

EH120

Intelligent Wireless Dimming-Type Controller for Commercial-Power Complementation (AC/DC Hybrid) LED Solar Street Lights

User Manual

Version : 1.01

The above information is subject to change without prior notice.

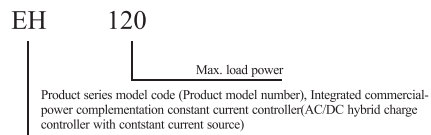


Main features

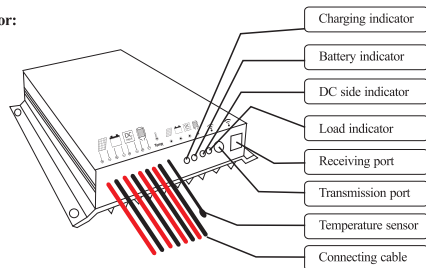
- With an all-new wireless remote control design, a hand-held device can be used to modify controller parameters and read system information.
- Fully-digital and high-precision constant current control boasting an efficiency of up to 96%.
- Supports 12 V and 24 V lead-acid batteries and lithium batteries.
- Features a DC detection function. With(If) DC available, the system will automatically switch to DC power supply when the battery voltage falls to the DC switching point; if DC power supply is not available (if DC powers off), the system will shut off output when the battery reaches the over-discharge point after continuous discharging.
- Boasts an adjustable operating current range of 0.15 A to (from) 3.96 A and an adjustment precision of 30 mA.
- Employs a load triple-stage brightness adjustment (dimming) and morning on (light) design, with an operating duration adjustable from 0 to 15 hours and a power settable from 0 to 100%.
- Features an intelligent power mode which can extend the battery life to its top limit by adjusting the load power automatically according to the remaining battery capacity.
- Features a system status log function, able to record a maximum of 7 days of system status, comprehensively and effectively monitoring the system's conditions.
- Data communication adopts a multi-time two-way handshake protocol and a data compression algorithm, realizing precise and fast data transmission.
- True constant current rather than current-limiting control ensures smooth and stable output current, effectively reducing LED light attenuation and extending LED service life.
- A metal case and an IP68 waterproof level enable the device to operate in various kinds of tough conditions.
- Adopts an improved charging algorithm to reduce the vulcanization effect caused by battery over-discharging, significantly extending the battery's service life.
- An overheat protection function enables the device to scale down the load or shut off the load completely when its temperature exceeds a certain point.
- A range of protection measures such as battery reverse-connection protection, LED short-circuit and open-circuit protection, etc., put the system under comprehensive and constant guard.

Exterior and Wiring

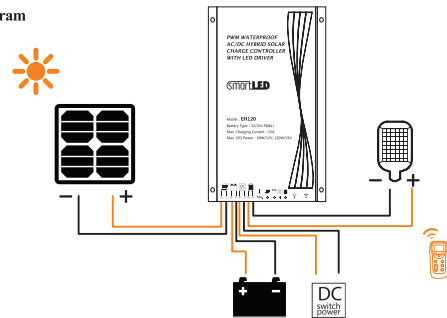
1. Model name composition



2. Exterior:



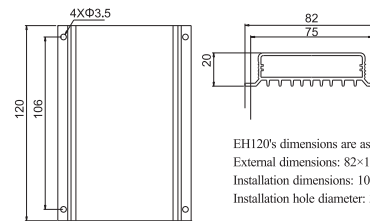
3. Wiring diagram



4. Wiring sequence: connect first the load, second the battery, third the solar panel, and finally the DC power supply.

▲ Connect the controller's DC terminal to the output terminal of the 12 V/ 24 V switching power supply, and do not directly connect 220 VAC to the controller!

Installation dimensions



EH120's dimensions are as follows:
 External dimensions: 82×120×20 (mm)
 Installation dimensions: 106×75 (mm)
 Installation hole diameter: 3.5 (mm)

LED Load Connection

1. With a built-in boost type constant current source, EH boasts a maximum output voltage of 60V, able to power up to 18 LED light bulbs.
2. This controller is of a boost type. When LED load is connected, be sure to connect a right number of LED lights in series.

The number of connected LED lights is recommended as follows:

System voltage	Recommended minimum No. of serially connected LEDs (n)	Load output voltage V _{out}
12V	n ≥ 5	V _{out} ≥ 15V
24V	n ≥ 10	V _{out} ≥ 30V

3. In practical use, make sure you correctly connect the LED lights before switching on the load.

Warning: if a wrong number of LED lights are connected in series, the LED load or the controller may get damaged. Always bear this in mind!

State Indicators

LED indicator	Indicated item	Status	Meaning
	Charging	Steady on	Solar panel voltage higher than light control voltage
		Off	Solar panel voltage lower than light control voltage
		Slow flashing	Charging in process
		Quick flashing	System over-voltage
	Battery	Steady on	Normal battery function
		Off	Battery not connected
		Quick flashing	Battery over discharged
	Load	Steady on	Load turned on
		Slow flashing	Open-circuit LED load
		Quick flashing	Short-circuit LED load
		Off	Load switched off
	DC	Steady on	DC available and powering the load
		Slow flashing	DC available
		Off	DC not available

Load Working Modes

The load's working time can be divided into 3 stages plus a 4th—morning on. The operating duration and power of each stage can be freely adjusted, with different combinations bringing about different control modes.

- A. Normal working mode:** operates according to time and power settings in sequence.
- B. Delay on mode:** e.g. set the 1st-stage operating duration to 4 hours and power to 0%, and the system will delay switching on the lights by 4 hours.
- C. Morning on(light) mode:** the controller will automatically calculate the length of the night and intelligently adjust the time point for switching on the light in the morning, thereby making the morning on time more precise.
- D. Test mode:** in daily use, the controller works in the light control + time control mode, but when test is needed during installation, you can use the remote control to switch on the load, and then the LED load will change its power according to the remote control settings. The test mode lasts for 1 minute, and after that, the system will automatically restore the normal working mode.

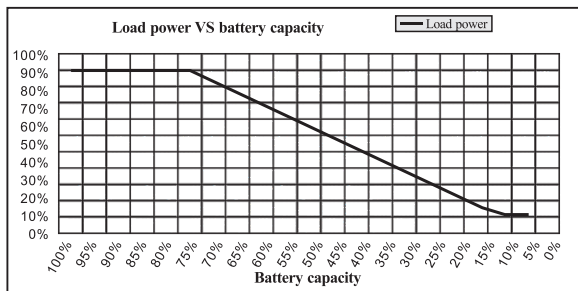
Adjustment item	Value	Default
1st-stage operating duration	0 to 15 hours	4
1st-stage operating power	0 to 100%	100%
2nd-stage operating duration	0 to 15 hours	0
2nd-stage operating power	0 to 100%	70%
3rd-stage operating duration	0 to 15 hours	4
3rd-stage operating power	0 to 100%	50%
Morning on (light) operating duration	0 to 15 hours	0
Morning on (light) operating power	0 to 100%	30%

Intelligent LED Power Control

When the controller's "intelligent power" mode is activated by the user, the LED load's power can be automatically adjusted according to the battery capacity. While the operating duration and load power set by the user are still valid, the system will choose the smaller one from between the automatically adjusted power and the power set by the user as the load output power.

For example: when the remaining battery capacity is 50% and the load power calculated in the intelligent power mode is 60%, and if the load power set by the user is 100%, then the final load power is 60%; however, if the load power set by the user is 20% instead, the final load power will also become 20% accordingly.

The typical curve of intelligent power is shown below:



DC Switching

In the night, when DC is available and the battery voltage falls below the DC switching point, the EH controller will automatically switch to the DC power supply; when the battery gets recharged and its voltage rises back to the over-discharge recovery voltage the next day, the EH controller will then automatically switch back to battery power.

Parameter Access and Modification

The EH controller can be used to set parameters including load operating duration, load operating power, light control delay, charging voltage, DC switching voltage, etc. When finishing settings through the remote control, aim it at the controller and press the "send" key to save the settings. Besides, current parameter settings in the controller can also be accessed to make sure the settings are correct.

System Status Log

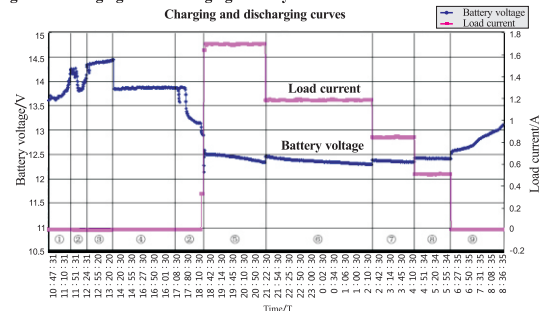
The EH controller can record the operating status of the whole system, including operating days, over-discharging times, full-charging times, etc. And besides, it can also keep a record of battery voltage changes in a week, enabling the user to have a clear understanding of the system and conduct better analysis on it. The user needs to use the remote control (CU-ALL) to read the system's operating status, and when the reading is successfully done, the parameters will be recorded in the remote control.

Charging and Discharging Control Cases

1. The parameters of the controller in this case are set as follows:

Item set in this case	Set value
1st-stage operating duration	3 hours
1st-stage operating power	100%
2nd-stage operating duration	5 hours
2nd-stage operating power	70%
3rd-stage operating duration	2 hours
3rd-stage operating power	50%
Morning on operating duration	2 hours
Morning on operating power	30%
Load current	1.74A
Boost charging voltage	14.4V
Floating charging voltage	13.8V
Light control voltage	8V
Light control delay	5 min

2. Diagram of charging and discharging in a day

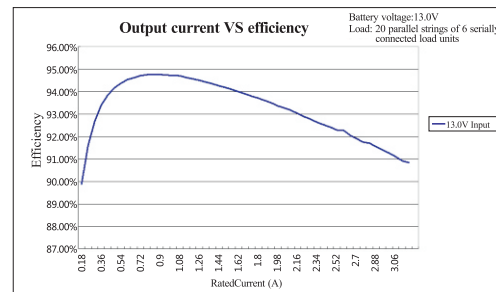


3. Operating stage descriptions

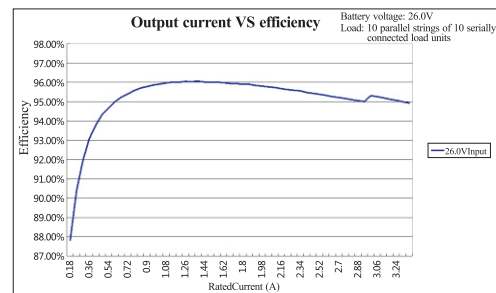
Stage	Description
1	Daytime: with the illumination steadily intensifying, the charging current keeps growing, making the battery voltage rise again.
2	Daytime: swaying of the illumination intensity puts the battery voltage in an unstable condition.
3	Daytime: boost charging stage
4	Daytime: when boost charging stage ends, floating charging stage starts.
5	Nighttime: the solar panel voltage falls to lower than the light control voltage, and after a time delay, the load is switched on. During the 1st stage, the load power starts at 100%.
6	Nighttime: during the 2nd stage, the load power becomes 70%.
7	Nighttime: during the 3rd stage, the load power falls to 50%.
8	Nighttime: the 4th stage is morning on stage, and load power at this stage is 30%. Note: as the entire set duration (12 hours) exceeds the length of the night at the given time of the year, the load is not shut off in the process, but keeps operating all the night.
9	Daytime: the solar panel voltage becomes higher than the light control voltage, and after a time delay, the load is shut off and the battery's voltage rises again as battery charging begins.

Typical Efficiency Curve

1. 12V system



2. 24V system



Frequently Met Abnormalities and Solutions

Symptoms	Causes and solutions
No output after reconnecting the open-circuit load.	Check whether connection is correct and reliable. A maximum of 10 s is needed for the load to get started again when reconnection is rightly done.
No output after solving a short-circuit load problem.	The load will restart following a time delay of 1 s (1s delay) after a short-circuit event.
The battery indicator is flashing quickly, and no output.	The battery is over-discharged, and will recover automatically when getting recharged to the over-discharge recovery point.
While sunlight is present, the solar panel indicator doesn't light up.	Check whether the solar panel is correctly connected and whether it's blocked.
The load current doesn't reach the set value.	Check whether the current value exceeds the max. current allowed by the controller.

Parameter Details

Parameter	Value	Adjustable or not	Default
Model	EH120		
Supported battery type	Lead-acid batteries (including gel batteries), lithium batteries	√	
System voltage	12V/24V		
Output power	12V/ 60W; 24V/ 120W		
Output current	0.15 A to 3.96A	√	330mA
No-load loss	9mA/ 12 V; 12mA/ 24 V		
Charging current	15A		
Solar energy (panel) input voltage	< 55 V		
Typical constant current source efficiency	90% to 96%		
Over-voltage protection	16.0V; × 2/24 V		
Charging voltage limit	15.5V; × 2/24 V		
Equalizing charging voltage	15.2V; × 2/24 V (25 °C)		
Equalizing charging time (duration)	1 hour		
Equalizing charging interval	30 days		
Boost charging voltage	7.5 V to 15.5 V; × 2/24 V (25 °C)	√	14.4V
Boost charging time (duration)	4 hours		
Floating charging voltage	7.5 V to 15.5 V; × 2/24 V (25 °C)	√	13.8V
Temperature compensation	-4.0mv/°C/2V;		
Whether charging is prohibited below 0 °C	<Yes, no>	√	NO
Charging methods	<0, 1>		N/A (Invalid)
Overcharge voltage	7.5 V to 15.5 V; × 2/24 V	√	14.6V
Overcharge recovery voltage	7.5 V to 15.5 V; × 2/24 V	√	13.6V
Over-discharge voltage	7.5 V to 15.5 V; × 2/24 V	√	11.0V
Over-discharge recovery voltage	7.5 V to 15.5 V; × 2/24 V	√	12.6V
DC switching voltage	7.5 V to 15.5 V; × 2/24 V	√	11.5V
Current accuracy	±3% (load current > 300 mA)		
Load output voltage	< 60V		
Over-temperature protection	Ambient temperature: 80°C (load downrating power)		
Over-temperature protection	Inside temperature: 120 °C (load off)		
Light control voltage	5V to 11V; × 2/24 V	√	5V
Light control delay	1min to 50min	√	1min
Operating temperature	-35 to +65 °C;		
Protection degree	IP68		
Weight	300g		
Dimensions (mm)	120*82*20		

▲ The DC mentioned in this manual refers to the DC output terminal of the "switching power supply", and do not connect commercial power directly to the controller!