



### Safety Instruction

	<b>Risk of electric shock</b> The device contains high voltages, both alternating and direct, and high leakage currents may be generated during operation. To avoid risk of electric shock during maintenance or installation, make sure that all DC and AC connection terminals are disconnected. First connect the grounding wire to grounding and disconnect it for maintenance. Check proper phase and neutral connection. If the unit is used without following the specifications of the manufacture, the protection provided by the equipment may be impaired. Disconnect the inverter from the grid and from the photovoltaic generator before cleaning photovoltaic strings. An unexpected capacitive current from the surface of the strings may surprise operators and cause them to fall from the roof.
 	<b>Handling the PV inverter</b> The PV inverter must only be handled by qualified service personnel. When the photovoltaic generator is exposed to sufficient light intensity, it generates a DC voltage and, when connected to the device, it charges the bulk capacitor. After having disconnected the photovoltaic inverter from the grid and the photovoltaic generator, an electric charge may remain in the bulk capacitor. Please wait at least 10 minutes after disconnecting from the grid before handling.
	<b>Exclusively for the grid</b> The PV inverter is designed for the sole purpose of converting from PV strings and injecting it into the grid. This inverter is not designed to be powered by sources of primary energy other than PV strings or to be connected to different loads other than the public grid.
	<b>Hot surfaces</b> Although it has been designed in accordance with international safety standards, the photovoltaic inverter may become hot during operation.

### Symbol Conventions

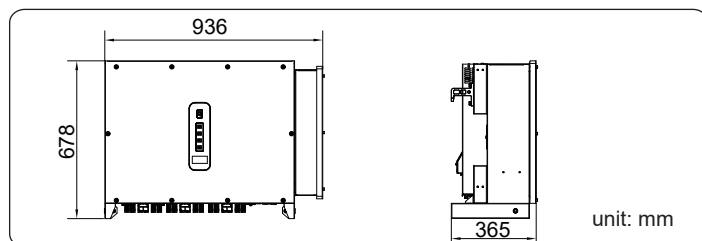
Read through the safety symbols used in this manual, which highlight potential safety risks and important safety information, before using the inverter.

	<b>DANGER</b> Indicates an imminently hazardous situation which, if not correctly followed, will result in serious injury or death.
	<b>WARNING</b> Indicates a potentially hazardous situation which, if not correctly followed, will result in serious injury or death.
	<b>CAUTION</b> Indicates a potentially hazardous situation which, if not correctly followed, could result in moderate or minor injury.
	<b>NOTICE</b> Indicates a potentially hazardous situation which, if not correctly followed, could result in equipment failure to run, or property damage.
	<b>NOTE</b> Call attention to important information, best practices and tips: Supplement additional safety instructions for your better use of the three phase PV inverter to reduce the waste of you resource.

### Guarantee

Guarantee conditions are available on the website: [www.riello-solartech.com](http://www.riello-solartech.com)

### Outline and Dimensions



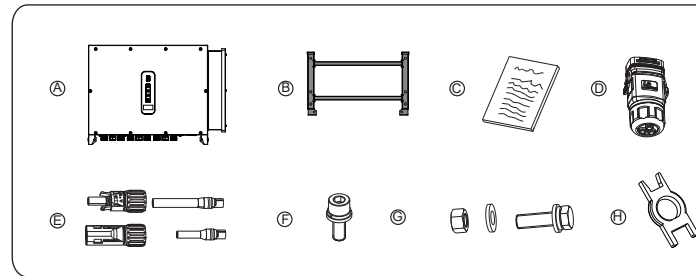
### Route connecting for PV strings installation

Route connecting for the installation of PV strings per inverter model is shown in below table:  
SIRIO-ES 100 totally 16 routes; SIRIO-ES 110 totally 18 routes.

Model	MPPT1	MPPT2	MPPT3	MPPT4	MPPT5	MPPT6	MPPT7	MPPT8	MPPT9
SIRIO-ES 100	2routes	2routes	2routes	2routes	2routes	2routes	2routes	2routes	
SIRIO-ES 110	2routes	2routes	2routes	2routes	2routes	2routes	2routes	2routes	2routes

### Installation

#### The deliverables in the fittings of inverter



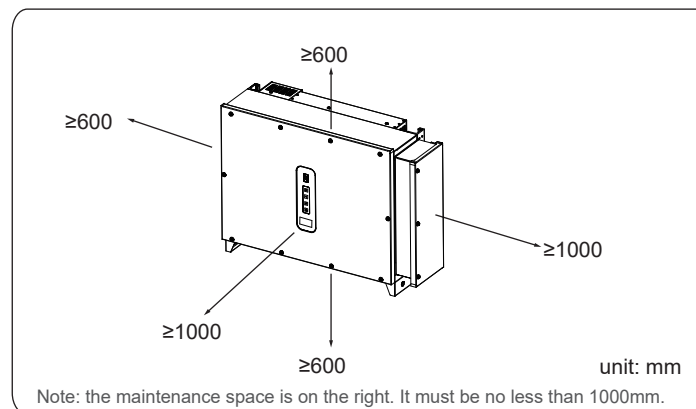
Items	Deliverables
A	The inverter
B	Mounting bracket
C	File package
D	RS485 terminal
E	PV terminal connector group
F	M8 screws
G	M12 Bolt group (including screw, nut) *4 (reserved for tightening the support and mounting bracket)
H	Removal tool for DC connectors

#### Determining the Installation Position

The inverter must be installed on the place where is free from direct exposure to sunlight, rain, and snow to extend its service life.

#### Installation Space Requirements

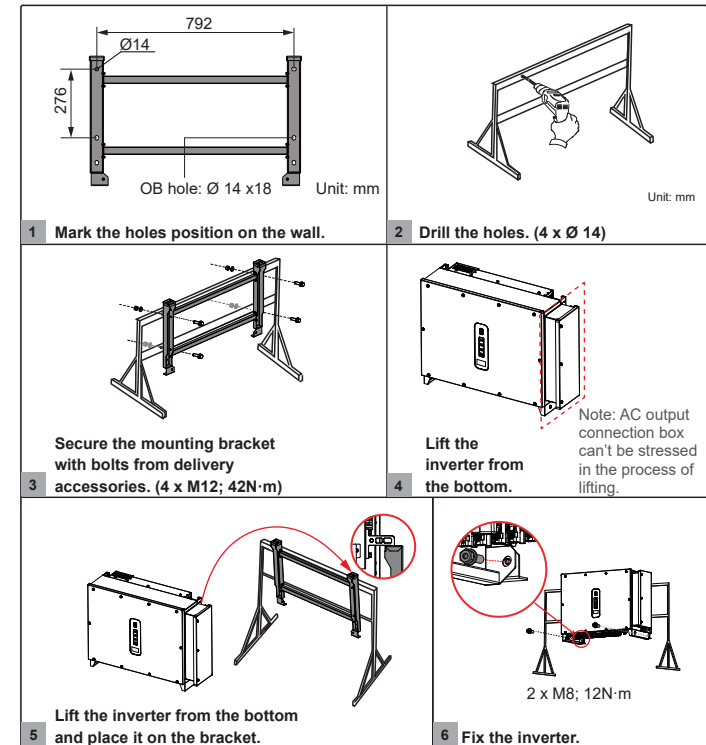
Reserve enough clearance around the inverter to ensure sufficient space for installation and heat dissipation, as shown in below image.



### Support-mounting the inverter

	<b>DANGER</b> 1. The walls must be fireproof and non-flammable materials, otherwise there is a fire risk. 2. Before drilling holes, check whether there are electric power pipes or other pipes buried in the walls to avoid risks.
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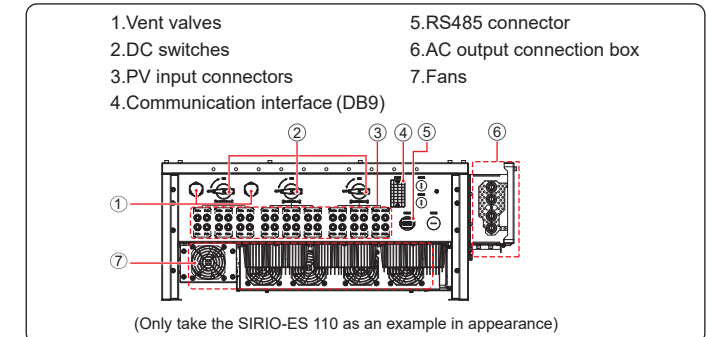
Inverter is installed on the wall or support by means of mounting bracket. The following steps are illustrated with only support-mounted installation. The load-bearing capacity of the wall must be greater than 10 KN/m<sup>2</sup>. M12 x 60mm stainless steel pressure-burst expansion bolts are recommended in wall-mounted installation.



#### Installation Self-check

1. Ensure that the inverter is well fixed.
2. Ensure that the inverter is locked on the support with an anti-theft lock installed.

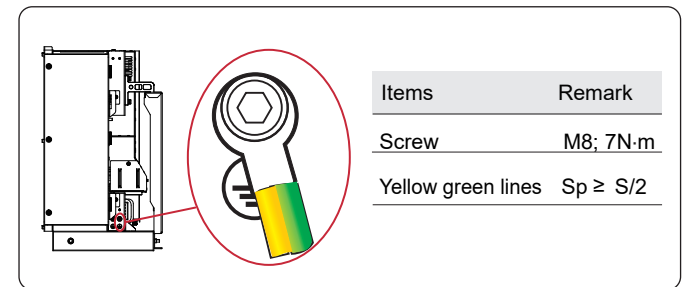
#### Preparation before wiring



#### Electrical Connections

	<b>DANGER</b> Before performing any electrical connections, ensure that both DC and AC switches are OFF. Otherwise, fatal injury can occur due to the high voltage generated from AC and DC cables.
	<b>CAUTION</b> Grounding the PV strings needs below prerequisites.
An isolation transformer must be installed on the AC side of each inverter. Ensure that the neutral wire of the isolation transformer must be disconnected from the PGND cable.	
One isolation transformer is with one PV inverter: do not install a single isolation transformer for multiple inverters. Otherwise, circulating current generated by the inverters will lead to operation failure.	

### Connecting External PGND Cables



#### NOTE

S: cross-sectional area of AC cable  
Sp: cross-sectional area of PE cable

The Sp value is valid only when the PE cable and the AC cable are of the same material.

	<b>NOTICE</b> Connecting External Protection Ground (PGND) Cables can not substitute the PE of connecting the AC power cables. Ensure that both connecting are grounding well. Otherwise, warranty will be void if damage is caused by electrical connection faults.
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#### AC circuit breaker

Connect the inverter with the power grid through installing one AC circuit breaker whose rated current is no less than 250A. Residual current protection function of square matrixes internally installed in the inverter and you can set leakage current protection value no less than the corresponding value in below table, if local utility department require leakage current protection function for AC circuit breaker. That set can save the inverter from its performance failure.

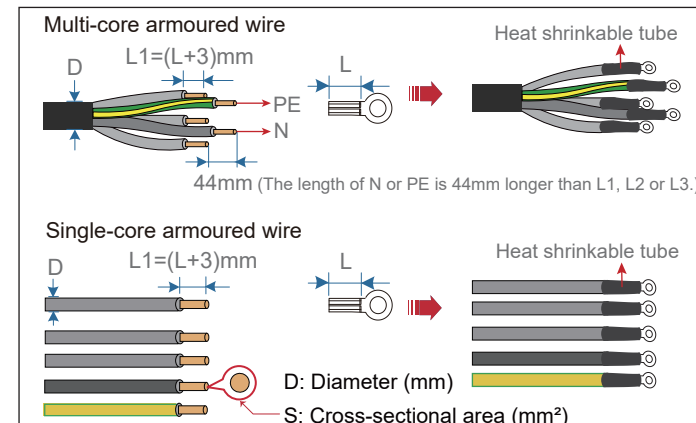
Inverter Model	Residual current
SIRIO-ES 100	≥1110mA
SIRIO-ES 110	≥1230mA

#### Connecting AC Output Cables

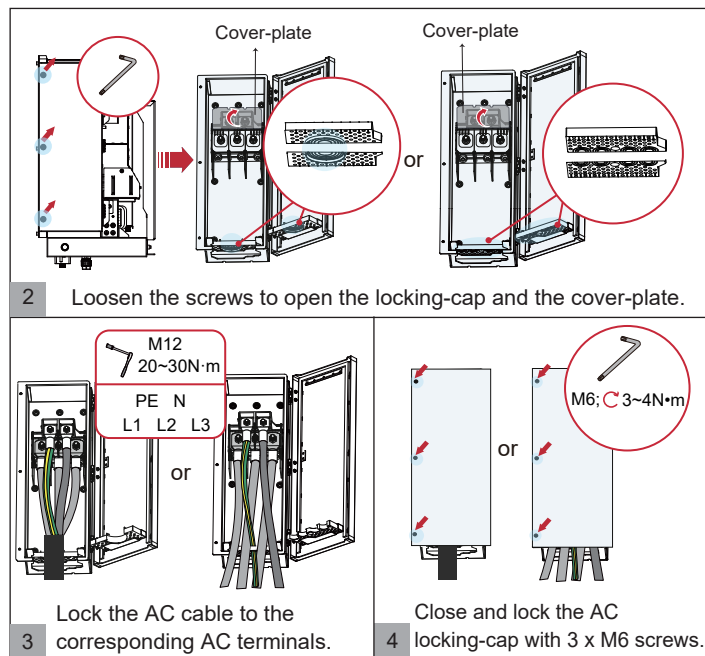
##### AC Cable Requirements:

Cable	Type	S (mm <sup>2</sup> )	D(mm)
AC cable (Multi-Core)	Outdoor triple-core cable(L1, L2, L3)	• Copper wire cable -S: 70mm <sup>2</sup> ~240mm <sup>2</sup> -Sp ≥ S/2	24mm~69mm
	Outdoor four-core cable(L1, L2, L3, PE) Outdoor five-core cable(L1, L2, L3, PE, N)	• Aluminum wire cable -S: 95mm <sup>2</sup> ~240mm <sup>2</sup> -Sp ≥ S/2	
AC cable (Single-Core)	Five single-core outdoor cables	• Copper wire cable -S: 70mm <sup>2</sup> ~240mm <sup>2</sup> -Sp ≥ S/2 • Aluminum wire cable -S: 95mm <sup>2</sup> ~240mm <sup>2</sup> -Sp ≥ S/2	14mm~32mm

	<b>NOTICE</b> For your operation and safety sake, please prepare multi-stranded wire, crimping terminals and a proper crimping tool before AC wiring.
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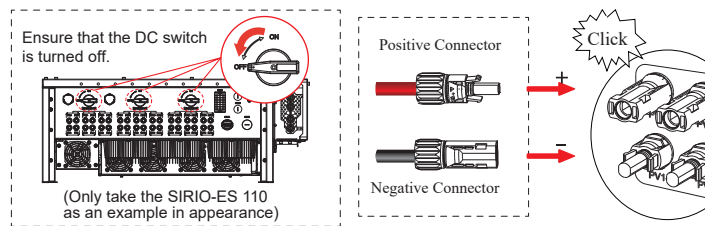
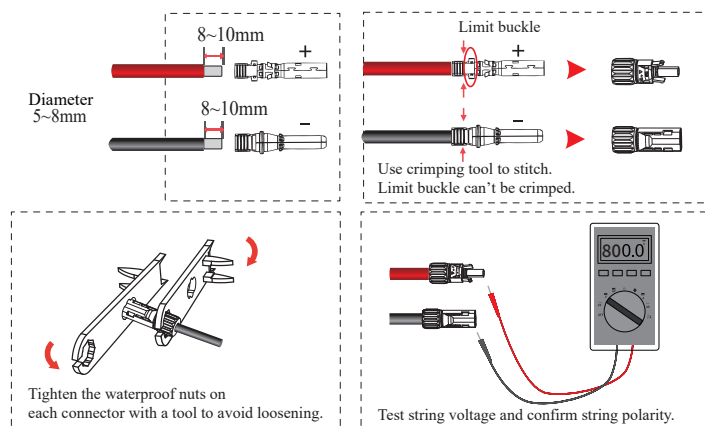
#### 1 Wires making.



### Connecting the PV Strings

**DANGER**

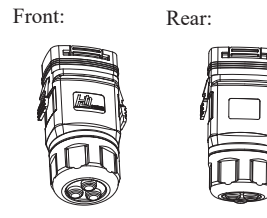
- Photovoltaic arrays exposed to sunlight will generate dangerous voltages!
- Before connecting the DC terminal, ensure that both the AC terminal and the DC terminal are powered off and the DC switch is OFF. Otherwise there is a risk of high voltage shock.
- Please check polarity of PV connectors! If polarity reversed, do not try to disconnect any PV connector until the irradiance declines and the DC currents fall below 0.5 A! Only then disconnect the PV plugs and correct the polarity before reconnecting.



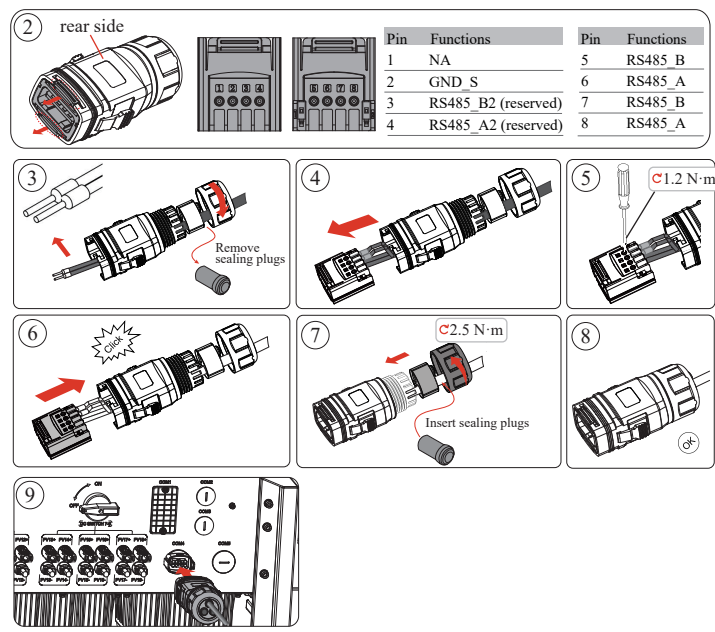
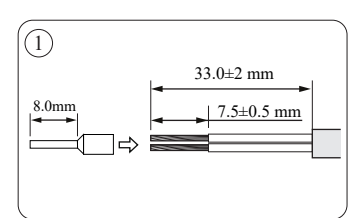
**WARNING** When taking out PV connectors, please ensure that PV strings are disconnected. Otherwise, a fire can occur.

### Connecting RS485 Communications Cables

#### RS485 Terminal Overview

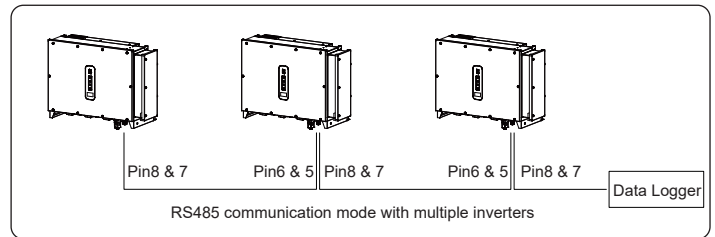


#### RS485 Terminal Installation



### RS485 communication mode with multiple inverters

Connect the differential positive and negative signal wires of the first RS485 cable from the data logger to Pin8 and Pin7 of the 8-Pin terminal respectively. If there is more than one inverter, connect Pin6 and Pin5 to Pin8 and Pin7 of another inverter.



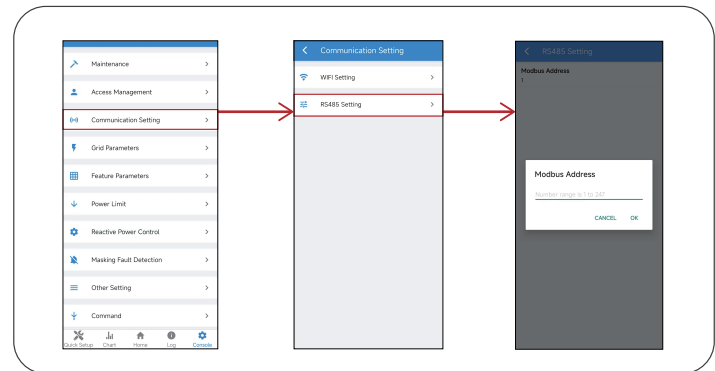
### Modbus Address setting

**Step 1** Scan QR code to download the APP. You need to grant all access rights in all pop-up windows when installing the APP or setting your phone.

**Step 2** Open the Bluetooth on your phone, enter the APP and connect the inverter.

**Step 3** Go to Console > Communication Setting > RS485 Setting page. In this page, you can set or change the Modbus address if necessary.

The default Modbus address is 1. Modbus address can not be identical when one RS485 is wired with multiple inverters.



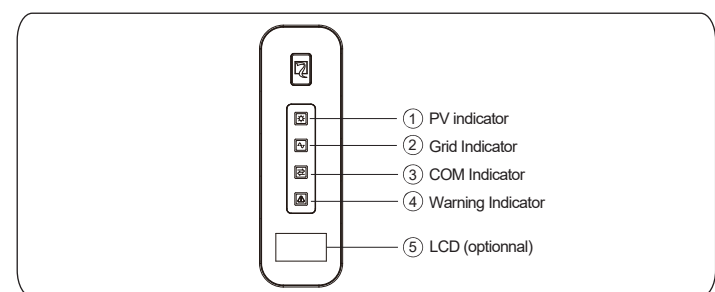
### System Operation

Switch ON the AC circuit breaker and set the DC SWITCH of the inverter to ON. Observe statuses of grid-connecting light on the inverter for a while. If the lights display that the inverter has entered grid-connecting, it means the inverter is operating well. Any query during operating the PV inverter, call your dealer.

To power off the Inverter, switch off the circuit breaker at AC terminal, and set the DC SWITCH to OFF.

**WARNING** After the inverter is powered off, the remaining electricity and heat may still cause electric shock and body burns. If need to disconnect the inverter cables, please wait at least 10 minutes before touching these parts of inverter.

### Interface



### LED Indicator

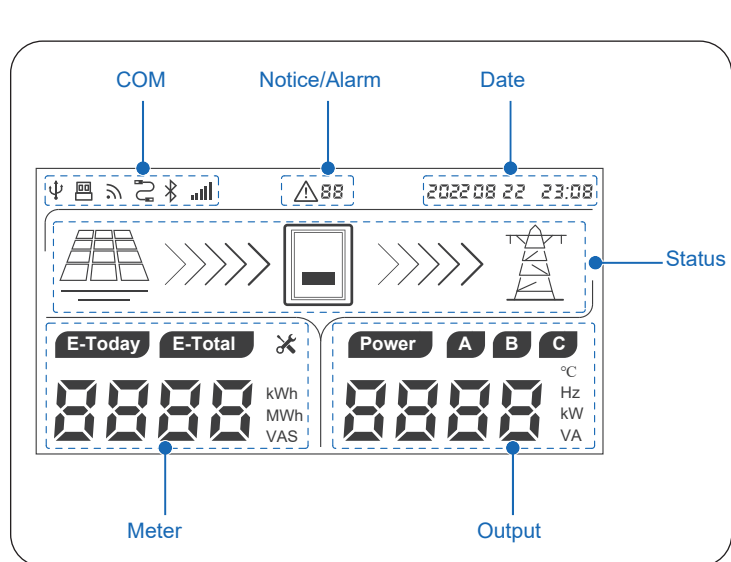
LED Indicator	Status	Descriptions
PV Indicator	on	Voltage of PV strings meets the requirements for inverter grid-connecting to generate power.
	blink	Voltage of PV strings can not meet the requirements for inverter grid-connecting to generate power.
Grid Indicator	blink	Grid abnormal, can not meet the requirements for inverter grid-connecting to generate power.
	off	The inverter is connecting to the grid.
COM Indicator	on	The inverter has connected to the grid. The inverter is generating power.
	blink	Communications data transmission is underway.
Warning Indicator	off	No external communications are connected or no communications data transmission.
	on/blink	Refer LED status in warning table.
	off	No warning.

### LED status and Warning code

	Warning code	PV Indicator	Grid Indicator	COM Indicator	Warning Indicator
Normal status		●	●/★	○	○
Starting up		●	○	○	○
WLAN/WIFI/RS485 communication		○	○	★	○
PV normal		●	○	○	○
Grid over voltage	A0				
Grid under voltage	A1				
Grid absent	A2				
Grid over frequency	A3	○	★	○	○
Grid under frequency	A4				
Grid unbalance	A6				
Grid high average voltage	A7				
PV over voltage	B0	★	○	○	○
PV under voltage	B4	★	○	○	○
Weak radiation	B5				
Grid N abnormal	A8				
Strings abnormal	B3	○	○	○	★
Inverter over temperature	C5				
Fan abnormal	C8				
Insulation resistance abnormal	B1	●	○	○	●
Leakage current abnormal	B2	○	●	○	●
Strings reverse	B7	○	○	●	●
Control power abnormal	C0	○	★	○	●
DC bias current abnormal	C2	★	●	★	●
Inverter relay abnormal	C3	○	●	●	●
Leakage current HCT abnormal	C6	●	●	○	●
System fault	C7	★	★	★	●
DC link voltage unbalance	C9	●	○	●	●
DC link over voltage	CA	○	●	★	●
Internal communications fault	CB	○	○	★	●
Software version incompatibility	CC	★	●	○	●
EEPROM fault	CD	★	○	●	●
Sampling inconsistency	CE	★	●	●	●
Inverter circuit abnormal	CF	●	●	●	●
Boost circuit abnormal	CG	★	○	○	●
Remote off	CN	●	○	○	○

Note: ● light on ○ light off ★ light blink ○ keep original status

### LCD Screen



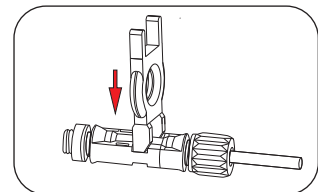
### Maintenance

Check periodically heat sink and the inlet/outlet of external FAN, clean them, and ensure that they are free dust and blockage. If any abnormal with the FAN, please replace it.

### Inverter Uninstall

Inverter uninstal requires below procedures:

**Step 1** Disconnect all electric connections including these of communications cables, DC input cables, AC output cables and the PGND cables.



When uninstalling DC input connectors, insert removal wrench into the bayonet shown in the Figure, press the wrench down, and take out the connector.

**Step 2** Remove the inverter from its rear panel.  
**Step 3** Remove the rear panel.

**WARNING** Before uninstalling DC input connector, please ensure that the DC SWITCH is set to OFF to avert equipment damage or personal injury.

### The Inverter Troubleshooting

If any abnormal phenomena occur, refer to below table for trouble shooting. If failed, call your dealer for help.

Issue	Solution
No display	1. Check whether DC switch of inverter is on or off. 2. If there is PV combiner box, check if terminals and wires are securely connected.
No generation	1. Check whether AC breaker is on or off. 2. Wait for stronger sunshine 3. Check if the number of PV panels meets requirements. 4. To operate according to inverter's manual
Inverter abnormal	1. Disconnect both AC and DC breakers. 2. Wait at least 10 minutes and then turn on AC and DC breakers. 3. Check whether the inverter runs normally or not.
Power generation is less than expected	1. Ensure that inverter is free from direct sunlight exposure and in good ventilation. 2. Check if the inverter is free from dust blockage, and fans run normally. 3. Ensure that there is enough installation distance between inverters.