SolarFAM

SX series
MPPT Solar Controller
12/24, 10/15/20/30/40A,
130/260/390/520/780/1040W
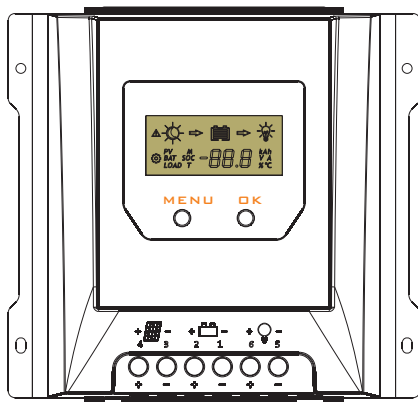
User Manual

Contents

Dear Clients,

Thanks for selecting the Magic 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

The following symbols are used throughout this manual to indicate potentially dangerous conditions or mark important safety instructions. Please take care when meeting these symbols.

WARNING: Indicates a potentially dangerous condition. Use extreme caution when performing this task.

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

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

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

Magic 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%.

2.1 It comes with a number of outstanding features, such as:

- Innovative Max Power Point Tracking(MPPT) technology, tracking efficiency >99.9%
- Full digital technology, high charge conversion efficiency up to 98%
- LCD display design, read operating data and working condition easily.
- Real-time energy statistics function.
- 12/24V automatic recognition
- AGM、Liquid and GEL battery for selection
- External temperature sensor, automatic temperature compensation
- Built-in temperature sensor, when the temperature exceeds the set value, the charging current will lower down followed by the decrease of temperature, so as to control the controller's temperature rise
- Four stages charge way: MPPT, boost, equalization, float
- With current-limiting charging mode, when the power of solar panel is over-sized and charging current exceeds the rated current, the controller will lower the charging power, which enables the system to work under the rated charging current
- Multiple load control modes: Always on, Dusk to Dawn, Evening, Manual
- Two USB interfaces(EU Series)
- Based RS-485 standard Modbus protocol, to maximize the communication needs of different occasions.
- 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)**
$$Iin \times Vmp = Iout \times Vout$$
* 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.
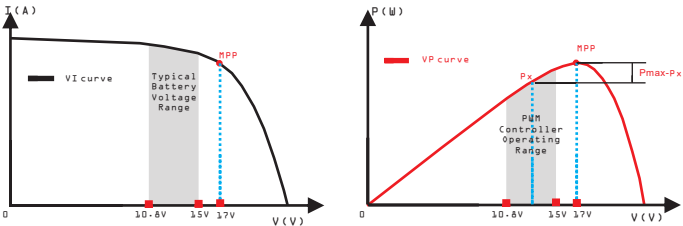
**Nominal 12 Volt Solar Module I-V curve and output power graph.**

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

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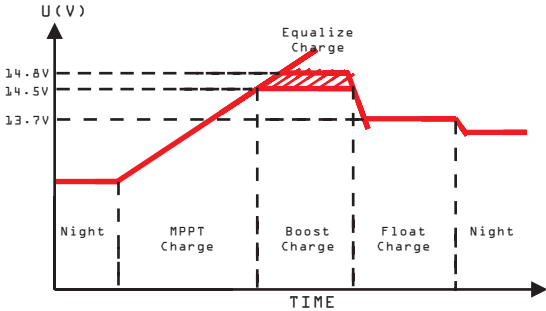
MPPT Charge

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.

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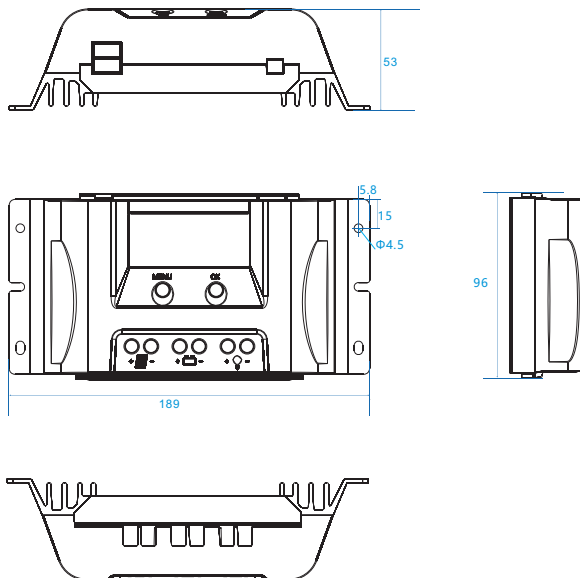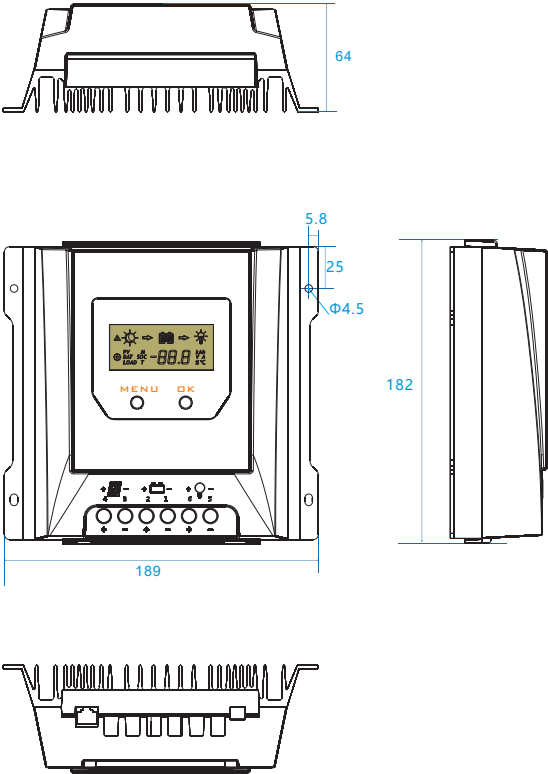
WARNING: Risk of explosion!
Equalizing flooded battery can produce explosive gases, so well ventilation of battery box is necessary.
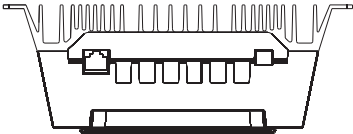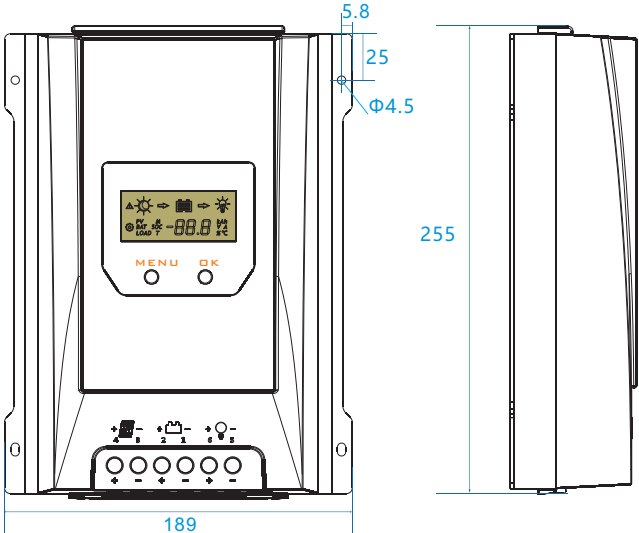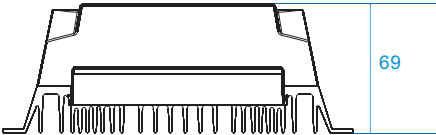
3, Dimensions

3.1 The dimensions of SX1050/1550EU
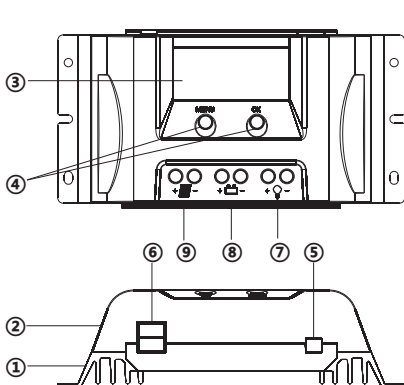
3.2 The dimensions of SX2010/2055/3055

64

5.8

25

Φ4.5

182

189

## 3.3 The dimensions of SX4010

69

5.8

25

Φ4.5

255

189

4, Structure & Accessory

4.1 Structure & Characteristics of SX1050/1550EU
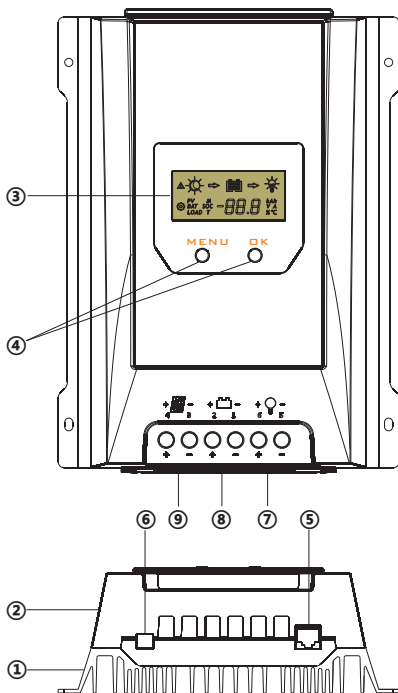

①Heat Sink
—dissipate controller heat

②Plastic Case
—Internal protection

③LCD
—Display settings and operating status, system parameters

④Key: MENU、OK
Set and view the operating parameters

⑤Temperature Sensor Port
—Collect temperature information, Temperature compensation.

⑥Two USB interfaces
—Output 5V, 2A

⑦ Load Terminals
—Connected load.

⑧Battery Terminals
—Connect the battery.

⑨Solar module terminals
—Connected solar modules.

4.2 Structure & Characteristics of SX2010/2055/3055
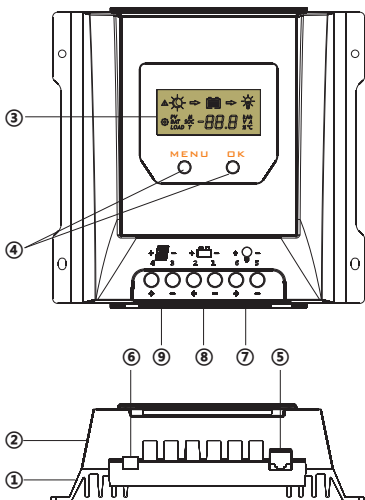
①Heat Sink
—dissipate controller heat

②Plastic Case
—Internal protection

③LCD
—Display settings and operating status, system parameters

④Key: MENU、OK
Set and view the operating parameters

⑤RJ11 interface
—Connecting monitoring devices

⑥Temperature Sensor Port
—Collect temperature information, Temperature compensation.

⑦ Load Terminals
—Connected load.

⑧Battery Terminals
—Connect the battery.

⑨Solar module terminals
—Connected solar modules.

4.3 Structure & Characteristics of SX4010

①Heat Sink
—dissipate controller heat

②Plastic Case
—Internal protection

③LCD
—Display settings and operating status, system parameters

④Key: MENU、OK
Set and view the operating parameters

⑤RJ11 interface
—Connecting monitoring devices

⑥Temperature Sensor Port
—Collect temperature information, Temperature compensation.

⑦ Load Terminals
—Connected load.

⑧Battery Terminals
—Connect the battery.

⑨Solar module terminals
—Connected solar modules.

4.4 Temperature Sensor

To collect battery temperature data for temperature compensation so the controller can charge the battery. The temperature sensor connected via interface 6.

If the external temperature sensor is not connected or damaged, the default environment temperature of the controller is 25℃, and the temperature compensation is not carried out when charging.

5, Installation

⚠️ **CAUTION: Please read all instructions and precautions in the manual before installing! It is recommended to remove the acrylic protective film covering the LCD screen before installation.**

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 mount the solar charge controller outdoors or in wet rooms. 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.
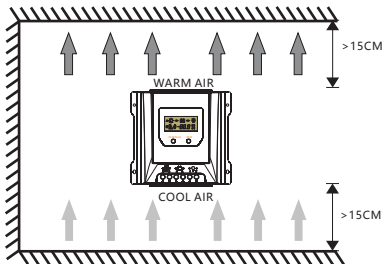
5.3 Wiring Specifications

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

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

Model	Rated charging current	Rated discharging current	Solar wire diameter (mm²/AWG)	Battery wire diameter (mm²/AWG)	Load wire diameter (mm²/AWG)
SX1050EU	10A	10A	2.5/13	2.5/13	2.5/13
SX1550EU	15A	10A	4/11	4/11	2.5/13
SX2055/2010	20A	20A	5/10	5/10	5/10
SX3055	30A	30A	6/9	6/9	6/9
SX4010	40A	30A	10/8	10/8	6/9

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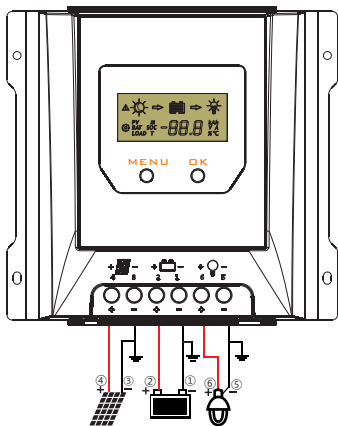
WARNING: Risk of electric shock! Exercise caution when handing solar wiring. The solar PV array can produce open-circuit voltages in excess of 100V when in sunlight. Pay more attention to it.

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.

CAUTION: 1.If no temperature sensor is connected to the controller, the battery temperature value will stay at 25 °C.
2.If an inverter is deployed in the system, directly connect the inverter to the battery, and do not connect it to the controller's load terminals.

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 10V~15V, else if the system is 24V, the battery voltage should between 20V~30V. If the polarity is correct, the LCD on the controller will begin to show.

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).

3rd step: Connect loads

  Connect the load cable to the correct polarity of the right pair of terminals on the solar charge controller (with the lamp symbol). To avoid any voltage on the wires, please connect the wire to the load before connect to the controller.
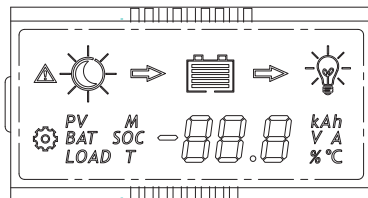
4th step: Final work

  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.

6, Operation

6.1 LCD Display

6.1.1 Status Description

Item	Icon	Status
PV array	☼ 🔋	Daytime, not charging
	☼ ⇒ 🔋	Daytime, charging
	🌙	Night
	PV	PV voltage、current and ampere hours
	PV T	The total charge ampere hours of the solar panel
Battery	🔋	Battery capacity
	⚙ BAT	Battery voltage(Programmable)
	BAT	Battery current
	BAT SOC	Battery state of charge(in %)
	25 ℃	Temperature
	⚙ BAT T GEL	Battery type(Programmable)
Load	LOAD	Load voltage、current and ampere hours
	LOAD T	The total discharge ampere hours of the load
	⚙ LOAD M	Load mode(Programmable)
	🔋 ⇒ 💡	The load is on
	🔋 💡	The load is off
Fault	⚠	Fault indication, see 6.1.4

PV array charge ampere hours and load ampere hours are off after power failure。

6.1.2 The interface automatically cycles
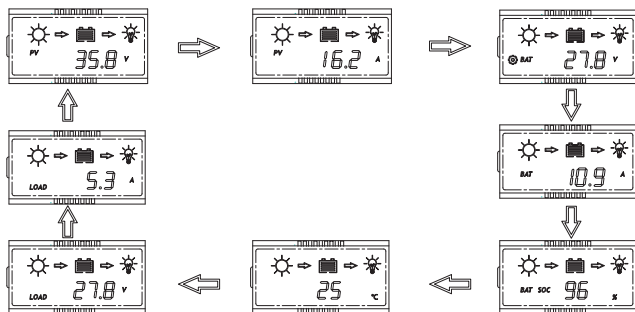
6.1.3 Press OK to browse the interface

15
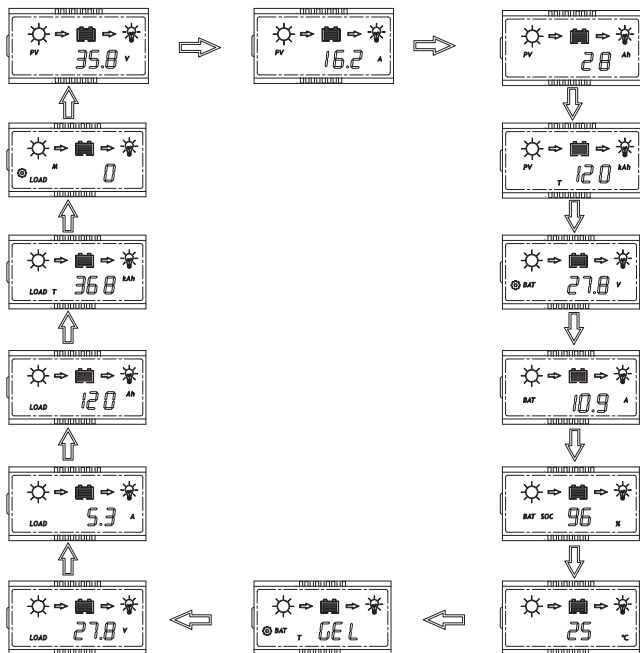
6.1.4 Fault indication

Status	Icon	Description
Short circuit	⚠ 💡 E1	Load off, fault icon display, load icon flashes, the LCD screen displays E1
Over current	⚠ 💡 E2	Load off, fault icon display, load icon flashes, the LCD screen displays E2
Low voltage	⚠ 🔋 E3	Battery level shows empty, fault icon display, battery frame flashes, the LCD screen displays E3
Over voltage	⚠ 🔋 E4	Battery level shows full, fault icon display, battery frame flashes, the LCD screen displays E4
Over temperature	⚠ ℃ E5	The charge and discharge are off, fault icon display, icon ℃ flashing, the LCD screen displays E5

6.2 Key function

MENU   OK
○   ○

Mode	Operating
Browse interface	Short press **OK**
Static display	Press the **MENU** and **OK** key at the same time for 1s, the LCD screen will lock the interface. Press the **MENU** and **OK** key again for 1s, the LCD interface will unlock and start scrolling.
Setting parameter	Press the **MENU** key for 1s to enter the setting mode when the icon ⊛ appears on the display interface, and exit automatically after 30s
Load On/Off	When the controller is working in street lamp mode, press the **MENU** key for 3s to turn on the load, press the **MENU** key again or 1min later the load will be off.

6.3 USB interface

SX-EU series have two USB interfaces, maximum output of single USB is 5V 1.5A, maximum output of two USB is 5V 2A, for charging mobile phones and other smart devices.

The USB stops output only when the controller is in low voltage protection.

6.4 Parameters setting

When the icon ⊛ appears in the display interface, it means that the parameters can be set.
Long press the **MENU** key for 1s, then icon ⊛ flashes, press **OK** to change the parameter.
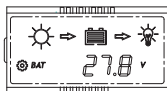
6.4.1 Low voltage protection and reconnect

When the LCD shows as the left, press the **MENU** key for 1s, the icon ⊛ flashes, you can set the controller's low voltage protection, low voltage protection is divided into battery voltage control and SOC.

①Battery voltage control

Low voltage protection setting range:
10.8~11.8V/21.6~23.6V.
The low voltage recovery voltage(LVR) is 0.8/1.6V higher than the low voltage protection voltage(LVD), When you change LVD, LVR will be changed automatically.

②SOC

Display	Low voltage protection range	Low voltage reconnect
5-1	11.0~11.6V/22.0~23.2V	12.4/24.8V
5-2	11.1~11.7V/22.2~23.4V	12.5/25.0V
5-3	11.2~11.8V/22.4~23.6V	12.6/25.2V
5-4	11.4~11.9V/22.8~23.8V	12.7/25.4V
5-5	11.6~12.0V/23.2~24.0V	12.8/25.6V

6.4.2 Battery type
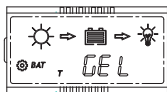
When the LCD shows as the left, press the **MENU** key for 1s, the icon ⊛ flashes, you can set battery type.

Display	Battery type
GEL	GEL(Default)
AG-	AGM
LI9	Liquid

6.4.3 Load mode
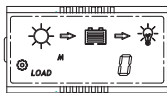
When the LCD shows as the left, press the **MENU** key for 1s, the icon ⊛ flashes, you can set the load mode.

Display	Load mode
0	Always on Mode: The load output is always switched on.
1	Dusk to Dawn Mode: The load output is switched on between sunset and sunrise.
23456789	Evening Mode: The load output will be switched on for 2~9hours after sunset.
USE	Manual Mode: The load output can be switched on and off manually by pressing **MENU** shortly.

Test Function(Evening mode)
When the controller is working in the street lamp mode, press the **MENU** key for 3 seconds to turn on the load. Press the **MENU** key again or the load turns off automatically after 1 minute.
If the controller is operating in always on mode, the test function does not work.

✎ **Manual mode**
If the load mode is selected "**USE**", you can switch on and off the load output manually by pressing **MENU** shortly.

Note:
1.If the controller turns off the load due to low voltage protection、overcurrent protection、short-circuit protection or over temperature protection, the load will turn on automatically when the controller recoverys from protection state,.
2.Please note: Pushing the MENU button can still activate the function of the key, even during of the above four kinds protection states.

7, Protections, Troubleshooting and maintenance

7.1 Protection

■ 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 15.5 / 31.0V, 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 controller will stop discharging to protect the battery from over discharging damage.

■ Load Over Current Protection

If the load current exceeds the maximum load current rating 1.25 times, the controller will disconnect the load.

■ Load Short Circuit Protection

Once the load short circuit happens , the load short circuit protection will start automatically.

■ 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 be charging or discharging at the default temperature 25℃ to prevent the battery damaged from overcharging or over discharged.

7.2 Troubleshooting

Faults			Reason	Troubleshooting
⚠	💡	E1	Short Circuit	Switch off all loads, remove short circuit, load will be reconnected after 1 minute automatically
⚠	💡	E2	Over Current	Reduce the load, the controller will resume to work after 1minute.
⚠	🔋	E3	Battery voltage is too low	Load will be reconnected when battery is recharged
⚠	🔋	E4	Battery voltage is too high	Check if other sources overcharge the battery. If not, controller is damaged.
⚠	℃	E5	Over temperature	After the temperature decreases, the controller will work normally
Wire connection is correct, LCD not display			Battery voltage is abnormal at start-up	Charge or discharge the battery so that the battery voltage is within the normal operating range (10~15V or 20~30V)
Battery can't be charged during daytime			PV panel fault or reverse connection	Check panels and connection wires

7.3 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.
■ Check and confirm that LCD is consistent with required. 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

8.1 Technical data of SX1050EU/SX2055/SX3055

	Item	SX1050EU	SX1150EU	SX2055	SX3055
Battery Parameters	System Voltage	12V		12/24V auto	
	Max Charging Current	10A	15A	20A	30A
	MPPT Charging Voltage	<14.5V@25℃		<14.5/29.0V@25℃	
	Boost Voltage	14.5V@25℃		14.5/29.0V @25℃	
	Equalization Voltage	14.8V@25℃		14.8/29.6V @25℃(Liquid,AGM)	
	Float Voltage	13.7V@25℃		13.7/27.4V @25℃	
	Low Volt. Disconnect	10.8~11.8V, SOC1~5		10.8~11.8/21.6~23.6V, SOC1~5	
	Reconnect Voltage	11.6~12.8V		11.6~12.8V/23.2~25.6V	
	Overcharge Protect	15.5V		15.5/31.0V	
	Max volt on Bat. terminal	20V		35V	
	Temp. Compensation	-4.17mV/K per cell (Boost, Equalization),			
		-3.33mV/K per cell (Float)			
	Battery Type	Gel, AGM, Liquid (default: Gel)			
Panel Parameters	Max volt on PV(-20℃) **1**	45V	35V	55V	
	Max volt on PV(25℃)	40V	30V	50V	
	Max input power	130W	200W	260W/520W	390W/780W
	Dusk/Dawn detect volt.	8.0V		8.0/16.0V	
	MPPT tracking range	(Battery Voltage + 1.0V) ~Voc*0.9 **2**			
Load	Output Current	10A		20A	30A
	USB interface	5V, 2A		—	
	Load mode	Always on, Dusk to Dawn, Evening, Manual			
System Parameters	Max tracking efficiency	>99.9%			
	Max charge conversion	97.5%		98.0%	
	Dimensions(mm)	189 * 96 * 53		189*182*58	189 * 182 * 64
	Weight	420g		1Kg	1.3Kg
	Self consumption	7mA		≤8mA(12V); ≤12mA(24V)	
	Communication	—		RS485(RJ11 interface)	
	Grounding	Common Negative			
	Power terminals	8AWG(10mm²)		6AWG(16mm²)	
	Ambient temperature	-20 ~ +55℃			
	Storage temperature	-25 ~ +80℃			
	Ambient humidity	0 ~ 100%RH			
	Protection degree	IP32			
	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.

8.2 Technical data of SX2010/SX4010

	Item	SX2010	SX4010
Battery Parameters	Max Charging Current	20A	40A
	System Voltage	12V/24V automatical recognization	
	MPPT Charging Voltage	<14.5/29.0V@25℃	
	Boost Voltage	14.5/29.0V @25℃	
	Equalization Voltage	14.8/29.6V @25℃ (Liquid, AGM)	
	Float Voltage	13.7/27.4V @25℃	
	Low Volt. Disconnect	10.8~11.8V/21.6~23.6V, SOC1~5(default: 11.2/22.4V)	
	Reconnect Voltage	11.6~12.8V/23.2~25.6V (default: 12.0/24.0V)	
	Overcharge Protect	15.5/31.0V	
	Max volt on Bat. terminal	35V	
	Temp. Compensation	-4.17mV/K per cell (Boost, Equalization), -3.33mV/K per cell (Float)	
	Battery Type	Gel, AGM, Liquid (default: Gel)	
Panel Parameters	Max volt on PV terminal	100V(-20℃), 90V(25℃)	
	Max input power	260/520W	520/1040W
	Dusk/Dawn detect volt.	8.0/16.0V	
	MPPT tracking range	(Battery Voltage + 1.0V) ~Voc*0.9 *	
Load	Output Current	20A	30A
	Load mode	Always on, Dusk to Dawn, Evening, Manual	
System Parameters	Max tracking efficiency	>99.9%	
	Max charge conversion	98.0%	
	Dimensions(mm)	189 * 182 * 64	189 * 255 * 69
	Weight	1.3Kg	2Kg
	Self consumption	≤8mA(12V); ≤12mA(24V)	
	Communication	RS485(RJ11 interface)	
	Grounding	Common Negative	
	Power terminals	6AWG(16mm²)	
	Ambient temperature	-20 ~ +55℃	
	Storage temperature	-25 ~ +80℃	
	Ambient humidity	0 ~ 100%RH	
	Protection degree	IP32	
	Max Altitude	4000m	

*1.Voc means the open circuit voltage of the solar panel.
*2.Around oblique line value separately on behalf of 12V and 24V system's value.