done only professional electrical engineer.

- Must be trained;
- Read and understand the User manual.



Attention!

If necessary obtain prior permission from the local energy supplier before connecting the inverter to the grid.

1.7 Operation



Attention!

Some internal components will be very hot when the inverter is working. Please wear protective gloves.

**Danger!**

Touching the power grid or electrical terminals may lead to electric shock or fire and may lead to death or serious injury.

- Don't touch the terminals or conductor When live.

1.8 Maintenance and repair

**Danger!**

Disconnect the PV array and electricity grid before undertaking any work on the inverter.

Wait about 5 minutes after turning off AC and DC switches to discharge capacitors before opening the inverter cover.

**Attention!**

In case of any problem with the inverter, please contact your local authorized service center.

**Attention!**

There are no user serviceable parts inside the inverters, hence do not open the inverter. Samil Power Co., Ltd does not take any responsibility if this advice is ignored.

1.9 EMC / noise level of inverter

Electromagnetic compatibility (EMC) ensures that electrical equipment function without electromagnetically interfering with other electrical equipment as well as not imposing unacceptable effect upon the environment. EMC represents the quality characters of electrical equipment.

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

**Warning!**

Electromagnetic radiation from inverter may be harmful to health.

- **Please do not stay close to the inverter for long periods when operating. Keep minimum distance of 20 cm.**

2 Product description

2.1 Function

The SolarLake Series PV inverters converts the DC power of a PV generator to grid compatible AC power and feed it into the public grid.

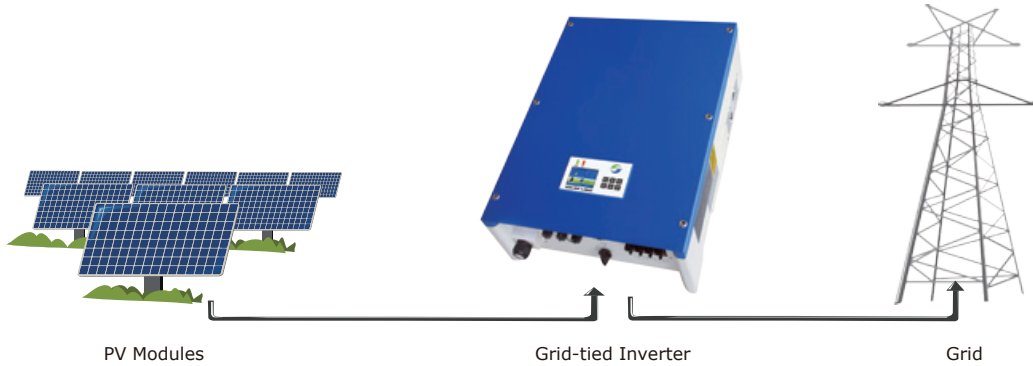


Figure 1 Grid tied Solar PV system

SolarLake inverters are manufactured using the latest technology and under strict safety standards. Even then in correct installation or operation will cause property destruction and personal injury.

The SolarLake series inverters are not designed for mobile application.

The SolarLake series inverters should not be used for anyother purpose than grid tied PV systems. The manufacturer/supplier does not take any responsibility if used for any other purpose.

2.2 Electrical block diagram

- Electrical block diagram

SolarLake inverter’s internal function process diagram is presented in Figure 2. The DC power generated by the PV array is filtered through the Input Board and the DC voltage gets boosted by the Boster Board. I Insulation impedance detection, auxiliary power and input DC voltage / current detection are performed by the Input Board. The Internal MPP tracker in the inverter ensures that the inverter produce maximum output power. The DC input is changed into AC power by the Inverter’s full-bridge circuit Board. The Control Board provides all the controls and monitors the performance parameters of the inverter. The inbuilt LCD Board and display various parameters including any fault information. The Control Board can also trigger internal relays so as to protect the internal components in case of any problem. Control Board also does functions like residual current detection, output DC voltage / current detection and EMC functions.

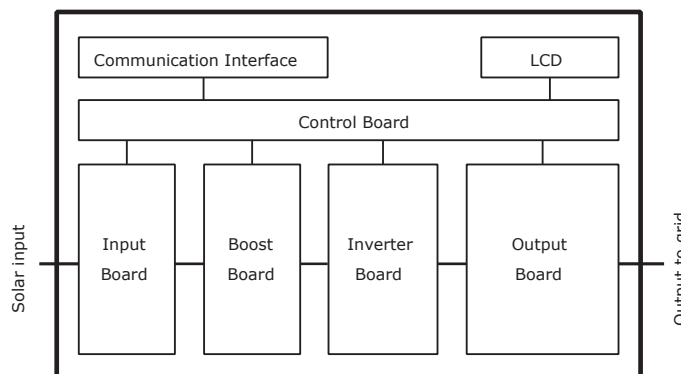


Figure 2 Electrical block diagram of SolarLake inverter (DC switch is optional)

- Terminals of SolarLake PV inverter

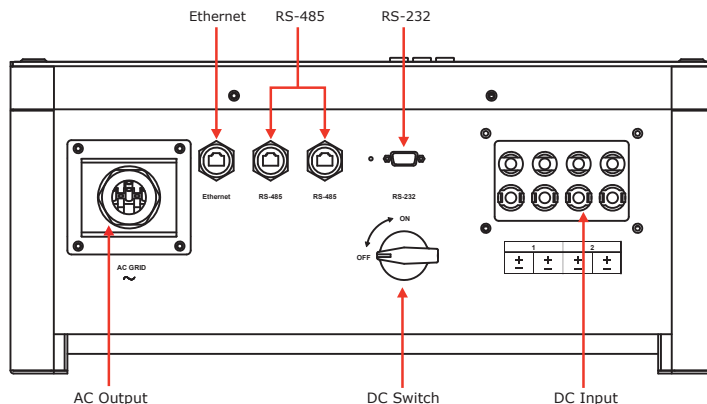


Figure 3 Terminals of SolarLake PV inverter 10 to17 KW (DC switch is optional)

Note: For safety reasons, use of a DC switch is recommended between the PV modules and the inverter's power modules. DC switch, when opted, is built into the SolarLake inverters.

2.3 Dimension

- Dimension for SolarLake 10000TL, 12000TL, 15000TL and 17000TL inverters.

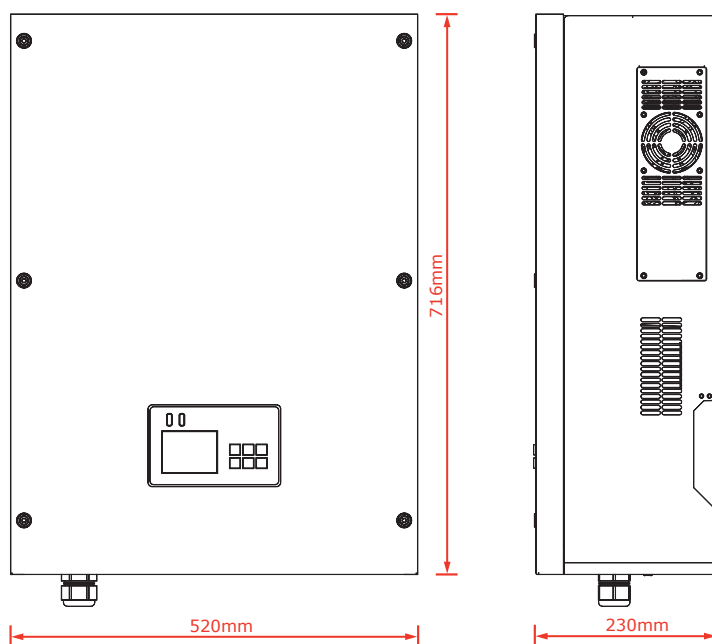


Figure 4 SolarLake inverter dimensions

Note: The AC output terminal projects out the most in these inverters, hence care should be taken to avoid any damage to the terminal. Avoid resting the inverter on the floor with the terminal touching the floor.

2.4 Product label

Product label attached to the right side of the inverter provides basic information about the inverter. Pay attention to the inverter model and other important specifications.


SolarLake 10000TL PV Netz-Wechselrichter PV Grid Inverter			SolarLake 12000TL PV Netz-Wechselrichter PV Grid Inverter			SolarLake 15000TL PV Netz-Wechselrichter PV Grid Inverter			SolarLake 17000TL PV Netz-Wechselrichter PV Grid Inverter		
DC	Maximum DC input voltage Max. DC-Eingangsspannung Massima tensione di ingresso cc Maximal de l'entree d'energie DC	1000V	DC	Maximum DC input voltage Max. DC-Eingangsspannung Massima tensione di ingresso cc Maximal de l'entree d'energie DC	1000V	DC	Maximum DC input voltage Max. DC-Eingangsspannung Massima tensione di ingresso cc Maximal de l'entree d'energie DC	1000V	DC	Maximum DC input voltage Max. DC-Eingangsspannung Massima tensione di ingresso cc Maximal de l'entree d'energie DC	1000V
DC	Operating voltage range Betriebsspannungsbereich Campo di tensione MPP Plage de tension de fonctionnement	250 - 950V	DC	Operating voltage range Betriebsspannungsbereich Campo di tensione MPP Plage de tension de fonctionnement	250 - 950V	DC	Operating voltage range Betriebsspannungsbereich Campo di tensione MPP Plage de tension de fonctionnement	250 - 950V	DC	Operating voltage range Betriebsspannungsbereich Campo di tensione MPP Plage de tension de fonctionnement	250 - 950V
DC	MPP voltage range MPP-Spannungsbereich Campo di tensione MPP Plage de tension MPP	320 - 800V	DC	MPP voltage range MPP-Spannungsbereich Campo di tensione MPP Plage de tension MPP	380 - 800V	DC	MPP voltage range MPP-Spannungsbereich Campo di tensione MPP Plage de tension MPP	380 - 800V	DC	MPP voltage range MPP-Spannungsbereich Campo di tensione MPP Plage de tension MPP	430 - 800V
DC	Normal operating voltage Nennbetriebsspannung Tensione normale Tension de fonctionnement normale	650V	DC	Normal operating voltage Nennbetriebsspannung Tensione normale Tension de fonctionnement normale	650V	DC	Normal operating voltage Nennbetriebsspannung Tensione normale Tension de fonctionnement normale	650V	DC	Normal operating voltage Nennbetriebsspannung Tensione normale Tension de fonctionnement normale	650V
DC	Max. input current Max. Eingangsstrom Corrente massima d'ingresso Courant d'entree Max.	2*16A	DC	Max. input current Max. Eingangsstrom Corrente massima d'ingresso Courant d'entree Max.	2*16A	DC	Max. input current Max. Eingangsstrom Corrente massima d'ingresso Courant d'entree Max.	2*20A	DC	Max. input current Max. Eingangsstrom Corrente massima d'ingresso Courant d'entree Max.	2*20A
DC	Maximum total PV array short circuit current Maximal PV Kurzschlussstrom Massima intensita' corrente di corto circuito Maximal PV courant de court circuit	2*18A	DC	Maximum total PV array short circuit current Maximal PV Kurzschlussstrom Massima intensita' corrente di corto circuito Maximal PV courant de court circuit	2*18A	DC	Maximum total PV array short circuit current Maximal PV Kurzschlussstrom Massima intensita' corrente di corto circuito Maximal PV courant de court circuit	2*22A	DC	Maximum total PV array short circuit current Maximal PV Kurzschlussstrom Massima intensita' corrente di corto circuito Maximal PV courant de court circuit	2*22A
AC	Normal operating voltage Nennbetriebsspannung Tensione normale Tension de fonctionnement normale	3*400 V	AC	Normal operating voltage Nennbetriebsspannung Tensione normale Tension de fonctionnement normale	3*400 V	AC	Normal operating voltage Nennbetriebsspannung Tensione normale Tension de fonctionnement normale	3*400 V	AC	Normal operating voltage Nennbetriebsspannung Tensione normale Tension de fonctionnement normale	3*400 V
AC	Max. output current Max. Ausgangsstrom Corrente massima d'uscita Courant de sortie Max.	3*16A	AC	Max. output current Max. Ausgangsstrom Corrente massima d'uscita Courant de sortie Max.	3*19,2A	AC	Max. output current Max. Ausgangsstrom Corrente massima d'uscita Courant de sortie Max.	3*24A	AC	Max. output current Max. Ausgangsstrom Corrente massima d'uscita Courant de sortie Max.	3*25A
AC	Normal operating frequency Nennbetriebsfrequenz Frequenza normale Frequence de fonctionnement normale	50Hz	AC	Normal operating frequency Nennbetriebsfrequenz Frequenza normale Frequence de fonctionnement normale	50Hz	AC	Normal operating frequency Nennbetriebsfrequenz Frequenza normale Frequence de fonctionnement normale	50Hz	AC	Normal operating frequency Nennbetriebsfrequenz Frequenza normale Frequence de fonctionnement normale	50Hz
AC	Normal output power Nennausgangsleistung Potenza normale d'uscita Puissance de sortie normale	10000W	AC	Normal output power Nennausgangsleistung Potenza normale d'uscita Puissance de sortie normale	12000W	AC	Normal output power Nennausgangsleistung Potenza normale d'uscita Puissance de sortie normale	15000W	AC	Normal output power Nennausgangsleistung Potenza normale d'uscita Puissance de sortie normale	17000W
AC	Maximum power Max. Ausgangsleistung Potenza massima d'uscita Puissance de sortie Max.	10000W	AC	Maximum power Max. Ausgangsleistung Potenza massima d'uscita Puissance de sortie Max.	12000W	AC	Maximum power Max. Ausgangsleistung Potenza massima d'uscita Puissance de sortie Max.	15000W	AC	Maximum power Max. Ausgangsleistung Potenza massima d'uscita Puissance de sortie Max.	17000W
IP	Ingress protection Eingangsenschutz Grado protezione protection de entree	IP65	IP	Ingress protection Eingangsenschutz Grado protezione protection de entree	IP65	IP	Ingress protection Eingangsenschutz Grado protezione protection de entree	IP65	IP	Ingress protection Eingangsenschutz Grado protezione protection de entree	IP65
Temp	Operating temperature range Betriebstemperaturbereich Temperatura di funzionamento Temperature de fonctionnement	-20~+60°C	Temp	Operating temperature range Betriebstemperaturbereich Temperatura di funzionamento Temperature de fonctionnement	-20~+60°C	Temp	Operating temperature range Betriebstemperaturbereich Temperatura di funzionamento Temperature de fonctionnement	-20~+60°C	Temp	Operating temperature range Betriebstemperaturbereich Temperatura di funzionamento Temperature de fonctionnement	-20~+60°C
Prot	Protection class Schutzklasse Classe di protezione Classe de protection	Class I	Prot	Protection class Schutzklasse Classe di protezione Classe de protection	Class I	Prot	Protection class Schutzklasse Classe di protezione Classe de protection	Class I	Prot	Protection class Schutzklasse Classe di protezione Classe de protection	Class I

Figure 5 Labels on SolarLake 10000TL, 12000TL, 15000TL and 17000TL inverter

3 Protection Devices

3.1 Auto shut down

SolarLake Inverters will be disconnected within a fraction of a second if grid power is lost or switched off to protect any person working on the grid supply. This facility corresponds with current national standards and regulations. SolarLake inverter is also equipped with automatic disconnection protection system to avoid any possible island operation.



Attention!
To learn details on possible malfunction of the inverter, please refer to section 8 of this manual.

3.2 Additional protection devices

SolarLake inverters are equipped with additional protection devices to ensure equipment and personal safety in case of problems. These protection features include:

- Continues monitoring of grid voltage and frequency to ensure that these are within the national regulation limits.
- Limit the power output of the inverter automatically based on the internal temperature so as to avoid overheating.
- Automatically measure the following parameters to ensure safe operation.
 - ✓ DC voltage of PV array;
 - ✓ Grid supply frequency across all the phases of three phase supply;
 - ✓ Internal temperature of inverter. I Input and output currents Output power of the inverter.

4 Installation

4.1 Packing list

Please ensure that the box contains all the materials mentioned in the packing list. If any item is missing or damaged please contact supplier immediately.

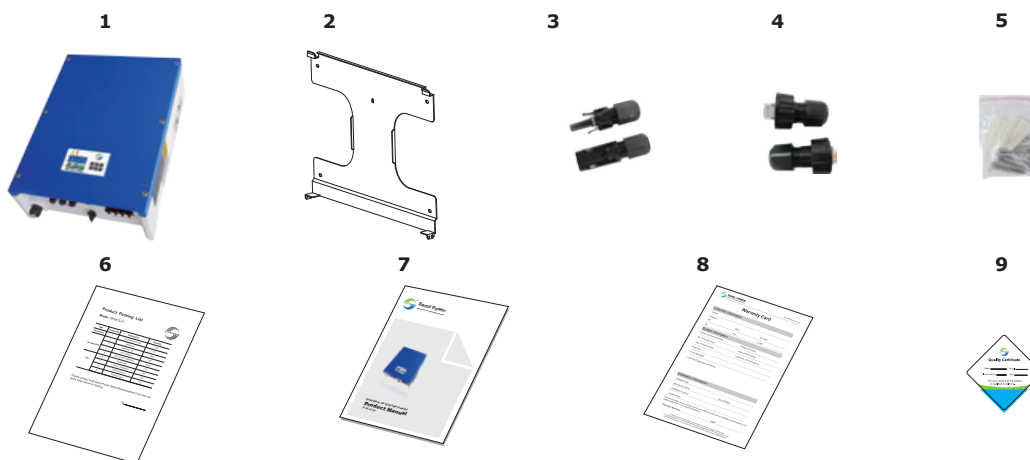


Figure 6 List of materials in the SolarLake box

Table 1 Packing list

No.	Description	QTY	Remark
1	SolarLake inverter	1	Screw package: 2 M4 screws, 5 ø6 screws, 5 expansion screws
2	Back panel	1	
3	Input DC connector	4	
4	RJ45	3	
5	Screw package	1	
6	Packing list	1	
7	Product manual	1	
8	Warranty card	1	
9	Quality certificate	1	

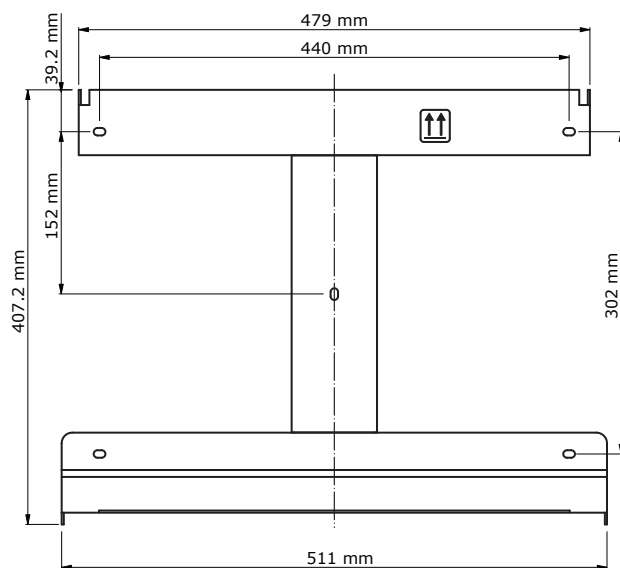


Figure 7 SolarLake 10000TL~17000TL Inverter Backboard

4.2 Safety instruction




Danger!

DC voltage can be as high as 1000V, three-phase AC voltage can be up to 400 V. Ensure AC/DC side are turned off before installing or maintaining the inverter.

Must strictly observe the following standard and specifications when installing, operating and maintaining SolarLake inverter.

1. Get permission from the local electricity supplier before connecting inverter to the grid.
2. All installation work must comply with local installation standards and regulations.
3. High voltage will be present when the inverter is working. Switch off AC/DC power and wait for at least 5 minutes before undertaking any maintenance work.
4. Some areas of the inverter could be very hot even after turning the inverter off.



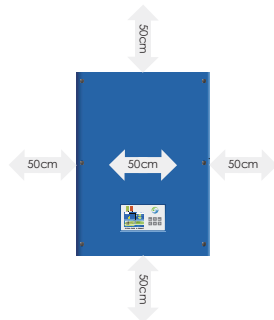
Warning!
Pay attention to the rated voltage and current when design the system.

4.3 Precaution

Before starting installation please check the site to ensure the following.

- Temperature at the site is likely to be within permitted range of -20°C to +60°C.
- Site altitude is less than 2,000m above sea level.
- Inverter not likely to be exposed to by sea water.
- Inverter is not close to corrosive gas or liquid (for example, avoid locations where chemicals are processed or poultry farm).
- Inverter is not exposed to direct sunlight.
- Not likely to be flooded or snowed in.
- Good ventilation .
- Not exposed to steam, vapor, or water.
- Not close to television antenna or antenna cable.

If the installation does not meet the above conditions, the product warranty may become void. Please provide the clearance shown in the drawing below as a minimum. Minimum clearance is essential for servicing product warranty.



Minimum space clearance needed

Position	Min. Size
Side	50cm
Top	50cm
Bottom	50cm
Front	50cm

Table 2 Minimum free space

Choose inverter installation position:

- Inverter must be installed on a solid surface which bears the weight of the inverter;
- Tilted degree should not exceed 15 degree, as figure 8:
- Terminals of inverter must be face down;
- Cannot be installed horizontally.

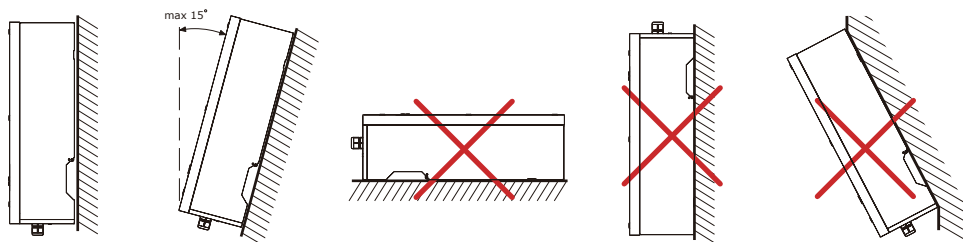


Figure 8 Incorrect installation

4.4 Preparation

Following tools may be needed for correct inverter installation.



Figure 9 Tools necessary for Installation

Tools: Crimping pliers, Screw drivers and Manual wrench and drill machine, and rubber hammer.

4.5 Installation steps

Step1: Drill holes on the wall using 8mm drill bit to match the size of bracket. Five holes matching the bracket are necessary for properly mounting the inverter. Insert the expansion pipe into the holes drilled, use rubber hammer to tap the pipe into the wall completely. Fix the bracket using screws and mount inverter as shown on diagrams below.

Step2: Mount the inverter on the narrow vertical section of the bracket.

Step3: Make sure the bracket and the inverter side screw holes are in line and match. Fix the side screws to keep inverter firm in place.

Step4: If necessary the inverter can be locked (lock not provided) to the bracket.

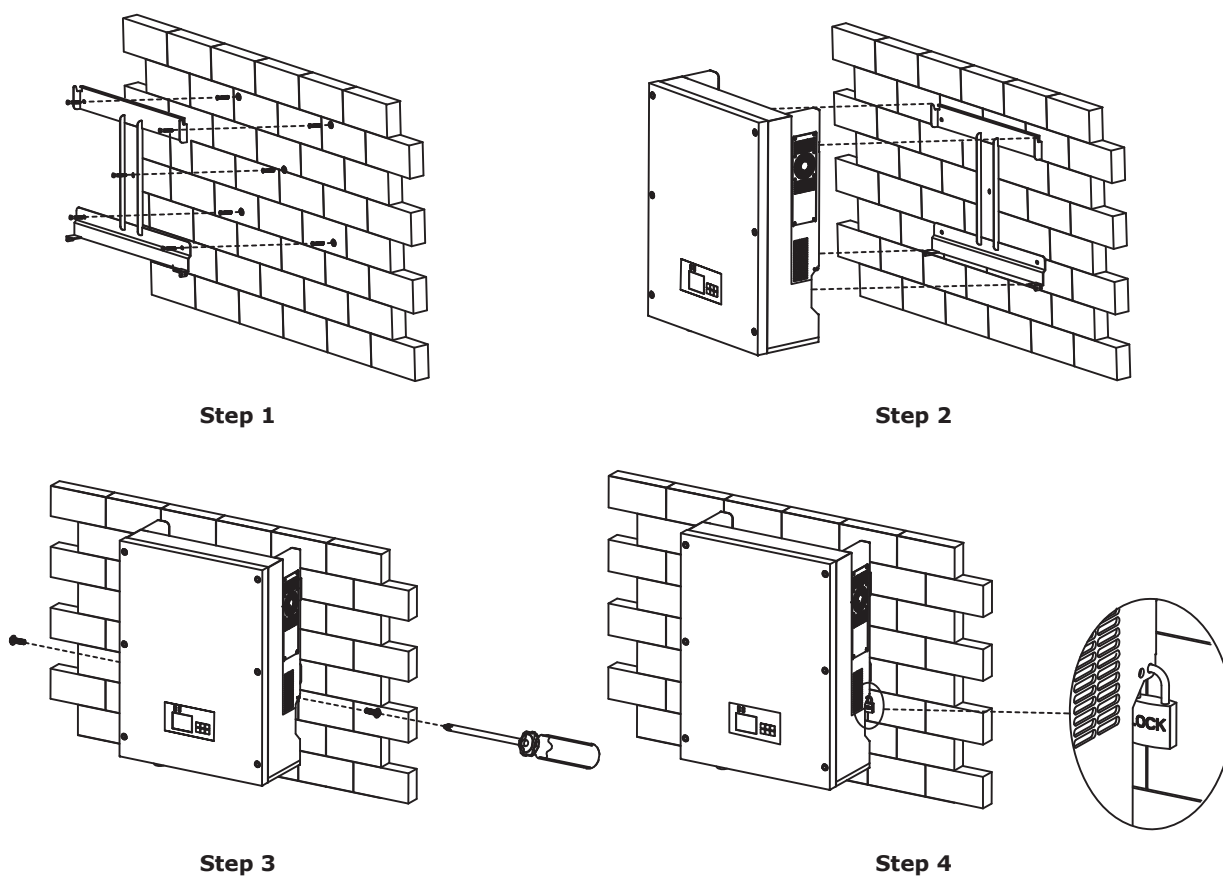


Figure 10 Inverter mounting steps

4.6 Connecting PV array to inveter

4.6.1 Notes



Warning!

Ensure that the DC side is not powered at the time of connecting. Note that the capacitors could be charged even after turning the inverter off, hence wait at least 5 minutes before opening the inverter lid.



Attention!

Only qualified and trained electrical engineers should install inverters.

- PV string input connection



Danger!

Before the electrical connection, make sure to use opaque material to cover the PV array or disconnect PV panels. While exposed to sun light, PV array will produce dangerous voltage.



Note!

There are 2 independent MPP trackers in Solar Lake inverters. PV arrays connected to each MPP tracker must be of the same make and model and receive the same solar radiation at all times.

4.6.2 PV array connection types

There are 2 independent MPP trackers in the SolarLake inverters. While common-string or multi-strings input connections can be used we suggest multi-strings to harvest max. PV energy.

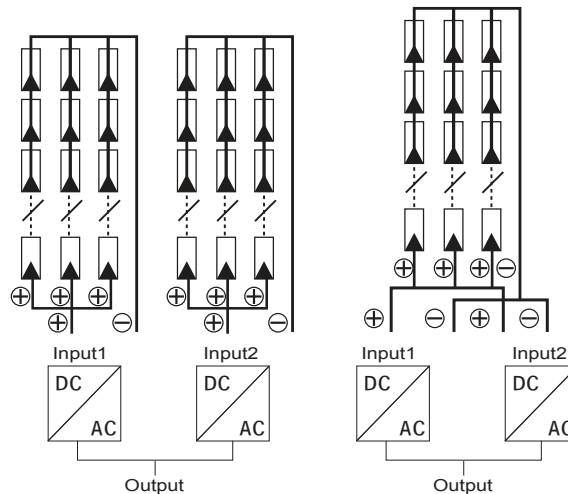


Figure 11 Multi-string input connection (Left) and common-string input connection (Right)

Note: Make sure to select the right PV string connection setting while commissioning. Please refer to parts 5.3 and 6.2 for details.

Please use good quality PV modules with Samil Power Inverters. Ensure that the open-circuit voltage of array is less than the Max. Input DC input voltage of the inverter. Also the operating voltage should be within the MPPT range of the inverter.

Table 3 DC Voltage Limits of SolarLake inverters

Model	SolarLake 10000TL	SolarLake 12000TL	SolarLake 15000TL	SolarLake 17000TL
MPPT voltage range	320~800 Vdc	380~800 Vdc	380~800 Vdc	430~800 Vdc
Max.DC voltage	1000 Vdc			

Please use standard PV cable to connect modules to inverter. Use fast action string fuses meeting Country regulations. Suggest the inverter is installed close PV module in order to reduce PV cables as well as reduce DC side losses.



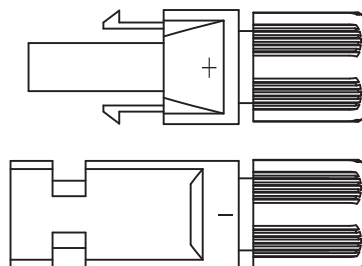
Note!

Please don't connect the PV panel positive or negative to ground except for thin film panels.

4.6.3 Assembly steps of DC connectors

4.6.3.1 Procedure

Step 1: Open the connector.



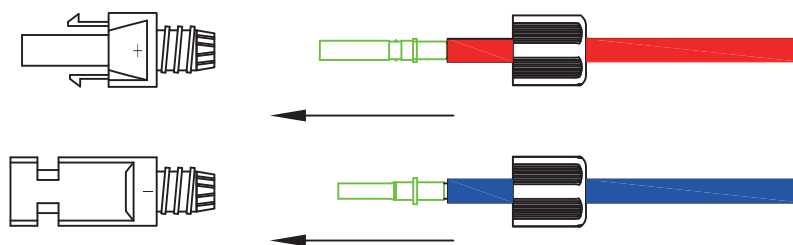
Step 2: Strip about 8mm length of insulation from the string cables, and then insert the bare wire core into core tube of connectors and crimp the connection using crimping tool.



Step 3: Insert the cable with the tube core into the fastening nut.

Step 4: Insert the core tube into slot of connection until clicked into place.

Step 5: Tight the nuts to complete the connection.

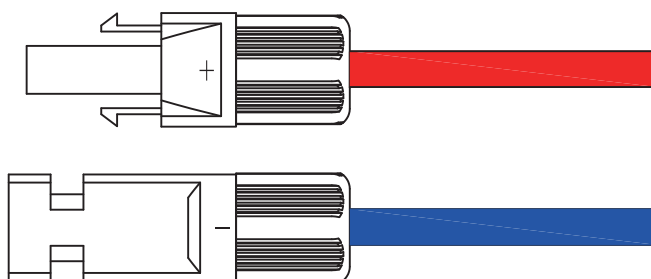


4.6.3.2 Electrical connections of DC side

Use string fuses and external DC switches on the string cables as per Country regulations.

Step 1: Check DC open circuit voltage of the strings to make sure that the voltages are within the inverter range. Do note that the voltage is subject to solar radiation.

Step 2: Connect the positive and negative string cables to the DC connectors on the inverter.



Step 3: Connect all the strings the same way.

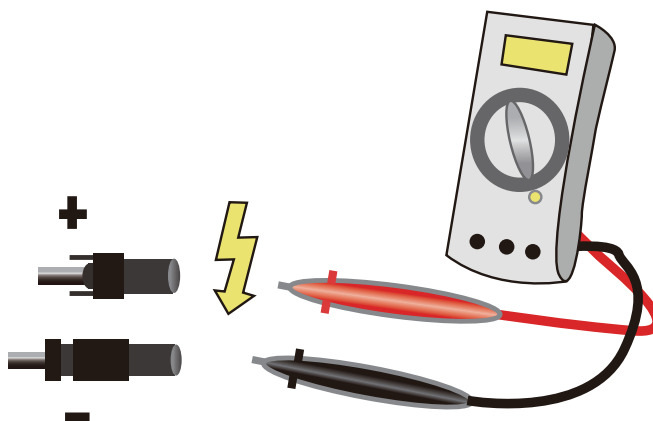



Figure 12 Use of Multimeter or other suitable meter to ensure polarity and open circuit voltage

Note: There are 4 pairs of DC terminals on SolarLake inverters. Left two are DC input terminals for MPPT 1 and marked PV1. The two on the right DC input terminals for MPPT 2 and marked PV2. Grounding of PV1 and PV2 should not be connected together, failure will result in fault message. Check the string cable polarity and voltage range before connection.



Warning!

DC string voltage is likely to be very high. Avoid contact with live cables and comply with all electric safety rules.

If any problem or concern is found with the String power, those need to be sorted out before connecting to the Inverter.

4.6.4 Assembly steps of AC connector

SolarLake series inverters are designed for three phases grid connection only. Voltage across phase can be $230\pm 20\%$, but these need to be set to Country regulations. Typical grid frequency is 50Hz.

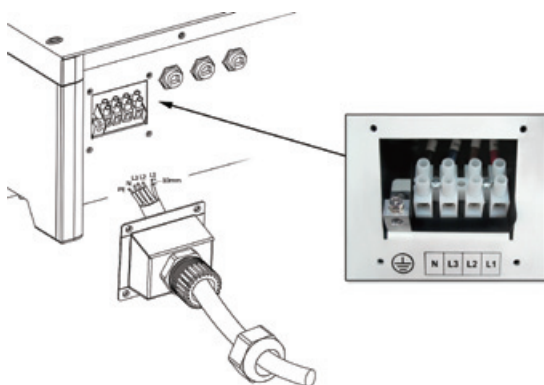


Figure 13 AC terminal block with facility for 5 wire connection

Table 4 Suggested Cable and Circuit Breaker Specifications

Model	SolarLake 10000TL	SolarLake 12000TL	SolarLake 15000TL	SolarLake 17000TL
Cable (Cu)	$\geq 4\text{mm}^2$	$\geq 4\text{mm}^2$	$\geq 6\text{mm}^2$	$\geq 6\text{mm}^2$
Micro-Breaker	25A	25A	32A	32A

Note: For safety reasons, suitable cables should be used. Unsuitable cable may lead to cable getting heated which could result in fire and serious risks.

Steps for AC output wiring

Step1: Open the cover on the AC connection terminal.

Step2: The 5 terminals are PE, N, L3(T), L2(S), L1(R). Route the 5 wire AC cable through the house tunnel, and connect to the correct terminal. The AC phase sequency need to be maintained correct for the inverter to work.

Step 3: Fix the terminal cover back

RCMU breaker should be installed between inverter and grid, and its rated fault current need to be $100\text{mA} \leq I_{fn} \leq 300\text{mA}$, 0.1S. No load should not be connected to the inverter directly.

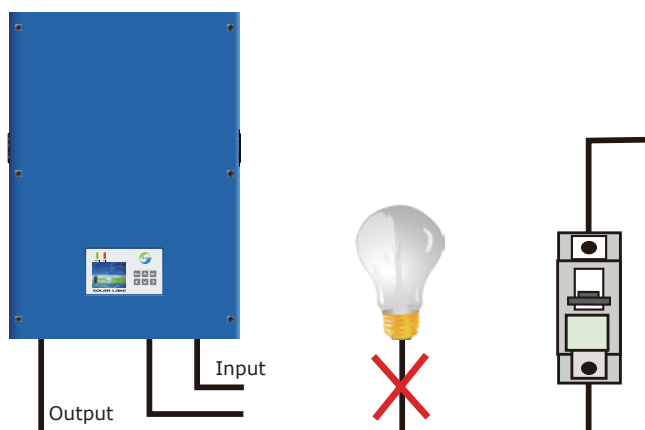


Figure 14 Example of incorrect load connections which should not be done

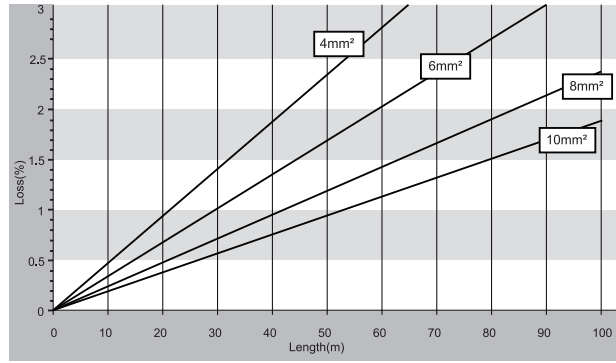


Figure 15 AC Cable Loss

4.6.5 Grounding



Attention!

As SolarLake inverters are Transformer less units, DC Positive or Negative terminals should be grounded. Failure will result in inverter damage.

All non-current-carrying metal parts should be connected to the earth.

PV String

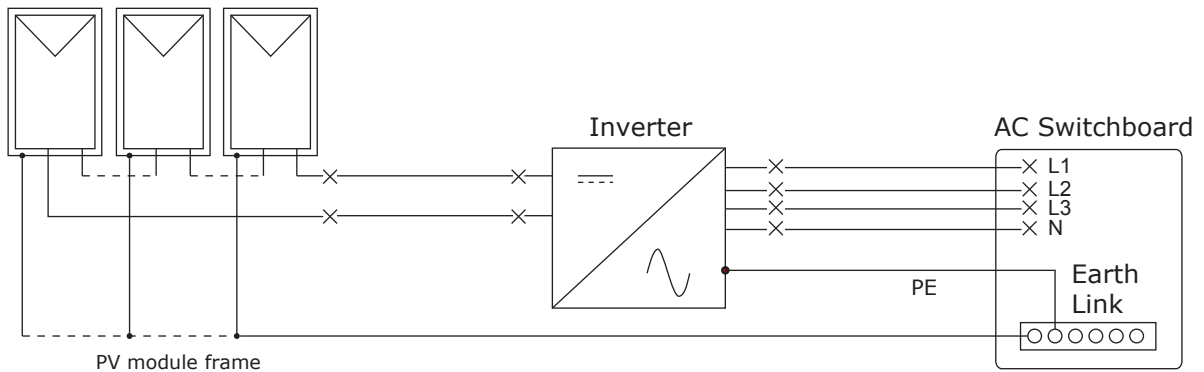


Figure 16 Grounding of the System

- For details of communication system wiring, refer to Part 7.2.2

4.7 Safety inspection before commissioning

PV array

Measure the Open circuit voltage of the each PV array to ensure that it is within the acceptable range of the inverter.

- Check and ensure polarity of the string cables.

Connection of string cables to inverter

Make sure that the DC Isolators are turned off before connecting string cables to inverter.

Connection grid power to inverter

Make sure that the AC Isolator is turned off before connecting grid supply to the inverter. Ensure that the AC voltage between the three phases and neutral are with in acceptable range and the cables are wired in in the correct order.

5 Commissioning of inverter

5.1 Start inverter



Attention!

Ensure that DC and AC voltages are within the range permitted by the inverter.

Step 1: Turn on all DC switch one after the other.

Step 2: If inverter is being switched on first time, the country setting and PV array connection type will need to be set as explained in part 5.3. (The default setting of PV array connection type: Multi-string input connection)

Step 3: Turn on AC switch;

When the solar arrays generate adequate power, the inverter will startup automatically. Display showing "normal" indicates correct operation. If the display shows error message "permanent", press key "ESC" key to go to main menu, and go to "Event list", and press "OK". It shows fault code "inv 44" the phase sequence of AC grid is wrong. Following action should be taken to correct the fault.

1. Turn off AC and DC switches.
2. Wait for 5 minutes.
3. Disconnect AC line cables and connect back in the correct order..
4. Turn on AC and DC switches.

If the inverter indicates any other fault, please refer to part 8—error messages for help.



Note!

If the inverter shows faults, please refer to part 8—error messages.

5.2 Check country setting and PV array connection type

It is essential to ensure that the inverter is set to the correct Country Regulations and String layout as explained below.

5.2.1 Checking Country setting

Inverter should enter standard interface automatically after startup (If not, press "ESC" to go to standard interface) shown in figure 17.

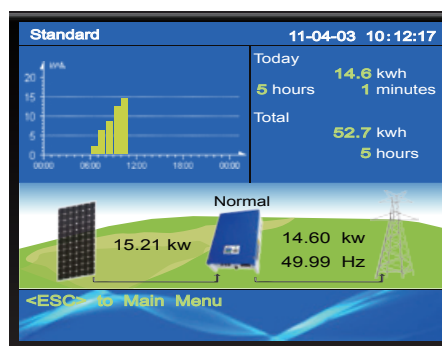


Figure 17 Standard interface display

In the standard interface display press "ESC" button to enter the main menu shown in figure 18.

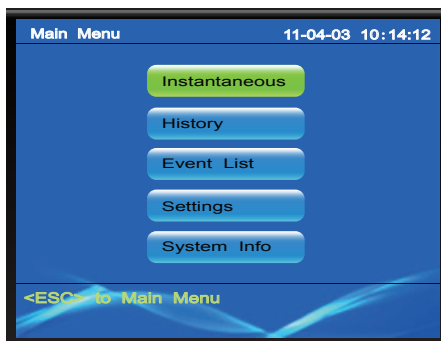


Figure 18 Main menu

Press the "down arrow key" to move the cursor to Settings and press "OK" key to enter setup interface, shown in figure 19.



Figure 19 Setup interface display

Click on "Country" and OK to enter the local country setting interface shown in figure 20.



Figure 20 Local country setting interface

Select the correct Country setting and OK it. The inverter may ask for a password which is 000111. Enter the password and press "OK" to confirm the selection. The display should return to standard interface.



Note!

When setting Country, PV array connection type and Factory reset , please use password 000111.

5.2.2 Programming PV array connection type

Enter setup interface as explained earlier and select Input.

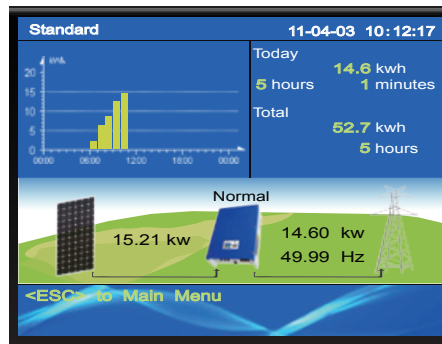


Figure 21 Standard interface

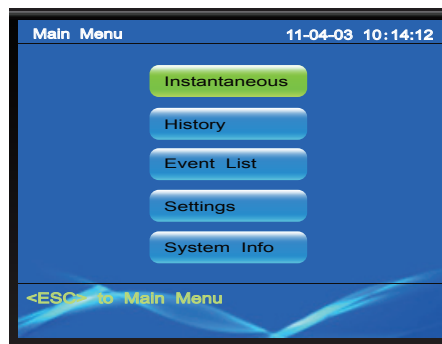


Figure 22 Main menu



Figure 23 Setup interface

Select " Input" and opt Multi-String. As shown in figure 24.

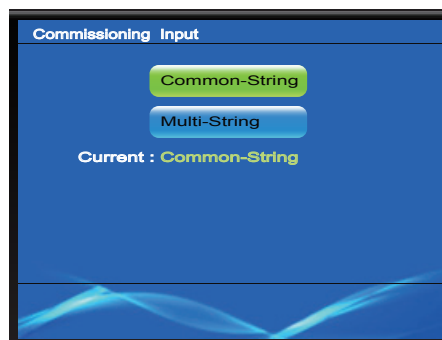


Figure 24 Type of PV array connection

Please refer to section 4.6.2" PV array connection types " for information on PV array connection options.

6 Operation

6.1 Control and display panel

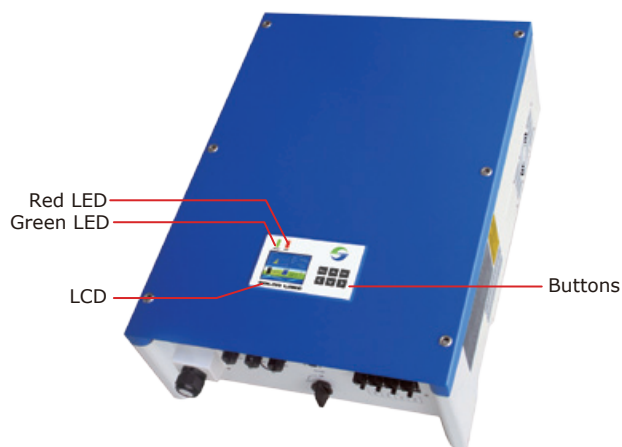


Figure 25 Display and control panel

There are 6 buttons next to the display for programming the inverter.

OK: to confirm selection.

ESC: to exit current screen or selection

Up: to move up or increase value

DOWN: to move down or decrease value.

RIGHT: to move right or increase the backlight.

LEFT: to move cursor left or decrease the backlight.

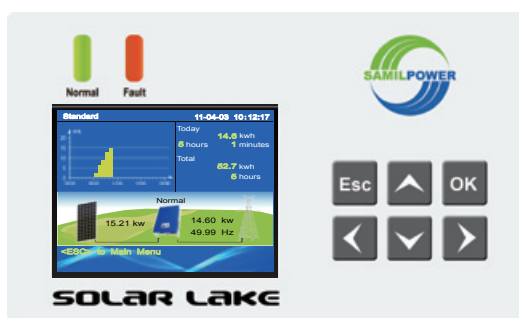


Figure 26 Display and keys

There are two LEDs on the front panel of the inverter to indicate inverter operation status.

Table 5 LED statuses

LED	ON	FLASHING	OFF
GREEN LED	Normal operation	Waiting or Checking state, or starting up.	Possible fault
RED LED	Fault	Possible recoverable fault	Normal

Wait State: Inverter is waiting to Check State at the end of reconnection time. In this state, the PV voltage is more than 250V and grid voltage value is between the max and min limits; If not, Inverter will go to Fault State or Permanent State.

Check State: Inverter is checking isolation resistor, relays, and other safety requirements. It also does self-test to ensure inverter software and hardware are functional. Inverter will go to Fault State or Permanent State if any error or fault occurs.

Normal State: Inverter is feeding power to the grid.

Fault State: Inverter has encountered recoverable error. It should recover if the errors disappear. If Fault State continues check the inverter according error code in table 6,7,8, and 9.

Permanent State: Inverter has encountered unrecoverable error. It will stay in the Permanent State till corrective action is taken.

6.2 LCD settings

6.2.1 Standard interface

Standard interface is shown in figure 27.

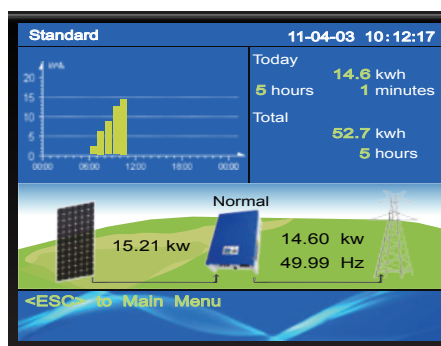


Figure 27 Standard interface

6.2.2 Main menu

In the standard interface press "ESC" button to enter the main menu shown in figure 28.



Figure 28 Main menu

6.2.3 Instantaneous data

Enter " Instantaneous" to see input and output voltages, current, power, temperature, and other real-time information.

6.2.4 Historical data

Enter " History" to see the power generation histogram of every hour. By pressing the left or right arrow one can see the DC input power curve, the AC output power curve, daily energy production for a month and also total output data.

6.2.5 Event list

Enter " Event List" to see the list of events recorded by the inverter. Up to 100 recent events recorded can be viewed by pressing "OK" one can see detailed information, including the occurrence time and error code.

6.2.6 Restore factory settings

It is possible to reset the inverter to factory set if that is necessary. A password will be required for this operation.

Date and time settings

Date and time settings interface as shown in figure 29, set according to the local date and time. Then, press "OK" key to enter the next step.

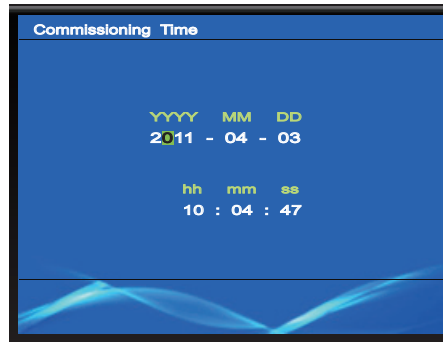


Figure 29 Date and time settings

Check boot settings information

LCD will display the settings information. Please check the settings information. If settings is wrong, please press the "ESC" key to reset. If all the information is correct, please press "OK" to confirm, the inverter will save all the settings. As shown in figure 30.

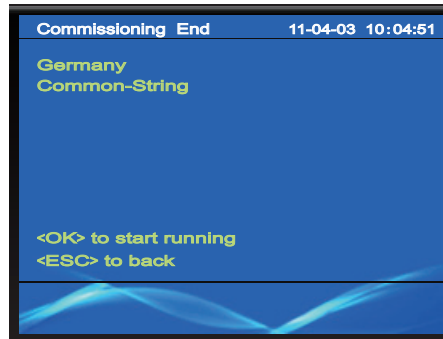


Figure 30 Check boot settings information

6.2.7 Autotest procedure - Italy only

This function is available only when ITALY is selected as country set.



Figure 31 Autotest selection for Italy only

Operate a new AutoTest according to "GUIDA PER LE CONNESSIONI ALLA RETE ELETTRICA DI ENEL DISTRIBUZIONE, Ed. 2.2, Dicembre 2011"

1. Before performing the AutoTest, confirm that the country setting "Italy" and that the inverter is running in normal state.
2. On the display Main Menu find Settings → AutoTest Ita. as per fig.35 and press OK. Then select "New Autotest", press OK, and after few seconds, you can see "(OK) to start Grid R V_max" on the LCD.
3. Press OK button to start grid R V_max test, or press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until test is over.
4. After grid R V_max test is over, the LCD will show the result and "(OK) to start V_min". The inverter will reconnect automatically.
5. Press OK button to start grid R V_min test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until test is over.
6. After grid R V_min test is over, the LCD will show the result and "(OK) to start F_max". The inverter will reconnect automatically.
7. Press OK button to start grid R F_max test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.
8. After grid R F_max test is over, the LCD will show the result and "(OK) to start F_min". The inverter will reconnect automatically.
9. Press OK button to start grid R F_min test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.
10. After grid R F_min test is over, the LCD will show the result and "(OK) to start Grid S V_max". The inverter will reconnect automatically.
11. Press OK button to start grid S V_max test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.
12. After grid S V_max test is over, the LCD will show the result and "(OK) to start V_min". The inverter will reconnect automatically.
13. Press OK button to start grid S V_min test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.
14. After grid S V_min test is over, the LCD will show the result and "(OK) to start F_max". The inverter will reconnect automatically.
15. Press OK button to start grid S F_max test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.

- 16.** After grid S F_max test is over, the LCD will show the result and "(OK) to start F_min". The inverter will reconnect automatically.
- 17.** Press OK button to start grid S F_min test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.
- 18.** After grid S F_min test is over, the LCD will show the result and "(OK) to start Grid T V_max", The inverter will reconnect automatically.
- 19.** Press OK button to start grid T V_max test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.
- 20.** After grid T V_max test is over, the LCD will show the result and "(OK) to start V_min".The inverter will reconnect automatically.
- 21.** Press OK button to start grid T V_min test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.
- 22.** After grid T V_min test is over, the LCD will show the result and "(OK) to start F_max".The inverter will reconnect automatically.
- 23.** Press OK button to start grid T F_max test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.
- 24.** After grid T F_max test is over, the LCD will show the result and "(OK) to start F_min". The inverter will reconnect automatically.
- 25.** Press OK button to start grid T F_min test. Alternatively press ESC button to exit from "New Autotest". If there is no button operation within 5 seconds, the test will start automatically. If the test has started, key operation is invalid until this test is over.
- 26.** After grid T F_min test is over, the LCD will show the result and "(Esc) to exit". The inverter will reconnect automatically.
- 27.** The autotest function is considered successful once all the previous 12 tests have been performed. When LCD shows "(Esc) to exit", press ESC button to exit from "New Autotest".
- Note:** If an unexpected grid disconnection occurs during the autotest, the autotest is interrupted. The LCD will show "AutoTest break! (OK) to exit". Press OK button or ESC button to exit from "New Autotest". Disconnect the AC breaker from all 3 phases and prevent it from being reactivated, disconnect the DC switch for 5 minutes and connect it again. The inverter is now initializing and the autotest procedure can be restarted.
- Note:** If user exits from "New Autotest" when any of the previous 12 tests haven't been performed yet, the inverter will not record any of the test results.
- Procedure of viewing AutoTest results from the inverter's LCD**
- Enter Main Menu, then enter Settings sub-menu, select "AutoTest.", then select "Last Results", press OK button, the LCD will show the latest results' time in terms of a list. The latest result shows on the top. Press DOWN or UP button to select a result and press OK to view the detail. When entering the detail screen, test results of grid R are shown, press RIGHT or LEFT button to view other phases' results. Press ESC button to exit from detail screen.
- Procedure of viewing AutoTest results from PC**
- Note:** After a new AutoTest is finished, the results' data can be sent to a PC through the RS-232 port between the inverter and PC, a "txt" format report can be automatically created. The detailed operation procedures are as follows:
- 28.** Open the "Enel.exe" file shown in figure 31 in PC(User can request "Enel.exe" application software at info@samilpower.com), a "Report" folder will created in the same "Enel.exe" file directory, and each "txt" report generated will be stored into the "Report" folder, as shown in Figure 32.



Figure 32



Figure 33

29. Select the corresponding models and communication port (PC and the inverter connection port: com1 ~ com9), as shown in figure 34 and figure 35.

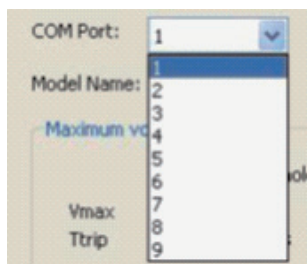


Figure 34

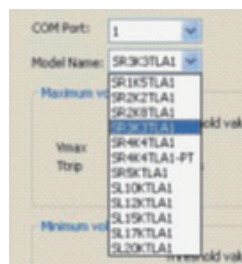


Figure 35

30. By clicking "OK" button, the "software Enel.exe" automatically reads the inverter's LATEST test data, and generates a "txt" format report, as shown in figure 36 and figure 37.

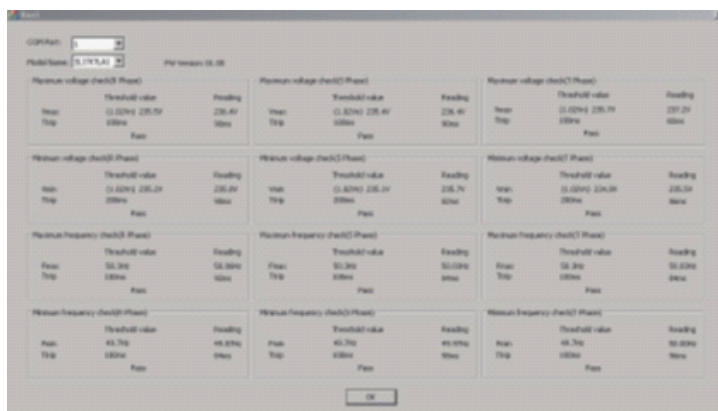


Figure 36

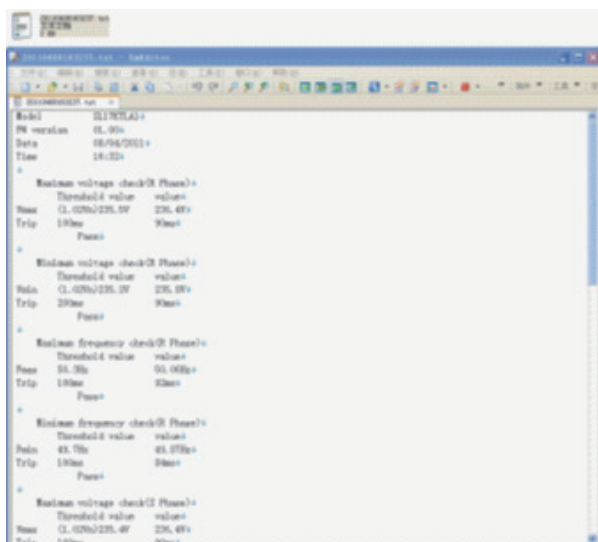


Figure 37

31. If you click "OK" button, a warning message as shown in figure 38 appears, please check the RS-232 communication connection between the Inverter and PC.

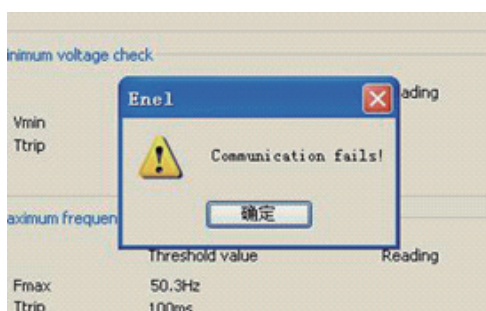


Figure 38

In figure 38, press any arrow key to move the cursor to the " System Info" and then press "OK", you will see the machine serial number, software version and so on. Press "ESC" and will return to the superior interface progressively.

6.3 LCD Function

LCD shows the information that most user are interested in. When the inverter operates normally, pressing any button will light up the display and show the standard interface.

If no key is operated for 60 seconds, the backlight will be turned off.

Note: After factory reset LCD background light will not shut down automatically.

6.4 CEI 0-21

The followings items can be set by Solar Browser

1. Fixed cosphi setting :Set cosphi to a fixed value.
2. Fixed reactive power setting: Set reactive power to a fixed value.
3. Cosphi=f(P):Cosphi as a function of active power generated by the inverter.
4. Q=f(V): Reactive power as a function of the grid voltage measured by the inverter.
5. P=f(F): Active power as a function of the frequency measured by the inverter.

- 6. LVRT: Low voltage ride through enabled and low voltage ride through parameter setting.
- 7. Active power derating settings
- 8. Safety parameters setting

Steps of the settings are as followings:

Step 1: Connect your laptop to the 485 port of inverter with an Ethernet cable and run Solar Power Browser (V2.10.0.0 or higher). If the connection is successful, the serial number of the inverter will be displayed in the left navigation bar.

A: Click "Inverters", interface is shown as the following figure. You can configure parameters conforming to standard CEI 0-21 all the inverters which connected to Solar Browser. Detailed settings refer to step 2.



Figure 39

B: Click the serial number, the interface is shown as following figure, set the safety parameters of this inverter. Detailed settings refer to step 3.



Figure 40

Setp 2: Click "CEI0-21/A70" on the top of navigation bar, configure parameters conforming to standard of CEI 0-21

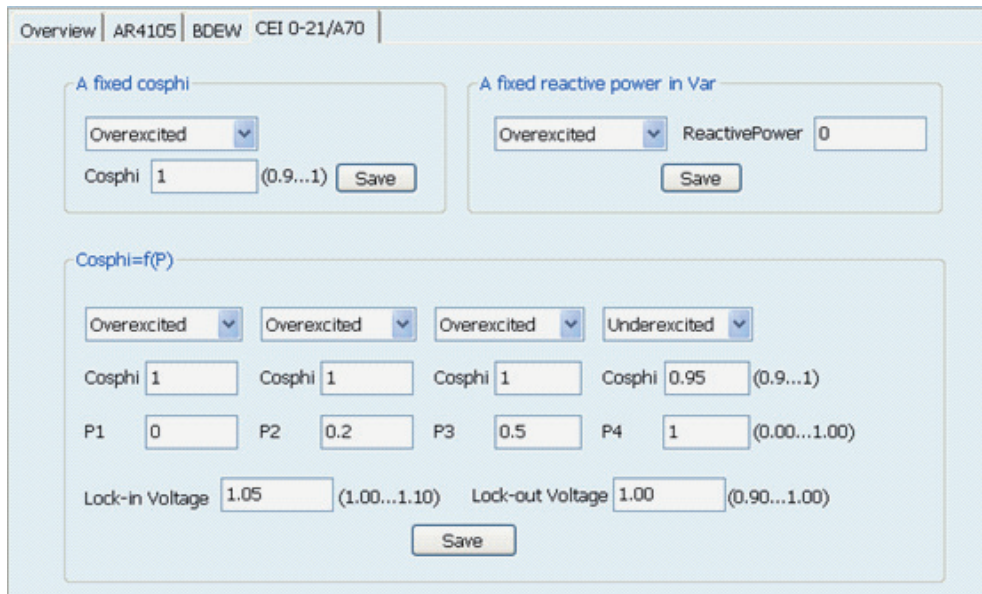


Figure 41

A: Fixed cosphi setting, as the following figure. Click on the drop-down menu, select Overexcited or Underexcited, fill in the cosphi value which range from 0.9 to 1.

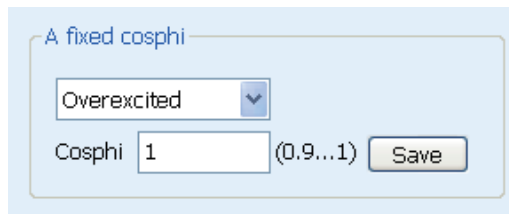


Figure 42

B: Fixed reactive power settings, as the following figure. Click on the drop-down menu, select Overexcited or Underexcited, fill in the reactive power which unit is Var.

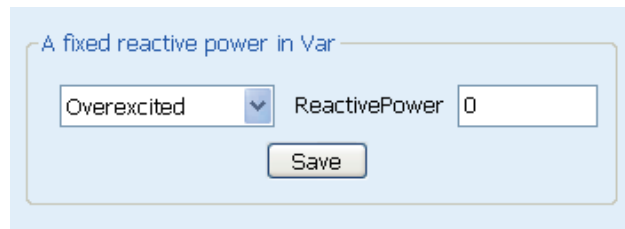


Figure 43

C: $\text{cosphi}=f(P)$, as the following figure. Click on the drop-down menu, select Overexcited or Underexcited, fill in cosphi value, ratio of P and Pn. Lock-in Voltage, Lock-out Voltage correspond to the voltage value of the reactive power production or not.

Cosphi=f(P)

Overexcited Overexcited Overexcited Underexcited

Cosphi 1 Cosphi 1 Cosphi 1 Cosphi 0.95 (0.9...1)

P1 0 P2 0.2 P3 0.5 P4 1 (0.00...1.00)

Lock-in Voltage 1.05 (1.00...1.10) Lock-out Voltage 1.00 (0.90...1.00)

Save

Figure 44

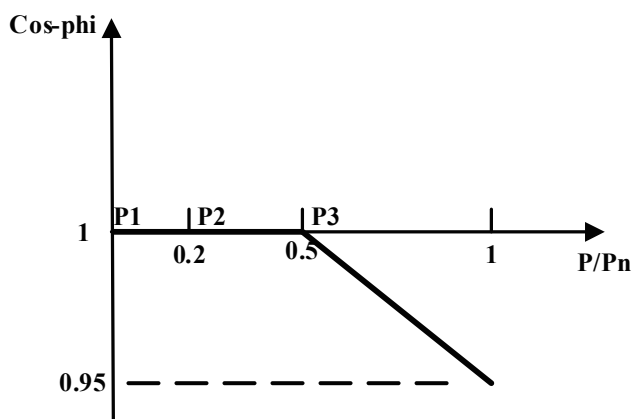


Figure 45

D: $Q=f(V)$, as the following picture. Parameters displayed are default parameters. U1s, U2s, U1i, U2i are the settable four points of Q value which range from 0.90-1.10, Lock-in Power, Lock-out Power correspond to the active power value of the reactive power production or not. Mode A and mode B refer to the following figures.

Q=f(V)

Mode A

V1s 1.08 (0.90...1.10) V1i 0.92 (0.90...1.10) Lock-in Power 0.20 (0.10...1.00)

V2s 1.10 (0.90...1.10) V2i 0.90 (0.90...1.10) Lock-out Power 0.05 (0.00...1.00)

Save

Figure 46

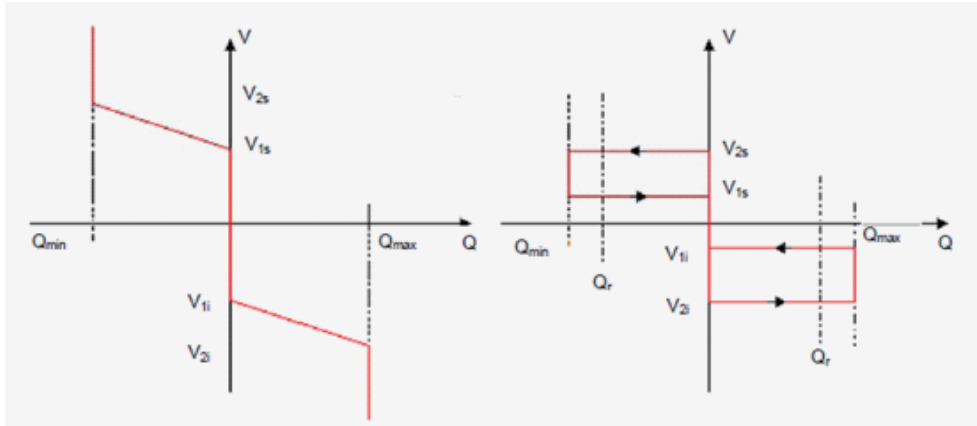


Figure 47

E: Low voltage ride through setting, as the following picture. Parameters displayed are default parameters . U/Uc and T are 4 points of LVRT.

LVRT

Mode

U/Uc(%) U/Uc(%) U/Uc(%) U/Uc(%) (0...100%)

T1(ms) T2(ms) T3(ms) T4(ms)

Figure 48

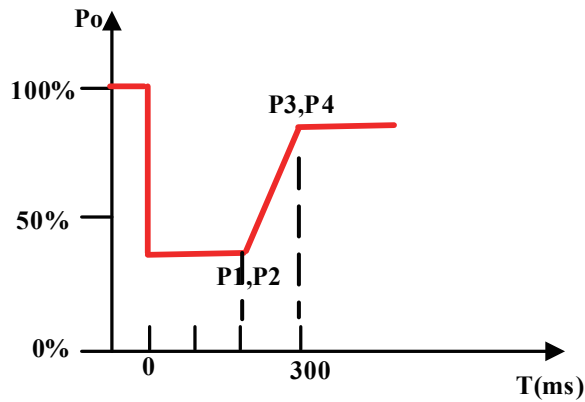


Figure 49

F: $P=f(F)$, as the following picture. Slope range is 2%-5%, the default slope is 2.4%.

P=f(F)

Slope % (2%...5%)

Mode

Figure 50

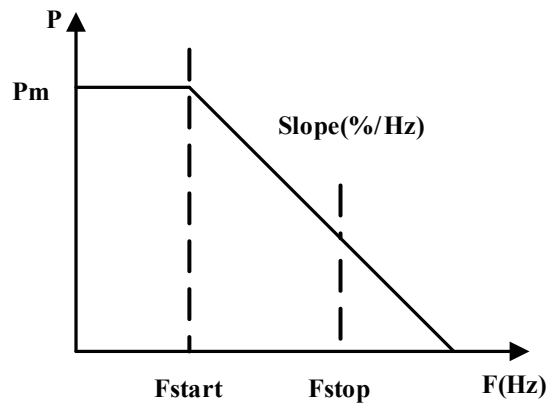


Figure 51

G: Active power derating settings, as the following picture. Fill in the ratio of the active power and rated active power, the range is 0%-100%, and the default is 100%.

Power Reducer

Active Power In % (0...100%)

Figure 52

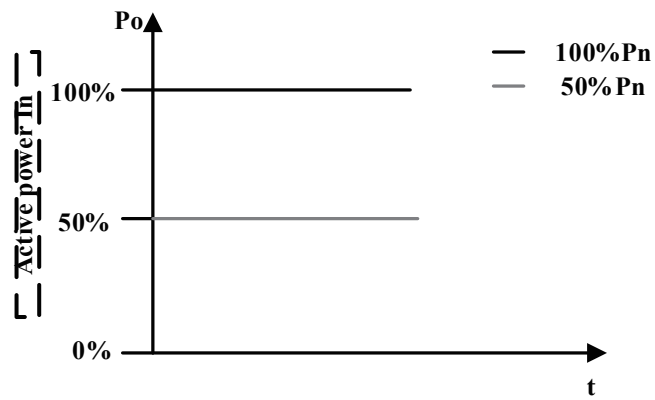


Figure 53

Step 3: Inverter safety parameters setting, as the following picture. Before setting, click "Read" to refresh current data then set parameters, click "save" at last. The following picture shows default parameters of CEI 0-21.

Parameter Name	Value	Disconnection time(0.02-5S)	Value	
Over voltage of grid stage 1 (1-1.3Un)	1.15	Disconnection time(0.02-5S)	0.30	
Over voltage of grid stage 2 (1-1.35Un)	1.21	Disconnection time(0.02-5S)	0.10	
Under voltage of grid stage 1 (0.1-1Un)	0.85	Disconnection time(0.02-5S)	0.10	
Under voltage of grid stage 2 (0-1Un)	0.40	Disconnection time(0.02-5S)	0.10	
Over frequency of grid stage 1 (50-56Hz)	51.50	Disconnection time(0.02-5S)	0.90	
Over frequency of grid stage 2 (50-57Hz)	52.00	Disconnection time(0.02-5S)	0.20	0.00
Under frequency of grid stage 1 (44-50Hz)	47.50	Disconnection time(0.02-5S)	3.90	
Under frequency of grid stage 2 (43-50Hz)	47.00	Disconnection time(0.02-5S)	0.20	0.00
Over voltage of Start / Re-connection (1-1.2Un)	1.10			
Under voltage of Start / Re-connection (0.8-1Un)	0.85			
Over frequency of Start / Re-connection (49-56Hz)	50.10			
Under frequency of Start / Re-connection (44-51Hz)	49.90			
Start time (0-900S)	30			
Re-connection time (0-900S)	300			

Figure 54

Parameters explanation:

Name	Explanation
Over voltage of grid stage 1	Over voltage protection (U>), the range is 1.00~1.30Un; protection time is (T>) 0.02~5.0s.
Over voltage of grid stage 2	Over voltage protection (U>>), the range is 1.00~1.30Un; protection time is (T>>) 0.02~5.0s.
Under voltage of grid stage 1	Under voltage protection (U<), the range is 1.00~1.30Un; protection time is (T<) 0.02~5.0s.
Under voltage of grid stage 2	Under voltage protection (U<<), the range is 1.00~1.30Un; protection time is (T<<) 0.02~5.0s.
Over frequency of grid stage 1	Over frequency protection (F>), the range is 50.00~52.00 Hz; protection time is (T>) 0.02~5.0s.
Over frequency of grid stage 2	Over frequency protection (F>>), the range is 50.00~52.00 Hz; protection time is (T>>) 0.02~5.0s.
Under frequency of grid stage 1	Under frequency protection (F<), the range is 47.00~50.00 Hz; protection time is (T<) 0.02~5.0s.
Under frequency of grid stage 2	Under frequency protection (F<<), the range is 47.00~50.00 Hz; protection time is (T<<) 0.02~5.0s.
Over voltage of start/ Re-connection	Upper limit of start voltage, the range is 1.00~1.10Un
Under voltage of start/ Re-connection	Lower limit of start voltage, the range is 0.85~1.00Un

Continued:

Over frequency of start/ Re-connection	Upper limit of start frequency, the range is 49.00~51.00Hz
Under frequency of start/ Re-connection	Lower limit of start frequency, the range is 49.00~51.00Hz
Start time	Count down of start, the range is 0~900s
Re-connection time	Count down of fault, the range is 0~900s

6.5 BDEW

The followings items can be set by Solar Browser

1. Fixed cosphi setting: Set cosphi to a fixed value.
2. Fixed reactive power setting: Set reactive power to a fixed value.
3. Cosphi=f(P): Cosphi as a function of active power generated by the inverter.
4. $Q=f(V)$: Reactive power as a function of the grid voltage measured by the inverter.
5. $P=f(F)$: Active power as a function of the frequency measured by the inverter.
6. LVRT: Low voltage ride through enabled and low voltage ride through parameter setting.
7. Active power derating settings
8. Safety parameters setting

Steps of the settings are as followings:

Step 1: Connect your laptop to the 485 port of inverter with an Ethernet cable and run Solar Power Browser (V2.04 or higher). If the connection is successful, the serial number of the inverter will be displayed in the left navigation bar.

A: Click "Inverters", interface is shown as the following figure. You can configure parameters conforming to standard BDEW all the inverters which connected to Solar Browser. Detailed settings refer to step 2.



Figure 55

B: Click the serial number, the interface is shown as following figure, set the safety parameters of this inverter. Detailed settings refer to step 3.



Figure 56

Step 2: Click "BDEW" on the top of navigation bar, configure parameters conforming to standard of BDEW

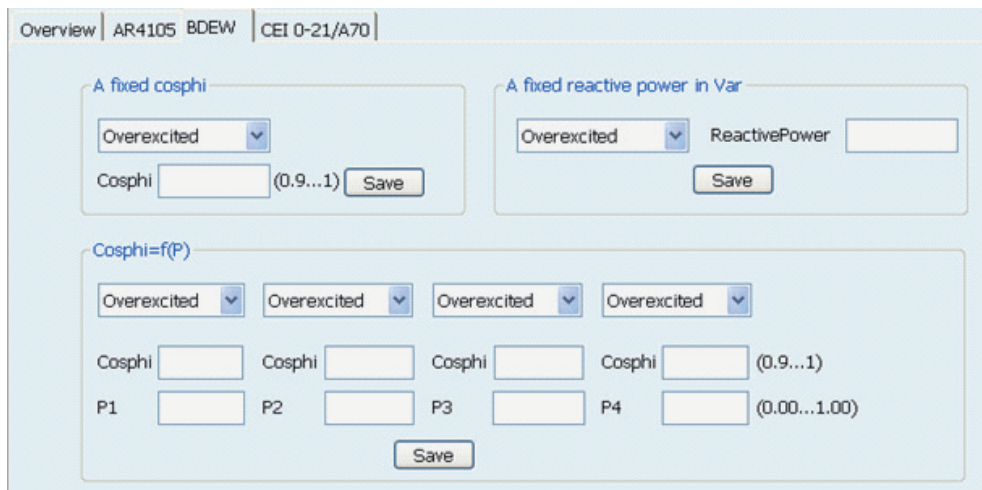


Figure 57

A: Fixed cosphi setting, as the following figure. Click on the drop-down menu, select Overexcited or Underexcited, fill in the cosphi value which range from 0.9 to 1.

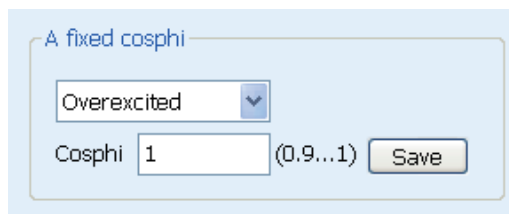


Figure 58

B: Fixed reactive power settings, as the following figure. Click on the drop-down menu, select Overexcited or Underexcited, fill in the reactive power which unit is Var.

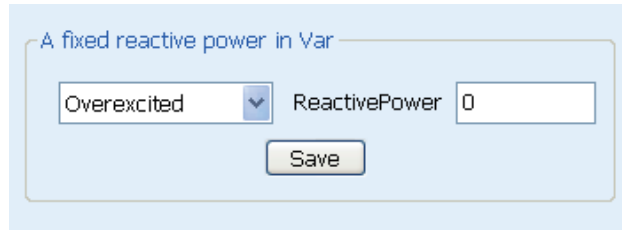


Figure 59

C: $\text{cosphi}=f(P)$, as the following figure. Click on the drop-down menu, select Overexcited or Underexcited, fill in cosphi value, ratio of P and Pn.

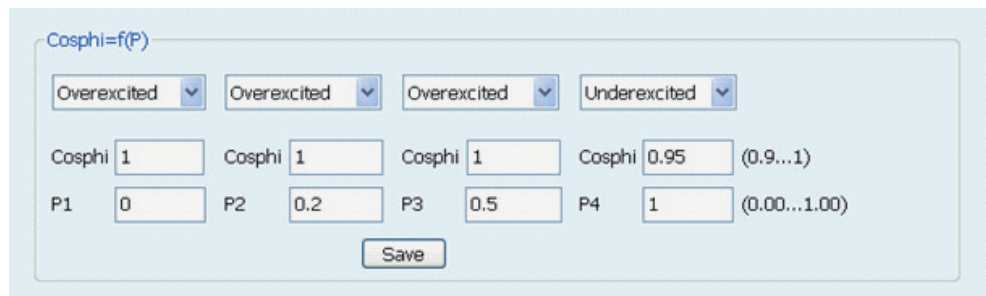


Figure 60

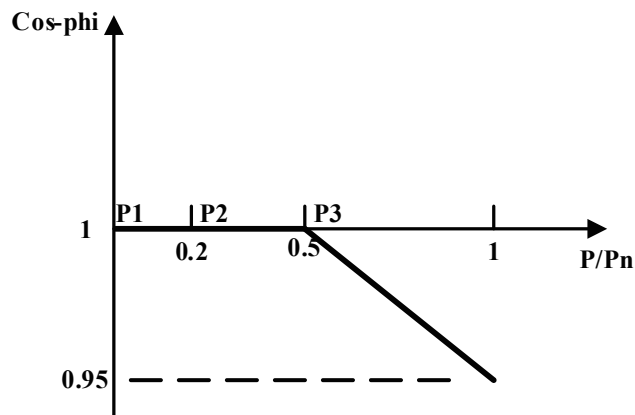


Figure 61

D: $Q=f(V)$, as the following picture. Parameters displayed are default parameters.

“Reactive Power Drop Mode” as the following figure. Click on the drop-down menu, select Overexcited or Underexcited.

Symmetrical Limit For Maximum Reactive Power is to limit the reactive power.

“Adjustment Time For Charact. Curve Operating Poir” specifies the corresponding time of the voltage set-point step to the time at which the reactive power reaches the set-point.

“Specified Voltage UQ0” is the fundamental voltage when the reactive power is zero.

“Reactive Power Gradient” and “Voltage Spread” must be combined together to determine the gradient of Reactive Power. In other words, The figure of “Voltage Spread” corresponds to the figure of “Reactive Power gradient”.

Make an example as following figure.

A reactive power/voltage characteristic Q(U)

Reactive Power Drop Mode	Overexcited
Reactive Power Gradient	10 % (0.0...10.0%)
Symmetrical Limit For Maximum Reactive Power	48 % (0.0...50.0%)
Adjustment Time For Charact. Curve Operating Poir	2 s (2s...60s)
Specified Voltage UQ0	100 % (80...120%)
Voltage Spread	1 % (0.0...20.0%)

Figure 62

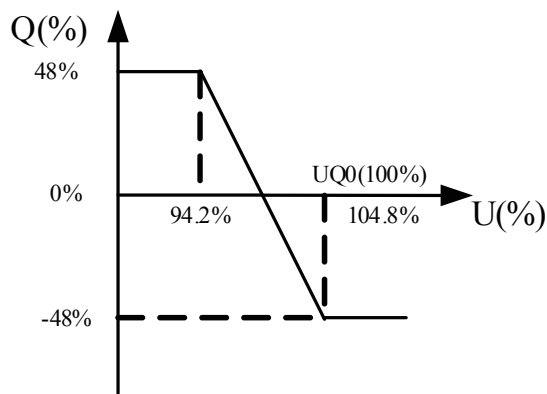


Figure 63

E: Low voltage ride through setting, as the following picture. Parameters displayed are default parameters . U/Uc and T are 4 points of LVRT.

LVRT

Mode

U/Uc(%)	<input type="text" value="30"/>	U/Uc(%)	<input type="text" value="30"/>	U/Uc(%)	<input type="text" value="90"/>	U/Uc(%)	<input type="text" value="90"/>	(0...100%)
T1(ms)	<input type="text" value="600"/>	T2(ms)	<input type="text" value="600"/>	T3(ms)	<input type="text" value="2000"/>	T4(ms)	<input type="text" value="2000"/>	

Figure 64

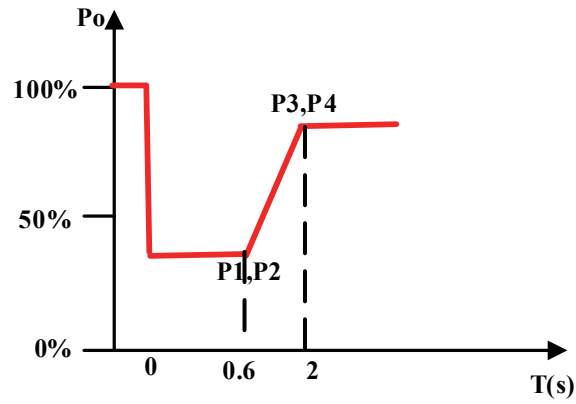


Figure 65

F: $P=f(F)$, as the following picture. Slope range is 2%-5%, the default slope is 5%.

P=f(F)

Slope % (2%...5%)

Mode

Figure 66

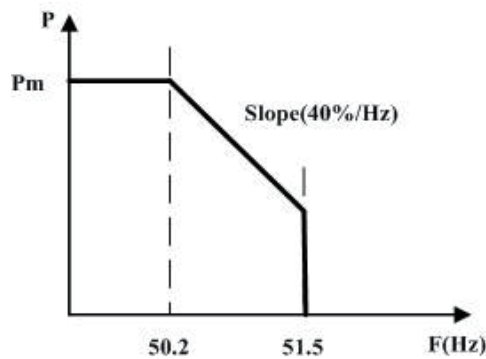


Figure 67

G: Active power derating settings, as the following picture. Fill in the ratio of the active power and rated active power, the range is 0%-100%, and the default is 100%.

Power Reducer

Active Power In % (0...100%)

Figure 68

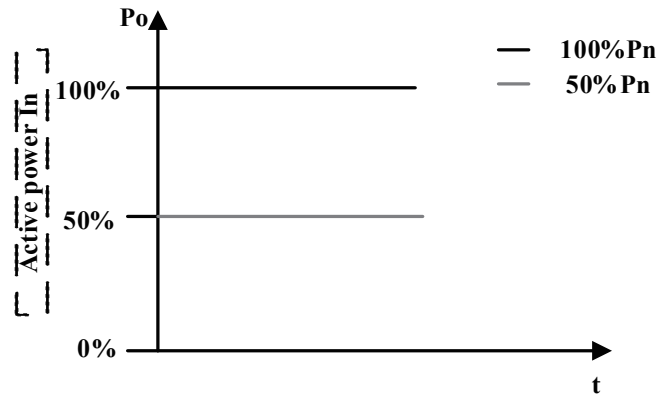


Figure 69

Setp 3: Inverter safety parameters setting, as the following picture. Before setting, click "Read" to refresh current data then set parameters, click "save" at last. The following picture shows default parameters of BDEW.

Parameters			
Over voltage of grid stage 1 (1-1.3Un)	1.20	Disconnection time(0.02-5S)	0.10
Over voltage of grid stage 2 (1-1.35Un)	1.30	Disconnection time(0.02-5S)	0.10
Under voltage of grid stage 1 (0.1-1Un)	0.80	Disconnection time(0.02-5S)	2.40
Under voltage of grid stage 2 (0-1Un)	0.45	Disconnection time(0.02-5S)	0.30
Over frequency of grid stage 1 (50-56Hz)	51.50	Disconnection time(0.02-5S)	0.10
Over frequency of grid stage 2 (50-57Hz)	52.00	Disconnection time(0.02-5S)	0.10 0.00
Under frequency of grid stage 1 (44-50Hz)	47.50	Disconnection time(0.02-5S)	0.10
Under frequency of grid stage 2 (43-50Hz)	45.00	Disconnection time(0.02-5S)	0.10 0.00
Over voltage of Start / Re-connection (1-1.2Un)	1.10		
Under voltage of Start / Re-connection (0.8-1Un)	0.94		
Over frequency of Start / Re-connection (49-56Hz)	50.05		
Under frequency of Start / Re-connection (44-51Hz)	47.50		
Start time (0-900S)	60		
Re-connection time (0-900S)	60		

Figure 70

Parameters explanation:

Name	Explanation
Over voltage of grid stage 1	Over voltage protection (U>), the range is 1.00~1.30Un; protection time is (T>) 0.02~5.0s.
Over voltage of grid stage 2	Over voltage protection (U>>), the range is 1.00~1.30Un; protection time is (T>>) 0.02~5.0s.
Under voltage of grid stage 1	Under voltage protection (U<), the range is 1.00~1.30Un; protection time is (T<) 0.02~5.0s.
Under voltage of grid stage 2	Under voltage protection (U<<), the range is 1.00~1.30Un; protection time is (T<<) 0.02~5.0s.

Continued:

Over frequency of grid stage 1	Over frequency protection (F>) , the range is 50.00~52.00 Hz; protection time is (T>) 0.02~5.0s.
Over frequency of grid stage 2	Over frequency protection (F>>) , the range is 50.00~52.00 Hz; protection time is (T>>) 0.02~5.0s.
Under frequency of grid stage 1	Under frequency protection (F<) , the range is 47.00~50.00 Hz; protection time is (T<) 0.02~5.0s.
Under frequency of grid stage 2	Under frequency protection (F<<) , the range is 47.00~50.00 Hz; protection time is (T<<) 0.02~5.0s.
Over voltage of start/ Re-connection	Upper limit of start voltage, the range is 1.00~1.10Un
Under voltage of start/ Re-connection	Lower limit of start voltage, the range is 0.85~1.00Un

7 Communication and monitoring

7.1 Communication interface

The standard interface on SolaLake inverter are RS485, and Ethernet. RS232 interface is optional.

Performance information like output voltage, current, frequency, fault details etc can be delivered to a PC or hardware storage devices or other monitoring equipment via the communication interface.

7.2 Communication mode

We offer 3 types of communications modes.

7.2.1 RS232 Communication for single inverter

RS232 is an optional communication interface which can transmit data between PC and one single SolarLake inverter (figure 71).

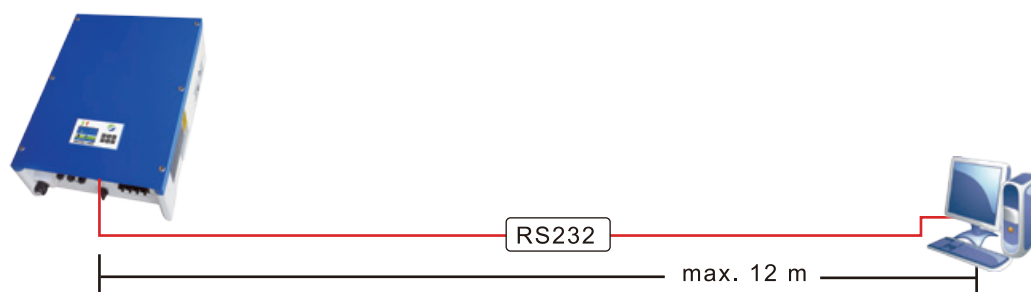


Figure 71 RS232 Communication Diagram

Only one inverter can communicate with a PC through RS232 port. Hence this is normally used for service requirements like software update and checking the inverter performance.

7.2.2 RS232 Communication

RS485 port can be used for communicating upto 32 inverters at the same time. The total length of the communication cable needs to be less than 1200m. One can also use the RS485 port for communicating with SolarLog. Please refer to SolarLog manual for more information on using SolarLog.

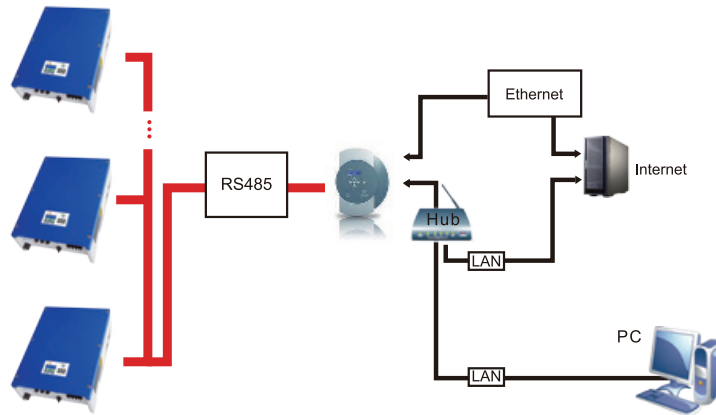


Figure 72 SolarLog communication diagram

7.2.3 Ethernet communication

The Ethernet port can be used to connect the inverter to a Router (router can be any brand in the market.) which will allow performance monitoring through Internet.

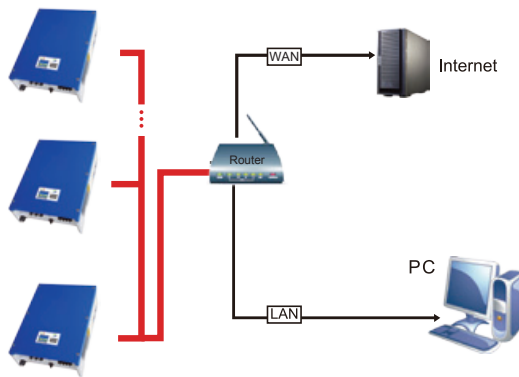


Figure 73 Ethernet communication

Hardware Requirements: Support only Windows operating system including XP,Vista,Win7.

Network interface for inverter: COM1.

Monitor mode: LAN and WAN.

LAN: In this mode, a router can be used.

If a router is used, upto 254 inverters can be monitored.

Parameter setting for router:

Step 1: As the step Standard=>Main Menu=>Settings=>Communication, will enter communication interface.

Step 2: On "Communication" press "OK", to enter IP settings interface, as shown in figure 74.



Figure 74 IP Settings interface

Step 3: Select " Auto IP". Inverter will reboot.

If a router is not used only one inverter can be monitored. Ethernet cable is to be used to connect inverter with PC.

Parameter setting for direct connection to PC:

Step 1: Go to communication interface and select Static IP.

Step 2: Enter IP Address: 192.168.000.002, Subnet Mask: 255.255.255.000, and leave the rest as shown in figure 75. Press "OK" after modifying. Display will Reboot.

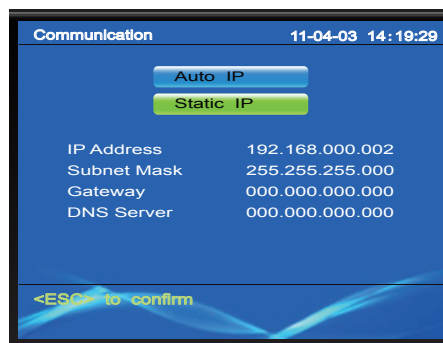


Figure 75 Static IP settings interface

Parameter set for PC:

On the PC, from Control Panel set Manual IP address as 192.168.000.001, and set Subnet mask as 255.255.255.000.



Note!

- ① Need to install SolarLake Inverter Monitoring software Solar Power Browser on the PC when using RS232 or Ethernet communication.
- ② Can't using RS232, RS485 and Ethernet communication mode at the same time
- ③ The default setting is "Auto IP".
- ④ In WAN mode, router is necessary and auto IP mode should be selected.
- ⑤ WAN is not available currently

8 Troubleshooting

8.1 Troubleshooting

This section contains information and procedures for solving possible problems with the SolarLake series inverters, and provides user with troubleshooting tips to identify and solve most problems that could occur.

In case of problem with inverter, check the following tips.

- Check the warning fault messages or Fault codes on the inverter information panel. Record it before doing anything further.
- Attempt the solution indicated in Tables 6 ,7,8,9 and 10.
- If inverter information panel is not displaying any Fault, check the following to make sure that the installation allows proper operation of the unit.
 - Is the inverter located in a clean, dry, adequately ventilated place?
 - Have the DC input breakers switched on?
 - Are the cables adequately sized and short enough?
 - Are the input and output connections and wiring in good condition?
 - Are the configuration settings correct for the particular installation?
 - Are the display panel and the communications cable properly connected and undamaged?

If necessary, contact Samil Power Customer Service for further assistance. Please be prepared to describe details of the system and provide the model and serial number of the unit.

To view recorded problems if any follow the steps below.

Press "ESC" to enter the main menu in the normal interface. In the interface screen select "Event List", then press "OK" to enter events list like figure 76.

Event List		11-06-24 09:11:11		
47	Inverter	06-24	09:05:29	ON
46	Inverter	06-24	09:05:29	ON
45	Inverter	06-24	09:05:29	ON
44	Inverter	06-24	09:05:29	ON
7	Grid	06-24	09:05:29	ON
16	Grid	06-24	09:05:29	ON
14	Grid	06-24	09:05:29	ON
12	Grid	06-24	09:05:29	ON
41	Inverter	06-24	09:05:29	ON
40	Inverter	06-24	09:05:29	ON

<ESC> to Main Menu 1/5

Figure 76 Typical events list

When SolarLake Inverter is at fault, the fault information is composed of "group+code". There are three kinds of faults related to grid, PV or inverter. The fault code indicates a like "Grid 3" indicates under voltage L2 phase.

The events list also displays the type of event, code, occurring time and current status. Use the right, left, up or down to move through the list and press OK to view the selected even as shown in Figure 77.

Event Details		11-06-24 09:11:20		
Start time	2011-06-24 09:05:29			
Inverter	47			
Turn off both AC and DC power to the Inverter, once the inverter has lost power turn the AC and DC back on.				
If the inverter resumes fault operation, please call support.				

<ESC> to Event List

Figure 77 Event details

The event details show event type, code, occurring time and rectification hints. If further help is needed please contact Samil Power technical help line.

Table 6 Error codes for AC supply related faults

Group	Code	Fault description	Suggestions or tips
Grid	0	L1 phase over-voltage	① Check whether AC grid voltage and frequency are within permitted limits. ② Check whether the AC connection is correct; ③ Contact installer for help.
	1	L1 phase under-voltage	
	2	L2 phase over-voltage	
	3	L2 phase under-voltage	
	4	L3 phase over-voltage	
	5	L3 phase under-voltage	
	6	Over-frequency	
	7	Under-frequency	
	8	DC component of L1 phase is too large	
	9	DC component of L2 phase is too large	
	10	DC component of L3 phase is too large	
	11	L1 phase over- frequency	
	12	L1 phase under- frequency	
	13	L2phase over- frequency	
	14	L2phase under- frequency	
	15	L3 phase over- frequency	
16	L3 phase under- frequency		

Table 7 Error codes for DC side faults

Group	Code	Fault description	Suggestions or tips
PV	0	DC side PV1 over-voltage (input mode: Multi-String)	① Check whether the output voltage of PV array is in the essential range. ② Check whether the insulation of PV cable is good; ③ Inspect whether the installation is correct and as per the manual. ④ If fault continues, please ask installer for help.
	1	DC side PV2 over-voltage (input mode: Multi-String)	
	2	DC side under-voltage (input mode: Common-String)	
	3	DC side over-voltage (input mode: Common-String)	
	4	PV1 insulation impedance error	
	5	PV2 insulation impedance error	
	6	Insulation impedance protects power source auxiliary	
	7	Input current is not balanced. (input mode: Common-String)	
	8	Leakage current error	
	9	30 mA jumping error	
	10	60 mA jumping error	
	11	150 mA jumping error	
12	Leakage current more than 300 mA		

Table 8 Error codes for inverter faults

Group	Code	Fault description	Suggestions or tips
Inverter	0	Start working	Without any remedy
	1	Electrify communication board	
	2	Electrify control board	
	3	Blackout of control board	
	4	Read communication board error	Ask for help if still at fault after rebooting.
	5	Write communication board error	
	6	Read communication board EEPROM error	
	7	Write communication board EEPROM error	
	8	Communication error between control board and communication board	
	9~29		
	30	Communication error between main control board and subordinate control board	Without any remedy
	31	Main control board and subordinate control board error	
	32	Auxiliary power source error	
	33	High temperature protection	
	34	Phase locking error	
	35	Bus under-voltage	
	36	Bus over-voltage	
	37	Bus voltage unbalanced	
	38	Bus Hardware over-voltage protection (restore)	
	39	Output hardware over-current protection (restore)	
	40	Boost hardware over-current protection	
	41	Over-current of output(RMS)	
	42	Choose input mode error	Check whether the string connection and setting on the inverter.
43	Self- checking error	Ask for help if still at fault after rebooting.	
44	Phase of output error	Check AC phase connections	
45	AD port used to gather output voltage has error	Ask for help if fault present after rebooting.	
46	AD port used to gather output current has error		
47	AD port used to gather DCI has error		

Continued:

Inverter	48	AD port using to gathering GFCI error	Ask for help if fault present after rebooting
	49	IAC_RMS_Unbalance	Without any remedy
	50	The output hardware over-current protection fault	Ask for help if fault present after rebooting
	51	Bus hardware over-voltage protection (not resume)	
	52	Boost 1 over-current protection fault	
	53	Boost 2 over-current protection fault	
	54	Output over-current fault	
	55	Relay can't be disconnect	
	56	Relay can't be closed	
	57	Unrecover IAC_RMS_imbalance	Inspect fan and if needed replace.
	58	Fan 1 error	
	59	Fan 2 error	
	60	Fan 3 error	Ask for help if fault present after rebooting
	61	Control board EEPROM read and write error	

Table 9 Error codes for Operational faults

Group	Code	Description	Suggestions or tips
User	0	Start serial upgrade program	Without any remedy
	1	Modify the language	
	2	Modify the time	
	3	Modify the country	
	4	Modify the input method	
	5	Clean up the production records	
	6	Clean up event record	
	7	Restore factory settings	
	8	Modify the LCD brightness	
	9	Modified the LCD time	
	10	Modified the network Settings	

Table 10 Other possible errors

Group	Code	Description	Suggestions or tips
Other error	0	LCD displays waiting at all times	Ask for help if fault present after rebooting

Note: "Without any remedy" means that the event is not an error, or inverter will resume working automatically.

8.2 Daily maintenance

Inverters generally do not need any daily or routine maintenance. Cooling fan should not be blocked by dust or any other items.

- Inverter cleaning

Please use hand blower, soft dry cloth or brush to clean inverters. Water, corrosive chemical substances or intense cleaning agent should not be used for cleaning the cooling fan or inverter. Switch off AC and DC power supply to inverter before undertaking any cleaning activity.

- Cooling fin cleaning

For long and correct inverter performance the heat emitters on the inverter need adequate clearance cooling fans should not be covered with dust or snow. Only use hand blower, soft cloth or brush to clean cooling fins.

9 Decommissioning

9.1 Decommissioning steps

- 1 Switch off the AC grid
- 2 Switch Off the DC switch
- 3 Wait for 5 minutes
- 4 Release the DC connectors
- 5 Release the AC terminals using screw drivers.

Remove inverter from the mounting carefully to avoid injury. Please note that the SolarLake inverters weight over 50 kgs.

9.2 Package

If possible, please pack the inverter in the original packaging. If original packing it is not available, use an equivalent carton suitable for loads more than 50 kg, has handle and can be closed fully.

9.3 Storage

Store the inverter in a dry place where ambient temperature is between -25 and +70 °C.

9.4 Disposal

At the end of its life, dispose inverters and packing materials at locations that can handle and or recycle electric equipment safely.

10 Technical data

10.1 Input (DC)

Model	SolarLake 10000TL	SolarLake 12000TL	SolarLake 15000TL	SolarLake 17000TL
Max. recommended DC power [W]	10400	12500	15600	17700
Max.DC voltage [V]	1000	1000	1000	1000
Total max. input Current [A]	PV 1:16/PV2:16	PV1:16/PV2	PV1:20/PV2:20	PV1:20/PV2:20
Number of MPP trackers / strings per MPP tracker	2/2	2/2	2/2	2/2
MPPT voltage range (at full power) [V]	320~800	380~800	380~800	430~800
Min. DC voltage / start voltage [V]	160/210	160/210	160/210	160/210

10.2 Output (AC)

Model	SolarLake 10000TL	SolarLake 12000TL	SolarLake 15000TL	SolarLake 17000TL
AC nominal power [W]	10000	12000	15000	17000
Max. AC power [W]	10000	12000	15000	17000
Max. AC current [A]	16	19.2	24	25
Nominal AC voltage [V]	3/N/PE, 230/400	3/N/PE, 230/400	3/N/PE, 230/400	3/N/PE, 230/400
AC grid freq. [Hz]	50	50	50	50
Power factor(Cos)	0.9leading..... 0.9lagging	0.9leading..... 0.9lagging	0.9leading..... 0.9lagging	0.9leading..... 0.9lagging
Total harmonic distortion (THD)	<3%	<3%	<3%	<3%

10.3 Efficiency, Safety and Protection

Model	SolarLake 10000TL	SolarLake 12000TL	SolarLake 15000TL	SolarLake 17000TL
Max. efficiency	97.9%	97.9%	98.0%	98.0%
Euro- efficiency	97.4%	97.4%	97.6%	97.6%
MPPT efficiency	99.9%	99.9%	99.9%	99.9%
Overvoltage / Undervoltage protection	Yes	Yes	Yes	Yes
DC isolation impedance monitoring	Yes	Yes	Yes	Yes
Ground fault protection	Yes	Yes	Yes	Yes
Grid monitoring	Yes	Yes	Yes	Yes
Ground fault current monitoring	Yes	Yes	Yes	Yes
DC injection monitoring	Yes	Yes	Yes	Yes

10.4 General Data

Model	SolarLake 10000TL	SolarLake 12000TL	SolarLake 15000TL	SolarLake 17000TL
Dimension (W/H/D) [mm]	520*716*230	520*716*230	520*716*230	520*716*230
Weight [kg]	40	40	40	40
Cooling concept	Fan			
Noise emission (typical) [dB]	<47			
Operating temperature range [°C]	-20 °C ~ +60 (Derating at 45 °C)			
Degree of protection	IP65			
Pollution Degree	II			
Topology	Transformerless			
Internal consumption (night) [W]	<5			
LCD display	3.5Inch, TFT-LCD			
Communication interfaces	Ethernet/ RS232/ RS485			
Standard warranty(Year)	5			

11 Manufacturer's warranty and liability clauses

Samil Power Co., Ltd offers 5 years product warranty for SolarLake inverters from date of installation. However the warranty period can't exceed 66 months from the date of delivery of the inverter.

During the warranty period, Samil Power Co., Ltd guarantees normal operation of the SolarLake inverter. In case of faults falling within manufacturers responsibility, Samil Power Co., Ltd will provide service and maintenance free of any charge. If during the warranty period, the inverter develops fault, please contact your installation contractor or supplier.

Samil Power warranty does not cover damage due to factors outside manufacturers responsibility which include:

- ✓ Use of SolarLake inverters for any other purpose than intended;
- ✓ Faulty system design or installation;
- ✓ Improper operation;
- ✓ Use wrong protection settings on the inverter;
- ✓ Carry out unauthorized modification on the inverter.
- ✓ Damage because of external factors or the majeure force (such as lightning, over-voltage, bad weather, fire, earthquake, tsunami etc);
- ✓ Poor ventilation;
- ✓ Do not comply with relevant safety regulations;
- ✓ Transportation damage.

SAMIL POWER CO., LTD.

Marketing & Sales Office

Add: No.52,Huigu Innovation Park, Huishan District,
Wuxi,Jiangsu Province,P.R.China 214174

Tel: +86 510 83593131

Fax: +86 510 81819678

E-mail:service@samilpower.com

<http://www.samilpower.com>

Factory

Add: No.66 Taihangshan Road,
Suyu Economic Development Zone, Suqian City,
Jiangsu Province, P.R.China 223800

Tel: +86 527 88754666

Fax: +86 527 84453877