



X1 Series User Manual

0.7kw~2.0kw



EN



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1 Notes on this Manual

1.1 Scope of validity

This installation guide describes the assembly ,installation, commissioning, maintenance and failure search of the following series inverters.

X1-0.7-S-N	X1-1.1-S-N	X1-1.5-S-N	X1-2.0-S-N
X1-0.7-S-D	X1-1.1-S-D	X1-1.5-S-D	X1-2.0-S-D

Note: **"1.1"** means 1.1kW. **"S"** means "single" or one MPPT string. **"D"** means with "DC Switch", **"N"** means without "DC Switch".

Please store this manual where it will be accessible at all times.

1.2 Target Group

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

1.3 Symbols Used

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



Danger!

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



Warning!

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



Caution!

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



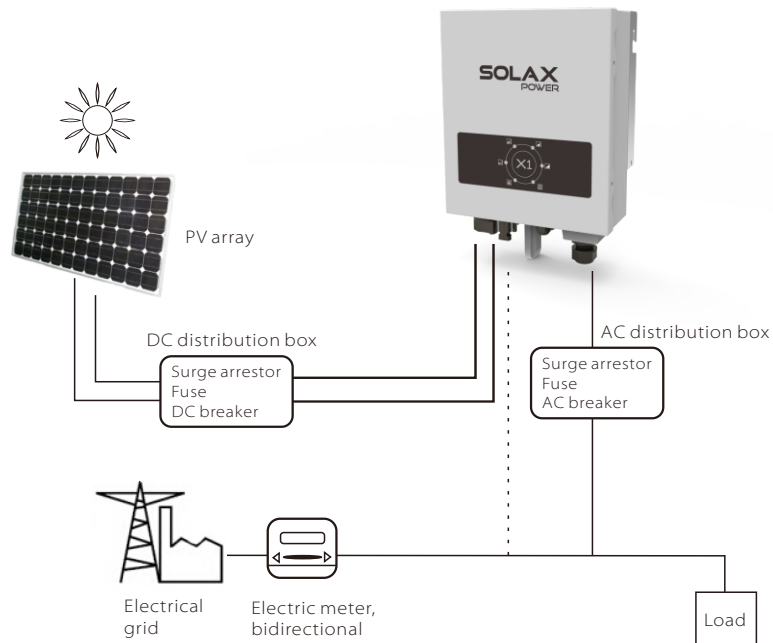
Note!

Note provides tips that are valuable for the optimal operation of your product.

2 Safety

2.1 Appropriate Usage

The X1Series are PV inverters which can convert the DC current of the PV generator into AC current and feed it into the public grid.



CAUTION!

For X1-0.7-S-N, X1-1.1-S-N, X1-1.5-S-N, X1-2.0-S-N, external dc breaker must be connected on the PV side.

► Surge protection devices (SPDs) for PV installation



WARNING !

Over-voltage protection with surge arresters should be provided when the PV power system is installed.
The grid connected inverter is not fitted with SPDs in both PV input side and MAINS side.

Lightning will cause a damage either from a direct strike or from surges due to a nearby strike.

Induced surges are the most likely cause of lightning damage in majority of installations, especially in rural areas where electricity is usually provided by long overhead lines. Surge may be included on both the PV array conduction and the AC cables leading to the building.

Specialists in lightning protection should be consulted during the end use application. Using appropriate external lightning protection, the effect of a direct lightning strike into a building can be mitigated in a controlled way, and the lightning current can be discharged into the ground.

Installation of SPDs to protect the inverter against mechanical damage and excessive stress include a surge arrester in case of a building with external lightning protection system (LPS) when separation distance is kept.

To protect the DC system, surge suppression device (SPD type2) should be fitted at the inverter end of the DC cabling and at the array located between the inverter and the PV generator, if the voltage protection level (VP) of the surge arresters is greater than 1100V, an additional SPD type 3 required for surge protection for electrical devices.

To protect the AC system, surge suppression devices (SPD type2) should be fitted at the main incoming point of AC supply (at the consumer's cutout), located between the inverter and the meter/distribution system; SPD (test impulse D1) for signal line according to EN 61632-1.

All DC cables should be installed to provide as short a run as possible, and positive and negative cables of the string or main DC supply should be bundled together. Avoiding the creation of loops in the system. This requirement for short runs and bundling includes any associated earth bundling conductors.

Spark gap devices are not suitable to be used in DC circuits once conducting, they won't stop conducting until the voltage across their terminals is typically more than 30 volts.

2.2 Important Safety Instructions



Danger!

Danger to life due to high voltages in the inverter!

- All work must be carried out by qualified electrician.
- The appliance is not to be used by children or persons with reduced physical sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.
- Children should be supervised to ensure that they do not play with the appliance.



Caution!

Danger of burn injuries due to hot enclosure parts!

- During operation, the upper lid of the enclosure and the enclosure body may become hot.
- Only touch the lower enclosure lid during operation.



Caution!

Possible damage to health as a result of the effects of radiation!

- Do not stay closer than 20 cm to inverter for any length of time.



Note!

Grounding the PV generator.

- Comply with the local requirements for grounding the PV modules and the PV generator. SolaX recommends connecting the generator frame and other electrically conductive surfaces in a manner which ensures continuous conduction and ground these in order to have optimal protection of system and persons.



Warning!

- Ensure input DC voltage \leq Max. DC voltage. Over voltage may cause permanent damage to inverter or other losses, which will not be included in warranty!



Warning!

- Authorized service personnel must disconnect both AC and DC power from X1-boost before attempting any maintenance or cleaning or working on any circuits connected to the X1-boost.



Warning !

Do not operate the inverter when the device is running.



Warning !

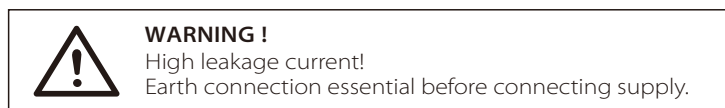
Risk of electric shock!

- Prior to the application, please read this section carefully to ensure correct and safe application. Please keep the user manual properly.
- Use only attachments recommended or sold by SolaX. Otherwise may result in a risk of fire, electric shock, or injury to person.
- Make sure that existing wiring is in good condition and that wire is not undersized.
- Do not disassemble any parts of inverter which are not mentioned in installation guide. It contains no user-serviceable parts. See Warranty for instructions on obtaining service. Attempting to service the X1-boost Series inverter yourself may result in a risk of electric shock or fire and will void your warranty.
- Keep away from flammable, explosive materials to avoid fire disaster.
- The installation place should be away from humid or corrosive substance.
- Authorized service personnel must use insulated tools when installing or working with this equipment.
- PV modules shall have an IEC 61730 class A rating.
- Never touch either the positive or negative pole of PV connecting device. Strictly prohibit touching both of them at the same time.
- The unit contains capacitors that remain charged to a potentially lethal voltage after the MAINS and PV supply has been disconnected.
- Hazardous voltage will present for up to 5 minutes after disconnection from power supply.
- CAUTION-RISK of electric shock from energy stored in capacitor. Never operate on the solar inverter couplers, The MAINS cables, PV cables or the PV generator when power is applied. After switching off the PV and Mains, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you unplug DC and MAINS couplers.
- When accessing the internal circuit of solar inverter, it is very important to wait 45 minutes before operating the power circuit or demounting the electrolyte capacitors inside the device. Do not open the device before hand since the capacitors require time to sufficiently discharge!
- Measure the voltage between terminals UDC+ and UDC- with a multi-meter (impedance at least 1Mohm) to ensure that the device is discharged before beginning work (35VDC) inside the device.

2.3 PE Connection and Leakage Current

- The end-use application shall monitor the protective conductor by residual current operated protective device (RCD) with rated fault current $I_{fn} \leq 240\text{mA}$ which automatically disconnects the device in case of a fault.
- DC differential currents are created (caused by insulation resistance and through capacities of the PV generator). In order to prevent unwanted triggering during operation, the rated residual current of the RCD has to be min 240mA.

The device is intended to connect to a PV generator with a capacitance limit of approx 700nf.



- Incorrect grounding can cause physical injury, death or equipment malfunction and increase electromagnetic.
- Make sure that grounding conductor is adequately sized as required by safety regulations.
- Do not connect the ground terminals of the unit in series in case of a multiple installation. This product can cause current with a d.c component, Where a residual current operated protective (RCD) or monitoring (RCM) device is used for protection in case of direct or indirect contact, only an RCD or RCM of type B is allowed on the supply side of this product.

➤ For United Kindom:

- The installation that connects the equipment to the supply terminals shall comply with the requirements of BS 7671.
- Electrical installation of PV system shall comply with requirements of BS 7671 and IEC 60364-7-712.
- No protection settings can be altered.
- User shall ensure that the equipment is so installed, designed and operated to maintain at all times compliance with the requirements of ESQCR22(1)(a).

➤ For Australia and New Zealand:

Electrical installation and maintenance shall be conducted by licensed electrician and shall comply with Australia National Wiring Rules.












• Island detection method

The island detection method for X1 series inverter is Active Frequency Drift (AFD).

2.4 Explanation of Symbols

This section gives an explanation of all the symbols shown on the inverter and on the type label.

• Symbols on the Type Label

Symbol	Explanation
	CE mark. The inverter complies with the requirements of the applicable CE guidelines.
	TUV certified.
	RCM remark.
	SAA certification.
	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!
	Observe enclosed documentation.
	The inverter can not be disposed together with the household waste. Disposal information can be found in the enclosed documentation.
	Do not operate this inverter until it is isolated from battery, mains and on-site PV generation suppliers.
	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 or the DC lid.

3. Introduction

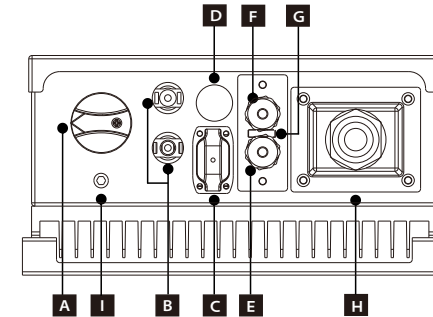
3.1 Basic features

Congratulations on your purchase of a X1 Series inverter from SolaxPower company.

The X1 Series inverter is one of the finest inverter on the market nowadays, incorporating state-of-the-art technology, cost-effective, high reliability.

- Optimal MPPT technology.
- Advanced anti-islanding solutions.
- Excellent protections.
- IP 65 protection level.
- Efficiency up to 97%.
- THD < 2%.
- Current (inrush) < 60A.
- Maximum output fault current < 50A.
- Safe & Reliable: transformer-less design with software and hardware protection.
- Friendly HMI.
 - LED status indicator
 - RS 485 communication interface.
 - PC remote control.
 - Update system by USB.
 - Plug and Play Pocket WiFi.

3.2 Terminals of PV Inverter



Object	Description
A	DC Switch (opt)
B	DC Connector
C	WiFi (opt)
D	E.F.Alarm (opt)
E	RS 485
F	DRM
G	USB for Update
H	AC Connector
I	Ground connection

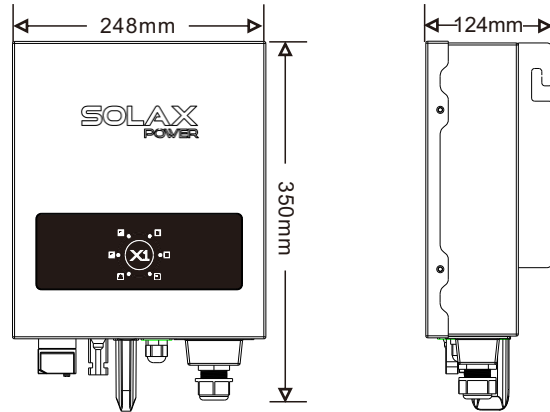


Caution!

Only authorized personnel is allowed to set the connection.

3.3 Dimension and Weight

• Dimension



• Weight

Table 1 Weight

Model	X1-0.7-S-D X1-0.7-S-N	X1-1.1-S-D X1-1.1-S-N	X1-1.5-S-D X1-1.5-S-N	X1-2.0-S-D X1-2.0-S-N
Net Weight	7KG	7KG	7KG	7KG
Gross Weight	9KG	9KG	9KG	9KG

4 Technical Data

4.1 DC Input

Model	X1-0.7-S-D X1-0.7-S-N	X1-1.1-S-D X1-1.1-S-N	X1-1.5-S-D X1-1.5-S-N	X1-2.0-S-D X1-2.0-S-N
Max.PV Input Power	840W	1250W	1650W	2200W
Max.PV Voltage	400V	400V	400V	400V
Nominal Voltage	360V			
MPPT Voltage Range	55~380V	55~380V	55~380V	55~380V
Max.PV Current	10A	10A	10A	10A
ISC PV	12A	12A	12A	12A
MPPT Tracking No.	1			
No. of PV Input	1			

4.2 AC Output

Model	X1-0.7-S-D X1-0.7-S-N	X1-1.1-S-D X1-1.1-S-N	X1-1.5-S-D X1-1.5-S-N	X1-2.0-S-D X1-2.0-S-N
Rated Output Power	700VA	1100VA	1500VA	2000VA
Max.Output Power	700VA	1100VA	1500VA	2000VA
On-grid Connection	Single-Phase			
Voltage Range	180-280V			
Nominal Voltage	220/230/240V			
Max.Output Current	3.5A	5.5A	7.5A	9.5A
Maximum Output fault current	5A	7A	9A	11A
Frequency Range	45-55/55-65 Hz			
Nominal Frequency	50/60Hz			
Power Factor	0.8leading~0.8lagging			
THD	<2%			

4.3 Efficiency,Safety and Protection

Model	X1-0.7-S-D	X1-1.1-S-D	X1-1.5-S-D	X1-2.0-S-D
	X1-0.7-S-N	X1-1.1-S-N	X1-1.5-S-N	X1-2.0-S-N
Euro - Efficiency	95%	95.5%	96%	96.5%
Max.Efficiency	97.1%	97.1%	97.1%	97.1%
MPPT Efficiency	99.9%	99.9%	99.9%	99.9%
Safety & Protection				
Over Voltage Protection	YES			
Over Current Protection	YES			
DC isolation Impedance Monitoring	YES			
Ground Fault Current Monitoring	YES			
DC injection Monitoring	YES			
Protective Class	Class I			

4.4 General Data

Model	X1-0.7-S-D	X1-1.1-S-D	X1-1.5-S-D	X1-2.0-S-D
	X1-0.7-S-N	X1-1.1-S-N	X1-1.5-S-N	X1-2.0-S-N
Net Dimension(W/H/D)	248*350*124mm			
Net Weight	7kg			
Installation	Wall-mounted			
Operating Temperature Range	-20°C~ +60°C(derating at 45°C)			
Storage Temperature	-20°C~ +60°C			
Storage/Operation Relative Humidity	0%~95%, no condensation			
Altitude	<2000m			
Protection Level	IP 65 (for outdoor use)			
Isolation Type	Transformerless			
Night-time Consumption	<1W			
Standby Consumption	<5W			
Cooling	Natural Cooling			
Noise Level	<25dB			
Communication Interface	RS485/WiFi(optional)/USB/DRM			
Standard Warranty	5years(10 years optional)			
Pollution degree	II			
Over voltage range(PV/AC)	II / III			

5 Function

Operation Mode

➤ [Waiting Mode]

The waiting mode means that the inverter is ready to but still not connect to grid.

Under this mode ,it will continue checking if PV array has enough power to feedback into grid.

When the inverter passed dump load test after start up ,it will change from waiting mode to checking mode.

The corresponding state of the inverter shows as right. "  "

➤ [Checking Mode]

If inverter passed load-dump test and no error/fault occurs, start checking to deliver power.

The corresponding state of the inverter shows as right. "  "

➤ [On-Grid Mode]

Under this mode, X1 series inverters convert PV array's DC into AC and feed back into grid.

The corresponding state of the inverter shows as right. "  "



CAUTION!

It is normal that the inverter decreases the power output in the condition of thermal protection, but if this phenomenon occurs frequently, you need to check the heatsink, or consider putting the inverter in the place where have better air flow. If output power decreases caused by electrical, please ask for professional supports.

➤ [Fault Mode]

If any fault/error occurs, the inverter will stop delivering power until the fault/error is cleared. Some fault/error will auto recover, and some may need manual restart.

6 Installation

6.1 Packaging

Description	QTY	Remark	
X1 series inverter	1	0.7~2kw Single MPPT 2 expansion screws and 2 expansion tubes;	
Bracket	1		
Expansion tube	2		
	2		
Screw package	Expansion screw		2
	Cross recessed screw		1
	Ring terminal		1
DC connector	2		
Product manual	1		
Warranty card	1		
Quick installation	1		
AC terminal	3		
Pocket WiFi (optional)	1		

6.2 Installation Precaution

Checking environment where system is installed. Make sure the installation site does not fall into any of the following conditions :

- The ambient temperature is outside the range of tolerable ambient temperature(-20°C to +60°C , -4°F to +140°F)
- Higher than the altitude of about 2,000m above sea level.
- Prone to be damaged by sea water.
- Close to corrosive gas or liquid(for example ,locations where chemicals are processed or the location where feed lots of poultry).
- Exposed to direct sunlight.
- Prone to be flooded or high levels of snow pack.
- Little or no air flow and high humidity.
- Exposed to steam ,vapor or water.
- Exposed to direct cool air.
- Near the television antenna or antenna cable.
- Ventilation is not enough to cool the inverter, that is to say ,outdoors ,the inverter requires. At least 30cm (see table 2) of clearance among the units is needed ,it is recommended that the same clearance between the units and the ground be used. Installing the inverter in the place mentioned above may cause the malfunction of the system caused by water or high temperature inside the inverter. Please let users know that SolaX Power company will not compensate the fault caused by the above situation.

Please avoiding direct sunlight,rain exposure,snow lay up when installing.

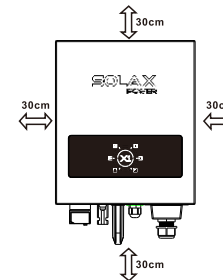
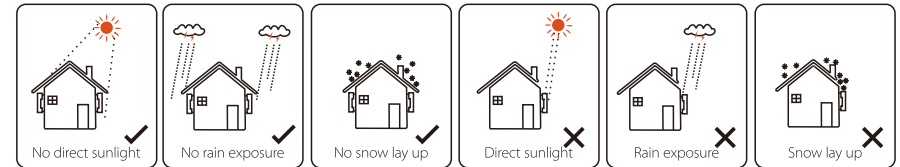


Table Available Space Size

Position	Min.size
Left	30cm
Right	30cm
Top	30cm
Bottom	30cm
Front	30cm

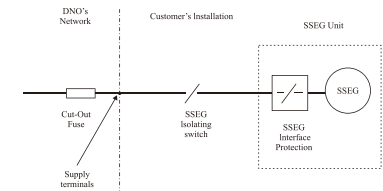
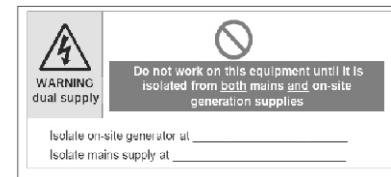
6.3 Preparation

Below tools are needed before installation.



Installation Tools :crimping pliers for binding post and RJ45 ,screw driver and manual wrench and φ 6 drilller.

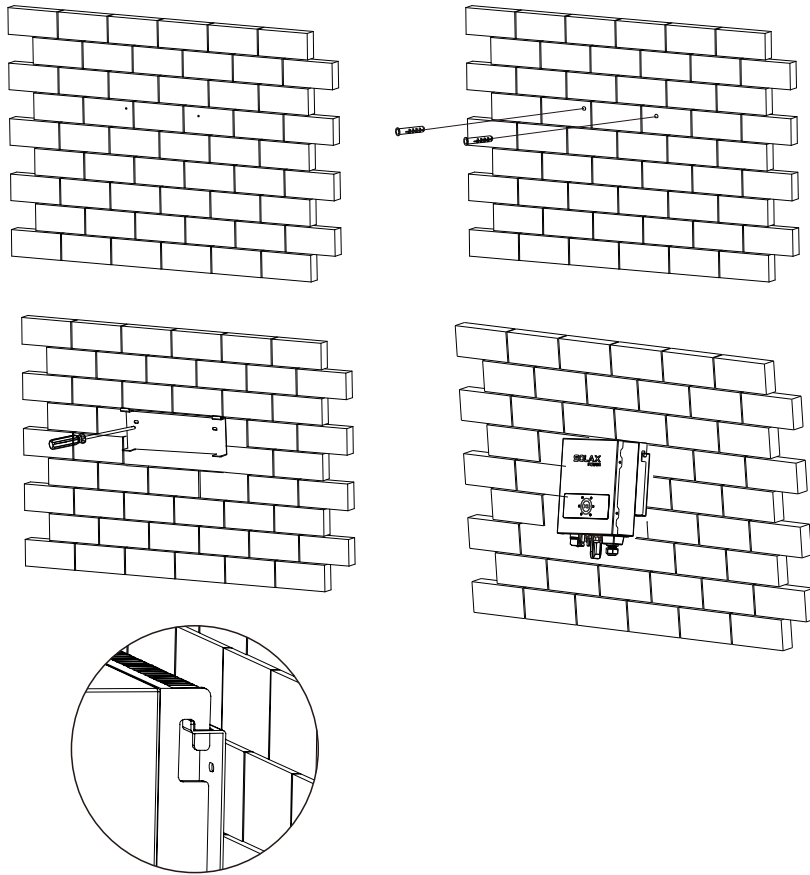
Pay attention to the dual supply.



6.4 Installation Steps

Step1: Screw the wall bracket on the wall

- Use the wall bracket as a template to mark the position of the 4 holes.
- Drill holes with driller, make sure the holes are deep enough (at least 50 mm) for install and tight the expansion tubes.
- Install the expansion tubes in the wall, and screw the wall bracket using the screws in the screw package.



Step2: Match the inverter with wall bracket.

- Transport the inverter to the bracket.
- Hang the inverter over the bracket, move the inverter close to it, match it on the wall bracket.

6.5 Connections of the Inverter

6.5.1 The Main Steps to Connect The Inverter

➤ PV String

0.7 kw - 2.0 kw X1 series inverter have one-string PV connector. Please select PV modules with excellent function and reliable quality. Open circuit voltage of module arrays connected in series should be < Max.DC (table as follow) input voltage: operating voltage should be within the MPPT voltage range.

Table3 Max. DC Voltage Limitation

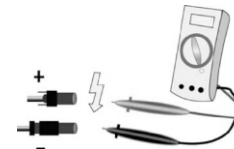
Model	X1-0.7-S-D X1-0.7-S-N	X1-1.1-S-D X1-1.1-S-N	X1-1.5-S-D X1-1.5-S-N	X1-2.0-S-D X1-2.0-S-N
Max.DC Voltage	400V	400V	400V	400V

Please use PV cable to connect modules to inverter .From junction box to inverter, voltage drop is about 1~2%. So we suggest the inverter install near PV module, in order to save cable and reduce DC loss.



Note!

Please do not make PV panel positive or negative ground.



Use multi meter to measure module array voltage



Warning!

PV module voltage is very high which belongs to dangerous voltage range, please comply with electric safety rules when connecting.



Warning!

When there is something wrong with module arrays, modules can be connected with PV grid-connected inverter only after eliminating these problems.

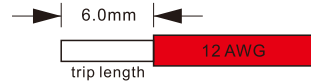


Attention

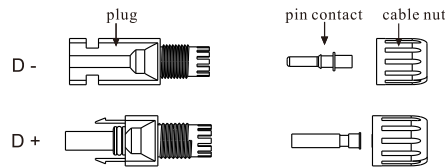
All electrical installations must comply with local regulation. And make sure that the grid connection is permitted by local grid company.

• Connection Step :

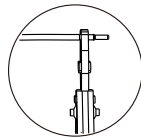
1. Disconnect the DC switch.
2. Choose 12 AWG wire to connect the PV module.
3. Trip 6mm of insulation from the Wire end.



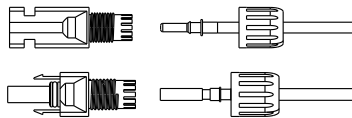
4. Separate the DC connector as below.



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



7. Insert pin contact through the cable nut to assemble into back of the male or female plug. When you feel or heard a "click" the pin contact assembly is seated correctly.



8. Separate the DC connector
 - a. Use the specified wrench tool.
 - b. When separate the DC+ connector, push the tool down from up side.
 - c. When separate the DC- connector, push the tool down from the bottom side.
 - d. Separate the connectors by hands.

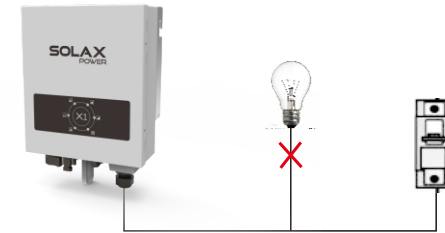
➤ AC Output Connection

X1 series inverter are designed for single phase grid. Voltage range is 220/230/240V, frequency is 50/60Hz. Other technical requests should comply with the requirement of the local public grid.

Table 4 Cable and Micro-breaker recommended

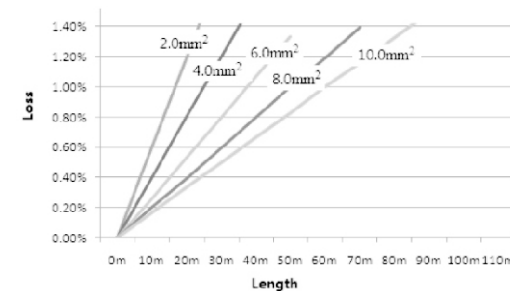
Model	X1-0.7-S-D X1-0.7-S-N	X1-1.1-S-D X1-1.1-S-N	X1-1.5-S-D X1-1.5-S-N	X1-2.0-S-D X1-2.0-S-N
Cable	12AWG	12AWG	12AWG	12AWG
Micro-Breaker	10A	10A	16A	16A

Micro-breaker should be installed between inverter and grid, any load should not be connected with inverter directly.



Incorrect Connection between Load and Inverter

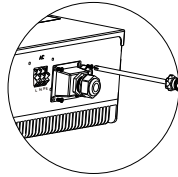
Impedance of X1 series inverter AC connecting dot should be less than 2Ω. To ensure reliable anti-islanding function, PV cable should be used to ensure wire loss <1% than normal power. Moreover, length between AC side and grid connecting dot should be less than 150m. Below chart is cable length, section area and wire loss.



This product has a professional IP65 AC waterproof connector. You have to wire AC by yourself. Please see figure below.

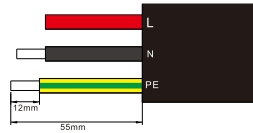
•Connection Step :

- 1.Check the grid voltage and compare with the permissible voltage range. (refer to technical data)
- 2.Disconnect the circuit-breaker from all the phases and secure against reconnection.
- 3.Open the AC lid on the back of the inverter.

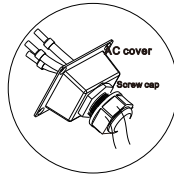


4.Strip the wires:

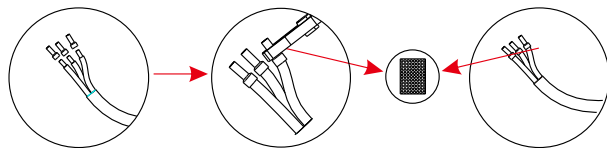
- a.Strip all the wires to 52.5mm and the PE wire to 55mm.
- b.Use the crimping pliers to strip 12mm of insulation from all wire ends as below.



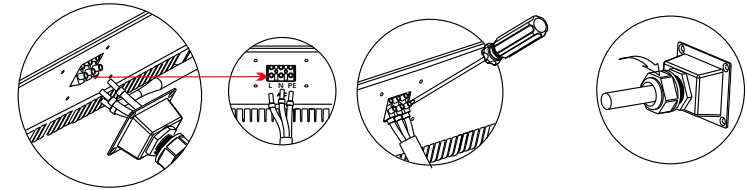
5.Put the cable through the AC components from the screw cap to the AC cover.



6.Insert stripped cable into AC terminal and insure all conductor strands are captured in AC terminal. Compress the AC terminal head by using a crimping pliers and screw down screw cap tight.Cable core section after crimp should be the section as below.



7. Insert the terminal into the corresponding holes (L-L,N-N,PE-PE) and fasten them by screwdriver.

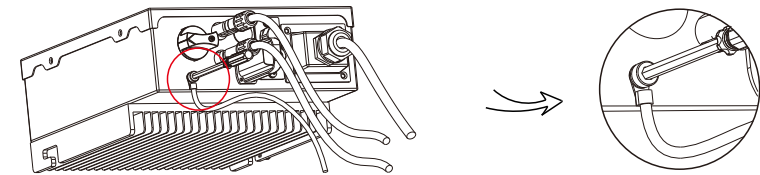


8.Confirm all the wires are screwed down.

9.Screw down screw cap again.

➤ Ground Connection

Screw the ground screw with allen wrench shown as follow.

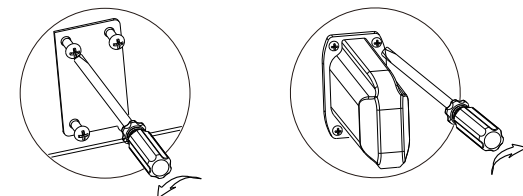


➤ WiFi Connection (optional)

You can read the real time data in the internet either from PC or smartphone with WiFi monitoring.

• Connection Step:

1. Open the WiFi lid on the back of the inverter.
2. Plug the Pocket WiFi (from Solax) into the port named "WiFi" on inverter, and tighten the four screws as below.



3. Connect the WiFi with the router. (Please refer to "WiFi Setting Guide")
4. Set the station account on the Solax web. (Please refer to "WiFi Setting Guide")

6.5.2 Communication Interface

This product has a series communication interfaces : RS 485, USB, DRM. Operating information like output voltage, current, frequency, fault information, etc., can be delivered to PC or other monitoring equipment via these interfaces.

➤ RS 485 Communication

When user wants the information of the power station and manage the entire power system. We offer RS 485 communication.



• Communication

RS 485 is generally for inverter's communication. System monitor should be configured to realize one PC communicates with inverter at same time. Through PC could get real time PV plants operating data. The correspond relationship of the pins of RJ 45 and network cable color shows as below.

T568B connection order

RJ 45 Line NO.	Cable Color
1	Whight orange
2	Orange
3	White green
4	Blue
5	White blue
6	Green
7	White brown
8	Brown

• Connection steps


Cable Color		RS 485 Converter
4	Blue	A
5	White blue	B

RS 485 converter connection

Choose high-quality network cable, trip the insulation from the wire ends. For the end use for the inverter, follow T568B order with press pliers to push into the 8-wire RJ 45 crystal head. For the other end, follow the 2-wire RJ 45 crystal head to connect with the RS 485 converter connector.

➤ USB for Updating

User can update the system through a USB flash drive.




Warning! Make sure the input voltage is more than 100V (in good illumination condition). Or it may result in failing during updating.

• Connection steps

- a) Prepare a USB flash drive. Download the latest installation package named "update.rar" from Solax website: www.solaxpower.com. And then extract it into following directory:

```
"update\ARM\618.00072.00_X1MINI_ARM_Vx.xx_xxxxxxx.usb";
"update\DSP\618.00070.00_X1MINI_DSP_Vx.xx_xxxxxxx.hex".
```



Warning! Make sure the directory is in accordance with above form strictly! Do not modify the program file name and the capital letter can not be changed to lower case! Or it may cause the inverter doesn't work anymore !

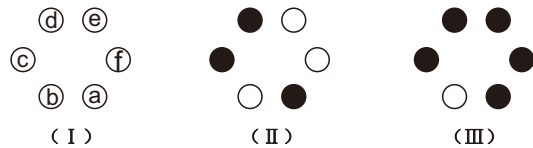
- b) Make sure the DC switch is off and disconnect the AC with grid. Insert USB flash drive into the **"USB"** port on the bottom of X1. Then turn on DC switch or connect the PV connector, green light "a" and red light "b" flash alternately for 10 times. Indicator light "c", "d", "e", "f" are unlit.

**Warning!**

During updating, don't switch off the DC switch or cut off the external dc breaker!

3. About 10 seconds later, the system will be updated automatically. During this period, green light "a" is always been on and red light "b" is unlit. Indicator light "c", "d", "e", "f" show the progress of system updating. Refer to figure II, it represents the updating is half-finished.

4. Once system updating has been finished completely, light "a""c""d""e""f" are all being on, as shown in figure III.



The updating process for ARM needs about 5 seconds and DSP needs about 3 minutes.

**Note !**

If the updating process is paused for more than 3 minutes, please reinsert the USB flash drive.

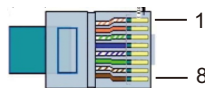
➤ DRM

DRM: demand response mode.

• Communication

DRM is provided to give a remote control with the optional accessory. The remote control function provides a contact signal to operate the inverter. The pin definition and the circuit connection show as below.

Pin	1	2	3	4	5	6	7	8
Definition	DRM1	DRM2	DRM3	DRM4	3.3V	DRM0	GND	GND

**• Connection steps**

1. Choose at least 1mm² wire. Trip the insulation from the wire ends.
2. Insert the tripped wire into the hole of the terminal block.
3. Screw down the screws on the terminal block.

➤ E.F.Alarm (optional)

E.F.Alarm means Earth Fault Alarm. It is the additional detection for functionally earthed PV arrays, as required by AS 4777.2 and AS/NZS 5033.

- a) Measure the resistance to earth of each conductor of the PV array.
- b) If the earth resistance is above the resistance limit (R_{iso} limit) threshold 30K Ω , the system shall reconnect the functional earth and shall be allowed to start.
- c) If the earth resistance is equal to or less than the resistance limit (R_{iso} limit) threshold 30K Ω , the inverter shall shut down and initiate an earth fault alarm in accordance with the requirements of IEC 62109-2.

**Note !**

Direct functional earthing of system is not recommended. Functional earthing via a resistor is a safer option.

6.6 Run the inverter

Start inverter after checking all below steps

- a. Make sure all the DC breaker and AC breaker are disconnected.
- b. AC cable is connected to grid correctly.
- c. All PV panels are connected to inverter correctly ,DC connectors which are not used should be sealed by cover.

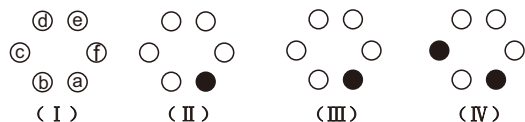
Start inverter

- a. Turn on DC and AC side switches.
- b. Inverter will start up automatically when PV panels generate enough energy. Below is three different states when operating, which means inverter starting up successfully .

Waiting: Inverter is waiting to checking when output DC voltage from PV panels is greater than 60V (lowest start-up voltage) but less than 100V (lowest operating voltage). Under this mode, the green light "a" is flickering, shown as figure II.

Checking: Inverter will check output environment automatically when DC output voltage of PV panels. Under this mode, the green light "a" is flickering, shown as figure III.

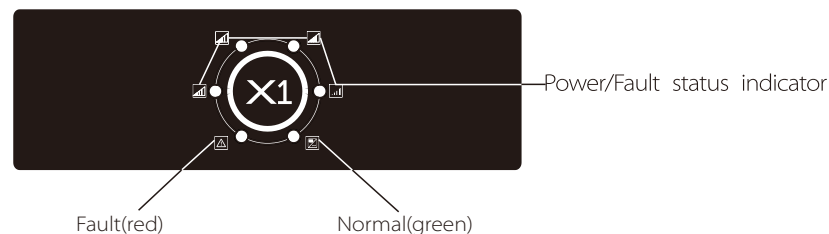
Normal: Inverter begins to operate normally with green light on. Inverters will work in MPPT mode when PV voltage is in the MPPT voltage range, inverter will stop feedback power to grid when PV power is not enough. Under this mode, the green light "a" is always on, light "b, c, d, e" represent the output power. As shown in figure IV, the output power is 0%~25%.









 **Note!**
If indicator light "b" turns red (Fault status), please refer to page 26-27.

7 Operation Method

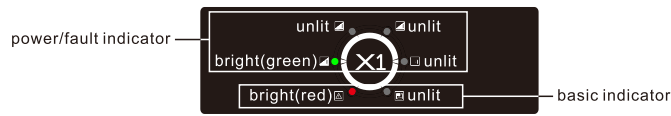
7.1 Indicator Panel



Symbol	Explanation
Basic status indicator	
	Fault, an error has occurred
	Normal operating
Power/Fault status indicator	
	Power range 0%~25%,or indicate fault state
	Power range 25%~50%,or indicate fault state
	Power range 50%~75%,or indicate fault state
	Power range 75%~100%,or indicate fault state

7.2 Indicator Information

Inverter has 2 basic indicator lamps,"Normal"(green) and "Fault"(red). It also has 4 power/falut status indicator lamps that identify the inverter output power range and type of fault. Read the power/fault indicator state , bright or unlit , if the lamp **bright** , use "●" represent it . If the lamp **unlit** , use "○" represent it . The corresponding state of the inverter refer to Table(as follow)Part2



	Indicator Light	Explanation
Ⓓ Ⓔ Ⓒ Ⓕ	a, b	Indicate normal / error
Ⓑ Ⓐ	c, d, e, f	Indicate output power or the type of error





First, read all indicator lamps, if the state of lamps "a" to "f" is "bright, unlit, bright, unlit, unlit", the corresponding figures is "● ○ ○". Refer to Table-Part2, it can be concluded that the operating state of inverter is normal.

Then, read the power/fault indicator state, if the state of lamps "a" to "f" is "unlit, bright, bright, unlit, unlit, unlit", the corresponding figures is "○ ○ ○". It could be find that the type of error is "PV Over Voltage Fault" refer to Table-Part 3.

Table Indicator Information
Part 1 Basic status indicator

Operating State	Indicator	Description
Normal	● ○ ○ ● ○ ○	Indicator light "a" is always being on. And indicator light "c", "d", "e", "f" represent the output power refer to Table-part 2. As shown left, it represents the output power is 25% ~ 50%.
Waiting/Checking	○ ○ ○ ○ ○ ○	Under this mode, indicator light "a" is flickering. Other lights are unlit.
Updating	○ ○ ○ ○ ○ ○	Please refer to page 21.
Fault	○ ○ ○ ● ○ ○	Indicator light "b" is always being on. And indicator light "c", "d", "e", "f" represent the type of error refer to Table-part 2.

Part 2 Normal status indicator

Power Range	Indicator
0-25% 	○ ○ ○ ● ○ ○
25-50% 	● ○ ○ ● ○ ○
50-75% 	● ● ○ ● ○ ○
75-100% 	● ● ● ○ ● ●

Part 3 Fault status indicator

Faults	Indicator	Description
PV Over Voltage Fault	○ ○ ○ ● ○ ○	PV Volt Fault
Isolation Fault	● ○ ○ ○ ○ ○	Isolation Fault
Over Temperature Fault	● ○ ○ ● ○ ○	Temp Over Fault
DCI Fault	○ ○ ○ ○ ○ ○	DCI Device Fault DCI OCP Fault
RCD /RC Fault	○ ○ ○ ● ○ ○	RCD Fault
Mains Lost	● ● ● ○ ○ ○	Grid Lost Fault

Faults	Indicator	Description
Grid Volt Fault		Grid Volt Fault
Grid Freq Fault		Grid Freq Fault
Consistant Fault		Sample Fault
Relay Fault		Relay Fault
Eeprom Fault		Inv Eeprom Error Mgr Eeprom Fault
Comms Lost		Include SPI,SCI Faults
Bus High		Bus Volt Fault
Tz Fault		Tz Protect Fault SW OCP Fault
Other Device Fault		Other Device Fault PLL Lost Fault
AC10M Volt Fault		AC10Min Volt Fault

8. Troubleshooting

8.1 Troubleshooting

This section contains information and procedures for solving possible problems with the X1 series inverter, and provides some troubleshooting tips to identify and solve most problems that could occur with X1 series inverter. This section will help you narrow down the source of any problems you may encounter. Please read the following troubleshooting steps.

Check the indicator light state. Record it before anything further solutions. Attempt the solution indicated in troubles shooting list. If the indicator lamp unlit, check the following list to make sure that the present state of the installation allows proper operation.

- Is the inverter located in a clean, dry, adequately ventilated place?
- Have the DC input breakers been opened?
- Are the cables adequately sized and short enough?
- Are the communication cable properly connected and undamaged?

Please contact SolaX Power company 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.

Troubles shooting list

Faults	Diagnosis and solutions
Pv Over Voltage Fault	-Check the panel's open-circuit voltage whether the value is similar or already >Max. DC voltage -Please seek help from us when voltage \leq Max. DC voltage
Isolation Fault	-Check the connection of the inverter. - Or seek for help from us.
Over Temperature Fault	-Check the connection of the inverter. -Or seek for help from us.
DCI Fault	-Disconnect PV+ , PV-, reconnect them. -Or seek help from us, if can not go back to normal state

Faults	Diagnosis and solutions
RCD /RC Fault	Leakage current detection circuit Fault -Disconnect PV+ , PV-, reconnect them. -Or seek help from us, if can not go back to normal state
Mains Lost	-Off to grid. -Please check grid-connection,like wire, interface, etc. -Checking grid usability. -Or seek for help from us.
Grid Volt Fault	Grid Voltage out of range -System will reconnect if the utility is back to normal. -Or seek help from us.
Grid Freq Fault	Grid Frequency out of range -System will reconnect if the utility is back to normal. -Or seek help from us.
Consistent Fault	CPU or other circuitry Fault -Disconnect PV+ , PV- , reconnect them. -Or seek help from us, if can not go back to normal state.
Relay Fault	Relay is failure between grid and inverters -Disconnect PV+ , PV-, reconnect them. -Or seek help from us, if can not go back to normal state.
Eeprom Fault	Eeprom Fault -Disconnect PV+ , PV- , reconnect them. -Or seek help from us, if can not go back to normal state.
Comms Lost	-Disconnect PV+ , PV-, reconnect them. -Or seek help from us, if can not go back to normal state
Bus High	Bus Voltage out of normal range. - Disconnect PV+ , PV- , reconnect them. - Check if the PV input is within the range of the inverter. -Or seek help from us, if can not go back to normal state
Tz Fault	-Disconnect PV+ , PV- , reconnect them. -Or seek help from us, if can not go back to normal state.
Else	Else -seek help from us.
AC10M Volt Fault	AC10Minute overvoltage Fault -System will reconnect if the utility is back to normal. -Or seek help from us.

8.2 Routine Manitenance

Inverters do not need any maintenance or correction in most condition , but if the inverter often loses power due to overheating , this can be the following reason:

The cooling fins on the rear of house are coverd with dirt.

Clean the cooling fins with a soft dry cloth or brush if necessary.

Only trained and authorized professional personnel who are familiar with the requirements of safety was allowed to perform servicing and maintenance work.

Safety checks

Safety checks should be performed at least every 12 mouths by manufacturers's qualified person 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 test ,the device has to be repaired .

Maintain periodically

Only qualified person may perform the following works.

During the process of using the inverter ,the manage person shall examine and maintain the machine regularly .The concrete operations are follow.

- 1.Check that if the cooling fins on the rear of house are covered by dirt, and the machine should be cleaned and absorbed dust when necessary . This work shall be check time to time.
- 2.Check that if the input and output wires are damaged or aged. This check should be performed at least every 6 months.
- 3.You should get the inverter panels cleaned and their security checked at least every 6 months.

9. Decommissioning

9.1 Decommissioning

Disconnect the inverter from DC input and AC output.
Remove all connection cables from the inverter.
Remove the inverter from the bracket.

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

Suitable for loads more than 30kg
With handle.
Can be fully closed.

9.2 Storage and Transportation

Store the inverter in dry place where ambient temperatures are always between $-20^{\circ}\text{C}\sim+60^{\circ}\text{C}$, Take care of the inverter during the storage and transportation ,keep less than 4 cartoons in one stack.

9.3 Disposal

Please be sure to deliver wasted inverter and packing materials to certain site , where can assist relevant department to dispose and recycle.