PEMCO
LIGHTING PRODUCTS, INC.

Induction Lighting

PHILIPS QL LAMP SYSTEM

Pemco Lighting Products is very pleased to be able to offer the Philips QL lamp system, as an option, in almost all fixtures we manufacture. The following information should help you determine if the QL System is right for your applications or use.

There are many advantages to installing this type of system over the standard HID systems, which more than compensate for the added cost. The following benefits and information should be very helpful. For pricing, contact the factory.

QL: LONG-LASTING BENEFITS

Philips Lighting's QL lamp system constitutes a complete revolution in lighting technology because the lamp has no filament or electrodes. This electrodeless technology results in an amazing 100,000 hr. rated life. QL's unmatched life makes it the system of choice for applications where lamp replacement is difficult, costly or hazardous. In fact, QL illuminates any application, from heavy industrial to upscale architectural, with a beautiful, efficient, high-color rendering (>80). crisp white light.

Designers, end-users, and fixture manufacturers are quickly developing creative uses for this unique lamp, as well as retrofit applications, due to its Federal Communications Commission compliant design.

THE EVOLUTION OF LIGHTING

In many respects, QL resembles Philips PL-T, in fact, QL lamp systems can be seen as the higher lumen version of Philips PL-T compact fluorescent line. Similar to a compact fluorescent lamp and ballast system, each QL system is comprised of a high-frequency (HF) ballast (generator) and an inductive power coupler that together induce a current inside the fluorescent lamp (discharge vessel). The bulb shapes, wattages, and lumen packages are progressively larger than the PL-T series.

BENEFITS OF ELECTRODELESS TECHNOLOGY

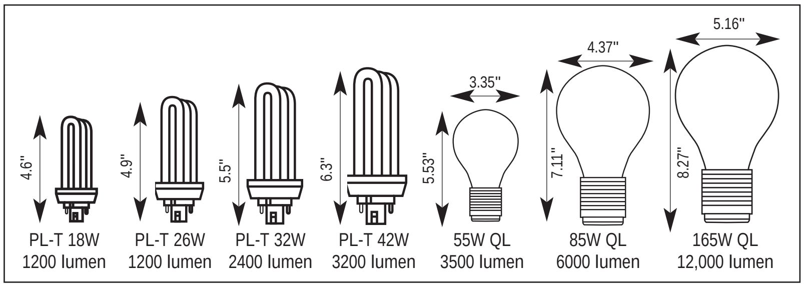
QL lamps last and last because there is no filament or electrode to wear out. Not having to relamp for 12 to 25 years can prove advantageous in any situation, but even more so in hard-to-reach or dangerous applications: train and bus stations, shopping centers, bridges, airports, street lighting, lighted advertisements, industrial plants, and tunnels, to name a few. The use of QL reduces safety hazards due to spot outages and results in effectively zero maintenance.

With up to 6000 lumens, QL induction lighting offers outstanding long-term economy, as well as:

- Flicker-free illumination
- Instant-on performance, hot or cold
- High color rendering, better than 80 CRI
- No color shift over system life
- Choice of color temperatures: 3000K, 4000K
- Vibration resistance
- Compact, versatile point-source lamp shape
- Resistance to voltage fluctuations

Unlike standard fluorescents, which undergo end blackening from electrode sputter at cold start-up, QL has no electrodes, and therefore no bulb blackening.

Resistance to failure under extreme vibration conditions is a notable benefit of QL: it has been used with long-term success on bridges, tunnels, high-voltage towers, and airport warning beacons, all of which are subject to vibrations and harsh conditions. Like standard fluorescents, QL operation is based on a low-pressure mercury discharge, leaving no chance of nonpassive failure. Therefore QL luminaires are rated for open fixture designs, such as downlights.



A REDESIGNED SYSTEM

Because the QL lamp system makes use of relatively high operating frequencies, there had been concern that radio frequency interference (RFI) might disturb nearby electrical or electronic equipment. Both the 55W and 85W QL lamps have been redesigned to produce low RFI, well within normal levels, and comply with FCC rules for Class A devices.

Low RFI means that external metal shielding (such as metal mesh) of the lamp is no longer needed, making the application and design of luminaires as easy as they are with conventional light sources.

FCC compliance also means that QL systems can be easily retrofitted into a wide variety of existing luminaires without submitting the luminaire for FCC testing. QL retrofits have been as easy as the more common PL-T compact fluorescent retrofits.

Another convenience of the design is the click-fit mounting assembly of the glass bulb (vessel), which facilitates lamp replacement. If the glass is accidentally broken, replacement is a snap. The 30% smaller HF ballast (generator) is easier to insert or build into luminaires. Plus, a copper heat rod incorporated into the power coupler ensures consistent light output in any burning position and over a wide temperature range. These crucial innovations have spurred numerous lighting fixture manufacturers to work with Philips to develop effective decorative and low-profile luminaires that maximize the technology's benefits.

Lamp	Lumen Package
18W PL-T	1200
26W PL-T	1800
32W PL-T	2400
42W PL-T	3200
55W QL	3500
85W QL	6000
165W QL	12000

Fixtures on the market take advantage of QL's point-source nature, including a variety of very stylish outdoor post-top luminaires, downlights and custom pieces. Manufacturers will be able to take advantage of a 165W QL system. This third lumen package will save on capital and installation costs, requiring fewer lighting fixtures in some high-ceiling applications. The lamp wattage will also be appropriate for taller pole mountings with wide spacing, The 165W QL vessel is only slightly larger (approximately 20%) than the 85W version, which means that it will fit into most post tops and offer greater possibilities for applications and innovative luminaire designs.

HOW IT WORKS

The QL induction lighting system is comprised of an HF ballast (generator); power coupler; and bulb (discharge vessel). An oscillator within the generator introduces an HF current (2.65 MHz) into the power coupler-an inductive coil wound around a ferrite core-inside the discharge vessel. A coaxial cable connects the generator to the power coupler. Just as in a transformer, the core-and-coil power coupler produces a magnetic field. This field then induces a secondary electrical current in the mercury vapor within the bulb.

From here, the physics are exactly the same as regular fluorescent lamps: UV radiation from the excited mercury ions collides with phosphors lining the bulb, producing visible white light. The high-quality triphosphors used inside the lamp (the same as those used in Philips popular TL80 T-8 series) are available in two color temperatures: 3000K and 4000K.

END OF LIFE CONDITIONS

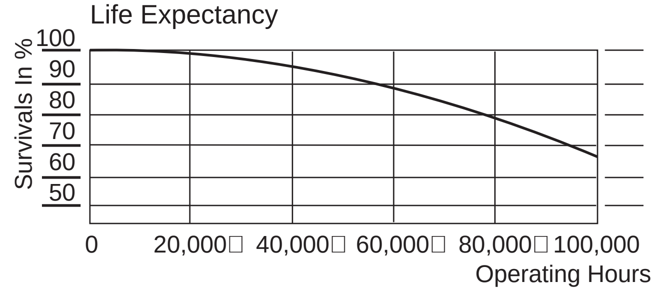
There are, under normal operating conditions, no life-determining parts in the power coupler or bulb (vessel), although the phosphors will degrade somewhat over the long term. Life is basically determined by the HF ballast (generator). The rated life of the QL system is 100,000 hrs., with a statistical failure rate of only 1% per 4000 hrs. After about 60,000 hrs., users can expect a 10% to 20% mortality rate with a maximum decline in light output of no more than 30% per lamp. After operating the full 100,000 hrs., one can expect 35% to 40% light loss.

APPLICATIONS

White light, compact size, round shape and a full range of lumen packages make QL suited for an incredible diversity of both indoor and outdoor applications: public buildings, indoor sports facilities, shops, malls, banks, and outdoor lighting in residential areas and in city beautification projects. The simplicity of retrofitting QL, as well as its point-source configuration, have led to the inclusion of this high-tech source in historic districts inside period lanterns and other luminaires.

QL is perfect for difficult-to-relamp spaces, particularly due to its reliability. The extremely low early failure rate virtually eliminates unscheduled maintenance. Long life QL lamps are suited for airports, hotel corridors, indoor signage, grocery stores, banks, and other 24-hr. installations will quickly realize savings in relamping costs, as will aquatic applications where the pool must be drained for relamping, and tunnels where maintenance requires halting or diverting traffic.

It is often easy to match the higher initial cost of a QL system with expedient payback.



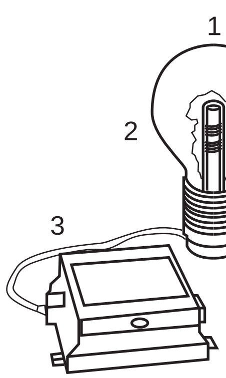
There may be several lighting solutions that fulfill the needs of the client. But by taking the total cost of ownership into account (energy, maintenance, and investment/amortization), the choice of QL becomes clear in monetary terms.

MAIN QL SYSTEM COMPONENTS

1. Power coupler
2. Lamp (discharge vessel)
3.) HF ballast (generator)

Induction Principle

The Alternating current (lp) in the primary coil induces by magnetism a corresponding current of the same frequency (ls) in the secondary coil, which is formed by the mercury vapor filling.



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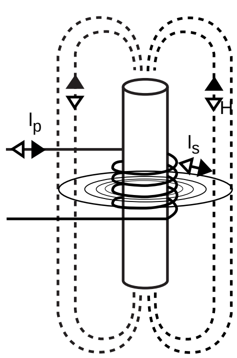

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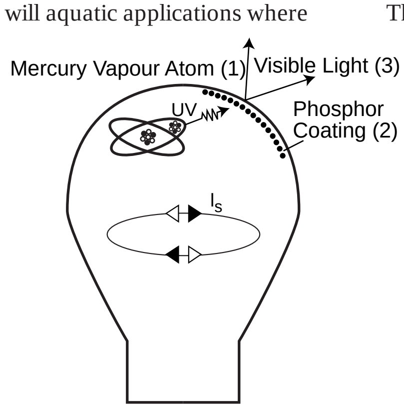


DISCHARGE PRINCIPLE

The free electrons in the mercury vapor filling (1) are excited by the induced secondary current. This produces ultraviolet radiation which, striking the phosphor coating (2), generates visible light (3).

LAMP USAGE, MOUNTING HEIGHTS, CALCULATIONS

To determine footcandle values for mounting heights, use the mounting height conversion table or the correction factor formula. To calculate average initial footcandles use the formula shown in conjunction with the coefficient of utilization charts provided on each photometric data sheet.

	Lamp Wattage	Lamp Number	Initial Lumens	Base Type
MERCURY VAPOR	50	H46DL-40-50/DX	1580	MED
	75	H43AV-75/DX	2800	MED
	100	H38JA-100/DX	4400	MOG
	175	H39KC-175/DX	8500	MOG
	250	H37KC-250/DX	13,000	MOG
	400	H33GL-400/DX	23,000	MOG
	1000	H34GW-1000/DX	60,000	MOG
HIGH PRESSURE SODIUM	35	C35S76/M	2250	MED
	50	C50S68	4000	MOG
	70	C70S62	6300	MOG
	100	C100S54	9500	MOG
	150	C150S55	16,000	MOG
	200	C200S66	22,000	MOG
	250	C250S50	28,500	MOG
	400	C400S51	50,000	MOG
	1000	C1000S52/ED37	125,000	MOG
METAL HALIDE	50	MH50/U/M	3200	MED
	70	MH70/U/M	5000	MED
	100	MH100/U/M	7800	MED
	150	MH150/U/M	12,500	MED
	175	MH175/U	13,000	MOG
	250	MH250/U	20,500	MOG
	400	MH400/U/ED28	36,000	MOG
	1000	MH1000/U/	110,000	MOG

Existing Mounting Heights	New Mounting Heights										
	10	15	20	25	30	35	40	45	50	55	60
10	–	0.44	0.25	0.16	0.11	0.08	0.06	0.05	0.04	0.03	0.03
15	2.25	–	0.56	0.36	0.25	0.18	0.14	0.11	0.09	0.07	0.06
20	4.00	1.78	–	0.64	0.44	0.33	0.25	0.20	0.16	0.13	0.11
25	6.25	2.78	1.56	–	0.69	0.51	0.39	0.31	0.25	0.21	0.17
30	9.00	4.00	2.25	1.44	–	0.73	0.56	0.44	0.36	0.30	0.25
35	12.25	5.44	3.06	1.96	1.36	–	0.77	0.60	0.49	0.40	0.34
40	16.00	7.11	4.00	2.56	1.78	1.31	–	0.79	0.64	0.53	0.44
45	20.25	9.00	5.06	3.24	2.25	1.65	1.27	–	0.81	0.67	0.56
50	25.00	11.11	6.25	4.00	2.78	2.04	1.56	1.23	–	0.83	0.69
55	30.25	13.44	7.56	4.84	3.36	2.47	1.89	1.49	1.21	–	0.84
60	36.00	16.00	9.00	5.76	4.00	2.94	2.25	1.78	1.44	1.19	–

Converting or Updating Footcandle Values

$$\frac{\text{New Lamp Lumen Output}}{\text{Old Lamp Lumen Output}} = \text{Converting Factor}$$

Example

$$\text{400 MH to 250 MH} = \frac{23000}{40000} = .575 \text{ Factor}$$

Old Footcandle Value x Converting Factor = New Footcandle Value

Mounting Height Correction Factor Using the Inverse Square Law

$$\frac{\text{Existing Mounting Height}^2}{\text{New Mounting Height}^2} = \text{Correction Factor}$$

Example

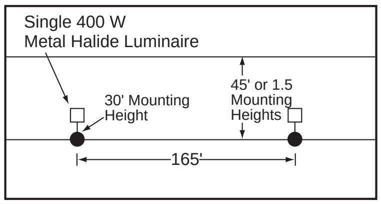
$$\text{30 ft to 40 ft} = \frac{30^2}{40^2} = \frac{900}{1600}. = .56$$

To convert footcandle readings from a 30 foot mounting height to a 40 foot height multiply values shown on Photometric Data Chart for the existing mounting height (in this case, 30 feet) by a factor of .56

Calculating Average Initial Footcandles

$$\frac{\text{Lumen Output per Lamp} \times \text{Number of Luminaires per Pole} \times \text{Coefficient of Utilization}}{\text{Spacing between Luminaires} \times \text{Width of Area}} = \text{Average Initial Footcandles}$$

Example



$$\frac{40000 \times 1 \times .31}{165' \times 45'} = 1.67 \text{ Average Initial Footcandles}$$