User Manual

SAJ Solar Inverter

R5-(0.7K, 1K, 1.5K, 2K, 2.5K, 3K)-S1-15
R5-(3K, 3.6K, 4K, 5K, 6K, 7K, 8K)-S2-15

Preface

Thank you for choosing SAJ solar inverter. We are pleased to provide you 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 our forever commitment. We hope this document proves to be of great assistance in your journey for a cleaner, greener world.

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

Guangzhou Sanjing Electric Co., Ltd.

Building e-Energy Management Solution Provider

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Chapter 1 Safety Precautions

1.1 Scope of Application

This User Manual describes the instructions for installing, operating, maintaining, and troubleshooting the following SAJ on-grid inverters:

R5-0.7K-S1-15, R5-1K-S1-15, R5-1.5K-S1-15, R5-2K-S1-15, R5-2.5K-S1-15, R5-3K-S1-15

R5-3K-S2-15, R5-3.6K-S2-15, R5-4K-S2-15, R5-5K-S2-15, R5-6K-S2-15, R5-7K-S2-15, R5-8K-S2-15

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

·Possible danger to life due to electrical shock and high voltage.

·Do not touch the operating component of the inverter, 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, otherwise, this may cause 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 completely 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 to protect properties and persons.

⚠ CAUTION
· The solar 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 solar 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
	**Danger of 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.
	**Danger of electrical shock** 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** See Chapter “Troubleshooting” to remedy the error.
	**This device shall not be disposed of in residential waste** See Chapter “Appendix” for proper disposal treatments.
	**Without Transformer** This inverter does not use transformer for the isolation function.

CE	**CE Mark** With CE mark & the inverter fulfills the basic requirements of the Guideline Governing Low-Voltage and Electro-magnetic Compatibility.
CQC	**CQC Mark** The inverter complies with the safety instructions from China's Quality Center.

Chapter 3 Product Information

3.1 Application Scope of Products

R5-*X*K-S*Y* products are on-grid single phase inverters without transformers, and the inverters are important components of on-grid solar power systems.

The R5 inverters can convert 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, Figure 3.1 shows the structural diagram of the typical application system of R5 inverter.

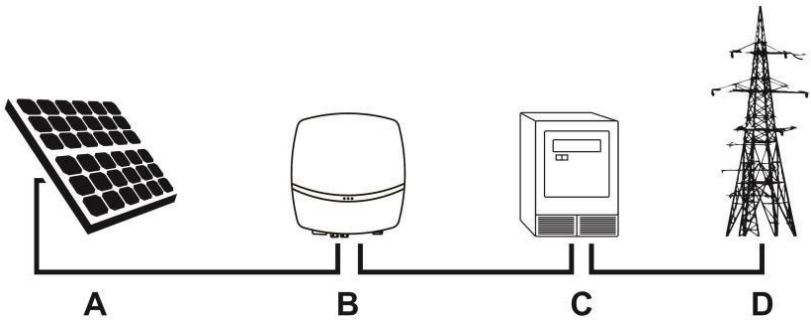


Figure 3.1 R5 series application

Callout	Name	Description
A	Solar panels	Monocrystalline or polycrystalline silicon, and thin-film PV modules with II protection and need no ground connection.
B	Inverters	R5-(0.7K, 1K, 1.5K, 2K, 2.5K, 3K)-S1-15 R5-(3K, 3.6K, 4K, 5K, 6K, 7K, 8K)-S2-15
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

3.2 Specification of Product Model

R5 – *X*K – S*Y*–15
① ② ③ ④

① R5 represents the product name.

② *X*K represents the rated power of the inverter in *x*kW. For example, 3K means 3kW.

③ S means single phase; 1 or 2 represents that the inverter has the function of one or double MPPT.

④ 15 means that the string current is 15A.

3.3 Dimensions

The dimensions of R5 series products are shown below. The measurement unit is mm.

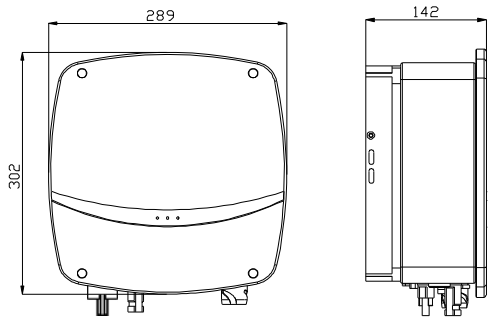


Figure 3.3 Dimensions of R5-(0.7K-3K)-S1-15

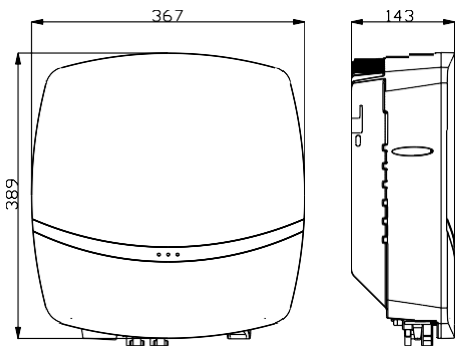


Figure 3.4 Dimensions of R5-(3K-6K)-S2-15

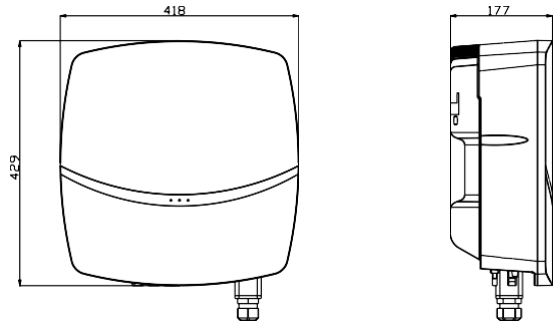


Figure 3.5 Dimensions of R5-(7K, 8K)-S2-15

3.4 Datasheet

3.4.1. R5-(0.7K, 1K, 1.5K)-S1-15

Model	R5-0.7K-S1-15	R5-1K-S1-15	R5-1.5K-S1-15
Input (DC)			
Max. PV Array Power [Wp]@STC	1050	1500	2250
Max. DC Voltage [V]	450		
MPPT Voltage Range [V]	40-425		
Nominal DC Voltage [V]	360		
Start Voltage [V]	40		
Min. DC Voltage [V]	40		
Max. DC Input Current [A]	15		
Max. DC Short Current [A]	18		
Number of DC Connection Sets per MPPT	1		
Number of MPPT	1		
Backfeed Current [A]	0		
DC Switch	Integrated		
Output (AC)			
Rated AC Power [W]	700	1000	1500
Rated Apparent Power [VA]	700	1000	1500
Rated AC Current [A]@230Vac	3.1	4.4	6.6
Max. AC Current [A]	3.5	5	7.5
Current Inrush [A]	30		
Backfeed Current [A]	0.1		
Max. AC Fault Current [A]	30		
Max. AC Over Current Protection [A]	27		
Nominal AC Voltage/Range [V]	220, 230, 240/180-280		
Grid Frequency/ Range [Hz]	50 Hz: 45-55; 60 Hz: 55-65		
Power Factor [cos ϕ]	0.8 leading to 0.8 lagging		
Total Harmonic Distortion [THDi]	< 2%		
Feed-in	L+N+PE		
Efficiency			
Max. Efficiency	97.20%	97.30%	97.40%
Euro Efficiency	96.40%	96.70%	96.80%
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
AC grounding detection	Integrated
DC Surge Protection	Integrated
AC Surge Protection	Integrated
Thermal Protection	Integrated
Anti-island Protection Monitoring	AFD
Interface	
AC Connection	Plug-in connector
DC Connection	D4; MC4 (optional)
Human Machine Interface	LED + (Bluetooth/Wi-Fi+App)
Communication Port	RS232 (USB) + RS485 (RJ45) + DRM (RJ45)
Communication Mode	Wi-Fi/GPRS/4G (optional)
General Data	
Topology	Transformerless
Consumption at Night [W]	<0.2
Consumption at Standby [W]	6
Operating Temperature Range	-40℃ to +60℃ (45℃ to 60℃ with derating)
Cooling Method	Natural convection
Ambient Humidity	0% to 100% Non-condensing
Altitude [m]	4000 (>3000m with power derating)
Noise [dBA]	<25
Ingress Protection	IP65
Mounting	Rear panel
Dimensions[H*W*D] [mm]	302*289*142
Weight [kg]	7.2
Standard Warranty [Year]	Refer to the warranty policy
Applicable Standard	CQC NB/T 32004, EN62109-1/2, EN61000-6-1/2/3/4, EN50438, EN50549-1, C10/C11, IEC62116, IEC61727, RD 1699, G98, G99, UNE206006, UNE206007-1, CEI0-21, AS/NZS4777.2

3.4.2. R5-(2K, 2.5K, 3K)-S1-15

Model	R5-2K-S1-15	R5-2.5K-S1-15	R5-3K-S1-15
Input (DC)			
Max. PV Array Power [Wp]@STC	3000	3250	4500
Max. DC Voltage [V]	500		
MPPT Voltage Range [V]	50-450		
Nominal DC Voltage [V]	360		
Start Voltage [V]	50		
Min. DC Voltage [V]	40		
Max. DC Input Current [A]	15		
Max. DC Short Current [A]	18		
Number of DC Connection Sets per MPPT	1		
Number of MPPT	1		
Backfeed Current [A]	0		
DC Switch	Integrated		
Output (AC)			
Rated AC Power [W]	2000	2500	3000
Rated Apparent Power [VA]	2000	2500	3000
Rated AC Current [A]@230V AC	8.7	10.9	13.1
Max. AC Current [A]	10	12.5	15
Current Inrush [A]	30		
Backfeed Current [A]	0.1		
Max. AC Fault Current [A]	30		
Max. AC Over Current Protection [A]	27		
Nominal AC Voltage/Range [V]	220, 230, 240/180-280		
Grid Frequency/ Range [Hz]	50 Hz: 45-55; 60 Hz: 55-65		
Power Factor [cos φ]	0.8 leading to 0.8 lagging		
Total Harmonic Distortion [THDi]	< 2%		
Feed-in	L+N+PE		
Efficiency			
Max. Efficiency	97.60%	97.70%	97.80%
Euro Efficiency	97.00%	97.10%	97.20%
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
AC grounding detection	Integrated
DC Surge Protection	Integrated
AC Surge Protection	Integrated
Thermal Protection	Integrated
Anti-island protection monitoring	AFD
Interface	
AC Connection	Plug-in connector
DC Connection	D4; MC4 (optional)
Human Machine Interface	LED + (Bluetooth/Wi-Fi+App)
Communication Port	RS232 (USB) + RS485 (RJ45) + DRM (RJ45)
Communication Mode	Wi-Fi/GPRS/4G (optional)
General Data	
Topology	Transformerless
Consumption at Night [W]	<0.2
Consumption at Standby [W]	6
Operating Temperature Range	-40℃ to +60℃ (45℃ to 60℃ with derating)
Cooling Method	Natural convection
Ambient Humidity	0% to 100% Non-condensing
Altitude [m]	4000 (>3000m with power derating)
Noise [dBA]	<25
Ingress Protection	IP65
Mounting	Rear panel
Dimensions[H*W*D] [mm]	302*289*142
Weight [kg]	7.5
Standard Warranty [Year]	Refer to the warranty policy
Applicable Standard	CQC NB/T 32004, EN62109-1/2, EN61000-6-1/2/3/4, EN50438, EN50549-1, C10/C11, IEC62116, IEC61727, RD 1699, G98, G99, UNE206006, UNE206007-1, CEI0-21, AS/NZS4 777.2

3.4.3. R5-(3K, 3.6K, 4K, 5K, 6K)-S2-15

Model	R5-3K-S2-15	R5-3.6K-S2-15	R5-4K-S2-15	R5-5K-S2-15	R5-6K-S2-15
Input (DC)					
Max. PV Array Power [Wp]@STC	4500	5400	6000	7500	9000
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]	15/15				
Max. DC Short Current [A]	18/18				
Number of DC Connection Sets per MPPT	1/1				
Number of MPPT	2				
Backfeed Current [A]	0				
DC Switch	Integrated				
Output (AC)					
Rated AC Power [W]	3000	3680	4000	4999	6000
Rated Apparent Power [VA]	3000	3680	4000	4999	6000
Rated AC Current [A]	13.1	16	17.4	21.7	26.1
Max. AC Current [A]	15.0	16.7	20.0	21.7	27.3
Current Inrush [A]	50				
Backfeed Current [A]	0.1				
Max. AC Fault Current [A]	28.8	32	38.4	43.4	52.2
Max. AC Over Current Protection [A]	25.9	28.8	34.6	39.1	47.0
Nominal AC Voltage/Range [V]	220, 230, 240/180-280				
Grid Frequency/Range [Hz]	50 Hz: 45-55; 60 Hz: 55-65				
Power Factor [cos ϕ]	0.8 leading to 0.8 lagging				
Total Harmonic Distortion [THDi]	< 2%				
Feed-in	L+N+PE				
Efficiency					
Max. Efficiency	97.8%	98.0%	98.0%	98.1%	98.2%

Euro Efficiency	97.2%	97.5%	97.5%	97.6%	97.6%
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				
AC Grounding Detection	Integrated				
DC Surge Protection	Integrated				
AC Surge Protection	Integrated				
Thermal Protection	Integrated				
Anti-island Protection Monitoring	AFD				
Interface					
AC Connection	Plug-in connector				
DC Connection	D4; MC4 (optional)				
Human Machine Interface	LED + (Bluetooth/Wi-Fi+App)				
Communication Port	RS232 (USB) + RS485 (RJ45) + DRM (RJ45)				
Communication Mode	Wi-Fi/GPRS/4G (optional)				
General Data					
Topology	Transformerless				
Consumption at Night [W]	<0.2				
Consumption at Standby [W]	6				
Operating Temperature Range	-40℃ to +60℃ (45℃ to 60℃ with derating)				
Cooling Method	Natural convection				
Ambient Humidity	0% to 100% Non-condensing				
Altitude [m]	4000 (>3000m with power derating)				
Noise [dBA]	<25				
Ingress Protection	IP65				
Mounting	Rear panel				
Dimensions[H*W*D] [mm]	389*367*143				
Weight [kg]	12.2				

Standard Warranty [Year]	Refer to the warranty policy
Applicable Standard	CQC NB/T 32004, EN62109-1/2, EN61000-6-1/2/3/4, EN50438, EN50549-1, C10/C11, IEC62116, IEC61727, RD1699, G98, G99, UNE206006, UNE206007-1, CEI0-21, AS/NZS4777.2

3.4.4. R5-(7K, 8K)-S2-15

Model	R5-7K-S2-15	R5-8K-S2-15
Input (DC)		
Max. PV Array Power [Wp]@STC	10500	12000
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]	30/15	
Max. DC Short Current [A]	36/18	
Number of DC Connection Sets per MPPT	2/1	
Number of MPPT	2	
Backfeed Current [A]	0	
DC Switch	Integrated	
Output (AC)		
Rated AC Power [W]	7000	8000
Rated Apparent Power [VA]	7000	8000
Rated AC Current [A]@230Vac	30.5	34.8
Max. AC Current [A]	35	36.4
Current Inrush [A]	50	
Backfeed Current [A]	0.1	
Max. AC Fault Current [A]	67	69.6
Max. AC Over Current Protection [A]	60.3	62.6
Nominal AC Voltage/ Range [V]	220, 230, 240/180-280	
Grid Frequency/ Range [Hz]	50 Hz: 45-55; 60 Hz: 55-65	
Power Factor [cos φ]	0.8 leading to 0.8 lagging	
Total Harmonic Distortion [THDi]	< 2%	
Feed-in	L+N+PE	
Efficiency		
Max. Efficiency	98.2%	98.3%
Euro Efficiency	97.7%	97.8%

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
AC Grounding Detection	Integrated
DC Surge Protection	Integrated
AC Surge Protection	Integrated
Thermal Protection	Integrated
Anti-island Protection Monitoring	AFD
Interface	
AC Connection	Terminal Block
DC Connection	D4; MC4 (optional)
Human Machine Interface	LED + (Bluetooth/Wi-Fi+App)
Communication Port	RS232 (USB) + RS485 (RJ45) + DRM(RJ45)
Communication Mode	Wi-Fi/GPRS/4G (optional)
General Data	
Topology	Transformerless
Consumption at Night [W]	<0.2
Consumption at Standby [W]	6
Operating Temperature Range	-40℃ to +60℃ (45℃ to 60℃ with derating)
Cooling Method	Natural convection
Ambient Humidity	0-100% Non-condensing
Altitude [m]	4000 (>3000m with power derating)
Noise [dBA]	<25
Ingress Protection	IP65
Mounting	Rear panel
Dimensions [H*W*D][mm]	429*418*177
Weight [kg]	18
Standard Warranty [Year]	Refer to the warranty policy
Applicable Standard	CQC NB/T 32004, EN62109-1/2, EN61000-6-1/2/3/4, EN50438, EN50549-1, C10/C11, IEC62116, IEC61727, RD1699, G98, G99, UNE206006, UNE206007-1, CEI0-21, AS/NZS4777.2

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 meets the pollution degree II. · Inappropriate 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 leaving factory, it is still possible 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 Determine the Installation Method and Position

4.3.1. Mounting Method

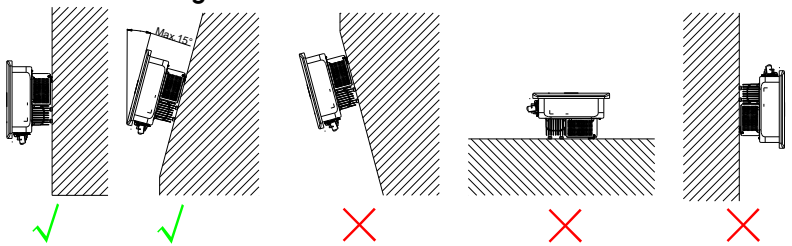


Figure 4.1 Mounting method

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

② Please install the equipment under the guidance of Figure 4.1. Vertical installation on floor level is recommended. Mount vertically or tilted backwards by max. 15°. Never install the inverter tilted forwards, sideways, horizontally or upside down.

③ Considering convenience for maintenance, please install the equipment at a position in parallel with line of sight.

④ When mounting the inverter, please consider the solidity of wall for inverter, including accessories. Ensure the rear panel mount tightly.

Before installation, make sure that the wall has enough strength to hold the screws and bear the weight of the equipment. Make sure the equipment is installed properly.

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 -40℃ to +60℃ (-40° F to 140° F) to ensure optimum operation. Choose locations with sufficient air exchange. Ensure additional ventilation, if necessary.

When multiple SAJ on-grid solar inverters are installed together, reserve the following safety space for proper ventilation:

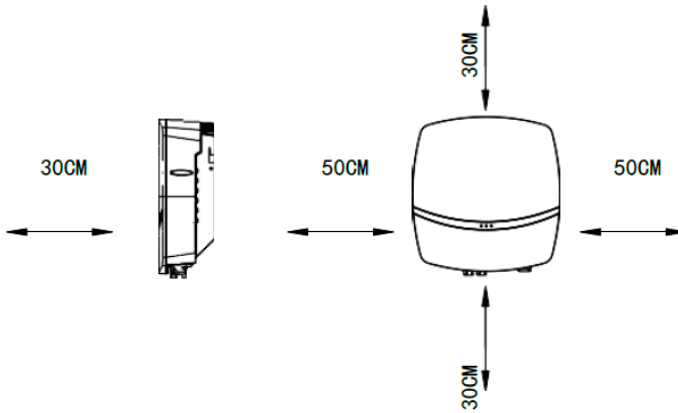


Figure 4.2 Installation position

4.4 Mounting Procedure

Step 1. Mark the drilling positions on the wall according to the holes on the rear panel.

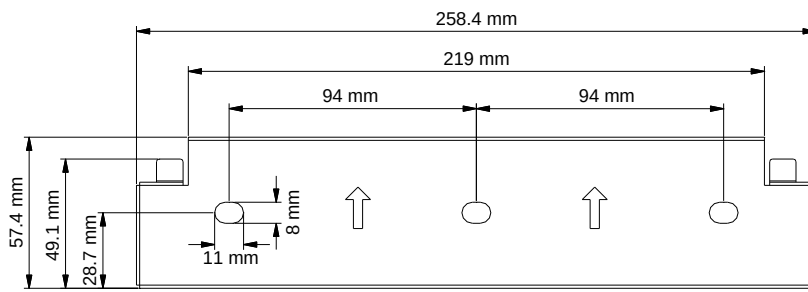


Figure 4.3 Dimensions of rear panel of R5-(0.7K-3K)-S1-15

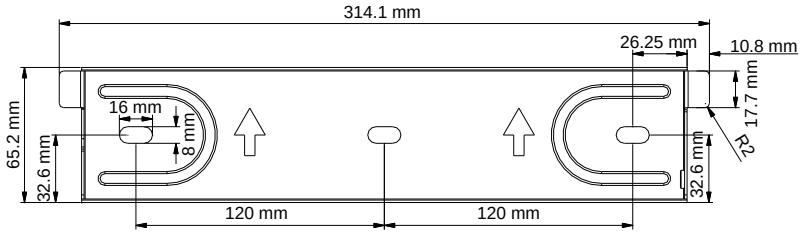


Figure 4.4 Dimensions of rear panel of R5-(3K-6K)-S2-15

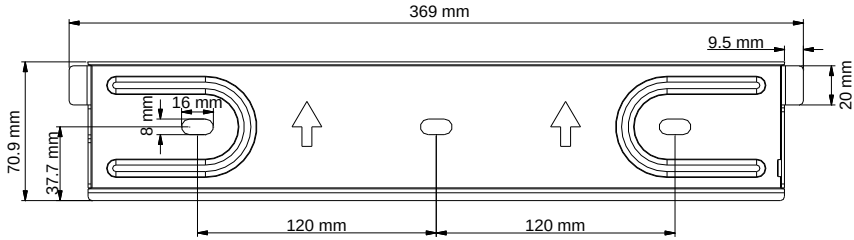


Figure 4.5 Dimensions of rear panel of R5-(7K, 8K)-S2-15

Step 2. Drill 3 holes in the wall according to the markings, and then place the expansion tubes in the holes using a rubber mallet.

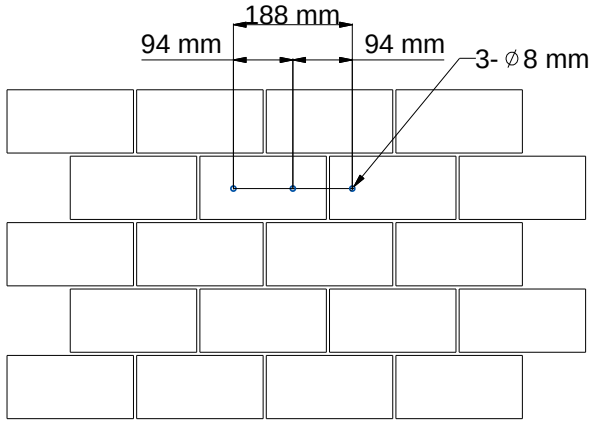


Figure 4.6 Drilling holes of R5-(0.7K-3K)-S1-15

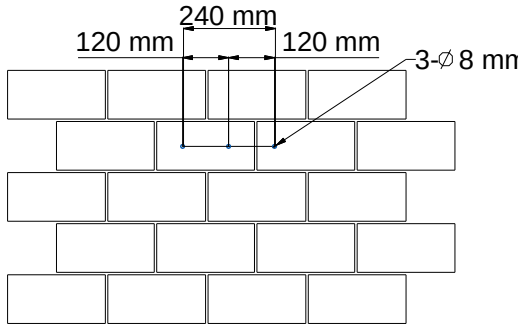


Figure 4.7 Drilling holes of R5-(3K-8K)-S2-15

Step 3. Secure the panels at the mounting position with screws.

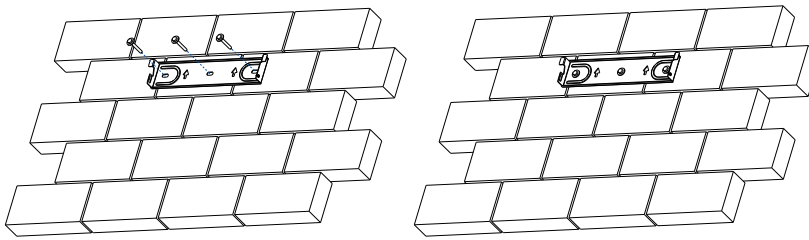


Figure 4.8 Mounting the rear panel

Step 4. Carefully mount the inverter to the rear panel. Make sure that the rear part of the equipment is closely mounted to the rear panel.

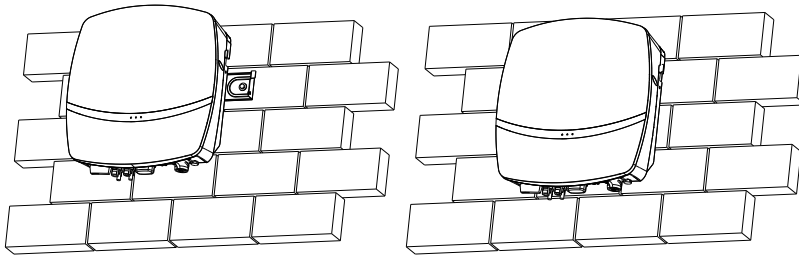


Figure 4.9 Mounting the inverter

Step 5. Secure the inverter to the rear panel with a screw.

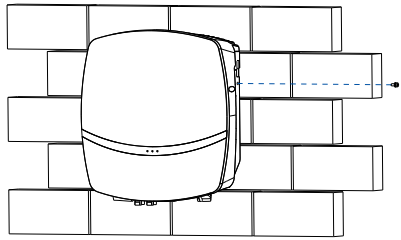


Figure. 4.10 Securing the inverter and hanging panel with screws

Step 6. (Optional) Prepare an anti-theft lock and lock the inverter as shown below.

Recommend using a lock with lock hole diameter of ϕ6.0mm and lock hook diameter of ϕ5.0mm.

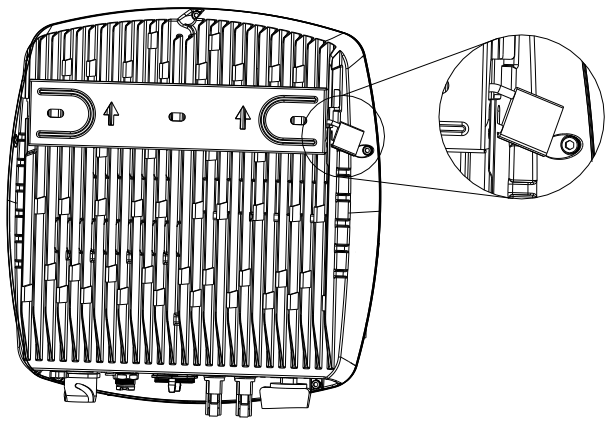


Figure 4.11 Installing an anti-theft lock

Chapter 5 Electrical Connection

5.1 Safety Instruction for Hot-line Job

Electrical connection must only be operated 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 connect ion between the inverter 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 PV array is exposed to light, it supplies DC 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, on AC output port is III.

5.2 Specifications of Electrical Interfaces

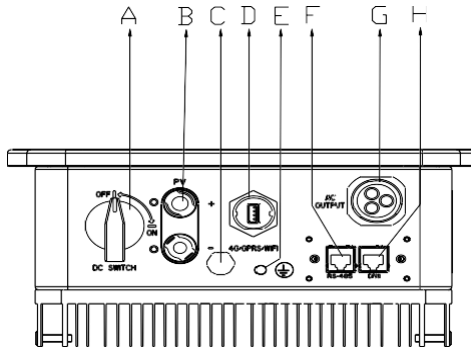


Figure 5.1. Electrical interface of R5-(0.7K-3K)-S1-15

Callout	Name
A	DC Switch
B	DC Input
C	Decompression Valves
D	RS232 Communication (GPRS/Wi-Fi/4G)
E	Ground Connection
F	RS485 Communication
G	AC Output
H	DRM

Table 5.2 Specifications of electrical interfaces

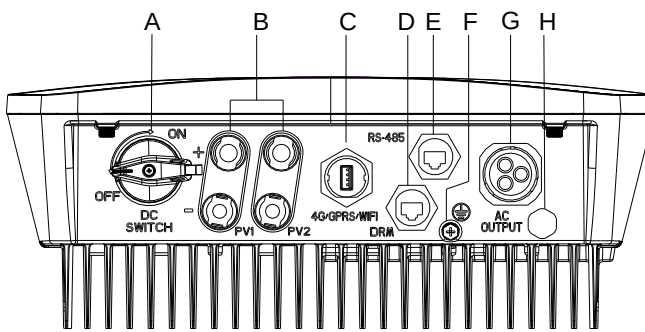


Figure 5.2. Electrical interfaces of R5-(3K-6K)-S2-15

Callout	Name
A	DC Switch (optional)
B	DC Input
C	RS232 Communication (GPRS/Wi-Fi/4G)
D	DRM
E	RS485 Communication
F	Ground Connection
G	AC Output (plug A/B)
H	Decompression Valves

Table 5.3 Specifications of electrical interfaces

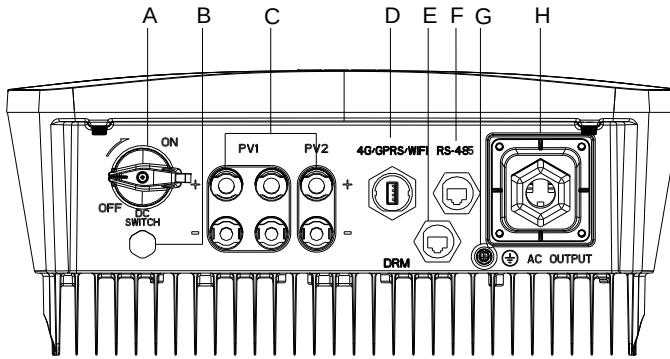


Figure 5.3. Electrical interfaces of R5-(7K, 8K)-S2-15

Callout	Name
A	DC Switch (optional)
B	Decompression Valves
C	DC Input
D	RS232 Communication (GPRS/Wi-Fi/4G)
E	DRM
F	RS485 Communication
G	Ground Connection
H	AC Output

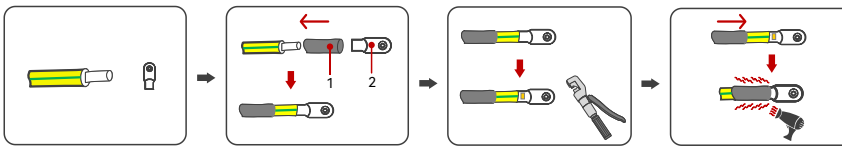
Table 5.4 Specifications of electrical interfaces

5.3 Grounding Cable Connection

The users need to prepare the cables and OT/DT terminals themselves. The recommended conductor cross-sectional area of the grounding cable is 6-16mm².

Procedure

Step 1. Assemble the cables with the OT/DT terminals as follows:



1. Heat shrink tubing 2. OT/DT terminal

Step 2. Remove the screw of the grounding terminal and secure the OT/DT terminal of the grounding cable with the screw.

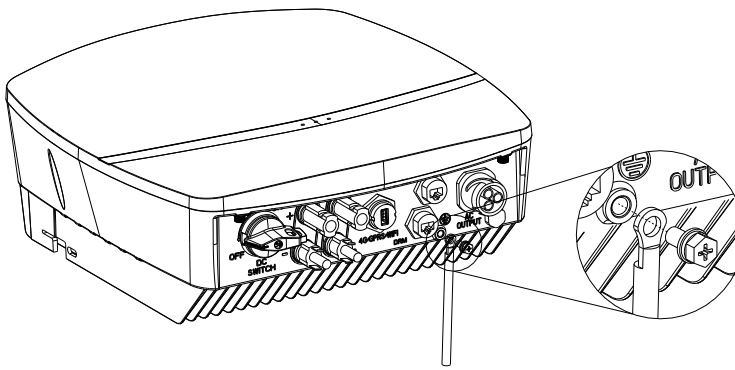


Figure 5.4. Inverter ground protection

5.4 AC-side Cable Connection

Model	Cross sectional area recommended value/max. value (mm^2)	Outer diameter (mm)
R5-(0.7K-3K)-S1-15	4.0/6.0	4.2-5.3
R5-(3K-6K)-S2-15	4.0/6.0	4.2-5.3
R5-(7K, 8K)-S2-15	3*8.37/3*10	15-22

Table 5.5 Recommended power grid connecting cable specification

If the grid-connection distance is too far, select an AC cable with larger diameter according to the actual condition.

5.4.1 Connect AC-side cables of R5-(0.7K-6K)-S1-15

Step 1. Feed the AC cable through the AC waterproof hole.

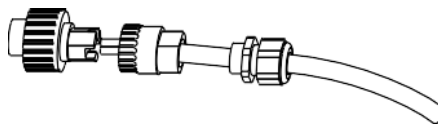


Figure 5.5. Feeding the AC cable

Step 2. Connect the cables according to connection marks of L, N and PE.

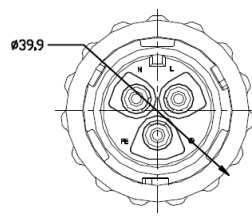


Figure 5.6. Connecting the cables

Step 3. Screw all parts of the AC connector.

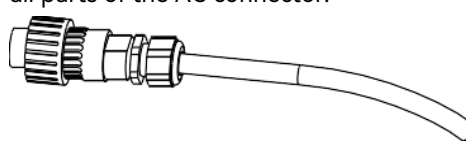


Figure 5.7. Tightening the connector

Step 4. Connect the AC connector to the equipment securely, ensuring the pins are connected directly to complete the AC cable connection.

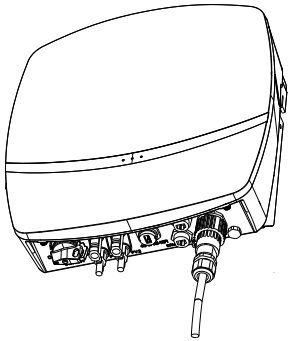


Figure 5.8. Connecting to the inverter

Step 5. Install the protective covers to protect the cable connectors.

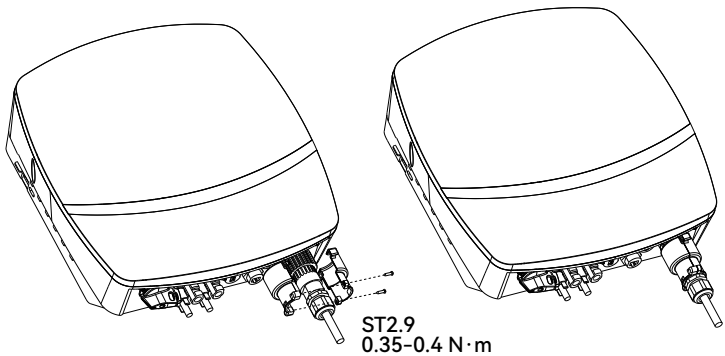


Figure 5.9. Installing the protective covers

5.4.2 Connect AC-side cables of R5-(7K, 8K)-S2-15

Step 1. Screw off the screws at the AC output wire cover and take out the cover. Peel off the insulation layer of the AC cable and insert the cable through the AC waterproof locking screw hole of the cover. Lock L, N and PE tightly according to the marked connection positions on the terminal block.

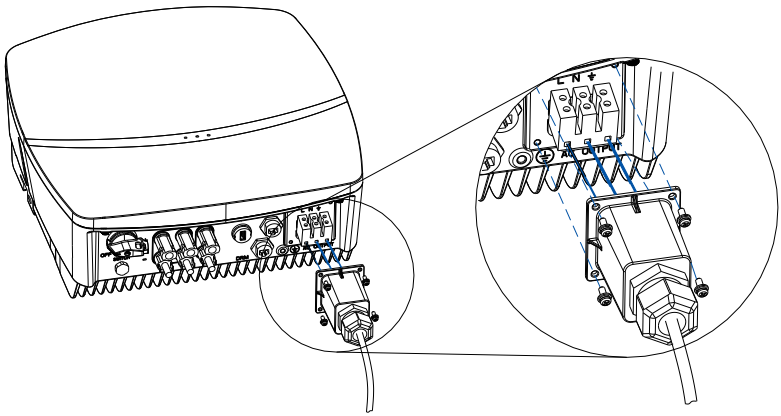


Figure 5.10. Connecting the AC cable

Step 2. Tighten up the AC waterproof nut.

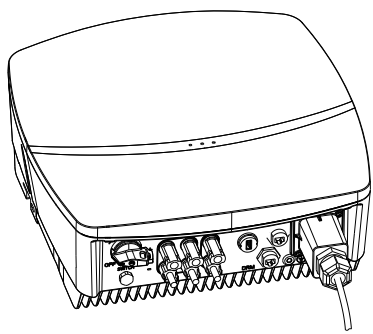


Figure 5.11. Tightening the waterproof nut

5.4.3 Earth Fault Alarm

This inverter complies with IEC 62109-2 clause 13.9 for earth fault alarm monitoring. If an Earth Fault Alarm occurs, all the LED indicators will light up in red and error code <31 ISO Error M> will be displayed on the screen of the Wi-Fi communication module until the error is solved and the inverter works properly.

5.4.4 External AC Circuit Breaker and Residual Current Device

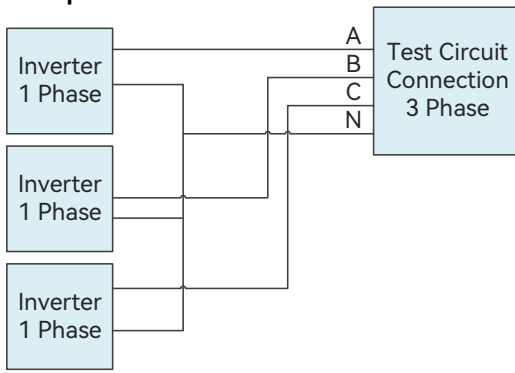
Install a 2P circuit breaker to ensure the inverter can disconnect from the grid safely. The inverter is integrated with an RCMU. However, an external RCD is needed to protect the system from tripping, either type A or type AB RCD are compatible with the inverter.

The integrated leakage current detector of the inverter can 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.

Model	Recommended breaker specification
R5-(0.7K-3K)-S1-15	25 A
R5-(3K-6K)-S2-15	40 A
R5-(7K, 8K)-S2-15	63 A
Notice: Do not connect multiple inverters to one AC circuit breaker.	

Table 5.6 Recommended breaker specification

5.4.5 Multiple Inverter Combinations



The inverter should not be installed in multiple phase combinations. If any such multiple inverter combination is not tested, it should not be used or external devices should be used in accordance with the requirements of AS/NZS 4777.1

5.5 DC-side Cable Connection

Cross-sectional area of cables (mm^2)		Outside diameter of the cables (mm)
Range	Recommended value	
4.0-6.0	4.0	4.2-5.3

Table 5.7 Recommended specifications of DC cables

NOTICE

· Place the connector separately after unpacking to avoid confusion for connection of cables.

· 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 the right position.

Step 1. Untighten the lock screws on the positive and negative connectors.

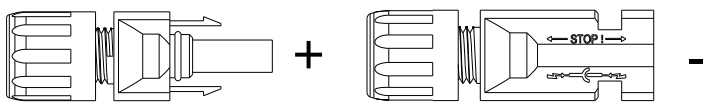


Figure 5.12. Untightening the positive and negative connectors

Step 2. Strip off the insulation of the positive and negative cables by 8–10 mm.

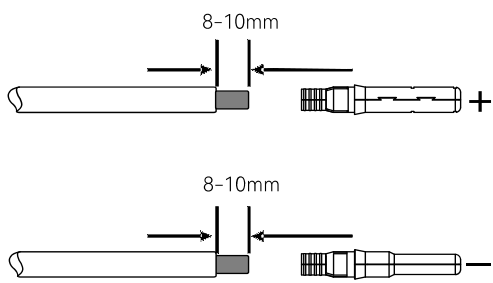


Figure 5.13. Stripping off the insulation

Step 3. Insert the cable ends to the sleeves. Use a crimping plier to assembly the cable ends.

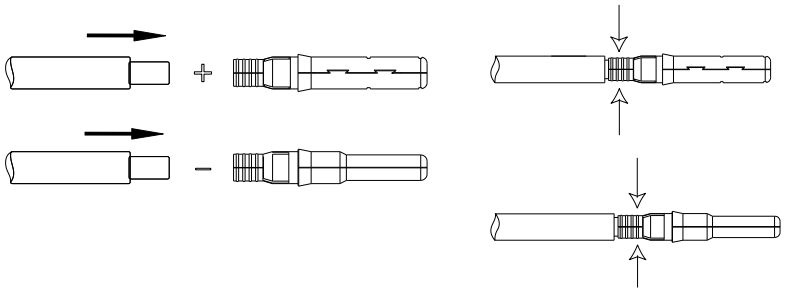


Figure 5.14. Assembling the cable ends

Step 4. Insert the assembled cable ends into the blue positive and negative PV connectors. Gently pull the cables backwards to ensure firm connection.

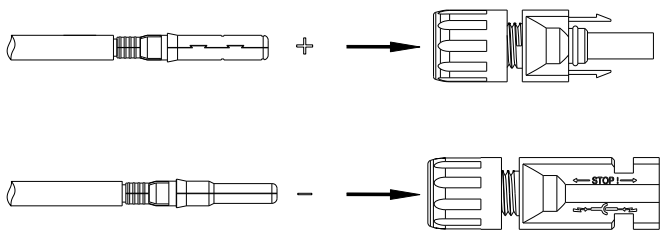


Figure 5.15. Inserting crimped cables to the connectors

Step 5. Tighten the lock screws on the positive and negative cable connectors.

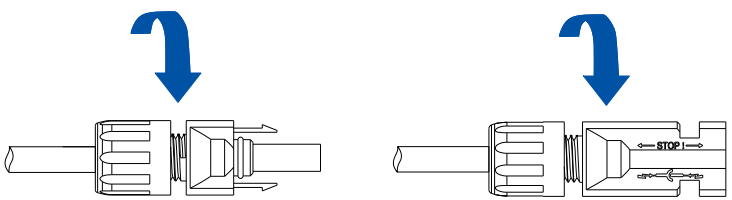


Figure 5.16. Tightening the connectors

Step 6. Make sure that the DC switch is at the OFF position.

Figure 5.17. DC switch at OFF position

Step 7. Connect the positive and negative connectors into the positive and negative DC input terminals of the inverter. A “click” sound should be heard when the contact cable assembly is seated correctly.

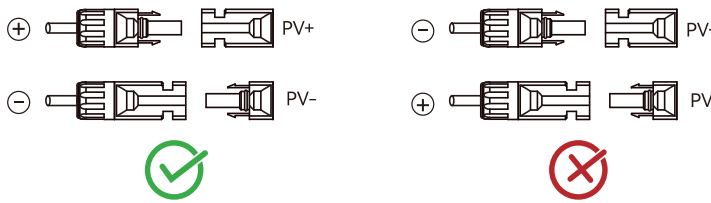


Figure 5.18. Plugging in the PV connectors

5.5.1 DC Isolator

The DC switch features a padlockable handle for safety purpose.

Diameter of padlock hole	6 mm

Table 5.7 Specification of DC switch

It is recommended to lock the DC switch with a padlock when it is in the OFF position. The user needs to prepare the padlock.

To lock the DC switch:

1. Turn the DC switch to the OFF position.
2. Inserting a lock through the knob hole.

Note: During maintenance or repairing, the DC switch must be in the OFF position and locked.

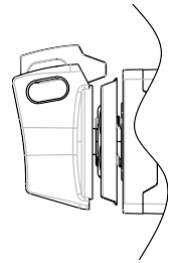


Figure 5.19. The DC switch

5.6 Communication Connection

R5 series inverters are standardly equipped with an RS485 interface, a Demand Response Modes (DRM) interface and an RS232 interface.

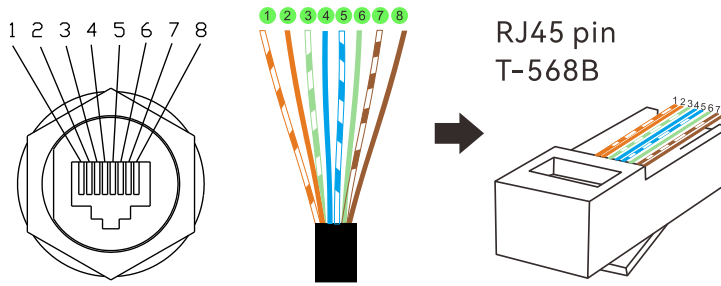


Figure 5.20. RS485 pin and DRM pin definitions

Pin No.	Description	Function
1	White-orange	NC
2	Orange	GND_W
3	White-green	+7V_W
4	Blue	NC
5	White-blue	NC
6	Green	NC
7	White-brown	RS485-A
8	Brown	RS485-B

Table 5.8 RS485 pin definition

Pin No.	Function
1	NC
2	NC
3	NC
4	NC
5	REF GEN
6	COM LOAD
7	NC
8	NC

Table 5.9 DRM pin definition

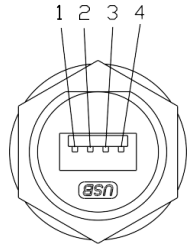


Figure 5.21. RS232 pin definition

Pin No.	Description	Function
1	+7 V	Power supply
2	RS-232 TX	Send data
3	RS-232 RX	Receive data
4	GND	Ground wire

Table 5.10 USB pin definition

Remove the dust-proof cover and insert the communication module to the 4G/GPRS/WIFI port of the inverter.

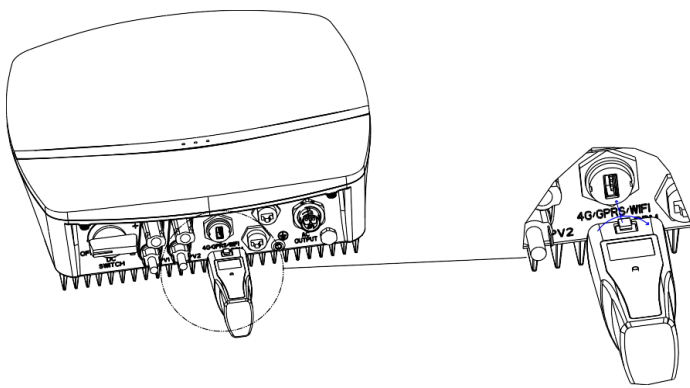


Figure 5.22. Installing the communication module

1. The USB interface could connect with the eSolar GPRS/4G communication module. For operation instructions, refer to eSolar GPRS/4G module *Quick Installation Guide* at https://www.saj-electric.com/.

2. The USB interface could be externally connected with eSolar WiFi communication module. For operation instructions, refer to eSolar WiFi module Quick Installation Guide at https://www.saj-electric.com/.

5.7 Start up and Shut down

5.7.1 Start up the inverter

1. Follow the installation standard from previous chapter strictly to connect the photovoltaic panels and AC power grid to the inverter.

2. Use a multimeter to check whether the AC side and DC side voltages have met the inverter start voltage.

3. Turn ON the DC switch (if applicable), LED indicators will light up.

4. Select the country grid code.

For compliance with AS/NZS 4777.2:2020, select from Australia Region A/B/C. Contact your local grid operator about which region to select.

After the settings, the inverter will be in self-testing mode. When the inverter has met all the grid connecting conditions, the inverter will connect to the grid and generate power automatically.

5.7.2 Shut down the inverter

1. 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 the inverter, inverter will shut down automatically.

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

Chapter 6 Debugging Instructions

6.1 Introduction of LED Indicators

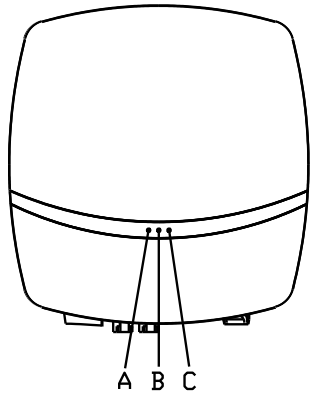


Figure 6.1 LED indicator

A/B/C are double-color LED indicators which could show green light or red light at the same time.

LED indicator	Status		Description
A/B/C	Green	Blinking per second	The inverter is in the initialization or waiting state.
		Solid	The inverter is in normal on-grid state.
	Red	Solid	The inverter is reporting fault.
	Blinking green and red alternatively		The inverter software is upgrading.

Table 6.1 Interface description

6.2 System Initialization

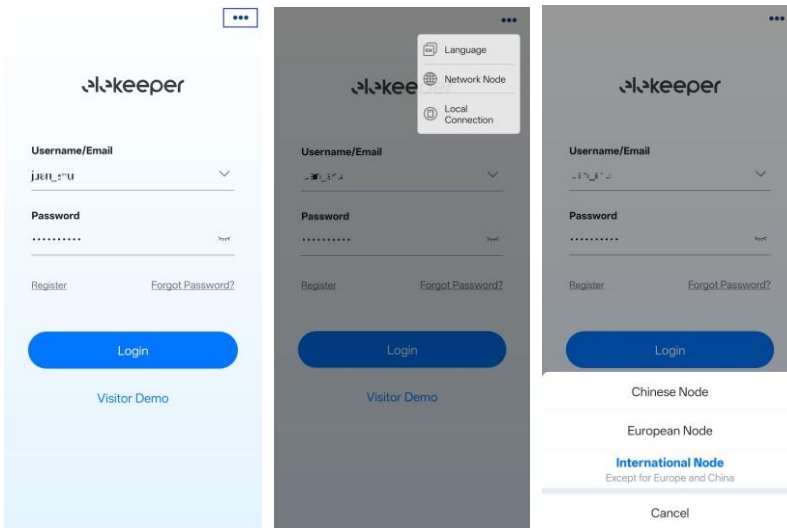
6.2.1. Download the elekeeper App

1. The elekeeper App can be used for both nearby and remote monitoring. It supports AIO3, 4G and Wi-Fi modules to communicate with the device.

2. On your mobile phone, search for “elekeeper” in the App store and download the App. You can also scan the following QR code to download the App.

6.2.2. Log in to the App

1. Open the App and click on the three-dot icon  on the top right corner.
2. Set **Language** to **English** and **Network Node** to **International Node**.



3. If you do not have an account, register first.

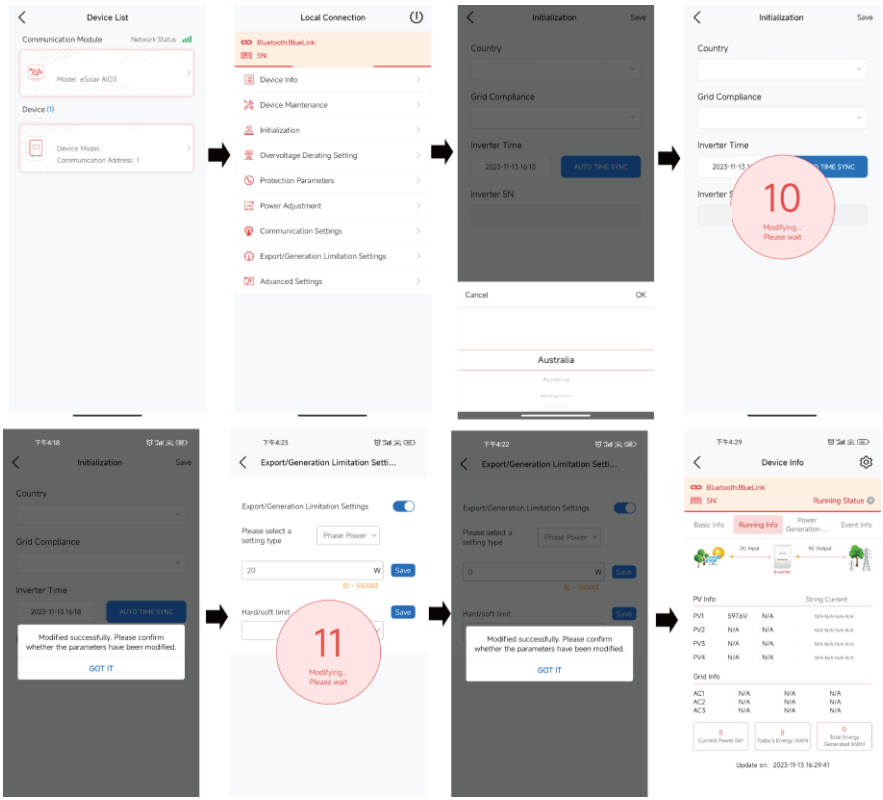
   a. Tap **Register**. Choose whether you are an owner, installer or distributor.

   b. Follow the instructions on the screen to complete the registration.

4. Use the account and password to log in to the App.
5. Enable the Bluetooth function on your mobile phone.
6. Select **Service** and **Remote Configuration**. Tap **Bluetooth** to connect to the inverter through Bluetooth connection.

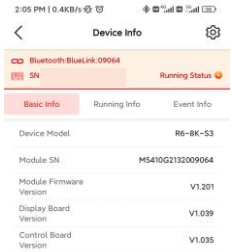
6.2.3. Complete the Initialization Settings

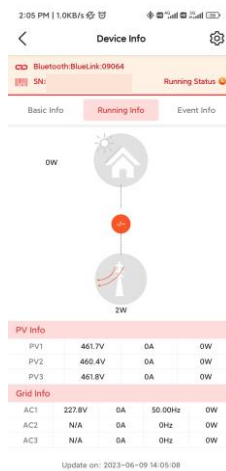
Follow the instructions on the screen to complete the initialization.

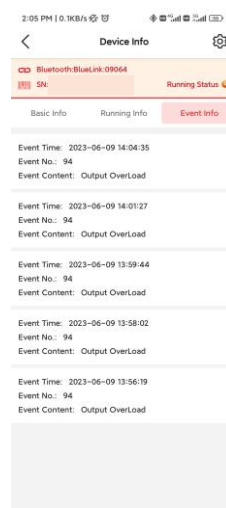


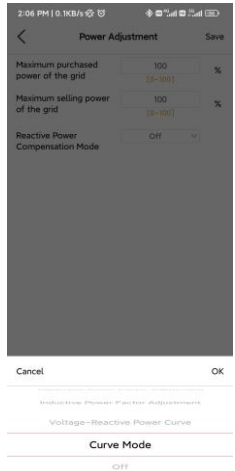
6.2.4. Inverter Setting Review

After commissioning, the device info including device basic info, running info and event info can be viewed. Country and grid code can be viewed from initial setting.









6.2.5. Remote Monitoring

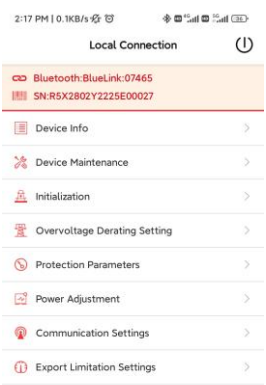
Connect to the internet via the eSolar/4G/WiFi communication module and upload the inverter data onto the server so that the customers could monitor the running information of the inverter remotely via the eSolar Web Portal or on their mobile phones.

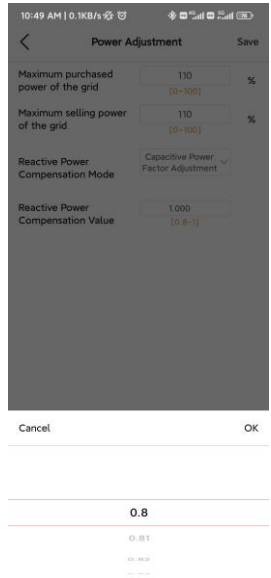
For details, refer to the user manual of the communication module.

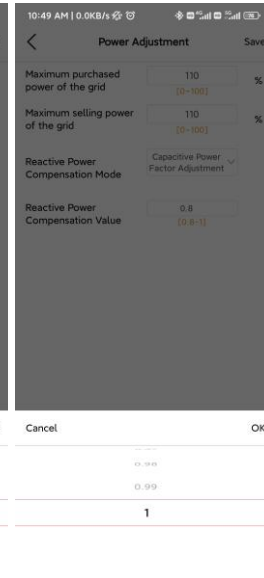
6.3 Set Reactive Power Control

6.3.1. Set up Fixed Power Factor Mode

Fixed Power Factor Mode:



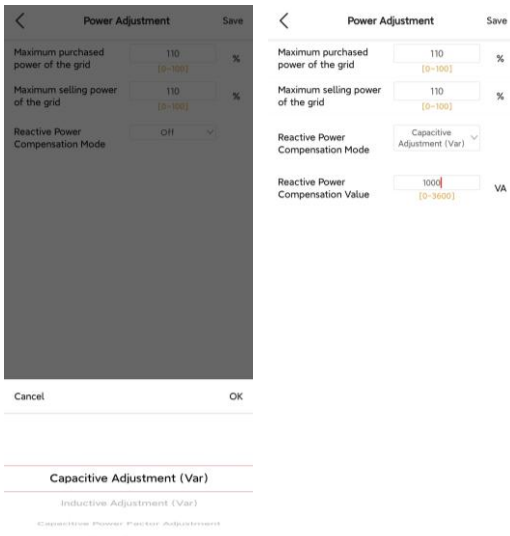




Step 1: On the **Location Connection** page, select **Power Adjustment**.

Step 2: Select **Capacitive Power Factor** or **Inductive Power Factor** according to your local grid regulation. The power factor range is from 0.8 leading to 0.8 lagging.

Fixed Reactive Power Mode:



Select **Inductive Adjustment Var** or **Capacitive Var** according to your local grid regulation. The power range is from -60%Pn to 60%Pn.

6.3.2. Set up V-Watt and Volt-Var mode

This inverter complies with AS/NZS 4777.2:2020 for power quality response modes. The inverter satisfies the DNSPs' grid connection rules requirements for volt-watt and volt-var settings in different regions. For example, AS4777 series setting as Fig 6.2 and Fig 6.3 show.

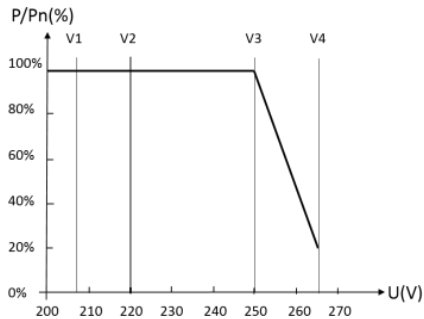


Figure 6.2 Curve for a Volt-Watt response mode (AS4777 Series)

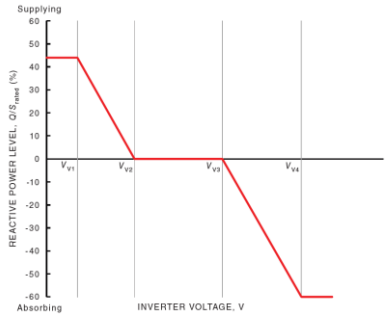


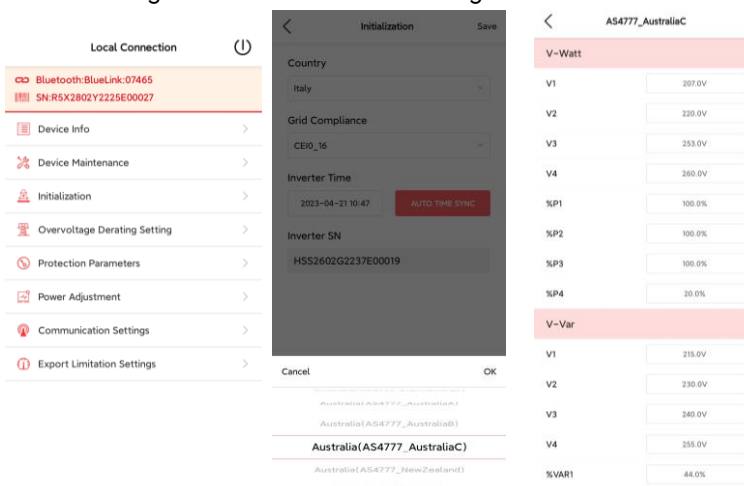
Figure 6.3 Curve for a Volt-Var control mode (AS4777 Series)

Procedure

1. AS4777 grid compliance has been set during production. Select corresponding grid compliance according to state regulation during installation. You can choose a state regulation compliance for your local grid on the elekeeper App.

2. Log in to the elekeeper App and connect to the inverter through Bluetooth connection.

3. On the **Local Connection** page, select **V-Watt/V-Var** to enter the DNSPs settings. Choose a suitable state regulation from the list.



Note: About the power rate limit mode, SAJ sets the product WGra to 16.67%Pn by default in the following cases according to the requirements of 3.3.5.2 as 4777.2: 2020:

1. Soft ramp up after connection.
2. Reconnect or soft ramp up/down following a response to frequency disturbance.

6.4 Export Limitation Setting

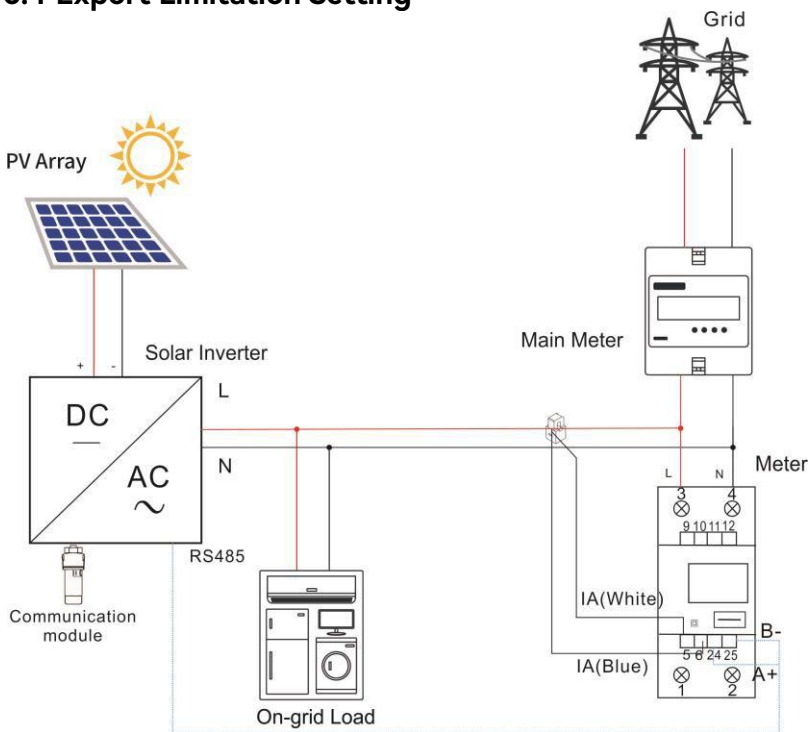


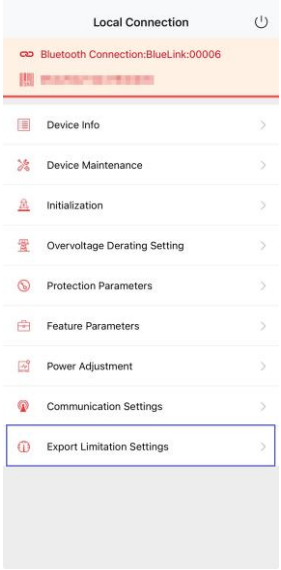
Figure 6.4 Export limit wiring schematic

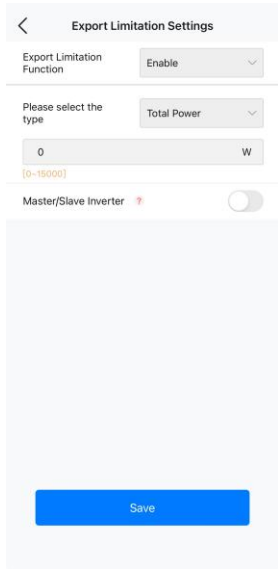
1. Log in to the elekeeper App and connect to the inverter through Bluetooth connection.
2. On the **Local Connection** page, select **Export Limitation Settings**.
3. Tap the icon to enable the export limitation function and wait for a few seconds for the change to take effect.

- **Total power**: The inverter controls the maximum power that is exported to the grid. Set the value within the range of 0 to the rated power of the current inverter in W. For example, value 1000 (W) indicates that the overall export power limit is 1000 W from the inverter.

  Note: Control types **Phase Power** and **Phase Current** are not applicable for this inverter series.

4. Tap **Save** and wait a few seconds for the change to take effect.





Chapter 7 Troubleshooting

For any errors reported as below, contact the after-sales for service support. The operations and maintenance must be performed by authorized technicians. The following table lists the error codes and corresponding messages:

Error Code	Error Message
01	Relay Error Master
02	Storer Error Master
03	High Temperature Master
04	Low Temperature Master
05	Interior Communication Error Master
06	GFCI Devices Error Master
07	DCI Devices Error Master
08	Current Sensor Error Master
09	Grid Over Voltage Master
10	Grid Low Voltage Master
15	High average voltage of 10 minutes Master
18	Over Frequency Master
19	Low Frequency Master
24	Grid Lost Error Master
27	GFCI Error Master
28	DCI Error Master
31	Insulation Error Master
33	Over Bus Voltage Master
34	Under Bus Voltage Master
35	Overcurrent Master
38	Bus Hardware Overvoltage Master
39	PV1 Hardware Overcurrent Master
40	PV2 Hardware Overcurrent Master
41	Hardware Overcurrent Master
44	Null line voltage to earth fault Master
45	Fan Error Master

49	Loss of communication between Power Meter and Control Board Master
50	Interior Communication Error Slave
51	Voltage Consistency Error Slave
54	Frequency Consistency Error Slave
57	GFCI Consistency Error Slave
61	Overvoltage Slave
62	Under Voltage Slave
67	Over Frequency Slave
68	Under Frequency Slave
73	Grid Lost Error Slave
76	PV1 Overvoltage Slave
77	PV2 Overvoltage Slave
81	Loss of Communication between Display Panel and Control Board Master
86	DRM0 Error Master

General troubleshooting methods for the inverters are as follows:

Error Message	**Troubleshooting**
Relay Error	If this error occurs frequently, contact your distributor or call SAJ technical support.
Storer Error	If this error occurs frequently, contact your distributor or call SAJ technical support.
High Temperature 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 call SAJ technical support.
GFCI Device Error	If this error occurs frequently, contact your distributor or call SAJ technical support.
DCI Device Error	If this error occurs frequently, contact your distributor or call SAJ technical support.
Current Sensor Error	If this error occurs frequently, contact your distributor or call SAJ technical support.

AC Voltage Error	· Check the voltage 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 voltage of the grid is higher than the voltage regulated by local grid, inquire the local grid workers whether they can adjust the voltage at the feed point or change the value of the regulated voltage. If the voltage of the grid is in regulated range as allowed and monitoring portal still shows this error, contact your distributor or call SAJ technical support.
Frequency Error	Check the setting of country and frequency of the local grid. If the setting is as expected, contact your distributor or call SAJ technical support.
Grid Lost Error	Check the connection status between the AC side of the inverter and the grid. If the connection is normal, contact your distributor or call SAJ technical support.
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 call SAJ technical support.
DCI Error	If this error always exists, please contact your distributor or call SAJ technical support.
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 call SAJ technical support.
Overcurrent	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 call SAJ technical support.
Over Bus Voltage	Check the settings of the solar panel. SAJ designer can help you. If the above mentioned are in normal, please contact your distributor or call SAJ technical support.
PV Overcurrent	If this error exists always, please contact your distributor or call SAJ technical support.
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 call SAJ technical support.
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 call SAJ technical support.
Null line-to-earth voltage fault	Check if connection of the AC output grounding terminal is stable and reliable. If the condition as above is normal, please contact your distributor or call SAJ technical support.

Chapter 8 Routine Maintenance

Inverter Cleaning

Clean the enclosure lid and LED indicator 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 the inverter.

Chapter 9 Appendix

9.1. Recycling and Disposal

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

9.2. Warranty

Check the product warranty conditions and terms on the SAJ website: https://www.sajelectric.com/.

9.3. Contact SAJ

Online technical support: Go to https://www.saj-electric.com/services-support-technical to check FAQs or send your message or product enquiry.

Call for assistance: For SAJ support telephone numbers, see https://www.saj-electric.com/locations for your region support details.

Head Quarter: Guangzhou Sanjing Electric Co., LTD.

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

Tel: +86 20 6660 8588

E-mail: service@saj-electric.com

Website: https://www.saj-electric.com/

9.4. Trademark

SAJ is the trademark of Sanjing.

Guangzhou Sanjing Electric CO., LTD.

Add: SAJ Innovation Park, No.9, Lizhishan Road, Science City,

Tel: +86 20 6660 8588 Zip: 510663 Fax: +86 20 6660 8589

Web: http: //www.saj-electric.com

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