



[www.AccessFixtures.com](http://www.AccessFixtures.com) [Sales@AccessFixtures.com](mailto:Sales@AccessFixtures.com) 888.521.2582

## **LEDs, LED Light Modules, LED Drivers and LED Luminaires**

### **The future is LEDs**

LEDs are the up and coming lighting technology. Each successive generation is more energy efficient than then last. Today LEDs last up to 10 times longer than compact fluorescents and far longer than typical incandescent bulbs. The latest LED (light emitting diode) light bulbs produce about the same amount of light per watt as compact fluorescent bulbs (CFLs). LEDs can be found in luminaires (light fixtures) and even retrofit lamps (bulbs).

### **The LED Difference**

There are other differences beyond life and energy savings. Unlike incandescent bulbs and CFLs, which splash light in all directions, LED bulbs are directional. LEDs drive their light in one direction, so that you have light exactly where you want it. This directional lighting equals savings in yet another fashion. LEDs don't waste light (energy) on areas you don't need illuminated, which is also why they are perfect task lights. Since LEDs do not have a filament, they are not damaged under circumstances when a regular incandescent bulb would be broken. Because they are solid, LED bulbs hold up well to jarring and bumping. These bulbs do not cause heat build-up; LEDs produce 3.4 btu's/hour, compared to 85 for incandescent bulbs. Last, no mercury is used in the manufacturing of LEDs, and they are more efficient. LED light bulbs use only 2-10 watts of electricity (1/3rd to 1/30th of Incandescent or CFL).



### **What are LEDs?**

A light-emitting diode (LED) is a semiconductor diode that radiates light (electroluminescence) when current passes through it in the forward direction. Electrons move through semiconductor medium and "fall into" other energy levels during their transit of the p-n junction. When these electrons make a transition to a lower energy level, they give off a photon of light. This photon may be in the infrared region or just about anywhere across the visible spectrum up to and into ultraviolet.

### **Incorporating LEDs into Luminaires**

Up to now, virtually all [LED luminaires](#) were made with LEDs mounted directly into a heat sink. They were typically wired in line and went back to a driver. This caused multiple performance issues. Now technology has evolved so LED modules that are replaceable, enabling LED luminaires to be repairable as well as forward retrofittable. That changes everything.

The issue with past LED fixture construction was the LEDs were usually permanently installed, or if not permanently installed, at least installed into pre-drilled holes specific to the LED package being used. The LED was then wired in series back to a driver. If an LED failed, it was virtually impossible to fix the fixture. Also, upgrading the LEDs was impossible. There was not an effective way to change out all the LEDs.

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### LED Light Engines/Modules

That has changed with the advent of LED modules. LED modules are LED light engines that are fitted into a package that enables them to be quickly taken out of a luminaire. If a LED module fails, it can be changed just like a light bulb. If technology advances, and it will, the LED modules can be swapped for the more energy efficient LEDs or higher lumen LEDs. Also, with some LED modules, even the optics can be changed.

### LED Module Manufacturers

There are at least 3 companies that make light modules, Helieon by Bridgelux, GE and Xicato. Xicato <http://www.xicato.com> is one of the most adaptable as it comes in multiple wattages, has changeable optics, and is available in many luminaires now.

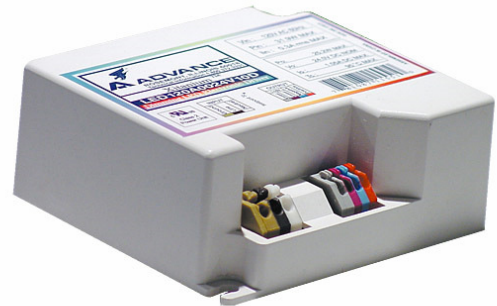


### LED Drivers

LEDs typically do not use standard line voltage. They require transformers to convert the power to a usable energy supply. This requirement is similar to low voltage halogen or a ballast for a metal halide luminaire. Selection of the driver is important as if the driver is not up to the task and fails, the entire light source fails.

### LED Driver Manufacturers

Leading [ballast](#) companies as well as a host of offshore manufacturers sell drivers for LEDs. One of the most reliable manufacturers is Advance which makes the [Xitanium](#) brand of drivers for LEDs. [Advance](#) is part of [Philips](#). Xitanium LED drivers operate 12V and 24V LED systems, are safe, versatile, and reliable. Additionally they are Compact in size to promote enhanced design flexibility and can support a broad spectrum of indoor and outdoor applications.



### LEDs and Glass Lenses

Most luminaires, whether they use standard lighting technology or LEDs, have a glass lens which the light passes through. The lens protects the ballast/transformer and lamp from dirt and the elements. The optics of a luminaire do not work the same way with different light technologies. Additionally, LEDs have radically different optics than other light sources. The efficacy of the fixture can be reduced by the type of glass or the LEDs being positioned wrong relative to glass if the glass is not clear. Consequently, LED wall packs are more likely to be designed to use clear or frosted non-prismatic lenses.



[Medium Wall Pack](#) with Borosilicate Glass



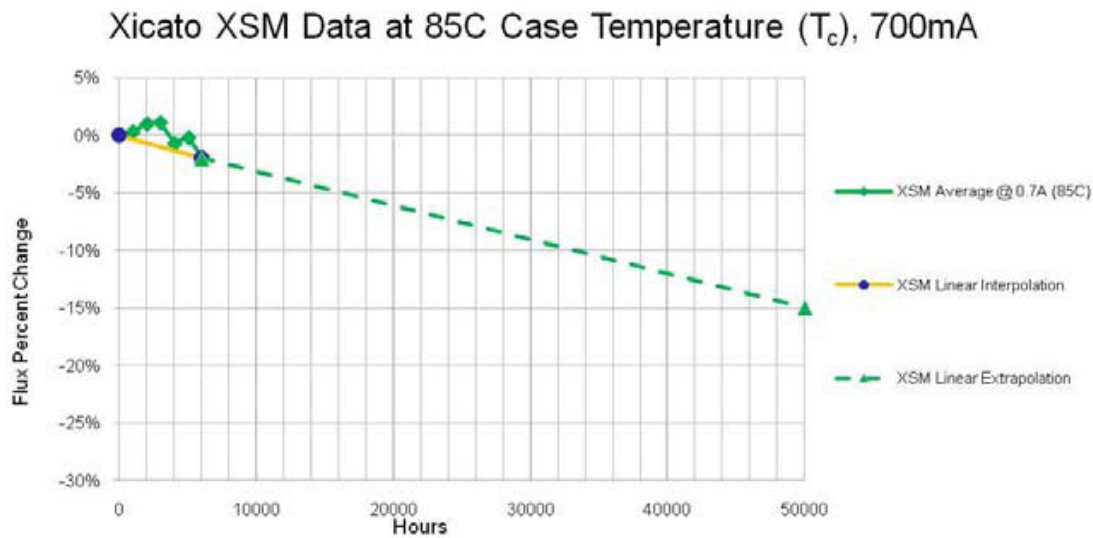
[Cut Off Wall Pack](#) with Clear Glass

## Independent Testing

With new technology it is always best to have independent lab testing of performance. This insures the system will be reliable. Most important is testing of lumen maintenance. Lumen maintenance is a measurement of the lumens (light) lost over the life of the product. If a luminaire doesn't put out enough light, it isn't appropriate no matter how little energy it uses. It should be noted that while lumen depreciation for most lighting technology accelerates over the life of the lamp, this is not true for LEDs. LEDs lumen depreciation is linear.

## IESNA Specified LM-80

The test for lumen depreciation of LEDs is known as IESNA specified LM-80. Below is an example of results. The results shown are for the Xicato brand LED module used in Access Fixtures luminaires. Access Fixtures LED luminaires have completed the IESNA-specified LM-80 testing for lumen maintenance at 6,000 hours, with only a 1.8% decrease in lumen output. The test results show the Xicato Modules will maintain 85% of their lumens over 50,000 hours.



| 85C $T_c$ , 700mA            | Test Time (Hours) |        |        |        |       |       |       |
|------------------------------|-------------------|--------|--------|--------|-------|-------|-------|
|                              | 1                 | 1000   | 2000   | 3000   | 4000  | 5000  | 6000  |
| <b>XSM Lumen Maintenance</b> | 100.0%            | 100.3% | 101.0% | 101.1% | 99.3% | 99.8% | 98.2% |

## Access Fixtures

Visit Access Fixtures at <http://www.AccessFixtures.com>. With 30 years of collective experience, Access Fixtures offers standard and custom lighting fixtures that are long lasting and energy saving. With custom manufacturing capabilities, Access Fixtures can build lighting fixtures to the performance specifications you require and does so at a very competitive price.

Access Fixtures extensive line up of interior and exterior lighting fixtures includes lighting fixtures for sports, commercial, industrial, residential and hospitality applications. Fixture types include [wall packs](#), [area lights](#), [bollards](#), [garage lighters](#), [vandal resistant](#), [exit and emergency](#), [high bay](#), [low bay](#), [linear fluorescent](#), [track lighting](#), [chandeliers](#), and [grow light fixtures](#). Lamp/Ballast types include LED, induction, magnetic ballast and electronic pulse start metal halide (eHID), T5 and T5HO linear fluorescent, T8 linear fluorescent, plug in compact fluorescent, and high pressure sodium. Contact Access Fixtures to discuss the correct long lasting, energy saving solution that best serves your needs.