Single-string PWM charging control Boost constant current AC/DC hybrid complementary 3228-AC Instruction Manual

Product model	Application scenario
3228-AC	-AC Single-string PWM charging control boost constant current integrated unit with AC/DC hybrid complementary function (External power supply module)
3228-AC-G	-AC-G features AC/DC hybrid complementary function and induction function; single-string PWM charging control boost constant current integrated unit (External power supply module, external induction module)
3228-AC-I	-AC-I features AC/DC hybrid complementary functionality and IoT capabilities. It is a single-string PWM charging control boost constant current integrated unit. (External power supply module, external communication module)

1. Product Features

- The lithium batteries are all parallel, resulting in a high cycle life and long lifespan. Production is simple and stable.
- The batteries require no protection board; the system features dual battery protection (software and hardware), validated over 5 years with millions of lamps, ensuring stable and reliable protection.
- The lighting power is automatically adjusted based on the real-time battery capacity and solar charging capacity, guaranteeing both brightness and lighting duration, ensuring 365-day illumination.
- Multiple intelligent power modes are available, automatically adjusting load power according to battery charge.
- Multiple protection functions including LED short circuit/open circuit/power limit protection.
- Automatically switches to AC power when the battery is low at night.
- Expandable sensing function.
- Supports IoT remote communication, real-time viewing, statistical data, and automatic fault alarms.
- All-aluminum metal casing, IP67 waterproof rating, capable of use in various harsh environments.

2. Operation Instructions

2.1 PWM Charging Introduction

The solar controller adopts advanced series pulse-width modulation (PWM) mode, with PWM wide range of regulation from 0 to 100%, which enables quick and stable charging of the battery under any system conditions.

The PWM charging mode is to charge the battery with the pulse current of automatic change duty cycle, so the pulsating charging can make the battery more safe and fast full charge, the disconnection period makes the oxygen and hydrogen produced by the chemical reaction of the battery have time to re-combine and be absorbed, so that the concentration polarization and ohmic polarization are naturally eliminated, thereby the internal pressure of the battery is reduced, and the battery can absorb more power. The pulse charging mode makes the battery have a more adequate reaction time, reduces the amount of gas(gas produced during the charging and discharging of battery), and improves the acceptance rate of the battery to the charging current.

2.2 Status Indicators

The 3228-AC controller has four indicator lights.

LED Light	Indicative content	State	Function	Remote control system status
	Green indicator light Indicates charging state	Constant light	The photovoltaic panel voltage is greater than the photocontrol voltage	Start the light control
		Extinguish	The photovoltaic panel voltage is less than the photocontrol voltage	Off the light control
		Slow flashing	Be Charging	Be Charging
		Quick flashing	Battery is fully charged	Battery is fully charged
	Red indicator light Indicates battery state	Constant light	Battery is working fine	Normal operation
		Extinguish	The battery is not connected or the remote shuts down	Not running or shutdown status
		Slow flashing	Battery overdischarge	Overdischarge
		Quick flashing	LED load short circuit	Short-Circuit
	Blue indicator light Indicates load state	Constant light	The load is turned on	Discharge
		Extinguish	The load is turned off	Leisure
		Slow flashing	LED load percentage output	Percentage discharge
		Quick flashing	LED load is disconnected	Open-circuit
 **Only 3230-AC**	Yellow indicator light indicates the status of mains power.	Always on	External power supply is connected, but mains power is not switched on.	Not connected to mains power
		Slow flash	When the external power supply is connected, the mains power supply is switched on.	Switch to mains power

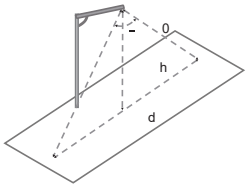
2.3 Sensing function

The default delay time for the controller is 20 seconds. The delay time can be changed within the factory as required before mass production.

Controller is divided into two types: human infrared induction (IR) and microwave induction (WB) :

Human infrared sensor is a kind of sensing product made by using the principle of pyroelectric effect, that is, a phenomenon that generates electric charge due to temperature change.The detection range of the infrared sensor probe will be affected by the difference between the temperature of the human body and the environment, and the higher the environment temperature (the closer to the human body temperature), the less sensitive the sensor.

Microwave inductive sensor is a moving object detector designed by using the principle of the Doppler effect. It detects whether the position of an object has moved by using a non-contact way, and then generates the corresponding switching operation. It has strong anti- RF interference ability, and is not affected by temperature, humidity, light, airflow, dust ,etc.



The type of induction	θ(Angle)	H ((Light Pole Height))	D(Induction Width)
IR(Infrared)	60 °	6 ~ 8m	9 ~ 14m
WB(Microwave)	65 °	6 ~ 9m	10 ~ 16m

2.4 IOT functions

IOT function: smart street lights IOT based on IOT technology can achieve intellectualized control of street lamp lighting, thereby improving the efficiency and quality of street lamp lighting.Main advantages:

1.On-demand lighting: realize automatic control of lighting;

2.Remote monitoring: real-time monitoring of the running status of the street lamp, and remote operation of the street lamp switch, remote adjustment of the lighting time;

3.Anomaly monitoring: It can monitor whether the street lamp is abnormal in real time, which is convenient for timely examine and repair.

2.5 Mains-Powered Complementary Function

Mains-Powered Complementary Function: Solar streetlights normally use a solar power system. However, if battery power is insufficient due to weather or other reasons, the controller automatically switches the power supply to mains power to keep the streetlights lit.

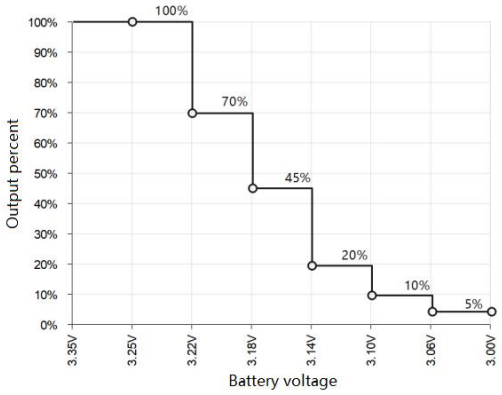
Because of the support of mains power, the mains-powered complementary system offers more stable lighting compared to a pure solar system, unaffected by weather. However, because it requires laying mains power cables, it completely negates the ease

of installation advantage of solar streetlights.

2.6Intelligent Power

Intelligent power: When the battery supply is insufficient due to weather or other reasons, in order to ensure the lighting time,the controller starts the smart power reduction to reduce the output power in the preceding period to ensure that there is power in the later time period.

Intelligent power reduction is shown as follows:



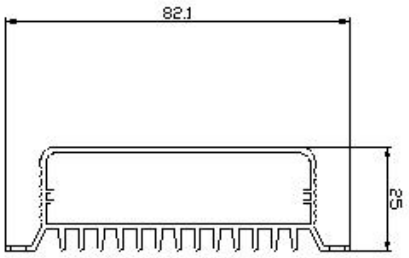
2.7 Size drawing:

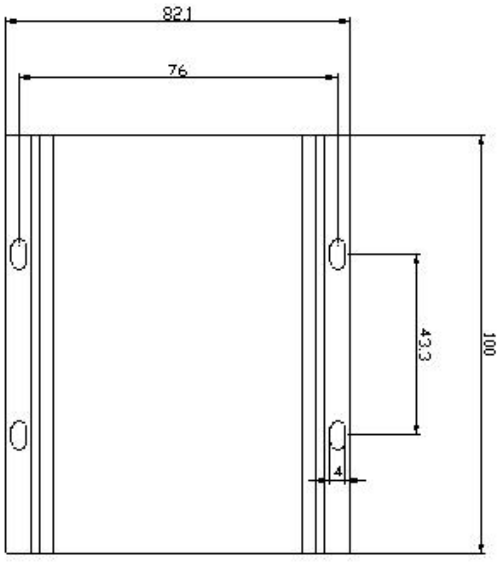
32328-AC size as follows:

Product size: 100×82×25mm

Installation size: 75.1×43.3mm

Installation aperture: φ4.0×8.0





3. Technical parameter

Parameter Name	Parameter Value	Parameter Adjustable	Default Value
Model number	3228-AC		
Controller type	PWM charging, load boost constant current		
System voltage	3.2V		
Static power consumption	≤20mA		
Dormant power consumption	≤6mA		
Load current	0.33A~1.65A	√	0.33
Load voltage	9V~30V		
Load LED string number	30W		
Maximum load power	97%		
Load conversion efficiency	< 3%		
Load current accuracy	Automatic		
Intelligent power	5 stage time control +1 stage morning light/ 4 stage time control +4 stage induction	All Support	
Load working period	30mins		
Time adjustment amplitude	5%		
Power adjustment amplitude	20A		
Maximum charging current	≤ 9V		
Solar input voltage	120W		
Automatic switching between AC power and battery voltage	3.15V	Factory settings	3.15V
Overvoltage	3.65V		

Charge return voltage	3.45V		
Overdischarge voltage	2.65V		
Light-controlled voltage	On: 1.5V, Off: 2.0V	√	Mid
Light control delay	5S~60S	√	5S
Operating temperature	-35℃~+65℃		
Class of protection	IP67		
Protection function	Photovoltaic panel reverse connection protection, photovoltaic panel overpressure protection, lithium battery overcharge and overdischarge protection, lithium battery BMS overvoltage detection protection, load short circuit protection, Load overcurrent protection		
Weight (g)	315		
Controller Size (mm)	100×82×25		

4. Protection Function

- **Waterproof Protection**

Waterproof rating: IP67

- **lithium battery BMS overcharge detection protection**

When the controller detects that the BMS is overcharged, the controller immediately stops charging to prevent the high voltage of the photovoltaic end from being added to both ends of the BMS for a long time, resulting in high voltage damage to the BMS.

- **High temperature protection**

When the ambient temperature is higher than the set value, the controller stops charging and discharging to prevent the risk of damage to the lithium battery due to excessive temperature.

- **Photovoltaic input overvoltage protection**

If the input voltage of the PV panel is too high (reaches 9V), the controller automatically cuts off the PV input.

- **Photovoltaic input reverse protection**

When the photovoltaic array polarity is reversed, the controller will not be damaged, and will continue to work normally after correcting the wiring error.

- **Load limit power protection**

When the customer uses the LED lamp power is too large, or the regulating load current is too large, the controller will limit the load power output to less than the rated power to ensure that the controller and the LED load will not be damaged.

- **Load short-circuit protection**

When a short circuit occurs, the controller immediately cuts off the load output to prevent damage to the controller. After the load short-circuit condition is lifted, the controller will automatically restore the output within 1 minute (if it is short-circuit for a long time, it will automatically restore the output once an hour), or press the remote control test button（CU or mini2） to automatically restore the output after 10S.

- **Load open circuit protection**

When the LED load light is on normally and the load connection is suddenly disconnected, the controller is not damaged.

- **Anti-charge protection at night**

Prevent the battery from discharging through the panel at night.

5. Electrical Wiring Diagram

3228-AC **Wiring Diagram:**