User Manual

SAJ Solar Inverter

Sununo Plus Series

www.saj-electric.com

Preface

Thank you for choosing a SAJ solar inverter. We are pleased to provide you with first-class products and exceptional service.

This manual includes information for installation, operation, maintenance, trouble shooting and safety. Please follow the instructions of this manual so that we can ensure delivery of our professional guidance and wholehearted service.

Customer-orientation is forever our commitment. We hope this document proves to be of great assistance in your journey for a cleaner and greener world.

Please check for the latest version at www.saj-electric.com

Guangzhou Sanjing Electric Co., Ltd.

Building e-Energy management solution provider

Content

Chapter 1 Safety Precautions

1.1 Scope of Application

This User Manual describes instructions and detailed procedures for installing, operating, maintaining, and troubleshooting of the following SAJ grid-tied inverters:

Sununo Plus 1K, Sununo Plus 1.5K, Sununo Plus 2K, Sununo Plus 2.5K, Sununo Plus 3K, Sununo Plus 3K-M, Sununo Plus 4K-M, Sununo Plus 5K-M

Please keep this manual all time available in case of emergency.

1.2 Safety Instructions

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, can result in death or serious injury or moderate injury.

CAUTION
· CAUTION indicates a hazardous condition, which, if not avoided, can result in minor or moderate injury.

NOTICE

· NOTICE indicates a situation that can result in potential damage, if not avoided.

1.3 Target Group

Only qualified electricians who have read and fully understood all safety regulations contained in this manual can install, maintain and repair the inverter. Operators must be aware of the high-voltage device.

Chapter 2 Preparation

2.1 Safety Instructions

DANGER

· There is possiblity of dying to electrical shock and high voltage.
· Do not touch the operating component of the inverter, or it might result in burning or death.
· To prevent risk of electric shock during installation and maintenance, please make sure that all AC and DC terminals are plugged out.
· Do not touch the surface of the inverter while the housing is wet, or it might lead to electrical shock.
· Do not stay close to the inverter while there are severe weather conditions including storm, lighting, etc.
· Before opening the housing, the SAJ inverter must be disconnected from the grid and PV generator; you must wait for at least five minutes to let the energy storage capacitors fully be discharged after disconnecting from power source.

WARNING

·The installation,service, recycling and disposal of the inverters must be performed by qualified personnel only in compliance with national and local standards and regulations.
·Any unauthorized actions including modification of product functionality of any form may cause lethal hazard to the operator, third parties, the units or their property. SAJ is not responsible for the loss and these warranty claims.
·The SAJ inverter must only be operated with PV generator. Do not connect any other source of energy to the SAJ inverter.
·Be sure that the PV generator and inverter are well grounded in order to protect safety of people's life and property.

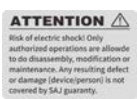
CAUTION

·The PV inverter will become hot during operation. Please do not touch the heat sink or peripheral surface during or shortly after operation.
·Risk of damage due to improper modifications.

NOTICE

·Public utility only.
·The PV inverter is designed to feed AC power directly to the public utility power grid; do not connect AC output of the inverter to any private AC equipment.

2.2 Explanations of Symbols

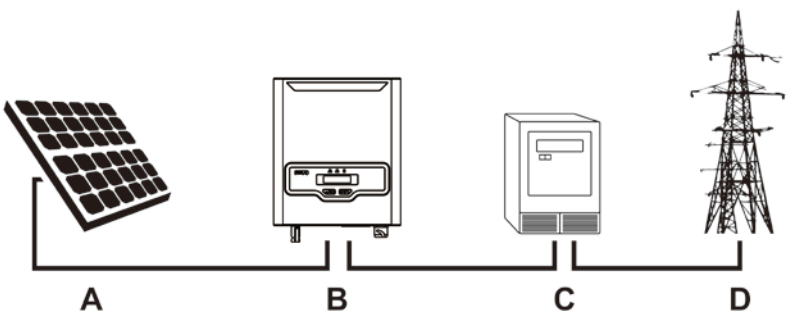
Symbol	Description
	**Dangerous electrical voltage** This device is directly connected to public grid, thus all work to the inverter shall only be carried out by qualified personnel.
	**DANGER to life due to high electrical voltage!** There might be residual currents in inverter because of large capacitors. Wait for 5 MINUTES before you remove the front lid.
	**NOTICE, danger!** This is directly connected with electricity generators and public grid.
	**Danger of hot surface** The components inside the inverter will release a lot of heat during operation. Do not touch metal plate housing during operating.
	**An error has occurred** Please go to Chapter 9 “Troubleshooting” to remedy the error.
	**This device SHALL NOT be disposed of as residential waste** Please go to Chapter 8 “Recycling and Disposal” for proper treatments.
	**Without Transformer** This inverter does not use transformer for the isolation function.
	**CE Mark** Equipment with the CE mark fulfills the basic requirements of the Guideline Governing Low-Voltage and Electro-magnetic Compatibility.
	**RCM Mark** Equipment meets safety and other requirements as required by electrical safety laws/regulations in Australian and New Zealand.
	**CQC Mark** The inverter complies with the safety instructions from China's Quality Center.
	**No unauthorized operations or modifications** Any unauthorized operations or modifications are strictly forbidden, if any defect or damage(device/person) occurs, SAJ shall not take any responsibility for it.

Chapter 3 Product Information

3.1 Application Scope of Products

Sununo Plus series products are grid-tied single phase inverters without transformers, and the inverters are important components of grid-tied solar power systems.

The Sununo Plus inverters change the DC generated by solar panels into AC which is in accordance with the requirements of public grid and send the AC into the grid, Table 3.1 shows the structural diagram of the typical application system of Sununo Plus inverters.



Name	Description	Remarks
A	Solar panels	Monocrystalline or polycrystalline silicon, and thin-film PV modules with II protection and need no ground connection
B	Inverters	Sununo Plus 1K/1.5K/2K/2.5K/3K/3K-M/4K-M/5K-M
C	Metering equipment	Standard metering tool for measuring the output electric power of inverters
D	Power grid	TT，TN-C，TN-S，TN-C-S

Table 3.1 Systematic Configuration Diagram

3.2 Specification for Product Model

Sununo Plus XK -M
① ② ③

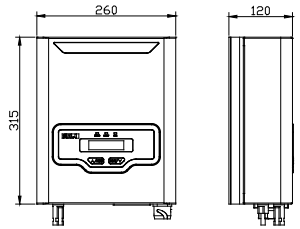
① Sununo Plus represents for product name.

② XK represents rated power XkW of inverter, for example 1.5K means 1.5kW.

③ -M represents the inverter has the function of dual MPPT.

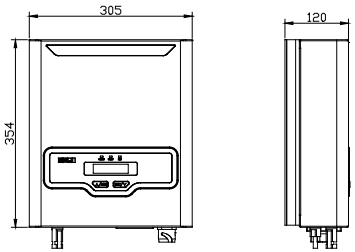
3.3 Overview and Dimensions of products

The dimensions of Sununo Plus series products is shown in Figure 3.2.



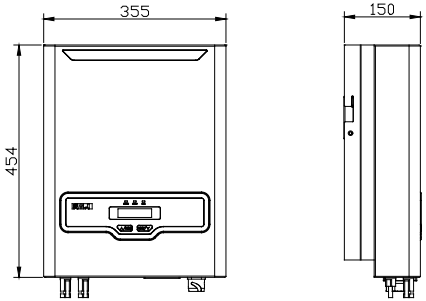
A

Sununo Plus 1K/1.5K



B

Sununo Plus 2K/2.5K/3K



C

Sununo Plus 3K-M/4K-M/5K-M

Figure 3.2 Dimensions of Sununo Plus series Products

3.4 Datasheet

Sununo Plus 1K/1.5K

Type	Sununo Plus 1K	Sununo Plus 1.5K
Input (DC)		
Recommended accessed DC power[1][W]	1330	1995
Max. DC Voltage [V]	450	
MPPT Voltage range [V]	60-425	
Nominal DC Voltage [V]	360	
Start Voltage [V]	70	
Min. DC Voltage [V]	50	
Max. DC Input Current [A]	11	
Max. DC Short Circuit Current [A]	13.2	
Number of DC Connection Sets per MPPT	1	
Number of MPPT	1	
Max. Inverter Backfeed Current to Array [A]	0	
Output (AC)		
Rated AC Power [W]	1000	1500
Max. AC Power [W]	1100	1650
Rated AC Current [A]	4.3	6.5
Max.AC Current [A]	4.8	7.2
AC Current (inrush) [A]	50	50
AC Max. Output Fault Current[A]	24	24
Max. AC Over Current Protection [A]	6.5	9.7
Nominal AC Voltage/ range	220V, 230V, 240V/180V-280V	
Grid Frequency/ range	50Hz, 60Hz/ ±5Hz	
Power Factor [cos φ]	>0.99(full load)	
Total Harmonic Distortion [THDi]	< 3%	
Feed in	1L+N+PE	
Efficiency		
Max. Efficiency	97.1%	97.2%
Euro Efficiency [at 360Vdc]	96.6%	96.7%

MPPT Accuracy	>99.5%
Protection	
Internal Over-voltage Protection	Integrated
DC Insulation Monitoring	Integrated
DCI Monitoring	Integrated
GFCI Monitoring	Integrated
Grid Monitoring	Integrated
AC Short Circuit Current Protection	Integrated
Thermal Protection	Integrated
Anti-island protection monitoring	AFD
Interface	
AC Connection	Plug-in connector
DC Connection	MC4/H4
LCD/LED Display	LCD (16x2 Characters, Backlight) & LED (3 Lights)
Display Language	English
Communication port	RS232 &DRM
Communication	WiFi/GPRS/Ethernet(Optional)
General Data	
Topology	Transformerless
Decisive Voltage Class (DVC)	DVC-C
Consumption at Night [W]	<0.2
Consumption at Standby [W]	6
Operating Temperature Range	-25°C to +60°C (45°C to 60°C with derating)
Cooling Method	Natural Covection
Ambient Humidity	0% to 100% Non-condensing
Altitude	Up to 2000m (without derating)
Noise [dBA]	<15
Ingress Protection	IP65 (Indoor & Outdoor Installation)
Mounting	Rear Panel
Dimensions (H*W*D) [mm]	315*260*120
Net Weight [kg]	5.6
Standard Warranty [Year]	5 (Standard)/10/15/20/25 (Optional)
Certificates	IEC/EN62109-1/2, EN61000-6-2/3/4, IEC61683, IEC60068-2, IEC62116, IEC61727,VDE0126-1-1/A1, VDE-AR-N 4105, AS/NZS4777.2, CQC NB/T 32004,G98, NBR 16149, NBR 16150, C10/11,RD1669,UNE206006,UNE206007, EN50438,CEI-021

Sununo Plus 2K/2.5K/3K

Type	Sununo Plus 2K	Sununo Plus 2.5K	Sununo Plus 3K
Input (DC)			
Recommended Accessed DC Power[1][W]	2660	3325	3990
Max. DC Voltage [V]	500		550
MPPT Voltage range [V]	60-450		60-500
Nominal DC Voltage [V]	360		
Start Voltage [V]	70		
Min. DC Voltage [V]	50		
Max. DC Input Current [A]	11		
Max. DC Short Circuit Current [A]	13.2		
Number of DC Connection Sets per MPPT	1		
Number of MPPT	1		
Max. Inverter Backfeed Current to Array [A]	0		
Output (AC)			
Rated AC Power [W]	2000	2500	3000
Max. AC Power [W]	2200	2750	3000
Rated AC Current [A]	8.7	10.9	13.0
Max. AC Current [A]	9.7	12.8	14.5
AC Current (inrush) [A]	50	50	50
AC Max**.** Output Fault Current [A]	24	24	24
Max. AC Over Current Protection [A]	13.1	16.4	19.5
Nominal AC voltage/ range	220V, 230V, 240V/180V-280V		
Grid Frequency/ range	50Hz, 60Hz/ ±5Hz		
Power Factor [cos φ]	>0.99(full load)		
Total Harmonic Distortion [THDi]	< 3%		
Feed in	1L+N+PE		
Efficiency			
Max. Efficiency	97.4%	97.5%	97.6%
Euro Efficiency [at 360Vdc]	96.9%	97.0%	97.1%
MPPT Accuracy	>99.5%		

Protection			
Internal Over-voltage Protection	Integrated		
DC Insulation Monitoring	Integrated		
DCI Monitoring	Integrated		
GFCI Monitoring	Integrated		
Grid Monitoring	Integrated		
AC Short Circuit Current Protection	Integrated		
Thermal Protection	Integrated		
Anti-island protection monitoring	AFD		
Interface			
AC Connection	Plug-in connector		
DC Connection	MC4/H4		
LCD/LED Display	LCD (16x2 Characters, Backlight) & LED (3 Lights)		
Display Language	English		
Communication port	RS232 &DRM		
Communication	WiFi/GPRS/Ethernet(Optional)		
General Data			
Topology	Transformerless		
Decisive Voltage Class (DVC)	DVC-C		
Consumption at Night [W]	<0.2		
Consumption at Standby [W]	6		
Operating Temperature Range	-25°C to +60°C (45°C to 60°C with derating)		
Cooling Method	Natural Covection		
Ambient Humidity	0% to 100% Non-condensing		
Altitude	Up to 2000m (without derating)		
Noise [dBA]	<25		
Ingress Protection	IP65 (Indoor & Outdoor Installation)		
Mounting	Rear Panel		
Dimensions (H*W*D) [mm]	354*305*120		
Net Weight [kg]	7.8	8.3	8.4
Standard Warranty [Year]	5 (Standard)/10/15/20/25 (Optional)		
Certificates	IEC/EN62109-1/2, EN61000-6-2/3/4, IEC61683, IEC60068-2, IEC62116, IEC61727, PEA/MEA,VDE0126-1-1/A1, CEI-021, VDE-AR-N 4105, AS/NZS4777.2, CQC NB/T 32004, G98, NBR 16149, NBR 16150, C10/11,RD1669,UNE206006, UNE206007,EN50438		

Sununo Plus 3K-M/4K-M/5K-M

Type	Sununo Plus 3K-M	Sununo Plus 4K-M	Sununo Plus 5K-M
Input (DC)			
Recommended Accessed DC Power[1][W]	3990	5320	6648
Max. DC Voltage [V]	600		
MPPT Voltage range [V]	90-550		
Nominal DC Voltage [V]	360		
Start Voltage [V]	100		
Min. DC Voltage [V]	80		
Max. DC Input Current [A]	11/11		
Max. DC Short Circuit Current [A]	13.2/13.2		
Number of DC Connection Sets per MPPT	1/1		
Number of MPPT	2		
Max. Inverter Backfeed Current to Array [A]	0		
Output (AC)			
Rated AC Power [W]	3000	4000	4999
Max. AC Power [VA]	3300	4400	5000
Rated AC Current [A]	13.0	17.4	21.7
Max. AC Current [A]	15.0	21.0	25.0
AC Current (inrush) [A]	50	50	50
AC Max**.** Output Fault Current [A]	24	24	48
Max. AC Over Current Protection [A]	19.5	26.1	33
Nominal AC voltage/ range	220V, 230V, 240V/180V-280V		
Grid Frequency/ range	50Hz, 60Hz/±5Hz		
Power Factor [cosφ]	>0.99(full load)	0.9 leading~0.9 lagging	
Total Harmonic Distortion [THDi]	< 3%		
Feed in	1L+N+PE		
Efficiency			
Max. Efficiency	97.6%	97.8%	97.9%

Euro Efficiency [at 360Vdc]	97.1%	97.4%	97.5%
MPPT Accuracy	>99.5%		
Protection			
Internal Over-voltage Protection	Integrated		
DC Insulation Monitoring	Integrated		
DCI Monitoring	Integrated		
GFCI Monitoring	Integrated		
Grid Monitoring	Integrated		
AC Short Circuit Current Protection	Integrated		
Thermal Protection	Integrated		
Anti-island protection monitoring	AFD		
Interface			
AC Connection	Plug-in connector		
DC Connection	MC4/H4		
LCD/LED Display	LCD (16x2 Characters, Backlight) & LED (3 Lights)		
Display Language	English		
Communication port	RS232 &DRM		
Communication	WiFi/GPRS/Ethernet(Optional)		
General Data			
Topology	Transformerless		
Decisive Voltage Class (DVC)	DVC-C		
Consumption at Night [W]	<0.2		
Consumption at Standby [W]	6		
Operating Temperature Range	-25℃ to +60℃ (45℃ to 60℃ with derating)		
Cooling Method	Natural Covection		
Ambient Humidity	0% to 100% Non-condensing		
Altitude	Up to 2000m (without derating)		
Noise [dBA]	<25		
Ingress Protection	IP65 (Indoor & Outdoor Installation)		
Mounting	Rear Panel		
Dimensions (H*W*D) [mm]	454*355*150		
Net Weight [kg]	14.8		
Standard Warranty [Year]	5（Standard）/10/15/20/25 （Optional）		
Certificates	IEC/EN62109-1/2,EN61000-6-2/3/4, IEC61683, IEC60068-2, IEC62116, IEC61727, PEA/MEA, VDE0126-1-1/A1, CEI-021,		

	VDE-AR-N 4105, AS/NZS4777.2, CQC NB/T 32004, G98,G99, NBR 16149, NBR 16150, C10/11,RD1669,UNE206006, UNE206007,EN50438

Note: 1. 1000W/M^2, 25℃

Chapter 4 Instructions for installation

4.1 Safety Instructions

DANGER
· Dangerous to life due to potential fire or electricity shock. · Do not install the inverter near any inflammable or explosive items. · This inverter will be directly connected with HIGH VOLTAGE power generation device; the installation must be performed by qualified personnel only in compliance with national and local standards and regulations.

NOTICE
· This equipment is suitable for the pollution degree II. · Inappropriate or unharmonized installation environment may jeopardize the life span of the inverter. · Installation directly exposed under intensive sunlight is not recommended. · The installation site must be well ventilated.

4.2 Pre-installation Check

4.2.1 Check the Package

Although SAJ's inverters have surpassed stringent testing and are checked before they leave the factory, it is uncertain that the inverters may suffer damages during transportation. Please check the package for any obvious signs of damage, and if

such evidence is present, do not open the package and contact your dealer as soon as possible

4.2.2 Check the Assembly Parts

Please refer to the Packing List inside the package container.

4.3 The Determination of the Installation Method and Position

4.3.1 Mounting Method

Please mount the inverter correctly as shown in Figure 4.1 below.

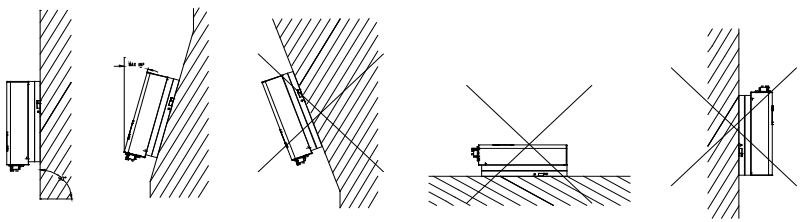


Figure 4.1 Mounting Method

(1)The equipment employs natural convection cooling, and it can be installed indoor or outdoor.

(2)Please install the equipment under the guidance of Figure4.1. Vertical installation on floor level is recommended. Mount vertically or tilted backwards by maximum. 15° . Never install the inverter tilted forwards, sideways, horizontally or upside down.

(3) Install the inverter at eye level for convenience when checking the LCD display and possible maintenance activities.

(4)When mounting the inverter, please consider that disassembly for service work may be required.

4.3.2 Installation Position

Do not expose the inverter to direct solar irradiation as this could cause power derating due to overheating. The ambient temperature should be between -25℃ ～ +60℃（-13° F ～ 140° F）to ensure optimum operation. Choose locations with sufficient air exchange. Ensure additional ventilation, if necessary.

To make sure the installation spot is suitably ventilated, if multiple SAJ grid-tied solar inverters are installed same area, the following safety clearance in Figure 4.2 Shall be followed for proper ventilation conditions.

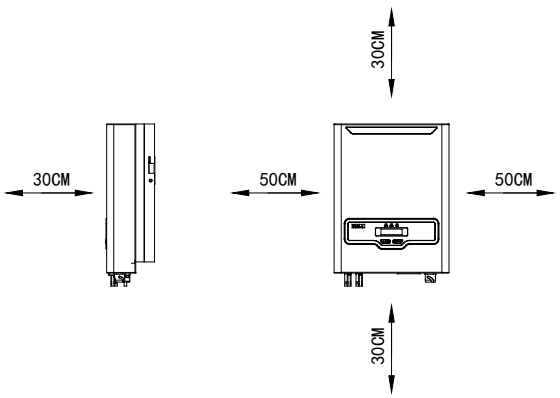


Figure 4.2 Minimum Clearance

4.4 Mounting Procedure

4.4.1 Mark the Positions of the Drill Holes of the Rear Panel

The mounting position should be marked as shown in Figure 4.3, Figure 4.4 & Figure 4.5.

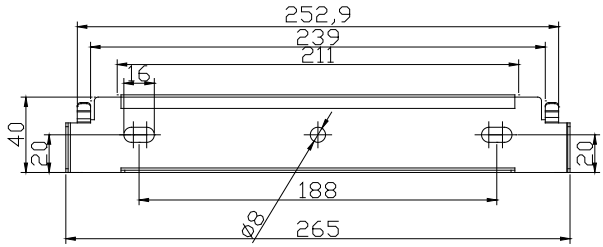


Figure 4.3 Dimensions of rear panel of Sununo Plus 1K/1.5K

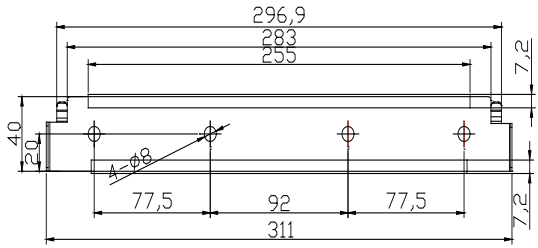


Figure 4.4 Dimensions of rear panel of Sununo Plus 2K/2.5K/3K

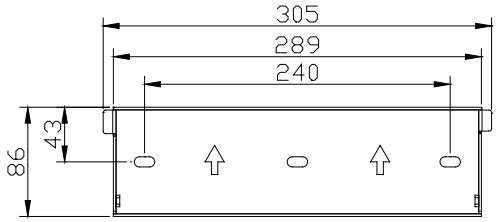


Figure 4.5 Dimensions of rear panel of Sununo Plus 3K-M/4K-M/5K-M

4.4.2 Drill Holes and Place the Expansion Tubes

According to the guides, drill 3 holes in the wall (in conformity with position marked in Figure 4.6, 4.7, 4.8), and then place expansion tubes in the holes using a rubber mallet.

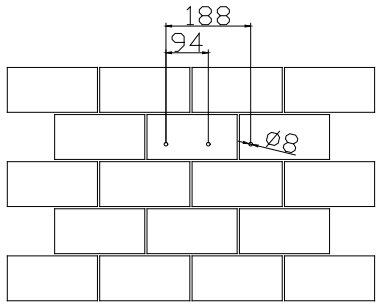


Figure 4.6 Drill holes' dimensions of Sununo Plus 1K/1.5K

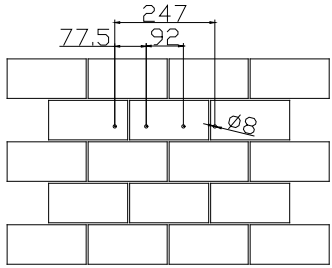


Figure 4.7 Drill holes' dimensions of Sununo Plus 2K/2.5K/3K

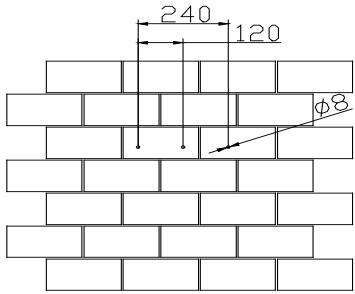


Figure 4.8 Drill holes' dimensions of Sununo Plus 3K-M/4K-M/5K-M

4.4.3 Mount the Screws and the Rear Panel

The panels should be mounted in the mounting position by screws as shown in

Figure 4.9, Figure 4.10 and Figure 4.11.

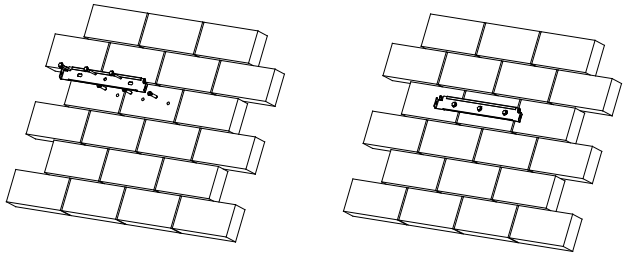


Figure 4.9 Mount the Rear Panel of Sununo Plus 1K/1.5K

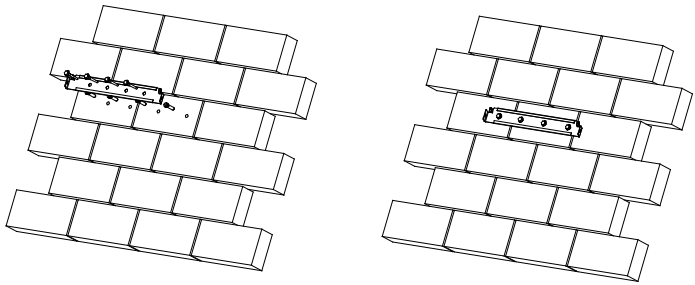


Figure 4.10 Mount the Rear Panel of Sununo Plus 2K/2.5K/3K

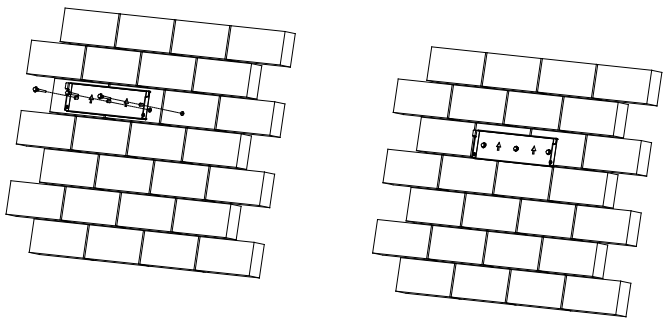


Figure 4.11 Mount the Rear Panel of Sununo Plus 3K-M/4K-M/5K-M

4.4.4 Mount the Inverter

Carefully mount the inverter to the rear panel as shown in Figure 4.12, Figure 4.13, and Figure 4.14. Make sure that the rear part of the equipment is closely mounted to the rear panel.

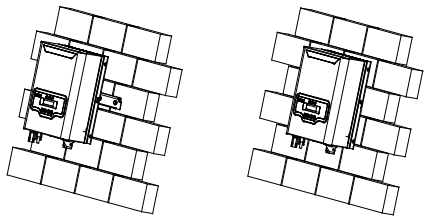


Figure 4.12 Mount Sununo Plus 1K/1.5K inverter

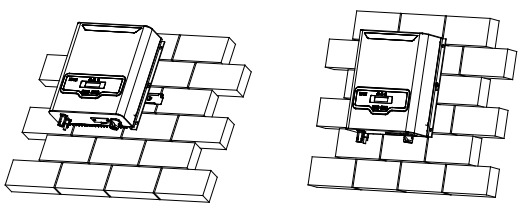


Figure 4.13 Mount Sununo Plus 2K/2.5K/3K inverter

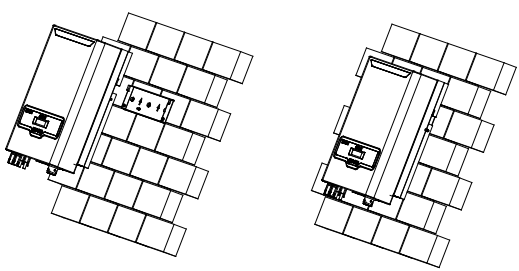


Figure 4.14 Mount Sununo Plus 3K-M/4K-M/5K-M inverter

Chapter 5 Electrical Connection

5.1 Safety Instruction for Hot-line Job

Electrical connection must only be operated on by professional technicians. Please keep in mind that the inverter is a bi-power supply equipment. Before connection, necessary protective equipment must be employed by technicians including insulating gloves, insulating shoes and safety helmet.

DANGER
· Dangerous to life due to potential fire or electricity shock. · When power-on, the equipment should be in conformity with national rules and regulations. · The direct connection between the converter and high voltage power systems must be operated by qualified technicians in accordance with local and national power grid standards and regulations.

WARNING
· When the photovoltaic array is exposed to light, it supplies a d.c voltage to the inverter.

NOTICE
·Electrical connection should be in conformity with proper stipulations, such as stipulations for cross-sectional area of conductors, fuse and ground protection. ·The overvoltage category on DC input port is II, and that on AC output port is III.

5.2 Specifications for Electrical Interface

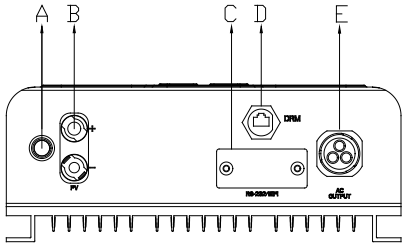


Figure 5.1 Electrical Interface of Sununo Plus 1K/1.5K/2K/2.5K/3K

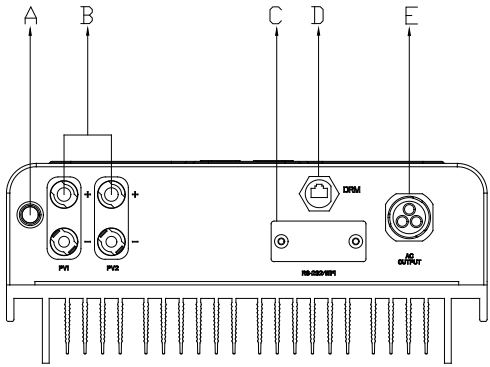


Figure5.2 Electrical Interface of Sununo Plus 3K-M/4K-M/5K-M

Code	Name
A	Decompression Valves
B	DC Input
C	RS232 /Wi-Fi Port
D	DRM
E	AC Plug Terminal

Table 5.1 Specifications for Interface

5.3 AC Side Connection

Cross-sectional Area of Cables（mm²）		Outside Diameter of the Cables（mm）
Scope	Recommended Value	
4.0-6.0	4.0	4.2~5.3

Table 5.2 Recommended Specifications of AC Cables

5.3.1 Feed the AC cable through the AC waterproof hole.

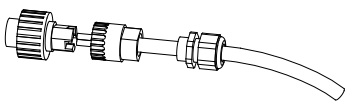


Figure 5.3 Thread the cables

5.3.2 Connect the cables according to connection marks of L, N and PE.

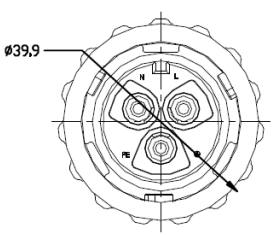


Figure 5.4 Connect the Cables

5.3.3 Secure all parts of the AC connector tightly.

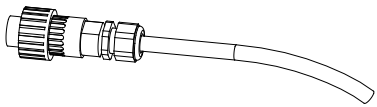


Figure 5.5 Screw the Connector

5.3.4 Connect the AC connector to the equipment securely, ensuring the pins are connected directly. Then the connection of AC cable is complete.

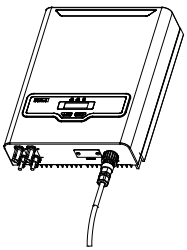


Figure 5.6 Connect the Inverter

5.3.5 GND of the Inverter.

After penetrating the external hex head screw through OT terminal of the grounding line, screw in the grounding port of enclosure of the inverter in clockwise direction and make sure it is screwed up tightly.

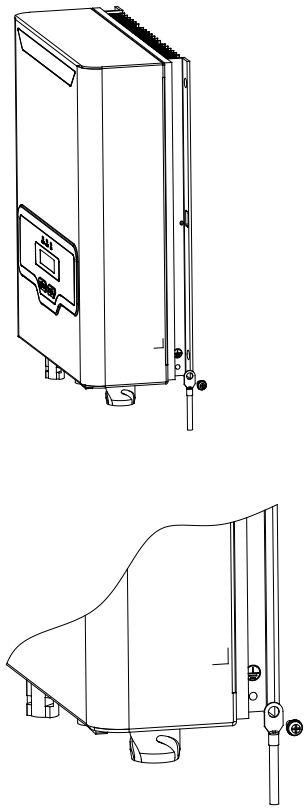


Fig. 5.7 Inverter ground protection

This inverter complies with IEC 62109-2 clause 13.9 for earth fault alarm monitoring. If an Earth Fault Alarm occurs, the second LED indicator will be lit up in red and error code <31 Insulation Error Master> will be displayed on the screen of inverter and Wi-Fi communication module screen until the error being solved and inverter functioning properly.

5.3.6 External AC Circuit Breaker and Residual Current Device

Please install a 2P circuit breaker to ensure the inverter is able to disconnect from grid safely. The inverter is integrated with a RCMU, however, an external RCD is needed to protect the system from tripping, either type A or type AB RCD are compatible with the inverter.

The integrated leakage current detector of inverter is able to detect the real time external current leakage. When a leakage current detected exceeds the limitation the inverter will be disconnected from grid quickly, if an external leakage current device is connected, the action current should be 300mA or higher.

Inverter type	Recommended breaker specification
Sununo Plus 1/ 1.5K	**16A**
Sununo Plus 2/ 2.5/ 3K	**25A**
Sununo Plus 3K-M/ 4K-M/ 5K-M	**32A**
Notice: **Do not connect multiple inverters to one AC circuit breaker.**	

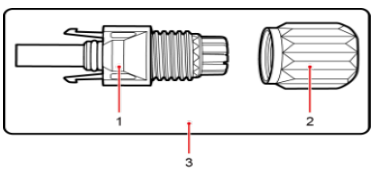
Table 5.3 Recommended breaker specification

5.4 DC Side Connection

Cross-sectional Area of Cables（mm²）		Outside Diameter of the Cables（mm）
Scope	Recommended Value	
4.0-6.0	4.0	4.2~5.3

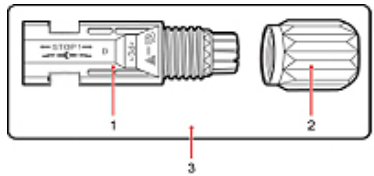
Table5.4 Recommended Specifications of DC Cables

DC connector is made up of the positive connector and the negative connector



1. Insulated Enclosure 2. Lock Screw 3. Negative Connector

Figure 5.8 Positive Connector



1. Insulated Enclosure 2. Lock Screw 3. Negative Connector

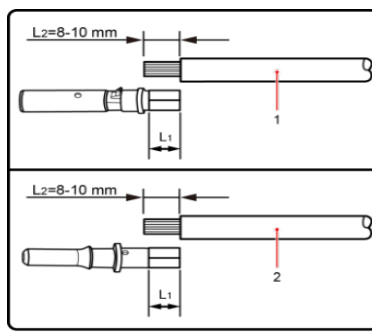
Figure 5.9 Negative Connector

NOTICE
· Please place the connector separately after unpacking in order to avoid confusion for connection of cables. · Please connect the positive connector to the positive side of the solar panels, and connect the negative connector to the negative side of the solar side. Be sure to connect them in right position.

Connecting Procedures:

1. Tighten the lock screws on positive and negative connector.

2. Use specified strip tool to strip the insulated enclosure of the positive and negative cables with appropriate length.



1. Positive Cable 2. Negative Cable

Figure 5.10 Connecting Cables

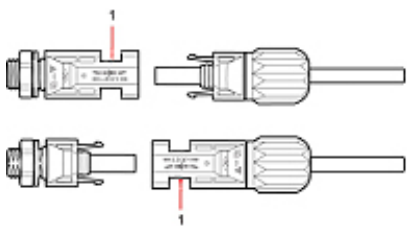
3. Feed the positive and negative cables into corresponding lock screws.

4. Put the metal positive and negative terminals into positive cable and negative cable whose insulated enclosure has been stripped, and crimp them tightly with a wire crimper. Make sure that the withdrawal force of the pressed cable is bigger than 400N.

5. Plug the pressed positive and negative cables into relevant insulated enclosure, a “click” should be heard or felt when the contact cable assembly is seated correctly.

6. Fasten the lock screws on positive and negative connectors into respondent insulated enclosure and make them tight.

7. Connect the positive and negative connectors into positive and negative DC input terminals of the inverter, a “click” should be heard or felt when the contact cable assembly is seated correctly.



1. Connection Port

Figure 5.11 Connect the Inverter

NOTICE
· Before inserting the connector into the DC input terminal of the inverter, please make sure that the DC switch of the inverter is OFF.

5.5 Communication Connection

Sununo Plus 1K/1.5K/2K/2.5K/3K/3K-M/4K-M/5K-M is equipped with a RS232 interface.

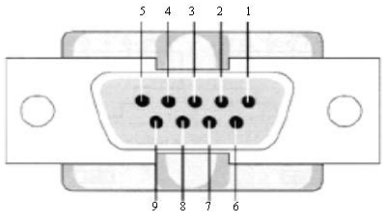


Figure 5.12 Pins of Nine Serial Port Cable

Pin No.	Name
1	VCC
2	TxD（Transmitted Ready）
3	RxD（Received Data）
4	NC
5	GND（Signal Ground）
6	NC
7	NC
8	NC
9	VCC

Table 5.5 Instruction of Nine Serial Port Pins

（1）RS232 can externally connect with Wi-Fi module. For more details, please refer to the operating manual of Wi-Fi module.

（2）RS232 can externally connect with Ethernet module. For more details, please refer to the operating manual of Ethernet module.

（3）RS232 can externally connect with GPRS module. For more details, please refer to the operating manual of GPRS module.

Sununo Plus 1K/1.5K/2K/2.5K/3K/3K-M/4K-M/5K-M is equipped with a RJ45 interface.

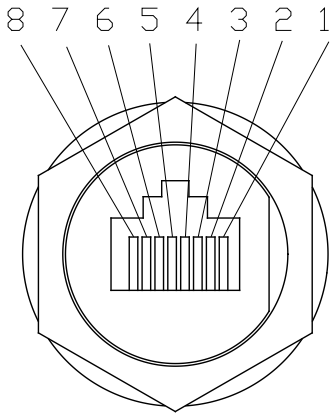


Figure 5.13 DRM pin

Pin No.	Name
1	Not connected
2	Not connected
3	Not connected
4	Not connected
5	REF GEN
6	COM LOAD
7	Not connected
8	Not connected

Chapter 6 Debugging Instructions

6.1 Introduction of Human-computer Interface

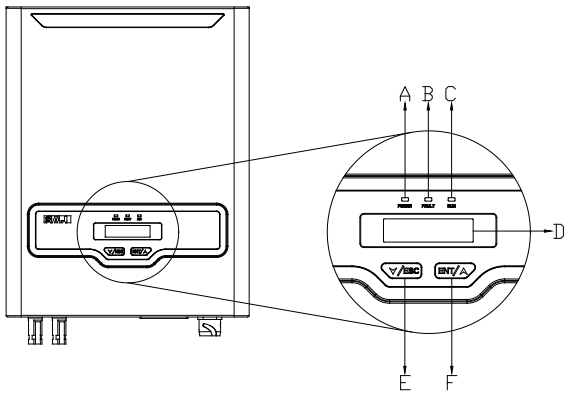


Figure 6.1 Human-computer Interface

Object	Description
A	Yellow LED light = Power - After the equipment is powered on, the yellow LED light will go on
B	Red LED light = Error - The red LED light will go on when an error occurs, it will go off automatically after errors are resolved
C	Green LED light = operation - The green LED light will go on when the equipment is in normal operation.
D	The LCD shows the operational data, recorded information and parameters
E	▼ Exit button
F	▲ Enter button

Table 6.1 Instructions of the Interface

The inverter provides two buttons for inquiry of operational information and parameters, these two buttons can be used repeatedly.

Name of the button	Operation	Description
▼/ ESC	Press time shorter than 1 second	Move down the cursor to enter into the sub-menu, or reduce the setting value.
	Press time longer than 1 second	Return to the previous menu or cancel the present order.
▲/ENT	Press time shorter than 1 second	Move up the cursor to enter into the superior menu, or increase the setting value.
	Press time longer than 1 second	Enter into the sub-menu, or confirm order.

Table 6.2 Instructions for buttons

6.2 Start Up Inverter

The inverter can be turn on by the following procedure:

1. Connect DC input (if applicable) between the inverter and PV string
2. Turn on DC switch
3. Connect AC output (if applicable) between the inverter and grid
4. Wait 30 seconds and observe the LED indicators and LCD on the front of the inverter to check the status of inverter (refer to table 6.1)

6.3 Shut Down Inverter

1. Automatically shut down, when the solar light intensity is not strong enough during sunrise and sunset or the output voltage of photovoltaic system is less than the minimum input power of inverter, inverter will shut down automatically.

2. Shut down manually, disconnect AC side circuit breaker first, if multiple inverters are connected, disconnect the minor circuit breaker prior to disconnection of main circuit breaker. Disconnect the DC switch after inverter has reported grid connection lost alarm.

6.4 First Run Setup

6.4.1 Set the Country

When the solar inverter begins to run for the first time, please configure the country of usage, and the inverter LCD will display as below:

Figure 6.2 Set the Country

Please press the "ENT" button, LCD will show the countries for option. Users can press"▼ " or"▲" to move the cursor">"to select the correct country and press "ENT" button to confirm the selection.

Note: 1.The configuration of the country of usage must be set before inverter starts to run for its first time; otherwise, the inverter will not operate correctly. The User can enter the menu of "Inverter-Info->Grid Compliance" to check whether the setting is correct.

2. If users cannot locate the corresponding country, please abort the setting and contact the after sales for confirmation.

6.4.2 State

If the country has been set the LCD shows the machine type when the inverter is started up, then it automatically displays the inverter operation status: Normal, Wait, Fault, Update.

Data name	Explanation
Normal	The inverter in normal (function) operation
Wait	The inverter in stand-by state
Fault	A fault occurs during operation
Update	The state of updating firmware

Turn on the AC switch, the LCD begins to count seconds backward, after this, the inverter begins to connect the gird.

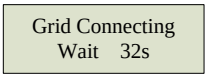
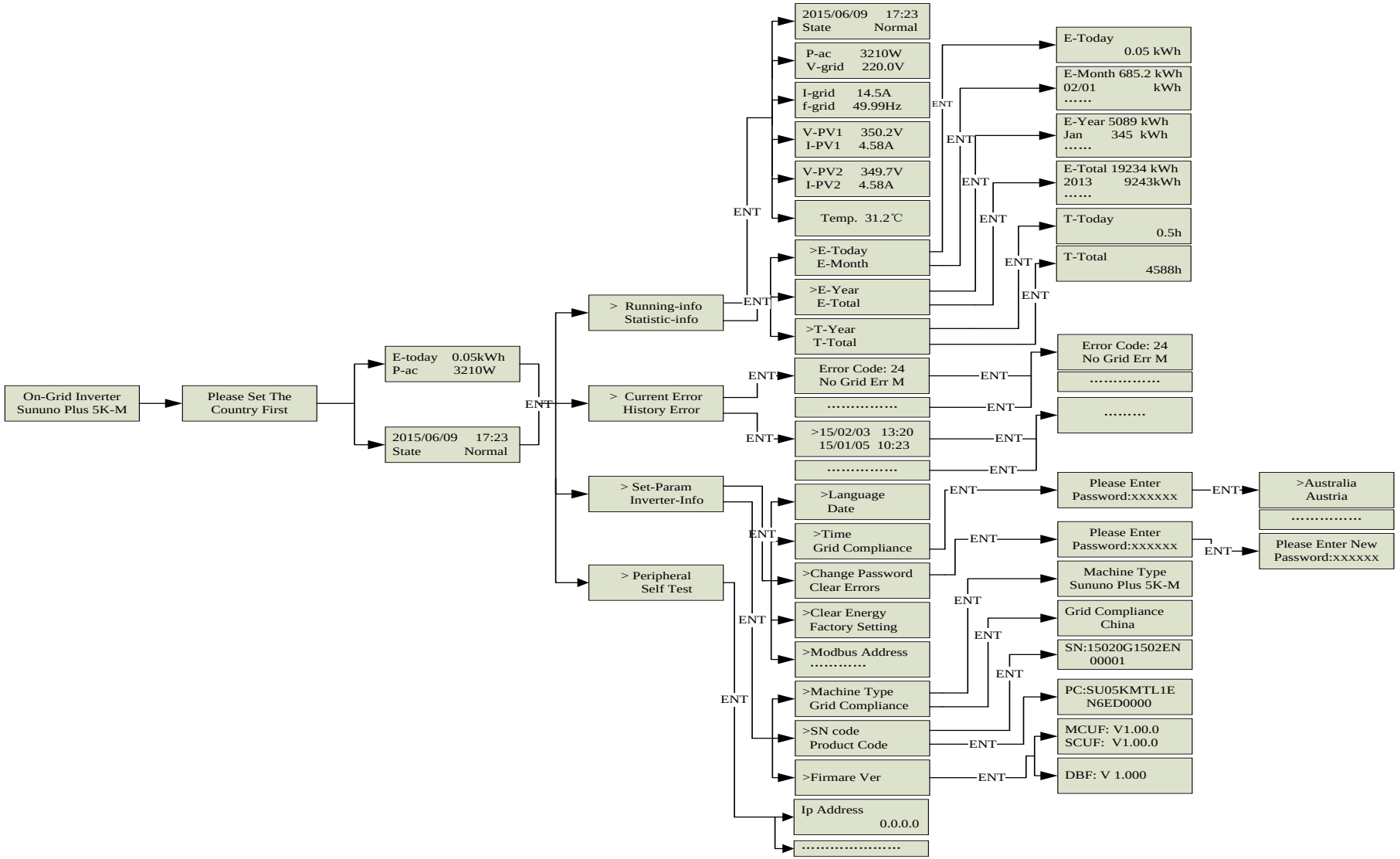


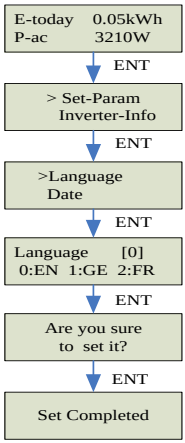
Figure 6.3 Count down Seconds

6.4.3 LCD menu is shown as below

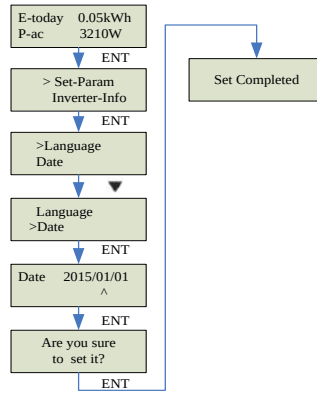


6.4.4 Settings of General Parameters of the Inverter

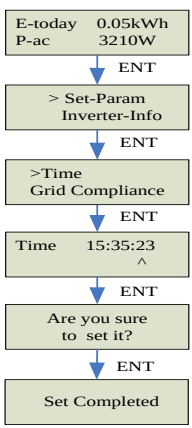
Language Setting



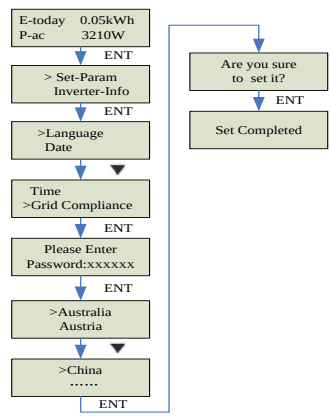
Date Setting



Time Setting

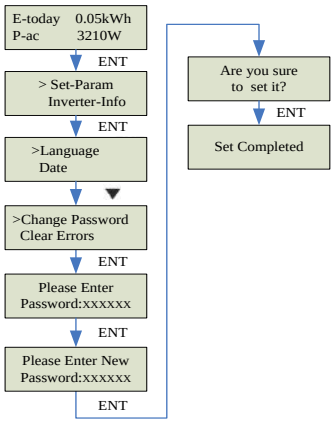


Reset Country



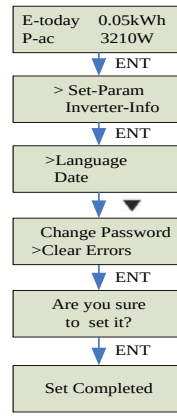
Note: Please contact SAJ if you need password.

Reset Password

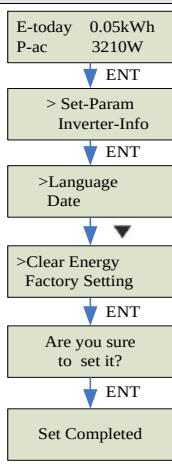


Note: Please contact SAJ if you need password.

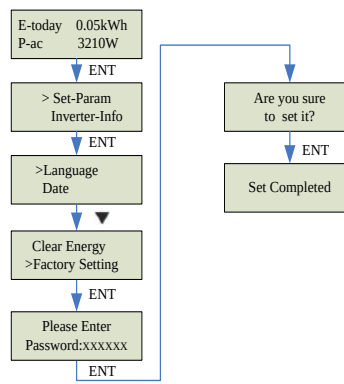
Clear Fault Records



Clear Energy

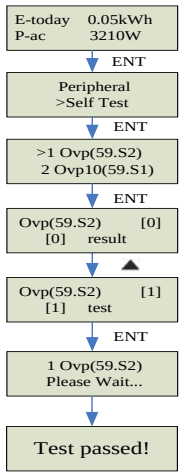
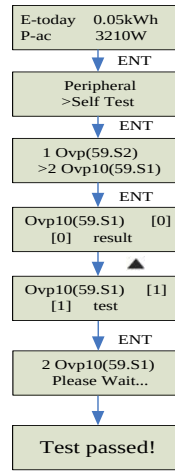
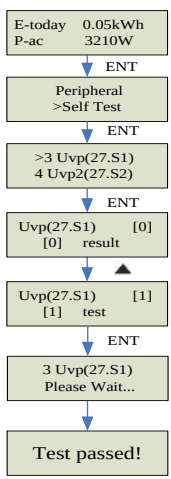
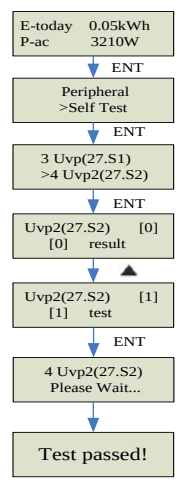


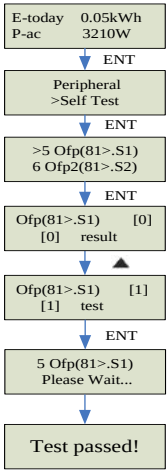
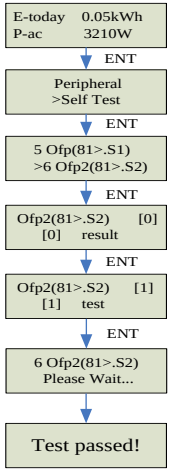
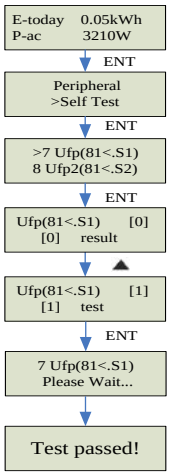
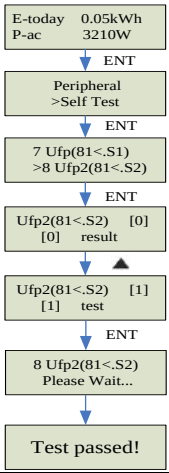
Factory Setting

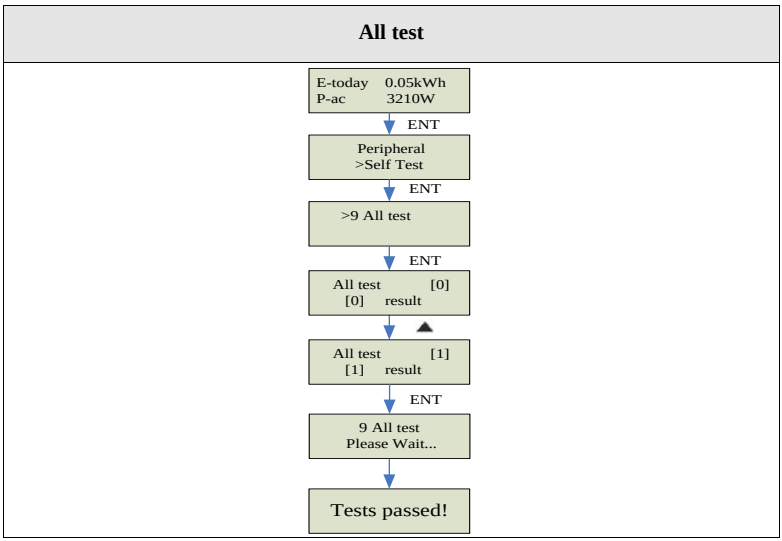


Note: Please contact SAJ if you need password.

6.4.5 Self test of the Inverter

Over-voltage protection test	Over-voltage protection test of average voltage
	
Under-voltage protection test	**Secondary under-voltage protection test**
	

Over-frequency protection test	Secondary over-frequency protection test
	
Under-frequency protection test	**Secondary under-frequency protection test**
	



Note:

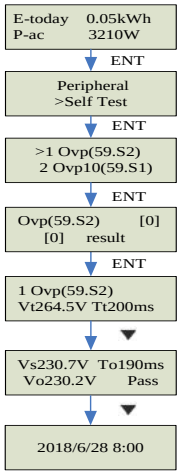
1.This setting only appears when the grid compliance selects Italy.

2.This setting shall be operated when the inverter is under normal grid-connected state.

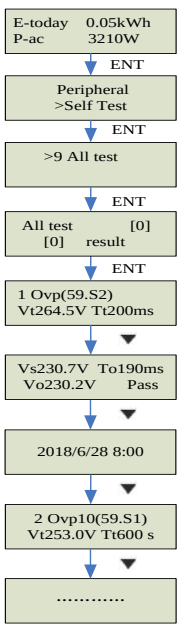
3. "All test" is starting from the item 1 to item 8 of the autotest.

4.The self-test information could be reviewed after successful setting. Self-test from item 1 to item 8 could only show the test results of each item respectively. By "All test", all test results from item 1 to item 8 could be checked all at once. as example:

over-voltage protection test

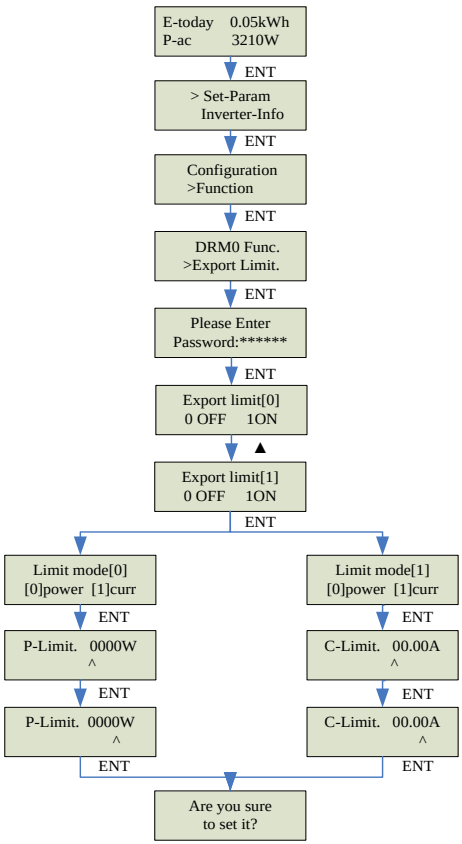


All test



6.4.6 Export Limitation Function of the Inverter

Inverter LCD Display is as below:



Note:

1. This function could be effective only when the inverter is connected with external modules.
2. Please contact SAJ if you need password.
3. Export limitation function is off by default.Select “1” to turn on the Export limitation. Select “0” to turn off the function.

4. Press“▲”“▼”to change the value of “P-Limit/C-Limit”，after a certain value settled, press “ENT”to move the cursor point to the last number, press “ENT”again then the settings complete.
E.g.: When Sununo Plus 1K is used, if set the“P-Limit” valueinto 1000W, the maximum power fed into the grid is 1000W.

6.5 Setting Reactive Power Control

6.5.1 Setup Fixed Power Factor mode

The characteristic power factor curve for cosφ (P) (Power response) mode varies the displacement power factor of the output of the inverter in response to changes in the output power of the inverter.

The response curve required for the cosφ (P) defined within displacement power factor of 0.8 leading to 0.8 lagging.

6.5.2 Setup V-Watt and Volt-Var mode

This inverter complies with IEC 62109-2 clause 6.3 for power quality response modes. The inverter satisfies for Volt-Watt and Volt-Var Settings.

Note: 1. V-Watt and V-Var setting is only available when the grid compliance chosen AS4777.

2. Customer can opt to contact supplier to activate V-Watt and V-Var setting after the inverter is connected to internet through communication module.

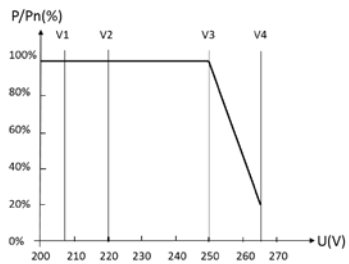


Figure 6.4 Curve for a Volt-Watt response mode (AS4777 Series)

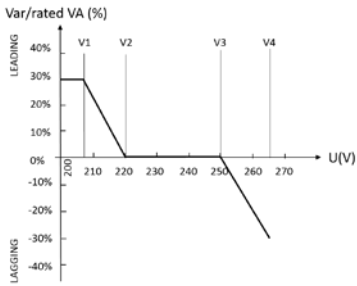


Figure 6.5 Curve for a Volt-Var control mode (AS4777 Series)

Setting procedure：

1. Please select corresponding grid compliance according to state regulation during installation via eSolar O&M APP.

2. Log in to eSolar O&M APP, select My > Remote control > Wi-Fi > Next.

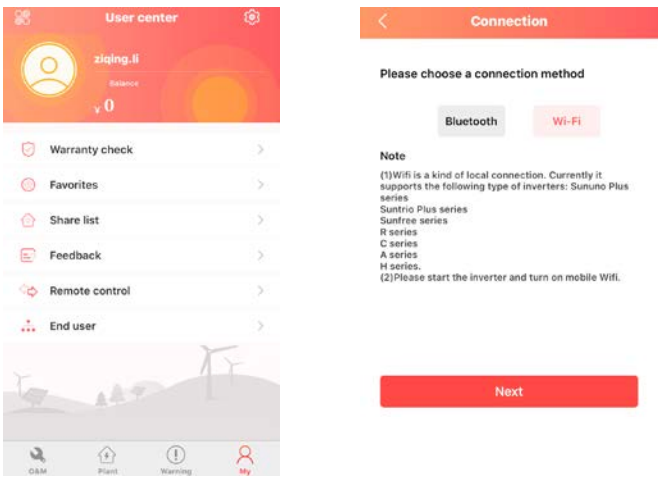


Figure 6.6 Process of remote control

3. Follow the instruction to connect Wi-Fi module

- Open the WiFi setting on your phone
- Select the Wi-Fi name of Wi-Fi module (such as DTU: Inverter: xxxxx)
- Connect Wi-Fi

4. Return to eSolar O&M APP, select “Next” > Skip > V-Watt/V-Var

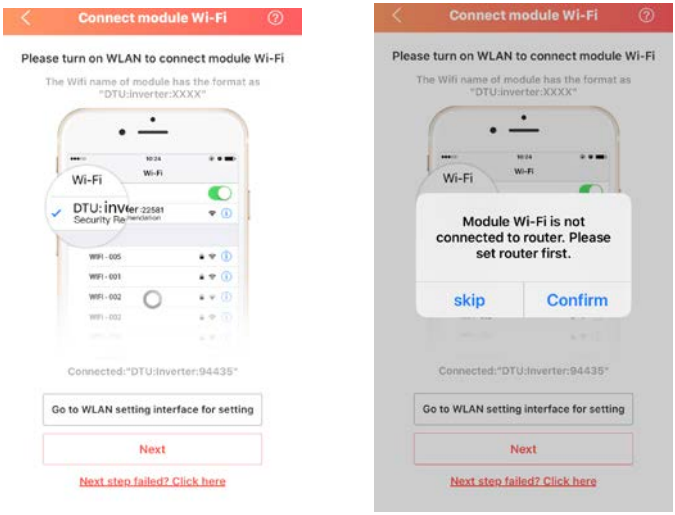


Figure 6.7 Process of accessing V-Watt/V-Var

5. Enable/ disable V-Watt/V-Var as per your local regulations, then save the setting, the inverter will restart and V-Watt/V-Var setting will be active.

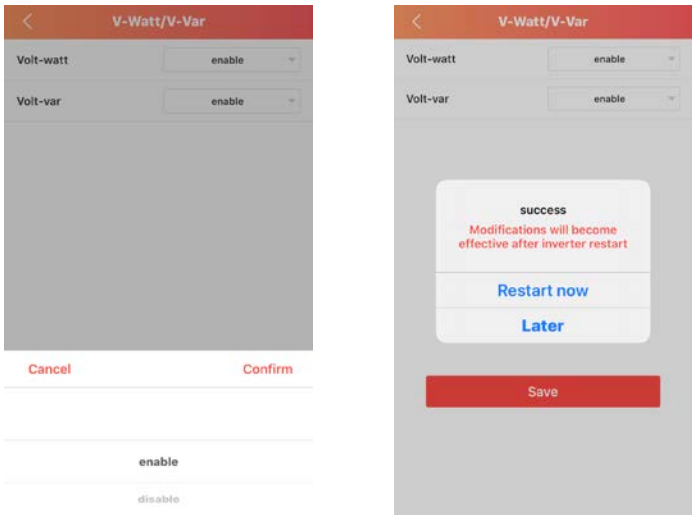


Figure 6.8 V-Watt/V-Var setting

6.6 Monitoring Operation

The equipment is equipped with a RS232 interface, and the RS232 interface can be connected to Wi-Fi module, Ethernet module, GPRS module which can be used in the monitoring of the operation status.

① The equipment can be connected to local internet via a Wi-Fi module and the Wi-Fi web server which is embedded in the machine; following this, the operational status of the inverter can be monitored.

② By connecting the Internet through Wi-Fi module and uploading the inverter data to the server, users can monitor the operational information of the inverter by web version web portal or mobile APP (please download the mobile APP from SAJ official website) remotely.

③ The equipment can be connected to local internet via Ethernet module and the Wi-Fi web server which is embedded in the machine; following this, the operational status of the inverter can be monitored.

④ By connecting the Internet through Ethernet module and uploading the inverter data to the server, users can monitor the operational information of the inverter by web version web portal or mobile APP (please download the mobile APP from SAJ official website) remotely.

⑤ By connecting the Internet through GPRS module and uploading inverter data to the server, users can monitor the operational information of the inverter by web version web portal or mobile APP (please download the mobile APP from SAJ official website) remotely.

Chapter 7 Fault Code and Troubleshooting

Error Code	Fault Information	Explanation
1	Relay Error M	Relay Error Master
2	Eeprom Error M	Storer Error Master
3	Temp. High Err M	High Temperature Master
4	Temp. Low Err M	Low Temperature Master
5	Lost Com. M<->S M	Lost Interior Communication Master
6	GFCI Dev Err M	GFCI Devices Error Master
7	DCI Dev Err M	DCI Devices Error Master
8	Cur Sensor Err M	Current Sensor Master
9	Grid Volt High M	Grid Voltage High Master
10	Grid Volt Low M	Grid Voltage Low Master
15	Volt 10m High M	Average voltage of 10 minutes High Master
18	Freq High M	Frequency High Master
19	Freq Low M	Frequency LowMaster
24	No Grid Err M	Grid Lost Error Master
27	GFCI Error M	GFCI Error Master
28	DCI Error M	DCI Error Master
31	ISO Error M	Insulation Error Master
33	Bus Volt High M	Bus Voltage High Master
35	Current High M	Current High Master
38	HW Bus Volt High M	Bus Voltage High Of Hardware Master
39	HW PV1 Curr High M	PV1 Current High of Hardware Master
40	HW PV2 Curr High M	PV2 Current High of Hardware Master
41	HW Curr High M	Current High of Hardware of Grid Master
49	Lost Com B<->C M	Lost communication between Power Meter and Control board Master
50	Lost Com. M<->S S	Lost interior communication Slave

51	Volt Consis Err S	Data Consistency of Voltage Error Slave
54	Freq Consis Err S	Data Consistency of Frequency Error Slave
57	GFCI Consis Err S	Data Consistency of GFCI Slave
61	Voltage High S	Grid Voltage High Slave
62	Voltage Low S	Grid Voltage Low Slave
67	Freq High S	Frequency High Slave
68	Freq Low S	Frequency Low Slave
73	No Grid Err S	No Grid Error Slave
76	PV1 Volt High M	PV1 Voltage High Master
77	PV2 Volt High M	PV2 Voltage High Master
81	Lost Com.D<->C M	Lost Communication Between Display board & Control board Master
86	DRM0Error M	DRM0 Error Master

Table 7.1 Error Code

Fault Information	Troubleshooting
Relay Error	If this error occurs frequently, please contact your distributor or phone SAJ.
Storer Error	If this error occurs frequently, please contact your distributor or phone SAJ.
Temperature High Error	Check whether the radiator is blocked, whether the inverter is in too high or too low temperature, if the above mentioned are in normal, please contact your distributor or phone SAJ.
GFCI Device Error	If this error occurs frequently, please contact your distributor or phone SAJ.
DCI Device Error	If this error occurs frequently, please contact your distributor or phone SAJ.
Current Sensor Error	If this error occurs frequently, please contact your distributor or phone SAJ.
AC Voltage Error	·Check the volt of the grid ·Check the connection between the inverter and the grid. ·Check the settings of the on-grid standards of the inverter. ·If the volt of the grid is higher than the volt regulated by local grid, please inquire the local grid workers whether they can adjust

	the volt at the feed point or change the value of the regulated volt. ·If the volt of the grid is in regulated range as allowed and LCD still in this error, please contact your distributor or phone SAJ.
Frequency Error	Check the set of country and check the frequency of the local grid, if the above mentioned are in normal, please contact your distributor or phone SAJ.
No Grid Error	Check the connection status between the AC side of the inverter and the grid, if the above mentioned are in normal, please contact your distributor or phone SAJ.
GFCI Error	Check the insulation resistance of the positive side and negative side of the solar panel; check whether the inverter is in wet environment; check the grounding of the inverter. If the above mentioned are in normal, please contact your distributor or phone SAJ.
DCI Error	If this error exists always, please contact your distributor or phone SAJ.
ISO Error	Check the insulation resistance of the positive side and negative side of the solar panel; check whether the inverter is in wet environment; check whether the grounding of the inverter is loose or not. If the above mentioned are in normal, please contact your distributor or phone SAJ.
Current High	Check the connection status between the inverter and the grid and test whether the volt of the grid is stable or not, if the above mentioned are in normal, please contact your distributor or phone SAJ.
Bus Voltage High	Check the settings of the solar panel. SAJ designer can help you.If the above mentioned are in normal, please contact your distributor or phone SAJ.
PV Current High	If this error exists always, please contact your distributor or phone SAJ.
PV Voltage Fault	Check the settings of the solar panel. SAJ designer can help you. If the above mentioned are in normal, please contact your distributor or phone SAJ.
Lost Communication	Check the connection of communication cables between control board and display board. If the above mentioned are in normal, please contact your distributor or phone SAJ.

Table 7.2 Troubleshooting

Chapter 8 Routine Maintenance

Inverter Cleaning

Clean the enclosure lid, LED indicators and LCD of the inverter with moistened cloth with clear water only. Do not use any cleaning agents as it may damage the components.

Heat Sink Cleaning

Clean the heat sink with dry cloth or air blower, Do Not clean the heat sink with water or cleaning agents. Make sure there is enough space for ventilation of inverter.

Chapter 9 Recycling and Disposal

This device should not be disposed as residential waste. An inverter that has reached the end of its life is not required to be returned to your dealer or you must find an approved collection and recycling facility in your area.

Chapter 10 Guarantee Service

Please refer to the warranty card.

Chapter 11 Contact SAJ

Guangzhou Sanjing Electric Co., Ltd.

SAJ Innovation Park, No.9, Lizhishan Road, Guangzhou Science City, Guangdong, P.R.China.

Postcode: 510663

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Fax: +86 20 6660 8589

E-mail: service@saj-electric.com

International Sales

Tel: 86-20-66608618/66608619/66608588/66600086

Fax: 020-66608589

E-mail: info@saj-electric.com

Domestic Sales

Tel: 020-66600058/66608588

Fax: 020-66608589

SAJ Warranty Policy in Australia

Standard Warranty Period:

Guangzhou Sanjing Electric, Co., Ltd ("SAJ") grants a standard warranty period of 66 months (5.5 years) for the Sununo Plus series, Suntrio Plus series, Sunfree hybrid series, AC-coupled inverters, starting from the date of shipment from SAJ factory or 60 months (5 years) starting from the date of purchased invoice marked (whichever is longer).

Our goods come with guarantees that cannot be excluded under the Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the goods repaired or replaced if the goods fail to be of acceptable quality and the failure does not amount to a major failure.

Extension of Warranty:

The purchaser of SAJ inverters (Sununo Plus series, Suntrio Plus series, Sunfree hybrid series and AC-coupled inverters) should extend the warranty period in 18 months from the date of settlement or 30 months from the date of shipment from SAJ by providing the serial number of the unit and purchased receipt (whichever is shorter). You can purchase the warranty extension for 10 years, 15 years, 20 years or 25 years but do not apply the extension beyond the specified date, or else your application will be unacceptable. Please refer to the Warranty Extension Order Form for more details.

Once the purchase of the warranty extension goes into effect, SAJ will send the warranty extension certificate to the customer for confirming the extended warranty period.

Warranty Conditions:

If your inverter gets fault and requires troubleshooting, please contact your distributor or dealer directly. Alternatively, feedback briefly to SAJ for logging and send your scanned warranty card to SAJ Service Team (service@saj-electric.com) by email to process the warranty claim.

During the Warranty Period, SAJ only covers the costs of materials, delivery (land or sea transportation) and other derived expense, for example custom taxation, when you send defective products to SAJ/SAJ distributor or/and SAJ/SAJ distributor send refurbished products to you for replacing any product or parts of the product proved to be defective in design or manufacture. To claim the warranty under the warranty policy of SAJ, you need to supply us with the following information and documentation regarding the faulty inverter:

1. Product Model No. (e.g. Sununo-Plus 5K-M) and serial number

（e.g.15020G1833EN00001)

2.Copy of the invoice and warranty certificate of the inverter.

3.Copy of the installation report and installation date.

3.Error message on LCD screen (if available) or any information which would be helpful to determine the defect.

4.Detailed information about the entire system (Solar Panels, System

Configuration, etc.).

Documentation of previous claims/exchanges (if applicable).

After receiving above information, SAJ will decide how to proceed the service:

- Repaired by SAJ factory, or
- Repaired on-site by SAJ Service Center, or
- Offer a replacement device of equivalent value according to model and age.

In the case of an exchange, the remaining portion of the original warranty period will be transferred to the replacement device. You will not receive a new certificate, as your entitlement is documented at SAJ. While the original model stop producing or

out of stock, SAJ will provide new model type of inverter or an equivalent value product.

If the inverter needs to be replaced following assessment, SAJ will send a replacement unit immediately. The defective inverter should be sent back to the closest SAJ Service Center by packing in its original package if possible. SAJ keeps the right to accomplish the warranty service works via SAJ authorized service partner.

Service after warranty expiration

If the inverters for maintenance are out of warranty, SAJ charges an on-site service fee, parts, labor cost and logistic fee to end-user. Detailed standard refers to the listed table.

Item	Return Factory Maintenance	On-site Maintenance
Without parts replacement	Labor + Logistic fee (to & from SAJ)	Labor + On-site attendance fee
With parts replacement	Labor + Parts + logistic fee (to & from SAJ)	Labor + On-site attendance fee + Parts

■On-site attendance fee: Cost of travel and time for the technician in attending on-site.

■Parts: Cost of replacement parts (including any shipping/admin fee that may apply).

■Labor: Labor time fee charged for the technician, who is repairing, maintaining, installing (hardware or software) and debugging the faulty product.

■Logistic fee: Cost of delivery, tariff and other derived expense when defective products are sent from user to SAJ or/and repaired products are sent from SAJ to user.

Exclusion of Liability:

Any defect caused by the following circumstances will not be covered by the manufacturer's warranty (the Installer or Distributors authorized by SAJ are responsible for the following investigation):

◆ "Warranty Card" not being sent back to Distributor/Installer or SAJ;

◆ Product modified, parts replaced or attempt to maintain;

◆ Changes, or attempted repairs and erasing of series number or seals by non SAJ technician;

◆ Incorrect installation or commissioning;

◆ Failure to comply with the safety regulations (VDE standards, etc.);

◆ The inverter has been improperly stored and damaged while being stored by the Dealer or the end user;

◆ Transport damage (including scratch caused by movement inside packaging during shipping). A Claim should be made directly to shipping company/insurance Company as soon as the container/packaging is unloaded and such damage is identified;

◆ Failure to follow any / all of the user manual, the installation guide and the maintenance regulations;

◆ Improper use or misuse of the inverter;

◆ Insufficient ventilation of the inverter;

◆ Influence of foreign objects and force majeure (lightning, grid over-voltage, severe weather, fire, etc.);

◆ Any out-of-pocket costs incurred by Installer/Distributor or compensation from electricity production loss are not borne by SAJ in the standard warranty;

For further information on SAJ warranty regulation and reliability, please visit our website: www.saj-electric.com.

Warranty Card

The installer should fill in the second form while installing the inverter. For warranty claim, please complete the below forms and send this page to SAJ attached with the Customer's invoice.

For Customer to fill in

Name:		
City:	Country:	Zip:
Tel:	Fax:	E-mail:

Information on Device

Device type:	Serial No.(S/N):
Invoice No:	Commissioning date::
Fault time:	
Error message (Display reading):	
Brief fault description & photo:	
Signature:_____ Date:_____	

For Installer to fill in

Modules Used:		
Modules Per String:	No. of String:	
Installation Company:	Contractor License Number:	
Company:		
City:	Country:	Zip:
Tel:	Fax:	E-mail:
Signature:_____	Date:_____	

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