SR-E 系列太阳能智能充电控制器
使用说明书

一、主要特点

1. 使用微处理器和专用控制算法，实现了智能控制。
2. 五种负载工作模式：纯光控、光控+定时、手动、调试模式、常开模式。
3. 具有先进的市电互补切换功能，采用市电单独给负载供电而非市电直接加到蓄电池上面的接入方式，可减小市电对蓄电池和市电电源造成的损坏，能有效减少市电电源功率配置。整个切换过程实现软切换，不会对负载和蓄电池造成冲击，负载工作不受影响。
4. 具有市电检测功能，当有市电时，蓄电池电压下降到市电切换电压点时自动切换到市电供电，无市电时，蓄电池持续放电到过放点后关闭输出。
5. 科学的蓄电池管理方式，当出现过放时，对蓄电池进行提升充电，进行一次补偿维护，正常使用时，使用直充充电和浮充结合的充电方式，每 7 天进行一次提升充电，防止蓄电池硫化，大大延长了蓄电池的使用寿命；同时具有高精度温度补偿。
6. 参数设置具有掉电保存功能，即系统模式和控制参数等重要数据均保存在芯片内部，掉电后不丢失，使调节更加方便，系统工作更可靠。
7. 充电回路采用双 MOS 串联式控制回路，使回路电压损失较使用二极管的电路降低近一半，充电采用 PWM 模糊控制，使充电效率大幅提高，用电时间大大增加。
8. LED 直观显示太阳能电池、蓄电池、负载和市电的状态，数码管显示调节参数，让用户实时了解系统运行状况。
9. 具有过充、过放、过载保护以及独特电子短路保护与防反接保护，所有保护均不损害任何部件，不烧保险；具有 TVS 防雷保护，无跳线设计，可提高系统的可靠性、耐用性。
10. 所有控制全部采用工业级芯片和精密元器件，能在寒冷、高温、潮湿环境正常运行。同时使用晶振定时控制，使定时控制更加精确。
11. 双位数字 LED 显示，一键式操作即可完成所有设置，使用方便直观。

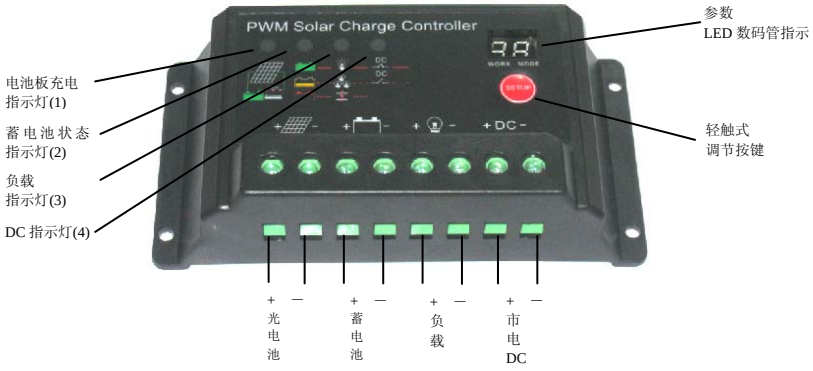
二、系统说明

本控制器专为太阳能直流供电系统、太阳能直流路灯系统、小型太阳能电站系统设计，使用专用电脑芯片实现了智能化控制，所有芯片均采用工业级别，可以在恶劣的环境下使用。系统具有短路、过载、和独特的防反接保护，充满、过放自动关断、恢复等全功能保护措施，详细的充电指示、蓄电池状态、负载、市电及各种故障指示。本控制器通过电脑芯片对蓄电池电压、光电池电压、放电电流、环境温度等参数进行采样，通过专用控制模型计算，实现符合蓄电池特性的放电率、温度补偿修正的高准确控制，并采用了智能高效的 PWM 模糊充电方式对蓄电池进行充电，保证蓄电池工作在最佳状态，大大延长了蓄电池的使用寿命。本控制器还具有多种工作模式，可满足不同用户各种需要。对于具有自动识别的型号，系统上电时将检测系统电压，如果是 12V 系统数码管显示“12”；如果是 24V 系统数码管将显示“24”。

三、安装及使用

1. 控制器安装要牢靠，尺寸如下：
   外形尺寸：133.5×70×34（mm）
   安装尺寸：126×50（mm）
2. 导线的准备：使用与电流相匹配的电缆，计划好长度，将接控制器一侧的接线头剥去 5mm 的绝缘，尽可能减少连接线长度，以减少电损耗。
3. 连接蓄电池：注意＋，－极，不要接反。如果连接正确，蓄电池指示灯会亮，否则，请检查连接是否正确。
4. 连接太阳能板：注意＋，－极，不要接反，如果有阳光，太阳能板指示灯会亮，否则，请检查连接是否正确。
5. 连接负载：将负载连接线接入控制器，电流不能超过控制器额定电流，并注意＋，－极，不要接反，以免损坏设备。
6. 市电连接：将市电接入，注意＋，－极，不要接反，如果有市电，DC 指示灯会闪烁，否则，请检测市电电源连接是否正确。同时注意蓄电池电压类型，选择电压合适的外接电源。

四、控制器面板图



五、使用说明

1、工作状态指示

状态 / 指示灯	长灭	长亮	慢闪	快闪
电池板	晚上	白天	正在充电	系统超压
蓄电池	-	工作正常	欠压	过放
负载	负载关闭	负载打开	过载	短路
DC	无市电	市电供电	有市电	-

2、设置方法：

按键按下持续 3s 以上数码管开始闪烁，系统进入调节模式，松开按键，每按一次按键，数码管数字会换一个数字，直到数码管显示的数字对上用户从表中所选模式对应的数字为止，等数码管停止闪烁或是再次按下按键 3s 以上即完成设置。

3、模式介绍

纯光控（00）：当没有阳光时，光强降至启动点，控制器延时 10 分钟确认启动信号后，根据设置参数开通负载，负载开始工作；当有阳光时，光强升到启动点，控制器延时 10 分钟确认关闭信号后关闭输出，负载停止工作。

光控+时控（01 ～ 14）：启动过程与纯光控相同，当负载工作到设定时间就自动关闭，设置时间 1 ～ 14 小时。

手动模式（15）：该模式下用户可以通过按键控制负载的打开与关闭，而不管是否在白天或是晚上。此模式用于一些特殊负载的场合或是调试时使用。

调试模式（16）：用于系统调试时使用，有光信号时即关闭负载，无光信号开通负载，方便安装调试时检查系统安装的正确性。

常开模式（17）：上电负载一直保持输出状态，此模式适合需要 24 小时供电的负载。

4、工作模式设置表

LED 显示	模式	LED 显示	模式	LED 显示	模式
00	纯光控模式	06	光时控 6 小时	12	光时控 12 小时
01	光时控 1 小时	07	光时控 7 小时	13	光时控 13 小时
02	光时控 2 小时	08	光时控 8 小时	14	光时控 14 小时
03	光时控 3 小时	09	光时控 9 小时	15	手动模式
04	光时控 4 小时	10	光时控 10 小时	16	调试模式
05	光时控 5 小时	11	光时控 11 小时	17	常开模式

注：控制器默认出厂设置为 15（手动模式），按下按键即可打开负载，方便用户安装调试使用。

六、参数说明

控制器型号：	SR-E 系列	
额定充电电流：	□5A □10A □15A □20A	
额定放电电流：	□5A □10A □15A □20A	
系统电压：	□12V ； □24V ； □12V/24V Auto	
空载损耗：	<5mA；	
充电回路压降：	不大于 0.20V；	
放电回路压降：	不大于 0.20V；	
超压保护：	17V；×2/24V；	
提升充电电压：	14.6V；×2/24V（维持时间：30min）（当出现过放电时调用，或每 7 天调用一次）	
直充充电电压：	14.4V；×2/24V（维持时间：30min）	
浮充电压：	13.6V；×2/24V（维持时间：直至降到充电返回电压动作）	
充电返回电压：	13.2V；×2/24V	
过放返回电压：	12.5V；×2/24V	
欠压电压：	12.0V；×2/24V	
市电切换电压：	11.5V； ×2/24V	
过放电压：	11.1V；×2/24V	
外接 DC 电压：	12.0V；×2/24V	
温度补偿：	4mv/℃/2V（提升、直充、浮充、充电返回电压补偿）；	
控制方式：	充电：PWM 脉宽调制；	
工作温度：	-35℃至+65℃；	
过载、短路保护：	1.25 倍额定电流 30 秒；1.5 倍额定电流 5 秒过载保护动作；≥3 倍额定电流短路保护。	
保护电路：	过充、过放、过载，蓄电池和市电**短路保护**	所有保护均不损害任何部件，不烧保险；保险丝只做终极保护作用。短路或过载后，每 4 小时解除一次或第二天自动解除。
	太阳能电池、蓄电池、市电**反接保护**	

七、常见问题及处理方法

现 象	问题及处理方法
有阳光时，电池板指示灯(1)不亮	请检查光电池连线是否正确，接触是否可靠
电池板充电指示灯(1)快闪	系统超压，请检查蓄电池是否连接可靠，或是蓄电池电压过高；
蓄电池指示灯(2)不亮	蓄电池供电故障，请检测蓄电池连接是否正确
蓄电池指示灯(2)快闪，无输出	蓄电池过放，充足后自动恢复
负载指示灯(3)慢闪，无输出	负载功率超过额定功率，减少用电设备后，长按键一次恢复
负载指示灯(3)快闪，无输出	负载短路，故障排除后，长按键一次或第二天自动恢复
负载指示灯(3)常亮，无输出	请检查用电设备是否连接正确、可靠
外接电源接上，DC 指示灯(4)不亮	请检查外接电源是否连接正确，＋，－极有无接反，电源有无供电
其他现象	检测接线是否可靠,12V/24V 自动识别是否正确（针对自动识别的型号）

如有变更，恕不另行通知！

SR-E Series solar power intelligent PV controller
Instruction book

Main features

1. Intelligent control is realized by using microprocessor and dedicated control calculation.
2. Four load working modes: Pure lighting control, lighting control & timing control, hand operation and debug mode.
3. Advanced switching function of commercial power complementation. By connecting commercial power with the load directly instead of linking with battery, the damage to the battery and current source is decreased to a large extent. Besides, the allocation for the current source of commercial power will be optimized. This soft switching makes no impact to the load and battery, thus no influence to the performance of load.
4. Detection of commercial power. The battery voltage decrease to the switching point voltage and the commercial power is on. While without the commercial power, battery discharges till the charge resumption set-point and the output is off.
5. Scientific management of battery: as it is overcharged, the battery will get booster tension charge. As a result compulsory maintenance is available for the battery. In normal working state, the direct charge and floating charge are both available, so that the battery life-span is increased. Besides, the adoption of high precision temperature compensation makes the charging more accurate.
6. Comparing with the charging loops using diodes, the one that adopts double MOS series circuit control makes the voltage loss dropped by 50%. With the PWM fuzzy control in charging, the charge efficiency is improved a lot.
7. LED screen shows the working state of solar battery, storage battery and load. LED shows the adjusted parameter. In this way, users can learn the operation state in ream time. Besides, there are various choices for parameter; users can select the proper working mode based on the different conditions.
8. Various protections include over-charge, over-discharge and over-load, as well as unique electron short circuit protection and connection-reverse protection. All the protections are harmless to any parts and fuse. TVS thunder proof protection is also available. Non wire jumpers design improves the reliability and durability of the products.
9. Technical grade chips and precision components are adopted for all the controls. Therefore, the controller performs well in very low and high temperature, as well as humid environment. At the same time, with the use of crystal timing control, the timing function of controller is much more reliable.
10. Double digital LED display.

System description

Our controllers are specially designed for solar power DC supply system, solar power DC street lamp system and mini solar power station system. Intelligent control is realized by using dedicated computer chips. The controllers can be used in harsh environment, since its adoption of technical grade chips. To the controllers with 12V/24V automatic identification function, the system will identify the voltage when the controllers are charged initially. When LED shows "12", it means the system voltage is 12V. While shows "24", means 24V.

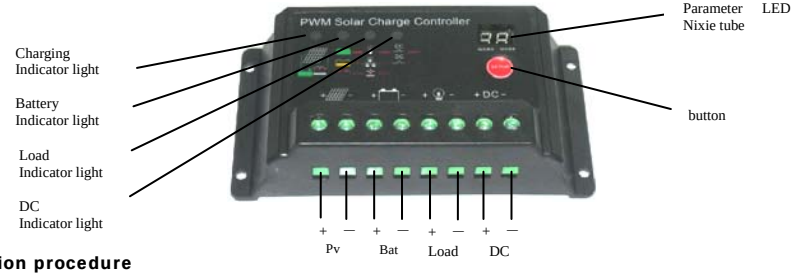
The short circuit, over-load, connection-reverse protection, as well as over-charge, over-discharge protection are available. Besides, the complete indications are usable, including indications for states of charge, storage battery and faults.

Through the computer chips, the controllers take samples from the parameters of storage battery voltage, photo battery, discharge current and environment temperature, and then use the dedicated control mode calculation to control the discharge rate and make it matched with the characters of storage battery, realize the high accurate temperature compensation. PWM fuzzy charge mode and 7 phase voltage control are available for the storage battery, so that storage battery is always in the perfect working state .The various working modes of controllers can meet customers' different requirements.

Installment and use

1. The controller must be well fixed. The dimension of the controller is as following:
   Outside dimension: 113.5×70×34 (mm); installation dimension: 126×50 (mm)
2. Leads: the leads must be matched with the current. The length of stripped leads at the end of controller should be about 5mm. The longer the leads, the more the loss.
3. The connection to storage battery: Pay attention to the "+" and "–" in case of reverse connection. If it is connected well, the indication light will be on. Otherwise, please check the connection.
4. The connection to solar panel: Pay attention to the "+" and "–" in case of reverse connection. If it is connected well, the indication light will be on. Otherwise, please check the connection.
5. The connection to load: connect the leads with load of controller. The two interfaces are in parallel connection, and the total current must be less than rated current. Pay attention to the "+" and "–" in case of reverse connection which may damage of the device.
6. The connection to DC: Pay attention to the "+" and "–" in case of reverse connection. If it is connected well,the Dc indicator light will flash.

outside view of the controller



Operation procedure

state / Indicator light	Off	On	Flash slowly	Flash quickly
Solar panel	Low voltage（at night）	Full voltage（daytime）	Charging	Over voltage
Storage battery	-	Norm	Under voltage	Over discharge
load	Load is off	Norm	Over current	Short circuit
DC	DC no connection	DC switched	DC connection	-

state of indicator light

B. Setting methods:

To press the button for 3 seconds, the LED flashes and the system of the device is under mode of regulation. After releasing the key, the data in the LED changes along with every key-press till matches with the model designated by customers. To finish the setting, please wait until the LED stops to flash. Or just press the button for 3 seconds.

C. Modes description

① **Lighting control:** without sunshine the light intensity decreases to start point. Then the controller recognizes the start signal after 10 minutes. Based on the parameter, the load is on. While under sunshine, the light intensity increase to start point, and then the controller recognizes the close signal after 3 minutes. The load is off.

② **Time control:** The starting procedure is the same with that of pure lighting control. Timing control is dual period control; hence the double load can be regulated respectively. The load-on and load-off are alternated till the load is off in daytime. The time for the load-on and load-off can be adjusted to realize the different control effect. If the time for load-on is zero, the load will be off at night till the time for load-off is past. If the time for load-off is zero, the control effect will be the same with that of pure lighting control.

③ **Manual mode:** Regardless of the daytime or night, users can control the load-on and load-off by key-press under this mode. This mode is used for some special load or regulation.

④ **Test mode:** this mode is designed for system regulation. It is almost the same with pure optical mode except that the cancelation of 10 minutes delay (Please refer to pure lighting control). The load is on with optical signal. In reverse, without optical signal, the load is off. This feature makes it easier to check the system installation.

Working mode setting table

Data in LED	Mode	Data in LED	Mode
00	Dusk-to-Dawn, light is on all light	09	9 hours light is turn on after sundown
01	1 hours light is turn on after sundown	10	10 hours light is turn on after sundown
02	2 hours light is turn on after sundown	11	11 hours light is turn on after sundown
03	3 hours light is turn on after sundown	12	12 hours light is turn on after sundown
04	4 hours light is turn on after sundown	13	13hours light is turn on after sundown
05	5 hours light is turn on after sundown	14	14 hours light is turn on after sundown
06	6 hours light is turn on after sundown	15	Manual mode
07	7 hours light is turn on after sundown	16	Test mode, lights on after it detects no light, lights off after it detects light.
08	8 hours light is turn on after sundown	17	Load open all times

Parameter Description

Model	SR-E series	
Rated current	□5A □10A □15A □20A	
Working Voltage	□12V ； □24V ； □12V/24V Auto	
No load losses	<5mA；	
Charging circuit voltage drop	Less than or equal to 0.20V	
Discharge circuit voltage drop	Less than or equal to 0.20V	
Over voltage protection	17V；×2/24V；	
boost charge voltage	14.6V; ×2/24V (time of duration: 30 minutes)	
Direct charge voltage	14.4V；×2/24V (time of duration: 30 minutes)	
Float charge voltage	13.6V；×2/24V	
Charge recover voltage	13.2V；×2/24V	
Over discharge recover voltage	12.5V；×2/24V	
Lower voltage indication	12.0V；×2/24V	
Switch voltage	11.5V；×2/24V	
Over discharge voltage	11.1V；×2/24V	
Temperature compensation	-4.0mV/℃/2V(boost voltage, direct charge, float charge and charge return voltage compensation)	
Control method	PWM Smart Charging	
Working temperature	From -35℃ to +65℃；	
Over-load and short circuit protection	Over-load protection: when the current of controller is 1.25 times of the rated current, the controller works for 30 seconds; 1.5 times of rated current, works for 5 seconds Short circuit protection: when the current of controller is more than or equal to 3 times of rated current, the protection starts.	
Circuit protection	Over-charge, over-discharge, short circuit and over-load protection	All the protections are harmless to any parts and fuse of controller
	Anti- connection-reverse protection for solar battery and storage battery.	

FAQ

phenomenon	solution
Under the sunshine, the indicator light (NO.1) of solar panel is off	Please check the line connected to photocell and make sure the proper connection
As the cell panel is charged, the indicator light (NO.1) flashes quickly.	The system is over-voltage. Please check whether the storage battery is well connected, or its voltage is too high.
The indicator light (NO.2) of storage battery is off	Please check whether the storage battery is well connected.
The indicator light (No.2) of storage battery flashes quickly without output.	The storage battery is over-discharged.
The indicator light (No.3) of load flashes slowly without output.	The load power is higher than the rated power. Please stop the operation of some equipment which consumes power, and then press the key for a longer time.
The indicator light (No.3) of load flashes quickly without output.	The load is short circuit and need to be adjusted. Then press the key for a longer time or wait till the next day, it will restart to work.
The indicator light (No.3) is on continually without output.	Please check whether the equipment which consumes power is well connected.
Others	Please check the connection, 12/24v Auto identified