G2(Generation 2) SUN Series Grid Tie Power Inverter

With Limit Sensor and WIFI Plug connectors

Installation and Operation Manual



SUN-1000G2

SUN-2000G2

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G2 Sun Series Grid Tie Inverter Models

Sun series grid tie inverters include several models, refer to table 1.

Table 1, G2 Sun Series Grid Tie Inverter Models

Model	Rated Power (Max./Continuous)	DC Input Voltage	AC Output Voltage	AC Output Frequency	Max. Efficiency	Night Power Consumption
SUN-1000G2-M	1000W / 900W	22V~65V	95V~265V	45Hz~64Hz	90%	1.0W
SUN-1000G2-H	1000W / 900W	45V~90V	95V~265V	45Hz~64Hz	92%	1.5W
SUN-2000G2-H	2000W / 1800W	45V~90V	185V~265V	45Hz~64Hz	92%	1.5W

Model Name description:

SUN-XXX G2-X

- DC Input Voltage Range, “M” is 22V~65V, “H” is 45V~90V
- “G2” is the Abbreviation of Generation Two
- The Rated Output Power
- The Title Name of Sun Series Products

Important Safety Information

Read this First!
This manual contains important instructions to follow during the installation and maintenance of the Sunshine Grid Tie Inverter.
To reduce the risk of electrical shock and ensure the safe installation and operation of the Sunshine Grid Tie Inverter, the following safety symbols appear throughout this document to indicate dangerous conditions and important safety instructions.



WARNING! This indicates a situation where failure to follow instructions maybe cause a safety hazard or equipment malfunction. Use extreme caution and follow instructions carefully.



NOTE: This indicates information particularly important for optimal system operation. Follow the instructions closely.

Safety Instructions



WARNING!
Be aware that the Sunshine Grid Tie Inverters' body is the heat sink and can reach a temperature of 80°C under extreme conditions. To reduce the risk of burns, do not touch.

- Perform all electrical installations in accordance with all local electrical codes and the National Electrical Code.
- Be aware that only qualified personnel should install or replace Sunshine Grid Tie Inverter.
- Do not attempt to repair the Sunshine Grid Tie Inverter; it contains no user-serviceable parts.
- If it failed, please contact Sunshine customer service to obtain an RMA number and start the replacement process. Tampering with or opening the Sunshine Grid Tie Inverter will void the warranty.
- Before installing or using the Sunshine Grid Tie Inverter, please read all instructions and cautionary markings in the technical description and on the Sunshine Grid Tie Inverter and the PV-array.

Introduction of Sunshine Grid Tie Inverter

Sunshine Grid Tie Power Inverter is the world's most technologically advanced inverter for use in utility-interactive applications. This manual details the safe installation and operation of the Sunshine Grid Tie Inverter.
This integrated system maximizes energy harvest, increases system reliability, and simplifies design, installation, and management.
The small type of solar grid tie power inverter can obtain solar energy from the solar panel and tie to the grid through its output cables with no extra equipment. The installation is very convenient and reliable.
We call the system combining with small solar grid tie inverter and solar panels as 'SGPV.' The system includes solar panels and small type grid tie inverter and installation kit. Solar panels can be mono silicon, polygon silicon, non-crystal film, or any other material that can convert solar energy into electric energy. The power of the grid tie inverter should be matched to the power of solar panels connected. So the power of SGPV is defined by its solar panels, it can be standardization according to the actual using.
The inverter can be connected to any outlets of the utility grid at the house. The small grid tie inverter monitors the voltage, frequency, and phase of the home utility grid, producing pure sine wave AC power that the frequency and phase are the same as the grids. The voltage is a bit higher than the grids, then according to the current-controlled PWM, to control the output power to the grid. The small grid tie inverter puts out power when the home grid is on. When the sun shines, the PV panel will produce DC voltage, and the grid tie inverter will change the DC voltage to AC voltage and puts out power to the home grid. When the total power of the electric apparatus that are using in the house is larger than the output power of the inverters, this power from the inverters will be consumed in the house. This will slow down the power meter; otherwise, the difference of the output power of the inverter between the total used power of the apparatus will go out from the house to the out grid.

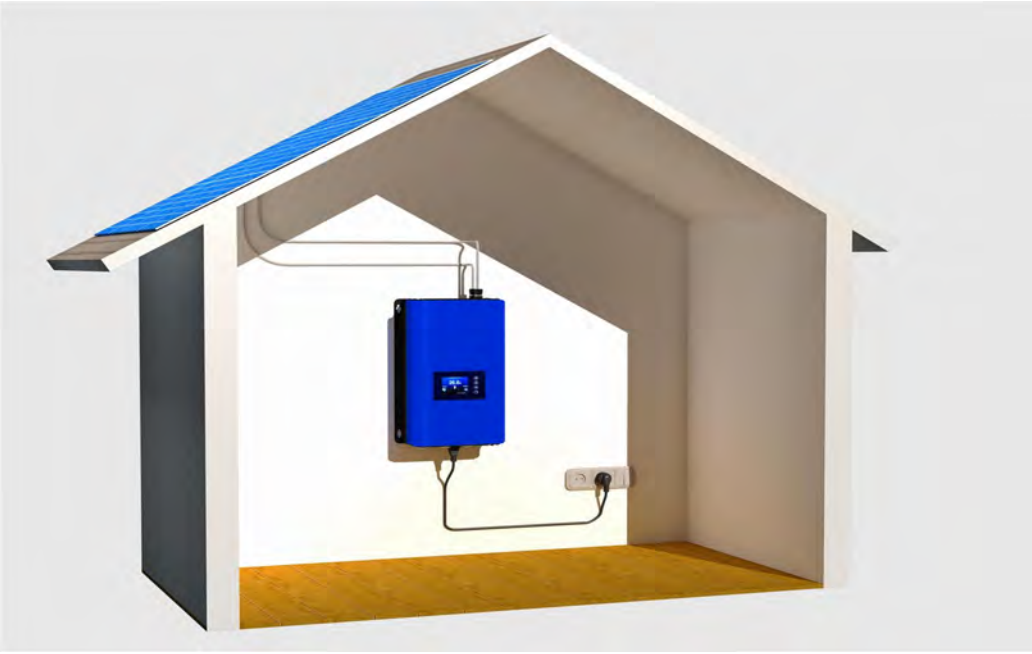
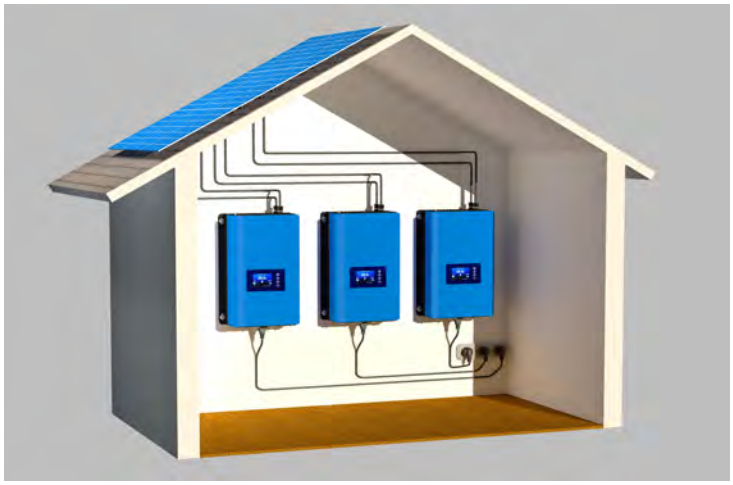


Fig 1. A Small Grid Tie Power System with Sunshine Grid Tie Inverter



Multiple inverters can be connected in parallel to create a bigger system. Plug and play installation.

Advantage of The Sunshine Grid Tie Power System

There are many advantages of SGPV compare with the traditional grid tie power system.
1. Low cost and easy installation - SGPV can make full use of all types of buildings' surfaces that face the sun in the city as well as fast and easy installation of solar modules and grid tie inverter. It just needs very low maintenance costs.
2. Free combination - SGPV can be used as a separate grid tie system and set up as a large solar array with many of them. The quantity of SGPV in the array is just according to your desire.
3. Combination of SGPV does not interact - The traditional solar grid tie system is always connected with many panels. Those solar panels are connected in series, so the input voltage is very high, although, the traditional grid inverter has an MPPT feature (Maximum Power Point Tracking), but the maximum power point is according to the entire series in terms of solar panels array, if the performance of one piece of solar panels in the system, for some reason, such as leaves, bird droppings, dust, shadow, etc. and degrades, the performance of the entire solar power system will decrease.

SGPV system has no such disadvantage. If the performance of a piece of solar panels in the system degrades, this just effects one SGPV, will not affect other SGPV in the system.

4. Improving the efficiency of the entire solar power system – In a traditional grid tie system, many solar panels are connected in series, so the MPPT of the inverter is according to the total panels in series, not to every panel. Still, there is a difference between every panel, so not every panel is working at the maximum power, this will reduce the total power of these panels in series.
But SGPV has no such disadvantage. Because every inverter of SGPV has MPPT function, so every panel is working at the maximum power, this will increase the efficiency of the entire system.
5. Low power consumption – Most of the parts in the small grid tie inverter are digital ICs and low power MCU, so the power consumption of it is low. Though the quantity of grid tie inverters is increased, this will not increase the power consumption much of the entire system.

Sunshine Grid Tie Inverter Installation

Follow the instructions in this section to install Sunshine Grid Tie Inverters.



WARNING: Before installing the Sunshine Grid Tie Inverter, read all instructions and cautionary markings in the user manual, on the Sunshine Grid Tie Inverter, and the photovoltaic array.



WARNING: Perform all electrical installations in accordance with all local electrical codes and the National Electrical Code (NEC)



WARNING: Connect the Sunshine Grid Tie Inverter to the electrical utility grid only after receiving prior approval from the utility company.



WARNING: Be aware that only qualified personnel should connect the Sunshine Grid Tie Inverter to the electrical utility grid.



WARNING: Be aware that the installation of this equipment includes the risk of electric shock. Normally grounded conductors may be ungrounded and energized when a ground fault is indicated.

Installation Procedure

Installing Sunshine Grid Tie Power System involves several key steps:

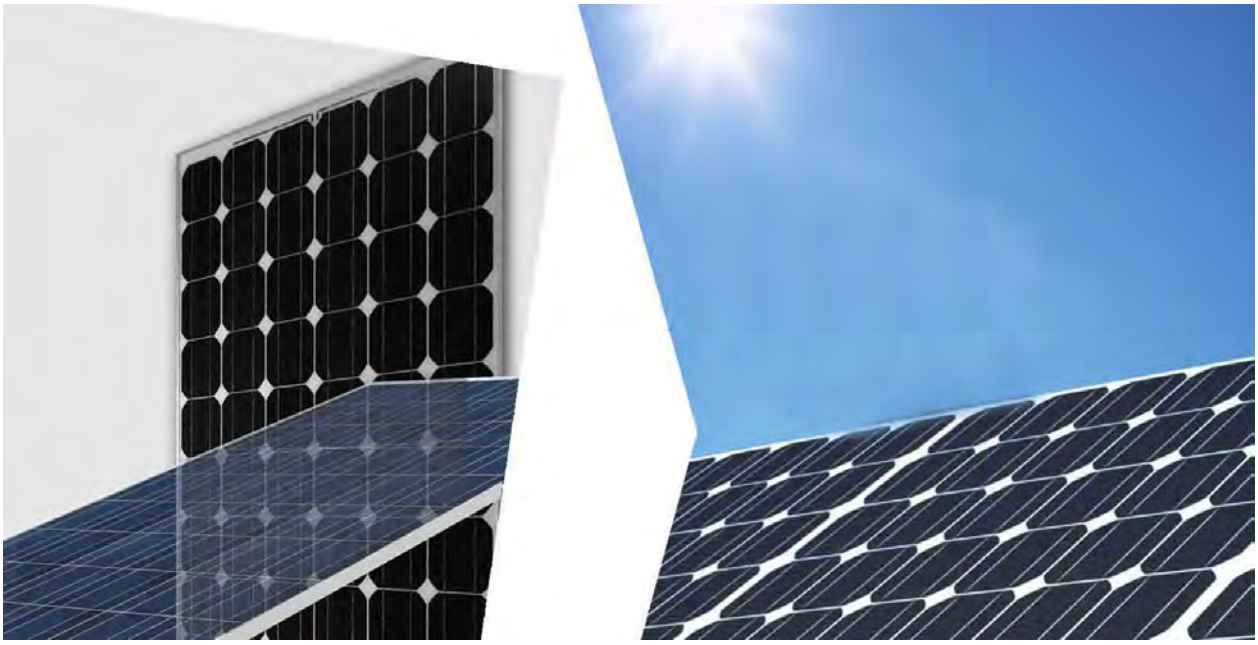
1. Considering the total capacity of the grid tie power system that you need
2. Choosing applicable solar panels for Sunshine Grid Tie Inverter
3. Selecting accessory for installation of the Grid Tie Power System
4. Selecting the correct model of Sunshine Grid Tie Inverter
5. Installing solar panels to a suitable place
6. Installing Sunshine Grid Tie Inverter to a suitable place
7. Connecting Sunshine Grid Tie Power System with cables and connectors
8. Grounding the system
9. Completing the Sunshine installation map and Connecting the PV modules

Each of the detailed installation steps in the following sections is numerically referenced in the installation diagram below.

WARNING: DO NOT connect Sunshine Grid Tie Inverters to the utility grid or energize the AC circuit(s) until you have completed all of the installations

Step1. Considering the total capacity of the grid tie power system that you need.
The whole grid tie power system's total capacity is according to your power consumption in the site you want to install, or how much power you want it to feed to the utility grid. The volume is just according to your will because when the total power of electric appliances used in the installation site is larger than the output power of the grid tie power system, this power from the system will be consumed in the site, this will slow down the power meter; otherwise, the difference of the system's output power between the total used power of the appliances will feed to the utility grid.
For example, suppose you want to install a grid tie power system in your house. In that case, you could decide the total power volume according to the total power the appliances that you use in your house, maybe the consumption of total energy per day is about 5KWH. Then you should realize the real irradiation time per day at your site actually the real irradiation time is an average result because it will vary every day according to the climate, just assume the time is 6 hours so that you can install a 1KW grid tie power system, with this capacity of the system, it can supply all power consumption in the whole year.
When the grid tie power system is working, sometimes, there is extra power feed to the utility grid if the power from the grid tie system is larger than the power consumed by the appliances in your house, and sometimes will not when it is not larger.
Of course, you can install a 500W grid tie power system or 2KW grid tie inverter, even more large capacity or more small capacity grid tie inverter, it doesn't matter. But if the capacity is too big, you should consider the volume of the AC system of your house, whether it can hold the fed power or not.
If you want not to allow the system to feed extra power to the grid, you can use the inverter's limit function.

Step2. Choosing applicable solar panels for Sunshine Grid Tie Inverter.



Description of Solar Panel

A solar panel is an array of solar cells. It is an electrical device that converts the energy of light directly into electricity by the photovoltaic effect. When exposed to light, it can generate and support an electric current without being attached to any external voltage source.

Most solar panels consist of solar cells connected in serial. Recently, the main solar cells have two types, Mono and Poly. Their performance is almost the same.
The main technical data of solar panels are including Efficiency, Pmax, Vmp, Imp, Voc, Isc, etc. For example, the specifications of one type of 245W solar panels consist of 60cells are shown below.

Module Efficiency: 14.8%	*Pmax:* 245W
Vmp: 29.4V	*Imp:* 8.34A
Voc: 36.9V	*Isc:* 8.68A

Note: These specifications are under Standard Test Conditions(STC).

STC: Irradiance 1000W/m², Cell temperature 25℃, Air mass AM1.5, according to EN60904-3.

Module Efficiency is the converting efficiency that the module converts the energy of light into electrical power.
Pmax is the Maximum Power of solar panels.
Vmp is the Rated Voltage at Pmax.
Imp is the Rated Current at Pmax.
Voc is the Open Circuit Voltage.
Isc is the Short Circuit Current.
Because these specifications are under STC, these specifications are also sensitive to the temperature of surroundings, so we should consider the variety of these specifications. Please check the curves of I-V and Temperature Dependence of Isc, Voc, Pmax.

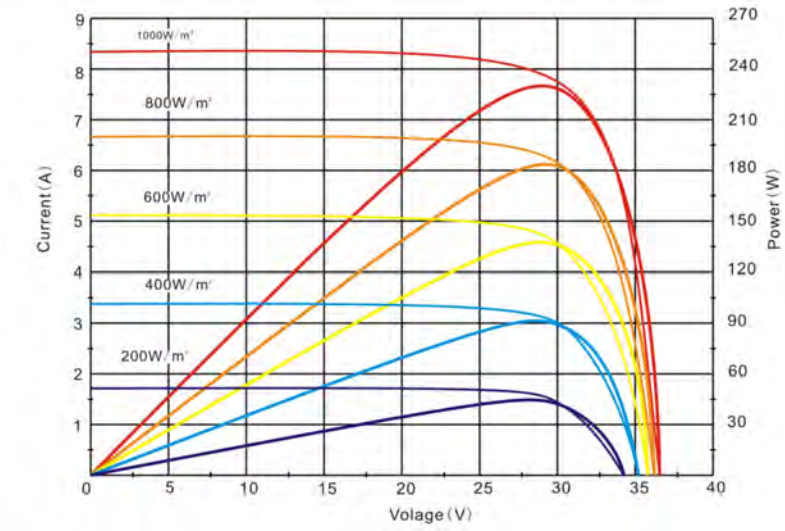


Fig 2. I-V Curves

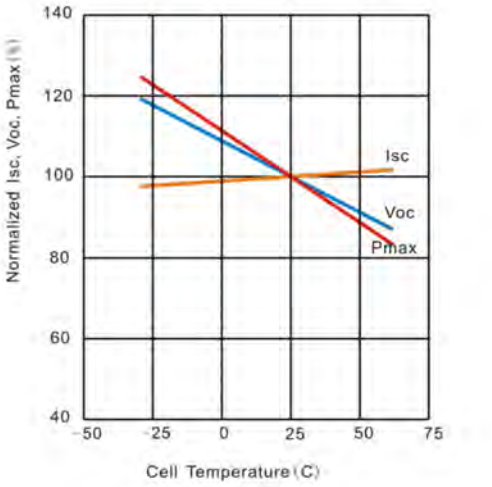


Fig 3. Temperature Dependence of Isc, Voc, Pmax

The I-V Curve shown in Fig. 2 is a solar panel's I-V curves that the power is 230W. You can get the information from this I-V curves that different irradiance under sunshine will get different power from the same solar panel, and also different power will be converted under the same irradiance, but the output of DC voltage is different, the solar panel just can get maximum power at one point under a certain irradiance, this point is called maximum power point(MPP). The MPP also is sensitive to the temperature of the surroundings.
The temperature dependence of Isc, Voc, Pmax is shown in Fig. 3. You can see that the Pmax and Voc have negative temperature characters, Vmp also has the same character.

Choosing solar panels

The most important specifications when selecting solar panels are Pmax, Voc, Vmp, and Isc.
1, The total Pmax of solar panels should be equal to or less than the Rated Power(Peak)of the inverter that you will connect.
2, The total Voc of solar panels should be less than the maximum point of the DC input range of the inverter. It is according to the connecting method if you connect solar panels in parallel, all panels must have the same Voc, the Pmax of each panel can be different or same, so the total Voc is as same as one Voc, but if you connect solar panels in serial, the Isc of each solar panel must be same, the Pmax of each panel can be different or same, so the total Voc is the summation of all solar panels connected in serial. Connecting solar panels with the same specifications in a single system is the best choice.
3, The total Vmp of solar panels should above the minimum point of the DC input range of the inverter. The connecting method principle is as same as item 2 above.

Step3. Selecting Accessory for Grid Tie Power System installation. The accessory for grid tie power system including:
1, DC cables will be connected with solar panels and inverters.
2, Connectors.
3, AC cables.
4, Power meter(Optional).
5, Bracket for solar panels installation(not included in this user manual).

Selecting DC cables

Before you connect the solar panels to the inverter, a suitable specification of cables should be selected. The selection of specifications of the cables is according to the total power of the solar panels and the connecting method of solar panels.

You should calculate the maximum current that will transit through the cables, we mark it as Imax. First, calculate the total Pmax of the solar panels that will be consisted of the grid tie power system, we mark it as TPmax, then calculate the total Vmp of them, we mark it as TVmp, we also can get total Imp, mark it as TImp, with this, we can get the TImax using formula (1) or (2) shown below.

TImp = TPmax/TVmp ------ (1)

or TImp = Imp×N ------ (2) N is the parallel number of solar panels

After finished the calculation of Imax, then we can pick suitable cables according to Table 2. It's the best way that you choose solar cables for outdoor use.

Selecting Connectors

When installing the SGPV system, maybe you should use some connectors for connecting solar panels and inverter. Most of these connectors are shown below.



MC4 Connectors



Connectors for parallel connecting

Selecting AC cables

AC cables will be supplied with inverters by our factory. We will supply different types of AC cables according to the standards of different countries. You should provide the information to the dealers where you will install the system.

Step4. Selecting Correct Model of Sunshine Grid Tie Inverter.

When finished step1 to step3 and decided the connecting method of the solar panels, you can select a correct inverter model. The input DC voltage range of the inverter should fit the DC output voltage of the solar panel array, the rated power of the inverter should also fit the total power of the solar panel array, and the AC output of the inverter should fit the standard of AC utility grid.

Table 2: American Wire Gauge (AWG) Cables / Conductor Sizes and Properties

AWG	Diameter [inches]	Diameter [mm]	Area [mm2]	Resistance [Ohms /1000 ft]	Resistance [Ohms/ km]	Max Current [Amperes]	Max Frequency for 100% skin depth
0 (1/0)	0.3249	8.25246	53.5	0.0983	0.322424	150	250 Hz
1	0.2893	7.34822	42.4	0.1239	0.406392	119	325 Hz
2	0.2576	6.54304	33.6	0.1563	0.512664	94	410 Hz
3	0.2294	5.82676	26.7	0.197	0.64616	75	500 Hz
4	0.2043	5.18922	21.2	0.2485	0.81508	60	650 Hz
5	0.1819	4.62026	16.8	0.3133	1.027624	47	810 Hz
6	0.162	4.1148	13.3	0.3951	1.295928	37	1100 Hz
7	0.1443	3.66522	10.5	0.4982	1.634096	30	1300 Hz
8	0.1285	3.2639	8.37	0.6282	2.060496	24	1650 Hz
9	0.1144	2.90576	6.63	0.7921	2.598088	19	2050 Hz
10	0.1019	2.58826	5.26	0.9989	3.276392	15	2600 Hz
11	0.0907	2.30378	4.17	1.26	4.1328	12	3200 Hz
12	0.0808	2.05232	3.31	1.588	5.20864	9.3	4150 Hz
13	0.072	1.8288	2.62	2.003	6.56984	7.4	5300 Hz
14	0.0641	1.62814	2.08	2.525	8.282	5.9	6700 Hz
15	0.0571	1.45034	1.65	3.184	10.44352	4.7	8250 Hz
16	0.0508	1.29032	1.31	4.016	13.17248	3.7	11 k Hz
17	0.0453	1.15062	1.04	5.064	16.60992	2.9	13 k Hz
18	0.0403	1.02362	0.823	6.385	20.9428	2.3	17 kHz
19	0.0359	0.91186	0.653	8.051	26.40728	1.8	21 kHz
20	0.032	0.8128	0.518	10.15	33.292	1.5	27 kHz
21	0.0285	0.7239	0.41	12.8	41.984	1.2	33 kHz
22	0.0254	0.64516	0.326	16.14	52.9392	0.92	42 kHz
23	0.0226	0.57404	0.258	20.36	66.7808	0.729	53 kHz
24	0.0201	0.51054	0.205	25.67	84.1976	0.577	68 kHz
25	0.0179	0.45466	0.162	32.37	106.1736	0.457	85 kHz
26	0.0159	0.40386	0.129	40.81	133.8568	0.361	107 kHz
27	0.0142	0.36068	0.102	51.47	168.8216	0.288	130 kHz
28	0.0126	0.32004	0.081	64.9	212.872	0.226	170 kHz
29	0.0113	0.28702	0.0642	81.83	268.4024	0.182	210 kHz
30	0.01	0.254	0.0509	103.2	338.496	0.142	270 kHz
31	0.0089	0.22606	0.0404	130.1	426.728	0.113	340 kHz
32	0.008	0.2032	0.032	164.1	538.248	0.091	430 kHz
33	0.0071	0.18034	0.0254	206.9	678.632	0.072	540 kHz
34	0.0063	0.16002	0.0201	260.9	855.752	0.056	690 kHz
35	0.0056	0.14224	0.016	329	1079.12	0.044	870 kHz
36	0.005	0.127	0.0127	414.8	1360	0.035	1100 kHz
37	0.0045	0.1143	0.01	523.1	1715	0.0289	1350 kHz
38	0.004	0.1016	0.00797	659.6	2163	0.0228	1750 kHz
39	0.0035	0.0889	0.00632	831.8	2728	0.0175	2250 kHz
40	0.0031	0.07874	0.00501	1049	3440	0.0137	2900 kHz

Step5. Installing Solar Panels to a suitable place.
Install the solar panels of the SGPV to a suitable location that sunshine can irradiate on them. There must have no shadow, the installation direction of the solar panels should be according to the geography position that the system will be installed. Different positions should have different installation directions, the principle is to get maximum irradiation in all year round.



Warning: Ensure that there is no shadow at the location that solar panels will be installed because even the shadow just covers only one cell of solar panel, maybe it will cause the total system to stop to produce power.



Warning: Ensure using a strong bracket to fix the solar panels to avoid the danger under high wind.

Step6. Installing Sunshine Grid Tie Inverter to a suitable place.
Place the Sunshine Grid Tie Inverter on a surface protected from direct sunlight, high temperatures, and water. The inverter requires at least 150mm of clearance around itself for ventilation. The inverters are for indoor use, can't use outdoor. You can use screws to fix the inverter to the surface because some models of Sunshine grid tie inverter have fans on the bottom cover, so the surface should be flat.

Step7. Connecting the Sunshine Grid Tie Power System with Cables and Connectors After finished from Step1 to Step6, you should connect the solar panels and inverters with cables and connectors to integrate the Sunshine Grid Tie System.

Step8. Grounding the system.
Route a continuous GEC through each of the solar panels to the NEC approved AC grounding electrode. The racking and module could be grounded to this conductor using a crimp connection. An alternative method would be to connect the grid tie inverters to the grounded racking using a grounding washer approved for the racking. The ground wire of the AC cables are connected to the housing of the inverter when the AC cables are connected to the inverters, so when the AC plug is inserted to the socket of the AC outlet of the utility grid in the house, the ground pin of the socket must be connected to the Earth ground.

Step9. Connecting the PV modules after complete from Step1 to Step8.



Warning: If you connect the PV modules to the inverter under sunshine, you should cover the modules with no transparent material like black cloth. If the modules have been connected in serial, cover one module, actually, just need to cover one cell of the module, but if the modules have been connected in parallel, you should cover one module of every branch, also just need to cover one cell when you cover a module.

Cover the modules under sunshine just to avoid the sparkle when connecting the cables.

Example of Installation of 1KW grid tie power system

To explain the installation operation, we assume that there is a house that the usual electricity consumption is about 5KWH per day, and the real irradiation time is about 5 hours.

1, Considering the total capacity of the grid tie power system that you need.
As we stated at Step1, we can get a result that a 1kW Sunshine Grid Tie Power System is suitable for this house, so we will establish a 1KW grid tie power system step by step. We also assume that we will install the system in the house where the utility grid is 230V/50Hz.

2, Choosing applicable Solar Panels.
Because the most popular solar panels are 240Wp~250Wp poly panels with 60 PCS solar cells, so choosing this kind type panels will be more economical. The system is a 1KW power system, so we should use 4 PCS 240Wp to 250Wp solar panels.
Most of these kinds of solar panels have similar specifications shown below.

Module Efficiency:14.8%	Pmax:245W
Vmp:29.4V	Imp:8.34A
Voc:36.9V	Isc:8.68A

so use 4 PCS of this type panels, we can get total power:
TPmax = 245Wp×4 = 980Wp
from these solar panels, it is suitable for the 1KW SUN-1000G model inverter.

Notes: The Pmax specification of a solar panel is under STC, the actual power is variation according to the irradiation on the panel and the temperature surroundings. The real output power can't reach Pmax for most in the whole day.

3, Selecting Accessory for Grid Tie Power System installation.
Because we should connect 4 PCS solar panels to Sunshine Grid Tie Inverter, so some connectors are necessary. Considering the Voc, Vmp, and Isc, we choose some MC4 connectors and some connectors for parallel connecting.
For the choice of DC cables, we should consider the connecting method of solar panels. There are two methods to choose.
Method 1: Connecting the 4 panels in parallel so that the maximum DC current will be

TImp = TPmax/TVmp = 980W/29.4V = 33.3A or

TImp = Imp × 4 = 8.34A × 4 = 33.3A

According to Table 2, we should choose AWG6 Cables.

Method 2: Connecting 2 panels in serial consist as a pair, so 4 panels can be gotten 2 pairs,

TImp = TPmax/TVmp = 980W/58.8V = 16.7A or

TImp = Imp × 2 = 8.34A × 2 = 16.7A

So, according to Table 2, we should choose AWG9 Cables.
Because the DC cables will be more expensive if the diameter is big, considering this matter, the method that can use smaller diameter cables will be a good choice.

4, Selecting correct model of Sunshine Grid Power Inverter.
Because maybe there will be several methods of connecting solar panels to Sunshine Grid Tie Inverter, different connecting methods maybe should use a different model inverter. In this case, there are two connecting methods.
With method 1, because all panels are connected in parallel, so we can know that the TVoc(total Voc of the solar panels) will be the same as Voc of one panel, and the TVmp also is the same as Vmp of one panel. So we can get the specifications of the solar panels array with solar panels connected to each other.
TPmax:245W×4 TVmp:29.4V
TImp:8.34A×4 TVoc:36.9V
TIsc:8.68A×4
From these specifications, we should use SUN-1000G-M. Because the DC input voltage range of this model is 22V to 65V, so the TVoc and TVmp are in the DC input voltage range.
With method 2, we also can get the specifications of the solar panels array.
TPmax:245W×4 TVmp:29.4V×2
TImp:8.34A×2 TVoc:36.9V×2
TIsc:8.68A×2
From these specifications, we should use SUN-1000G-H. Because the DC input voltage range of this model is 45V to 90V, so the TVoc and TVmp are in the DC input voltage range.

The two connecting method diagrams are shown in Fig.4 and Fig.5 below.

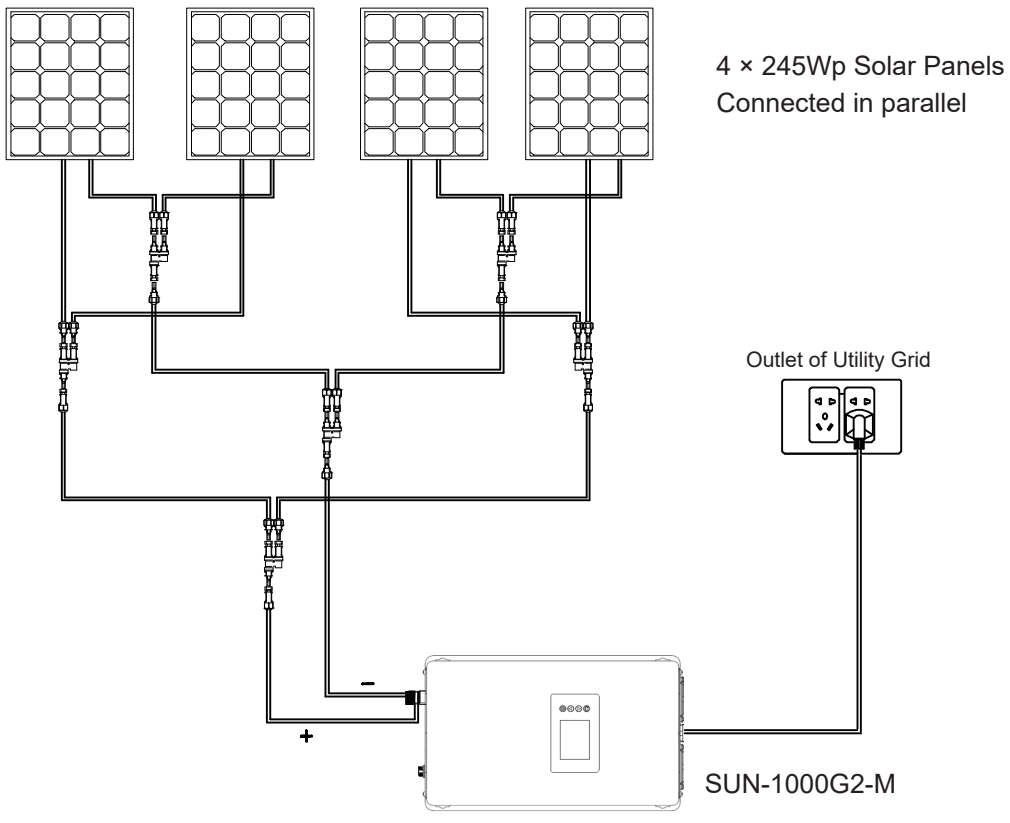


Fig.4 1KW Sunshine Grid Tie Power System Connected With Method 1

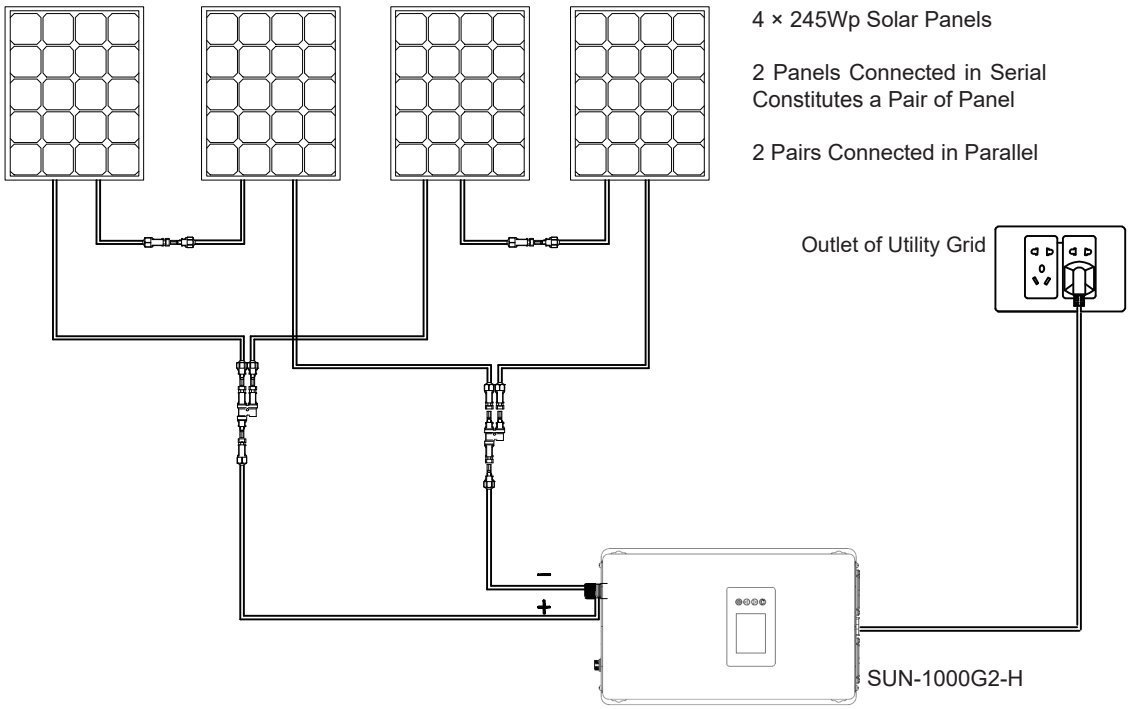


Fig. 5 1KW Sunshine Grid Tie Power System Connected With Method 2

Comparing the connected method in Fig.4 and Fig5, we can see that method 2 is a good choice because with method 1, the DC cables are thicker, so it is more expensive, and three pairs of connectors for parallel connecting plus three pairs of MC4 connectors should be used.
But with method 2, the DC cables are thin, and just a pair of connectors for parallel connecting and a pair of MC4 connectors should be used.

Installing a larger capacity of grid tie power system.

Sometimes, maybe you are willing to install a larger capacity of grid tie inverter in your house, this is also very easy to operate. For example, you want to install a 2KW grid tie power system, you can install two 1KW grid tie power systems as shown in Fig.5, two AC output cables should be all connected to the AC outlet of the utility grid with the plugs. The diagram of the 2KW grid tie system with two 1KW systems is shown in Fig. 6, we call this kind system as "Stackable System".

You can use just one SUN-2000G2 2KW inverter to replace two SUN-1000G2 1KW inverter, connect arround 2KW solar panels to the inverter to get a 2KW "SGPV". You also can install many "SGPV" in parallel to get large power grid tie system.

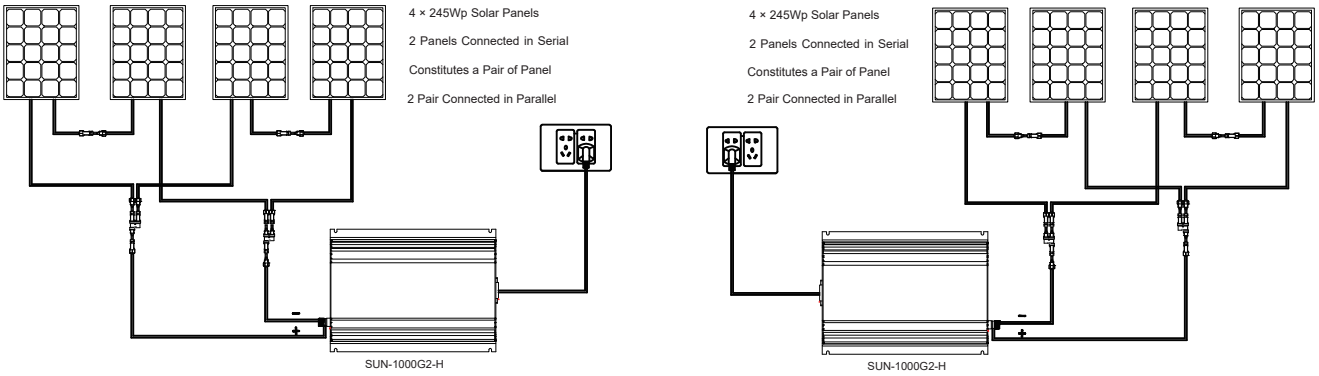


Fig.6 2KW Grid Tie Power System Consist of Two 1KW Grid Tie Power System Stacked

You can install any capacity of the grid tie power system by stack small grid tie power systems. For example, if you want to install a 12KW grid tie power system, there are many choices, you can stack six 2KW grid tie power systems, or twelve 1KW grid tie systems. Even you can mix different capacity grid tie power systems to gain large capacity system.

WARNING: Don't Connect the DC input Terminals of one Sunshine Grid Tie Power Inverter to another's. If so, neither of the inverters can find the correct maximum power point(MPP), this will reduce the efficiency of the system. Shown in Fig.7.

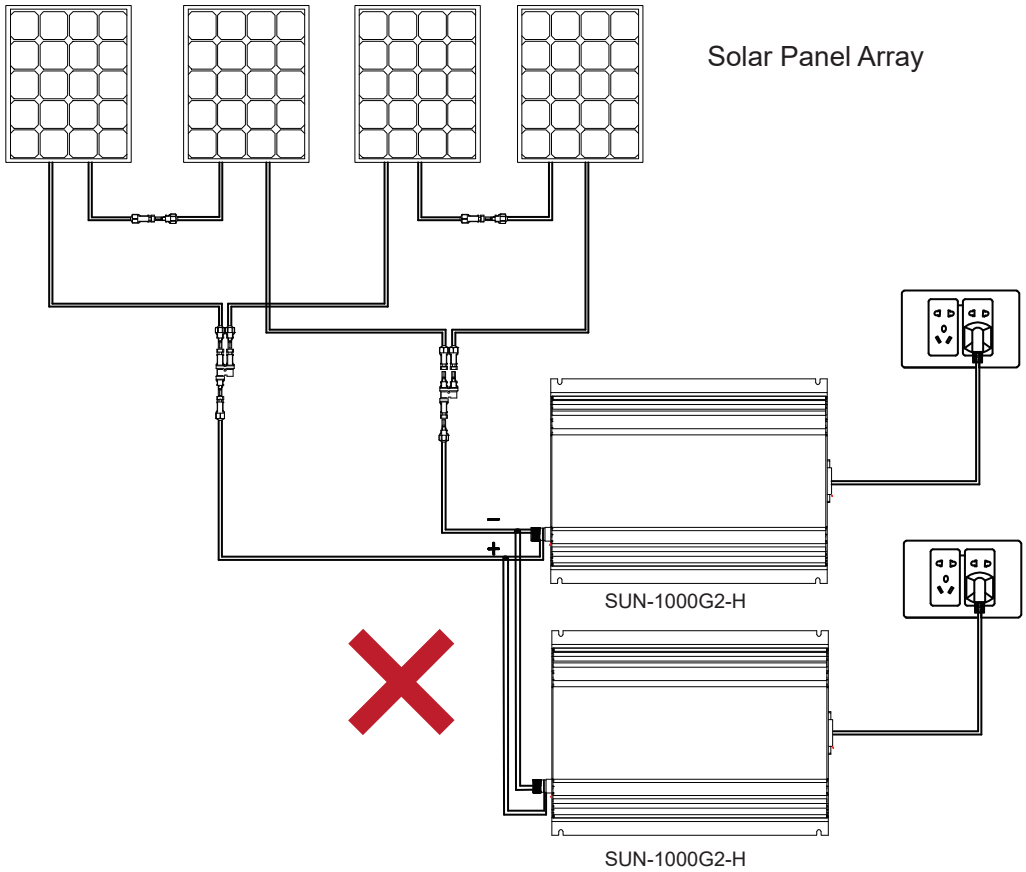


Fig.7 Error Connecting of DC Input Terminals

Installing Sunshine Grid Tie Power System to Three Phases Utility Grid.

When the Capacity of the Grid Tie Power System is large, install all the power systems to one phase of the utility grid is not reasonable. Maybe this will cause an unbalance of the three phases of the utility grid.
In this section, we will explain how to install a Sunshine Power System to three phases of the utility grid separately to balance the fed power.

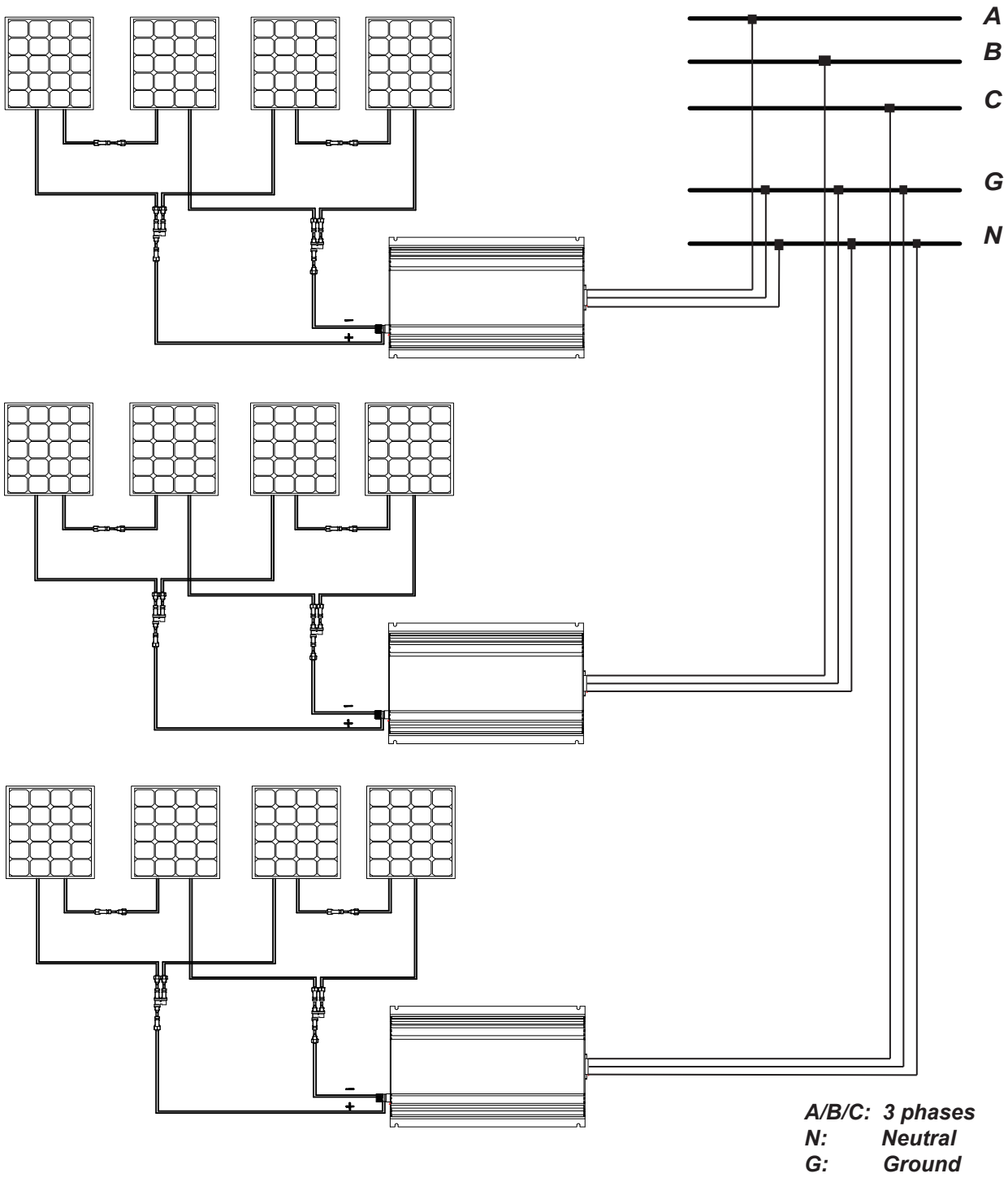


Fig.8 Three Phases Grid Tie Power System

For example, install a 3KW grid tie power system to a three phases utility grid.
The diagram is shown in Fig. 8, we separate the 3KW power system to three power system units, every unit has 1KW power. Connecting every system unit to a different phase can balance all grid tie power to three phases of the utility grid.
Follow this way, you can install a more large grid tie power system to three phases, just separate the whole power system to three equal power system units.

The Layout of Sunshine Grid Tie Power Inverter

SUN-1000G2-X layout, please see Fig. 9

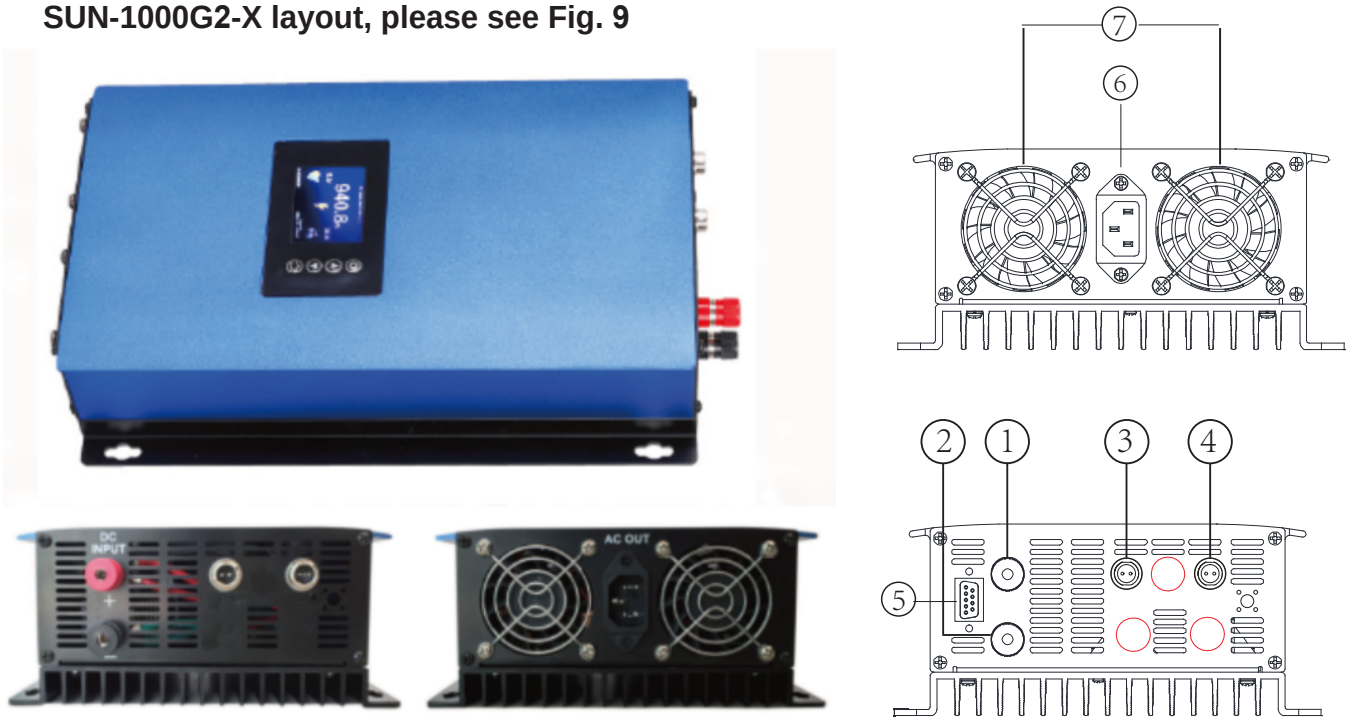


Fig. 9 SUN-1000G2-X layout

① DC Input Positive Terminal. This terminal will connect to the positive wire of solar cables connected with the positive pole of the solar panels.

② DC Input Negative Terminal. This terminal will connect to the negative wire of solar cables connected with the negative pole of the solar panels.

③ ④ Limit Connection. Please check the user manual of the limit function.

⑤ Wifi Plug Connection. Please check the user manual of Wifi Plug.

⑥ AC socket. This socket will connect the inverter to the public grid via the AC cable.

⑦ Cooling fans.

SUN-2000G2-X layout, please see the Fig. 10

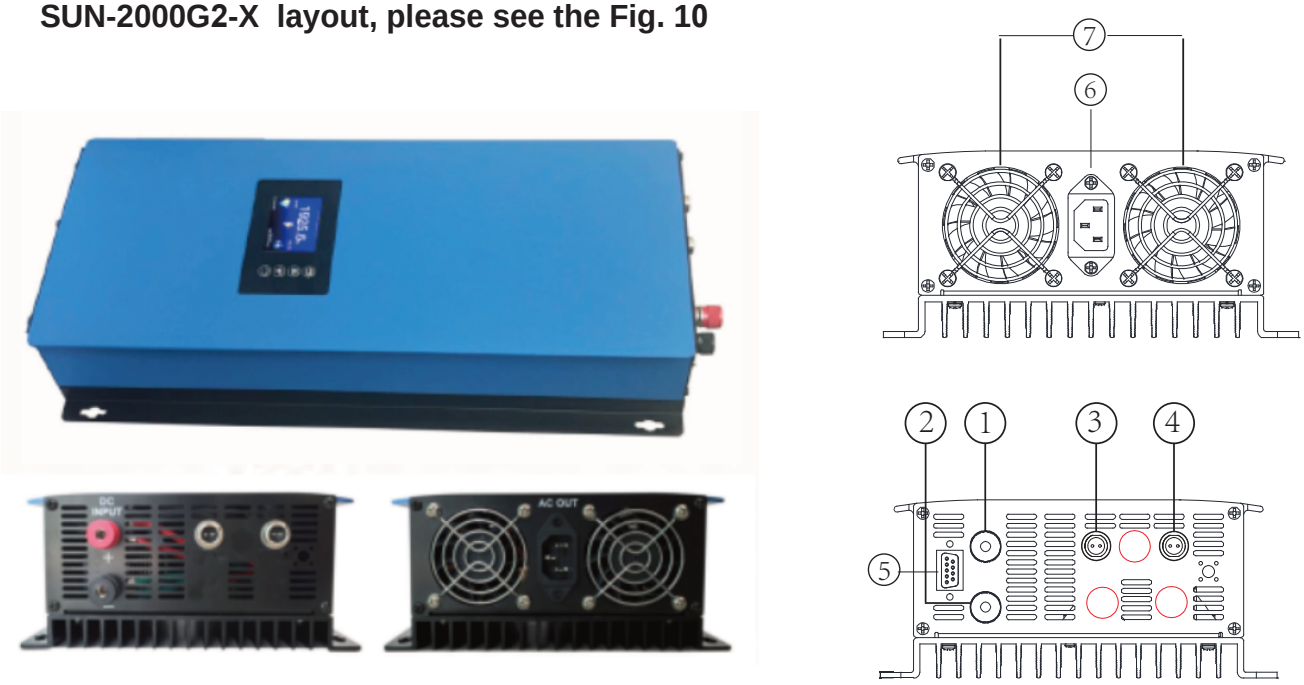


Fig 10. SUN-2000G2-X layout

① DC Input Positive Terminal. This terminal will connect to the positive wire of solar cables connected with the positive pole of the solar panels.

② DC Input Negative Terminal. This terminal will connect to the negative wire of solar cables connected with the negative pole of the solar panels.

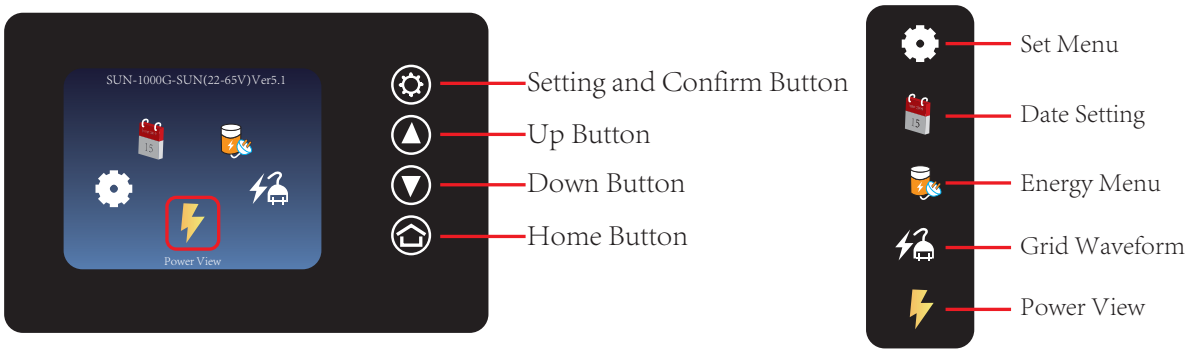
③ ④ Limit Connection. Please check the user manual of the limit function.

⑤ Wifi Plug Connection. Please check the user manual of Wifi Plug.

⑥ AC socket. This socket will connect the inverter to the public grid via the AC cable.

⑦ Cooling fans.

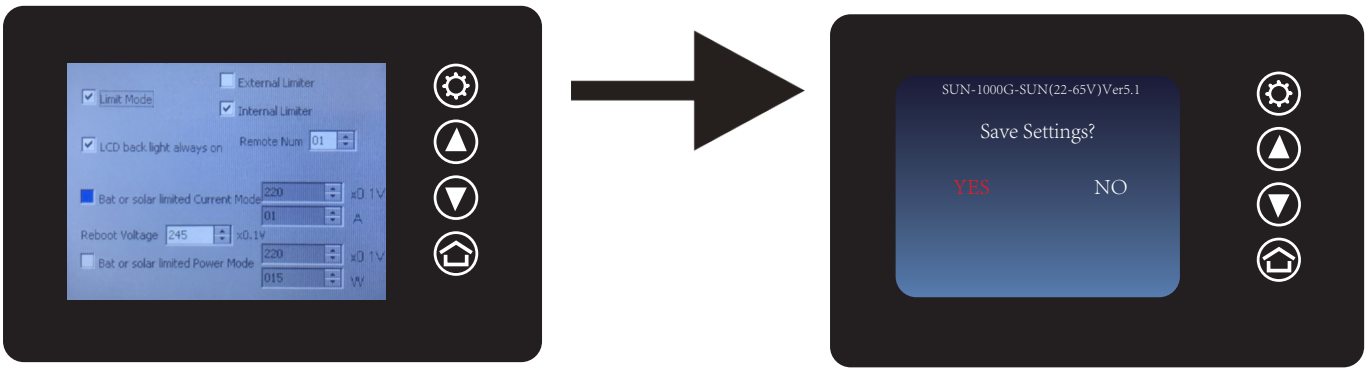
Inverter Display Instruction



The Inverter display can show many information. The main interface of the display and the icon explanations are shown above.

Set Menu: Choose the set menu icon on the main screen interface, click the confirm button to enter into the interface shown below. In this interface, the LCD backlight can be set to always on or auto turn off after 3 minutes no action.
The inverter also integrates with limit function, preventing excess power from going to the public grid. Select the limit mode, the inverter will work under limit mode. The inverter's output power will be determined by load power. For more details about the limit function, please read the user manual of the limit function.

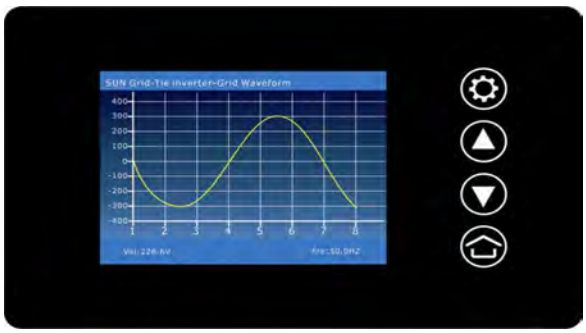
On this screen, you can select "Bat or solar limit Current Mode," which allows you to limit the DC input current by adjusting the numbers. You also need to set the low protect voltage and reboot voltage. This is very useful for battery discharge.
You also can select "Bat or solar limit Power Mode," this function is similar to "Bat or solar limit Current Mode," just use power to replace the current.



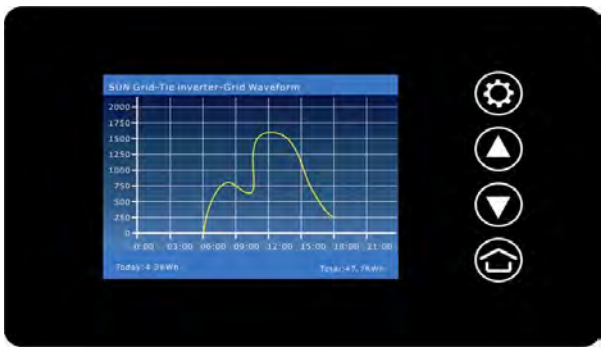
Notes: Save the setting after you reconfigure the working mode or backlight setting.

Notes: Battery Discharge Current Mode And Battery Discharge Power Mode are not developed yet.

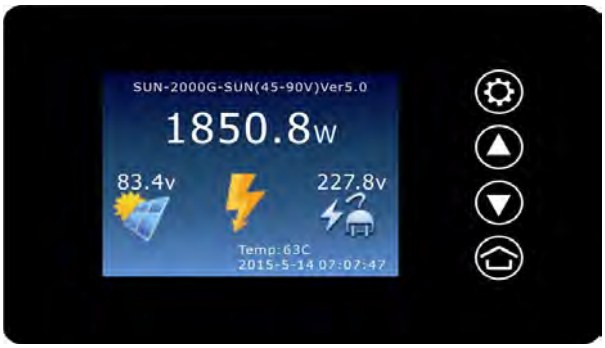
Grid Waveform: This interface will show the real time grid waveform. The grid voltage and frequency also will show in this interface.



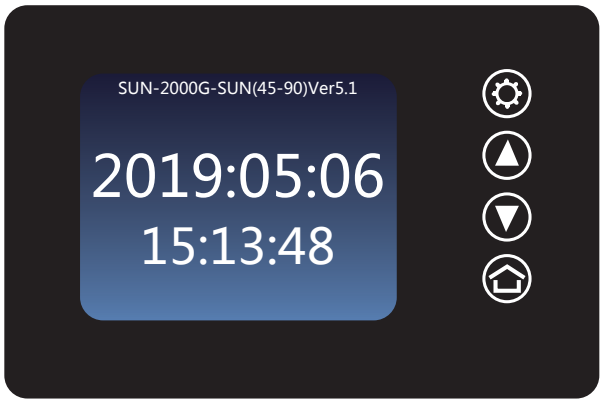
Energy Menu: The energy interface will show the power generation curve every day. Today KWH and Total KWH are also shown in this interface.



Power View: In this interface, the display shows real time power, PV input voltage, inside temperature, date, and time.



Clock And Date Setting: Set the clock and date on this page, save the setting before exit.



Technical Data of SUN Series Grid Tie Power Inverter

Table 3. Common Specifications for SUN Series Grid Tie Power Inverter

INPUT DATA (DC)	SUN-XXXG2-M	SUN-XXXG2-H
Maximum Input DC Voltage	65 V	90 V
MPPT Voltage Range	25V - 60 V	50 V - 90 V
Operating DC Voltage Range	22 V - 65 V	45 V - 90 V
Startup Voltage	25V	49V
OUTPUT DATA (AC)	**SUN-1000G2-X**	**SUN-2000G2-X**
Nominal Voltage (Range)	110V(95-140V)/230V(185-265V)	230V(185-265V)
Frequency (Range)	50Hz(45-55 Hz)/60Hz(56-64Hz)	50Hz(45-55 Hz)/60Hz(56-64Hz)
Power Factor	>0.95	>0.95
Output Waveform	Pure Sine Wave	Pure Sine Wave
CHARACTERISTIC DATA	**SUN-XXX-X-X**	
MPPT Efficiency	99%	
Over Current Protection Over	Yes	
Temperature Protection	Yes	
Reverse Polarity Protection	No	
Anit-Island Protection	Yes	
Stackable	Just for AC Output	
Operating Temperature Range	-20℃ ~ 45℃	
Storage Temperature Range	-40℃ ~ 65℃	

There are some common specifications of SUN Series Grid Tie Power Inverter shown in Table 3.
Other electrical specifications of every model are listed in Table 1.

Weight and Dimension of SUN series Grid Tie Power Inverter

Model	SUN-1000G-X-X	SUN-2000G-X-X
Net Weight	4.0Kg	6.0Kg
Gross Weight	5.0Kg	7.0Kg
Dimension(Package)	430mm×310mm×155mm	540mm×310mm×155mm

Outline Drawing of G2 SUN Series Grid Tie Power Inverter

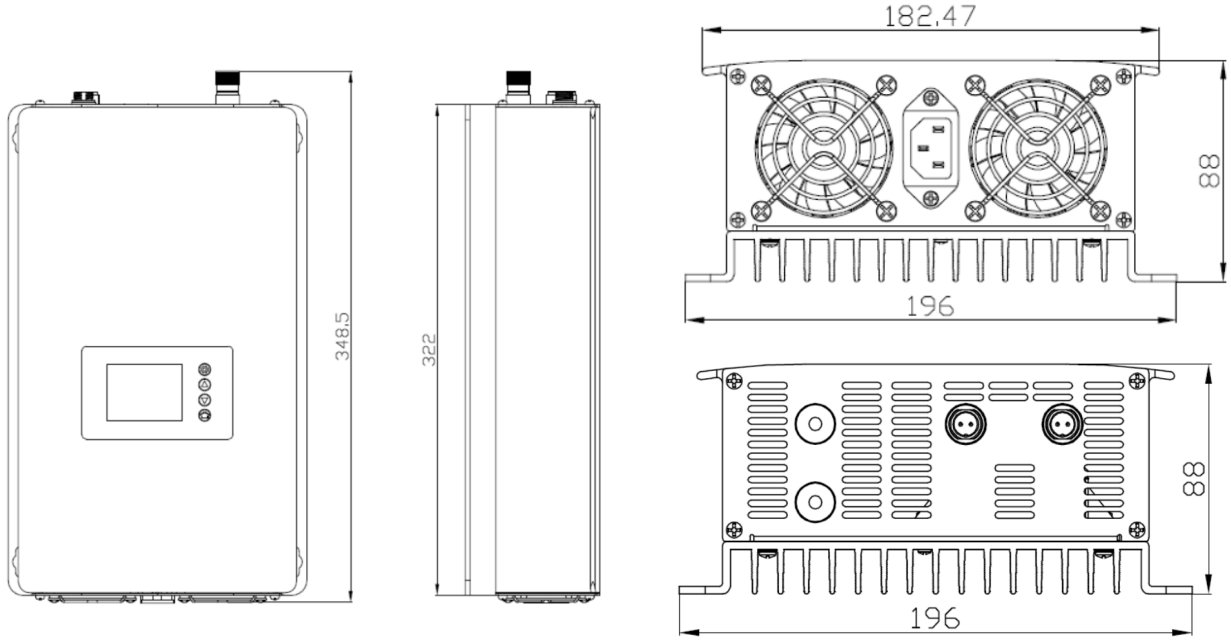


Fig. 11 SUN-1000G2-X Outline Drawing

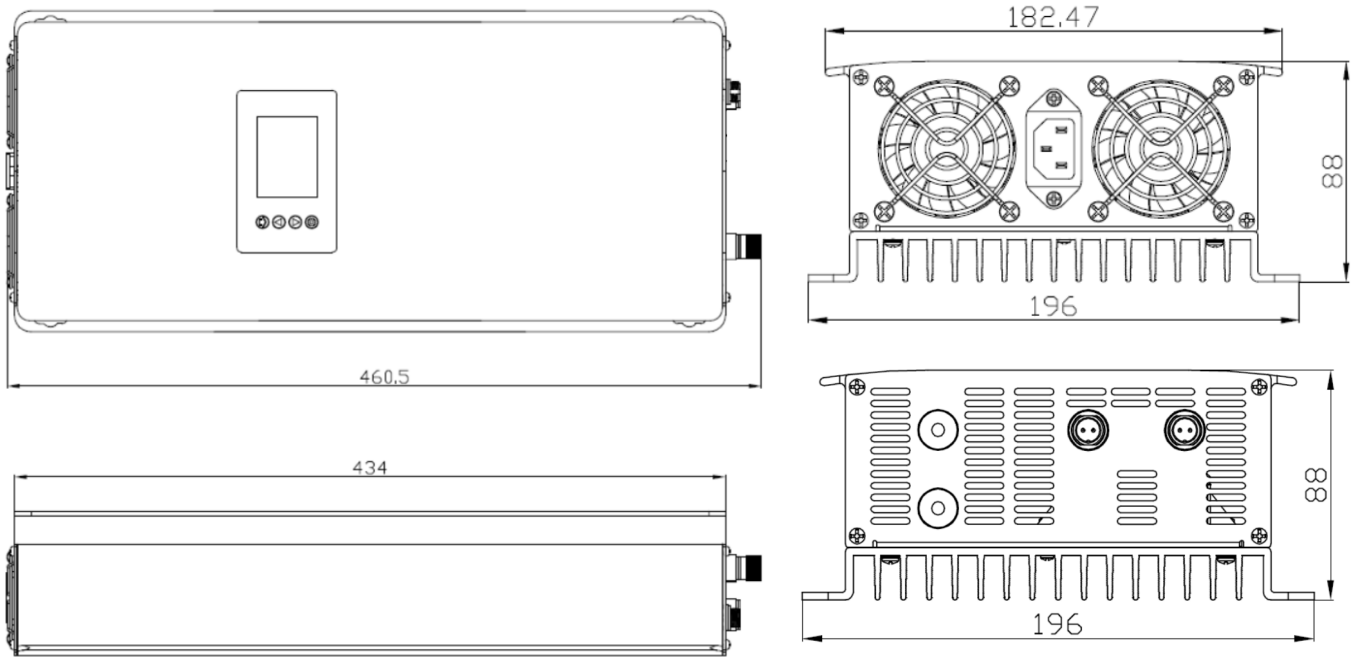


Fig. 12 SUN-2000G2-X Outline Drawing

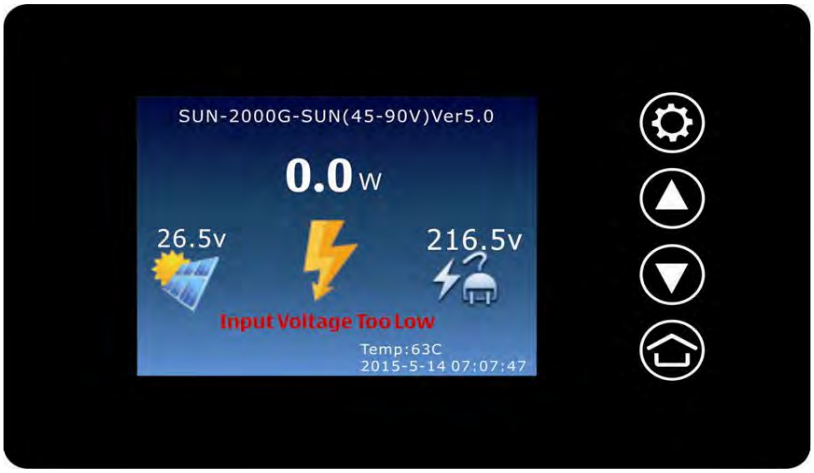
Troubleshooting

After all the installation step described throughout this manual, qualified personnel can use the following troubleshooting steps if the Sunshine Grid Tie Power System does not operate correctly.

WARNING: Do not attempt to repair the Sunshine Grid Tie Inverter, it contains no user-serviceable parts. If it fails, please contact Sunshine customer service to obtain an RMA number and start the replacement process.

Status LCD Indications and Error Reporting

The status of errors will be displayed with red letters on the grid tie inverter LCD display.



1) Overtemperature: The inverter will stop working if the temperature reaches 75℃ inside the inverter. Make sure the inverter is installed in good condition to prevent it from going overheat.
2) Input Voltage Too Low: This indicates that the DC input voltage is too low or the DC connection is not good. You should measure the output voltage of the solar array.
3) Input Voltage Too High: This indicates that the DC input voltage is too high. You should adjust the connecting method according to the description in this manual.
4) Grid Error: This indicates that the AC cable is not connected with the utility grid, or the AC voltage or frequency of the utility grid is out of the range of the specification of the inverter. Please check the AC cable and the outlet of the utility grid, you can use a multimeter to measure the AC voltage.
5) Dumping Load Shorted: This indicates something shorted inside the inverter or outside connection has somewhere shorted.
6) Starting Voltage Too Low: This indicates the output of the solar array is to low. Please reconfigure the panels or choose suitable panels, make sure the output voltage of the panel array in the inverter input voltage range.

WARNING: Never disconnect the DC wire connectors under load. Ensure that no current is flowing in the DC wires before disconnecting. An opaque covering may be used to cover the module before disconnecting the module.

AC Output Current Waveform and PF Test Of 2000W Model

Tested 2000W model at nearly full load, output current waveform shows good pure sine wave in the oscilloscope, the PF value also shows a good result, 99.8% PF value.



