

Fulham SmartSet

*Easy, efficient and confident programming
for WorkHorseLED drivers.*

LEDs are impacting the lighting industry unlike any technology in the last century. The combination of size, low energy usage and lumen output is driving LED adoption in nearly all segments and for nearly all luminaire types. But with this powerful technology comes new challenges for luminaire manufacturers including keeping up with ever changing efficacies, an increasing demand for a broader number of fixtures, and an ever shortening window between customer order and the need to deliver.

It is for just these business demands that Fulham created the WorkHorseLED drivers - programmable devices for standard and emergency power of luminaires, and the companion SmartSet programming approach. This white paper explains how SmartSet can enhance your business and product offering.

LED Drivers

LED drivers are the technological equivalent to ballasts for fluorescent or HID lighting systems and are used to convert system voltage from AC mains to a DC device. Drivers isolate lighting systems from high voltage, which mitigates the shock hazard, and regulate system power to counter line-voltage fluctuations, which can damage LEDs. LED drivers deliver either a constant-current or constant-voltage output to a lighting system's LEDs, depending on LED module and application requirements.

Constant-Voltage vs. Constant-Current Drivers

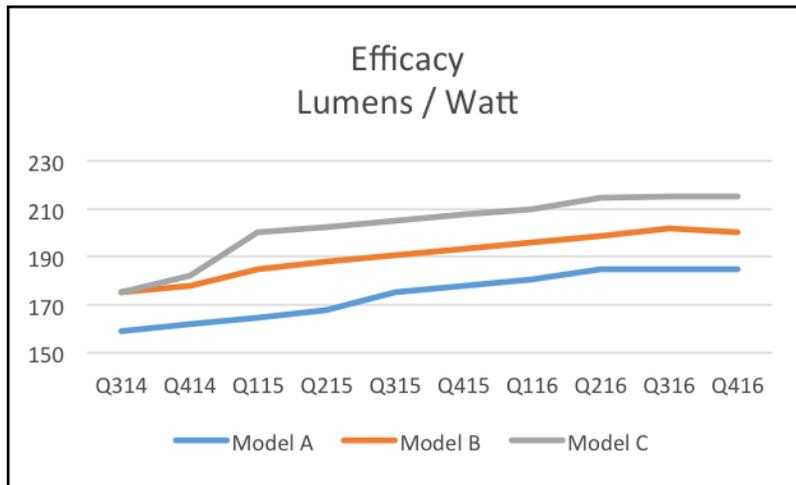
Historically, LED drivers have been available in two basic formats: constant-voltage, which are widely used in illuminated signs; and constant-current. Constant voltage LED designs require additional onboard current regulators for protection and current balancing; efficiency is negatively impacted as a result. Constant current drivers deliver the required current directly to an LED light source, removing the need for additional onboard current regulators and improving overall system efficiency. Constant current drivers are typically available in the 350mA to 700mA output range, with some products now ranging up to 1400mA.

Programmable Current Drivers

With this wide constant-current driver adoption, luminaire manufacturers began to design for optimal light delivery and shaping, resulting in the utilization of a large number of LED light sources and accompanying drivers. The business result was component inventories grew much larger, as units of many different types had to be on the shelf for Just-in-Time orders and delivery.

The problem is compounded with the ever improving efficacy of LED chips themselves. According to the US Energy Information Administration¹ (EIA) LED lumens per watt has nearly doubled since 2010, and performance is expected to continue on this improvement trajectory through at least 2020, then grow at about half that improvement rate through 2030. As a result, light source designs done today can be replaced in 6 months with the same lumen output yet consuming 10% less energy.

¹Source: U.S. Energy Information Administration, Annual Energy Outlook 2014 Early Release



The chart above, provided by a leading LED component supplier, shows efficacy of 3 different 0.2W LED models growing between 15 and 23% over a two year period.

But technology can be a two-edged sword. With shorter product lifecycles and customer expectations of ever improving energy and light efficiency, the pressure on planning and logistics becomes intense. These business realities are driving luminaire manufacturers increasingly to programmable drivers.

Programmable drivers enable the manufacturer to set the appropriate output current for the specific light source(s) used in a specific luminaire. Therefore, a single driver can be used in a broader number of fixtures, as well as be tuned over time to reduce the output current driven as LEDs become more efficient and require less power. Or a manufacturer can further reduce its component inventory by using different LED bins, tuning the driver current, and delivering the same amount of light output. Programmable drivers save the time and cost of qualifying a new lower constant-current driver, and enables one item to be kept in inventory instead of multiple drivers.

SmartSet – Ease, Efficiency and Confidence

Seeking to assist our customers to gain maximum flexibility while maintain confidence in delivering a high quality product, Fulham created SmartSet, a feature rich programming approach that utilizes either a PC or a SmartSet Controller to program WorkHorseLED drivers. SmartSet balances ease of programming while delivering confidence that the driver is prepared perfectly for the light source.

Here are the key advantages of SmartSet:

- **Programming Confirmed**

SmartSet programming occurs when the driver physically touches the Rset port, and does not complete until the driver acknowledges the programming has been successfully set via LED light indicator or audible notification. There is no opportunity for a driver to be incorrectly programmed, or for a driver’s program to be missed.

SmartSet best practices are for the drivers to be programmed during installation, to guarantee that the programming matches the fixture being assembled. After all, an incorrectly programmed driver can result in physical damage to a light source. When installed on a bench, the programming of an individual driver takes less than a second.

This guaranteed programming produces total confidence in the programming, and has been found to be much more reliable than some wireless programming methods.

- *Driver Does Not Need to Be Powered*

No power needs to be applied to the driver for its programming to be received and set. This frees the assembler from having to connect power to the driver or fixture, speeding up the programming and providing flexibility for bench utilization.
- *Programmed by 1mA increments*

SmartSet enables drivers to be programmed in increments as small as 1mA, giving manufacturers the tool to optimize luminaire design for power utilization and light output.
- *Customizable Dimming Curve*

In addition to output current, SmartSet also enables the programming of custom dimming curves to enable different light sources to be mixed and matched while delivering consistent light quality at various dimming levels to the end user. Custom dimming curves also allow useful features such as step dimming and dim-to-off.
- *Same Programmer for the entire family of Programmable Drivers, including Emergency*

With the growing requirements for Emergency Lighting functionality worldwide, it is important that manufacturers can use the same tools to program all of their luminaires. With SmartSet, the same programmer can be used on standard and emergency drivers, resulting in fewer changes between production runs, and more comfort with programming based on assembler familiarity with the tool.
- *Running Count of Drivers Programmed*

When using SmartSet software on a PC, the screen keeps a running count of the number of drivers successfully programmed. So if 32 drivers are needed, for example, the technician can watch the screen until enough drivers are ready for the manufacturing floor.
- *Continually Evolving*

SmartSet continues to evolve as Fulham gets feedback from its customers. For example, in the near future SmartSet will include the ability to receive LED temperature feedback via an NTC from a light source and customize the programming appropriately.

Programming lock down is another planned feature. With it, SmartSet will be configured with lock down functionality that enables a Manufacturing Supervisor to set the programming characteristics for a given production run, then “lock down” the programmer so no changes can be made on the line. This further ensures the right programming is being delivered to the driver and luminaire combination.

Taken together, no other programming approach combines the ease and efficiency of SmartSet, while at the same time providing complete confidence in the validity of the programming.

To see SmartSet in use, view the videos at these links:

Dimming Curve programming: www.fulham.com/smartsetdimmingcurve

Auto-Programming feature: www.fulham.com/smartsetauto

To learn more about how SmartSet can help produce better products with fewer inventory components, contact Fulham today.



TPSB-100 SmartSet
Controller



SmartSet Software

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