User Manual

U SERIES

In order to prevent improper operation before use, please read this manual carefully.

Table of Contents

1. Notes on This Manual

1.1 Scope of Validity

This manual describes assembly, installation, commissioning, maintenance and troubleshooting of the following model(s) of Fox ESS products:

U30, U33, U36, U40

Note: Store this manual where it will be accessible at all times.

1.2 Target Group

This manual is for qualified electricians. The tasks described in this manual can be performed by qualified individuals only.

1.3 Symbols Used

The following types of safety instructions and general information appear in this document as described below:

⚠ DANGER
Danger! “Danger” indicates a hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING
Warning! “Warning” indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION
Caution! “Caution” indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTE
Note! “Note” provides important tips and guidance.

This section explains the symbols shown on the inverter and on the type label:

Symbols	Explanation
	Beware of hot surface. The inverter can become hot during operation. Avoid contact during operation.
	Danger of high voltages. Danger to life due to high voltages in the inverter!
	Danger. Risk of electric shock!

	Danger to life due to high voltage. There is residual voltage in the inverter which needs 5 min to discharge. Wait 5 min before you open the upper lid.
	Read the manual.
	Product should not be disposed as household waste.
	PE protective earth terminal.

2. Safety

2.1 Appropriate Usage

This series inverter is designed and tested in accordance with international safety requirements. However, certain safety precautions must be taken into account when installing and operating this inverter. The installer must read and follow all instructions, cautions and warnings in this installation manual.

- All operations including transport, installation, start-up and maintenance, must be carried out by qualified, trained personnel.
- The electrical installation & maintenance of the inverter shall be conducted by a licensed electrician and shall comply with local wiring rules and regulations.
- Before installation, check the unit to ensure it is free of any transport or handling damage, which could affect insulation integrity or safety clearances. Choose the installation location carefully and adhere to specified cooling requirements. Unauthorized removal of necessary protections, improper use, incorrect installation and operation may lead to serious safety and shock hazards or equipment damage.
- Before connecting the inverter to the power distribution grid, contact the local power distribution grid company to get appropriate approvals. This connection must be made only by qualified technical personnel.
- Do not install the equipment in adverse environmental conditions such as in close proximity to flammable or explosive substances; in a corrosive environment; where there is exposure to extreme high or low temperatures; or where humidity is high.
- Do not use the equipment when the safety devices do not work or are disabled.
- Use personal protective equipment, including gloves and eye protection during the installation.
- Inform the manufacturer about non-standard installation conditions.
- Do not use the equipment if any operating anomalies are found. Avoid temporary repairs.
- All repairs should be carried out using only approved spare parts, which must be installed in accordance with their intended use and by a licensed contractor or authorized Fox ESS service representative.
- Liabilities arising from commercial components are delegated to their respective manufacturers.
- Any time the inverter has been disconnected from the public network, please be extremely cautious

as some components can retain charge sufficient to create a shock hazard. Prior to touching any part of the inverter please ensure surfaces and equipment are under touch safe temperatures and voltage potentials before proceeding.

2.2 PE Connection and Leakage Current

PV System Residual Current Factors

- With an integrated universal current-sensitive residual current monitoring unit included, the inverter will disconnect immediately from the mains power once a fault current with a value exceeding the limit is detected.
- However if an external residual current device (RCD) (type A is recommended) is mandatory,
- the switch must be triggered at the residual current. RCD of other specifications can also be used according to local standard. The recommended residual current is as follows.

Inverter	Recommended Residual Current
U30	300 mA
U33	330 mA
U36	360 mA
U40	400 mA

- Hint:Each 10 kW can cause 100mA of leakage.

⚠ WARNING

Warning!

High leakage current! The ground connection is essential before connecting the power supply.

- Incorrect grounding can cause personal injury, death or equipment failure and increase electromagnetic interference.
- Ensure that the size of the grounding conductor meets the requirements of the safety regulations.

3. Introduction

3.1 Basic Features

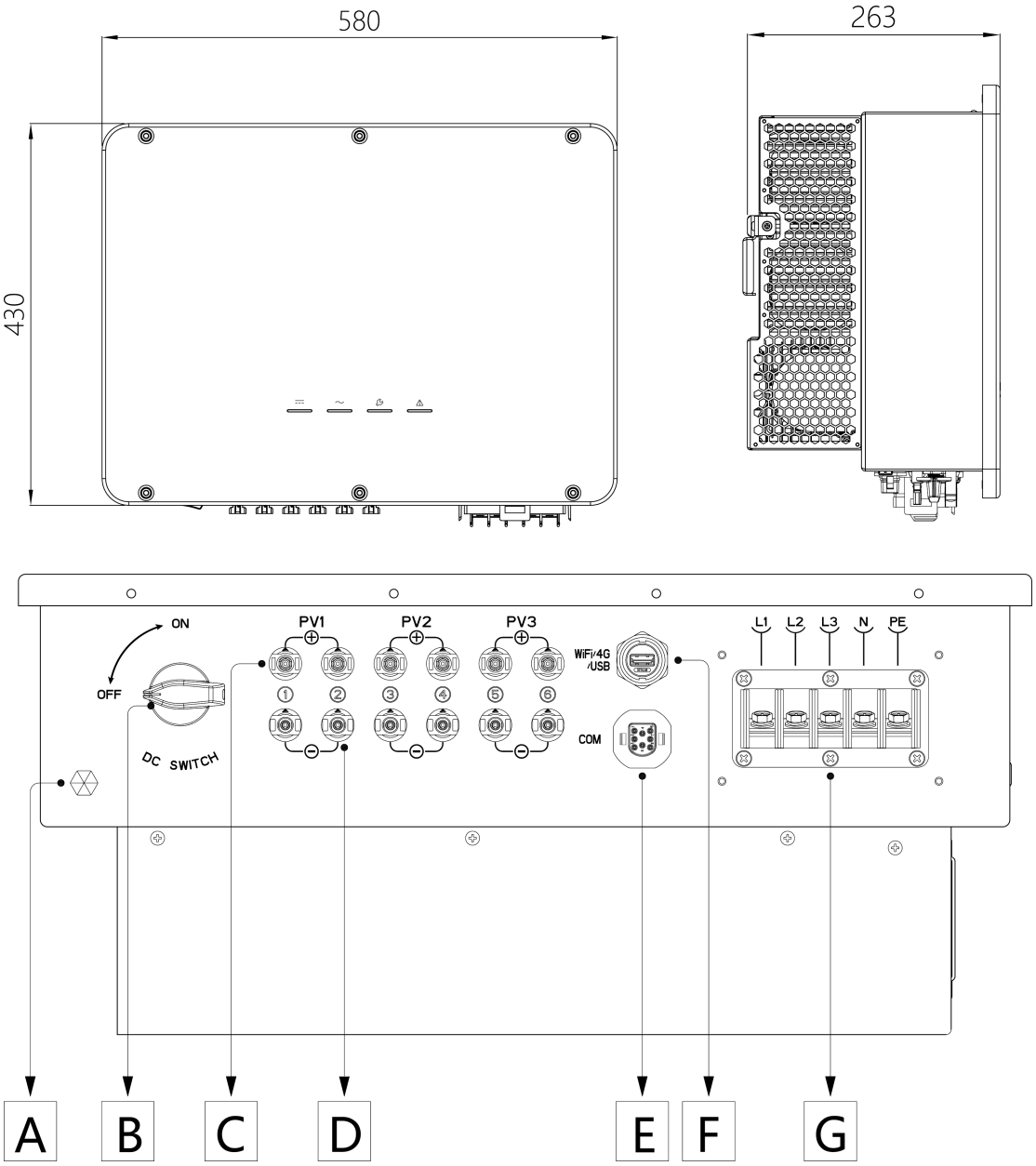
This three-phase high performance inverter covers 30kW to 40kW. The inverter is integrated with 3 MPP trackers with high efficiency and reliability.

System advantages:

- Advanced DSP control technology.
- Utilizes the latest high-efficiency power components.
- Optimal MPPT technology.
- Three independent MPP trackers.
- Wide MPPT voltage range.
- Advanced anti-islanding solutions.
- IP66 protection level.
- Max. Efficiency up to 98.3%.
- Safety & Reliability: Transformerless design with software and hardware protection.
- LED status indications.
- Remote monitoring via PC or APP.

- Upgrade through USB 2.0 interface.

3.2 Dimensions

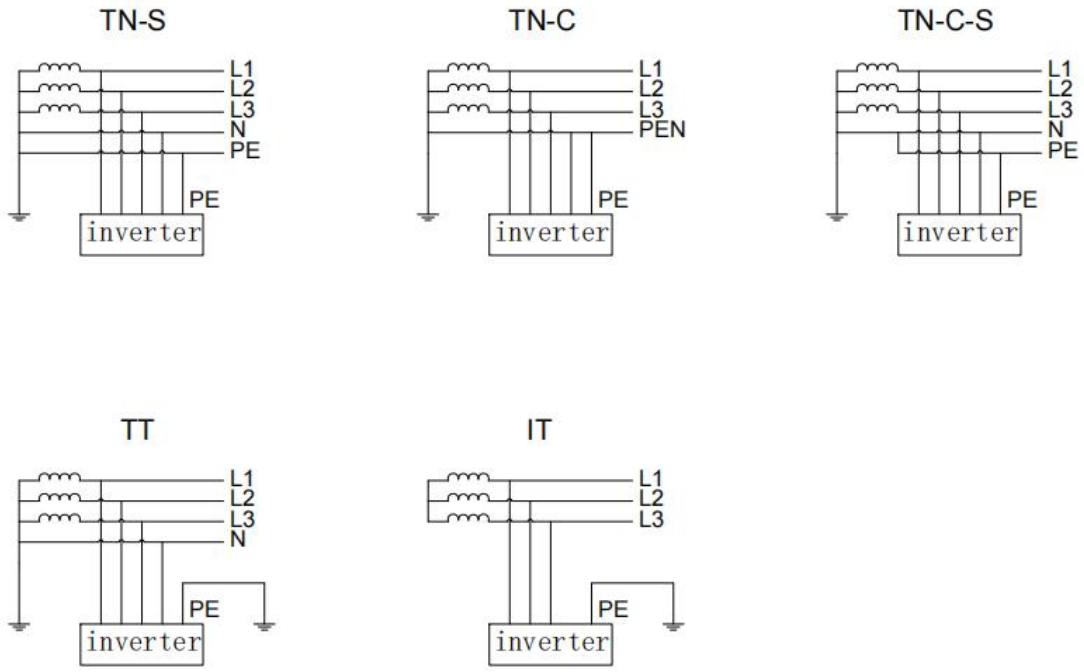


3.3 Terminals of Inverter

Item	Description
A	Waterproof Lock Valve
B	DC Switch
C	PV+
D	PV-
E	COM
F	WiFi /4G /USB
G	AC Connector

Note: Only authorized personnel are allowed to set up the connection.

3.4 Utility grid



The grid forms supported by the inverter are shown in the figure.

4. Technical Data

4.1 PV Input / AC Output

Model	U30	U33	U36	U40
	30000	**33000**	**36000**	**40000**
PV INPUT				
Max. input power (W)	45000	49500	54000	60000
Max. input voltage (V d.c.)	1100	1100	1100	1100
Nominal voltage (V d.c.)	600	600	600	600
Max. PV input currentt (A)	36/40/40	36/40/40	36/40/40	36/40/40
Max. Isc PV current (A)	46.8/52/52	46.8/52/52	46.8/52/52	46.8/52/52
MPP voltage range (V d.c.)	200-1000			
Start-up voltage (V d.c.)	200			
No. of MPP trackers	3	3	3	3
Strings per MPP tracker	2+2+2	2+2+2	2+2+2	2+2+2
Max.Inverter backfeed current to the array	0A			
AC OUTPUT				
Rated power (W)	30000	33000	36000	40000
Max. apparent power (VA)	34000	37000	40000	44000
Nominal voltage (V)	400V/230Vac; 380V/220Vac, 3L/N/PE			
Nominal frequency (Hz)	50/60			
Rated output current (A)	45.5	50.0	54.5	60.6
Max. output current (A)	51.5	56.0	60.6	66.7
Power factor	1 (Adjustable from 0.8 leading to 0.8 lagging)			
Max. output fault current	140Apeak 20μs			
Inrush current	27Apeak, 0.05ms			
Max. output overcurrent protection	80.4A			
THDI	<3%@rated power			

4.2 Efficiency, Safety and Protection

Model	U30	U33	U36	U40
EFFICIENCY				
Max. static MPPT efficiency	99.80%	99.80%	99.80%	99.80%
European efficiency	98.10%	98.10%	98.10%	98.10%
Max. conversion efficiency	98.30%	98.30%	98.30%	98.30%
PROTECTION				
PV Reverse Polarity Protection	Yes			
Anti-islanding Protection	Yes			
Insulation resistance detection	Yes			
Leakage Current Protection	Yes			
Output Short Protection	Yes			
Over-current protection	Yes			
AC Output over voltage protection	Yes			
DC/AC Surge Protection	Type Ⅱ (DC) and Type Ⅱ (AC)			
Over-temperature Protection	Yes			
DC switch	Yes			
PID	Optional			
AFCI Protection	Optional			
String Level Monitor	Optional			
STANDARD				
Safety	IEC62109-1/2			
EMC	IEC 61000-6-1 / IEC 61000-6-2 / IEC 61000-6-3 / IEC61000-4-2/3/4/5/6/8			
Certification	IEC62116 / IEC61727 / IEC61683			

4.3 General Data

Model	U30	U33	U36	U40
GENERAL DATA				
Demensions(WxHxD) [mm]	580*430*263			
Net weight (kg)	33			
Cooling concept	FAN			
Ingress Protection	IP66			
Inverter topology	Non-Isolated			
Overvoltage Category	III(AC),II(DC)			
Noise emission(typical)[dB] @1m	<55			
Max. Operating Altitude (m)	3000			
Operating temperature range (°C)	-25..... +60 (derating at +45)			
Storage temperature range (°C)	-40..... +70			
Humidity (%)	0-100			
Protective class	class I			
Self consumption(night) (W)	<1			
Pollution degree	III			
Monitoring module (optional)	WiFi (optional)/ 4G(optional)			
Communication Interface	RS485*2			
Display	LED, App,Web site			

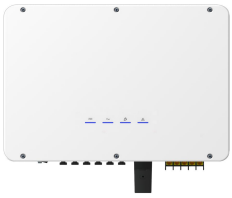
5. Installation

5.1 Visual inspection

Make sure the inverter has not been damaged during transportation. If there is any visible damage, such as cracks, please contact your dealer immediately.

5.2 Packing List

Open the package and take out the product, please check the accessories first. The packing list is as shown as below.



A

B

C

D

E

F

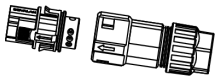
G

H

I

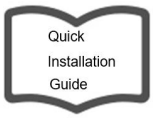
J

K



L

M



N

Object	Quantity	Description
A	1	Inverter
B	1	Bracket
C	12	PV terminal (positive shell*6, negative shell*6)
D	1	AC Terminal Waterproof Cover
E	8	Expansion tube*4, Expansion screw*4
F	12	PV terminal (positive core*6, negative core*6)
G	1	M40 Waterproof head

Object	Quantity	Description
H	1	Screw
I	1	PE screw
J	4	Waterproof cover screws (M4*15)
K	4	AC terminal insulation sheet
L	1	Communication connector
M	1	WiFi/4G (optional)
N	1	Quick installation guide

5.3 Mounting

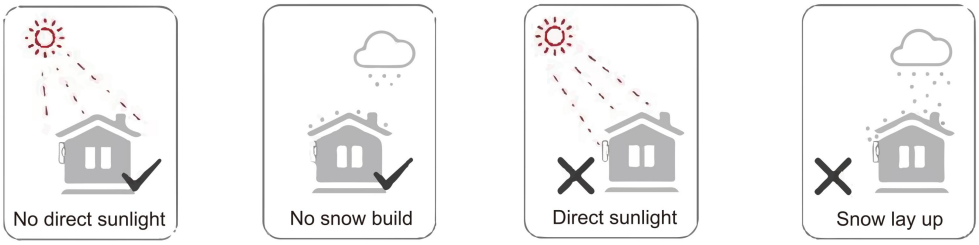
- Installation Precaution

Make sure the installation location complies with the following conditions:

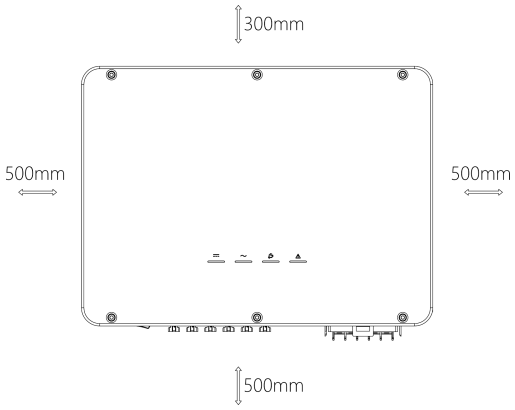
- Not in direct sunlight.
- Not in areas where highly flammable materials are stored.
- Not in potentially explosive areas.
- Not in a direct flow of cool air.
- Not near a television antenna or antenna cable.
- Not higher than altitude of 3000m above sea level.
- Not in environment of precipitation or humidity (> 95%).
- Is well ventilated.
- The ambient temperature is in the range of -25°C to +60°C.
- The slope of the wall should be within ±5°.
- The wall where the inverter is mounted should comply with the following conditions:

  1. Is solid brick/concrete or a mounting surface of equivalent strength;

  2. The Inverter must be supported or strengthened if the wall's strength isn't adequate (such as a stud wall or where the wall is covered by thick layer of decoration).
- Avoid direct sunlight or accumulations of snow during installation and operation.



- Space Requirement



Position	Min Size
Left	500mm
Right	500mm
Top	300mm
Bottom	500mm
Front	500mm

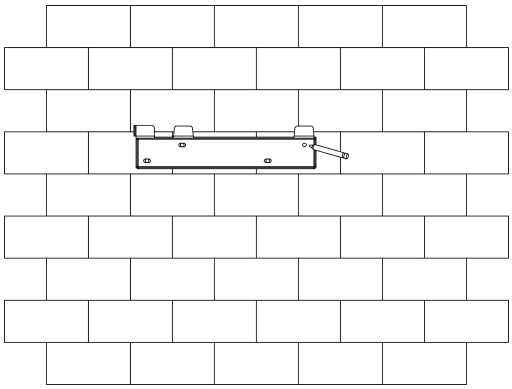
- Mounting Steps

Tools required for installation.

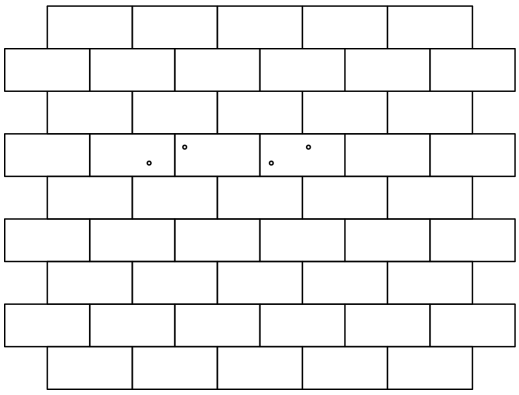
- Manual wrench;
- Electric drill (drill bit set 8mm);
- Crimping pliers;
- Stripping pliers;
- Screwdriver.

Step 1: Fix the bracket on the wall

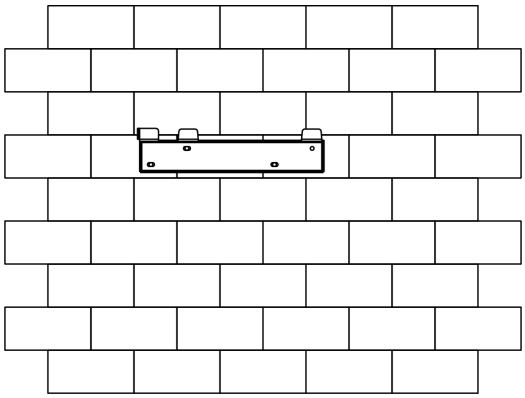
Choose the place you want to install the inverter. Place the bracket on the wall and mark the position of the 4 holes from bracket.



Drill the holes with an 8 mm diameter drill, making sure that the holes are at least 50 mm deep, and then tighten the expansion tubes.

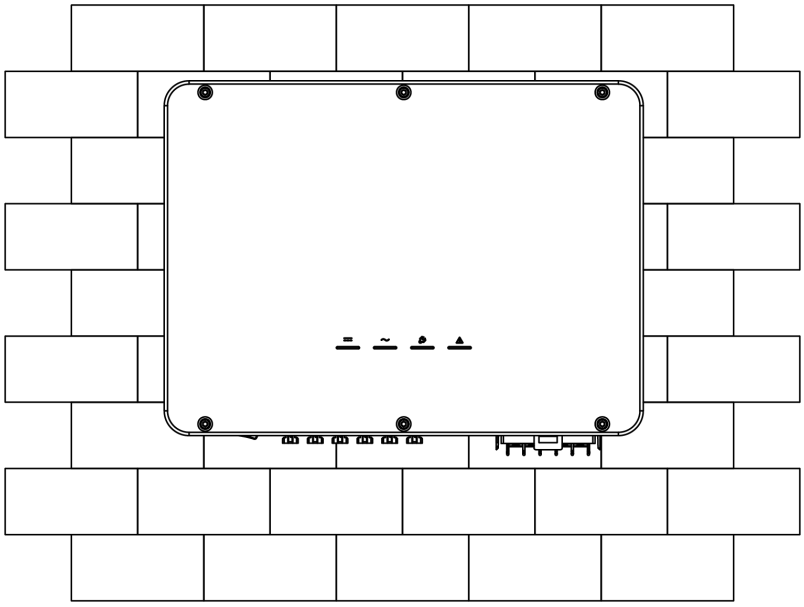


Insert the expansion tubes into the holes and tighten them. Install the bracket with the expansion screws.

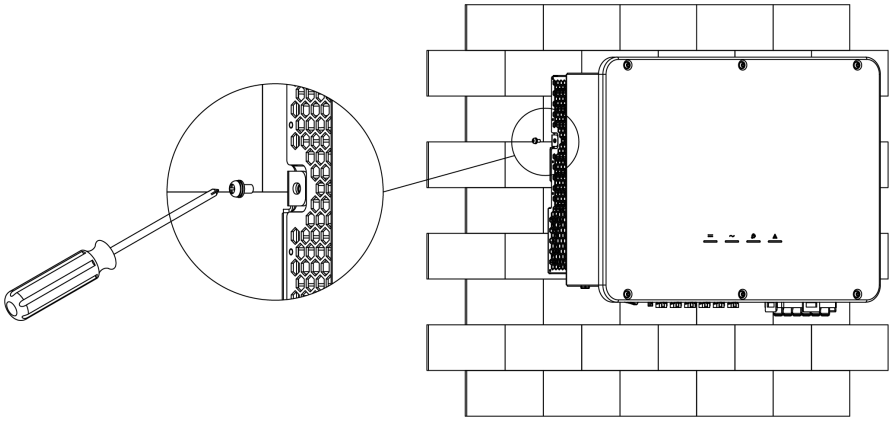


Step 2: Assembling the inverter with the wall plate

Hang the inverter on the wall plate, making sure the inverter is in place with the wall plate.

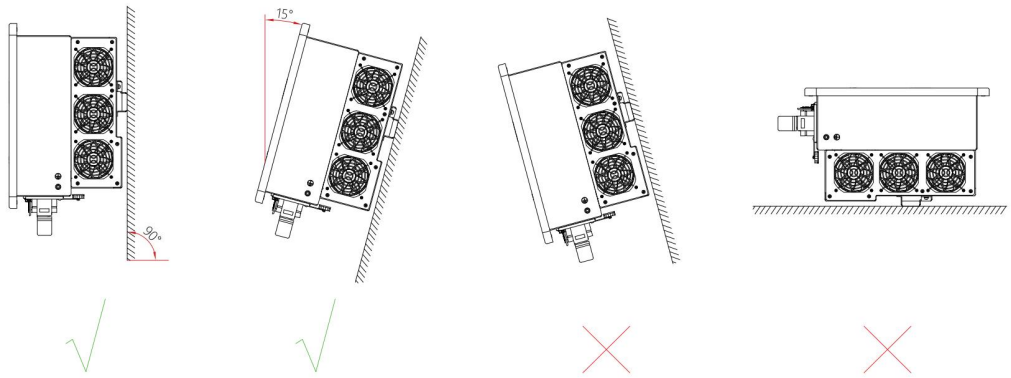


Lock inverter set screws.



Please refer to the correct installation method for installation:

Vertical	Front	Tilt Back	Tilt Flat



6. Electrical Connection

6.1 Wiring Steps

Step 1: PV String Connection

This series inverters can be connected with 6 strings of PV modules depending on the inverter type. Please select suitable PV modules with high reliability and quality. Open circuit voltage of the module array connected should be less than 1100V, and operating voltage should be within the MPPT voltage range.

NOTE

Note!

Please choose a suitable external DC switch if the inverter does not have a built-in DC switch.

⚠ WARNING

Warning!

PV module voltage is very high and within a dangerous voltage range, please comply with the electric safety rules when connecting.

⚠ WARNING

Warning!

Please do not make PV positive or negative to ground!

NOTE

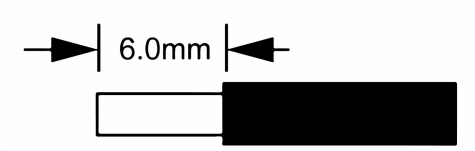
Note!

PV modules: Please ensure they are the same type, have the same output and specifications, are aligned identically, and are tilted to the same angle. In order to save cable and reduce DC loss, we recommend installing the inverter as near to the PV modules as possible.

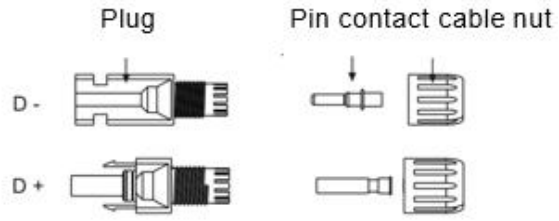
A maximum of two PV strings can be connected to an MPPT controller. For the best use of PV power, the type,quantity, tilt, and orientation of PV modules connected to the same MPPT shall be the same.

Step 2: DC Wiring

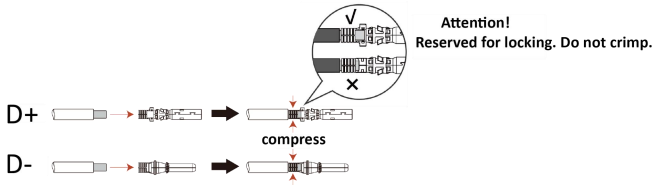
- Turn off the DC switch.
- Choose 4~6 mm² wire to connect the PV module.
- Trim 6mm of insulation from the wire end.



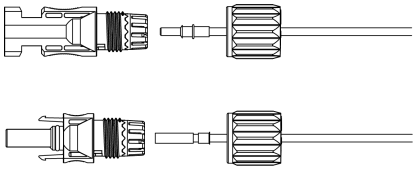
- Separate the DC connector as below.



- Insert striped cable into pin contact and ensure all conductor strands are captured in the pin contact.
- Crimp pin contact by using a crimping plier. Put the pin contact with striped cable into the corresponding crimping pliers and crimp the contact.



- Insert pin contact through the cable nut to assemble into back of the male or female plug. When you feel or hear a “click” the pin contact assembly is seated correctly.



- Unlock the DC connector
  - Use the specified wrench tool.
  - When separating the DC+ connector, push the tool down from the top.
  - When separating the DC - connector, push the tool up from the bottom.
  - Separate the connectors by hand.

- Grid Connection

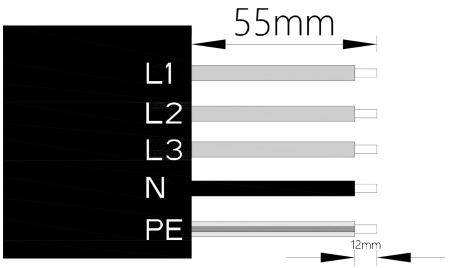
This series inverters are designed for three-phase grid. Normal operating voltage is 220/230/240V; frequency is 50/60Hz. Other technical requests should comply with the requirement of the local public grid.

Power (kW)	30.0	33.0	36.0	40.0
Cable	14~20mm²			
Micro-Breaker	80A	80A	100A	100A

AC Wiring

- Check the grid voltage and compare with the permitted voltage range (refer to technical data).
- Disconnect the circuit-breaker from all the phases and secure against re-connection.
- Trim the wires:

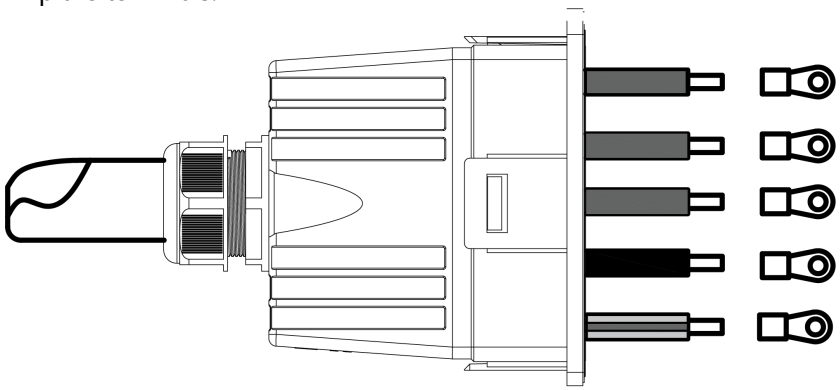
- Trim all phase, neutral and PE wires to 55mm.
- Use the crimping pliers to trim 12mm of insulation from all wire ends as below.



Note: Please refer to local cable type and color for actual installation.

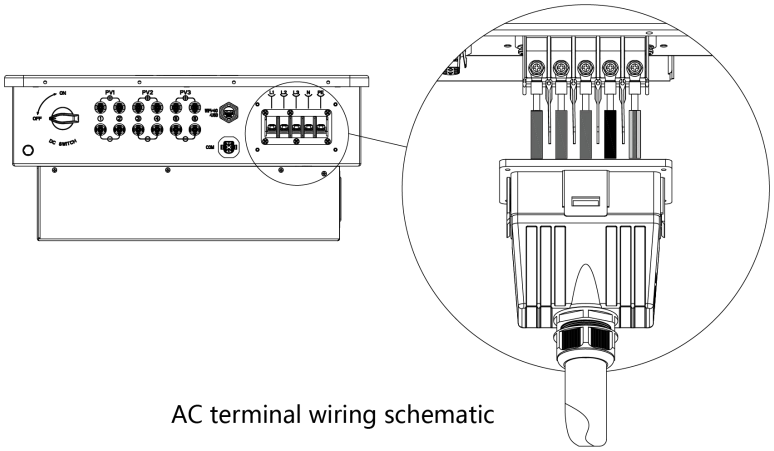
AC connection steps:

1. Connect the 5 wires of the grid (L1, L2, L3 wires, PE and N wires) through the AC waterproof cover, then crimp the terminals.



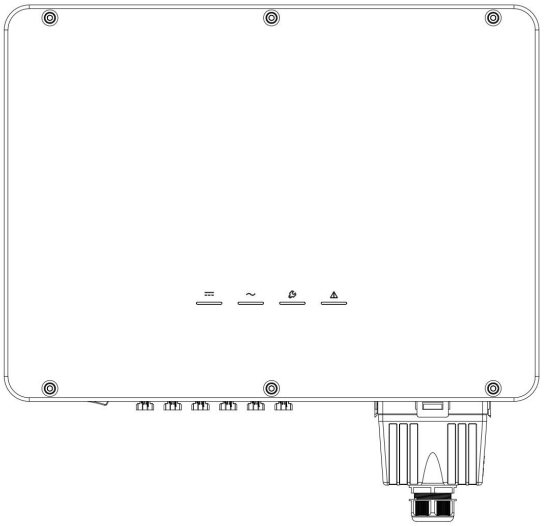
AC terminal wiring schematic

2. Lock the AC cable on the corresponding AC terminal by thread locking (5.7N·m).



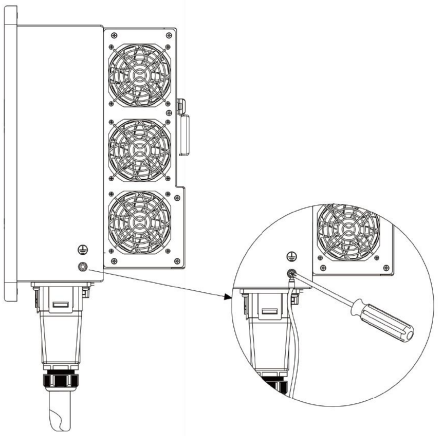
AC terminal wiring schematic

3. Lock the waterproof connector on the waterproof cover, and finally lock the waterproof cover with M4*15(1.6-2.0N·m) screws (in the accessories) outside the AC terminals of the inverter.



6.2 Grounding Wiring

Screw the grounding screw with screwdriver as shown below:



6.3 Communication Device Installation (Optional)

This series inverter is available with multiple communication options such as WiFi, 4G and Meter with an external device.

Operating information like output voltage, current, frequency, fault information, etc. can be monitored locally or remotely via these interfaces.

- WiFi/4G (Optional)

The inverter has an interface for WiFi/4G devices that allow this device to collect information from inverter; including inverter working status, performance etc., and update that information to monitoring platform (the WiFi/4G device is available to purchase from your local supplier).

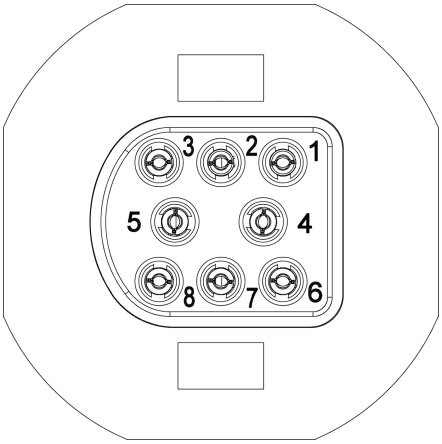
Connection steps:

1. For 4G device: Please insert the SIM Card (please refer to the 4G product manual for more details).
2. Plug the WiFi/4G device into “WiFi/4G” port at the bottom of the inverter.
3. For WiFi device: Connect the WiFi with the local router and complete the WiFi configuration (please refer to the WiFi product manual for more details).

4. Set-up the site account on the Fox ESS monitoring platform (please refer to the monitoring user manual for more details).

• Communication and Monitoring

This series of inverters features an optionally mounted 8Pin communication port with a maximum torque of 0.2N-m on the locking line.The client signal line port is shown below:



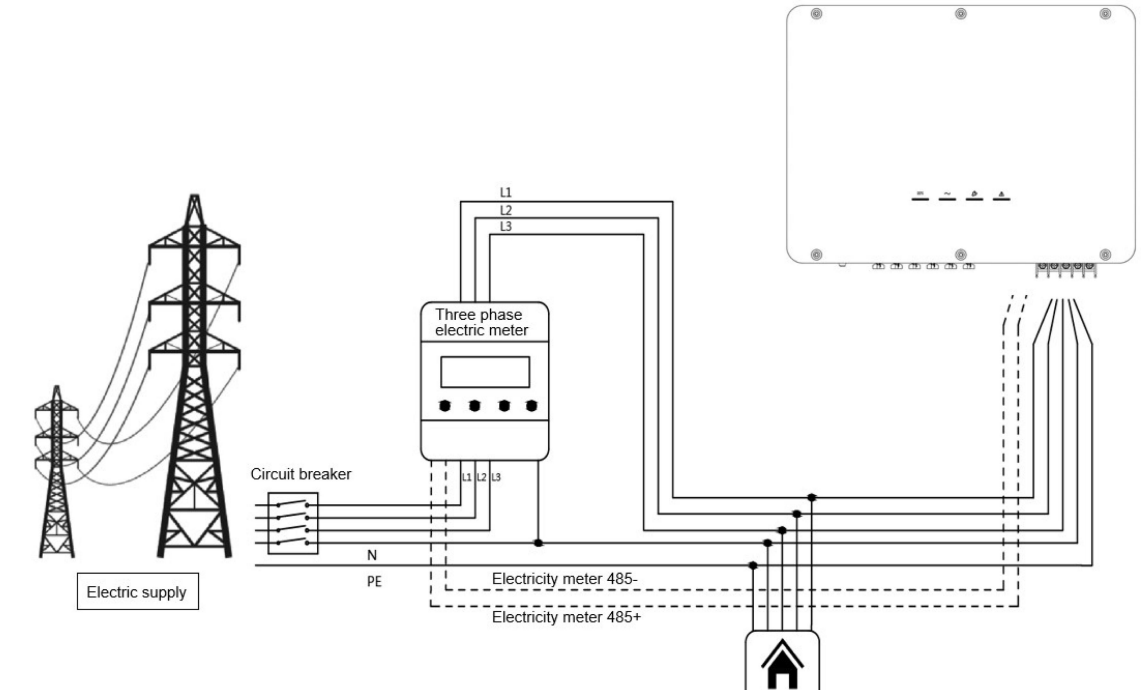
PIN	Definition	Feature description
1	RS485B4	RS485 communication port2
2	RS485A4	
3	RS485B3	Meter communication
4	RS485A3	
5	RS485B2	RS485 communication port1
6	RS485B1	
7	RS485A2	
8	RS485A1	

- Meter connection

This series of inverters is equipped with output power limiting and anti-reverse current functions. A three-phase meter can be installed on the client side to realize the output power limiting or anti-reverse current function.

1. You can refer to the following diagram to complete the meter connection. Please note that the meter needs to be connected to the grid side, with the current facing the inverter side.

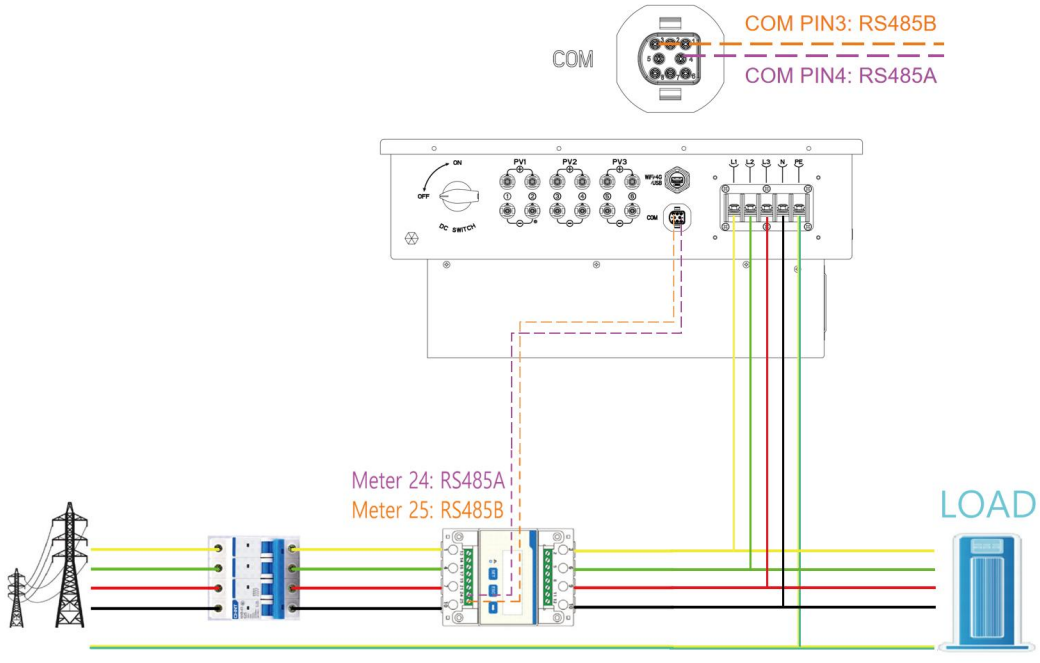
2. After completing the wiring, you need to complete the settings on the web or APP side to realize the power limitation and anti-reverse current function.



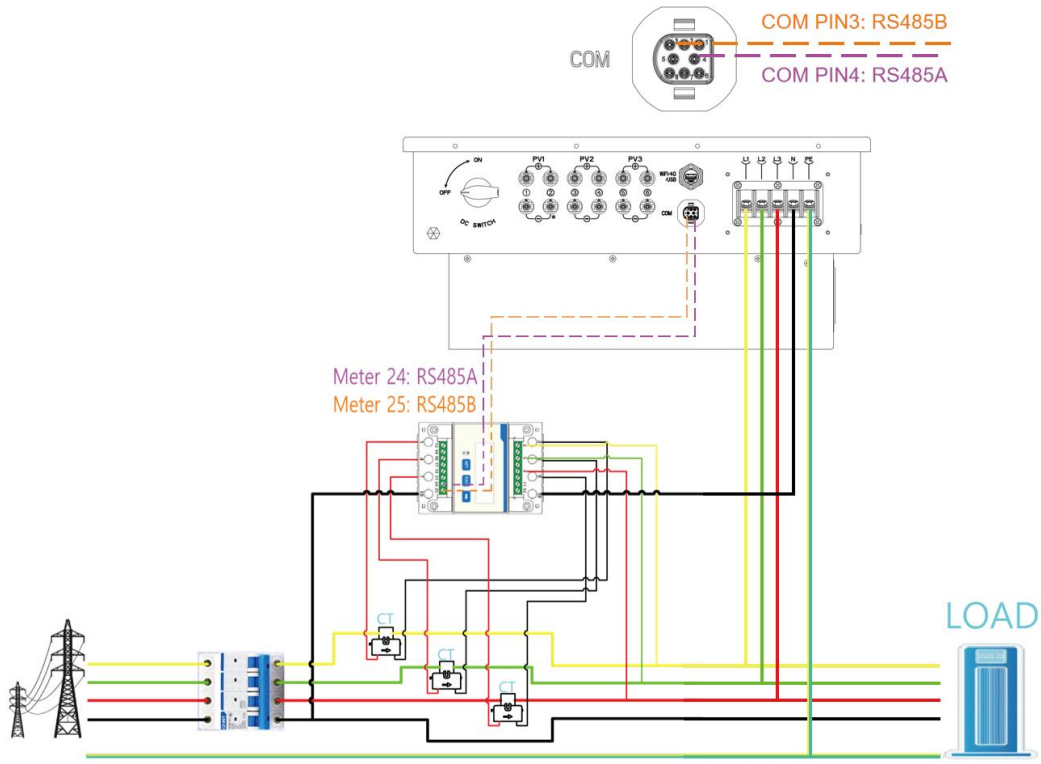
Note: For meter wiring, see meter manual.

There are four multimeter&CT connection methods as follows:

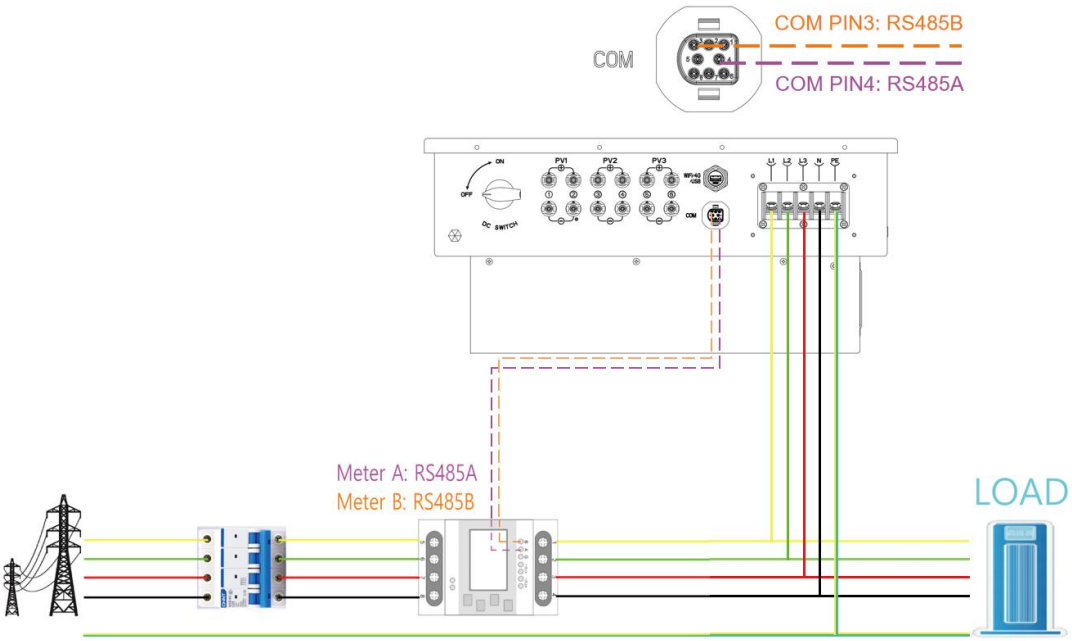
CHINT Multimeter without CT:



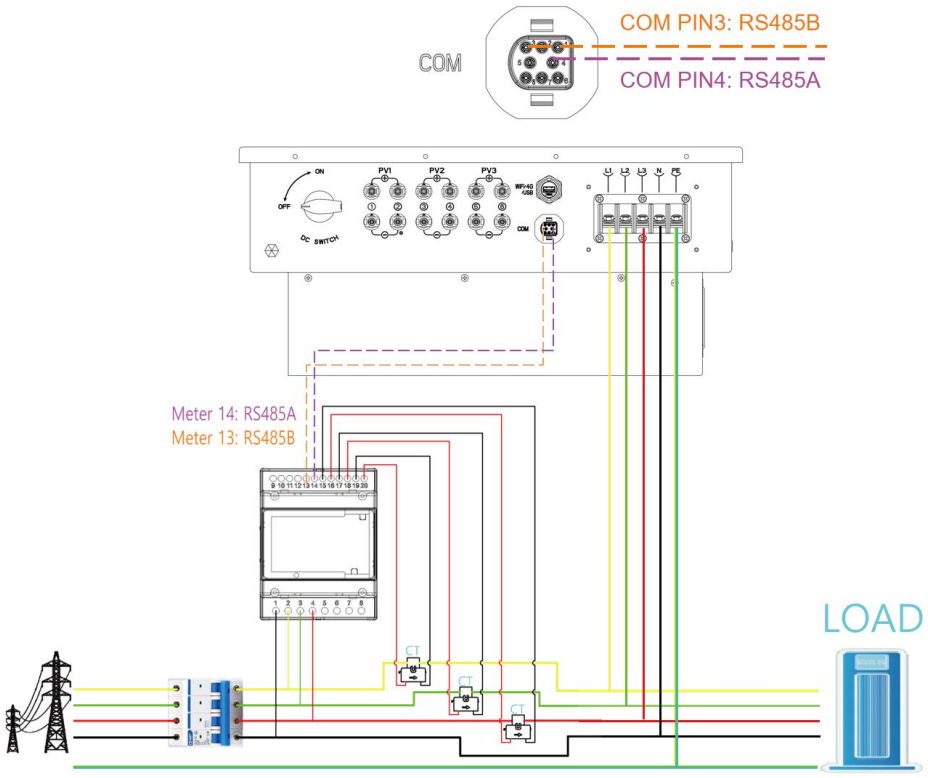
CHINT Multimeter with CT:



EASTRON Multimeter without CT:



EASTRON Multimeter with CT:



6.4 Inverter startup

Refer to the following procedure to start the inverter:

a) Check that the unit is securely fastened to the wall;

b) Make sure all AC circuit breakers and DC circuit breakers are disconnected;

c) Ensure that the AC cable is properly connected to the grid;

d) All PV panels are properly connected to the inverter; unused DC connectors should be capped;

e) Close the external AC and DC circuit breakers;

f) Turn the DC switch to the "ON" position (if the inverter is equipped with a DC switch).

If the LED does not light, check the following:

- All connections are correct.
- All external disconnects are closed.
- The DC switch of the inverter is in the "ON" position.

⚠ Warning

Warning!

Only switch on the power supply to the appliance after the installation work has been completed. All electrical connections must be made by qualified personnel in accordance with the legislation in force in the country where the installation is to take place.

6.5 Inverter shutdown

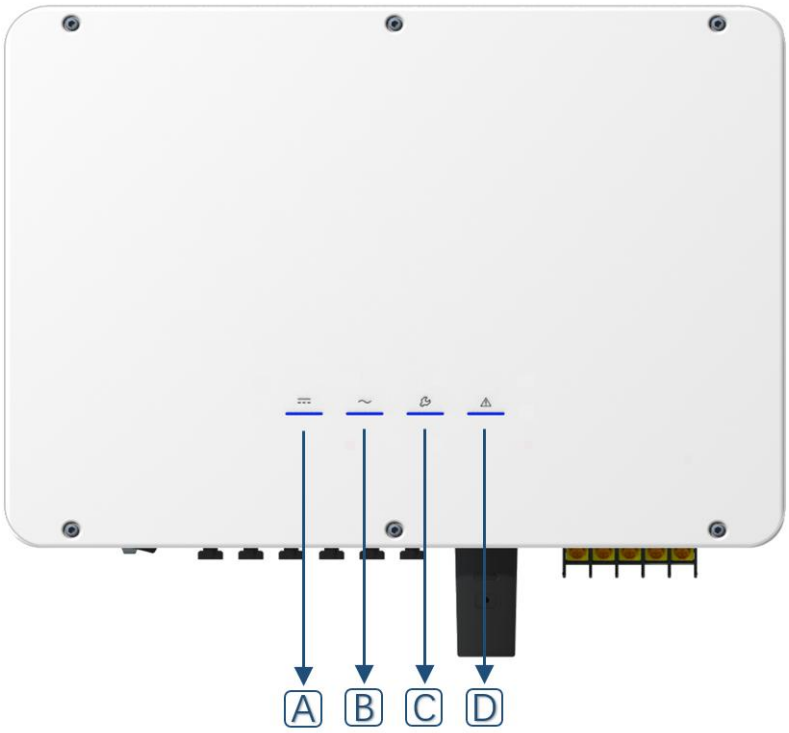
Follow the steps below to turn off the inverter:

a) Turn off the inverter AC switch.

b) Turn off the DC switch and wait at least 5 minutes for the inverter to completely power down.

7. Operation

7.1 Control Panel



No	Indicator	Status	Description
A	PV connection indicator (Light blue)	Steady On	At least one PV string is properly connected, and the DC input voltage of the corresponding MPPT circuit is at least 200 V. The solar inverter is in grid-tied mode.
		Blinking	At least one PV string is properly connected, and the DC input voltage of the corresponding MPPT circuit is at least 200 V. The solar inverter is not in grid-tied mode.
		Off	The solar inverter disconnects from all PV strings, or the DC input voltage of all MPPT circuits is less than 200V. The solar inverter is not in grid-tied mode.
B	Grid indicator (Light blue)	Steady On	Grid voltage is in normal range. The solar inverter is in grid-tied mode.
		Blinking	Grid voltage is in normal range. The solar inverter is not in grid-tied mode.
		Off	Grid voltage is not in normal range. The solar inverter is not in grid-tied mode.

C	Optional function indicator (Light blue)	Steady On	AFCI function working.
		Blinking	PID function working.
		Off	Optional function not working.
D	Alarm indicator (Red)	Steady On	An alarm is generated.
		Off	No alarm.

8. Maintenance

This section contains information and procedures for solving possible problems with the Fox ESS inverters and provides you with troubleshooting tips to identify and solve most problems that can occur.

8.1 Alarm List

Fault Code	Solution
SPS fault	- Turn off the PV and grid, reconnect them. - Please seek for help from us if it does not go back to normal state.
Bus volt fault	- Disconnect PV (+), PV (-) using DC switch. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.
DCI over range	- Wait for one minute after the inverter reconnects to grid. - Disconnect PV (+), PV (-) using DC switch. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.
EEprom fault	- Disconnect PV (+), PV (-) using DC switch. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.
GFCI fault or GFCD fault	-Disconnect DC and AC connector, check the surrounding equipment on the AC side. -Reconnect the input connector and check the state of inverter after troubleshooting. -Please seek for help from us if it does not go back to normal state.
Grid10MinOVP	- System will reconnect if the grid is back to normal. - Or seek for help from us if it does not go back to normal state.
Grid freq fault	- Wait for one minute, grid may go back to normal working state. - Make sure that grid voltage and frequency complies with standards. - Or, please seek for help from us.
Grid lost fault	- Please check grid-connection, e.g., wires, interface etc. - Checking grid usability. - Or seek for help from us.
V grid transient	- Disconnect PV (+), PV (-) using DC switch. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.

Grid volt fault	- Wait for one minute, grid may go back to normal working state. - Make sure that grid voltage and frequency complies with standards. - Or, please seek for help from us.
Inconsistency	- Disconnect PV (+), PV (-) using DC switch. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it cannot go back to normal state.
ISO fault	- Check the impedance among PV (+), PV (-) and ground. Impedance should be >100kohm. - Please seek for help from us if the impedance is >100kohm.
Ground fault	- Check the voltage of neutral and PE. - Check AC wiring. - Disconnect PV (+), PV (-) using DC switch. - After the LCD switches off, reconnect and check again.
OCP fault	- Turn off the PV and grid, reconnect them. - Or seek for help from us if it does not go back to normal.
PLL fault	- Check the connection of ac grid - System will reconnect if the utility is back to normal. - Or seek for help from us if it does not go back to normal state.
Pv volt fault	- Check the panel's open-circuit voltage whether the value is similar or already >1000Vdc. - Please seek help from us when voltage ≤1000Vdc.
Relay fault	- Disconnect PV (+), PV (-) using DC switch. - Check the connection of ac grid - After the LCD switches off, reconnect and check again. - Please seek for help from us if it does not go back to normal state.
Sample fault	- Disconnect PV (+), PV (-) using DC switch. - After the LCD switches off, reconnect and check again. - Please seek for help from us if it cannot go back to normal state.
SCI Comm fault or SPI Comm fault	- Disconnect PV+, PV-, reconnect them. - Or seek for help from us if it does not go back to normal state.
Over temp fault	- Check if the environment temperature is over the limit. - Or seek for help from us.
Meter fault	- Check the inverter's setup items about meter. - Disconnect DC and AC connector, check the connection of the meter. - Reconnect the DC and AC connector. - Please seek for help from us if it does not go back to normal state.
Fan fault	- Disconnect PV+, PV-, reconnect them. - Check whether the FAN is seized up by something or not. - Or seek for help from us if it does not go back to normal state.

8.2 Troubleshooting

A. Please check the fault message on the System Control Panel or the fault code on the inverter inform ation panel. If a message is displayed, record it before doing anything further.

B. Attempt the solution indicated in table above.

C. If your inverter information panel is not displaying a fault light, check the following to make sure that the current state of the installation allows for proper operation of the unit:

(1) Is the inverter located in a clean, dry, adequately ventilated place?

(2) Have the DC input breakers opened?

(3) Are the cables adequately sized?

(4) Are the input and output connections and wiring in good condition?

(5) Are the configurations settings correct for your particular installation?

(6) Are the display panel and the communications cable properly connected and undamaged?

Contact Fox ESS Customer Service for further assistance. Please be prepared to describe details of your system installation and provide the model and serial number of the unit.

8.3 Routine Maintenance

• Safety check

A safety check should be performed at least every 12 months by a qualified technician who has adequate training, knowledge and practical experience to perform these tests. The data should be recorded in an equipment log. If the device is not functioning properly or fails any of the tests, the device has to be repaired. For safety check details, refer to section 2 of this manual.

• Maintenance checking list

During the process of using the inverter, the responsible person shall examine and maintain the machine regularly. The required actions are as follows.

- Check that if the cooling fins at the rear of the inverters are collecting dust/dirt, and the machine should be cleaned when necessary. This work should be conducted periodically.
- Check that if the indicators of the inverter are in normal state, check if the display of the inverter is normal. These checks should be performed at least every 6 months.
- Check if the input and output wires are damaged or aged. This check should be performed at least every 6 months.
- Get the inverter panels cleaned and their security checked at least every 6 months.

Note: Only qualified individuals may perform these actions.

9. Decommissioning

9.1 Dismantling the Inverter

- Disconnect the inverter from DC Input and AC output. Wait for 5 minutes for the inverter to fully de-energize.
- Disconnect communication and optional connection wirings. Remove the inverter from the bracket.
- Remove the bracket if necessary.

9.2 Packaging

If possible, please pack the inverter with the original packaging. If it is no longer available, you can also use an equivalent box that meets the following requirements.

- Suitable for loads more than 30 kg.
- Contains a handle.
- Can be fully closed.

9.3 Storage and Transportation

Store the inverter in dry place where ambient temperatures are always between -40°C - + 70°C. Take care of the inverter during the storage and transportation; keep less than 4 cartons in one stack. When the inverter or other related components need to be disposed of, please ensure it is carried out according to local waste handling regulations.

FOXESS CO., LTD.
Add: No.939, Jinhai Third Road, New Airport Industry Area, Longwan District, Wenzhou, Zhejiang, China.
WWW.FOX-ESS.COM

Due to product version upgrade or other reasons, the content of the document will be updated from time to time, if you need the latest version, please download from the official website

V1.0
10-500-10181-00