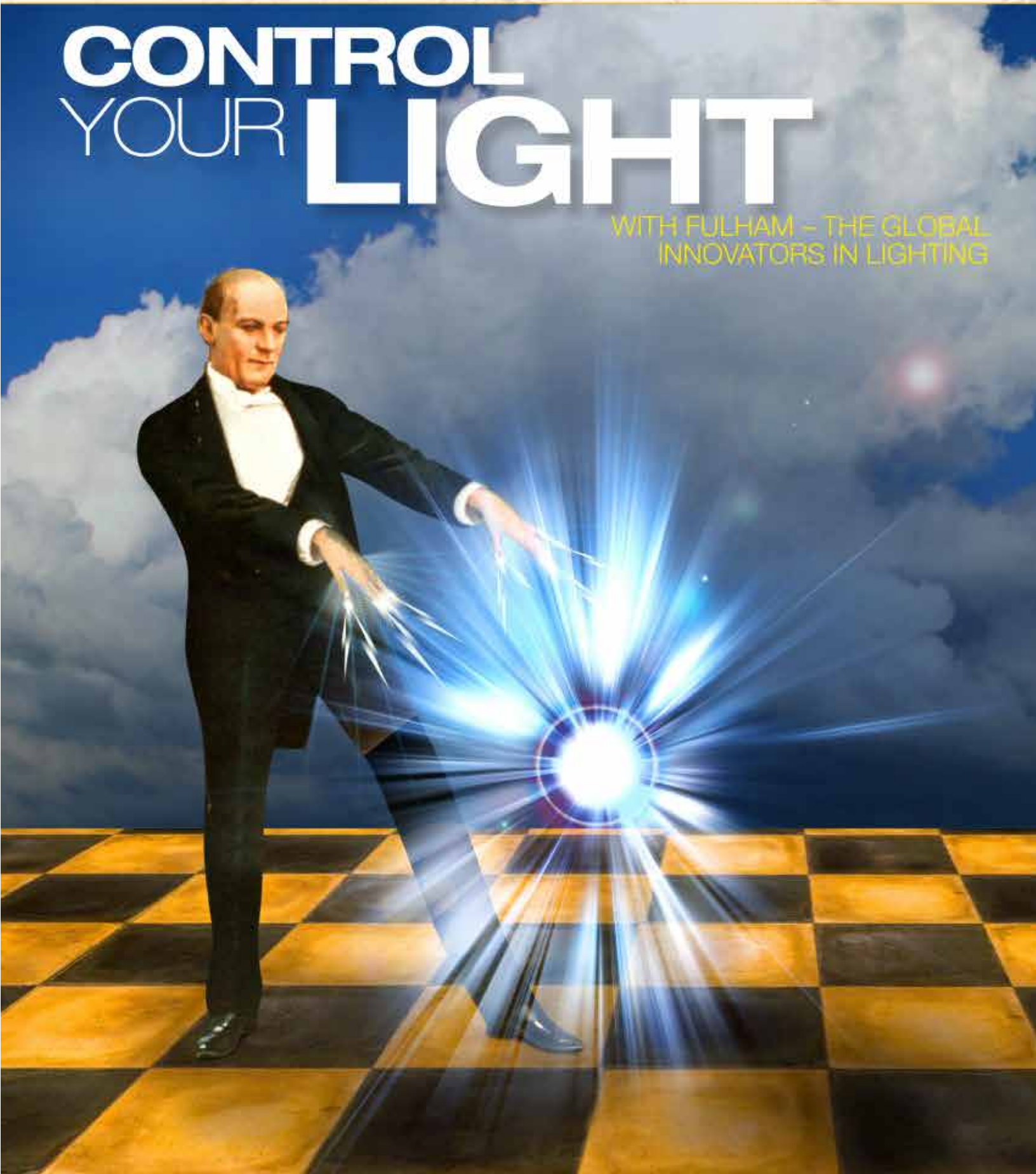
FULHAM
Lighting...Global. Intelligent. Sustainable.

CONTROL YOUR LIGHT

WITH FULHAM – THE GLOBAL INNOVATORS IN LIGHTING



LET THERE BE LIGHT... LIGHTING... AND LIGHTING CONTROL.

No, we're not trying to rewrite history. We don't suggest that Lighting Control Systems (LCS) are bolts from the blue; that they burst fully cooked from the head of Zeus. They evolved through the dogged effort and ingenuity of generations of curious, sometimes brilliant humans. Light itself is a physical phenomenon; a universal raw material: electromagnetic radiation, photons, wavelengths, particles, optical receptors – remember Science 101?

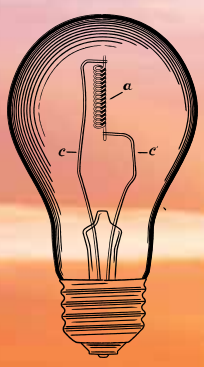
But Lighting is the conscious manipulation of Light, developed over thousands of years. The latest developments are Lighting Control Systems (LCS) -- producing and managing the most efficient lighting conditions possible. We owe this latest technology to the effort and ingenuity of generations of brilliant scientists. In these pages we will explain lighting control and its many benefits.

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!

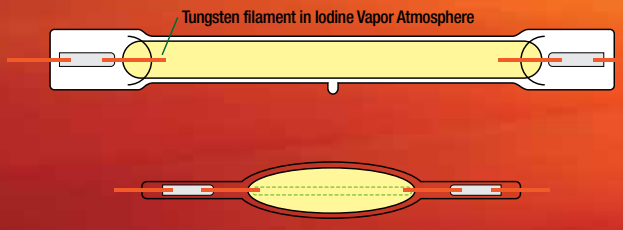
INCANDESCENT

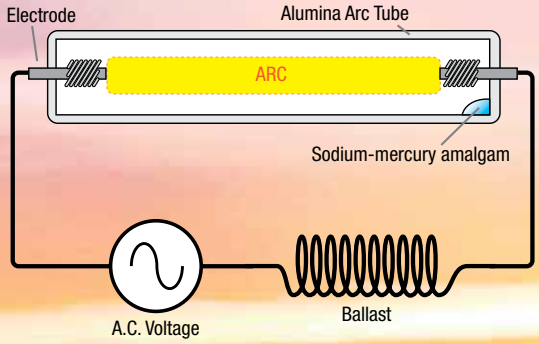
The incandescent lamp -- popularly called the "light bulb" -- came into widespread use roughly a century ago. Incandescence is produced by a heated, glowing filament sealed in a gas-filled (or vacuum) tube. Electricity surges in; a filament heats up; the bulb glows, produces light. (It also produces higher local temperatures and utility bills.)



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



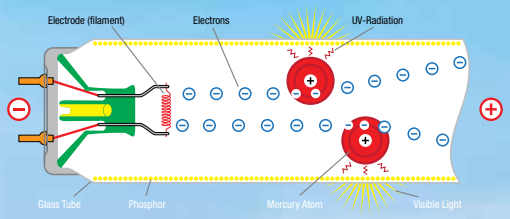


HID

High Intensity Discharge (HID) lamps fall into the gas-discharge lamp category. This means that 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." But despite their brilliance, HID lamps consume less energy than incandescent or fluorescent lamps, delivering more lumens per watt. HIDs' internal phosphor coating delivers a powerful and broad light spectrum, making them highly desirable for many uses in the home, in commerce and in industry.

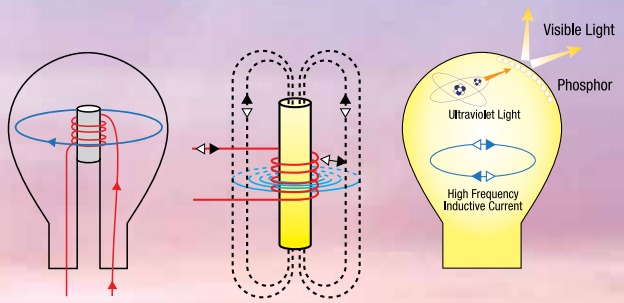
FLUORESCENT

Fluorescent lights are basically airtight tubes full of reactive gases that light up when electricity charges up their atoms, which then become... fluorescent. Compact fluorescent lamps (CFLs) are often either self-ballasted lamps or pin-based replacement lamps that operate using fluorescent technology in various residential and commercial applications, based on their relatively small sizes.



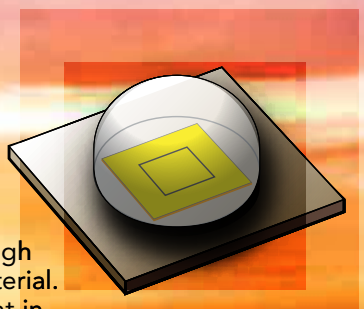
INDUCTION

Induction lighting is a hybridized form of fluorescent lighting, so it involves no electrodes. The "ignition system" isn't internal; it's not even electrical. The "spark plug" is a high frequency electromagnetic field, usually generated outside the tube. Since there are no



electrodes constantly heating up and cooling down, there are no electrodes to eventually burn out. This means longer, more efficient lamp life.

LED



Light Emitting Diodes (LEDs) operate by electroluminescence -- an optical phenomenon in which electrical current, in this case, triggers light emission as it passes through certain semiconductor material. LEDs are the source of light in light fixtures. 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. LED technology has allowed creation of architectural designs that were previously impossible.

PHOTOLUMINESCENT

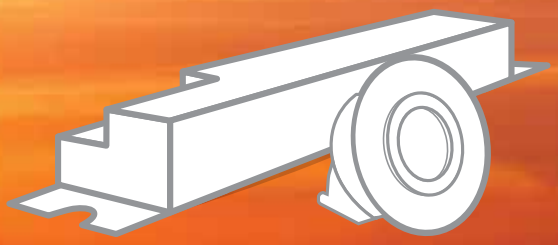
Photoluminescence (PL) is a phenomenon that lets certain substances absorb and hold photons, then re-emit them after the photon source is gone. It's like a rebound of the light the substance was exposed to. This is how glow-in-the-dark toys and signs work. PL is non-toxic, non-radioactive, and independent of electricity. It requires no batteries either, making it 100% dependable and highly cost effective. Super long-lasting PL can't experience power failure, because, as long as it is fully charged, it will "replay" that light when it's needed! This makes PL emergency lighting -- easily visible even in smoke and darkness -- ideal for safety code compliance nationwide.

PLASMA

Just think of plasma lamps as HID without the electrodes. Some science buffs even call plasma “the 4th state of matter.” Liquids, solids, gases… and this latest expression of light energy. 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 such small lamps.They’re rapid start, efficient, durable (hovering around 50,000 burn-hours) and eminently recyclable. At this writing, suitable applications for plasma technology are continuing to be explored.

LIGHTING CONTROL SYSTEMS (LCS)

Lighting Control Systems are to light what advanced music systems are to sound. 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. “No way!” you say? “Way!” we say. Read on and believe.



LIGHTING FIXTURE POWER SUPPLY & DEVICES

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

-- Sir Isaac Newton (1642 - 1727)

FULHAM 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 and at the U.S. Headquarters, where we host an on-site UL testing facility. 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 lighting solutions.

U.S. INNOVATIONS BY FULHAM

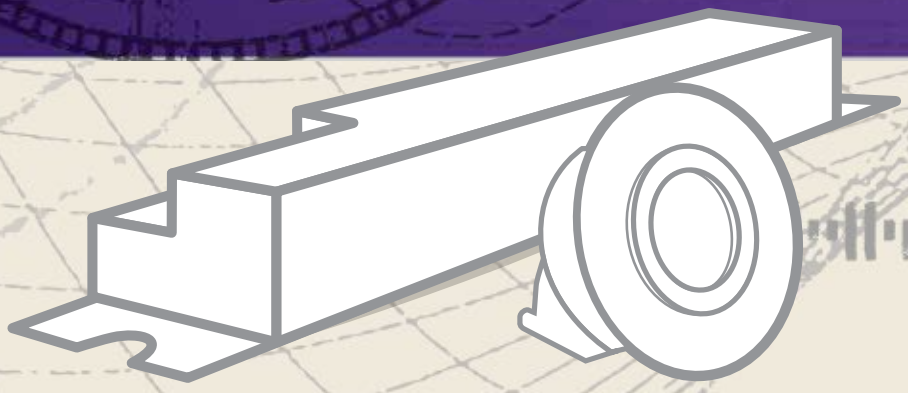
Fulham has a rich history of developing innovative, award-winning lighting solutions. From Fulham's U.S. Headquarters near Los Angeles, California, Fulham Product Managers and Engineers (working from our own UL Data Acceptance Program Testing Facility) team up to develop innovative, new product ideas 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 many years.

Our global programs include LED modules & drivers, electronic fluorescent ballasts & lamps, electronic halogen transformers, induction lighting systems, HID lighting systems, lighting control solutions, emergency lighting, photoluminescent egress solutions, custom solutions and more. Visit us online at www.fulham.com or contact Fulham Client Services for more information: order@fulham.com / (323) 599-5000.

CONTROL SYSTEMS
SMART MADE SIMPLE

Lighting Control Systems (LCS) may seem a bit mind-boggling at first, like all new technology. Remember your first computer? Baffling, abstract, complicated. But now you handle it without a second thought.

Guess what? LCS – for all its advanced capabilities – is as easy to use as your laptop. No bloated manuals, no tricky procedures to master. All you need to know are: (1) Which lighting scenes you want; (2) How to open a box; (3) How to use a plug. Okay, maybe you're not gizmo-friendly. Do not panic. Just hand the box to your in-house tech. Take an early lunch. Come back and enjoy your sophisticated new lighting environment! Engineers get paid to remove hassles.

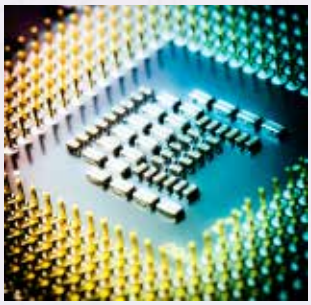


LIGHTING FIXTURE
POWER SUPPLY & DEVICES

Unlike earlier advances in the history of artificial light mentioned elsewhere in these pages, the modern state of lighting controls was not invented by any one genius, but furthered by many geniuses around the world, including Fulham's brilliant R&D team.

Through their constantly ingenious manipulation of atoms and energies, scientists and engineers are able to refashion the way the world works. Indeed, what the world IS! Once we discovered light, and kept insisting on making better and better light, human societies really got cracking. Literally -- not just metaphorically -- enlightened.

What is this thing called 'semiconductor'?



A "semiconductor" is neither a short band leader, nor a guy who drives an 18-wheeler. Electrical engineers use the term for materials (e.g., silicone, germanium) that conduct electricity better than insulators (e.g., glass, rubber), but not as well as true conductors (e.g., copper, rare gases).
Semiconductors permit nuanced control of electrical flow through circuits. Lighting engineers have employed semiconductors in many breakthroughs over the years. The transistor was one such advance. And now come Lighting Control Systems – the latest, greatest leap forward – made possible because semiconductors, wrapped in advanced technology, allow for extremely sophisticated management of two-way current flow.

LET'S GET small: Those Teeny Tiny Transistors.

Scientific progress typically moves from general theory to specific applications; from crude and cumbersome to refined and manageable. The engineer's mantra is "Lighter. Smaller. More efficient." Thus, stone clubs evolved into tasers; mainframes begat laptops; and now the telephone, camera, wristwatch, internet browser, calendar, note pad, address book and photo archive can all co-exist in palm-sized gizmos.

None of these astonishing advances would have been possible without the transistor. And the transistor would not have been inventable without the development of semiconductor technology (see above), which allowed unprecedented precision in current flow.

The "gateway" achievement in semiconductors created the physical basis for the transistor. When we hear the word "transistor," most adults remember the transistor radio. But transistors have quickly become the heart of virtually everything that runs on electrical current: lighting, telecommunications, computers, guided missiles, satellites, medical diagnostics – you name it. Now amazingly miniaturized, computers may contain billions of them; tiny calculators many millions – all functioning as internal "On-Off" switches and current modulators almost at the molecular level!

The main benefit of transistors: they replaced clunky, inefficient, fragile vacuum tubes. They generate less heat, waste less power and don't require warmup time. They operate at low voltage, so they're compatible with most small batteries. Unlike tubes, transistors are not vulnerable to shock. So they are reliable, versatile and durable – some operate for decades without replacement.

Although R&D is increasingly handled by teams of anonymous white-smocked Ph.Ds at universities, corporate labs and private research facilities, true progress still depends upon individual geniuses and their breakthrough thinking.

For the transistor, those individual geniuses were Bell Laboratory's John Bardeen and Walter Brattain, collaborating (and sometimes in competition with!) British-born physicist William Shockley. For their transistor work, that threesome was jointly awarded the 1956 Nobel Prize for physics.

Their contribution made the Information Age and the Internet possible.

In 1972, Bardeen shared a second Nobel Prize for physics – the only person ever so honored – this time for work in superconductivity. But by 1951 he had already moved to the University of Illinois (Urbana-Champaign). As Professor of both Electrical Engineering and Physics, he mentored Nick Holonyak, his first doctoral student (1954). His insight and guidance clearly contributed to Holonyak's 1962 invention of the first LED. (See page 75.) And so the torch of scientific progress is passed from genius to genius.

CONTROLLABLE LIGHTING SYSTEMS

"Hey, it's cold in here!"

Few of us would run the sprinkler hours after our lawn is already drenched. Or keep gulping water after we're no longer thirsty. Or want the light burning inside a closed refrigerator. Yet we think nothing of wasting electrical power inside empty rooms with many times the volume of a fridge.

WASTE MATTERS

Championship athletes train for the most efficient use of their bodies' energy. Grand Prix drivers fine tune their engines for the most efficient use of automotive energy. However, no matter what kind of lighting we use, the fact is that, in most cases, we all use too much of it. We waste light energy all over the place.

And waste is bad. Bad for profits, bad for the environment – and bad for engineers' self-esteem! So lighting scientists got together to solve the waste problem. And voila! Lighting Control Systems... the latest stage in the evolution of artificial light technology.

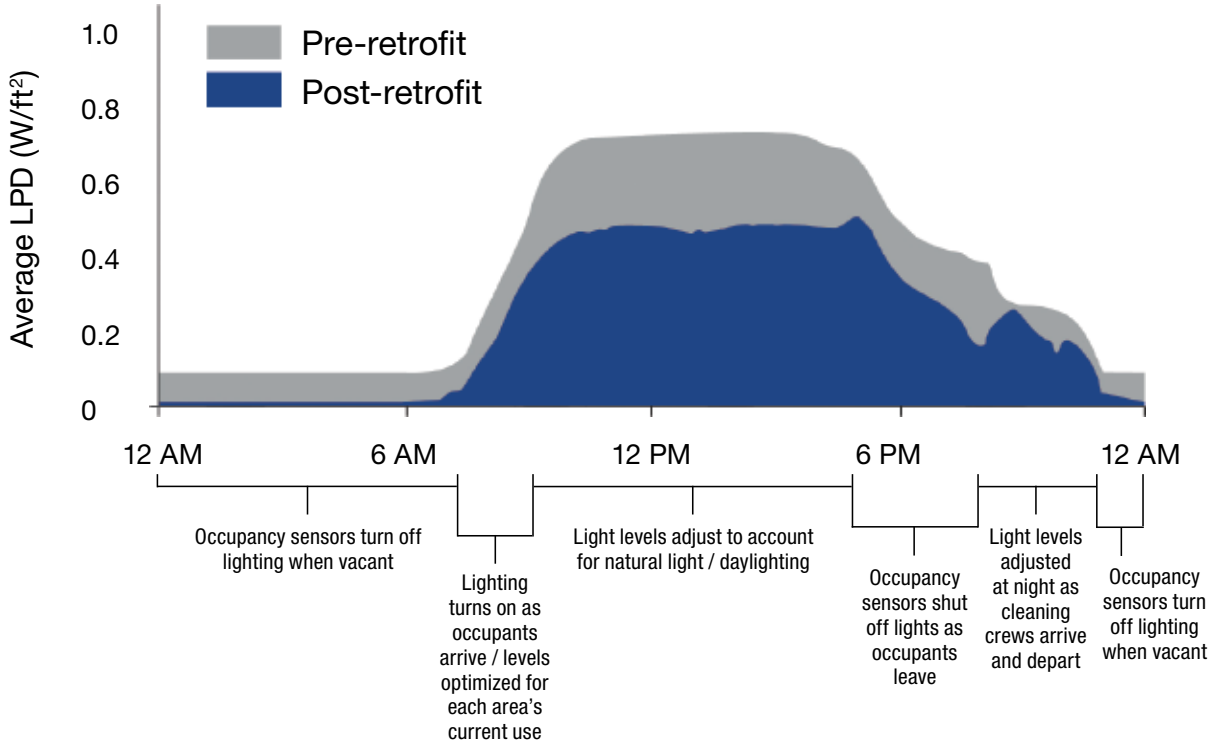
Smart people don't waste money on options they don't need. Serious mountain bikers find that a 10-speed makes sense. But they'd probably see no added value in a 175-speed bike. It's unlikely that the hundreds of ingredients

listed on a 24-page menu will be as fresh as the smaller selection in a high-quality, limited-menu restaurant.

Fulham's "prime directive" is to produce high quality lighting technologies, but never dilute their value by trying to make them all things to all people. The Fulham Lighting Control System is designed to coordinate many lighting configurations with widely adaptable ballasts and peripheral devices. We focused on that mission and (if we do say so ourselves) accomplished it brilliantly.

CONTROLS

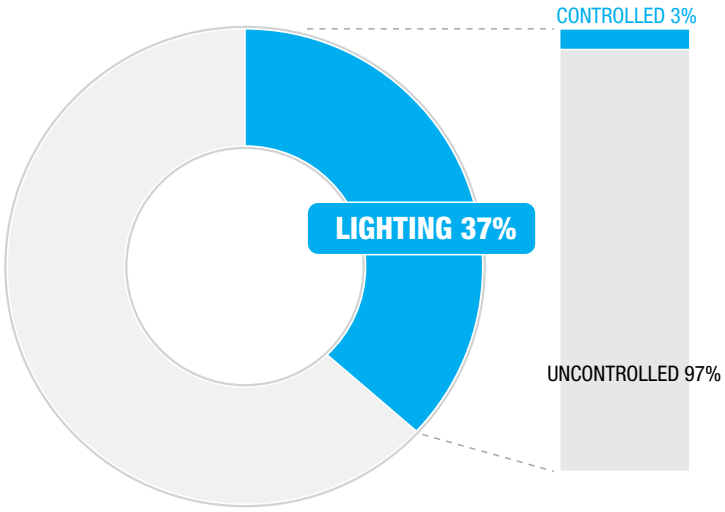
WEEKDAY LIGHTING LEVELS
COMMERCIAL BUILDING EXAMPLE



LIGHTING COST IN COMMERCIAL BUILDINGS

Commercial building lighting accounts for some 37% of all energy costs, yet only 3% of that lighting is "controlled." This offers an opportunity to save energy (and therefore to save money) with lighting control technology that senses occupancy, makes use of timers, and adjusts fixture light levels according to the light coming in through windows. Savings can reach 70% or even more – without changing the lighting type or removing existing fixtures.

Chart Reference:
Energy Information Administration, 2003 Commercial Buildings - Energy Consumption Survey, released April 2009. (www.eia.doe.gov/emeu/cbecs/cbecs2003/lightings.html) - J. Sweeny, 2009



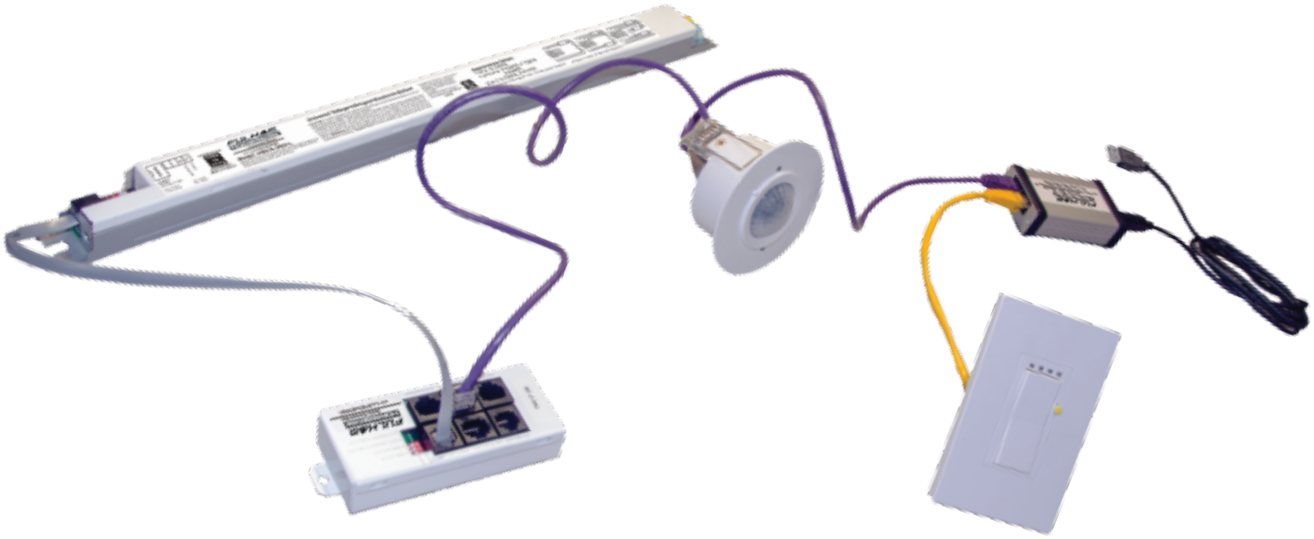
A-B-C... 1-2-3...
FLUORESCENT ROOM SOLUTIONS

Fulham Lighting Control ROOM SOLUTIONS provide efficient lighting control for virtually any warehouse, workplace, individual or multiple dwelling, corporate office, municipal area or entertainment venue.

Fulham's controllable fluorescent ballasts have individual, pre-programmed two-way communicators that the lighting control system recognizes. They're simple to install.

Fulham Lighting Controls work with fixtures and lamps of your existing lighting infrastructure.

Fulham's ROOM SOLUTION is simply "plug and play." No outside help is needed. It's self-explanatory, ready to go. Your own tech just slips the pre-addressed ballast out of the box and installs it into the fixture. Easy-shmeasy hookup to switches and sensors by way of interconnect hardware that uses common CAT5 cable. The computer control knows what to do from there on. So, if your LCS is an individual office, conference room or other self-contained workplace, there's no need for "commissioning" (no, not making a non-com an officer; just bringing in an outside specialist.)



CONTROLLABLE
LIGHTING SYSTEMS

- PLUG-N-PLAY "ROOM" SOLUTIONS (NO COMMISSIONING)
- FLUORESCENT CONTROLLABLE TECHNOLOGY PRESERVES YOUR EXISTING FIXTURE INVESTMENT

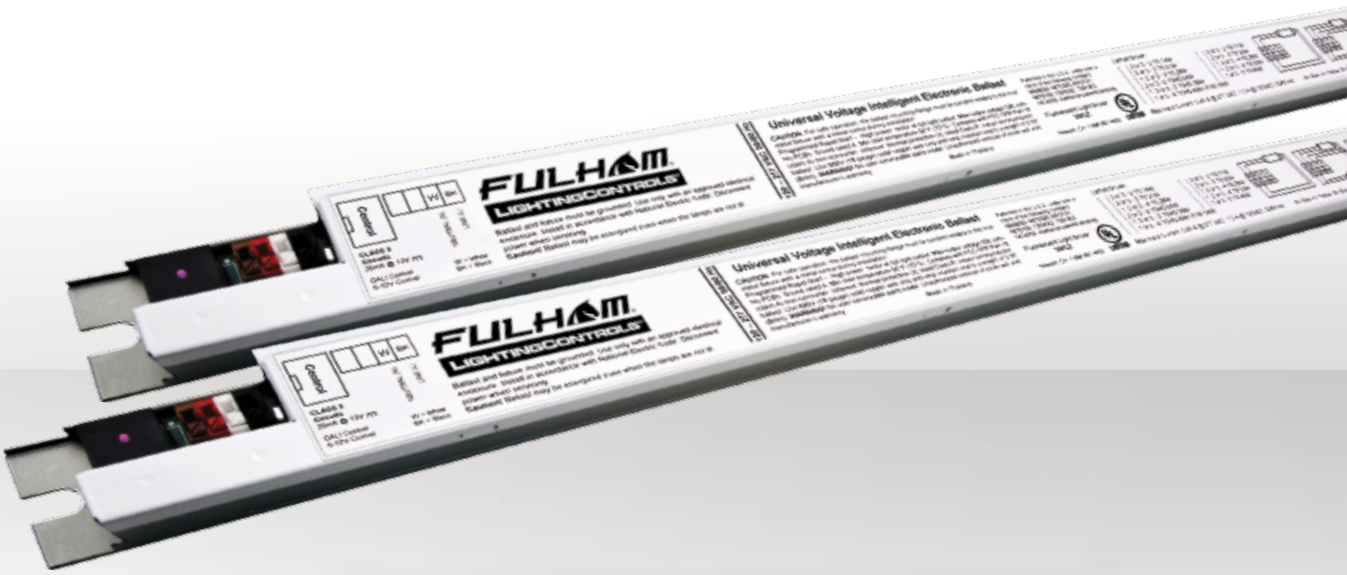



FLUORESCENT ROOM SOLUTIONS

FULHAM® LIGHTINGCONTROLS™

Fulham Lighting Controls specification sheets and other related literature online

CONTROLS



FULHAM LIGHTINGCONTROLS™

FLUORESCENT BALLASTS & DEVICES

Fulham offers a wide assortment of 0-10V Dimmable Electronic Fluorescent Ballasts. Please see page 45 for details within the Fluorescent section of this book.

CS AA IOP LR C Intelligent Sensor (Long Range)
CS AA IOP SR C Intelligent Sensor (Short Range)

The Intelligent Sensor brings together occupancy and photo-sensing technology as well as control capabilities, providing tremendous value in a single sensor. Built on proven, reliable photo-sensing and passive infrared sensing (PIR) technology, the intelligent sensor comes in two configurations - long and short range - to best meet the needs of a project.

CU A SSC004 S WD Control Switch

The Control Switch is an intuitive, powerful, and individually addressable dimming scene controller. The Control Switch commands four lighting scenes customized to the light level of each individual fixture. Combining dimming control within every scene, the Control Switch is ideal for numerous applications, including control of classrooms, private offices or conference rooms.

CW QU Quick Connect Box (Unpowered)
CW QP Quick Connect Box (Powered)

The Quick Connect Box provides a simple way to connect ballasts/drivers, sensors, and control switches to Fulham's Room, Area, and Building Solutions in the ceiling or inside a single light fixture.

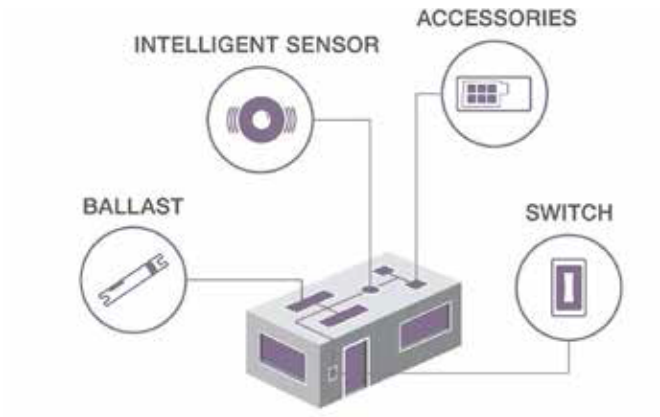
Interconnect Cables

Interconnect Cables incorporate quick connecting standard Cat 5 cable via RJ45 and RJ12 jacks throughout the installation. They eliminate mis-wiring and provide error-free system communication.

Cable Part Numbers	Purpose is to connect:	Length	Cable End Descriptions
CW C5 1200 A 002	Non-polarized DALI wires	2'	Cat 5 RJ12 : 18 gauge wire
CW C5 1200 A 012	Non-polarized DALI wires	12'	Cat 5 RJ12 : 18 gauge wire
CW C5 1200 M 002	Polarized 0-10V wires	2'	Cat 5 RJ12 : 18 gauge wire
CW C5 1200 M 012	Polarized 0-10V wires	12'	Cat 5 RJ12 : 18 gauge wire
CW C5 4545 I 008	Quick Connect Box / Controller	8'	Cat 5 RJ45 : Cat 5 RJ45
CW C5 4545 I 016	Quick Connect Box / Controller	16'	Cat 5 RJ45 : Cat 5 RJ45
CW C5 4545 I 025	Quick Connect Box / Controller	25'	Cat 5 RJ45 : Cat 5 RJ45
CW C5 4545 I 100	Quick Connect Box / Controller	100'	Cat 5 RJ45 : Cat 5 RJ45
CW C5 1212 C 012	Ballast	12'	Cat 5 RJ12 : Cat 5 RJ12
CW C5 1245 I 016	Control Switch	16'	Cat 5 RJ12 : Cat 5 RJ45

FULHAM LIGHTINGCONTROLS™

ROOM SOLUTIONS



The Fulham Room Solution is a true plug-and-play, wired system that brings digital control to small spaces.

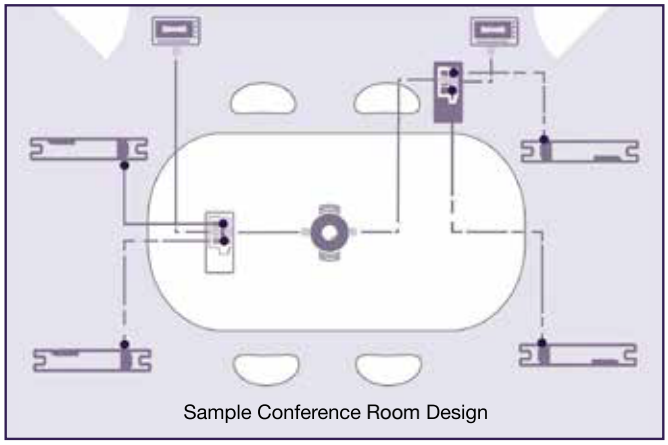
50% Lighting Energy **Savings**

Features:

- Plug-and-play installation
- Full-range dimming
- DALI Wired Controls
- Four customized lighting scenes
- Occupancy sensing

Benefits:

- Easy and quick to install
- No commissioning required (no configuration)
- Fluorescent T8 fixture support
- Packaged for 2, 3, 4, 5 or 6 fixture locations
- Highly reliable DALI control
- Room-by-room installation minimizes tenant interruptions

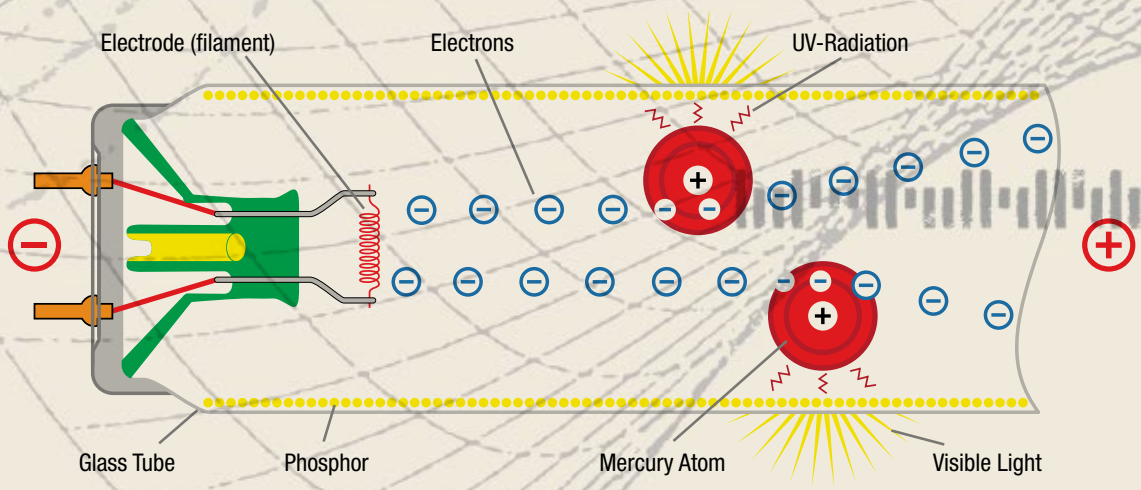

Sample Conference Room Design

This is a Fulham simplified installation that uses a quick, easy connection system of plenum rated cables with RJ45 (Ethernet) and RJ12 (Telephone) type plugs to connect devices. This shortens installation time and removes opportunity for errors.

# of Luminaires:	Lamp Type:	Number of Lamps/Wattage:	Part Number:
2	T8	2 LAMPS: F17T8, F40T8 3 LAMPS: F25T8, F32T8	CRS2F-T8
3			CRS3F-T8
4			CRS4F-T8
5			CRS5F-T8
6			CRS6F-T8
2	T5	1 or 2 LAMPS: F39T5HO, F49T5HO, F54T5HO 2 or 3 LAMPS: F25T5HO, F21T5, F14T5	CRS2F-T5
3			CRS3F-T5
4			CRS4F-T5
5			CRS5F-T5
6			CRS6F-T5

FLUORESCENT
THE RELIABLE INDUSTRY STANDARD

Fluorescent light still accounts for a great deal of industrial, commercial, municipal and residential lighting. More sophisticated than incandescence, fluorescent light comes not from electrically "cooking" a filament inside the bulb, but from gases excited to brilliance by electricity flowing between two electrodes. That charge, triggered by a ballast, generates ultraviolet light, made visible by a phosphor coating inside the tube. A major benefit: it doesn't generate as much ambient heat as incandescence, burns up less electricity per unit of light and costs much less.



Electromagnetism, Embryo

The ingenious English physicist and chemist Michael Faraday (1791-1867) was one of the most inspired experimental scientists in history. He proved the relationship between magnetism and electricity, which laid the foundation for electromagnetic theory.

His work with electromagnetic rotary devices led to the development of electric motors, the generator, and thus to the practical use of electrical power for home, industry and technology. It is Faraday who brought the terms electrode, cathode, anode, diode and others to the popular vocabulary.

In a famous exchange between Queen Victoria (1819-1901) and Faraday, the monarch noted that his lab demonstrations were fascinating -- but of what practical use were they? Faraday is reputed to have replied, "Madam, of what use is a baby?"

Her Majesty was not amused.

Michael Faraday

Scottish-born James Maxwell (1831-1879) synthesized research from several disciplines, including Farrady's initial work (magnetism, electricity, optics, classical physics), into the unified theory we now call Electromagnetism. This was his crowning achievement -- the one our industry is founded upon. Maxwell's breakthrough confirmed the suspected interrelationships among electricity, magnetism and light itself.

Maxwell's work is particularly important to daily life on Earth: his equations led to practical applications for the lighting industry. Maxwell's intuitive leap "connected the dots," producing the comprehensive theory of electromagnetism. Many believe that, without ideas advanced in Maxwell's Equations, Einstein's 1905 paper on relativity might not have been possible. (Einstein was born in 1879, the year Maxwell died.)

Peter Cooper Hewitt

Fluorescence was a lighting technique first researched in 1857 by French physicist A.-E. Becquerel (1820 - 1891). He believed that light didn't necessarily have to come from heat, but also from chemical reactions. A respected experimenter with photo-voltaic processes, he coated tubes with various chemicals that could be excited to luminescence by spraying electrons on them. This became full-fledged fluorescence when American engineer P.C. Hewitt (1861 - 1921) patented the mercury vapor lamp in 1901. Electrically charged vapors produce the glow inside the tube. It all seems so easy now: replacing nitrogen with mercury vapor creates a de facto filament, which, when electrified, produces invisible ultraviolet light, converted to visible light when it collides with the phosphorescent coating inside the lamp.

Edmund Germer (1901-1987) is credited by some historians as being the inventor of the first true fluorescent lamp. However, as we've seen, a great deal of work went into the development of fluorescent lamps prior to Germer.

FLUORESCENT
LIGHTING SYSTEMS

HUNDRED OF MODELS, COUNTLESS APPLICATIONS

A Bit About Fluorescent Ballasts and Lamps

A ballast is an ignition device and regulator, which "fires up" a gas-filled lamp and regulates the current flowing through it. Ballasts are essential to the operation of fluorescent lighting and its offshoots (CFL, HID, etc.). They vary in complexity and function, but all limit and stabilize the flow of current in an electrical circuit.

THE LIGHT THAT CAME IN FROM THE COLD

Electric power in general is affected by heat and cold, and varies with ambient temperature. The same is true for lamps. If exposed to lower or higher than normal temperatures, their power decreases.

Fluorescent lamps dislike the cold, and they show it. Like people on a sub-zero day, they take longer to get going; longer to reach maximum performance. Their problem is the cold tube wall's unfriendly effect on the vapor inside the lamp, condensing it to lazy droplets. Only when the lamp warms can they become useful "lightable" vapor. As the temperature rises, so does illumination.

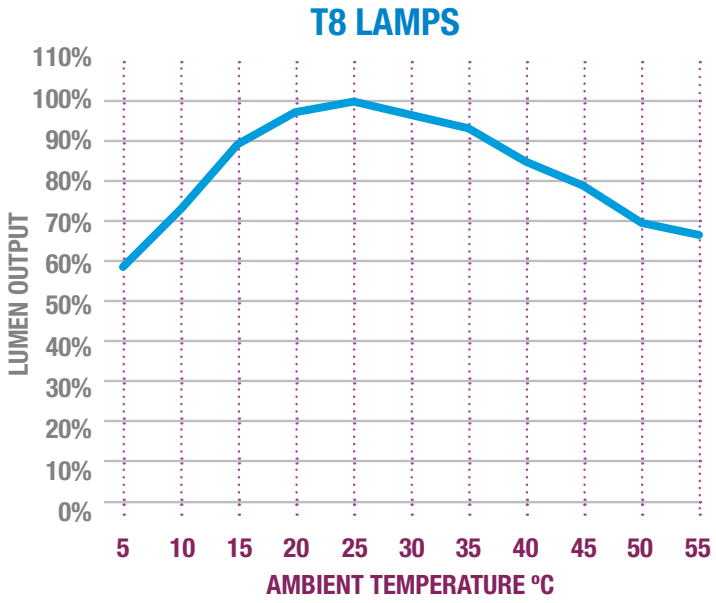
These charts track Lumen output for T8 and T5 lamps at ambient temperatures ranging from 5°C/41°F to 55°C/131°F.

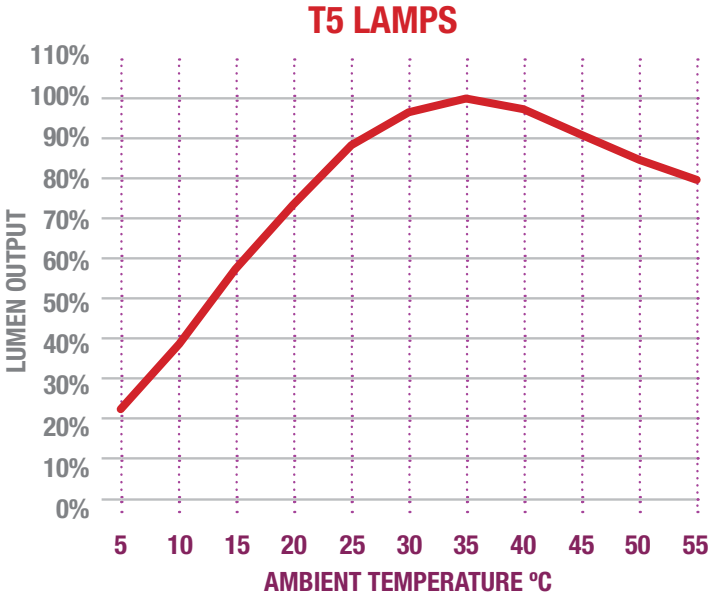
The T8 performs more or less the same at both ends of the scale, with peak luminescence between 20°C/68°F and 30°C/86°F.

T5 is somewhat crankier in the cold, producing lower lumens for somewhat longer, reaching top output later, between 30°C/86°F and 40°C/104°F. This would seem to make T5s a better choice for tropical parking lots for example.

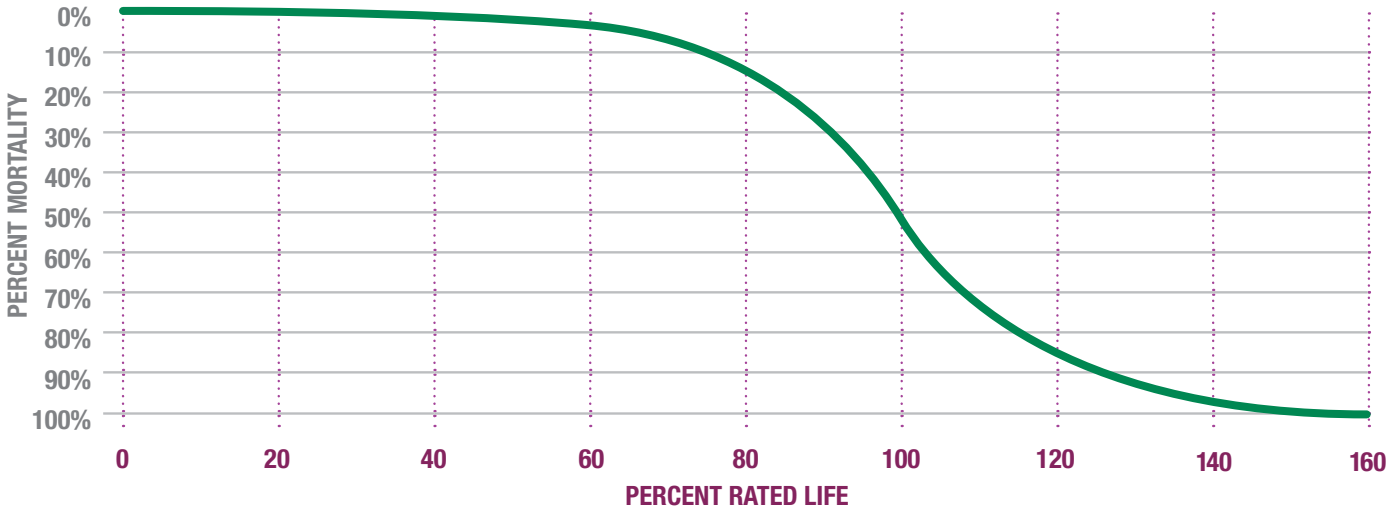
Fulham ballasts are engineered for optimal functioning of fluorescent lamps all across the use spectrum. Just two examples: IceHorse works T8 well in consistently low ambient temperatures like refrigerators, cold display cases and outdoor Siberian warehouses. SunHorse driving T12s is an excellent choice for germicidal purposes or your tanning salon. And so it goes.

LIGHT OUTPUT VS TEMPERATURE





TYPICAL FLUORESCENT LAMP MORTALITY



MEAN VS MEDIAN

Here's what you can expect for fluorescent lamp lifespan, expressed as a "rated lifespan." Don't confuse that with either "average lifespan" or "mean lifespan," which is calculated by adding up the working hours of all lamps tested, then dividing by the total number of lamps.

Instead, rated life indicates the median lifespan, the point when 50% of all tested lamps expired and the other 50% were still going strong. Following the 50% mortality line across, we see that half of the lamps in the test sample were still alive and kicking at 100% rated life span.

DID YOU KNOW?
WHERE GLASS TUBES COME FROM

There are three basic techniques for shaping glass. The most ancient one -- seen in TV documentaries or old classroom films -- is blowing. The craftsman collects a blob of molten glass on the end of a long metal pipe, then gently blows through the pipe into the blob. He does not inhale. Bad idea. He shapes the glass by blowing while turning the pipe, occasionally re-heating his creation. When it reaches the desired form and thickness, it is cooled down and snapped from the pipe. Blowing can be done, more uniformly, by machine.

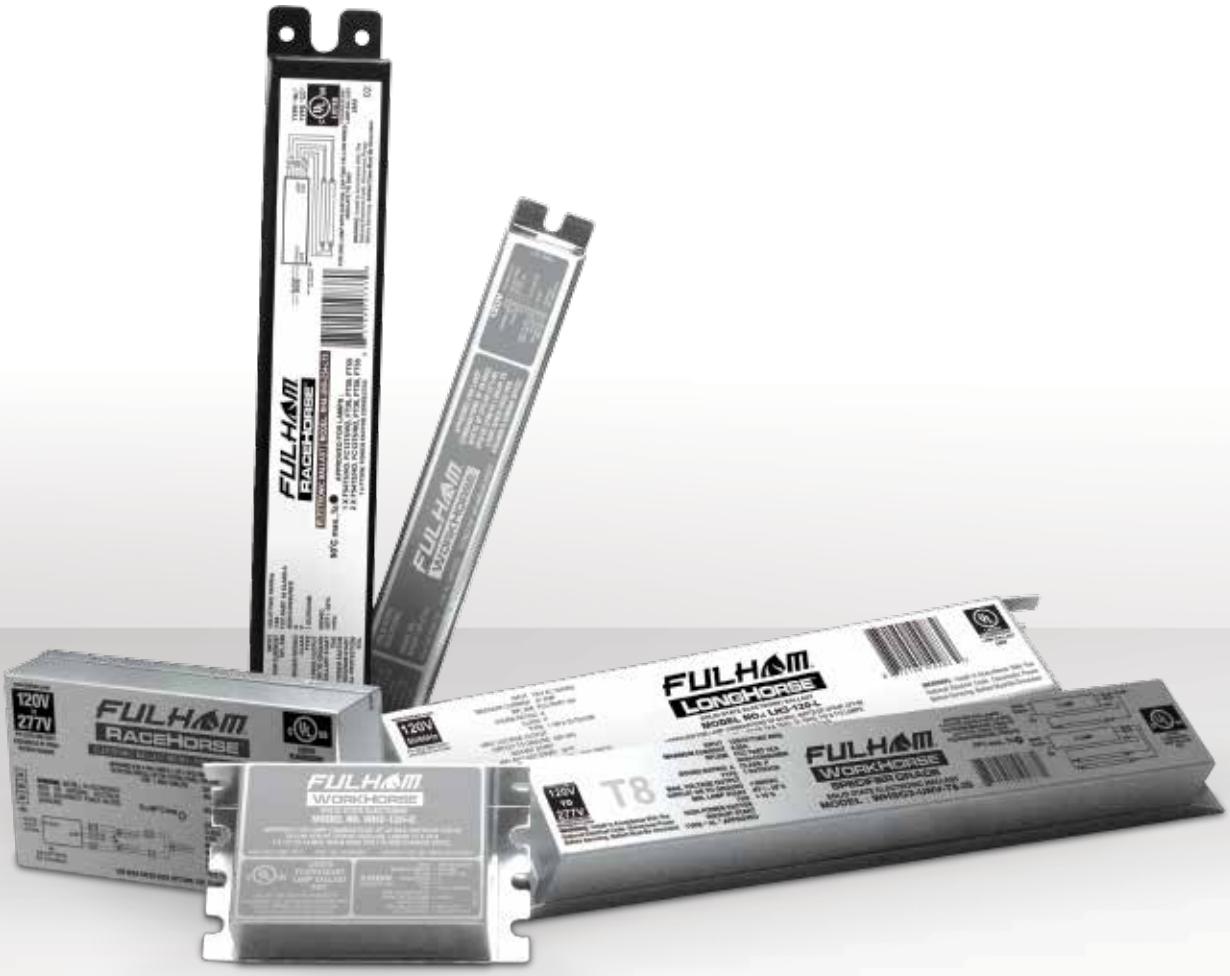
Glass can also be "pressed," dropping the molten discharge from the oven into a mold and pressing on it, like a waffle iron. This is the preferred way to make glass containers, ovenware and items like ash trays or platters.

The third method is "drawing." The glass is either flattened (windows, mirrors) or teased into tubes (fluorescent lamps, test tubes). For fluorescent tubes, molten glass is drawn in to coat the inside surface of a rotating cylinder. Air blows through it, forming a continuous tube as it exits the cylinder and cools. The tube is then cut into desired lengths.

All three methods require controlled reheating and cooling for molecular bonding to prevent shattering.

FLUORESCENT
LIGHTING SYSTEMS

- COMPLETE FLUORESCENT SYSTEMS WITH PREMIUM FULHAM LAMPS AND BALLASTS
- OVER 800 SYSTEM COMBINATIONS
- TRIED AND TRUE, RELIABLE TECHNOLOGY THAT WILL CONTINUE TO BE EMBRACED FOR MANY YEARS TO COME



COMMERCIAL & RESIDENTIAL BALLASTS

COMMERCIAL & RESIDENTIAL

COUNTLESS FLUORESCENT LAMP APPLICATIONS

INDUSTRIAL & SPECIALTY

GERMICIDAL/UV, REFRIGERATION, TANNING, SIGNAGE, CONTROLS

LAMPS

CFL, LINEAR

FULHAM LIGHTINGCONTROLS™ · FULHAM WORKHORSE™ · FULHAM WHAM™ · FULHAM LONGHORSE™ · FULHAM SUGARCUBE™ · FULHAM RACEHORSE™ · FULHAM PONY™ · FULHAM SINEHORSE™ · FULHAM ICEHORSE™ · FULHAM SUNHORSE™

Fluorescent product specification sheets and other related literature online

FLUORESCENT

INDUSTRIAL & SPECIALTY BALLASTS

LAMPS

FULHAM

RACEHORSE™

CFL FLUORESCENT ELECTRONIC BALLASTS

CANADA SERIES

c UL us

FEATURES

- 347V
- < 10% ATHD
- High Power Factor
- End of Life (EOL) Protection
- Operate 1 or 2 Lamps
- Twin, Triple, Quad, Double Quad 9-70W
- cULus
- 90ºC Max. Operating Temp.
- -30ºC Min. Start Temp.
- Programmed Start
- Auto Restart
- Cold Start
- Push-In Connectors

APPLICATIONS

- Retail & Industrial Medium & High Bay
- Canopy Lighting
- Flood Lighting
- Parking Garages
- Gymnasiums
- Indirect Wall Washing
- Downlighting
- Outdoor Architectural
- Post Tops
- Wall Sconces
- Ceiling Surface Mount
- Air Handling Spaces (BLS Models)

RaceHorse Kits

COMMON SPECIFICATIONS

Operating Voltage:	347V	Lamp Starting Temp.:	See Lamp Specifications
Frequency:	50/60Hz	Ballast Maximum Case Temp.:	167ºF (75ºC) - 5 Year Warranty
ATHD:	< 10% Meets ANSI C82.11-1993	Ballast Maximum Case Temp.:	194ºF (90ºC) - 3 Year Warranty
Protection/Output:	Open Lamp, Shorted Lamp, End of Life	Ballast Lamp Starting Mode:	Programmed Start
Input Over Current Protection:	Fuse	Inherent Thermal Protection	Class P
Transient Protection:	C62.41 Class A 7 strikes	Sound Rating	"A"
Regulatory Approvals:	UL & cULus Listed Type 1 Outdoor	Remote Mounting	18' Maximum at -18ºC
High Power Factor:	> .98	Anti-Arcing Protection	UL Type CC
Open Circuit Voltage:	< 300V RMS Max.	RHA-EMI: FCC CFR Title 47 Part 18 non-consumer	
Ballast Min. Operating Temp.:	-22°F (-30ºC)	BLS models are approved for air handling spaces	

FLUORESCENT

Model No.	RHA-347-213-BLS/C/K	RHA-347-218-BLS/C/K	RHA-347-226-BLS/C/K	RHA-347-242-BLS/C/K
Max Load	26W	36W	57W	84W
Max Input Current	0.088 AMP	0.115 AMP	0.165 AMP	0.274 AMP
Ballast Size	L 5.0" (4.2" case), W 2.4", H 1"	L 5.0" (4.2" case), W 2.4", H 1"	L 5.0" (4.2" case), W 2.4", H 1"	L 5.0" (4.2" case), W 3", H 1.3"
Ballast Weight	5.2 oz.	5.2 oz.	5.2 oz.	7 oz.
Case Quantity	BLS Models: 40 pcs/ case C Models: 50 pcs/ case Kits (K): 20 pcs/ case	BLS Models: 40 pcs/ case C Models: 50 pcs/ case Kits (K): 20 pcs/ case	BLS Models: 40 pcs/ case C Models: 50 pcs/ case Kits (K): 20 pcs/ case	BLS Models: 50 pcs/ case C Models: 50 pcs/ case Kits (K): 30 pcs/ case

- **BLS** = Compact Case with mounting studs (8/32" studs on bottom plate, 2" on center)
- **C** = Compact Case; No studs on bottom plate
- **K** = Contractor Kit with stud adapter plate, lead wire set and wire removal tool

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
RHA-347-213-BLS/C/K	1 x	9CFT, 13CFQ, 13CFTR, 2D10W, 2D16W
	2 x	7CFT, 9CFT, 13CFQ, 13CFTR, 2D10W
RHA-347-218-BLS/C/K	1 x	18CFQ, 18CFTR, 2D21W
	2 x	18CFQ, 18CFTR, 2D16W, 2D21W
RHA-347-226-BLS/C/K	1 x	13CFT, 26CFQ, 26CFTR, 32CFTR, 42CFTR, 2D21W, 2D28W, 2D38W, T5CR22W, FT18, FT36/39, T5CR40W, FT24/27, 57CFM
	2 x	13CFT, FT18W, 26CFQ, 26CFTR, FT24/27, 2D21W, F24T5HO
RHA-347-242-BLS/C/K	1 x	CFM57, CFM70, 42CFTR, FT24/27, FT36/39, FT40, 2D28W, 2D38W, T5CR40W, 36TUV, GPH793T5L
	2 x	26CFQ, 26CFTR, 32CFTR, 42CFTR, FT24/27, FT36/39, FT40, 2D28W, 2D38W, T5CR22W, T5CR40W, 36TUV, GPH793T5L

FULHAM RACEHORSE™

FLUORESCENT ELECTRONIC BALLASTS

FEATURES

- ENEC / VDE / EMC certified
- Designed to CE requirements
- Programmed Preheat Lamp Start
- Cut-Off Technology
- End of Life Protection (EOL)
- High Power Factor
- Active Power Factor Control (APFC)
- Auto-Restart
- Standard distances between the mounting holes
- Solid Housing and Electronics
- 5 Year Warranty - 50,000 hour life

APPLICATIONS

- Decorative
- Architectural
- Industrial
- Commercial
- Wall Washing / Flood Lighting

COMMON SPECIFICATIONS

Input Voltage:	220 - 240 VAC (±10%)	Automatic Restart after lamp change:	Yes
Power Line Frequency:	50/60Hz	Cut-Off Technology:	Yes
Overvoltage Consistency (V AC, 1h):	320	End of Life Protection (EOL):	Yes
Power Factor - APFC (λ):	≥ 0.96	Case Material:	CFL: Thermoplast - T5/T8: Metal
Line Current Harmonics:	< 10%	Immunity:	EN 61547
Lamp Operating Frequency:	> 42,000Hz	Harmonic Content:	EN 61000-3-2
Preheat Lamp Start (Seconds):	≤1.5	Radio Interference Suppression:	EN 55015
Max. Case Hot Spot Temperature Tc:	70ºC	ENEC, VDE, CE:	EN 60929:2006-03
Ambient Temperature: CFL: -25°C to +60°C; T5/T8: -25°C to +50°C			EN 61347-1:2008+A1:2011-02
Expected Service Life at Ta max.:	50,000 hours		EN 61347-2-3: 2011+AC:2011-11

CFL LAMP OPERATION

Ballast Size 1 (L x W x H in mm): 103 x 67 x 31 - Ballast Size 2 (L x W x H in mm): 123 x 79 x 31

BALLASTS	BALLAST SIZE	TC-DEL (Quad)				TC-TEL (Triple)					TC-L (Twin Hi-Lumen)		TC-SEL (Twin)	
		10W	13W	18W	26W	13W	18W	26W	32W	42W	18W	21W	9W	11W
RHS 230 113 C CFL	1	1	1			1							1	1
RHS 230 118 C CFL	1			1			1							
RHS 230 142 C CFL	1				1			1	1	1	1	1		
RHS 230 213 C CFL	2	2	2			2							2	2
RHS 230 218 C CFL	2			2			2							
RHS 230 232 C CFL	2				2			2	2					
RHS 230 242 C CFL	2									2				

T5 LAMP OPERATION

Ballast Size 1 (L x W x H in mm): 280 x 30 x 21 - Ballast Size 2 (L x W x H in mm): 360 x 30 x 21

BALLASTS	BALLAST SIZE	T16 (T5)							TC-L (Twin Hi-Lumen)
		14W	21W	28W	35W	49W	54W	80W	55W
RHS 230 135 L T5	1	1	1	1	1				
RHS 230 149 L T5	1					1			
RHS 230 154 L T5	1						1		
RHS 230 180 L T5	2							1	1
RHS 230 235 L T5	2	2	2	2	2				
RHS 230 249 L T5	2					2			
RHS 230 254 L T5	2						2		
RHS 230 414 L T5	2	3/4							

T8 LAMP OPERATION

Ballast Size 1 (L x W x H in mm): 280 x 30 x 21 - Ballast Size 2 (L x W x H in mm): 360 x 30 x 21

BALLASTS	BALLAST SIZE	T26 (T8)			TC-L (Twin Hi-Lumen)			
		18W	36W	58W	18W	24W	36W	40W
RHS 230 118 L T8	1	1			1			
RHS 230 136 L T8	1		1			1	1	1
RHS 230 158 L T8	1			1				
RHS 230 218 L T8	1	2						
RHS 230 236 L T8	1		2		2		2	
RHS 230 258 L T8	1			2				
RHS 230 418 L T8	2	3/4						

FULHAM RACEHORSE™

DIMMABLE FLUORESCENT ELECTRONIC BALLASTS

RoHS COMPLIANT

FEATURES

- Designed to CE requirements
- ENEC/VDE Certified
- Programmed Preheat Lamp Start
- Dimming 0-10V
- Cut-Off Technology
- End of Life Protection (EOL)
- High Power Factor
- Active Power Factor Control (APFC)
- Auto-Restart
- Standard distances between the mounting holes
- Solid Housing and Electronics
- 5 Year Warranty - 50,000 hour life

APPLICATIONS

- Decorative
- Architectural
- Industrial
- Commercial
- Wall Washing / Flood Lighting

COMMON SPECIFICATIONS

Input Voltage:	220 - 240 VAC	Automatic Restart after lamp change:	Yes
Power Line Frequency:	50/60Hz	Cut-Off Technology:	Yes
Input Power Factor (PF) (λ):	>0.98	End of Life Protection (EOL):	Yes
Line Current Harmonics (ATHD):	<10%	Case Material:	CFL: Thermoplast - T5/T8: Metal
Dimming Interface:	0 to 10V	Immunity:	EN 61547
Lamp Operating Frequency:	> 42,000Hz	Harmonic Content:	EN 61000-3-2
Lamp Starting Type:	Programmed Preheat	Radio Interference Suppression:	EN 55015
Preheat Time [S]:	< 1.5	ENEC, VDE, CE:	EN 60929:2006-03
Overvoltage Protection [V, hr]:	Yes		EN 61347-1:2008+A1:2011-02
Undervoltage Protection [V]:	Yes		EN 61347-2-3: 2011+AC:2011-11
Expected Service Life at Ta max.:	50,000 hours		

CFL LAMP OPERATION

Ballast Size 1 (L/W/H in mm): 103 x 67 x 31 Ballast Size 2 (L/W/H in mm): 123 x 79 x 31

BALLASTS	BALLAST SIZE	TC-DEL (Quad) 10W	TC-DEL (Quad) 13W	TC-DEL (Quad) 18W	TC-DEL (Quad) 26W	TC-TEL (Triple) 13W	TC-TEL (Triple) 18W	TC-TEL (Triple) 26W	TC-TEL (Triple) 32W	T16R (T5 Circline) 22W	T16R (T5 Circline) 40W
RHD 230 140 C CFL	1									1	1
RHD 230 213 C CFL†*	2	2	2			2					
RHD 230 218 C CFL†*	2			2			2				
RHD 230 232 C CFL†*	2				2			2	2		

T5 LAMP OPERATION

Ballast Size 1 (L x W x H in mm): 280 x 30 x 21 - Ballast Size 2 (L x W x H in mm): 360 x 30 x 21

BALLASTS	BALLAST SIZE	T16 (T5) 14W	T16 (T5) 21W	T16 (T5) 28W	T16 (T5) 35W	T16 (T5) 39W	T16 (T5) 54W
RHD 230 135 L T5†*	1	1	1	1	1		
RHD 230 235 L T5†*	2	2	2	2	2		
RHD 230 139 L T5	1					1	
RHD 230 239 L T5†	2					2	
RHD 230 154 L T5	1						1
RHD 230 254 L T5†	2						2
RHD 230 414 L T5	2	4					
RACEHORSE DIMMABLE AUTO-DIM							
RHDC 230 135 L T5	1	1	1	1	1		
RHDC 230 235 L T5†	2	2	2	2	2		

T8 LAMP OPERATION

Ballast Size 1 (L x W x H in mm): 280 x 30 x 21 - Ballast Size 2 (L x W x H in mm): 360 x 30 x 21

BALLASTS	BALLAST SIZE	T26 (T8) 18W	T26 (T8) 36W	T26 (T8) 58W
RHD 230 136 L T8†	1		1	
RHD 230 236 L T8†	2		2	
RHD 230 158 L T8†	1			1
RHD 230 258 L T8†	2			2
RHD 230 418 L T8	2	4		

†These ballasts have been CCC certified.

*These ballasts have been EMC certified

FLUORESCENT

FULHAM PONY™ FULHAM SUGARCUBE™ 230V FLUORESCENT ELECTRONIC BALLASTS

COMMON SPECIFICATIONS

Operating Voltage:	230VAC±10%
Frequency:	50/60Hz
Starting Type:	Rapid Start
Starting Temperature:	14ºF (-10°C)
Ballast Max Case Temperature: 158ºF (70ºC)	
Transient Protection:	C62.41 Class A 7 strikes
EMI: FCC CFR Title 47 Part 18 non-consumer	
Sound Rating:	"A"
CCF:	< 1.7
Normal Power Factor:	> .5

GLOBAL SERIES

Model Number	Operates Lamps	Ballast Size
SC-230-113-LT5	1 x F8T5, F13T5	L 121mm, W 24mm, H 19mm / L 4.76", W .95", H .73"
SC-230-115-LT8	1 x F15T8	L 121mm, W 24mm, H 19mm / L 4.76", W .95", H .73"
SC-230-120-LT12	1 x F20T12	L 121mm, W 24mm, H 19mm / L 4.76", W .95", H .73"
SC-230-125-LT8	1 x F25T8	L 121mm, W 24mm, H 19mm / L 4.76", W .95", H .73"
SC-230-118-CFL*	1 x 18CFQ/E, 18CFTR/E	L 78.5mm, W 37mm, H 25.4mm / L 3.09", W 1.45", H 1"
SC-230-213-LT5	2 x F8T5, F13T5 1 x F8T5 + F13T5	L 140mm, W 32mm, H 25.4mm / L 5.5", W 1.26", H 1"
SC-230-118-LT8	1 x F18T8	L 121mm, W 24mm, H 19mm / L 4.76", W .95", H .73"
SC-230-113-CFL	1 x QUAD (CFQ/E), 4 PIN 13W 1 x TRIPLE(CFTR/E), 4 PIN 13W	L 78.5mm, W 37mm, H 25.4mm / L 3.09", W 1.45", H 1"

SUGARCUBES FOR UV LAMPS

Model Number	Operates Lamps	
SC-230-287-CUV* SC-230-287-CUV-R*†	1 x 180mm T5 UV, 287mm T5 UV	L 78mm, W 37.1mm, H 25.4mm / L 3.07", W 1.46", H 1"

*cULus listed. c UL us

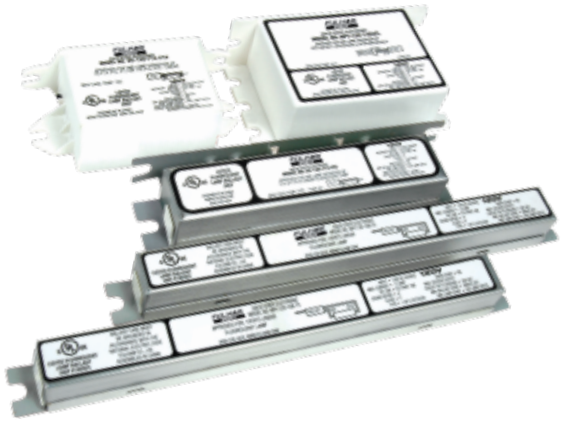
†RoHS Compliant

FULHAM PONY™ FULHAM SUGARCUBE™ 230V FLUORESCENT ELECTRONIC BALLASTS

COMMON SPECIFICATIONS

Operating Voltage:	220-240V±10%
Frequency:	50/60Hz
Starting Type:	Rapid Start
Starting Temperature:	14ºF (-10°C)
Ballast Max Case Temperature: 149ºF (65ºC)	
EMI: EN 55015	
Sound Rating:	"A"
CCF:	< 1.7
High Power Factor:	> .95

GLOBAL SERIES



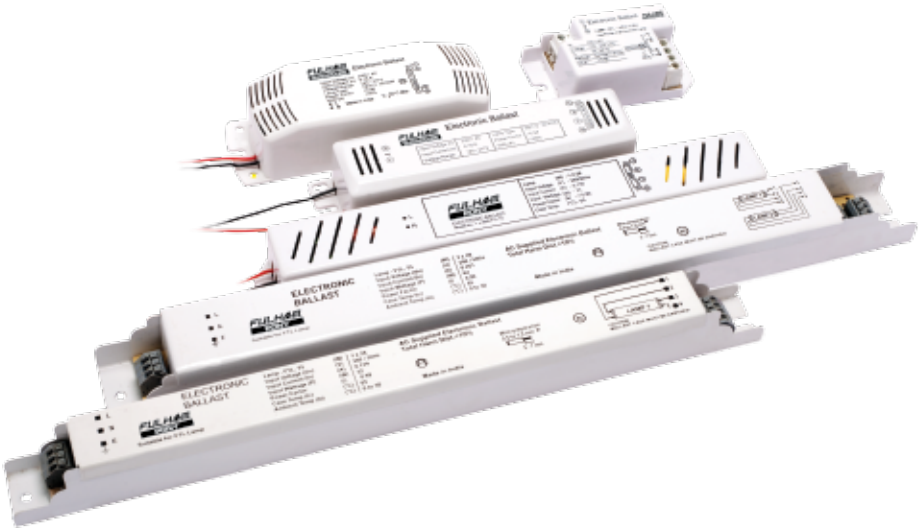
Model Number	Operates Lamps	Ballast Size	Reg Approval
HPY-230-118-XT8-OEC	1 x F18T8 or F20T12	L 150mm, W 40mm, H 28mm / L 5.905'', W 1.575'', H 1.102''	CE
HPY-230-118-XT8-OJC	1 x F18T8 or F20T12	L 150mm, W 40mm, H 28mm / L 5.905'', W 1.575'', H 1.102''	
HPY-230-136-XT8-OEC	1 x F36T8 or F40T12	L 150mm, W 40mm, H 28mm / L 5.905'', W 1.575'', H 1.102''	CE
HPY-230-136-XT8-OJC	1 x F36T8 or F40T12	L 150mm, W 40mm, H 28mm / L 5.905'', W 1.575'', H 1.102''	
HPY-230-218-XT8-OEC	2 x F18T8 or F20T12	L 150mm, W 40mm, H 28mm / L 5.905'', W 1.575'', H 1.102''	CE
HPY-230-218-XT8-OJC	2 x F18T8 or F20T12	L 150mm, W 40mm, H 28mm / L 5.905'', W 1.575'', H 1.102''	
HPY-230-236-XT8-OEC	2 x F36T8 or F40T12	L 210mm, W 40mm, H 30mm / L 8.267'', W 1.575'', H 1.181''	CE
HPY-230-236-XT8-OJC	2 x F36T8 or F40T12	L 210mm, W 40mm, H 30mm / L 8.267'', W 1.575'', H 1.181''	
HPY-230-418-XT8-OEC	4 x F18T8 or F20T12	L 210mm, W 40mm, H 30mm / L 8.267'', W 1.575'', H 1.181''	CE
HPY-230-418-XT8-OJC	4 x F18T8 or F20T12	L 210mm, W 40mm, H 30mm / L 8.267'', W 1.575'', H 1.181''	

FULHAM PONY™ FULHAM SUGARCUBE™

T5/T8 FLUORESCENT ELECTRONIC BALLASTS

COMMON SPECIFICATIONS

Operating Voltage:	240VAC±10%
Frequency:	50/60Hz
Starting Type:	Rapid Start
Starting Temperature:	0°C
Ballast Max Case Temperature: 158ºF (70ºC)	
Sound Rating:	"A"
CCF:	< 1.7
High Power Factor:	> .9



MASTER MODEL NUMBER REFERENCE (Example)

HSC 240 1 36 X T8 0 A E

Function
A = Nothing C = EMI
B = Over Voltage Protection
D = EMI + Over Voltage Protection
E = High Voltage Rating
F = High Voltage Rating + EMI

Certification
U = UL, cULus E = CE
V = VDE, TUV, ENEC J = CCC
L = UL Only A = None

Dimming Control Type
A = Dali B = DMX
N = DMX + Dali M = 0-10V (2 Wire)
T = Triac O = Non Dimming
R = Wireless Remote
S = Sensor 0-10V (4 Wire)

Lamp Type
12 = T12 T8 = T8
T5 = T5 CF = CFL

Case Type
L = Long Metal C = Cube Metal
X = Long Plastic Y = Cube Plastic
B = Back Leads Metal N = only PCB without cabinet
Z = Back Leads Plastic
I = Long Metal Slim
H = Long Plastic Slim
U = Ultra Long Plastic Slim

Target Lamp Power

Number of Lamps

Input Voltage
UNV = 120V-277V
MLT = 120V - 240V
MID = 208V - 240V
MIE = 240V - 277V
MIF = 208V - 277V
230 = 220V-240V
# # # = Dedicated e.g. 120V

Regular Ballast Type
RHA = Active Power Factor Correction + Preheat Start
HPY = High Power Factor + Rapid Start
NPY = Normal Power Factor + Rapid Start
HSC = Passive Power Factor Correction + Rapid Start
NSC = Normal Power Factor + Rapid Start (Economic)

Model Number	Description	Type	Termination
HSC 240 111 YCF OAA	1X11W<35% THD CFL D/E 2/4 PIN	Economic	Connector
HSC 240 118 YCF OAA	1X18W<35% THD CFL D/E 2/4 PIN	Economic	Connector
HSC 240 118 HT8 OAA	1X18W<35% THD FTL T8 (Also for 1X20W T12 and 1X18W PLL "L" lamps)	Economic	Wire
HSC 240 136 HT8 OAA	1X36W<35% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)	Economic	Wire
HSC 240 118 XT8 OAA	1X18W<35% THD FTL T8 (Also for 1X20W T12 and 1X18W PLL "L" lamps)	Economic	Wire
HSC 240 136 XT8 OAA	1X36W<35% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)	Economic	Wire
HSC 240 118 UT8 OAA	1X18W<35% THD FTL T8 (Also for 1X20W T12 and 1X18W PLL "L" lamps)	Economic	Wire/Connector
HSC 240 136 UT8 OAA	1X36W<35% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)	Economic	Wire/Connector
HSC 240 136 XT8 OAE	1X36W<30% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)	Commercial	Wire
HSC 240 114 UT5 OAE	1X14W<30% THD FTL T5	Commercial	Wire/Connector
HSC 240 124 UT5 OAE	1X24W<30% THD FTL T5	Commercial	Wire/Connector
HSC 240 128 UT5 OAE	1X28W<30% THD FTL T5	Commercial	Wire/Connector
HSC 240 136 UT8 OAE	1X36W<30% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)	Commercial	Wire/Connector
HSC 240 218 UT8 OAE	2X18W<30% THD FTL T8 (Also for 2X20W T12 and 2X18W PLL "L" lamps)	Commercial	Wire
HSC 240 118 UT8 OAE	1X18W<30% THD FTL T8 (Also for 1X20W T12 and 1X18W PLL "L" lamps)	Commercial	Wire/Connector
HSC 240 128 NT5 OAE	1x28W<20% THD FTL T5 (No case; only PCB without cabinet)	Commercial	Wire
HPY 240 218 YCF OAE	2X18W<20% THD CFL D/E 4 PIN	Professional	Connector
HPY 240 226 YCF OAE	2X26W<20% THD CFL D/E 4 PIN	Professional	Connector
HPY 240 218 YCF OAF	2X18W<10% THD CFL D/E 4 PIN	Professional	Connector
HPY 240 226 YCF OAF	2X26W<10% THD CFL D/E 4 PIN	Professional	Connector
HPY 240 218 LT8 OAE	2X18W<20% THD FTL T8 (Also for 2X20W T12 and 2X18W PLL "L" lamps)	Professional	Connector
HPY 240 136 LT8 OAE	1X36W<20% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)	Professional	Connector
HPY 240 236 IT8 OAE	2X36W<20% THD FTL T8 (Also for 2X40W T12 and 2X36W PLL "L" lamps)	Professional	Connector
HPY 240 114 LT5 OAE	1X14W<20% THD FTL T5	Professional	Connector
HPY 240 214 LT5 OAE	2X14W<30% THD FTL T5	Professional	Connector
HPY 240 224 LT5 OAE	2X24W<30% THD FTL T5	Professional	Connector
HPY 240 128 LT5 OAE	1X28W<20% THD FTL T5	Professional	Connector
HPY 240 228 LT5 OAE	2X28W<20% THD FTL T5	Professional	Connector
HPY 240 136 IT8 OAF	1X36W<10% THD FTL T8 (Also for 1X40W T12 and 1X36W PLL "L" lamps)	Professional	Connector
HPY 240 236 IT8 OAF	2X36W<10% THD FTL T8 (Also for 2X40W T12 and 2X36W PLL "L" lamps)	Professional	Connector
HPY 240 114 IT5 OAF	1X14W<10% THD FTL T5	Professional	Connector
HPY 240 214 IT5 OAF	2X14W<10% THD FTL T5	Professional	Connector
HPY 240 124 IT5 OAF	1X24W<10% THD FTL T5	Professional	Connector
HPY 240 224 IT5 OAF	2X24W<10% THD FTL T5	Professional	Connector
HPY 240 128 IT5 OAF	1X28W<10% THD FTL T5	Professional	Connector
HPY 240 228 IT5 OAF	2X28W<10% THD FTL T5	Professional	Connector
RHA 240 154 LT5 OAD	1X54W<10% THD FTL T5 (Also for 1X T8 58W, 1X TC-L 55W lamp)	Professional	Connector
RHA 240 254 LT5 OAD	2X54W<5% THD FTL T5 (Also for 2X T8 58W, 2X TC-L 55W lamp)	Professional	Connector
RHA 240 414 LT5 OAD	4X14W<5% THD FTL T5 (Also for 3X T5 14W lamp)	Professional	Connector

FULHAM

WORKHORSE™ PROJECT GRADE

PROJECT GRADE T8/T12 FLUORESCENT ELECTRONIC BALLASTS

FEATURES

- Rapid Start
- High Power Factor (HPF)
- End of Life (EOL) Protection
- Multiple Lamp Operation
- Suitable for T8 and T12 Operation
- Solid Housing and Compact Case

APPLICATIONS

- Decorative Lighting
- Indoor Architectural Lighting
- Outdoor Architectural Lighting
- Commercial and Industrial Lighting

COMMON SPECIFICATIONS 127 & 220V

Input Voltage:	127V ± 10%, 50/60Hz 220V ± 10%, 50/60Hz
Power Factor:	> 0.98
Efficacy Factor:	> 88%
ATHD:	< 10%
Current Crest Factor:	< 1.7
EMI/RFI Compliance:	FCC PART 18 non-consumer
Sound Rating:	"A"
Ballast Type:	Rapid Start
Voltage Transients:	ANSI 62.41
Min. Operating Temp.:	-10ºC (14ºF)
Max. Case Temp.:	75ºC (167ºF)
Approvals/Class:	UL Listed, Class P 1 Outdoor

LAMP OPERATION 127 & 220V

Model Number	# of Lamps	Lamp Type
WHSG5 127 T12 RS†	1 x, 2 x	F36T8, F40T12
WHSG6 127 T12 RS†	1 x, 2 x	F18T8, F20T12
WHSG9 127 T12 RS	2 x 3 x, 4 x	F36T8, F40T12 F18T8, F20T12
WHSG5 220 T12 RS†	1 x, 2 x	F36T8, F40T12
WHSG6 220 T12 RS†	1 x, 2 x	F18T8, F20T12
WHSG9 220 T12 RS	2 x 3 x, 4 x	F36T8, F40T12 F18T8, F20T12

WHSG5-127/220 - Ballast Size (mm): 235 L x 40 W x 25.4 H
WHSG6-127/220 - Ballast Size (mm): 235 L x 40 W x 25.4 H
WHSG9-127/220 - Ballast Size (mm): 255 L x 40 W x 25.4 H

COMMON SPECIFICATIONS 120-240V

Input Voltage:	120V-240V ± 10%, 50/60Hz
Power Factor:	> 0.98
Efficacy Factor:	> 88%
ATHD:	< 10%
Current Crest Factor:	<1.7
EMI/RFI Compliance:	FCC PART 18 non-consumer
Sound Rating:	"A"
Ballast Type:	Rapid Start
Voltage Transients:	ANSI 62.41
Min. Operating Temp.:	-10ºC (14ºF)
Max. Case Temp.:	75ºC (167ºF)
Approvals/Class:	UL Listed, Class P 1 Outdoor

LAMP OPERATION MLT 120-240V

Model Number	# of Lamps	Lamp Type
WHSG5 MLT T12 RS†	1 x, 2 x	F36T8, F40T12
WHSG6 MLT T12 RS†	1 x 2 x	F18T8, F36T8, F20T12, F40T12 F18T8, F20T12
WHSG9 MLT T12 RS†	2 x 3 x, 4 x	F36T8, F40T12 F18T8, F20T12

WHSG5-MLT - Ballast Size (mm): 235 L x 40 W x 25.4 H
WHSG6-MLT - Ballast Size (mm): 235 L x 40 W x 25.4 H
WHSG9-MLT - Ballast Size (mm): 255 L x 40 W x 25.4 H

† These products have previously been tested as per SASO guidelines and comply with the SASO standards. If you are interested in your shipment being accompanied by a SASO conformity certificate, this can be arranged at cost for the testing. Please contact the Middle East regional office for details.

FULHAM WORKHORSE™ DISTRIBUTION GRADE

DISTRIBUTION GRADE T8/T12 FLUORESCENT ELECTRONIC BALLASTS

FEATURES

- Rapid Start
- High Power Factor (HPF)
- End of Life (EOL) Protection
- Multiple Lamp Operation
- Suitable for T8 and T12 Operation
- Solid Housing and Compact Case

APPLICATIONS

- Decorative Lighting
- Indoor Architectural Lighting
- Outdoor Architectural Lighting
- Commercial and Industrial Lighting

COMMON SPECIFICATIONS

Input Voltage:	127V ± 10%, 50/60Hz 220V ± 10%, 50/60Hz
Power Factor:	> 0.98
Efficacy Factor:	> 88%
ATHD:	< 25%
Current Crest Factor:	< 1.7
Sound Rating:	"A"
Ballast Type:	Rapid Start
Voltage Transients:	ANSI 62.41
Min. Operating Temp.:	-10ºC (14ºF)
Max. Case Temp.:	75ºC (167ºF)

BALLAST SIZES (mm)

WHCG5 127 / WHCG6 127	L 240.5, W 43.7, H 25.4
WHCG9 127 / 220	L 255, W 40, H 25.4
WHCG5 220 T12 RS	L 235, W 40, H 25.4
WHCG5 220 T12 RS L	L 240.5, W 43.8, H 25.4
WHCG6 220	L 240.5, W 43.7, H 25.4

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
WHCG5 127 T12 RS WHCG5 127 T12 RS L*†	1 x, 2 x	F36T8, F40T12
WHCG6 127 T12 RS WHCG6 127 T12 RS L*†	1 x 2 x	F18T8, F20T12, F36T8, F40T12 F18T8, F20T12
WHCG9 127 T12 RS	2 x 3 x, 4 x	F36T8, F40T12 F18T8, F20T12
WHCG5 220 T12 RS WHCG5 220 T12 RS L*†	1 x, 2 x	F36T8, F40T12
WHCG6 220 T12 RS WHCG6 220 T12 RS L*†	1 x, 2 x	F18T8, F20T12
WHCG9 220 T12 RS	2 x 3 x, 4 x	F36T8, F40T12 F18T8, F20T12

*Ballasts with lead wire lengths as follows:

Black	630mm	Red	730mm	Yellow	1210mm
White	630mm	Blue	710mm		

FULHAM WORKHORSE™ FLUORESCENT IN-FIXTURE ELECTRONIC BALLASTS

FEATURES

- Versatile
- Energy Saving
- High Power Factor
- Lightweight
- Small Case Size
- Solid-State Electronics

10 BALLASTS OPERATE 132 LAMPS IN 860 COMBINATIONS

COMMON SPECIFICATIONS

Operating Voltage:	120VAC ± 10% 230VAC ± 10% 277VAC ± 10%	**Protection/Output:**	Open/Shorted Lamp
		Regulatory Approvals:	UL Listed Type1 or Type 2
Frequency:	50/60Hz	High Power Factor:	> .90
ATHD:	Meets ANSI C82.11-1993	Open Circuit Voltage:	600V RMS Max.
Protection/Input:		Ballast Min. Operating Temp.:	-20°F (-30°C)
Over Current:	Fuse	Ballast Maximum Case Temp.:	158°F (70°C)
Transient Protection:	C62.41 Class A 7 strikes	Ballast Lamp Starting Mode:	Instant Start
EMI: FCC CFR Title 47 Part 18 non-consumer		Inherent Thermal Protection	Class P
		Sound Rating	"A"

NOTE: Frequently switched, short duration ON/OFF cycles with any Instant Start ballast will reduce lamp life. Please contact your lamp manufacturer for details.

FLUORESCENT

	WORKHORSE 1	WORKHORSE 2	WORKHORSE 22	WORKHORSE 3	WORKHORSE 33
Model No. 120V	WH1-120-L	WH2-120-L WH2-120-C (BLS)	WH22-120-L WH22-120-C (BLS)	WH3-120-L WH3-120-C (BLS)	WH33-120-L WH33-120-C (BLS)
Max. Current 120VAC	.20 AMP	.33 AMP	.25 AMP	.56 AMP	.53 AMP
Model No. 230V	N/A	WH2-230-L	N/A	WH3-230-L	N/A
Max. Current 230VAC		.26 AMP		.29 AMP	
Model No. 277V	WH1-277-L	WH2-277-L WH2-277-C (BLS)	WH22-277-L WH22-277-C (BLS)	WH3-277-L WH3-277-C (BLS)	N/A
Max. Current 277VAC	.11 AMP	.15 AMP	.15 AMP	.24 AMP	
Max. Power	28W	35W	35W	64W	64W
Black/White Wires	12"	L-18" C-12"	L-18" C-12"	L-18" C-12"	L-18" C-12"
Red/Yellow Wires	24"	L-36" C-12"	L-36" C-12"	L-36" C-12"	L-36" C-12"
Ballast Sizes	120L: H .75", W 1", L 6" 277L: H .75", W 1", L 7.5"	120L: H 1", W 1", L 5.5" 230L: H 1", W 1", L 5.5" 277L: H 1", W 1", L 5.5" 120C: H 1", W 1.75", L 3.3" 277C: H 1", W 2.3", L 3.3"	120L: H 1", W 1", L 5.5" 277L: H 1", W 1", L 5.5" 120C: H 1", W 1.75", L 3.3" 277C: H 1", W 2.3", L 3.3"	120L: H 1", W 1.5", L 6.5" 230L: H 1", W 1.5", L 6.5" 277L: H 1", W 1.5", L 6.5" 120C: H 1", W 2.5", L 3.8" 277C: H 1", W 3.1", L 3.8"	120L: H 1", W 1.5", L 6.5" 120C: H 1", W 3.1", L 3.82"
Weight	4.5 oz.	7 oz.	7 oz.	10 oz.	10 oz.
Case Qty	50 pcs.	50 pcs.	50 pcs.	50 pcs.	50 pcs.

Refer to pages 140-147 for lamp compatibility.
Refer to pages 148 and 149 for wiring diagrams.

	WORKHORSE 4	WORKHORSE 5	WORKHORSE 6	WORKHORSE 7	WORKHORSE 8
Model No. 120V	WH4-120-L	WH5-120-L	WH6-120-L	WH7-120-L WH7-120-H	WH8-120-L
Max. Current 120VAC	.56 AMP	1.15 AMP	1.04 AMP	1.82 AMP	1.8 AMP
Model No. 230V	N/A	WH5-230-L	N/A	WH7-230-L	WH8-230-L
Max. Current 230VAC		0.57 AMP		1.10 AMP	1.1 AMP
Model No. 277V	WH4-277-L	WH5-277-L	WH6-277-L	WH7-277-L	WH8-277-L
Max. Current 277VAC	.21 AMP	0.48 AMP	0.50 AMP	.85 AMP	.74 AMP
Max. Power	70W	128W	140W	220W	220W
Black/White Wires	18"	18"	18"	18"	18"
Red/Yellow Wires	36"	36"	36"	36"	36"
Ballast Sizes	L: H 1", W 1.5", L 6.5"	120L: H 1", W 1.72", L 8.5" 277L: H 1", W 1.72", L 9.5"	L: H 1", W 1.72", L 8.5" 277L: H 1", W 1.72", L 9.5"	L: H 1", W 1.72", L 19.25" H: H 1.25", W 3.25", L 11.75"	L: H 1", W 1.72", L 19.25"
Weight	10 oz.	14 oz.	15 oz.	32.8 oz.	34 oz.
Case Qty	50 pcs.	50 pcs.	50 pcs.	25 pcs., except the WH7-120-H: 16pcs/case	25 pcs.

FLUORESCENT

	WORKHORSE 15
Model No. 120-277V (UNV)	WH15-UNV-L
Max. Current 120VAC	.75 AMP
Max. Current 277VAC	.318 AMP
Max. Power	90.32W
Black/White Wires	25" +/- 1"
Red/Yellow Wires	46" +/- 1"
Blue Wire	31" +/- 1"
Ballast Sizes	H 1.04", W 1.41", L 9.48"
Weight	1.15 lbs.
Case Qty	25 pcs.

Refer to pages 140-147 for lamp compatibility.
Refer to pages 148 and 149 for wiring diagrams.

AVAILABLE NOW

UNV WorkHorse Ballasts

Universal Voltage (120V-277V) WorkHorse ballasts are available in two case styles: Cube cases for CFLs and Linear cases for linear lamps. One, two, three and four lamp combinations are available.

Models:

WH41-UNV-C
WH41-UNV-L
WH42-UNV-L
WH43-UNV-L
WH44-UNV-C
WH44-UNV-L
WH45-UNV-L

Contact Client Services for details at order@fulham.com or visit www.fulham.com for updates.

CANADIAN UL LISTED WORKHORSE BALLASTS

Model No.	Description	Model No.	Description
CWH2-120-BLS	WH2,120V, Cube Case, BLS	CWH3-277-L	WH3, 277V, Long Case
CWH2-120-C	WH2,120V, Cube Case	CWH33-120-BLS	WH33,120V, Cube Case, BLS
CWH2-120-L	WH2,120V, Long Case	CWH33-120-C	WH33,120V, Cube Case
CWH22-120-BLS	WH22,120V, Cube Case, BLS	CWH33-120-L	WH33,120V, Long Case
CWH22-120-C	WH22,120V, Cube Case	CWH4-120-L	WH4,120V, Long Case
CWH22-120-L	WH22,120V, Long Case	CWH5-120-L	WH5,120V, Long Case
CWH22-277-C	WH22, 277V, Cube Case	CWH5-120-LR	WH5,120V, Long Case, RoHS Compliant
CWH22-277-L	WH22, 277V, Long Case	CWH6-120-L	WH6,120V, Long Case
CWH3-120-BLS	WH3,120V, Cube Case, BLS	CWH7-120-H	WH7,120V, H CAN
CWH3-120-C	WH3,120V, Cube Case	CWH7-120-L	WH7,120V, Long Case
CWH3-120-L	WH3,120V, Long Case	CWH8-120-L	WH8,120V, Long Case

NOTE: For Canadian WorkHorse Ballasts, refer to pages 144-147 for compatibility with lamp sizes T6 and larger.

FULHAM WHAM™

FLUORESCENT T5 ULTRA SLIM ELECTRONIC BALLASTS

FEATURES

- All of the features of the WorkHorse in a slim case
- Designed for Thin Undercabinet Applications
- 3/4" x 1" Cross Section Allows the WHAM to Easily Fit Extrusions
- See the WorkHorse 1 for another 3/4" x 1" Case for T2 & T5 Lamps

COMMON SPECIFICATIONS

Operating Voltage:	120VAC ± 10%
Frequency:	50/60Hz
ATHD:	Meets ANSI C82.11-1993
Protection/Input:	
Over Current:	Fuse
Transient Protection:	C62.41 Class A 7 strikes
EMI: FCC CFR Title 47 Part 18 non-consumer	
Open/Shorted Lamp:	
Regulatory Approvals:	UL Listed Type 1 or Type 2
High Power Factor:	> .90
Open Circuit Voltage:	600 V RMS Max.
Ballast Min. Operating Temp.:	-20°F (-30°C)
Ballast Maximum Case Temp.:	158°F (70°C)
Ballast Lamp Starting Mode:	Instant Start
Class P Inherent Thermal Protection	
Sound Rating	"A"

2 BALLASTS OPERATE 41 LAMPS IN 70 COMBINATIONS

	WHAM 1	WHAM 2
Model No. 120V	WHAM1-120-135-L	WHAM2-120-213-L
Max. Current 120VAC	.33 AMP	.22 AMP
Max. Power	35W	28W
Black/White Wires	18"	18"
Red/Yellow Wires	24"	24"
Ballast Size	L 7.5", W 1", H .75"	L 7.5", W 1", H .75"
Weight	5 oz.	5 oz.
Case Qty	50 pcs.	50 pcs.

Refer to pages 140-147 for lamp compatibility.
Refer to pages 148 and 149 for wiring diagrams.

FULHAM LONGHORSE™ FLUORESCENT REMOTE MOUNT ELECTRONIC BALLASTS

FEATURES

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

6 BALLASTS OPERATE 124 LAMPS IN 628 COMBINATIONS

COMMON SPECIFICATIONS

Operating Voltage:	120VAC ± 10% 277VAC ± 10%	Regulatory Approvals:	UL Listed Type 1 or Type 2
Frequency:	50/60Hz	High Power Factor:	> .90
ATHD:	Meets ANSI C82.11-1993	Open Circuit Voltage:	600 V RMS Max.
Protection/Output:	Open Lamp and Shorted Lamp	Ballast Min. Operating Temp.:	-20°F (-30°C)
Protection/Input:		Ballast Maximum Case Temp.:	158°F (70°C)
Over Current:	Fuse	Ballast Lamp Starting Mode:	Instant Start
Transient Protection:	C62.41 Class A 7 strikes	Inherent Thermal Protection	Class P
EMI: FCC CFR Title 47 Part 18 non-consumer		Sound Rating	"A"

NOTE: Frequently switched, short duration ON/OFF cycles with any Instant Start ballast will reduce lamp life. Please contact your lamp manufacturer for details.

	LONGHORSE 1	LONGHORSE 2	LONGHORSE 3	LONGHORSE 4	LONGHORSE 5	LONGHORSE 6
Model No. 120V	LH1-120-L	LH2-120-L	LH3-120-L	LH4-120-L	LH5-120-L	LH6-120-L
Max. Current 120VAC	0.26 AMP	0.36 AMP	0.61 AMP	0.65 AMP	1.25 AMP	1.25 AMP
Model No. 277V	LH1-277-L	LH2-277-L	LH3-277-L	LH4-277-L	LH5-277-L	LH6-277-L
Max. Current 277VAC	0.10 AMP	0.15 AMP	0.25 AMP	0.22 AMP	0.48 AMP	0.50 AMP
Max. Power	28W	35W	64W	70W	128W	140W
Black/White Wires	18"	18"	18"	18"	18"	18"
Red/Yellow Wires	36"	36"	36"	36"	36"	36"
Ballast Sizes	L 6.5", W 1.5", H 1"	L 9.5", W 1.72", H 1"	L 9.5", W 1.72", H 1"	L 9.5", W 1.72", H 1"	120: L 13.3", W 1.72", H 1" 277: L 16", W 1.72", H 1"	120: L 13.3", W 1.72", H 1" 277: L 16", W 1.72", H 1"
Weight	7 oz.	14 oz.	14 oz.	14 oz.	120: 24 oz. 277: 26.4 oz.	120: 22.4 oz. 277: 27.2 oz.
Case Qty	50 pcs.	50 pcs.	50 pcs.	50 pcs.	25 pcs.	25 pcs.

CANADIAN UL LISTED LONGHORSE BALLASTS

Model No.	Description
CLH1-120-L	WH1 for Remote Mounting
CLH2-120-L	WH2 for Remote Mounting
CLH3-120-L	WH3 for Remote Mounting
CLH4-120-L	WH4 for Remote Mounting
CLH5-120-L	WH5 for Remote Mounting
CLH6-120-L	WH6 for Remote Mounting

NOTE: For Canadian LongHorse Ballasts, refer to pages 144-147 for compatibility with lamp sizes T6 and larger.

Refer to pages 140-147 for lamp compatibility.
Refer to pages 148 and 149 for wiring diagrams.

FULHAM

WORKHORSE SPECIFIER GRADE

SPECIFIER GRADE T8/T12 FLUORESCENT ELECTRONIC BALLASTS

FEATURES

- Drop In Replacement for Magnetic Ballasts
- Parallel Lamp Operation
- Specifier Grade = < 10% ATHD
- High Ballast Factor (1.18) Available
- Low Ballast Factor (0.78) Available

APPLICATIONS

- Offices
- Schools
- Hotels
- Apartments
- Retirement Complexes
- Industrial
- Retail Stores

COMMON SPECIFICATIONS

Power Factor:	98.5 % Min.
ATHD:	Less than 10%
EMI: FCC CFR Title 47 Part 18 non-consumer	
Ballast Factor::	>.87
Lamp CF:	< 1.7
Starting Method:	T8: Instant Start T12HO: Modified Rapid Start
Regulatory Approvals:	UL & cULus Listed Type1 or Type 2
Min. Starting Temp. :	0°F (-18°C)
Inherent Thermal Protection:	Class P
Transient Protection:	C62.41 Class A 7 strikes
Ballast Sizes:	T8: L 9.5", W 1.38", H 1.0" (L 240mm, W 35mm, H 25mm) T12HO: L 11.75", W 2.3", H 1.6" (H L 299mm, W 58mm, 41mm)
Weights:	T8: 1.5 lbs. (700g) T12HO: 4.0 lbs. (1.8 kg)

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
Universal Voltage for T8 - (Instant Start) <10% ATHD		
WHSG1-UNV-T8-IS	1 x	F17T8, F25T8, F32T8, F40T8, FBO31T8, F32T8/30, F32T8/28, F32T8/25
WHSG2-UNV-T8-IS	1 x	F17T8, F25T8, F32T8, F40T8, FBO31T8, F32T8/30, F32T8/28, F32T8/25
	2 x	F17T8, F25T8, F32T8, FBO31T8, F32T8/30, F32T8/28, F32T8/25
WHSG3-UNV-T8-IS	2 x	F25T8, F32T8, F40T8
	3 x	F17T8, F25T8, F32T8
WHSG4-UNV-T8-IS	3 x	F25T8, F32T8, F40T8
	4 x	F17T8, F25T8, F32T8
WHSG8-UNV-T8 SL	1 x	F96T8, F96T8HO,
	2 x	F96T8
Dedicated Voltage for T12HO - (Rapid Start) <10% ATHD		
WHSG7-120-T12 HO	1 x	F96T12HO, F96T12/ESHO
	2 x	F96T12HO, F72T12HO, F60T12HO, F48T12HO, F96T12/ES/HO

Model No.	WHSG1-UNV-T8-IS	WHSG2-UNV-T8-IS	WHSG3-UNV-T8-IS	WHSG4-UNV-T8-IS	WHSG7-120-T12 HO	WHSG8-UNV-T8 SL
Input Voltage	120V-277V 50/60Hz	120V-277V 50/60Hz	120V-277V 50/60Hz	120V-277V 50/60Hz	120V 50/60Hz	120V-277V 50/60Hz
Input Power	33W	59W	85W	112W	200W	109W
Max. Current	.28 AMP	.50 AMP	.71 AMP	.93 AMP	1.65 AMP	.92 AMP
Black/White Wires	24"	24"	24"	28"	22"	25"
Red Wires	46"	46"	46"	30"	46"	79"
Blue Wires	32"	32"	32"	30"	46"	46"
Yellow Wires	N/A	N/A	N/A	46"	70"	N/A
Case Qty	25 pcs.	25 pcs.	25 pcs.	25 pcs.	10 pcs.	25 pcs.
CEE		✓	✓	✓		

CEE Lamp Ballast Combinations: These ballasts meet new, high efficiency standards in combination with T8 four foot lamps. Please contact Fulham Customer Service for details.

FULHAM WORKHORSE SPECIFIER GRADE

SPECIFIER GRADE T8 FLUORESCENT HIGH & LOW BALLAST FACTOR ELECTRONIC BALLASTS

FEATURES

- Drop In Replacement for Magnetic Ballasts
- Parallel Lamp Operation
- Specifier Grade = < 10% ATHD
- High Ballast Factor (1.18) Available
- Low Ballast Factor (0.78) Available

APPLICATIONS

- Offices
- Schools
- Hotels
- Apartments
- Retirement Complexes
- Industrial
- Retail Stores

COMMON SPECIFICATIONS

Power Factor:	98.5% Min.
ATHD:	Less than 10%
EMI: FCC CFR Title 47 Part 18 non-consumer	
Ballast Factor:	>.87
Lamp CF:	< 1.7
Starting Method:	T8: Instant Start
Regulatory Approvals:	UL & cULus Listed Type 1 or Type 2
Min. Starting Temp.:	0°F (-18°C)
Inherent Thermal Protection:	Class P
Transient Protection:	C62.41 Class A 7 strikes
Ballast Size:	L 9.5", W 1.38", H 1.0"
LB 2-4, HB 2-3	(L 240mm, W 35mm, H 25mm)
HB 4	L 9.5", W 1.7", H 1.2"
	(L 240mm, W 43mm, H 30mm)
Weight:	1.5 lbs. (700g)

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
Universal Voltage for High and Low Ballast Factor T8 Applications		
WHSG2-UNV-T8-LB	1 x	F25T8, F32T8, F40T8, FBO31T8, F32T8/30, F32T8/28, F32T8/25
	2 x	F17T8, F25T8, F32T8, FBO31T8, F32T8/30, F32T8/28, F32T8/25
WHSG2-UNV-T8-HB	1 x	F32T8, F40T8, FBO31T8, F32T8/30, F32T8/28, F32T8/25
	2 x	F32T8, FBO31T8, F32T8/30, F32T8/28, F32T8/25
WHSG3-UNV-T8-LB	2 x	F32T8, F40T8
	3 x	F17T8, F25T8, F32T8
WHSG3-UNV-T8-HB	2 x	F25T8, F32T8, F40T8
	3 x	F17T8, F25T8, F32T8
WHSG4-UNV-T8-LB	3 x	F25T8, F32T8, F40T8
WHSG4-UNV-T8-HB	3 x	F25T8, F32T8, F32T8/ES/25, F32T8/ES/28, F32T8/ES/30, F40T8
	4 x	F25T8, F32T8, F32T8/ES/25, F32T8/ES/28, F32T8/ES/30

Model No.	WHSG2-UNV-T8-LB	WHSG2-UNV-T8-HB	WHSG3-UNV-T8-LB	WHSG3-UNV-T8-HB	WHSG4-UNV-T8-LB	WHSG4-UNV-T8-HB
Input Voltage	120V-277V 50/60Hz	120V-277V 50/60Hz	120V-277V 50/60Hz	120V-277V 50/60Hz	120V-277V 50/60Hz	120V-277V 50/60Hz
Input Power	52W	74W	76W	104W	98W	146W
Max. Current	.44 AMP	.62 AMP	.64 AMP	.91 AMP	.82 AMP	1.24 AMP
Black/White Wires	24"	24"	24"	24"	24"	24"
Red Wires	46"	46"	46"	46"	46"	30"
Blue Wires	32"	32"	32"	32"	32"	30"
Yellow Wires						46"
Case Qty	25 pcs.	25 pcs.	25 pcs.	25 pcs.	25 pcs.	25 pcs.
CEE	✓	✓	✓	✓	✓	✓

CEE Lamp Ballast Combinations: These ballasts meet new, high efficiency standards in combination with T8 four foot lamps. Please contact Fulham Customer Service for details.

FULHAM WORKHORSE™

HIGH EFFICIENCY & PROGRAM START T8 FLUORESCENT ELECTRONIC BALLASTS

FEATURES

- WHHE: Instant Start
- WHPS: Program Start for Long Lamp Life
- High Efficiency
- Multiple Lamp Operation
- WHHE: CEE Qualified

APPLICATIONS

- Decorative Lighting
- Indoor Architectural Lighting
- Outdoor Architectural Lighting
- Commercial and Industrial Lighting

COMMON SPECIFICATIONS

Operating Voltage:	WHHE: 120-277VAC (UNV) WHPS: 120-277VAC (UNV) ± 10%	Ballast Maximum Case Temp.:	WHHE: 194ºF (90ºC) WHPS: 158ºF (70ºC)
Frequency:	50/60Hz	Ballast Lamp Starting Mode:	WHHE: Instant Start WHPS: Program Start
Power Factor::	WHHE: 98% WHPS: 98.6% Min.	Min. Operating Temp.:	0°F (-18°C)
ATHD:	≤ 10%	Inherent Thermal Protection:	Class P
EMI: FCC CFR Title 47 Part 18 non-consumer		Ballast Size:	L 8.91", W 1.32", H 1.05" (L 226.3mm, W 33.5mm, H 26.7mm)
Ballast Factor:	>.93	Sound Rating	"A"
Lamp CF:	< 1.7	Regulatory Approvals: UL & cULus Listed Type1 or Type 2 Type HL, CC	

FLUORESCENT

Model No.	WHHE-UNV-T8-IS	WHPS1-UNV-T8-PS	WHPS2-UNV-T8-PS	WHPS3-UNV-T8-PS
Starting Method	Instant Start	Program Start	Program Start	Program Start
Max. Load	59W	30W	57W	87W
Max. Current	0.46 AMP	0.25 AMP	0.48 AMP	0.72 AMP
Case Quantity	25 pcs.	25 pcs.	25 pcs.	25 pcs.
CEE	✓	✓	✓	✓

CEE Lamp Ballast Combinations: These ballasts meet new, high efficiency standards in combination with T8 four foot lamps. Please contact Fulham Customer Service for details.

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
WHHE2-UNV-T8-IS	1 x	F40T8
	1 or 2	F32 / FB32 / FB31 / FB28 / F25 / F17 T8; F32T8/ES/30; F32T8/ES/28; F32T8/ES/25
WHPS1-UNV-T8-PS	1 x	F32T8, FB32T8, FB31T8, FB28T8, F32T8/ES/30, F32T8/ES/28, F32/ES/25
WHPS2-UNV-T8-PS	2 x	F32T8, FB32T8, FB31T8, FB28T8, F32T8/ES/30, F32T8/ES/28, F32/ES/25
WHPS3-UNV-T8-PS	3 x	F32T8, FB32T8, FB31T8, FB28T8, F32T8/ES/30, F32T8/ES/28, F32/ES/25

FULHAM WORKHORSE™ COMMERCIAL GRADE

COMMERCIAL GRADE T8/T12 FLUORESCENT ELECTRONIC BALLASTS

APPLICATIONS

- Offices
- Schools
- Hotels
- Apartments
- Retirement Complexes
- Industrial
- Retail Stores

COMMON SPECIFICATIONS

Power Factor:	97.5% Min.
ATHD:	Less than 20%
EMI: FCC CFR Title 47 Part 18 non-consumer	
Ballast Factor::	>.87
Lamp CF:	< 1.7
Starting Method:	WHCG1-4: Instant Start WHCG5 & 6: Rapid Start
Regulatory Approvals:	UL & cULus Listed Type 1 or Type 2
Min. Starting Temp. :	0°F (-18°C)
Inherent Thermal Protection:	Class P
Ballast Size:	L 9.5", W 1.7", H 1.2" (L 240mm, W 43mm, H 30mm)
Weight:	1.7 lb. (760g)

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
Dedicated Voltage (120V) for T8 - (Instant Start) <20% ATHD		
WHCG1-120-T8-IS	1 x	F17T8, F25T8, F32T8
WHCG2-120-T8-IS	1 x	F25T8, F32T8, F40T8, FB031T8
	2 x	F17T8, F25T8, F32T8, FB031T8
WHCG3-120-T8-IS	2 x	F25T8, F32T8, F40T8
	3 x	F17T8, F25T8, F32T8
WHCG4-120-T8-IS	2 x	F40T8
	3 x	F17T8, F25T8, F32T8, F40T8, FB031T8, F32T8/30, F32T8/28, F32T8/25
	4 x	F17T8, F25T8, F32T8, FB031T8, F32T8/30, F32T8/28, F32T8/25
Dedicated Voltage for T12 - (Rapid Start) <20% ATHD		
WHCG5-120-T12 RS	1 x	F36T8, F34T12, F40T12
	2 x	F18T8, F36T8, F40T8, F20T12, F34T12, F40T12
WHCG6-120-T12 RS	1 x	F18T8, F36T8, F20T12, F34T12, F40T12
	2 x	F18T8, F20T12

IS: Instant Start - RS: Rapid Start

Model No.	WHCG1-120-T8-IS	WHCG2-120-T8-IS	WHCG3-120-T8-IS	WHCG4-120-T8-IS	WHCG5-120-T12 RS	WHCG6-120-T12 RS
Input Voltage	120V 60Hz (108V-132V)	120V 60Hz (108V-132V)	120V 60Hz (108V-132V)	120V 60Hz (108V-132V)	120V 60Hz (108V-132V)	120V 60Hz (108V-132V)
Input Power	30W (with T8 32W lamp)	58W (with T8 32W lamp)	85W (with T8 32W lamp)	112W (with T8 32W lamp)	74W (with T12 40W lamp)	36W (with T12 20W lamp)
Max. Current	.26 AMP	.50 AMP	.71 AMP	.93 AMP	.62 AMP	.31 AMP
Black/White Wires	24"	24"	24"	28"	24"	24"
Red Wires	48"	48"	48"	30"	32"	32"
Blue Wires	32"	32"	32"	30"	32"	32"
Yellow Wires	N/A	N/A	N/A	46"	48"	48"
Case Qty	25 pcs.	25 pcs.	25 pcs.	25 pcs.	25 pcs.	25 pcs.
CEE				✓		

NOTE: WorkHorse Commercial Grade 277V available for models 1-5 while supplies last. Contact Customer Service for details.

FULHAM PONY™ FULHAM SUGARCUBE™ LINEAR, COMPACT & CIRCLE LAMP ELECTRONIC BALLASTS

COMMON SPECIFICATIONS

Operating Voltage:	120VAC±10% or 230VAC±10%	Regulatory Approvals:	UL & cULus Listed Type 1 or Type 2
Frequency:	50/60Hz	EMI: FCC CFR Title 47 Part 18 non-consumer	
Starting Type:	Rapid Start	Sound Rating:	"A"
Starting Temperature:	14ºF (-10°C)	CCF:	< 1.7
Ballast Max Case Temperature: 158ºF (70ºC)		Normal Power Factor:	> .5
Transient Protection:	C62.41 Class A 7 strikes		

LAMP OPERATION

SUGARCUBES FOR T5, T8, T12

Model Number	Operates Lamps
SC-120-115-CT8*	1 x F14T8, F15T8, F17T8, F14T12, F15T12
SC-120-120-CT12*	1 x F20T12
Ballast Size: L 3.09", W 1.45", H 1"	
SC-120-108-LT5*	1 x F6T5, F8T5
SC-120-113-LT5*	1 x F13T5, F14T5
SC-120-120-LT12*	1 x F20T12
Ballast Size: L 4.76", W 1.05", H .76"	
SC-120-128-LT5*	1 x F21T5, F28T5
Ballast Size: L 5.91", W 1.09", H 1.04"	
SC-120-115-T8XL*	1 x F14T8, F15T8, F14T12, F15T12
SC-120-125-T8XL*	1 x F17T8, F25T8
Ballast Size: L 6.30", W .95", H .73"	
SC-120-117-LT8*	1 x F15T8, F17T8
SC-120-132-T8XL*	1 x F15T8, F17T8, F25T8, F32T8
Ballast Size: L 6.30", W 1.08", H 1.01"	
SC-120-125-LT8*	1 x F17T8, F25T8
Ballast Size: L 4.76", W .95", H .73"	
SC-120-208-LT5*	1 x F13T5, F14T5, F6T5+F8T5 2 x F6T5, F8T5
SC-120-213-LT5	1 x F21T5, F8T5+F13T5 2 x F13T5, F14T5
Ballast Size: L 5.53", W 1.27", H 1.01"	

SUGARCUBES FOR CFL, CIRCLE & T8

SC-120-113-CTW	1 x 13CFT/E
SC-120-113-CFL*	1 x 13CFQ/E, F15T8, F17T8, 13W Spiral
SC-120-118-CFL	1 x 18CFQ/E, 18CFTR/E
SC-120-118-CTW	1 x 18CFT/E
Ballast Size: L 3.09", W 1.45", H 1"	

SUGARCUBES FOR UV LAMPS

Model Number	Operates Lamps
SC-120-287-CUV* SC-120-287-CUV-R*† SC-230-287-CUV* SC-230-287-CUV-R*†	1 x 180mm T5 UV, 287mm T5 UV
Ballast Size: L 3.07", W 1.46", H 1"	

(See page 48 for additional UV ballasts under the SunHorse brand.)

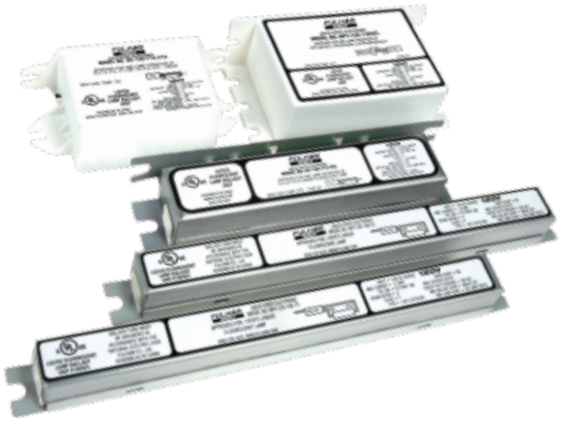
GLOBAL SERIES

SUGARCUBES FOR 230V LAMPS (not UL listed)

Model Number	Operates Lamps
SC-230-113-LT5	1 x F8T5, F13T5
Ballast Size: L 4.76", W .95", H .73"	
SC-230-115-LT8	1 x F15T8
SC-230-120-LT12	1 x F20T12
SC-230-125-LT8	1 x F25T8
Ballast Size: L 121mm, W 24mm, H 19mm	
SC-230-118-CFL*	1 x 18CFQ/E, 18CFTR/E
Ballast Size: L 78.3mm, W 37mm, H 25.4mm	
SC-230-213-LT5	2 x F8T5, F13T5 1 x F8T5 + F13T5
Ballast Size: L 140mm, W 32mm, H 25.4mm	
SC-230-118-LT8	1 x F18T8
Ballast Size: L 4.76", W .95", H .73"	
SC-230-113-CFL	1 x QUAD (CFQ/E), 4 PIN 13W 1 x TRIPLE(CFTR/E), 4 PIN 13W
Ballast Size: L 3.09", W 1.45", H 1"	

*Also cULus listed.

†RoHS Compliant



LAMP OPERATION

PONY FOR CFL

Model Number	Operates Lamps
NPY-120-113-CFL	1 x 7CFT/E, 9CFT/E, 11CFT/E, 13CFQ/E, 13CFTR/E
NPY-120-118-CFL*	1 x 13CFT/E, 18CFQ/E, 18CFTR/E
Ballast Size: L 3.36", W 1.76", H 1.03"	
NPY-120-113-BL	1 x 7CFT/E, 9CFT/E, 11CFT/E, 13CFQ/E, 13CFTR/E
NPY-120-118-BL*	1 x 13CFT/E, 18CFQ/E, 18CFTR/E
Ballast Size: L 3.34", W 1.77", H 1"	
NPY-120-126-CFL*	1 x 18CFT/E, 24/27CFT/E, 26CFQ/E, 26CFTR/E, 32CFTR/E, 22CRT9
NPY-120-126-BLS*	1 x 18CFT/E, 24/27CFT/E, 26CFQ/E, 26CFTR/E, 32CFTR/E, 22CRT9
NPY-120-132-CFL	1 x 36/39CFT/E, 32CFTR/E, 32CRT9, 24/27CFT/E
Ballast Size: L 3.36", W 2.39", H 1.02"	
NPY-120-213-CFL*	2 x 7CFT/E, 9CFT/E, 13CFQ/E, 13CFTR/E
NPY-120-218-CFL*	2 x 13CFT/E, 18CFQ/E, 18CFTR/E
Ballast Size: L 3.36", W 2.39", H 1.02"	
NPY-120-226-CFL*	2 x 18CFT/E, 24/27CFT/E, 26CFQ/E, 26CFTR/E, FC22T9
NPY-120-232-CFL*	2 x 36/39CFT/E, 32CFTR/E, 32CRT9
Ballast Size: L 3.83", W 3.11", H 1.01"	

PONY FOR CIRCLE

NPY-120-240-CR*	1 x FC8T9-22W + FC12T9-32W, 1 x FC12T9-32W + FC16T9-40W
Ballast Size: L 3.84", W 3.11", H 1.04"	
NPY-120-126-CR*	1 x FC8T9-22W
NPY-120-132-CR*	1 x FC12T9-32W
Ballast Size: L 3.36", W 2.39", H 1.02"	

*Also cULus listed.

†RoHS Compliant

PONY ULTRASLIM FOR T5

Model Number	Operates Lamps
NPY-120-108-T5US	1 x F8T5
NPY-120-113-T5US	1 x F14T5, F13T5
Ballast Size: L 6.81", W .67", H .69"	

PONY T5

NPY-120-214-LT5*	1 or 2 x F14T5
NPY-120-221-LT5	1 or 2 x F21T5
NPY-120-228-LT5*	1 or 2 x F28T5
Ballast Size: L 11.5", W 1.01", H 1.01"	
NPY-120-139-T5	1 x F39T5HO
NPY-120-154-T5	1 x F54T5HO
Ballast Size: L 9.06", W 1.23", H .91"	

PONY T8

NPY-120-232-LT8*	1 or 2 x F32T8 2 x F25T8, F40 / F34 / F30 / F25 T12 1 x F32T8 + F25T8, 1 x F32T8 + F17T8
NPY-120-217-LT8*	2 x F17T8 or F20T12
Ballast Size: L 12.01", W .96", H .83"	
NPY-120-232-T8IS*	1 or 2 x F32T8, FB031T8, F25T8, FB024T8, F17T8, FB016T8, F32T8 (30/28W), F20T12, F25T12, F30T12, F34T12, F40T12
Ballast Size: L 6.5", W 1.41", H 1"	
NPY-120-432 T8IS*	2 x F40T8 3 x F17T8, F25T8, F32T8, F40T8, F32T8 (30W/28W/25W), FB031T8, FB024, FB016, F20T12, F25T12, F30T12, F34T12, F40T12 4 x F17T8, F25T8, F32T8, F32T8 (30W), FB031T8, FB024, FB016, F20T12, F25T12, F30T12, F34T12, F40T12
Ballast Size: L 9.45", W 1.32", H 1.06"	

PONY FOR T8, T12

NPY-120-130-T8*	1 x F30T8, F30T12
Ballast Size: L 6.72", W .90", H .96"	
NPY-120-140-T8*	1 x F32T8, F40T8, F40T12
Ballast Size: L 6.72", W 1.85", H .96"	
NPY-120-230-T8*	2 x F30T8, F30T12
NPY-120-240-T8*	2 x F32T8, F40T8, F40T12
Ballast Size: L 9.49", W 1.74", H 1.02"	

FULHAM RACEHORSE™

CFL FLUORESCENT ELECTRONIC BALLASTS

FEATURES

- 120V-277V
- < 10% ATHD
- High Power Factor
- End of Life (EOL) Protection
- Operate 1 or 2 Lamps
- Twin, Triple, Quad, Double Quad 9-70W
- UL, cULus
- 90ºC Max. Operating Temp.
- -30ºC Min. Start Temp.

APPLICATIONS

- Retail & Industrial Medium & High Bay
- Canopy Lighting
- Flood Lighting
- Parking Garages
- Gymnasiums
- Indirect Wall Washing
- Downlighting
- Outdoor Architectural
- Post Tops
- Wall Sconces
- Ceiling Surface Mount
- Air Handling Spaces (BLS Models)

RaceHorse Kits

COMMON SPECIFICATIONS

Operating Voltage:	120V-277V (Universal Voltage)	Lamp Starting Temp.:	See Lamp Specifications
Frequency:	50/60Hz	Ballast Maximum Case Temp.:	167ºF (75ºC) - 5 Year Warranty
ATHD:	< 10% Meets ANSI C82.11-1993	Ballast Maximum Case Temp.:	194ºF (90ºC) - 3 Year Warranty
Protection/Output:	Open Lamp, Shorted Lamp, End of Life	Ballast Lamp Starting Mode:	Programmed Start
Input Over Current Protection:	Fuse	Inherent Thermal Protection	Class P
Transient Protection:	C62.41 Class A 7 strikes	Sound Rating	"A"
Regulatory Approvals:	UL & cULus Listed Type 1 Outdoor	Remote Mounting	18' Maximum at -18ºC
High Power Factor:	> .98	Anti-Arcing Protection	UL Type CC
Open Circuit Voltage:	< 300V RMS Max.	RHA-EMI: FCC CFR Title 47 Part 18 non-consumer (RH-EMI: FCC CFR Title 47 Part 18 consumer & non-consumer)	
Ballast Min. Operating Temp.:	-22°F (-30ºC)	BLS models are approved for air handling spaces	

FLUORESCENT

	RACEHORSE 1	RACEHORSE 2†	RACEHORSE 3†	RACEHORSE 4†
Model No.	RHA-UNV-213-BLS/C/K	RHA-UNV-218-BLS/C/K	RHA-UNV-226-BLS/C/K	RHA-UNV-242-BLS/C/K
Max Load	26W	36W	57W	84W
Max Input Current	.28 AMP	.344 AMP	.52 AMP	.752 AMP
Ballast Size	L 5.1" (4.3" case), W 2.4", H 1"	L 5.1" (4.3" case), W 2.4", H 1"	L 5.1" (4.3" case), W 2.4", H 1"	L 5.1" (4.3" case), W 3", H 1.3"
Ballast Weight	5.2 oz.	5.2 oz.	5.2 oz.	7 oz.
Case Quantity	BLS Models: 50 pcs/ case C Models: 50 pcs/ case Kits (K): 20 pcs/ case	BLS Models: 40 pcs/ case C Models: 50 pcs/ case Kits (K): 20 pcs/ case	BLS Models: 40 pcs/ case C Models: 50 pcs/ case Kits (K): 20 pcs/ case	BLS Models: 50 pcs/ case C Models: 50 pcs/ case Kits (K): 30 pcs/ case

- **BLS** = Compact Case with mounting studs (8/32" studs on bottom plate, 2" on center)
- **C** = Compact Case; No studs on bottom plate
- **K** = Contractor Kit with stud adapter plate, lead wire set and wire removal tool

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
RHA-UNV-213-BLS/C/K	1 x	13CFQ, 13CFTR, 2D16W
	2 x	7CFT, 9CFT, 13CFQ, 13CFTR, 2D10W
RHA-UNV-218-BLS/C/K	1 x	18CFQ, 18CFTR, 2D21W
	2 x	18CFQ, 18CFTR, 2D16W, 2D21W
RHA-UNV-226-BLS/C/K	1 x	13CFT, 26CFQ, 26CFTR, 32CFTR, 42CFTR, 2D21W, 2D28W, 2D38W, T5CR22W, FT18, FT36/39, T5CR40W, FT24/27, 57CFM
	2 x	13CFT, FT18W, 26CFQ, 26CFTR, FT24/27, 2D21W, F24T5HO
RHA-UNV-242-BLS/C/K	1 x	CFM57, CFM70, 42CFTR, FT24/27, FT36/39, FT40, 2D28W, 2D38W, T5CR40W, 36TUV, GPH793T5L
	2 x	26CFQ, 26CFTR, 32CFTR, 42CFTR, FT24/27, FT36/39, FT40, 2D28W, 2D38W, T5CR22W, T5CR40W, 36TUV, GPH793T5L

† These products have previously been tested as per SASO guidelines and comply with the SASO standards. If you are interested in your shipment being accompanied by a SASO conformity certificate, this can be arranged at cost for the testing. Please contact the Middle East regional office for details.

FULHAM RACEHORSE™

T5HO & T5HE FLUORESCENT ELECTRONIC BALLASTS

FEATURES

- 120V-277V
- < 10% ATHD
- High Power Factor
- End of Life (EOL) Protection
- Operate 1x, 2x, 3x & 4x Lamps
- TW, CR, T5HO, T5HE
- UL, cULus
- Programmed Preheat Start

APPLICATIONS

- Retail and Industrial Medium and High Bay
- Canopy Lighting
- Flood Lighting
- Parking Garages
- Gymnasiums
- Indirect Wall Washing
- Downlighting
- Outdoor Architectural
- Post Tops

COMMON SPECIFICATIONS

Operating Voltage:	120V-277V (Universal Voltage)	High Power Factor:	> .98
Frequency:	50/60Hz	Open Circuit Voltage:	600 V RMS Max.
ATHD:	< 10%	Ballast Min. Operating Temp.:	-18°C (0°F)
Protection/Output: Protection/Input:	End of Life (EOL)	Ballast Maximum Case Temp.:	167ºF (75ºC) - 5 Year Warranty
Over Current:	Fuse	Ballast Maximum Case Temp.:	194ºF (90ºC) - 3 Year Warranty
Transient Protection:	C62.41 Class A 7 strikes	Ballast Lamp Starting Mode:	Programmed Preheat Start
EMI: FCC CFR Title 47 Part 18 non-consumer		Inherent Thermal Protection	Class P
Regulatory Approvals:	UL & cULus Listed Type 1 Outdoor	Sound Rating	"A"

Model No.	RH21-UNV-224 LT5	RHA-UNV-224-LT5	RH22-UNV-239 LT5	RHA-UNV-239-LT5
Max. Load	52W	54W	87W	93W
Max. Current	0.44 AMP	0.45 AMP	0.73 AMP	0.78 AMP
Ballast Size	L 16.89", W 1.20", H 1"	L 9.45", W 1.31", H 1.06"	L 16.34", W 1.18", H 1"	L 9.45", W 1.31", H 1.06"
Connector Type	No Leads	Leads	No Leads	Leads
Case Quantity	20 pcs.	20 pcs.	20 pcs.	20 pcs.
Compliance	RoHS	RoHS	RoHS	RoHS

Model No.	RH23-UNV-254 LT5	RH28-UNV-454 LT5	RH13-UNV-228 LT5	RHA-UNV-228-LT5	RH14-UNV-235 LT5
Max. Load	115W	238W	67W	67W	77W
Max. Current	0.96 AMP	1.96 AMP	0.56 AMP	0.56 AMP	0.64 AMP
Ballast Size	L 16.88", W 1.23", H 1"	L 16.88", W 2.29", H 1"	L 16.89", W 1.20", H 1"	L 9.45", W 1.31", H 1.06"	L 16.89", W 1.20", H 1"
Connector Type	Push-in	Leads	No Leads	Leads	No Leads
Case Quantity	30 pcs.	15 pcs.	20 pcs.	20 pcs.	20 pcs.
Compliance			RoHS	RoHS	RoHS

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
RH21-UNV-224 LT5	1 x	F24T5HO, F39T5HO, FT24W, T5CR22W, T5CR40W, FT40W, FT36W
RHA-UNV-224-LT5	2 x	F24T5HO, FT24W, T5CR22W
RH22-UNV-239 LT5 RHA-UNV-239-LT5	1 x	F39T5HO, F24T5HO, T5CR40W, T5CR22W, FT36W, FT24W, FT40W
	2 x	F39T5HO, F24T5HO, T5CR40W, T5CR22W, FT36W, FT24W
	1 each	T5CR22W + T5CR40W
RH23-UNV-254 LT5	1 x	F54T5HO, FT55W, FT50W, FT36W, FC12T5 55W
	2 x	F54T5HO, FT55W, FT50W, FT36W, FC12T5 55W
RH28-UNV-454 LT5	3 x	F54T5HO, FT55W, FT50W, FT36W, FC12T5 55W
	4 x	F54T5HO, FT55W, FT50W, FT36W, FC12T5 55W
RH13-UNV-228 LT5 RHA-UNV-228-LT5	1 x	F28T5/HE, F21T5/HE, F14T5/HE
	2 x	F28T5/HE, F21T5/HE, F14T5/HE
RH14-UNV-235 LT5	1 x	F35T5/HE, F28T5/HE, F21T5/HE
	2 x	F35T5/HE, F28T5/HE, F21T5/HE, F14T5/HE

FULHAM RACEHORSE™

T5HO FLUORESCENT ELECTRONIC BALLASTS

FEATURES

- Programmed Preheat Start for extended lamp life in frequent switching applications
- End of Life (EOL) Protection to safely remove power from the lamp as it nears end of life
- Cold Starting to ensure proper functionality even in low temperature applications (-18°C)
- Improved Reliability due to precision control flicker-free operation
- Auto-Restart which eliminates the need to reset the power mains after lamp replacement

COMMON SPECIFICATIONS

Operating Voltage:	120V-277V (Universal Voltage)	Type HL Approval:	Approved for Hazardous Location
Frequency:	50/60Hz	High Power Factor:	> .98
ATHD:	< 10%	Open Circuit Voltage:	600 V RMS Max.
Protection/Output:	End of Life (EOL)	Ballast Min. Operating Temp.:	-18°C (0°F)
Protection/Input:		Ballast Maximum Case Temp.:	(158°F) (70°C) - 5 Year Warranty
Over Current:	Fuse	Ballast Maximum Case Temp.:	(194°F) (90°C) - 3 Year Warranty
Transient Protection:	C62.41 Class A 7 strikes	Ballast Lamp Starting Mode:	Programmed Preheat Start
EMI: FCC CFR Title 47 Part 18 non-consumer		Inherent Thermal Protection	Class P
Regulatory Approvals:	UL & cULus Listed Type 1 Outdoor	Sound Rating:	"A"

FLUORESCENT

Model No.	RHA-UNV-254-LT5	RHA-UNV-454-LT5
Max. Load	120W	240W
Max. Current	1.0 AMP	2.0 AMP
Ballast Size	L 9.53", W 1.32", H 1.05"	L 16.88", W 1.69", H 1.18"
Connector Type	Leads	Leads
Case Quantity	25 pcs.	20 pcs.

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
RHA-UNV-254-LT5	1 x	F54T5HO, FT55W, FT50W, FC12T5 55W
	2 x	F54T5HO, FT55W, FT50W, FC12T5 55W
RHA-UNV-454-LT5	2 x	F54T5HO, FT36W, FT55W
	3 x	F54T5HO, FT36W, FT55W
	4 x	F54T5HO, FT36W, FT55W

FULHAM LIGHTINGCONTROLS™

0-10V DIMMABLE FLUORESCENT ELECTRONIC BALLASTS

FEATURES

- Easily installs in standard lighting fixtures to protect your fixture investment
- Allows for material energy savings in conjunction with Fulham Lighting Controls devices; see pages 14 - 15
- Utilizes microprocessor technology to provide more performance at less cost
- RoHS and CEE/NEMA High Performance varieties available
- Programmed Start
- Series Sequential Circuit Type
- Universal Voltage 120V - 277V

Model Numbers	Certifications	Lamp Compatibility
HSM-UNV-114-LT5	cCSAus, UL, RoHS	1 x F35T5, F28T5, F21T5, F14T5
HSM-UNV-126-C	cCSAus, UL, RoHS	1 x FT18W/2G11, FT24W/2G11, CFQ26/GXq, CFTR26W/GX24q, FC9T5, FC12T5
HSM-UNV-132-C	cCSAus, UL, RoHS	1 x CFTR32W/GX24q, FT40W/2G11/RS, FT36W/2G11, FC9T5, FC12T5
HSM-UNV-139-LT5	cCSAus, UL, RoHS	1 x F39T5HO, F24T5HO
HSM-UNV-142-C	cCSAus, UL, RoHS	1 x CFTR42W/GX24q, FT40W/2G11/RS, FT36W/2G11, FC9T5, FC12T5
HSM-UNV-154-LT5	cULus, RoHS	1 x F54T5HO, FT55W/2G11/RS, FT50W/2G11/RS, F58T8
HSM-UNV-214-LT5	cULus, RoHS	2 x F35T5, F28T5, F21T5, F14T5
HSM-UNV-239-LT5	cULus, RoHS	2 x F39T5HO, F24T5HO, FT40/2G11/RS, FT36W/2G11, FT24W/2G11, FT18W/2G11, FC12T5, FC9T5
HSM-UNV-254-LT5	cCSAus, UL, RoHS	2 x F54T5HO, FT55W/2G11/RS, FT50W/2G11, F58T8

0-10V & DALI DIMMABLE ELECTRONIC FLUORESCENT BALLASTS

Operates industry-standard low voltage 0-10VDC or DALI control modes & electrical inputs (UNV).

CF DA UNV 332T8 W	UL Class P, Indoor, FCC 47CFR Part 18 (Non-consumer); CEE/NEMA High Performance	1x or 2x 32W T8s, or 1x to 2x 25W, or 2x 17W T8s.
CF DA UNV 332T8 L CF DA UNV 254T5 L	UL Class P, Indoor, UL 935, FCC 47CFR Part 15 Class A or B; CEE/NEMA High Performance	These two ballasts operate many T8, T5, and T5HO lamp wattages and numbers of lamps. See spec sheet on www.fulham.com for full details.

FULHAM® ICEHORSE™

FLUORESCENT LOW TEMPERATURE ELECTRONIC BALLASTS

FEATURES

- A Dynamic Ballast that automatically synchs/adjusts in cold temperatures to provide optimal light output
- Universal Voltage 120V-277V
- High Power Factor
- Deactivated Lamp Protection
- Fault Condition Protection
- Programmed Pre-Heat Start
- Minimum Starting Temperature -30°C/-22ºF
- No PCBs
- Low ATHD < 10%
- 18' Remote Mountable
- Type "HL" approved for hazardous locations

APPLICATIONS

- Refrigerator Cases
- Freezer Cases
- Vending Machines
- Coolers
- Consistently Cold Outdoor Locations

STANDARD MOLEX® CONNECTORS

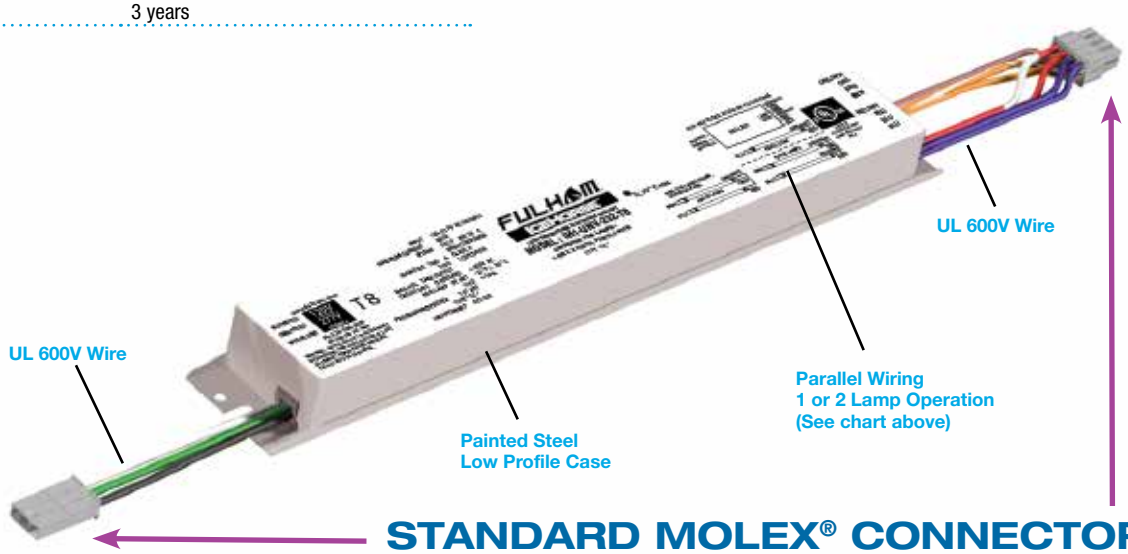
COMMON SPECIFICATIONS

Input Voltage	120V-277V (UNV)
Input Voltage Range	± 10%
Power Line Frequency	50/60Hz
High Power Factor	> 0.98
ATHD	< 10%
Re-Lamping Circuit	Deactivated Lamp Protection
Current Protection	Fuse
Lamp Operation Mode	Programmed Start
Lamp Connection	Parallel
Ignition Method	Programmed Pre-Heat Start
Lamp Current Crest Factor	< 1.7
Transient Protection:	C62.41 Class A 7 strikes
Circuit to Ground	< 600 VAC
UL / cULus Listed	Type 1 Outdoor
Type "CC" Rated	Anti-Arc
Thermal Protection	Class "P"
EMI/RFI Compliance	FCC Part 18 non-consumer
Sound Rating	A
Minimum Operating Temperature	-30°C (-22°F)
Maximum Case Temperature	70°C (158°F)
Ballast Case Construction	Painted Steel
Input/Output Connections	Wire Leads + Connectors
Potted	Yes
Warranty	3 years

	ICEHORSE 1	ICEHORSE 2	ICEHORSE 3
Model No.	IH1-UNV-232-T8	IH2-UNV-270-T8	IH3-UNV 272 T12HO
Max. Current	.85 AMP	1.35 AMP	1.38 AMP
Max. Power	100W	155W	150W
Common Ballast Size	L 12", W 1.7", H 1" L 304.80mm, W 43.18mm, H 25.4mm		
Weight	1.4 lbs	1.5 lbs	1.4 lbs
Case Qty	25 pcs.	25 pcs.	25 pcs.

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

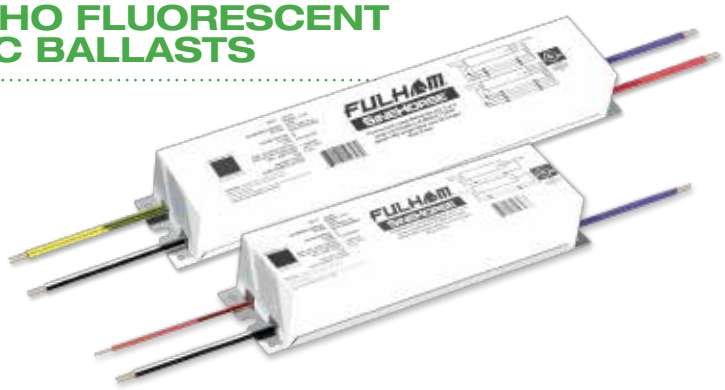


STANDARD MOLEX® CONNECTORS

FOR PLUG-N-PLAY COMMERCIAL REFRIGERATION APPLICATIONS

FULHAM SINEHORSE™

T12HO & T8HO FLUORESCENT ELECTRONIC BALLASTS



FEATURES

- Instant Start
- Energy Efficient / Green Responsible
- Reduced Installation and Maintenance Cost
- Reduced Weight and Profile for Signage
- Lower Inventory Carrying Cost with just 3 SKUs

GLOBAL SERIES

COMMON SPECIFICATIONS

Operating Voltage:	120V - 277V (UNV)	Input Protection	Fuse
Frequency:	50/60Hz	Lamp Current Regulation	±5%
ATHD:	< 10%	Starting Temperature	-29°C (-20°F)
Power Factor	>90%	Operating Temperature	29°C - 50°C
EMI: FCC 47 CFR Part 18 Consumer		Max Case Temperature	70°C
Min./Max. Lamp Length Per Output	2' / 10'	RMS Open Circuit	<1000V
Lamp Configuration	Parallel	Sound Rating:	"A"
Regulatory Approvals:	cULus Listed Type 2 Outdoor	Transient Protection:	C62.41 Class A 7 strikes

Model No.	SN1-UNV-1324-IS	SN2-UNV-2432-IS	SN3-UNV-4650-IS
Input Current	1.55A	2.1A	3.2A
Lamp Load Min/Max	2ft-24ft with 1, 2 or 3 Lamps	4ft-32ft with 2, 3 or 4 Lamps	8ft-50ft with 4, 5 or 6 Lamps
Ballast Size	12" L, 2.8" W, 1.8" H	12" L, 2.8" W, 1.8" H	14.37" L, 2.83" W, 1.92" H

FLUORESCENT

MODEL SELECTION CHART

# LAMPS PER BALLAST	TOTAL LAMP FOOTAGE: 2 3 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
1, 2 or 3	BL-UNV-1-3-24
2, 3 or 4	BL-UNV-2-4-32
4, 5 or 6	BL-UNV-4-6-50

N. GLANTZ & SON SIGN SUPPLIES FOUNDED 1906

beBrite™ POWERED BY FULHAM

SineHorse electronic ballasts for signage applications in the United States of America are available under the "beBrite | powered by Fulham" brand through N. Glantz & Son. (www.nglantz.com)

MODEL SELECTION CHART

# LAMPS PER BALLAST	TOTAL LAMP FOOTAGE: 2 3 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
1, 2 or 3	BL-UNV-1-3-24
2, 3 or 4	BL-UNV-2-4-32
4, 5 or 6	BL-UNV-4-6-40
4, 5 or 6	BL-UNV-4-6-50

120 • 210 • 230
208-240 • 120-277 UNV 50/60Hz

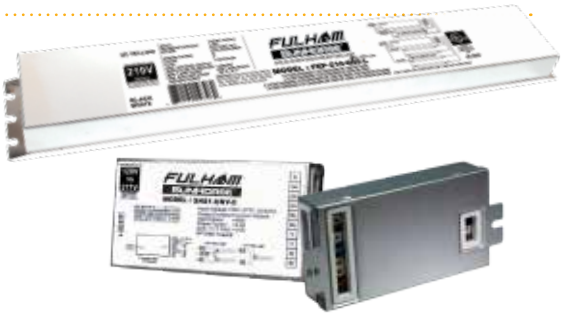
FULHAM SUNHORSE™

DIMMABLE & STANDARD ELECTRONIC BALLASTS FOR UV & TANNING

COMMON SPECIFICATIONS

Frequency	50/60Hz
Protection Output	Yes
Protection Input	Fuse/MOV
Over Current	Yes
Transient Protection	C62.41 Class A 7 strikes
EMI	FCC PART 18 non-consumer

Regulatory Approvals	UL/cULus as indicated in chart below
Class P Inherent Thermal Protection	Type 1 Outdoor
Sound Rating	"A"



Standard Models (Non-Dimming)	Operating Voltage	Max. Input Current	Rated Max. Load	Min. Operating Temp.	Max Case Temp.	Ballast Dimensions	c UL us	CE
FOR UV								
SHS4-120-C	120VAC	0.303A	21W	0ºC (32ºF)	75ºC (167ºF)	L 3.09", W 1.45", H 1"	✓	
SHS1-UNV-C	120-277VAC	0.408A	42W	0ºC (32ºF)	75ºC (167ºF)	L 5.05", W 2.36", H 1.00"	✓	
SHS1-UNV-C-I*	120-277VAC	0.408A	42W	0ºC (32ºF)	75ºC (167ºF)	L 5.05", W 2.36", H 1.00"	✓	
SHS5-024-C	24VAC	2.59A	42W	0ºC (32ºF)	75ºC (167ºF)	L 3.64", W 3.12", H 1.01"	✓	
SHS2-MLT-L	120-240VAC	0.19A	17W	0ºC (32ºF)	75ºC (167ºF)	L 5.87", W 1.50", H 1.04"		
SHS3-MLT-L	120-240VAC	0.29A	32W	-10ºC (14ºF)	75ºC (167ºF)	L 5.87", W 1.50", H 1.04"		
SHS10-UNV-H	120-277VAC	1.25A	150W	0ºC (32ºF)	80ºC (176ºF)	L 10", W 2.6", H 1.26"		
SHS11-UNV-H	120-277VAC	1.35A	190W	0ºC (32ºF)	70ºC (158ºF)	L 10", W 2.6", H 1.26"		
SHS14-UNV-H	120-277VAC	1.6A	150W	0ºC (32ºF)	70ºC (158ºF)	L 10", W 2.6", H 1.26"		
SHS15-UNV-H	120-277VAC	2.9A	310W	0ºC (32ºF)	75ºC (167ºF)	L 10", W 2.8", H 1.79"		
FOR UV & TANNING								
FEP-120-600-L	120VAC	2.86A	320W	-18ºC (0ºF)	70ºC (158ºF)	L 19.25", W 3", H 1.25"	✓	
FEP-210-600-L	210VAC	1.52A	320W	0ºC (32ºF)	70ºC (158ºF)	L 19.25", W 3", H1.25"	✓	
FEP-230-600-L	230VAC	1.50A	320W	-18ºC (0ºF)	70ºC (158ºF)	L 19.25", W 3", H 1.25"	✓	
SHGS1 MID 2 200 L	208-240VAC	1.85A	380W	0ºC (32ºF)	75ºC (167ºF)	L 12", W 3.11", H 1.73"	✓	
SHGS2 MID 4 100 L	208-240VAC	1.88A	380W	0ºC (32ºF)	75ºC (167ºF)	L 12", W 3.11", H 1.73"	✓	
SHGS3 MID 6 100 L	208-240VAC	2.50A	600W	0ºC (32ºF)	75ºC (167ºF)	L 16", W 3.11", H 1.77"	✓	
SHGS5 MID 2 200 N	208-240VAC	1.70A	400W	10ºC (50ºF)	N/A - No case	L 9.84", W 2.76", H 1.89"		✓
SHGS6 MID 4 120 N	208-240VAC	1.70A	480W	10ºC (50ºF)	N/A - No case	L 9.84", W 2.76", H 1.89"		✓
SHGS7 MID 6 120 N	208-240VAC	2.50A	720W	10ºC (50ºF)	N/A - No case	L 12.72", W 2.95", H 1.97"		✓
WH15-UNV-L***	120-277VAC	0.955A	95W	-18ºC (0ºF)	70ºC (158ºF)	L 9.5", W 1.38", H 1.0"	✓	

Dimmable
OPTIONS AVAILABLE

DIMMING FEATURES

Instant Start with 0-10V dimming control and linear (smooth) dimming from 100-70%.

Dimming Models								
SHGD1 MID 2 200 L	208-240VAC	1.71A	400W	0ºC (32ºF)	75ºC (167ºF)	L 12", W 3.11", H 1.73"	✓	
SHGD2 MID 4 100 L	208-240VAC	1.74A	400W	0ºC (32ºF)	75ºC (167ºF)	L 12", W 3.11", H 1.73"	✓	
SHD21-230-L	230VAC	1.64A	320W	0ºC (32ºF)	70ºC (158ºF)	L 16.69", W 1.72", H 1.18"	✓	
SHD21-230-L-I*	230VAC	1.64A	320W	0ºC (32ºF)	70ºC (158ºF)	L 16.69", W 1.72", H 1.18"	✓	

*These models feature an indicator for lamp operation.

***Universal Voltage WorkHorse 15 is also suitable for UV/Tanning applications. See page 33 for details.

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
SHS4-120-C	1 x	GPH500T5L
SHS1-UNV-C	1 x	TUV36W, 38W / 41W T5
	1 or 2	10W / 14W / 15W / 17W / 21WT5, TUV18W
SHS1-UNV-C-I	1 x	TUV36W, 38W / 41W T5
	1 or 2	10W / 14W / 15W / 17W / 21WT5, TUV18W
SHS5-024-C	1 x	TUV36W, 38W / 41 WT5
	1 or 2	T3 12", T3 17", 10W / 14W / 15W / 17W / 21W T5, TUV 18W
SHS2-MLT-L	1 x	5W / 9W / 17W UV Lamp
SHS3-MLT-L	1 x	19W / 32W UV, GPH287 / GPH357 T5HO
SHS10-UNV-H	1 x	LMPHGS600 (122 37-L77)
SHS11-UNV-H	1 or 2	GPH893 T5/L/HO/4PSE
SHS14-UNV-H	1 or 2	G64 T5L/4P
SHS15-UNV-H	1 or 2	GHO64 T5/L/4PSE (LIGHT SOURCES 155W), GHO64 T5/L/4PSE (ATLANTIC 155W)
FEP-120-600-L	1 x	F79 (200W) T12HO
	2 x	F72 (160W) / F79 (200W) T12HO
	3 x	F24 / F30 / F36 / F48 / F59 (85W) / F60 / F64 / F72 / F72 (100W) / F84 / F84 (120W) T12HO
	4 x	F24 / F30 / F36 / F48 / F59 (85W) / F60 / F64 / F72 / F72 (100W) T12HO
FEP-230-600-L	2 x	F72 (160W) / F79 (200W) T12VHO
	3 or 4	F59 (85W) / F72 (100W) T12HO
SHGS1 MID 2 200 L	1 or 2	F59 / F60 / F71 / F72 / F73 / F74 / F79 (180W) / F79 (200W) T12VHO
SHGS2 MID 4 100 L	3 or 4	F59 / F71 / F72 / F73 T12HO
SHGS3 MID 6 100 L	5 or 6	F59 / F71 / F72 / F73 T12HO
SHGS5 MID 2 200 N	1 or 2	F59 (140W) / F71 (160W) / F73 (160W) / F74 (200W) / F79 (180W) / F79 (200W) T12VHO
SHGS6 MID 4 120 N	3 or 4	F59 (80W) / F71 (100W) / F73 (100W) / F74 (120W) / F79 (120W) T12HO
SHGS7 MID 6 120N	5 or 6	F59 (80W) / F71 (100W) / F73 (100W) / F74 (120W) / F79 (120W) T12HO

LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
WH15-UNV-L	1 x	GPH560T5LHO, GPH436T5L/HO, PGH357T5L/HO, GPH893T5/HO, TUV60W
	2 x	GPH212T5L, GPH287T5L, GPH303T5L, GPH357T5L, GPH436T5L, GPH793T5L, GPH843T5L, TUV 18W
SHGD1 MID 2 200 L	1 or 2	F59 / F60 / F71 / F72 / F73 / F74 / F79 T12VHO
SHGD2 MID 4 100 L	3 or 4	F59 / F71 / F72 / F73 T12HO
SHD21-230-L	1 x	GPHHA1554T6L (320W UV T6)
SHD21-230-L-I	1 x	GPHHA1554T6L (320W UV T6)

FULHAM SUGARCUBE™

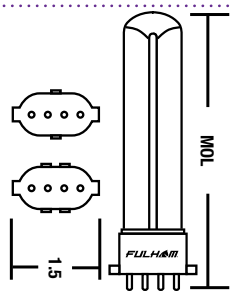
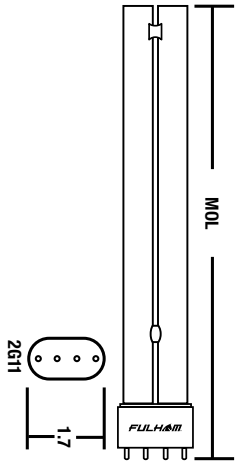
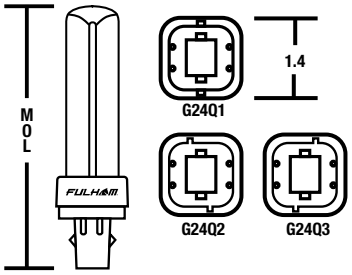
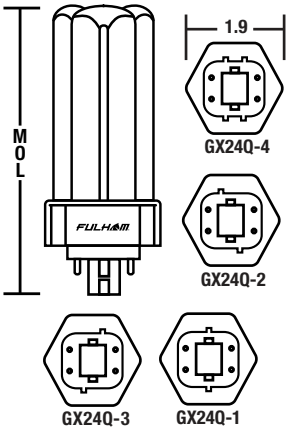
LINEAR UV LAMP ELECTRONIC BALLASTS

SUGARCUBES FOR UV LAMPS

Model Number	Operates Lamps
SC-120-287-CUV*	1 x 180mm T5 UV, 287mm T5 UV
SC-120-287-CUV-R*†	
SC-230-287-CUV*	
SC-230-287-CUV-R*†	

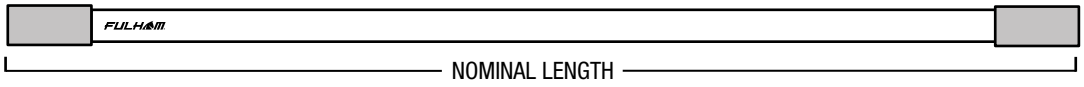
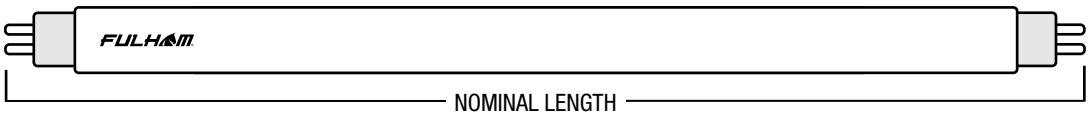
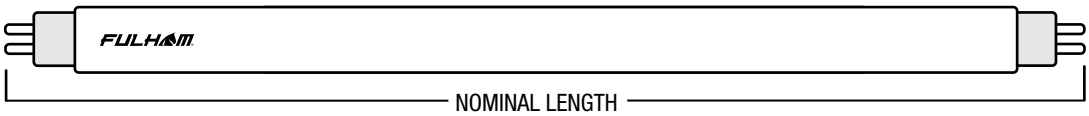
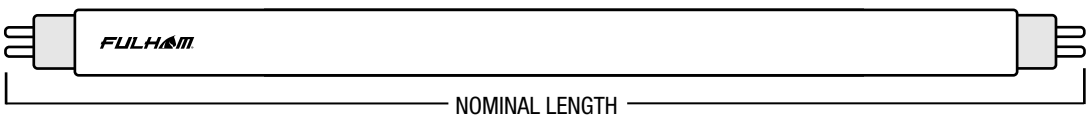
Ballast Size: L 3.07", W 1.46", H 1"

*cULus listed.
†RoHS Compliant

	Watts	Item Number*	CCT (K)* Color Temp	Initial Lumens	Rated Life[1]	Base	MOL (IN)	Case Qty
TWIN								
	5W	FCFTE5W8	27, 35, 41	250	10K HRS	2G7	3.6	100
	7W	FCFTE7W8	27, 35, 41	400	10K HRS	2G7	4.7	100
	9W	FCFTE9W8	27, 35, 41	600	10K HRS	2G7	5.9	100
	13W	FCFTE13W8	27, 35, 41, 50	900	10K HRS	2GX7	6.4	100
TWIN HI-LUMEN T5								
	18W	FCFTE18W8	27, 30, 35, 41	1250	10K HRS	2G11	8.9	50
	24W	FCFTE24W8	27, 30, 35, 41	1800	10K HRS	2G11	12.8	50
	36W	FCFTE36W8	27, 30, 35, 41	2900	10K HRS	2G11	16.4	50
	40W	FCFTE40W8	27, 30, 35, 41	3150	10K HRS	2G11	22.5	50
	55W	FCFTE55W8	27, 30, 35, 41, 50	4800	10K HRS	2G11	21.2	50
QUAD T4								
	13W	FCFQE13W8	27, 30, 35, 41	900	10K HRS	G24Q1	5.1	100
	18W	FCFQE18W8	27, 30, 35, 41	1250	10K HRS	G24Q2	5.8	100
	26W	FCFQE26W8	27, 30, 35, 41	1850	10K HRS	G24Q3	6.5	100
TRIPLE								
	13W	FCFTRE13W8	27, 30, 35, 41, 50	900	10K HRS	GX24Q-1	4.1	100
	18W	FCFTRE18W8	27, 30, 35, 41	1250	10K HRS	GX24Q-2	4.5	100
	26W	FCFTRE26W8	27, 30, 35, 41, 50	1850	10K HRS	GX24Q-3	4.9	100
	32W	FCFTRE32W8	27, 30, 35, 41, 50	2400	10K HRS	GX24Q-3	5.5	100

*ADD DESIRED COLOR TEMP CCT (K) TO END OF ITEM NUMBER WHEN ORDERING. EXAMPLE: FCFTE5W827

LAMP NOTES: **(1)** RATED LAMP LIFE BASED ON 3 HOURS PER START (MIN.). **(2)** CUSTOM COLORS (CCT) ARE AVAILABLE 27K THRU 64K, AS SPECIAL ORDER. CALL 323-599-5000. **(3)** ALL LAMPS CARRY A CRI RATING OF 80 TO 84 MIN. CRI. **(4)** DETAILED LAMP SPECIFICATIONS ARE AVAILABLE. CALL 323-599-5000 OR VISIT WWW.FULHAM.COM

	Watts	Item Number*	CCT (K)* Color Temp	Initial Lumens	Rated Life[1]	Base	NOM. LENGTH (IN)	Diameter	Case Qty
T2									
	6W	FLFT2E6W8	27,30,35,40,41, 50,60	330	7,000 HRS	T2 AXIAL	8.6	.25"	100
	8W	FLFT2E8W8	27,30,35,40,41, 50,60	540	7,000 HRS	T2 AXIAL	12.6	.25"	100
	11W	FLFT2E11W8	27,30,35,40,41, 50,60	750	7,000 HRS	T2 AXIAL	16.5	.25"	100
	13W	FLFT2E13W8	27,35,40,41,50,60	930	7,000 HRS	T2 AXIAL	20.6	.25"	100
T5 & T5 HIGH EFFICIENCY									
CE RoHS COMPLIANT TCLP	8W	FLFT58W8	27, 35, 41, 65	400	8,000 HRS	MNBI-PIN	12.0	.625"	25 / Bulk 50
	13W	FLFT513W8	27, 41	800	8,000 HRS	MNBI-PIN	21.0	.625"	25 / Bulk 50
	14W	FLFT514W8	27, 30, 35, 41, 50, 65	1350	35,000 HRS	MNBI-PIN	22.0	.625"	25 / Bulk 50
	21W	FLFT521W8	27, 30, 35, 41, 50, 65	2100	35,000 HRS	MNBI-PIN	34.0	.625"	25 / Bulk 50
	28W	FLFT528W8	27, 30, 35, 41, 50, 65	2900	35,000 HRS	MNBI-PIN	46.0	.625"	25 / Bulk 50
	35W	FLFT535W8	27, 30, 35, 41, 50, 65	3650	35,000 HRS	MNBI-PIN	58.0	.625"	25 / Bulk 50
T5 HIGH OUTPUT									
CE RoHS COMPLIANT TCLP	24W	FLFT5EH24W8	30, 35, 41, 50, 65	2000	35,000 HRS	MNBI-PIN	22.0	.625"	25 / Bulk 50
	39W	FLFT5EH39W8	30, 35, 41, 50, 65	3500	35,000 HRS	MNBI-PIN	34.0	.625"	25 / Bulk 50
	54W	FLFT5EH54W8	30, 35, 41, 50, 65	5000	35,000 HRS	MNBI-PIN	46.0	.625"	25 / Bulk 50
T5 VERY HIGH OUTPUT (VHO)									
CE RoHS COMPLIANT	95W	FLFT5EV95W8	30, 41, 65	7200	35,000 HRS	MNBI-PIN	45.795	.625"	30

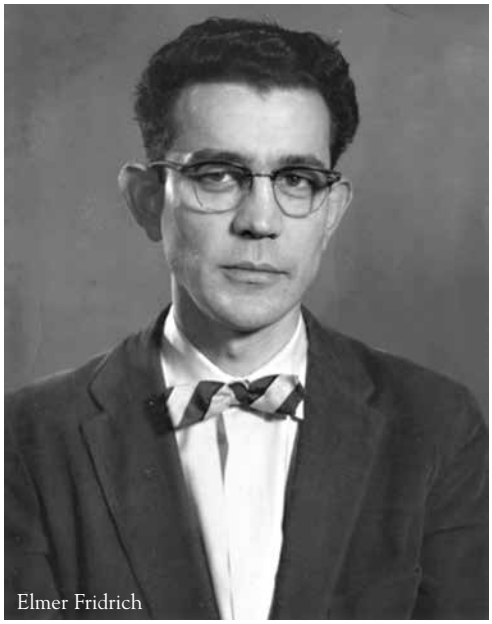
*ADD DESIRED COLOR TEMP CCT (K) TO END OF ITEM NUMBER WHEN ORDERING. EXAMPLE: FCFTE5W827

LAMP NOTES: **(1)** RATED LAMP LIFE BASED ON 12 HOURS PER START (MIN.). **(2)** CUSTOM COLORS (CCT) ARE AVAILABLE 27K THRU 64K, AS SPECIAL ORDER. CALL 323-599-5000. **(3)** ALL LAMPS CARRY A CRI RATING OF 80 TO 84 MIN. CRI. **(4)** DETAILED LAMP SPECIFICATIONS ARE AVAILABLE. CALL 323-599-5000 OR VISIT WWW.FULHAM.COM

Lamp color availability may vary by geographic region. Contact Customer Service for details.

HALOGEN
LIGHTING SYSTEMS

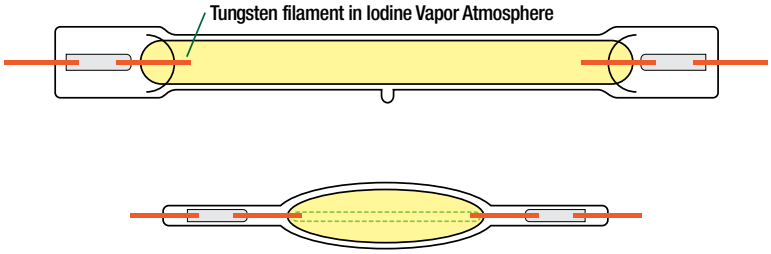
Think of halogen lighting as incandescence on steroids. It's bright, shows color well and is very affordable. Halogen is an excellent choice for track lighting, architectural design and displays.


Elmer Fridrich

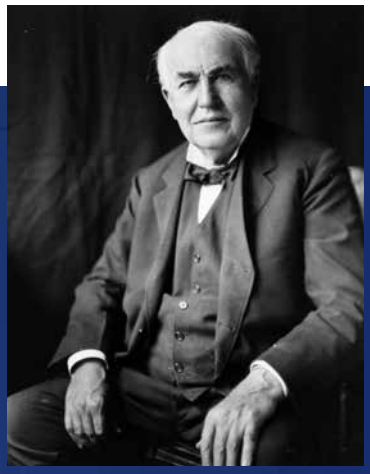
In 1959 Elmer Fridrich and Emmett Wiley created the first workable (and patentable) tungsten halogen lamp. Only a year later, GE scientist Frederick Moby improved on Fridrich and Wiley's invention with the "A-Lamp" that anyone could screw into their ceiling sockets or bedside table lamps. In 1962 came "Multi-Vapor Metal Halide" technology. Since then, lighting companies have been refining the design and operation of halogen lamps.

The halogen cycle kicks in only at high temperatures (nearly 500 degrees F.), otherwise the gas won't vaporize enough to work its magic on the tungsten. So bulbs must be smaller and stronger than incandescent bulbs, and made of heat resistant materials. Thick walls enable it to be packed with gases at very high pressure. The gas density slows tungsten degeneration from the filament, so the bulb doesn't become as blackened as soon. And the lamp's useful lifespan is increased.

That's not all. Halogen produces brighter, whiter-quality light while using less energy than ordinary incandescent bulbs of the same wattage. They are available in a variety of configurations, ranging from as low as 20 up to 2,000 watts.



DID YOU KNOW?
A MOST PRODUCTIVE MIND: THOMAS ALVA EDISON



Earlier we spoke of "the shoulders of giants" upon which scientific advances depend. Surely no Comprehensive Lighting Guide could be complete without mention of the giant called Thomas Edison (1847-1931) whose work in incandescence paved the way for halogen lighting. Edison's work is largely responsible for the "electrified" modern world: the phonograph, movies, municipal power grids and practical home lighting.

Few realize that Edison also possessed a first rate business mind. Establishing the nation's first major industrial rersearch laboratory, he pioneered the concepts of team research and mass production. Among history's most productive inventors, Edison held over 1,000 patents in the U.S. alone, and hundreds abroad.

He was mainly self-taught. A slow talker (he didn't speak until almost age 4), "Little Al" was considered dull-witted by his first teachers. So he rarely attended school, being tutored instead at home by his mother. At age 11 he began devouring the contents of the local library, increasing his knowledge by endlessly questioning adults on topics that interested him.

Unlike his rival, the lifelong celibate Nikola Tesla (see Induction), Edison was a family man. He married twice and fathered six children. Considering his exhaustive work schedule, where he found the time remains a mystery.

FULHAM PONY ET™ DIMMABLE ELECTRONIC TRANSFORMERS

FEATURES

- Operate Multiple MR16 & MR11 Lamps up to Stated Wattage
- Short Circuit, Overload & Thermal Protection
- cURus (UL recognized components)
- Solid State Electronics

COMMON SPECIFICATIONS

Dimmable

- Dimmer Capability: Leading Edge Or Trailing Edge
- Maximum Ambient Temperature: 50°C
- Auto Reset Electronic Short Circuit And Overload Protection
- High Power Factor, Low Total Harmonic Distortion
- Aluminum Case, Waterproof Potting
- Minimum Load Requirement: 20W

	PONY ET 60W CLASS 2	PONY ET 75W	PONY ET 150W	PONY ET 300W Linear	PONY ET 300W Circular
Model No.	PET-120-12-60	PET-120-12-75	PET-120-12 150W L	PET-120-12 300W L	PET-120-12 300W R
Max. Load	60W	75W	150W	300W	300W
Transformer Size	L 2.08", W 1.29", H 0.78"	L 2.08", W 1.29", H 0.78"	L 3.375", W 1.375", H 1.0625"	L 5.1875", W 1.5", H 1.0625"	H 1.375", Diameter 3.6875", Inside Diameter 0.375"
Lead Wire	6"	6"	6"	6"	6"
Case Qty	100 pcs.	100 pcs.	60 pcs.	48 pcs.	42 pcs.

FULHAM PONY ET™ DIMMABLE ELECTRONIC TRANSFORMERS

CE SELV EQUIVALENT

RoHS COMPLIANT

COMMON SPECIFICATIONS

Dimmable

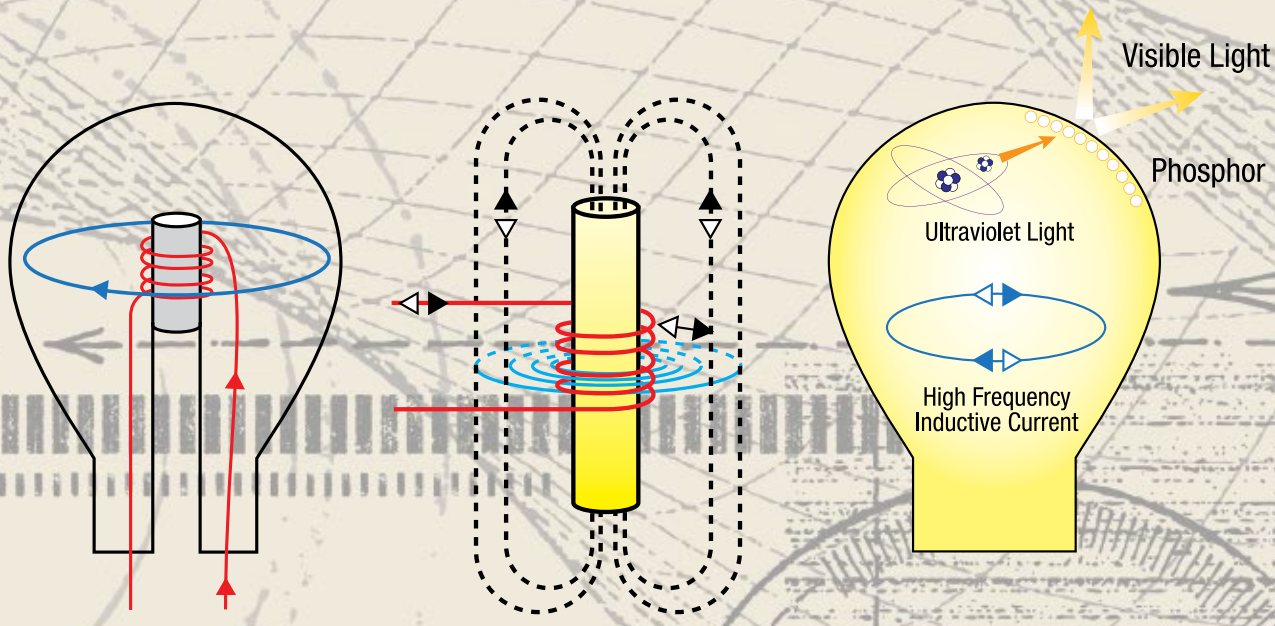
Input Voltage:	220V~240V, 50/60Hz	Temperature Protection	Yes
Output Voltage	10.6~12V	Approvals/Class	TUV, ROHS
EMI/RFI compliance	EN55015	Sound Rating	"A"
Power Factor	>0.99	Max. Case Temp	75ºC (167ºF)
Dimmable	100%~20% trailing edge	Max. Ambient Temp	40ºC (104ºF)
Short Circuit Protection	Auto-Reset	Hi-Pot	Input & Output 3750VAC
Over Load Protection	Auto-Reset	Warranty	2yrs

Model No.	PET-230-12-060 (PET-230-12060W)	PET-230-12-105
Input Power	20~60W	35~105W
Max. Line Current	0.25A	0.42A
THD	<12% IEC 61000-3-2	<8% IEC 61000-3-2
Over Load Range	<150W	<250W
Lamp Watts/Type:	3x20W/1x50W/6x10W 12V	3x35W/2x50W/5x20W/1x75W/1x100W 12V
Transformer Size	L 107mm, W 33mm, H 22mm	L 166mm, W 45mm, H 23mm

INDUCTION

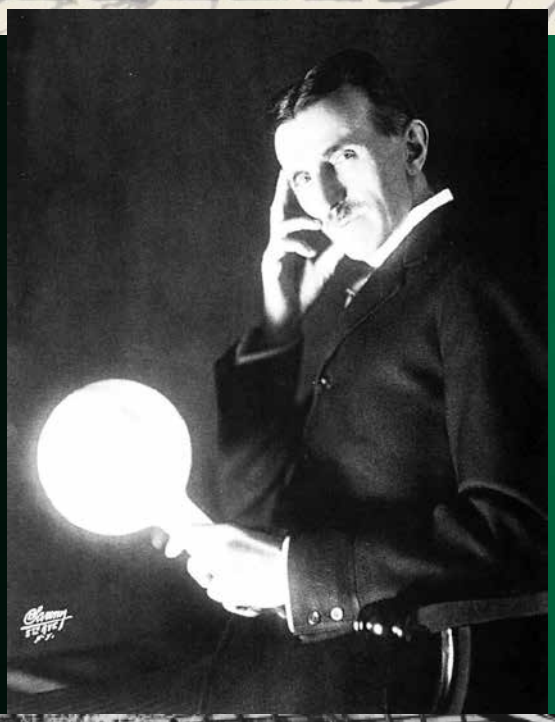
BRINGING NEW CLARITY TO BRILLIANCE

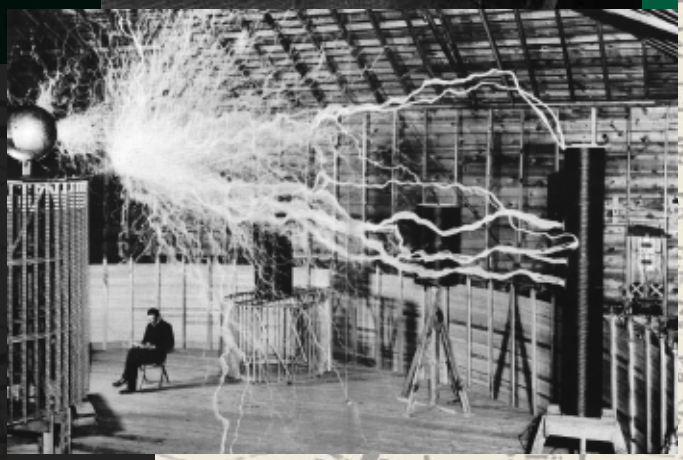
Picture a fluorescent lamp with an electromagnet wrapped around it. The electromagnet fires up. This excites gas molecules inside the lamp, producing a powerful electrochemical reaction that results in a stream of photons generating ultraviolet light, then visible light – based on the phosphor coating on the inside of the glass tube.



Here, Igor - Hold These Two Wires!

Enigmatic scientist and inventor Nikola Tesla (1856-1943) has been defined in many ways. Visionary. Pioneer. Seminal genius. Renaissance man. Polyglot. Prophet. Crackpot. An ethnic Serb born in what is now Croatia, he studied at several European universities in various languages before emigrating to America. An eccentric by most standards (vegetarian; lifelong celibate; clean-freak; claimed not to need sleep; photographic memory; devoted to pigeons, et al.), many aspects of his life remains opaque. To this day, many of his works are still studied, puzzled over, classified -- even suppressed (was he developing a Death Ray?). But our interest centers on his revolutionary work in electromagnetism and its applications, which match -- and often surpass -- those of his rival Edison. In the late 1800s (!), Tesla had already devised ways to transfer electrical energy into both fluorescent and incandescent lamps. In 1891, he patented a recognizable ancestor of the induction lamp. His diagrams for the U.S. Patent Office look very like designs for the electrode-less lamps we know today!





"An inventor's endeavor is essentially life saving. Whether he harnesses forces, improves devices, or provides new comforts and conveniences, he is adding to the safety of our existence."

-Nikola Tesla

INDUCTION
SUPERIOR LIGHTING

VISION IS IN THE EYE OF THE BEHOLDER

Popular wisdom holds that "the better the light, the better you can see." But not necessarily "the brighter the light." It's the quality of the light, not the wattage, that matters for visual acuity. Induction lighting produces breakthrough light quality because it was engineered according to the latest understanding of how our eyes process visual stimuli.

The human eye is built to perceive shapes, motion, colors, spatial orientation and other information from the environment (about 80% of human perception comes via eyesight). Induction lighting produces vision-friendly light. More clarity per watt.

Visual stimuli must transit the eye for processing in the brain. Efficient transit depends on the efficient functioning of cells in your retina called rods and cones. Rods are excellent for seeing at night ("scotopic vision") but don't "do" color. That's a job for the cones, which thrive at brighter levels ("photopic vision"). When the two work smoothly together they create optimal "seeing." The better the quality of the S/P balance ("mesopic"), the better the quality of that seeing.

Induction lighting assures the best possible interaction between rods and cones, thereby achieving superb mesopic balance.

Color Temperature

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 the lamp -- not the bulb's 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 induction lamps are offered in a wide variety of color temperatures by adjusting the phosphor coating applied to the inside of the lamp's glass tube. This delivers the quality of light you need for YOUR purposes.

CRI

"Color Rendering Index" is the expression electrical engineers use to describe how white your white looks; how red your red; how blue your blue -- in other words, how closely your lamp reproduces colors to the way they look in ordinary daylight. The more color matters to you or to your business, the happier you'll be with a high CRI.

Lighting Efficiency

For cars, efficiency = MPG. For batters, it's RBIs. Lamp efficiency is expressed by Lm/Wt -- Lumens per Watt. That's light output per unit of energy input. Different lamps deliver different Lm/Wt ranges. Your choice.

SCOTOPIC/PHOTOPIC (S/P) RATIO

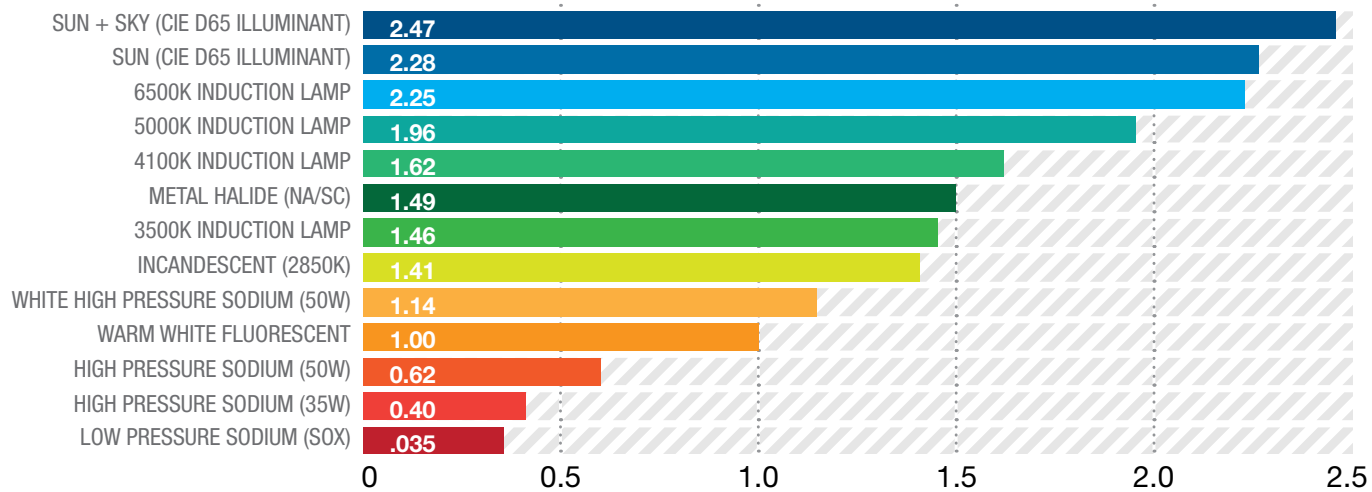
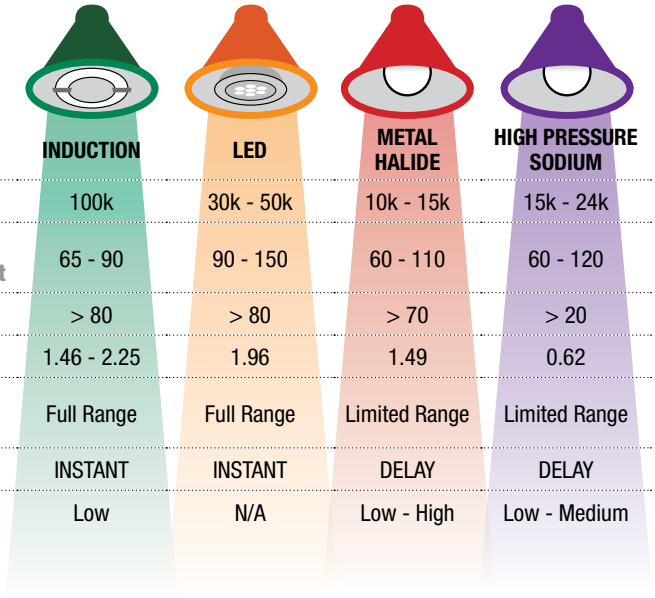


Chart calculations by Berkley Labs - actual selection of induction lamp wattage and type will vary with installation and user requirement.

> *The scientific man does not aim at an immediate result. He does not expect that his advanced ideas will be readily taken up. His work is like that of the planter – for the future. His duty is to lay the foundation for those who are to come, and point the way.* -Nikola Tesla

COMPARE THE SPECS

When compared to other common light sources, Induction's specifications clearly dominate the competition



	INDUCTION	LED	METAL HALIDE	HIGH PRESSURE SODIUM
LAMP LIFE HRS	100k	30k - 50k	10k - 15k	15k - 24k
LIGHTING EFFICIENCY Lm/Wt	65 - 90	90 - 150	60 - 110	60 - 120
CRI	> 80	> 80	> 70	> 20
S/P RATIO	1.46 - 2.25	1.96	1.49	0.62
COLOR TEMPERATURE	Full Range	Full Range	Limited Range	Limited Range
HOT RESTART	INSTANT	INSTANT	DELAY	DELAY
MERCURY	Low	N/A	Low - High	Low - Medium

Hot Restart

Your lamp goes dark. You need to light it up again. But how quickly can you do it? Some lamps are designed for instant re-start. Others need a cooling-off period, which could be as long as half an hour, sucking up valuable production time, etc., etc., etc.This table shows which lamps jump right back on line (Induction, LED), and which need time to think things over (MH, HPS).

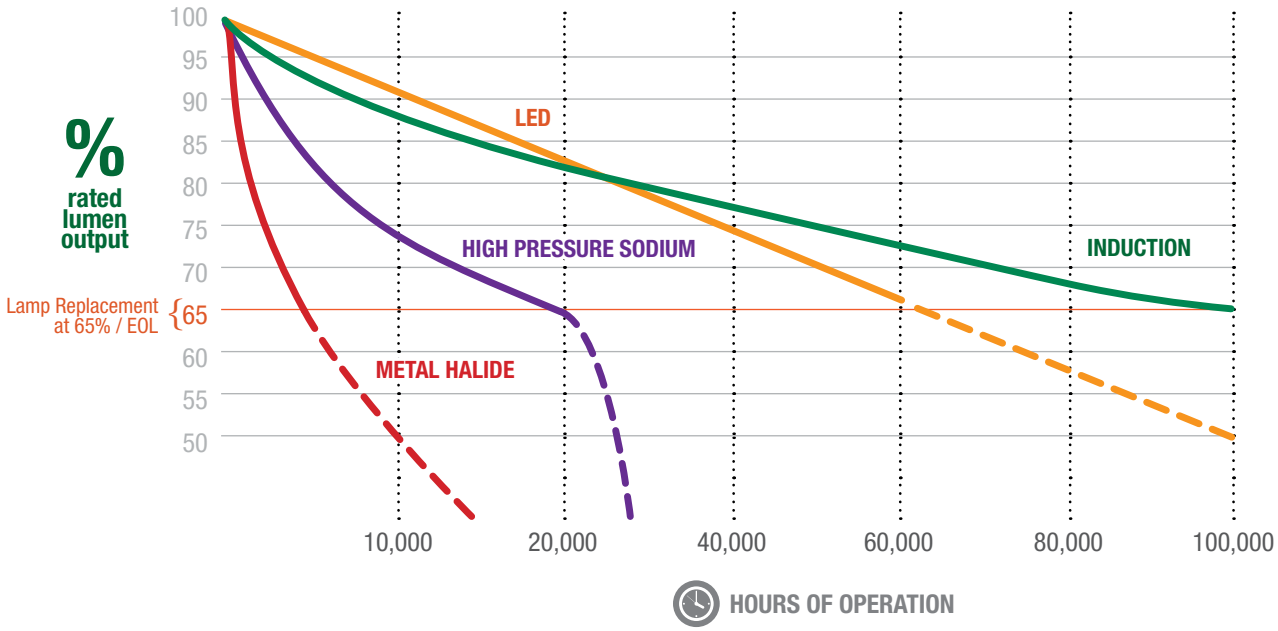
Lumen Maintenance

This "actuarial chart" below compares the active life expectancies of several of the most common lamps. Even though a lamp may still provide marginal light levels, industry norms consider its real potency gone at 65%, the failure level used in this diagram. All four lamps start at 100% efficiency, then gradually, as is to be expected in the real world, lose potency over their lifetime. Some maintain high levels fairly long; others reach dropoff (see the dotted line) relatively early.

HID lamps (MH and HPS) live fast, love hard and die fairly young. LEDs maintain robust levels until 50,000 hours or so, before dipping below useful levels. But induction lighting is engineered for the long haul. It unquestionably outlasts them all -- while still maintaining impressive strength.

LUMEN MAINTENANCE

Induction's ultra long lamp life provides low maintenance costs through out the life of the lamp. This means big savings over the competition.



INDUCTION
LIGHTING SYSTEMS

- COMPLETE INDUCTION SYSTEMS WITH PREMIUM FULHAM LAMPS AND GENERATORS
- OVER 1,100 SYSTEM MODELS, INCLUDING MOGUL AND MEDIUM BASED SCREW-IN VARIETIES
- 100,000 HOUR AVERAGE LAMP LIFE
- ENHANCED VISUAL ACUITY USING HALF THE ENERGY OF HID




TUBULAR BULB

CIRCULAR | 40W - 500W SYSTEMS

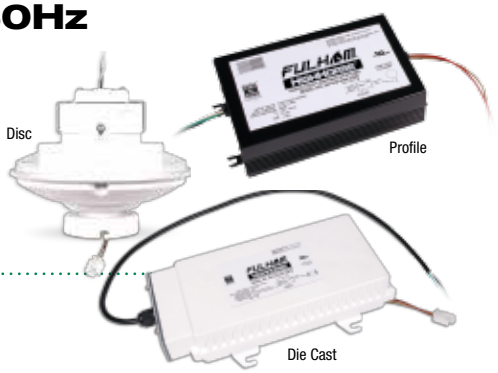
TUBULAR | 40W - 400W SYSTEMS

BULB | 35W - 120W SYSTEMS

HighHorse Induction product specification sheets and other related literature online

CIRCULAR

GENERATORS



FULHAM HIGHHORSE™

INDUCTION LIGHTING SYSTEM GENERATORS

COMMON GENERATOR SPECIFICATIONS

Input Voltage	120V-277V (UNV)	Case Temp.	<65°C
Input Frequency	50/60Hz	Operating Temp. Open Fixture	(0°C to 50°C)
Output Frequency	< 250KHz		
ATHD	< 10%	Operating Temp. Closed Fixture	(-20°C to 50°C)
Power Factor	> 0.95		
Constant Wattage Ouput	± 5%	Max Remote Distance**	7 ft. (84")
EMI/RFI Compliance	FCC Part 18-A	Sound Rating	Class A
Surge Protection	Yes		

**IMPORTANT: Do not modify wiring type or length without contacting Fulham. Special generator can be ordered from Fulham for a maximum remote distance of 49 ft.

CONTACT CLIENT SERVICES FOR THE FOLLOWING OPTIONS:

- Color Temperature: 2720K to 6500K
- Ambient -40°C to 0°C
- Dimming Options
- Replacement Ballast and Lamp
- Remote Mount Options

order@ fulham.com | 323-599-5000

INDUCTION

BEFORE&AFTER

How can visual acuity actually be improved by replacing a 150W HID system with an 85W HighHorse™ Induction system?

150W HPS

85W INDUCTION

The answer is found in how the human eye responds to light and how lighting sources affect vision.

The ratio of Scotopic light vs. Photopic light from a lamp is called the S/P ratio. This ratio determines the apparent visual brightness of a light source. Induction lighting produces a high S/P ratio and this is why the 85W lamp appears as bright or brighter to the human eye than a sodium vapor or metal halide of twice the wattage. Visual Effective Lumens (VEL) is a key factor in vision.

SYSTEM MODEL NUMBERS

HH	ILS OR IL OR I	B	P	35	5K OR 5 10 M OR 5C
HH = HIGHHORSE	**ILS** = INDUCTION LIGHTING SYSTEM	**B** = BULB **T** = TUBULAR **C** = CIRCULAR	**P** = PROFILE **DS** = DISC **DC** = DIE CAST	**WATTS**	**COLOR TEMP.** **0-10V MANUAL DIMMING** **COLD START MODEL**

EXAMPLES (GENERATOR + TUBULAR, CIRCULAR OR BULB LAMP)

HH ILS CP40 5K
HighHorse Induction Lighting System with a circular lamp and profile generator. 40W and 5K color temp.

HH ILS BP35 5K
HighHorse Induction Lighting System with a bulb lamp and profile generator. 35W and 5K color temp.

HH IL TP150 510M
HighHorse Induction Lighting System with a tubular lamp and profile generator. 150W, 5K color temp., and 0-10V manual dimming.

HH IL TP150 5C
HighHorse Induction Lighting System with a tubular lamp and profile generator. 150W, 5K color temp., with Cold Start capability.

FULHAM HIGHHORSE™ **INDUCTION TUBULAR SYSTEMS**

c UL us

Dimmable
OPTIONS AVAILABLE

System Model Number	Watts	Input Current (Amp) 120V - 277V	Input Power	Rated Initial Luminance (LM)	Efficacy (LM/W)††	Luminance Maintenance (60K Hrs)	CRI	Color Temp. (Kelvin)	Average Lamp Life (Hours)
HH ILS TP40 5K HH IL TP40 510M*	40	0.35-0.15	42	2800-3000	70-75	70%-75%	> 80	5000K (standard) Additional Color Temps: 2700K, 3000K, 3500K, 4000K, 4100K, 4500K, 6000K, 6500K	100,000
HH ILS TP70 5K HH IL TP70 510M*	70	0.62-0.27	74	4900-5250	70-75				
HH ILS TP80 5K HH IL TP80 510M* HH ILS TDC80 5K	80	0.70-0.30	84	6000-6400	75-80				
HH ILS TP100 5K HH IL TP100 510M* HH ILS TDC100 5K	100	0.88-0.38	105	7500-8000	75-80				
HH ILS TP120 5K HH ILS TDC120 5K	120	1.05-0.45	126	9000-9600	75-80				
HH ILS TP150 5K HH IL TP150 510M* HH ILS TDC150 5K	150	1.32-0.57	158	12000-12750	80-85				
HH ILS TP200 5K HH IL TP200 510M* HH ILS TDC200 5K	200	1.75-0.76	210	16000-17000	80-85				
HH ILS TP200 5 17† HH IL TP200 510M 17† HH ILS TDC200 5 17†	200	1.75-0.76	210	16000-17000	80-85				
HH ILS TP250 5K HH IL TP250 510M* HH ILS TDC250 5K	250	2.19-0.95	263	21250-22500	85-90				
HH ILS TDC300 5K	300	2.63-1.14	315	25500-27000	85-90				
H I TDC400 5 35 HH ILS TDC400 5K	400	3.50-1.52	420	34000-36000	85-90				

*10M denotes 0-10V Manual Dimming. † This shorter 200W lamp is only 17" long to fit into more fixtures.

FULHAM HIGHHORSE™

INDUCTION CIRCULAR SYSTEMS

c UL us

Dimmable

OPTIONS AVAILABLE

System Model Number	Watts	Input Current (Amp) 120V - 277V	Input Power	Rated Initial Luminance (LM)	Efficacy (LM/W)††	Luminance Maintenance (60K Hrs)	CRI	Color Temp. (Kelvin)	Average Lamp Life (Hours)
HH ILS CP40 5K HH IL CP40 510M* HH ILS CDS40 5K	40	0.35-0.15	42	2800-3000	70-75	70%-75%	> 80	5000K (standard) Additional Color Temps: 2700K, 3000K, 3500K, 4000K, 4100K, 4500K, 6000K, 6500K	100,000
HH ILS CP70 5K HH IL CP70 510M* HH ILS CDS70 5K HI CDS70 5M*	70	0.62-0.27	74	4900-5250	70-75				
HH ILS CP80 5K HH IL CP80 510M* HH ILS CDS80 5K HH ILS CDC80 5K	80	0.70-0.30	84	6000-6400	75-80				
HH ILS CP100 5K HH IL CP100 510M* HH ILS CDS100 5K HH ILS CDC100 5K HI CDS100 5M*	100	0.88-0.38	105	7500-8000	75-80				
HH ILS CP120 5K HH ILS CDS120 5K HH ILS CDC120 5K	120	1.05-0.45	126	9000-9600	75-80				
HH ILS CP150 5K HH IL CP150 510M* HH ILS CDS150 5K HH ILS CDC150 5K HI CDS150 5M*	150	1.32-0.57	158	12000-12750	80-85				
HH ILS CP200 5K HH IL CP200 510M* HH ILS CDS200 5K HH ILS CDC200 5K HI CDS200 5M*	200	1.75-0.76	210	16000-17000	80-85				
HH ILS CP250 5K HH IL CP250 510M* HH ILS CDS250 5K HH ILS CDC250 5K HI CDS250 5M*	250	2.19-0.95	263	21250-22500	85-90				
HH ILS CDS300 5K HH ILS CDC300 5K HI CDS300 5M*	300	2.63-1.14	315	25500-27000	85-90				
HH ILS CDS400 5K HH ILS CDC400 5K HI CDS400 5M*	400	3.50 - 1.52	420	34000-36000	85-90				
HH ILS CDS 500 5K	500	4.61 - 2.00	525	42500-45000	85-90				

*M denotes 0-10V Manual Dimming.

FULHAM HIGHHORSE™ INDUCTION BULB SYSTEMS

System Model Number	Watts	Input Current (Amp) 120V - 277V	Input Power	Rated Initial Luminance (LM)	Efficacy (LM/W)††	Luminance Maintenance (60K Hrs)	CRI	Color Temp. (Kelvin)	Average Lamp Life (Hours)
HH ILS BP35 5K	35	0.31-0.13	37	2450-2625	70-75	70%-75%	> 80	5000K (standard) Additional Color Temps: 2700K, 3000K, 3500K, 4000K, 4100K, 4500K, 6000K, 6500K	100,000
HH ILS BP55 5K	55	0.48-0.21	58	4125-4380	75-80				
HH ILS BP85 5K HH ILS BDS85 5K	85	0.74-0.32	89	6375-6800	75-80				
HH ILS BP100 5K HH ILS BDS100 5K	100	0.88-0.38	105	7500-8000	75-80				
HH ILS BP120 5K	120	1.05-0.45	126	9000-9600	75-80				

FULHAM HIGHHORSE™ INDUCTION SCREW-IN LAMPS

MOGUL AND MEDIUM-BASED BULB
MOGUL-BASED CIRCULAR

Dimmable OPTIONS AVAILABLE

H	I	B	P	55	5	B
HH = HIGHHORSE	**I** = INDUCTION LIGHTING SYSTEM	**B** = BULB LAMP	**P** = PROFILE BALLAST	**WATTS**	**COLOR TEMP.**	**B** = E39 Mogul Base **D** = E26 Edison Base

HH OR H	IL OR I	C	P	200	5	B OR MB
HH = HIGHHORSE	**IL** = INDUCTION LIGHTING SYSTEM	**C** = CIRCULAR LAMP	**P** = PROFILE BALLAST	**WATTS**	**COLOR TEMP.**	**B** = E39 Mogul Base **MB** = Dimmable with E39 Mogul Base

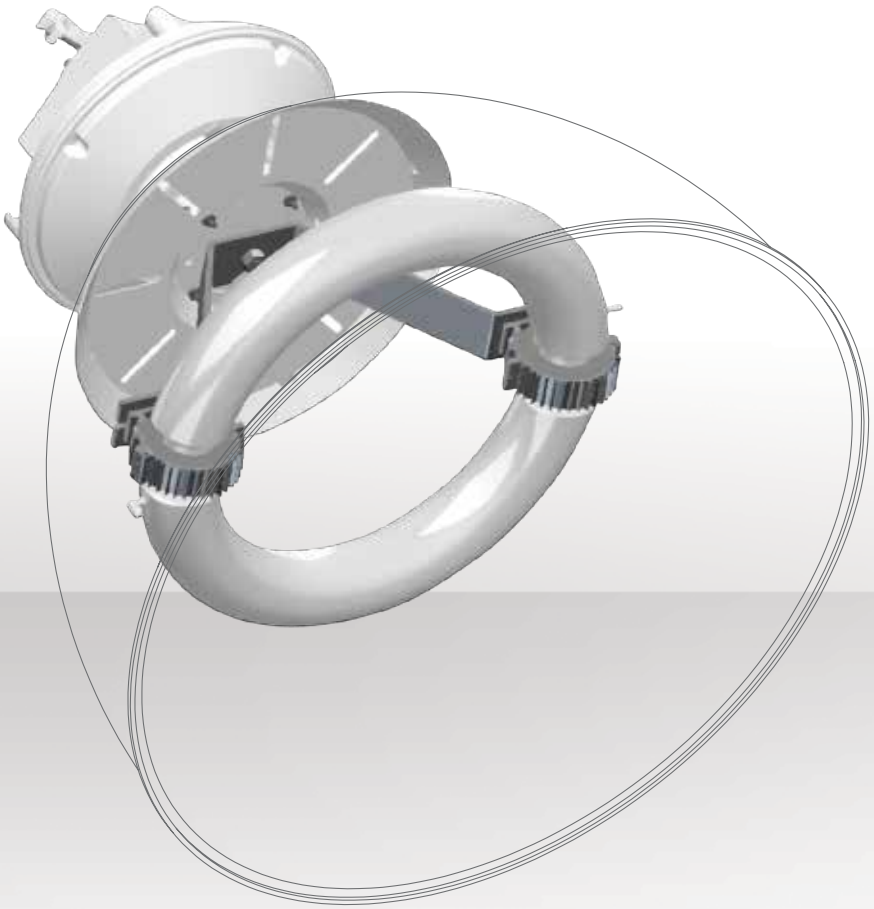
System Model Number	Watts	Input Current (Amp) 120V - 277V	Input Power	Rated Initial Luminance (LM)	Efficacy (LM/W)††	Luminance Maintenance (60K Hrs)	CRI	Color Temp. (Kelvin)	Average Lamp Life (Hours)
HI BP35 5B	35	0.31 - 0.13	37	2450 - 2625	70 - 75	70%-75%	> 80	5000K (standard) Additional Color Temps: 2700K, 3000K, 3500K, 4000K, 4100K, 4500K, 6000K, 6500K	100,000
HI BP35 5D	35	0.31 - 0.13	37	2450 - 2625	70 - 75				
HI BP55 5B	55	0.48 - 0.21	58	4125 - 4380	75 - 80				
HI BP55 5D	55	0.48 - 0.21	58	4125 - 4380	75 - 80				
HI BP85 5B	85	0.74 - 0.32	89	6375 - 6800	75 - 80				
HH IL CP40 5B	40	0.35 - 0.15	42	2800 - 3000	70 - 75				
HI CP40 5MB (dimmable)	40	0.35 - 0.15	42	2800 - 3000	70 - 75				
HH IL CP70 5B	70	0.62 - 0.27	74	4900 - 5250	70 - 75				
HI CP70 5MB (dimmable)	70	0.62 - 0.27	74	4900 - 5250	70 - 75				
HH IL CP80 5B	80	0.70 - 0.30	84	6000 - 6400	75 - 80				
HH IL CP100 5B	100	0.88 - 0.38	105	7500 - 8000	75 - 80				
HI CP100 5MB (dimmable)	100	0.88 - 0.38	105	7500 - 8000	75 - 80				
HH IL CP120 5B	120	1.05 - 0.45	126	9000 - 9600	75 - 80				
HH IL CP150 5B	150	1.32 - 0.57	158	12000 - 12750	80 - 85				
HI CP150 5MB (dimmable)	150	1.32 - 0.57	158	12000 - 12750	80 - 85				
HH IL CP200 5B	200	1.75 - 0.76	210	16000 - 17000	80 - 85				
HI CP200 5MB (dimmable)	200	1.75 - 0.76	210	16000 - 17000	80 - 85				

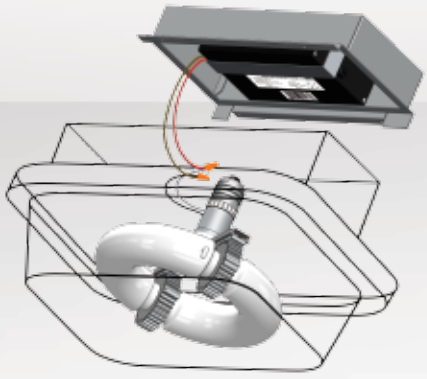
††LM/W is based on Lamp Power.

INDUCTION
EASY INSTALL KITS & CUSTOM RETROFIT SYSTEMS

- COMPLETE INDUCTION SYSTEMS WITH PREMIUM FULHAM LAMPS AND GENERATORS
- DOZENS OF STANDARD KITS OF VARYING FIXTURE TYPES
- 100,000 HOUR AVERAGE LAMP LIFE







HIGHBAY, CANOPY AND BILLBOARD KITS

EASY INSTALL CONVERSION KITS

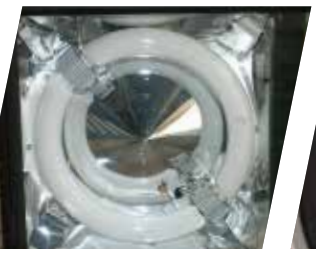
MULTIPLE SYSTEM OPTIONS

FULHAM HIGHHORSE™

CUSTOM RETROFIT SYSTEMS

COUNTLESS APPLICATIONS / PATENT-PENDING HIGH PERFORMANCE REFLECTOR SYSTEM

HighHorse Induction product specification sheets and other related literature online



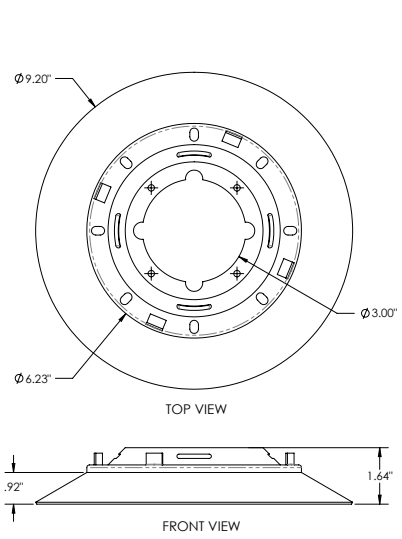

HUNDREDS OF CUSTOM SOLUTIONS

FULHAM HIGHHORSE™

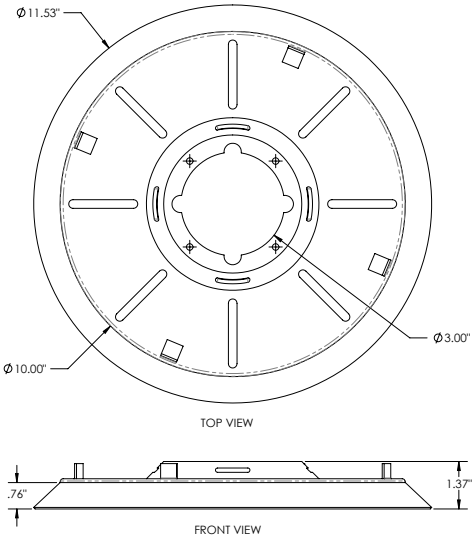
HIGHBAY INDUCTION CONVERSION KITS FOR 16", 22" & 25" ACRYLIC REFRACTORS

Fulham Highbay Induction Conversion Kits have been successfully conceptualized, engineered and tested as standard lighting alternatives for use with common 16" and 22"/25" acrylic refractors.

These ready-made, fully warranted kits make it easy to assemble energy-efficient induction highbay fixtures with minimal installation time. All components, hardware and instructions come standard with each kit. Compared with use of traditional HID units, end user Induction benefits include approximately 50% energy cost savings, between 3x – 5x increased life, far better lumen maintenance, and superior visual acuity (Scotopic/ Photopic [S/P] ratio). They have been designed for maximum thermal management and optical performance. (IES files available.)



16" Collar Mount Plate



22"/25" Collar Mount Plate

CRITERIA FOR SELECTING THE CORRECT SYSTEM INCLUDE:

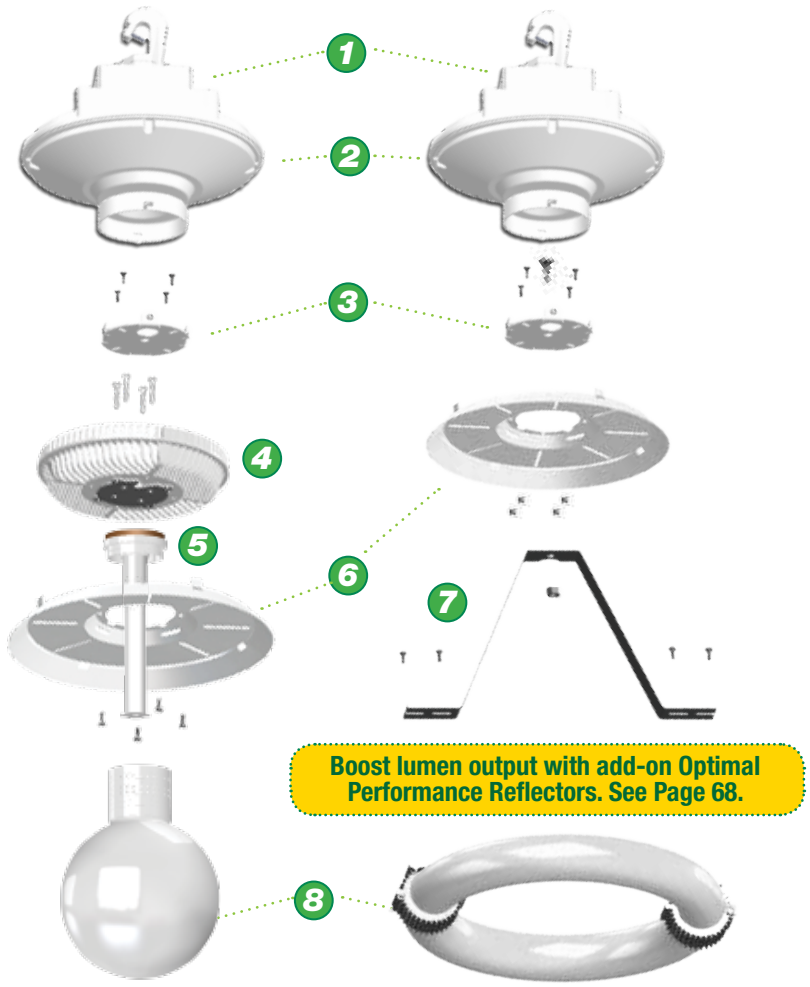
Bulb or Circular Shape: Both systems offer approximately 100,000 lamp hours.

Lamp Wattage: Generally, Induction offers approximately 50% energy savings over traditional HID.

Diameter of your Acrylic Refractor Opening: These conversion kits have been prefabricated specifically for use with either 16” acrylic refractors or 22”/25” acrylic refractors. (NOTE: Shades with both 22” and 25” diameter openings have identical mount plate measurements).

Additional aspects of the system include:

1. Standard Junction Box (or larger J-box for step down transformer)
2. Disc Generator
3. Disc Mount
4. Heat Sink (for bulb systems only)
5. Power Coupler (for bulb systems only)
6. Collar Mount Plate
7. Lamp Bracket (for circular systems only)
8. Bulb or Circular Lamp



Boost lumen output with add-on Optimal Performance Reflectors. See Page 68.

Certain components/parts are patent pending by Fulham Co., Inc.
UL recognized lamp and generator components. Pending UL listing for entire retrofit kit.

BULB SYSTEM FOR 16" AND 22"/25" ACRYLIC REFRACTORS

Wattage	Refractor Diameter	Induction System Kit P/N	Bottom Lens? With	Bottom Lens? Without	Ambient Certified
85	16" Refractor	HH ISK B85 HB 16	Yes	Yes	50°C
100	16" Refractor	HH ISK B100 HB 16	Yes	Yes	50°C
85	22"/25" Refractor	HH ISK B85 HB 22	Yes	Yes	50°C
100	22"/25" Refractor	HH ISK B100 HB 22	Yes	Yes	50°C

CIRCULAR SYSTEM FOR 16" AND 22"/25" ACRYLIC REFRACTORS

Wattage	Refractor Diameter	Non-Dimmable Kits P/N	Dimmable Kits P/N	Bottom Lens? With	Bottom Lens? Without	Ambient Certified
70	16" Refractor	HH ISK C70 HB 16		Yes	Yes	50°C
80	16" Refractor	HH ISK C80 HB 16		Yes	Yes	50°C
100	16" Refractor	HH ISK C100 HB 16		Yes	Yes	50°C
120	16" Refractor	HH ISK C120 HB 16		Yes	Yes	50°C
150	16" Refractor	HH ISK C150 HB 16			Yes	45°C
				Yes		40°C
70	22"/25" Refractor	HH ISK C70 HB 22	HH ISK C70 HB 22M	Yes	Yes	50°C
80	22"/25" Refractor	HH ISK C80 HB 22		Yes	Yes	50°C
100	22"/25" Refractor	HH ISK C100 HB 22	HH ISK C100 HB 22M	Yes	Yes	50°C
120	22"/25" Refractor	HH ISK C120 HB 22		Yes	Yes	50°C
150	22"/25" Refractor	HH ISK C150 HB 22	HH ISK C150 HB 22M	Yes	Yes	50°C
200	22"/25" Refractor	HH ISK C200 HB 22	HH ISK C200 HB 22M	Yes	Yes	50°C
250	22"/25" Refractor	HH ISK C250 HB 22	HH ISK C250 HB 22M	Yes	Yes	45°C
300	22"/25" Refractor	HH ISK C300 HB 22	HH ISK C300 HB 22M		Yes	40°C
				Yes		30°C
400	22"/25" Refractor	HH ISK C400 HB 22	HH ISK C400 HB 22M	No	Yes	40°C

GENERATOR SPECIFICATIONS

Input Voltage:	120V-277V
Input Frequency	50/60Hz
Output Frequency	250kHz
ATHD	< 10%
Power Factor	> 0.95
Case Temp.	< 65°C
Operating Temp. Open Fixture	(0°C to 50°C)
Operating Temp. Closed Fixture	(-20°C to 50°C)
Surge Protection	Yes

480V/347V STEP DOWN TRANSFORMER

Wattage	Transformer Model	Losses	Input Current Max Load	Input Current No Load	Weight Lbs
35W - 100W	HH-ILS-SD-1-125VA	7W	0.26 A	0.070 A	2.3
120W - 200W	HH-ILS-SD-2-245VA	10W	0.57 A	0.080 A	5.3
250W - 400W	HH-ILS-SD-3-460VA	18W	0.96 A	0.220 A	7.2

J-box is required for Step Down Transformer (Model #: HHILPQ32840)

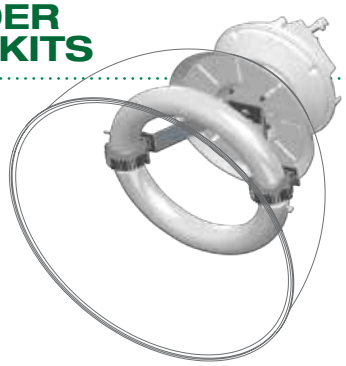
Input Voltage 480V or 347V
Output / Step Down Voltage 277V
Operating Frequency 60Hz
Insulation Rating 90°C Class A
Warranty 5-Years

Standard J-box

Required J-box for Step Down Transformer
HHILPQ32840

FULHAM HIGHHORSE™

STOCK AND SPECIAL ORDER INDUCTION CONVERSION KITS



HIGHBAY CONVERSION KITS FOR 16", 22" & 25" ACRYLIC REFRACTORS

FEATURES

- Includes lamp, disc generator, hardware and installation instructions
- Circular lamp and Bulb lamp options
- Easy and fast to install
- Thermally tested and fully warranted
- Patent pending components
- IES files available
- UL recognized lamp and generator components

STOCK KITS

The following (7) Induction Kits for 22"/25" acrylic refractors are now stock items:

For 22"/25" Acrylic Refractors:

Kit P/N	System Type
HH ISK C120 HB 22	Circular 120W
HH ISK C150 HB 22	Circular 150W
HH ISK C200 HB 22	Circular 200W
HH ISK C250 HB 22	Circular 250W
HH ISK C150 HB 22M*	Circular 150W
HH ISK C200 HB 22M*	Circular 200W
HH ISK C250 HB 22M*	Circular 250W

SPECIAL ORDER KITS

The (14) kits listed below are special order items and have an (8) week lead time. These are also thermally tested but are build-to-order items:

For 16" Acrylic Refractors:

Kit P/N	System Type
HH ISK B85 HB 16	Bulb 85W
HH ISK B100 HB 16	Bulb 100W
HH ISK C70 HB 16	Circular 70W
HH ISK C80 HB 16	Circular 80W
HH ISK C100 HB 16	Circular 100W
HH ISK C120 HB 16	Circular 120W
HH ISK C150 HB 16	Circular 150W

For 22"/25" Acrylic Refractors:

Kit P/N	System Type
HH ISK B85 HB 22	Bulb 85W
HH ISK B100 HB 22	Bulb 100W
HH ISK C70 HB 22	Circular 70W
HH ISK C80 HB 22	Circular 80W
HH ISK C100 HB 22	Circular 100W
HH ISK C300 HB 22	Circular 300W
HH ISK C400 HB 22	Circular 400W
HH ISK C70 HB 22M*	Circular 70W
HH ISK C100 HB 22M*	Circular 100W
HH ISK C300 HB 22M*	Circular 300W

*M denotes Manual Dimming

OPTIMAL PERFORMANCE REFLECTOR

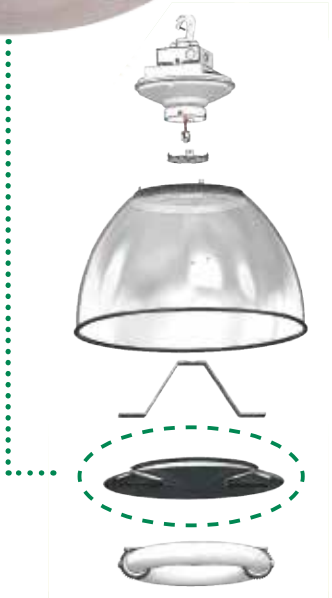
PATENT PENDING

Fulham's innovative, patent-pending Optimal Performance Reflector is a recommended add-on component for Fulham HighHorse™ brand Highbay Induction Conversion Kits. The Optimal Performance Reflector is compatible with low and high wattage luminaires. It provides comparable performance gains with or without a diffuser lens.

FEATURES

- Increases light output by up to approximately 80% (at 0º to 30º on lit surface)
- UL listed in both the U.S. and Canada
- 5-Year Warranty
- IES files available
- Made in the U.S.A.

Optimal Performance Reflector	Entire Induction Kit Part Number	Acrylic Refractor Diameter	Ambient Certified	Bottom Lens	
				With	Without
HH ILP F000 20	HH ISK C150 HB 22	22"/25" (822/825 Refractor)	50º C	Yes	Yes
HH ILP F000 20	HH ISK C200 HB 22				
HH ILP F000 20	HH ISK 250 HB 22			Yes	Yes
HH ILP F000 22	HH ISK 300 HB 22			Yes	Yes
HH ILP F000 22	HH ISK 400 HB 22			No	Yes



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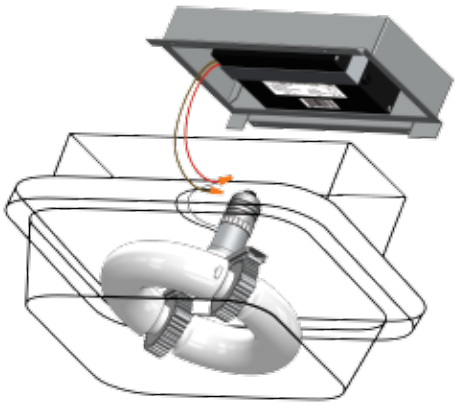
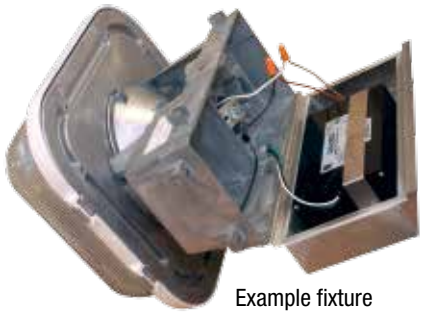
FULHAM HIGHHORSE™

GAS STATION CANOPY CONVERSION KITS

FEATURES

- Includes circular lamp, generator, hardware and installation instructions
- Easy and fast to install
- Thermally tested and fully warranted
- Patent pending components
- UL recognized lamp and generator components





Example fixture after Retrofit Kit installation.

		Ballast Mounted Inside/On			
Kit P/N	System Type	Enclosure	Top of Fixture	Surface 2' X 2' Box	UL Certified
Canopy Kit (with enclosure) - STOCK KITS					
HH ISK C70 CNL S01	Circular 70W	Yes	–	–	Yes
HH ISK C80 CNL S01	Circular 80W	Yes	–	–	Yes
HH ISK C100 CNL S01	Circular 100W	Yes	–	–	Yes
HH ISK C120 CNL S01	Circular 120W	Yes	–	–	Yes
Canopy Kit (with top mounted ballast) - SPECIAL ORDER KITS					
HH ISK C70 CNL S02	Circular 70W	–	Yes	–	–
HH ISK C80 CNL S02	Circular 80W	–	Yes	–	–
HH ISK C100 CNL S02	Circular 100W	–	Yes	–	–
HH ISK C120 CNL S02	Circular 120W	–	Yes	–	–
Canopy 2X2 Kit - SPECIAL ORDER KITS					
HH ISK C70 CNL S03	Circular 70W	–	–	Yes	–
HH ISK C80 CNL S03	Circular 80W	–	–	Yes	–
HH ISK C100 CNL S03	Circular 100W	–	–	Yes	–
HH ISK C120 CNL S03	Circular 120W	–	–	Yes	–

INDUCTION

FULHAM HIGHHORSE™

BILLBOARD CONVERSION KITS

FEATURES

- Includes tubular lamp, generator, hardware and installation instructions
- Easy and fast to install in popular billboard fixture types
- Thermally tested and fully warranted at maximum ambient temperature of 40ºC
- Patent pending components
- IES files available
- UL recognized lamp and generator components
- Pending UL listing for entire retrofit kit

Illustration of a post-installation fixture

Available Kits		
Kit P/N	System Watts	Suited for Retrofit of:
HH ISK 120HP01	120 Watt	Panel-Vue®* / Sign-Vue®*
HH ISK 150HP02	150 Watt	Panel-Vue®* / Sign-Vue®*
HH ISK 200HP03	200 Watt	AdVue®*
HH ISK 150HP04	150 Watt	AdVue®*

*Panel-Vue, Sign-Vue and AdVue are regestered trademarks of Acuity Brands Lighting, Inc.

FULHAM HIGHHORSE™

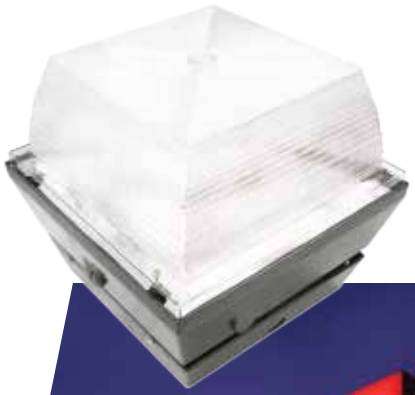
AVAILABLE INDUCTION RETROFIT KITS

HUNDREDS OF INDUCTION RETROFIT KITS AVAILABLE:

Why start from scratch? Fulham has already retrofitted hundreds of HID fixtures to energy-saving Induction. Contact Fulham Client Services with either the make/model of your fixture or a photo, so that we can determine if we have a pre-made solution ready to go. If not yet, we can initiate our 7-step retrofit process for your fixture; see page 72.

(323) 599-5000 order@fulham.com


T150W



FULHAM HIGHHORSE™

CUSTOM FIT INDUCTION RETROFIT SYSTEMS

Fulham provides a complete range of supportive services that may enable the customer to retrofit their existing fixtures with HighHorse Induction Lamps & Generators. This unique Fulham retrofit system not only takes full advantage of Induction technology, but also provides a cost-effective solution with minimal investment.

HighHorse Induction Retrofit systems services make it easy to retrofit existing fixtures, minimize labor cost of conversion, ensure reliability and maximize the expected life of components.

The Fulham laboratories in Los Angeles, California are staffed with highly skilled engineering talent and the most state-of-the-art testing equipment in the world, including lamp spheres for testing lumen output and efficiency.

Complete Generator & Lamp Mounting Assembly

BASIC 7-POINT ENGINEERED SYSTEM

- ✓ Generator Mounting and Thermal Management
- ✓ Lamp Mounting and Optical Enhancement
- ✓ Ease of Component Installation
- ✓ Thermal & Conductivity Test Report
- ✓ Component CAD Drawings*
- ✓ Installation Instructions
- ✓ Warranty Evaluation

*Contact Factory for Applicable Charges

Highbay fixture for warehouse application. 400 Watt MH retrofitted to a 200 Watt Induction lighting system with disc generator.

Cobrahead for street lighting. 100 Watt HPS retrofitted to a 55 Watt Induction lighting system with profile generator.

ENGINEERING SERVICES
SYSTEM EVALUATION

Fulham determines the best lamp and generator combination for the existing fixture; this includes:

- Generator mounting & thermal management
- Lamp mounting and optical enhancement
- Ease of component installation options
- Retrofit component CAD drawings
- Installation instructions
- Evaluation sample

CERTIFICATION SERVICES
UL CERTIFICATION

Fulham takes the responsibility to ensure that the retrofit meets the UL Certification standard and provides the customer with a Multiple Listing for the retrofitted fixture. This ensures the fixtures operate safely and meet UL standards for this type of fixture conversion.

IES PHOTOMETRIC FILES
INDEPENDENT LAB TESTING

During the initial system evaluation Fulham evaluates basic performance; most often this performance level exceeds the existing levels of illumination. Fulham is contracted with an Independent Test Lab and can provide a new IES Photometric file for application specific purposes.

SAMPLE PROGRAM
BETA-SITE TESTING

Fulham provides flexible sample programs to ensure the HighHorse Retrofit System meets all the customer requirements.

To take full advantage of HighHorse Induction Lighting in various applications, Fulham works with the customer to maximize the lighting effect and minimize the energy cost; this may require testing the retrofit fixtures before wholesale conversion.

Decorative pole top fixture for pathway lighting. 70 Watt MH retrofitted to a 35 Watt Induction lighting system with profile generator.

Highbay fixture for warehouse lighting. 400 Watt MH retrofitted to a 200 Watt Induction lighting system with disc generator.

WARRANTY PROGRAM
APPLICATION EVALUATION PROCESS

Fulham is known for high quality products and superior support services. HighHorse Induction Systems are designed for the Lamp and Generator to operate as a system which provide long-life and consistent operation.

Before and during the process of retrofit evaluation, Fulham provides a Warranty Evaluation Summary. This identifies all the critical data necessary to determine life-expectancy.

HighHorse Induction Systems come with a Full Five-Year Warranty, but much longer life is possible with proper thermal management.

GREEN ENERGY SERVICES
REBATE PROGRAMS

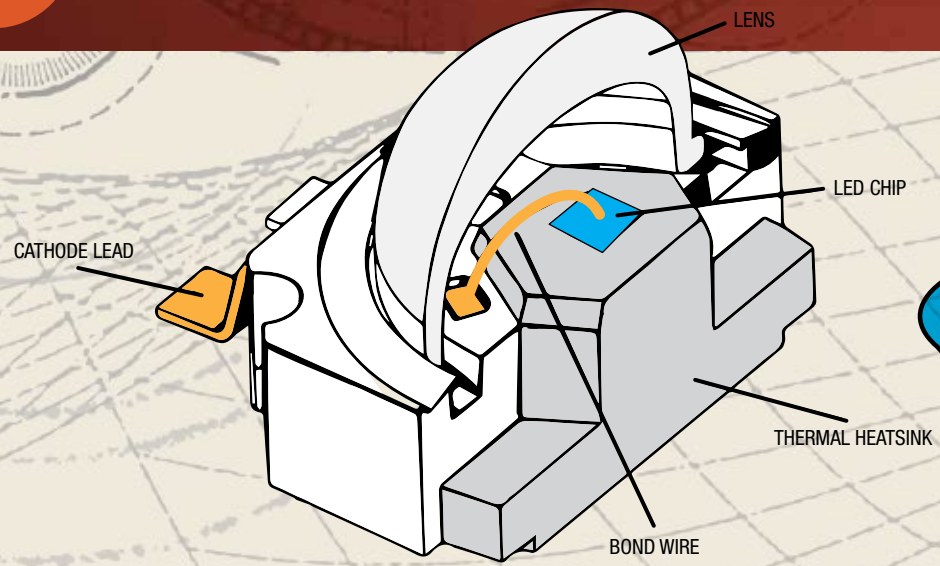
Many programs have been or are being offered for converting conventional lighting systems to Induction Lighting technology. Fulham is constantly reviewing these programs and providing our customers with information about these financial offers.

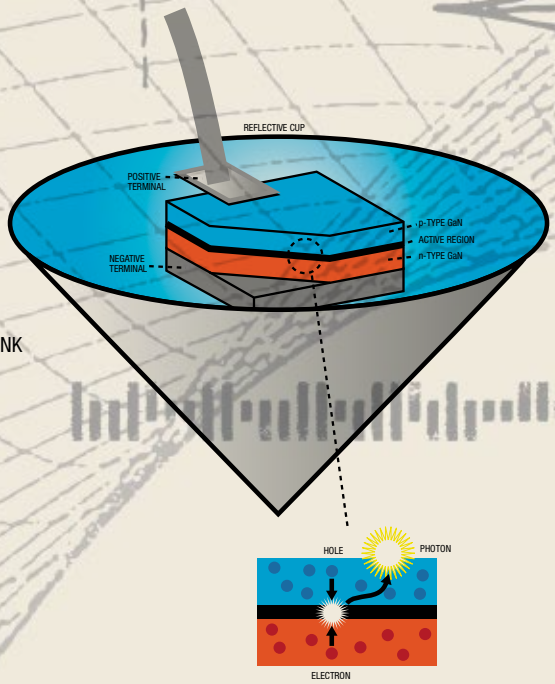
Where rebate programs do not exist, we can assist by providing cost and technical evaluation materials that can assist with implementation of a rebate program.

HighHorse Induction product specification sheets and other related literature online

LED LIGHT EMITTING DIODE BREAKING NEW GROUND

A Light Emitting Diode (LED) is a semiconductor designed to let electric current pass through in one direction and convert part of that energy to light while preventing backflow, not unlike a water valve.



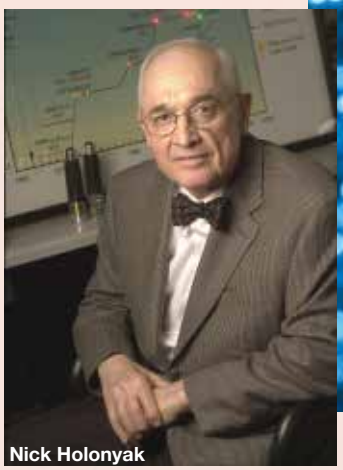


Here's to the red, blue and white!

The light-emitting diode, or LED, was invented in 1924 by the Soviet Russian scientist Oleg Losev (1903 - 1942). A skilled radio technician, Losev noticed that diodes in crystal set radios glowed when electrical current flowed through them. Based on that insight, he developed devices to generate light by electro-luminesence -- light produced by substances charged with electrical current. Although Losev published papers on his findings in various technical journals, credit for his breakthrough came only decades after his premature death.

Nick Holonyak, Ph.D. (b.1928) gets credit for inventing the first practically useful LED in 1962 while consulting at GE labs. Some have dubbed him "the father of the LED," but that paternity has been at the very least a shared, if not a group, enterprise. Dr. Holonyak has fathered many other inventions, including the first light dimmer; the red-light semiconductor laser (used in CD, DVD and cell phones); and a transistor laser.

LED technology developed relatively slowly, partly due to high R&D costs. The earliest LEDs were red only, followed by green and amber. By the mid-1990's blue and white LEDs joined the spectrum.


Nick Holonyak


Shuji Nakamura


H. Paul Maruska

Pankove, Maruska, Nakamura: these guys gave us the blues

In 1968, Dr. James Tietjen of RCA labs - already envisioning what is now flat screen TV - tasked Herbert Paul Maruska (b. 1944) with finding a way to produce blue-yield LEDs. Maruska had already been "growing" red LEDs. He pored over research studies from the '30s and '40s, and beavered away for the next two years. In 1970, at 26, no longer eligible for the Vietnam draft, he moved to Stanford for his Ph.D. RCA financed the degree, stipulating only that his thesis consist of work on the blue LED. He was to rejoin RCA's research team as Dr. Maruska, and destined to join forces with the legendary Russian-born, French-raised Jacques Pankove (b. 1922), a pioneer in LED luminescence. (Indeed, Pankove's groundbreaking research virtually spawned the LED industry.) With a Master's from Berkeley, Pankove had joined RCA's research team in 1948. Teamed with Maruska at RCA, he created the Gallium Nitride LED (GaN LED) and the first blue LED (1971), cornerstones of the category.

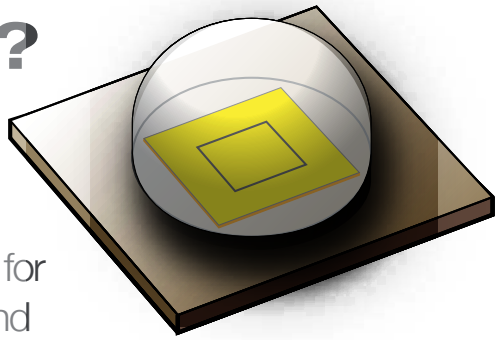
Later, halfway around the world, the founder of Nichia Corporation, Mr. Nobuo Ogawa, sponsored research headed by Shuji Nakamura (b. 1954) who was inventing the process that led to the first truly marketable GaN LED capable of emitting bright blue light. By 1993, Nichia had succeeded in developing a marketable product, which then went into production.

A year later Nakamura was awarded a Ph.D. in Engineering degree from his alma mater, the University of Tokushima. In 1999 Dr. Nakamura parted company with Nichia and accepted an engineering professorship at UC Santa Barbara.

In recent years, he has worked on green and white LEDs, and also blue lasers (as in Blu-ray™). And in 2014, Nakamura, together with Japanese scientists Isamu Akasaki and Hiroshi Amano, won a Nobel Prize in Physics for the invention of the blue LED.

LED
LIGHTING SYSTEMS

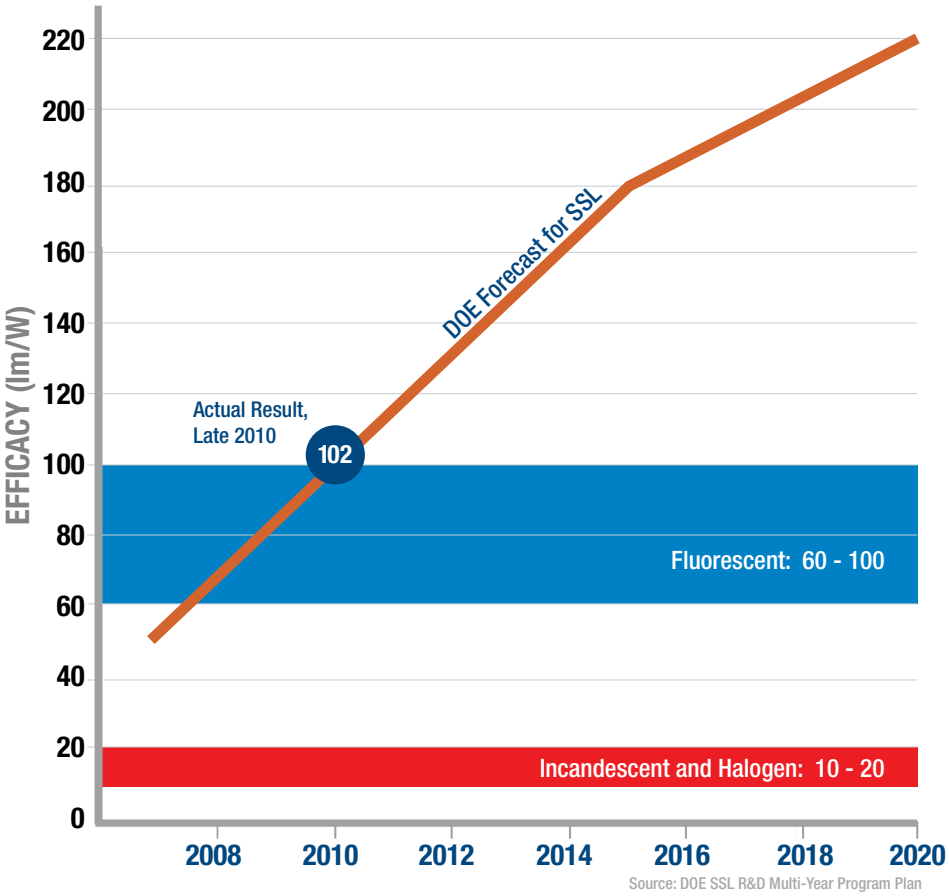
SURE, THEY'RE COOL, BUT WHAT USE ARE THEY?



LEDs are an excellent choice for aviation and automotive lighting (indicator lights, turn signals, brake lamps, etc.); traffic signals; advertising billboards; VCRs, video and computer displays; communications applications and remote control units for a variety of consumer electronic products. Colored, Ultraviolet and Infrared LED lamps are ideal for signalling, tracking, inspection, forensics (tracing blood), fluorescent dyes or other marked substances. Infrared LEDs are an important component in night vision equipment.

Here's what users like about them

LED lamps use about 30% less power than high-intensity discharge (HID) lighting, and generate less heat. They're fast switching, and pack lots of lumens in a smaller size. LEDs are bright enough to be plainly visible in broad daylight. They're also tougher than typical incandescent lamps (Solid State means no filaments to break). LEDs are trustworthy "work horses," often burning far longer than comparably powered incandescent lamps. They also require no special disposal, because they are entirely mercury-free.



Source: DOE SSL R&D Multi-Year Program Plan

SSL forecast

This chart at left dramatizes the skyrocketing SSL forecast. These are heady times for LED development. Not only are new applications being discovered regularly, but outyear projections for LED efficacy are

LED Lumen/Watt efficacy is predicted to hit an amazing 220⁺ in less than a decade!

nothing short of stunning. 2010 DOE data shows LED efficacy indexing at 102. In 2014, 150 is a better estimate; at its current rate of improvement, LED Lumen/Watt efficacy is predicted to hit an amazing 220⁺ in less than a decade! Meanwhile, other lamp categories are predicted to remain static.

CONSTANT CURRENT VS. CONSTANT VOLTAGE

There are two different approaches to the electrical interconnection between an LED driver and LED modules. Those are called 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.

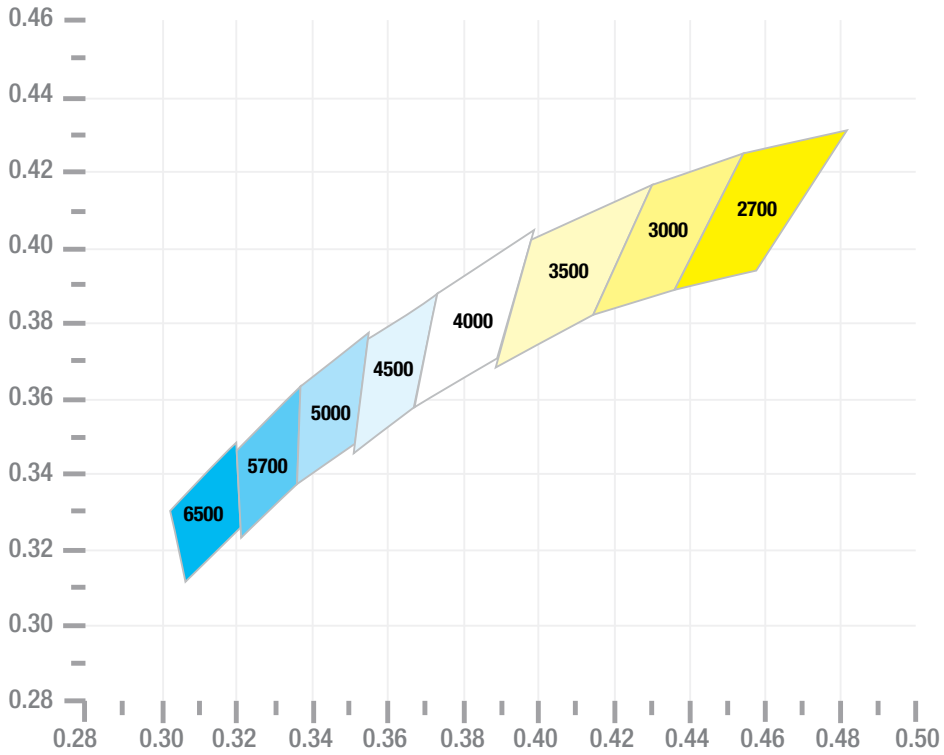
With Constant Voltage, the LED driver provides a steady voltage supply that enables power to flow through all LEDs connected. Since any given current flow requires a specific amount of voltage for each individual LED, it is necessary to buffer or regulate the voltage with a resistor (or equivalent component) 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.

DID YOU KNOW?
SIGNIFICANCE OF GALLIUM NITRIDE

Gallium Nitride (GaN) is a non-toxic compound composed of elements Gallium and Nitrogen that form the basis for most blue and white LEDs. For use in LEDs, it is formed by a process that takes place at >1000°C known as metal organic chemical vapor deposition (MOCVD). In addition to Gallium, small amounts of Indium and Aluminum can be added to GaN in order to change the wavelengths of the LEDs to be fabricated. Gallium Nitride is unique among semiconductor materials; it has a hexagonal crystal structure of its individual atoms that results in unique properties. Gallium Nitride is also used to make lasers for HD DVD and Blu-Ray players and can be used to fabricate microelectronic devices for applications such as high-speed wireless communication and electrical power conversion. Most recently, advanced scientific research is being conducted to explore uses of GaN in biomedical implants.

ANSI BINNING

Not everyone realizes that, despite advanced manufacturing techniques and our best intentions, LEDs are not all created equal. There is always some variation from one to another in color temperature, lumens and even voltage among newly-minted LED "wafers," ranging from very slight to fairly significant.

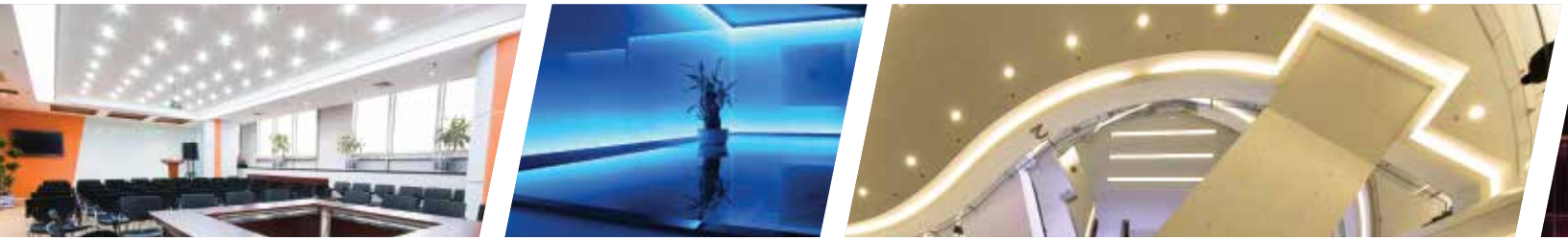


This means that precise matching of color depends on further processing.

LEDs are taken one by one, activated, measured, then sorted into bins, each bin tagged for a Kelvin color range. This graph depicts that range, from bright white daylight (6500 K bin) all across the visual spectrum to soft mellow yellow (2700 K). There is an accepted industry standard for managing this color-matching process. Fulham follows that convention. This ensures that all our LEDs can be reliably interchanged with equivalent lamps of other manufacturers, either as original equipment (OE) or replacements.

LED
LIGHTING SYSTEMS

- COMPLETE LED SYSTEMS WITH PREMIUM FULHAM MODULES AND DRIVERS
- HUNDREDS OF VERSATILE, STATE-OF-THE-ART LED ITEMS
- TOMORROW'S LIGHTING SYSTEMS... TODAY



CONSTANT CURRENT DRIVERS

LED MODULES

STANDARD AND CUSTOM

LED DRIVERS

STANDARD & DIMMING, CONSTANT CURRENT, CONSTANT VOLTAGE



ThoroLED product specification sheets and other related literature online

CONSTANT VOLTAGE DRIVERS

LED MODULES

FULHAM THOROLED™ 0-10V DIMMING CONSTANT CURRENT SINGLE OUTPUT

Dimmable · cULus · CE · RoHS COMPLIANT

	T1M1 UNV 0700-28BL	T1M1 UNV 0700-40C	T1M1 UNV 1050-42C	T1M1 UNV 1400-60L
Certifications	cURus, CE	cURus, CE	cURus, CE	cURus, CE
Input Voltage	100-277V (UNV)	100-277V (UNV)	100-277V (UNV)	100-277V (UNV)
Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1	1
Output Wattage	28	42	42	60
Output Volts	12~40VDC	18~58VDC	12~40VDC	18~42VDC
Output Current (mA)	700	700	1050	1400
Driver Size (L/W/H)	3.15"/2.99"/1.02" 80mm/76mm/26.0mm	4.72"/2.69"/1.18" 120mm/68.4mm/30mm	4.72"/2.69"/1.18" 120mm/68.4mm/30mm	9.49"/1.70"/1.20" 241mm/43.2mm/30.5mm
Case Material	Metal	Metal	Metal	Metal
Min. Operating Temp	-20ºC	-20ºC	-20ºC	-40ºC
Max. Case Temp	90ºC	90ºC	90ºC	60ºC
Dimming Type	0-10V	0-10V	0-10V	0-10V
Dimming Range	100% - 10%	100% - 10%	100% - 10%	100% - 10%
Conforms to IP Rating:	64	64	64	64
	This model has Studs with Back Leads			

FULHAM THOROLED™ 347V 0-10V DIMMING CONSTANT CURRENT SINGLE OUTPUT

CANADA SERIES · Dimmable · CE · cULus · RoHS COMPLIANT

	T1M1 347 0700-28C	T1M1 347 0700-40C
Certifications	cURus, CE	cURus, CE
Input Voltage	347V	347V
Frequency	60Hz	60Hz
Number of Channels	1	1
Output Wattage	28	40
Output Volts	18~40VDC	18~57VDC
Output Current (mA)	700	700
Driver Size (L/W/H)	4.72"/2.69"/1.2" 120mm/68.4mm/30mm	4.72"/2.69"/1.2" 120mm/68.4mm/30mm
Case Material	Metal	Metal
Min. Operating Temp	-20ºC	-20ºC
Max. Case Temp	90ºC	90ºC
Dimming Type	0-10V	0-10V
Dimming Range	0-1V=Off; 9-10V= Full Output	0-1V=Off; 9-10V= Full Output
Conforms to IP Rating:	64	64

FULHAM THOROLED™

0-10V DIMMING CONSTANT CURRENT MULTIPLE OUTPUTS

FEATURES

- Multiple Outputs for Greater Flexibility
- UL Class 2
- Size Similar to Standard Ballasts

Dimmable

	TCD4 UNV 0300-34 L	TCD4 UNV 0350-39 L	TCD4 UNV 0350-56L
Certifications	cURus	cURus	cURus, CE
Input Voltage	120-277V (UNV)	120-277V (UNV)	120-277V (UNV)
Frequency	50/60Hz	50/60Hz	50/60Hz
Number of Channels	4	4	4
Output Wattage	34	39	56
Output Volts	15~27VDC	15~27VDC	15~40VDC
Output Current (mA)	300	350	350
Driver Size	L 9.5", W 1.7", H 1.2" L 241mm, W 43mm, H 30mm	L 9.5", W 1.7", H 1.2" L 241mm, W 43mm, H 30mm	L 9.5", W 1.7", H 1.2" L 241mm, W 43mm, H 30.5mm
Case Material	Metal	Metal	Metal
Min. Operating Temp	0ºC	0ºC	-20ºC
Max. Case Temp	70ºC	70ºC	90ºC
Dimming Type	0-10V	0-10V	0-10V
Dimming Range	0-1V=Off; 9-10V= Full Output	0-1V=Off; 9-10V= Full Output	0-1V=Off; 9-10V= Full Output
Conforms to IP Rating:	-	-	64

RoHS COMPLIANT

	TCD4 UNV 0385-42 L	T1M2 UNV 0600-36L	T1M2 UNV 0700-49L
Certifications	cURus	cURus, CE	cURus
Input Voltage	120-277V (UNV)	120-277V (UNV)	120-277V (UNV)
Frequency	50/60Hz	50/60Hz	50/60Hz
Number of Channels	4	2	2
Output Wattage	42	36	49
Output Volts	22~27VDC	23~30VDC	10~35VDC
Output Current (mA)	385	600	700
Driver Size	L 9.5", W 1.7", H 1.2" L 241mm, W 43mm, H 30mm	L 11.9", W 1.5", H 1.2" L 302mm, W 38mm, H 31mm	L 10.28", W 1.57", H 1.2" L 261mm, W 40mm, H 30.5mm
Case Material	Metal	Metal	Metal
Min. Operating Temp	0ºC	-20ºC	-20ºC
Max. Case Temp	70ºC	85ºC	75ºC
Dimming Type	0-10V	0-10V	0-10V
Dimming Range	0-1V=Off; 9-10V= Full Output	0-1V=Off; 9-10V= Full Output	0-1V=Off; 9-10V= Full Output

RoHS COMPLIANT

FULHAM THOROLED™

TRIAC DIMMING CONSTANT CURRENT

FEATURES

- Smooth Dimming from 100% - 10%
- Compatible with Leading Dimmer Brands
- Compact Size
- UL Class 2

Dimmable

	TCD1 120 0350-11 C	TCD1 120 0650-18 C	TCD1 120 0700-9 C
Certifications	cURus	cURus	cURus
Input Voltage	120V	120V	120V
Frequency	50/60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1
Output Wattage	11	18	9
Output Volts	12~32VDC	12~27VDC	6~13VDC
Output Current (mA)	350	650	700
Driver Size	L 3.2", W 2.8", H 1" L 81mm, W 71mm, H 25mm	L 3.2", W 2.4", H 1" L 81mm, W 61mm, H 25mm	L 3.15", W 1.8", H 1.01" L 80mm, W 46mm, H 25.7mm
Case Material	Metal	Metal	Metal
Min. Operating Temp	-20ºC	-20ºC	-20ºC
Max. Case Temp	87ºC	82ºC	75ºC
Dimming Type	Triac Phase Control Dimmer Switch	Triac Phase Control Dimmer Switch	Triac Phase Control Dimmer Switch
Dimming Range	100% - 25%	100% - 10%	100% - 10%
Conforms to IP Rating:	62	62	62

	T1T1 120 0700-9 C	T1T1 120 0700-18C	T1T1 120 1000-20C
Certifications	cURus, CE	cURus	cURus
Input Voltage	120V	120V	120V
Frequency	50/60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1
Output Wattage	9	18	20
Output Volts	12.8VDC	17~26VDC	11~20VDC
Output Current (mA)	700	700	1000
Driver Size	L 3.20", W 2.83", H 1.00" L 81.4mm, W 71.9mm, H 25.4mm	L 3.20", W 2.83", H 1" L 81.4mm, W 71.9mm, H 25.4mm	L 4.18", W 2.21", H 1.14" L 106mm, W 56mm, H 29mm
Case Material	Metal	Metal	Metal
Min. Operating Temp	-30ºC	-25ºC	-20ºC
Max. Case Temp	90ºC	90ºC	86ºC
Dimming Type	Triac Phase Control Dimmer Switch	Triac Phase Control Dimmer Switch	Triac Phase Control Dimmer Switch
Dimming Range	100% - 10%	100% - 25%	100% - 10%
Conforms to IP Rating:	62	62	62

RoHS COMPLIANT

FULHAM THOROLED™

CONSTANT CURRENT SINGLE OUTPUT

FEATURES

- Optimized System Efficiency
- High Efficiency
- UL Class 2
- Compact Size

	TC1 120 0350-6C	TC1 120 0350-15C	TC1 120 0700-18C
Certifications	cURus	cURus, CE	cURus
Input Voltage	120V	120V	120V
Frequency	50/60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1
Output Wattage	6	15	18
Output Volts	3~18VDC	24~45VDC	10~26VDC
Output Current (mA)	350	350	700
Driver Size	L 2.57", W 1.8", H 1" L 65mm, W 45mm, H 25mm	L 2.57", W 1.8", H 1" L 65mm, W 45mm, H 25mm	L 3.2", W 2.4", H 1" L 81mm, W 61mm, H 25mm
Case Material	Metal	Metal	Metal
Min. Operating Temp	-20ºC	-20ºC	-20ºC
Max. Case Temp	70ºC	75ºC	80ºC
		RoHS COMPLIANT	

	T1 UNV 0700-28C	T1 UNV 0700-36C	T1 UNV 0700-40C	T1 UNV 1050-42C
Certifications	cURus, CE	UR, CE	cURus, CE	cURus, CE
Input Voltage	100-277V (UNV)	120-277V (UNV)	100-277V (UNV)	100-277V (UNV)
Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1	1
Output Wattage	28	33	40	42
Output Volts	12~40VDC	26~48VDC	18~58VDC	12~40VDC
Output Current (mA)	700	700	700	1050
Driver Size	L 3.15", W 2.99", H 1.02" L 80mm, W 76mm, H 26mm	L 3.8", W 2.8", H 1.3" L 95mm, W 70mm, H 32mm	L 3.74", W 2.76", H 1.2" L 95mm, W 70mm, H 30mm	L 3.74", W 2.76", H 1.2" L 95mm, W 70mm, H 30mm
Case Material	Metal	Metal	Metal	Metal
Min. Operating Temp	-20ºC	-30ºC	-20ºC	-20ºC
Max. Case Temp	90ºC	85ºC	90ºC	90ºC
Conforms to IP Rating:	64	66	64	64
	RoHS COMPLIANT	RoHS COMPLIANT SAM INCLUDED IN SIGN ACCESSORIES MANUAL (SAM)	RoHS COMPLIANT	RoHS COMPLIANT

FULHAM THOROLED™

CONSTANT CURRENT MULTIPLE OUTPUTS

FEATURES

- Optimized System Efficiency
- Multiple outputs for greater flexibility for LEDs run in Series
- High Efficiency
- UL Class 2
- Compact Size

	TC3 MLT 0350-50L	TC3 120 0500-75 LA	TC3 MLT 0500-80L	T4 230 0600-120 L
Certifications	cURus, CE	cURus	cURus, CE	CCC, CE
Input Voltage	120-240V	120V	120-240V	230V
Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Number of Channels	3	3	3	4
Output Wattage	50 (16.7 Max per Channel)	75 (25 Max per Channel)	80 (26.7 Max per Channel)	120 (30 Max per Channel)
Output Volts	18~48VDC	20~50VDC	18~53VDC	32~52VDC
Output Current (mA)	350	500	500	600
Driver Size	L 14.8", W 1.7", H 1" L 376mm, W 43mm, H 25.4mm	L 12", W 1.34", H 1" L 305mm, W 34mm, H 25.4mm	L 18", W 1.7", H 1" L 457mm, W 43mm, H 25.4mm	L 8.43", W 3.46", H 1.50" L 214mm, W 88mm, H 38mm
Case Material	Metal	Metal	Metal	Metal
Min. Operating Temp	-30ºC	-30ºC	-30ºC	-20ºC
Max. Case Temp	90ºC	75ºC	90ºC	90ºC
Conforms to IP Rating:	62	62	62	67
	RoHS COMPLIANT		RoHS COMPLIANT	RoHS COMPLIANT

LED

FULHAM LIGHTINGCONTROLS™

Fulham has proven capabilities in developing and manufacturing lines of digital addressable drivers (DALI and DMX drivers) as private-label LED controllable items and can work with you to develop products to meet your precise specifications.

Zhaga

FULHAM IS A MEMBER OF THE ZHAGA CONSORTIUM.

Zhaga is a global cooperation with participation by luminaire manufacturers, lamp manufacturers, LED module makers, and companies that supply the lighting industry. The Zhaga Consortium aims to make the LED light sources ("LED light engines") manufactured by different companies interchangeable.

Learn more about The Zhaga Consortium at:
www.zhagastandard.org

FULHAM THOROLED™

CONSTANT VOLTAGE

FEATURES

- High Efficiency
- Reliability & Flexibility
- 12V, 24V & 48V
- Low Temperature Performance

	T1UNV 012V-20 L	T1M1UNV 012V-20 L	T1UNV 012V-60 L	T1 120 012V-60 LE	T1 UNV 012V-60 LF	T1UNV 024V-20 L
cURus, CE and RoHS	✓	✓	✓	✓	✓	✓
Input Voltage	100-277V (UNV)	100-277V (UNV)	100-277V (UNV)	120V	100-277V (UNV)	100-277V (UNV)
Frequency	50/60Hz	50/60Hz	50/60Hz	60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1	1	1	1
Output Wattage	20W	20W	60W	60W	60W	20W
Output Volts	12VDC	12VDC	12VDC	12VDC	12VDC	24VDC
Output Current	max. 1.66A	max. 1.66A	max. 5A	max. 5A	max. 5A	max. 0.833A
Case Size (L/W/H) (Inch)	6.30/1.57/0.98	6.30/1.57/0.98	9.5/1.7/1.2	9.5/1.7/1.22	9.5/1.7/1.22	6.30/1.57/0.98
Case Size (L/W/H) (mm)	160/40/25	160/40/25	241/43/30	241/43/31	241/43/31	160/40/25
Case Material	Metal	Metal	Metal	Metal	Metal	Metal
Min. Operating Temp	-20°C	-20°C	-40°C	-25°C	-25°C	-20°C
Max. Case Temp	90°C	90°C	90°C	90°C	90°C	90°C
Conforms to IP Rating:	62	62	64	64	64	62
	SAM INCLUDED IN SIGN ACCESSORIES MANUAL (SAM)	Dimmable 100% to 10% (0-10V Dimming)	SAM INCLUDED IN SIGN ACCESSORIES MANUAL (SAM)			SAM INCLUDED IN SIGN ACCESSORIES MANUAL (SAM)

	T1M1UNV 024V-20 L	T1UNV 024V-60 L	T1UNV 024V-100 LS	T1 UNV 024V-100 LE	T1UNV 030V-100 LS	T1UNV 048V-150 L
cURus	✓	✓	✓	✓	✓	✓
CE and RoHS	✓	✓	✓	✓	✓	
Input Voltage	100-277V (UNV)	100-277V (UNV)	100-277V (UNV)	100-277V (UNV)	100-277V (UNV)	100-277V (UNV)
Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1	1	1	1
Output Wattage	20W	60W	100W	100W	100W	150W
Output Volts	24VDC	24VDC	24VDC	24VDC	30VDC	48VDC
Output Current	max. 0.833A	max. 2.5A	max. 4.1A	max. 4.17A	max. 3.3A	max. 3.12A
Case Size (L/W/H) (Inch)	6.30/1.57/0.98	9.5/1.7/1.2	10.27/1.59/1.19	9.5/1.7/1.22	10.27/1.59/1.19	8.3/2.6/1.6
Case Size (L/W/H) (mm)	160/40/25	241/43/30	262/43/30	241/43/31	262/43/30	211/66/41
Case Material	Metal	Metal	Metal	Metal	Metal	Metal
Min. Operating Temp	-20°C	-40°C	-40°C	-25°C	-40°C	-40°C
Max. Case Temp	90°C	90°C	89°C	90°C	88°C	80°C
Conforms to IP Rating:	62	66	64	64	64	66
	Dimmable 100% to 10% (0-10V Dimming) SAM INCLUDED IN SIGN ACCESSORIES MANUAL (SAM)	SAM INCLUDED IN SIGN ACCESSORIES MANUAL (SAM)	SAM INCLUDED IN SIGN ACCESSORIES MANUAL (SAM)		SAM INCLUDED IN SIGN ACCESSORIES MANUAL (SAM)	

SELV EQUIVALENT

FULHAM THOROLED™ CONSTANT CURRENT SINGLE OUTPUT

FEATURES

- Optimized System Efficiency
- High Efficiency
- Compact Size

	T12400350-06C	T12300350-12L	T12300700-12L
Input Voltage	240V	240V	240V
Frequency	50/60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1
Output Wattage	6	12	12
Output Volts	9-18VDC	9-36VDC	3-18VDC
Output Current	350	350	700
Driver Size	L 80mm, W 40.2mm, H 27mm	L 123mm, W 45mm, H 19mm	L 123mm, W 45mm, H 19mm
Case Material	ABS	ABS	ABS
Min. Operating Temp	-10ºC	-10ºC	-10ºC
Max. Case Temp	65ºC	75ºC	75ºC
Approvals Class	SELV Equivalent	SELV Equivalent	SELV Equivalent

	T12400700-15C	T12400700-25E	T12400700-25F
Input Voltage	240V	240V	240V
Frequency	50/60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1
Output Wattage	15	25	25
Output Volts	12-21VDC	18-36VDC	18-36VDC
Output Current	700	700	700
Driver Size	L 80mm, W 40.2mm, H 27mm	L 210mm, W 40mm, H 30mm	L 103mm, W 67mm, H 31mm
Case Material	ABS	ABS	ABS
Min. Operating Temp	-10ºC	-10ºC	-10ºC
Max. Case Temp	65ºC	75ºC	70ºC
Approvals Class	SELV Equivalent	SELV Equivalent	SELV Equivalent

		Dimmable 100% to 30% (Triac Dimming)	Dimmable 100% to 30% (Triac Dimming)
	T12401000-36E	T1T12400700-25F	T1T12401000-36E
Input Voltage	240V	240V	240V
Frequency	50/60Hz	50/60Hz	50/60Hz
Number of Channels	1	1	1
Output Wattage	36	25	36
Output Volts	18-36VDC	18-36VDC	18-36VDC
Output Current	1000	700	1000
Driver Size	L 210mm, W 40mm, H 30mm	L 103mm, W 67mm, H 31mm	L 210mm, W 40mm, H 30mm
Case Material	ABS	ABS	ABS
Min. Operating Temp	-10ºC	-10ºC	-10ºC
Max. Case Temp	75ºC	75ºC	75ºC
Approvals Class	SELV Equivalent	SELV Equivalent	SELV Equivalent

CE SELV EQUIVALENT

FULHAM THOROLED™ CONSTANT CURRENT SINGLE CHANNEL

FEATURES

- Conforms to EN55015
- DC Output
- Independent direct current power supply for LED Modules
- High Efficiency
- Compact Size

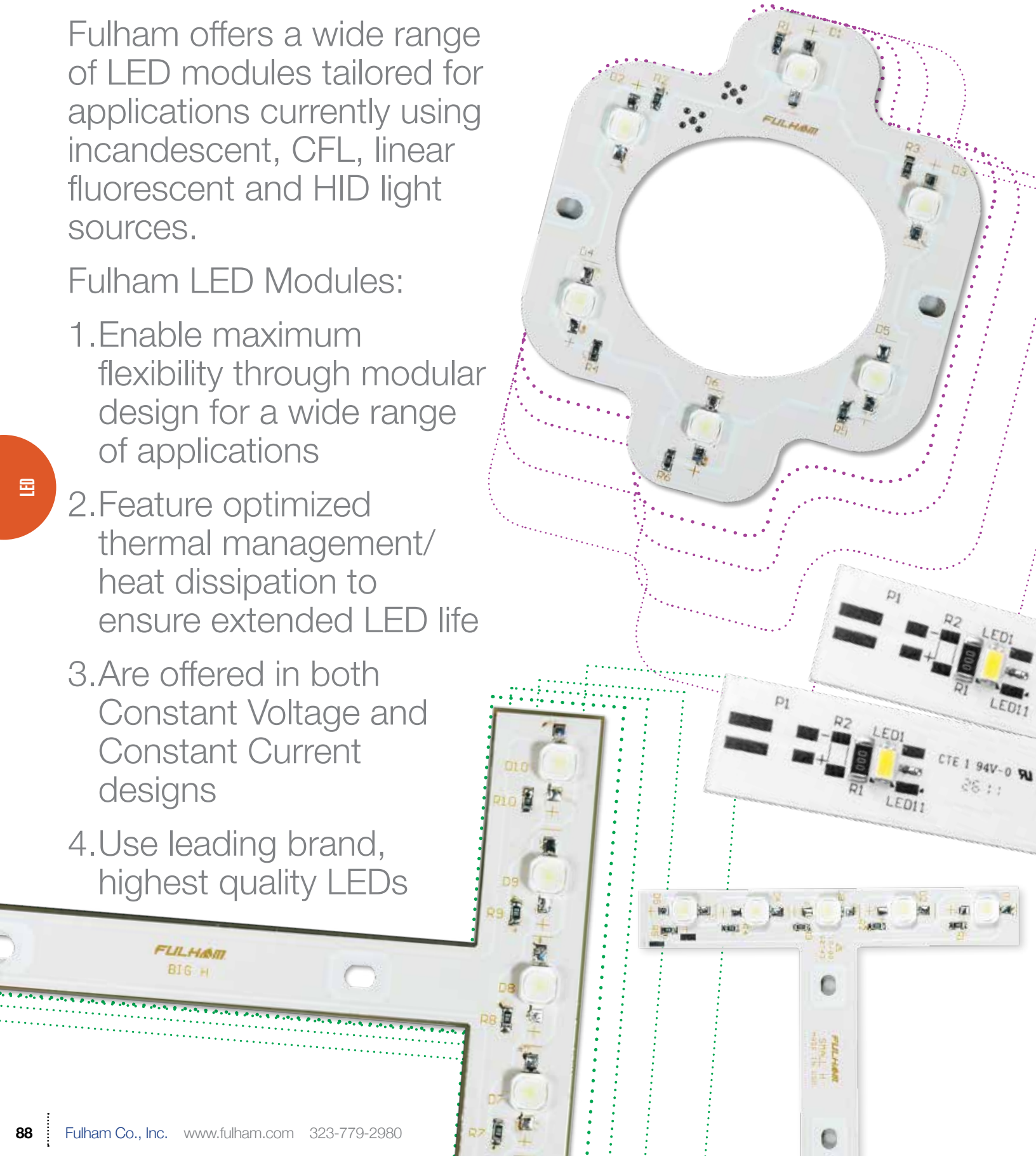
	TC12300350-6L	TC12300700-6L	TC12300350-12L	TC12300700-12L
Output Current	350mA	700mA	350mA	700mA
Output Voltage	MAX 16V	MAX 8V	MAX 36V	MAX 18V
Min. Load	1W	2W	3W	2W
Max. Load	6W	6W	12W	12W
Channels	1	1	1	1
Input Voltage	220-240V	220-240V	220-240V	220-240V
Power Factor	>.50	>.50	>.50	>.50
Frequency	50/60Hz	50/60Hz	50/60Hz	50/60Hz
Output Connection	Leads	Leads	Connectors	Connectors
Max. Case Temp	75ºC	75ºC	75ºC	75ºC
Min. Lamp Starting Temp	-15ºC	-15ºC	-15ºC	-15ºC
Max. Ambient	45ºC	45ºC	45ºC	45ºC
Approvals	CE, SELV, CLASS II	CE, SELV, CLASS II	CE, SELV, CLASS II	CE, SELV, CLASS II
Dimensions (inches) with mounting tabs	3.2" L X 1.7" W X 0.9" H	3.2" L X 1.7" W X 0.9" H	4.9" L X 1.8" W X 0.8" H	4.9" L X 1.8" W X 0.8" H
Dimensions (mm) with mounting tabs	81.6mm L X 42.5mm W X 23mm H	81.6mm L X 42.5mm W X 23mm H	122.8mm L X 45.1mm W X 19mm H	122.8mm L X 45.1mm W X 19mm H
Notes	Output Short Circuit Protection, Output Open Circuit Protection, Output To Ground Short Protection, Over Load Protection		Output Short Circuit Protection, Output Open Circuit Protection, Output To Ground Short Protection, Over Load Protection	

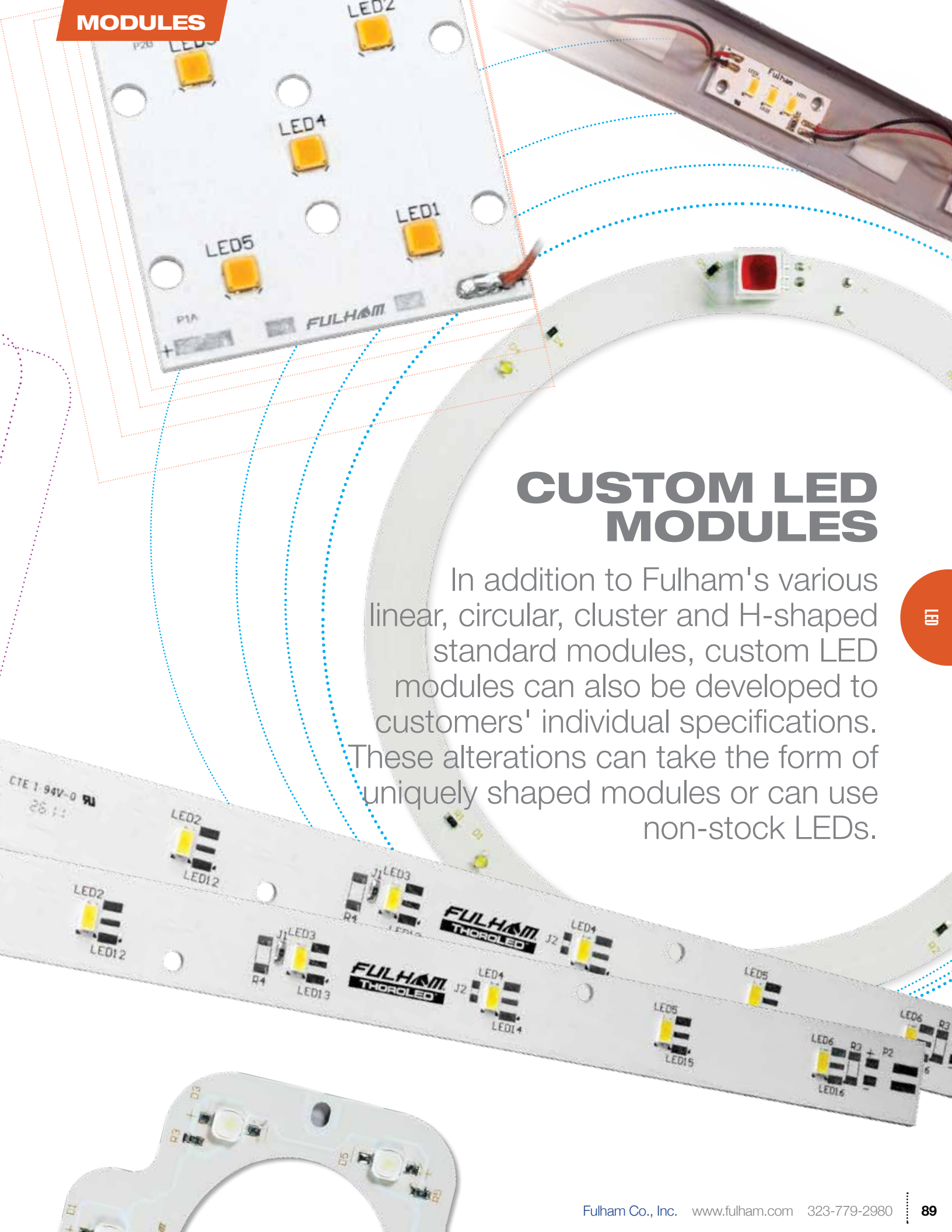
FULHAM THOROLED™ STANDARD & CUSTOM LED MODULE/DRIVER SOLUTIONS

Fulham offers a wide range of LED modules tailored for applications currently using incandescent, CFL, linear fluorescent and HID light sources.

Fulham LED Modules:

1. Enable maximum flexibility through modular design for a wide range of applications
2. Feature optimized thermal management/ heat dissipation to ensure extended LED life
3. Are offered in both Constant Voltage and Constant Current designs
4. Use leading brand, highest quality LEDs





CUSTOM LED MODULES

In addition to Fulham's various linear, circular, cluster and H-shaped standard modules, custom LED modules can also be developed to customers' individual specifications. These alterations can take the form of uniquely shaped modules or can use non-stock LEDs.

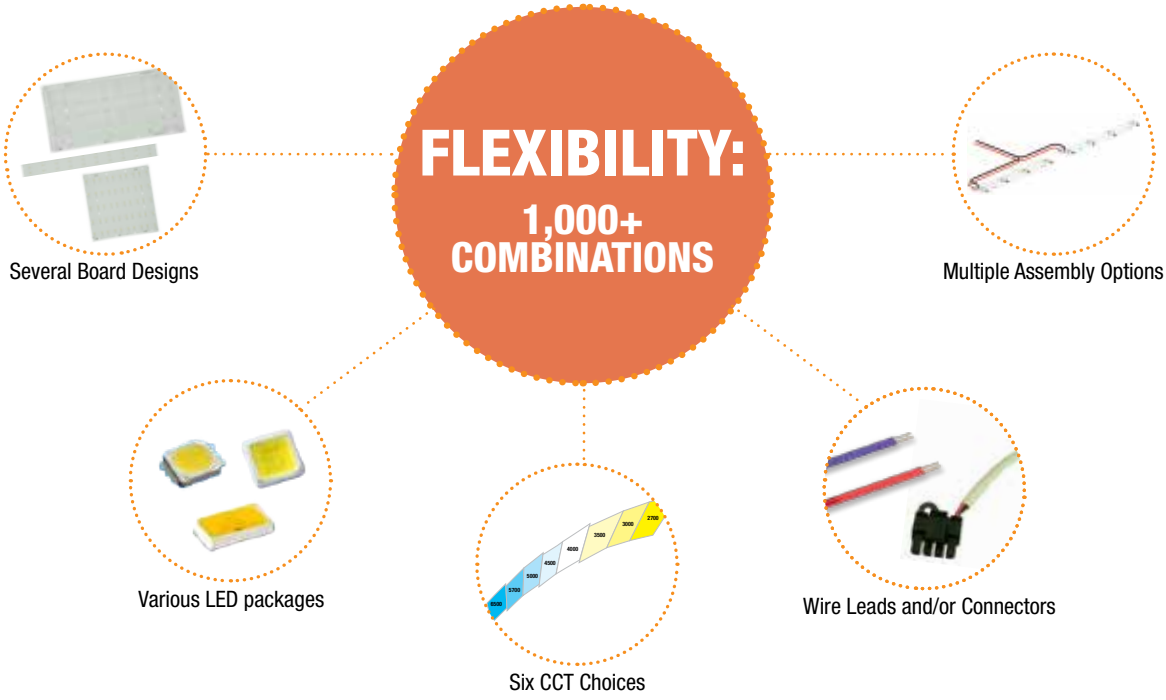
FULHAM THOROLED™ LED LIGHT ENGINES MODULE MODELS

CUSTOMIZATION AVAILABLE

Contact Client Services for details at order@fulham.com or 323-599-5000

MODULE MODEL NUMBERS:

When ordering modules, replace "xx" with desired correlated color temperature (CCT) option.
27 = 2700K, 30 = 3000K, 35 = 3500K, 40 = 4000K, 50 = 5000K, 65 = 6500K
Example: TM02LN40xx-001 would be TM02LN4027-001 for a system with a CCT of 2700K.



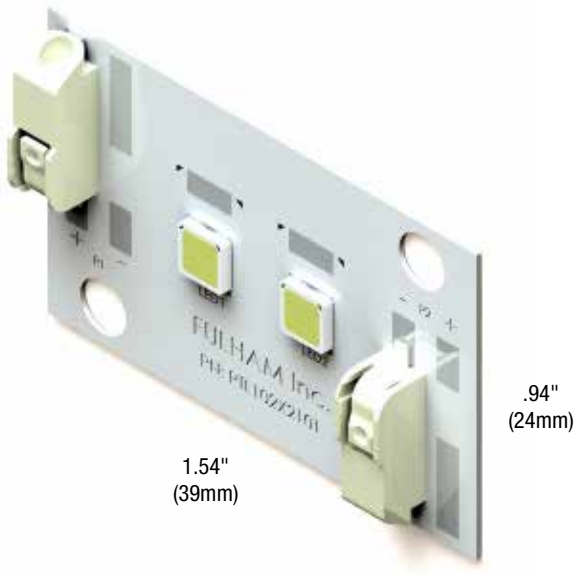
NOTE: See page 120 for HotSpot2 LED Emergency Lighting System options.

TM02 COMPACT LED MODULES

IMAGES NOT SHOWN TO SCALE RELATIVE TO EACH OTHER

c UL us

ThoroLED Module	Max Input Current	Forward Voltage	Rated Power	Nominal Lumens (4000K)
TM02LN26XX-001	700 mA	6.6V DC	4.6W	425
TM02LN40XX-001	350 mA	20V DC	7W	550



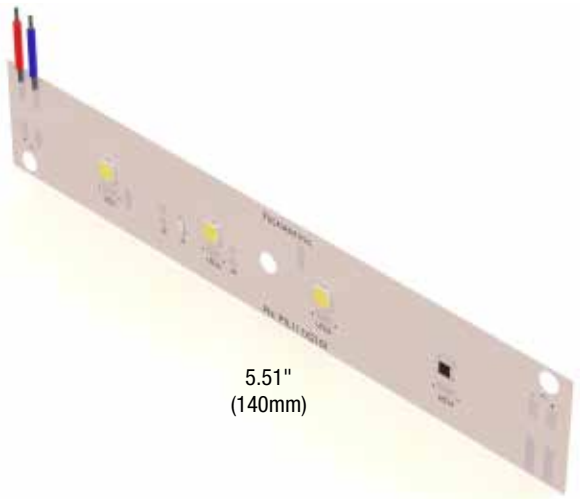
FULHAM THOROLED™

TM02-TM04 LINEAR LED MODULES

c UL us

IMAGES NOT SHOWN TO SCALE RELATIVE TO EACH OTHER

ThoroLED Module	Max Input Current	Forward Voltage	Rated Power	Nominal Lumens (4000K)
TM02LN26xx-002	700 mA	6.6V DC	4.6W	425
TM02LN40xx-002	700 mA	10V DC	7W	550
TM02LN40xx-003	350 mA	20V DC	10.5W	550
TM03LN26xx-001	700 mA	9.9V DC	6.9W	625
TM03LN40xx-001	350 mA	30V DC	10.5W	850
TM04LN26xx-001	700 mA	13.2V DC	9.2W	850
TM04LN40xx-001	350 mA	40V DC	14W	1100
TM04LN40xx-002	700 mA	20V DC	14W	1100

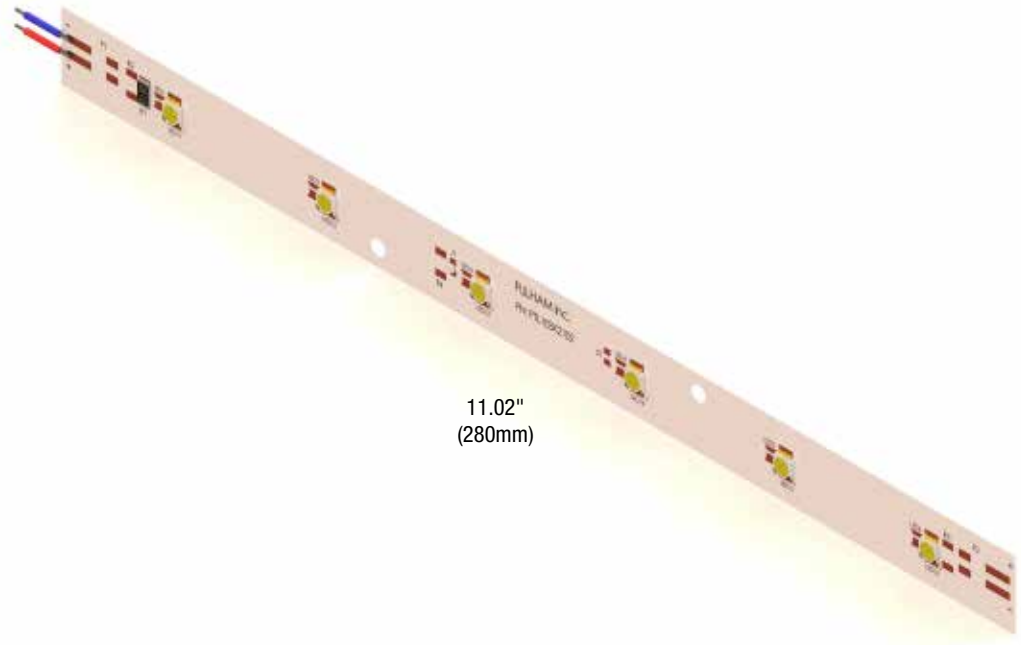


5.51"
(140mm)

.94"
(24mm)

TM06 LINEAR LED MODULES

ThoroLED Module	Max Input Current	Forward Voltage	Rated Power	Nominal Lumens (4000K)
TM06LN13XX-001	700 mA	20V DC	14W	1275
TM06LN40XX-001	700 mA	30V DC	21W	1650



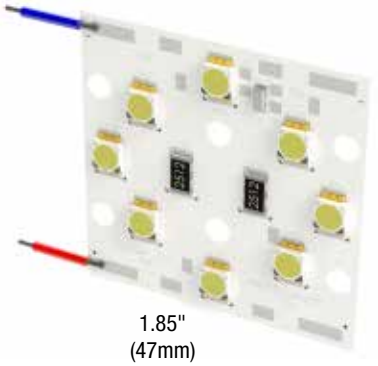
11.02"
(280mm)

.79"
(20mm)

IMAGES NOT SHOWN TO SCALE
RELATIVE TO EACH OTHER

FULHAM THOROLED™ TM04-TM10 SQUARE LED MODULES

ThoroLED Module	Max Input Current	Forward Voltage	Rated Power	Nominal Lumens (4000K)
TM04SQ26xx-001	700 mA	13.2V DC	9.2W	850
TM04SQ40xx-001	350 mA	40V DC	14W	1100
TM04SQ40xx-002	700 mA	20V DC	14W	1100
TM05SQ26xx-001	700 mA	16.5V DC	11.6W	1050
TM05SQ40xx-001	350 mA	50V DC	17.W	1400
TM06SQ26xx-001	700 mA	20V DC	14W	1275
TM06SQ40xx-001	700 mA	30V DC	21W	1650
TM07SQ26xx-001	700 mA	23.1V DC	16.2W	1500
TM08SQ26xx-001	700 mA	26.4V DC	18.5W	1700
TM08SQ40xx-001	700 mA	40V DC	28W	2200
TM10SQ26xx-001	700 mA	33V DC	23.1W	2150

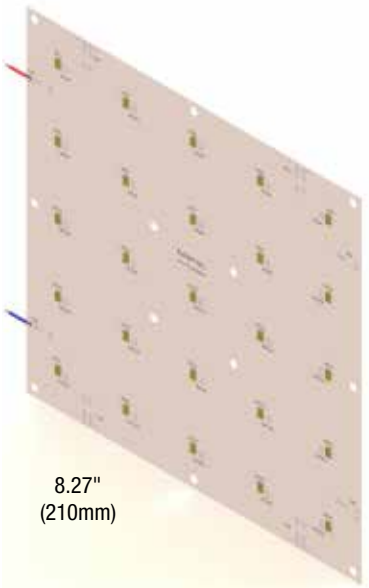


1.85"
(47mm)

1.85"
(47mm)

TM16/TM25 SQUARE LED MODULES

ThoroLED Module	Max Input Current	Forward Voltage	Rated Power	Nominal Lumens (4000K)
TM16SQ05xx-001	500 mA	13.7V DC	6.8W	600
TM16SQ12xx-001	700 mA	25.4V DC	17.8W	1675
TM25SQ05xx-001	650 mA	17.2V DC	11.1W	950
TM25SQ12xx-001	700 mA	31V DC	21.7W	2150



8.27"
(210mm)

8.27"
(210mm)

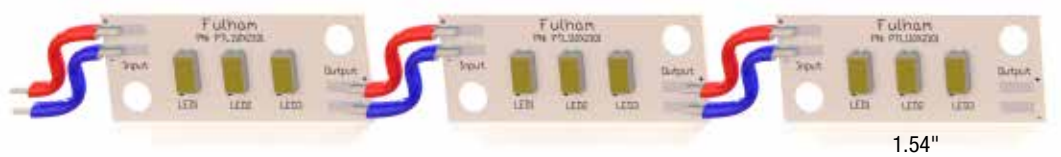
IMAGES NOT SHOWN TO SCALE
RELATIVE TO EACH OTHER

FULHAM THOROLED™

TM03 LINEAR LED MODULES/ STRING ASSEMBLIES

ThoroLED Module	Max Input Drive	Forward Voltage	Rated Power	Nominal Lumens at 4000K
TM03LN05xx-003	350 mA - CC	3.15V DC	1.1W	100 lumens
TM03LN05xx-001	12V DC - CV	N/A	1.2W	100 lumens

ThoroLED String Assembly	Max Input Drive	Forward Voltage	Rated Power	# Modules per String	C-C	Dimensions	Nominal Lumens (4000K)
TM03LN05xx-D01	350 mA - CC	12.6V DC	4.4W	4	4.7"	15.7" x 0.6"	400
TM03LN05xx-D02	12V DC - CV	N/A	4.8W	4	4.7"	15.7" x 0.6"	400
TM03LN05xx-E01	350 mA - CC	18.9V DC	6.6W	6	4.1"	22.2" x 0.6"	600
TM03LN05xx-E02	12V DC - CV	N/A	7.2W	6	4.1"	22.2" x 0.6"	600
TM03LN05xx-F01	350 mA - CC	31.4V DC	11.0W	10	3.74"	35.2" x 0.6"	1000
TM03LN05xx-F02	12V DC - CV	N/A	12.0W	10	3.74"	35.2" x 0.6"	1000
TM03LN05xx-G01	350 mA - CC	18.9V DC	6.6W	6	2.95"	16.3" x 0.6"	600
TM03LN05xx-G02	12V DC - CV	N/A	7.2W	6	2.95"	16.3" x 0.6"	600



.6"
(15mm)

1.54"
(39mm)

TM24 LINEAR LED MODULES/ STRING ASSEMBLIES

ThoroLED Module	Max Input Current	Forward Voltage	Rated Power	Nominal Lumens (4000K)
TM24LN05xx-002	500 mA	20.4V DC	10.2W	900
TM24LN05xx-003	700 mA	13.4V DC	9.4W	850
TM24LN05xx-004	1050 mA	10.3V DC	10.8W	925
TM24LN05xx-005	350 mA	26.8V DC	9.4W	850

ThoroLED String Assembly	Max Input Current	Forward Voltage	Rated Power	# Modules per String	C-C	Dimensions	Nominal Lumens (4000K)
TM24LN05xx-A01	500 mA	40.8V DC	20.4W	2	22.6"	40.55" x 0.63" (18.11" x 0.63" board size)	1800
TM24LN05xx-B01	700 mA	26.8V DC	18.8W	2	22.6"	40.55" x 0.63" (18.11" x 0.63" board size)	1700
TM24LN05xx-C01	1050 mA	20.6V DC	21.6W	2	22.6"	40.55" x 0.63" (18.11" x 0.63" board size)	1850
TM24LN05xx-D01	350 mA	56.6V DC	18.8W	2	22.6"	40.55" x 0.63" (18.11" x 0.63" board size)	1700

.63"
(16mm)

18.11"
(460mm)

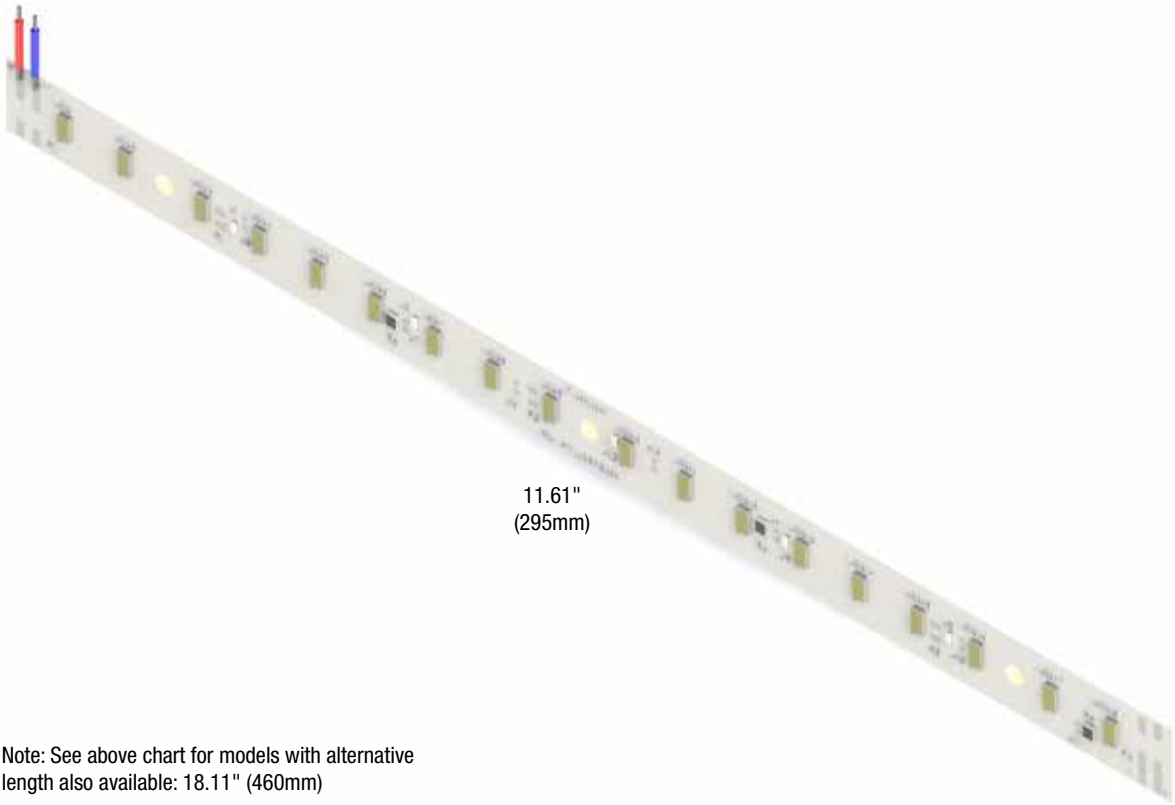
IMAGES NOT SHOWN TO SCALE
RELATIVE TO EACH OTHER

FULHAM THOROLED™

TM18 LINEAR LED MODULES/ STRING ASSEMBLIES

ThoroLED Module	Max Input Drive	Forward Voltage	Rated Power	Dimensions	Nominal Lumens (4000K)
TM18LN05xx-010	700 mA - CC	10.2V DC	7W	11.61" x 0.63"	600
TM18LN05xx-003	700 mA - CC	10.2V DC	7W	18.11" x 0.63"	600
TM18LN05xx-011	350 mA - CC	20.4V DC	7W	11.61" x 0.63"	600
TM18LN05xx-009	350 mA - CC	20.4V DC	7W	18.11" x 0.63"	600
TM18LN05xx-005	12V DC - CV	N/A	7.2W	11.61" x 0.63"	600
TM18LN05xx-002	12V DC - CV	N/A	7.2W	18.11" x 0.63"	600
TM18LN05xx-019	24V DC - CV	N/A	7.2W	11.61" x 0.63"	600
TM18LN05xx-014	24V DC - CV	N/A	7.2W	18.11" x 0.63"	600

ThoroLED String Assembly	Max Input Drive	Forward Voltage	Rated Power	# Modules per String	C-C	Dimensions	Nominal Lumens (4000K)
TM18LN05xx-G01	12V DC - CV	N/A	28.8W	4	12.0"	48.03" x 0.63" (11.61" x 0.63" board size)	2200
TM18LN05xx-K01	24V DC - CV	N/A	28.8W	4	12.0"	48.03" x 0.63" (11.61" x 0.63" board size)	2200
TM18LN05xx-P01	350 mA - CC	40.8V DC	14.2W	2	12.0"	24.02" x 0.63" (11.61" x 0.63" board size)	1275
TM18LN05xx-R01	700 mA - CC	20.4V DC	14.2W	2	12.0"	24.02" x 0.63" (11.61" x 0.63" board size)	1275



11.61"
(295mm)

.63"
(16mm)

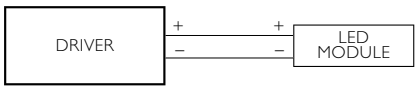
Note: See above chart for models with alternative length also available: 18.11" (460mm)

FULHAM THOROLED™

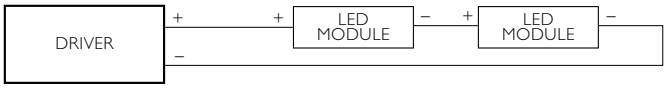
LED LIGHT ENGINES WIRING DIAGRAMS

SINGLE CHANNEL

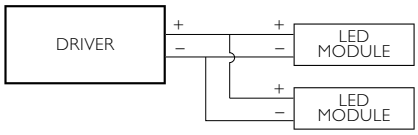
A - Single Channel Driver,
1 LED Module connected



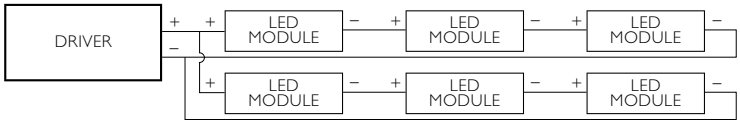
B - Single Channel Driver
LED Modules connected in series



C - Single Channel Driver
LED Modules connected in parallel

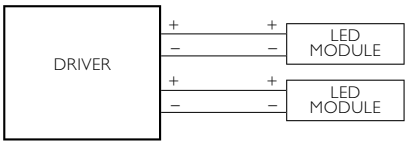


D - Single Channel Driver
LED Modules connected in series & parallel

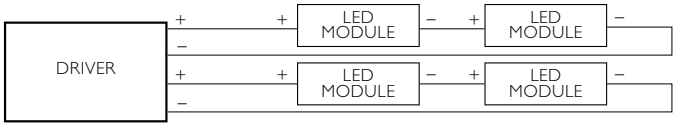


MULTI-CHANNEL

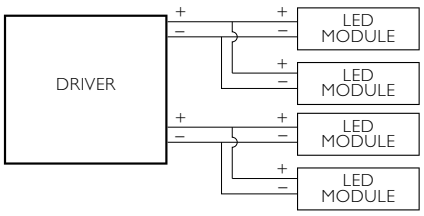
E - Multi-Channel Driver
LED Module/channel connected



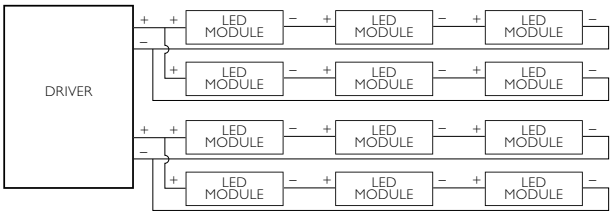
F - Multi-Channel Driver
LED Modules connected in series



G - Multi-Channel Driver
LED Modules connected in parallel



H - Multi-Channel Driver
LED Modules connected in series & parallel



FULHAM THOROLED™ INDIA LED MODULE & LED DRIVER MATRIX

Fulham India offers unique solutions for various LED lighting applications by providing perfectly paired modules and drivers. Follow the steps below to achieve your desired lighting requirement :

- Select the conventional light fixture to be replaced
- Identify the light source in the selected conventional fixture or light application
- Choose the corresponding LED Module based on the lumen package required
- Identify the corresponding Fulham LED Driver to match

Sr. No.	Traditional Light Source	LED Module Code	Size (mm)	Input Voltage (Vdc)	Input Current (mA)
Downlights					
1	2x9/11W CFL	TMB20RD05XXS5P4M10L6	100 Dia.	15	700
2	2x13W CFL	TMB22RD05XXS11P2F16L6	120 Dia.	33	350
3	2x9/11W CFL	TMB35RD03XXS5P7F16L5	120 Dia.	15	700
4	2x9/11W CFL	TMB35RD03XXS5P7M16L5	120 Dia.	15	700
5	2x18W CFL	TMB36RD05XXS9P4M10L6	120 Dia.	27	700
6	2x26W CFL	TMB44RD05XXS11P4M10L6	170 Dia.	33	700
7	2x9/11W CFL	TMB20SQ05XXS10P2M10L6	95x95	30	350
8	2x13W CFL	TMB24SQ05XXS6P4M10L6	95x95	18	700
9	2x9/11W CFL	TMB20SQ05XXS5P4M10L6	95x95	15	700
10	2x18W CFL	TMB36SQ05XXS9P4M10L6	120x120	27	700
11	2x26W CFL	TMB44SQ05XXS11P4M10L6	170x170	33	700
Other Luminaires					
12	2x13W CFL	TMB49SQ03XXS7P7F16L5	240x240	21	700
13	2x26W CFL	TMB54SQ05XXS9P6M16L6	240x240	27	1000
14	2x26W CFL	TMB81SQ03XXS9P9M16L5	240x240	27	1000
15	2x36W CFL	TMB36SQ03XXS6P6F16L5	240x240	18	600
16	2x9/11W CFL	TMB18SQ05XXS9P2F16L6	260X260	27	350
17	2x13W CFL	TMB22SQ05XXS11P2F16L6	260X260	33	350
18	36W CFL/T8	TMB10RT30XXS10P1M16LXH83	150X90	28	700
19	2x36W T8/4x14WT5/2x36WCFL	TMB33RT03XXS11P3F16L5	280X52	33	300
20	2x36W CFL/4x14WT5/4x18WT8	TMB50RT03XXS10P5F16L5	420x210	30	500
21	2x36W T8/4x14WT5/2x36WCFL	TMB33RT03XXS11P3F16L5	280X55	33	300
22	2x36W CFL/4x14WT5/4x18WT8	TMB05LN03XXS5P1F16L5	240x20	15	100
23	9/11W CFL	TMB09LN03XXS3P3F16L5	140x20	9	300
24	2x36W CFL/4x14WT5/4x18WT8	TMB10LN03XXS10P1F16L5	420x20	30	100
25	2x9/11W CFL	TMB11LN03XXS11P1F16L5	140x20	33	116
26	2x9W CFL	TMB12LN03XXS4P3F16L5	280x30	12	350
27	2x13W CFL	TMB18LN03XXS6P3F16L5	280x30	18	350
28	2x9W CFL	TMB12LN03XXS4P3F16N157	140X20	12	300
29	2x36W CFL/4x14WT5/4x18WT8	TMB05LN03XXS5P1F16P35L	240X20	15	100
30	2x36W CFL/4x14WT5/4x18WT8	TMB24LN04XXS12P2F16P35L	560X24	36	300

- All LED Modules compatible with 25W LED Drivers T12400700-25F (cube version) can also be used with T12400600-25E (linear version).
- When ordering modules, replace "xx" with desired CCT options (27=2700K, 35=3500K, 40=4000K, 50=5000K, 65=6500K).

IMAGES NOT SHOWN TO SCALE
RELATIVE TO EACH OTHER

Calculated Usable Lumen Output per Module (@6500K) at Tj 75oC	# of LED Modules used with a Single Driver	Compatible LED Driver Code	Output Power (W)	Output Voltage (Vdc)	Output Current (mA)
Downlights					
1416	1	T12400700-15C	15	12-21V	700
1558	1	T12300350-12L	12	9-36V	350
1292	1	T12400700-15C	15	12-21V	700
1292	1	T12400700-15C	15	12-21V	700
2549	1	T12400700-25F	25	18-36V	700
3116	1	T12400700-25F	25	18-36V	700
1416	1	T12300350-12L	12	9-36V	350
1699	1	T12400700-15C	15	12-21V	700
1416	1	T12400700-15C	15	12-21V	700
2549	1	T12400700-25F	25	18-36V	700
3116	1	T12400700-25F	25	18-36V	700
Other Luminaires					
1809	1	T12400700-15C	15	12-21V	700
3657	1	T12401000-36E	36	18-36V	1000
3262	1	T12401000-36E	36	18-36V	1000
1329	4	T12401000-36E	36	18-36V	1000
1275	1	T12300350-12L	12	9-36V	350
1558	1	T12300350-12L	12	9-36V	350
2556	1	T12400700-25F	25	18-36V	700
1218	4	T12401000-36E	36	18-36V	1000
1846	2	T12401000-36E	36	18-36V	1000
1218	4	T12401000-36E	36	18-36V	1000
185	20	T12401000-36E	36	18-36V	1000
332	2	T12400350-6C	6	9-18V	350
369	10	T12401000-36E	36	18-36V	1000
460	3	T12300350-12L	12	9-36V	350
501	2	T12400700-15C	15	12-21V	700
752	2	T12400700-15C	15	12-21V	700
456	1	T12400350-6C	6	9-18V	350
205	20	T12401000-36E	36	18-36V	1000
1262	4	T12401000-36E	36	18-36V	1000

- Dimmable Drivers (Triac Dimming) are available for T12400700-25F and T12401000-36E. Add prefix "T1" to the driver codes to order dimmable driver varieties, e.g. T1T12400700-25F.
- All the LED Drivers are single channel, constant current type.

FULHAM THOROLED L.E.A.P.
LIGHT ENGINE APPLICATION PROGRAM

Fulham offers a comprehensive set of engineering services that can enable OEM customers and other lighting professionals to convert existing fixture styles or new lighting products to take advantage of ThoroLED Light Engines. This unique Fulham program takes full advantage of LED technology and provides a cost efficient solution with a relatively low investment.

The ThoroLED L.E.A.P. makes it easy to:

1) Convert existing fixture product lines or installations;

2) Design new LED lighting products for optimized performance and cost;

3) Minimize time to market for new LED fixture products;

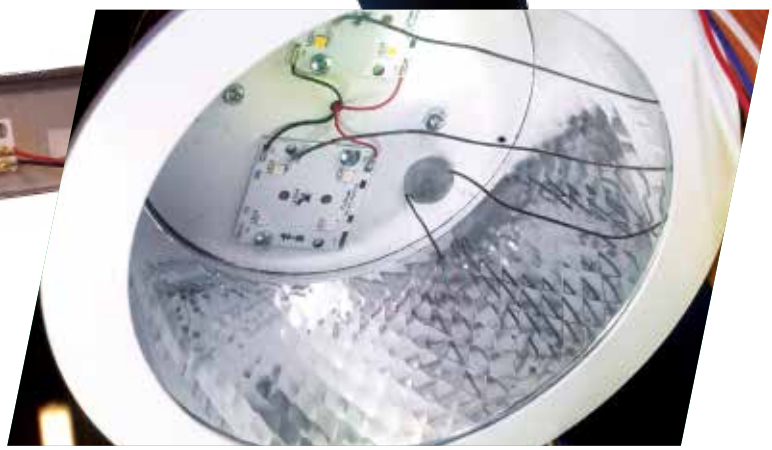
4) Ensure reliability and performance of LED modules and LED drivers; and,

5) Maximize the expected life of all LED Light Engine components.

Fulham's engineering laboratories in Los Angeles, California are replete with highly skilled staff and an extensive array of testing equipment for successful implementation of LED technology into lighting products and applications.

LED LIGHTING SYSTEMS: ENGINEERED FOR VALUE AND PERFORMANCE

- Thermal and optical optimization for LED Modules and Assemblies
- Thermal management solutions for LED Driver mounting
- Configuration for ease of component installation
- Conversion accessory component CAD drawings
- Complete installation instructions for the LED Light Engine Kit
- Prototype assembly and optimization
- Regulatory and Standards Compliance evaluation



Above: LED Light Engine solution for desk lamp. Right: Testing thermal performance of LED Light Engine solutions.

ENGINEERING SERVICES
SYSTEM EVALUATION

Fulham determines the best LED Light Engine for the existing OEM fixture, including:

- LED module mounting; thermal and optical optimization
- Driver mounting and thermal management
- Ease of component installation options
- Conversion Component CAD drawings
- Complete installation instructions for the LED Light Engine
- Prototype assembly and optimization

LED Light Engine solution for 2' x 2' flat panel commercial light.

CERTIFICATION SERVICES
UL CERTIFICATION

Fulham's components are designed to meet or exceed UL's new exacting LED Lighting Products safety standard known as UL8750. Similarly, Fulham's products are compliant with international standards such as CE and others. Employment of Fulham's UL Recognized LED drivers and LED modules ensures that customers are able to successfully achieve UL certification for their products.

IES PHOTOMETRIC FILES
INDEPENDENT LAB TESTING

During the initial converted system evaluation, Fulham can provide basic photometric performance and evaluation. Fulham is contracted with a National Recognized Independent Test Lab and can provide a new IES Photometric file for application specific purposes.

LED Light Engine solution for outdoor wall sconce.

SAMPLE PROGRAM
BETA-SITE TESTING

Fulham provides flexible sample programs to ensure the ThoroLED L.E.A.P. systems meet customer requirements. To take full advantage of the ThoroLED L.E.A.P. in various applications, Fulham works with the customer to maximize the lighting effect and minimize the energy cost.

WARRANTY PROGRAM
APPLICATION EVALUATION PROCESS

Fulham is reputed for high quality products and superior support services; ThoroLED Systems are designed for the LED Light Engine to operate as a system that provides long-life and consistent operation.

Before and during the process of conversion evaluation, Fulham offers a Warranty Evaluation Summary that identifies critical data and performance attributes needed to insure the life expectancy of the LED Light Engine is achieved. ThoroLED Systems come with a Five-Year Warranty, while in most cases much longer life is possible due to superior thermal management of the components.

GREEN ENERGY SERVICES
REBATE PROGRAMS

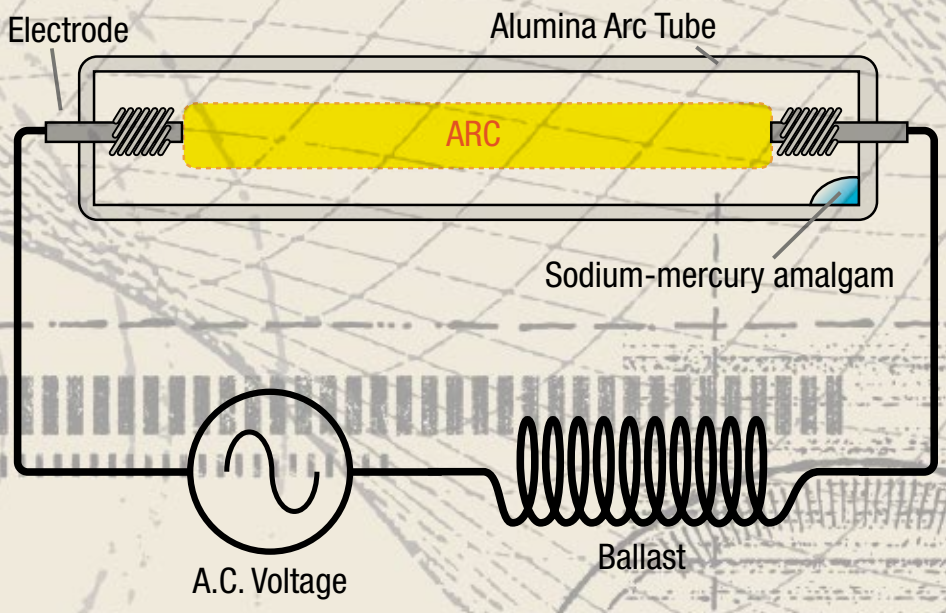
Many government programs are being offered for converting conventional lighting systems to more efficient, new lighting technologies such as LED technology. Fulham is constantly reviewing these programs and adapting its products and solutions to meet these money-saving program requirements. Many of Fulham's LED Light Engines are designed and tested for use in a fixture that will meet all crtiteria for certification under EPA's Energy Star Program for Luminaires, version 1.0.

ThoroLED product specification sheets and other related literature online

HID HIGH INTENSITY DISCHARGE

AN ARC OF GENIUS

The light from HID lamps is produced by electricity passing between tungsten electrodes inside a tube that's filled with an ignition gas and metal salts. Firing up the arc converts the salts into an intensely glowing plasma. Despite the brilliance, HID power consumption is less than ordinary incandescent or fluorescent lamps, delivering far more lumens per watt.



More Light, Less Heat

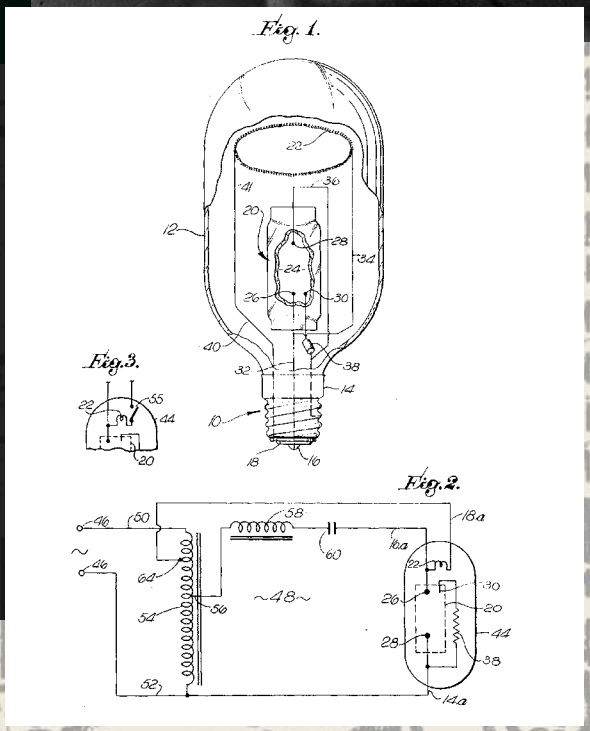
High Intensity Discharge lamps are, in fact, pretty intense. They belong to a group of gas-discharge lamps that literally developed over centuries.

The earliest work on what evolved into mercury vapor lamps was done by the English scientist Francis Hauksbee (1666-1713), a Fellow of the Royal Society. Around 1705, he found that electrical charges on metals in an airless globe produced a glow not unlike St. Elmo's Fire (that scary electricity that zigzags on airplane wings and in mad scientists' labs). This work eventually led to developments such as neon lighting and vapor lamps.

In 1912, the gnomish German-born mathemetician/engineer Charles Steinmetz (1865-1923) promoted the development of alternating current, helping to grow the U.S. electric power industry. Steinmetz experimented with metal halide compounds in mercury lamps, which laid an important foundation for productive research in the 1950s, when many physicists were testing the feasability of halogen lamps.

Xenon gas short-arc lamps - the model for HID - were developed by German scientists in the 1940s. The lamps were quickly adopted by cinema projectionists, as a replacement for the less efficient carbon arc lamps because of their daylight-quality luminance. This benefit was subsequently improved upon by Gilbert Reiling (b. 1928), who in 1959 began work on the thermodynamics of mercury discharge lamps at GE labs. A year later he produced a lamp with about twice the light output of the standard 400 Watt mercury-vapor lamp with an even brighter white light. This became the metal halide lamp, which GE began to develop vigorously in 1962.

Charles Steinmetz



HID
LIGHTING SYSTEMS

INTENSE LIGHT, WITH LOW ENERGY CONSUMPTION

HID lamps have been in use, as an alternative to "regular" light bulbs, since the introduction of the mercury lamp in 1901. All versions of HID are more efficient than electric filament lamps, delivering more light per unit of electrical energy.

Some of today's HIDs have phosphor coating inside the lamp, providing a powerful and broad color and light spectrum. This makes them highly desirable for architectural, industrial, municipal and commercial lighting.

HID lamp attractive advantages

HID lamps take a moment to fire up, because they run off ballasts. But they last longer and burn brighter than their incandescent cousins. They consume less wattage – electricity is only to start – so they cost less to operate. HID delivers high light output from a concentrated source.

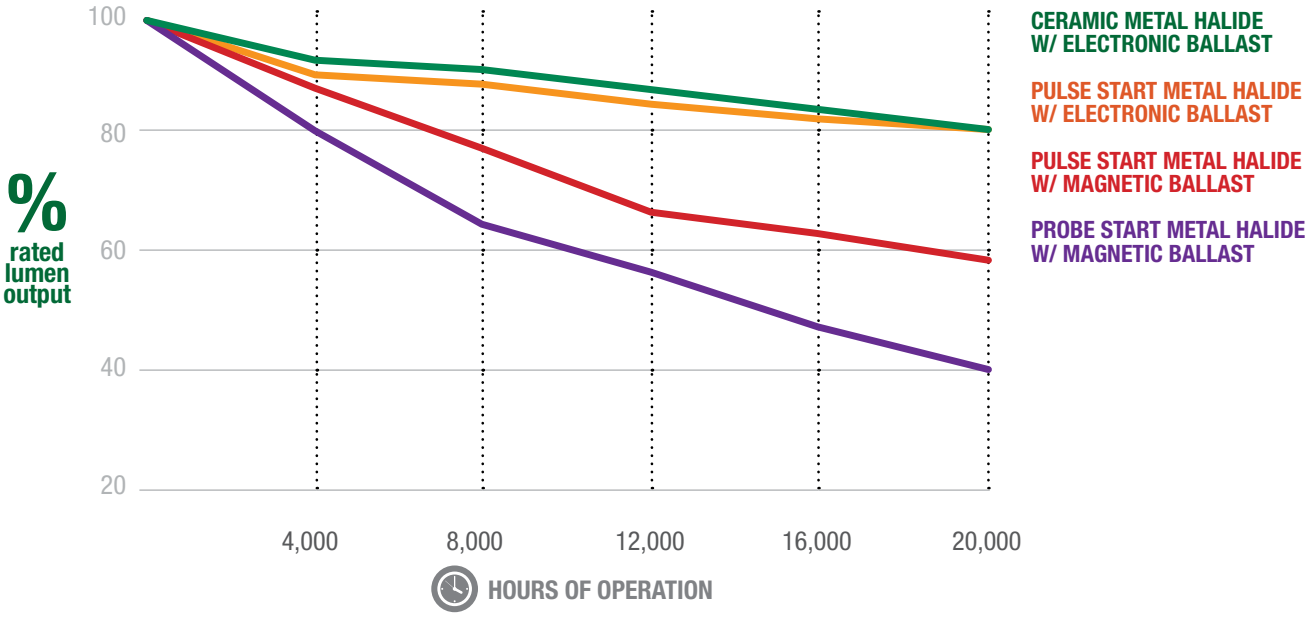
They come in four iterations. Mercury Vapor was the earliest version but can no longer be sold in fixtures. High Pressure Sodium lamps often line highways, with their yellowish-orange glow. Low Pressure Sodium delivers the best Lumens per Watt ratio (about 200!), but probably has the least light quality. Metal Halide, on the market since 1960, seems to deliver the best blend of benefits, so it has become the lamp of choice for big stores, warehouses, industrial plants, outdoor arenas and municipal locales. These lamps are cost efficient; the light quality is good enough for home use; and they are color-friendly.

Magnetic ballasts

With your basic "core and coil" magnetic HID ballast, a coil of (usually copper and/or aluminum) wire is wound around some

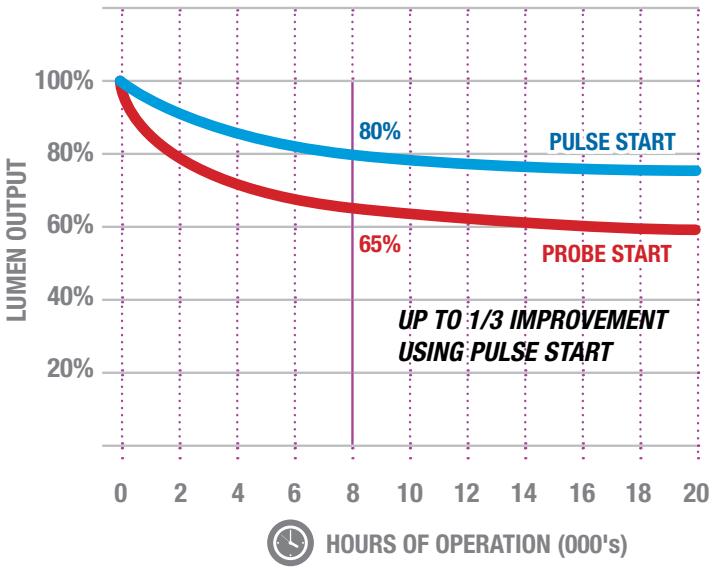
LUMEN MAINTENANCE

This graph illustrates Lumen dropoff for the four basic categories of Metal Halide (MH) lamps, comparing efficacy of magnetic vs. electronic ballasts. Probe Start Metal Halide lamps with magnetic ballasts show the earliest and steepest lumen decline. Pulse Start Metal Halide lamps with magnetic ballasts fare somewhat better, maintaining a relatively higher lumen level for longer. Pulse Start electronic ballast MHs have a much higher lumen level, staying fairly consistent through 20,000 hours; while Ceramic MH lamps managed by electronic ballasts do best of all, achieving 80% lumen maintenance at 20,000 hours and beyond.

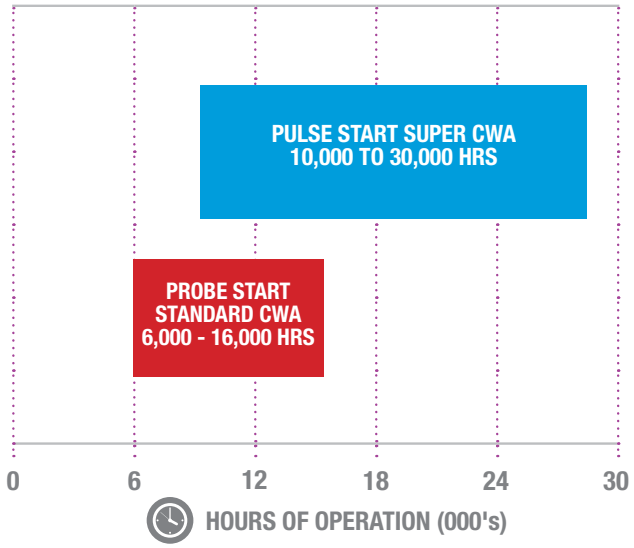


PULSE START VS PROBE START MAGNETIC HID BALLASTS

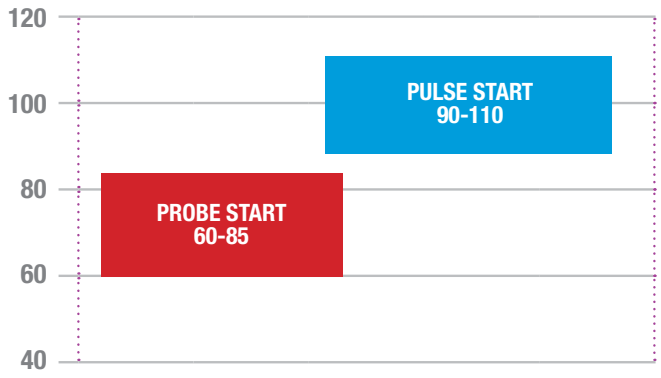
BETTER LUMEN MAINTENANCE



LONGER LAMP LIFE



MORE LUMENS PER WATT



kind of metallic core. Electricity charging through the wire loops produces an electromagnetic field – hence "magnetic" ballast. It modulates current inflow at a fairly low cycle rate. Because "core and coil" technology involves metals, magnetic HID ballasts are heavier, therefore somewhat more expensive to operate than Electronic HID ballasts.

Magnetic ballasts operate a variety of metal halide and high pressure sodium HID lamps, using either Probe or Pulse technology.

Probe technology consists of a starter electrode and two operating electrodes inside the lamp. The electrical charge arcs from the starter to one of the operating electrodes, which in turn bounces electrons over to the other one. Once the lamp is "live," the starter electrode switches off. Side effect: continued operation of the lamp results in tungsten atom deposits on the tube's wall, eventually dimming the light output and affecting true color perception.

The Pulse system, instead of a starter probe, employs an ignitor that sends high voltage "pulses" which heat the electrodes faster. Pulse starting has a reputation for extending MH lamp life up to 50%, providing faster starts even in extreme cold, and delivering faster re-strike times with less warm-up time. The eyes have it: Pulse CRI and general luminescence is about a third better than Probe, since the ignitor system cuts down on tungsten escape.

Electronic ballasts

Sophisticated Electronic HID ballasts are computerized to sense the appropriate power level for their designated lamp(s), and restrict current flow to that level. So they can quite precisely regulate the current flowing through the circuit. Their higher cycle rate reduces or eliminates most noise and flicker.

Electronic ballasts offer the advantages of increased overall efficiency and lower operating costs. They run cooler than magnetic ballasts and aren't energy gluttons. They operate at higher frequencies. This cuts end losses, and delivers 10% to 15% higher lamp-ballast efficacy. They extend lamp life by at least 50%. EHID ballasts are lighter than magnetic ballasts, because they have no copper coils.

MAGNETIC VS ELECTRONIC

Running on magnetic ballasts, you can expect lumen depreciation of about 60%... as opposed to only 20% over the same time period from electronic ballasts.

When HID is boosted with electronic ballasts, lighting becomes more efficient and less expensive. Switching to EHID significantly cuts the need for service visits, resulting in fewer service charges. You can use the same lamps, but they will work better and last longer. And you can get the same illumination from lower-wattage lamps or fewer fixtures!

HID
LIGHTING SYSTEMS

- COMPLETE HID SYSTEMS WITH PREMIUM FULHAM LAMPS AND BALLASTS
- OVER 200 SYSTEM MODELS
- PREFERRED CHOICE WHEN EFFICIENT, RELIABLE HIGH LUMEN OUTPUT IS REQUIRED




HID LAMPS

MAGNETIC HID BALLASTS

ELECTRONIC HID BALLASTS

22W - 1000W BALLASTS

MAGNETIC HID BALLASTS

70W - 1000W BALLASTS

HID LAMPS

50W - 1000W HPS LAMPS

70W - 1000W PROBE, PULSE & PROTECTED METAL HALIDE LAMPS

175W MERCURY VAPOR LAMPS

HighHorse HID product specification sheets and other related literature online

HID

ELECTRONIC HID BALLASTS

FULHAM HIGHHORSE™ LOW FREQUENCY ELECTRONIC HID MH BALLASTS

FEATURES

- Short Circuit Operation Protection
- Open Circuit Operation Protection
- Ignitor Failure Protection
- Thermal Protection (UNV only)
- Energy-Efficient Compared to Magnetic
- Extended Lamp Life
- Less Color Shift Over Time
- Type 1 Outdoor Listed
- Low Noise
- Compact Ballast Profiles
- Superior Lumen Maintenance
- Faster Strike and Restrike Times
- Side and Back Lead Options Available
- Light Weight

Frequency	140-220Hz
CCF	<1.5
Min Starting Temp	-30ºC/-20ºF
Max Case Temp	85ºC
EMI/RFI	FCC PART18 CLASS A, NON-CONSUMER

Short Circuit Operation Protection	Yes
Open Circuit Operation Protection	Yes
Ignitor Failure Protection	Yes
End of Lamp Life Protection	Yes

MODELS	DESCRIPTION	ANSI CODES	CASE SIZE (mm) LxWxH	CASE SIZE (inches) LxWxH
H1-120-22HSC	22 W, 120V MH Side Leads	M156, C156, C175, M175	89 x 75 x 30.5	3.50 x 2.95 x 1.20
H3-120-39HSC	39 W, 120V MH Side Leads	M130, C179, C130	89 x 75 x 30.5	3.50 x 2.95 x 1.20
H3-UNV-39HBC	39 W, UNV MH Back Leads	M130, C179, C130	123 x 91.5 x 38	4.84 x 3.60 x 1.50
H3-UNV-39HSC	39 W, UNV MH Side Leads	M130, C179, C130	123 x 91.5 x 38	4.84 x 3.60 x 1.50
H4-120-50HSC	50 W, 120V MH Side Leads	M110, M148	89 x 75 x 30.5	3.50 x 2.95 x 1.20
H5-UNV-70HBC	70 W, UNV MH Back Leads	M98, M139, C139, M143	123 x 91.5 x 38	4.84 x 3.60 x 1.50
H5-UNV-70HSC	70 W, UNV MH Side Leads	M98, M139, C139, M143	123 x 91.5 x 38	4.84 x 3.60 x 1.50
H6-UNV-100HBC	100 W, UNV MH Back Leads	M90, M140	123 x 91.5 x 38	4.84 x 3.60 x 1.50
H6-UNV-100HSC	100 W, UNV MH Side Leads	M90, M140	123 x 91.5 x 38	4.84 x 3.60 x 1.50
H7-UNV-150HBC	150 W, UNV MH Back Leads Ⓔ	M102, M142, C142, M81, M107	155 x 91.5 x 38	6.10 x 3.60 x 1.50
H7-UNV-150HSC	150 W, UNV MH Side Leads Ⓔ	M102, M142, C142, M81, M107	155 x 91.5 x 38	6.10 x 3.60 x 1.50
H8-UNV-175HBC	175 W, UNV MH Back Leads Ⓔ	M57, M152, M137	155 x 91.5 x 38	6.10 x 3.60 x 1.50
H8-UNV-175HSC	175 W, UNV MH Side Leads Ⓔ	M57, M152, M137	155 x 91.5 x 38	6.10 x 3.60 x 1.50

Back Lead Option has 8/32 studs on bottom, 2" on center.

FULHAM HIGHHORSE™ LOW FREQUENCY 230V ELECTRONIC HID MH BALLASTS

FEATURES

- Energy-Efficient Compared to Magnetic
- Extended Lamp Life
- Less Color Shift Over Time
- Superior Lumen Maintenance
- Faster Strike and Restrike Times
- Light Weight, Compact Ballast Profiles
- Outdoor Listed
- Low Noise

Frequency	50/60Hz
CCF	<1.5
Min Starting Temp.	-30ºC/-20ºF
Max Case Temp.	85ºC
EMI/RFI	FCC PART18 CLASS A, NON-CONSUMER

Short Circuit Operation Protection	Yes
Open Circuit Operation Protection	Yes
Ignitor Failure Protection	Yes
End of Lamp Life Protection	Yes
Thermal Protection	Yes

MODELS	DESCRIPTION	CASE SIZE (mm) LxWxH	CASE SIZE (inches) LxWxH
H1-230-20HSC	20/22W 220-240V MH Side Terminals	100 x 74.5 x 32*	4.33" x 2.95" x 1.26"*
H2-230-35HSC	35W 220-240V MH Side Terminals	100 x 74.5 x 32*	4.33" x 2.95" x 1.26"*
H5-230-70HSC	70W 220-240V MH Side Terminals	100 x 74.5 x 32*	4.33" x 2.95" x 1.26"*
H7-230-150HSC	150W 220-240V MH Side Terminals	164 x 91 x 38**	6.57" x 3.58" x 1.50"**

*Mounting length 97mm/3.81" (20-70W) **Mounting length 154mm/6.06" (150W)

208 • 230 • 240 • 480 • 208-240
240-277 • 208-277 50/60Hz

NON-STOCKING ITEMS FOR OEM & PRIVATE LABEL APPLICATIONS

CONTACT US WITH YOUR SPECIFIC NEEDS BASED UPON THESE OPTIONS BELOW:

ORDER@FULHAM.COM - 323-599-5000

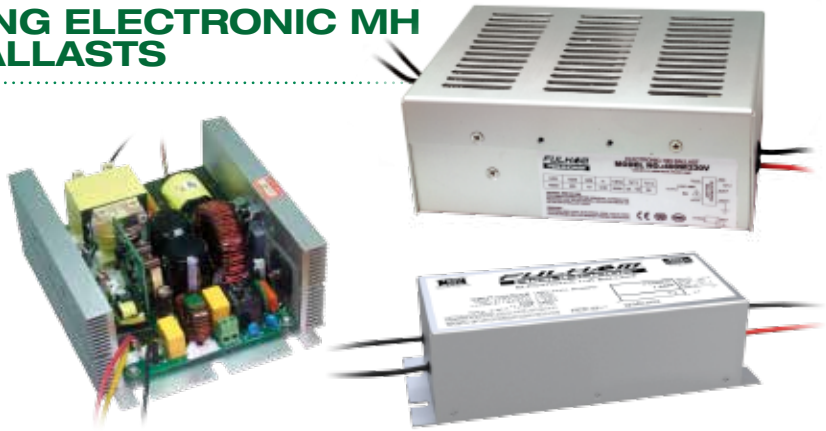
FULHAM HIGHHORSE™

TANNING ELECTRONIC MH HID BALLASTS

METAL HALIDE MODELS

- 400W 600W 1000W, Dimming and Non-Dimming Options Available
- Aluminum Case Construction

Dimmable
OPTIONS AVAILABLE



CE UL c UL us

FULHAM HIGHHORSE™

INDUSTRIAL ELECTRONIC MH & HPS HID BALLASTS

FEATURES

- 200W-450W MH & HPS Models
- Aluminum Case Construction
- Multi-Voltage Options
- 208 / 240 / 277 / 208V-240V / 240V-277V / 208V-277V
- Non-Dimming Options
- 0-10V Dimming Options
- Auto-Dimming Options
- Manual Dimming Options
- UL - cULus Type Outdoor 1

Dimmable
OPTIONS AVAILABLE

CE

FULHAM HIGHHORSE™

EUROPEAN SERIES HID BALLASTS

METAL HALIDE MODELS

- 20W-150W
- 250W-400W

Dimmable
OPTIONS AVAILABLE

HIGH PRESSURE SODIUM MODELS

- 70W-400W

FEATURES

- 0-10V Dimming Options
- Auto Dimming Options
- Manual Dimming Options

APPLICATIONS

- Commercial
- Architectural
- Industrial
- Street Lighting

230 • 240 • 347 • 400
DUAL 120 or 240 • 120-240 50/60Hz

NON-STOCKING ITEMS FOR OEM & PRIVATE LABEL APPLICATIONS

CONTACT US WITH YOUR SPECIFIC NEEDS BASED UPON THESE OPTIONS BELOW:

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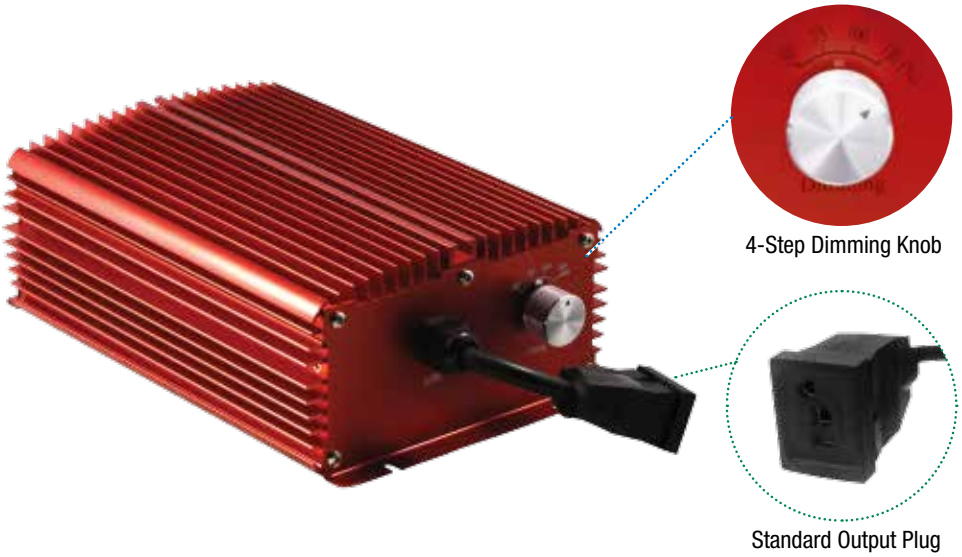
FULHAM HIGHHORSE™ HORTICULTURAL HOBBYIST ELECTRONIC HID BALLASTS

HOBBY HORTICULTURE MH/HPS BALLASTS

Dimmable
OPTIONS AVAILABLE

- 250W, 400W, 600W, 750W, 1000W
- Dual 120V or 240V: UL, cULus
- Dedicated 230V: CE
- 4-Step Dimming Options:
  50%, 75%, 100%, 110%
- Same Ballast operates both MH and HPS Lamps
- Many Case Color Options Available:
  Blue, Red, Black, Purple, Yellow, etc.



4-Step Dimming Knob

Standard Output Plug

FULHAM HIGHHORSE™ HORTICULTURAL ELECTRONIC HID BALLASTS

GREENHOUSE COMMERCIAL HORTICULTURE
HIGH PRESSURE SODIUM MH BALLAST-REFLECTOR KITS

Dimmable
OPTIONS AVAILABLE

- 230V: CE
  400W, 600W, 750W, 1000W
- 240V: UL, cULus
  400W, 600W, 750W, 1000W
- 347V: UL, cULus
  600W, 750W, 1000W
- 400V: CE, UL, cULus
  600W, 750W, 1000W
- 0-10V Dimming Options
- Greenhouse Applications / Commercial Growers
- HPS and MH Models

FULHAM HIGHHORSE™

5 TAP HID HIGH PRESSURE SODIUM & METAL HALIDE BALLASTS

FEATURES

- 5 tap voltage range (120, 208, 240, 277, 480V)
- All include high temperature rated capacitor, ignitor (where applicable), and mounting brackets
- Dry capacitors standard on all models except 1000W MH and HPS which offer wet capacitors
- CWA circuits, Class H (180C) and select Class N (200C) models
- Precision wound, vacuum impregnation coils for quiet operation and long life
- Starting temperature HPS -40ºC; MH -30ºC
- Color coded and voltage marked wires for ease of installation

Part Number	Watts	Description	ANSI CODE
High Pressure Sodium 5 Tap Ballast Kits		D=Dry / W=Wet	
HH HPS MLT5 250D	250W	250W HPS 5 Tap CWA with Dry Capacitor	S50
HH HPS MLT5 400D	400W	400W HPS 5 Tap CWA with Dry Capacitor	S51
HH HPS MLT5 1000W	1000W	1000W HPS 5 Tap CWA with Wet Capacitor	S52
Probe Start Metal Halide 5 Tap Ballast Kits			
HH MH MLT5 175D	175W	175W MH 5 Tap Probe Start CWA with Dry Capacitor	M57 or M107(150W)
HH MH MLT5 250D	250W	250W MH 5 Tap Probe Start CWA with Dry Capacitor	M58
HH MH MLT5 400D	400W	400W MH 5 Tap Probe Start CWA with Dry Capacitor	M59
HH MH MLT5 1000W	1000W	1000W MH 5 Tap Probe Start CWA with Wet Capacitor	M47

EVERYTHING YOU NEED IN 1 KIT

Ballast, Lamp, Wet or Dry Capacitor, Ignitor and Mounting Hardware

- Available from 175W to 1000W
- UL Recognized Components
- Attractive, Durable Packaging
- Competitive Pricing
- Multivolt - 120V/208V/240V/277V/480V

5 TAP

Kit Part Number	Kit Description	Lamp Part Number	Ballast Part Number (+Ignitor +Capacitor)
Probe Start Metal Halide 5 Tap Ballast & Lamp Kits			D=Dry / W=Wet
HH MH Q5 175 DM3	Ballast & Lamp Kit 175W MH 5 Tap w/ Dry Capacitor	HM0175DBU4K	HHMHMLT5175D
HH MH Q5 250 DM3	Ballast & Lamp Kit 250W MH 5 Tap w/ Dry Capacitor	HM0250DBU4K	HHMHMLT5250D
HH MH Q5 400 DM7	Ballast & Lamp Kit 400W MH 5 Tap w/ Dry Capacitor	HM0400GBU4K	HHMHMLT5400D
HH MH Q5 1000 WM7	Ballast & Lamp Kit 1000W MH 5 Tap w/ Wet Capacitor	HM1000GBU4K	HHMHMLT51000W
High Pressure Sodium 5 Tap Ballast & Lamp Kits			D=Dry / W=Wet
HH HPS Q5 250 DM5	Ballast & Lamp Kit 250W HPS 5 Tap w/ Dry Capacitor	HL0250CBU	HHHPSMLT5250D
HH HPS Q5 400 DM5	Ballast & Lamp Kit 400W HPS 5 Tap w/ Dry Capacitor	HL0400CBU	HHHPSMLT5400D

FULHAM HIGHHORSE™

4 TAP MAGNETIC HID MH & HPS CORE & COIL BALLASTS

FEATURES

- 70W - 1000W Range
- Contractor Replacement Kits Include Ballast, Capacitor, Ignitor and Mounting Hardware
- Probe Start and 2009 Energy Savings Compliant Pulse Start Models
- High Temperature Rated Capacitor & Ignitor
- HX-HPF & CWA Circuits
- Four-Tap Voltage 120/208/240/277V
- Precision Coil Winding
- Starting Temperature HPS -40°C
- Starting Temperature MH -30°C

Description	ANSI CODE	Input Watts	Ballast + Ignitor + Dry Capacitor + Mounting Hardware	Ballast + Ignitor + Wet Capacitor + Mounting Hardware	Ballast + Ignitor (Less Capacitor) + Mounting Hardware	Ignitor Only	Dry Capacitor	Dry Capactior VAC Rating	Wet Capactior	Wet Capactior VAC Rating	Ballast Weight lbs.
High Pressure Sodium			HHHPS-MLT4-	HHHPS-MLT4-	HHHPS-MLT4-	HHHPS-	HHHPS-DCAP-		HHHPS-WCAP-		
HX-HPF HPS70W/120V/208V/240V/277V	S62	91	70D	70W	70	IG70-150	70	7uF/280VAC	70	7uF/280VAC	4.85
HX-HPF HPS100W/120V/208V/240V/277V	S54	123	100D	100W	100	IG70-150	100	10uF/280VAC	100	10uF/280VAC	6.61
HX-HPF HPS150W/120V/208V/240V/277V	S55	185	150D	150W	150	IG70-150	150	14uF/280VAC	150	14uF/280VAC	7.71
CWA HPS200W /120V/208V/240V/277V	S66	240	200D	200W	200	IG200-400	200	28uF/330VAC	200	28uF/280VAC	7.71
CWA HPS250W/120V/208V/240V/277V	S50	290	250D	250W	250	IG200-400	250	35uF/330VAC	250	35uF/240VAC	11.13
CWA HPS400W/120V/208V/240V/277V	S51	460	400D	400W	400	IG200-400	400	55uF/240VAC	400	55uF/240VAC	13.77
CWA HPS600W/120V/208V/240V/277V	S106	665	600D	600W	600	IG600	600	64uF/280VAC	600	64uF/300VAC	20.06
CWA HPS1000W/120V/208V/240V/277V	S52	1,090	N/A†	1000W	1000	IG1000	N/A†	N/A†	1000	26uF/525VAC	25.79
Probe Start Metal Halide			HHMH-MLT4-	HHMH-MLT4-	HHMH-MLT4-	HHMH-	HHMH-DCAP-		HHMH-WCAP-		
HX-HPF MH70W/120V/208V/240V/277V	M98/M143	90	70D	70W	70	IG70-150	70	8uF/280VAC	70	8uF/280VAC	5.51
HX-HPF MH100W/120V/208V/240V/277V	M90/M140	129	100D	100W	100	IG70-150	100	10uF/280VAC	100	10uF/280VAC	5.62
HX-HPF MH150W/120V/208V/240V/277V	M102/M142	185	150D	150W	150	IG70-150	150	16uF/280VAC	150	16uF/280VAC	7.71
CWA MH175W /120V/208V/240V/277V	M57/H39 150w-M107	205	175D*	175W*	175*	N/A	175	10uF/400VAC	175	10uF/400VAC	6.83
CWA MH250W/120V/208V/240V/277V	M58/H37	305	250D*	250W*	250*	N/A	250	15uF/400VAC	250	15uF/400VAC	9.03
CWA MH400W/120V/208V/240V/277V	M59/H33	445	400D*	400W*	400*	N/A	400	24uF/400VAC	400	24uF/400VAC	10.58
CWA MH1000W/120V/208V/240V/277V	M47/H36	1,075	N/A†	1000W*	1000*	N/A	N/A†	N/A†	1000	24uF/480VAC	25.8
2009 Compliant Pulse Start Metal Halide Ⓔ			HHMH-MLT4-	HHMH-MLT4-	HHMH-MLT4-	HHMH-	HHMH-DCAP-		HHMH-WCAP-		
CWA MH175W /120V/208V/240V/277V	M137/M152	198	175PD	175PW	175P	IG175-200	175P	11uF/370VAC	175P	11uF/370VAC	9.29
CWA MH200W /120V/208V/240V/277V	M136	225	200PD	200PW	200P	IG175-200	200P	15uF/330VAC	200P	15uF/350VAC	7.93
CWA MH250W /120V/208V/240V/277V	M138/M153	281	250PD	250PW	250P	IG175-400	250P	17uF/330VAC	250P	17uF/400VAC	9.85
CWA MH320W /120V/208V/240V/277V	M132/M154 M170	362	320PD	320PW	320P	IG175-400	320P	21uF/400VAC	320P	21uF/400VAC	11.00
CWA MH350W /120V/208V/240V/277V	M131/M171	392	350PD	350PW	350P	IG175-400	350P	23uF/400VAC	350P	23uF/400VAC	11.00
CWA MH400W /120V/208V/240V/277V	M135/M155 M172	445	400PD	400PW	400P	IG175-400	400P	26uF/400VAC	400P	26uF/400VAC	11.02
CWA MH450W /120V/208V/240V/277V	M144	504	450PD	450PW	450P	IG450	450P	26uF/400VAC	450P	26uF/400VAC	13.12

*Integral Ignitor. †Dry Cap not available in 1000W models.

FULHAM HIGHHORSE™

4 TAP HID HIGH PRESSURE SODIUM & METAL HALIDE KITS

EVERYTHING YOU NEED IN 1 KIT

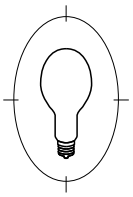
Ballast, Lamp, Wet or Dry Capacitor, Ignitor and Mounting Hardware

- Available from 70W to 1000W
- UL Recognized Components
- Attractive, Durable Packaging
- Competitive Pricing
- Multivolt - 120V/208V/240V/277V

Dry Kit Model #	Wet Kit Model #	Watts	Lamp	Coil & Core Ballast Kit
High Pressure Sodium 4 Tap Kits				D=Dry / W=Wet
HH HPS Q4 70 DE1	HH HPS Q4 70 WE1	70W	HL0070AU	HHHPSMLT470 D or W
HH HPS Q4 70 DM2	HH HPS Q4 70 WM2	70W	HL0070BBU	HHHPSMLT470 D or W
HH HPS Q4 100 DE1	HH HPS Q4 100 WE1	100W	HL0100AU	HHHPSMLT4100 D or W
HH HPS Q4 100 DM2	HH HPS Q4 100 WM2	100W	HL0100BBU	HHHPSMLT4100 D or W
HH HPS Q4 150 DE1	HH HPS Q4 150 WE1	150W	HL0150AU	HHHPSMLT4150 D or W
HH HPS Q4 150 DM2	HH HPS Q4 150 WM2	150W	HL0150BBU	HHHPSMLT4150 D or W
HH HPS Q4 250 DM5	HH HPS Q4 250 WM5	250W	HL0250CBU	HHHPSMLT4250 D or W
HH HPS Q4 400 DM5	HH HPS Q4 400 WM5	400W	HL0400CBU	HHHPSMLT4400 D or W
Probe Start Metal Halide 4 Tap Kits				
HH MH Q4 70 DE1	HH MH Q4 70 WE1	70W	HM0070AU4K	HHMHMLT470 D or W
HH MH Q4 100 DE1	HH MH Q4 100 WE1	100W	HM0100AU4K	HHMHMLT4100 D or W
HH MH Q4 175 DE1	HH MH Q4 175 WE1	175W	HM0175AU4K	HHMHMLT4175 D or W
HH MH Q4 175 DM3	HH MH Q4 175 WM3	175W	HM0175DU4K	HHMHMLT4175 D or W
HH MH Q4 250 DM3	HH MH Q4 250 WM3	250W	HM0250DU4K	HHMHMLT4250 D or W
HH MH Q4 400 DM3	HH MH Q4 400 WM3	400W	HM0400DU4K	HHMHMLT4400 D or W
HH MH Q4 400 DM4	HH MH Q4 400 WM4	400W	HM0400EU4K	HHMHMLT4400 D or W
N/A	HH MH Q4 1000 WM7	1000W	HM1000GBU4K	HHMHMLT41000W
Pulse Start Metal Halide 4 Tap Kits Ⓔ				
HH MH Q4 175 PDM3	HH MH Q4 175 PWM3	175W	HP0175DPBU4K	HHMHMLT4175P D or W
HH MH Q4 200 PDM3	HH MH Q4 200 PWM3	200W	HP0200DPBU4K	HHMHMLT4200P D or W
HH MH Q4 250 PDM3	HH MH Q4 250 PWM3	250W	HP0250DPBU4K	HHMHMLT4250P D or W
HH MH Q4 320 PDM3	HH MH Q4 320 PWM3	320W	HP0320DPBU4K	HHMHMLT4320P D or W
HH MH Q4 400 PDM7	HH MH Q4 400 PWM7	400W	HP0400GPBU4K	HHMHMLT4400P D

HIGH PRESSURE SODIUM LAMPS

- Medium Base 50W - 150W
- Mogul Base 70W - 400W
- 24,000+ Hour Long Life
- High Efficiency
- Coated Finishes, 600W, and 1000W Lamps Available as Special Order

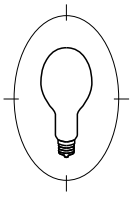


UNIVERSAL
INSTALLATION ORIENTATION

Part Number	Install Method	Description	Watts	CCT (K)	Avg. Life (Hr.)	Initial Lumens (lm)	Mean Lumens (lm)	MOL (inches)
Medium Base								
HL 0050 AU	UNV	LU50/ED17/MED	50W	2000	24,000+	3400	2800	5.43
HL 0070 AU	UNV	LU70/ED17/MED	70W	2000	24,000+	6000	4800	5.43
HL 0100 AU	UNV	LU100/ED17/MED	100W	2000	24,000+	9500	7700	5.43
HL 0150 AU	UNV	LU150/ED17/MED	150W	2000	24,000+	15000	12000	5.43
Mogul Base								
HL 0070 BBU	UNV	LU70/ED23.5	70W	2000	24,000+	6000	4800	7.75
HL 0100 BBU	UNV	LU100/ED23.5	100W	2000	24,000+	9500	7700	7.75
HL 0150 BBU	UNV	LU150/55/ED23.5	150W	2000	24,000+	15000	12000	7.75
HL 0250 CBU	UNV	LU250/ET18	250W	2000	24,000+	26000	22100	9.65
HL 0400 CBU	UNV	LU400/ET18	400W	2000	24,000+	47000	39950	9.65

STANDARD METAL HALIDE LAMPS

- Medium Base 70W - 175W
- Mogul Base 175W - 1000W
- High Color Rendering
- 15,000 Hour Long Life
- Standard MH Suitable for Enclosed Fixtures
- Coated Finish Available as Special Order



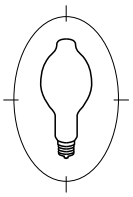
UNIVERSAL
INSTALLATION ORIENTATION

Part Number	Install Method	Description	Watts	CCT (K)	Avg. Life (Hr.)	Initial Lumens (lm)	Mean Lumens (lm)	MOL (inches)
Medium Base								
HM 0070 AU	UNV	MH70/ED17/U	70W	3K, 4K	15000	6000	4400	5.44
HM 0100 AU	UNV	MH100/ED17/U	100W	3K, 4K	15000	8000	5500	5.44
HM 0175 AU	UNV	MH175/ED17/U	175W	3K, 4K	15000	14000	9300	5.44
Mogul Base								
HM 0175 DU	UNV	MH175/ED28/U	175W	3K, 4K	15000	16000	12800	8.31
HM 0250 DU	UNV	MH250/ED28/U	250W	3K, 4K	15000	20500	17500	8.31
HM 0400 DU	UNV	MH400/ED28/U	400W	3K, 4K	15000	36000	27200	8.31
HM 0400 EU	UNV	MH400/ED37/U	400W	3K, 4K	15000	36000	28000	11.5
HM 1000 FBU	UNV	MH1000/BT56/BU	1000W	3K, 4K	15000	110000	86000	15.38

* CCT Standard colors: 3K= 3200K; 4K= 4200K Add Color Temperature CCT (K) required to item number when ordering; Example HP0070AU4K
Lamp Notes: (1 All lamps listed are CLEAR finish. COATED lamps available for special order. (2 Other Wattages and Lamp types available special order. Please contact Fulham at 323-599-5000

PROTECTED METAL HALIDE

- Medium Base 70W - 175W
- Mogul Base 400W, 1000W
- High Color Rendering
- 15,000+ Hour Long Life
- Protected Metal Halide Lamps Suitable for Open and Enclosed Fixtures
- Coated Finish Available as Special Order



UNIVERSAL
INSTALLATION ORIENTATION

BASE UP 15º
INSTALLATION ORIENTATION

Part Number	Install Method	Description	Watts	CCT (K)	Avg. Life (Hr.)	Initial Lumens (lm)	Mean Lumens (lm)	MOL (inches)
Medium Base								
HP 0070 AU	UNV	MP70/ED17/U/4K	70W	3K, 4K	15000	6000	4400	5.44
HP 0100 AU	UNV	MP100/ED17/U/4K	100W	3K, 4K	15000	8500	5800	5.44
HP 0150 AU	UNV	MP150/ED17/U/4K	150W	3K, 4K	15000	12500	10000	5.44
HP 0175 AU	BU	MP175/ED17/U/4K	175W	3K, 4K	15000	16000	12800	5.44
Mogul Base								
HP 0400 GBU	BU	MP400/BT37/BU/4K	400W	3K, 4K	20000	36000	30500	11.5
HP 1000 GBU	BU	MP1000/BT37/BU/4K	1000W	3K, 4K	20000	107000	85000	11.5

PULSE START PROTECTED METAL HALIDE 2009 EISA COMPLIANT

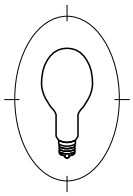
- 175W to 1000W
- Suitable for Open and Enclosed Fixtures
- Better Color Uniformity
- Better Lumen Maintenance
- Faster Re-Strike & Warm-Up Time
- Coated Finish Available as Special Order

BASE UP 15º
INSTALLATION ORIENTATION

Part Number	Install Method	Description	Watts	CCT (K)	Avg. Life (Hr.)	Initial Lumens (lm)	Mean Lumens (lm)	MOL (inches)
Mogul Base								
HP 0175 DPBU 4K	BU	MP175/ED28/PS/BU/4K	175W	3K, 4K	15000	17000	12500	8.31
HP 0200 DPBU 4K	BU	MP200/ED28/PS/BU/4K	200W	3K, 4K	15000	20000	16000	8.31
HP 0250 HPBU 4K	BU	MP250/BT28/PS/BU/4K	250W	3K, 4K	15000	23800	19000	8.31
HP 0250 DPBU 4K	BU	MP250/ED28/PS/BU/4K	250W	3K, 4K	15000	23800	19000	8.31
HP 0320 DPBU 4K	BU	MP320/ED28/PS/BU/4K	320W	3K, 4K	15000	28600	21000	8.31
HP 0350 EPBU 4K	BU	MP350/ED37/PS/BU/4K	350W	3K, 4K	15000	33000	24500	8.31
HP 0400 GPBU 4K	BU	MP400/BT37/PS/BU/4K	400W	3K, 4K	15000	42000	33600	11.5
HP 0450 EPBU 4K	BU	MP450/ED37/PS/BU/4K	450W	3K, 4K	15000	47000	37000	11.5
HP 1000 FPBU 4K	BU	MP1000/BT56/PS/BU/4K	1000W	3K, 4K	15000	105000	80000	11.5

MERCURY VAPOR LAMPS

- For replacement purposes only
- Mogul Base 175W
- Rated Life 10,000 hours
- Mean Lumen Output is 6800
- Light Output (Lumens 100 Hrs) = 7800



UNIVERSAL
INSTALLATION ORIENTATION

Part Number	Install Method	Watts	CCT (K)	MOL
HG 0175 DCBU 4K	UNV	175W	3900	8.3"

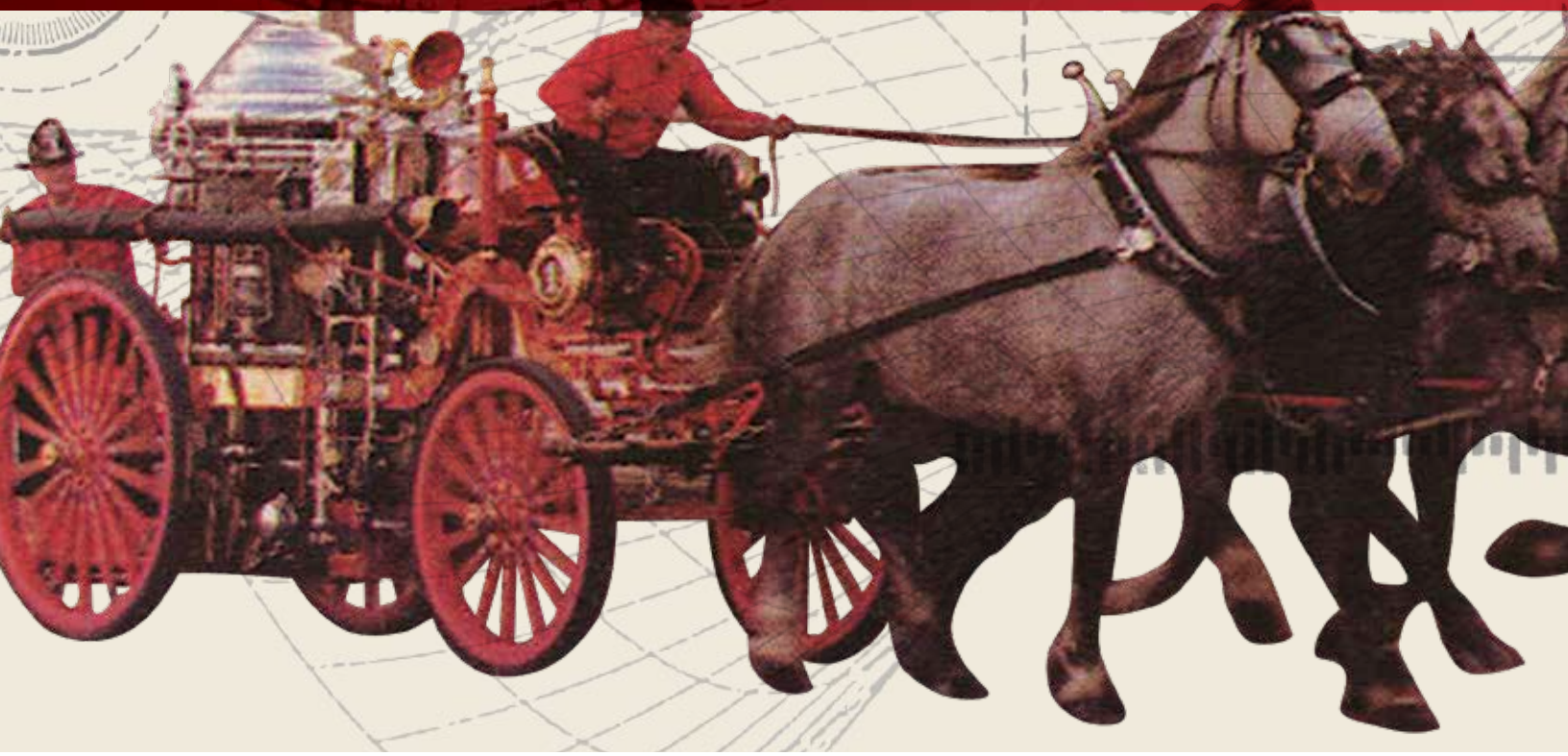
* CCT Standard colors: 3K= 3200K; 4K= 4200K Add Color Temperature CCT (K) required to item number when ordering; Example HP0070AU4K
Lamp Notes: (1 All lamps listed are CLEAR finish. COATED lamps available for special order. (2 Other Wattages and Lamp types available special order. Please contact Fulham at 323-599-5000

EMERGENCY EXIT LIGHTING THE WAY

EMERGENCY EXIT

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.



“Hey, Pop, What's An Egress?”

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. Can't find the exit. Trip over the cat. Bump into something lethal, harmful or just plain messy. Even if it's not a fire or an earthquake, when lights fail, we're back in prehistoric times.

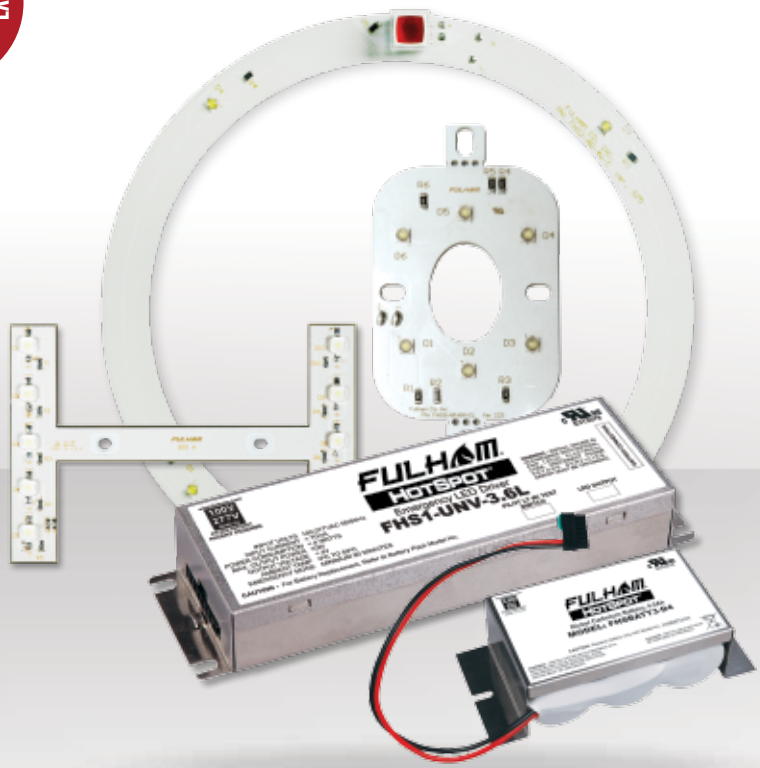
That's why, in modern times, we created emergency backup lighting, designed to kick in automatically when the main system goes down. This is usually a secondary generator or battery system that provides temporary illumination until a location is vacated, or the lights go back on. Until recently, backup 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 we slap on when our high quality, 100,000-mile radials unexpectedly plotz.

But now, in response to increasingly stringent safety code requirements, the lighting industry has developed a variety of reliable, long-lasting and brighter-burning emergency systems. These range from incandescent bulbs to LED clusters to banks of batteries to newer self-luminescent technologies. The objective is to get us out of some dark, maybe smoky, danger zone. So besides lamps to light the "egress path," an approved emergency system usually includes illuminated signage to speed the evacuation process safely along.

In most cities, emergency lighting is mandatory for all commercial, industrial and multiple residence buildings. Code specs list requirements for lamp locations; wiring; mimimum illumination levels; periodic system testing and maintenance; timely equipment replacement; and clear indications of emergency service call box locations, stairnosing, handrails, stairwell landings, clear delineations for paths of egress and related code requirements. Inexpensive home emergency lighting packages have also become increasingly popular.

EMERGENCY/EXIT
LIGHTING SYSTEMS

- COMPLETE EMERGENCY/EXIT SYSTEMS, INCLUDING PREMIUM FULHAM EXIT SIGNS, BATTERY BACK-UP BALLASTS, AND LED & HALOGEN LIGHTING SYSTEMS
- OVER 400 SYSTEM MODELS
- FULL LINE OF EXIT & EMERGENCY FIXTURES INCLUDE AC ONLY, BATTERY BACK UP, SELF DIAGNOSTIC & PHOTOLUMINESCENT (GLOW-IN-THE-DARK)

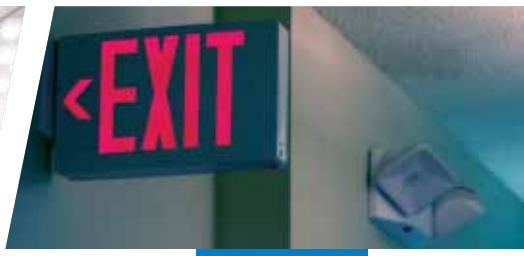


LED EMERGENCY LIGHTING SYSTEMS

EMERGENCY LIGHTING BALLASTS (DUAL & UNV)

LED EMERGENCY LIGHTING SYSTEMS	1W - 20W 90 - 360MIN
EMERGENCY LIGHTING BALLASTS	450 - 3000 LUMEN OUTPUT
EMERGENCY LIGHTING	LED & INCANDESCENT 90 MINUTE BATTERY BACK UP
EXIT SIGNS	LED AC ONLY, 90 MINUTE BATTERY BACK UP & PHOTOLUMINESCENT

FULHAM
FIREHORSE™
EMERGENCY EXIT PRODUCTS



FireHorse product specification sheets and other related literature online

EMERGENCY EXIT

EMERGENCY LIGHTING

EXIT SIGNS

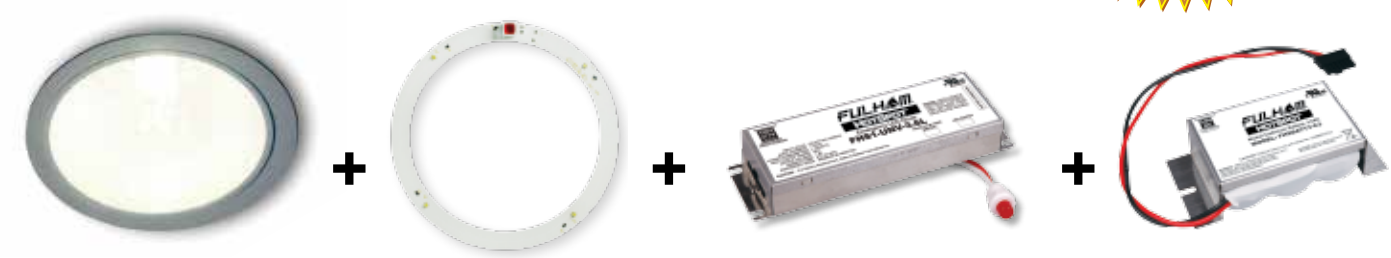
PATENT PENDING

HOTSPOT1 LED EMERGENCY LIGHTING SYSTEM
A FULHAM EXCLUSIVE

FireHorse HotSpot1 modular LED systems add inconspicuous emergency lighting capability to existing non-emergency fixtures, such as recessed lighting and wall sconces. 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. Ask About our UL Certified Retrofit Kits.

WINNER LIGHTFAIR INTERNATIONAL INNOVATION AWARD
Industrial, Vandal, Emergency, Exit & Emergency Lighting Category

COMPLETE HOTSPOT1 SYSTEM:



Fixture + LED Module + HotSpot1 Driver + HotSpot1 Battery Pack

EMERGENCY EXIT

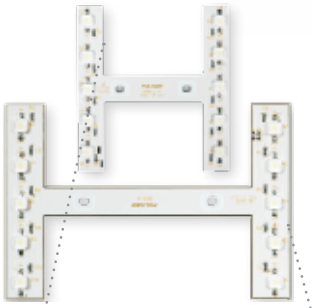
DOWNLIGHT FIXTURE
IN NORMAL OPERATION

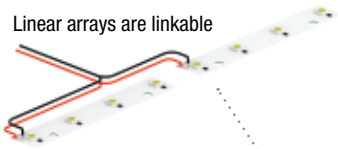
HOTSPOT1 IN OPERATION
DURING POWER OUTAGE

LED MODULES







	LINEAR	CIRCULAR	H-CONFIG SMALL	H-CONFIG LARGE	CLUSTER
Model No.	FHS1 AR 4W L	FHS2 AR 4W C	FHS3 AR 10W SH FHS3 AR 6W SH	FHS4 AR 10W LH FHS4 AR 8W LH	FHS5 AR 6W CL
Wattage	4W	4W	10W 6W	10W 8W	6W
Applications	Wall Sconce Ceiling Flush Mount Low Level Lighting	Recessed Down Lighting Wall Sconce Cylinder	Wall Sconce Ceiling Flush Mount		Circular Lamp Applications, e.g. Parking Lot Fixtures

EMERGENCY EXIT

HOTSPOT1 DRIVER

Model	**FHS1-UNV-3.6L**	Input Wattage	4W
Compatible Batteries	NiCd, 3.6 VDC	Surge Protection	C62.41 (TVS)
Battery Capacities	3AH, 4AH, 7AH	Over Current Protection	Fuse
Total LED power	10W	Recharge Time	24 Hrs - 48 Hrs
Illumination time	90 - 360 Min.	LED Connection	Parallel
Input Voltage	100-277VAC (UNV)	LED Output Protection	Self Resetting PTC
Input Frequency	50/60Hz	Output Classification	UL1310/Class 2
Input Current	0.07 A		

HOTSPOT1 BATTERY PACKS (NiCd, 3.6 VDC)



	FHSBATT3-C3	FHSBATT3-D4	FHSBATT3-F7
Battery Qty/Type	3 C	3 D	3 F
Operation Duration	3 Amp Hours	4 Amp Hours	7 Amp Hours
Output Power/Time	4W:145min, 6W:90min	4W:200min, 6W:125min, 8W:90min	4W:360min, 6W:235min, 8W:175min, 10W:135min
Case Size	1"H, 2"W, 3.1"L	1.35"H, 2.5"W, 4"L	1.35"H, 3.6"W, 4"L

PATENT PENDING

HOTSPOT2 LED EMERGENCY LIGHTING SYSTEM
A FULHAM EXCLUSIVE

FireHorse HotSpot2 is a UL924 recognized emergency lighting system useable with LED modules driven by a constant current source. The battery charger automatically adjusts to the battery size and use. With the proper connector, the driver provides output current based on the harness connected, allowing a wide choice of lumen output and run times.

A FULHAM EXCLUSIVE

LED Fixture

+

HotSpot2 Driver

+

HotSpot2 Battery Pack

EMERGENCY EXIT

LED FIXTURE IN NORMAL OPERATION

HOTSPOT2 IN OPERATION DURING POWER OUTAGE

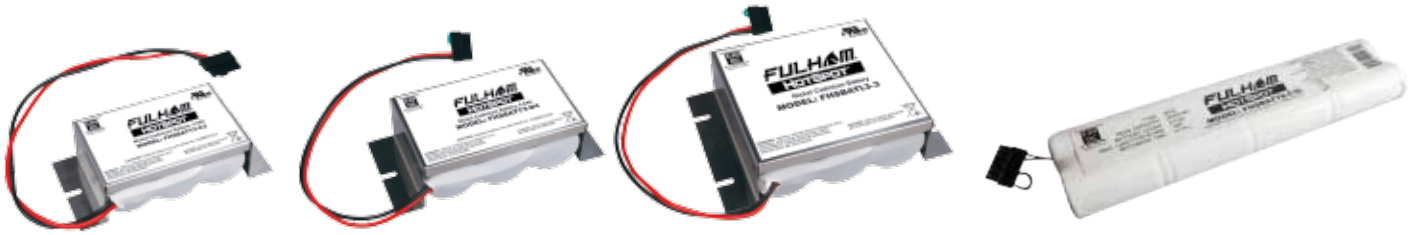
NOTE: May operate all modules at either full or partial power.

HOTSPOT2 DRIVER

Model	FHS2-UNV-36L
Compatible Batteries	LiFePo4, NiCd, 9.6 VDC
Battery Capacities	.9Ah, 1Ah, 1.2Ah, 1.5Ah, 1.8Ah, 3Ah, 4Ah, 6Ah
LED Types	1W or 2W
LED Currents	100mA - 700mA
Total LED power	20W
Illumination time	90 - 350 Minutes
Input Voltage	100-277VAC (UNV) ±10%
Input Frequency	50/60Hz
Output Working Voltage	11-36 VDC
Ambient Temp.	0ºC-50ºC NiCd/ 10ºC-50ºC LiFePo4

Input Current	0.07 A
Input Wattage	<4W
No Load Power Loss	0.5W
Surge Protection	C62.41 (MOV)
Over Current Protection	Fuse
Recharge Time	24 Hrs - 48 Hrs
LED Connection	Series
LED Output Protection	Self Resetting PTC
Output Classification	UL1310/Class 2
Throughput Maximum	Red Lead: 3A, 60V Max. White/Black Lead: 100W Max.

HOTSPOT2 BATTERY PACKS (LiFePo4, NiCd, 9.6 VDC)



Model #	Dimensions (L x W x H)	Chemistry	Capacity	Battery Count	Max Load for 90 min.	Recharge Time
FHSBATT8-AA.9	5.23" x 2.39" x 0.66"	NiCd	900mAh	8 Cells	4W	24Hrs
FHSBATT8-C3	4.15" x 3.29" x 2.11"	NiCd	3000mAh	8 Cells	16W	32Hrs
FHSBATT8-C3L**	7.89" x 2.06" x 1.04"	NiCd	3000mAh	8 Cells	16W	32Hrs
FHSBATT8-D4	4.95" x 3.84" x 2.66"	NiCd	4000mAh	8 Cells	20W	32Hrs
FHSBATL3-1	3.48" x 2.29" x 0.91"	LiFePo4	1000mAh	3 Cells	4W	24Hrs
FHSBATL3-1.5	3.48" x 2.70" x 0.91"	LiFePo4	1500mAh	3 Cells	8W	24Hrs
FHSBATL3-3	4.39" x 2.76" x 1.22"	LiFePo4	3000mAh	3 Cells	16W	32Hrs
FHSBATL6-.6	5.23" x 1.88" x 0.88"	LiFePo4	1200mAh	6 Cells	6W	24Hrs
FHSBATL6-1.5	5.70" x 2.70" x 0.91"	LiFePo4	3000mAh	6 Cells	16W	32Hrs
FHSBATL6-1.5L**	7.89" x 1.50" x 1.19"	LiFePo4	3000mAh	6 Cells	16W	32Hrs
FHSBATL6-3	7.52" x 2.76" x 1.22"	LiFePo4	6000mAh	6 Cells	20W	48Hrs
FHSBATL6-3L**	7.94" x 2.09" x 1.19"	LiFePo4	6000mAh	6 Cells	20W	48Hrs
FHSBATL9-.6	7.52" x 1.88" x 0.88"	LiFePo4	1800mAh	9 Cells	10W	24Hrs

**NOTE: L denotes new linear profile to fit inside of a greater number of fixtures

NOTE: See page 92 for additional LED Light Engine solutions for use with HotSpot2 LED Emergency Lighting Systems.

FULHAM HOTSPOT LED

HOTSPOT2 OUTPUT CURRENT HARNESS ASSEMBLIES

Model Number	mA	Model Number	mA
FHS-HARNESS-100	100	FHS-HARNESS-450	450
FHS-HARNESS-150	150	FHS-HARNESS-500	500
FHS-HARNESS-200	200	FHS-HARNESS-550	550
FHS-HARNESS-250	250	FHS-HARNESS-600	600
FHS-HARNESS-300	300	FHS-HARNESS-650	650
FHS-HARNESS-350	350	FHS-HARNESS-700	700
FHS-HARNESS-400	400		

FireHorse HotSpot harnesses are used to set the constant current to the LED module during emergency operation.

EC&M Product of the year 15 Category Winner

CLASSIFIED C UL US

HotSpot1 Kits for Troffers

Install ready-engineered LED battery backup capability to your existing non-Emergency troffer fixtures in the field with HotSpot1 UL Classified Kits.

Contact Client Services for details at order@fulham.com or visit www.fulham.com for updates.

FIELD- INSTALLABLE LED BATTERY BACKUP KITS FOR TROFFERS

FULHAM HOTSPOT LED

HOTSPOT1 & HOTSPOT2 BATTERY LEAD EXTENSIONS

FireHorse HotSpot lead extensions allow for remote-mounting of HotSpot battery packs and convenient battery disconnection (quick disconnect), if desired.

HOTSPOT1 12" LEAD EXTENSIONS

Your HotSpot1 Battery Type:	Appropriate Lead Extension Model Number:
FHSBATT3-C3	FHS-EXT12L
FHSBATT3-D4	FHS-EXT12M
FHSBATT3-F7	FHS-EXT12H

HOTSPOT2 12" LEAD EXTENSIONS

Your HotSpot2 Battery Type:	Appropriate Lead Extension Model Number:
FHSBATT8-AA.9	FHS-EXT12L
FHSBATT8-C3	FHS-EXT12M
FHSBATT8-C3L**	FHS-EXT12M
FHSBATT8-D4	FHS-EXT12H
FHSBATL3-1	FHS-EXT12M
FHSBATL3-1.5	FHS-EXT12M
FHSBATL3-3	FHS-EXT12M
FHSBATL6-.6	FHS-EXT12M
FHSBATL6-1.5	FHS-EXT12M
FHSBATL6-1.5L**	FHS-EXT12M
FHSBATL6-3	FHS-EXT12M
FHSBATL6-3L**	FHS-EXT12M
FHSBATL9-.6	FHS-EXT12M

**NOTE: L denotes new linear profile to fit inside of a greater number of fixtures

FULHAM FIREHORSE™

DUAL VOLTAGE EMERGENCY FLUORESCENT BALLASTS

FEATURES

- End of Life (EOL) Time Delay (FH7, 8, 9, 10)
- Wide Range of Lamp and Ballast Compatibility
- Factory or Field Installation
- Low Profile Models for Integral Mounting
- Damp Location Rated
- Wide Range of Lumen Output
- 2, 3 and 5 Year Warranties

COMMON SPECIFICATIONS

Operating Voltage	Dual 120V or 277V	Ballast Compatibility	Electronic / Energy Saving
Frequency	60Hz	Special Ballast Compatibility	Electronic Dimming Type
Listing	Emergency	Lamp Compatibility	Fluorescent Type - See next page
Alternate Listing	Inverter / Charger Pack	Fixture Wiring	Switched Or Unswitched
Regulatory Approval	UL	Installation	Factory Or Field
Regulatory Compliance	Meets Or Exceeds N.E.C./LSC	Remote Mounting	See Installation Instructions
Location Rating	Damp	Battery Type	Long Life Rechargable Ni-Cad
Operating Temp Range (Except FH7)	0ºC - 50ºC	Minimum Emergency Operation	90 Minutes
Operating Temp Range FH7	20°C - 55°C	Min. Required Charging Time	24 Hours
Test Switch	Single Pole	Case Construction (FH1, 3, 4 5, 6)	Vandal-Resistant Painted Steel
Test Indicator	LED Type	Case Construction (FH7, 8, 9, 10)	Vandal-Resistant Galvanized Steel

	FH1-DUAL-750CFL	FH3-DUAL-450L	FH4-DUAL-700L	FH5-DUAL-1400L	FH6-DUAL-3000L
Initial Lumen Output	750	450	700	1400	3000
EOL Time Delay	No	No	No	No	No
AC Input	3.5W	2.5W	3.5W	3.5W	8.0W
Charging Current	280mA Max.	280mA Max.	280mA Max.	280mA Max.	280mA Max.
Battery Voltage	3.6VDC	2.4VDC	3.6VDC	6.0VDC	14.4VDC
Battery Rating	14.4Wh	9.6Wh	14.4Wh	24.0Wh	57.6Wh
Warranty	2 Years	2 Years	3 Years	5 Years	5 Years
Ballast Size	H 1.5" W 2.4" L 9.4"	H 1.5" W 2.4" L 9.4"	H 1.5" W 2.4" L 9.4"	H 1.5" W 2.4" L 13.3"	H 1.7" W 5.5" L 16.3"
Ballast Weight	2.8 lbs	2.5 lbs	2.8 lbs	3.4 lbs	9.2 lbs
Case Quantity	1 pc.	1 pc.	1 pc.	1 pc.	1 pc.
Master Carton Quantity	6 pcs.	6 pcs.	6 pcs.	6 pcs.	2 pcs.

	FH7-DUAL-500L	FH8-DUAL-1300L	FH9-DUAL-800L	FH10-DUAL-500L
Initial Lumen Output	500	1300	800	500
EOL Time Delay	Yes	Yes	Yes	Yes
AC Input	2.5W	2.5W	2.5W	2.5W
Charging Current	280mA Max.	126mA Max.	126mA Max.	127mA Max.
Battery Voltage	6.0Vdc	8.4Vdc	6.0Vdc	3.6Vdc
Battery Rating	9.0Wh	21.0Wh	15.0Wh	9.0Wh
Warranty	5 Years	5 Years	5 Years	5 Years
Ballast Size	H 1.125" W 2.25" L 9.8"	H 1.2" W 1.3" L 21.5"	H 1.2" W 1.3" L 17.5"	H 1.2" W 1.3" L 14.2"
Ballast Weight	2.3 lbs	2.1 lbs	1.7 lbs	1.4 lbs
Case Quantity	1 pc.	1 pc.	1 pc.	1 pc.
Master Carton Quantity	6 pcs.	12 pcs.	12 pcs.	12 pcs.

LAMP OPERATION*

	FH1	FH3	FH4	FH5	FH6	FH7	FH8	FH9	FH10
LUMEN OUTPUT	750	450	700	1400	3000	500	1300	800	500
CFT/CFQ/CFTR - 4 PIN									
9W - 32W	1 or 2	1	1 or 2	1 or 2	1 or 2				
42W	1		1	1	1 or 2				
57W - 70W				1	1				
FT/CFM/FQL - 4 PIN									
9W - 18W	1 or 2	1	1 or 2	1 or 2	1 or 2	1	1	1	
24W - 39W	1 or 2	1	1	1 or 2	1 or 2	1	1	1	
40W	1	1	1	1	1	1	1	1	
50W - 55W			1	1	1		1	1	
CIRCULAR - FCRT5									
15W - 30W	1	1	1	1	1	1			
40W	1	1	1	1	1	1			
55W			1	1	1				
CIRCULAR - FCRT9									
20W - 32W	1	1	1	1	1	1			
40W	1	1	1	1	1	1			
2D/4P									
10W - 28W	1 or 2	1	1	1 or 2	1 or 2	1			
38W - 39W	1 or 2	1	1	1 or 2	1 or 2	1			
T5 LOW WATTAGE									
F4 - F13	1	1	1	1	1	1	1	1	1
T5 STANDARD									
F14 - F21	1	1	1	1	1	1	1	1	1
F28			1	1	1	1	1	1	1
F35				1	1		1	1	
T5 HIGH OUTPUT									
F24 - F39				1	1		1	1	1
F54				1	1		1	1	
T8 STANDARD (Includes U-Bent)									
F13 - F25	1 or 2	1	1 or 2	1 or 2	1 or 2	1	1	1	1
F28	1	1	1 or 2	1 or 2	1 or 2	1	1	1	1
F30 - F32		1	1 or 2	1 or 2	1 or 2	1	1	1	1
F35 - F40		1	1	1	1		1	1	
F58 - F72			1	1	1				
T8 HIGH OUTPUT									
F44			1	1	1				
F55 - F96			1	1	1				
T12/T10 STANDARD (Includes U-Bent)									
F14 - F25	1 or 2	1	1 or 2	1 or 2	1 or 2	1	1	1	
F30 - F40		1	1 or 2	1 or 2	1 or 2	1	1	1	
F50 - F75			1	1	1				
T12 HIGH OUTPUT									
F25 - F48			1	1	1				
F55 - F96			1	1	1				
F100 - F110			1	1	1				
T12/T10 VERY HIGH OUTPUT									
F110			1	1	1				
F115 - F215				1	1				

* As of publication. Anticipated changes may occur in 2014 based on new regulations. Contact Fulham Client Services for more details.

Meets UL924 Supplement SH

FULHAM FIREHORSE™ UNIVERSAL VOLTAGE EMERGENCY FLUORESCENT BALLASTS SPECIFIER GRADE

FEATURES

- Universal voltage (120-277V, 50/60Hz)
- Designed for use with standard and TCLP "green" lamps
- Lamps operated on AC during emergency operation
- Wide range of lumen output
- Wide range of lamp & ballast compatability
- Low profile models available
- Integrated LED Power Indicator/ Test Switch
- Complies with minimum light output requirements per UL924, supplement "SH"
- Factory or field installation
- Full 5-year warranty
- UL listed for damp locations
- Vandal-resistant, sealed, painted steel case type

COMMON SPECIFICATIONS

Operating Voltage	Universal 120V - 277V	Ballast Compatibility	Electronic / Energy Saving
Frequency	50/60Hz	Special Ballast Compatibility	Electronic Dimming Type / End-of-Life
Listing	Emergency		
Alternate Listing	Inverter / Charger Pack	Lamp Compatibility	Fluorescent Type / TCLP
Regulatory Approval	cULus	Fixture Wiring	Switched Or Unswitched
Regulatory Compliance	Meets Or Exceeds N.E.C./LSC	Installation	Factory Or Field
Location Rating	Damp	Battery Type	High Temp. Long Life Rechargable NiCd
Operating Temp Range	0°C - 55°C		
§Operating Temp Range FH7	20°C - 55°C	Minimum Emergency Operation	90 Minutes
Test Switch	LED Push Button	Min. Required Charging Time	24 Hours
Indicator Type	LED Type	Case Construction	Vandal Resistant Painted Steel

EMERGENCY EXIT

	FH7-UNV-500L	FH11-UNV-750L	FH12-UNV-1400L
Initial Lumen Output	500	750	1400
EOL Time Delay	Yes	Yes	Yes
AC Input	3W	3W	4W
Output Type	AC	AC	AC
Charging Current at 120VAC	50mA Max.	50mA Max.	60mA Max.
Charging Current at 277VAC	30mA Max.	30mA Max.	40mA Max.
Battery Voltage	6.0Vdc	3.6Vdc	12.0Vdc
Battery Rating	12.0Wh	14.4Wh	24.0Wh
Minimum Illumination Time	90 minutes	90 minutes	90 minutes
Recharge Time	24 hrs	24 hrs	24 hrs
Warranty	5 Years	5 Years	5 Years
Ballast Size	H 1.13" W 2.16" L 9.60"	H 1.53" W 2.33" L 9.37"	H 1.23" W 2.17" L 14.58"
Ballast Weight	1.7 lbs	2.0 lbs	1.7 lbs

EXPECTED IN 2014

Mounting Studs and Back Leads

Additional FH11 UNV and FH12 UNV models are on the horizon – to include mounting studs with back leads.

Contact Client Services for details at order@fulham.com or visit www.fulham.com for updates.

LAMP OPERATION FOR FH UNV MODELS (OPPOSITE PAGE)

	FH7-UNV-500L	FH11-UNV-750L	FH12-UNV-1400L
LUMEN OUTPUT	500	750	1400
FT			
FT18W			2
FT24/27W	1	1	1 or 2
FT36/39W	1	1 or 2	1 or 2
§FT40W	1	1	1
FT50W, FT55W		1	1
FQL - 4 PIN			
FQL28W		1	
CFQ - 4 PIN			
CFQ13W			1 or 2
CFQ18W, CFQ26W	1	1	1 or 2
CFTR - 4 PIN			
CFTR13W			1 or 2
CFTR18W, CFTR26W, CFTR32W	1	1	1 or 2
§CFTR42W	1		1
CFM - 4 PIN			
CFM57W			1
CFM70W			1
Circular - FCRT5			
22CRT5		1	1
§40CRT5	1	1	1
55CRT5		1	1
Circular - FCRT9			
32WCRT9			1
§40WCRT9	1	1	1
2D - 4 PIN			
2D21W	1		
2D28W, §2D38W	1	1	1 or 2
T5 - Standard			
F14T5	1	1	1 or 2
F21T5, §F28T5	1	1	1
F35T5		1	1
T5HO - High Output			
F24T5HO, §F39T5HO	1	1	1 or 2
§F49T5HO, §F54T5HO	1	1	1
T8 - Standard			
F17T8		2	1 or 2
F24T8		1	
F25T8	1	1	1 or 2
F28T8		1	
FBO24T8			1
FO30T8		1	
FBO31T8			1
F32T8	1	1	1 or 2
F32T8 ES (25W/28W/30W)	1	1	1
§F40T8	1	1	1
F58T8, F70T8, F96T8		1	1
T8HO - High Output			
F60T8HO			1
F72T8HO		1	1
T8VHO - Very High Output			
F48T10VHO		1	1
T10 / T12 - Standard			
F20T12			2
F30T12			1 or 2
F40T12, F60T12, F72T12, F96T12		1	1
T12HO - High Output			
F36T12HO		1	
F48T12HO, F60T12HO, F72T12HO		1	1
F84T12HO, F96T12HO			1

EMERGENCY EXIT

PATENT PENDING

FULHAM FIREHORSE™ COMBINATION AC ELECTRONIC & EMERGENCY BALLAST

FEATURES

- Inventory reduction benefits and installation cost-savings based on combination AC/Emergency Ballast design
- Multiple-region certifications for versatility (cULus, CE)
- Reduces wiring assembly time through use of push-in connectors instead of leads
- Modular battery allows easy replacement in the field and continued use of AC/Emergency module
- Pre-connected battery eliminates need for contractor to connect external battery in the field
- Battery low voltage cutoff
- Recommended applications include staircases, ocean linersand more
- Illuminated test switch

COMMON SPECIFICATIONS

Operating Voltage	120V - 277V (UNV)
Frequency	50/60Hz
Regulatory Approval	cULus, CE
ATHD	<20%
Battery Voltage	6V
Battery Capacity	2.0Ah
Battery Type	High Temperature NiCd
Emergency Mode	Minimum 90 Minutes Run Time

FHR1 LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
FHR1-UNV-218T8-L	1 or 2	F17T8 (U.S.), F18T8 (Europe)

FHR2 LAMP OPERATION

Model Number	# of Lamps	Lamp Type / Designation
FHR2-UNV-236T8-L	1 or 2	F32T8 (U.S.), F36T8 (Europe)

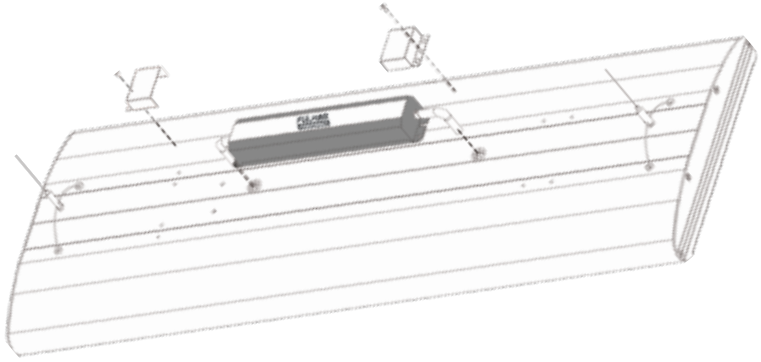
EMERGENCY EXIT

FULHAM FIREHORSE™ WIRING COVER KIT: ACCESSORY FHWC1

The Fulham® FireHorse™ wiring cover kit (Part# FHWC1) is used to enclose wiring when externally top mounting a FireHorse3 **FH3-DUAL-450L**, FireHorse4 **FH4-DUAL-700L**, or FireHorse5 **FH5-DUAL-1400L** fluorescent emergency ballast. This comes in handy, for instance, when there is either no space for the emergency ballast within a fixture or when it is easier and quicker to mount the ballast on top of the fixture.

FEATURES

- Galvanized Steel
- Includes two 5/8” wire way mounting bushings and two # 8 x 1/2” slotted sheet metal screws
- For use with FireHorse3, FireHorse4, or FireHorse5 models



FULHAM FIREHORSE™ EMERGENCY EXIT PRODUCTS

ORDERING INSTRUCTIONS & QUICK REFERENCE KEY

HOW TO ORDER = SERIES NUMBER + OPTIONS

PRODUCT LISTING EXAMPLE : FHE11 model with white case color, high lumen reflector and self-diagnostic test.

FHEM11	W	H	SD
SERIES	**W** = White	**H** = High Lumen Reflector	**SD** = Self-Diagnostic

NOTE: Bold options mean quick-ship availability.

FHEM11

Contemporary, low profile, quick-installing emergency light with fully adjustable heads.

SERIES	HOUSING COLOR	OPTIONS
FHEM11*	**W = White**	**H = High Lumen Reflector**
	B = Black	SD = Self-Diagnostic
		RC = Remote Capable

SYMBOL KEY

UL meets UL924 – N.E.C. and LSC minimal emergency operational standards; local fire and safety codes are primary consideration for model selection. FireHorse Emergency Exit Products provide a wide range of models to meet all national and models meet most local fire and safety codes. It is recommended to review your local codes when selecting a FireHorse Emergency Exit Product. Selected models ETL listed only.

Damp Location Rated for indoor locations where fixtures are not exposed to direct contact with water or washdown conditions.

Wet Location Rated for locations where fixtures are exposed to water and washdown conditions.

LED light source (Red and Green) is available with a wide range of FireHorse Emergency Lighting Exit Products for long life and low power consumption. Selected models now available with all White LED light source for ultra-bright performance and reduced inventory requirements.

RC provides the capability for remote emergency lighting heads to be operated with the FireHorse emergency fixture; a broad range of head type, wattage and application is available for models with this capability.

Sealed Lead Acid battery type.

NiCd battery type.

SELF-TEST/DIAGNOSTIC OPERATION

The SELF TESTING feature included in the circuitry tests the fixture every 30 days for 15 minutes and once every 12 months for a full 90 minute discharge test, simulating a maximum use power failure. After each test, it recharges the battery automatically and returns to normal operating mode. Any problems found during or after the test are reported through the user interface.

This SELF TESTING actually helps prolong the life of the batteries by keeping them exercised and fresh. Without the ST feature, the battery can remain idle for long periods of time, only being used in an actual power failure and thereby depleting their ability to hold and maintain a proper charge.

Self-Test/Diagnostic option is available on selected FireHorse models by specifying suffix "**SD.**"

FULHAM FIREHORSE™ EMERGENCY EXIT PRODUCTS

NEW YORK CITY APPROVED EXIT LIGHTING & SIGNAGE

FHNY10

Slim profile metal exit sign offers long lamp life, energy efficiency and uniform illumination in an economical package.

SERIES	DESCRIPTION
FHNY1029*	**Emergency light with 6-Volt 18-Watt lead-acid battery, two lamp heads**
FHNY1039*	**Emergency light with 6-Volt 27-Watt lead-acid battery, three lamp heads**
FHNY10312*	**Emergency light with 12-Volt 50-Watt lead-acid battery, three lamp heads**

FHNY20

8" Steel LED exit designed to New York City specifications.

SERIES	DESCRIPTION
FHNY20AC*	**Exit Sign, 20-GA Steel, White Housing, Universal Face, Red Lettering, AC only**
FHNY20EM*	**Exit Sign, 20-GA Steel, White Housing, Universal Face, Red Lettering, Battery B/UP**

FHNY21

8" die-cast aluminum exit sign designed to New York City specifications, offering rich, unparalleled aesthetics in a durable, all-metal construction.

SERIES	HOUSING COLOR	# of Faces	OPERATION	OPTIONS
FHNY21	Blank = Black w/Brushed Faceplate W = White B = Black	S = Single	AC = AC Only EM = Battery Back Up	SD = Self-Diagnostic

FHNY23

8" Edge-lit exit sign designed to New York City specifications, provides superior aesthetics in a surface-mount design. Excellent LED performance and energy efficiency combined with infield installation flexibility.

SERIES	HOUSING COLOR	# of Faces	OPERATION
FHNY23*	**A = Aluminum** W = White B = Black	**S = Single** **D = Dual**	**AC = AC Only** **EM = Battery Back Up**

FHNY30

8" Steel LED exit sign and emergency unit combo is designed to New York City specifications.

SERIES	DESCRIPTION
FHNY30*	**Combo, 20-GA Steel, White Housing, Single Face, Red Lettering, Battery B/UP**

This model is shipped with a third installable head.
All three heads can be used at one time, if desired.

Options available for quick ship are bolded.

ICON KEY: Damp Location Rated; Wet Location Rated; Self-Test Diagnostic Operation; Remote Capability; Uses LED Lamps; Sealed Lead Acid Battery; NiCd Battery

EMERGENCY EXIT

FULHAM FIREHORSE EMERGENCY EXIT PRODUCTS

CHICAGO APPROVED EXIT LIGHTING & SIGNAGE

FHCH10

Steel emergency light designed for new construction or retrofit applications that must meet all City of Chicago listing requirements. Ideal for wall-mounted applications in stores, offices, hospitals and schools.

SERIES	DESCRIPTION
FHCH10	Emergency light with 6V 24W sealed lead acid battery and two heads

FHCH20

Heavy duty steel exit signs are Chicago approved. Ideal for applications such as schools, offices, retail and hospitals.

SERIES	# of Faces	DIRECTIONAL	OPERATION
FHCH20	S = Single D = Dual	NA = No Arrow	AC = AC Only EM = Battery Back Up

OPTIONAL FACEPLATES ONLY

FHCHGONA = No Arrow
FHCHGORA = Right Arrow
FHCHGOLA = Left Arrow
FHCHGODA = Double Arrow
FHCHGOST = Stairs

FULHAM FIREHORSE EMERGENCY EXIT PRODUCTS

EMERGENCY LIGHTING

FHEM10

Low profile, thermoplastic emergency lighting unit with adjustable LED lamp heads.

SERIES	HOUSING COLOR	OPTIONS
FHEM10*	**W = White** B = Black	H = High Lumen Reflector

FHEM11

Contemporary, low profile, quick-installing emergency light with fully adjustable heads.

SERIES	HOUSING COLOR	OPTIONS
FHEM11*	**W = White** B = Black	**H = High Lumen Reflector** SD = Self-Diagnostic RC = Remote Capable

FHEM12

Damp-location-rated LED emergency fixture (waterproofed variety also available). UL Listed, Dual Voltage (120V or 277V). Maintenance-free 3.6V NiCd Battery, Push-to-Test Switch, adjustable glare-free heads, "snap fit" construction installs quickly. 90 min. emergency operation.

SERIES	HOUSING COLOR	OPTIONS
FHEM12*	**W = White**	Blank = Damp Location **W = Wet Location**

OR

FHEM13

Low profile, compact emergency light with fixed optics provides a consistent, predictable aiming pattern for wall or ceiling mounting.

SERIES	HOUSING COLOR
FHEM13*	**W = White** B = Black

FHEM14

High Capacity units with larger batteries to operate additional remote lamp heads or extended emergency operation. 12 Volt units are ideal for operating remote lamps with long runs, minimizing voltage drop issues.

SERIES	VOLTAGE	OUTPUT	LAMP WATTAGE
FHEM141250	12V	50W	2 x 9W
FHEM1412100	12V	100W	2 x 9W
FHEM14650	6V	50W	2 x 7.2W
FHEM146100	6V	100W	2 x 7.2W

FHEM15

Rugged, sealed and gasketed emergency units are ideal for wet or corrosive environments, providing resistance to dust, hose-downs, water spray and splashing water.

SERIES
FHEM15

FHEM16

LED, dual voltage (120V/277V) Emergency Fixture with NiCd battery that operates for 90 minutes in emergency mode. UL listed and damp location rated, available in white or black and with self diagnostic and remote capable options available.

SERIES	HOUSING COLOR	OPTIONS
FHEM16	W = White B = Black	SD= Self-Diagnostic RC=Remote Capable

FULHAM FIREHORSE™

EMERGENCY EXIT PRODUCTS **EXIT SIGNAGE**

FHEX20 – Thermoplastic Micro LED

Slim profile thermoplastic LED exit sign offers long lamp life, energy efficiency and uniform illumination in an economical package.

SERIES	HOUSING COLOR	LETTER COLOR	OPERATION
FHEX20*	**W = White** B = Black	**R = Red** **G = Green**	**AC = AC Only** **EM = Battery Back Up**

DAMP LOCATION RATED · LED · NiC

This model has a universal faceplate and is shipped with an extra plate.

FHEX21 – Thermoplastic LED

Thin-profile, thermoplastic LED exit sign offers long life, energy efficiency and uniform illumination in an economical package.

SERIES	HOUSING COLOR	LETTER COLOR	OPERATION	OPTIONS
FHEX21*	**W = White** B = Black	**R = Red** **G = Green**	**AC = AC Only** **EM = Battery Back Up**	SD = Self-Diagnostic DC = Dual Circuit

DAMP LOCATION RATED · ST · LED · NiC

This model has a universal faceplate and is shipped with an extra plate.

FHEX22 – Aluminum Die Cast

Die-Cast aluminum exit signs offer rich, unparalleled aesthetics in a durable, all-metal construction.

SERIES	HOUSING COLOR	LETTER COLOR	OPERATION	OPTIONS
FHEX22*	**Blank = Black w/ Brushed Faceplate** W = White B = Black	**R = Red** **G = Green**	**AC = AC Only** **EM = Battery Back Up**	SD = Self-Diagnostic

ST · LED · NiC

This model has a universal faceplate and is shipped with an extra plate.

FHEX23 – Recessed Edge Lit

Architectural LED Edge-Lit exit signs recess into the ceiling, offering superior aesthetic appeal.

SERIES	HOUSING COLOR	# of Faces	LETTER COLOR	OPERATION	OPTIONS
FHEX23	A = Aluminum W = White B = Black	S = Single D = Dual	R = Red G = Green	AC = AC Only EM = Battery Back Up	SD = Self-Diagnostic

DAMP LOCATION RATED · ST · SL

FHEX24 – Surface Edge Lit

Ideal for architectural applications, surface mount Edge-Lit LED exit signs offer specification-grade aesthetics with in-field installation flexibility.

SERIES	HOUSING COLOR	# OF FACES	LETTER COLOR	OPERATION	OPTIONS
FHEX24	A = Aluminum W = White B = Black	S = Single D = Dual	R = Red G = Green	AC = AC Only EM = Battery Back Up	SD = Self-Diagnostic

DAMP LOCATION RATED · LED · SL

FHEX25 – Wet Location

Wet location approved exit signs feature an enclosure resistant to corrosive atmospheres, non-hazardous dust environments, hose-downs, water spray and splashing water.

SERIES	LETTER COLOR	OPERATION
FHEX25	R = Red G = Green	AC = AC Only EM = Battery Back Up

WET LOCATION RATED · LED · NiC

Options available for quick ship are bolded.

ICON KEY: DAMP LOCATION RATED Damp Location Rated · WET LOCATION RATED Wet Location Rated · ST Self-Test Diagnostic Operation · RC Remote Capability · LED Uses LED Lamps · SL Sealed Lead Acid Battery · NiC NiCd Battery

FULHAM FIREHORSE™ EMERGENCY EXIT PRODUCTS

EMERGENCY EXIT COMBO & ACCESSORIES

FHEC30 - Thermoplastic Micro LED

Energy-saving combination LED exit sign and emergency lighting unit in one compact, modern design. Flexibility and multi-function capabilities include LED performance on both the exit sign and the lamp heads.

SERIES	HOUSING COLOR	LETTER COLOR	OPTIONS
FHEC30*	**W = White** B = Black	**R = Red** **G = Green**	H = High Lumen Reflector

FHEC31 - Thermoplastic Square Head Combo 5.4W T5 Wedge Base

Energy saving combination LED exit sign and emergency lighting unit provides contemporary design, flexibility and multi-function capabilities.

SERIES	HOUSING COLOR	LETTER COLOR	OPTIONS
FHEC31*	**W = White** B = Black	**R = Red** **G = Green**	SD= Self-Diagnostic RC=Remote Capable

FHEC32 - Wet Location Combo Round Head 5.4W T5 Wedge Base

Wet location LED exit sign and emergency unit includes two sealed and gasketed, weatherproof lamp heads with tempered glass lenses.

SERIES	LETTER COLOR
FHEC32	R = Red G = Green

FHEC33 - Thermoplastic EXIT Emergency Combo

Damp location LED exit sign includes injection-molded, high impact, UV-stabilized, UL94 V-0 thermoplastic construction, and TWO factory installed fully adjustable glare-free high brightness LED lighting lamps. Dual-Voltage input 120V/277V

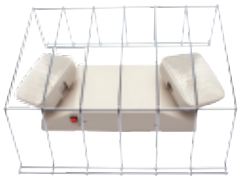
SERIES	HOUSING COLOR	LETTER COLOR	OPTIONS
FHEC33	W = White B = Black	R = Red G = Green	SD= Self-Diagnostic[1] RC=Remote Capable[1]

[1] Options may be combined

VANDAL-RESISTANT SHIELD (Fixture not included)

FHEMVS for: FHEM10, FHEM11, FHEM13

WIRE GUARD (Fixture not included)



FHEMWG for: FHEM10, FHEM11, FHEM13

VANDAL-RESISTANT SHIELD (Exit Sign not included)

FHEXVS for: FHEX20, FHEX21, FHEX22

FHECVS for: FHEC30, FHEC31

WIRE GUARD (Fixture not included)

FHEXWG for: FHEX20, FHEX21, FHEX22

FHECWG for: FHEC30, FHEC31

REMOTE HEADS

FireHorse Series	FireHorse Model Number (Remote Heads Only)	Accessory Type	Operation (Remote Head Only)
FHEC – FireHorse Combo	11 – Square Head Emergency	RH1 – Remote Head Single	12V12 – 12V 12W Lamp (FHEM14 Only)
FHEM – FireHorse Emergency	14 – High Output Emergency	RH2 – Remote Head Dual	12V7 – 12V 7W Lamp (Not available on FHEM15)
FHEX – FireHorse Exit	15 – Wet Location	VS – Vandal Shield	6V9 – 6V 9W Lamp (Not available on FHEM15)
		WG – Wire Guard	6V7 – 6V 7W Lamp (FHEM15 Only)
			6V5 – 6V 5W Lamp (Not available on FHEM15)

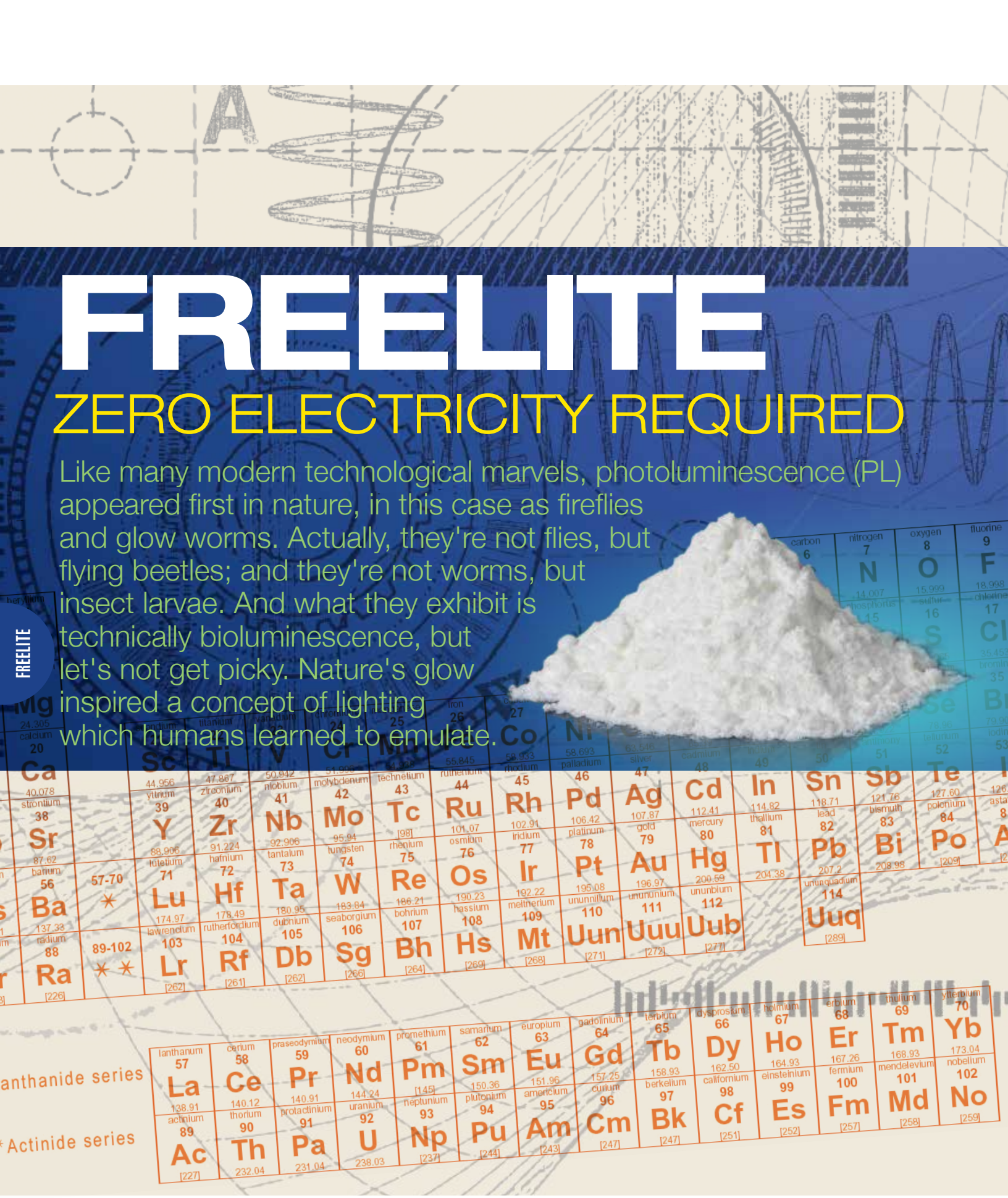
***Options available for quick ship are bolded.**

ICON KEY: Damp Location Rated; Wet Location Rated; Self-Test Diagnostic Operation; Remote Capability; Uses LED Lamps; Sealed Lead Acid Battery; NiCd Battery

FREELITE

ZERO ELECTRICITY REQUIRED

Like many modern technological marvels, photoluminescence (PL) appeared first in nature, in this case as fireflies and glow worms. Actually, they're not flies, but flying beetles; and they're not worms, but insect larvae. And what they exhibit is technically bioluminescence, but let's not get picky. Nature's glow inspired a concept of lighting which humans learned to emulate.



The glow in the dark that saves lives.

In simplest terms, PL is a kind of "light echo." Certain rare earth elements, when exposed to ambient light energy, gobble up the photons, then re-emit them into the environment even when the light source is no longer present.

Many American children have photoluminescent glow-in-the-dark toys, bedroom ceiling "stars" and spooky Halloween toys. The same principle applies to emergency safety lighting. PL systems are just like those glowing toys -- only more so.

10-YEAR COST COMPARISON (EST.)	COMPACT FLUORESCENT	LED	FREELITE PL (Without frame)
Lamp Life	14,000 Hrs	50,000 Hrs	None
Energy Consumption	21 Watts	5 Watts	-0-
Sign Cost	$60	$75	$64
Installation Materials	$48	$48	$0
Installation Labor	$196	$196	$6
Total Initial Costs	$304	$319	$70
10 Year Costs			
Electrical Power	$184	$53	$0
Lamp Replacement Costs	$100	$50	$0
Lamp Replacement Labor	$120	$24	$0
Battery Replacement Costs	$20	$20	$0
Battery Replacement Labor	$24	$24	$0
Total Operating Costs	$448	$171	$0
Total 10 Yr Life Cycle Cost for 100 signs	$75,200	$49,000	$7,000

"GLOWING" IS GROWING, NATIONWIDE

"Safety first" is more than just a slogan -- it's the law. Safety codes in most cities require sufficient and prominently positioned exit and emergency signs. Specifics vary, but the basic requirement nationwide is for commerical buildings, factories and multiple tenant residences to clearly indicate safe egress -- day or night -- for all hazardous conditions (fires, earthquakes, power outages, hostile incidents, severe weather or floods, etc.). PL is ideally suited to comply with these laws.

PL PROVIDES MULTIPLE BENEFITS

Photoluminescent lighting is highly visible in dark and smoke emergencies. It's virtually failure proof, since it doesn't depend on electrical power. (Just 5 foot candles of light during the day is enough to keep it charged.) It can't just go out.

PL is non-toxic, non-radioactive (Tritium-free), recyclable and shock proof. There are no batteries to buy, replace or dispose of, which also eliminates the significant cost and hassles of testing and record keeping for Code compliance.

Energy savings are especially significant in larger structures. And the savings last for years -- a typical PL system's life span is about 25 years!

This chart outlines typical expenses for 10-year operation of three major lamp categories, dramatizing the astonishing cost effectiveness of Freelite PL. Compare the numbers for CFL and LED against Freelite. Then tell us which column you'd rather have represent your operation. We didn't even include T10 incandescents, which score "off the chart" in terms of cost and energy use.

FREELITE
EMERGENCY EXIT PRODUCTS

- COMPLETE PHOTOLUMINESCENT EXIT OPTIONS (GLOW-IN-THE-DARK)
- OVER 150 VARIETIES
- CUTTING-EDGE, NEW EGRESS AND DECORATIVE TECHNOLOGY THAT REQUIRES NO ADDITIONAL POWER OR MAINTENANCE

FULHAM®

FREELITE™

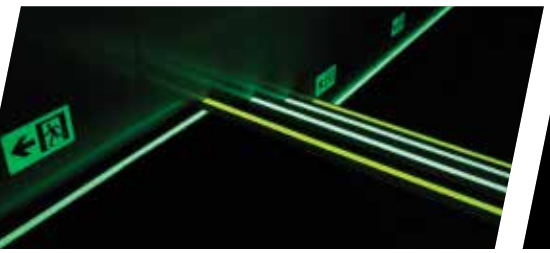
EMERGENCY EXIT PRODUCTS

EXIT SIGNS

SPECIAL-ORDER CUSTOM SOLUTIONS

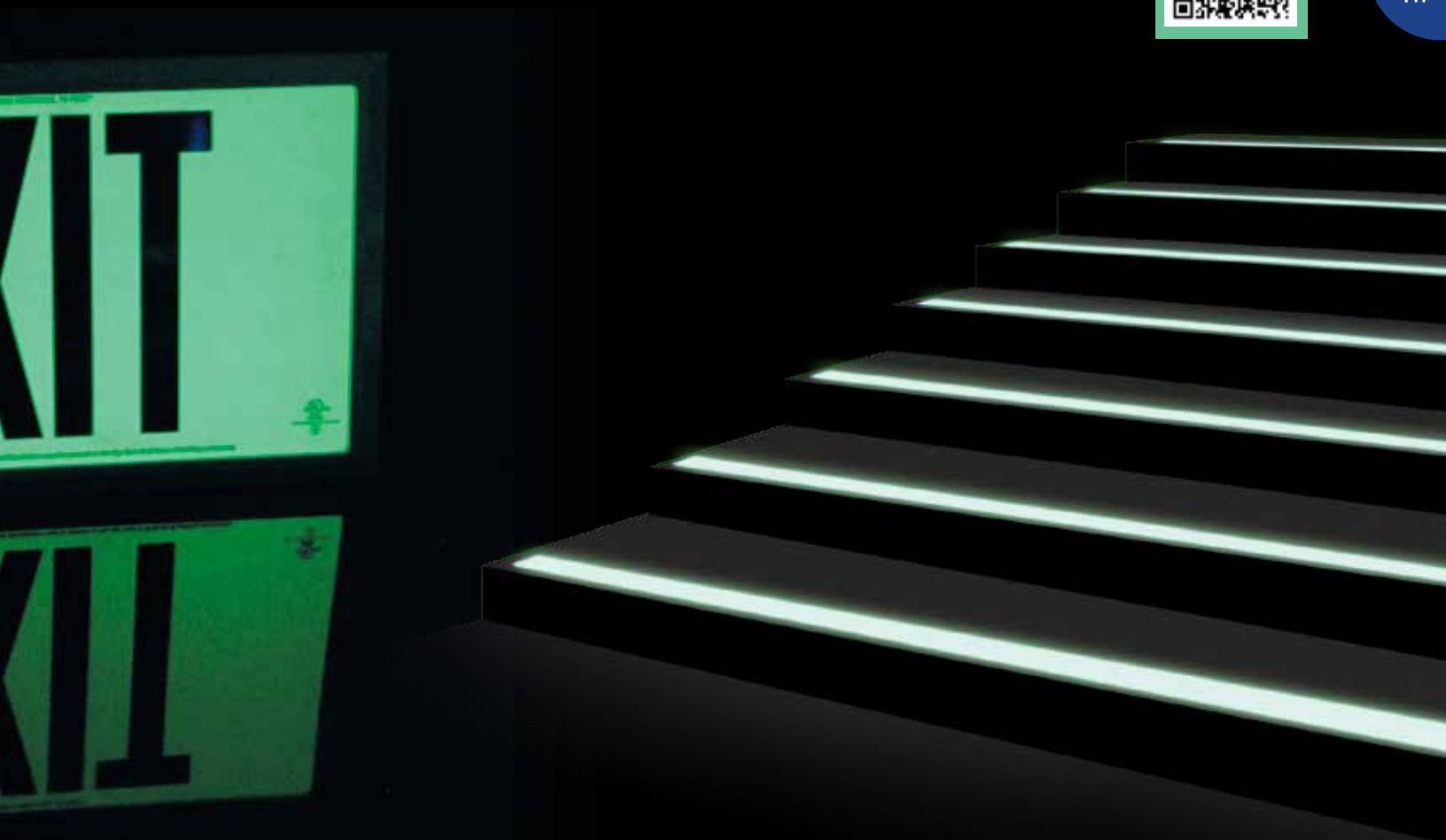
MANY STYLES & COLORS FOR DIFFERENT VIEWING DISTANCES

ENDLESS POSSIBILITIES FOR DECORATIVE & SAFETY APPLICATIONS



FREELITE product specification sheets and other related literature online

FREELITE



FULHAM
FREELITE™
EMERGENCY EXIT PRODUCTS

PHOTOLUMINESCENT EXIT SIGNS (GLOW-IN-THE-DARK)

FEATURES

- LEED points qualified
- Manufactured in the United States
- Reduces emergency generator loads
- Architectural and aesthetically pleasing designs
- Meets low location egress requirements
- Flexibility of design
- No energy cost – Uses no electricity
- Stores and re-emits ambient light - minimum 5 footcandles required.
- No maintenance cost
- No disposal cost
- Reduces overhead costs
- Non-radioactive (Tritium free)
- Recyclable
- Lower labor and material cost
- No conduit or wire to run
- No emergency circuit required
- Standard bracket options for easy mounting

FLPL50

50' Viewing Distance with PL Legend

SERIES	# of Faces	BACKGROUND COLOR	FRAME COLOR
FLPL50*	**S = SINGLE**	**G = GREEN**	**BLANK = NO FRAME**
	D = DUAL	**R = RED**	**B = BLACK**
c UL us		B = BLACK	**G = GREEN**
		SR = BRUSHED ALUMINUM W/ RED LETTER OUTLINE	**R = RED**
		SG = BRUSHED ALUMINUM W/ GREEN LETTER OUTLINE	**S = SILVER POWDER COAT**
			W = WHITE

FLPL51

NOTE: SHOWN WITH FRAME

50' Viewing Distance, Vandal Resistant with PL Legend

SERIES	# of Faces	BACKGROUND COLOR	FRAME COLOR
FLPL51*	**S = SINGLE**	**G = GREEN**	**B = BLACK**
	D = DUAL	**R = RED**	**G = GREEN**
c UL us		B = BLACK	**R = RED**
			S = SILVER POWDER COAT
			W = WHITE

FLPL75

NOTE: SHOWN WITH FRAME

75' Viewing Distance with Photoluminescent Background

SERIES	# of Faces	LETTER COLOR	FRAME COLOR
FLPL75*	**S = SINGLE**	**G = GREEN**	**BLANK = NO FRAME**
	D = DUAL	**R = RED**	**B = BLACK**
c UL us			**G = GREEN**
			R = RED
			S = SILVER POWDER COAT
			W = WHITE

FLPL10

100' Viewing Distance with PL Legend

SERIES	# of Faces	BACKGROUND COLOR	FRAME COLOR
FLPL10*	**S = SINGLE**	**G = GREEN**	**BLANK = NO FRAME**
	D = DUAL	**R = RED**	**B = BLACK**
ETL		**W = WHITE**	**G = GREEN**
		B = BLACK	**R = RED**
			S = SILVER POWDER COAT
			W = WHITE

MOUNTING BRACKETS FOR USE WITH FRAMED SIGNS

MODEL		COLOR	
FLPLMB*	For FLPL50 and FLPL75 signs	B – Black	R – Red
FLPLMB10*	For FLPL10 signs only	S – Silver	W – White
		G – Green	

Options available for quick ship are bolded.

FULHAM
FREELITE™
EMERGENCY EXIT PRODUCTS

PHOTOLUMINESCENT CUSTOM SOLUTIONS

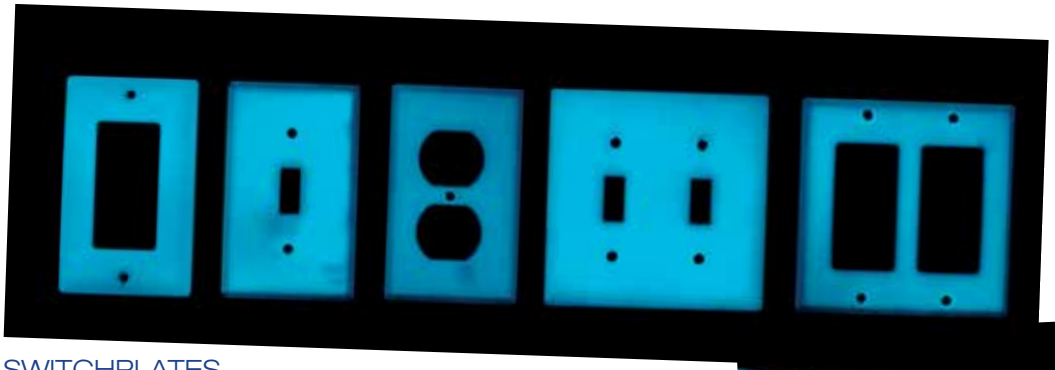
NON-STOCKING CUSTOM ITEMS FOR COMMERCIAL VOLUME ORDERS

Fulham offers a wide range of Photoluminescent solutions, limited only by your imagination!

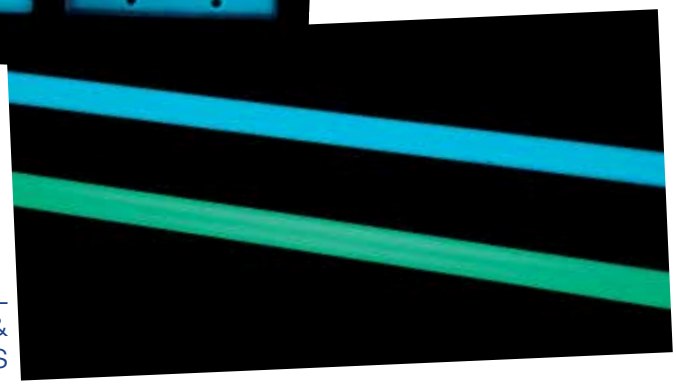
Photoluminescent FREELITE material can be cast into tile, molded into shapes or used for custom signs. It is particularly well-suited as stair nosing and for handrail demarkation in buildings. Minimum order quantities apply. Please contact Fulham Customer Service for details.

TILES

RUNNING MAN SIGNS



SWITCHPLATES



HANDRAIL DEMARKATION & STAIR STRIPS

LAMP COMPATIBILITY

WORKHORSE • WHAM • LONGHORSE

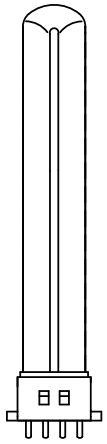
Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts

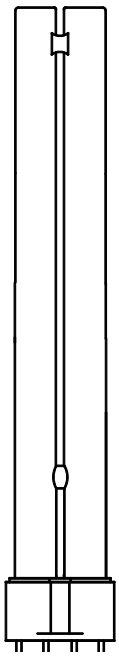
1. Find your lamp type.
2. Find the quantity and wattage of lamps.
3. Look across and find the ballast you need.
4. The indicated number represents wiring diagram needed.
5. Fulham reserves the right to alter these compatibility charts without notice; please refer to www.fulham.com for latest information.

4 PIN ONLY

LAMPS	WORKHORSE										WHAM		LONGHORSE					
	WH 1	WH 2	WH 22	WH 3	WH 33	WH 4	WH 5	WH 6	WH 7	WH 8	WM 1	WM 2	LH 1	LH 2	LH 3	LH 4	LH 5	LH 6
TWIN																		
1 X 5W	3	2				2					15	2	3	2		2		
2 X 5W			1			1		9						1		1		9
3 X 5W								8										8
4 X 5W					7			7									7	7
1 X 7W	3	2									15	2	3	2				
2 X 7W		1				1		9				1		1		1		9
3 X 7W								8										8
4 X 7W								7										7
1 X 9W	3	2									15	2	3	2				
2 X 9W		1				1						1		1		1		
3 X 9W								8										8
4 X 9W								7										7
1 X 11W	3										15	2	3					
2 X 11W		1				1						1		1		1		
3 X 11W								8										8
4 X 11W								7										7
1 X 13W		3	2	2		2		14				3		3	2	2		14
2 X 13W			1	1	9			11							1		9	11
3 X 13W					8		8										8	
4 X 13W					7		7										7	
1 X 18W		3	2	2	14	2		14				3		3	2	2		14
2 X 18W			1	1	9			9							1		9	9
3 X 18W					8		8										8	
4 X 18W							7										7	
1 X 24W		3	2	2	14	3		14				3		3	2	3	14	14
2 X 24W				1	9		9	11							1		9	11
3 X 24W							8										8	
1 X 27W		3	2	2	14	3		14				3		3	2	3	14	14
2 X 27W					9		9	11									9	11
1 X 28W PA				3	14			10							3		14	10
2 X 28W PA					11												11	
1 X 36/39W			2	2	14	3		10							2	3	14	10
2 X 36/39W							9	11		22							9	11
3 X 36/39W									8	25								
4 X 36/39W									7	27								
5 X 36/39W										28								
6 X 36/39W										29								
1 X 40W				2	14	2		14							2	2		14
2 X 40W							9	11									9	11
3 X 40W							8		8	25							8	
4 X 40W									7	27								
5 X 40W										28								
1 X 50W				3	14	3	14	10							3	3	14	10
2 X 50W							11	11		22							11	11
3 X 50W									8	25								
4 X 50W									7	27								
1 X 55W				3	10		10	12		16					3		10	12
2 X 55W							11		9								11	
3 X 55W									8	26								
1 X 55WPA					10			13									12	13
2 X 55WPA										23								
3 X 55WPA										26								

TWIN





NOTE: For Canadian WorkHorse (CWH) and Canadian LongHorse (CLH) ballasts, please refer to lamp sizes T6 and higher.

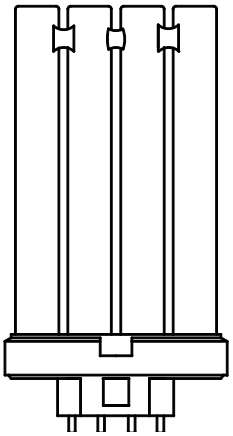
FLUORESCENT

WORKHORSE • WHAM • LONGHORSE

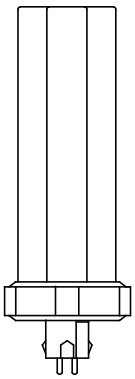
Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts

4 PIN ONLY

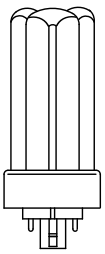
FLAT QUAD



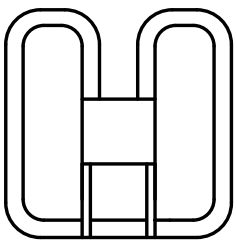
QUAD



TRIPLE



2-D



NOTE: For Canadian WorkHorse (CWH) and Canadian LongHorse (CLH) ballasts, please refer to lamp sizes T6 and higher.

LAMPS	WORKHORSE										WHAM		LONGHORSE					
	WH 1	WH 2	WH 22	WH 3	WH 33	WH 4	WH 5	WH 6	WH 7	WH 8	WM 1	WM 2	LH 1	LH 2	LH 3	LH 4	LH 5	LH 6
1 X 96W										17							12	
2 X 96W										24								
FLAT QUAD																		
1 X 18W		3	2	2	14	3		14				3		3	2	3	14	14
2 X 18W					9		9	11									9	11
3 X 18W							8										8	
1 X 24W		3	2	2	14	3		14				3		3	2	3		14
2 X 24W				1	9		9	11							1		9	11
3 X 24W							8										8	
1 X 28W PA				3	10										3		10	13
1 X 36W				2	14	3	14	10							2	3	14	10
2 X 36W					9		9	11									9	11
3 X 36W										25								
1 X 55W PA					10			13									12	13
1 X 96W PA																	12	
QUAD																		
1 X 10W	3					2					15	2	3	2		2		
2 X 10W						1		9						1		1		9
3 X 10W								8										8
4 X 10W					7			7										7
1 X 13W	3	2									15	2	3	2				
2 X 13W		1				1						1		1		1		
3 X 13W								8										8
4 X 13W								7										7
1 X 18W	3	2				2					15	2	3	2		2		
2 X 18W				1		1		9							1	1		9
3 X 18W					8		8	8									8	8
4 X 18W							7										7	
1 X 26W		3	2	2	14	3		14				3		3	2	3		14
2 X 26W					9		9	11							1		9	11
3 X 26W							8										8	
4 X 26W							7										7	
1 X 27W PA					10			13									10	13
TRIPLE																		
1 X 13W	3	2									15	2	3	2				
2 X 13W		1				1						1		1		1		
3 X 13W								8										8
4 X 13W								7										7
1 X 18W	3	2				2					15	2	3	2		2		
2 X 18W				1				9							1			9
3 X 18W					8			8										8
4 X 18W							7										7	
1 X 26W		3	2	2	14	3		14				3		3	2	3		14
2 X 26W					9		9	11									9	11
3 X 26W							8										8	
4 X 26W							7										7	
1 X 32W		3	2	2	14	3		14						3	2	3	14	14
2 X 32W					9		9	11									9	11
3 X 32W							8										8	
2-D																		
1 X 10W	3	2									15	2	3	2				
2 X 10W		1				1		9				1		1		1		9
3 X 10W								8										8

LAMP COMPATIBILITY

WORKHORSE • WHAM • LONGHORSE

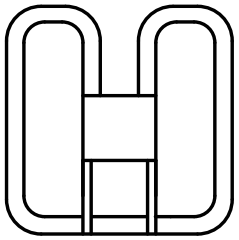
Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts

LAMPS	WORKHORSE										WHAM		LONGHORSE					
	WH 1	WH 2	WH 22	WH 3	WH 33	WH 4	WH 5	WH 6	WH 7	WH 8	WM 1	WM 2	LH 1	LH 2	LH 3	LH 4	LH 5	LH 6
4 X 10W								7										7
1 X 16W	3	2				2					15	2	3	2		2		
2 X 16W		1	1					9										9
3 X 16W								8										8
4 X 16W					7		7	7									7	7
1 X 21W		2				2								2		2		
2 X 21W				1				9							1			9
3 X 21W					8		8	8									8	8
4 X 21W							7										7	
1 X 28W		3	2	2		2		14				3		3	2	2		14
2 X 28W				1	9		9	11							1		9	11
3 X 28W							8										8	
4 X 28W							7										7	
1 X 38W				2	14	3	14	14							2	3	14	14
2 X 38W							9	11									9	11
4 X 38W									7									
1 X 55W					12		12		14								12	
T9 CIRCLINE																		
1 X 20W		3	2	2	14	3		14				3		3	2	3	14	14
2 X 20W					9		9	11									9	11
4 X 20W									7									
1 X 22W		3	2	2	14	3		14				3		3	2	3	14	14
2 X 22W					9		9	11									9	11
4 X 22W									7									
1 X 32W			3	3	14			10							3		14	10
2 X 32W					11		9										11	
3 X 32W									8									
4 X 32W									7									
1 X 40W				2	14	3	14	10							2	3	14	10
2 X 40W							9	11									9	11
3 X 40W									8									
4 X 40W									7									
1 X 22+32W				1			9	11							1		9	11
1 X 32+40W							11										11	
T5 CIRCLINE																		
1 X 22W		3	2	2	14	3		14				3		3	2	3		14
2 X 22W					9		9	11									9	11
3 X 22W					8		8										8	
1 X 40W				2	14	3		14							2	3	14	14
2 X 40W							9	11									9	11
1 X 55W OS				3	10			12							3			12
2 X 55W OS							11		9								11	
1 X 22+40W				1			9	11							1		9	11
T2 LINEAR																		
1 X F6	2												2					
2 X F6	1												1					
1 X F8	2												2					
2 X F8	1												1					
1 X F11	2												2					
2 X F11	1												1					
1 X F13	2												2					
2 X F13	1												1					

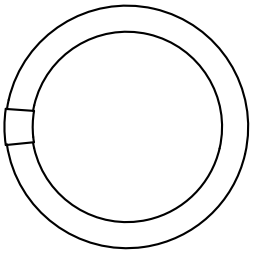
1. Find your lamp type.
2. Find the quantity and wattage of lamps.
3. Look across and find the ballast you need.
4. The indicated number represents wiring diagram needed.
5. Fulham reserves the right to alter these compatibility charts without notice; please refer to www.fulham.com for latest information.

4 PIN ONLY

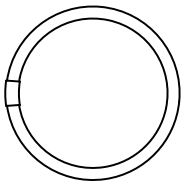
2-D



T9 CIRCLINE



T5 CIRCLINE



T2 LINEAR

1/4" DIAMETER

NOTE: For Canadian WorkHorse (CWH) and Canadian LongHorse (CLH) ballasts, please refer to lamp sizes T6 and higher.

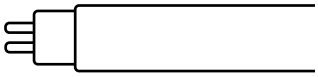
FLUORESCENT

LAMP COMPATIBILITY

WORKHORSE • WHAM • LONGHORSE

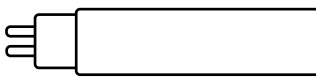
Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts

T5 LINEAR



5/8" DIAMETER

T5 HO



5/8" DIAMETER

T5 UV LINEAR

5/8" DIAMETER

NOTE: For Canadian WorkHorse (CWH) and Canadian LongHorse (CLH) ballasts, please refer to lamp sizes T6 and higher.

LAMPS	WORKHORSE										WHAM		LONGHORSE					
	WH 1	WH 2	WH 22	WH 3	WH 33	WH 4	WH 5	WH 6	WH 7	WH 8	WM 1	WM 2	LH 1	LH 2	LH 3	LH 4	LH 5	LH 6
T5 LINEAR																		
1 X F4	3	2									15	2	3	2				
2 X F4		1				1						1		1		1		
3 X F4								8										8
4 X F4								7										7
1 X F6	3	2									15	2	3	2				
2 X F6		1				1						1		1		1		
3 X F6								8										8
4 X F6								7										7
1 X F8	2	2									15	2	2	2				
2 X F8		1				1						1		1		1		
4 X F8								7										7
1 X F13	3	2									15	2	3	2				
2 X F13		1				1						1		1		1		
3 X F13								8										8
4 X F13								7										7
1 X F14	3	2									15	2	3	2				
2 X F14		1				1						1		1		1		
3 X F14								8										8
4 X F14								7										7
1 X F21	3	2									15	2	3	2				
2 X F21		1				1								1		1		
3 X F21								8										8
4 X F21								7										7
1 X F28	3	2									15	2	3	2				
2 X F28						1										1		
3 X F28								8										8
4 X F28								7										7
1 X F35											15			2				
2 X F35						1										1		
3 X F35								8										8
4 X F35								7										7
T5 HO																		
1 X F24 HO		3	2	2	14	3		14						3	2	3		14
2 X F24 HO				1	9		9	11							1		9	11
3 X F24 HO							8										8	
4 X F24 HO							7			27							7	
5 X F24 HO										28								
6 X F24 HO										29								
1 X F39 HO				2	14	3		14							2	3	14	14
2 X F39 HO							9	11									9	11
3 X F39 HO							8			25							8	
4 X F39 HO									7	27								
5 X F39 HO										28								
1 X F54 HO				3	14		14	12		16					3		14	12
2 X F54 HO							11			22							11	
3 X F54 HO									8									
4 X F54 HO									7									
1 X F80 HO								12		16							10	12
2 X F80 HO									9									
T5 UV (LINEAR)																		
1 X 90W							12											
1 X 110W							12											

LAMP COMPATIBILITY

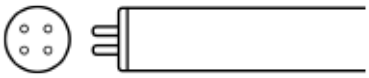
WORKHORSE • WHAM • LONGHORSE

Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts

LAMPS	WORKHORSE										WHAM		LONGHORSE					
	WH 1	WH 2	WH 22	WH 3	WH 33	WH 4	WH 5	WH 6	WH 7	WH 8	WM 1	WM 2	LH 1	LH 2	LH 3	LH 4	LH 5	LH 6
T6 UV (LINEAR)																		
1 X 38W							12											
1 X 50W							12											
1 X 55W							12											
1 X 90W									10									
1 X 120W									10									
1 X 150W									10									
T6 SLIMLINE																		
1 X F42	3	2				2							3	2		2		
2 X F42				1		1		9							1	1		9
3 X F42								8										8
4 X F42								7										7
1 X F64						2										2		
2 X F64						1		9								1		9
3 X F64								8										8
T8 LINEAR																		
1 X F13		3	2	2	14	3		14				3		3	2	3		14
2 X F13				1	9			11							1		9	11
3 X F13					8		8										8	
4 X F13							7		7	27								
5 X F13										28								
6 X F13										29								
1 X F14		3	2	2	14	3		14				3		3	2	3	14	14
2 X F14					9			11									9	11
3 X F14							8			25							8	
4 X F14							7		7	27								
5 X F14										28								
6 X F14										29								
1 X F15		3	2	2		3		14				3		3	2	3		14
2 X F15			1	1	9			11							1		9	11
3 X F15					8		8										8	
4 X F15					7		7										7	
5 X F15										28								
6 X F15										29								
1 X F17		3		2		2						3		3	2	2		
2 X F17			1	1				9							1			9
3 X F17					8		8										8	
4 X F17					7		7										7	
6 X F17										29								
1 X F18		3	2	2	14	3		14				3		3	2	3		14
2 X F18					9		9	11									9	11
3 X F18							8			25							8	
4 X F18							7			27								
5 X F18										28								
6 X F18										29								
1 X F25		3		2		2						3		3	2	2		
2 X F25				1				9							1			9
3 X F25							8										8	
4 X F25							7										7	
6 X F25										29								
1 X F30		3	2	2	14	3		14						3	2	3		14
2 X F30					9		9	11									9	11
3 X F30							8			25							8	

1. Find your lamp type.
2. Find the quantity and wattage of lamps.
3. Look across and find the ballast you need.
4. The indicated number represents wiring diagram needed.
5. Fulham reserves the right to alter these compatibility charts without notice; please refer to www.fulham.com for latest information.

T6 UV LINEAR



3/4" DIAMETER

T6 SLIMLINE

3/4" DIAMETER

T8 LINEAR

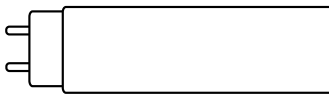
1" DIAMETER

LAMP COMPATIBILITY

WORKHORSE • WHAM • LONGHORSE

Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts

T8 LINEAR

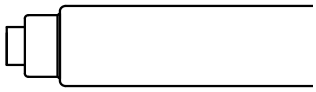


1" DIAMETER

T8 SLIMLINE

1" DIAMETER

T8 HO



1" DIAMETER

T10 LINEAR

1 1/4" DIAMETER

T10 VHO

1 1/4" DIAMETER

T12 LINEAR

1 1/2" DIAMETER

LAMPS	WORKHORSE										WHAM		LONGHORSE					
	WH 1	WH 2	WH 22	WH 3	WH 33	WH 4	WH 5	WH 6	WH 7	WH 8	WM 1	WM 2	LH 1	LH 2	LH 3	LH 4	LH 5	LH 6
4 X F30							7		7	27								
5 X F30										28								
6 X F30										29								
1 X F32		2		2		2								3	2	2		
2 X F32				1				9							1			9
3 X F32							8										8	
4 X F32							7										7	
6 X F32										29								
1 X F40				2		2									2	2		
2 X F40								9										9
3 X F40																	8	
1 X F58								10										10
2 X F58							11			22							11	
3 X F58									8									
1 X F70								10										10
2 X F70										22							11	
T8 SLIMLINE																		
1 X F72						2										2		
2 X F72						1		9								1		9
3 X F72								8										8
4 X F72								7										7
T8 HO																		
1 X F48 HO				3	14		14	10							3		14	10
2 X F48 HO										22							11	
3 X F48 HO									8	25								
4 X F48 HO									7	27								
1 X F60 HO				3	14		14	10							3		14	10
2 X F60 HO										22							11	
3 X F60 HO									8	25								
4 X F60 HO										27								
1 X F72 HO				3	14		14	10							3		14	10
2 X F72 HO										22								
3 X F72 HO									8	25								
T10 LINEAR																		
1 X F40				3	14	3		10							3	3	14	10
2 X F40								11		22							11	11
3 X F40										25								
4 X F40										27								
5 X F40										28								
T10 VHO																		
1 X F48 VHO									12	19								
1 X F60 VHO									12	19								
1 X F72 VHO									12	19								
1 X F96 VHO										19								
T12 LINEAR																		
1 X F14		3	2	2	14	3	14	10				3		3	2	3	14	10
2 X F14					9		9	11									9	11
3 X F14										25								
4 X F14									7	27								
5 X F14										28								
6 X F14										29								
1 X F15		3	2	2		3		14				3		3	2	3		14
2 X F15				1	9		9	11							1		9	11

LAMP COMPATIBILITY

WORKHORSE • WHAM • LONGHORSE

Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts

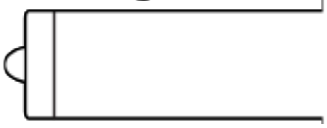
1. Find your lamp type.
2. Find the quantity and wattage of lamps.
3. Look across and find the ballast you need.
4. The indicated number represents wiring diagram needed.
5. Fulham reserves the right to alter these compatibility charts without notice; please refer to www.fulham.com for latest information.

LAMPS	WORKHORSE										WHAM		LONGHORSE					
	WH 1	WH 2	WH 22	WH 3	WH 33	WH 4	WH 5	WH 6	WH 7	WH 8	WM 1	WM 2	LH 1	LH 2	LH 3	LH 4	LH 5	LH 6
3 X F15					8		8										8	
4 X F15							7			27							7	
5 X F15										28								
6 X F15										29								
1 X F20		3	2	2	14	3		14				3		3	2	3	14	14
2 X F20					9		9	11									9	11
3 X F20							8			25								
4 X F20							7		7	27								
5 X F20										28								
6 X F20										29								
1 X F25			3	3	14		14	10							3		14	10
2 X F25					11		9			22							11	
3 X F25									8	25								
4 X F25									7	27								
1 X F30			3	3	14	3	14	10							3	3	14	10
2 X F30					11		9	11		22							11	11
3 X F30									8	25								
4 X F30									7	27								
5 X F30										28								
1 X F40				3	14	3	14	10							3	3	14	10
2 X F40							9	11		22							11	11
3 X F40									8	25								
4 X F40									7	27								
5 X F40										28								
T12 SLIMLINE																		
1 X F24			3		14	3	14	10				3				3	14	10
2 X F24					11		9	11		22							11	11
3 X F24									8	25								
4 X F24									7	27								
5 X F24										28								
1 X F36				3	14	3	14	10							3	3	14	10
2 X F36					11		9	11		22							11	11
3 X F36									8	25								
4 X F36									7	27								
5 X F36										28								
1 X F42				3	14	3		10							3	3	14	10
2 X F42								11		22							11	11
3 X F42									8	25								
4 X F42									7	27								
5 X F42										28								
1 X F48				3	14	3	14	10							3	3	14	10
2 X F48							9	11		22							11	11
3 X F48									8	25								
4 X F48									7	27								
5 X F48										28								
1 X F60				2	14	3	14	10							2	3	14	10
2 X F60							9	11		22							11	11
3 X F60									8	25								
4 X F60									7	27								
1 X F64				2	14	3	14	10							2	3	14	10
2 X F64							9	11		22							11	11
3 X F64									8	25								
4 X F64									7	27								

T12 LINEAR

1 1/2" DIAMETER

T12 SLIMLINE



1 1/2" DIAMETER

WORKHORSE • WHAM • LONGHORSE

Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts

T12 HO

1 1/2" DIAMETER

T12 VHO

1 1/2" DIAMETER

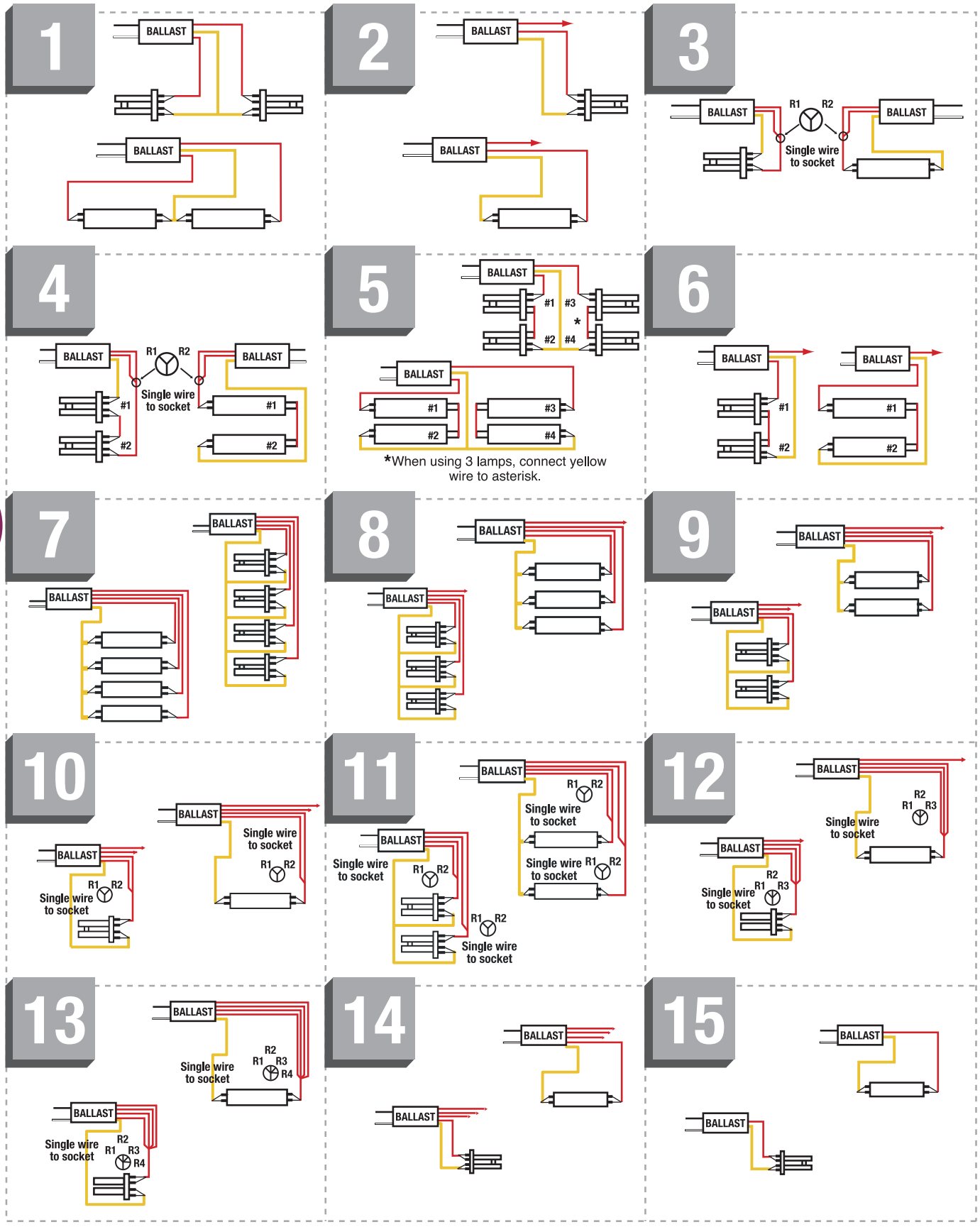
LAMPS	WORKHORSE										WHAM		LONGHORSE					
	WH 1	WH 2	WH 22	WH 3	WH 33	WH 4	WH 5	WH 6	WH 7	WH 8	WM 1	WM 2	LH 1	LH 2	LH 3	LH 4	LH 5	LH 6
1 X F72				2	14	3	14	10							2	3	14	10
2 X F72							9	11		22							11	11
3 X F72									8	25								
4 X F72										27								
1 X F84				2		3	14	10							2	3	14	10
2 X F84							9	11		22							11	11
3 X F84										25								
1 X F96 (60W Only)							14	10									14	10
2 X F96 (60W Only)							9	11		22							9	11
3 X F96 (60W Only)									8									
T12 HO																		
1 X F18 HO					12		12	13	14								12	13
2 X F18 HO									11	23								
3 X F18 HO										26								
1 X F24 HO					12		12	13	14								12	13
2 X F24 HO									11	23								
3 X F24 HO										26								
1 X F30 HO					12		12	13	14								12	13
2 X F30 HO									11	23								
3 X F30 HO										26								
1 X F36 HO					12		12	13	14								12	13
2 X F36 HO									11	23								
3 X F36 HO										26								
1 X F42 HO					12		12	13	14								12	13
2 X F42 HO									11	23								
3 X F42 HO										26								
1 X F48 HO					12		12	13	14								12	13
2 X F48 HO									11	23								
3 X F48 HO										26								
1 X F60 HO							12	13	14								12	13
2 X F60 HO									11	23								
3 X F60 HO										26								
1 X F64 HO							12	13	14								12	13
2 X F64 HO									11	23								
1 X F72 HO							12	13	14								12	13
2 X F72 HO									11	23								
1 X F84 HO							12	13	14								12	13
2 X F84 HO									11	23								
1 X F96 HO							12	13	14								12	13
2 X F96 HO (95W only)									11	23								
T12 VHO																		
1 X F48 VHO									12	19								
1 X F60 VHO									12	19								
1 X F72 VHO									12	19								
1 X F96 VHO									12	19								

WORKHORSE • WHAM • LONGHORSE

Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts

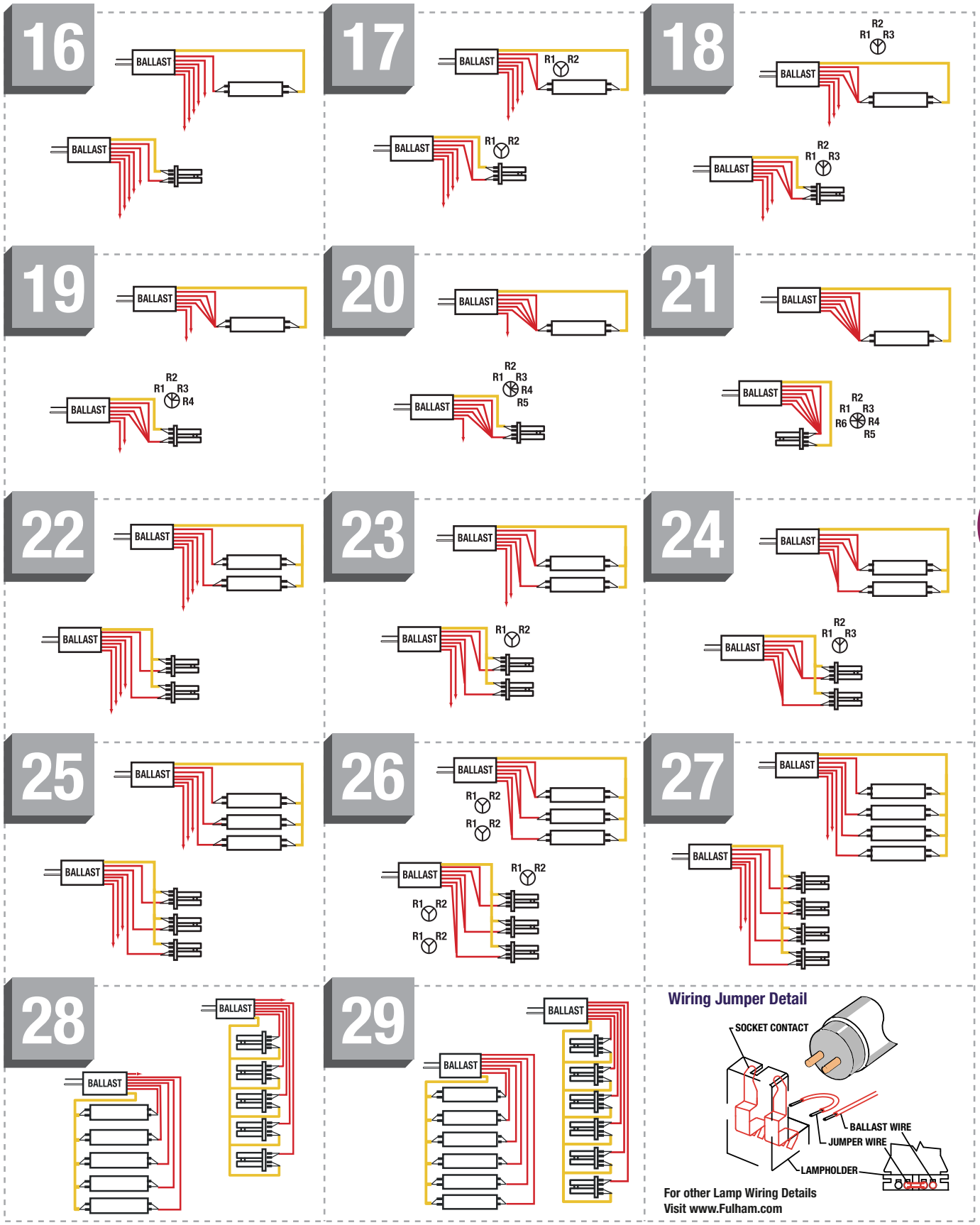
OPERATION & INSTALLATION TIPS

1. Connect both pin sets of the socket before connecting "RED" & "YELLOW" wires.
2. Ground case in accordance with the "National Electric Code."
3. With Linear lamp use a starting aid.
4. Ballast case temperature can not exceed 70°C.
5. Remote mounting distance varies with lamp type. Contact customer service.
6. Ballast can not be used with dimmer switch but can be used with occupancy sensor. (Note: Sensor will shorten lamp life.)
7. Cap and insulate any unused red power wire. → = Cap
8. When connecting two red power wires, they must be joined to make one wire before attaching to the socket.
9. BLS (Back Leads with Studs) Dimensions: Stud Length: 5/8", Stud Size: 8/32, Center to Center: 2"
10. Running lamps in series will reduce the turn-on cycles of both lamps. (Configuration diagrams 4, 5, 6)



WORKHORSE • WHAM • LONGHORSE

Refer to pages 32-35 for specifications on WorkHorse, WHAM & LongHorse Ballasts



CUSTOM SOLUTIONS

Fulham is your technology partner when it comes to custom applications and solutions to your lighting needs.

We can design and build:

Custom LED Modules

Unique shapes and sizes can be created to customer specifications.

Custom LED Drivers

Built to customer specifications, available in different sizes and shapes. Proven capabilities in developing and manufacturing lines of digital addressable, controllable LED drivers (DALI and DMX drivers) as private-label items.

Custom Ballasts

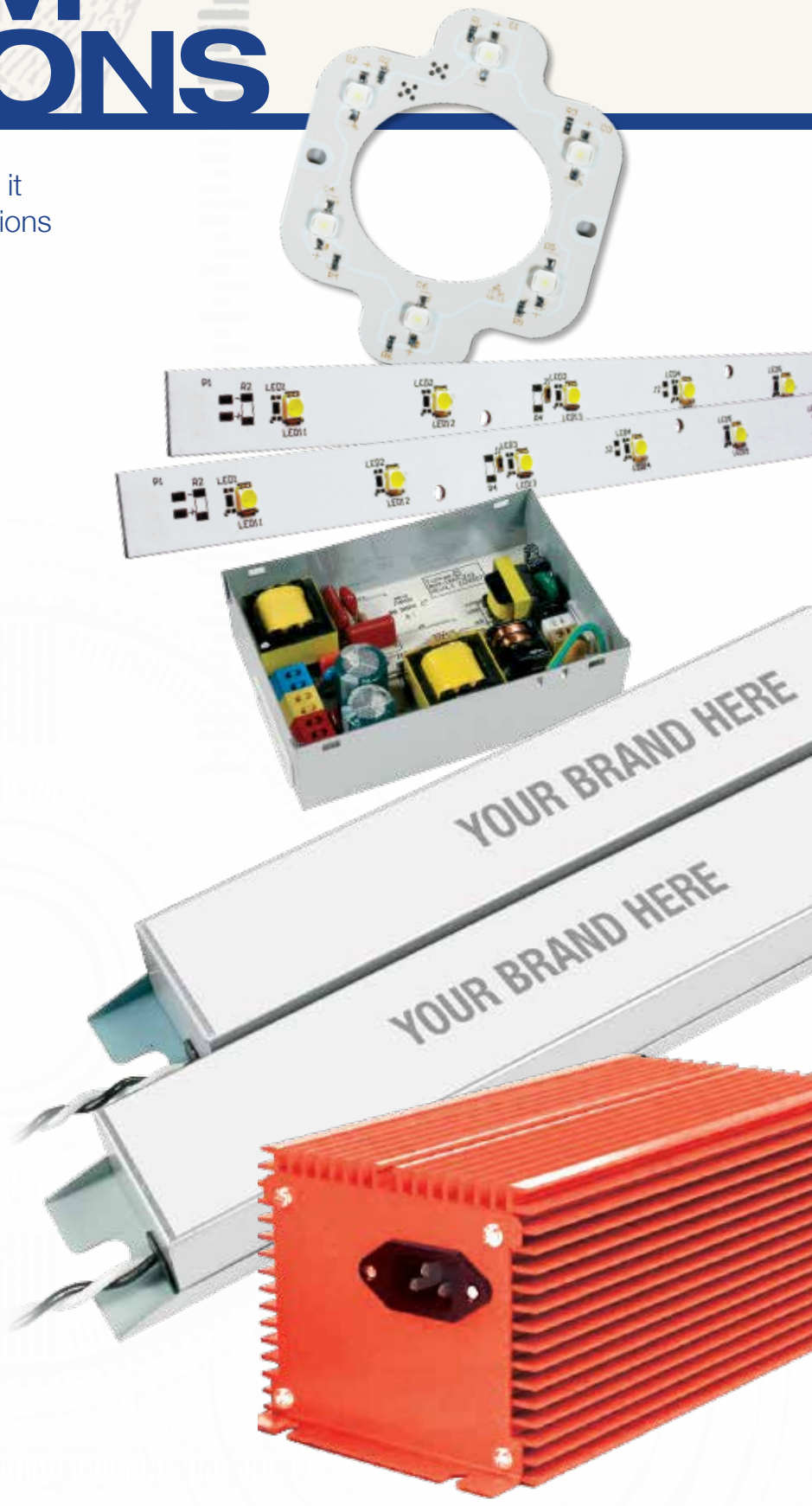
Built to customer specifications, available in different sizes and shapes and can operate custom compact and linear lamps. (CCFL thru T12)

Electrical Control Systems

Custom Controls built to customer specifications.

Custom Assemblies

Wiring Harnesses, custom ballast lead lengths, Kits including ballasts with lampholders and lamps. All made to customer specifications.



FULHAM 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:

FireHorse™ - 2 to 5 Years
FREELITE™ - 5 Years
Fulham Lighting Controls Components - 5 Years
HighHorse™ Electronic HID Ballast - 3 Years
HighHorse™ Magnetic HID Ballast - 2 Years
HighHorse™ Induction - 5 to 7 Years (If installed per instructions)
IceHorse™ Ballast - 3 Years
LongHorse™ Electronic Remote Fluorescent Ballast - 5 Years
PONY™ Electronic Ballast - 2 Years
PONY™ Electronic SugarCube™ - 2 Years
PONY™ Electronic Transformer - 2 Years
RaceHorse™ Electronic Ballast - 70ºC 5 Years, 90ºC 3 Years
SunHorse™ Ballast - 3 Years
SineHorse™ Ballast - 3 Years
ThoroLED™ Drivers - 2 to 5 Years
ThoroLED™ Modules - 1 Year
WorkHorse™ Electronic Fluorescent Ballast - 5 Years

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 ballast. Fulham is not responsible for any auxiliary equipment not furnished by Fulham, which is used in connection with or attached to the ballast, or for operation of the ballast 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 ballast resulting from the use of auxiliary equipment not supplied by Fulham.

Warranty Conditions Not Covered

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

* Underwriters Laboratories Inc. (UL)
* National Electrical Code (NEC)
* Applicable international federal, state and local codes
* Remote applications beyond specifications
  - WorkHorse - Length of the leads
  - HighHorse - 9 feet
  - LongHorse - 20 feet
* Fulham specific, most recent instructions and application guidelines provided for installation of the ballast

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

Obtaining Warranty Service

If within the warranty period it appears that the installed ballast does not meet the warranty conditions specified, the purchaser must notify Fulham Co., Inc. at 323-599-5001 (or through email at warranty@fulham.com) of its warranty claim. Fulham or its authorized service company will provide warranty service directly to you.

General Provisions

All responsibilities regarding the ballast are set forth by this warranty. Replacement or repairs of the ballast is your exclusive remedy. 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 ballast, 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.

State Law Exceptions

Some states 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 from state to state.

Returned Goods Authorizations (RGA)

Customers shall contact Fulham directly at 323-599-5000 for all RGA's.

After receiving the RGA, the user shall promptly return the product at the user's expense to Fulham Co., Inc. 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 RGA either +/-, the customer will be notified and adjustments will be made at that time.

Fulham Co. Inc. reserves the right to examine all failed ballasts and reserves the right to be the sole judge as to whether any ballasts are defective and covered under this warranty.

FULHAM
Lighting... Global. Intelligent. Sustainable.

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