

FULHAM PRESENTS

WIRELESS CONNECTION

A RESOURCE FOR PAST & PRESENT LIGHTING INNOVATIONS & SOLUTIONS



FULHAM
Harness the Horsepower

WHAT'S NEXT? POSITRONIC IMPLANTS? TELEKINESIS?



From the dawn of time, we humans have strived to manipulate our surroundings through innovation. From the humblest beginnings – merely trying to lengthen our days with artificial light – to present day Wireless Connectivity, we’ve been obsessed with controlling our lighting. Our ability to do so has evolved through the dogged effort and ingenuity of generations of curious, brilliant humans.

Light itself is a physical phenomenon. Electromagnetic radiation. Light is a universal raw material: photons, wavelengths, particles, optical receptors – remember Science 101? But Lighting is the conscious manipulation of Light, developed over thousands of years.

The latest development is Wireless Connectivity – producing and managing the most efficient lighting conditions possible, from anyplace at any time with the touch of a button on a hand-held device or per preset schedules. We owe this latest technology to the effort and ingenuity of centuries of gifted scientists. (What’s left? Mind control?) In these pages, we review Wireless Connectivity and the strides we’ve made along the way.

THE SUN, MOON & STARS

This was Square One. But life couldn’t come to a grinding halt just because the sun went down...

FIRE

Fire was good. It was humanity’s first stab at producing light on demand. Fire sparked our entry into controlled lighting. Over the ages, it led to candles, oil lamps and gas lighting. Although fire produced cheery light, it did have its dark side, like accidentally burning down the house. Still, it was generally agreed that fire was... hot!

INCANDESCENT

The incandescent lamp (“light bulb”) came into widespread use roughly a century ago. Light is produced by a heated, glowing filament sealed in a gas-filled (or vacuum) tube. Electricity surges in; a filament heats up; the bulb glows, produces light.



HALOGEN

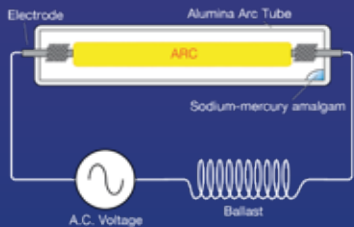
Halogen lamps are souped-up incandescent bulbs with a tungsten filament. The filament is engulfed in inert gas, spiked with one of the halogen group of gases. When the tungsten heats up, its interaction with the gases triggers a chemical reaction.



During this halogen cycle, tungsten atoms stream from the bulb’s inside surface and back onto the tungsten filament. The lamp can run safely at higher temperatures, can last longer, and has the added benefit of shining brighter per unit of electricity flowing through it.

HID

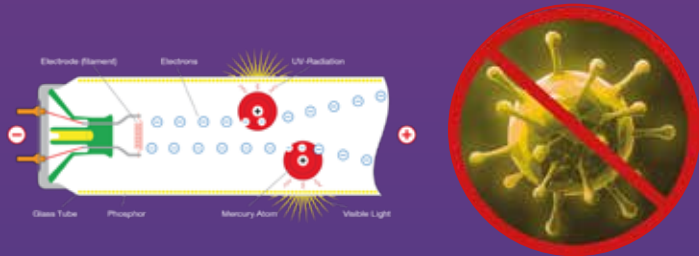
High Intensity Discharge (HID) lamps fall into the gas discharge lamp category. Their light output comes from electricity coursing between tungsten electrodes inside a tube filled with gas and metal salts.



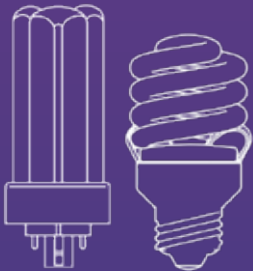
Sparking the arc charges the salts into a “plasma” that glows intensely -- hence the word “intensity.” Despite their brilliance, HID lamps consume less energy than incandescent or fluorescent lamps, delivering more lumens per watt.

FLUORESCENT

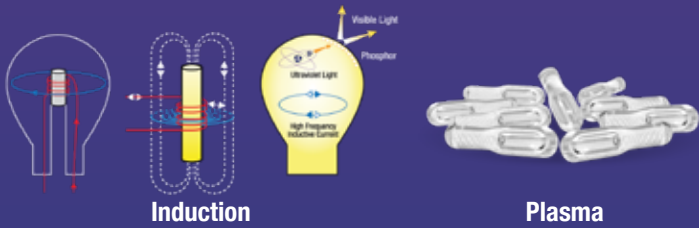
Fluorescent lights are basically airtight tubes full of reactive gases that light up when electricity charges up their atoms, which then become... fluorescent. We even adapted this technology for specialty applications, such as UV germicidal purposes for purifying air and water, via modified lamps to kill germs. (See UV Germicidal Ballasts on page 55.)



Compact Fluorescent Lamps (CFLs) are often either pin-based replacement lamps or self-ballasted, screw-based lamps that operate using fluorescent technology in various residential and commercial applications, due to their relatively small sizes and lesser energy draw versus incandescent.



ELECTRODELESS TECHNOLOGIES

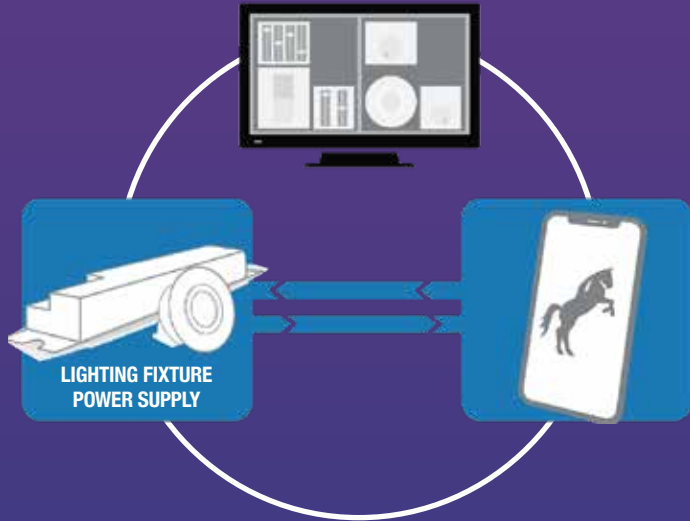


Induction is essentially an offshoot of fluorescent technology but whose light-generating reaction uses an external electromagnetic field, rather than electrodes. It lasts longer than standard fluorescent, but as the cost of LEDs fell, the utility of Induction severely diminished. Plasma was dubbed electrodeless HID. Plasma is created by heat or streamed electromagnetism. Radiating microwaves

transform certain gases and other materials into light-emitting plasma. This technology delivers remarkable illumination from tiny lamps, but the cost of these fixtures has made commercial adoption impractical.

LED

Light Emitting Diodes (LEDs) operate by electroluminescence – an optical phenomenon in which electrical current triggers light emission as it passes through semiconductor material. An LED light fixture is comprised of a fixture body, a diffuser lens, and an LED Light Engine. The LED Light Engine generally consists of an array of white (or color) LEDs placed on a printed circuit board (PCB) which is powered by an LED driver, an electronic component which precisely controls the flow of electricity through the LEDs to ensure both quality of light and long life. LED Light Engines are generally tailored to specific fixtures in order to meet efficiency, aesthetics, color consistency and life requirements.



WIRELESSLY CONNECTED LIGHTING CONTROL

Wireless Connectivity is to light what advanced music systems are to sound. Just as acoustic scientists created precise technologies to faithfully record, fine tune, control and distribute music within sound environments, today’s lighting engineers have made equivalent advances in visual environments. Now one simple “smart” device can control a full range of lighting situations. You can program lighting to automatically manage a great variety of scenes, locally or remotely, by computer – even over the internet – from any place at any time with a handheld device.



ON THE SHOULDERS OF GIANTS

According to the ancient parable he was citing, even a dwarf can see further than a giant if he stands on the giant's shoulders. Sir Isaac -- indisputably an intellectual giant himself -- modestly credited the "shoulders of giants" for his success. The expression acknowledges the contribution of earlier workers for one's own achievements, since knowledge advances on the basis of previous knowledge.

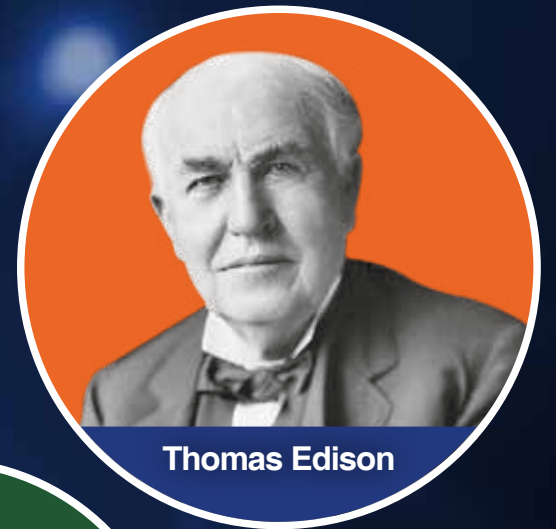
But sometimes giants stand upon the shoulders of other giants. Consider the sequence of advances made by "giants" like Michael Faraday, James Maxwell, Nikola Tesla and Thomas Edison.

The solitary work of individual geniuses created a series of inspired lighting inventions. This established the foundation for a universe of practical applications, developed by later generations of scientists and technicians. The lonely eccentric's makeshift workshop has given way to extravagantly equipped lab complexes staffed with teams of trained researchers. Nowadays it is common to see close collaboration among colleagues half a world apart; speaking different languages; people from vastly divergent cultural backgrounds -- all working together in the common interest.

Technological and production advances will always be driven by inspired individual efforts. But in general, progress in our industry is the result of solid teamwork. Nowhere is trans-national teamwork more evident than at Fulham. We are a worldwide company in manufacturing, marketing, sales and distribution. We also have world class R&D facilities in Asia, India and at our U.S. Headquarters. Our international research team includes some of the best brains in the industry from many diverse backgrounds. All are united in Fulham's dedication to exceeding customer expectations. This commitment has grown us into a company that is truly trusted worldwide for cost efficient, innovative, reliable, relevant lighting solutions.

*If I have seen further than other men,
it is because I have stood upon the
shoulders of giants.*

-- Sir Isaac Newton (1642 - 1727)



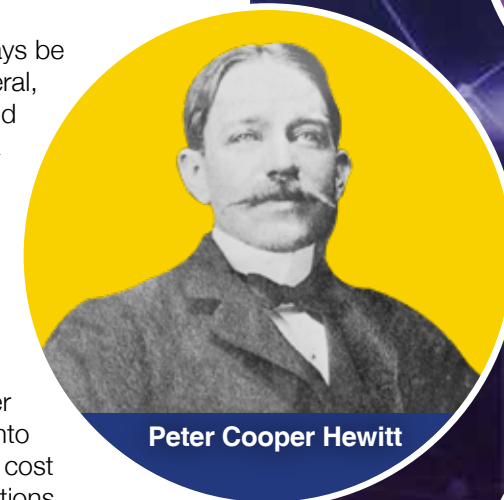
Thomas Edison



Nikola Tesla



Charles Steinmetz



Peter Cooper Hewitt



Elmer Fridich

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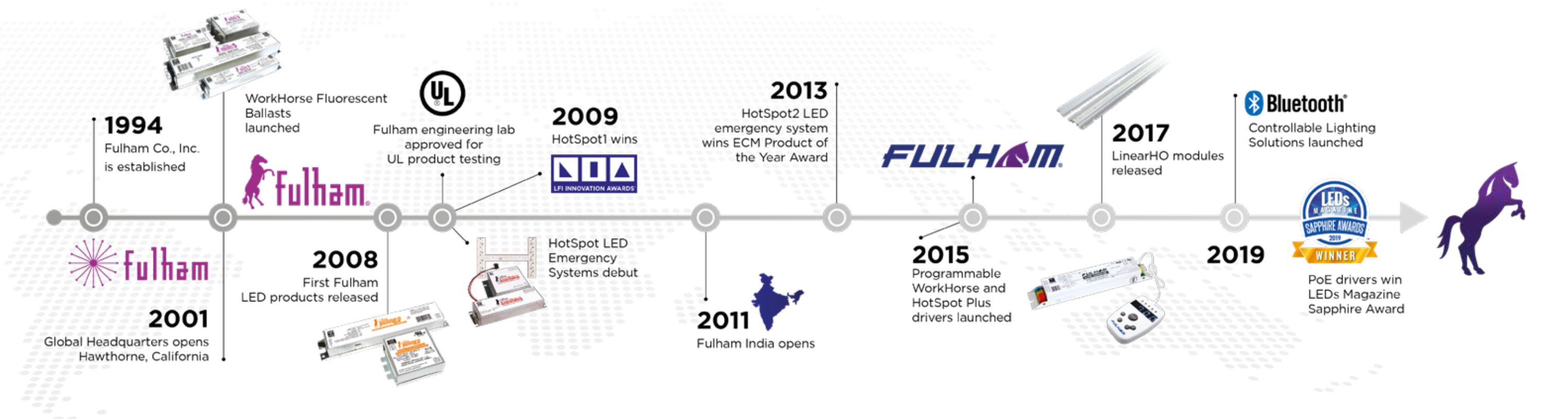
FLUORESCENT

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A Pioneer in Lighting Electronics

From its beginnings in 1994, Fulham has been dedicated to creative, sustainable lighting programs that give our users the power to build or install smart, differentiated, versatile lighting. Fulham’s revered product quality and world-class customer responsiveness make us the preferred partner to over 3,000 lighting manufacturers and distributors worldwide.

From our headquarters in Los Angeles and design centers in China and India, our teams of product managers and engineers work with our customers to conceive, design, manufacture and supply reliable, sustainable lighting solutions that bring cutting-edge, relevant innovation to a global market.





EliteControl
FULHAM



Jaap Haartsen
Founder of Bluetooth®

THE ARCHITECT OF THE CONNECTED REVOLUTION

The pioneering Dutch electrical engineer Jaap Haartsen (b. 1963) was a ground-breaking researcher, inventor and entrepreneur who spearheaded the design of the standard that would later be known as Bluetooth® Wireless Technology, enabling connections between a seemingly endless array of devices.

It was in the summer of 1994, during his tenure at mobile phone maker Ericsson in Sweden, when his eureka moment arrived. Little did he know, however, what an essential and ubiquitous technology Bluetooth would become. His discovery turned out to be so unforeseeably revolutionary that, over 20 years later, it continues to have an enormous impact on not only the global lighting industry, but also a large breadth of technological sectors.

An inductee into the Consumer Technology Association Hall of Fame, Haartsen remains steadfast in his commitment to driving the Bluetooth standard forward, still working on its development over a quarter century after designing the initial Bluetooth version 1.0.

Bluetooth is a registered trademark of Bluetooth SIG, Inc.



**“DID YOU
KNOW?”**

Bluetooth is named after Danish Viking king Harald “Blåtand” Gormsson, whose uncanny ability to bring people together in non-violent negotiations through effective communication resembled the connectivity of the modern wireless protocol.

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SIG Qualified Bluetooth® Mesh Lighting Control System



Bluetooth mesh is an emerging platform for connected lighting that is paving the way to IoT smart lighting. It provides fast, reliable performance, unmatched scalability, high-level security and out-of-the-box interoperability, creating opportunities for larger, more efficient lighting networks.

- **Wireless** High speed communication at distances of over 300 feet, creating massive savings on installation and wiring
- **Scalable** Start small with a single room, or connect thousands of devices in a building-wide installation
- **Secure** Advanced encryption standards with multiple authentication keys for maximum protection
- **Reliable** Self-healing network prevents communication losses and allows devices to be added or removed without disruption
- **Interoperable** All SIG Qualified Bluetooth mesh devices can communicate seamlessly, regardless of manufacturer

Fulham eliteBlue Commissioning Software

Fulham’s eliteBlue commissioning software provides an intuitive set of tools for commissioning and monitoring qualified Bluetooth mesh lighting devices. Using simple web and iOS apps, users can easily customize lighting control parameters in accordance with site-specific needs and building energy codes.

- **Web portal**
Used off site to manage lighting installation projects and plan commissioning, including mapping zones within a building, setting up control scenarios for zones and managing users collaborating on the project.
Try it at eliteblue.fulham.com
- **Mobile app for iOS**
Used onsite to commission devices and fine-tune installations. No specialized training or lighting control expertise is needed- the intuitive interface lets you add Bluetooth mesh lighting devices to a wireless network in no time.



Connected Driver

A 40W, 0-10V constant current driver with the unique ability to add Bluetooth mesh connectivity by attaching an intelligent Bluetooth antenna. Compatible with third-party sensors, wall switches, and other devices, the connected driver serves as the core component for powerful, easy-to-expand connected systems.

- 0-10V dimming standard. Add Bluetooth dimming with optional ESLI01HB01 SmartLink
- Compatible with Fulham’s SmartSet programming platform



Specifications

Model Number	Input Voltage (VAC)	Watts	Output Voltage (VDC)	Dimensions (L x W x H)	Case Type	Case Qty.
T2C1UNV150P-40L	UNV (120-277)	40	10-57	6.61" x 1.97" x 1.18"	Compact w/End Leads	30

Bluetooth to 0-10V SmartBridge

A simple, easy-to-install component that connects to an existing 0-10V driver to add SIG Qualified Bluetooth mesh capability. The SmartBridge is an ideal solution for manufacturers looking to develop their Bluetooth product lines or contractors seeking to provide wireless lighting options in the field.



Specifications

Model Number	Max Load (W)	Max Input Current (A)	Input Voltage (VAC)	IP	Features	Dimensions (L x W x H)	Case Qty.
CTBRCB02JM02	600	5	UNV (120-277)	66	On / Off, 0-10V Dimming Control, Sensor Input	5.17" x 2.26" x 1.29"	30
CTBRCB03JM03-PC					On / Off, 0-10V Dimming Control, Sensor Input, Color Control, Power Metering		

Bluetooth Accessories

Model Number	Description
ESLTOPJX00SR	Short-range PIR occupancy, daylight harvesting sensor and Bluetooth Radio for connected LED driver
ESLTOPJX00LR	Long-range PIR occupancy, daylight harvesting sensor and Bluetooth Radio for connected LED driver
ESLI01HB01	Bluetooth SmartLink (attaches to T2C1UNV150P-40L to provide Bluetooth capability)
ELIOPJX00SR	Short-range PIR occupancy and daylight harvesting sensor for SmartBridge
ELIOPJX00LR	Long-range PIR occupancy and daylight harvesting sensor for SmartBridge
ESRPB-W-EO	Single Rocker EnOcean Switch
EDRPB-W-EO	Double Rocker EnOcean Switch
CTGATBPOE	IoT Bluetooth Gateway extends a mesh network with Internet access to visualize/analyse data



Bluetooth Mesh Lab Kit The simple way to get started with Bluetooth

Part number: BLEM-KIT1

Ready to take the first step with Bluetooth mesh? There’s no better way than to experience it yourself. Fulham’s complete Bluetooth mesh lab kit has everything you need to launch your implementation. In just than 30 minutes, you’ll be testing Bluetooth mesh in your lab and planning your future.

Bluetooth Mesh Lab Kit Contents:

Bluetooth SmartBridge | iPad® with eliteBlue Commissioning app | EnOcean Double Rocker switch | 9W Vizion LED Engine | Documentation



Contact Fulham to order your Bluetooth Mesh Lab Kit today



Michael Faraday
Scientist

ELECTROMAGNETISM, EMBRYO

Not many scientists can claim to have had their picture displayed on the wall of renowned physicist Albert Einstein's study, but such was his notoriety in scientific circles, that inspiring English physicist and chemist Michael Faraday was one of them.

In a time when science was usually the preserve of people born into wealthy families, the inspiring Faraday (1791-1867) – who himself came from a very poor family – emerged as one of the greatest experimental scientists in history.

His work proved the relationship between magnetism and electricity, laying the foundation for electromagnetic theory, and led to the development of electric motors, the generator, and thus to the practical use of electrical power for home, industry and technology. He even brought the terms electrode, cathode, anode, diode and others to the popular vocabulary.



“DID YOU KNOW?”

Programmable LED Drivers allow designers and assembly lines to customize key output characteristics, including the output power in any configuration required for customers.

”



WorkHorse LED - IP20 Programmable Drivers

- 250mA - 1500mA programmable output current
- 0-10V and DALI dimming
- Handheld programmer or SmartSet software
- Programmable dimming curve allows step dimming and dim-to-off
- Advanced programmability of output current and thermal temperature protection (NTC)



0 - 10V Dimming										
Model Number	Output Watts (W)	Output Current (mA)	Output Voltage (VDC)	Input Voltage (VAC)	Dimming Type	Surge Protection		IP	Dimensions (L x W x H)	Case Type
						L-N	L&N-G			
T1M1UNV105P-40E	40	250 - 1050	10 - 57	120-277; 50/60Hz	0 - 10V	2kV	4kV	20	10.83" x 1.22" x 0.98"	Linear w/End Terminals
T1M1UNV105P-60E	60	250 - 1050	10 - 57	120-277; 50/60Hz	0 - 10V	2kV	4kV	20	9.33" x 1.59" x 1.18"	Linear w/End Terminals
T1M1UNV105P-60F	60	250 - 1050	10 - 57	120-277; 50/60Hz	0 - 10V	2kV	4kV	20	4.98" x 2.99" x 1.22"	Compact w/End & Back Terminals
T2C1UNV150P-40L	40	250 - 1500	10 - 57	120-277; 50/60Hz	0 - 10V or Bluetooth	2.5kV	2.5kV	20	6.61" x 1.97" x 1.18"	Compact w/End Leads

DALI Dimming										
Model Number	Output Watts (W)	Output Current (mA)	Output Voltage (VDC)	Input Voltage (VAC)	Dimming Type	Surge Protection		IP	Dimensions (L x W x H)	Case Type
						L-N	L&N-G			
T1A1UNV105P-40E	40	250 - 1050	10 - 57	120-277; 50/60Hz	DALI	2kV	4kV	20	10.83" x 1.22" x 0.98"	Linear w/End Terminals

The Power of Programmability

All WorkHorse LED drivers feature Fulham’s innovative SmartSet programming platform, which gives the user the power to create the right driver for any situation.

- Auto-Programming capability for high volume usage
- Driver does not need to be powered during programming
- Programming via handheld controller or PC software



TPSB-100 SmartSet Controller



SmartSet Software

To see the Fulham SmartSet programming platform in action visit the links below:
Overview of basic programming features: www.fulham.com/smartsetprogramming
One touch Auto-Programming: www.fulham.com/smartsetauto
Programming custom dimming curves: www.fulham.com/smartsetdimmingcurve



WorkHorse LED - IP65 Programmable Drivers

- IP65 for harsh, demanding environments
- 0-10V, DALI, and wireless dimming options
- Wide programmable current range in 1mA increments
- Handheld programmer or SmartSet software
- Advanced programmability of output current and thermal temperature protection (NTC)



XP Series: Programmable output current, dimming curves, and NTC profile										
Model Number	Output Watts (W)	Output Current (mA)	Output Voltage (VDC)	Input Voltage (VAC)	Dimming Type	Surge Protection		IP	Dimensions (L x W x H)	Case Type
						L-N	L&N-G			
T1M1UNV210P-60L	60	500-2100	10-57	120-277; 50/60Hz	0-10V	4kV	6kV	65	9.49" x 1.69" x 1.14"	Linear w/End Leads
T1M1UNV150P-150L	150	500-1500	70-280	120-277; 50/60Hz	0-10V	4kV	6kV	65	9.47" x 2.33" x 1.52"	Linear w/End Leads
T1M1UNV140P-200L	200	500-1400	80-280	120-277; 50/60Hz	0-10V	4kV	6kV	65	8.86" x 2.71" x 1.52"	Linear w/End Leads
Certifications	120-277V models: cULus Class P, CE, ENEC, CB Scheme, RoHS, FCC (for wireless models)									

XE Series: Programmable output current										
Model Number	Output Watts (W)	Output Current (mA)	Output Voltage (VDC)	Input Voltage (VAC)	Dimming Type	Surge Protection		IP	Dimensions (L x W x H)	Case Type
						L-N	L&N-G			
T1M1UNV240P-96L	96	700-2400	30-56	120-277V; 50/60Hz	0-10V	4kV	6kV	65	6.69" x 2.56" x 1.26"	Linear w/End Leads
T1M1UNV500P-185L	185	1500-5000	30-56	120-277V; 50/60Hz	0-10V	4kV	6kV	65	8.74" x 2.68" x 1.65"	Linear w/End Leads
Certifications cULus Class P, RoHS										

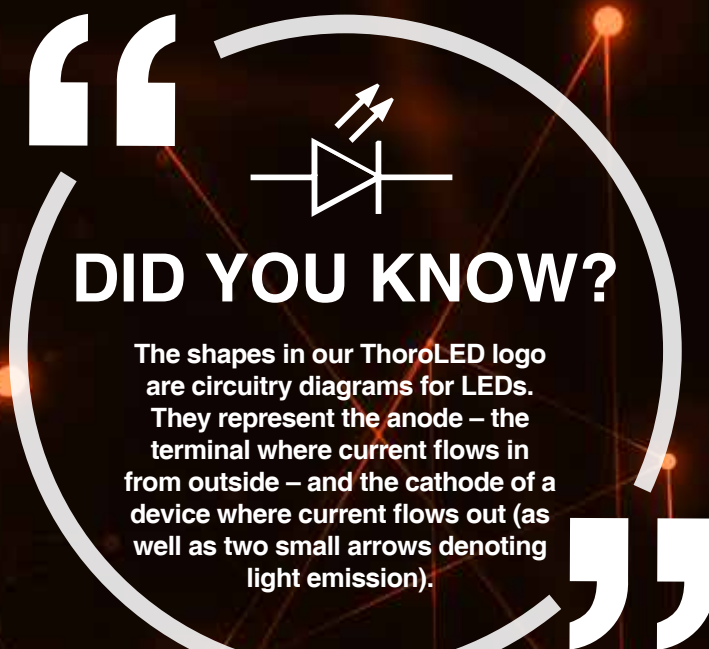


Nick Holonyak
American Engineer

“THE FATHER OF THE LED”

A visionary leader of his generation, Nick Holonyak, Ph.D. (b.1928) is credited for the invention of a new age of energy efficient technology in 1962, the Light Emitting Diode (LED). Dubbed “the father of the LED” by many, Holonyak has a total of 41 patents to his name, having also been responsible for development of other innovative creations such as the dimmer switch, as well as the red-light semiconductor laser (laser diode) which is used in CD, DVD and cell phones.

While he was not recognized for his invention of the original LED – missing out on the Nobel Prize in physics, which went to Isamu Akasaki, Hiroshi Amano, and Shuji Nakamura for the development of the blue light-emitting diode – Holonyak remains an inspiration to inventors everywhere.





Dimmable Dedicated Constant Current LED Drivers

- Smooth dimming: 100% to 10% models
- Dedicated output, single channel
- Wide range of output currents and voltages
- Compatible with leading dimmer brands
- Compact and linear case types to fit numerous applications



Dimmable Dedicated Constant Current LED Drivers: 0-10V

Model Number	Output Watts (W)	Output Current (mA)	Output Voltage (VDC)	Input Voltage (VAC)	Surge Protection		IP	Dimensions (L x W x H)	Case Type	cULus Class P
					L-N	L&N-G				
T1M1UNV0350-15L	15	350	18 - 45	120-277; 50/60Hz	1kV	2kV	64	3.94" x 1.18" x 0.91"	Linear w/End Leads	
T1M1UNV0700-30L	30	700	18 - 45	120-277; 50/60Hz	1kV	2kV	64	4.65" x 1.18" x 1.16"	Linear w/End Leads	
T1M1UNV0900-40L	40	900	10 - 45	120-277; 50/60Hz	1kV	2kV	64	9.49" x 1.3" x 1.06"	Linear w/End Leads	
T1M1UNV1400-60L	60	1400	10 - 43	120-277; 50/60Hz	2kV	4kV	64	9.49" x 1.69" x 1.21"	Linear w/End Leads	
T1M1UNV0800-100Z	100	800	70 - 130	120-277; 50/60Hz	2kV	3kV	Dry	8.40" x 1.97" x 1.42"	Interconnect Terminals	

Dimmable Dedicated Constant Current LED Drivers: TRIAC

T1T11200350-15L	15	350	20 - 42	120	1kV	2kV	64	3.94" x 1.18" x 0.91"	Linear w/End Leads
T1T11200700-30C	30	700	21 - 42	120	1kV	2kV	64	3.35" x 2.56" x 0.75"	Compact w/End Leads
T1T11200700-30L	30	700	21 - 42	120	1kV	2kV	64	4.65" x 1.18" x 1.16"	Linear w/End Leads

“

DID YOU KNOW?

There are 2 different approaches to the electrical interconnection between LED driver and modules: Constant Current and Constant Voltage”

Factors considered when deciding whether to use Constant Current or Constant Voltage include how the system will be installed, how it will be configured, and overall system efficiency requirements.

With Constant Current, the LED driver feeds a steady current through all LEDs on the module. Since each individual LED requires a certain voltage for the current to flow (known as Vf), the driver must provide enough voltage to equal the sum total of all the voltages of that module's LEDs. Note that, while the LED module is frequently designed with all LEDs connected in one continuous serial electrical chain, it is also possible to create branches that split the current flowing through the module. So it's essential to understand the design of the module's circuitry, and the electrical rating of the LEDs themselves when connecting a Constant Current driver to Constant Current LED modules. Constant Current architectures offer higher operating efficiency than Constant Voltage, but less flexibility in connecting different modules and LEDs to the driver.

With Constant Voltage, the LED driver provides a steady voltage supply that enables power to flow through all LEDs connected. Since any given current flow requires a specific amount of voltage for each individual LED, it is necessary to buffer or regulate the voltage with a resistor (or equivalent component) in line with the connected LEDs. With proper resistance selection, the series connected LEDs receive proper -- never excessive -- voltage to regulate the current inflow. The Constant Voltage approach is most commonly used when the number of LED modules varies widely from different installations or product designs.



Non-Dimmable Dedicated Constant Current LED Drivers

- Optimized for high efficiency performance
- Dedicated output, single channel
- Wide range of output currents and voltages
- Compact and linear case types to fit numerous applications



Non-Dimmable Dedicated Constant Current LED Drivers

Model Number	Output Watts (W)	Output Current (mA)	Output Voltage (VDC)	Input Voltage (VAC)	Surge Protection		IP	Dimensions (L x W x H)	Case Type
					L-N	L&N-G			
TC11200350-15C	17.5	350	24-50	120; 50/60Hz	2kV	4kV	Damp	2.57" x 1.77" x 0.98"	Compact w/End Leads
T1UNV1400-60L	60	1400	20 - 43	120-277; 50/60Hz	2kV	4kV	64	7.72" x 1.69" x 1.18"	Linear w/End Leads

Dont see it? Ask for it!

A distinct advantage of Fulham is that we are the actual design engineers. Fulham is not merely a buyer / multiple-lister / re-brander and reseller.

Come to us with your specific application details and requirements. We'll get back to you with the feasibility of producing a custom solution!





Dimmable Constant Voltage LED Drivers

- 12VDC or 24VDC Output
- 0-10V Dimming; 100% -10%
- Linear form factor
- Surge protection, overload protection
- Low temperature performance
- Ideal for signage, cove, and niche applications



Dimmable Constant Voltage LED Drivers										
Model Number	Output Watts (W)	Output Current (mA)	Output Voltage (VDC)	Input Voltage (VAC)	Ch.	Surge Protection		IP	Dimensions (L x W x H)	Case Type
						L-N	L&N-G			
T1M1UNV012V-20L	20	1660	12	100-277; 50/60Hz	1	1kV	2kV	Damp	6.30" x 1.57" x 0.98"	Linear w/End Leads
T1M1UNV024V-20L	20	833	24	100-277; 50/60Hz	1	1kV	2kV	Damp	6.30" x 1.57" x 0.98"	Linear w/End Leads
T1M1UNV012V-60L	60	5000	12	100-277; 50/60Hz	1	2kV	4kV	64	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1M1UNV024V-60L	60	2500	24	100-277; 50/60Hz	1	2kV	4kV	64	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1M1UNV012V-75L	75	6250	12	100-277; 50/60Hz	1	2kV	4kV	64	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1M1UNV024V-75L	75	3125	24	100-277; 50/60Hz	1	2kV	4kV	64	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1M1UNV024V-150L	150	6250	24	100-277; 50/60Hz	1	4kV	6kV	67	8.94" x 2.66" x 1.56"	Linear w/End Leads



Non-Dimmable Constant Voltage LED Drivers

- 12VDC or 24VDC Output
- Linear form factor
- Surge protection, overload protection
- Low temperature performance



Non-Dimmable Constant Voltage LED Drivers										
Model Number	Output Watts (W)	Output Current (mA)	Output Voltage (VDC)	Input Voltage (VAC)	Ch.	Surge Protection		IP	Dimensions (L x W x H)	Case Type
						L-N	L&N-G			
T1UNV012V-60LF	60	5000	12	100-277; 50/60Hz	1	2kV	4kV	64	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1UNV024V-60L	60	2500	24	100-277; 50/60Hz	1	2kV	4kV	66	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1UNV012V-60LG	60	5000	12	100-277; 50/60Hz	1	2kV	4kV	68	9.53" x 1.67" x 1.34"	Linear w/End Leads
T1UNV024V-60LF	60	2500	24	100-277; 50/60Hz	1	2kV	4kV	64	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1120012V-60LE	60	5000	12	120	1	2kV	4kV	64	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1UNV012V-75L	75	6250	12	100-277; 50/60Hz	1	2kV	4kV	64	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1UNV024V-75L	75	3120	24	100-277; 50/60Hz	1	2kV	4kV	64	9.49" x 1.69" x 1.22"	Linear w/End Leads
T1UNV024V-100LE	100	4170	24	120-277; 50/60Hz	1	2kV	4kV	64	9.49" x 1.69" x 1.16"	Linear w/End Leads
T1UNV024V-100LS	100	4100	24	100-277; 50/60Hz	1	2kV	4kV	64	10.27" x 1.59" x 1.19"	Linear w/End Leads
THCV1UNV024V-100L	100	4100	24	110-277; 50/60Hz	1	2kV	4kV	64	10.47" x 1.69" x 0.96"	Linear w/End Leads

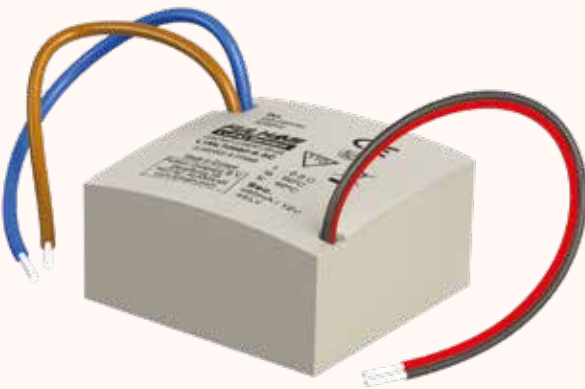


Exporting to Europe?
Fulham Lumo Series is your answer.

Fulham Lumo Series drivers are built on core engineering design principles for exceptional standards of performance and reliability in LED systems. Highest grade critical components together with design features for thermal management ensure excellent reliability. Low ripple designs create flicker-free lighting and perfectly smooth dimming. Simplicity of specification and installation is a key characteristic of all Fulham Lumo Series drivers, hence the wide voltage and current ranges and industry leading low inrush current.

Ask your Fulham representative for more details about the Fulham Lumo Series.

fulham.com/product-systems/led-systems/lumoseries/



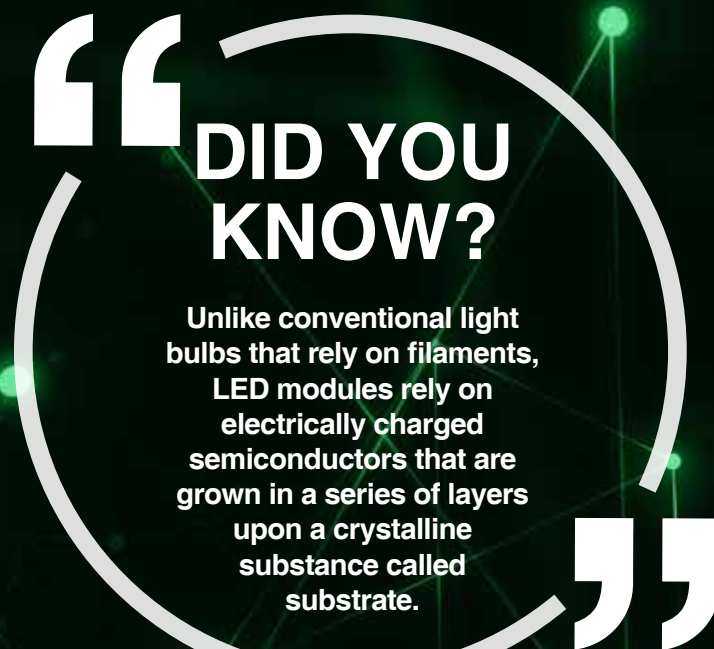


Shuji Nakamura
*American-Japanese
Engineer*

A NOBEL ACHIEVEMENT

When Japanese-born American materials scientist Shuji Nakamura (b. 1954) entered the office of Nichia's CEO, Ogawa Nobuo, in 1998 demanding more than \$3 million (U.S. dollars) to fund his research into semiconductors for the blue LED, he was wholly unaware of the journey it would take him on and the Nobel-prize lauded invention it would result in.

In fact, his pioneering work on the development of the blue light-emitting diode – alongside Isamu Akasaki and Hiroshi Amano – resulted in the first truly marketable GaN LED capable of emitting bright blue light in the early 1990s, a major breakthrough in lighting technology. Such was its impact that the trio were recipients of the Nobel Prize in physics in 2014.



DID YOU KNOW?

Unlike conventional light bulbs that rely on filaments, LED modules rely on electrically charged semiconductors that are grown in a series of layers upon a crystalline substance called substrate.



450mA ECO Series DC LED Modules

- Range of common lengths and wattages to fit a variety of luminaires
- High efficacy: up to 150 lm/W @ 350mA, 4000K/90 CRI
- On board connectors allow easy wire connections and end-to-end board linking
- 3 SDCM for high color consistency
- CRI90 Standard, meets CEC Title 24 requirement



Specifications	
Beam Angle	120°
Operating Temperature Range	-35°C to +45°C (-31°F to 113°F)
Lumen Maintenance	L70 = 60,000hrs @ Tc=105°C / L90 = 40,000hrs @ Tc=105°C
Color Consistency	Binning per ANSI C78.377-2008; 4 SDCM
PCB Material	FR-4
Warranty	5 years @ Max Tc from the date of manufacture
Safety/compliance	cURus (File # E351548), Class 2 Lighting System, RoHS Compliant

Product Models							
Model Number	Number of LEDs	Nominal Input Current* (mA)	Forward Voltage (VDC)	Nominal Power (W)	Dimensions (L x W) (including connector)	Lumens @4000K/80CRI (lm)	Nom. Efficacy @4000K / 80 CRI (lm/W)
VMU045005EC9xxA	12	350	11.5	4.0	1.5" x 0.94" x 0.22"	554	138
VMU045005EC9xxB	12	350	11.5	4.0	5" x 0.71" x 0.22"	605	150
VMU045010EC9xxA	24	350	23.0	8.1		1096	136
VMU045010EC9xxB	24	350	23.0	8.1	11" x 0.71" x 0.22"	1172	145
VMU045010EC9xxC	24	350	23.0	8.1	17" x 0.71" x 0.22"	1172	145

* Max input current 450mA. See specification sheets for detailed information on input current levels.

Part Numbering Key

V M U 045 015 E C 9 30 A

CRI

Standard: 9 = 90

Color Temperature

Standard: 30 = 3000K
35 = 3500K
40 = 4000K

Made-to-order: 27 = 2700K
50 = 5000K



Low Profile Linear High Output DC LED Modules

- Ideal replacement for T5HO in linear highbays, water/vapor proof, and recessed and wall luminaires
- Aluminium extrusion mount provides superior thermal management
- Low profile design for use in smaller luminaires
- Constant current, high-efficacy LEDs, 3 SDCM for high color consistency
- Up to 219 lm/W; output range 234 lm to 14,699 lm (@4000K/80CRI)
- Optional lenses snap on in seconds (See page 25)



Specifications			
Operating Temp. Range	-40°C to 55°C / -40°F to 131°F	PCB Material	MCPCB (Aluminium Clad)
Color Consistency	Binning per ANSI C78.377-2015 @ 25°C; 3 SDCM	Warranty	5 years @ 105°C Tc from the date of manufacture
Lumen Maintenance	L70: >60,000Hrs / L90: 40,000Hrs (meets DLC Premium and Standard requirements)	Safety/compliance	cURus (File # E351548), UL Class 2 Lighting System, CE, SELV, RoHS Compliant

Product Models								
Model Number / Dimension (L x W x H)	Number of LEDs	Input Current (mA)	Nom.Fwd. Voltage (VDC)	Nom. Rated Power (W)	Max. Fwd. Voltage (V)	Max. Rated Power (W)	Nom. Lum. @4000K/80CRI (lm)	Nom. Efficacy @4000K/80CRI (lm/W)
VMU048012LPyxxA 5.51" x 1.26" x 0.29" (140mm x 32mm x 7.4mm)	24	175	22.3	3.9	25	4	799	205
		350	23.1	8.1	25	9	1518	187
		480*	23.8	11.40	26	12	1959	172
VMU064025LPyxxA 10.94" x 1.26" x 0.29" (278mm x 32mm x 7.4mm)	48	350	34.0	11.9	37	13	2347	197
		450	34.7	15.6	38	17	2942	189
		640*	35.6	22.8	39	25	3919	172
VMU080030LPyxxA 22.01" x 1.26" x 0.29" (559mm x 32mm x 7.4mm)	60	350	33.7	11.8	37	13	2380	202
		700	35.1	24.6	39	27	4418	180
		800*	35.6	28.5	39	31	4899	172
VMU125050LPyxxA 22.01" x 1.26" x 0.29" (559mm x 32mm x 7.4mm)	96	350	32.9	11.5	35	12	2425	211
		700	34.1	23.9	36	26	4698	197
		1250*	35.5	44.4	38	49	7700	173
VMU140055LPyxxB† 33.07" x 1.26" x 0.29" (840mm x 32mm x 7.4mm)	108	700	33.8	23.7	36	25	4736	200
		1050	34.7	36.4	38	39	6847	188
		1400*	35.5	49.7	39	55	8656	174
VMU140055LPyxxA 44.13" x 1.26" x 0.29" (1121mm x 32mm x 7.4mm)	108	700	33.8	23.7	36	25	4736	200
		1050	34.7	36.4	38	39	6847	188
		1400*	35.5	49.7	39	55	8656	174
VMU140055LPyxxC† 45.98" x 1.26" x 0.29" (1168mm x 32mm x 7.4mm)	108	700	33.8	23.7	36	25	4736	200
		1050	34.7	36.4	38	39	6847	188
		1400*	35.5	49.7	39	55	8656	174
VMU240095LPyxxA 44.13" x 1.26" x 0.29" (1121mm x 32mm x 7.4mm)	180	700	33.0	23.1	35	24	4838	209
		1400	34.2	47.9	37	52	9331	195
		2400*	35.6	85.4	39	94	14,699	172
VMU240095LPyxxC† 57.95" x 1.26" x 0.29" (1472mm x 32mm x 7.4mm)	180	700	33.0	23.1	35	24	4838	209
		1400	34.2	47.9	37	52	9331	195
		2400*	35.6	85.4	39	94	14,699	172

* Indicates maximum rated current. Modules may be operated at a current less than or equal to this value, below the Tc rating.
† Made to order. Minimum order quantity applies.

Part Numbering Key

V M U 240 095 LP 8 30 A

CRI

Standard: 8 = 80
Made-to-order: 9 = 90

Color Temperature

Standard: 30 = 3000K
35 = 3500K
40 = 4000K
50 = 5000K

Made-to-order: 27 = 2700K
57 = 5700K
65 = 6500K



Linear High Output DC LED Modules

- Ideal replacement for T5HO in linear highbays, water/vapor proof, and recessed and wall luminaires
- Aluminum extrusion mount for thermal management with positioning magnets
- LED at each end and connector underneath for even light distribution
- Constant current, high-efficacy LEDs, 3 SDCM for high color consistency
- Up to 198 lm/W; output range 2,200 lm to 13,310 lm (@4000K/80CRI)



Specifications			
Operating Temp. Range	-40°C to 55°C / -40°F to 131°F	PCB Material	CEM3
Color Consistency	Binning per ANSI C78.377-2015 @ 25°C; 3 SDCM	Warranty	5 years @ 105°C Tc from the date of manufacture
Lumen Maintenance	L70: >60,000Hrs / L90: 40,000Hrs (meets DLC Premium and Standard requirements)	Safety/compliance	cURus (File # E351548), UL Class 2 Lighting System, CE, SELV, RoHS Compliant

Product Models

Model Number / Dimension (L x W x H)	Number of LEDs	Input Current (mA)	Nom.Fwd. Voltage (VDC)	Nom. Rated Power (W)	Max. Fwd. Voltage (V)	Max. Rated Power (W)	Nom. Lum. @4000K/80CRI (lm)	Nom. Efficacy @4000K/80CRI (lm/W)
TMU125050CLyxxA 22" x 1.73" x 0.39" (560mm x 44mm x 10mm)	96	350	33	12	35	12	2245	195
		1050	35	37	38	40	6210	169
		1250*	36	44	39	49	7130	161
TMU140055CLyxxA 44.1" x 1.73" x 0.39" (1120mm x 44mm x 10mm)	108	350	33	11	34	12	2255	196
		1050	35	36	38	39	6340	174
		1400*	36	50	39	55	8015	161
TMU140055CLyxxB† 33.7" x 1.73" x 0.39" (840mm x 44mm x 10mm)	180	350	32	11	34	12	2230	198
		1400	34	48	37	52	8640	180
		2400*	36	85	39	94	13610	159

* Indicates maximum rated current. Modules may be operated at a current less than or equal to this value, below the Tc rating.
† Made to order. Minimum order quantity applies.

Part Numbering Key

T

M

U

240

095

CL

8

30

A

CRI

Standard: 8 = 80

Made-to-order: 9 = 90

Color Temperature

Standard: 30 = 3000K

35 = 3500K

40 = 4000K

50 = 5000K

Made-to-order: 27 = 2700K

57 = 5700K

65 = 6500K

Accessories for Low Profile Linear HO & Linear HO Output DC Modules			
Model Number	Description	Model Number	Description
TLE-OPT-120-002	5.5" snap-on lens, 82% transmissivity	TLE-OPT-120-021	58" snap-on lens, 82% transmissivity
TLE-OPT-120-003	11" snap-on lens, 82% transmissivity	TLE-OPT-120-020	Standard LinearHO module end caps (2 pieces)
TLE-OPT-120-004	22" snap-on lens, 82% transmissivity	VLE-OPT-120-012	Low Profile LinearHO module end caps (2 pieces)
VLE-OPT-120-033D	33" snap-on lens, 82% transmissivity	TLC-HN02	22" wire harness for 1 or 2 modules in parallel
TLE-OPT-120-013	44" snap-on lens, 82% transmissivity	TLC-HN04	22" wire harness for 3 or 4 modules in parallel
TLE-OPT-120-014	46" snap-on lens, 82% transmissivity		



Linear High Output LED Retrofit Kits

- Complete LED retrofit kit: modules, driver, wiring harness, installation hardware, and UL labels
- Universal voltage (120V-277V) with high power factor and low THD
- Multiple color temperatures: 3000K, 3500K, 4000K, 5000K
- Modules feature aluminum extrusion heatsink with positioning magnets
- UL Classified for field installation: 5-10 minutes per kit installation
- Optimized for use with Fulham HotSpot LED Emergency backup systems
- 0-10V dimmable
- 5-year warranty
- Listed on DLC Qualified Product List for utility rebate eligibility. Visit www.fulham.com/utilityrebates to learn more.



Product Models

Model Number	Length	Number of LED Modules	Number of LED Drivers	Input Voltage (VDC)	Input Current (A)		Total System Power (W)	Driver Efficacy (%)	Total System Lumens (lm)	Total System Efficiency (lm/W)
					120V	277V				
VR22-MU-150-840-0350A	22"	1	1	120~277	0.117	0.053	13.7	84	2245	164
VR22-MU-250-840-0350A		2	1	120~277	0.114	0.052	13.3	84	2266	170
VR22-MU-250-840-0700A		2	1	120~277	0.241	0.109	27.1	85	4490	166
VR22-MU-250-840-1050A	44"	2	1	120~277	0.347	0.157	41.4	85	6634	160
VR44-MU-195-840-0700A		1	1	120~277	0.242	0.110	27.2	85	4480	165
VR44-MU-295-840-0700A		2	1	120~277	0.237	0.107	26.6	85	4460	168
VR44-MU-295-840-1050A	44"	2	1	120~277	0.337	0.153	40.2	85	6756	168
VR44-MU-295-840-1400A		2	1	120~277	0.445	0.202	52.5	88	8960	171
VR44-MU-495-840-2400A		4	1	120~277	0.746	0.339	87.1	90	15,404	177

Values reflect performance at 277VAC unless otherwise specified.

Luminous Flux De-Rating: CCT and CRI Multipliers

	2700K	3000K	3500K	4000K	5000K	5700K	6500K
CRI 80	0.92	0.95	0.97	1.00	1.01	1.01	1.00

DID YOU KNOW?

The correlated color temperature (CCT) of white light is expressed in degrees Kelvin (K)

Degrees Kelvin is a temperature measurement as commonly understood. But in the context of “color temperature” it can be misleading, since that expression refers to the spectral quality of the color emitted by a light source -- not its hotness, chill or color saturation.

That quality of light, described in Kelvin (K), ranges from yellowish “soft white” at the low end (standard household bulbs); through “bright white” (big retail store lighting); to “daylight” at the upper (bluish-white) end. The lower the “K” (2700 - 3000) the “warmer” the light quality; the higher the “K” the “cooler” as it rises to the blue end of the spectrum (5000+K).

Fulham offers several different popular color temperatures to meet customer requirements.



UVA LED Products

- Ideal UVA light source for curing, Photo-catalyst and detecting applications
- Near-UV (UVA) and visible light range, harmless to human body or eyes
- Available in 365nm and 395nm peak wavelength options
- Available in flexible tape and rigid 11” & 22” strip
- For use in UL Class 2 lighting systems



Specifications			
Operating Temp. Range	-20°C to 55°C / -4°F to 131°F	Max. Tc temperature	80°C / 176°F
Warranty	5 years @ 80°C Tc from the date of manufacture	Safety/compliance	cURus (File # E351548), UL Class 2 Lighting System, RoHS Compliant

Product Models								
Model Number	Number of LEDs	Dimension (L x W x H)	Type	Peak Wavelength (nm)	Input Current* (mA)	Forward Voltage (VDC)	Nominal Power (W)	Radiation Power (W)
VUU24V015KB365A	60/m	196.8" x 0.39" x 0.079" (5000 x 10 x 2mm)	Constant Voltage (Flex. Tape)	365 - 370	625/m	24.0	15/m	0.29/m
VUU24V015KB395A				395 - 400	625/m	24.0	15/m	4.38/m
VUU064025LP365A	48	10.94" x 1.26" x 0.29" (278 x 32 x 7.4mm)	Constant Current	365 - 370	640*	38.8	24.8	0.60
VUU064025LP395A				395 - 400	640*	38.8	24.8	8.97
VUU125050LP365A	96	22.01" x 1.26" x 0.29" (559 x 32 x 7.4mm)	Constant Current	365 - 370	1250*	38.9	48.6	1.17
VUU125050LP395A				395 - 400	1250*	38.9	48.6	17.53

* Indicates maximum rated current. Modules may be operated at a current less than or equal to this value, below the Tc rating.



UVC LED Products

- High efficiency germicidal UVC radiation, 270nm peak wavelength
- 395nm UVA + 270nm UVC in-one LED package, visual indicator when UVC is on
- 8”L x 1.26” W rigid strip with aluminum extrusion, superior thermal management
- 24VDC constant voltage input, for use in UL Class 2 lighting systems



Specifications			
Operating Temp. Range	-20°C to 45°C / -4°F to 113°F	Max. Tc temperature	50°C / 122°F
Warranty	3 years @ 50°C Tc from the date of manufacture	Safety/compliance	cURus (File # E351548), UL Class 2 Lighting System, RoHS Compliant

Product Models								
Model Number	Number of LEDs	Dimension (L x W x H)	Type	Peak Wavelength (nm)	Input Current* (mA)	Input Voltage (VDC)	Nominal Power (W)	UVC Radiation Power (mW)
VUU24V003LP270C-8	9	8" x 1.26" x 0.29" (203 x 32 x 7.4mm)	Constant Voltage	UVC: 270 - 280 UVA: 390 - 400	145	24.0	3.5	45



Highbay and Lowbay LED Modules

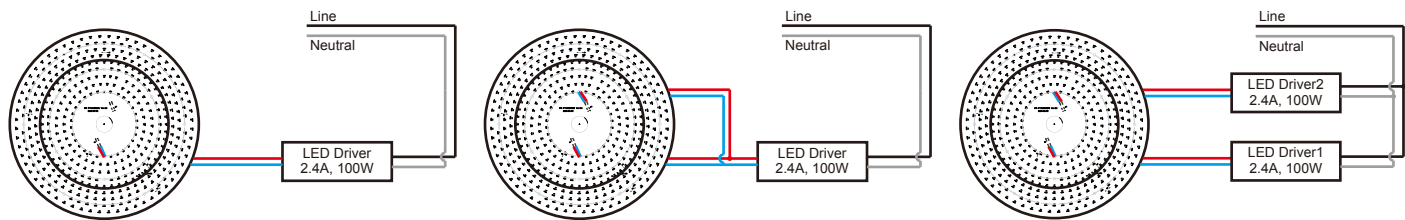
- 13” diameter round constant current DC modules
- Suitable for high output high bay and low bay applications
- 3 SDCM for high color consistency
- Options for dual-channel 200W max. and single-channel 100W max.
- Each channel for use in UL Class2 lighting system
- High efficacy up to 200lm/W; output range 3,000 lm to 32,000lm



Specifications			
Operating Temp. Range	-40°C to 55°C / -40°F to 131°F	PCB Material	MCPCB (Aluminium Clad)
Color Consistency	Binning per ANSI C78.377-2015 @ 25°C; 3 SDCM	Warranty	5 years @ 105°C Tc from the date of manufacture
Lumen Maintenance	L70: >60,000Hrs / L90: 40,000Hrs (meets DLC Premium and Standard requirements)	Safety/compliance	cURus (File # E351548), UL Class 2 Lighting System, RoHS Compliant

Product Models								
Model Number	Number of LEDs	Number of Input Channels	Wiring Diagram	Input Current* (mA)	Forward Voltage (VDC)	Nominal Power (W)	Lumens @4000K/80CRI (lm)	Nom. Efficacy @4000K / 80 CRI (lm/W)
VMU240095HB8xxA	208	1	#1	1200	36.4	43.7	8085	185
				2400	38.2	98.7	14701	160
VMU240095HB8xxB	312	1	#1	1200	35.8	42.9	8416	196
				2400	37.0	88.9	16074	181
VM2240190HB8xxA	416	2	#2	1200	35.4	42.4	8320	196
				2400	36.5	87.4	16170	185
			#3	1200*2	36.4	87.4	16170	185
				2400*2	38.2	183.4	29401	160
VMU2240190HB8xxB	624	2	#2	1200	34.9	41.8	8549	204
				2400	35.8	85.8	16833	196
			#3	1200*2	35.8	85.8	16833	196
				2400*2	37.0	177.8	32149	181

* Max input current 2400mA. See specification sheets for detailed information on input current levels.



Wiring Diagram #1

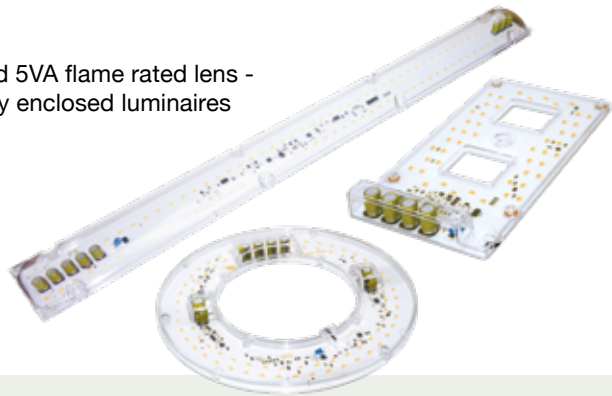
Wiring Diagram #2

Wiring Diagram #3



DirectAC LED Retrofit Kits

- Very low flicker, meets Title 24 requirements
- DirectAC Drive with integrated LED board
- Smooth TRIAC/ELV dimming down to 10%
- Kits include installation hardware and labels
- High voltage barrier and 5VA flame rated lens - suitable for open or fully enclosed luminaires
- JA8 Compliant



Specifications	
Input Voltage	UNV (120-277VAC)
Beam Angle	120°
Estimated Lumen Maintenance (L70)	Round and Rectangular models: L70 > 54,000hrs / L90 = 20,000hrs Linear models: L90 = 35,000hrs
Flicker Percentage	<30%
Operating Ambient Temp. Range (Ta)	-35°C to +50°C
PCB Material / Lens Material	MCPCB (superior thermal management) / Optical Grade Polycarbonate (5VA Flame rated)
Safety/Compliance	cULus Classified, cURus, RoHS, ENERGY STAR Luminaire 2.0 Listed, JA8 Compliant (2700K - 4000K @90CRI)
Protections	Surge 2.5kV; Over temperature control
Warranty	5 Years @ Max Tc from the date of manufacture

Product Models									
Model Number	Input Power	Max Lumens @4000K**	CRI	Available CCT	Shape	Dimensions (Inches)	ENERGY STAR Listed*	ENERGY STAR CSD*	
TJTUNV010ACyxxB	10W	1065	80/90†	Standard options: 2700K, 3000K, 3500K, 4000K Made-to-order: 5000K	Round	3.11 Dia. x 0.71 H			
VJTUNV010LNIyxxB05	10W	1087	90		Linear	5.52 L x 2.21 W x 0.67 H			
VJTUNV015LNIyxxB11	15W	1644	90		Linear	11.03 L x 2.21 W x 0.67 H			
TJTUNV015ACyxxB	15W	1680	80/90†		Round	5.08 Dia. x 0.75 H			
TJTUNV015ARyxxB	15W	1725	80/90†		Rectangular	7.40 L x 4.00 W x 0.71 H			
TJTUNV023ACyxxB	23W	2540	80/90†		Round	6.97 Dia. x 0.71 H			
VJTUNV030LNIyxxB22	30W	3235	90		Linear	22.06 L x 2.21 W x 0.67 H			
TJTUNV034ACyxxB	34W	3685	90		Round	9.55 Dia. x 0.81 H			

* ENERGY STAR designations: Listed = Luminaire 2.0. CSD= Certified Subcomponent Database

Part Numbering Key

V J T UNV 030 LN 9 30 B 22

CRI

Round & Rectangular models
Standard: 9 = 90

Linear models
Standard: 9 = 90

Color Temperature

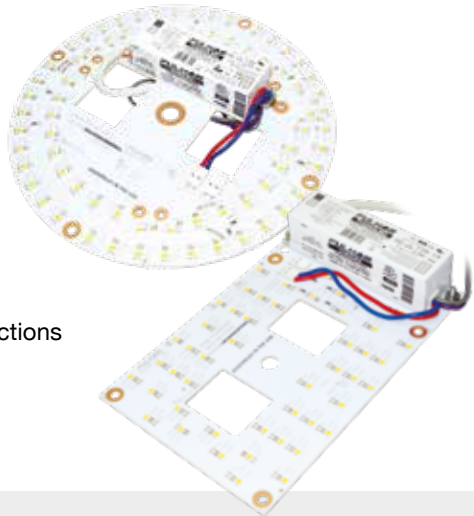
Standard: 27 = 2700K
30 = 3000K
35 = 3500K
40 = 4000K

Made-to-order: 50 = 5000K



DC LED Engine Retrofit Kits

- Highly efficient LED technology reduces energy costs
- Protects investment by preserving existing luminaires
- No bulbs to change means lower maintenance costs
- Simple installation can be done in the field in minutes
- ENERGY STAR® Luminaire 2.0 Listed and CSD for utility rebate eligibility. Visit www.fulham.com/utilityrebates to learn more.
- Kits include installation hardware, required UL Classified labels, and installation instructions



Specifications	
Input Voltage	120~277VAC +/- 10% (50/60Hz)
Operating Temperature Range	-35°C to 60°C / -31°F to 140°F
Lumen Maintenance @105°C	L70= >60,000 hours / L90= 40,000 hours (@Tc max = 105°C)
Dimming Type / Range	0-10V / 100% ~ 10%
Color Consistency	Binning per ANSI C78.377-2015 @25°C; 3 SDCM
PCB Material / Connector Qty / Em. Connection	CEM1 / 2 / Yes
Input Surge Test	2.5kV Common and Differential mode (Per ES Ring Wave Test)
Warranty	5 years @ Max. Tc from the date of manufacture
Safety/compliance	cURus (File # E351548, E342838), cULus (File # E365124), RoHS Compliant, Energy Star Luminaire 2.1 Listed and CSD

Product Models											
Model Number	Number of LEDs	Input Power (W)	Nom. Lum. @4000K/ 90CRI (lm)	Engine Efficacy @90CRI (lm/W)	Nom. Lum. @4000K/ 80CRI (lm)	Engine Efficacy @80CRI (lm/W)	Shape	Dimensions (inches)	ENERGY STAR Listed*	ENERGY STAR CSD*	
VKMUNV008RDyxxA	48	9	1190	132	1404	156	Round	7.83 Dia. x 0.92 H			
VKMUNV008RTyxxA	48	9	1190	132	1404	156	Rectangular	7.4 L x 4.7 W x 0.92 H			
VKMUNV012RDyxxA	72	13	1800	138	2115	163	Round	7.83 Dia. x 0.92 H			
VKMUNV018RDyxxA	48	20	2400	120	2820	141	Round	7.83 Dia. x 0.92 H			
VKMUNV018RTyxxA	48	20	2400	120	2820	141	Rectangular	7.4 L x 4.7 W x 1.18 H			
VKMUNV025RDyxxA	72	28	3415	122	4015	143	Round	7.83 Dia. x 1.18 H			

* ENERGY STAR designations: Listed = Luminaire 2.0. CSD= Certified Subcomponent Database

Part Numbering Key

V K M UNV 025 RD 8 30 A

CRI

8 = 80
9 = 90

Color Temperature

27 = 2700K
30 = 3000K
35 = 3500K
40 = 4000K
50 = 5000K

Standard stocked CRI/CCTs All CCTs and CRI not listed as standard are made to order. Contact Fulham for details.

8RD, 8RT, 12RD, 18RD, and 18RT models	80CRI: 2700K, 3000K, 3500K, 4000K	90CRI: 3000K
25RD models	80CRI: 2700K, 3000K, 3500K, 4000K, 5000K	90CRI: 3000K

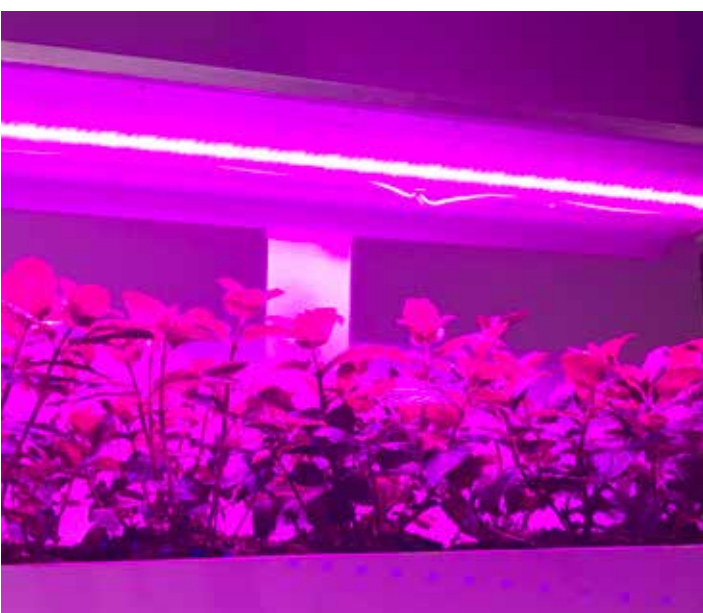


Low Profile Horticultural Modules

- Multiple color options: Full Spectrum, White + Red, Blue + Red
- Extruded aluminum material for superior thermal protection
- Low profile design for direct mounting to luminaire housing
- PPF/W up to 2.5 umol/j at hot state
- 22” or 44” lengths



Product Models			
Model Number	Colors	CRI	K
VHU125050LPFLSA	Full spectrum	90	4000
VHU240095LPFLSA			
VHU125050LPFWRA	White + Red (5:1 ratio)	90	6500
VHU240095LPFWRA			
VHU125050LPNBRA	Blue + Red (1:3 ratio)	-	-
VHU240095LPNBRA			



Horticulture 101:
Vertical Farming Growth



Exploding vertical farming popularity, for which LED is embraced, is attributable to a number of factors:

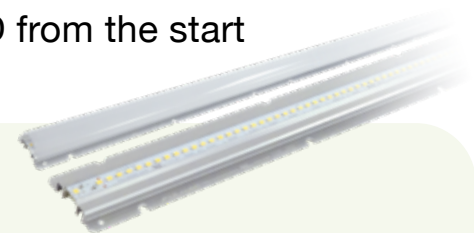
- Limited land and resources – Vertical farming uses approximately 90% less water, 70% less fertilizer and over 95% less land than traditional farms
- Much more manageable pest control
- Easier access when distribution/supply is strained, e.g. during COVID-19
- Need for non-seasonal food supply, despite weather
- “Farm to Table” freshness trends and lesser transportation costs
- Energy savings of LED, plus IoT-capable devices being integrated
- Few lighting retrofits; these newer farms adopt LED from the start



Dont see it? Ask for it!

A distinct advantage of Fulham is that we are the actual design engineers. Fulham is not merely a buyer / multiple-lister / re-brander and reseller.

Come to us with your specific application details and requirements. We'll get back to you with the feasibility of producing a custom solution!



 **HOTSPOT**
FULHAM

 **FIREHORSE**
FULHAM



Let's admit it. Deep down, we're all afraid of the dark. This is especially true in emergencies, when bad things can happen in the dark, even in familiar places. That's why, in modern times, we created emergency backup lighting, designed to kick in automatically when the main system goes down. This is usually a secondary generator or battery system that provides temporary illumination until a location is vacated, or the lights go back on. Until recently, backup lighting was noticeably inferior to the main system. It was, after all, designed to be just a stopgap measure, like those dinky 25-mile emergency spare tires. But now, based on increasingly stringent safety code requirements, the lighting industry has developed a variety of reliable, long-lasting and brighter-burning emergency systems. Explore on!



DID YOU KNOW?

A 1-foot model of Fulham's FireHorse "FirePumper" has been on display as part of the Fire Museum of Maryland's permanent collection since 2013.



HotSpot Plus LED Driver & Emergency System

The revolutionary HotSpot Plus LED Driver & Emergency System combines the functions of a dimmable, programmable LED driver, emergency LED driver, and replaceable backup battery in a single compact unit. Under normal conditions this all-in-one solution operates as a constant current driver; during a power outage the integrated battery automatically activates, providing reliable emergency illumination for safe building egress. Benefits include smaller size, simplified installation, and the ability to bring emergency LED capability to smaller luminaires.

- Programmable output current in 1mA increments
- UL 924 Self-Diagnostics
- Selectable emergency output:
 - 40W models: 5W for 180 minutes or 10W for 90 minutes
 - 70W model: 7W for 90 minutes, programmable for lower power and longer runtime
- Compact size and simple installation for maximum flexibility



HotSpot Plus LED Driver and Emergency System

Watts	Output Current (mA)	Output Voltage (VDC)	Model Number	Input Voltage (VAC)	Dimming Type	Ch.	Dimensions (L x W x H)	Case Type
40	250-1400	11-55	FHSAC1-UNV-40BLS	120-277; 50/60Hz	0-10V	1	6.37" x 3.13" x 1.54"	Compact w/ Bottom Leads
40	250-1400	11-55	FHSAC1-UNV-40C	120-277; 50/60Hz	0-10V	1	6.32" x 3.13" x 1.14"	Compact w/ End Leads
40	250-1400	11-55	FHSAC1-UNV-40L	120-277; 50/60Hz	0-10V	1	9.49" x 2.40" x 1.34"	Linear w/ End Leads
70	350-2400	11-55	FHSAC1-UNV-70S	120-277; 50/60Hz	0-10V	1	16.70" x 1.18" x 1.00"	Linear w/ Terminals

HotSpot Plus Accessories

FHS-TSTWL-BC	IP67, bicolor LED Indicator / test switch for use in exposed, outdoor-rated luminaires for 40W models
FHS-TSTWL-BC-S	IP67, bicolor LED Indicator / test switch for use in exposed, outdoor-rated luminaires for 70W model
FHS-EXT-48-TST	48" test switch extension cable

The Power of Programmability

All HotSpot LED drivers feature Fulham’s innovative SmartSet programming platform, which gives the user the power to create the right driver for any situation.

- Auto-Programming capability for high volume usage
- Driver does not need to be powered during programming
- Programming via handheld controller or PC software



TPSB-100
SmartSet Controller



SmartSet
Software

To see the Fulham SmartSet programming platform in action visit the links below:

Overview of basic programming features: www.fulham.com/smartsetprogramming

One touch Auto-Programming: www.fulham.com/smartsetauto

Programming custom dimming curves: www.fulham.com/smartsetdimmingcurve



HotSpot Constant Power Programmable LED Emergency Driver

Provides programmable, constant power emergency output for existing LED modules. Advanced features include self-diagnostics and detailed data logging. Meets CEC Title 20 battery charger requirements. Complete system includes emergency driver and emergency battery.



Specifications

Model Number	FHSCP-UNV-10P-L-SD	Output Type	Class 2
Input Voltage	100-277VAC, 50/60Hz	RFI/EMI	FCC Part 15A Non-Consumer
Input Current	0.06A Max.	Ambient Operating Temperature Range	10°C to 55°C (50°F to 131°F)
Output Power	1-10W	Dimensions (L x W x H)	7.89" x 2.05" x 1.17"
Output Current	620mA Max.	Battery Type / Recharge Time	LiFePO4 9.6VDC / 12 Hours
Output Voltage Range	16-55VDC	Input Surge Protection	Line-Neutral 2kV, Line & Neutral-Ground 2kV
Number of Output Channels	1	Warranty	5 years
Self-Diagnostics	Factory-enabled by default, can be disabled by luminaire manufacturer		
Bicolor LED Indicator	Included LED indicator/test switch provides automatic system status updates		

HotSpot Constant Power Programmable Battery Packs

Model Number	Max. Load for 90 Min	Capacity	Battery Voltage	Battery Type	RoHS	Recharge Time	Dimensions (L x W x H)
FHSBATL3-1.5-SD	5W	1500mAh	9.6V	LiFePO4	Compliant	12 hours	3.48" x 2.87" x 0.96"
FHSBATL9-.6-SD	6W	1800mAh					7.52" x 1.87" x 0.79"
FHSBATL3-3-SD	10W	3000mAh					4.39" x 2.92" x 1.30"
FHSBATL6-1.5L-SD	10W	3000mAh					9.13" x 1.63" x 0.97"
FHSBATT8-C3L-SD	10W	3000mAh		NiCd	Exempt	24 hours	9.25" x 2.11" x 1.21"



HotSpot Constant Power LED Emergency Drivers

Adds field-installable emergency capability to LED luminaires. Provides backup power to the luminaire’s LED modules for at least 90 minutes. The cULus Classified driver is designed for flexibility, with multiple mounting options, a conduit feed, and an illuminated test switch.



Specifications

Input Voltage	120-277V (UNV)	Recharge Time	24 Hours	Illumination Time	Minimum 90 minutes
Output Voltage	10-55VDC	Ambient Temperature	0°C - 50°C	RFI/EMI	FCC Part 15A Non-Consumer
Surge Protection	Per C62.41 (TVS)	Output Type	Class 2		

HotSpot Constant Power LED Emergency Drivers

Model Number (CEC Title 20)	Output Power (W)	Output Lumens*	Output Current (mA)	Dimensions (L x W x H)
FHSCP-UNV-5WL	5	800	90-500	11.5" x 2.6" x 1.5"
FHSCP-UNV-7.8WL	7.8	1250	140-780	15.4" x 2.6" x 1.5"
FHSCP-UNV-10.7WL	10.7	1700	195-1007	15.4" x 2.6" x 1.5"
FHSCP-UNV-13.7WL	13.7	2200	250-1370	19.2" x 3.03" x 1.63"
FHSCP-UNV-17WL	17	2700	300-1700	19.2" x 3.03" x 1.63"

* Based on 160 lumens/Watt light source



FHSCP-UNV-4W-L

The Lighting Industry’s Smallest 4W Emergency Constant Power LED Driver



Provides constant power emergency output for existing LED modules. Meets CEC Title 20 battery charger requirements. This system includes emergency driver and integrated battery.



Specifications			
Model Number	FHSCP-UNV-4W-L	Output Type	Class 2
Input Voltage	120-277VAC, 50/60Hz	RFI/EMI	FCC Part 15A Non-Consumer
Input Current	0.1A Max.	Ambient Operating Temperature Range	5°C to 55°C (41°F to 131°F)
Output Power	4W	Dimensions (L x W x H)	5.34" x 1.69" x 1.01"
Output Current	333mA Max.	Battery Type / Recharge Time	LiFePO4 6.4VDC / 12 Hours
Output Voltage Range	12-55VDC	Input Surge Protection	Line-Neutral 1kV, Line & Neutral-Ground 2kV
Number of Output Channels	1	Warranty	5 years



FHSCP-UNV-10P-S-SD

10W Slim Emergency System Approximately 50% smaller than competition



Provides programmable, constant power emergency output for existing LED modules. Advanced features include self-diagnostics and detailed data logging. Meets CEC Title 20 battery charger requirements. This system includes emergency driver and integrated battery.



Specifications			
Model Number	FHSCP-UNV-10P-S-SD	Output Type	Class 2
Input Voltage	120-277VAC, 50/60Hz	RFI/EMI	FCC Part 15A Non-Consumer
Input Current	0.1A Max.	Ambient Operating Temperature Range	0°C to 55°C (32°F to 131°F)
Output Power	3-10W	Dimensions (L x W x H)	16.7" x 1.18" x 1.00"
Output Current	666mA Max.	Battery Type / Recharge Time	Lithium 11.1VDC / 12 Hours
Output Voltage Range	15-55VDC	Input Surge Protection	Line-Neutral 1kV, Line & Neutral-Ground 2kV
Number of Output Channels	1	Warranty	5 years
Self-Diagnostics	Factory-enabled by default, can be disabled by luminaire manufacturer		
Bicolor LED Indicator	Included LED indicator/test switch provides automatic system status updates		



FHSCP-UNV-6W-L-SD

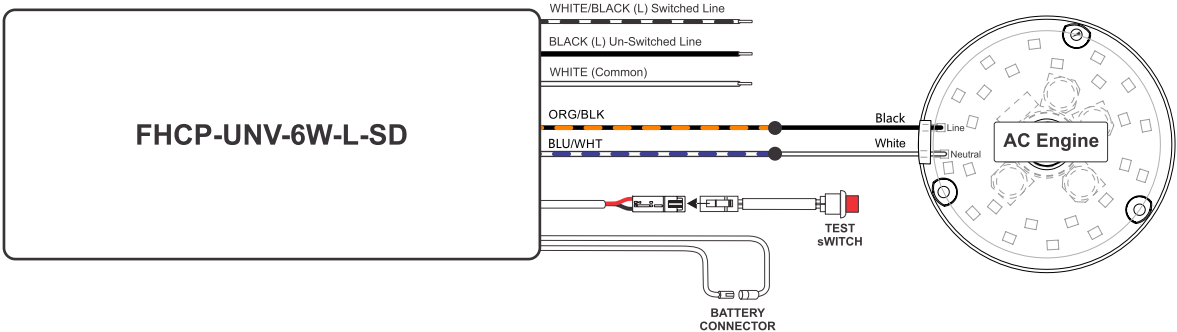
Field-Installable 6 Watt Emergency Driver for AC Engines



Most cost-effective emergency solution designed to operate Fulham AC LED engines (Ex. linear, round, rectangular)



Specifications			
Model Number	FHSCP-UNV-6W-L-SD	Output Type	Class 1
Input Voltage	120-277VAC, 50/60Hz	RFI/EMI	FCC Part 15A
Input Current	0.85A Max.	Ambient Operating Temperature Range	0°C to 50°C (32°F to 122°F)
Output Power	6W	Dimensions (L x W x H)	9.5" x 2.4" x 1.49"
Normal Output Voltage Range	120-277VAC	Battery Type / Recharge Time	Ternary Lithium Battery 11.1VDC / 12 Hours
Emergency Output Voltage Range	60-230VDC	Input Surge Protection	Line-Neutral 1kV, Line & Neutral-Ground 2kV
Number of Output Channels	1	Warranty	5 years
Self-Diagnostics	Factory-enabled by default, can be disabled in the field		
Bicolor LED Indicator	Included LED Indicator/test switch provides automatic system status updates		





25W Micro-Inverter / Emergency Power Supply

Works with any fixture(s) ≤150W for 25W of Constant Emergency Power for 90 minutes



Fulham’s innovative, new Micro-Inverter offers the ability to power any fixture in emergency mode at 25W for a period of 90 minutes.

Its uniqueness stems from its ability to run a fixture GREATER than 25W by using built-in 0-10V dimming wires. For example, the unit will scale down the power of a 150W fixture to 25W in Emergency Mode, allowing customers to use this inverter in high output applications where previously a costly inverter was the only solution.

The FHUPS1-UNV-25L-SD can support one fixture rated for 150W or multiple fixtures whose system wattage adds up to 150W in normal operation (although anything greater exceeds the input power rating of the unit.) This reduces the number of SKUs needed for emergency fixtures to save money.

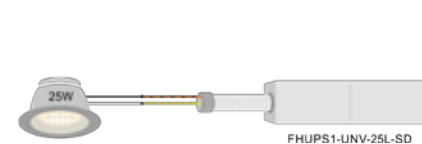
- Uninterrupted Power Supply
- UL listed and CEC Title 20 compliant
- Dims luminaires of up to 150W down to 25W(45VA) in emergency with 0-10V dimming; 25W(45VA) max without 0-10V dimming
- Conduit for leads
- Under voltage protection, short circuit protection, overload protection



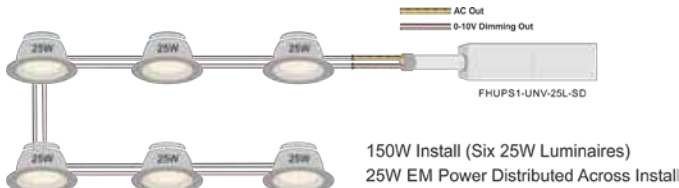
- Easy installation time: no need to open up a luminaire to connect this device to the driver.
- Can be used with luminaires where the driver is not accessible, e.g. UFO high bays
- Saves money: higher wattage fixtures previously required a higher wattage/higher cost inverter
- Self diagnostic standard
- RJ11 port allows Bluetooth compatibility

Specifications			
Model Number	FHUPS1-UNV-25L-SD	Output Type	Class 1
Input Voltage	120-277VAC, 50/60Hz	RFI/EMI	FCC Part 15A
Input Current	0.12A Max.	Ambient Operating Temperature Range	0°C to 50°C (32°F to 122°F)
Input Power	11W	AC Drive Input Power	150W Max (0-10V dimming required past 25W)
Output Power	25W (45Va) Max	Dimensions (L x W x H)	15.3" x 2.9" x 1.5"
Normal Output Voltage Range	120-277VAC.	Battery Type / Recharge Time	LiFoPo4 3600mAh / 12 Hours
Emergency Output Voltage Range	120/220/277VAC	Input Surge Protection	Line-Neutral 1kV, Line & Neutral-Ground 2kV
Number of Output Channels	1	Warranty	5 years
Self-Diagnostics	Factory-enabled by default, can be disabled in the field		
Bicolor LED Indicator	Included LED Indicator/test switch provides automatic system status updates		

Wiring one single luminaire without 0-10V dimming



Wiring multiple luminaires with 0-10V dimming



Fluorescent Emergency Ballasts

- Wide range of lamp and ballast compatibility
- CEC Title 20 Compliant models available
- UL listed for damp locations
- Integrated LED power indicator/test switch



Specifications			
Operating Voltage	UNV 120 - 277V	Fixture Wiring	Switched or Unswitched
		Minimum Emergency Operation	90 Mins.
Frequency	50/60Hz	Min. Required Charging Time	24 Hours
Regulatory Compliance	Meets or Exceeds N.E.C./LSC	Test Switch / Indicator	LED Push Button
Battery Type	High Temp. Long Life Rechargeable NiCd	Optional Wall Plate: FHSWLPWH	Used for remote mounting of test switch

FireHorse Ballast Models								
Model Number	AC Input (W)	Standby Power Rating (W)	Max Charge Current (120VAC)	Battery Voltage (VDC)	Battery Rating (Wh)	Dimensions (L x W x H)	Weight (lbs)	Warranty (Yrs.)
FH7-UNV-500L-CEC*	3	0.7	50mA	30mA	6.0	12.0	9.60" x 2.16" x 1.13"	1.7
FH11-UNV-750L-CEC*	4	0.4	50mA	30mA	3.6	14.4	9.37" x 2.33" x 1.53"	2.0
FH11-UNV-750L-CEC-A†	4	0.4	50mA	30mA	3.6	14.4	9.37" x 2.33" x 1.53"	2.0
FH12-UNV-1400L-CEC*	4	0.7	60mA	40mA	12.0	24.0	14.58" x 2.17" x 1.23"	1.7

* California Energy Commission Small Battery Charging Title 20 compliant † Conduit feed

FireHorse Lamp Operation | Also works with TLEDs. Check lamp manufacturers’ specifications for compatibility.

LAMP APPLICATIONS	FH7	FH11	FH12
FT - 4 pin			
FT18W	1	2	
FT24W	1	1 or 2	2
FT27W	1	1 or 2	
FT36W	1	1	1 or 2
FT39W	1	1	
FT40W	1	1	1
FT50W		1	
FT55W		1	1
CFQ - 4 pin			
CFQ13W	1	2	
CFQ18W	1		2
CFQ26W	1	1	2
CFTR - 4 pin			
CFTR13W	1	2	
CFTR18W	1	2	
CFTR26W	1	2	
CFTR32W	1	1	2
CFTR42W	1	1	
Circular-FCRT5			
22WCRT5	1	1	
40WCRT5	1		1
55WCRT5		1	
Circular-FCRT9			
32WCRT9	1	1	
40WCRT9	1	1	

LAMP APPLICATIONS	FH7	FH11	FH12
2D - 4 pin			
2D21W	1		
2D28W	1	1 or 2	1 or 2
2D - 4 pin			
2D38W	1	1 or 2	1 or 2
T5-Standard			
F14T5	1	1	2
F21T5	1	1	1
F28T5	1	1	1
F35T5		1	1
T5-HO High Output			
F24T5HO	1	1	2
F39T5HO	1	1	1 or 2
F49T5HO			1
F54T5HO (49W)	1	1	
F54T5HO	1	1	1
T8- Standard			
F17T8	1	2	2
F25T8	1	1 or 2	2
FB29T8			1
FBO31T8			1
F32T8 (25W)	1	1	
F32T8 (28W)	1	1	2
F32T8 (30W)	1	1	
F32T8 (32W)	1	1	1 or 2
F40T8	1	1	1

LAMP APPLICATIONS	FH7	FH11	FH12
T8- Standard (continued)			
F58T8		1	1
F70T8		1	1
T8-HO High Output			
F60T8HO		1	1
F72T8HO		1	1
T8-SL Slim Line			
F96T8SL			1
T12-Standard			
F20T12	1	2	2
F30T12		2	2
FB34T12	1 or 2		
F40T12		1 or 2	2
F40T12 ES (34W)	1 or 2		
F75T12, F85T12	1		
F85T12	1		
T12-HO High Output			
F48T12HO		1	
F60T12HO		1	1
F72T12HO			1
F96T12HO (95W)		1	
F96T12HO (110W)		1	1
T12-SL Slim Line			
F60T12SL		1	
F96T12SL		1	1



HotSpot2 LED Emergency System



Unlike the HoSpot1 LED Emergency System that comes equipped with separate LED modules, the HotSpot2 system operates a fixture's existing LED modules in emergency mode. HotSpot2 is a CEC-compliant, UL924 recognized emergency lighting system for use with LED modules driven by a constant current source.

The battery charger automatically adjusts to the connected battery, and output current can be set by a wiring harness or Fulham's SmartSet programming software, allowing a wide range of lumen outputs and runtimes. Self-diagnostic capability reduces liability and maintenance costs.

LED Fixture in Normal Operation



HotSpot2 in Operation During Power Outage



HotSpot2 LED Emergency System



The HotSpot2 emergency lighting system drives existing constant current LED modules during power outages. A complete system is composed of an emergency driver, emergency battery, and output wire harness. A wide range of lumen output and run times are available.



HotSpot2 Drivers		
Model Number (CEC Title 20)	FHS2-UNV-36L	FHS2-UNV-56S
Input Voltage	100-277VAC	
Input Frequency	50/60Hz	
Input Current	0.1A Max	
LED Currents	100mA - 700mA	
Standby Input Power	<0.8W	
Total LED Power	20W	
Input Surge Protection	2.5KV Ring Wave	
Over Current Protection	Fuse	
Illumination Time	90 - 350 Min	
LED Connection	Series	
LED Output Protection	Self Resetting PTC	
Output Classification	UL1310/Class 2	
Bicolor LED Indicator	Included LED indicator / test switch provides automatic system status updates	
Output Voltage	12 - 55VDC	12 - 56VDC
Dimension (L x W x H)	5.3" x 1.7" x .93"	9.5" x 1.19" x 1"

HotSpot2 Emergency Battery Packs

Model Number	Dimensions (L x W x H)	Chemistry	Capacity (mAh)	Battery Count	Recharge Time	Max. Load for 90 min. (W)	
						-36L	-56S
FHSBATT8-AA.9	5.23" x 2.5" x 0.7"	NiCd	900	8 Cells	24Hrs	4	4
FHSBATL3-1	3.48" x 2.35" x 0.99"	LiFePO4	1000	3 Cells	24Hrs	4	4
FHSBATL6-.6	5.23" x 1.87" x 0.85"	LiFePO4	1200	6 Cells	24Hrs	6	4
FHSBATL3-1.5	3.48" x 2.76" x 0.99"	LiFePO4	1500	3 Cells	24Hrs	8	8
FHSBATL3-1.5S	8.87" x 1.11" x 0.96"	LiFePO4	1500	3 Cells	24Hrs	8	8
FHSBATL9-.6	7.52" x 1.87" x 0.85"	LiFePO4	1800	9 Cells	24Hrs	10	8
FHSBATTCC3-3†	6.00" x 3.60" x 1.55"	LiFePO4	3000	3 Cells	24Hrs	14*	14*
FHSBATL6-1.5	5.70" x 2.76" x 0.99"	LiFePO4	3000	6 Cells	24Hrs	16	14
FHSBATL6-1.5L	7.89" x 1.56" x 0.92"	LiFePO4	3000	6 Cells	24Hrs	16	14
(with optional mounting bracket)	9.07" x 1.63" x 0.93"		3000	6 Cells	24Hrs	16	14
FHSBATL6-1.5S	16.67" x 1.11" x 0.96"	LiFePO4					
FHSBATT8-C3	4.15" x 3.29" x 2.11"	NiCd	3000	8 Cells	24Hrs	16	16
FHSBATT8-C3L	7.89" x 2.17" x 1.04"						
(with optional mounting bracket)	9.07" x 2.18" x 1.07"	NiCd	3000	8 Cells	24Hrs	16	16
FHSBATL3-3	4.39" x 2.82" x 1.3"	LiFePO4	3000	3 Cells	24Hrs	16	16
FHSBATT8-D4	4.89" x 3.84" x 2.72"	NiCd	4000	8 Cells	24Hrs	20	20
FHSBATL6-3	7.52" x 2.82" x 1.3"	LiFePO4	6000	6 Cells	32Hrs	20**	20**
FHSBATL6-3L	7.94" x 2.17" x 1.21"						
(with optional mounting bracket)	9.13" x 2.21" x 1.28"	LiFePO4	6000	6 Cells	32Hrs	20**	20**

† Cold Pack Battery: -20°C minimum operating temperature * Rated 10W for Canada ** Rated 16W for Canada

HotSpot2 Accessories

Wiring harnesses:

Used to set the output current to the LED module during emergency operation. Using lower current will allow longer run times.

Model Number	mA	Model Number	mA	Model Number	mA
FHS-HARNESS-100	100	FHS-HARNESS-250	250	FHS-HARNESS-550	550
FHS-HARNESS-125	125	FHS-HARNESS-300	300	FHS-HARNESS-600	600
FHS-HARNESS-150	150	FHS-HARNESS-350	350	FHS-HARNESS-650	650
FHS-HARNESS-175	175	FHS-HARNESS-400	400	FHS-HARNESS-700	700
FHS-HARNESS-200	200	FHS-HARNESS-450	450		
FHS-HARNESS-225	225	FHS-HARNESS-500	500		
FHS-TSTWL-BC	IP67, bicolor LED Indicator / test switch for use in exposed, outdoor-rated luminaires				
FHS-EXT12M	12" battery extension cable				
FHS-EXT-48-TST	48" test switch extension cable				

Also available: battery mounting brackets and wallplates. For more information, visit www.fulham.com



HotSpot1 LED Emergency System



Seamlessly add inconspicuous emergency lighting capability to existing non-emergency fixtures, such as recessed lighting and wall sconces, with the HotSpot1 modular LED systems.

A wide choice of lumen output levels, run times, discrete size, universal input voltage, and plug-n-play low voltage output wiring provide extreme adaptability, low cost of installation, and a high level of safety during operation.



Linear



H-configuration



HotSpot1 LED Emergency System



HotSpot1 systems add LED emergency lighting capability to existing luminaires, including TLED luminaires and retrofit projects. UL Classified kits are approved for field installation and are ideal for both fluorescent and Type A and B LED tubes. A complete kit includes an emergency driver, module, battery, installation instructions, and all necessary hardware and labels. The system operates independently of the luminaire's light source, ensuring compatibility with many types of luminaires.

HotSpot1 Emergency Driver		HotSpot1 Emergency Modules			
Model Number	FHS1-UNV-3.6L	Model Number	Watts	Shape	Applications
Input Voltage	100-277VAC (UNV)	FHS6-AR-3WL	3	Linear	Wall sconce, ceiling flush mount, low level lighting
Input Frequency	50/60Hz	FHS1-AR4-WL	4	Linear	Wall sconce, ceiling flush mount, low level lighting
Input Current	0.06 A Max.	FHS3-AR-6W-SH	6	Small-H	Wall sconce, ceiling flush mount
Input Wattage	10W Max.	FHS4-AR-8W-LH	8	Large-H	Wall sconce, ceiling flush mount
Standby Input Power	<0.8W	FHS3-AR-10W-SH	10	Small-H	Wall sconce, ceiling flush mount
Compatible Batteries	NiCd, 3.6 VDC	FHS4-AR-10W-LH	10	Large-H	Wall sconce, ceiling flush mount
Battery Capacities	3AH, 4AH, 8AH				
Total LED Power	1-10W				
Illumination Time	90 - 360 Min.				
Surge Protection	C62.41 (TVS)				
Over Current Protection	Fuse				
Recharge Time	32 - 48 Hrs				
LED Connection	Parallel				
LED Output Protection	Self Resetting PTC				
Output Classification	UL1310/Class 2				

HotSpot1 Emergency Battery Packs				
Model Number	Battery Qty/Type	Operation Duration	Output Power/Time	Dimensions (L x W x H)
FHSBATT3-C3	3/C	3 Amp/Hrs	4W: 145min, 6W: 90min	3.1" x 2.00" x 1.00"
FHSBATT3-D4	3/D	4 Amp/Hrs	4W: 200min, 6W: 125min, 8W: 90min	4.00" x 2.50" x 1.35"
FHSBATT3-F7	3/F	8 Amp/Hrs	4W: 360min, 6W: 235min, 8W: 175min, 10W: 135min	4.00" x 3.60" x 1.35"
FHSBATT3-F7L	3/F	8 Amp/Hrs	4W: 360min, 6W: 235min, 8W: 175min, 10W: 135min	11.75" x 1.56" x 1.37"

HotSpot1 LED Emergency Retrofit Kits



Model Number	Watts	Lumen Output	Comparable Fluorescent Lumen Output	Estimated Run Time (Mins)	Module Dimensions (L x W)	Case Qty.
Linear Module						
FHSKITT03LNC	3	450	720	145	4.68" x 0.82"	10
FHSKITT03LND	3	450	720	200	4.68" x 0.82"	10
FHSKITT03LNF	3	450	720	360	4.68" x 0.82"	20
FHSKITT03LNFL*	3	450	720	360	4.68" x 0.82"	20
FHSKITT04LNC	4	500	800	145	4.68" x 0.82"	10
FHSKITT04LND	4	500	800	200	4.68" x 0.82"	10
FHSKITT04LNF	4	500	800	360	4.68" x 0.82"	20
Linked Linear (2 Modules)						
FHSKITT07LND	7	900	1440	100	4.68" x 0.82"	10
FHSKITT07LNF	7	900	1440	180	4.68" x 0.82"	20
FHSKITT07LNFL*	7	900	1440	180	4.68" x 0.82"	20
Linked Linear (3 Modules)						
FHSKITT10LNF	10	1350	2160	120	4.68" x 0.82"	20
FHSKITT10LNFL*	10	1350	2160	120	4.68" x 0.82"	20
Small-H Module						
FHSKITT06SHC	6	750	1200	90	3.54" x 3.93"	10
FHSKITT06SHD	6	750	1200	125	3.54" x 3.93"	10
FHSKITT06SHF	6	750	1200	235	3.54" x 3.93"	20
FHSKITT10SHF	10	1250	2000	135	3.54" x 3.93"	20
Large-H Module						
FHSKITT08LHD	8	1000	1600	90	5.71" x 3.93"	10
FHSKITT08LHF	8	1000	1600	175	5.71" x 3.93"	20
FHSKITT10LHF	10	1250	2000	135	5.71" x 3.93"	20

* Linear battery



Civilized societies take seriously the health and security of their citizens. Therefore, they use technology not just for material practicality, but also for people's well-being. Along with the rise of social awareness, safety lighting evolved for normal daily convenience, and especially for emergencies.

Emergency lighting can be provided by just about any lighting technology. When trouble strikes, we don't much care about specifics - we just want to see well enough to get to safety. Fulham Engineering has developed a variety of reliable systems to handle any emergency lighting situation.



“DID YOU KNOW?”

The now universally identifiable 'running man' egress design was developed in the '70s by Japanese designer Yukio Ota and adopted for international use in 1985.

”



The EZ Exit LED Emergency System replaces one of the grid pieces in a T-grid ceiling. Once installed, it holds up a ceiling panel, while inconspicuously resting in place to be activated as Emergency lighting in a power outage.



Optionally use T-grid clips to secure the wire harness to the grid ceiling.



Driver Mounting Option A: Secure driver to a horizontal or vertical surface with screws.



Optionally use a caddy clip to secure the wiring harness to hanger wires.



Driver Mounting Option B: Use caddy clips to secure driver to hanger wires.



- Inconspicuous, architectural solution that nearly disappears into the ceiling
- Fits seamlessly into standard T-grid ceilings
- Replaces obtrusive “bug-eye” emergency lights
- Integrated test switch, multiple mounting options
- Constant power emergency driver provides reliable, high lumen output
- 2 foot or 4 foot lengths



Inconspicuous, hidden placement during normal conditions



Emergency LEDs activated during power outage

HotSpot EZ Exit T-Bar LED Emergency System



FHEZ10A24

24" EZ Exit Luminaire, 10.7W HotSpot Constant Power Emergency Driver
2 Caddy clips, 2 Silver clips, 4 Screws, 10' Extension harness



FHEZ17A48

48" EZ Exit Luminaire, 17W HotSpot Constant Power Emergency Driver
2 Caddy clips, 2 Silver clips, 4 Screws, 10' Extension harness

Specifications

Input Voltage	100-277VAC, 50/60Hz	Output Type	Class 2
Recharge Time	24 Hours	Surge Protection	Per C62.41 (TVS)
Emergency Operation	90 Minutes	Protective Lens	1.2mm Frosted Polycarbonate V-0 Flame rated
Operating Temp. Range (Ta)	0°C to 50°C / 32°F to 122°F	Lens Transmittance	15%
Module Case Temperature (Tc)	Tc max 90°C / 194°F	PCB Material	FR4
Estimated Lumen Maintenance	L70: >60,000Hrs / L90: 40,000Hrs	Warranty	5 years from the manufacture date
RFI/EMI	FCC PART15A Non-Consumer		

Product Models

Model Number	Max Input Current (A)	Nominal Input Power (W)	Output Power (W)	Module Operating Voltage (VDC)	Max Lumen Output(lm)	Battery	Dimensions (L x W x H)
FHEZ10A24	0.087	5.7	10.7	26.2	1300	NiCd 9.6Vdc	23.9" x 1.02" x 1.86"
FHEZ17A48	0.11	7.9	17	25.8	2200	NiCd 14.4Vdc	47.9" x 1.02" x 1.86"

* CEC Title 20 Compliant

Visit Fulham.com or [YouTube.com/FulhamItgco](https://www.youtube.com/FulhamItgco) to see the EZ Exit in action



VALUE COMPARISON: HotSpot EZ Exit Emergency System vs. “Bug Eye” Emergency Lights



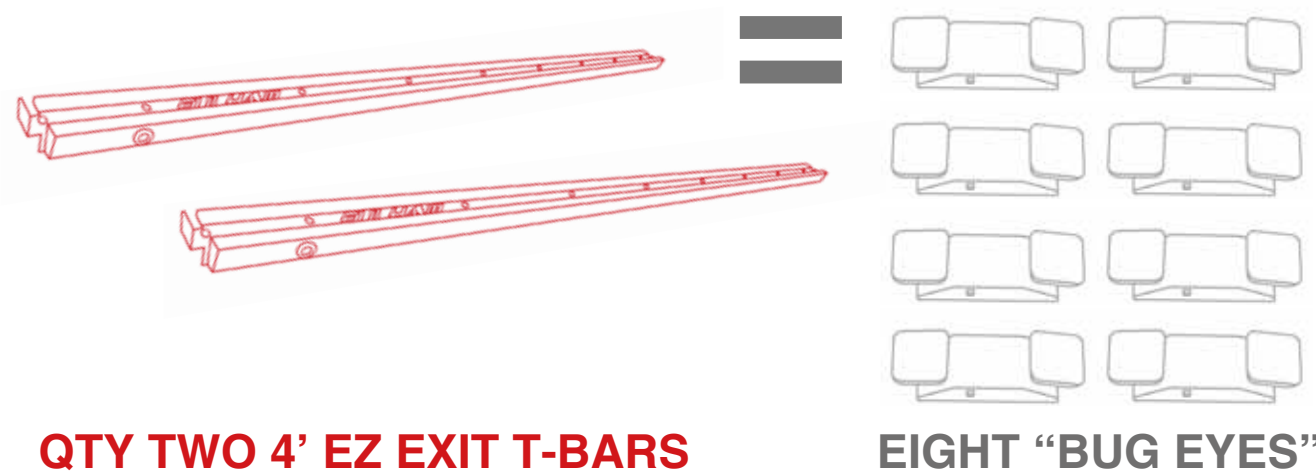
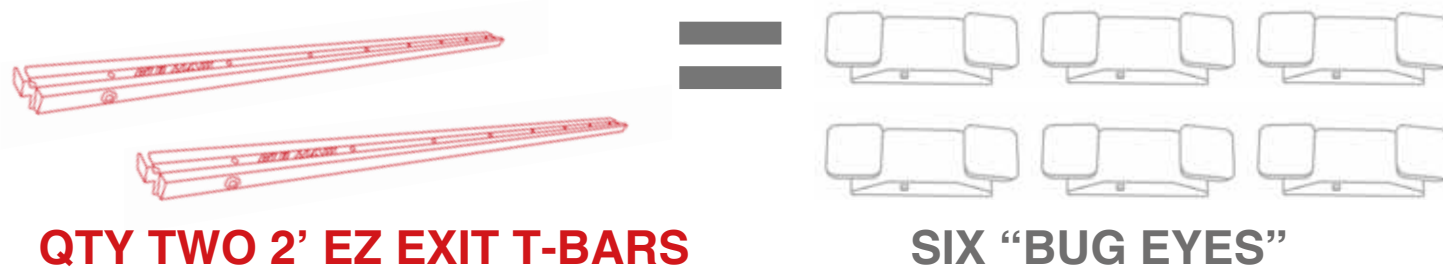
The award-winning HotSpot EZ EXIT T-Bar LED Emergency System fits seamlessly into standard T-grid ceilings, providing an ideal architectural alternative to more noticeable, unattractive “bug eye” emergency lights. In normal conditions, you barely notice they are there!

A unique ‘one phase installation’ process allows for simple and quick EZ Exit Emergency T-Bar installation compared with bug eyes. There’s no hole to cut, no wire to fish, no mud ring needed and no wall to repaint.

Additionally, the high lumen output of EZ Exit lighting means that a single luminaire can often replace multiple bug eyes, even further decreasing installation, labor, testing and maintenance time.

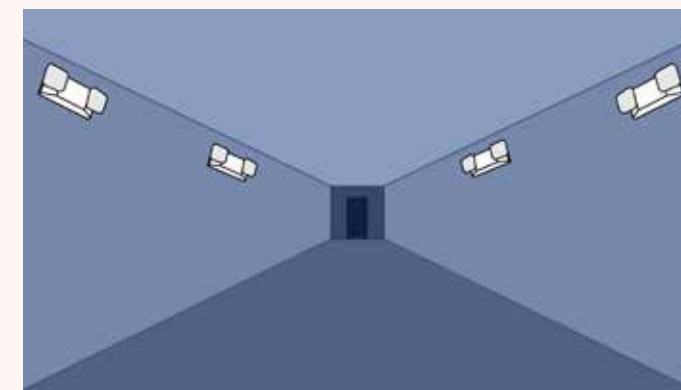
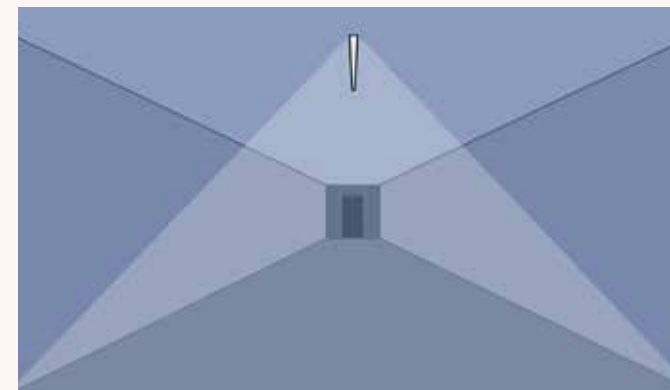
The product acquisition cost itself may create a false impression that these seem more expensive than bug eyes at first glance, but it’s no contest after weighing all the factors. They truly result in measurable savings! EZ installation, EZ savings... an EZ decision to make!

EZ EXIT VS. “BUG EYE”: FOOTCANDLE COMPARISON* (Approx)



*Approximation based on foot candles in a controlled environment. Variables such as the walls and paint colors of floors can affect this comparison.

TWO 4’ EZ EXIT T-BARS VS. EIGHT “BUG EYES” IN 60’ HALLWAY: INSTALLATION COST COMPARISON



<p>Two 4’ EZ Exit T-Bars</p> <p> 2 Hours</p>	<h1>VS</h1>	<p>Eight “Bug Eyes”</p> <p> 16 Hours</p>
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**INSTALLATION COST:
AT \$65 PER HOUR**

\$130
EZ EXIT

VERSUS

\$1040
“Bug Eyes”

TESTIMONIAL



“The EZ Exit product is awesome and definitely serves a real purpose in our industry. The 4’ units are great. I have sold quite a few for both open ceilings and drop ceilings. When I first show this to electricians, they don’t know what it is, but once they see it in action, it’s sold! I’m fully convinced that it’s truly just a matter of educating people about these, before they take off. They’re different, but they really work!”

- Scott of City Electric Supply



Emergency Lighting

Reliable, energy-efficient emergency lights in a variety of styles and sizes



Low Profile Emergency Lighting				
Model Number	Housing Color	Light Source	Operation Mode	Features
FHEM10W*	White	LED	Battery Back Up	Adjustable Heads
FHEM10WH*				High Lumen Output
FHEM10WHW*				High Lumen Output / Wet Location
FHEM10WHU*				High Lumen Output / Universal Voltage
FHEM10WHUW*				High Lumen Output / Universal Voltage / Wet Location
FHEM11W	White	Halogen 5.4W	Battery Back Up	Adjustable Heads / Self-Diagnostics and Remote Capability Available
FHEM12W	White	LED	Battery Back Up	Fully Adjustable Heads
FHEM12WW				Fully Adjustable Heads / Wet Location
FHEM16W*	White	LED	Battery Back Up	High Lumen Output / Self-Diagnostics and Remote Capability Available

* CEC Title 20 Compliant



Emergency Lighting / Exit Sign Combo

Versatile emergency light and exit sign combination units with remote head capability



Emergency Lighting / Exit Sign Combo					
Model Number	Description	Housing Color	Letter Color	Operation Mode	Features
FHEC30WR	Combo	White	Red	Battery Back Up	Micro LED Heads
FHEC30WG			Green		
FHEC31WR	L5.4 Watt T5 Wedge Base Combo	White	Red	Battery Back Up	Two 5.4W Heads / Remote Capability Available
FHEC31WG			Green		
FHEC33WR	High Brightness Combo	White	Red	Battery Back Up	LED High Output Heads / Remote Capability Available
FHEC33WG			Green		
FHEC34R	Wet Location Combo	White	Red	Battery Back Up	Wet Location / Remote Capability Available
FHEC34G			Green		
FHEC35R	Thermoplastic Slim Adjustable Combo	White	Red	Battery Back Up	Self-Diagnostics and Remote Capability Available
FHEC35G			Green		

= Self-Diagnostic



LED Exit Signs

Dependable LED exit signs with slim profile and edge-lit options



Model Number	Description	Housing Color	Letter Color	Operation Mode	Features
FHEX20WREM	Slim Profile Thermoplastic Micro LED Exit Sign	White	Red	Battery Back Up	Micro LED
FHEX20WGEM			Green		
FHEX21WREM	Thin Profile Thermoplastic LED Exit Sign	White	Red	Battery Back Up	Self Diagnostic and Remote Capability Available
FHEX21WGEM			Green		
FHEX21WRAC			Red	AC Only	
FHEX21WGAC			Green		
FHEX23ASGEM	Edge-Lit LED Exit Sign	Aluminum	Green	Battery Back Up	Recessed Mount
FHEX24ASREM	Edge-Lit LED Exit Sign	Aluminum	Red	Battery Back Up	Surface Mount
FHEX24ASGEM			Green		
FHEX26R	Wet Location LED Exit Sign	White	Red	Battery Back Up	Wet Location / Remote Capability Available
FHEX26G			Green		

We also have an expansive selection of Specialty / Regional Emergency Exit items available for review online, including:



Chicago Approved Exit Signage
FHCH21



New York City Approved Exit Lighting
FHN11



New York City Approved Exit Signage
FHN31

Visit www.fulham.com for additional options and accessories
Housing color, letter color, self-diagnostics, New York/Chicago models, remote heads, salida faceplates, wire guards, and more.



Edward E.
Hammer
Engineer

TWISTED LOGIC: THE CFL WAS BORN!

When the energy crisis struck large parts of the Western world in the 1970s, particularly the United States, it spurred a need for measures to conserve energy and led to a remarkable fluorescent breakthrough by electrical engineer Edward E. Hammer (1931 - 2012).

It was during this challenging period that Hammer led the development of a pioneering energy-efficient fluorescent lamp in 1973, which directly led to the invention of the compact fluorescent lamp (CFL) in 1976.



DID YOU KNOW?

The American Journal of Infection Control indicates that fluorescent UV light eliminates $\leq 97.7\%$ of pathogens in operating rooms, and researchers at Boston University confirm that UVC kills SARS-CoV-2, the virus causing COVID-19.



UV Germicidal & Tanning Ballasts

for air and water purification purposes



Standard Electronic UV Ballasts

Model Number	Operating Voltage (VAC)	Max. Input Current (A)	Rated Max. Load (W)	Min. Operating Temp.	Max Case Temp.	Dimensions (L x W x H)		
SHS2-MLT-L	120-240	0.33	41	0°C (32°F)	75°C (167°F)	6.45" x 1.49" x 0.96"	✓	✓
SHS3-MLT-L	120-240	0.29	58	0°C (32°F)	75°C (167°F)	6.45" x 1.49" x 0.96"	✓	✓
SHS1-UNV-C-I	120-277	0.408	45	0°C (32°F)	75°C (167°F)	5.05" x 2.36" x 1.00"	✓	
SHS5-024-C	24	2.59	41	0°C (32°F)	75°C (167°F)	3.64" x 3.12" x 1.01"	✓	
SHS10-UNV-H	120-277	1.25	150	0°C (32°F)	70°C (158°F)	10" x 2.6" x 1.26"	✓	✓
SHS14-UNV-H	120-277	1.6	150	0°C (32°F)	70°C (158°F)	10" x 2.6" x 1.26"	✓	✓
SHS11-UNV-H	120-277	1.35	190	-20°C (-4°F)	70°C (158°F)	10" x 2.6" x 1.26"	✓	✓
FEP-120-600-L	120	2.86	320	-18°C (0°F)	70°C (158°F)	19.25" x 3" x 1.25"	✓	
FEP-230-600-L	230	1.50	320	0°C (32°F)	70°C (158°F)	19.25" x 3" x 1.25"	✓	
SHGS1 MID 2 200 L	208-240	1.85	380	0°C (32°F)	75°C (167°F)	12" x 3.11" x 1.73"	✓	

Dimmable Electronic UV Ballasts For UV & Tanning

SHD21-230-L-I	230	1.64	320	0°C (32°F)	70°C (158°F)	16.69" x 1.72" x 1.18"	✓
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Low Temperature Ballasts

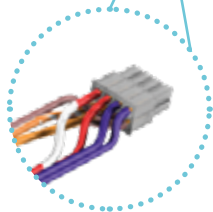
that automatically adjust in cold temperatures to provide optimal light output.



MINIMUM STARTING TEMPERATURE

-30°C -22°F

Operates T8, T10 & T12 Lamps



Standard Molex® Connectors
for Plug-n-Play commercial refrigeration applications

Specifications

Input Voltage	120V-277V; 50/60Hz
High Power Factor	> 0.98
ATHD	< 10%
Lamp Operation Mode	Programmed Start
Ignition Method	Programmed Pre-Heat Start
Min. Operating Temperature	-30°C (-22°F)

Fluorescent Low Temperature Electronic Ballasts

Model Number	Max. Current (A)	Max. Power (W)	Dimensions (L x W x H)	Weight (lbs)	Case Qty. (pcs.)
IH1-UNV-232-T8	.85	100	12.03" x 1.71" x 1"	1.4	25
IH2-UNV-270-T8	1.35	155		1.5	25
IH3-UNV-272T12HO	1.38	150		1.4	25

Lamp Operation

Model Number	# of Lamps	Lamp Type / Designation
IH1-UNV-232-T8	1 or 2	F25 / F32 / F40 T8
IH2-UNV-270-T8	1 or 2	F58 / F70 T8
IH3-UNV 272 T12HO	1 or 2	F48 / F60 T8HO, F48 / F60 T10VHO, F48 / F60 / F72 T12HO
	1	F72T8HO, F72T10VHO, F96T12VHO

Molex is a registered trademark of Molex Incorporated.



Compact Fluorescent (CFL) Electronic Ballasts



Specifications

Operating Voltage	120V-277V; 50/60Hz
ATHD	< 10%
Over Current	Fuse
Transient Protection	C62.41 Class A 7 strikes
Regulatory Approvals	UL & cULus Listed Type 1 Outdoor
EMI	FCC CFR Title 47 Part 18 non-consumer
High Power Factor	> .98
Ballast Maximum Case Temp.	167°F (75°C) - 5 Year Warranty
Ballast Maximum Case Temp.	194°F (90°C) - 3 Year Warranty
Lamp Starting Mode	Program Start
Inherent Thermal Protection	Class P



CFL Ballasts & Kits

Model Number	Max Load	Max. Current	Dimensions (L x W x H)	Weight	Case Quantity
RHA-UNV-226-C	57W	.52 A	5.1" x 2.4" x 1" (4.3" L case)	5.2 oz.	C Models: 50 pcs/ case Kits (K): 20 pcs/ case
RHA-UNV-242-C	84W	.752 A	5.1" x 3" x 1.3" (4.3" L case)	7 oz.	C Models: 50 pcs/ case



T5HO & T5HE Fluorescent Electronic Ballasts



T5HO & T5HE Fluorescent Ballasts

Model Number	Max. Load (W)	Max. Current (A)	Dimensions (L x W x H)	Connector Type	Case Qty (pcs.)
RHA-UNV-254-LT5	120W	1.0 A	9.53" x 1.32" x 1.05"	Leads	25
RHA-UNV-454-LT5†	240W	2.0 A	16.88" x 1.69" x 1.18"	Leads	20

† Made to order. Minimum order quantity applies.



Fluorescent Ballasts



Universal Voltage (120-277V)			
Model Number	Dimensions (L x W x H)	Input Current	Master Carton Qty.
WH41-UNV-L	9.48" x 1.41" x 1.02"	0.496A	25
WH43-UNV-L	9.48" x 1.41" x 1.02"	0.88A	25
WH44-UNV-L	9.48" x 1.41" x 1.02"	0.496A	25



Dedicated Voltage (120, 230, and 277V)							
Series	Model Number	Input Voltage (V)	Max Power (W)	Max Current (Amp)	Dimensions (L x W x H)	Configuration	Case Qty.
WORKHORSE 1	WH1-120-L	120	28	.10	5.92" x 0.94" x .76"	Linear case, side leads	90
	WH2-120-L	120		.33	5.52" x 1.25" x 1.02"	Linear case, side leads	50
WORKHORSE 2	WH2-120-C	120	35	.33	3.36" x 1.84" x 1.01"	Compact case, side leads	40
	WH2-277-L	277		.15	5.52" x 1.25" x 0.99"	Linear case, side leads	50
	WH2-277-C	277		.15	3.37" x 2.32" x 1"	Compact case, side leads	40
	WH2-277-L	277		.15	3.37" x 2.32" x 1"	Compact case, side leads	40
WORKHORSE 22	WH22-120-L	120	35	.25	5.52" x 1.25" x 1.02"	Linear case, side leads	50
	WH22-120-C	120		.25	3.36" x 1.84" x 1.01"	Compact case, side leads	50
	WH3-120-L	120		.56	6.48" x 1.50" x 1.02"	Linear case, side leads	50
	WH3-120-C	120		.56	3.8" x 2.5" x 1.01"	Compact case, side leads	60
WORKHORSE 3	WH3-230-L	230	64	.29	6.45" x 1.5" x 1"	Linear case, side leads	50
	WH3-277-L	277		.24	6.48" x 1.5" x 1.02"	Linear case, side leads	50
	WH3-277-C	277		.24	3.83" x 3.11" x 1.01"	Compact case, side leads	60
	WH3-277-L	277		.24	3.83" x 3.11" x 1.01"	Compact case, side leads	60
WORKHORSE 33	WH33-120-L	120	64	.53	6.48" x 1.5" x 1.02"	Linear case, side leads	50
	WH33-120-C	120		.53	3.64" x 3.12" x 1.01"	Compact case, side leads	60
WORKHORSE 4	WH4-120-L	120	70	.56	6.48" x 1.5" x 1.02"	Linear case, side leads	50
	WH5-120-L	120		1.15	8.5" x 1.73" x 1.01"	Linear case, side leads	50
WORKHORSE 5	WH5-230-L	230	128	0.57	9.5" x 1.73" x 1.01"	Linear case, side leads	50
	WH5-277-L	277		0.48	9.5" x 1.73" x 1.01"	Linear case, side leads	50
	WH5-277-L	277		0.48	9.5" x 1.73" x 1.01"	Linear case, side leads	50
WORKHORSE 6	WH6-120-L	120	140	1.04	8.5" x 1.73" x 1.01"	Linear case, side leads	50
	WH6-277-L	277		0.50	9.5" x 1.73" x 1.01"	Linear case, side leads	50
	WH6-277-L	277		0.50	9.5" x 1.73" x 1.01"	Linear case, side leads	50
WORKHORSE 7	WH7-120-L	120	220	1.82	19.24" x 1.72" x 1.03"	Linear case, side leads	25
	WH7-120-H	120		1.82	11.73" x 3.23" x 1.23"	H can w/ magnetic footprint	16
	WH7-230-L	230		1.10	19.24" x 1.72" x 1.03"	Linear case, side leads	25
WORKHORSE 8	WH8-120-L	120	220	1.8	19.24" x 1.72" x 1.03"	Linear case, side leads	25



Canadian UL Listed WorkHorse Ballasts					
Model Number	Description	Model Number	Description	Model Number	Description
CWH2-120-C	WH2, 120V, Cube Case	CWH3-120-L	WH3, 120V, Long Case	CWH33-120-L	WH33, 120V, Long Case
CWH2-120-L	WH2, 120V, Long Case	CWH33-120-C	WH33, 120V, Cube Case	CWH5-120-L	WH5, 120V, Long Case

Find WorkHorse and LongHorse wiring diagrams here:
<https://www.fulham.com/contact-us/wiring-diagrams/>

Or scan this QR Code with your SmartPhone's camera >



Fluorescent Specifier Grade Ballasts



Specifier Grade T8/T12 Specifications	
Power Factor	98.5% Min.
ATHD	Less than 10%
EMI	FCC CFR Title 47 Part 18 non-consumer
Ballast Factor	>.87
Starting Method	T8: Instant Start T12HO: Modified Rapid Start
Regulatory Approvals	UL & cULus Listed Type 1 or Type 2
Inherent Thermal Protection	Class P
Transient Protection	C62.41 Class A 7 strikes
Dimensions (L x W x H)	T8: 9.5" x 1.3" x 1.0" T12HO: 9.5" x 2.3" x 1.6"
Lamp CF	< 1.7
Min. Starting Temp.	0°F (-18°C)
Weight	T8: 1.5 lbs. (700g) T12HO: 2.4lb. (1.09 kg)



Specifier Grade T8/T12 Ballasts										
Model Number	Input Voltage (VAC)	Input Power (W)	Max. Current (A)	Black/White Wires	Red Wires	Blue Wires	Yellow Wires	Case Qty (pcs.)	CEE	
WHSQ2-UNV-T8-IS	120-277; 50/60Hz	59	.50	25"	46"	31"	N/A	25	CEE	
WHSQ3-UNV-T8-IS	120-277; 50/60Hz	85	.71	25"	46"	31"	N/A	25	CEE	
WHSQ4-UNV-T8-IS	120-277; 50/60Hz	112	.93	25"	31"	31"	46"	25	CEE	



Remote Mount Electronic Ballasts



Specifications	
Power Factor	>0.9
THD	<34.6%
EMI/RFI Compliance	FCC Part 18-A
Sound Rating	"A"
Ballast Type	Instant Start
Voltage Transients	ANSI C82.11 - 1993
Input / Protection	FUSE
Remote Mounting	20ft Max
Min. Operating Temp	-30°C (-20°F)
Max. Case Temp	70°C (158°F)
Approvals / Class	UL Listed, Class "P", 1 or 2 Outdoor

- Operates up to 20ft. from lamp
- Versatile
- High Power Factor
- Energy Saving
- Lightweight
- Solid-State Electronics

Fluorescent Low Temperature Electronic Ballasts						
Model Number	Lamp Watts / Type	Lamps Operated	Input Watts	Line Current	Ballast Factor	Efficacy Factor
LH4-120L	F28T5	2	55	0.48	1.0	1.7



Pony Electronic Ballasts



Pony Electronic Ballasts			
Model	Model Number	Operates Lamps	Dimensions (Inches)
Pony for CFL	NPY-120-118-BL	1 x 13CFT/E, 18CFQ/E, 18CFTR/E	H 1", W 1.77", L 3.34"
	NPY-120-126-CFL	1 x 18CFT/E, 24/27CFT/E, 26CFQ/E, 26CFQ/E, 26CFTR/E, 32CFTR/E, 22CRT9	H 1.02", W 2.39", L 3.36"
	NPY-120-218-CFL	2 x 13CFT/E, 18CFQ/E, 18CFTR/E	H 1.02", W 2.39", L 3.36"



SugarCube Ballasts



Pony Electronic Ballasts			
Model	Model Number	Operates Lamps	Dimensions (Inches)
For T5 / T8 / T12	SC-120-108-LT5	1 x F6T5, F8T5	H 4.76", W 1.05", L .76"
	SC-120-213-LT5	1 x F21T5, F8T5 + F13T5; 2 x F13T5, F14T12	H 5.53", W 1.27", L 1.01"
	SC-120-115-CT8	1 x F14T8, F15T8, F17T8, F14T12, F15T12	H 3.09", W 1.45", L 1"
	SC-120-132-T8XL	1 x F15T8, F17T8, F25T8, F32T8	H 6.3", W 1.08", L 1.01"
For CFL & Circle	SC-120-113-CFL	1 x 13CFQ/E, F15T8, F17T8, 13W Spiral	H 3.09", W 1.45" L 1"
For UV Lamps	SC-120-287-CUV	1 x 180mm T5 UV, 287mm T5 UV	H 3.07", W 1.46", L 1"
	SC-230-287-CUV	1 x 180mm T5 UV, 287mm T5 UV	H 3.07", W 1.46", L 1"
For 230V	SC-230-113-CFL	1 x Quad (CFQ/E), 4 Pin 13W; 1 x Triple (CFTR/E), 4 Pin 13W	H 3.09", W 1.45", L 1"



U.S INNOVATION BY FULHAM

Fulham has a rich history of developing innovative, award-winning lighting solutions. From Fulham’s U.S. Headquarters near Los Angeles, California, Fulham Product Managers, Engineers, Salespeople and Marketers team up to develop innovative, new product ideas that are then researched, designed and manufactured by Fulham’s own factories abroad. This all occurs under Fulham’s direct supervision as a Prime Manufacturer, thus guaranteeing the extremely high quality upon which Fulham has built its reputation for over 25 years.

Our global lighting programs include:

- Wireless Control Systems
 - Programmable LED Drivers
 - Standard LED Modules & Drivers
 - Horticulture Modules
 - Everyday Electronic Fluorescent Ballasts
- Specialty Ballasts such as UV/Germicidal, Refrigeration, or Remote Mount
 - Electronic halogen transformers
 - Emergency lighting
 - Custom solutions
 - And more...



A Special Thank You to Fulham’s Warehouse Staff

Throughout this trying time, as the world grapples with this horrible pandemic, Fulham’s warehouse staff have been our “everyday heroes.” They have worked carefully and tirelessly to ensure that Fulham remains OPEN FOR BUSINESS and completely incident-free. Measures were implemented early on to operate with social distancing and proper personal protective equipment – a conservative model to follow wherever you are!

Fulham is proud of these dedicated colleagues who’ve helped us do our part delivering essential Germicidal UV ballasts, Refrigeration ballasts, and all kinds of replacement power supplies for crucial facility maintenance and new construction.

From your fellow colleagues, and on behalf of all of Fulham’s valued customers around the globe, Thank You Very Much.

WHY CHOOSE FULHAM?

- **Known and Trusted Worldwide:**
Successful Global Operation
- **Stable:**
25 Year Legacy, Stand Behind Our Products
- **Reputation for Quality:**
Minimal In-Field Service or Re-installations Required
- **Always Growing and Innovating:**
We are the Engineers (Not Just Buyers and Resellers)
- **Relevant:**
Strong foothold with new items in emerging markets; ongoing sales of legacy goods
- **Diversified in Technologies Served:**
Powered Light, Emergency and Control all under one roof
- **Varied Solutions (General & Specialty):**
20 Year Germicidal UV Program, Programs in Refrigeration, Horticulture and more
- **Resilient:**
Diverse Customer Base
- **Differentiated:**
Unique Sales and Marketing Approaches, broad product offering not reliant on one technology
- **Leading:**
#1 Independent Innovator of globally-mandated Emergency Lighting Solutions
- **Insulated:**
Redundant Sources of Supply (both India and Asia manufacturing)

LIMITED WARRANTY

Length of Warranty and Coverage

Warranty period will be determined from the date of manufacture as indicated by the date code stamped on each product and will be covered as follows:

- EliteControl™ – 5 Years*
- FarmHorse Modules – 5 Years*
- FireHorse™ – 2 to 5 Years
- FREELITE™ – 5 Years
- HighHorse™ Electronic HID Ballast – 3 Years
- HighHorse™ Induction – 5 to 7 Years (If installed per instructions)
- HotSpot™ – 5 Years*
- IceHorse™ Ballast – 3 Years
- LongHorse™ Electronic Remote Fluorescent Ballast – 5 Years
- LumoSeries™ – 5 Years
- PONY™ Electronic Ballast – 2 Years
- PONY™ Electronic SugarCube™ – 2 Years
- PONY™ Electronic Transformer – 2 Years
- RaceHorse™ Electronic Ballast – 70°C 5 Years, 90°C 3 Years
- SunHorse™ Ballast – 3 to 5 Years (depending on the model)
- SineHorse™ Ballast – 3 Years
- ThoroLED™ Drivers – 2 to 5 Years
- ThoroLED™ Modules/Engines – 3 to 5 Years*
- ThoroLED™ Retrofit – 5 Years*
- ThoroLED™ Luminaire – 5 Years*
- Vizion™ Modules/Engines – 5 Years*
- Vizion™ Retrofit – 5 Years*
- Vizion™ Luminaire – 5 Years*
- WorkHorse™ Electronic Fluorescent Ballast – 5 Years
- WorkHorse LED™ Drivers – 5 Years

* Covered defects for FarmHorse, Vizion, ThoroLED, and HotSpot LED modules. For purposes of this limited warranty, a defect in a module shall be defined as one or more individual LEDs dark at initial installation or greater than 10% of individual LEDs dark during the Warranty Period. Replacement and/or repair of individual Vizion, ThoroLED, or HotSpot LED Modules does not extend this limited warranty beyond the original Warranty Period.

Warranty Conditions

Fulham extends this express limited warranty only to the original purchaser or to the first user. This constitutes the complete warranty for the product. Fulham is not responsible for any auxiliary equipment not furnished by Fulham, which is used in connection with or attached to the product, or for operation of the product with any auxiliary equipment. Damage to all such equipment is expressly excluded from this warranty. In addition, Fulham is not responsible for any damage to the product resulting from the use of auxiliary equipment not supplied by Fulham.

Warranty Conditions Not Covered

This warranty is not applicable to any product manufactured by Fulham not installed and operated in accordance with:

- * Underwriters Laboratories Inc. (UL)
- * National Electrical Code (NEC)
- * Standards set by the International Electrotechnical Commission (IEC)
- * European Norms Electrical Certification (ENEC)
- * Applicable international federal, state and local codes
- * Remote applications beyond maximum distance noted on product specification sheet. If maximum distance is not provided, remote application is not covered.
- * Fulham specific, most recent instructions and application guidelines provided for installation of the product

Additionally, this warranty is not applicable to Fulham manufactured products that have been subjected to excessive stress including, but not limited to, operating temperatures exceeding the recommended maximum temperature on any part of the product.

Obtaining Warranty Service

If within the warranty period it appears that the installed product does not meet the warranty conditions specified, the purchaser must notify Fulham of its warranty claim. Fulham or its authorized service company will provide warranty service directly to you.

General Provisions

All responsibilities regarding the product are set forth by this warranty. Replacement or repairs of the product is your exclusive remedy. For purposes of clarity, “replacement or repairs of the product” does not include any removal or reinstallation costs or expenses, including, without limitation, any labor costs or expenses, shipping costs to return non-conforming products or any damages that may occur during the return of product to Fulham. If Fulham chooses to replace the product and is not able to do so because it has been discontinued or is not available, Fulham may replace it with a comparable product. Fulham reserves the right to use new, reconditioned, refurbished, repaired or remanufactured products or parts in the repair or replacement of any product covered by this warranty. If no replacement product is available, Fulham, solely at its discretion, may issue a credit for the product, prorated for its remaining warranty life.

This warranty is given in lieu of all other express warranties. Implied warranties, including those without limitation, warranties of merchant ability and fitness for a particular purpose, are limited to the duration of this limited warranty. Fulham shall in no event be liable for damages in excess of the purchase price of the product, for any loss of use, loss of time, inconvenience, commercial loss, lost profits or savings or other incidental, special or consequential damages arising out of the use or inability to use such product, to the full extent such may be claimed by law.

Local Exceptions

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, therefore the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and purchasers may have other rights that vary by jurisdiction.

Returned Materials Authorizations (RMA)

Customers shall contact Fulham directly for all RMA's.

After receiving the RMA, the user shall promptly return the product at the user's expense to Fulham after receiving instructions as to when and where to ship product. Failure to follow this procedure shall void this warranty. Should the number of pieces received by Fulham differ from the RMA either +/-, the customer will be notified and adjustments will be made at that time.

Fulham reserves the right to examine all failed products to determine the cause of failure and patterns of usage and reserves the right to be the sole judge as to whether any products are defective and covered under this warranty.

Contact Information

Fulham North America	+1 323 599 5001 warranty@fulham.com
Fulham Europe	warranty.eu@fulham.com

Effective: August 1st, 2018

FULHAM®

Harness the Horsepower



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