User Manual



T SERIES

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

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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:

T3-M T4-M T5-M T6-M T8-M T10-M

T10-M-B T12-M T8(Dual)-M T10(Dual)-M T12(Dual)-M

T15-M T17-M T20-M T23-M T25-M T30-M

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
CE	Symbol Explanation CE mark. The inverter complies with the requirements of the applicable CE guidelines.
	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 conductor 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

- In every PV installation, several elements contribute to the current leakage to protective earth (PE). these elements can be divided into two main types.
- Capacitive discharge current - Discharge current is generated mainly by the parasitic capacitance of the PV modules to PE. The module type, the environmental conditions (rain, humidity) and even the distance of the modules from the roof can effect the discharge current. Other factors that may contribute to the parasitic capacitance are the inverter's internal capacitance to PE and external protection elements such as lighting protection.
- During operation, the DC bus is connected to the alternating current grid via the inverter. Thus, a portion of the alternating voltage amplitude arrives at the DC bus. The fluctuating voltage constantly changes the charge state of the parasitic PV capacitor (i.e capacitance to PE). This is associated with a displacement current, which is proportional to the capacitance and the applied voltage amplitude.
- Residual current - if there is a fault, such as defective insulation, where an energized cable comes into contact with a grounded person, an additional current flows, known as a residual current.

Residual Current Device (RCMU)

- All Fox ESS inverters incorporate a certified internal RCD (Residual Current Device) to protect against possible electrocution in case of a malfunction of the PV array, cables or inverter (DC). The RCD in the Fox ESS inverter can detect leakage on the DC side. There are 2 trip thresholds for the RCD as required by the DIN VDE 0126-1-1 standard. A low threshold is used to protect against rapid changes in leakage typical of direct contact by people. A higher threshold is used for slowly rising leakage currents, to limit the current in grounding conductors for the safety. The default value for higher speed personal protection is 30mA, and 300mA per unit for lower speed fire safety.

Installation and Selection of an External RCD device

- An external RCD is required in some countries. The installer must check which type of RCD is required by the specific local electric codes. Installation of an RCD must always be conducted in accordance with local codes and standards. Fox ESS recommends the use of a type-B RCD. Unless a lower value is required by the specific local electric codes, Fox ESS suggests an RCD value between 100mA and 300mA.

  Hint: Each 10 kW can cause 100mA of leakage.
- In installations where the local electric code requires an RCD with a lower leakage setting, the discharge current might result in nuisance tripping of the external RCD. The following steps are recommended to avoid nuisance tripping of the external RCD:

1. Selecting the appropriate RCD is important for correct operation of the installation. An RCD with a rating of 30mA may actually trip at a leakage as 15mA (according to IEC 61008). High quality RCDs will typically trip at a value closer to their rating.

2. Configure the trip current of the inverter' internal RCD to a lower value than the trip current of the external RCD. The internal RCD will trip if the current is higher than the allowed current, but because the internal inverter RCD automatically resets when the residual currents are low it saves the manual reset.

3. Introduction

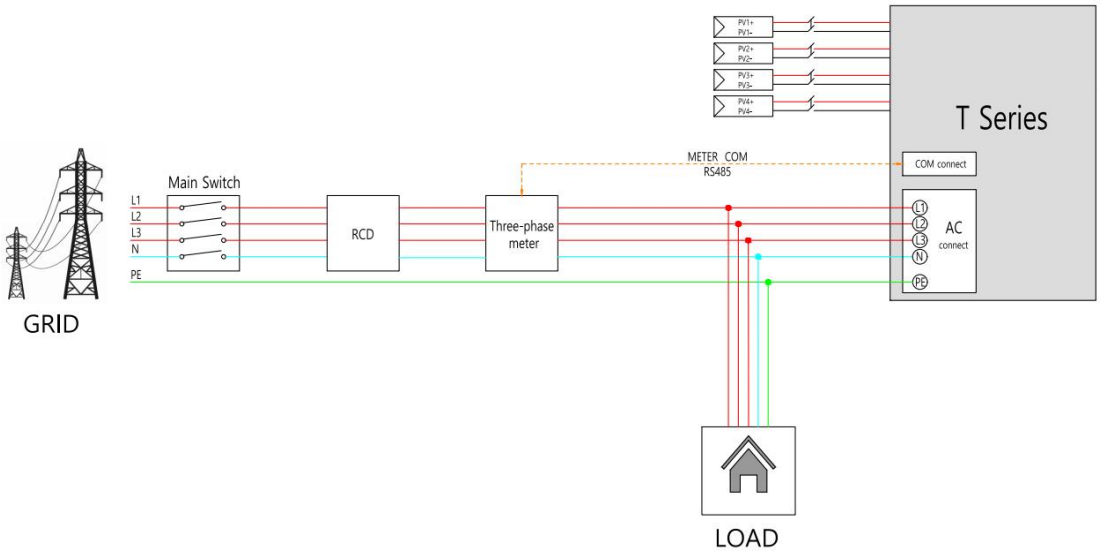
3.1 Basic Features

This three-phase high performance inverter covers 3kW to 30kW. The inverter is integrated with 2 MPP trackers with high efficiency and reliability.

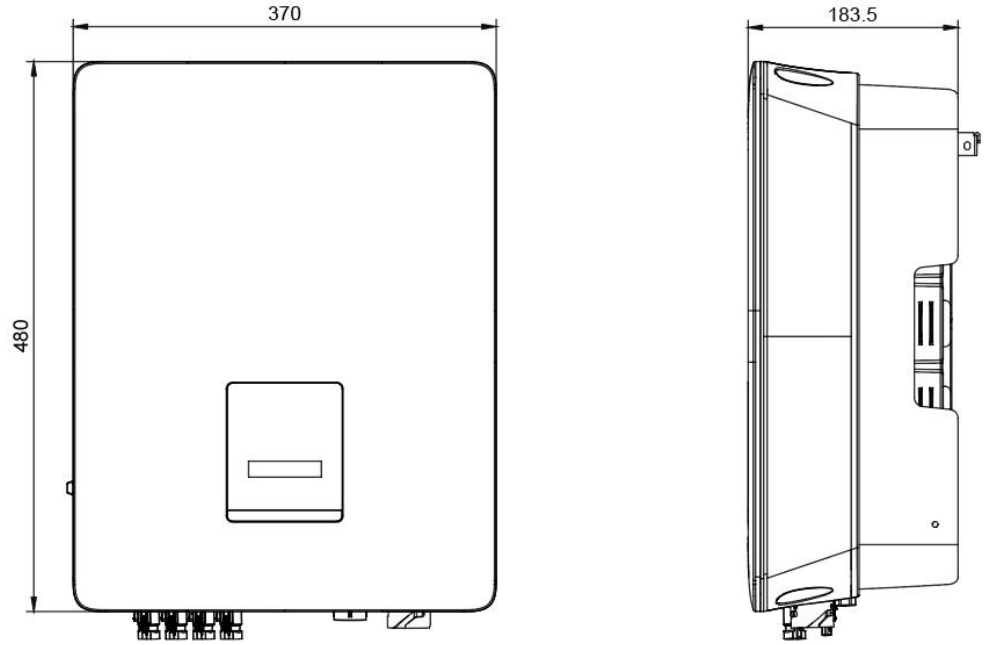
System advantages:

- Advanced DSP control technology.
- Utilizes the latest high-efficiency power components.
- Optimal MPPT technology.
- Two independent MPP trackers.
- Wide MPPT voltage range.
- Advanced anti-islanding solutions.
- IP65 protection level.
- Max. Efficiency up to 98.6%. EU efficiency up to 97.8%. THD<3%.
- Safety & Reliability: Transformerless design with software and hardware protection.
- External limitation (Meter/DRM0/ESTOP).
- Power factor regulation.
- Friendly HMI.
- LED status indications.
- LCD display technical data, human-machine interaction through touch key.
- Remote monitoring via PC or APP.
- Upgrade through USB interface.

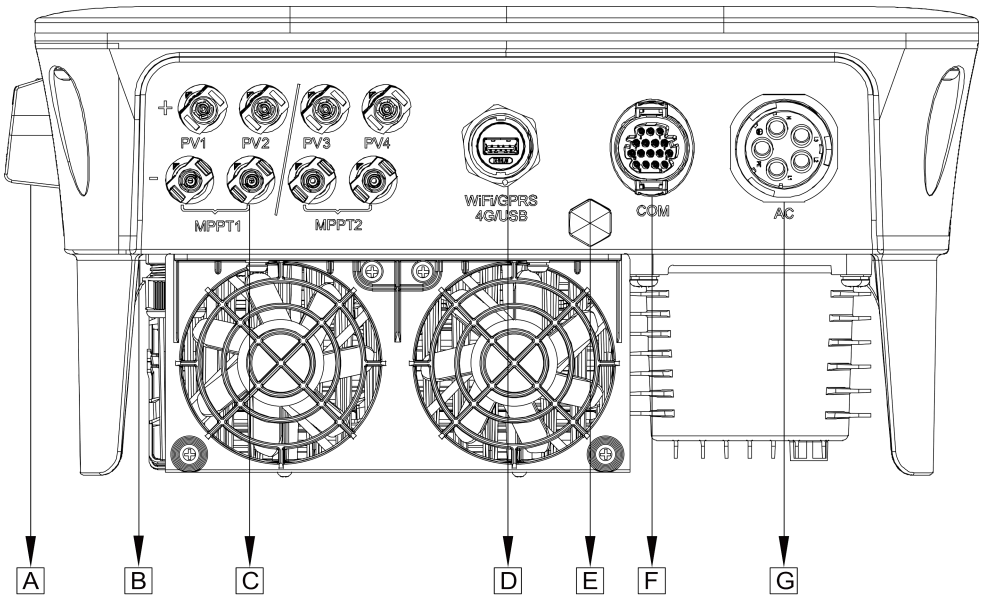
• System connection diagrams



3.2 Dimensions (mm)



3.3 Terminals of Inverter



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

4. Technical Data

4.1 PV Input / AC Output

Model	T3-M	T4-M	T5-M	T6-M	T8-M, T8(Dual)-M	T10-M, T10(Dual)-M	T10-M-B	T12-M, T12(Dual)-M	T15-M	T17-M	T20-M	T23-M	T25-M	T30-M
PV INPUT														
Max. PV array power (W)	6000	8000	10000	12000	16000	20000	20000	24000	30000	34000	40000	46000	50000	60000
Max. input voltage (V)	1100 [1]													
Min. input voltage (V)	140 [2]													
Start-up PV voltage (V)	160													
Nominal voltage (V)	600													
MPP voltage range (V)	140-1000													
MPP voltage range (full load) (V)	140-850	140-850	140-850	160-850	210-850, 140-850	260-850, 140-850	260-850	310-850, 160-850	250-850	220-850	260-850	295-850	320-850	385-850
Max. PV input current (A)	20/20	20/20	20/20	20/20	20/20, 40/40	20/20, 40/40	20/20	20/20, 40/40	32/32	40/40	40/40	40/40	40/40	40/40
Max. Isc PV current (A)	25/25	25/25	25/25	25/25	25/25, 50/50	25/25, 50/50	25/25	25/25, 50/50	40/40	50/50	50/50	50/50	50/50	50/50
Strings per MPP tracker	1+1	1+1	1+1	1+1	1+1, 2+2	1+1, 2+2	1+1	1+1, 2+2	2+2	2+2	2+2	2+2	2+2	2+2
No. of MPP trackers	2													
AC OUTPUT														
Rated power (W)	3000	4000	5000	6000	8000	10000	10000	12000	15000	17000	20000	23000	25000	30000
Rated apparent power (VA)	3000	4000	5000	6000	8000	10000	10000	12000	15000	17000	20000	23000	25000	30000
Max. apparent power (VA)	3300	4400	5500	6600	8800	11000	10000	13200	16500	18700	22000	25300	27500	33000
Nominal voltage (V)	415/240Vac; 400V/230Vac; 380V/220Vac, 3L/N/PE													
Nominal frequency (Hz)	50/60Hz , ±5Hz													

Rated output current (Per phase) (A)	4.5	6.1	7.6	9.1	12.1	15.2	15.2	18.2	22.7	25.8	30.3	34.8	37.9	45.5
Max. AC current (Per phase) (A)	4.8	6.4	8.0	9.6	12.8	15.9	15.2	19.1	23.9	27.1	31.9	36.7	39.9	47.8
Power factor	1(Adjustable from 0.8 leading to 0.8 lagging)													
Inrush current (A)	9.6A@0.8ms				14.5A@0.7ms, 12.1A@0.6ms	14.5A@0.7ms, 12.1A@0.6ms	14.5A@ 0.7ms	14.5A@0.7ms, 12.1A@0.6ms	12.1A@0.6ms			19.3A@1.3ms		
Max. output fault current (A)	30				58, 93	58, 93	58	58, 93	93			145		
Max. output overcurrent protection (A)	10.1	13.5	16.9	20.3	27.1	33.8	33.8	40.6	50.7	57.5	67.6	70	84.5	113
THDI	<3%@rated power													

[1] For 1100V system, PV Maximum operating voltage is 1020V.

[2]The starting working voltage of the power supply is 140V.

4.2 Efficiency and Protection

Model	T3-M	T4-M	T5-M	T6-M	T8-M, T8(Dual)-M	T10-M, T10(Dual)-M	T10-M-B	T12-M, T12(Dual)-M	T15-M	T17-M	T20-M	T23-M	T25-M	T30-M
EFFICIENCY														
Max. static MPPT efficiency	99.80%	99.80%	99.80%	99.80%	99.80%	99.80%	99.80%	99.80%	99.80%	99.80%	99.80%	99.80%	99.80%	99.80%
Max. conversion efficiency	98.60%	98.60%	98.60%	98.60%	98.60%	98.60%	98.60%	98.60%	98.60%	98.60%	98.60%	98.60%	98.60%	98.60%
European efficiency	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%
Chinese efficiency	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%	97.80%
PROTECTION														
PV Reverse Polarity Protection	YES													
Anti-islanding Protection	YES (frequency shift)													
Output Short Protection	YES													
Leakage Current Protection	YES													
Insulation resistance detection	YES													
Grid Reverse Connect Protection	YES													
Over-current protection	YES													
Over-temperature Protection	YES													
DC/AC Surge Protection	YES [Type II (PV) / Type II (AC)]													
AFCI protection	Optional													

4.3 General Data

Model	T3-M	T4-M	T5-M	T6-M	T8-M, T8(Dual)-M	T10-M, T10(Dual)-M	T10-M-B	T12-M, T12(Dual)-M	T15-M	T17-M	T20-M	T23-M	T25-M	T30-M
GENERAL DATA														
Dimension (W/H/D) (mm)	370*480*183.5													
Dimension of packing (W/H/D) [mm]	454*592*312													
Net weight [kg]	16.5				17.5, 20.5	17.5, 20.5	17.5	17.5, 20.5	20.5					22.5
Installation	Wall-mounted													
Operating temperature range [℃]	-25 to +60 ℃ (Derating at 45℃)													
Storage temperature	-40 to +70 ℃													
Storage/Operation Relative humidity	0-100% (no condensation)													
Altitude [m]	3000m													
Protective class	I													
Overvoltage category	III(AC),II(DC)													
Pollution degree	PD3(PD2 inside)													
Ingress protection	IP65 (For Outdoor Use)													
Standby consumption [W]	<3													
AFCI function	Optional													
Cooling principle	Natural				Natural, Fan cooling	Natural, Fan cooling	Natural	Natural, Fan cooling	Fan cooling					
Noise emission [dB]	<30				<30, <55	<30, <55	<30	<30, <55	<55					
Inverter topology	Non-Isolated													
Communication Interface	WIFI or 4G, RS485													
Display	LCD, App,Web site													
Export limit control	YES													
DC switch	YES													
Button	YES													

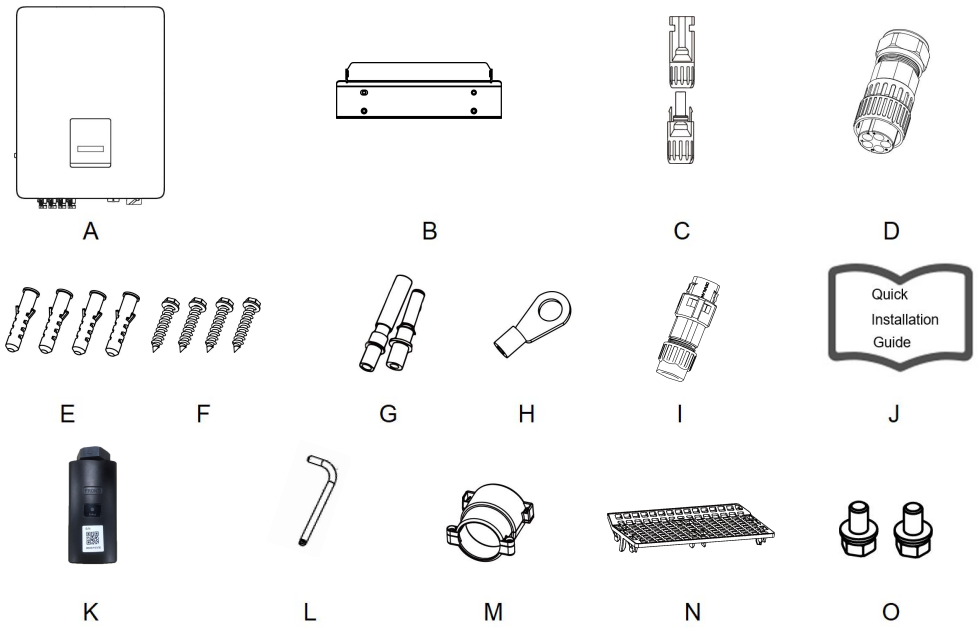
5. Installation

5.1 Check for Physical Damage

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.



Object	Quantity	Description	Object	Quantity	Description
A	1	Inverter	I	1	Communication connector
B	1	Bracket	J	1	Quick installation guide
C[1)]	4/8	DC connector (F*2/4，M*2/4)	K	1	WiFi/4G (optional)
D	1	AC connector	L	1	Spanner
E	4	Expansion tube	M	1	Protective sleeve (only for Australia)
F	4	Expansion screw	N	1	Filter (for fan cooling inverter)
G[1)]	4/8	DC pin contact (positive contact*2/4, negative contact*2/4)	O	2	Screw
H	1	Earth terminal			

Note: Different inverter model will have different number of DC connector and DC pin contact included by the package:

Description	Qty	Model
DC connector	Female×2，Male×2	Natural cooling model
	Female×4，Male×4	Fan cooling model
DC pin contact	Positive contact×2，Negative contact×2	Natural cooling model
	Positive contact×4，Negative contact×4	Fan cooling model

5.3 Mounting

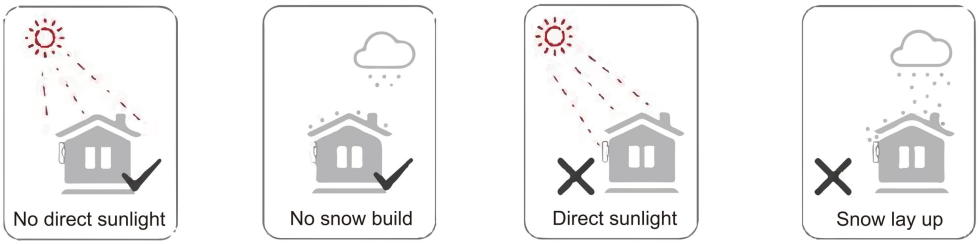
- Installation Precaution

Make sure the installation location complies with the following conditions:

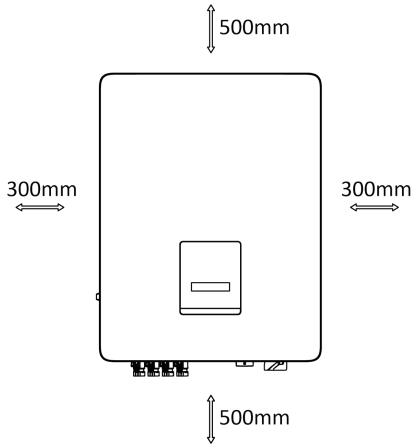
- Not in direct sunlight.
- Not in areas where highly flammable materials are stored.
- Not in potentially explosive areas.
- Not in a direct flow of cool air.
- Not near a television antenna or antenna cable.
- Not higher than altitude of 3000m above sea level.
- Well ventilated.
- Not exposed to rain or humidity.
- 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	300mm
Right	300mm
Top	500mm
Bottom	500mm
Front	500mm

- Mounting Steps

Tools required for installation.

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

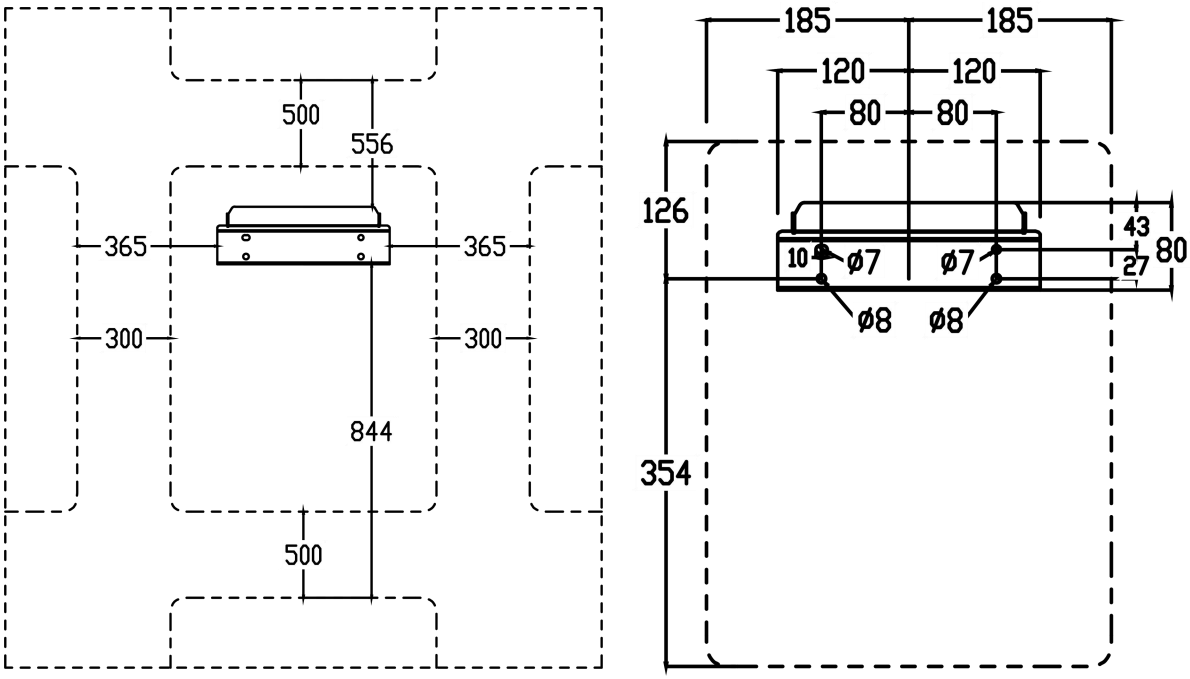


Step 1: Fix the bracket on the wall

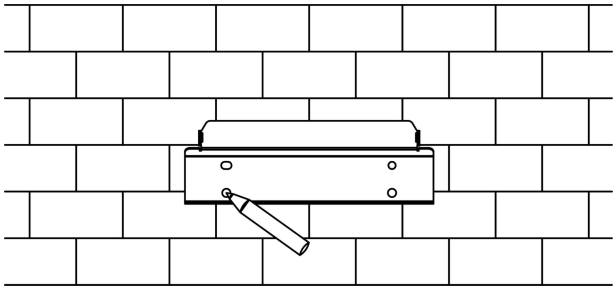
Choose the place you want to install the inverter. Place the bracket on the wall and mark the position of the 4 holes from bracket.

⚠ DANGER
Before drilling, please make sure to avoid the water and electricity lines embedded in the wall to avoid danger.

The dimensions on the back of the machine are as follows:



Before drilling holes, please ensure the distance between the machine and nearby objects.

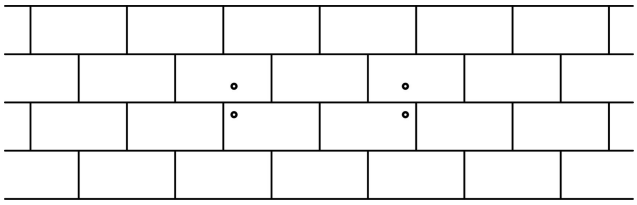


Drill holes with electric drill, make sure the holes are at least 50mm deep and 8mm wide, and then tighten the expansion tubes.

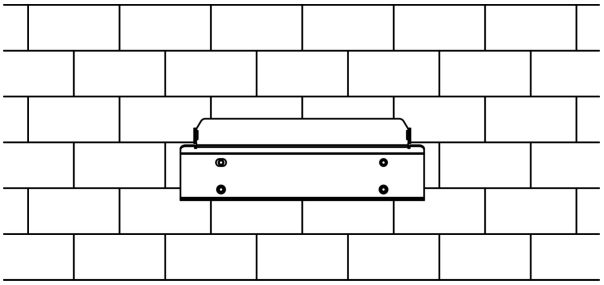
⚠ CAUTION

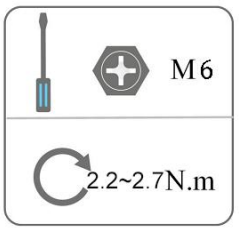
Please pay attention to safety when using the tools. Unsafe use of the drilling tools may cause damage to the body.

Please select solid brick-concrete structure and concrete wall for installation location. If other types of wall are selected, the wall must be made of fire-retardant materials and meet the load bearing requirements of the equipment.



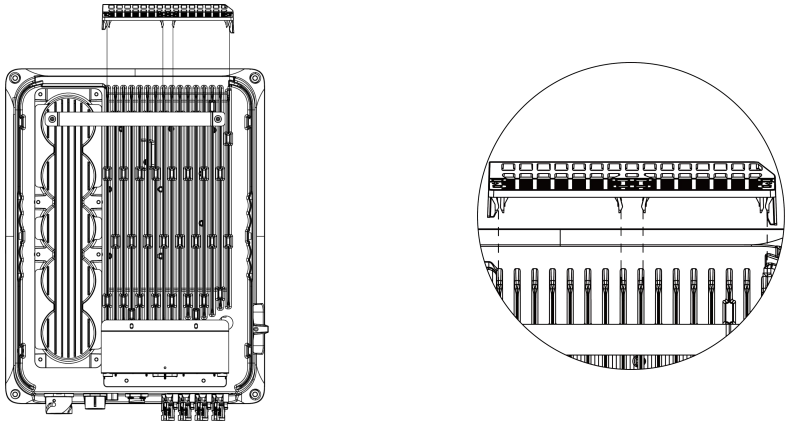
Insert the expansion tubes into the holes and tighten them. Install the bracket with the expansion screws.



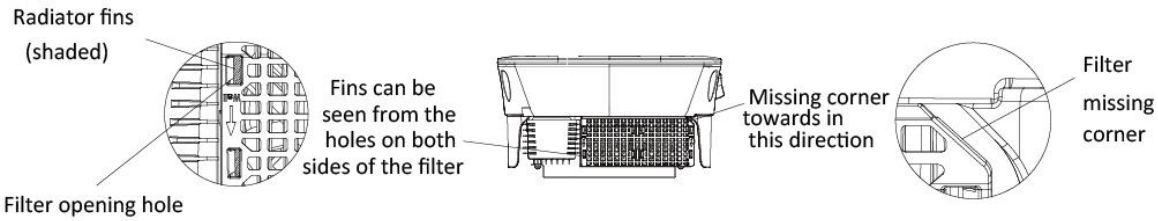


Step 2: Install the filter on top side (for fan cooling inverter)

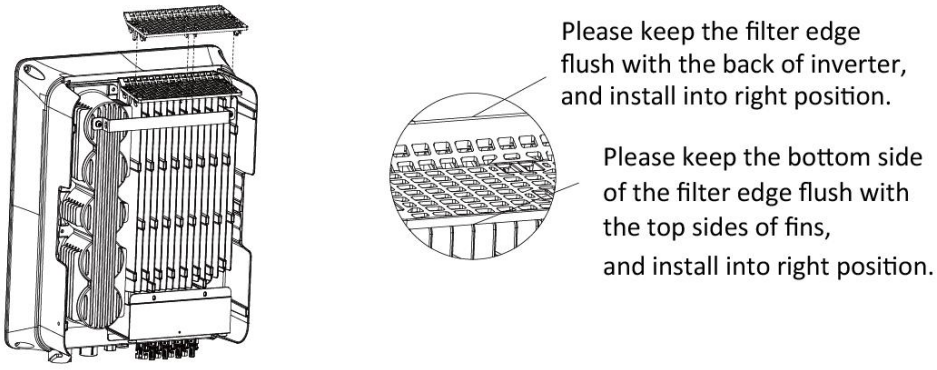
Put the filter into the right position as shown by below figure. Align the long legs on both side of the filter with the outermost fin.



Please keep the top of filter flush with the back of inverter. Please adjust to the position where the lateral fins can be seen from the holes on both sides of the filter according to the figure in which the arrow towards to the wall.

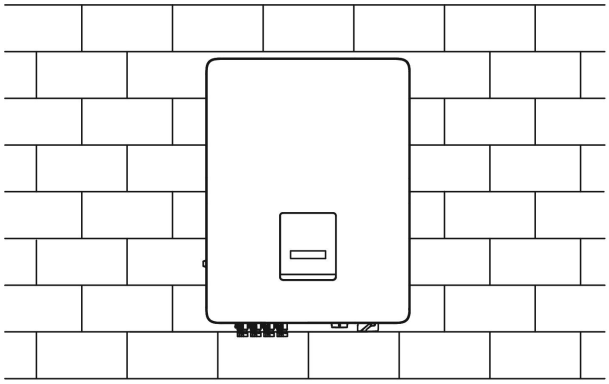


Press the filter down from the top. Check if all fins are covered by filter. Ensure that the filter is installed and secured in right position.



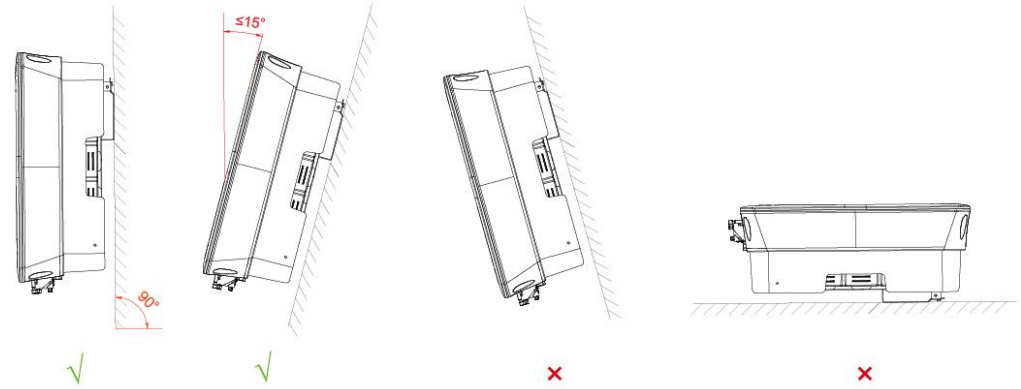
Step 3: Match the inverter with wall bracket

Mount the inverter to the bracket. Secure the inverter with the M5 screw and washer.



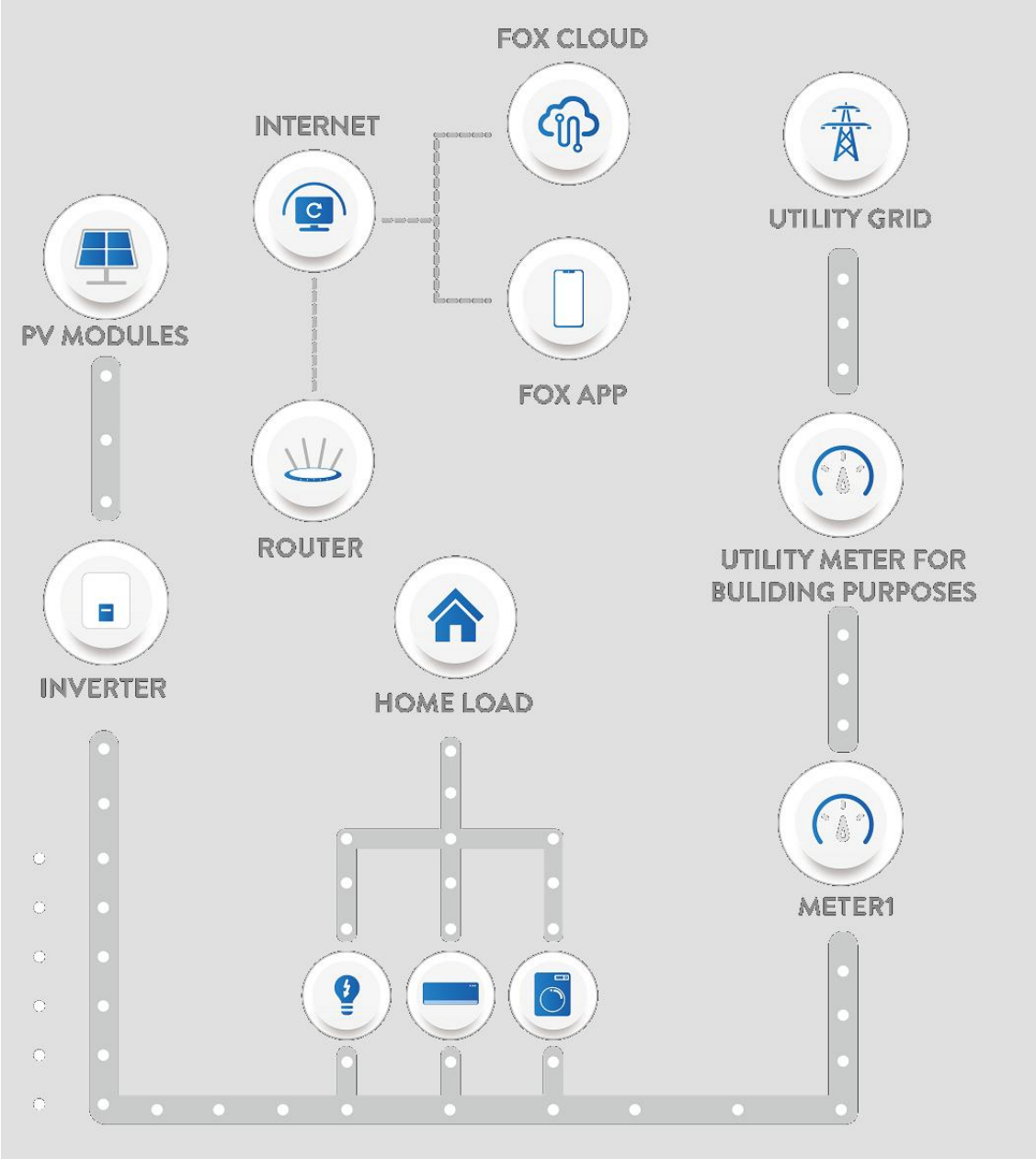
Please refer to the correct installation method to install:

Vertical	Front	Tilt Back	Tilt Flat



6. Electrical Connection

6.1 circuit overview



6.2 Wiring Steps

Step 1: PV String Connection

This series inverters can be connected with 2 to 4 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.

For T8(Dual)-M, T10(Dual)-M, T12(Dual)-M, T15-M, T17-M, T20-M, T23-M, T25-M and T30-M, each pair of PV terminals is corresponding to an independent PV string. PV input PV1 and PV2 connect to MPPT1, PV3 and PV4 connect to MPPT2. For the best use of PV power PV1 and PV2 should be the same, PV3 and PV4 should be the same in PV string structure, including the type, number, tilt, and orientation of the PV modules.

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!

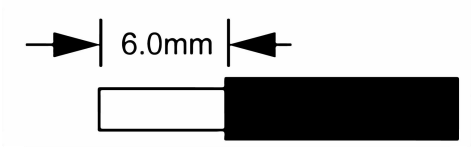
NOTE

Note!

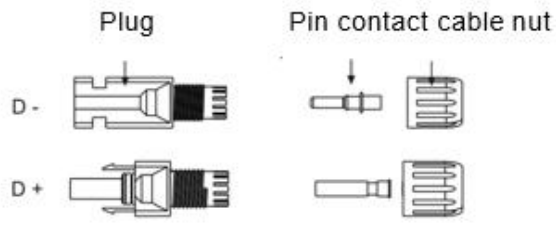
PV modules: Please ensure they are the same type, have the same output and specifications, are aligned identically, and are tilted to the same angle. In order to save cable and reduce DC loss, we recommend installing the inverter as near to the PV modules as possible.

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.

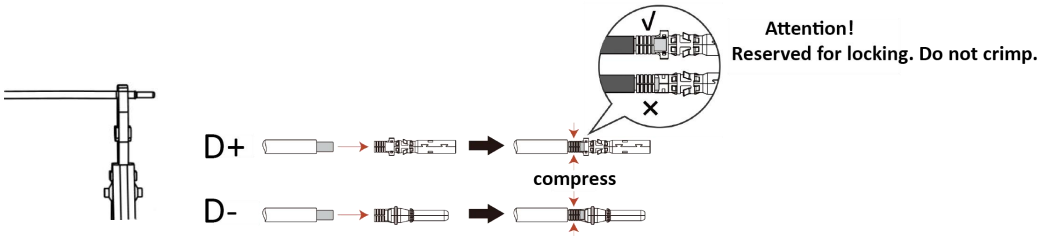


NOTICE

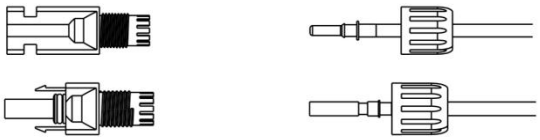
When making PV terminals, please make sure that the copper cores of PV positive and PV negative terminals and the copper cores on the inverter can be inserted, and use a multimeter to measure whether the positive and negative terminals are correct, otherwise the machine may not work normally or individual strings may not work.

The maximum open-circuit voltage of PV should be less than 900V, otherwise an error may be reported when mppt cannot be traced.

- 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

⚠ DANGER

Before plugging the DC connector off, make sure that there is no current on the DC connector. You can measure it with current clamp or disconnect the DC switch, otherwise serious safety accidents may occur.

- 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

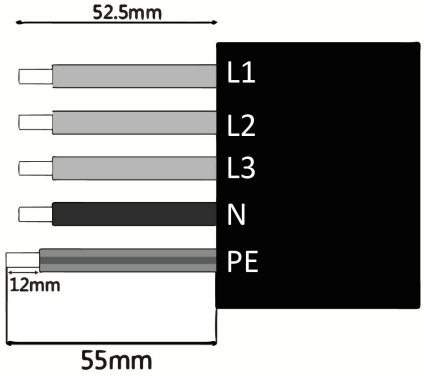
This series inverters are designed for three-phase grid. Normal operating voltage is 220/230/240V; frequency is 50/60Hz. Other technical requests should comply with the requirement of the local public grid.

Power (kW)	3.0	4.0	5.0	6.0	8.0	10.0	12.0	15.0	17.0	20.0	23.0	25.0	30.0
Cable	2.5~6mm²				4~6mm²			6mm²					10mm²
Micro-Breaker	25A				32A			40A		63A			80A

Step 3: AC Wiring

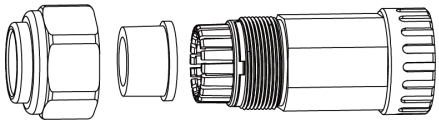
- Check the grid voltage and compare with the permitted voltage range (refer to technical data).
- Disconnect the circuit-breaker from all the phases and secure against re-connection.
- Trim the wires:

- Trim all the wires to 52.5mm and the PE wire to 55mm.
- Use the crimping pliers to trim 12mm of insulation from all wire ends as below.

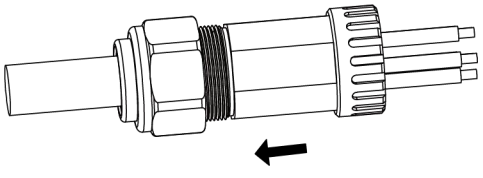


L1/L2/L3: Brown/Red/Green or Yellow Wire
N: Blue/Black Wire
PE: Yellow & Green Wire
Note: Please refer to local cable type and color for actual installation.

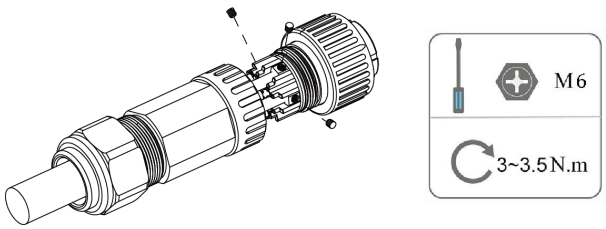
- Separate the AC plug into three parts as below.



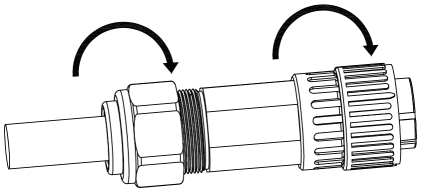
- Insert the sleeve assembly into the cable.



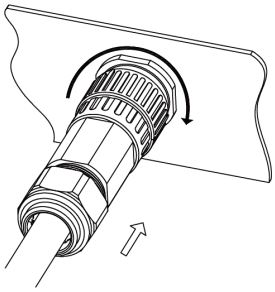
- Install the copper wire into the plug terminal and lock the screw.



- Lock the lock nut and the sleeve (3~5N·M), lock the sleeve and the plug (1.5~1.7N·M).

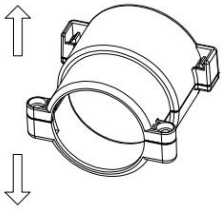


- Insert the plug assembly into the socket (inverter end) and lock each other by the coupling twist.

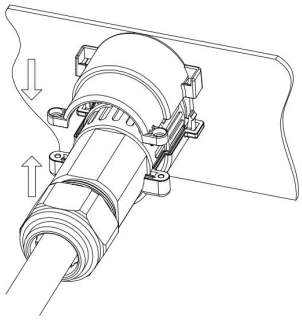


The following three steps apply to the Australian market only:

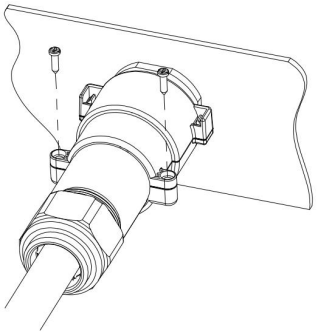
- Dismantle the protective sleeve.



- Install the protective sleeve by assembling the connector's knob into it.



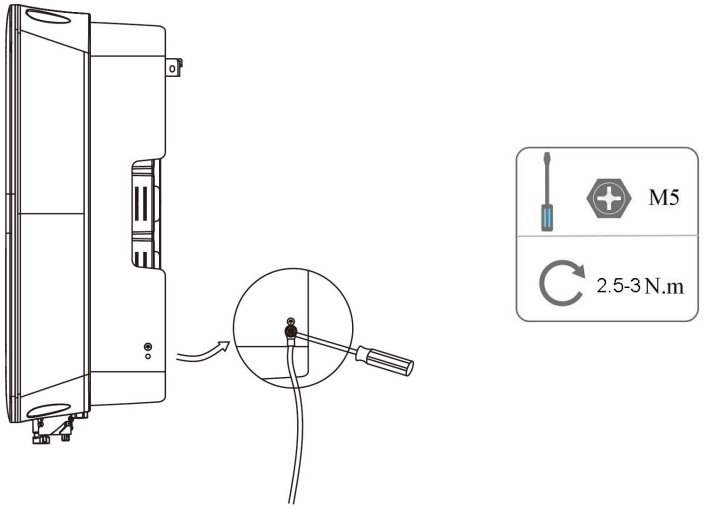
- Fix the protective sleeve with M3*10 self-tapping screws (torque 0.35-0.45 N·M).



6.3 Earth Connection

The cross-sectional area of the ground wire is the same as that of the AC wire.

Screw the ground screw with screwdriver as shown below:



6.4 Communication Device Installation (Optional)

This series inverter is available with multiple communication options such as WiFi, 4G,RS485 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).

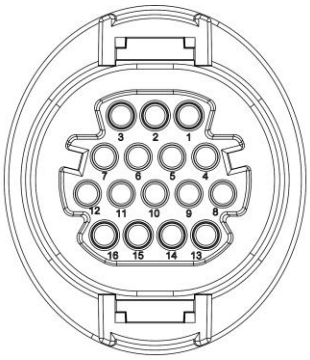
Connection steps:

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/USB” 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

As mentioned above, except the USB port, there is another communication port with a multi Pin connector for monitoring and communication on this series inverter. Two RS485 ports are possible. RS485-1 can be used to monitoring the inverter. RS485-2 is used to connect a smart meter(single machine anti-backflow function). Please read following information carefully for the pin definition of the connector. DRM0 function is also available on this COM connector.

The pin definition of the connectors is shown in the table below.



PIN	Definition	Feature description
1	RS485B1	RS485 communication port
2	RS485A1	
3	RS485B2	Meter communication port
4	RS485A2	
5	GND	
6	RS485B3	Parallel communication port
7	RS485A3	
8	E-STOP	Short connect pin 5 and pin 8 to trigger inverter emergency stop.
9	Contact_1/5	Multiplexed port, compatible with DRM or Ripple control.
10	Contact_2/6	
11	Contact_3/7	
12	Contact_4/8	
13	RefGen	
14	Com/DRM0	
15	DRY+	Reserved
16	DRY-	

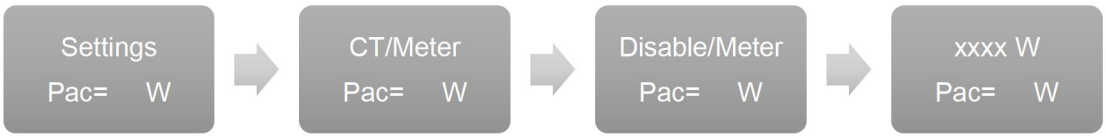
Note: Maximum torque of lock wire is 0.2N·M.

- Meter (optional)

The inverter has integrated export limitation functionality. To use this function, a power meter must be installed. For Meter installation, please install it on the grid side.

Export limitation setting:

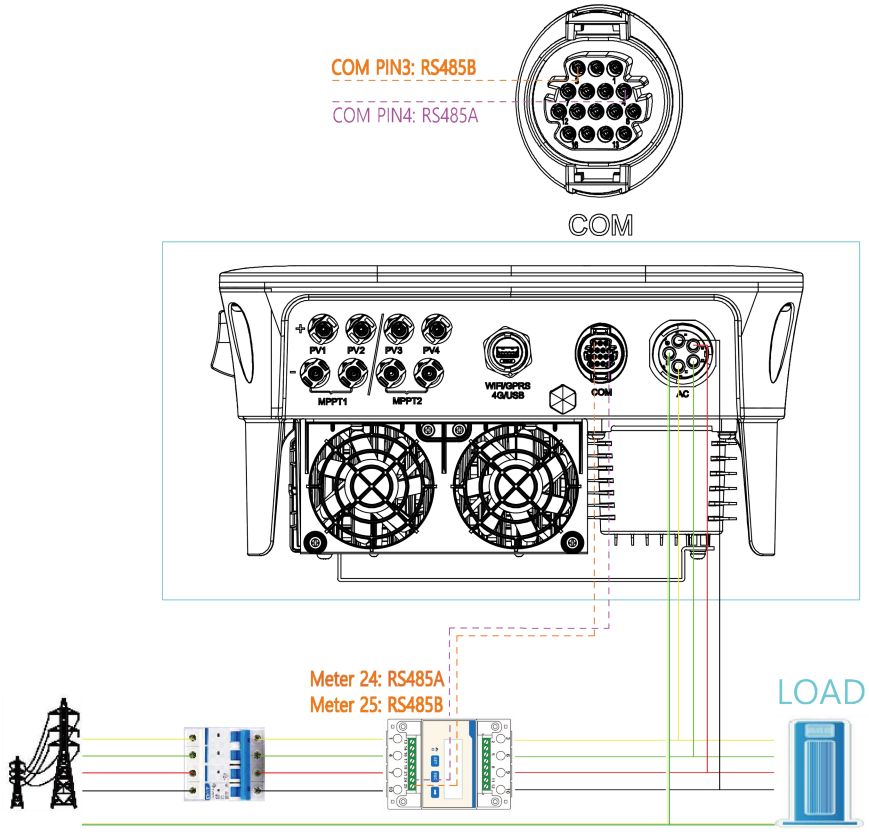
Short press the touch key to switch display or make the Value+1. Long press the touch key to confirm your setting.



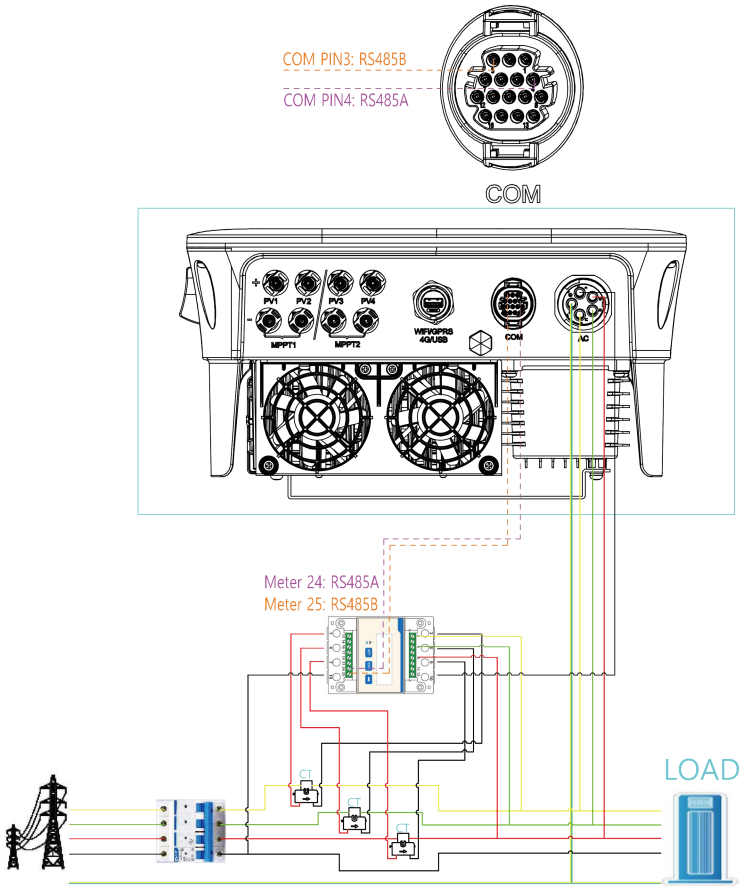
NOTICE
When connecting the electricity meter, please make sure that the way of the electricity meter is correct, otherwise it will affect the size of the load obtained by the inverter and affect the normal operation of the inverter. For the meter wiring please refer to meter's manual for more details.

There are four multimeter&CT connection methods as follows:

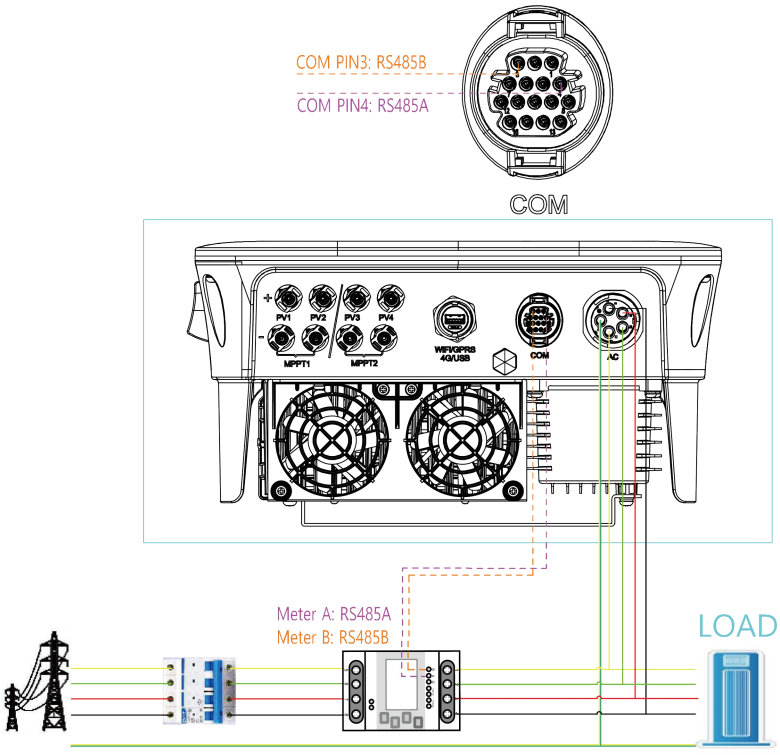
CHINT Multimeter without CT:



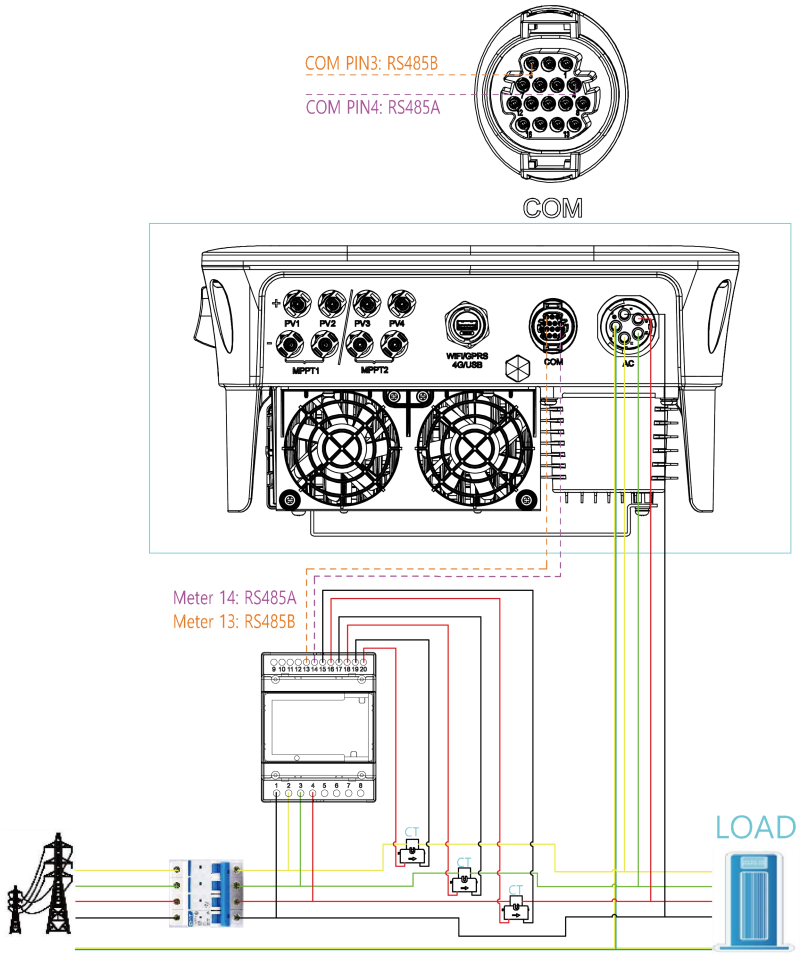
CHINT Multimeter with CT:



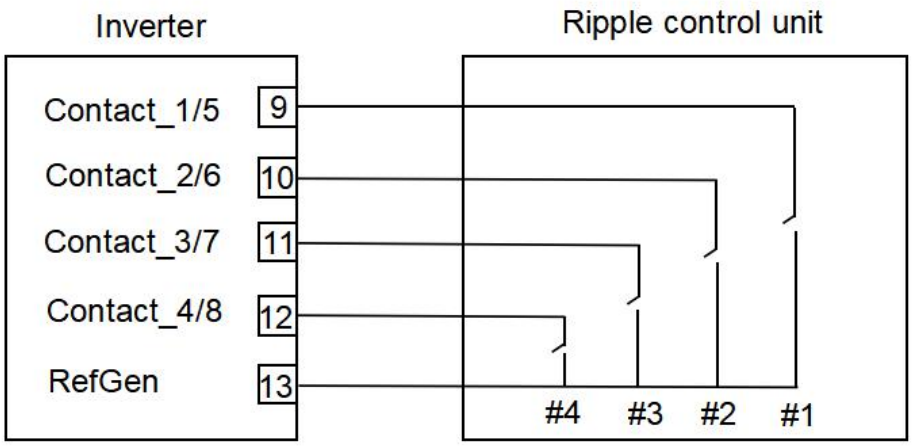
EASTRON Multimeter without CT:



EASTRON Multimeter with CT:



- Ripple control wiring



Ripple control unit	Active power limit (%Pn)
No contact	100%
Multiple contact	100%
Contact #1	60%
Contact #2	30%
Contact #3	0%
Contact #4	Immediate OFF

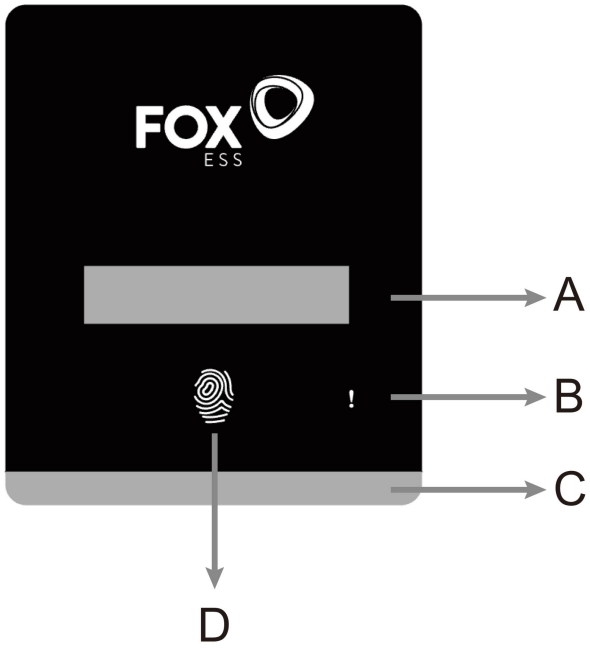
Note:

- Isolation Fault

This inverter complies with IEC 62109-2 clause 13.9 for earth fault alarm monitoring. If an Earth Fault Alarm occurs, the fault code Isolation fault will be displayed on the inverter screen and the RED LED indicator will light up.

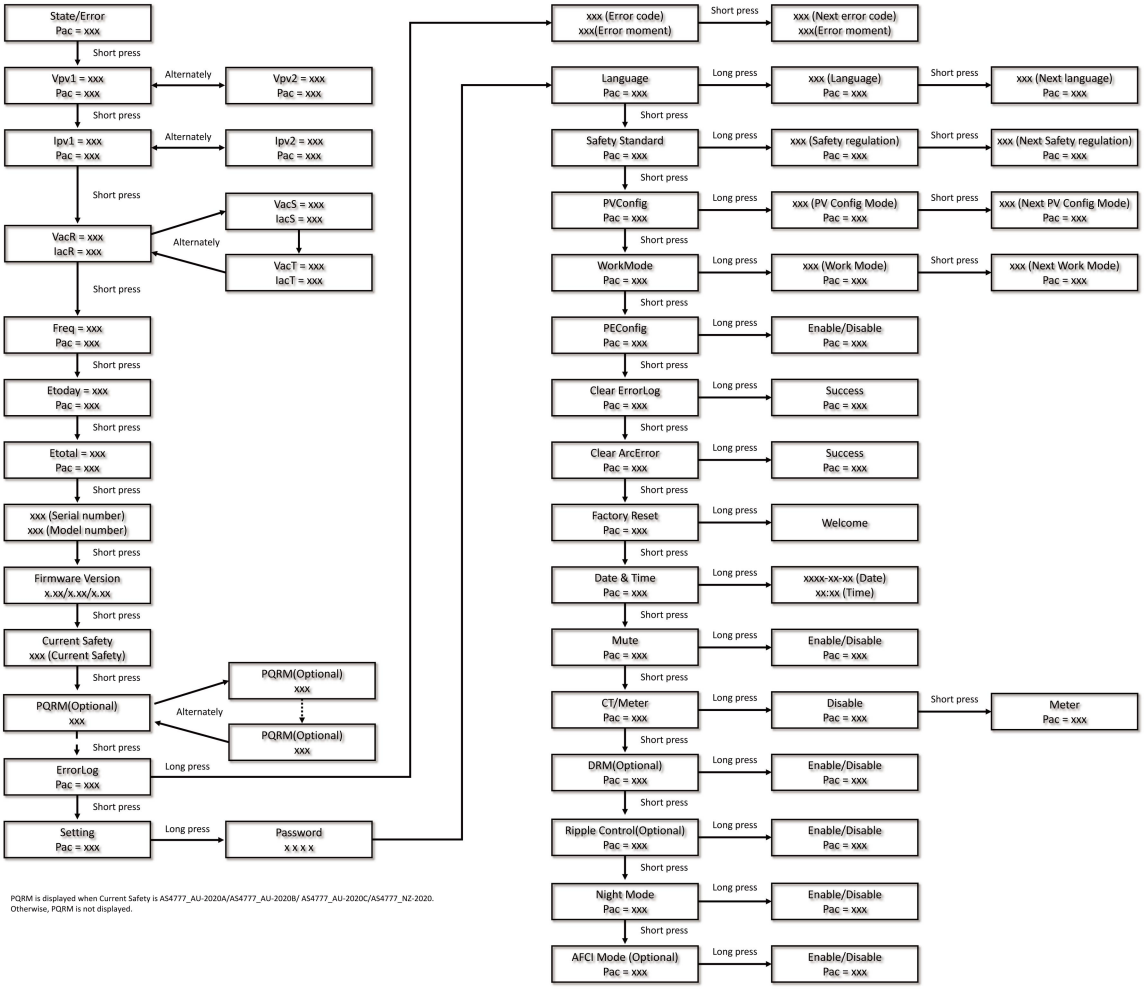
7. Operation

7.1 Control Panel



Object	Name	Function
A	LCD Screen	Display the information of the inverter.
B	Indicator LED	Red: The inverter is in fault mode.
C		Flashing blue light: The inverter is in waiting/checking mode. Blue： The inverter is in normal state.
D	Touch Key	The touch key is used to set the LCD to display different parameters. Press time <1s (short press): Next; Press time >2s (long press): Enter. Wait time 15s: Return to start.

7.2 Function Tree



Note:

- Short press to select, long press to confirm.
- The default password is "3210". Please let qualified installer or distributor to do the settings, end users are not recommended to do the settings.
- PQRM is displayed when Current Safety is AS4777_AU-2020A/AS4777_AU-2020B/ AS4777_AU-2020C/AS4777_NZ-2020. Otherwise,PQRM is not displayed.
- Rippple control is only compatible on the device which has 16 PIN port.

7.3 Inverter Start-Up

Please refer to the following steps to start-up the inverter:

a) Check if device is fixed well on the wall;

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

c) Ensure AC cable is connected to the grid correctly;

d) All PV panels are connected to inverter correctly; DC connectors that are not used should be sealed by cover;

e) Turn on the external AC and DC connectors;

f) Turn the DC switch to the “ON” position (if equipped with DC switch on the inverter).

If the LED is not blue, please check the below:

- All the connections are correct.
- All the external disconnect switches are closed.
- The DC switch of the inverter is in the “ON” position.

Note:

- When starting the inverter for the first time, the country code will be set by default to the local settings. Please check if the country code is correct.
- Set the time on the inverter using the button or by using the APP.

Below are the three possible inverter states indicating that the inverter has started up successfully.

Waiting: Inverter is checking whether or not the DC input voltage from panels is greater than 140V (lowest start-up voltage) and is checking whether the voltage and frequency on AC side are within the range; display will indicate the Waiting status and blue LED will flash.

Checking: Inverter is checking whether PV panels have enough energy to start inverter, display will indicate the Checking status and blue LED will flash.

Normal: Inverter begins to operate normally with blue light on. Meanwhile feedback energy to grid, LCD displays present output power.

Note: You can go to the setting interface on the display to follow the instructions if it is the first time to start up.

- **Complete inverter Start-up guide**

After the initial start-up the inverter, display will go to the language settings page, short press to switch language and long press to confirm selection. Once language set, display will guide to set the safety regulation. Short press to switch safety regulation, and long press to confirm selection.

NOTE

Note!

Please set-up the inverter if it is the first time to start-up. The above steps are for the regular start-up of the inverter. If it is the first time to start up the inverter, you need to carry-out the initial set-up of the inverter.

⚠ WARNING

Warning!

Power to the unit must be turned on only after installation work has been completed.

All electrical connections must be carried out by qualified personnel in accordance with legislation in force in the country of installation.

7.4 Inverter Switch Off

Please follow the below steps to switch off the inverter:

a) Switch off the inverter AC isolation switch.

b) Switch off the DC isolation switch and allow 5 minutes for the inverter to power down completely.

8. Firmware Upgrading

User can upgrade inverter's firmware via a U-disk.

- Preparation

Please ensure the inverter is steadily powered on.

Inverter must remain powered through whole procedure of upgrading. Prepare a PC and make sure the size of U-disk is under 32G, and the format is fat 16 or fat 32.

NOTE
Note! Please DO NOT apply USB3.0 on inverter USB port, the inverter USB port only support for USB2.0.

- Upgrading steps:

Step 1: Please contact our service support to get the update files, and extract it into your U-disk as follows:

Master: “Update\Master\xxx_Master_Vx.xx.bin”

Warning: Make sure the directory is in accordance with above form strictly! Do not modify the program file name, or it may cause the inverter not work anymore!

Slave: “Update\Slave\xxx_Slave_Vx.xx.hex”

Manager: “Update\Manager\xxx_manager_Vx.xx. hex”

AFCI: “Update\AFCI\xxx_AFCI_Vx.xx. hex”

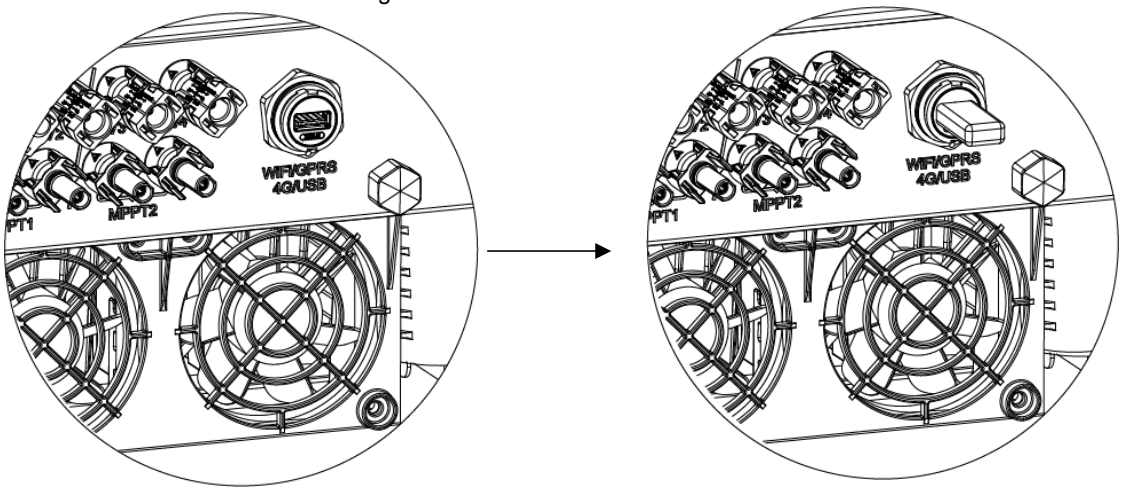
Note: Vx.xx is version number.

Warning: Make sure the directory structure is strictly in accordance with above! Do not modify the program file name, or it may cause the inverter to cease working.

Step 2: Unplug the monitoring device from the "WiFi/4G/USB" port and insert U-disk into the "WiFi/4G/USB" port at the bottom of the inverter.

Step 3: The LCD will show update information. Then shortly press touch key to select the firmware that you want to upgrade and press touch key for 5 seconds to confirm the upgrade.

Step 4: Wait for few minutes until the upgrade is finished. The LCD will go back to the first page and show “Upgrade Master”. Pull out the U-disk and check if the firmware version is the correct one. Please remember to insert the monitoring device.



9. 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.

9.1 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.

9.2 Troubleshooting

a. Please check the fault message on the System Control Panel or the fault code on the inverter information 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 been 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.

9.3 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

Please disconnect all PV strings from the inverter, and turn off DC switch before any maintenance.

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.

10. Decommissioning

10.1 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.

10.2 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.

10.3 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.

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