

SmartTM-N5/Li series Solar charge controller 10/20A

User Manual

Solar charge controller Smart-N5/Li series User Manual

Dear Clients,

Thanks for selecting the Smart™-N5/Li series solar controller. Please take the time to read this user manual, this will help you to take advantage of controller's new features. This manual gives important recommendations for installing, programming, using and so on. Read it carefully in your own interest please.

1. Description of Function

Smart-N5/Li series intelligent solar controller, is programmable and especially for solar light system.

It comes with some outstanding features, such as:

- 5 stages time can be adjusted
- Can read parameters and running status
- Suitable for Liquid, GEL and Lithium battery
- 12/24V system voltage automatic recognition(Liquid/GEL)
- Automatic temperature compensation(Liquid/GEL)
- Four stages charge way: fast, boost, equal, float(Liquid/GEL)
- When BMS power off because of LVD, it can activate the system automatically(Lithium)
- Charging target and charging recovery voltage can be set(Lithium)
- Day/Night threshold can adjust automatically
- Remote Unit to configure, with LCD display
- IP67, Strong and durable aluminum case
- Full automatic electronic protect function

2. Safety instructions and waiver of liability

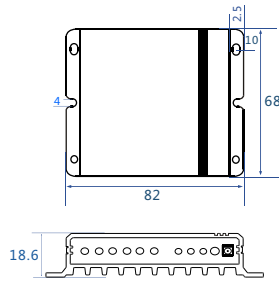
2.1 Safety

- ①The 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.
- ②Batteries 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 protect any short circuit at the battery wiring.
- ③Batteries can produce flammable gases. Avoid making sparks, using fire or any naked flame. Make sure that the battery room is ventilated.
- ④Avoid 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.
- ⑤Keep children away from batteries and the charge controller.

2.2 Liability Exclusion

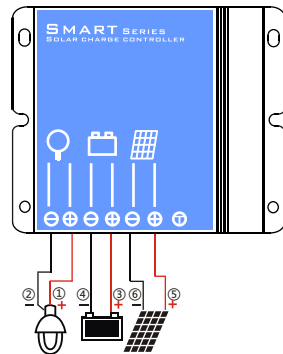
The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by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

3. Dimensions



4. Installation

The following diagrams provide an overview of the connections and the proper order.



1. Follow the chart, connect the load (positive pole and negative pole) with the corresponding red and black cables firstly, then seal them with tape.
2. Connect battery positive pole and negative pole to the corresponding red and black cables, the load will be on.
3. Connect the panel positive pole and negative pole to the corresponding red and black cables, the controller begins to charge.
4. Please refer to the **10.2 Faults and Alarms** to confirm the controller's status.

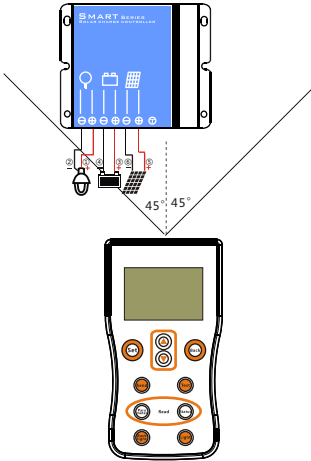
- Make sure the length between battery and controller is as short as possible.
- Recommended minimum wire size:
10A: 2.5mm²; 20A: 4mm².

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5.Remote controller, Default setting

When Smart-N5/Li series controller is connected to the system, you can choose "DC 5-Stage" icon on the display of S-Unit infrared remote controller, as shown below! Detailed setting operations, please read S-Unit User Manual.

Remark : Be sure to set only one Smart-N5/Li unit at a time.



5.1 Read the parameters

Press the "Parameter" key of the S-unit to read the setting parameters of the controller.

| Num | Name | Smart-N5 | Smart-N5 Li |
|-----|----------|----------|-------------|
| 1 | Time1 | 24H | 24H |
| 2 | Dim1 | 100% | 100% |
| 3 | Time2 | 0H | 0H |
| 4 | Dim2 | 100% | 100% |
| 5 | Time3 | 0H | 0H |
| 6 | Dim3 | 100% | 100% |
| 7 | Time4 | 0H | 0H |
| 8 | Dim4 | 100% | 100% |
| 9 | Time5 | 0H | 0H |
| 10 | Dim5 | 100% | 100% |
| 11 | D/N Thr | 5V | 8.0V |
| 12 | D/N Dly | 0min | 0min |
| 13 | Load I | — | — |
| 14 | Dim Auto | — | — |
| 15 | Battery | GEL | LI |
| 16 | CVT | — | 16.8V |
| 17 | CVR | — | 16.4V |
| 18 | LVD | 11.2V | 12.0V |
| 19 | LVR | 12.0V | 12.8V |



1. Dimming function, if you set 0%, the load will be off, otherwise the load will be on.
2. The setting data of "Load I" and "Dim Auto" is for "DC" series with LED driver built-in, does not apply to this type controller.

5.2 Read the running status

Press the "Status" key of the S-unit to read the running status of the controller.

| Num | Name | Name describe | Unit |
|-----------------|----------|--------------------------------|-------|
| Status : Charge | | | |
| 1 | Batt V | Battery voltage | V |
| 2 | Load I | Load current | A |
| 3 | Load V | Load voltage | V |
| 4 | PV V | PV voltage | V |
| 5 | PV I | PV current * | A |
| 6 | Energy | Total generating capacity | AH |
| 7 | OD Times | Over discharge times | Times |
| 8 | FC Times | Fully charge times | Times |
| 9 | Day1-HV | A day ago highest voltage | V |
| 10 | Day1-LV | A day ago lowest voltage | V |
| 11 | Day2-HV | Two days ago highest voltage | V |
| 12 | Day2-LV | Two days ago lowest voltage | V |
| 13 | Day3-HV | Three days ago highest voltage | V |
| 14 | Day3-LV | Three days ago lowest voltage | V |



Smart-N5/Li series controller can not detect PV current, the remote control displays "---."

5.3 Test function(Streetlight mode)

Press the "Test" key of S-Unit, the controller will turn on load for 1min. During daytime, the testing function can help users to verify correct installation or for system trouble shooting. 1min later the load will automatically turn off.



Default "24H" mode, the test key is invalid.

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6. Starting up the controller

6.1 Self Test

As soon as the controller is connected to battery, it starts self test. Then the display changes to normal operation.

6.2 Battery Type

Smart-N5 series controller applies to Liquid and Gel battery, the factory default setting is suitable for Gel battery.

Smart-N5 Li series controller applies to Lithium rechargeable battery. The charging target and charging recovery voltage can be set according to customer requirements.

6.3 System Voltage(Liquid/ GEL battery)

Smart-N5 series controller adjusts itself automatically to 12V or 24V system voltage. As soon as the battery voltage at the time of start-up is within 10V to 15V, the controller implies a 12V system, else if the battery voltage is within 20V to 30V, the controller implies a 24V system.

7. Safety Features

| | Solar terminal | Battery terminal | Load terminal |
|------------------|---|------------------|--------------------------|
| Reverse polarity | Protected | Protected | Protected *1 |
| Short circuit | Protected | Protected *2 | Switches off immediately |
| Over current | — | — | Switches off with delay |
| Reverse Current | Protected | — | — |
| Over voltage | Max.55V *3 | Max. 40V | — |
| Low voltage | — | — | Switches off |
| Over temp. | If the temperature reaches the set value, the controller cuts off the load. | | |

*1. Controller can protect itself, but loads might be damaged.

*2. Battery must be protected by fuse, or battery will be permanently damaged.

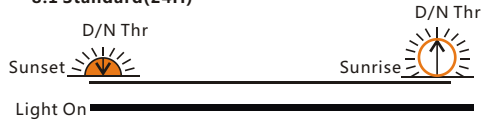
*3. The solar panel voltage should not exceed this limit for a long time.

Warning: The combination of different error conditions may cause damage to the controller. Always remove the error before you continue connecting the controller.

8. Output Function

Smart-N5/Li controller with advanced light control function. The modes of lighting can be based on customer needs.

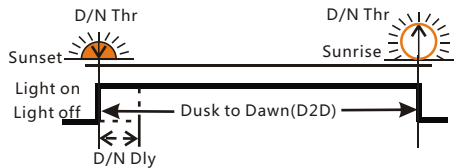
8.1 Standard(24H)



Light On

If "Time1" of "DC 5-Stage" is set to "24H" and sent to the controller successfully, the controller's load will always be open.

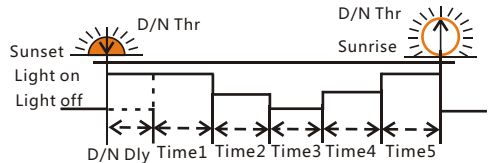
8.2 Dusk to Dawn (D2D)



If "Time1" of "DC 5-Stage" is set to "D2D", the controller works in dusk to dawn mode.

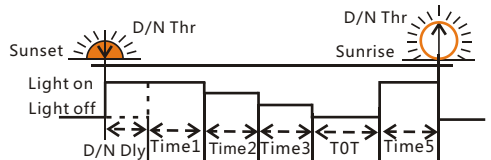
1. Smart-N5/Li series controller is set to D2D mode, the corresponding dimming setting is still valid.
2. If "Time1" is set to D2D mode, "Time4" can not be set to TOT mode.

8.3 Five-stage Night Mode



You can set the Time 1-5 and Dim 1-5 with S-Unit.

8.4 TOT mode(can set the load on time before morning coming)



If "Time4" of the S-Unit is set to "TOT", this mode is TOT mode.

* If Time4 is set to TOT mode, Time1 can not set to D2D mode.

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9. LVD, LVR, Threshold

9.1 Low Voltage Disconnect (LVD)

Smart-N5 Li Series setting range: 8.0~30.0V.

Smart-N5 series has two low voltage protection modes: battery capacity control and battery voltage control, the setting range is as follows:

① Battery capacity control

SOC1 : 11.0 ~ 11.6V/22.0 ~ 23.2V

SOC2 : 11.1 ~ 11.7V/22.2 ~ 23.4V

SOC3 : 11.2 ~ 11.8V/22.4 ~ 23.6V

SOC4 : 11.4 ~ 11.9V/22.8 ~ 23.8V

SOC5 : 11.6 ~ 12.0V/23.2 ~ 24.0V

② Battery voltage control

LVD setting range : 10.8 ~ 11.8V/21.6 ~ 23.6V.

9.2 Low Voltage Reconnect (LVR)

Smart-N5 series setting range: 11.4~12.8V/22.8~25.6V.

Smart-N5 Li series setting range: 8.6~31.0V.

1. If the controller goes into low voltage disconnect, it will restore only when the battery being recharged to the recovery voltage.

2. LVR should be higher than LVD at least 0.6/1.2V.

9.3 Day/Night Threshold, Day/Night Delay

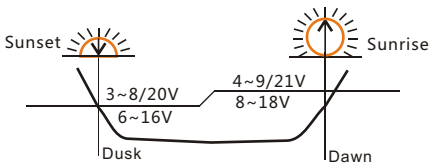
The controller recognizes day and night based on the solar array open circuit voltage. This day/night threshold can be modified according to local light conditions and the solar array used.

Smart-N5 series setting range: 3.0~8.0V/6.0~16.0V.

Smart-N5 Li series setting range: 3.0~20.0V.

In the evening, when the solar array open circuit voltage reaches the setting day/night threshold, you can adjust the day/night delay time to make the load turn on a little later.

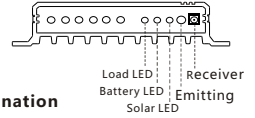
Day/Night delay time setting range: 0~30min.



1. Day/Night threshold voltage of load disconnect is 1V/2V higher than the setting data, means the load will disconnect when the solar voltage at 4~9V/8~18V (Smart-N5 series) / 4.0~21.0V (Smart-N5 Li series).

2. The controller has an automatic day/night threshold adjustment function. If the lowest voltage of solar array is higher than the setting day/night threshold, the load has no output in first night, 24 hours later the controller can automatically adjust the day/night threshold to meet the requirements of lighting at night.

10. LED indications and Faults & Alarms



10.1 LED Display Explanation

| LED | Status | Function |
|-------------|-----------------------|----------------------------------|
| Solar LED | Slow flash(1s/1s) | Float charging |
| | Flash(0.4s/0.4s) | Boost charging |
| | Fast flash(0.1s/0.1s) | Equal charging |
| | Flash(0.4s/0.4s) | Charging |
| | Off | Stop charging |
| Battery LED | On | Battery works normal |
| | Slow flash(1s/1s) | Low voltage protection |
| | Fast flash(0.1s/0.1s) | Over voltage protection |
| Load LED | On | Load works normal |
| | Off | Load has no output |
| | Slow flash(1s/1s) | Overcurrent protection |
| All LED | Fast flash(0.1s/0.1s) | Short circuit protection |
| | Slow flash(1s/1s) | Can not recognize system voltage |
| | Both on 1s | Start up Self test |
| | Both off | No connection to battery |

10.2 Faults & Alarms

| Fault | Status | Reason | Remedy |
|-------------------------------------|---------------------------------------|--|---|
| Loads are not powered | Low volt. protection | Battery capacity is low | Load will be reconnected when battery is recharged |
| | Overcurrent, short circuit protection | Loads are over current or short circuit | Switch off all loads, remove short circuit, load will be reconnected after 1 minute automatically |
| | Over temp. protection | Controller temp. is too high | Load reconnects after temp. reduces |
| High voltage at battery terminal | Over voltage protection | High battery voltage >15.5V/31.0V * | Check if other sources overcharge the battery. If not, controller is damaged. |
| | | Battery wires or battery fuse damaged, battery has high resistance . | Check battery wires, fuse and battery. |
| Can't recognize system voltage | All LED slow flashing (1s on/1s off) | Battery voltage is not in right range | Charge or discharge, make battery voltage in the right range |
| Battery is empty after a short time | Low voltage protection | Battery has low capacity | Change battery |
| Battery can't be charged | Solar LED is off | PV panel fault or reverse connection | Check panels and connection wires |

Smart-N5 Li Series: If the battery voltage is 0.2V higher than "CVT", the controller will trigger over voltage protection.

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11. Technical Data

| Model | SMR10-N5 | SMR20-N5 | SMR10-N5 Li | SMR20-N5 Li |
|---------------------------|---|------------------|---------------------------|------------------|
| Max. Current | 10A | 20A | 10A | 20A |
| System Voltage | 12/24V | | — | |
| Fast Voltage | <14.5V/29.0V (25°C) | | <Charging voltage target | |
| Boost Voltage | 14.5V/29.0V (25°C) | | — | |
| Equal Voltage | 14.8V/29.6V (25°C) (Liquid) | | — | |
| Float Voltage | 13.7V/27.4V (25°C) | | — | |
| Charging voltage target | — | | 11.0~32.0V(Programmable) | |
| Charging voltage recovery | — | | 9.5~31.8V(Programmable) | |
| Low voltage disconnect | 10.8~11.8V/21.6~23.6V; SOC1~5 | | 8.0 ~30.0V(Programmable) | |
| Low voltage reconnect | 11.4~12.8V/22.8~25.6V(Programmable) | | 8.6 ~ 31.0V(Programmable) | |
| Day/Night threshold | 3.0~8.0V/6.0~16.0V(Programmable) | | 3.0~20.0V(Programmable) | |
| Battery type | Liquid、 GEL (Programmable) | | Lithium | |
| Temp compensation | -4.17 mV/K per cell (Boost, Equal) ; -3.33 mV/K per cell (Float) | | — | |
| Day/Night delay time | 0~30min(Programmable) | | | |
| Max. panel voltage | 40V | | | |
| Max. battery voltage | 55V | | | |
| Dimensions | 82 x 68 x 18.6mm | | | |
| Weight | 190g | | | |
| Wire size | 2.5mm ² | 4mm ² | 2.5mm ² | 4mm ² |
| Self consumption | 10mA | | | |
| Ambient temperature | -35°C ~ +60 °C | | | |
| Degree of protection | IP67 | | | |
| Max. Altitude | 4000m | | | |

Note : Around oblique line value separately on behalf of 12V and 24V system' s value.