LESSO GROUP
STOCK CODE: 2128.HK

LESSO

On-grid PV Inverter User Manual

LSBH225-230KTL3HV-OC1

*1. The pictures are for reference only, and the actual product shall prevail.
*2. Information is subject to update without prior notice.

Thank you for choosing the non-isolated photovoltaic grid-connected inverter of Guangdong Liansu Energy Storage Technology Co., LTD. For your safe and correct use of the product, please read the instructions in detail before you use it. Thank you for your cooperation!

Contents

1. Overview

1.1 Use of the instructions

This manual mainly introduces the product information, installation, operation and maintenance guidelines of the inverter, suitable for the installation, operation and maintenance of the technicians, as well as the end users who need to view the inverter information. Please read this manual carefully before installing this product, and put the manual in a reasonable place to ensure that the relevant installation and operators can easily access it.
This manual is applicable to the following high power series-connected grid-connected inverters:
LSBH225 / 230KTL 3 HV-OC1 series

1.2 Symbols used in the instruction manual

When installing and operating this product, please strictly observe the safety regulations containing the following warning symbols.

Danger

Represents a high potential danger, and failure to comply with such warnings can directly lead to serious personal injury and even life threatening.

Warnin

Represents a moderate potential danger, and failure to comply with such warnings can directly lead to serious personal injury or even life threatening.

Cautio

Indicates a low potential hazard, and that failure to comply with such warnings may result in mild or moderate personal injury, or serious property damage.

Note

Indicates a potential risk that failure to comply with such warnings may result in property damage.

2. Product description

2.1 Photovoltaic grid-connected power generation system

The photovoltaic grid-connected power generation system is usually composed of solar panel array, junction box, inverter, electricity meter plate and power grid. The core of the system is the photovoltaic grid-connected inverter. When the sunlight shines on the surface of the solar panel, the direct current output by the solar panel array is tracked and controlled by the maximum power point of the photovoltaic grid-connected inverter to generate AC power at the same frequency and phase as the power grid voltage and is sent to the power grid.

The photovoltaic grid-connected inverter is a three-phase series transformer-less inverter. Its application in the photovoltaic power generation system is shown in Figure 2-1.

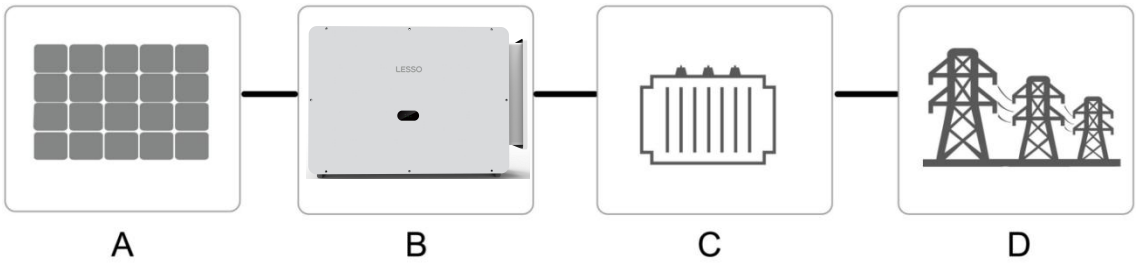
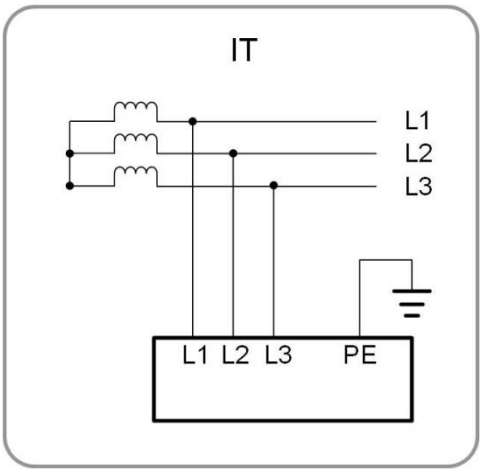


Figure 2-1 Application of grid-connected photovoltaic inverters in photovoltaic power generation system

name	description	remarks
A	Photovoltaic group string	Monocrystalline silicon, polysilicon, and thin-film cells without grounding
B	dc-to-ac converter	LSBH225/230KTL 3 HV-OC1
C	step-up transformer	Increase the output voltage of the inverter to the level of grid requirements
D	electrified wire netting	The power grid form supported by the inverter is shown in the figure below



If the photovoltaic system exceeds the capacity of a single inverter, multiple inverters can be used in the system. On the input side, each inverter is connected to the appropriate PV input, and the power grid is connected in parallel on the output side.

Warning

- The inverter cannot be connected to the photovoltaic group string that requires positive grounding or negative grounding.
- Do not connect the local load between the inverter and the AC side circuit breaker.

Inverter is only suitable for grid-connected power generation system, except for the above occasions, the inverter can not be used for other occasions.

Product performance features:

- No transformer isolation, the highest efficiency of 99.02%;
- Wide voltage input range, maximum power point tracking (MPPT) efficiency of 99.9%;
- Active and passive anti-island effect protection technology;
- Perfect protection performance, higher reliability;
- Outdoor type (IP66) design, to adapt to the harsh environment;
- RS485 communication;
- The GPRS / WIFI communication function is optional.

2.2 Product Introduction

- **product appearance**

The product appearance is shown in Figure 2-1. Pictures are for reference only, subject to the physical object.

graph 2-1

- **product size**

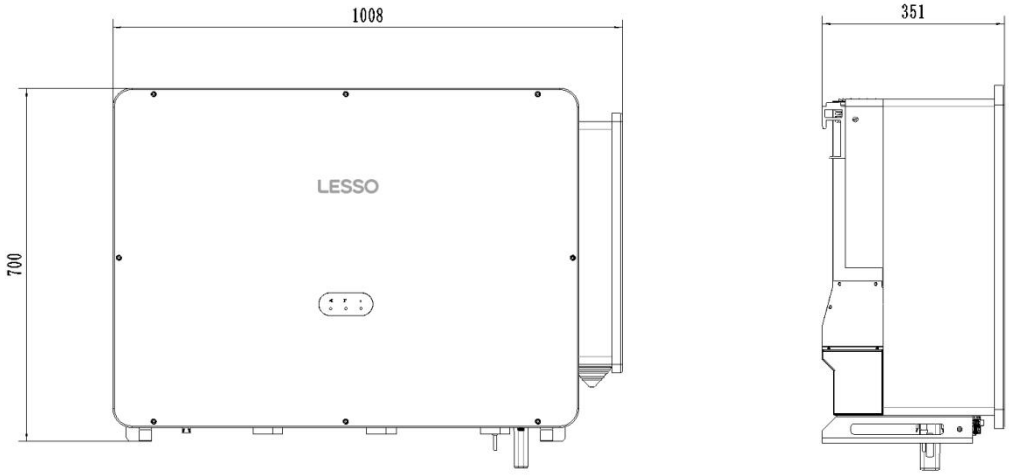


Figure 2-2 Size drawing of inverter (unit: mm)

- **peripheral interface**

The external interface is located at the bottom of the product, with PV + input port, PV-input port, WIFI / G PRS / RS485 communication port, AC output port and DC switch. The schematic diagram of the external interface is shown in Figure 2-3

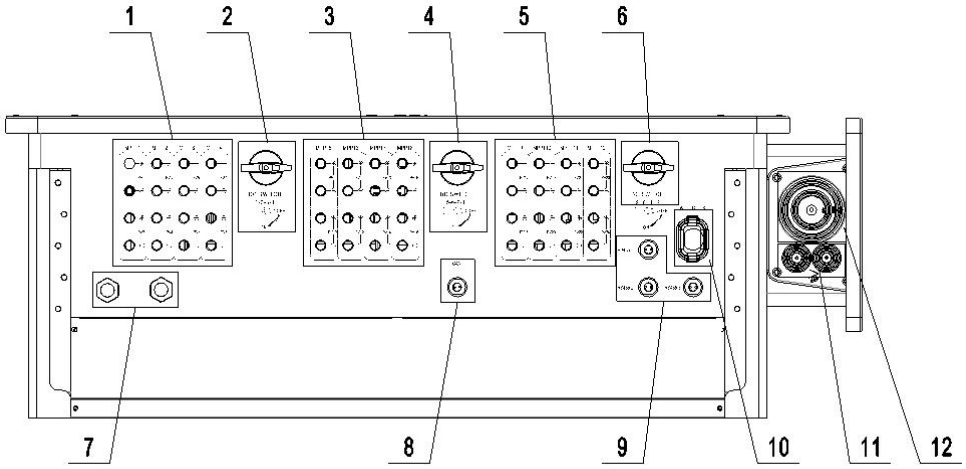


Figure 2-3 Schematic diagram of the external interface (bottom side)

The description of each port is shown in Table 2-1 below

Table 2-1, and the external interface

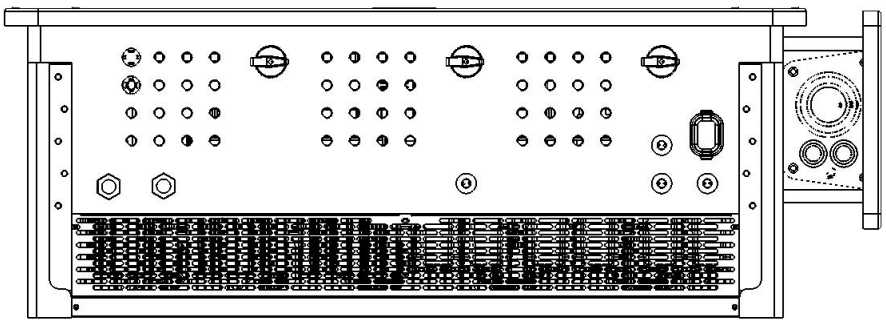
Order number	Name	Port description
1	DC input terminal	The DC input terminal of the inverter, controlled by DC SWITCH 1
2	DC switch 1	The DC disconnecting switch is the DC SWITCH 1
3	DC input terminal	The DC input terminal of the inverter, controlled by DC SWITCH2
4	DC switch 2	The DC disconnecting switch is the DC SWITCH 2
5	DC input terminal	The DC input terminal of the inverter, controlled by DC SWITCH 3
6	DC switch 3	The DC disconnecting switch is DC SWITCH 3
7	The air valve	Balance the air pressure inside the machine
8	communication interface	CAN communication interface
9	communication interface	RS485-1, RS485-2 interface is used for external communication, and RS485-3 interface is used for photovoltaic bracket tracking system
10	USB joggle	Wireless communication acquisition bar interface
11	Through the line hole	The system tracks the power cord and the internal protective ground connections
12	Through the line hole	AC output line hole

- **DC switch**

The DC switch can safely disconnect the inverter from the pv group string. The inverter is equipped with three DC switches, each switch control
Make the DC terminal of the corresponding region.
The DC switch type of this inverter are manual DC switch and intelligent disconnecting switch. The following diagram is for reference only
The type and quantity of the DC switch of the transformer are subject to receipt.

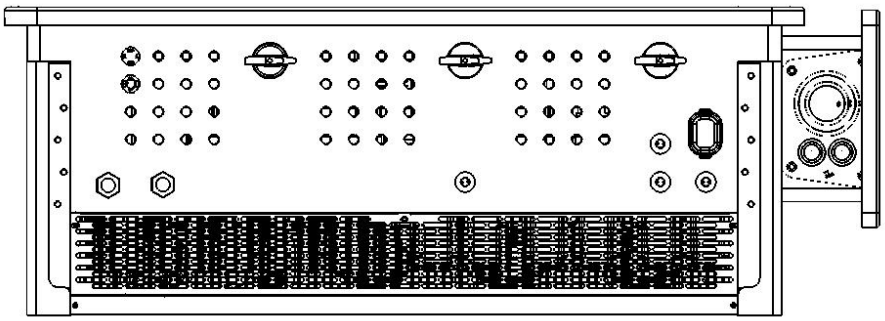
➢ **Manual DC switch**

If the switch is a manual DC switch, turn the switch to the OFF-state to disconnect the DC input.
Contains the base that has this type of switch
The view is as follows:



➢ **Intelligent isolation switch**

If the DC switch is an intelligent disconnecting switch, the intelligent isolation will be triggered when the device detects the reverse connection or the internal fault of the inverter
Off automatic off protection to disconnect the DC input. The bottom view with this type of switch is as follows:



- **Principle description**

The principle design of the inverter is as shown in the following figure.

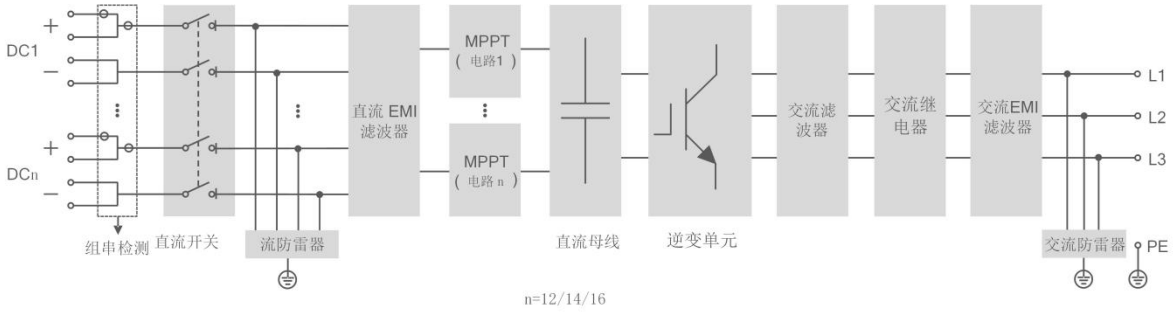


Figure 2-4 Block diagram of the circuit structure

The DC switch is used to cut off the DC current safely when necessary to ensure the safe operation and personnel safety of the inverter.
The EMI filter filters out the electromagnetic interference inside the inverter to ensure that the inverter can meet the requirements of the electromagnetic compatibility standard.
The inverter is equipped with multiple MPPT for the DC input, ensuring that the maximum power can be obtained even under different photovoltaic input conditions.
The inverter unit converts direct current into alternating current that meets the requirements of the grid and feeds it into the grid.
The AC filter filters out the high-frequency component of the output current of the inverter to ensure that the output current meets the requirements of the power grid.
The output relay separates the AC output of the inverter from the power grid, and enables the inverter to safely leave the power grid when the inverter fails or the power grid fails.
Through the AC surge protector (lightning protector), provide the discharge circuit for the AC side overvoltage energy, to prevent the impact of the AC side overvoltage resulting causing damage to the internal circuit of the inverter.

- **Function declaration**

The functions of the inverter can be summarized as follows:

➢ **Inverter function**

The inverter converts direct current into alternating current that meets the requirements of the grid and feeds it into the grid.

➢ **Data storage and display function**

The inverter stores the operation information, fault records and other system information.

➢ **Parameter configuration**

The inverter provides a variety of parameter configurations, and users can configure the parameters through the App to meet various requirements or adjust to the best performance.

➢ **Communication interface**

The inverters provide a standard RS485 communication interface.
The standard RS485 communication interface is used to establish communication with the monitoring equipment of the power station, and to upload the monitoring data to the monitoring background through the communication cable. After the inverter is successfully established with the communication equipment through the communication interface, users can view the relevant information of the inverter or set the operation and protection parameters of the inverter through the

intelligent energy management platform.

- **Protection function**

The inverter has island protection, low voltage crossing, DC back protection, AC short circuit protection, leakage current protection, surge protection and other protection functions.

- **PID(optional)**

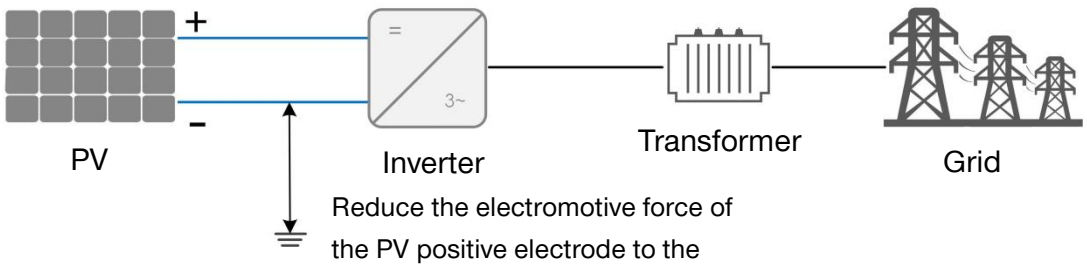
The PID phenomenon of photovoltaic modules can lead to serious loss of power generation. The PID protection function can inhibit the PID effect, which is applied to the inverter daytime grid connection operation scenario or the SVG function opening scene at night; after the PID repair function, it is applied to the DC scene without power of the inverter.

The PID protection function and the PID repair function are used differently between the P-type panel and the N-type panel.

- **P-shaped panels**

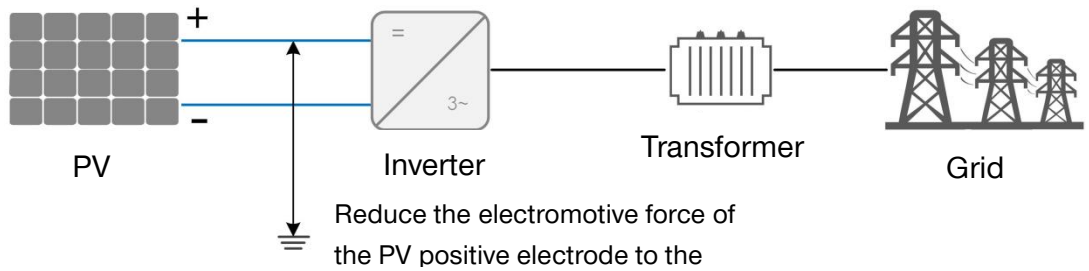
When the PID protection function is turned on, the negative potential of the P-type panel photovoltaic array is raised similar to the earth potential through the PID module to suppress the PID effect.

When the PID repair function is turned on, the potential between the negative electrode of the P-type panel photovoltaic array and the ground is raised to 500 Vdc through the PID module for PID repair.



- **N-type panels**

The electric power design institute and the users should confirm the compensation voltage direction of the selected panel anti-PID to the photovoltaic panel manufacturer when designing the power station.



Ensure that the inverter is applied to the IT system before opening the PID protection function.
The PID repair and night SVG functions can be turned on at the same time, but not working simultaneously. In IT systems, PID protection and nighttime SVG functions work simultaneously.
The PID repair function only works in the inverter DC without power scene and the PID repair function is enabled.
After the PID repair function is enabled, the module voltage of the pv string is 500 Vdc.

Caution

Before turning on the PID protection or repair function, please note the requirements of ground voltage polarity of different structural types of photovoltaic modules. If you have any questions, please contact the pv module manufacturer or read the module user manual.
When the component type does not match the voltage scheme of the PID protection or repair function, the PID function will not achieve the desired effect and even adversely affect the panel.
When the inverter is in the PID repair state, it is necessary to turn off the PID repair function before the manual power-up and maintenance of the inverter.

3. Installation

The following are the installation instructions for this product. Please read this instructions carefully to help you install them correctly.

3.1 Installation process

When installing and operating this product, please strictly observe the safety regulations containing the following warning symbols.

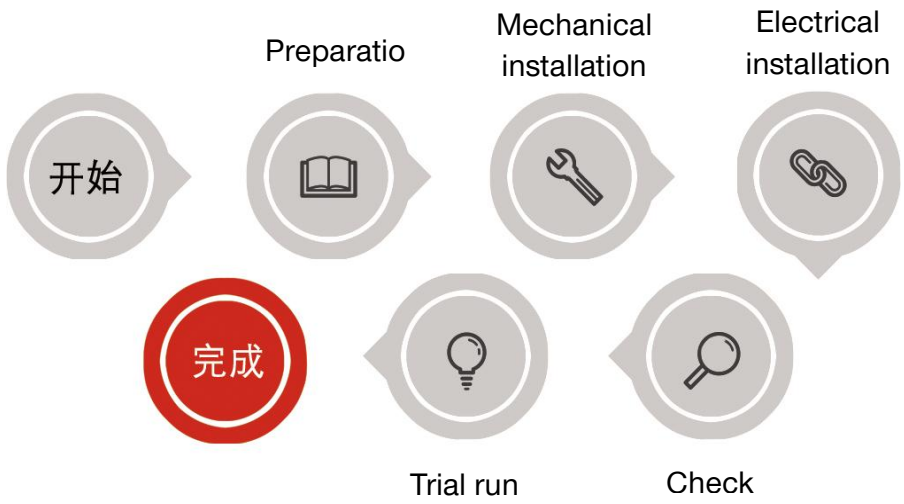


Figure 3-1, Installation process

3.2 Installation and preparation

➢ **Unbox and check**

Although we have carefully tested and detected the inverter before transportation, it may be damaged during transportation, so please conduct a detailed check before installation.

- Check the packing box for any damage when receiving the goods.
- Check whether the goods are complete and consistent with the order according to the packing list.
- Check the internal equipment for intact condition after unpacking.

If any damage is detected, please contact the transportation company or Guangdong LianSu Energy Storage Technology Co., Ltd. Please provide photos of the damage, and we will provide the fastest and best service.

Table 3-1, Scope of supply

number	name	quantity	explain
A	dc-to-ac converter	A	——
B	dead plate	One piece	For fixing the inverter to the mounting surface (solid wall, etc.)

C	D	A set	Including: quick installation instructions, protection Card repair, qualification certificate, and product test report
D	Install the plate-fixing screws	Four sets	Screw M10X40, hexagonal nut M10, flat pad 10
E	fix screw	Two	Used to fix the inverter with the fixing plate
F	DC connector	24 To	For the connection of the photovoltaic DC and the inverter, please ensure that the polarity of the photovoltaic DC corresponds to the polarity of the inverter input end!

➢ **Inverter storage**

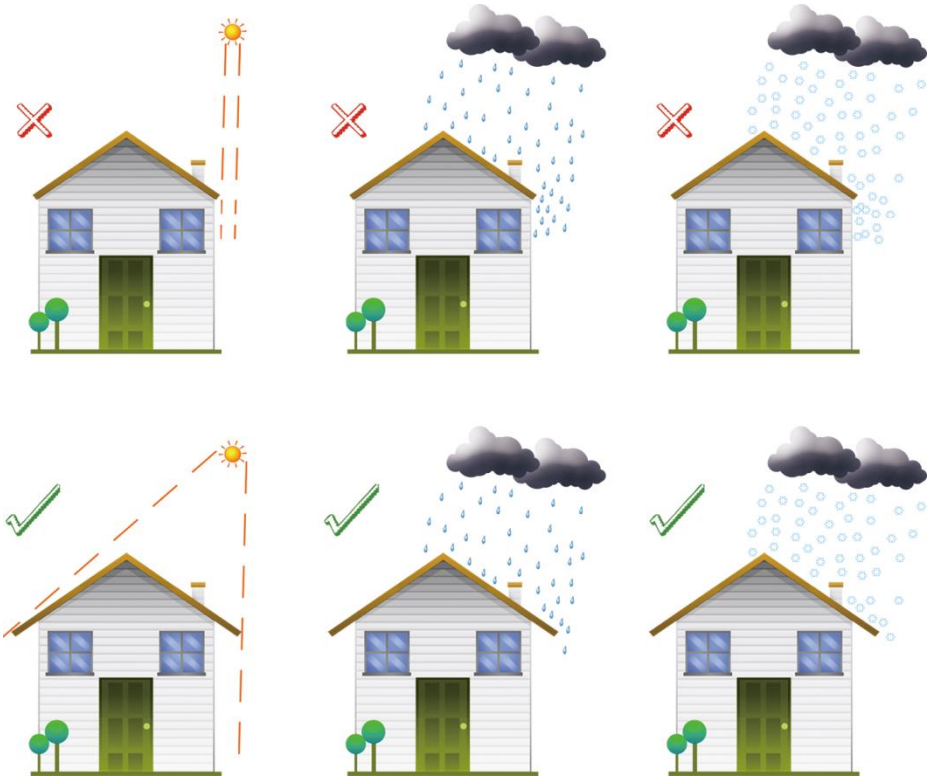
If the inverter is not immediately put into operation, store the inverter in a specific environment:

- The inverter shall be packed with the original packing box, sealed with adhesive tape, and placed in a clean and dry environment to prevent dust and water vapor erosion.
- The temperature of the storage site should be kept at-40℃ ~70℃, and the relative humidity should be kept between 0 and 95% without condensation.
- Do not store the products in direct sunlight, rain wet, strong electric field and other places.
- If the storage space needs to be stacked, it must be stacked in turn. The maximum number of stack layers should not exceed 2 layers, and the stack should not be stored for a long time.
- The packing box should not be tilted or inverted.
- The storage time of the inverter is more than one year, and the inverter can be fully checked and tested by professionals before being put into operation.
- Regular inspection. Check at least once every six months. If any worm-eaten rat bite is found, the packaging materials should be replaced in time.
- Please store the product according to the storage requirements, if the storage conditions do not meet the requirements of the product damage will not be covered by the warranty.

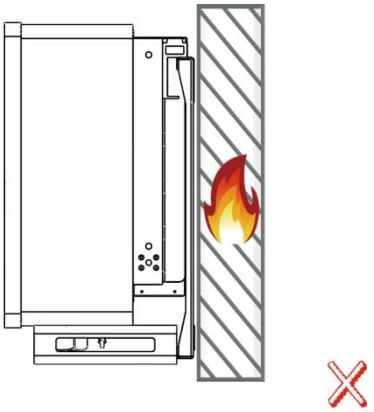
3.3 Installation environment requirements

The choice of inverter installation environment is important for its safe operation, performance guarantee and life guarantee
act on. Here are some basic requirements:

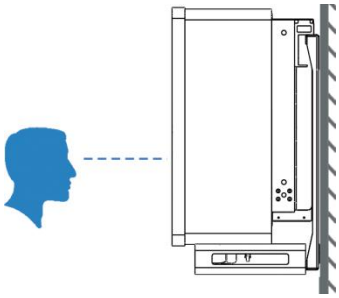
- The waterproof and dustproof grade is IP66, which can be installed indoors or outdoors.
- In order to extend the service life of the inverter and avoid the inverter directly affected by the sun, rain and snow, choose the installation site with shelter as far as possible.



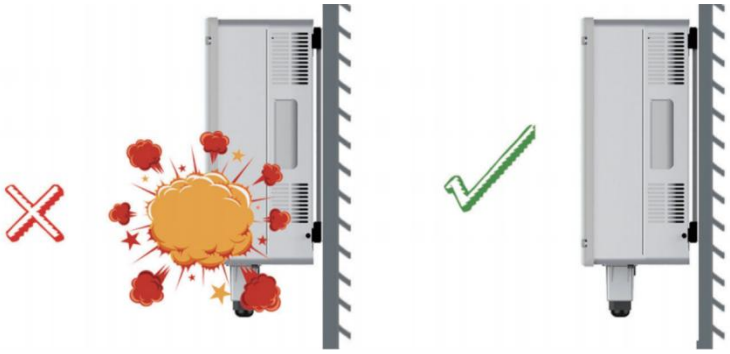
- The installation site of the inverter (wall or steel frame) shall be solid and reliable, and shall be able to bear the weight of multiple inverters for a long time, and shall have fire protection performance.



- Inverters shall be installed in locations for easy electrical connection, operation and maintenance.
- The installation height preferably makes the LCD LCD flush with the eye so that the LCD display panel operation.



- The installation space requires good ventilation, the inverter can not be installed in the enclosed space, can not have flammable or flammable gas.



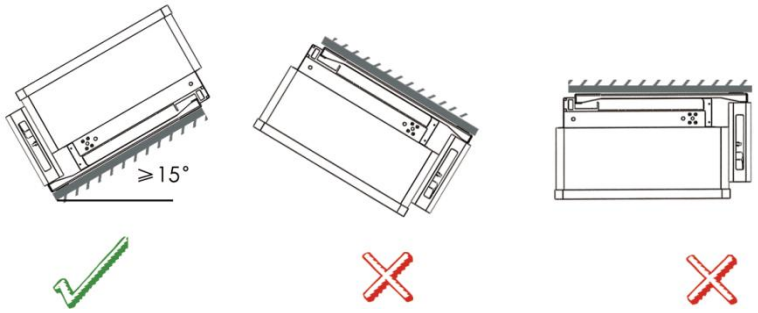
- The temperature range of the installation environment should be between-40℃ and 60℃, and the relative humidity is 0~ 100% (when the ambient temperature exceeds 45℃, the output power of the inverter will be reduced).

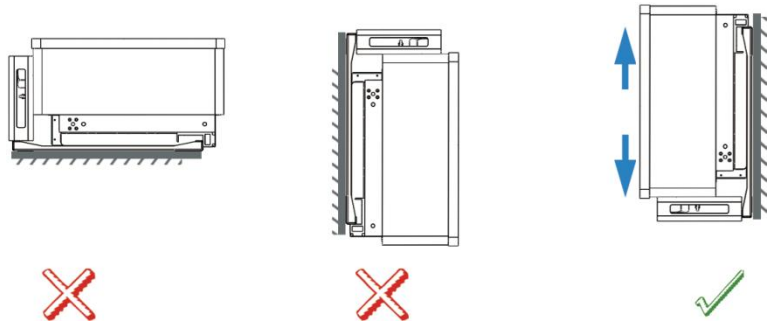
Bottom-level ambient temperature: - 40℃

Maximum ambient temperature: +60℃

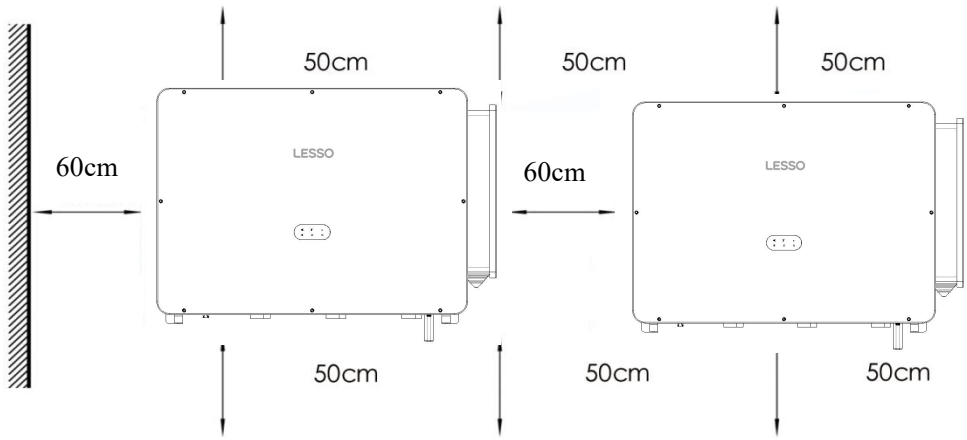
ambient humidity: 0~100% without condensation

- The installation environment requires cleanliness.
- Installation must be installed upright, not horizontally, tilted or inverted.





- If multiple inverters are installed horizontally side by side, the distance between each other is preferably above 100cm, and things should not be placed on the top of the inverter, and there should be enough gaps between the front and back to facilitate the heat dissipation of the system; it is recommended to stagger the inverter.



- Do not install the inverter in a place where children can touch. During the operation, the local temperature (such as radiator) is high, so as to avoid scald or electric shock.
- When the inverter is installed back to back, the spacing between the two inverters is at least 600mm. Bles need to be added between the two devices to form a heat dissipation channel. The baffle is placed horizontally in the middle of the two inverters, which cannot block the air inlet and outlet of the inverter.

Danger

Do not place the inverter together with flammable and explosive items.

Caution

During the inverter work process, the temperature is high, do not touch!

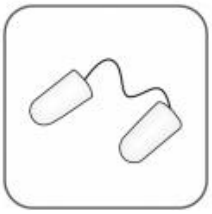
- Do not install the inverter in the living area. The inverter will produce some noise, which may affect normal life.

3.4 Mechanical installation

3.4.1 Installation tools

The installation tools include, but are not limited to, the following recommended tools. If necessary, other auxiliary tools can be used on site.


Protective glasses


Anti-noise earplugs


Dust mask


Insulating gloves


Insulated shoes


Utility knife


Flat screwdriver (M2, M3, M6)


Cross screwdriver (M4, M6, M8)


Drill (φ12)


Pliers


Marker pen


Ruler


Rubber hammer


Sleeve (M4, M8, M12)


Wrench (16 mm, 35 mm)


Electrostatic


Wire Cutting pliers


Wire Stripping pliers


Hydraulic tongs


Heat air gun


EVO Pressing pliers
(4 ~ 6mm²)


Terminal wrench


Multimeter
(≥ 1500 Vdc)


Vacuum cleaner


Scissor


Hexagon
(T30)


Drill (φ12)

3.4.2 mobile inverter

Before installation, remove the inverter from the packing box and transport it to the selected installation site. To move the inverter, follow the following instructions:

- The LSBH225KTL3HV-OC1 is about 107kg.
- Move the inverter according to the requirements in the Quick Installation Instructions.
- At least four staff members will work together to move the inverter or use other suitable mobile tools.
- Prevent the inverter from bumping, dumping or falling off.

3.4.3 Install the inverter

The fixing plate and fastener expansion bolts in the accessory bag are used to mount the inverter vertically on the wall or metal
On scaffold olds, as shown in Figure 3-4.

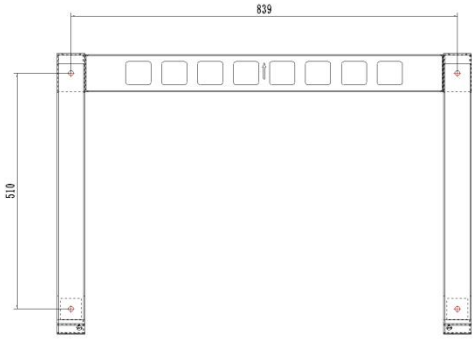
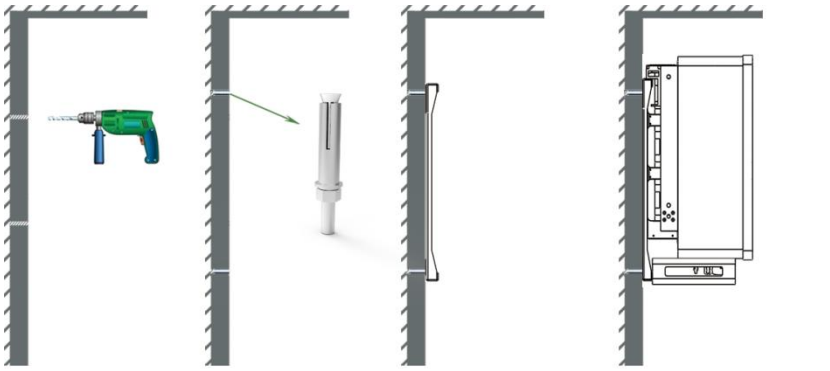


Figure 3-4 Dimensions of the fixed plate

- If installed on the concrete wall, mark the position of drilling on the wall according to the

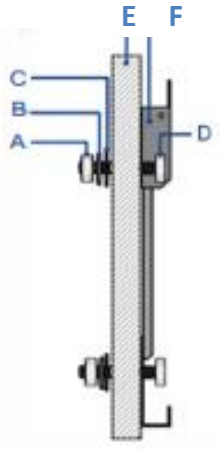
specifications of the fixed plate, and then drill in the marked position, fix the fixed plate on the wall with expansion bolts, and hang the chassis on the fixed plate.



graph 3-5

- If installed on the metal bracket, drill into the metal bracket according to the fixing plate specification, fix the fixing plate with M10 bolts, and hang the chassis on the fixing plate.

Install the backplane



Number	Name	Explain
A	hex nut	M10
B	Bullet gasket	Φ10
C	flat gasket	Φ10
D	screw bolt	M10
E	steel support	
F	dead plate	appendix

graph 3-6

- After hanging the inverter on the fixing plate, the screw needs to be used to fix the inverter on the hanging plate.

Note: During the installation of the inverter, please pay attention to maintain the balance to avoid the machine hitting the wall or other obstacles and damaging the machine shell.

3.5 Electrical connection

3.5.1 Safety instructions

As an electronics, touching any charged part can be deadly. The installation of the inverter must be completed by the professional electrical and mechanical engineers.

Warning

The inverter must be installed by qualified professionals.

- Incorrect wiring may result in operator casualties or permanent damage to the equipment.
- Before making the electrical connection, remember that the inverter has a dual power supply. Electrical personnel must be equipped with protective equipment, such as helmets, insulating shoes, protective gloves, etc.

matters need attention:

- During installation, except for the terminal, do not use other parts of the motive box;
- All electrical installations must comply with local regulations and electrical specifications;
- If the equipment needs maintenance, you must contact the local designated system installation and maintenance personnel;
- The use of this equipment for grid-connected power generation shall be allowed by the local power supply department;

Warning

Ensure that the input DC voltage does not exceed 1500V, higher input voltage may permanently damage the equipment and cause other losses, in this case, the company does not do warranty and assume responsibility.

3.5.2 Wiring requirements

After the inverter is firmly installed to the installation site, it can be connected to the photovoltaic system. Electrical connections shall conform to local regulations and relevant electrical specifications. The following are the wiring requirements of the inverter.

- **photovoltaic array**

The open-circuit voltage of the photovoltaic array should not exceed 1500V.

Caution

Recommended maximum PV array open circuit voltage: 1 350V, maximum PV array power: reference technical parameters.

- **Three-phase grid:**

The inverter will constantly detect whether the power grid meets the grid-connected conditions. The following are the power grid restrictions that meet the grid-connected conditions. At the same time, the grid-connected photovoltaic inverter should be allowed before the installation.

Caution

LSBH225-230KTL3HV-OC1: Grid line voltage: 640VAC-920VAC, power grid frequency: 45-55 Hz / 55-65Hz.

- **cable conductor:**

The AC and DC lines shall meet the local safety standards, and the line diameter shall ensure the most basic overflow capacity.

Table 3-4 Suggestions for cable line specifications

Component	Type	Cable size（mm^2）	Cable outer diameter (mm)	Torque force
DC cable	Meet the 1,500 V standard of photovoltaic cable	4-6	4.7-6.4	NA
Tracking system terminal	Outdoor two core copper	4-6	8-18	
Ground terminal	Outdoor single core copper	Sp ≥ S/2	/	10~12N·m
Power grid terminal	Outdoor four-core copper wire / aluminum	copper core: S：70-185 Sp ≥ S/2 Aluminum core wire: S：150-400 Sp ≥ S/2	Four-core wire: 40-75	10~20 N·m
	Outdoor three-core copper wire / aluminum Outdoor single-core PE line		Three-core wire: 40-75 PE line: 15-32	
The RS485 terminal	Shield twisted pair cable	0.3-1.3²	4-11	0.6 N·m
COM terminal	data acquisition unit	NA		NA

Caution

1) The value of Sp is only applicable to the grounding cable with the same material as the AC cable conductor. If the material is different, ensure that the equivalent conductivity of the grounding cable is consistent with the requirements in the table.

2) When using aluminum wire, it is necessary to use copper and aluminum transition terminal to avoid direct contact between copper row and aluminum wire.

Caution

Please ensure that the selected terminal can have direct contact with the copper bar. If in doubt, please contact the terminal manufacturer.

Ensure that copper strip and aluminum wire are not in direct contact or it will cause chemical corrosion and affect the reliability of electrical connection.

- **circuit breaker:**

In order to ensure the safe installation and operation of the equipment, it is necessary to be equipped with manual circuit breakers, which should meet the local safety regulations and meet the basic over-current and overvoltage protection capacity. The rated voltage and current range of the AC circuit breaker shall be greater than 800V and 200A.

Caution

The following two prohibitions should be noted:

- Multiple inverters cannot share one circuit breaker
- The load is not accessible between the inverter and the circuit breaker

- **Leakage protector:**

The inverter is equipped with an integrated integrated leakage current monitoring unit, and the inverter can distinguish the fault current from the capacitor leakage current. When the inverter detects a leakage current greater than the allowable value, it will quickly disconnected from the grid.

3.5.3 inverter wiring

- **Leakage protector:**

The AC terminal is in the left half of the inverter, and the AC connection mode is three-phase four-wire power grid connection L1, L2, L3 and PE.

Caution

- If the PID lifting function is added to the AC side, then: the neutral point of the power grid on the inverter side cannot be grounded;
- The AC side cable should choose 1500V / 1080V specifications;
- Choose "3 + 1" scheme, "3" requires Uc not less than 640 Vac; "1" requires DC breakdown voltage Uag 1080 Vdc;
- If there is no PID lifting requirement on the AC side and no other special requirements, then: the grid neutral point ground or the AC output terminal "N" inside the machine is connected to the PE.

Terminal steps:

1) Disconnect the AC circuit breaker to ensure that the AC line connected to the terminal is not charged, and measure and confirm with a multimeter.

2) Peel the cable according to the following instructions, as shown in the figure below.

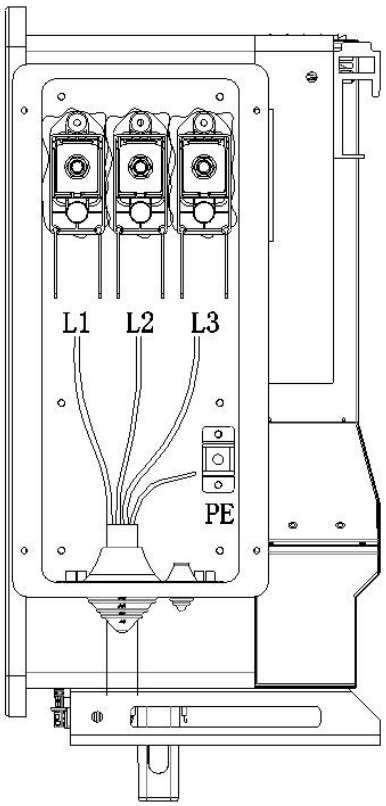


Figure 3-7 Schematic diagram of the AC stripping line

3) Peel the insulation of the cable through the cable crimping area of the OT terminal and press the terminal using the hydraulic crimping tool. The crimping part of the terminals must be insulated with heat shrink pipe or insulating tape.

Note: If aluminum cable is selected, copper and aluminum adapter terminal is required to avoid direct contact between copper row and aluminum cable (copper and aluminum adapter is configured according to the selection of cable).

4) Remove the four screws on the inverter junction box, then remove the junction box cover and pass the cable through the nut, sheath and AC terminal cover. Use a socket wrench to connect the cable to the AC junction box in turn. Tighten the screws on the junction box. Torque ranged from 10 to 20 N · m.

Warning

- The positions of L1, L2 and L3 of the AC side cable should not be wrong, and the wiring should be reliable.
- Avoid the cable insulation layer extrusion or force, and improper connection operation may cause damage to the inverter.

Caution

- Except for the AC side terminal, the other side terminals of the inverter are all straight-in.
- The best flexible cable is used for the AC side cable.

Tighten the tight nut of the AC cable fixing head at the bottom of the box.

- **DC line (LSBH225KTL3HV-OC1 as an example)**

➢ **Pv input configuration**

The inverter has twelve photovoltaic array input areas DC1-DC12, and the inverter is configured with an MPPT tracker for each input area.

Danger

Electric shock danger!

Pay attention to safety before the electrical connection, and the exposure of photovoltaic arrays to sunlight will produce dangerous voltages.

Warning

Before connecting the photovoltaic array to the inverter, ensure that the photovoltaic array is well insulated to the ground.

Caution

- The following two precautions must be met, otherwise the inverter damage caused will not be within the warranty scope.
- When designing the PV array, it is important to ensure that the serial voltage of each PV group cannot exceed 1500V even at the minimum temperature. Otherwise, the inverter will be damaged irrevocably.
- Ensure that the maximum short-circuit current on the DC side is within the allowable range of the inverter, otherwise it may cause irreversible damage to the inverter.

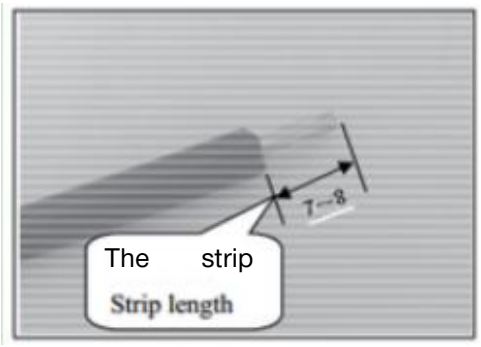
The 12-way photovoltaic input operates independently, and each has its own MPPT. Therefore, the photovoltaic input can be different, including: different panel types; different cell numbers; different inclination angles; different azimuth angles.

DC cable connection steps:

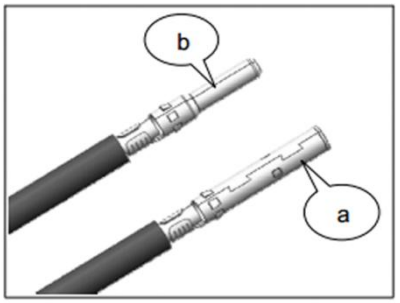
Danger

- There may be a high pressure in the inverter!
- Ensure that all cables are not charged prior to electrical operation!
- Do not switch the AC circuit breaker until the electrical connection of the inverter is completed!

Step 1 Remove 7mm insulation from all DC cables.

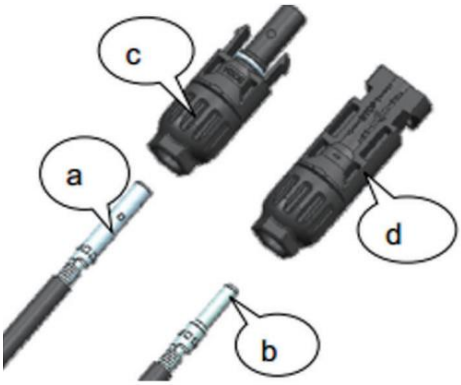


Step 2 Cluster the cable terminal with the cable clamp.



a. 金属插孔 Male terminal　　b.金属插针 Female terminal

Step 3 Pass the cable through the cable envelope.
Step 4 insert the terminal into the insulation sleeve until it is fastened and gently pull the cable to ensure that it is firmly connected.
Step 5 tighten the seal and insulating sleeve with a force of 2.5 ~ 3 N·m.



A. Male terminal b. Female terminal

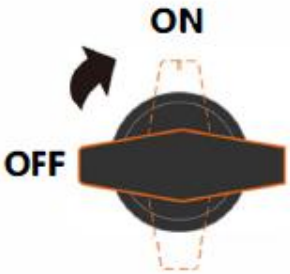
C. Male housing body d. Female housing body

Step 6: Check and verify that the polarity of the pv group string connection cable is correct.

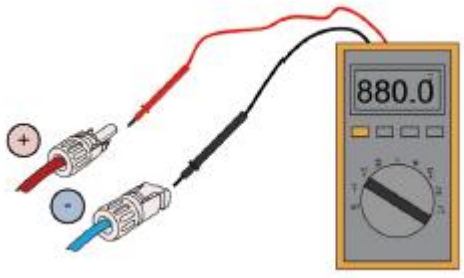
Caution

If the DC input polarity is reversed, the inverter will not operate normally.

Step 7. Disconnect the DC switch.



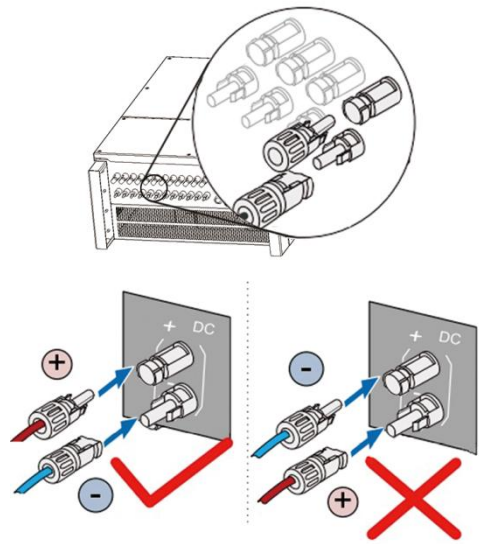
Step 8 Check the correct polarity of the connection cable and ensure that the open circuit voltage does not exceed the inverter input upper limit of 1500V, even at the minimum operating temperature.



pay

- Before connecting the DC terminal to the inverter, check the positive and negative polarity of the panel, and confirm that the terminal can be inserted into the input terminal corresponding to the bottom of the inverter.
- In the same road MPPT, no single string reverse, or permanent failure of the system or inverter.

Step 9 insert the positive and negative electrode connector into the input terminal at the bottom of the inverter and fasten it.



Step 10 connects the other pv group strings according to the above steps.
Step 11 Block the vacant DC terminal with a terminal cap.

- **grounding connection**

Warning

Because the inverter is transformer-less type, it is required that the positive and negative electrodes of the photovoltaic group string can not be connected Ground, otherwise it will cause the inverter can not operate normally.

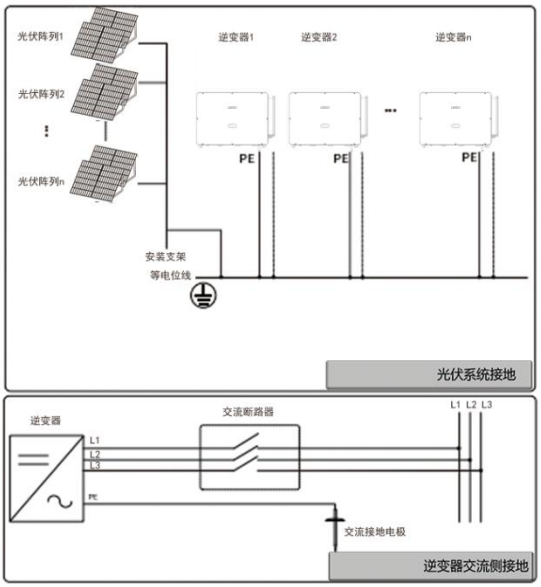
➢ **Overview of grounding system**

In this photovoltaic power generation system, all the shells of the non-current-carrying metal parts and equipment shall be grounded (such as the photovoltaic module bracket, the inverter shell, etc.).

1. The single inverter system needs to ground the "PE" cable.

2. Multiple inverter systems support multi-point grounding, but it is necessary to ground the PE cables of multiple inverters and the metal frame of the photovoltaic array

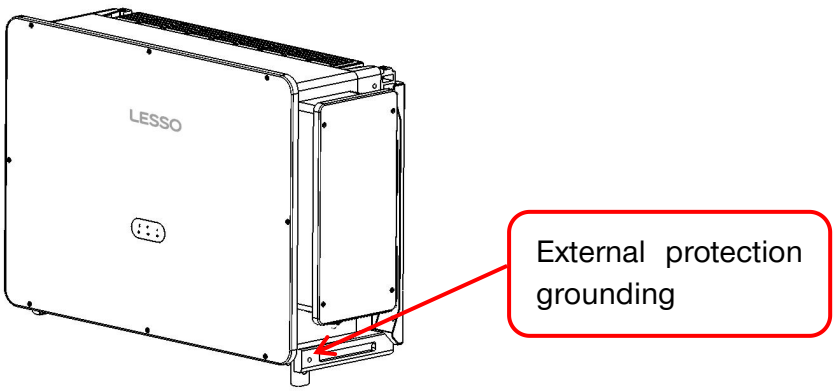
Point, connected to the equiline to achieve equipotential connection.



Ground diagram

➢ **Secondary protection grounding**

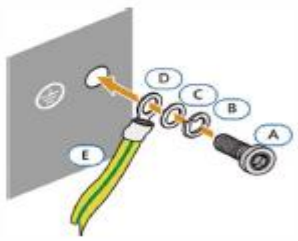
There is a secondary protection grounding terminal at the bottom of the inverter, which must be grounded.



Warning

- The grounding connection of the secondary protection grounding terminal cannot replace the connection of the PE terminal in the AC cable, and both must be ensured to be reliably grounded, otherwise, the company will not bear any responsibility for the possible consequences.
- Because the inverter is transformer less type, it is required that the positive and negative electrode of the photovoltaic string can not be grounded, otherwise it will cause the inverter can not work normally.

➢ **Cable connection**



Secondary protection grounding connection
(* Connection parts are not included in the delivery scope)

Number	Name	Explain
A	nut bolt	M10 × 20
B	Tighten the pad	
C	pad	
D	Cold pressure terminal	
E	Yellow and green grounding line	

(* The cross-sectional area of the yellow and green lines must be the same as that of the PE cable in the AC cable)

4. Monitoring

4.1 Overview

The inverter has a variety of communication modes. When the user needs to monitor the operation information of the photovoltaic power generation system, we provide the communication system scheme as shown in Figure 4-1 and 4-2.

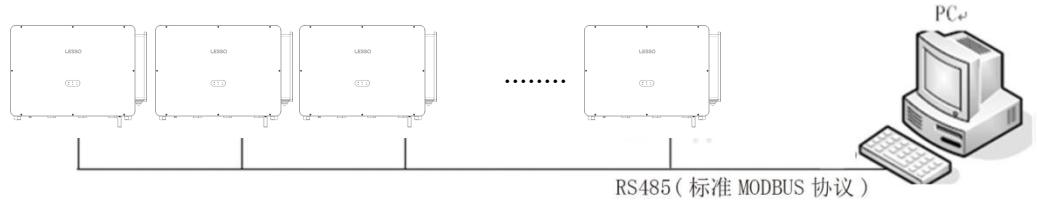


Figure 4-1 RS485 (Standard MODBUS Protocol) Communication system mode

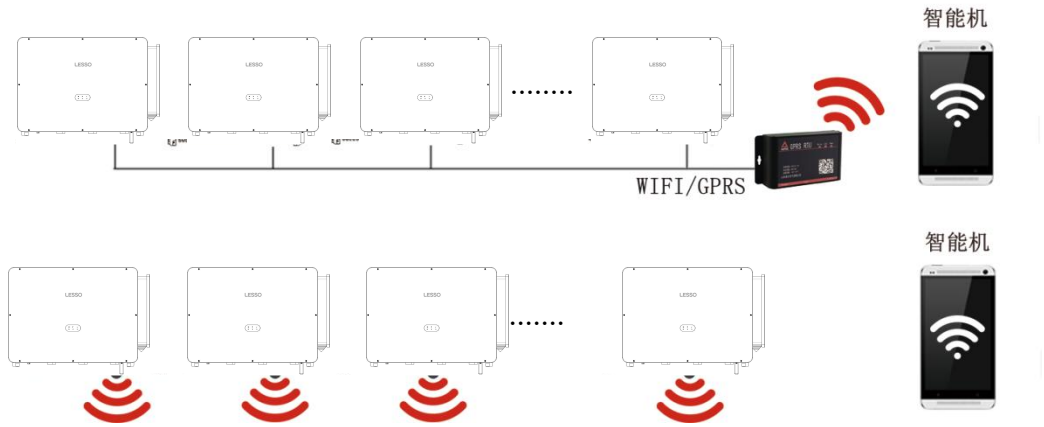
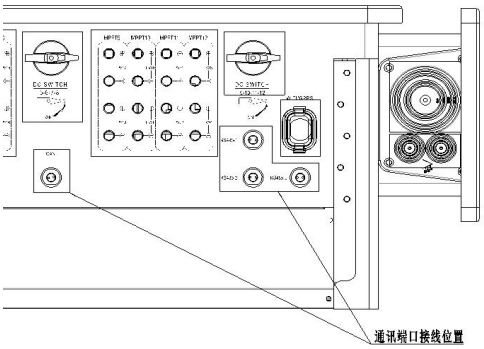
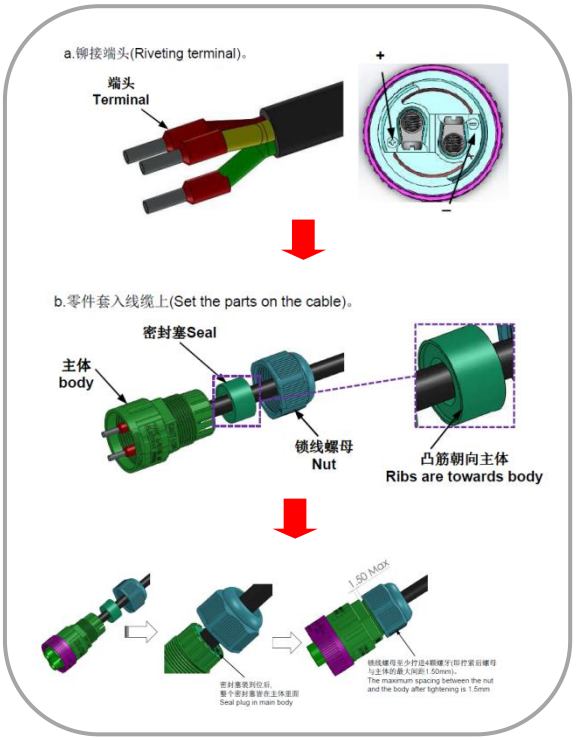


Figure 4-2 The WIFI / GPRS communication system mode

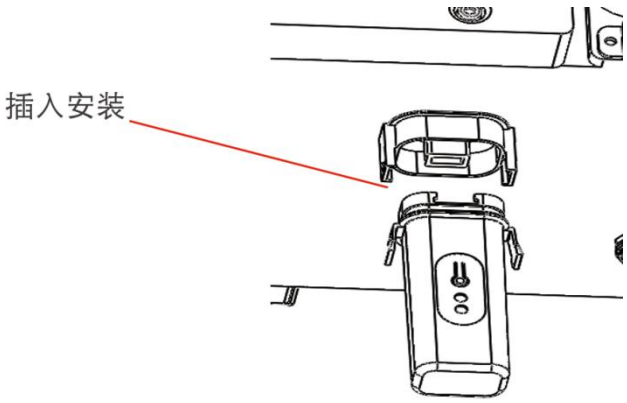
- **RS485 wire instructions**

RS485 Wiring





- **The WIFI / GPRS installation instructions**



5. Trial operation

Trial operation is an important step for the installation of photovoltaic system. Correct trial operation can prevent system fire, electric shock and other accidents.

5.1 Check before the trial run

The following inspection is required before the first header.
Environmental inspection
1). The inverter position is convenient for easy operation and maintenance.
2). Again, confirm that the inverter is firmly installed.
3). The ventilation condition is good.
4). No external objects or parts are left on top of the inverter.
5). Accessories around the inverter are properly connected.
6). The cables are reasonably distributed and are well protected from mechanical damage.
7). Reasonable type selection of the AC circuit breaker.
8). The vacant terminals are sealed off.
9). All safety labels and warning labels on the inverter are firmly and clearly visible.

5.2 Trial run steps

If all the above checks have passed, the inverter can perform the following first startup commissioning steps.
Step 1 Determine that the above inspection items meet the requirements.
Step 2. Close the AC-side circuit breaker.
Step 3 Turn the DC switch to the ON N position.
Assuming adequate light and grid conditions meet the conditions:
The PV array is initialized and starts providing power.
The inverter grid-connected inverter starts to charge its own DC bus.
If the conditions are met, the inverter will go into operation and feed the AC into the grid.
Step 4 Observe the status of the control panel

6. Disassemble

6.1 Stop running the inverter

Under normal circumstances, there is no need to artificially shut down the inverter, but for maintenance or repair work, it is necessary to shut down the inverter. In order to disconnect the inverter from the AC / DC power supply, need to follow the following steps, otherwise it may cause casualties or equipment damage.

Step 1. Disconnect the external AC circuit breaker and prevent reconnection due to misoperation.
Step 2. Rotate the DC switch to the OFF " position and unplug all DC group string inputs.
Step 3. Wait about 10 minutes until the internal capacitance discharge is completed.
Step 4. At the AC terminal, measure the AC ground voltage to confirm that the inverter AC output voltage at the AC circuit breaker is zero.
Step 5. Remove the DC connection cable.
Step 6. Remove the DC connection cable.

Caution

Please strictly follow the above steps, otherwise the inverter will not work properly.

6.2 Remove the inverter

The user may remove the inverter in opposite steps according to the aforementioned electrical installation and mechanical installation.

6.3 Waste the inverter

For the inverter that is no longer put into operation in the future, users need to properly discard it by themselves.(The light indicator panel, battery, module and other components included in the inverter may cause pollution to the environment, and users need to properly handle them according to the relevant regulations.）

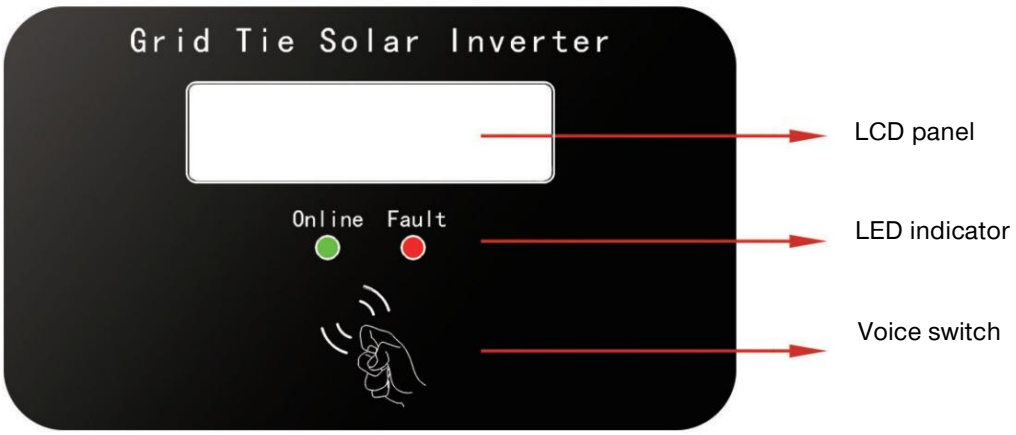
7. Operating

7.1 Working mode

The working mode of the inverter includes: startup mode, operation mode, and standby mode. In each working mode, the LCD displays the corresponding information.

7.1.1 Display panel

The panel of OC1 series grid-connected photovoltaic inverter contains LCD screen. In order to better human-computer interface interaction, two LED lights and one sound switch are set on the panel, as shown in Figure 7-1.



The LED display status and display meaning are shown in Table 7-1

LED lamp	Eeaning
Online	Grid-connected running lamp (normal operation, grid-connected power generation lamp is on)
Fault	Fault light (on when fault occurs and not removed)

Description of the voice-control switch:
When switching the LCD screen, just tap the picture logo on the panel. 

7.1.2 indicator light panel

In order to better operate the indicator panel of OC1 series grid-connected photovoltaic inverter, three LED lights are set on the panel, as shown in Figure 7-2.

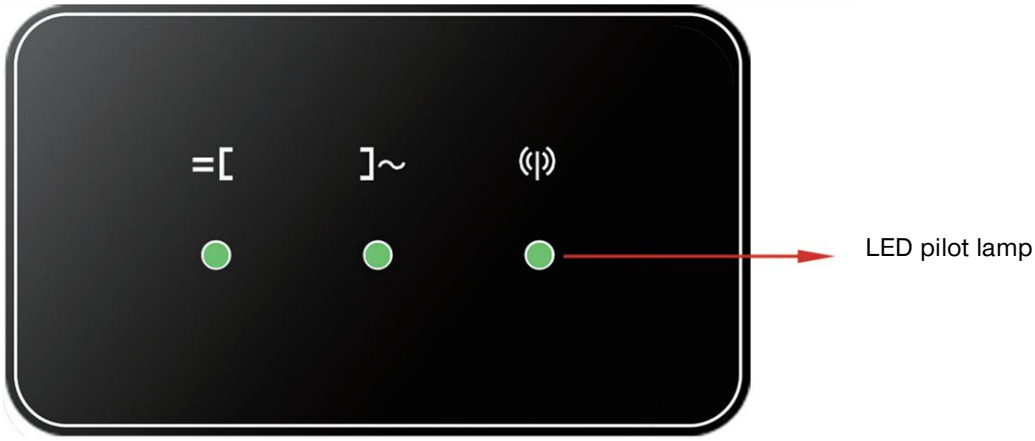


Figure 7-2 OC1 series of indicator light panels

- **LED display status**

Function	Status		Description
Running	=[	]~	
	■	■	Grid-connected and power generation
	■	□	DC is normal, AC is not powered on
	■	● ● ● ●	DC is normal, grid-connected standby
	● ● ● ●	● ● ● ●	Equipment failure
	□	□	DC is not powered on
Communication	((|))		
	● ● ● ●		The communication cable or communication module is connected, and there is data interaction on the communication channel
	□		The communication cable or communication module is not connected or there is no data interaction on the communication channel

Light ON ■ Light OFF □ light flashes ● ● ● ●

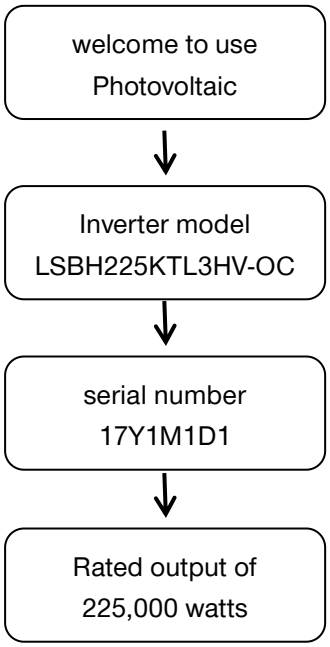
Caution

The data in the following tables and figures are only example data, and taking LSBH225KTL3HV-OC1 as an example, the actual display content and data may change to some extent.

7.2 Start-up mode

The starting mode means that the lighting conditions meet the DC starting conditions of the inverter, but there is no grid-connected power generation. In this mode, the inverter information is displayed successively. After the display, the inverter meets the grid connection conditions from the starting mode to the operation mode, otherwise it turns to the standby mode.
The screen display order of startup mode is shown in Figure 7-3 (LSBH225KTL3HV-OC1 for example).

Figure 7-3 starts the display page



Caution

After the array voltage is> 550V, the system will countdown for 20 seconds, and within 20 seconds, the array voltage will meet the requirements of grid-connected power generation, before it will be transferred to the operation mode.

- **running mode**

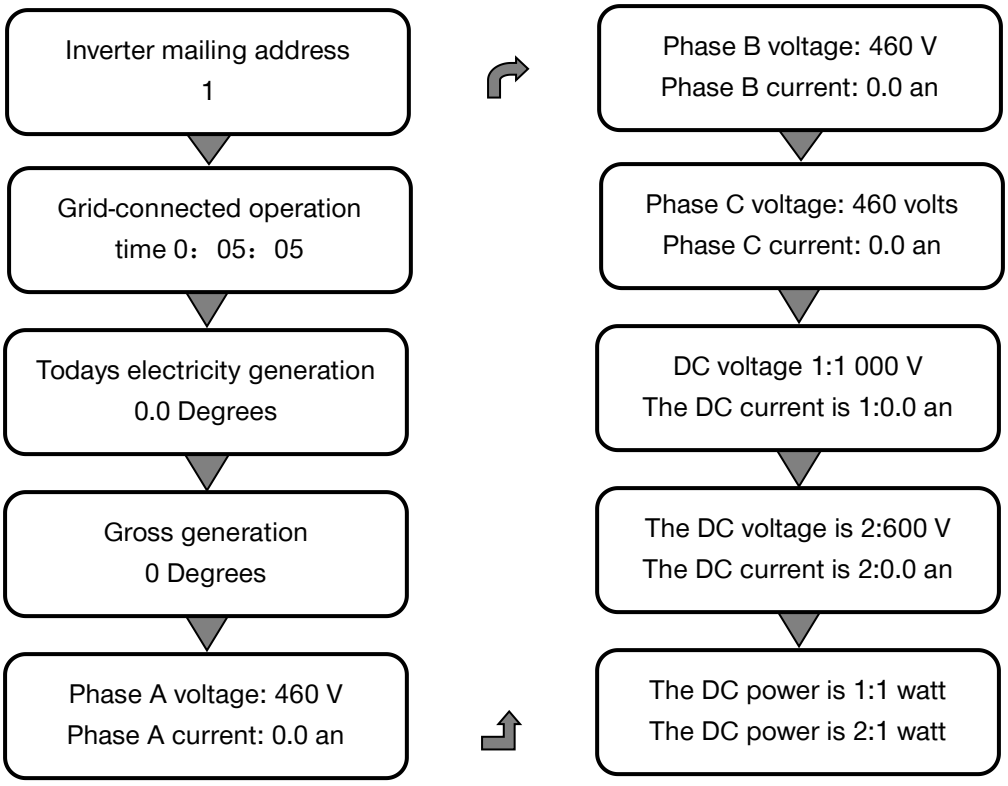
In this mode, the inverter converts the direct current of the photovoltaic array into alternating current into the grid, while the inverter always delivers the maximum energy by maximum power point tracking (MPPT).

In running mode, the LCD LCD display content is refreshed every two seconds, so the display content is only valid for the current 2 seconds. The display screen has the default display content. After 5 seconds into the normal operation state, the LCD displays the default interface, as shown in Figure 7-4.

Figure 7-4 Running mode shows the page by default

In running mode, the screen is shown in Table 7-5 and 7-6 (LSBH225KTL3HV-OC1 for example).

Figure 7-5 Normal operation mode display page



Note: Tap on the position of the voice control switch sign, the background display light of the LCD screen is on, and the switch interface is displayed. The display content of the switch is shown in Figure 7-5. If the LCD screen is no longer operated, the background light is off after 20 seconds, and the LCD screen will resume the default display interface.

Caution

The content of the above LCD display interface is switched by tapping the position of the voice switch logo.

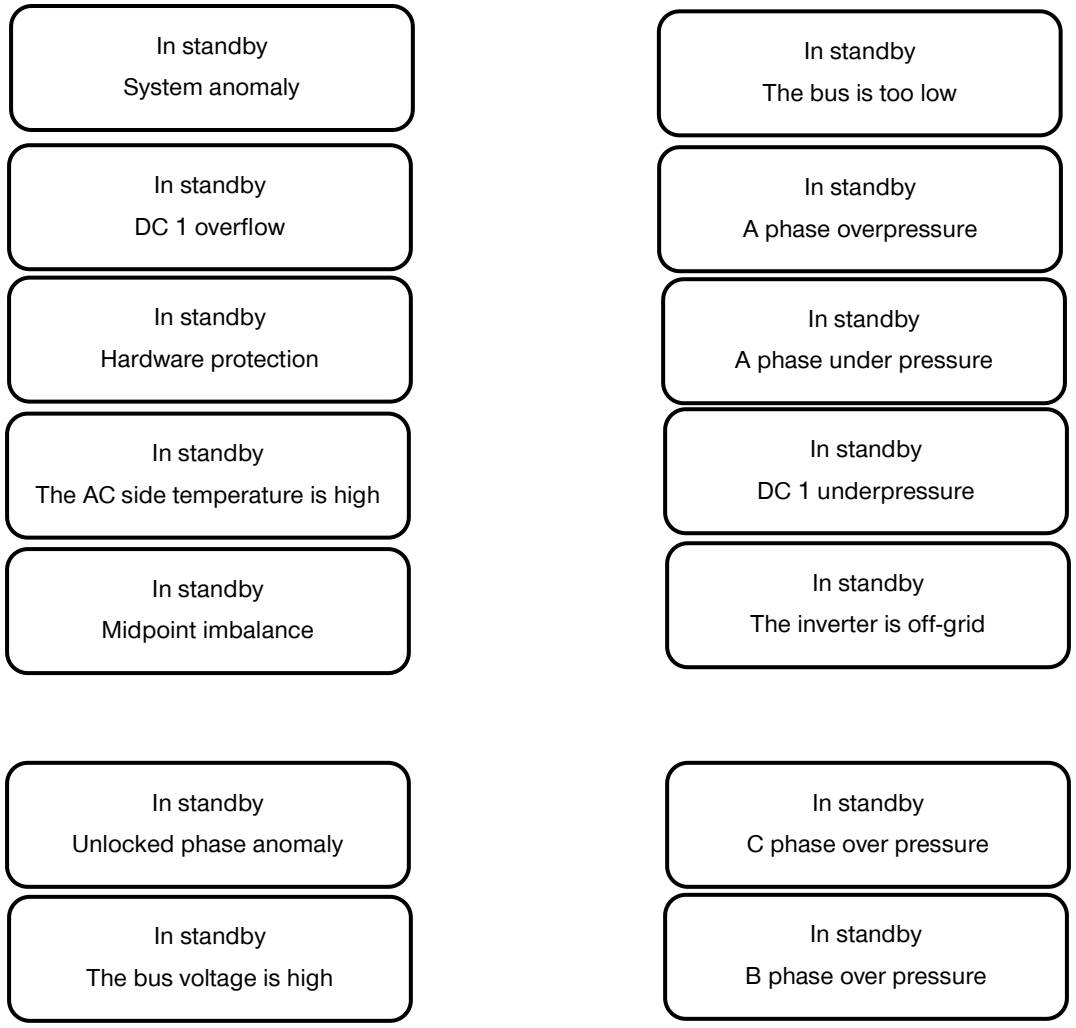
Caution

If the DC side is powered off, the power supply is a new day for the inverter, and the total energy generated on the day begins to be recalculated.

- **standby mode:**

DC start and not meeting the grid connection condition is standby mode.
In the standby mode, the inverter constantly detects whether it meets the grid-connected power generation conditions. After meeting the countdown of 20 seconds, the inverter changes from the standby mode to the operation mode.
The second row of the default display interface of the inverter in standby mode, as shown in Figure 7-6, is one or more of them; you can tap the front panel to switch to other display interfaces to view the detailed information.

Figure 7-6 The standby mode cycle displays the standby information page



Note: Tap on the position of the voice control switch sign, the background display light of the LCD screen is on, and the switching interface is also displayed. If the LCD screen is no longer operated, the background light is off after 20 seconds, and the LCD screen will resume the default display interface.

Caution

The content of the above LCD display interface is switched by tapping the position of the voice switch logo.

7.3 Grid-connected power generation process

The grid-connected power generation process of OC1 photovoltaic grid-connected inverter is automatic. The grid-connected process is briefly described (take LSBH225KTL3HV-OC1 as an example):

1. Close the DC and AC circuit breaker, the inverter into the start mode;
2. When the DC input side voltage is higher than 550V, the AC side voltage is 640 Vac-920 Vac, and the power grid frequency is normal, the countdown begins;
3. The DC side starts after 20 seconds of countdown;
4. After the DC bus voltage is stable, the inverter side begins to work and generates electricity connected to the grid.

7.4 Disconnect from the power grid

When the inverter is immediately disconnected from the grid:

- The power grid voltage is beyond the normal range of 640V-920V;
- The power grid frequency is beyond the normal range of 45-55Hz / 55-65Hz;
- The photovoltaic array voltage is outside the normal operating range of the inverter;
- The ambient temperature is outside the normal operating range of the inverter.

8. Maintenance

Danger

Do not disassemble the machine. The user trying to repair the machine by itself may cause electric shock and fire danger.

8.1 Maintenance

Due to the influence of ambient temperature, humidity, dust and vibration, the devices inside the inverter will age and wear, affecting the service life of the inverter. Therefore, the daily and regular maintenance should be implemented for the inverter to ensure its normal operation and service life.

- Always clean the radiator from dust and debris.
- When the photovoltaic array accumulates dust, clean the photovoltaic array with flowing water to ensure the cool weather when cleaning.
- Check the system regularly to ensure no errors in all wiring and supply conditions.
- Read the display content of the monitor frequently to understand the working state changes of the inverter.

Warning

Do not clean the inverter with a pressure washer or other methods that may cause water to enter the machine.

8.2 Trout troubleshooting

Warning ned personnel can carry out inverter troubleshooting work!

Most of the errors and faults will be displayed on the display screen of the inverter, and the table below provides solutions to several possible problems.

Table 8-1, exception type

Exception type	The exclusion method
LED indicator and LCD LCD screen is not bright	1. Disconnect the AC-side circuit breaker
	2. Disconnect the DC side circuit breaker
	3. Check the photovoltaic array input voltage (less than 550V) and the grid voltage
	4. If the above conditions are met, check the quality of the circuit breaker
The "online" indicator light extinct	1. Disconnect the AC-side circuit breaker
	2. Disconnect the DC side circuit breaker
	3. Check whether the parameters on the AC and DC side meet the startup requirements, such as each parameter Meet the requirements, check the wiring according to 4.4 Electrical connection
The DC voltage is abnormal (DC voltage> 1500V Or <5 00V abnormal)	1. Disconnect the AC-side circuit breaker
	2. Disconnect the DC side circuit breaker
	3. Check whether the voltage of each group of photovoltaic arrays is between 5 00V and 1500V
	When the DC voltage returns to the allowable range of the inverter, restart the inverter
The grid voltage is abnormal (Grid voltage> 920V Or <640 V abnormal)	1. Disconnect the AC-side circuit breaker
	2. Disconnect the DC side circuit breaker
	3. Check the voltage on the AC side
	4. If the grid voltage is not in the allowable voltage range of the inverter, please contact the local area Power companies adjust the grid voltage
The frequency of the grid is abnormal (The grid frequency is neither there 45-55Hz, and also not in the 55-65Hz）	1. Disconnect the AC-side circuit breaker
	2. Disconnect the DC side circuit breaker
	3. Check the frequency of the AC side
	4. If the current grid frequency is not in the allowable frequency range of the inverter, please contact Local power companies adjust the grid frequencies
The temperature is too	1. Disconnect the AC-side circuit breaker

high and abnormal (The inverter temperature is too high)	2. Disconnect the DC side circuit breaker
	3. Whether the external ambient temperature exceeds 60℃
	4. Please check whether the ventilation of the machine is normal, whether the mounting and installation is correct, and whether the air duct is smooth
	5. Whether the output power exceeds the rated value
Ground anomaly	1. Disconnect the AC-side circuit breaker
	2. Disconnect the DC side circuit breaker
	3. Check whether the ground resistance of each group of photovoltaic arrays is> 2 MΩ

If the exception still exists or your question is not mentioned in the table, please contact us.

8.3 Quality assurance

- **guarantee period:**

Shandong Aotai Electric Co., Ltd. (hereinafter referred to as the company) will be repaired or replaced free of charge for products faulty during the warranty period
new product.
evidence
During the warranty period, the customer to show the invoice and date of the purchase. At the same time, the trademark on the product should be clearly visible,
Otherwise, they shall have the right not to give any quality assurance.

- **condition:**

1. For products fail during the warranty period, Shandong Aotai Electric Co., Ltd. will repair or replace new products free of charge.
2. The unqualified products after replacement should be returned to Shandong Aotai Electric Co., Ltd.
3. The customer shall reserve a reasonable time for Shandong Aotai Electric Co., Ltd. to repair the faulty equipment.

- **The Company has the right not to conduct quality assurance in the following cases:**

1. Transport damage
2. Incorrect installation
3. Incorrect refit
4. Incorrect use
5. Operating beyond the very harsh environment described in this manual
6. Any scope beyond the installation and use specified in the relevant international standards
7. Damage caused by an abnormal natural environment

9. Appendix

Technical parameter	LSBH225KTL3HV-OC1	LSBH230KTL3HV-OC1
Import		
Maximum DC input power (KW)	337.5	
Maximum DC input voltage (VDC)	1500	
Maximum DC input current (A)	40A*12	
MPPT Voltage Range (VDC)	500~1500	
Recommended MPP Operating Voltage (VDC)	1080	
MPPT quantity	12	
Max. input string number per MPPT	2	
Output		
Rated output power (KW)	225	230
Maximum output power (KW)	247.5	253
Maximum output current (A)	178.7	182.6
Rated Grid Voltage (V)	800	
Power Grid Voltage Range (Vac)	640~920	
Rated power grid frequency	50Hz/60Hz	
Power grid frequency range	45～55Hz/55～65Hz	
THD	<2% (rated power rate)	
Power factor	> 0.99 (rated power) / adjustable range 0.8 (advance) ~0.8 (Lagging lag)	
DC component	<0.5% (rated power)	
System		
Max. Efficiency(%)	99.02%	
Euro. efficiency(%)	98.52%	
Humidity	0~100%, with no condensation	
Cooling	Intelligent speed conditioning air cooling	

Allowed ambient temperature range	- 40℃～+60℃
Consumption during night	<2W
Max. working altitude	5000m (> 4000m drop)
Display	LED / LCD (optional)
Communication interface	RS485 / WIFI / GPRS (Optional)
Machinery	
Dimensions (WxHxD)	1008mm×700mm×351mm
Weight	107kg
Protection class	IP66
Standard	
Grid-connected standards	NB/T32004-2018; IEC61727
Safety standards	NB/T32004-2018; IEC62109-1/2
electromagnetic compatibility	IEC61000-6-2/4