

The advantage of solar energy lighting

Hydro-Electric Power will encounter a dry season, firepower consume a large amount of coal, natural resources will be exhausted in the future. so Our human being is facing the world's growing energy shortages, recently in the domestic , we set off a vigorous saving energy boom.. "Solar energy", is no stranger to all the terms, it attracted more and more people's attention. It is nature offered this non-polluting, renewable clean energy.

The total investment of solar street lighting system, although you should arrange the initial investment costs of equipment, batteries and lighting lamp update fees, as the reliability of solar street lamp system, no conventional energy consumption, maintenance and other basic operating costs to zero, so you cannot consider it. No need to add power equipment, facilities, with capacity to save electricity costs.

Conventional lamps used in the open air exist the creepage, officials electric shock, power failure accidents, and something security problems like that. But solar street lighting does not exist over the issues. Social benefits, long-term use, energy-saving, environment-friendly as obviously. It also could reduce greenhouse gas and other harmful gases emissions. Solar street lamp is characterized by beautiful appearance, easy installation, stable performance, long service life, low operation and maintenance costs, emission-free, noise-free and pollution-free in the operation process.

Efficiency & Energy-saving High-efficiency lighting, low-cost operation.

Green & pro-environment The crystallization of high-tech, on behalf of the future development direction.

Safety & Saving No worries, once investment in permanent benefit.

Full seasons lighting Rain, snow and even seval cloudy days also can be used in continue.

Durability sophisticated and high quality

Exquisite design Automatic control, maintenance-free operation, on behalf of the sophisticated high-tech lighting technology.

Performance requirements and quality assurance of solar PV lighting system

First. Solar street lighting systems performance & requirements

1. General requirements

(1) The system operating environmental temperature is (-20 ~ +50 °C), humidity (90%).

(2) The largest wind resistance of solar cells array must not be lower than 27m / s, to ensure that the sealed battery valve pressure range and heat dissipation of the electronic components.

3) all the system equipment at least should have grounding protection device; system design should have anti-lightning devices.

2. Solar street lighting system

When the system battery to charge more than 85% of rated power capacity, should guarantee, in the normal system, at least 7 day in a row of lights.

3. Other technical requirements

(1) system should have perfect, over-voltage, over-current, less voltage, less flow, short circuit, automatic protection functions, strong over-loading capacity, anti-charge performance.

(2) system fitted for the project target area environmental conditions, batteries and other electronic components working environment temperature is -20 °C ~ +50 °C, the humidity was 90%.

Second, solar street lighting systems technical specifications and requirements

1. Solar cell components

(1) solar cell components , solar cell is made of single crystal silicon material. Silicon solar cells should be used to film or quasi-film, more than 16 percent efficiency.

(2) the selection criteria of solar photovoltaic components:

(3) 1. Do the quality certification by well-known quality inspection center at home and abroad.

In line with the corresponding drawings and technological requirements as provided for materials and components manufacturing, after a routine inspection of the manufacturing, quality control and up to grade production methods. Components is complete, in addition, should attach into the factory storage and transportation, installation and circuit connection instructions.

Should choose products from the factory which has good results in installing photovoltaic products.

About the PV cell panel design, it is necessary to meet the following requirements:

Designed should ensure that the components and their support connected strong and reliable.

Support must be installed on the best angle, in order to get the best output.

All the fasteners of support must have antirust and plating processing, and have sufficient strength.

Ensure the entire system to be stable, safe and reliable.

Intelligent controller

(1) Control system can be used to switch level approach to control the charge, according to the temperature changing, automatically adjust the largest charge-off of batteries, charge-off to restore battery voltage, battery over-discharge, battery over-discharge restoration. When the system voltage battery charge-off,

over-discharge, such as discharge failure, controllers can immediately start protection function.

(2) Control, protection function for the Control system:

Night anti-charging protection.

Battery charge-off, over-discharge protection.

solar cells reverse, reverse battery protection.

Circuit protection of the inner short-circuit of controller equipment.

Preventing the breakdown caused by the lightning strike.

There are quality certifications from the appointed national quality inspection institutions. Such as CE、TUV、IEC.

3.battery

There are quality certifications from the appointed national quality inspection institutions.

(2) should be in line with the corresponding drawings and technological requirements as provided for materials and components manufacturing, after a routine inspection of the manufacturing, quality control and production methods of passing. Equipment should be complete, with the factory's usage instruction and certificate.

(3) long service life, small daily maintenance work , easy to install .

4. Lamps and light source

(1) design principles: Green light source, safe and reliable, advanced technology, energy-saving, easy maintenance.

(2) design basis: According to the urban road lighting standards, should meet the type of their construction Road sections evaluation

solar lighting systems technical explanation and the performance description

As the resources increasingly scarce in the earth, infrastructure energy investment in growing up, and a variety of safety and pollution can be hidden everywhere. Solar energy as a "inexhaustible" safety and environmental protection new energy is receiving increasing attention, in the field of lighting in a wide range of applications, as solar street lighting has the following advantages:

Solar street lamp is easy installation: do not have to lay complex lines, as long as a cement base, and then use stainless steel screws to fix it.

solar lighting lamp no need electricity: a one-time investment, no operating costs, long-term benefit.

solar lighting is no security risk: low-voltage products, safe and reliable operation.

solar street lighting without energy consumption, environmental protection, easy installation, maintenance-free, automatic control for the inherent characteristics directly benefit the construction of municipal works.

Solar street lamp is an automatic work control system, as long as setting up the operation mode, it will automatically work. Solar street lamp is the ideal path lighting lamp, with the improvement of people's lives and social development, it will be widely used, it can use the sun's bright light at day to lighten us at night.

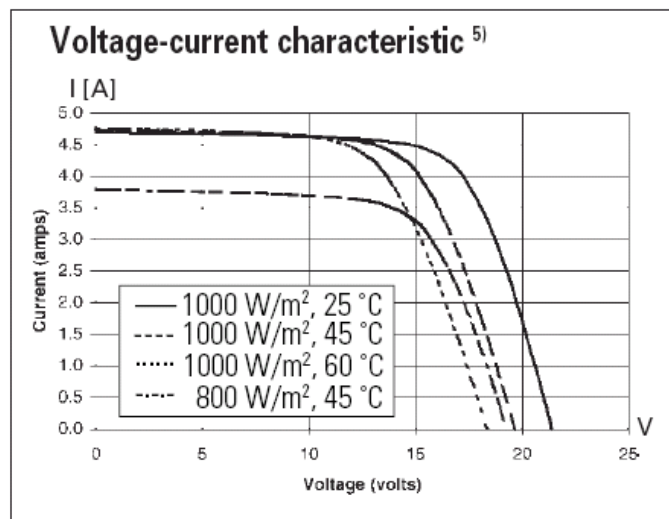
1、 Solar street lamp working principle

Solar street lamp is made of the following components: solar cells, batteries, solar lamps dedicated controller, lamp house and light poles. During the day, the solar cell receive sunnies to produce electricity in the sun, through the battery charge controller for recharged, stored the

electric energy in batteries. And on the same day night, that is, to stop charging solar energy, the charge controller to open lamp source, and 8 hours later ,it would closed. Inside the battery, power source can offer light in continuous 40 hours, according to the daily 8-hour working hours, and it can continue 5 days.

3、 Equipment selection and presentation

3.1 Solar cell component design selection



Technical parameters

The componennt is made of 125 × 125 silicon solar cells in series.

Anodized aluminum alloy frame constitutes a practical square structure, allowed a single use or the use of array

- With a standard support system, hole
- To ensure that the service life is 25 years.
- Dust-proof junction box to ensure the safe and reliable connection.

Silvery aluminum alloy frame and high transmittance tempered glass, white TPT substrate.

representative parameter:

series	size	1200×1200×40
1	Conversion efficiency	≥16%
2	Open circuit voltage (V)	36
3	Short-circuit current(A)	6.33
4	Peak voltage (V)	44
5	Peak current (A)	5.72
6	Peak power (Wp)	206
7	Dimensions (length × width) (mm) Area (m ²)	1200×1200×40 1.5 m ²
8	Anti-Wind or surface pressure	130km/h 2400Pa
10	Insulation voltage (V)	≥600V
11	Weight (kg)	
12	Life (years)	≥25
	Characteristics	High-efficiency crystalline silicon solar cell Tablets, High conversion efficiency: ≥ 14%; Long life: ≥ 25 years, small attenuation; No screw to fasten the aluminum alloy frame, easy to install, high anti-mechanical strength High-transmittance tempered glass packaging, high transparency and mechanical strength The multi-function junction box water-proof sealed; Have good weather durability, wind-proof, hail-proof; Can effectively resist the corrosive salt spray and moisture, not affect by the geographical environment

The main features:

(1)、Component design

Design according to the International Electrotechnical Commission IEC: 1215:1993 standards, using 36 or 72 for polycrystalline silicon solar cells in series to 12V and 24V to form various types of components. The components can be used for a variety of household photovoltaic systems, an independent photovoltaic power station and grid-connected photovoltaic power stations and so on.

(2)、Component selection

- Cell chip: The single crystal silicon solar cell Tablets (with dimensions of 125mm × 125mm). Reflective film of the battery enhanced the plasma chemical vapor deposition of silicon nitride film, dark blue or black. The average cell conversion efficiency is more than 14.5 percent.
- Components frame: components frame is made of high-quality anodized aluminum alloy frame. Aluminum oxide on the surface thickness is 25 microns. Component borders have four easy installation screws and a set of ground-hole, fully meet the requirements of international certification authorities.
- Tempered glass: The surface glass of the components adopted low-iron (iron content less than 0.02%) tempered glass which produced by Pilkington Australia company. The thickness is 3mm. Most of the light bands transmittance are greater than 92%.
- Packaging materials: components is made of laminated anti-aging EVA (ethylene - vinyl acetate polymer) imported from other countries and weatherability and good quality TPT (fluorine compound plastic membrane).
- Junction Box: Design and manufacturing of the components junction box is based on the current international market requirements for solar. High-quality PP materials used as a junction box shell and insulating materials, silver-plated copper electrode material as a post, and configured two bypass diodes in order to reduce the effects of hot streaks. Junction box has good seal and waterproof performance.

3.2 solar street lamp charge controller



The main features:

- 1、The use of a single chip and special software, realized the direct current solar street lamp intelligent control
- 2, with a pure light-control mode, open light control light +timer close + timer open+ close light control, GM controller mode;
- 3, with a charge-off, over-discharge, electronic short-circuit, overload protection, the unique anti-reverse protection, and other automatic control;
- 4, high-performance PWM charge mode, with temperature compensation control;
- 5, intuitionistic LED direct the current battery status, allows users to understand the using situation;

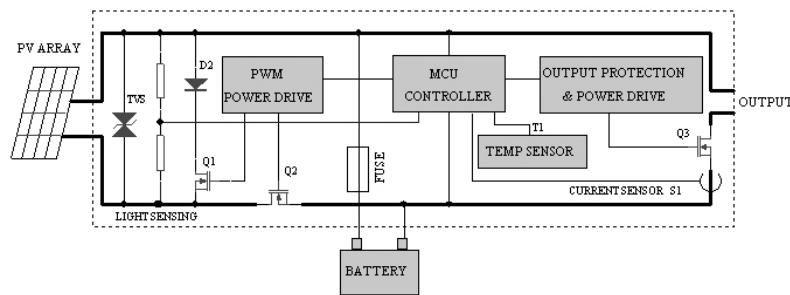
6, All the controllers used industrial chip, can be run in the cold, high temperature, humid environment.

7, the abolition of the potentiometer which adjust the control set point, and the use of Flash memory to record every work control point, as a result of the elimination of the potential side-shock devices, drift and so on. These factors would cause some errors to reduce the accuracy and reliability of the control points.

Product Description:

The controller is special designed for solar-powered DC street lamp, can also be used as a general controller. With a pure light control that is controlled by light and automatically shut down, light-controlled open from time to time to close + from time to time to open the closure of light control mode, Optically Controlled start time+delay closure time, the regular closing time can be adjust; It has a short-circuit, overload, unique Anti-reverse protection with full protection, automatically put off and so on full-featured protective measures, charging instructions, failure and over-discharge instructions.

The controller, adopt the high-performance PWM batteries , as well as over-discharge voltage for the discharge rate to compensate the amended over-charge control through the single-chip controller of the battery terminal voltage, the discharge current, temperature, and other related parameters of the battery capacity to carry out sampling, computing, in line with its own batteries discharge at different rates has different end-of-discharge voltage characteristics of the battery to ensure that the battery worked in a reasonable state, to extend battery life. System schematic is as follows:



Technic parameters:

Model	CLP10-ST	CLP15-ST
Maximum charge current	10A	15A
Maximum load current	10A	15A
System voltage	12V/24V	
Overload, short	12.5A/60s, 15.0A, 20A	12.5A/60s, 15.0A

circuit protection	overload protection, 20A short-circuit protection
No-load loss	≤20mA
Balanced charge voltage	14.8V/29.6V
Fast charging voltage	14.4V/28.8V
Floating voltage	13.6V/27.2V
Low voltage protection voltage	11.2V/22.4V
The resumption of low voltage	12.6V/25.2V
Temperature compensation	-5mV/ 12V
Open Light Control + timer delay to open, close the light control	Light start signal 10-15Lex delay 10min to open, after fix the time, you can post-switch according to your demand.
Set up a fixed time situation	8 kinds of "work situations setup"
Operating temperature	-35 ~+50
Protection level	IP22
Size	145×92×30mm
Weight	120g

Debugging mode: This mode used for light control and time control system,only cancelled the estimate optical signal output of a 10-minute delay, to retain all the other features. Light signal that is connected to the load, vice versa.Easy to install when debugging check the accuracy of the system installed

3.3 According to past experience, solar street lamp operating environment is on the open air, no shelter, no temperature control. In most cases, at first, it is the battery damaged.We take the waste battery bad environmental impacts into account, so specifically chose this environmental friendly, long-life valve control lead-acid and maintenance-free batteries Hai Chi.

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The main characteristics of the battery:
completely sealed, maintenance-free design

- design service life is up to 6-8 years.
- Cater to the high frequency and deep discharge , greatly increased the discharge permanance and persistent cycle of discharge capacity.
- Marinated plate (unique FTF plate technology).
- analyze pure sulfuric acid electrolyte.
- No leakage
- valve model, the greatest open pressure is 2Psi (1Psi ≈ 7KPA).

- Use at any directions.
- battery shells and materials is made of ABS, strengthen fule resistance (V0 level) may be available for customers selection.
- Low self-discharge.
- **passed the FAA and IATA-friendly product certification**
- Accordance to the IEC896-2, D/N43534, and BS6290 EUROBAT standards.

The internal structure of the battery

AGM battery structure shown in the figure, plus or minus gate electrode by lead, calcium, tin alloy by casting. substances from the battery (99.9999%) made of lead, controlled the impurities to impurities are the main plate corrosion and self –discharge .



Cells active is of high purity the lead has been minimize. These reasons to cause

Battery separators is made of ultra-fine fibers glass, complete with acid-resistant performance. It can act as a sponge, make the electrolyte does not have the liquidity in the battery. In the course of discharge acid needed,it can maintain adequate Acid supply. "S"-shaped plate application package will help reduce the dendrite or lead tablets at the bottom of battery which will cause short circuit.

The purpose of plate is to maintain the distance between the positive and negative electrode and totally eliminate the short-circuit possibility which caused by the active substance chemical react with the electrolyte. In addition, the clapboard with the openings structure characteristics, such a structure increases the acid on the flow of electrolyte with little resistance.

Safety valve:

Pressure produced from internal battery, but safety valve has a good exhaust function. When the pressure reaches a certain value, the safety valve will automatically open and start to release, after the pressure released, it will automatically close again. the greatest pressure to open the safety valve is 2Psi (14KPA), close value is1.2Psi (8.4KPA).

AGM battery internal structure

Terminal structure:

The combination quality between the embedded terminal and the lead terminal which casted with it, impact for a short period of time the battery discharge current use, is a vita factor that it affect the use of lethal high-current battery. Battery terminal fever is the bad connection between the terminal with the lead. Thus it lead to the breakdown of sealant and electrolyte leakage. HAZE battery terminal unique design and technical characteristics of the casting process avoid of the quality problems within the battery life.

3.4 LED light source technical instruction and functional characteristics

3.41 The application of high-power LED light MC-15 model, equipped with its optical design is the world's first street lights precincts of the free-form optical lens, the reasonable control of the distribution of light so that the spot was close to the rectangular shape and ensure an ideal surface brightness and uniformity, eliminates LED glare and make LED light energy utilization rate to the limits, there is no light pollution.

▲ unique free-form lens to avoid the waste of flux, reduce the loss of light, but also reduce the weight of the product, so that it make the production structure simplified, product more light.

▲ High-power package and the plane cluster lamp holder and heat sink design, thus provided adequate protection for LED cooling requirements and service life, to meet the LED lamps structure and any other designs, has the most distinctive characteristics of LED lamp.

▲ Innovative integrated modular design, can combine into any brightness and power demand products. Each module is an independent and interchangeable light sources, the partial failure of the lamp, as a whole does not affect the normal working, facilitate to assembly and maintenance, save maintenance costs, and make it very easy to maintain.

▲ No adverse glare, eliminate the dazzling, visual fatigue and interfere with the line of sight caused by ordinary street lamp glare, improve driving safety, reduce the occurrence of traffic accidents, fully embodies the "people-oriented science and technology".

▲ no light pollution, light distribution for lighting design, except to illuminate the road itself, will not illuminate the road outside the region.

▲ low-voltage, heat small, the elimination of the high-pressure absorption as a result of ordinary street lamp shade led to the black dust and caused the brightness reduced, removes high-temperature baking its yellow light brightness and caused the shortened life expectancy and lower brightness.

▲ Highlighted ultra high-power LED light source, a significant energy-saving, energy-saving than the traditional sodium lamp more than 65%. Long life for more than 50,000 hours (10 hours a day, can be used for more than 13 years).

▲ PWM constant current technology, high efficiency, low-power, high-precision constant current ,12-220VAC / DC full-range of current voltage, input voltage worldwide.

▲ Power efficiency $\geq 90\%$, power factor ≥ 0.95 , harmonic distortion $\leq 5\%$, EMI in line with global targets, to reduce the power loss in the transmission lines and to avoid the high-frequency interference for the power grid.

▲ Impact-resistant, strong earthquake, no ultra-violet (UV) and infrared (IR) radiation

▲ environmental, mercury-free and other harmful elements, no pollution to the environment.

▲ LED junction temperature control at the desired temperature ($T_j < 60^\circ\text{C}$, the ambient temperature $T_a = 25^\circ\text{C}$), work at low-voltage low heat situation, it is safe and reliable. It can be combined with solar energy, give full play to the advantages of the low-voltage LED and energy saving and environmental protection. According to the local solar energy resources, it also can combine the city supply electricity with the solar energy to achieve the best cost-effective and highly reliable.

3.42 LED light source technology indicators

Model	ML015-100
Input Voltage	DC 24V
Frequency range	
Power Factor (PF)	
Total harmonic distortion (THD)	$< 5\%$
Operating voltage	24V DC
LED power	100W
LED light-emitting efficiency	$\geq 80 \text{ lm/w}$
The initial flux LED	8000 lm ($T_j=25^\circ\text{C}$)
LED luminous flux to maintain	8000 lm ($T_j=60^\circ\text{C}, T_a=25^\circ\text{C}$)
Flux lamps	8000 lm ($T_j=60^\circ\text{C}, T_a=25^\circ\text{C}$)
Lighting efficiency (%)	$> 90 \%$
Illumination (E)	$\geq 45 \text{ lux}$ (height=6 m) $\geq 32 \text{ lux}$ (height=8 m) $\geq 25 \text{ lux}$ (height=10 m) $\geq 20 \text{ lux}$ (height=12m)

Effective range of exposure	20×8 m (height=6 m) 26×10 m (height=8 m) 33×13 m (height=10 m) 40×16 m (height=12 m)
Color temperature-related	White: 5000 ~ 7000 K, warm white: 3000 ~ 4000K
Color-rendering index CRI	> 80
光源 Light Source	LED 100 Watt
Light distribution curve / spot	Asymmetric (bat wing) / rectangular spot
The biggest angle of light	Horizontal axis: 120 °, vertical axis: 45 °
light angle	Horizontal axis: 140 °, vertical axis: 60 °
Junction temperature	60 ° C ± 1 0% (Ta= 25 ° C)
system Resistance (Rja)	0.56 ° C / W
Operating temperature	- 30 ° C ~ 60 ° C
Working humidity	100 % RH
Storage temperature	-30 ° C ~ 85 ° C
Service life	> 50,000 Hrs
Light and shade	Aluminum alloy and PC
N.W	8 kg
protection level	IP 67

3.4 streetlight poles technical indicators

According to the urban road and lighting construction acceptance (GJ89-2001) provisions and requirements of the contract, this street lighting project transformation and installation height is 7 meters, the distance should meet customer requirements.

▲ vertical poles deviation should be less than half of a shoot-bar, straight sections quoted poles in a line, lamp pole position excursion is less than half of a pole to.

▲ Steel poles hoisting should be used to prevent steel cable scratching the pole surface coating anti-corrosion layer.

When the installation of steel cable, connection hole should be towards the sidewalk.

▲ Arm lights should be fixed and solid road longitudinal vertical deviation should not be greater than 3 degrees.

▲ After modified the entire poles, the projection surface should undertake 35m / s wind speed and below, the poles should not bend, structural components should not be turning in the visual.

▲ After transformation, the whole structure of the poles post-linked components and a variety of ways should meet the requirements of all stress calculation, the color of the poles should keep the same as far as possible.

the basis of the poles in the post-transformation can meet the full range of stress conditions and complex calculations requirements.

Pole device battery box should meet the use of water-proof, moisture-proof before up to other functions.