

# **Smart<sup>TM</sup>-N5 series**

# **Solar charge controller**

## **10/20A**

# **User Manual**

# Solar charge controller Smart-N5 series User Manual

## Dear Clients,

Thanks for selecting the **Smart™-N5** 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 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, AGM, GEL and Lithium battery
- 12/24V system voltage automatic recognition
- Automatic temperature compensation(Liquid/AGM/GEL)
- Four stages charge: fast, boost, equal, float(Liquid/AGM/GEL)
- When BMS power off because of LVD, it can activate the system automatically(Lithium)
- Charging target and 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

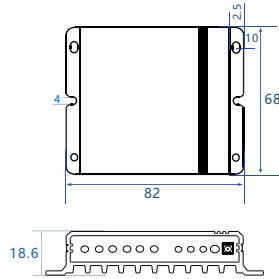
### 2.1 Safety

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

### 2.2 Liability Exclusion

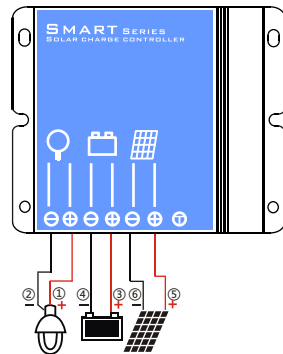
The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by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

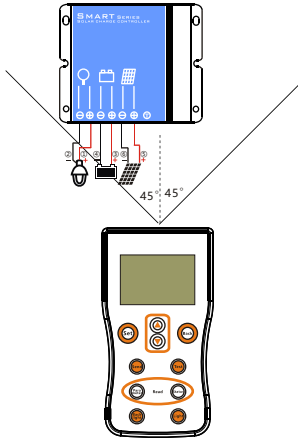
- Make sure the length between battery and controller is as short as possible.
- Recommended minimum wire size:  
10A: 2.5mm<sup>2</sup>; 20A: 4mm<sup>2</sup>.

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## 5.Remote controller, Default setting

When Smart-N5 series controller is connected to the system, you can setting the controller with S-Unit infrared remote controller. Detailed setting operations, please read S-Unit User Manual.

**Remark:** Be sure to set only one Smart-N5 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
1	Time1	24H
2	Dim1	100%
3	Time2	0H
4	Dim2	100%
5	Time3	0H
6	Dim3	100%
7	Time4	0H
8	Dim4	100%
9	Time5	0H
10	Dim5	100%
11	D/N Thr	5V
12	D/N Dly	0min
13	Load I	0.3A
14	Dim Auto	No
15	Battery	GEL
16	LVD	11.2V
17	LVR	12.0V

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 work in 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

### 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

The controller applies to Lithium, AGM, Liquid and Gel battery, the factory default setting is suitable for Gel battery.

When the controller is set to Lithium battery, the charging target voltage and charging recovery voltage can be set according to customer requirements.

The controller adjusts itself automatically to 12V or 24V system voltage when it is set to Gel, Liquid or AGM battery. If the battery voltage on start-up is 0V-15.5V then the controller infers a 12V system.

If the battery voltage is 20V-30V the controller infers a 24V system.If the battery voltage is not within the normal operating rang(ca.10 to 15V or ca.20 to 30V) at start-up, please refer to **10.2 Faults & Alarms**.

## 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.

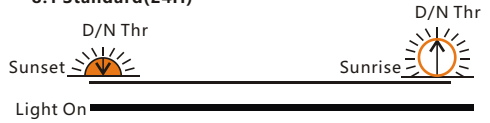
\*3. The solar panel voltage should not exceed this limit for a long time.

**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

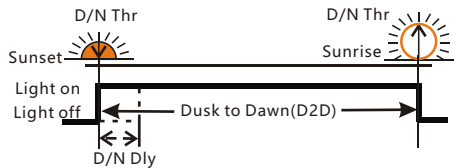
Smart-N5 controller with advanced light control function. The modes of lighting can be based on customer needs.

### 8.1 Standard(24H)



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

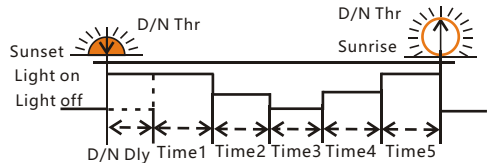
### 8.2 Dusk to Dawn (D2D)



If "Time1" is set to "D2D", the controller works in dusk to dawn mode.

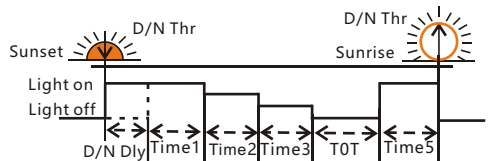
- 1.Smart-N5 series controller is set to D2D mode, the corresponding dimming setting is still valid.
2. If "Time1" is set to D2D mode, "Time4" can not be set to TOT mode.

### 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)

When the battery voltage drops below the LVD voltage, the controller will disconnect the load to prevent deep discharge of the battery. If this occurs, the battery should be well charged before resuming use.

#### 1. Gel, Liquid and AGM Battery

##### Battery capacity control

SOC1: 11.0~11.6V/22.0~23.2 V

SOC2: 11.1~11.7V/22.2~23.4 V

SOC3: 11.2~11.8V/22.4~23.6 V

SOC4: 11.4~11.9V/22.8~23.8 V

SOC5: 11.6~12.0V/23.2~24.0 V

##### Battery voltage control

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

#### 2. Lithium Battery

LVD range: 9.0~30.0V.

### 9.2 Low Voltage Reconnect (LVR)

If the low voltage disconnect is triggered, the controller will restore load connection only when the battery voltage increases above the LVR voltage.

#### 1. Gel, Liquid and AGM Battery

LVR range: 11.4~12.8V/22.4~25.6V.

#### 2. Lithium Battery

LVR range: 9.6~31.0V.

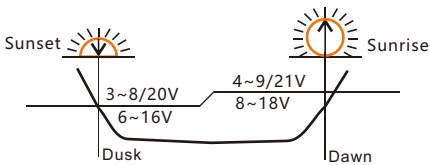
### 9.3 Day/Night Threshold, Day/Night Delay

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.

Liquid, AGM or GEL: 3.0~8.0V/6.0~16.0V.

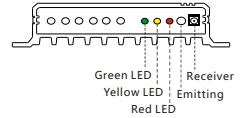
Lithium: 3.0~20.0V.

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 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(Liquid, AGM or GEL) / 4.0~21.0V(Lithium).
- 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



### 10.1LED Display Explanation

LED	Status	Function
Green LED	On	Not charged
	Flash fast(0.1/0.1s)	MPPT charging
	Flash(0.5/0.5s)	Equal or Boost charging (Gel, Liquid or AGM)
	Flash slowly(0.5/2s)	Charging
Yellow LED	Off	Over voltage protection
	On	Battery is normal
	Slow flash(0.5/2s)	Battery voltage is low
	Fast flash(0.1/0.1s)	Low voltage protection
Red LED	On	Work normal
	Off	The output power is 0.
	Flash(0.5s/0.5s)	Over temperature
	Fast flash(0.1/0.1s)	Short circuit or over * current protection

### 10.2Faults & 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 * Battery wires or battery fuse damaged, battery has high resistance .	Check if other sources overcharge the battery. If not, controller is damaged. 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

\* Lithium: Battery overvoltage >(CVT+0.2V)

Gel, Liquid and AGM: Battery overvoltage > 15.5/31.0V

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## 11. Technical Data

	Model	SMR10-N5	SMR20-N5	
	Max. Current	10A	20A	
	System Voltage	12/24V		
	Max. battery voltage	40V		
	Battery type	Liquid, AGM, GEL and Lithium(Programmable)		
Battery Parameters	Liquid, AGM, GEL	Fast Voltage	<14.5V/29.0V (25°C)	
		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)	
		Overcharge Protect	15.5/31.0V	
		Low voltage disconnect	10.8~11.8V/21.6~23.6V; SOC1~5	
		Low voltage reconnect	11.4~12.8V/22.8~25.6V(Programmable)	
	Lithium	Temp compensation	-4.17 mV/K per cell (Boost, Equal) ; -3.33 mV/K per cell (Float)	
		Charging voltage target	11.0~32.0V(Programmable)	
		Charging voltage recovery	9.5~31.8V(Programmable)	
		Low voltage disconnect	8.0 ~30.0V(Programmable)	
		Low voltage reconnect	8.6 ~ 31.0V(Programmable)	
	Panel Parameters	Day/Night threshold	Liquid, AGM, GEL: 3.0~8.0V/6.0~16.0V(Programmable) Lithium: 3.0~20.0V(Programmable)	
Day/Night delay time		0~30min(Programmable)		
Max. panel voltage		55V		
System Parameters	Dimensions	82 x 68 x 18.6mm		
	Weight	190g		
	Wire size	2.5mm <sup>2</sup>	4mm <sup>2</sup>	
	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.