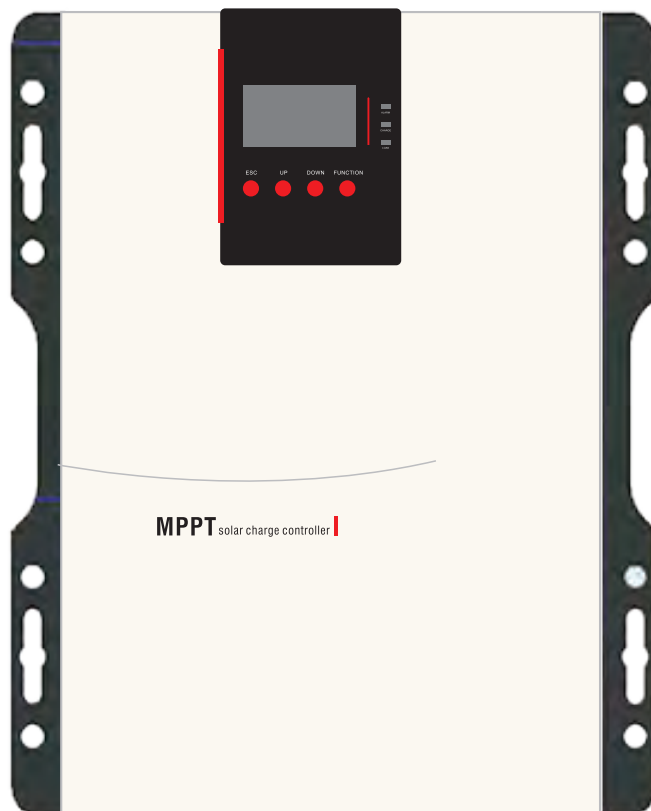


MPPT Solar Charge Controller

User Manual





Important safety instructions (This manual contains important information about the safe installation and operation of the solar charge controller. Please keep this manual for future reference.)

This manual contains all the safety, installation and operation instructions of the series solar charge controller (hereinafter referred to as “controller”).

◇ This manual contains important information about the safe installation and operation of the solar charge controller. Please keep this manual for future reference.

◇ Mount the controller indoors only. Prevent exposure to the elements and do not allow any contact with water.
Please install the controller in a well ventilated place to ensure adequate heat dissipation from the controller's heat sink.

◇ It is recommended that safety and circuit breakers be connected to the input, load and battery terminals to prevent the danger of electric shock in use.

◇ Power connections must remain tight to avoid potential dangers and excessive heating from a loose connection.

◇ If the display is not displayed normal at the first time, please cut off the fuse or circuit breaker immediately and check the line if it is connected correctly.

◇ When the controller is in the normal charging mode, please DO NOT disconnect the battery otherwise the DC load would be damaged.

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1.MPPT Controller General Information

1.1 Overview

Controller based on multiphase synchronous rectification technology(MSRT)andadvanced MPPT control algorithm, has the features ofhigh response speed ,high reliability.and high industrial standard, MSRT can guarantee very high conversion efficiency in anycharge power, which sharply improves the energy efficiency ofsolar system. Advanced MPPTcontrol algorithm minimize the maximum power point loss rate and loss time, to ensure thetracking efficiency, corresponding speed as well as high conversion efficiency under high orlow power, so that in any situation, products can rapidly track the maximum power point(MPPof PV array to obtain the maximum energy ofthe panel. The limitation function ofthe chargingpower and current, and automatic power reduction function fully ensure the stability whenworks with oversize PV modules and operate under high temperature environment.

With the adaptive three-stage charging mode based on digital control circuit, controllerscan effectively prolong the life-cycle of battery and significantly improve the system performanceAll-around electronic protections, including overcharging, over discharging, and PV reversepolarity protection, effectively ensure the safer and more reliable operation ofthe solar systemfor a longer service time.

Features:

Advanced MPPT technology & ultra-fast tracking speed, with tracking efficiency no less than 99.5%.

Maximum DC/DC transfer efficiency is as high as 98.5%, full load efficiency is up to 97%.

Advanced MPPT control algorithm will minimize the MPP loss rate and loss time.

The accuracy ofthe recognition and tracking at the highest point ofmultiple-peaks MPP.

The wider range ofMPP operating voltage.

Auto control system to limit the charging power & current go over the rated value.

Support the lead-acid and lithium batteries.

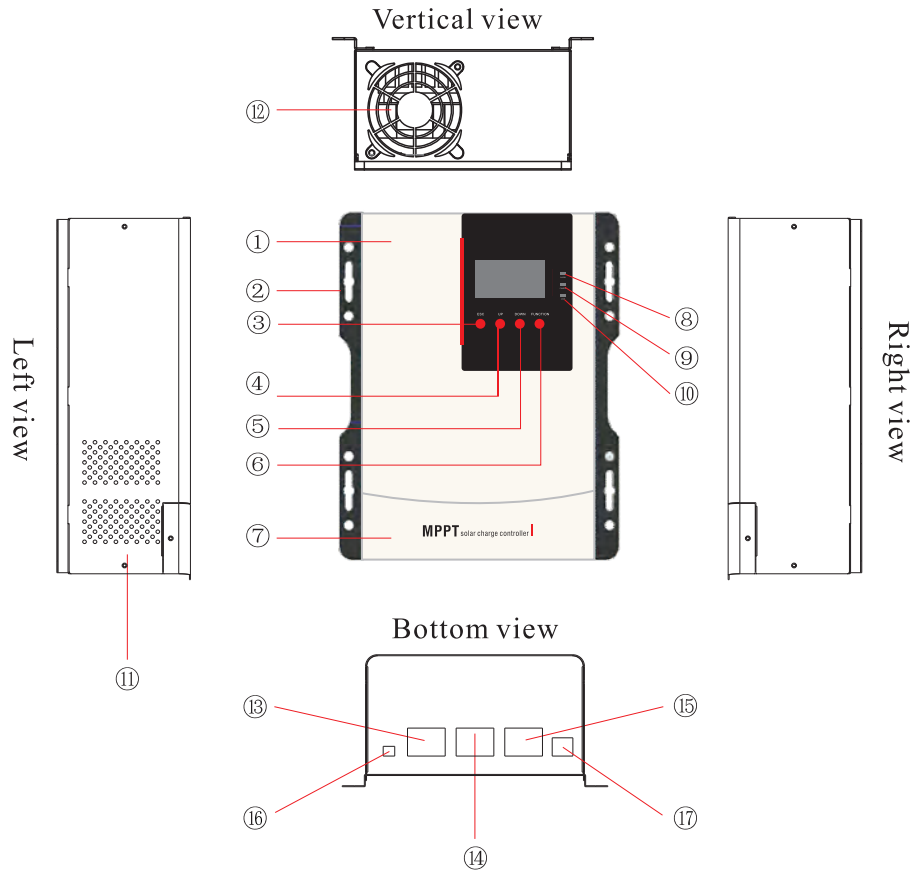
It has a settable battery temperature compensation function.

Real-time energyrecording and statistical function.

Automatic over-temperature power reduction function.

It has the protection function of photovoltaic panel input reverse connection and batteryreverse connection.

1.2 Characteristics

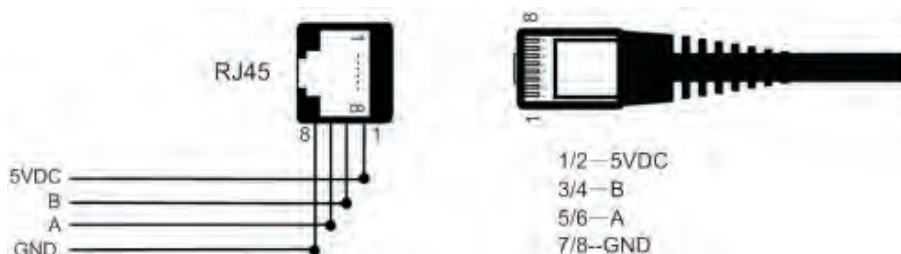


Item	Name	Item	Name
1	Cabinet	10	Load LED indicator
2	Mounting hole	11	Cooling vent
3	Return button	12	Fan vent
4	Page up button	13	PV terminals
5	Page down button	14	Battery terminals
6	Function button	15	Load terminals
7	Terminal cover	16	Temperature sensor
8	Alarm LED indicator	17	RS485 port
9	Charging LED indicator		/

- (1) Connect the remote temperature sensor and detect the temperature of the battery.
The sampling distance needs to be less than or equal to 20 meters.

⚠ Note: When the controller is not connected to the remote temperature sensor or the temperature sensor is damaged, the system will charge or discharge the battery by default at 25°C without temperature compensation.

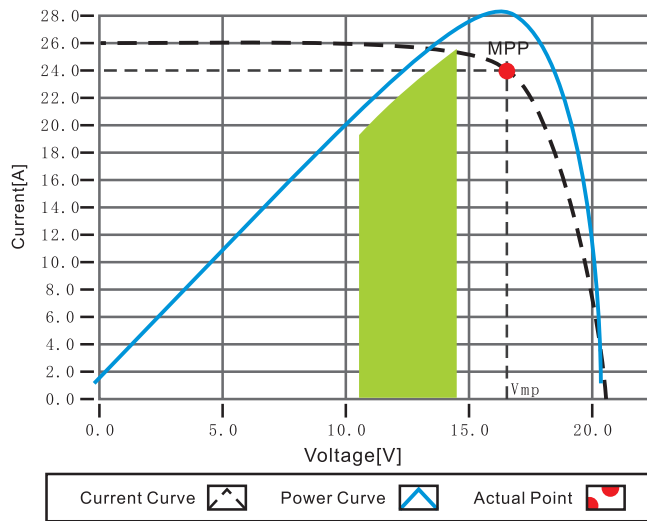
- (2) When the communication interface is connected to a peripheral



1.3 Maximum Power Point Tracking Technology

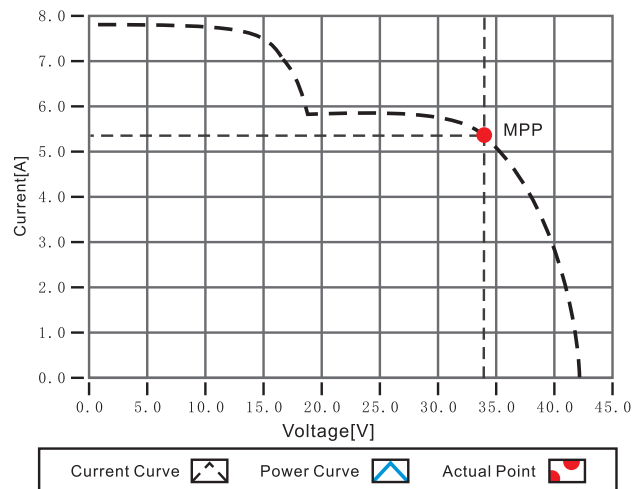
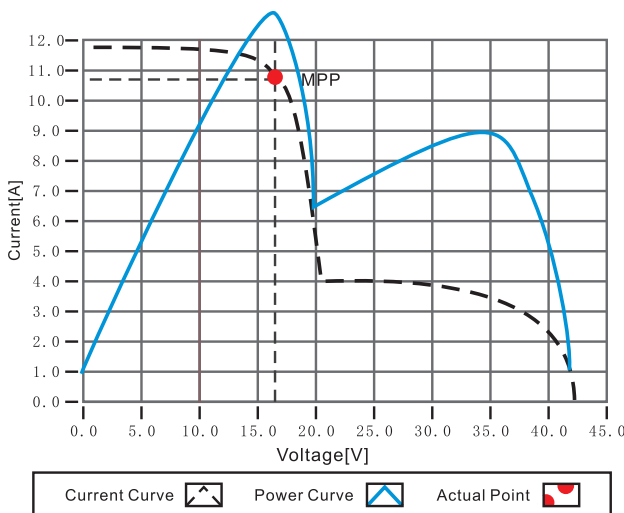
Due to the nonlinear output of a solar panel or solar array, there is a maximum energy point (Max Power Point, or MPP) on the output curve at which the solar panel achieves its highest efficiency. Traditional solar charge controllers with switch charging PWM technology cannot track this highest efficiency point of a solar panel, so most of the time they work with reduced efficiency and do not extract the full energy available from the solar panel.

The below figure is the maximum power point curve of a solar panel. The shaded area is the charging range of a standard PWM controller. The MPPT technology of this controller can shift the point on the curve to the higher current, and raise the efficiency by 20%-60% compared to a standard PWM controller. (The efficiency may be different due to the working environment.)



Maximum Power Point Curve

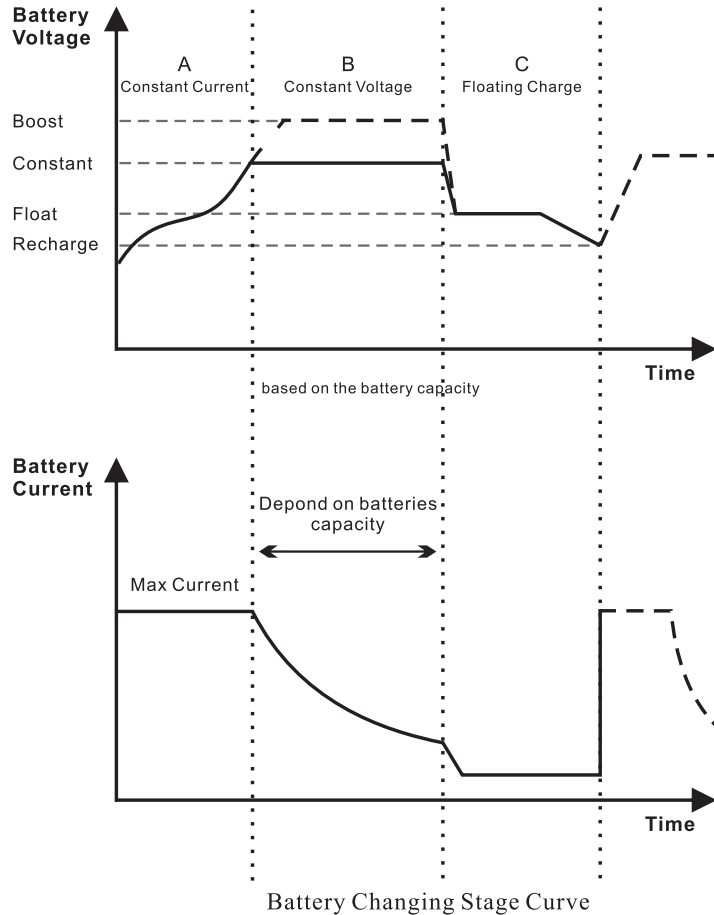
In practice, due to shading from clouds, trees, snow etc, a solar panel might have multiple MPP points, but in reality there is only one true Maximum Power Point (see below examples):



If there are multiple MPPT points, if there is no good algorithm, it will lead to work on the unreal MPPT point. This solar charge controller has a special MPPT technology that can handle multiple MPPT points and track the true MPPT point quickly and accurately, improving the system efficiency and avoiding energy waste.

1.4 Battery Charging Stage

The controller has 3 stages charge mode, Constant Current Charging (Bulk Charging), Constant Voltage Charging (CV) and Floating Charging (CF) for rapid, efficient, and safe battery charging.



a) Battery Changing Stage Curve

In this stage, the battery voltage has not yet reached the constant voltage point (Equalize or Boost Voltage) and the controller operates in a constant current mode, delivering its maximum current to the batteries (MPPT charging).

b) Constant Voltage Charging: CV (Constant and Boost Charging)



When the battery voltage reaches the constant voltage set point, the controller will start to operate in constant voltage charging mode, this process the charging current will drop gradually.

c) Floating Charging: CF

After the constant voltage stage, the controller will reduce charging current to maintaining the battery voltage on the Floating Voltage set point. Charging the battery with a smaller current and voltage on Floating Voltage stage, while maintaining full battery storage capacity.

In Floating charging stage, loads are able to obtain almost all power from solar panel. If load exceeds the power, the controller will no longer be able to maintain battery voltage in Floating charging stage. If the battery voltage remains below the Recharge Voltage, the system will leave Floating charging stage and return to Bulk charging stage.

1.5 Accessories (optional)

1	Remote Temperature Sensor(RTS300R47K)		Acquisition of battery temperature for undertaking temperature compensation of control parameters, the standard length of the cable is 3m (length can be customized). The RTS300R47K connects to the port ⑩ on the controller. NOTE: The temperature sensor short-circuited or damaged, the controller will be charged or discharged at the default temperature 25°C.
2	USB to RS485 cable		USB to RS485 converter is used to monitor each controller using Solar Station PC software. The length of cable is 1.5m.

2.Installation Instructions

2.1 Selecting the Mounting Location

The position should be taken into consideration of the weight and size of the controller.

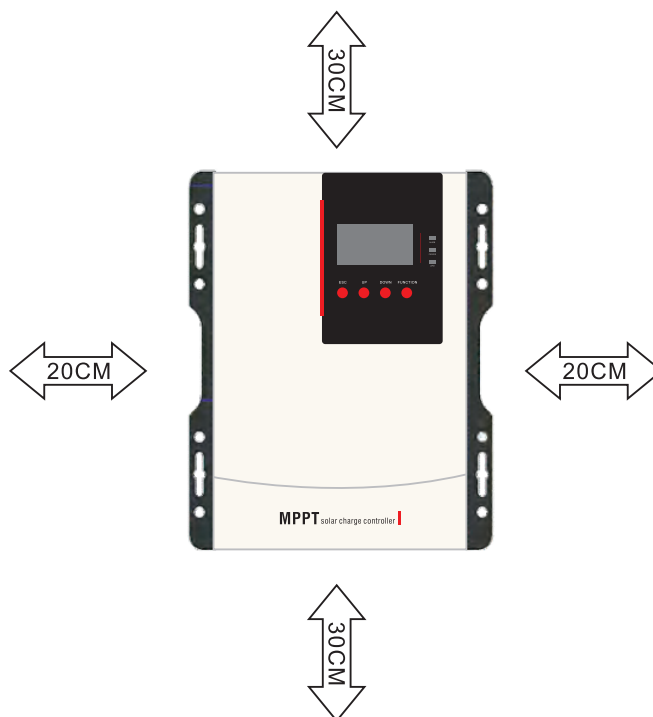
The ambient temperature of the position should be within the range of -20°C ~50°C.

A good ventilation environment should be maintained in the position. Install position should avoid direct sunlight

2.2 Safe Distance

Refer to the following safety clearance to ensure that other equipment or objects are not within this range to ensure that there is sufficient space for heat dissipation.

Direction	Safe Distance
Left-Right direction	>20cm
Up-Down direction	>30cm



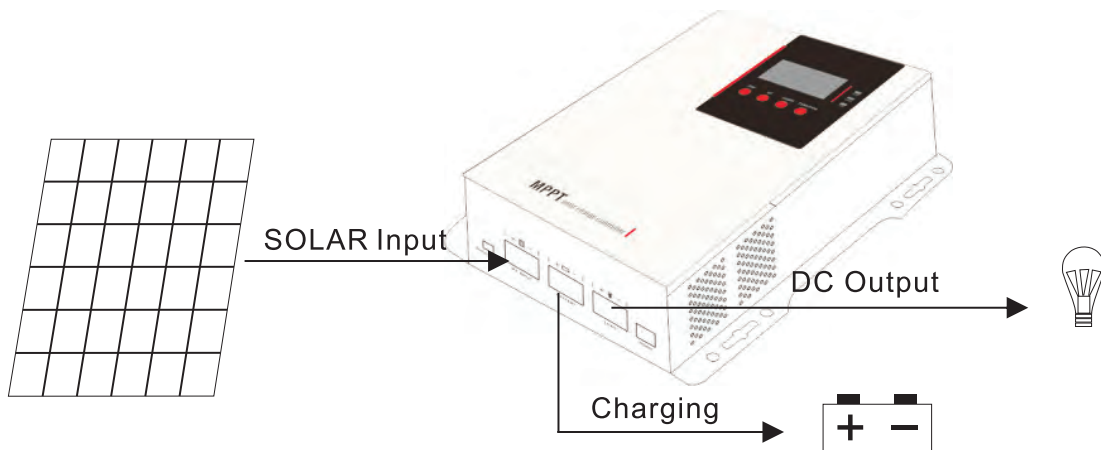
Safe Distance

2.3 Precautions for controller installation

- ◆ Be very careful when installing the battery. For the installation of the open lead-acid battery, you should wear protective glasses. Once the battery acid is contacted, please rinse with clean water in time.
- ◆ Avoid placing metal objects near the battery to prevent the battery from short-circuiting.
- ◆ Acid gas may be generated when the battery is charged. Ensure that the environment is well ventilated.
- ◆ Virtual connection points and corroded wires may cause great heat to melt the wire insulation, burn surrounding materials, and even cause fire. Therefore, make sure that the connectors are tightened and the wires are best fixed with ties to avoid moving applications. When the wire shakes, the connector loosens.
- ◆ Only lead-acid batteries and lithium batteries within the control range of this controller can be charged.
- ◆ The system connection line is selected according to the current density not greater than $5A/mm^2$.

3. MPPT Controller Connection

3.1 Connection of the PV Power System



3.2 Serial connection (string) of PV modules

(1) The number of photovoltaic modules connected in series

As the core component of PV system, controller could be suitable for various types of PV modules and maximize converting solar energy into electrical energy. According to the open circuit voltage (V_{oc}) and the maximum power point voltage (V_{Mpp}) of the MPPT controller, the series number of different types PV modules can be calculated.

The following table is provided for general guidance only:

40415 | 60415 | 80415 | 100415F:

System Voltage	36cell $V_{oc} < 23V$		48cell $V_{oc} < 31V$		54cell $V_{oc} < 34V$		60cell $V_{oc} < 38V$	
	Max	Best	Max	Best	Max	Best	Max	Best
12V	4	2	2	1	2	1	2	1
24V	6	3	4	2	4	2	3	2
48V	6	5	4	3	4	3	3	3

System Voltage	72cell Voc<46V		96cell Voc<62V		Thin-Film Module Voc>80V
	Max	Best	Max	Best	
12V	2	1	1	1	1
24V	3	2	2	1	1
48V	3	2	2	2	1

NOTE: The above parameter values are given under Standard Test Conditions (STC): irradiance 1000W/m², Module Temperature 25°C, Air Mass 1.5.)

40825|60825|80825|100825F:

System Voltage	36cell Voc<23V		48cell Voc<31V		54cell Voc<34V		60cell Voc<38V	
	Max	Best	Max	Best	Max	Best	Max	Best
96V	10	8	6	5	6	5	6	4

System Voltage	72cell Voc<46V		96cell Voc<62V		Thin-Film Module Voc>80V
	Max	Best	Max	Best	
96V	4	4	3	3	2

NOTE: The above parameter values are given under Standard Test Conditions (STC): irradiance 1000W/m², Module Temperature 25°C, Air Mass 1.5.)

3.3 PV Array Input Total Power

This MPPT controller has a limiting function of charging current, the charging current will be limited within rated range. Therefore, the controller will charge the battery with the rated charging power even if the input power at the PV exceeds. Such as: for 12V Solar System with 30A controller, no matter the input power of the solar panel is greater than the rated number, the charging current will not be more than 30A. The actual operation power of the PV array conforms to the conditions below:

- 1) PV power less or equal to controller rated power, the maximum power of the controller is equal to the actual power of the PV array.
- 2) If the PV array actual power is more than the controller nominal rated power, the controller will reduce the PV array power and charge the battery at its nominal rated power.

According to the "sunshine time curve", if the power of the photovoltaic array exceeds the rated charging power of the controller, the charging time with the rated power will be extended, so more energy can be obtained to charge the battery. However, in practical applications, the maximum power of the photovoltaic array must not exceed 2 times the controller's customer-specified charging power, if it is checked that the photovoltaic array power exceeds the controller's rated charging power too much, not only the photovoltaic modules will be wasted, but also due to the influence of ambient temperature. The open circuit voltage of the array increases, which increases the probability of damage to the controller. Therefore, a reasonable configuration of the system is particularly important. For the maximum power of the PV array recommended by this controller, please refer to the following table:

Model	Rated charging current	Rated charging power	Maximum PV array power	Maximum PV open circuit voltage
40415F	40A	540W/12V 1080W/24V 1620W/36V 2160W/48V	1080W/12V 2160W/24V 3240W/36V 4320W/48V	150V (最低温度) 138V (25℃)
60415F	60A	800W/12V 1600W/24V 2400W/36V 3200W/48V	1600W/12V 3200W/24V 4800W/36V 6400W/48V	
80415F	80A	1080W/12V 2160W/24V 3240W/36V 4320W/48V	2160W/12V 4320W/24V 6480W/36V 8640W/48V	
100415F	100A	1300W/12V 2600W/24V 3900W/36V 5200W/48V	2600W/12V 5200W/24V 7800W/36V 10400W/48V	
120415F	120A	1560W/12V 3120W/24V 4680W/36V 6240W/48V	3120W/12V 6240W/24V 9360W/36V 12480W/48V	
40825F	40A	4160W/96V	8320W/96V	
60825F	60A	6240W/96V	12480W/96V	
80825F	80A	8320W/96V	16640W/96V	
100825F	100A	10400W/96V	20800W/96V	

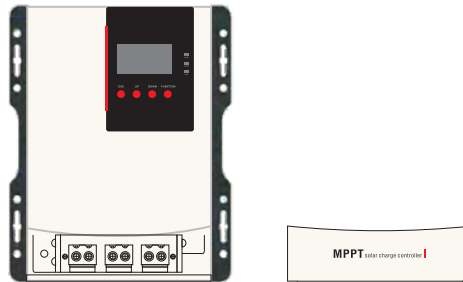
3.4 Model of wires and breaker

The installation of inverter must strictly follow the local electrical requirements. The output current of solar panels will be affected by the model of solar panel cell, connection setting and the light intensity, so the minimum wire size is design according to the short circuit current of solar panels. Please check the short circuit current on the manual book of solar panel (The short circuit current will not change when the solar panels serial connect. The total short circuit current are the sum of each solar panel group when parallel connect.) The short circuit current of solar panel can not over the maximum input current of the solar charge controller. For the convenient of turning on and off, also for the safety, we suggest you to install a breaker. Kindly choose right breaker and wires according to below chart.

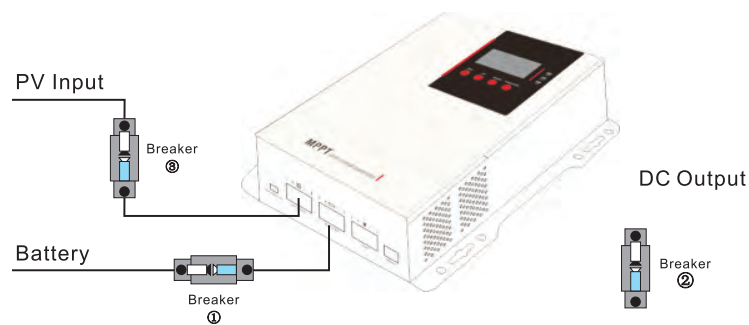
Model	PV maximum input Current	PV end max Wire diameter	Rated charging current	Battery wire diameter	Circuit breaker specifications
40415F 40825F	40A	7AWG/10mm ²	40A	7AWG/10mm ²	60A
60415F 60825F	60A	6AWG/16mm ²	60A	6AWG/16mm ²	80A
80415F 80825F	80A	4AWG/25mm ²	80A	4AWG/25mm ²	100A
100415F 100825F	100A	2AWG/35mm ²	100A	2AWG/35mm ²	120A
120415F	100A	2AWG/35mm ²	120A	2AWG/35mm ²	150A

3.5 Controller opening and closing steps

Before you connect the wire, please open the product case. After done it, please close and locked them, it is helpful to protect the connection port.



(1) Basic wiring



Make sure that the controller is installed and connected correctly!

Opening process: Step 1: open the circuit breaker ① on the battery side, make sure that the controller is connected with the battery (the LCD of the controller will display the content), and set the battery type.

Step 2: if you need to use the DC load output, then set the output control mode first, and then open the DC output circuit breaker ②.

Step 3: open the circuit breaker ③ on the input side of the solar panel pV, if the pV input voltage is in the charge range of the controller, then the controller will enter the charging state.

Closing process: turn off the circuit breaker in turn: ③②①



Caution:

1. If the system needs to connect to the inverter, please connect the inverter to the battery directly, but DO NOT connect to the load terminal of the controller.
2. When the controller is in the normal charge state, do not disconnect the battery connection, otherwise the Controller may be damaged. Therefore, the damage to the controller will not be within the warranty.

(2) Connect accessories

- Connect the remote temperature sensor cable (Model: RTS300R47K)

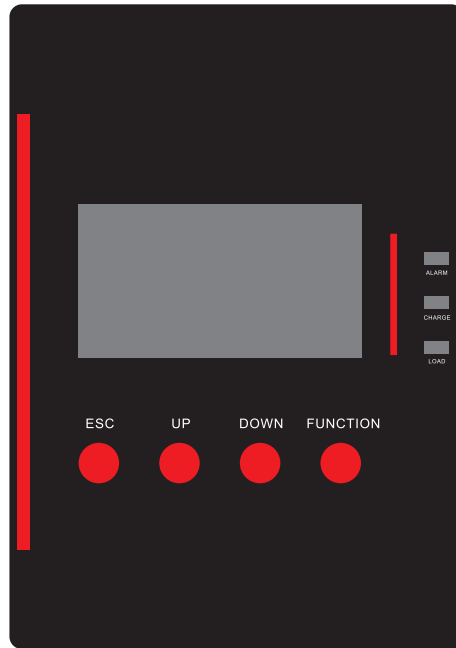
Connect the remote temperature sensor cable to the interface ⑩ and place the other end close to the battery.



CAUTION: If the remote temperature sensor is not connected to the controller, the default setting for battery charging or discharging temperature is 25 °C without temperature compensation.

- Connect the accessories for RS485 communication, refer to the accessories list.

4.Controller Operation







4.1 Indicator Lights

Indicator Lights	Color	Status	Instructions
<input type="checkbox"/> ALARM	RED	Blink	Alarm
<input type="checkbox"/> CHARGE	RED	Bright	Fault
<input type="checkbox"/> LOAD	GREEN	Blink	No Charging/Standby
	GREEN	Bright	Charging
	YELLOW	Bright	Load Output Function Open

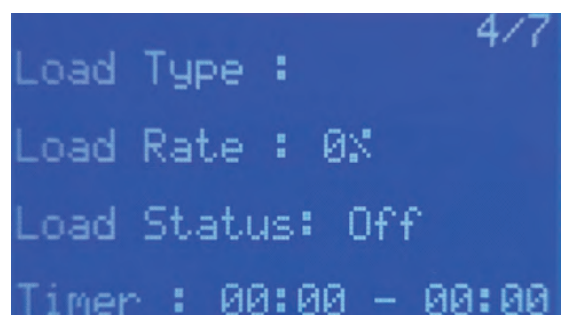
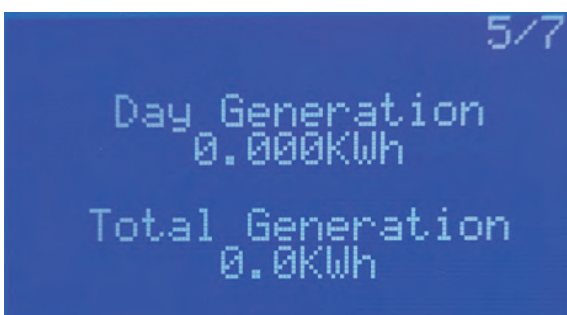
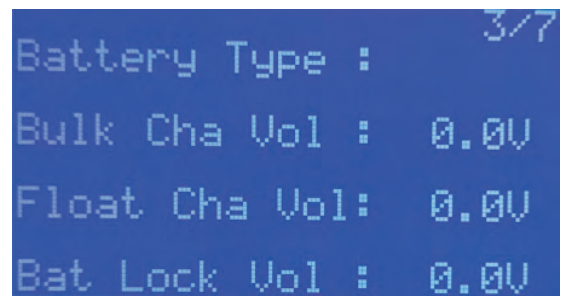
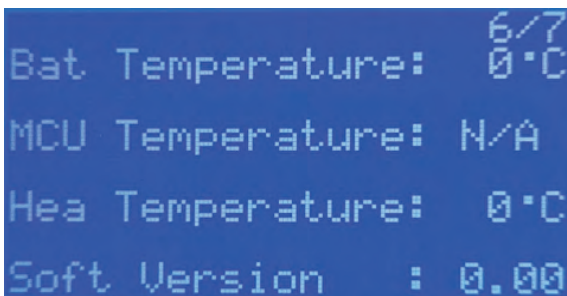
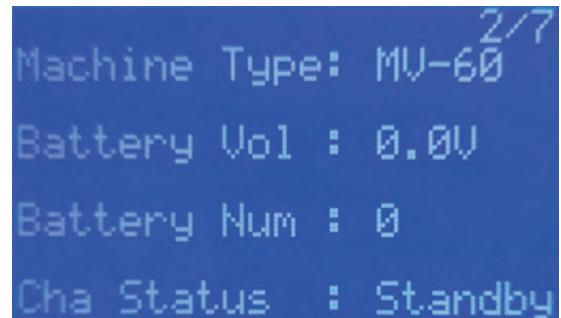
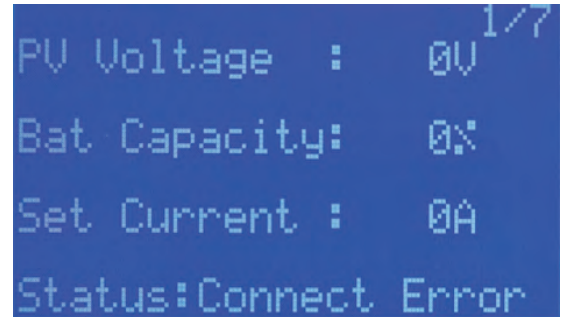
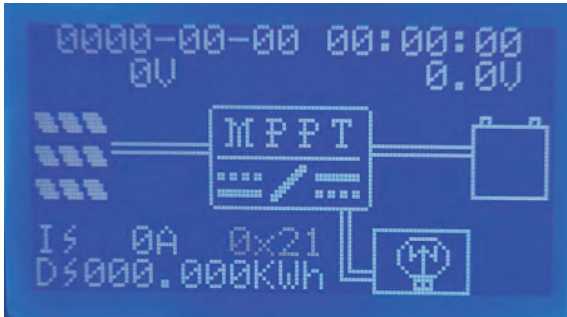
Note: Please refer to the chapter 4.3 "Alarming instructions"

4.2 Buttons

Mode	Icons	Instructions
Back		Tap ESC Button to return to the host interface to browse
Up		Tap the UP button to browse the page up or perform a selection function in the setting mode
Down		Tap the DOWN button to scroll down the page or perform a selection function in the setting mode
Function confirmation		Lightly press the FUNCTION button when the flashing font appears, it means that the setting operation can be change. After the setting, tap FUNCTION button to confirm the setting.
Press and hold "FUNCTION" for 3 seconds		Enter the quick setting page
Press and hold "ESC"+"FUNCTION" for 3 seconds		Enter the advanced settings page

4.3 LCD display

(1) Browsing interfaces



(2) Fault alarm display

Fault LED indicator	Code	Descriptions
Flash	0X33	PV input over voltage
Flash	0X34	Battery over heat
Flash	0X35	Overheating inside the controller
Flash	0X36	Battery low voltage
Flash	0X37	Battery extreme-lower voltage
Flash	0X38	DC Loads overloaded
Light on	0X52	Temperature sensor fault
Light on	0X53	Overheating inside of controller
Light on	0X54	Battery overheating
Light on	0X55	DC Loads output locked
Light on	0X56	Battery overcharged

4 . 4 Operation settings

☞ Basic settings

(1)Language setting

Setting steps: Press and hold "FUNCTION" for 3 seconds into setting pages. At first line is for language setting, press "FUNCTION" then the Language will flashing, then press UP and DOWN buttons to choose the language you want. At last, press "FUNCTION" again to confirm and save the setting.

(2)LCD screen light setting

Setting steps: Press and hold "FUNCTION" for 3 seconds into setting pages. At second line is for screen light setting, press "FUNCTION" then the light setting will flashing, then press UP and DOWN buttons to choose the light mode you want. At last, press "FUNCTION" again to confirm and save the setting.

(3)System time setting

Setting steps: Press and hold "FUNCTION" for 3 seconds into setting pages. At third line is for time setting, press "FUNCTION" then the time setting will flashing, then press UP and DOWN buttons to choose the time you want. At last, press "FUNCTION" again to confirm and save the setting.

(4)DC load output mode settings

Setting steps: Press and hold "FUNCTION" for 3 seconds into setting pages. At fourth line is for time setting, press "FUNCTION" then the time setting will flashing, then we using UP and DOWN buttons to choose the time you want. At last, press "FUNCTION" again to confirm and save the setting.

☞ Advanced settings

Note: To enter the advanced settings, you need to press the "ESC" + "FUNCTION" buttons at the same time for three seconds to enter the password input interface. The password defaults to "↓ ↓ ↓ ↓ ↑ ↑", select ↑ or ↓ by the page up and down button, and then press "FUNCTION" button to confirm the selection, after the final password is entered, choose whether to confirm, and then press the "FUNCTION" button to enter the setting mode.

(1)Battery type

① The type of batteries supported by the MPPT charge controller

Battery	VRLA Battery (by default)	Lithium battery	Lithium iron phosphate
	GEL battery		Ternary lithium
	Flooded battery		Customizing
	Customizing		

Setting steps: Enter the advanced setting page, select the first battery type, press the "FUNCTION" key and the font will flash, then use the page up and down keys to select the desired battery type, and then press the "FUNCTION" key to confirm.

② Control voltage parameters of battery

◆ Battery parameters

Voltage parameters are 25°C/12V system parameters, 24V system parameters X2, 36V system parameters X3, 48V system parameters X4, 96V system parameters X8

Voltage control parameters	VRLA Battery	GEL battery	Flooded battery	Customizing
Overvoltage disconnect voltage	15.9V	15.7V	16.1V	9~17V
Charging limited voltage	15.4V	15.2V	15.6V	9~17V
Overvoltage disconnection recovery voltage	15.4V	15.2V	15.6V	9~17V
Strong charging voltage	14.4V	14.2V	14.6V	9~17V
Float charge voltage	13.6V	13.6V	13.6V	9~17V
Boost recovery voltage	13V	13V	13V	9~17V
Low voltage disconnect recovery voltage	11.5V	11.5V	11.5V	9~17V
Undervoltage alarm recovery voltage	11.5V	11.5V	11.5V	9~17V
Undervoltage alarm voltage	11.4V	11.4V	11.4V	9~17V
Undervoltage disconnect voltage	11V	11V	11V	9~17V
Strong charge duration time	120 min	120 min	120 min	120 min

1. When the default battery type is selected, the battery voltage control parameters cannot be changed by default; if you want to change the battery voltage control parameters, you can only select the corresponding "Customizing" type.

2. "Customizing" must follow the logic

- ▶ Strong charge voltage > Float charge voltage
- ▶ Low voltage disconnect recovery voltage > Low voltage break voltage
- ◆ Lithium battery parameters

The voltage parameters are all 25°C/12V system parameters, 24V system parameters x2, 48V system parameters x4, 96V system parameters x8.

Voltage control parameters	Lithium iron phosphate	Ternary lithium	Customizing
Overvoltage disconnect voltage	16.1V	14.1V	9~17V
Charging limited voltage	15.6V	13.6V	9~17V
Overvoltage disconnection recovery voltage	15.6V	13.6V	9~17V
Strong charging voltage	14.6V	12.6V	9~17V
Float charge voltage	14.6V	12.6V	9~17V
Boost recovery voltage	13V	12V	9~17V
Low voltage disconnect recovery voltage	11.5V	9.5V	9~17V
Undervoltage alarm recovery voltage	11.5V	9.5V	9~17V
Undervoltage alarm voltage	11.4V	9.4V	9~17V
Undervoltage disconnect voltage	11V	9V	9~17V



Warning: The lithium battery parameters can be set, but the setting must refer to the voltage parameters of the lithium battery protection board to set the corresponding parameters. The lithium battery protection board must be connected during the lithium battery charging process and the accuracy of the lithium battery protection board must not exceed 0.2V. Otherwise, the system will not be responsible for any abnormality!

(2) System voltage

Setting steps: Enter the advanced settings page, the second system voltage, press the "FUNCTION" button after the font flashes, and then by turning the page up and down button to select the desired mode, and then press the "FUNCTION" button to confirm it.

(3)Charging current

Setting steps: Enter the advanced settings page, the third charging current, press the "FUNCTION" button after the font flashes, and then by turning the page up and down button to select the desired percentage of the charging current size, and then press the "FUNCTION" button to confirm.

(4)Cut-off voltage

Setting steps: Enter the advanced settings page, the fourth cut-off voltage, press the "FUNCTION" button after the font flashes, and then through the page-turning button to select the desired DC load output undervolt protection voltage value, and then press the "FUNCTION" button to confirm.

(5)Strong charging voltage

Setting steps: Enter the advanced settings page, the fourth strong charging voltage, press the "FUNCTION" button after the font flashes, and then through the page-turning button to select the required "customizing" strong charging voltage value, and then press the "FUNCTION" button to confirm it.

(6)Floating charging voltage

Setting steps: Enter the advanced settings page, the fifth floating charging voltage, press the "FUNCTION" button after the font flashes, and then by turning the page up and down button to select the required "customizing" floating charging voltage value, and then press the "FUNCTION" button to confirm.

(7)DC load output on time

Setting steps: Enter the advanced settings page, the sixth DC load output time, press the "FUNCTION" button after the font flashes, and then by turning the page up and down button to select the required time period to control the DC load output on/off, and then press the "FUNCTION" button to confirm.

(8)Restore factory settings

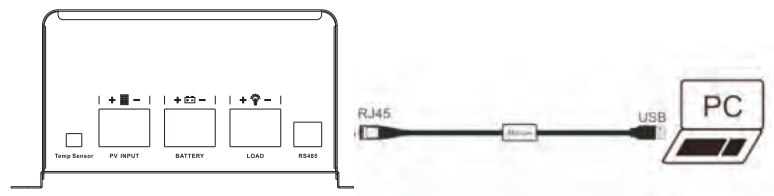
Setting steps: Enter the advanced settings page, the seventh item to restore factory settings, press the "FUNCTION" button after the font flashes, and then by turning the page up and down button to choose whether to reset the parameters, and then press the "FUNCTION" button to confirm.

☞ Communication settings

• Host settings

Setting steps: Connect the PC terminal via a communication line and set the controller parameters in the host.

1. Connection method



4 . 5 Operation and use of lithium battery mode



Note: The lithium battery system voltage cannot be set to auto-recognition and self-adaptation. When a lithium battery needs to be inserted for use, the system voltage needs to be set to the working voltage of the currently received lithium battery.

☞ Operation steps:

Step 1: Connect the battery input terminal to the lithium battery pack, press the "ESC" + "FUNCTION" buttons for three seconds at the same time, enter the password to enter the advanced setting mode, set and select the type of lithium battery.



Step 2: Set the current system voltage. (For example: if the lithium battery pack is lithium iron phosphate 16 strings, the system voltage is set to 48V).

Step 3: Set the charging current according to the battery capacity of the current lithium battery pack, generally about 0.5~0.7C of the capacity.

Step 4:Cut off the power and connect it again.

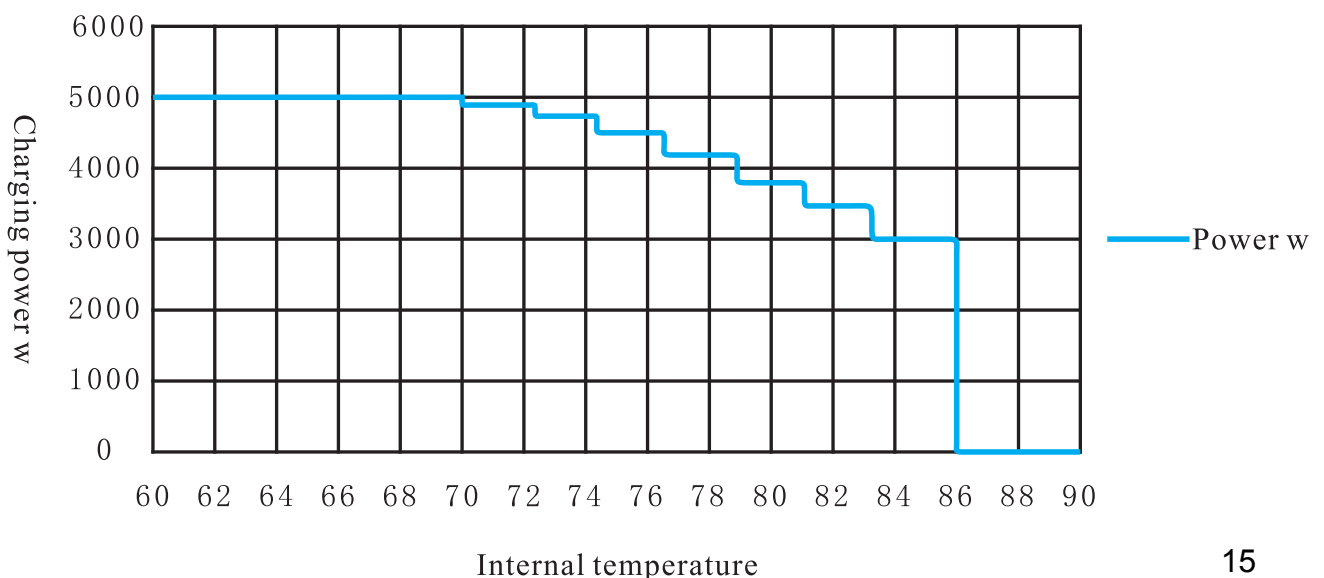
5. Protection, Troubleshooting, System maintenance

5.1 Protections

Protections	Descriptions
PV current limiting power protection	When the photovoltaic array charging current or power exceeds the pv rated current or power, it will be charged with the rated current or power.
PV short circuit protection	When the PV is not charging, the controller will not be damaged when the PV array is short-circuited.
	 Warning: PV is forbidden to short circuit during charging, otherwise the controller will be damaged.
PV reverse connection protection	When the polarity of the photovoltaic array is reversed, the equipment will not be damaged, the display will report a fault, and it can continue to work after correction.
Anti-recharge protection at night	At night, since the battery voltage is greater than the voltage of the PV module, the battery is prevented from discharging through the PV module.
Battery reverse connection protection	When the battery polarity is reversed, the equipment will not be damaged.
Battery overvoltage protection	When the battery voltage reaches the overvoltage disconnect voltage point, it will automatically stop charging the battery to prevent damage to the battery due to overcharging.
Battery over-discharge protection	When the battery voltage reaches the undervoltage disconnection voltage point, it will automatically stop discharging the battery to prevent the battery from being damaged by over-discharge.
	 Note: This protection function will only be available when the DC load output is connected to a load discharge.
Battery overheat protection	The controller detects the battery temperature through an external temperature sensor, and stops working when the battery temperature exceeds 60°C, and resumes operation when the battery temperature falls below 55°C.
Equipment overheating protection ^①	The controller detects the internal temperature of the controller through an internal temperature sensor. When the temperature inside the machine exceeds 85°C, it will stop working, and resume working when it is below 70°C.
TVS high voltage surge protection	The internal circuit of this controller is designed with transient suppression diode TVS components, but it can only protect the high-voltage surge pulse with low energy. If the controller is used in areas with frequent lightning, it is recommended to install an external lightning arrester.

- ① When the internal temperature of the machine is 70°C, turn on the charging power reduction mode. For every 2°C increase, the charging power will be reduced by 5%, 10%, 20%, 30%, 40%, 50%, 70%, 90%. When the temperature reaches 85°C or higher, stop charging immediately. When the internal temperature is not more than 65°C, the maximum power tracking charge will be resumed.

E.g. 100415F 48V system



5.2 Troubleshooting

Descriptions	Failures	Solutions
When the sunlight is strong, the charging indicator does not stay on and there is no charging current	PV array connection is open	Please check whether the wiring at both ends of the photovoltaic array is correct and whether the contact is reliable.
Normal wiring, but the controller cannot work normally	The battery voltage is less than 11V	Measure the voltage across the battery, at least 11V to turn on the controller.
The red light of the controller is flashing, and the LCD display code is 0X33	PV array polarity is reversed or PV array input open circuit voltage exceeds the limit	Check whether the polarity of the two ends of the photovoltaic array input is connected correctly, and measure whether the voltage across the photovoltaic array is within the specified range.
The red light of the controller is flashing, and the LCD display code is 0X37	The battery is over discharge	①Automatically restore load output when the power is sufficient; ②Supply the battery power in other ways.
No charging, the controller red light is on, LCD flashing code 0X52	Internal temperature sensor failure	Check whether the temperature sensor plug in the machine is loose.
No charging, the controller red light is on, LCD flashing code 0X53	The high internal temperature causes fault	When the temperature in standby cools to a safe temperature, resume normal charging.
No charging, the controller red light is on, LCD flashing code 0X54	The battery overheated	When the battery cools to below 55°C, resume normal charging.
No charging, the controller red light is on, LCD flashing code 0X56	The battery overvoltage	Measure whether the voltage across the battery is too high and disconnect the wiring of the photovoltaic array.
Controller red light is on, LCD flashing code 0X55	DC load output lock down	Please check whether the power of the DC appliance is excessive or there is a short-circuit fault inside the appliance.

5.3 System maintenance

In order to maintain the best long-term working performance, we recommend to check the following items twice a year

Make sure that the airflow around the controller is not blocked, and remove the dirt or debris from the air outlet of the cooling fan.

Check whether all exposed wires are damaged due to sunlight, friction with other surrounding objects, dry rot, insect or rodent damage, etc. If necessary, the wire needs to be repaired or replaced.

Check all the wiring terminals to see if there are signs of corrosion, insulation damage, high temperature or burning discoloration, and tighten the terminal screws.

Check for dirt, insect nesting and corrosion, and clean up as required.* [If the lightning arrester has failed, replace the failed arrester in time to prevent lightning damage to the controller and even other user equipment.



WARNING: Beware of electric shock! When performing the above operations, make sure that all power to the controller has been disconnected, and then perform corresponding inspections or operations!

6. Technical parameters

Parameter xxxxF	40415	60415	80415	100415	120415	40825	60825	80825	100825	
System rated voltage	12/24/36/48VDC or self-identification									
Controller operating voltage range	12~64V									
Lead-acid battery type	Maintenance-free (default)/colloid/liquid/custom									
Lithium battery type	Lithium Iron Phosphate/Ternary Lithium/Custom									
Rated charging current	40A	60A	80A	100A	120A	40A	60A	80A	100A	
Rated charging power	540W/12V	800W/12V	1040W/12V	1300W/12V	1560W/12V	4160W/96V	6240W/96V	8320W/96V	10400W/96V	
	1080W/24V	1600W/24V	2080W/24V	2600W/24V	3120W/24V					
	1620W/36V	2400W/36V	3120W/36V	3900W/36V	4680W/36V					
	2160W/48V	3200W/48V	4160W/48V	5200W/48V	6240W/48V					
Maximum open circuit voltage of photovoltaic modules	150V (under the lowest temperature condition) 138V (under 25℃ condition)									
Maximum power point operating voltage range	20~150VDC									
	36~150VDC									
	48~150VDC									
	64~150VDC									
Tracking efficiency	≥99.5%									
Maximum conversion efficiency	97.5%									
Temperature compensation coefficient	-3mV/℃/2V									
Static loss	350mA/12V;170mA/24V;85mA/48V;			700mA/12V;350mA/24V;175mA/48V;			40mA/96V			83mA/96V
DC load output voltage	Can be turned on in 12/24V mode									
DC load rated output current	40A									
DC load output control	Normally open normally closed mode/time control mode/light control mode									
Protective function	PV input reverse connection protection, battery input reverse connection protection, battery overcharge protection, battery overvoltage protection, battery over temperature protection, machine over temperature protection									
Cooling method	Wind cooling									
way of communication	RS485									
LCD backlight time	Default 60S, backlight mode can be set									
Environmental parameters										
Working environment temperature range	-20℃~+50℃									
Storage temperature range	-40℃~+70℃									
Relative humidity range	0~90%RH									
Mechanical parameters										
parameter	40415F	60415F	80415F	100415F	120415F	40825F	60825F	80825F	100825F	
Dimensions	219*260*110mm	219*260*110mm	275*348*109mm	275*348*109mm	275*348*109mm	219*260*110mm	219*260*110mm	275*348*109mm	275*348*109mm	
Recommended wiring	7AWG/10mm ²	6AWG/16mm ²	4AWG/25mm ²	2AWG/35mm ²	2AWG/35mm ²	7AWG/10mm ²	6AWG/16mm ²	4AWG/25mm ²	2AWG/35mm ²	
net weight	2.8kg	2.8kg	4.6kg	5.2Kg	5.2Kg	2.8kg	2.8kg	4.6Kg	5.2Kg	