

PV Inverter
Sunteams 1500
Sunteams 2000
Sunteams 3000
Sunteams 4000
Sunteams 5000

**Installation Guide For Sunteams
PV Grid-connected Inverter**

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1. Notes on this Manual

1.1 Validity

This manual describes the assembly, installation, commissioning and maintenance of the following:

- Sunteams 1500
- Sunteams 2000
- Sunteams 3000
- Sunteams 4000
- Sunteams 5000

1.2 Target Group

This manual is for qualified electricians. The tasks described in this manual may be performed by electrically qualified persons only.

1.3 Archiving of this Manual

The Installation Guide of Sunteams PV Grid-connected Inverter and KLNE Warranty Card of should be stored in a unified manner so as to provide you the most comprehensive assistance and the services with the highest quality.

1.4 Additional Information

You can download the related information from the website www.kinglongpower.com, for example, you can download the supporting software related to your model.

1.5 Symbols Used

The security warning symbols and explanations are as follows:

To avoid the risks of injury or damage to people or properties, users and operators must carefully read the safety instruction and warning information so as to ensure the proper installation and normal operation of the inverter.



DANGER!

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



WARNING!

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



CAUTION!

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



ATTENTION!

"ATTENTION" indicates a situation that can result in property damage if not avoided.



The above are the signs and symbols used in this manual, which will be beneficial to you.

2. Safety

2.1 Appropriate Usage

Grid-connected PV power systems consist of the photovoltaic array, a grid-connected inverter, metering device and power distribution system. Solar energy can be converted to DC energy through the solar cell array, and then convert the DC power energy to AC of same frequency and same voltage with the grid through the grid inverter. It is then fed into the power grid. The grid-connected PV inverter is the key piece of equipment in the photovoltaic power generation system.

The Sunteams PV system configuration diagram is as follows:



Note: If the Sunteams' output terminal is only connected to the home load, Sunteams will stop working; Sunteams' output must be connected to the grid or in parallel with the loads, and then connected to the grid.

- When designing this PV system, ensure that all the supporting equipment parameters except for Sunteams should always conform to the normal operating scope of Sunteams. Please refer to the technical parameter sheet in the appendix of this manual.
- Users must ensure that the data given by the photovoltaic panel array manufacturers is authentic and valid.

Do not use the inverter for purposes other than those described here. The amendments to Sunteams clauses or the installation of parts, as well as Sunteams technological process and warranty claims, operating license, etc are not specially described.

Relevant Certifications of Sunteams

Sunteams 1500/2000/3000//4000/5000 series have passed the following certification standards.

- AS 4777 & AS 3100
- VDE 0126-1-1, EN50178
- ENEL (DK5940)
- G83 & G59
- ETL
- CE (EN 61000-6-3; EN 61000-6-1; EN 61000-3-12; EN 61000-3-11)
- RoHS
- EN50438-Denmark

In accordance with the requirements of clients in different countries and different installation locations, Sunteams is able to set its network parameters to conform to the local grid connection regulations.

2.2 Safety Instructions

Incorrect operation or mistaken use may cause danger:

- The life and health of operators or the third party.
- Equipments and other tangible property of the owner/operator.
- Working efficiency of equipments.
- Service life of equipments.
- The inverter has to be grounded, otherwise there will be suspended potential difference between the casing and the ground.



DANGER!

Danger of life due to high voltages in the Sunteams!

- All work on the Sunteams must only be carried out by a qualified electrician.



CAUTION!

Danger of burn injuries due to hot housing parts!

- During operation, the upper cover of the housing and the housing body may become hot.



CAUTION!

Possible health risks due to the effects of radiation!

- Do not remain within a distance of less than 20 cm from the Sunteams for long periods of time.



Grounding of PV panel

The grounding of panels should comply with the local requirements.

To protect the properties and personal safety to the greatest extent, KLNE recommends that the external frame of the panel array should be grounded when the inverter is connected to it.

3. Unpacking

3.1 Products and Accessories



Sunteams



Accessory Bag



Sealing plug

| Target | Product description and quantity |
|----------------------|---|
| Inverter | One set of Sunteams |
| File pocket | One piece of KLNE Warranty Card |
| | One piece of Installation Guide of Sunteams PV Grid-connected Inverter |
| | One piece of technical parameters |
| Accessory bag | No sealing plug for Sunteams 1500/2000 |
| | One set of sealing plugs for Sunteams 3000 |
| | 2 sets sealing plugs for Sunteams 4000/5000 |
| | 2 RS485 terminals, 4 installation screws, 2 security screws, 4 expansion bolts, 4 white flat gaskets, 1 AC external terminals |
| Installation support | One installation support |

Role of the Sealing Plug


After installation, block the terminal port with a sealing plug to prevent the water vapor from accessing the Sunteams and affecting the service life.

3.2 Examination for Damage during Transportation

The inverter has been inspected before packaging and transportation. Although the product's packaging is firm, unpredictable damages may occur due to accidents in the transportation process. When delivery, please carefully check the product's packaging and internal parts such as housing, display screen, DC terminals and so on. If you find any damages, please record them in the form of a picture and contact your distributors.

3.3 Identify Sunteams

You must confirm the trademark of Sunteams and put the trademark at the display screen of the housing.

| SUNTEAMS PV Grid Inverter | |
|---|----------------------|
| Model Number | Sunteams 4000 |
| Certificate Number | SAA100606 |
| U_{DC max} | 500V |
| I_{DC max} | 18A |
| V_{DC range} | 100~500V |
| V_{AC norm} | 230V |
| f_{AC norm} | 50Hz |
| P_{AC norm} | 4000W |
| I_{AC norm} | 17.4A |
| PF | 1.0 |
| Protection Degree | IP65 |
| Operating Ambient Temperature | -20~45°C |
| AS4777 CS9380N  | |
| AS3100 | |
| Kinglong New Energy Technology Co.Ltd. | |

Sunteams 4000

Trademark



4. Equipment Installation

4.1 Select the installation position

WARNING!



Danger to life due to fire or explosion!

The Sunteams housing can become hot during operation.

- Do not mount the Sunteams on flammable construction materials.
- Do not mount the Sunteams in areas where highly flammable materials are stored.
- Do not mount the Sunteams in areas where there is a risk of explosion.

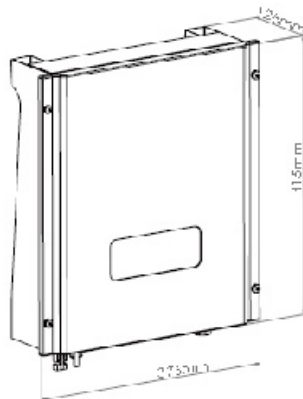
CAUTION!



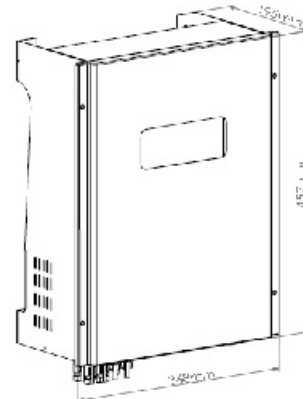
Danger of burn injuries due to hot housing parts!

- Mount the Sunteams such that it cannot be touched inadvertently.

4.1.1 Dimension and weight



Sunteams 1500/2000/3000: 14.1kg



Sunteams 4000/5000: 20.0kg

4.1.2 Ambient environment

The protection level of Sunteams is IP65. The inverter can be placed outdoors.

- The installation location should be kept clean.
- When choosing Sunteam's installation position and method, its weight and size should be taken into consideration.
- Make sure to install on a solid surface.
- The installation position should be easily accessible.
- The temperature of the installation position should be kept within the range between -20℃ and 40℃, but not too humid so as to ensure the optimum operation.
- Do not make the inverter exposed to the sun, which will reduce the power of the inverter due to overheating.
- Do not install the inverter on plaster walls to avoid making the resonant sound.

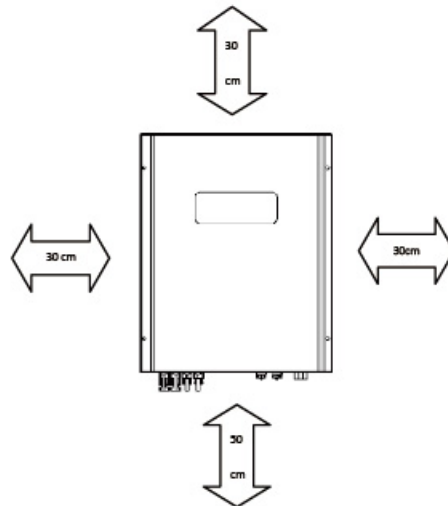


The inverter will give out tiny noise when in service (<30db).

4.1.3 Safety Clearance

Comply with the minimum clearance to the wall to ensure sufficient heat dissipation space.

| Direction | Minimum clearance |
|-----------|-------------------|
| Sides | 30 cm |
| Above | 30 cm |
| Below | 50 cm |



When several Sunteams are in parallel connection, it will produce high ambient temperature.

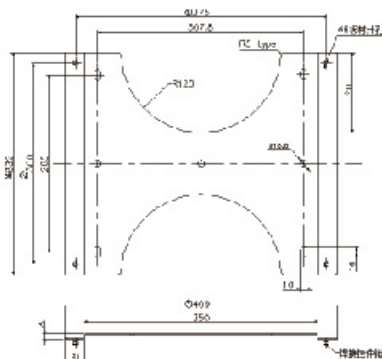
For this situation, ensure the good operation of Sunteams by increasing its clearance from the wall and the supplying cool air.

4.1.4 Position for Keeping

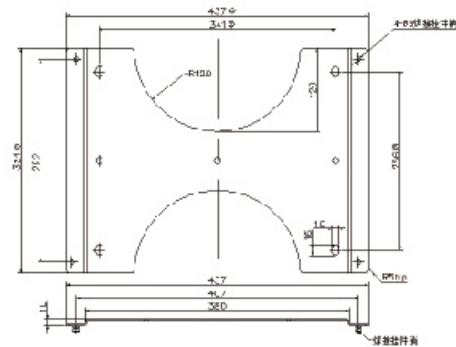
- When installing, keep perpendicular to the ground.
- Do not install horizontally.
- When choosing an installation position, its height should facilitate the observation of LED lights and LCD screen.

4.2 Instructions for Installation

4.2.1 Installation with Rack

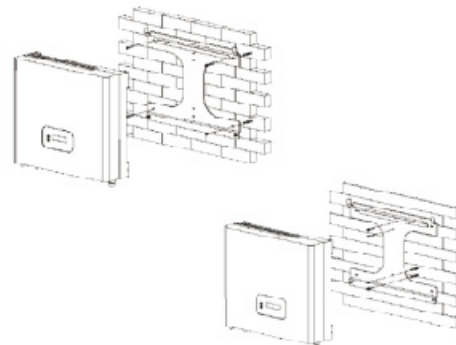
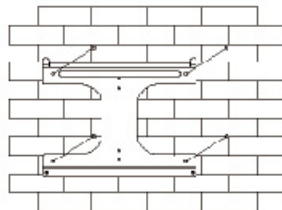


This bracket is applicable for Sunteams 1500/2000/3000



this bracket is applicable for Sunteams 4000/5000

- Choose a wall or solid vertical surface that can support the inverter.
- Put the hanging bracket in the proper position, mark them and then drill four small holes with the depth of 40mm-45mm with an electric drill of 8mm in width.



- Put the four expansion bolts provided by KLNE to the four holes and make the hanging brackets correspond to the four holes.
- Insert the four installation bolts into the four corresponding white pads and then tighten the hanging bracket with them.
- Lightly attach the Sunteams on the bracket and then insert the two feet on the top of the inverter into the corresponding bracket holes.
- Then slowly pull down the inverter until the other two feet on the downside surface of the inverter access to bracket holes.
- After the above steps, mount the two safety screws provided by KLNE on the both sides on the top of the inverter with a screwdriver.
- Finally determine whether the Sunteams is firmly installed.

5. Electrical Connection



WARNING!

Electric shock due to short circuit!

If cables with different voltages are laid parallel to one another, short circuits can result if the cable insulation becomes damaged.

- Lay all cables separately.



ATTENTION!

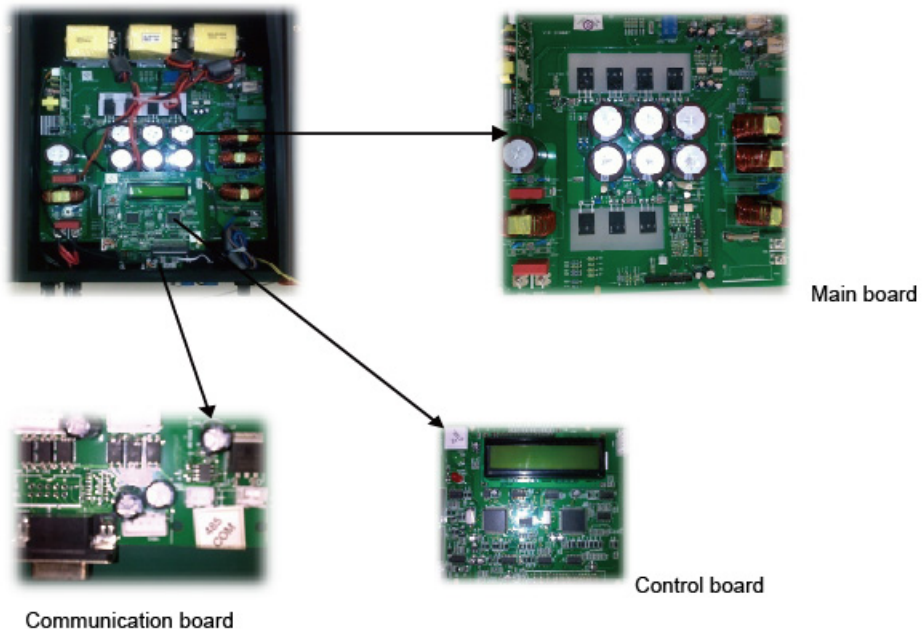
Electrostatic discharges can damage the Sunteams!

Internal components of the Sunteams can be irreparably damaged by static discharge.

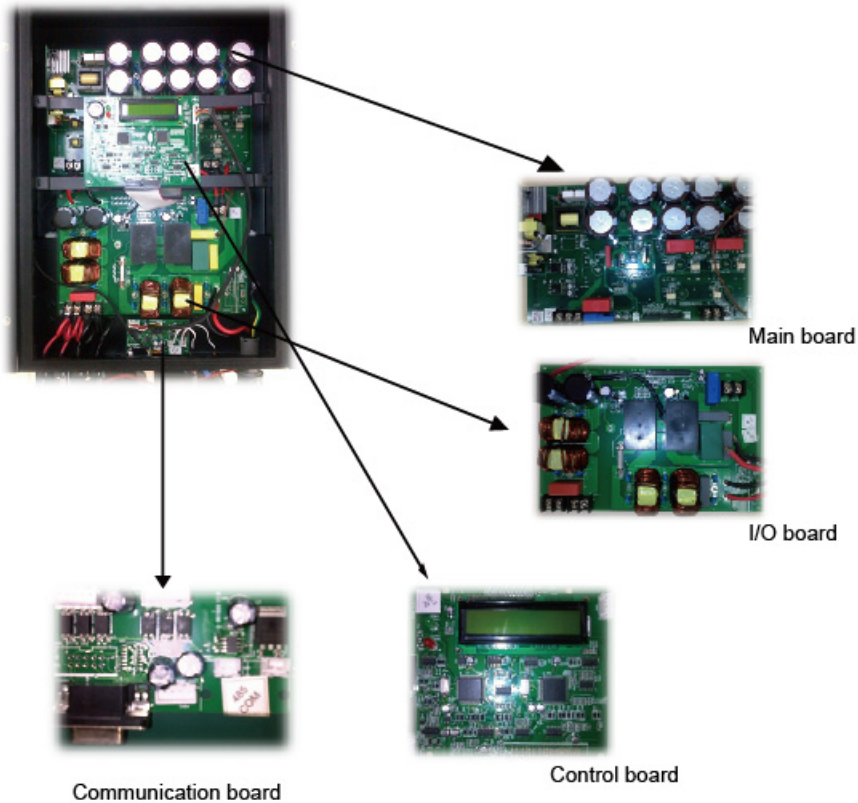
- Ground yourself before touching a component.

5.1 Overview of various areas inside the Sunteams

Sunteams 1500/2000/3000



Sunteams 4000/5000



5.2 Connection to Grid

► Requirements for connection

Ensure that the connection of Sunteams conforms to the connection requirements of the public grid;

Ensure that the parameter setting of Sunteams conforms to the local grid requirements.

► Leakage detection device

Sunteams is provided with complete leakage detection device, which can automatically recognize the actual leakage and normal capacitive discharge.

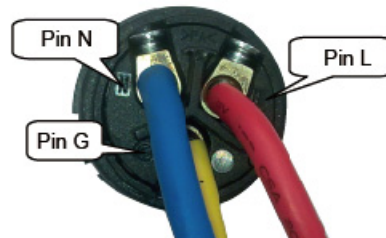
If the leakage current exceeds the safety value of the detection device, the inverters alarm will trip and display the fault information, and automatically disconnect from the grid to prevent dangers.

The following display is the AC terminal of Sunteams 1500/2000/3000:

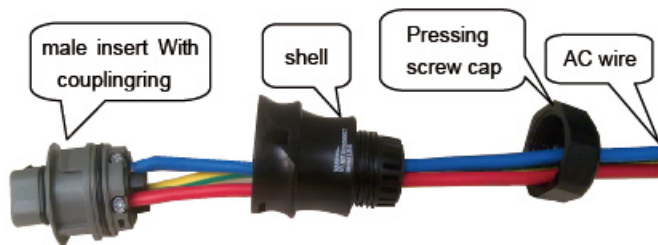


AC terminal of Sunteams 1500/2000/3000

The live wire L, neutral wire N, and grounding wire G of Sunteams 1500/2000/3000 are shown below:

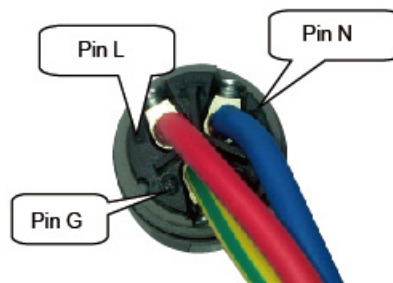


The following displays the AC terminal of Sunteams 4000/5000:



AC terminal of Sunteams 4000/5000

The live wire L, neutral wire N, and grounding wire G of Sunteams 4000/5000 are shown below:



Note: The ground wire G should not go through breaker.

5.3 Connection of the AC Terminal

5.3.1 Connection of Sunteams 1500/2000

The DC terminal of Sunteams 1500/2000 has one group of MC4 terminals, one positive pole and one negative pole;

The following is the requirements for the installation of terminals:

Same model;

Same quantity;

one-one correspondence;

The panel array must be equipped with the plug-style connection cable, which connects with the DC terminal of Sunteams.

The limit value of DC terminal is shown in the table below:

| Maximum input voltage | Maximum total input current |
|-----------------------|-----------------------------|
| 450V/500V(DC) | 9A/10A (DC) |

5.3.2 Connection of Sunteams 3000

Sunteams3000 has two groups of MC4 terminals, two positive poles and two negative poles;

The following is the requirements for the installation of terminals:

Same model;

Same quantity;

one-one correspondence;

The panel array must be equipped with the plug-style connection cable, which connects with the DC terminal of Sunteams.

The limit value of DC terminal is shown in the table below:

| Maximum input voltage | Maximum total input current |
|-----------------------|-----------------------------|
| 500V(DC) | 13A (DC) |

5.3.3 Connection of Sunteams 4000/5000

The DC terminal of Sunteams 4000/5000 has four groups of MC4 terminals, four positive poles and four negative poles;

The following is the requirements for the installation of terminals:

Same model;

Same quantity;

one-one correspondence;

The panel array must be equipped with the plug-style connection cable, which connects with the DC terminal of Sunteams.

The limit value of DC terminal is shown in the table below:

| Maximum input voltage | Maximum total input current |
|-----------------------|-----------------------------|
| 550V/550V(DC) | 19A/19A(DC) |

5.3.4 Steps for DC Terminal's Connection



DANGER!

Danger to life due to high voltages in the Sunteams!

- Before connecting the PV generator, ensure that the AC line circuit breaker is switched off.

1. Check whether the wiring of two poles of PV is correct, and whether the output voltage and current of PV array are within the allowable range of Sunteams;



Attention!

Over-voltage can cause damages to Sunteams!

If the DC input voltage is greater than the maximum input voltage of the inverter, the inverter will be subject to irreparable damages due to overvoltage; all the claims in the warranty period will become invalid!

- The open-circuit voltage of the PV array must be lower than the maximum input voltage of the inverter.

**Caution!**

Over-current will cause damages to the battery panels!

Because Sunteams has current-limiting effect, if the current of PV modules exceeds the allowable maximum input current of the inverter, it will cause damage to the battery panel.

2. After confirming the above connections are correct, insert the DC terminals into their connecting ports correspondingly. The DC terminals not in use must be sealed with a sealing plug to prevent entry of water vapor. As shown in below:



Sunteams 3000



Sunteams 4000/5000

**DANGER!**

Electric shock may endanger your life!

Before connecting to the DC terminals, make sure that the circuit breakers at the DC terminals and AC terminals are disconnected to prevent electric shock.

- Before inserting the DC terminals, firstly turn off the circuit breakers, ; operate on the Sunteams only after the DC terminals are stable

5.4 Starting Steps of Sunteams

1. Ensure that the voltage at the DC and AC side of Sunteams conform to the normal operating range;
2. Firstly close the DC terminal, and then close the circuit breaker at the AC terminal. After self-checking of Sunteams, start normal operation.



DANGER!

Danger to life due to high voltages in the Sunteams!

- Do not switch on the AC breaker until the PV generator has been connected and the sunteams is securely closed.

5.5 Stoppage of the Inverter

The inverter's DC terminals and AC terminals should be controlled with circuit breakers separately. When stopping the operation of the inverter, it is necessary to disconnect circuit breaker of AC terminal, and then disconnect circuit breaker of DC terminal. For any loss caused by failing to observe this requirement, KLNE will assume no warranty and no joint liabilities.



ATTENTION!

Danger of crushing when the terminals snap closed!

- When the AC terminals are snap closed, Sunteams cannot immediately get the power off and power discharge will occur inside.
- Before the screen is completely off, do not operate the inverter.



Disconnecting the power grid is allowed

Only the circuit breaker should be used as a tool to disconnect from the power grid.

6. Setting the Country-specific Parameters

Because there are varied installation regulations in different regions, the installer should make appropriate changes to the parameters of the inverter before being used.

7. Communication

7.1 Communication ports

There are two communication ports for Sunteams — RS232 and RS485 respectively.

► Use of RS232

RS232 serial line can be connected to a computer to monitor the operating state of the inverter, upgrade the program of inverter and modify the parameters of the inverter.

To protect the normal use in the future, please tighten the RS232 port with a screw when not in use.



► Use of RS 485

RS485 can connect several inverters to realize the monitoring of the inverters; There are 4 Pins in total, but only Pin 2 and pin 4 are in use. when not in service, please tighten the sealing cap.



8. System Operation

Preparation before the start:

1. Check the connection

- Check whether Sunteams is securely tightened on the hanging bracket ;
- Check whether the DC terminal is correctly connected with the PV modules ;
- Check whether the AC terminal is correctly connected with the grid;
- Check the wiring at the AC terminal and DC terminal is secured;
- Check the circuit breakers on both the AC and DC terminals are connected securely;
- Check whether the Sunteams housing is fastened and sealed.

2. Confirm the parameters

- Check whether PV modules conform to the operating parameters of Sunteams;
- Check whether Sunteams conforms to the local grid regulations.

Run Mode

Open the circuit breaker

If the sunlight is enough, the green light on the inverter will be on; then the waiting period starts during which the grid parameters and PV modules are tested; after that, you will hear four ticktacks, which indicates that Sunteams has been in normal operation.

Display status

► The inverter may have the following four states:

Standby: This is a standby state;

Waiting: The state means waiting for grid connection;

Normal operation: this state means in normal operation;

Fault state: this state means fault.

LCD display is as follows:

| The first line of LCD | | |
|-----------------------|---------------------|--------------------------|
| State | Display content | Remark |
| Wait State | Waiting | Initial waiting |
| | Checking xxS | System checking |
| | Reconnect in xxs | System checking |
| | Standby | PV voltage low |
| Normal State | Pac = xxxx.x W | Inverter watt at working |
| Auto Test State | Auto testing | Protection auto test |
| Fault State | System xx Fault | System fault |
| Permanent State | Inverter xx Damaged | Inverter fault |
| Program State | Programing | Update software |

| The second line of LCD | | |
|------------------------|-----------------|--------------------------------|
| Cycle display | Display time /s | Remark |
| User: xxxx | 1 | The user type |
| Spec: xxxx | 1 | The Inverter spec type |
| Model:x.xkw | 1 | The Inverter model |
| SW Version:xx.xx | 1 | The software version |
| Ettotal: xxxkwh | 2 | The energy total |
| Etoday: xx.xkwh | 2 | The energy today |
| Ttoday:xxhxxmin | 2 | The work time today |
| PV:xxxv BUS:xxxv | 2 | The PV and Bus voltage |
| AC:xxxv xx.xhz | 2 | The Grid voltage and frequency |

The fault state can be divided into system fault and inverter fault, as shown in table below:

| Display | Operation |
|-----------------------|---|
| System Fault | |
| Disconnect Grid | Disconnect grid |
| Grid V Fault | Grid voltage out range |
| Grid F Fault | Grid frequency out range |
| Low Isolation | Low input isolation |
| High PV Voltage | PV input voltage high |
| High Ground I | GFCI active |
| High Temperature | Temperature too high |
| Inverter Fault | |
| EEPROM Damaged | EEPROM has problem |
| Please Initiate | System has not been initiated at the first time |
| GFCI Damaged | GFCI device damaged |
| Sensor Damaged | Output AC sensor damaged |
| SCI Damaged | The communication between the two MCU fault |
| Not Consistent | The data is not the same for the two MCU |
| High DC INJ | Output DC Injection Too High |
| Relay Damaged | Output Relay Failure |
| High Bus Voltage | DC Bus Voltage Is Too High |
| Auto test failed | Auto test failed |
| 2.5V Ref Fault | 2.5V Reference Voltage Inside has problem |

9. Troubleshooting and Maintenance

9.1 Troubleshooting

The common error messages and troubleshooting are as follows:

| No. | Cause | Remedy |
|-----|---|--|
| 1 | <Disconnect Grid> Possible causes: Stop power supply from the grid; AC circuit breaker is disconnected; The both sides of AC circuit breaker are in poor contact. | Identify whether the grid stops power supply; Identify whether the AC circuit breaker is closed; Identify whether the breakover of the two terminals of AC circuit breaker is good; If there are no above problems, please contact your distributor or customer service department. |
| 2 | <Grid V fault> Possible causes: The grid voltage exceeds the scope prescribed in the local regulations. | When reporting error, check whether the grid voltage of the inverter is within the range prescribed in local regulations; Report this problem to the distributor or customer service department. |
| 3 | <Grid F Fault> Possible cause: The grid frequency exceeds the scope prescribed in the local regulations. | Whether this problem is always existing or intermittently existing; Report this problem to the distributor or customer service department. |
| 4 | <Low Isolation> Possible causes: The ground wires at the AC terminal are in poor contact. | Check whether the ground wire of AC is in good contact; If there is no problem, please contact the distributor or customer service department. |
| 5 | <High PV Voltage>The actual voltage at the DC side exceeds the specified range of the inverter. | Check whether the actual voltage at the DC side is within the specified range of the inverter; If complying with the range of the inverter voltage, please contact the distributor or customer service department. |
| 6 | <High Ground I> The possible cause is that there is leakage at the AC side. | Disconnect the circuit breakers at the DC side and AC side and check whether there are damages to the cables and circuit breakers at the AC side. |
| 7 | <High Temperature> The ambient temperature of the inverter is too high. | Identify whether the ambient temperature is abnormal; Identify whether the inverter has sufficient heat dissipation space; Identify whether the cooling fin of the inverter is blocked; If the external environment is normal, please contact the distributor or customer service. |

9.2 Maintenance

Check the heat dissipation:

If the Sunteams is in low power for a long time, it is possible the inside temperature is too high, possible causes are as follows:

- ▶ There are earths in the cooling fins at the back of the housing and the heat dissipation channels are blocked;
- ▶ The installation space of Sunteams is too narrow and there is no enough space for the cooling fins to dissipate heat;
- ▶ The ambient temperature of Sunteams is too high.

If necessary, clean the cooling fins on a regular basis and keep good ventilation of Sunteams; otherwise, if the temperature is too high, it will reduce its efficiency and reduce the service life of Sunteams.

Contact

If you have any technical problems for our products, please contact our customer services. To offer assistance to you, we need you provide the following information.

- Type of inverter
- Sunteams Serial number
- The displayed error messages
- Data of the connected PV modules
- System installation regions

▪ Appendix ▪

System configuration list

| | | |
|-------------------------|----------------------------------|-------------------------------------|
| PV module | Voc: | Vm: |
| | Isc: | Im: |
| | Input strings number: | Module number (series/parallel): |
| DC breaker | Parameter: | |
| Grid-connected inverter | Model : | |
| AC breaker | Parameter: | |
| Meter | One-way <input type="checkbox"/> | Both ways <input type="checkbox"/> |
| Grid | Voltage: | Frequency: |
| | Grid type: | |