

SSL Postings

As more and more LED lighting products have come onto the market, one issue that has generated considerable confusion is dimmability. As discrete devices, LEDs are fully dimmable, and as a result the technology has long been touted as being more suitable for dimming than other lighting technologies. Many SSL products come with claims of dimmability, but in practice, many users have encountered problems when trying to dim them, resulting in no small degree of frustration. What's more, LED sources exhibit other unfamiliar dimming behavior, as they typically do not lose efficacy or shift in color as much as incandescent sources do when they dim.

Why have there been dimming problems with LED lighting products? A big reason is that nearly the entire existing stock of dimmer controls – those already installed in residential, office, and commercial settings – was designed for incandescent lamps, and not for LEDs. That's important, because the two technologies, in addition to being based on totally different principles, also interact with this installed base of controls quite differently. Electrically, an incandescent lamp is a simple resistor, whose light output is determined by the effective average of the voltage that feeds it, and responds predictably and consistently to the various circuitries used in traditional dimming controls. An LED lamp, on the other hand, consists of not only the chips, but also typically a driver. Separately, and especially together, they comprise something considerably more complicated than a simple resistor – something that is very much affected by nuances in circuit design used in traditional line-voltage dimming controls.

Making LED lighting products dimmable is not an easy task, and is further complicated by a lack of standards. For example, there are no performance standards for making dimmability claims about a product, and thus the term "dimmable" remains vague and undefined. This wasn't much of a problem with incandescent lamps, which all behave pretty much the same way with dimmers. The National Electrical Manufacturers Association has formed multiple committees focused on improving LED dimming experiences. To date, they have produced an educational white paper, as well as guidance aimed at helping LED product developers improve their dimming compatibility with the installed base of dimmer controls. Additional efforts are still needed to define standard dimming performance evaluation and dimming compatibility testing.

Such efforts are sure to reduce dimming issues, but they likely won't eliminate them. The bottom line is that successfully dimming an LED lighting product with a familiar line-voltage dimmer control depends on the driver and its compatibility with the dimmer and, for low-voltage circuits, the transformer, too.

The best way to know how or if a product will dim is to test it out – and this means the entire circuit, not just one lamp with one dimmer. That's because there are minimum and maximum numbers of lamps that will work with a given dimmer, and this varies by the lamp and dimmer (and, for low-voltage systems, the transformer) combinations. But such testing is not always practical. To make it easier on buyers and specifiers, a number of manufacturers have started providing this kind of information in dimming compatibility tables for their SSL products, and the [Lighting Facts](#)[®] database will be adding links to such tables at some point in the near future. It should be noted that system variations can lead to performance variations, however, so even though a circuit with a specific combination of lamps and dimmer works today, if a different lamp (either a different make/model, or even a revision to an installed make/model) is swapped in for an existing lamp, all bets may be off.

Although dimming problems persist, and many product dimming claims are still unreliable, the prospects for dimming LED lighting are much better today than they were even a year ago – and will continue to improve. Not only are dimmable LED sources available, but new dimmers are also hitting the market. The new approaches to dimming may eliminate many compatibility concerns entirely. But for now, at least, successful dimming depends on buyers and users being well-informed and exercising due diligence.

As always, if you have questions or comments, you can reach us at postings@lightingfacts.com.
