

## Frequently Asked Questions

1. Can I use Lithium or rechargeable batteries in my Mini Maglite with the MiniSTAR2?

Yes, they both provide excellent results.

2. How can I compare TerraLUX to other light sources, bulbs, and flashlights for lighting performance?

### Beam Candlepower

This is a term often referred to in flashlight specifications as an indicator of brightness. Technically, it refers to how bright an isotropic light source (one that emits light uniformly in every direction) would have to be at the specified distance (usually 5-10 feet) in order to produce that level of illumination intensity at a surface. Since a light source that is sending its light in every direction is going to have to be awfully bright to produce a measurable illumination level that distance away, the Candlepower number is usually very big. You've probably seen the ubiquitous "million candlepower automobile emergency light" advertised inside a matchbook cover. However it REALLY only refers to the brightness of the center portion of the flashlight's beam so it can be quite misleading. It gives you no indication of the actual light output of the flashlight. This is because it is most often used in flashlights that have a means of focusing, and the value only represents the brightness of the very brightest part of the beam. The value is strongly dependent on the optics of the system, and probably represents the value obtained by bringing the optics into sharp focus, thus concentrating all the flashlights output into a very small spot.

TerraLUX does not use candlepower.

### Comparing Brightness of Light Sources

Many factors come into play when comparing brightness of light sources, particularly in systems such as flashlights. Not only is the source of light (LED or incandescent) important, but also the optics and how well it does, or does not focus. If we consider only the source of light for a moment, the problem becomes a bit easier. Incandescent lamp manufacturers specify their products precisely, and so do LED manufacturers, but the former probably do a better job than the latter since they've been doing it for more than 100 years.

Incandescent lamps use the MSCP, or Mean Spherical Candlepower to specify the maximum amount of light produced by their lamps. Despite the term Candlepower in this acronym, MSCP refers to the average number of candelas (Luminous Intensity) coming from the light source. Since the light coming from the filament travels throughout a sphere in all directions, and there are  $4\pi$  Steradians (solid angle in a sphere),  $4\pi$  times the MSCP gives the number of Lumens from the incandescent light source. Lumens are an indication of the luminous flux i.e., the quantity of light passing through a solid angle within a sphere. Thus multiplying the lamp manufacturers MSCP figure by 12.57 gives the number of Lumens. 1 Candela = 1 Lumen per Steradian (unit solid angle).

Unlike incandescent bulbs, virtually all LEDs contain built-in optics that direct the light from the semiconductor chip to the light source. Hence the light usually travels in a cone, instead of uniformly in all directions. This makes the comparison with incandescents more complicated. Although some LED manufacturers, such as Luxeon, specify the light output in Lumens, most do not. Instead manufacturers give the number of millicandelas (thousandths of a Candela) and publish a radial graph of relative output as a function of angle (measured from  $0^\circ$ , i.e., from straight ahead). See Figure 1. This angle is usually called the half angle. In order to calculate the number of Lumens from this information, it is necessary to calculate the amount of light passing through each portion of the solid angle for which data is supplied. This mathematical process is called integration.

TerraLUX does the math calculations for you! Each TerraLUX LED Light EngineT has the Lumen output calculated based on the LED data and operating conditions used in the LED replacement bulb. If you want more information about light measurements and want to roll up your sleeves, check out Professor Schwengerdt's excellent presentation on Radiometry at:

[www.ece.arizona.edu/~dial/ece425/notes3.pdf](http://www.ece.arizona.edu/~dial/ece425/notes3.pdf)

Figure 1

## Practical Considerations - Performance over time as batteries get weak

One final note about comparing light sources in the practical sense is that battery powered units degrade over time very rapidly for incandescent bulbs and less so for LEDs and even less so for properly regulated LEDs. These factors can often be the overwhelming consideration because lack of sufficient light output over time and cost of batteries are important to many users. Adding voltage boost and regulation circuits to the LEDs enables a new level of performance unavailable to incandescent bulbs. All TerraLUX LED Light Engines® use the proprietary PowerPush™ circuitry to keep the light output constant and completely drain the battery, thus making these LED devices superior to incandescent in ways that are practical for the user. This is why TerraLUX also gives specifications on all its LED Light Engines showing light output versus time and performance for various battery combinations since they can be used with 2, 3 or 4 cells of any size (AAA, AA, C, D cells) except for the MiniSTARs which just work in the Mini Maglite® with two AA cells.

### 3. How would I use the low power TLE - 1,2 or 3 products effectively?

Here is what one customer has to say on this topic:

"A couple years ago, I bought a cheap 2-D cell flashlight for my car that barely worked and it seemed like the batteries were always dead. I don't know why I kept the piece of junk in my car after all this time. Today, I can't think of driving anywhere without it, thanks to the Terralux light engine. It seems like the batteries keep going and going, no matter what brand they are. I keep the Terralux Spot Miser in the flashlight all the time and keep a QuadStar in my ashtray in the event that I need more light. What's better yet, I plugged the QuadStar into the flashlight when I thought the batteries were dead (with the regular old bulb) and it shined brighter than the old bulb with fresh batteries!! TerraLux turned my "zero" light into a hero light! Thanks Terralux!!! " B.K., MS AeroSpace Engineering, University of Colorado

### 4. Do you have any users in the law enforcement community?

I am a detective in a small police department in Connecticut and have found the TerraLUX MiniStar2 to be a great tool. A flashlight is one of a police officers most used tools. The TerraLUX MiniStar2 provides a clean bright white in a small easy to carry package so I always have it on hand. The fact that it runs on AA batteries is convenient as we always have AA batteries with our crime scene equipment because we use them for camera flashes, etc. The TerraLUX MiniStar2 is bright enough that it is often the primary light I use when processing a crime scene. It provides a bright enough light to side light objects when looking for latent prints and is bright enough to use when doing a room search.

Call TerraLUX to find out about other law enforcement agencies using our products in the line of duty. .

5. Do you have any users in the martial arts community?

See this review for the MiniStar2 at The Martialist  
(<http://www.themartialist.com/pecom/terralux.htm>)