

( New Model , Aug. 2015, Timer attached )

# Solar MPPT Battery Charging Controller

Free standing with Hybrid function

( Only for Li-Ion / Li-Polymer Battery )

( Load Output Control Timer Equipped )

## 1. FEATURES



### 1) Functions

- ◇ Solar Battery Charging and Discharging Controller.
- ◇ Load output control timer is available.
- ◇ Day night sensing and automatic load connection control ( Auto Mode )
- ◇ Accommodates Li-Ion / Li-Polymer Batteries.
- ◇ Hybrid function

### 2) Strong Points

- ◇ High Efficiency Battery Charging Control by MPPT ( Maximum Power Point Tracking ) Control Functions.
- ◇ Equipped adjustable 5 step load output control timer.
- ◇ Charging efficiency from PV array to Lithium batteries is Max. 95%
- ◇ Protected against reverse polarity connection of the solar panels and/or battery
- ◇ Protection Functions ; Over Current, Over Voltage, Under Voltage.

## Models

①      ②      ③      ④      ⑤  
 SH - 12V    10A - D / 3S  
 SH - 24V    10A - D / 6S  
 SH - 24V    10A - D / 7S

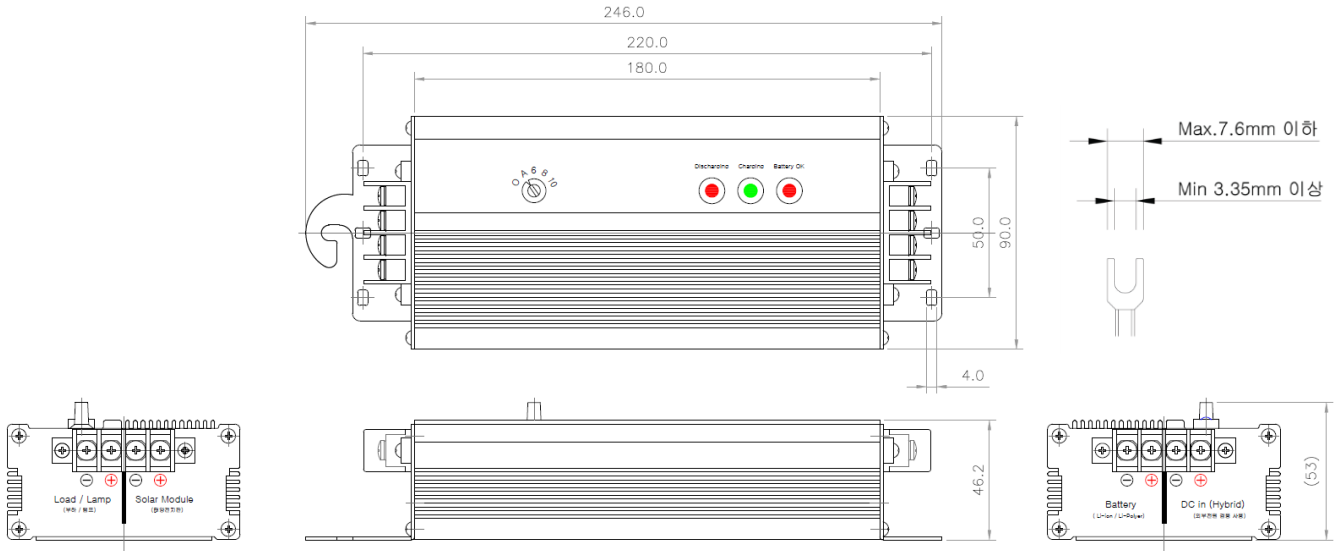
①	Series Name	SH
②	Battery Voltage	12V : Lithium-ion 3-Series cells (3S) (Rated 10.8V) 24V : Lithium-ion 6-Series cells (6S) (Rated 21.6V) 24V : Lithium-ion 7-Series cells (7S) (Rated 25.2V)
③	Amount of Charging Current	12V Model    10A → 19A 24V Model    10A → 11A
④	Stand Alone with Hybrid function	D : Stand Alone with Hybrid (External DC Power input) function
⑤	Li-ion or Polymer Batteries applied	3S : Lithium-ion 3-Series cells (Rated 10.8~11.1V) 6S : Lithium-ion 6-Series cells (Rated 21.6~22.2V) 7S : Lithium-ion 7-Series cells (Rated 25.2~25.9V)

## 2. Specifications

CE Certification , Made in Korea

Model Name :		SH-12V10A-D/3S	SH-24V10A-D/6S	SH-24V10A-D/7S
General	Weight	700 g		
	Opt. Temperature	-30°C ~ 60°C		
Batteries applied and charging current	Only for Li-Ion Li-Polymer Batteries	3S (3series cells ) ( Rated 10.8V± ) ( Max. 12.6V)	6S (6series cells ) ( Rated 21.8V± ) ( Max. 25.2V)	7S (7series cells ) ( Rated 25.2V± ) ( Max. 29.4V)
	Charging Current	Rated 18A, Max. 19A	Rated 10A, Max. 11A	Rated 10A, Max. 10A
Solar Modules applied	Power of Solar Modules	Max. 250Wp	Max. 250Wp	Max. 300Wp
	Max. Peak Power Voltage of Solar	16 ~ 20V	30~36V	30~36V
	Max. Open Circuit Voltage	Under 30V	Under 55V	Under 55V
	Maximum Power Point Tracking	16 ~ 20V	30~36V	30~36V
Load applied	Output Voltage = Battery Output Voltage	3S Battery voltage : 9.5V~12.6V	6S Battery voltage : 19V~25.4V	7S Battery voltage : 22V~29.4V
	Load Current	Rated 10A, Max.15A	Rated 6A, Max.10A	Rated 6A, Max.10A
	LED Lamp	①3 series LED's lamp ②Needed Constant Current Circuit	①6 series LED's lamp ②Needed Constant Current Circuit	①6~7 series LED's lamp ②Needed Constant Current Circuit
Load Output Control ( Timer )	By Rotary Select Switch	1) 5 Step load output control ① 24 hour continuous load output. ② From sunset to daybreak. ③ 6 hours, 8 hours or 10 hours load output from sunset by time setting. 2) Automatic Day/Night Sensing.		
Performance	Charging Methods	MPPT ( Maximum Power Point Tracking ) and PWM DC-DC Converter		
	Charging Efficiency	Max. 95% Nominal 90%		
Hybrid Function		① The controller connects the load automatically to the external DC power which is connected to the 'DC in(Hybrid)' terminal when the battery is low. ② The controller does not charge the batteries with the external power		
Protection Function		① Battery over charging disconnection ② Battery over discharging disconnection ③ Charging Current Limitation systems ④ The +,-polarity reversal wiring protection functions		

### 3. Drawings

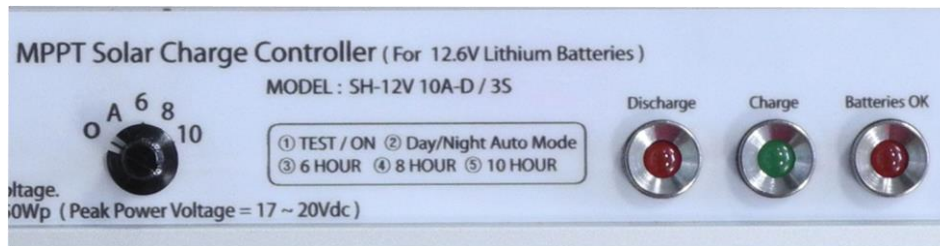


[ Left ]



[ Right ]

#### 4. Load output control with timer setting / Signal Lamps



##### ◇ Timer Setting.

- O : 24 hour continuous load output.  
‘O’ means ‘On normally’.
  
- A : Day night sensing and automatic load connection control during all night.  
‘A’ means ‘Auto’.
  
- 6 : Power Output for 6 hours from sunset.  
‘6’ means ‘for 6 hours’.
  
- 8 : Power Output for 6 hours from sunset.  
‘8’ means ‘for 8 hours’.
  
- 10 : Power Output for 6 hours from sunset.  
‘10’ means ‘for 10 hours’.

##### ◇ Signal Lamps.

- 1) ‘Battery OK ‘ Lamp ON  
: Battery is correctly connected and the voltage level is also normal.
- 2) ‘Charging’ Lamp ON  
: Solar module is correctly connected and the voltage level is also normal.
- 3) ‘Discharging’ Lamp ON  
: Power Output to the load.

## 5. Wiring

### 1) Wiring procedure

First, Do wire connections between the [solar modules](#) and solar charger  
Next, Do wire connections between the [batteries](#) and solar charger

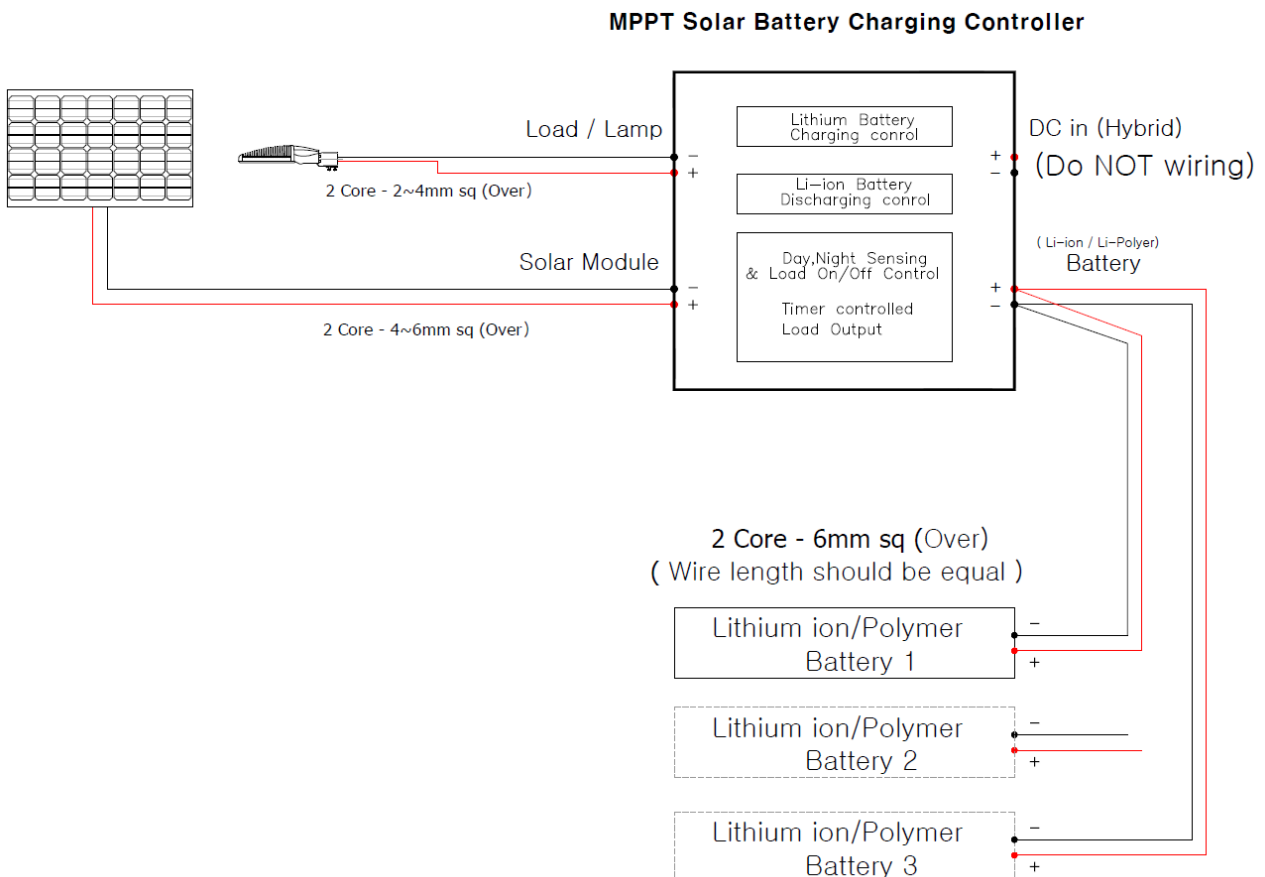
Even though you do not stick to the connection procedure there is no problem.  
But when you install and do wiring the solar street lights in the toward evening ( not yet dark but bright) there comes a possibility of lighting at that time even though sun does not set yet.

If you avoid this problem you had better to stick to the wiring procedure.

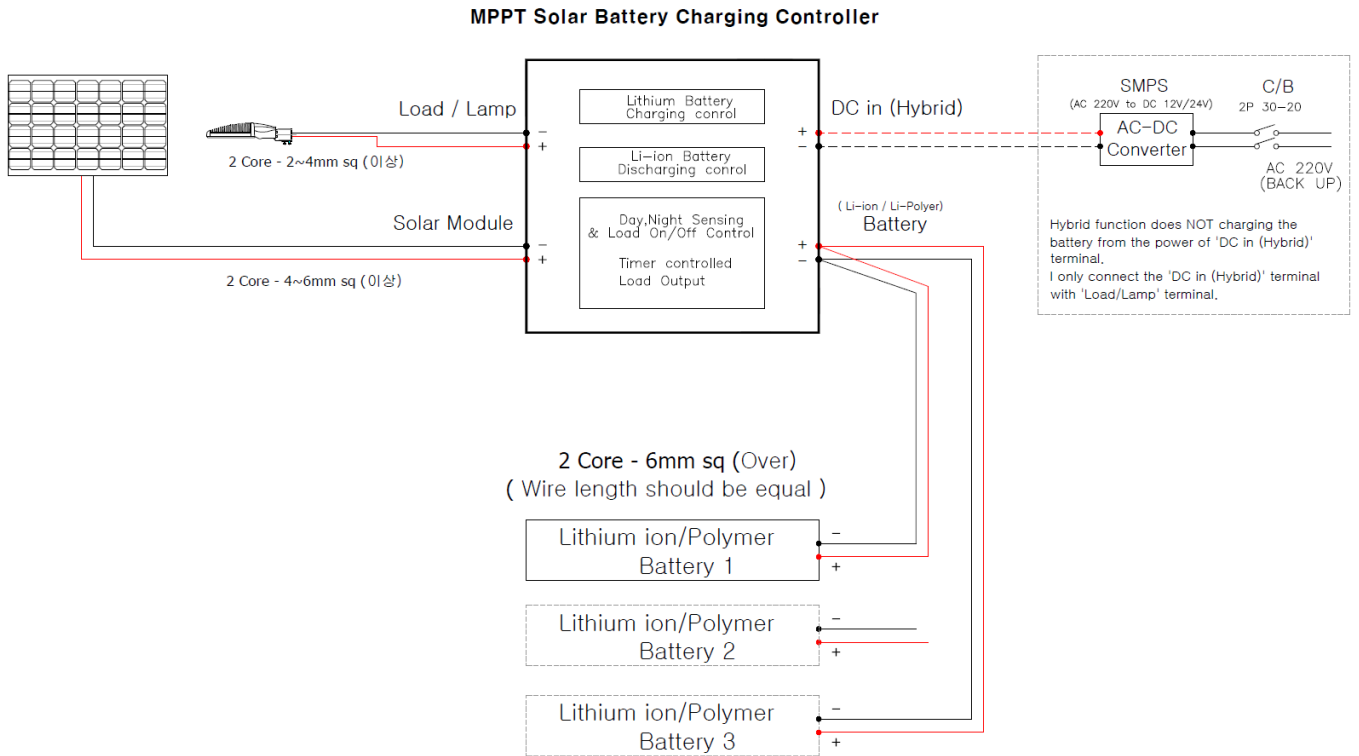
If you did not stick to the wiring procedure and there came a problem  
Just disconnect the battery wire and reconnect it if the lamp lights at toward evening.

### 2) Wiring drawings

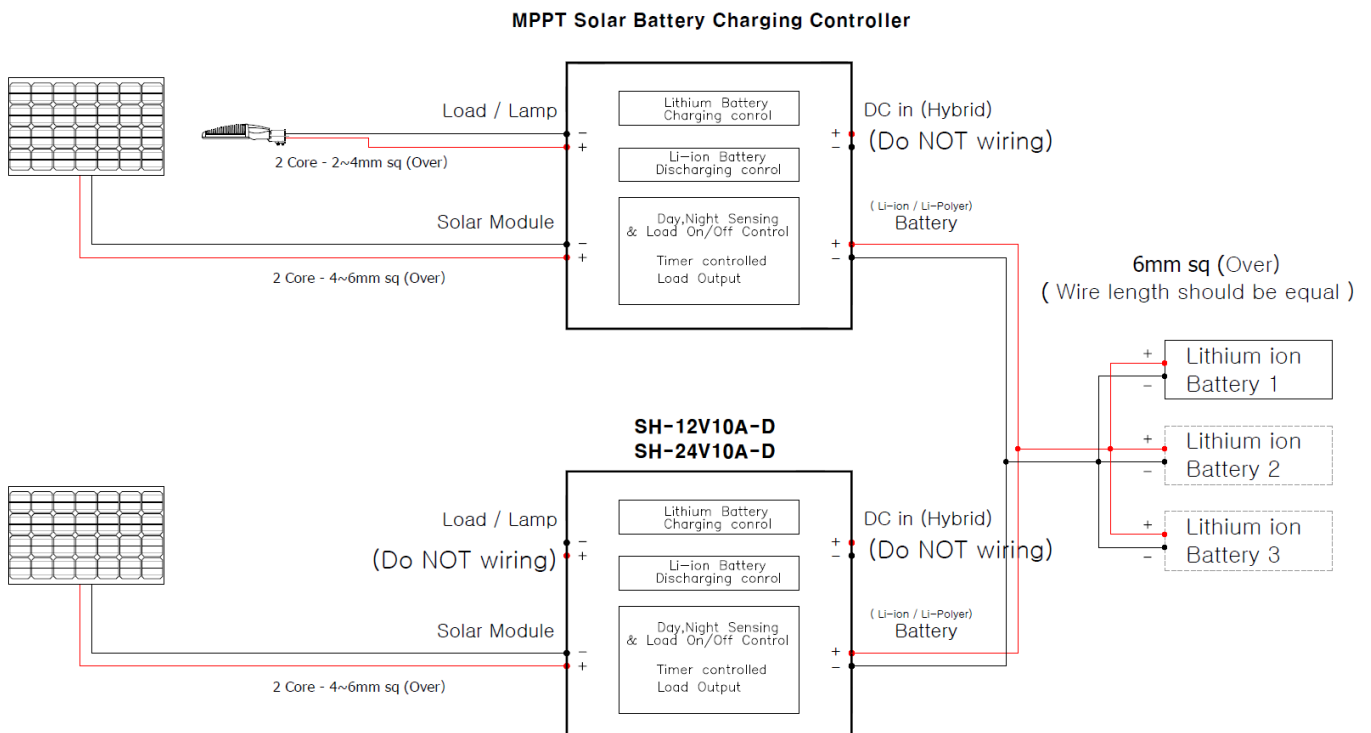
[ Wiring Drawing 1 ] General free standing solar street light



[ Wiring Drawing 2 ] Free standing solar street light with hybrid function



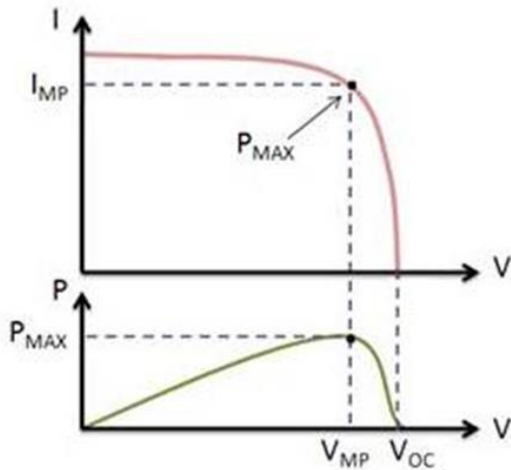
[ Wiring Drawing 3 ] Using two solar charging controllers parallel connection



### 3) Recommended wire size in between Solar module and Solar charger

Solar Modules	SH-12V10A-D	SH-24V10A-D
0~ 80Wp	Minimum 4mm <sup>2</sup>	Minimum 4mm <sup>2</sup>
90~ 120Wp	Minimum 6mm <sup>2</sup>	Minimum 4mm <sup>2</sup>
130Wp ~ 200Wp	Minimum 6mm <sup>2</sup>	Minimum 4mm <sup>2</sup>
200Wp ~250Wp	-	Minimum 6mm <sup>2</sup>

## 6. MPPT (Maximum Power Point Tracking) Function



Smart-Hi has a DC-DC converter that holds the voltage of solar module at a point of  $V_{MP}$  and also sustains the battery side voltage at a charging voltage.

It charges the solar power to the batteries at a maximum efficiency.

It increases the charging power in excess of 30% compared to normal solar charger.

[ PV Module Power/Voltage/Current ]

To increase the charging power in excess of 30%.

## 7. Hybrid Function

- ◇ Hybrid Function works only by connecting external DC power to the 'DC in(Hybrid)' terminal.
- ◇ The controller connects the load automatically to the external DC power which is connected to the 'DC in(Hybrid)' terminal when the battery is low.
- ◇ The controller does not charge the batteries with the external power which is connected to the 'DC in(Hybrid)' terminal.
- ◇ The controller does not use the external power when the power of batteries is available



◇ For more information please refer to the ‘ [ Wiring Drawing 3 ] Free standing solar street light with hybrid function’ above.



## 8. Trouble shutting

1) When the charging function does not work.

Check the reverse polarity connection of the Solar / Battery.  
If the wiring was correctly done, check the PV module or battery.

2) When the Load or Lamp does not work.

Check the reverse polarity connection of the Load Terminal.  
Check if the Rotary Timer Switch is correctly set.

3) Especially when wiring in the time of around sun sets.

First, do wire connection between the [solar module](#) and solar charger  
Next, do wire connection between the [batteries](#) and solar charger

Even though you do not stick to the connection procedure there is no problem.  
But when you install and do wiring the solar street lights in the toward evening ( not yet dark but bright) there comes a possibility of lighting at that time even though sun does not set yet.

If you avoid this problem you had better to stick to the wiring procedure.

**If you did not stick to the wiring procedure and there came a problem  
Just disconnect the battery wire and reconnect it if the lamp lights at toward evening.**

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