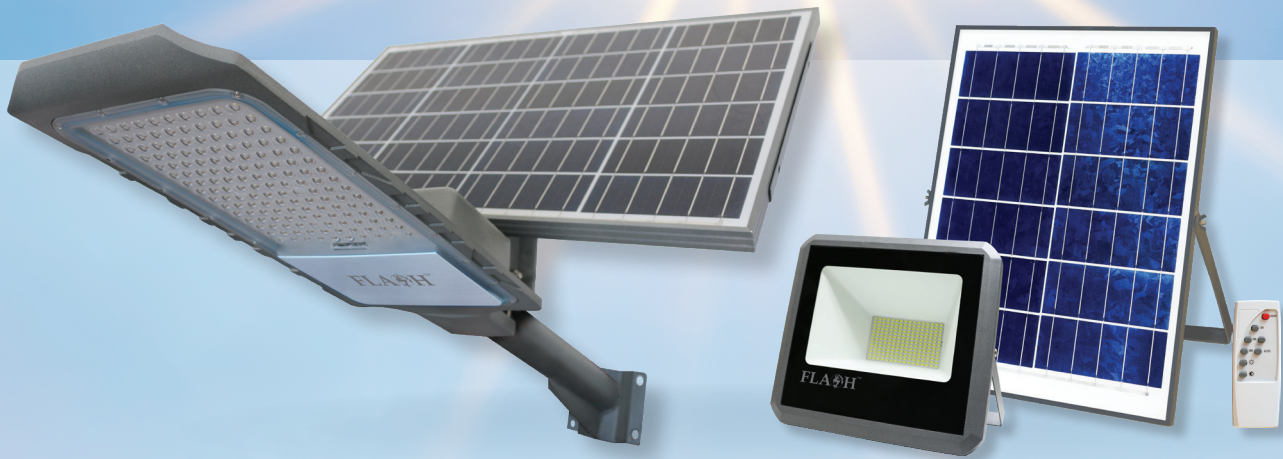




Lighting Africa
Saving Energy
Saving You Money

Understanding Lighting

Issue 4: Solar Lighting



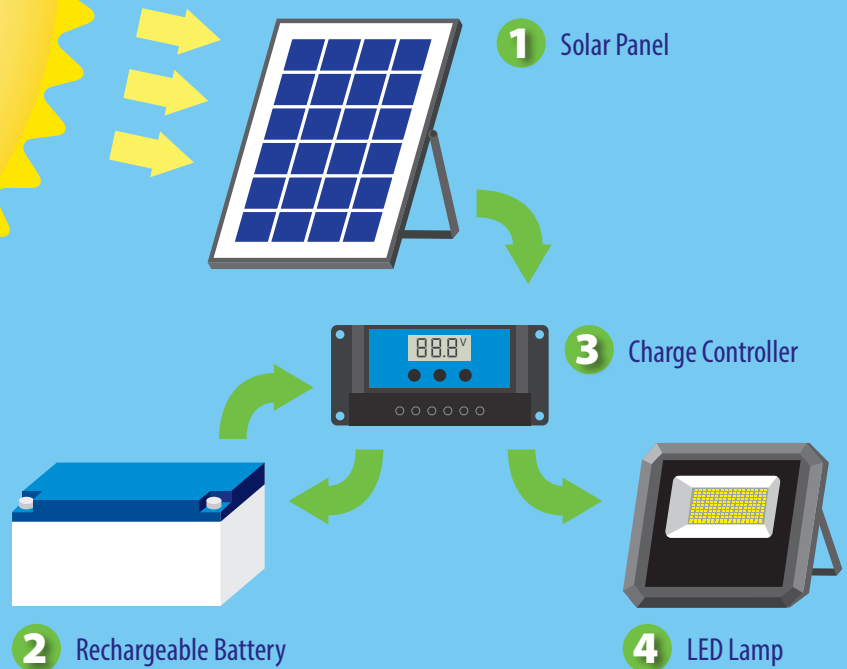
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Solar* Lighting

*Solar: of or relating to the sun.
Solar lighting refers to lighting that is powered by the sun. It is composed of:

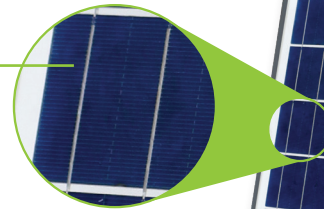
- 1 Solar Panel
- 2 Rechargeable Battery
- 3 Charge Controller
- 4 LED lamp



1. Solar Panel

A solar panel is composed of solar cells made from a special material that captures the sun's light or heat and turns it into electrical energy (power / electricity). The process of converting sunlight into electrical energy is called photovoltaics, and a solar panel is sometimes referred to as a photovoltaic (PV) panel.

Solar Cell

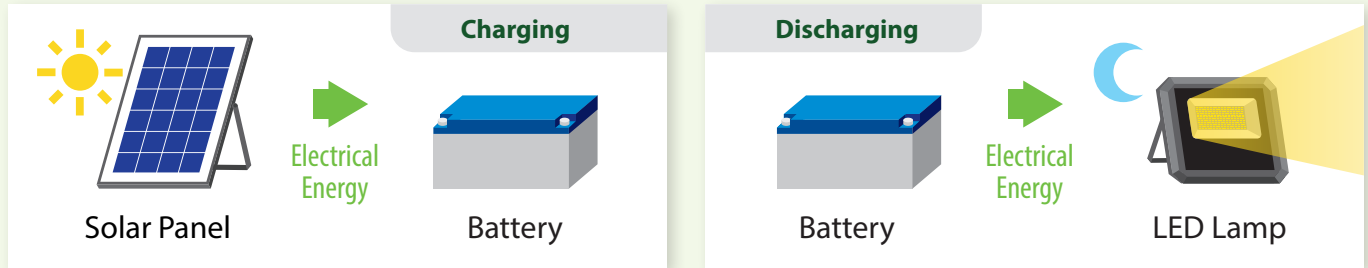


Solar Panel



2. Rechargeable Battery*

*A battery is a container which stores electrical energy. In a solar lighting system, the battery stores the electrical energy created by the solar panel during the day and uses it later. In other words, the sun charges the battery during the day, then at night, the battery discharges (releases) the energy to power the LED light.



Life Cycle

The charging and discharging of a battery is called a cycle, or life cycle.



Lifespan

The lifespan of a battery is the number of times a battery can charge and discharge energy until reaching the end of its useful life.



Capacity

The capacity of a battery means how much energy it can store / produce when it is fully charged.



Depth of Discharge (DoD)

Refers to the amount of energy discharged from a battery within a cycle, expressed as a percentage of the total battery capacity. A battery's life cycle is determined by the DoD; higher DoD provides more life cycles and lower DoD provides less life cycles. Therefore, it is important to consider the recommended DoD to get more life cycles out of a battery. Manufacturers of batteries specify the recommended DoD, which varies for each product.

Lithium Batteries
90% DOD



Lead Acid Batteries
50% DOD



You get more life cycles with Lithium Batteries compared to Lead Acid Batteries.



Some rechargeable batteries are susceptible to damage if left in storage for too long, fully discharged, or overcharged. To maintain and prolong the battery life, it is recommended to charge a product fully before first use, and periodically thereafter when not in use.

The 3 most used battery types

a. Lead acid batteries

Lead-acid batteries were the first type of rechargeable batteries created. They contain acid and can potentially explode under pressure or if misused. They are quite affordable, have a shorter lifespan and require regular maintenance. Their shelf life deteriorates when left uncharged for a lengthy period. Deep-cycle batteries are a type of lead acid battery more compatible with solar panels due to their increased ability to withstand constant discharge.



b. Lithium-ion batteries

Lithium is a chemical element. Lithium-ion batteries (or Li-ion) are superior compared with lead-acid batteries. They are long-lasting and maintenance-free. Compared to a lead-acid battery of the same container size, they have a higher capacity to store energy, and discharge it over a longer period of time. They charge faster and are efficient, using about 90% of their stored energy. Li-ion batteries are flammable, and if damaged or incorrectly charged, could potentially cause a fire or explosion.



c. Lithium-ion Phosphate batteries

Lithium-ion Phosphate batteries (or LiFePO₄) are notably one of the most durable and reliable batteries on the market. They are considered a huge improvement on lead-acid in terms of weight, capacity, and shelf life. This is the safest type of Lithium battery with the highest life-cycle.



Advantages:

- ☀ More compact than lead-acid batteries
- ☀ 4x the storage capacity compared with lead-acid batteries
- ☀ Charge up to 5x faster than lead-acid batteries
- ☀ Weigh 50% to 60% less than lead-acid equivalent
- ☀ Less sensitive to extreme temperatures compared with lead-acid batteries
- ☀ Last 2x longer than other lithium batteries
- ☀ Safest choice of batteries

Battery Type Efficiency Comparison

Lithium
95%



Lead Acid
70%



3. Charge* Controller

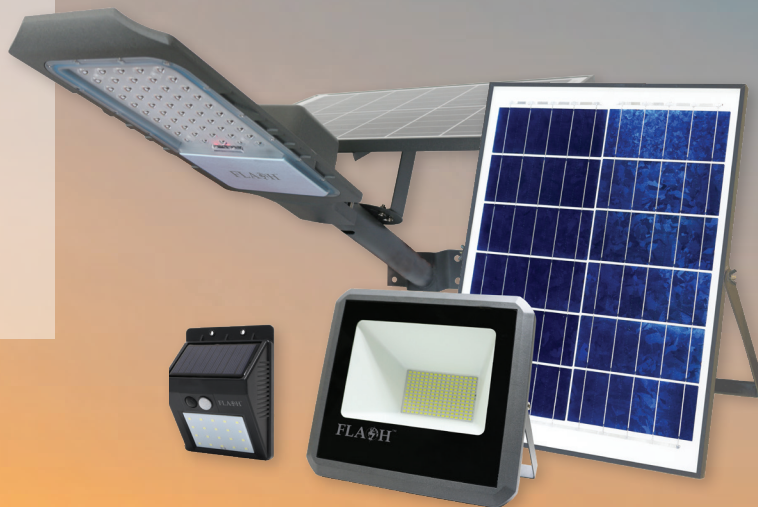
*Charge refers to the receiving and storing of electrical energy in a battery. It comes from Latin meaning 'to load'.

The charge controller is the component that manages the electrical energy transferred from the solar panel into the battery. Its main function is to control and optimize the battery's life span by preventing it from overcharging during the day and over discharging overnight. The charge controller controls other functions like automatically switching on the light at night and switching it off at daytime.



4. LED Lamp

A solar light will most often use an LED lamp due to its lumen efficiency and long life compared with traditional lamps. It provides much higher lumen while consuming much less energy, making it highly compatible with a solar lighting system.



Solar Energy – Advantages



It is renewable, free, and environmentally friendly



Reduces maintenance costs and electricity bills



Works during power failure and load-shedding



Some solar powered devices may power multiple lamps, or charge other devices such as cell phones



Easy to install and maintain – no need for electrical supply



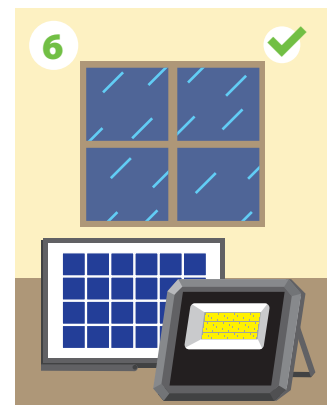
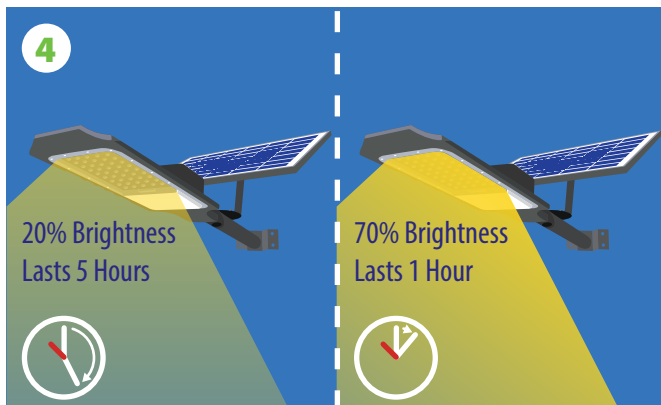
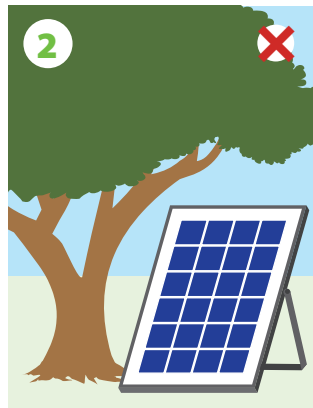
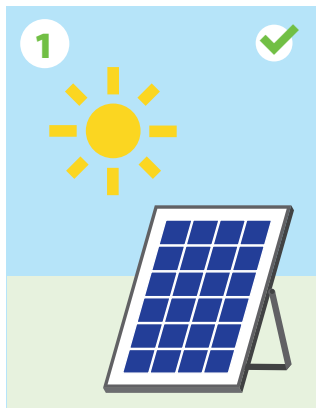
Easy to use in remote and rural areas where there is no electrical grid or reliable power supply



Safe for household use compared to candles and kerosene (paraffin) lamps

Installation & Maintenance

- 1 Position the solar panel where it can receive maximum sunlight.
- 2 Make sure there are no obstructions between the solar panel and the sun.
Avoid the shade, for example from plants or trees.
- 3 A solar light that switches on automatically using a sensor may be affected by light around it, so keep it away from other sources of light.
- 4 Brightness settings impacts the battery usage. To ensure your light remains on longer during the night, lower the brightness settings where applicable.
- 5 Clean the solar panel regularly.
- 6 Disconnect or store away during long periods of rain to prolong the lifespan.



Choosing a solar light – what to look for

Lumen Output ①

The amount of light produced by the LED lamp.

Lumen Output Over Time ②

The amount of light produced over a certain period of time.

To calculate lumen output over time, use the following formulas:

Working Time = Battery Capacity (Battery Voltage × Amp-hour) ÷ W

E.g. $(3.2V \times 10Ah) \div 7W = 4.5hrs$

Total Lumen

E.g. 660lm

Lumen Over Time refers to the Total Lumen produced over a period of time (Working Time).

E.g. 660lm for 4.5hrs

Charging Time ③

The duration until battery is fully charged.

Battery Type ④

Li-ion or preferably LiFePO4



Example of Flash packaging & where to find the above information:

① Lumen: 660lm

② Battery: 3.2V 10Ah
Wattage: 7W

③ Charging Time: 6hrs

④ LiFePO4 Battery

FLASH™
Solar LED Floodlight
Urban Range
With Solar Panel & Remote Control

Lumen: 660lm
Wattage: 7W
Battery: 3.2V 10Ah
Charging Time: 6hrs
Working Time: 4hrs
Colour Temperature: Daylight 6500K
Beam Angle: < 120°
Dimmable
Material: Die-Cast Aluminium
Colour: Grey
Dimensions: 265mm x 235mm
Solar Panel Dimensions: 300mm x 350mm x 17mm
Inc. Mounting Bracket
5m Cable
IP65

Features

- Eco-Friendly 100% Green energy
- Solar charging system
- Can operate 100% independently without electricity
- Turn OFF Modes: 1hr / 5hr / 1hr / Auto

Attention: Please refer to the instruction manual inside the box before installation. This light fitting is integrated, the LED is not replaceable. Always switch off power before installation. Must be installed by a qualified electrician.

Lighting Africa
Saving Energy
Saving You Money

FLASH™
Solar LED Floodlight · Urban Range
With Solar Panel & Remote Control

660lm | 7W | 100% GREEN ENERGY
Daylight 6500K

LED Integrated
7W
120°
Dimmable
IP65

SOLAR POWER
LiFePO4 Battery

FLASH™
Solar LED Floodlight
Urban Range
With Solar Panel & Remote Control

FLASH COMPONENTS CC
Gateway Office, Chaparral Park
Muzzenberg, Cape Town
info@flash.za.com
www.flash.za.com

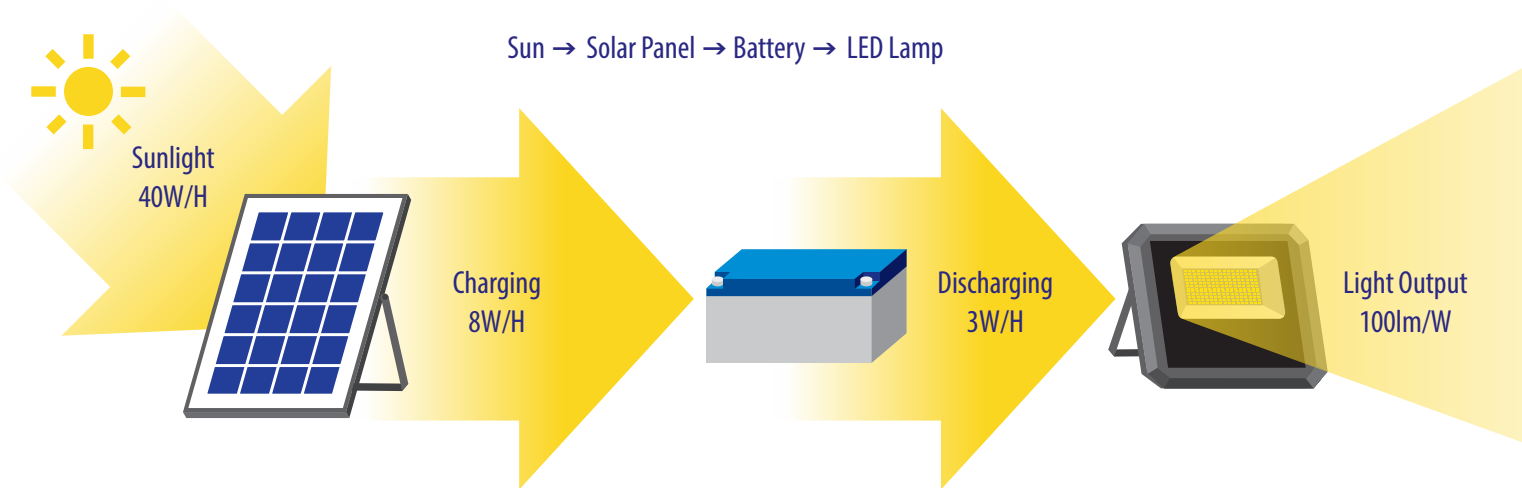
2 YEAR WARRANTY

CE | IP65 |
Item no. 50789L
Rev. no. 50789L
Production No. 621300789L

BARCODE
6009711142027

Solar Lighting – Review

1. The solar panel converts sunlight into electrical energy measured in Wh (watt-hour). The solar panel is rated based on how many watts it generates.
2. During the day, the battery receives and stores (charges) this electrical energy. It is measured in Wh, and referred to as the capacity of the battery (fully charged).
3. At night, the battery discharges electrical energy to light the LED, also measured in Wh.
4. The LED produces light, measured in lumen per watt (lm/W).
Total lumen = $W \times \text{lm/W}$.
lm/W = $\text{Total lumen} \div W$.
5. Wattage output from the solar panel is not necessarily equal to the wattage output powering the LED light. See illustration below (based on the table on page 10).

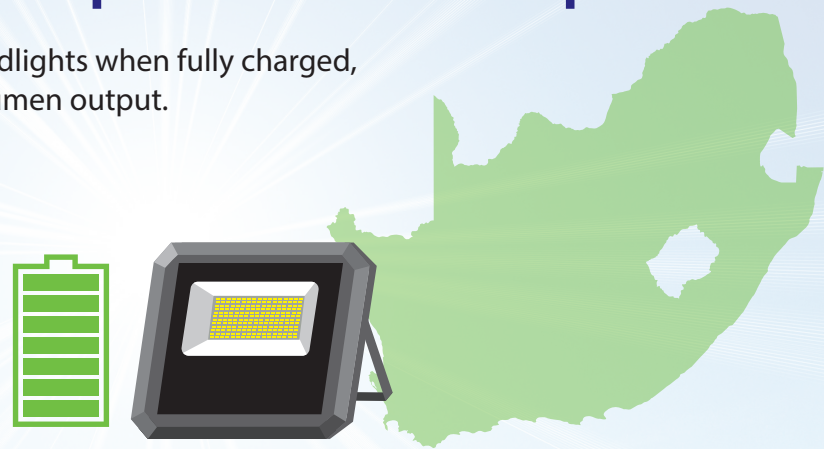


The information written on solar products on the market can be confusing and misleading. It is important to understand that different components affect each other, how much light a product produces and for how many hours. Essentially, when comparing solar lights, always refer to the lumen.

Performance Comparison - Example

The below table compares solar floodlights when fully charged, at 100% lumen output and at 50% lumen output.

Based on 8 hours of sun in South Africa.



				100% Lumen Output		50% Lumen Output	
Floodlight Power (Watt)	Solar Panel Output Power (Watt)	Battery Capacity (Watt-hour)	Charging Time (Full Sun) +/-	Lumen*	Lumen over Time	Lumen*	Lumen over Time
3W	8W	16Wh	2h	300lm	5h+	150lm	10h+
7W	12W	32Wh	2.5h	700lm	4.5h+	350lm	9h
12W	20W	48Wh	2.5h	1200lm	4h+	600lm	8h

*Calculated at 100 Lumen/Watt

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