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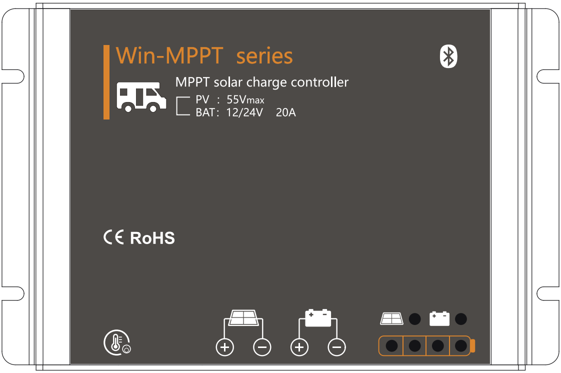
Win series

MPPT Solar Controller

12/24V, 260/520W



User Manual

User Manual_Win series_JL
CE, Rohs, ISO9001:2015
Subject to change without notice!

Contents

Dear Clients,

Thanks for selecting the Win series solar controller.

Please take the time to read this user manual, this will help you to make full use of many advantages the controller can provide your solar system. This manual gives important recommendations for installing and using and so on. Read it carefully in your own interest and pay attention to the safety recommendations in it please.

1, Safety instructions and waiver of liability

1.1 Safety Instructions

WARNING: Danger of explosion from sparking.
Danger of electric shock.

CAUTION:Indicates a critical procedure for safe and proper operation of the controller.

1)There are no user serviceable parts inside the controller. Do not disassemble or attempt to repair the controller.
2)Keep the children away from batteries and the charge controller.

(1) It is advised to read this manual carefully before the product is installed and put into use.
(2) There are no user serviceable parts inside the controller. Do not disassemble or attempt to repair the controller.
(3)Install the controller at well ventilated places, the controller's heat sink will be very hot during operation.
(4)Refer to the specifications provided by the manufacturer of the battery to ensure that the battery is suitable for use with this product. The battery manufacturer's safety instructions should always be observed.
(5)Protect the solar modules from incident light during installation, e.g. cover them.
(6)Ensure that the connection cables are provided with fuses or circuit breakers.
(7)Please make sure to switch off all connections of the PV array and the fuse/breakers which close to the battery before the controller installation and adjustment.
(8)Power connections must remain tight to avoid excessive heating from the loose connection.
(9)Do not open the controller casing. Only the terminal cover may be removed by a technical professional for installation.

1.2 Liability Exclusion

The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by any unauthorized person, unusual use, wrong installation, or bad system design.

2,Overview

Win series solar controller is based on an advanced maximum power point tracking (MPPT) technology developed, dedicated to the solar system, the controller conversion efficiency up to 98%.

The controller can rapidly track the maximum power point(MPP) of PV array to obtain the maximum energy of the panel, especially in case of a clouded sky, when light intensity is changing continuously, an ultra fast MPPT controller will improve energy harvest by up to 30% compared to PWM charge controllers.

2.1 Outstanding features

- Innovative Max Power Point Tracking(MPPT) technology, tracking efficiency >99.9%
- Full digital technology, high charge conversion efficiency up to 98%
- LED indicator for easy to read charging state and battery information
- 12/24V automatic recognition
- Liquid, Gel, AGM and Lithium battery for selection
- The separate ports for remote temperature sensor, make battery temperature compensation more accurate
- Four stages charge way: MPPT, boost, equalization, float
- Automatic over-temperature power reduction function
- Dual automatic restriction function when exceeding rated charging power and charging current
- Android APP version for Bluetooth communication
- Common negative design
- Perfect EMC & thermal design
- Full automatic electronic protect function

2.2 MPPT

MPPT profile

The full name of the MPPT is maximum power point tracking. It is an advanced charging way which could detect the real-time power of the solar Modulel and the maximum point of the I-V curve that make the highest battery charging efficiency.

Current Boost

Under most conditions, MPPT technology will "boost" the solar charge current.

MPPT Charging: Power Into the controller **(Pmax)=**Power out of the controller **(Pout)**

Iin x Vmp= Iout x Vout

* **Assuming 100**% **efficiency**. **Actually**, **the losses in wiring and conversion exist**.

If the solar module's maximum power voltage (Vmp) is greater than the battery voltage, it follows that the battery current must be proportionally greater than the solar input current so that input and output power are balanced. The greater the difference between the Vmp and battery voltage, the greater the current boost. Current boost can be substantial in systems where the solar array is of a higher nominal voltage than the battery as described in the next section.

High Voltage Strings and Grid-Tie Modules

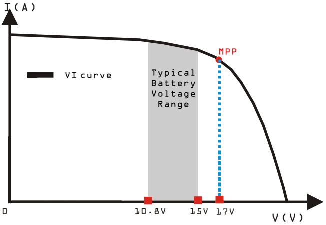
Another benefit of MPPT technology is the ability to charge batteries with solar arrays of higher nominal voltages. For example, a 12 Volt battery bank may be charged with a 12-, 24-, 36-, or 48-Volt nominal off-grid solar array. Grid-tie solar modules may also be used as long as the solar array open circuit voltage (Voc) rating will not exceed the maximum input voltage rating at worst-case (coldest) module temperature. The solar module documentation should provide Voc vs. temperature data.

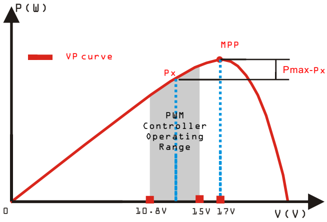
Higher solar input voltage results in lower solar input current for a given input power. High voltage solar input strings allow for smaller gauge solar wiring. This is especially helpful and economical for systems with long wiring runs between the controller and the solar array.

An Advantage Over Traditional Controllers

Traditional controllers connect the solar module directly to the battery when recharging. This requires that the solar module operate in a voltage range that is usually below the module's Vmp. In a 12 Volt system for example, the battery voltage may range from 10.8-15 Vdc, but the module's Vmp is typically around 16 or 17V.

Because traditional controllers do not always operate at the Vmp of the solar array, energy is wasted that could otherwise be used to charge the battery and power system loads. The greater the difference between battery voltage and the Vmp of the module, the more energy is wasted.





Nominal 12 Volt Solar Module I-V curve and output power graph.

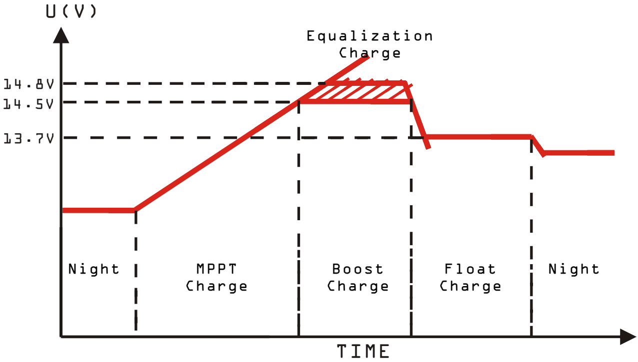
Contrast with the traditional PWM controller, MPPT controller could play a maximum power of the solar panel so that a larger charging current could be supplied. Generally speaking, the MPPT controller's energy utilization efficiency is 15%~20% higher than PWM controller.

Conditions That Limit the Effectiveness of MPPT

The Vmp of a solar module decreases as the temperature of the module increases. In very hot weather, the Vmp may be close or even less than battery voltage. In this situation, there will be very little or no MPPT gain compared to traditional controllers. However, systems with modules of higher nominal voltage than the battery bank will always have an array Vmp greater than battery voltage. Additionally, the savings in wiring due to reduced solar current make MPPT worthwhile even in hot climates.

2.3 MPPT—Four Charging Stage

Win series controller has a 4-stage battery charging algorithm for rapid, efficient, and safe battery charging.



MPPT Charge

In this stage, the battery voltage has not yet reached boost voltage and 100% of available solar power is used to recharge the battery.

Boost Charge

When the battery has recharged to the Boost voltage setpoint, constant-voltage regulation is used to prevent heating and excessive battery gassing. The Boost stage remains 120 minutes and then goes to Float Charge. Every time when the controller is powered on, if it detects neither over discharged nor overvoltage, the charging will enter into boost charging stage.

Float Charge

After the Boost voltage stage, the controller will reduce the battery voltage to Float voltage setpoint. When the battery is fully recharged, there will be no more chemical reactions and all the charge current transmits into heat and gas at this time. Then the controller reduces the voltage to the floating stage, charging with a smaller voltage and current. It will reduce the temperature of battery and prevent the gassing, also charging the battery slightly at the same time. The purpose of Float stage is to offset the power consumption caused by self consumption and small loads in the whole system, while maintaining full battery storage capacity.

In Float stage, loads can continue to draw power from the battery. In the event that the system load(s) exceed the solar charge current, the controller will no longer be able to maintain the battery at the Float setpoint. Should the battery voltage remains below the boost reconnect charging voltage, the controller will exit Float stage and return to Bulk charging.

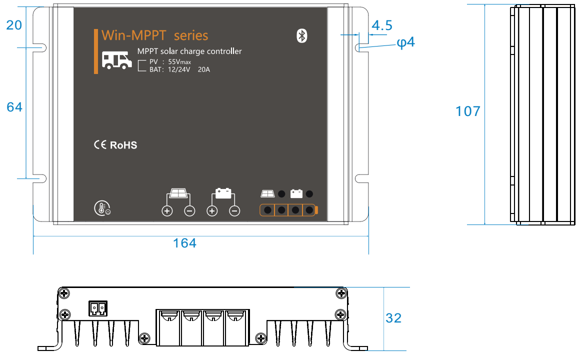
Equalization Charge

Certain types of batteries benefit from periodic equalizing charge, which can stir the electrolyte, balance battery voltage and complete chemical reaction. Equalizing charge increases the battery voltage, higher than the standard complement voltage, which gasifies the battery electrolyte. If it detects that the battery is being over discharged, the solar controller will automatically turn the battery to equalization charging stage, and the equalization charging will be 120mins. Equalizing charge and boost charge are not carried out constantly in a full charge process to avoid too much gas precipitation or overheating of battery.

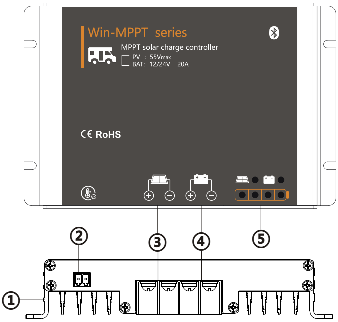
WARNING: Risk of explosion!
Equalizing flooded battery can produce explosive gases, so well ventilation of battery box is necessary.

3,Dimensions

Unit: mm



4,Structure & Accessory



①Aluminum case
—dissipate controller heat, Internal protection.
②Temperature Sensor Port
—Collect temperature information. Temperature compensation.
③Solar module terminals
—Connected solar modules.
④Battery Terminals
—Connect the battery.
⑤LED Display
—Display the status of the controller.

Remote Temperature Sensor(Accessory)

The controller is shipped with a temperature sensor of length 80mm. If you need longer remote temperature sensor, you need to purchase separately.

The remote temperature sensor can measure the temperature at the battery and use this data for very accurate temperature compensation. The standard length of the cable is 3m (length can be customized). The temperature sensor connected via interface ②.

1. The connection polarity is irrelevant.
2. If the external temperature sensor is not connected or damaged, the internal temperature will be used for temperature compensation during charging.
3. If the controller and battery are not located in the same room then an external temperature sensor for measuring the battery temperature must be installed.

5,Installation

Please read all instructions and precautions in the manual before installing.

5.1 Installation Notes

(1)The solar charge controller may only be used in PV systems in accordance with this user manual and the specifications of other modules manufacturers. No energy source other than a solar generator may be connected to the solar charge controller.

(2)Before wiring installation and adjustment of controller, Always disconnect the solar modules and insurance or circuit breaker of battery terminal.

(3)Only to comply with the range of the battery charge controller.

(4)Batteries store a large amount of energy, never short circuit a battery under all circumstances. We strongly recommend connecting a fuse directly to the battery to avoid any short circuit at the battery wiring.

(5)Batteries can produce flammable gases. Avoid making sparks, using fire or any naked flame. Make sure that the battery room is ventilated.

(6)Uses insulated tools and avoid placing metal objects near the batteries.

(7)Be very careful when working with batteries. Wear eye protection. Have fresh water available to wash and clean any contact with battery acid.

(8)Avoid touching or short circuiting wires or terminals. Be aware that the voltages on special terminals or wires can be as much as twice the battery voltage. Use isolated tools, stand on dry ground, and keep your hands dry.

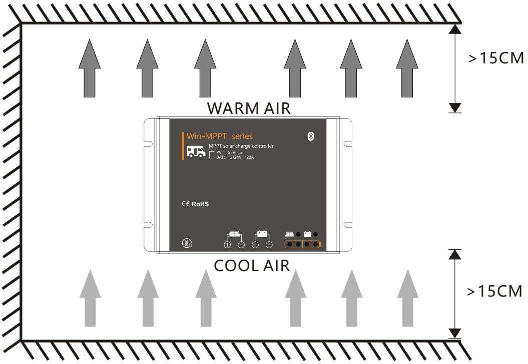
(9)Prevent water from entering the internal controller, outdoor installation should avoid direct sunlight and rain penetration.

(10)After installation check that all connections are tight line, avoid heat accumulation caused by virtual access danger.

5.2 Mounting Location Requirements

Do not subject the solar charge controller to direct sunshine or other sources of heat. Protect the solar charge controller from dirt and moisture. Mount upright on the wall on a non-flammable substrate. Maintain a minimum clearance of 15cm below and around the device to ensure unhindered air circulation. Mount the solar charge controller as close as possible to the batteries.

Mark the position of the solar charge controller fastening holes on the wall, drill 4 holes and insert dowels, fasten the solar charge controller to the wall with the cable openings facing downwards.



5.3 Wiring Specifications

Wiring and installation methods must comply with national and local electrical specifications.

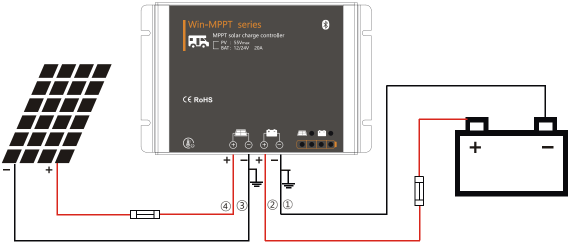
The wiring specifications of the solar, battery must be selected according to rated currents, and see the following table for wiring specifications:

The cable total length One-way distance(M)	<3	3-6	6-9	9-12
The cable size (mm^2/AWG)	5/10	6/9	10/8	16/5

The wire size is only for reference. If there is a long distance between the PV array and the controller or between the controller and the battery, larger wires can be used to reduce the voltage drop and improve performance.

5.4 Connection

We strongly recommend connecting a fuse directly to the battery to protect any short circuit at the battery wiring. Solar PV modules create current whenever light strikes them. The current created varies with the light intensity, but even in the case of low levels of light, full voltage is given by the modules. So, protect the solar modules from incident light during installation. Never touch uninsulated cable ends, use only insulated tools, and make sure that the wire diameter is in accordance with the expected currents of solar charge controller. Connections must always be made in the sequence described below.



WARNING: Risk of electric shock! Exercise caution when handing solar wiring. The solar PV array can produce open-circuit voltages in excess of 100V when in sunlight. Pay more attention to it.

WARNING: Risk of explosion! Once the battery's positive and negative terminals or leads that connect to the two terminals get short-circuited, a fire or explosion will occur. Always be careful in operation.

1st step: Connect the battery

Connect the battery connection cable with the correct polarity to the middle pair of terminals on the solar charge controller (with the battery symbol). If the system is 12V, please make sure that the battery voltage is within 5V~15.5V, else if the system is 24V, the battery voltage should between 20V~31V.

2nd step: Connect the solar module

Ensure that the solar module is protected from incident light. Ensure that the solar module does not exceed the maximum permissible input current. Connect the solar module connection cable to the correct polarity of the left pair of terminals on the solar charge controller (with the solar module symbol).

3th step: Final work

Tighten all cables connected to the controller and remove all the debris around the controller (leaving a space of approx. 15 cm).

5.5 Grounding

Be aware that the negative terminals of controller are connected together and therefore have the same electrical potential. If any grounding is required, always do this on the negative wires.

For common-negative system, such as motorhome, it is recommended to use a common-negative controller, but if in the common-negative system, some common-positive equipment are used, and the positive electrode is grounded, the controller may be damaged.

6.Bluetooth

6.1 Bluetooth Communication

Bluetooth communication has the following characteristics:

1.Support Android mobile phone APP.

2.Realize wireless monitoring function of solar controller.

3.Use high performance, ultra-low power consumption Bluetooth dedicated chip.

4.Adopt Bluetooth 4.2 and BLE technology.

5.communication distance up to 10m.

Refer to Bluetooth APP instructions for detailed operation of mobile APP.

6.2 Battery Type

The controller applies to Liquid, Gel, AGM and Lithium battery, the factory default setting is suitable for Gel battery.

6.2.1 Liquid, GEL, AGM

When choosing Liquid, GEL or AGM for battery type, the parameters of boost, equalization and float charging voltage can be set by mobile phone APP. The range of parameters is as follows. The following voltage parameters are 25℃/12V system parameters, 24V system automatically multiplied by 2.

Charging stage	Boost	Equalization	Float
Charging voltage range	14.0~14.8V	14.0~15.0V	13.0~14.5V
Default charging voltage	14.5V	14.8V	13.7V

Low voltage disconnect and low voltage reconnect can also be set by Bluetooth app of mobile phone.

Low voltage disconnect(LVD) setting range: 10.8-11.8V/21.6-23.6V(default: 11.2/22.4V)

Low voltage reconnect(LVR) setting range: 11.4~12.8V/22.8~25.6V(default: 12.0/24.0V)

6.2.2 Lithium

① Parameters setting

When choosing lithium battery type, the charge target voltage, charge recovery voltage, low voltage disconnect and low voltage reconnect of lithium battery can be set by mobile phone APP, the setting range is as follow.

Charge target voltage(CVT) setting range: 10.0-32.0V (default: 14.4V)

Charge recovery voltage(CVR) setting range: 9.2-31.8V (default: 14.0V)

Low voltage disconnect(LVD) setting range: 9.0-30.0V (default: 10.6V)

Low voltage reconnect(LVR) setting range: 9.6-31.0V (default: 12.0V)

② 0℃ Charging

"0℃ Charging" function is only applicable for lithium battery, it can be set to "Yes", "Slow" or "No". When the controller detects that the ambient temperature is higher than 0℃, the charging function is normal. when the ambient temperature is low than 0℃, if the "0℃ Charging" is set to "Yes", the charging function is normal, else if the "0℃ Charging" is set to "slow", the max charging current is 20% of the rated current, else if the "0℃ Charging" is set to "No", the controller does not charge the battery.

The user can select the appropriate charging method.

The low voltage reconnect(LVR) should be higher than the low voltage disconnect (LVD) at least 0.6/1.2V, if you want to improve LVD, you should first improve LVR.

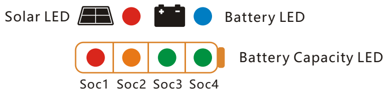
(Charge recovery voltage+1.5V)≥Lithium Charge target voltage≥(Charge recovery voltage+0.2V)

Mobile App does not support parameters beyond this range.

Warning: The required accuracy of BMS shall be at least 0.2V. If the deviation is higher than 0.2V, the manufacturer will assume no liability for any system malfunction caused by this.

7, LED indications, Protections and Maintenance

7.1 LED Display



LED	Status	Function
Solar LED (Red)	On	Solar panel is correctly connected, but not charged
	Fast Flash(0.1s/0.1s)	MPPT charging
	Flash(0.5s/0.5s)	Equal or Boost charging
	Slow Flash(0.5s/2s)	Float charging
	Off	Night
Battery LED (Blue)	On	Battery is normal
	Flash(0.2s/0.2s)	Over temperature
Battery Capacity LED (Red, Orange, Green, Green)	Soc1 Flash(0.2s/0.2s, Red)	Low voltage protection
	Soc4 Flash(0.2s/0.2s, Green)	Over voltage protection
	Soc1 On	Battery capacity < 20%
	Soc2 On	20% < Battery capacity < 50%
	Soc3 On	50% < Battery capacity < 90%
	Soc4 On	Battery capacity > 90%

7.2 Faults & Alarms

Fault	Reason	Troubleshooting
High voltage at battery terminal	Battery voltage is too high	Check if other sources overcharge the battery. If not, controller is damaged.
Can't recognize bluetooth	Communication failure	Reconnect after disconnecting the battery for about 1 minute and reconnect the Bluetooth device.
Can't recognize system voltage	Battery voltage is abnormal at start-up	Charge or discharge the battery so that the battery voltage is within the normal operating range (5~15.5V or 20~31V).
Battery can't be charged during daytime	PV panel fault or reverse connection	Check panels and connection wires.

7.3 Protection

Protection	Description
PV Over Current	The controller will limit charging power in rated charge power. An over-sized PV array will not operate at maximum power point.
PV Short Circuit	When PV short circuit occurs, the controller will stop charging. Remove it to start normal operation.
PV Reverse Polarity	Fully protection against PV reverse polarity, no damage to the controller. Correct the connection to start normal operation.
Battery Reverse Polarity	Fully protection against battery reverse polarity, no damage to the controller. Correct the connection to start normal operation.
Battery Over voltage	If there are other energy sources to charge the battery, when the battery voltage exceeds 15.8 / 31.3V, the controller will stop charging to protect the battery from overcharging damage.
Battery Over discharge	When battery voltage drops to the setting voltage point of low voltage disconnect ,the low voltage protection indicator of the controller will flash.
Over Temperature Protection	The controller detects the internal temperature through internal sensor, when the temperature exceeds the setting value, the charging current will lower down followed by the decrease of temperature, so as to control the controller's temperature rise, when the internal temperature exceeds the setting over temperature protection threshold, the controller stops working and restores after the temperature is lowered.
Damaged Remote Temperature Sensor	If the temperature sensor is short-circuited or damaged, the controller will use the internal temperature for charging temperature compensation.

7.4 Maintenance

The following inspections and maintenance tasks are recommended at least two times per year for best performance.

- Make sure no block on air-flow around the controller. Clear up any dirt and fragments on radiator.
- Check all the naked wires to make sure insulation is not damaged. Repair or replace some wires if necessary.
- Tighten all the terminals. Inspect for loose, broken, or burnt wire connections.
- Pay attention to any troubleshooting or error indication .Take corrective action if necessary.
- Confirm that all the system components are ground connected tightly and correctly.
- Confirm that all the terminals have no corrosion, insulation damaged, high temperature or burnt/discolored sign, tighten terminal screws to the suggested torque.
- Check for dirt, nesting insects and corrosion. If so, clear up in time.

WARNING：Risk of electric shock!
Make sure that all the power is turned off before above operations, and then follow the corresponding inspections and operations.

8, Technical Data

	Item	Win500-MPPT
Battery Parameters	System voltage	12/24V automatical recognization
	Max charging current	20A
	MPPT charging voltage	before boost or equalization charging stage
	Boost voltage	14.0~14.8V/28.0~29.6V(default:14.5/29.0V@25℃)
	Equalization voltage	14.0~15.0V/28.0~30.0V(default:14.8/29.6V@25℃)
	Float voltage	13.0~14.5V/26.0~29.0V(default:13.7/27.4V@25℃)
	Low voltage disconnect	10.8~11.8V/21.6~23.6V(default: 11.2/22.4V)
	Low voltage reconnect	11.4~12.8V/22.8~25.6V(default: 12.0/24.0V)
	Temperature compensation	-4.17mV/K per cell (Boost, Equalization), -3.33mV/K per cell (Float)
	Charging target voltage	10.0~32.0V(Lithium, default: 14.4V)
	Charging recovery voltage	9.2~31.8V(Lithium, default: 14.0V)
	Low voltage disconnect	9.0~30.0V(Lithium, default: 10.6V)
	Low voltage reconnect	9.6~31.0V(Lithium, default: 12.0V)
	Max volt on bat. terminal	35V
	Battery type	Gel, AGM, Liquid, Lithium(default: Gel)
Panel Parameters	Max voltage on PV(-20℃)	55V *1
	Max voltage on PV(25℃)	50V
	Max input power	260/520W
	MPPT tracking range	(Battery Voltage + 1.0V) ~Voc*0.9 *2
System Parameters	Max tracking efficiency	>99.9%
	Max conversion efficiency	98.0%
	Dimensions	164 * 107 * 32mm
	Weight	700g
	Communication	BLE
	Grounding	Common Negative
	Power terminals	10AWG(5mm²)
	Ambient temperature	-20 ~ +55℃
	Storage temperature	-25 ~ +80℃
	Ambient humidity	0 ~ 100%RH
	Protection degree	IP54
	Max Altitude	4000m

***1.This value represents the maximum voltage of the solar panel at the minimum operating ambient temperature.**
***2.Voc means the open circuit voltage of the solar panel.**
***3.Around oblique line value separately on behalf of 12V and 24V system's value.**