

Product Specification

Product Model: SR-SN40

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Guide of product selection:

Product models	Application scenarios
SR-SN40-R	Apply to ordinary lead-acid / lithium battery system, and it is infrared remote control type.
SR-SN40-T	Lead indicator lights, integration system of storing and controlling for infrared remote control communication, etc.
SR-SN40-W	Long-distance wireless remote control

Prepared by	Reviewed by	Approved by



1. Product introduction

SR-SN40 series waterproof type of control and constant current one-in-all machine, which integrates solar energy charge-discharge management of lead-acid / lithium battery, LED boost constant current drive, hibernation low power control and other functions, mainly applies to the solar energy road lights, solar energy garden lights, integration system of storing and controlling for lithium battery, etc., and features high reliability, high efficiency, high precision, easy installation and convenient maintenance, etc.

Product features:

- Both lead-acid battery and lithium battery can be used, and the running parameters can be set via remote controller.
- Extremely low hibernation electric current is convenient for the long-distance transportation and storage in the integration system of storing and controlling for lithium battery.
- Constant voltage charge is modulated in high precision and high efficiency pulse width.
- Lead-acid battery compensates constant voltage charge at multi-stage of temperatures.
- Programmed load power / time control with 10 time range.
- Protection function of high and low temperature for battery charge-discharge is available, of which the working temperature can be set.
- Multiple smart power modes are available, and load power can be automatically adjusted based on the battery level.
- It is digital boost constant and current control algorithm in high precision, with high efficiency and high constant current precision.
- It is infrared wireless communication, and the parameters can be set/read, and status can be read, etc.
- Reverse connection protection for Battery/PV, LED short circuit/open circuit/power limit protection, and other multiple protection functions.
- Can lead indicator lights, infrared remote control communication, and it is convenient to apply the lithium battery system which is the integration of storing and controlling.

2. Use instruction

2.1 Hibernation and wake-up:

Enter into hibernation:

By pressing [OFF] key of CU remote controller or mini remote controller, the controller turns off all external controlled devices, and enters into hibernation status with extremely low power in order to avoid power supply of lithium battery caused by no use for a long time.

Hibernation wake-up:

1. In hibernation, controller will be woken up after pressing [ON] key of CU remote controller or mini remote controller and resumed to the normal work;
2. PV wake-up:
 - A. If [YES] of the [PV wake-up] function is chosen, when the controller is hibernated, if photovoltaic panel is connected, when charge condition is met during the day, the



controller will be woken up to charge. When charge time is more than 30 minutes, load will be automatically opened up at night, and if charge time is less than 30 minutes, the light will not be up at night and the controller will be continued to hibernate;

- B. If [NO] of the [PV wake-up] function is chosen, when the controller is hibernated, if photovoltaic panel is connected, when charge condition is met during the day, the controller will be woken up to charge, but the controller will be continued to hibernate at night.

Note:

- [PV wake-up] function can be chosen by CU remote controller, the default factory setting is [YES];**
- The controller of SR-SN40-W wireless remote controller cannot be woken up via remote controller after hibernation, and can only be woken up by PV charge.**

Controller Status Wake-up method	Hibernation	Wake-up	Charge	Discharge
CU-ALL5	OFF key	ON key	--	--
CU-mini2	OFF key	ON key	--	--
PV wake-up [YES]	--	PV charge for 1 minute	Normal charge can be carried out during the day.	When the charge time during the day is more than 30 minutes, discharge can be carried out at night.
PV wake-up [NO]	--	PV charge for 1 minute	Normal charge can be carried out during the day.	Discharge is not to be carried out at night, and hibernation to be continued.

2.2 Status of indicator light and remote controller:

There are three red indicator lights on controllers of SR-SN40-R and SR-SN40-W.

Controller of SR-SN40-T leads indicator light through 7P wires, which can be connected externally to T2 small plate or T5 probe, of which there are three red indicator lights on T2 small plate and a pair of infrared transmitter receivers heads;

There is an indicator in red and blue on T5 probe and a pair of infrared transmitter receiver heads;

7P wires led by controller of SR-SN40-T can automatically identify T2 small plate or T5 probe when energizing power each time, and controller shows the followings based on the automatically identified T2 or T5:

Three red indicator lights:

Indicator light	Status of indicator light	Explanation of indicator light	System status of remote controller
PV Indicator light	Constant lighting	Voltage of battery plate is greater than the voltage of light control.	Idle
	Off	Voltage of battery plate is less than the voltage of light	Idle



		control.	
	Slow flash	It is charging.	Charge
	Double flash	Lithium battery is full of electricity.	Full of electricity
	Quick flash	Lithium battery is protected by BMS or BAT is over voltage or PV is over voltage or Over temperature (ambient temperature)	E-BMS BV exceeds PV exceeds Over temperature
BAT Indicator light	Constant lighting	Battery works normally.	Idle
	Off	Battery is not connected or protection plate of lithium battery is protected by over discharge protection.	
	Quick flash	Battery is over discharge.	Over discharge
LOAD Indicator light	Constant lighting	Load is opened.	Discharge
	Off	Load is closed.	Idle
	Slow flash	Open Load.	Open circuit
	Quick flash	Load in short circuit status.	Short circuit

One red and blue indicator:

Color	Status of indicator light	Explanation of indicator light	System status of remote controller
Blue	Constant lighting	Load is opened.	Discharge
	Single flash	Battery is normal, in standby status.	Idle
	Slow flash	It is charging.	Charge
	Double flash	Lithium battery is full of electricity.	Full of electricity
	Quick flash	BMS over charge protection for the lithium battery	E-BMS
Red	Slow flash	Open Load.	Open circuit
		Load in short circuit status.	Short circuit
		PV is over voltage.	PV exceeds
		BAT is over voltage.	BV exceeds
		Over temperature	Over temperature
	Quick flash	Battery is over discharge.	Over discharge



2.3 Smart power:

Smart power model can be chosen for controller of SR-SN40 according to the actual battery capacity, number of cloudy and rainy days and other factors, the specific smart power models include HIGH, MIDDLE, LOW, AUTOMATIC, USE (self-customized), NO (close).

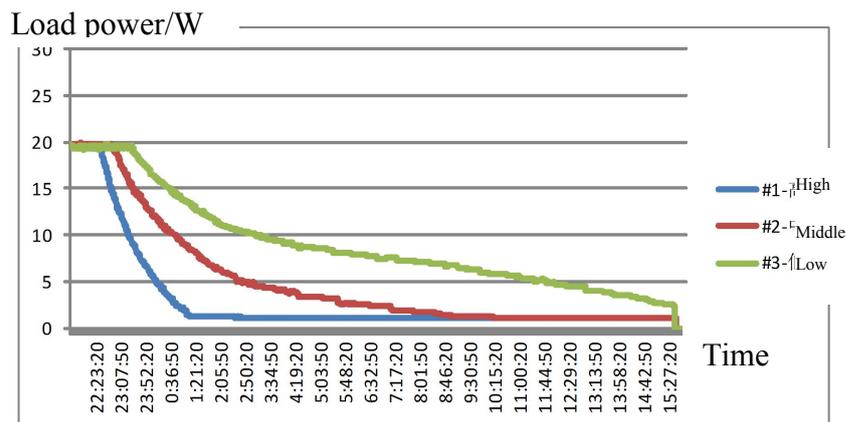
Smart power level:

HIGH - Battery capacity of starting point of decreasing power is relatively high, load lighting time is the longest, which is suitable for the areas where are more cloudy and rainy days or bad illumination;

MIDDLE - Battery capacity of starting point of decreasing power is moderate, load lighting time is moderate, which is suitable for the scenarios where lighting level and number of cloudy and rainy days need to be considered;

LOW - Battery capacity of starting point of decreasing power is relatively low, load lighting time is the shortest, which is suitable for the scenarios with high requirements for lighting effects.

Smart power curve



Experimental data of smart power

Comparison on consume electricity and number of cloudy and rainy days of smart power		
Smart power level	Power consumption for each day	Sustainable working days
No	100%	1
Low	50%	2
Middle	25%	4
High	15%	6

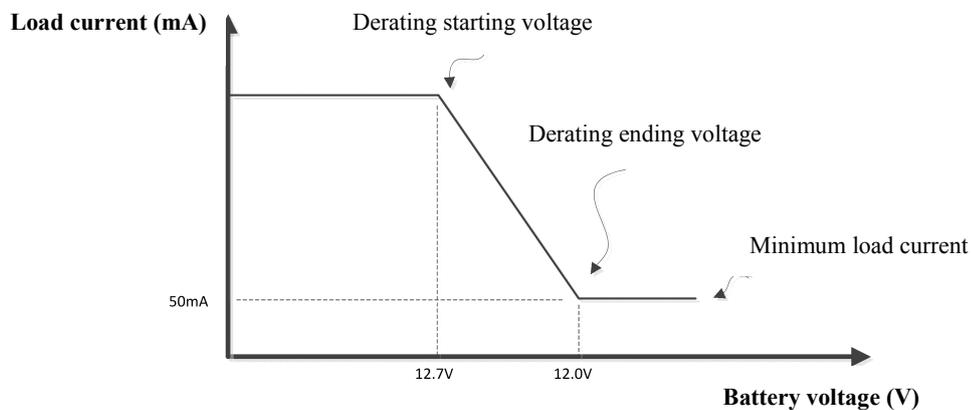
Test explanation: 1. The test battery is completely full of electricity, the maximum power of the load is identical, and the working time is the same.
 2. Presume that the power consumption is 100% when turning the smart power off.
 3. The test result is the data obtained under the single condition (the

charge amount is 0 each day). The actual usage situation may be different from the test conditions and the test result is only for reference.

Automatic - High/middle/low level can be automatically chosen for smart power mode according to the charge amount, electricity consumption and other parameters.

For example, in summer, charge amount is large, running smart mode - low and the lighting effect is relatively better; in winter, charge amount is less, running smart mode - high, load working is in the power saving mode, therefore it is able to get through more days of rain.

USE (self-customized) - Users set the derating starting voltage of the smart power, derating ending voltage, and the minimum load current value;



No (close) - Smart power is turned off, load power is outputted based on the power in the set time period.

2.4 Operation of remote controller:

2.4.1. Remote controller CU-ALL5:

The communication between the controller and the handheld remote control CU-ALL5 can be operated by infrared remote control or wireless remote control. Remote control operation can be carried out by pressing [+] and [-] keys on the remote controller to select the [remote control type] (**infrared/wireless**). In the practical application, the signal of infrared remote control is easy to be decreased under the strong sunshine outdoor, the remote control communication distance is 5-6m, and the remote control communication distance is 8-10m at night; the signal of wireless remote control can penetrate through plastic shell or aluminous shell, and the wireless remote control distance can be adjusted from 0.3 to 20 meters through the remote controller.

The specific [parameter setting] and [running status] of the remote controller is as below:

Parameter setting:



Parameter name	Default parameter	Parameter range
Battery type	Lithium 12V	Lead / lithium 12V
Sensor time-delay	No	No
PV wake-up	Yes	No/Yes
Light control voltage	5V	3V-11V
Light control time-delay	10s	5s-60min
Over discharge voltage	09.20	09.00-17.00V
Over discharge return	10.20	09.00-17.00V
Charge voltage	12.50	09.00-17.00V
Charge recovery	12.00	09.00-17.00V
Charge at low temperature	-35℃	-35℃-0℃
Working at high temperature	65℃	40℃-90℃
Load current	0.33A	0.15A-2.0A
Smart power	Middle	No/High/Middle/Low/Automatic/*USE
*Derating starts	11.30	09.00-17.00V
*Derating ends	10.50	09.00-17.00V
*Minimum current	0.05A	0.05A-1.00A
Load parameter setting	Duration	00:00-15:00
	Manned power	0%-100%
	Unmanned power	0%-100%
Recovery of default value	No	No/Yes

Set default value for load parameter:

Time range	Hour/Minute	Power
1	00:30	50%
2	00:30	70%
3	02:00	100%
4	00:30	70%
5	00:30	50%
6	04:00	30%
7	00:00	0%
8		
9		
Dawn time		



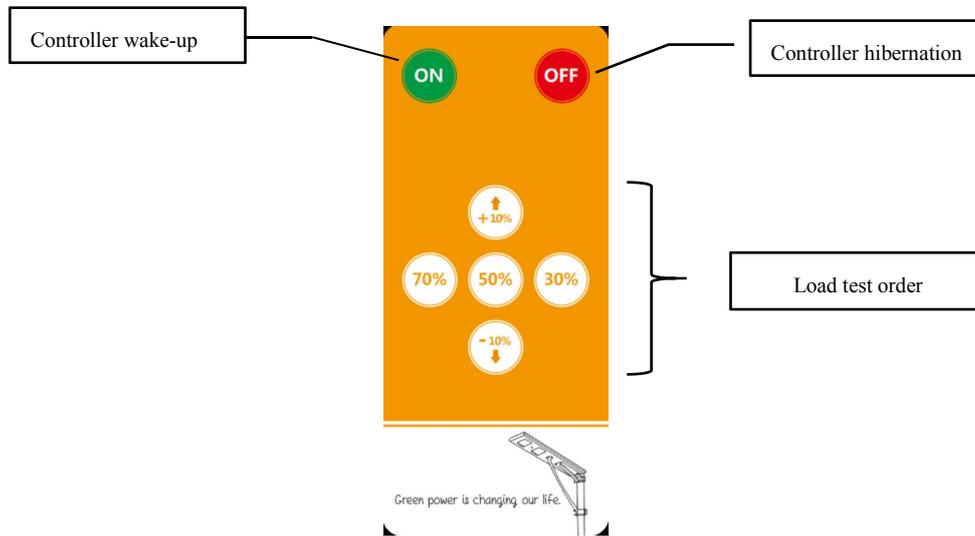
Running status:

Status name	Example	Explanation of status value
System status	Discharge	Current running status: Discharge/charge/idle/full of electricity/over discharge, etc.
Battery voltage	12.30	Current battery voltage
PV voltage	17.60	Current solar energy plate voltage
Charge current	0.0A	Current charge current (The data of SN40 is only for reference.)
Charge power	0.0W	Current charge power (There is no such data for SN40.)
Charge ampere-hour	0.01AH	Charge ampere-hour of that day (There is no such data for SN40.)
Load voltage	27.11	Current load voltage
Load current	0.19A	Current load current
Load power	5.15W	Current load power
Lighting time	05:20	Actual lighting total duration of that night
Sensor time	01:10	Total duration of the actual sensor manned power lighting of that night
Discharge ampere-hour	2.05AH	Discharge ampere-hour of that night
Ambient temperature	23°C	Current inner temperature
Running days	15D	Accumulated running days
Over discharge times	2N	Total over discharge times of the lithium battery
Full of electricity times	10N	Total times of full of electricity of the lithium battery
Production date	1805	Production date of the controller
Software edition	1000	Software edition of the controller



2.4.2 Remote controller CU-mini2:

Small remote controller CU-mini2 is used for turn-on, turn-off and test.



There are in total seven keys, which are [ON], [OFF], [70%], [50%], [30%], [+10%], [-10%]. The keys' icons and their definitions are showed as below.

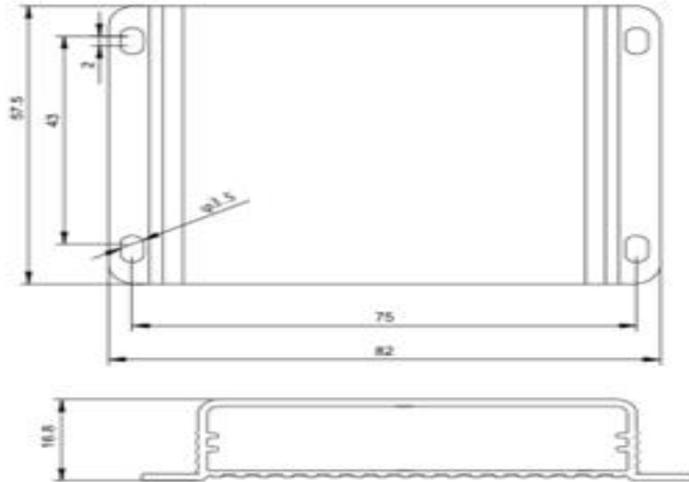
Icon	Key's definition
	Controller is woken up from hibernation mode.
	Controller enters into low power hibernation mode.
	Controller runs for 1 minute using 70% set load current.
	Controller runs for 1 minute using 50% set load current.
	Controller runs for 1 minute using 30% set load current.
	When pressing one time, test electrical current will be added 10%, which needs to run for 1 minute.
	When pressing one time, test electrical current will be reduced 10%, which needs to run for 1 minute.



2.5 Installation method:

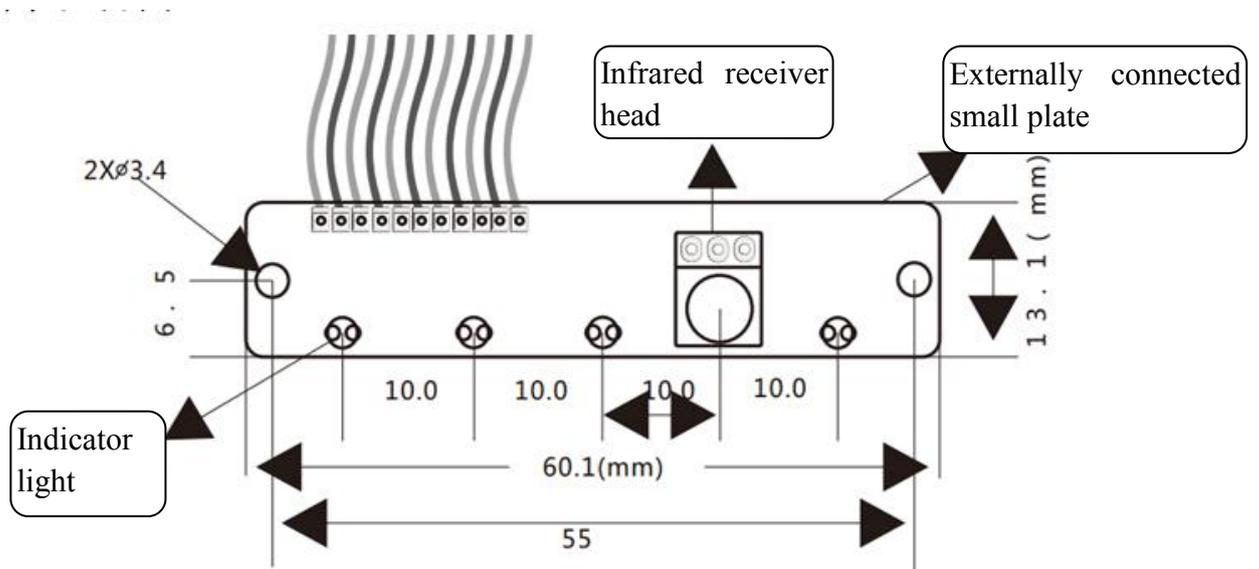
Installation method and dimension:

1. Dimensions of controller are as below:
 External dimension: 58*82*17mm
 Installation dimension: 43*75
 Installation bore diameter: $\phi 3.5$



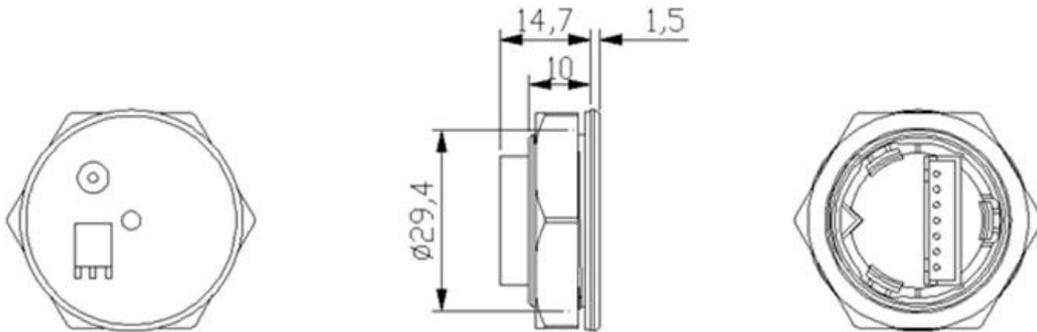
2. Opening holes and installation dimensions of T2 small plate / T5 probe are showed as below:

Distance between components of T2 small plate is 10mm:



Dimension diagram of T2 small plate

Diameter of the round hole opened of Installation plate of T5 probe is $\phi 30$ mm.

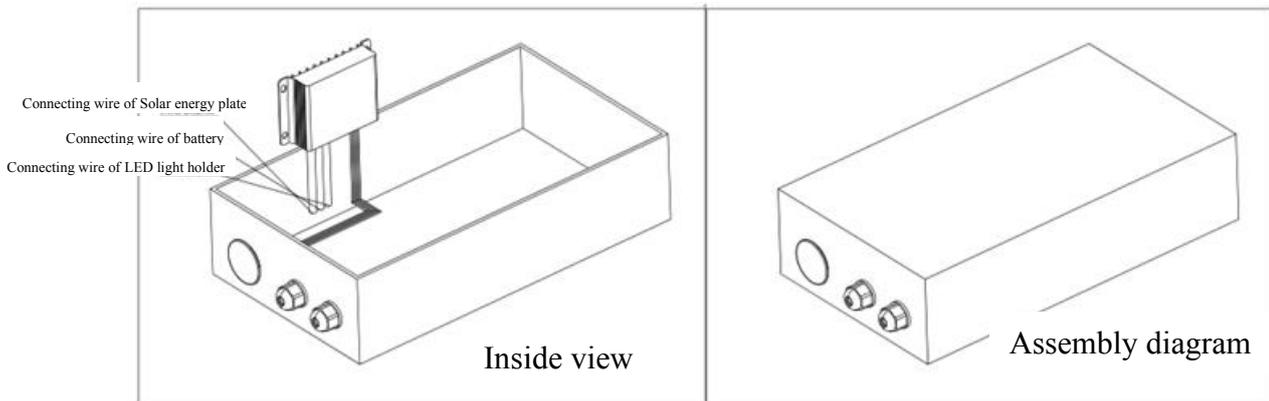


Front view
Opening hole size of plate:

Side view

Bottom view

**3. Installation diagram is showed as below:
T5 installation diagram**



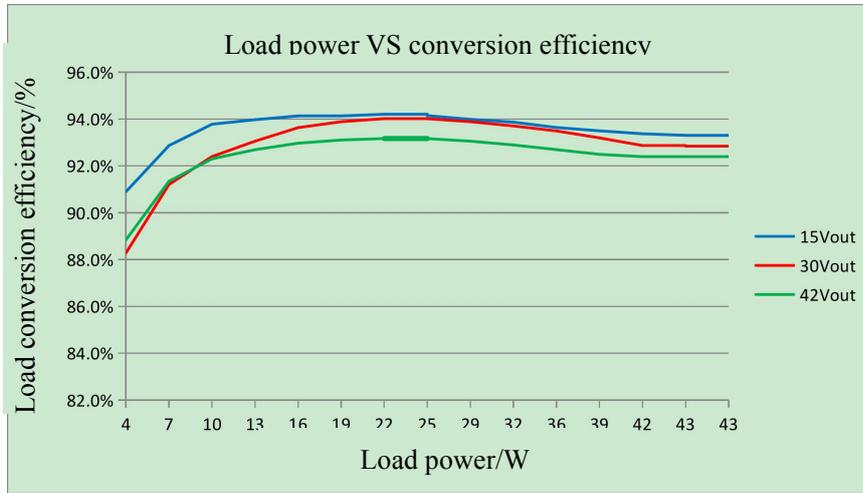
3. Technical parameter

Parameter name	Parameter value			Adjustable parameter	Default value
Model	SN40-R	SN40-W	SN40-T		
Controller type	Infrared remote control	Wireless remote control	Externally connected small plate		
System voltage	12V				
Static power consumption	< 10mA/12V				
Power consumption when hibernation	< 0.8mA/12V				
Load current	50mA~2000mA			√	330mA
Load voltage	15V~45V				
Maximum power of the load	40W				
Conversion efficiency of the load	90% ~ 96%				
Current precision of the load	< 2%				
Smart power	High / middle/ low / automatic / self-customized / no			√	Middle
Working time range of the load	Nigh time ranges + dawn				
Adjustment scope of time range	1 minute				
Adjustment scope of the power	1%				
Maximum charge current	10A				
Solar energy input voltage	≤ 25V				
Over voltage	Plumbic acid battery: 16V; lithium battery: charge voltage +2V				
Equalizing charge voltage	Plumbic acid battery: 14.6V; lithium battery: No equalizing charge				
Equalizing charge time period	30 days				
Increasing of charge voltage (plumbic acid battery)	9.00V ~17.00V can be set			√	12.45V
Charge voltage (lithium battery)					
Floating charge voltage (plumbic acid battery)	9.00V ~17.00V can be set			√	12.00V
Charge return voltage (lithium battery)					
Over discharge voltage	9.00V ~17.00V can be set			√	09.20V
Over discharge return voltage	9.00V ~17.00V can be set			√	10.20V
Temperature compensation coefficient	Plumbic acid battery: -3.0mV/°C/2V; lithium battery: No temperature compensation				
Light control voltage	3V ~ 11V			√	5V
Light control time-delay	5s~60s/2min~60min			√	10s
Working at high temperature	40°C ~ +90°C			√	65°C
Charge at low temperature	0°C ~ -35°C			√	-35°C
Working temperature	-35°C ~+65°C				
Protection class	IP67				
Protection function	Reverse connection protection for battery, reverse connection protection for battery plate, over voltage protection for battery plate, over charge and over discharge protection for lithium battery, BMS over charge test protection for lithium battery, overheat protection, open circuit and short circuit protection for load, over current protection for load, etc.				
Weight	150g				
Size of controller (mm)	58*82*17				
Installation size of controller (mm)	43*75				
Installation bore diameter (mm)	φ3.5				



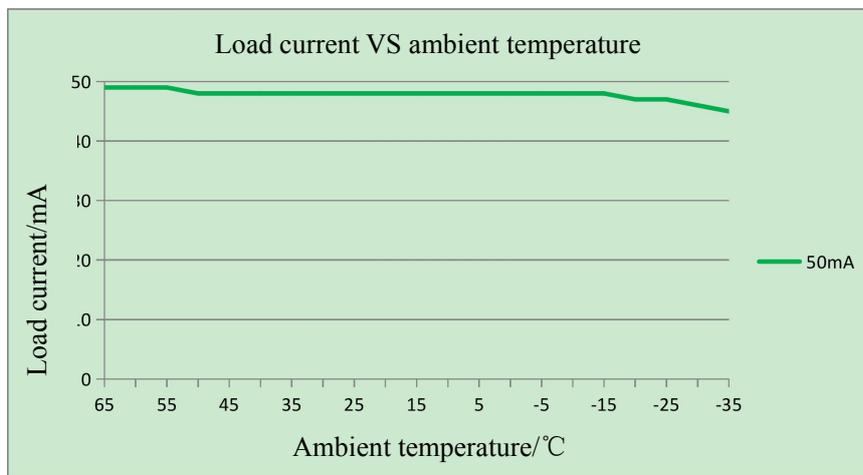
4. Typical curve

4.1 Load efficiency

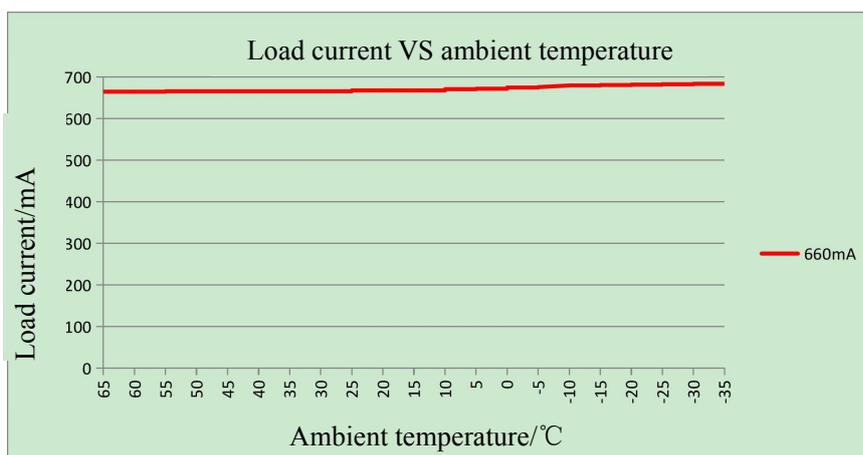


4.2 Current precision

4.2.1 Load current setting 50mA



4.2.2 Load current setting 660mA





5. Protection functions

- Waterproof protection

Waterproof class: IP67

- BMS over charge test protection for lithium battery

When detecting overcharge protection for BMS, the controller will stop charging immediately to prevent high-voltage of the photovoltaic terminal imposed at both ends of the BMS for a long time, which can result in damage to BMS due to high-voltage.

- Charging protection for lithium battery at low temperature

When the ambient temperature drops to the set value, the controller will stop charging to prevent irreversible damage to the lithium battery due to charging at low temperature.

- High temperature protection

When the ambient temperature is above the set value, the controller will stop charging and discharging to prevent damage to the lithium battery due to the high temperature.

- Reverse connection protection for battery

When the battery is connected reversely, the system does not work, which will not burn out the controller,

- Overvoltage protection for photovoltaic input terminal

The controller will automatically cut off the photovoltaic input, when the voltage of the input terminal of the photovoltaic panel is excessively high.

- Short circuit protection for photovoltaic input terminal

The controller will stop charging when short circuit happens at the input terminal of the photovoltaic array, and charging will be resumed automatically when the short circuit condition is cleared.

- Reverse connect protection for photovoltaic input terminal

When photovoltaic array is connected with reverse polarity, the controller will not be damaged, and will resume working normally after correcting wiring errors.

- Power protection for load limit

When the LED lamp with excessive power is applied or the load current is adjusted too much, the controller will limit the power output of load less than the rated power, ensuring that the controller and LED load will not be damaged.

- Overload and short circuit protection for load

When the number of lamp connected with the load is too low (3 strings or less), the controller will stop outputting immediately to prevent damage to LED load or controller;

When short circuit occurs, the controller will cut off the load output immediately to prevent damage to the controller. The controller will resume output automatically within 1



minute, when short circuit of the load condition is cleared (it will resume output automatically once in an hour, if short circuit with long time occurs), or it will resume output automatically after pressing the test button of the remote controller (CU or mini2) for 10s.

- Open load protection for load

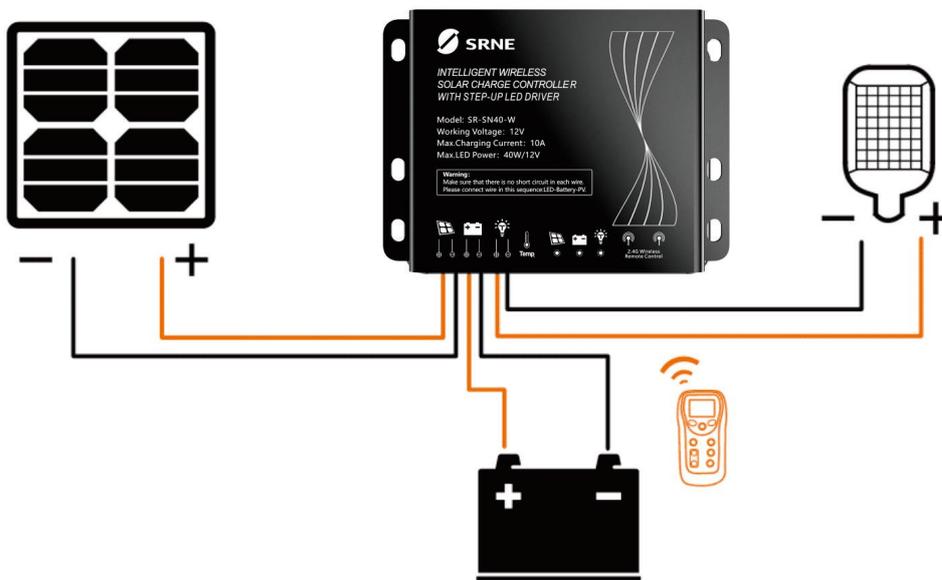
When the LED load light is normally on and the load connection is cut off unexpectedly, the controller may turn off the load output immediately to prevent damage to the controller. The controller will resume output automatically within 10 seconds, when the connection of load is restored (it will resume output automatically once in an hour, if open circuit with long time occurs), or it will resume output automatically after pressing the test button of the remote controller (CU or mini2) for 10s.

- Protection preventing reverse charging at night

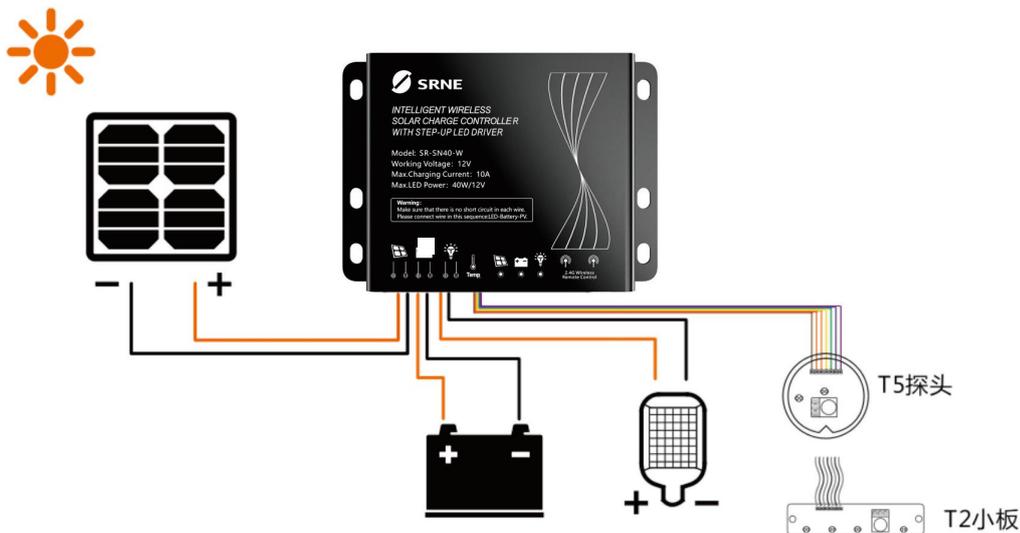
Prevent the battery from discharging through the battery panel at night.

- TVS Lightning protection.

6. Electrical connection diagram



SN40-R/W connection diagram



SN40-T connection diagram

1. Connection sequence: connect the load first, then the battery, and finally the solar cell
2. The controller of SN40-T shall be connected to the T2 small panel or T5 probe before the controller is energized (**This must be done, otherwise the indicator will give wrong indication!!!**).

7. Common abnormal states and treatment methods

No.	State	Problem (s)	Processing method (s)
1	The remote control does not work.	A、 Wrong password of the remote control B、 Remote operation mode (infrared or wireless) is not applied correctly C、 The too short distance for the remote control is set D、 Low battery of the remote control	B1. Press "+" and "-" keys at the same time so as to bring up the "remote setting" interface and then set the correct password. B2. Press "+" and "-" keys at the same time so as to bring up the "remote control setup" interface, and then select "infrared remote control" or "wireless remote control". C1. Press the "+" and "-" keys at the same time so as to bring up the "remote setting" interface, and then increase the remote distance before testing. D1. Replace 2 AA (no. 5) batteries
2	The controller equipped with the battery does not work, the indicator light of which is not on, and the remote control does not work.	A. Something wrong with the battery B. Controller is in dormant state	A1. Check whether the battery is well connected A2. Check the voltage of battery terminal and protection of protective plate, if there is no voltage of battery terminal due to protection of protective plate, the battery may be charged to activate. B1. Press the "ON" button of the remote control to activate the controller B2. Connect the battery panel to charge the battery and finish the activation
3	Charging may be carried out normally during the day, but at night the light of load and the LED indicator of the controller	A. Controller is in dormant state	A1. Press the "ON" button of the remote control to activate the controller A2. Select 'yes' for PV wake-up, to activate the controller automatically after finishing charging during the day.



	are off.		
4	Battery indicator is flashing with load LED lamp off.	A. Low battery	A1. Check whether the battery panel is charged normally and the panel is covered. A2. Check whether the battery and battery panel are disconnected or the connection between them is loose
5	Load light is on in very short time	A. Low battery B. Excessive load power	A1. Check whether the battery panel is charged normally and the panel configuration is correct. A2. Check whether there is single protection for the lithium battery. A3. Open the “smart power” option. B1. Check whether current setting of the controller is correct and load power is normal.
6	Load current with the light on does not reach the set value	A. Load current is adjusted by smart power B. LED lamp power exceeds rated power	A1. Turn off "smart power", and then test the load current again B1. The current set is turn down or fewer lamps in series are applied.
7	Load indicator is flashing with load LED lamp off.	A. Open load B. Short circuit has happened to wiring for LED load or too few LED lamps in series are applied.	A1. Check whether the load connection is correct and the anode and cathode of LED are connected correctly. B1. Check whether short circuit has happened to wiring for LED load, the anode and cathode of LED are connected correctly. B2. Check whether LED lamps are applied correctly, and replace appropriate number of LED Lamps in series and parallel
8	LED load lamp cannot be adjusted	A. The wrong number of lamps in series is applied, namely 3 strings or lamps with voltage reduced are applied	A1. Replace lamps with voltage rised (more than 5 strings)
9	Light is on during the day or LED load lamp is on one night only	A. The battery panel is not connected B. The battery panel is connected reversely.	A1. Check whether connection for the battery panel is correct and reliable. B1. Connect the battery panel reversely during the day and see whether the charging indicator is flashing.
10	When there is sunlight during the day, the charging indicator is not flashing slowly during charging.	A. Battery panel failed or incorrect wiring for battery panel	A1. Check whether the solar panel is connected correctly and reliable and whether the solar panel is covered.
11	LED load lamp is off, with battery indicator lamp on.	A. The battery panel voltage is not lower than the optically controlled voltage or the delay time has not reached the time set B. Controller time has run out	A1. The light will be on automatically when the voltage of battery panel is reduced B1. Recharge the controller and reset the timer
12	Charging indicator is flashing without charging current.	A. Overcharge protection for Lithium battery BMS protective plate is applied	A1. Charging will be resumed automatically, when the lithium battery voltage drops to the overcharge return voltage.