

User Manual

AS1-3KS-5.1

The lower half of the page features a complex abstract graphic. It consists of several overlapping, semi-transparent geometric shapes. A large, bright red shape dominates the right side, extending from the middle of the page down towards the bottom. To its left, a lighter, peach-colored shape overlaps it. A white diagonal line cuts across the composition from the middle-left towards the bottom-right. Below the red and orange shapes, there is a light gray shape that also overlaps with the white line. The overall effect is a modern, layered design.

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Chapter 1 Safety Precautions

This user manual describes the instructions and procedures for the installation of the AS1 AC Retrofit Battery System. Please read the user manual before operating it.

Keep this user manual properly and operate strictly according to all safety tips and operation instructions in this manual.

1.1 Safety Tips



Danger

- Electric shock and high voltage.
- Do not expose the inverter to temperatures in excess of 45°C.
- Do not subject the inverter to any strong force.
- Do not place the inverter near a heat source, such as direct sunlight, a fireplace.
- Keep inflammable and explosive dangerous items or flames away from the inverter.
- Do not soak the inverter in water or expose it to moisture or liquids.
- Do not charge or discharge damaged inverter.



Warning

- Installation, repair, recycling, and disposal of AS1 must be performed by qualified personnel in accordance with national and local standards and regulations.
- Any behavior to change the functionality of the product without permission will

cause fatal injury to the operator, third parties, and equipment. The manufacturer is not responsible for these losses and warranty claims.

- To ensure property and personal safety, the battery modules and inverter shall be well grounded.









 **Caution**

- Do not modify or tamper with AS1 and other components of the system.
- Please pay attention to the risks caused by improper modification.

 **Notice**

- This device has a built-in lithium battery and a dedicated extended battery. Do not extend other brands of batteries at the battery port.
- AS1 outputs AC power directly to the utility grid side and the backup loads side. Do not reverse output of the two AC terminals of the inverter.

1.2 Symbols Instructions

Symbol	Description
	<p>Dangerous electrical voltage</p> <p>The device is directly connected to public grid, thus all work to the battery shall only be carried out by qualified personnel.</p>
	<p>No open flames</p> <p>Do not place or install near flammable or explosive materials.</p>
	<p>Danger of hot surface</p> <p>The components inside the device will release a lot of heat during operation. Do not touch metal plate housing of the inverter during operating.</p>
	<p>Attention</p> <p>Install the product out of reach of children</p>
	<p>An error occurred</p> <p>Read the usage manual to troubleshoot problems</p>
	<p>This device SHALL NOT be disposed of in residential waste</p> <p>Please go to Chapter 8 “Recycling and Disposal” for proper treatment.</p>
	<p>CE Mark</p> <p>The device is in compliance with Low Voltage Directive and</p>
	<p>Recyclable</p>

1.3 Emergency Situation

Despite of its careful and professional protection design against any hazard results, damage of the battery may still occur. If a small amount of battery electrolyte is released due to a serious damage of the outer casing; or if the battery explodes due to not being treated timely after a fire breaks out nearby, and leaks out poisonous gases such as carbon monoxide, carbon dioxide and etc., the following actions are recommended:

1) Eye contact: Rinse eyes with a large amount of running water and seek medical advice.

2) Contact with skin: Wash the contacted area with soap thoroughly and seek medical advice.

3) Inhalation: If you feel discomfort, dizziness or vomiting, seek medical advice immediately.

4) Use a FM-200 or Carbon Dioxide (CO₂) fire extinguishers to extinguish the fire if there is a fire in the area where the battery pack is installed. Wear a gas mask and avoid inhaling toxic gases and harmful substances produced by the fire.

5) Use an ABC fire extinguisher, if the fire is not caused by battery and not spread to it yet.



Warning

- If a fire has just occurred, try to disconnect the battery circuit breaker and cut off the power supply first, but only if you can do so without endangering yourself.
- If the battery is on fire, do not attempt to extinguish the fire and evacuate the crowd immediately.

Potential danger of damaged battery:

Chemical Hazard: Despite of its careful and professional protection design

against any hazard results, rupture of battery shall may still occur due to mechanical damage, internal pressure and etc., and may result in a leakage of battery electrolyte. The electrolyte is corrosive and flammable. When there is fire, the toxic gases produced will cause skin and eyes irritation, and discomfort after inhalation. Therefore:

- 1) Do not open damaged batteries;
- 2) Do not damage the battery again (shock, fall, trample, etc.);
- 3) Keep damaged batteries away from water (except to prevent an energy storage system from catching fire);
- 4) Do not expose the damaged battery to the sun to prevent internal heating of the battery.

Electrical hazard: The reason of fire and explosion accidents in lithium batteries is battery explosion. Here are the main factors of battery explosion:

1) Short circuit of battery. Short circuit will generate high heat inside battery, resulting in partial electrolyte gasification, which will stretches the battery shell. The temperature reaching ignition point of internal material will lead to explosive combustion.

2) Overcharge of battery. Overcharge of battery may precipitate lithium metal. If the shell is broken, it will come into direct contact with the air, resulting in combustion. The electrolyte will be ignited at the same time, resulting in strong flame, rapid expansion of gas and explosion.

Chapter 2 Product Introduction

2.1 Scope of Application

AS1 series is used in energy storage retrofits and is a new type of AC coupled

energy storage system. The built-in lithium battery inside AS1 can be expanded in capacity according to user demands, and the modular design of the slave device makes it easy to install wiring.

In daytime, solar power supports the loads first while the surplus power will be stored by AS1, to improve self-consumption rate.

In peak power price hours, power from AS1 supports the loads; while in valley power price hours, AS1 is charged by the grid. Finally a balance could be realized. In case of grid fault, AS1 will make sure no outage in the loads, achieving UPS function

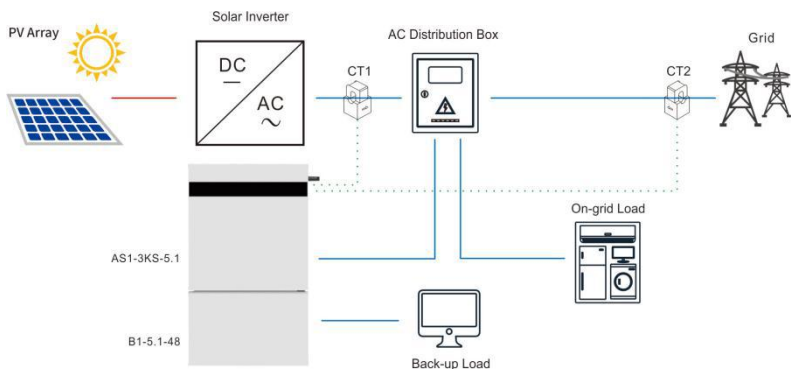


Fig. 2.1 System composition diagram

2.2 Product Model Description

AS1 - XKS - XX

① ② ③ ④

- ① AS1 represents the product series.
- ② XK indicates the rated power of the product XkW, such as 3K for 3kW.
- ③ S represents single phase; T represents three phase.

④ Indicates the built-in battery capacity, such as 5.1 for 5.1kWh.

2.3 Datasheet

AS1-3KS-5.1

Type	AS1-3KS-5.1
Battery Data	
Battery Type	Lithium ion
Total Energy Capacity[Wh]	5120
Battery Capacity [Ah]	100
Rated Voltage [V]	51.2
Voltage range [V]	42~58.4
Depth Of Discharge[DOD]	≤90%
Cycle Life	≥6000
Max.Charge Current [A]	60
Max.Discharge Current [A]	60
Scalability	Yes (up to 20kWh)
Grid Data	
Max. Continuable Output Power [VA]	3000
Max.Output Current [A]@230Vac	13.1
Max.Output Fault Current [A]	28
Inrush Current [A]	50
Max.Output Overcurrent Protection [A]	28
Rated Grid/Backup Voltage/Range [V]	220, 230, 240/180-280
Rated Grid/Backup Frequency/Range [Hz]	50, 60/±5
Power factor [cos φ]	0.8 leading~0.8lagging
Feed-in	L+N+PE
AC Output [Back-up Mode]	
Max. Continuable Output Power [VA]	3000
Output Voltage [V]	220/230/240
Max.Output Current [A]@230Vac	13.1
Output Frequency [Hz]	50/60
Max.Output Power [VA]	3600 ,10sec
General Data	

Communication Mode	Wi-Fi/4G/Ethernet(Optional)
Operating Temperature Range	0°C~50°C (>45°C derating)
Cooling Method	Natural Convection
Ambient Humidity	0-95% Non-condensing
Noise[dBA]	<29
Ingress Protection	IP65
Dimensions [H*W*D][mm]	738*650*186
Weight [kg]	64
Standard Warranty [Year]	5
Applicable Standard	AS 4777.2, VDE 4105, G98, C10/C11, CEI0-21, IEC 62619, IEC 62040

Chapter 3 Installation Instructions

3.1 Safety Tips



- Potential fires and electric shocks that are life threatening.
- Do not place any flammable or explosive materials beside AS1.
- Equipment connected to high-voltage power generation equipment must be performed by qualified personnel in compliance with national and local standards and regulations.

! Notice

- The pollution level applicable to AS1 is Class II.
- Inappropriate or inconsistent installation environment can shorten the life of AS1.
- Do not install AS1 directly by exposing it under strong sunlight.
- Please do not install in damp places.
- The installation location must be well ventilated.
- AS1-3KS-5.1 (hereinafter also referred to as the master device) can be used independently. If the battery capacity needs to be expanded, please use B1-5.1-48 (slave device), and maximum 3 slave devices can be accessed.

3.2 Determine the Installation Method and Location

AS1 series product dimension

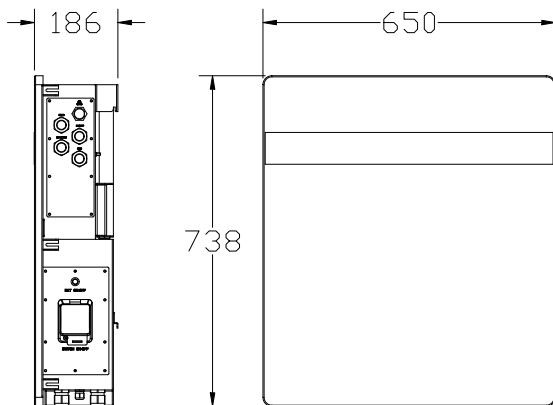


Fig. 3.1 AS1-3KS-5.1 appearance and dimension diagram

AS1-3KS-5.1 is cooled by natural wind convection. It is recommended to install in indoors or sheltered areas to avoid direct sunlight, rain and snow.

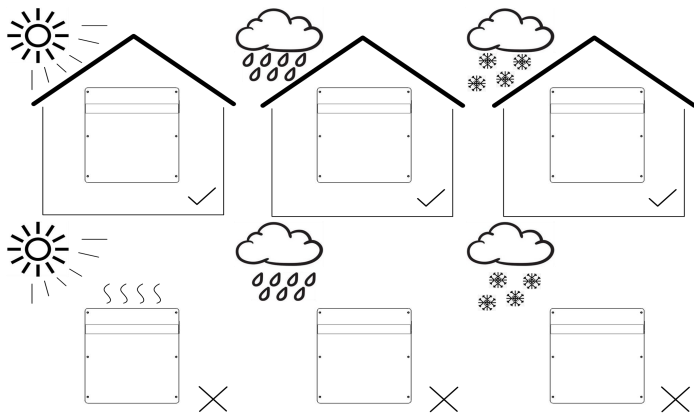


Fig. 3.2 Installation tips

Vertical ground mounting method is recommended and it's allowed to be installed by maximum tilting 15° backward. Do not install it horizontally or reversely.

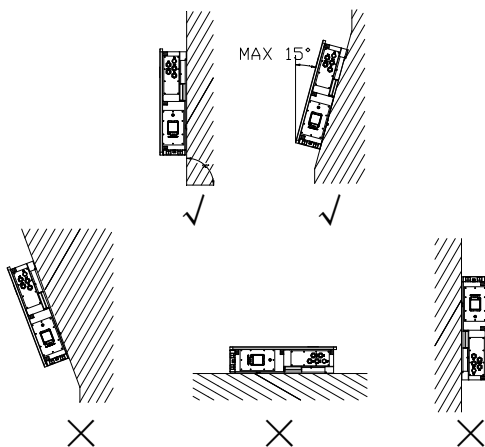


Fig. 3.3 Installation angle

Please ensure that the air at the installation point is circulated. Bad air ventilation will affect the working performance of internal electronic components and shorten the service life of AS1.

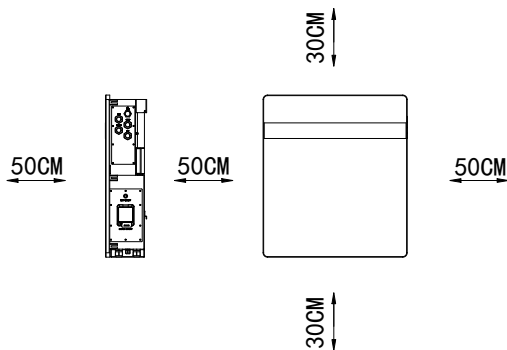


Fig. 3.4 Installation distance

3.3 Installation Steps

3.3.1 Determine the mounting hole position of the hanging panel

The AS1 series is mounted on a hanging panel. The mounting position is determined according to the position of the hanging hole on the hanging panel. Choose either 239mm holes (away from center) or 300mm holes (away from center) to install. Unit: mm.

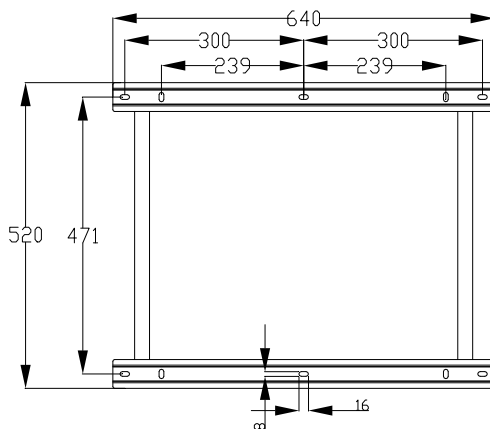


Fig. 3.5 AS1- 3KS-5.1 hanging panel size (master device)

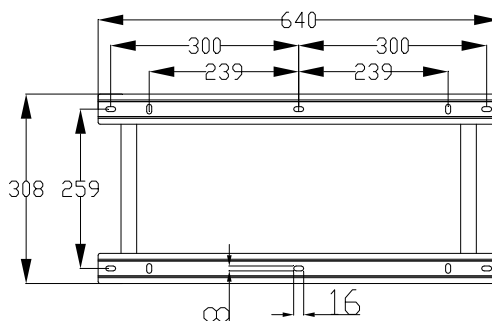


Fig. 3.6 B1-5.1-48 hanging panel dimension (slave device)

Before installation, please make sure that the wall has sufficient strength to fix the screws and bear the weight of AS1. Mark the hanging hole position of the hanging panel on the wall and drill the corresponding hole position; then use a rubber hammer to drive the screw fixing seat into the hole.

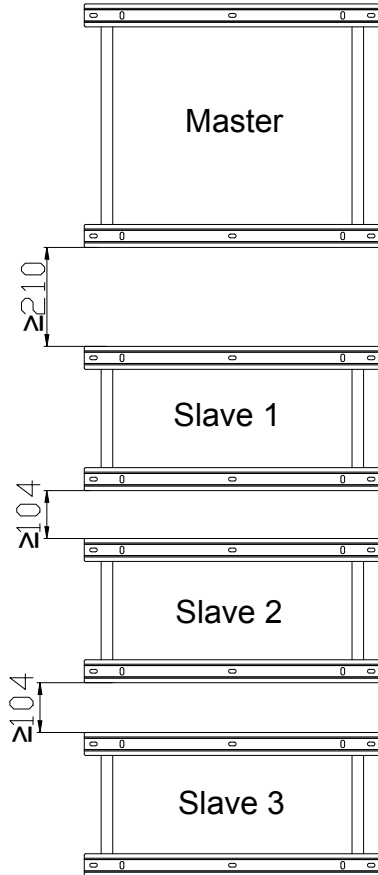


Fig. 3.9 Distance between hanging panels

Fix the hanging panel with hex head screw on the installation position.

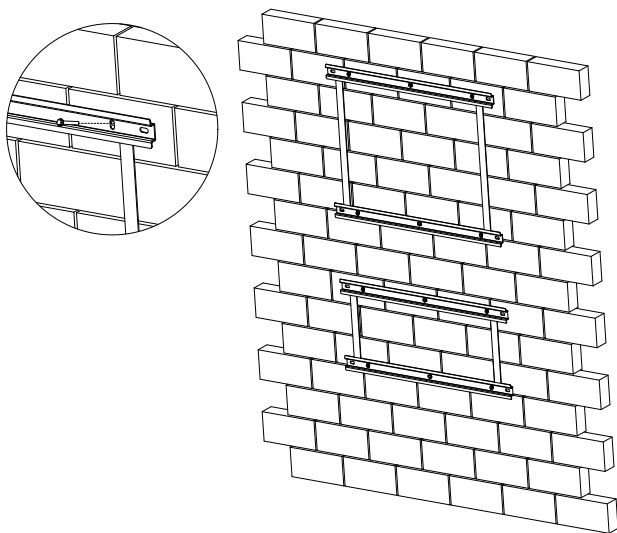


Fig. 3.10 Fixing the hanging panel

Please be careful when installing the device. Please install the slave device first and then install the master device. In case the distance between the master device and the slave device is not enough, installation can't be done. Carefully attach the device to the hanging panel and make sure the bottom of the device fits snugly with the panel.

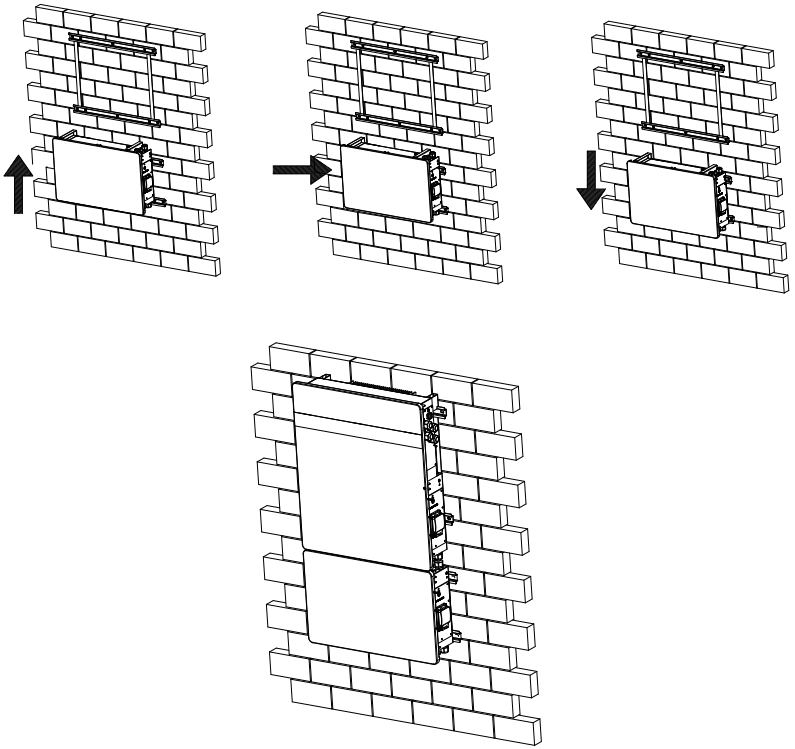


Fig. 3.11 Install ASI-3KS-5.1

Chapter 4 Electrical Connections

4.1 Electrical Interface Description

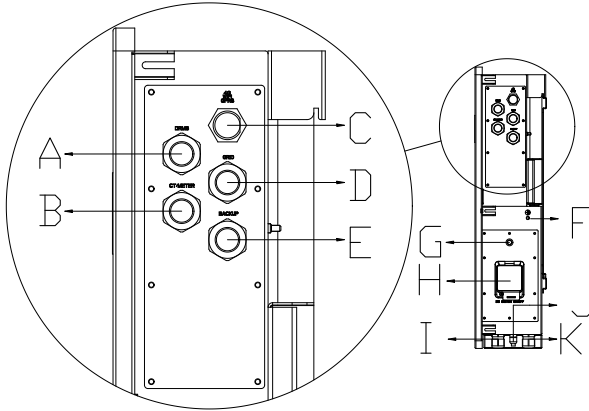


Fig. 4.1 AS1-3KS-5.1 electrical interfaces

Code	Name
A	DRMS Port
B	CT connection
C	RS232 communication
D	Grid connection
E	Backup connection
F	Ground
G	BMS switches
H	Battery switches
I	BAT+
J	BMS LINK
K	BAT-

Table 4.1 Interface description

4.2 System Wiring Schematic

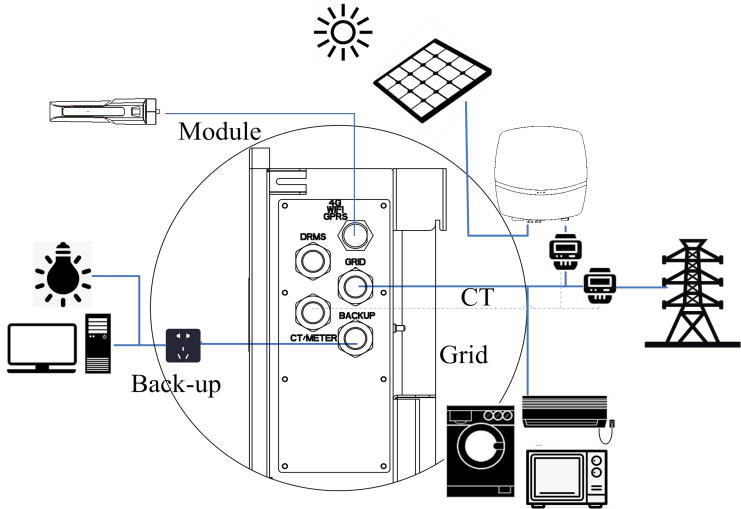


Fig. 4.2 Wiring schematic diagram

Don't connect the backup loads side with the grid or battery

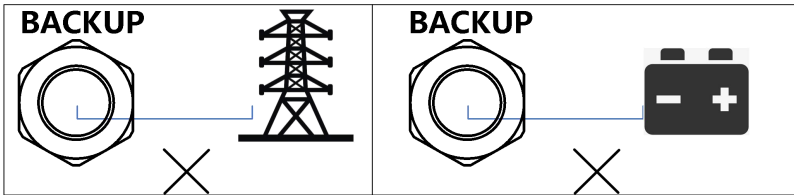


Fig. 4.3 Wrong connection example

4.3 Master Device Wiring

When wiring the master device, you need to disassemble the wiring cover in the upper right corner and connect as per the terminal identification.

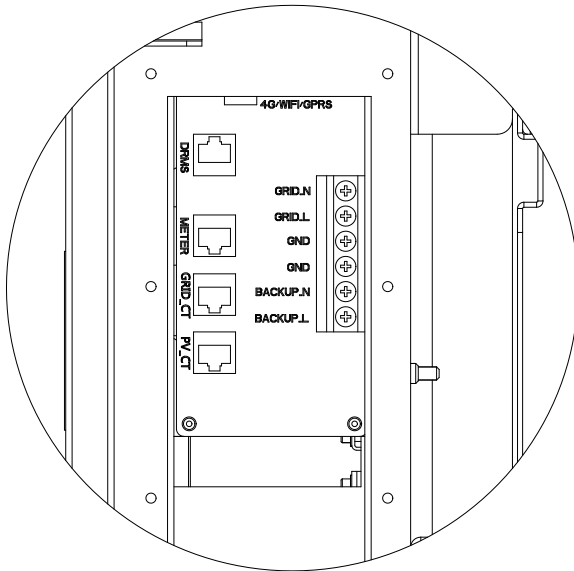


Fig. 4.4 Master device wiring terminals

4.4 Slave Device Wiring

More capacity is required to connect the slave devices in parallel. Disconnect the battery connector cover of the master device and the slave unit before wiring. Only 3 lines are required to connect a slave device. (BAT+-BAT+, BAT--BAT-, LINK-LINK)

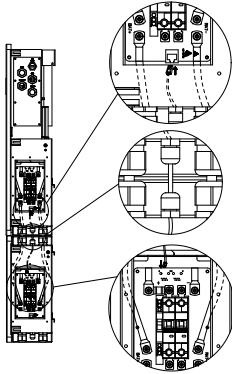


Fig. 4.5 Slave device wiring terminals



Notice

- Please use the battery cable in original package.
- Do not share 1 lithium battery slave device on 2 AS1.

4.5 Communication Interface Description

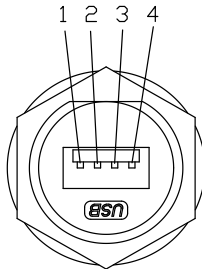


Fig. 4.6 RS232 pins

Pin number	Name
2	RS-232 TX
3	RS-232 RX
4	GND

Table 4.2 RS232 pins description

Note: The RS232 interface can be connected to the eSolar GPRS/4G/WiFi module. For operation details, please refer to the quick installation guide of each monitoring module.

4.5.2 Inverter Demand Response Mode

To comply with Australian and New Zealand safety requirements, the DRMs terminals should be connected. A RJ45 plug is being used as the inverter DRED connection.

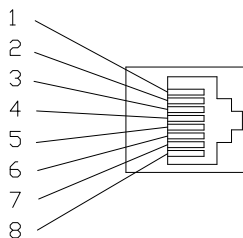


Fig. 4.7 DRMS pins

Table 4.4 DRMS pins description

Mode	Corresponding pins	Requirement
DRM0	5 & 6	The inverter is on standby mode
DRM1	1 & 6	The inverter is not consuming power
DRM2	2 & 6	The inverter is consuming less than 50% of rated power
DRM3	3 & 6	The inverter is consuming less than 75% of rated power AND source reactive power if capable
DRM4	4 & 6	The inverter is consuming 100% of rated power (Subject to constrains from other active DRMs)
DRM5	1 & 5	The inverter is not generating power
DRM6	2 & 5	The inverter is generating less than 50% of the rated power

DRM7	3 & 5	The inverter is generating less than 75% of the rated power AND sink reactive power if capable
DRM8	4 & 5	The inverter is generating 100% of rated power (Subject to constrains from other active DRMs)

Table 4.3 DRMS requirement

4.6 CT Installation

Opening-closing current transformer (CT) is adopted. It can be opened by pushing the buckle by its side. Lead the Live of the Mains through the CT. Tighten up the CT buckle. (Note: both CT directions point to the load side.) For wiring, refer to figure 4.10

The other end of CT is RJ45 crystal head. Make CT cable pass through waterproof nut and get it stuck in the sealing ring. Then, insert the cable in corresponding position through the cover plate. A click sound suggests it is in the right position.

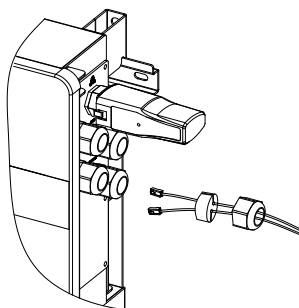


Fig. 4.8 CT installation

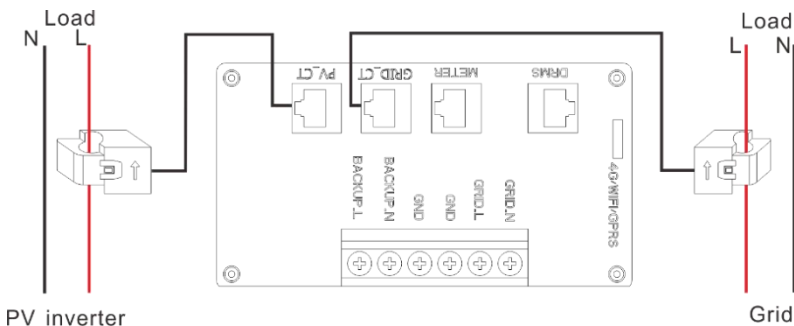


Fig. 4.9 CT connection

4.7 Ground Connection

After penetrating the external hex head screw through OT terminal of the grounding line, screw in the grounding port of inverter enclosure in clockwise direction.

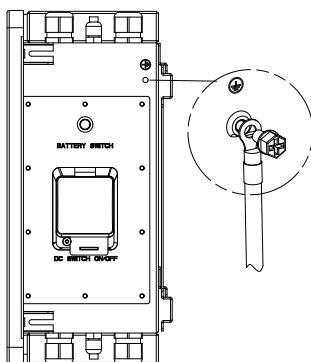


Figure 4.10 Ground connection

4.8 External AC Circuit Breaker and Residual Current Device

Please install a 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 residual current device is connected, the action current should be 30mA or higher.

Chapter 5 Debugging Instructions

5.1 Human-computer Interface Introduction

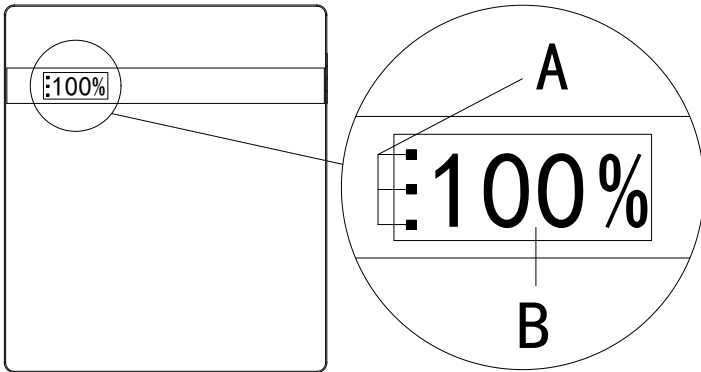


Fig. 5.1 Human-computer interface

	LED lamps state		Description
A	Green/Red LED lamp	Green lamp flicker from bottom to top	Battery discharging
		Green lamp flicker from top to bottom	Battery charging
		Red lamp flicker:1 s/time	Standby
		Green lamp and red lamp flicker in alternative	Procedures are being upgrade
		Red lamp Always light on	Faults in device
B	Residual battery capacity percentage (SOC)		Total remained battery capacity of the system

Table 5.1 Human-computer interface description

5.2 System Commissioning

After finishing connecting wiring, please install the communication modules. Use eSolar O&M software to realize initialization of the device. (Terminal users please check relevant info by eSolar Air)

Notice: before starting slave device, open the battery switches and BMS switches first.

5.3 Start Up the Inverter

The inverter can be turn ON by the following steps:

1. Turn ON the DC switch on the right side of the inverter;
2. Press the battery switch on the right side of the inverter, a blue light will be shown on the button area;
3. Wait for about half minute, and observe the LCD and LED indicators on the front of the inverter.

5.4 Shut Down the Inverter

The inverter can be shut down by the following steps:

1. Turn OFF the DC switch on the right side of the inverter;
2. Long pressing the battery switch on the right side of the inverter (approx. 5 second), the blue light shown on the button area will be gone out after the button is being released, the battery is shut down;
3. Disconnect the external AC switch, the inverter is shut down.

5.5 Remote Monitoring

The communication module is connected to the Internet, and the inverter data is uploaded to the server. The user can remotely monitor the inverter operation info through the web version of the Web Portal or mobile device. Installation of communication module

The procedure of connecting module via eSolar SET APP.

- 1) Download eSolar SET APP and log in

For iOS system, you could search “eSolar SET” in App Store to download and install this APP.

For Android system, you could search “eSolar SET” in Google play to download and install this APP.

- 2) Module connection

After installation of the module, power on the inverter. If the module signal light is green and flickering, it indicates that the module is working normally and sending data to server. If the station is built, the inverter information can be viewed on APP or website.

- 3) Bluetooth connection

- ① Turn on mobile phone's Bluetooth connection.



Fig. 5.2 iOS system

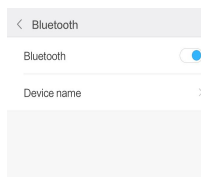


Fig. 5.3 Android system

- ② Log in APP→ Enter password:123456→Sign in→ Select“Bluetooth” → Select“Next” →Search equipment → Click on the Bluetooth name of the inverter (such as AS1-3K-5.1:03704)

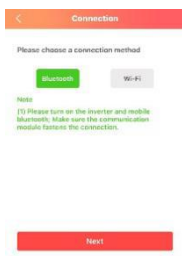


Fig. 5.4 Bluetooth connection

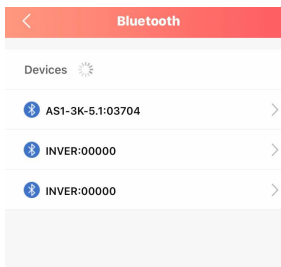


Fig. 5.5 Search equipment

- ③ Bluetooth connected, module signal light is blue→Set country and grid code for first start-up at Initial Setting→After inverter starts, users can view inverter's information.

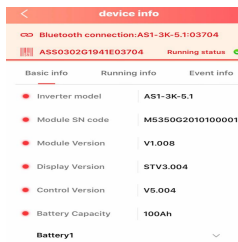
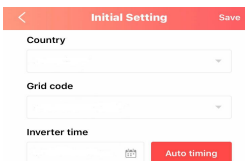


Fig. 5.6 Initial setting

Fig. 5.7 Equipment information

Grid compliance, working modes and measuring device can be selected from eSolar SET,

The working modes description stated as below.

Self-consumption Mode

Power generated by will be supplied firstly to the load, secondly to the battery and the remaining power will be export to grid.

Time-of-use Mode

Set battery charge/discharge hours manually.

Back-up Mode

Battery will be fully charged and will not discharge until there is a blackout of grid

Chapter 6 Fault Codes and Common Troubleshooting

	Explanation	Fault type
01	Communication loss of the main and subordinate machine Master	Error
02	High temperature Master	Error
03	Low temperature Master	Error
04	DCI Err Master	Error
05	Synchronizing pulse fault Master	Error
06	Relay fault Master	Error
07	Storage fault Master	Error
08	Battery input short circuit Master	Error
09	Battery overvoltage Master	Error
10	Battery open circuit Master	Error
11	DC side hardware overcurrent Master	Error
12	Battery discharging fault Master	Error
13	Battery controller overcurrent Master	Error
14	Bus soft-start timeout Master	Error
15	Bus voltage high Master	Error
16	Bus voltage low Master	Error
17	Bus voltage high of hardware Master	Error
18	Inverter overcurrent Master	Error
19	Inverter hardware overcurrent Master	Error
20	Inverter short circuit fault Master	Error

21	Output overload Master	Error
25	Voltage of grid high warning Master	Alarm
26	Voltage of grid low warning Master	Alarm
27	Frequency of grid high warning Master	Alarm
28	Frequency of grid low warning Master	Alarm
29	Grid loss warning Master	Alarm
30	Grid average overvoltage within 10 mins Master	Alarm
31	Overload alarm Master	Alarm
33	Fan Err Slave	Error
34	Output terminal abnormal Slave	Error
35	Inverter voltage wave form fault Slave	Error
49	Grid voltage consistent alarm Slave	Alarm
50	Grid frequency consistent alarm Slave	Alarm
51	GND Loss Warn	Alarm
52	LN Wrong Warn	Alarm
53	CAN communication loss Slave	Alarm
54	Low battery SOC alarm Master	Alarm
55	Voltage of battery high alarm Master	Alarm
56	Voltage of battery low alarm Master	Alarm
57	Voltage of grid high warning Slave	Alarm
58	Voltage of grid low warning Slave	Alarm
59	Grid over frequency alarm Slave	Alarm
60	Grid under-frequency alarm Slave	Alarm
61	Grid loss alarm warning Slave	Alarm
65	Communication loss of the main and	Error

	subordinate machine Slave	
66	Storage fault Slave	Error
67	RTC fault Slave	Error
68	BMS equipment fault Slave	Error
81	Unit cell over-voltage alarm Slave	Alarm
82	Unit cell under-voltage alarm Slave	Alarm
83	Over charging current alarm Slave	Alarm
85	Over discharging current alarm Slave	Alarm
86	Over discharging temperature alarm Slave	Alarm
87	Over charging temperature alarm Slave	Alarm
88	Battery low voltage alarm Slave	Alarm
89	BMS communication loss alarm Slave	Alarm
91	Ammeter communication loss alarm Slave	Alarm
92	DRM0 alarm Slave	Alarm

Chapter 7 Inverter & battery maintenance

7.1 Transportation

Lithium batteries are dangerous goods. Passed the test of UN38.3, this product meets the transportation requirements for dangerous goods for lithium batteries. After the installation of the battery on site, the original packaging (contains the lithium battery identification) should be kept. When the battery needs to be returned to the factory for repair, please pack the battery with the original packaging to reduce unnecessary trouble.

7.2 Storage

After purchasing the battery, please store it with following instructions:

- 1) Please store it in a dry and ventilated environment, keep it away from heat sources;
- 2) Please keep it in an environment with storage temperature as $-20^{\circ}\text{C} \sim 50^{\circ}\text{C}$, humidity $<85\% \text{ RH}$;
- 3) For long-term storage (>3 months), please put it in an environment with a temperature of 18°C to 28°C and a humidity of $<85\% \text{ RH}$;
- 4) The battery should be stored in accordance with the storage requirements mentioned above, and the battery should be installed within 6 months since delivered from the factory and used with compatible inverters;

Notice



- The battery remains 40% power when it is sent from the factory.
- The longer the battery is stored, the DOD value is getting bigger. When the battery remaining voltage fails to reach the startup voltage requirement, the battery may be damaged.
 - Judgment condition: Close the battery breaker switch and press the BMS switch. At this time, if the LED light is flashing, it is running normal. If the LED light is off, the battery is in faulty.

The battery cannot be disposed of as household refuse. When the service life of the battery reaches to the limit, it is not required to return it to the dealer or manufacturer, but it must be recycled to the special waste lithium battery recycling station in the area.

