

Candela vs Lux vs Lumens

Lighting Terms

It happens far too often. You walk into a store, pick up light bulb or a handheld spotlight and look at the specifications- only to find that one says **lumens**, another says **lux**, and the last reads something about **candela**. Inside, you question why no one uses the same system for measuring these things, and take your best guess based on the other items on the shelf. The short answer is that they're all separate standards for measuring different kinds of lighting effects. Let's break it down into the long answer to dispel a few more shadows.

Candela

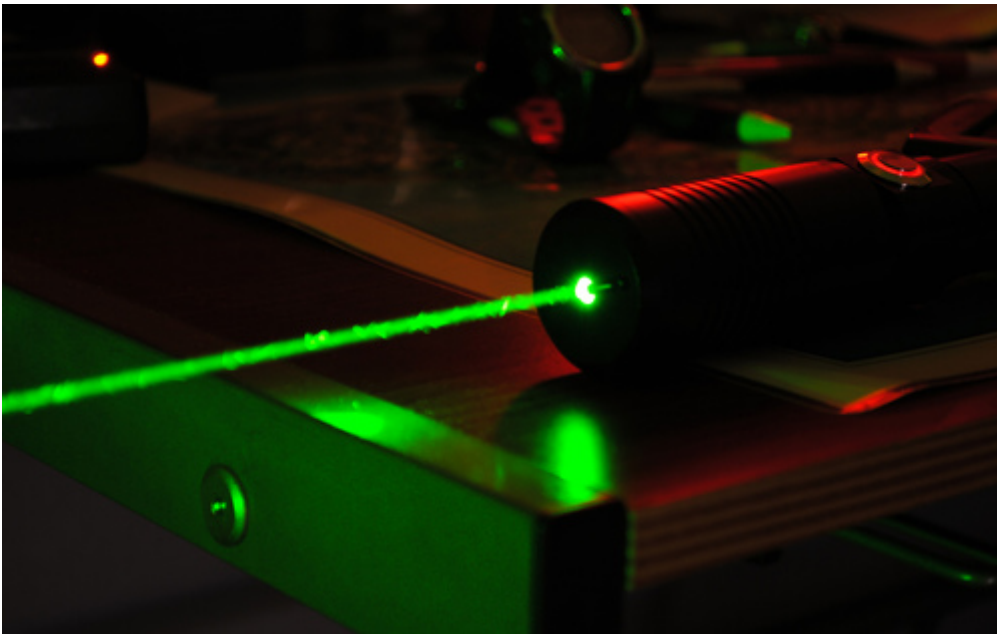


Image used courtesy of Andrew Adam

We'll start with candela (cd) – also commonly called **candlepower**. Candela is the base measurement for describing **luminous intensity**. It tells you how bright the light source is which shows how far away from an object you can be and while still being able to see it. Any light source eventually becomes too dim to see the further away you are. This is different from lumens (a total light output) because it's the value of light intensity from any point in a single direction from the light source. Laser pointers or spot lights have the highest candela rating since the majority of their light is focused in a single direction. A simple comparison is that 1 candela is roughly equivalent to the light from a single candle. If you have a light bulb generating 1 cd and block part of the light, every direction not obscured still produces 1 cd. This is because the same intensity of light can be seen from any non-obscured direction at the same distance. Again, candela is the luminous intensity which describes how bright a light source is.

Lux

The Las Vegas hotel right? Wrong, that's the Luxor. Lux (lx) measures **illuminance**, which is the amount of light on a surface per unit area. A single lux is equal to one lumen per square meter. If the lamp displays its brightness as a measurement of lux, it usually lists a distance from the bulb since any change in distance or bulb type changes the lux level. As an example, if you place a **100 lumen bulb** in a flood light that shines on only **one square meter** of surface, that surface will be lit at **100 lx**. However, if you back the flood light away to shine on four square meters, the surface is now lit with 25 lx.

*Fun Fact: A full moon on a clear night can shine up to a single lux. In full daylight, indirect sunlight can illuminate a surface by between 10,000 to 25,000 lux. This is why **seasonal affective disorder** (SAD) lamps should be rated at 10,000 lux minimum.*

Lumens



Image used courtesy of Roland Tanglao

Lumens are now the most common measurement for a light bulb. The lumen (lm) is a measurement of **luminous flux**, or the total amount of visible light. To put it simply, the lumen rating is how much total visible light is produced by a light source. To show the difference between lumens and candela, let's go back to the example previously used for candela with the partially obscured light bulb. For a bulb emitting 1 cd, that bulb would also have a luminous intensity of 12.57 lm. Obscuring half the bulb (making it a hemisphere instead of a full sphere), a 1 cd bulb will emit only 6.28 lm. This is because lumens measure the total amount of visible light from a light source.

So why all of the different ratings? Since candelas, lux, and lumens are all measuring something different, you can gain insight into how a lamp is useful. A laser pointer will have an extremely low lumen value but a very high candela rating, since a laser pointer doesn't give off very much light but is visible from great distances. Light bulbs are usually listed in lumens to show how much illumination the uncovered bulb produces. And lamps will often display a lux value for a set distance to give you an idea of how bright your surface will be for task lighting.

A good way to remember the differences between terms is:

- Lumens are how much light is given off
- Lux is how bright your surface will be
- Candela measures the visible intensity from the light source