GE Lighting

Technical Catalogue

European Edition

GE Lighting

Reflector Heat Lamps

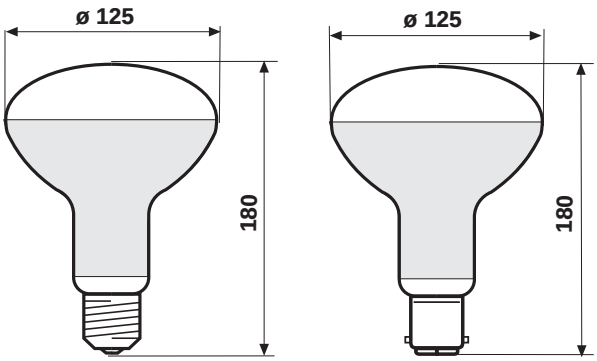
Hard Glass Infra-Red Reflectors

Description

GE tungsten filament heat lamps in blown hard glass provide efficient, instantaneous and easily controllable infra-red radiant energy for a wide range of heating applications in industry, agriculture and the home.

The lamps are available in clear, satin, and rubinized (red) finishes to meet differing heating requirements. A clear finish is recommended for maximizing the thermal energy of both the visible and infra-red light. A satin finish maintains much of the visible light content but offers a more diffused and even distribution of the heat.
A rubinized (red) finish eliminates most of the visible light but maintains the infra-red heating properties. This type is often recommended for agricultural applications such as live stock rearing.

Dimensions — mm



Features

- 6,000 hour average rated life.
- Near instantaneous heating.
- Easily controllable.
- Efficient, localized heating.
- Splash proof.
- Available in E27 and B22 bases.

Applications

- Live stock rearing and agricultural climate control.
- Hot food displays and food processing.
- Industrial varnish and paint curing, baking, etc.
- Space heating.
- Bathroom heating.
- Personal therapeutic warming.

Ordering Information

Clear Finish

Watts	Volts	Cap	Pack Qty	Description	Product Code
150	235-245	E27	9	150R/IR/CL E27 235-245V	28720
250	235-245	E27	9	250R/IR/CL E27 235-245V	28724
250	235-245	B22	9	250R/IR/CL B22 235-245V	28725
275	235-245	E27	9	275R/IR/CL E27 235-245V	32569

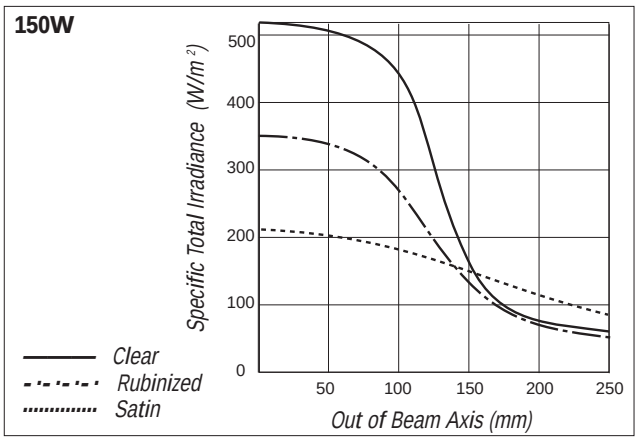
Satin Finish

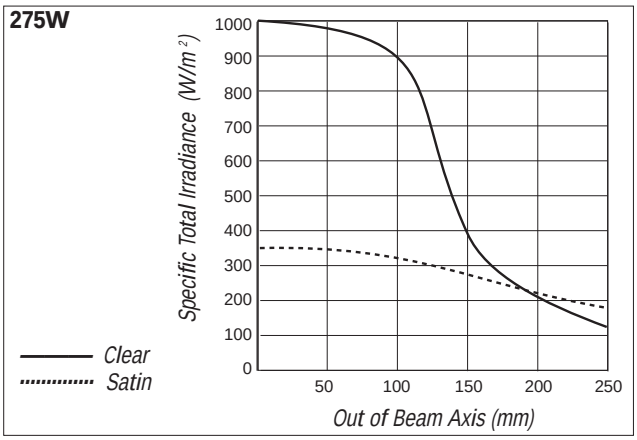
Watts	Volts	Cap	Pack Qty	Description	Product Code
150	235-245	E27	9	150R/IR/F E27 235-245V	28726
250	235-245	E27	9	250R/IR/F E27 235-245V	28729
250	235-245	B22	9	250R/IR/F B22 235-245V	28730
275	235-245	E27	9	275R/IR/F E27 235-245V	32296

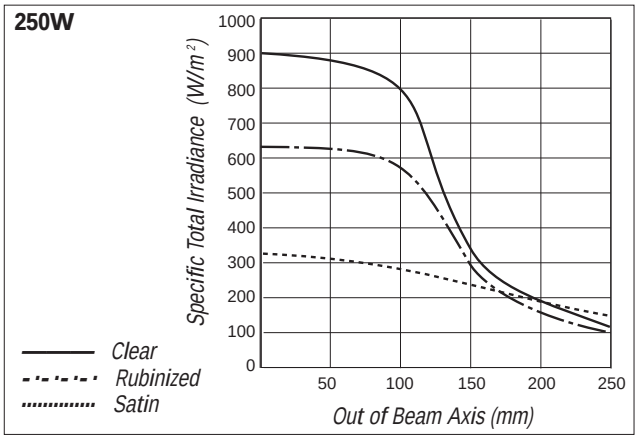
Rubinized Finish

Watts	Volts	Cap	Pack Qty	Description	Product Code
150	235-245	E27	9	150R/IR/R E27 235-245V	28731
250	235-245	E27	9	250R/IR/R E27 235-245V	28735
250	235-245	B22	9	250R/IR/R B22 235-245V	28736

Radiation Intensity at 50cm from Subject







Precise™ MR11

Precise™ MR 11
35mm ø Dichroic Mirror Halogen Lamps
12W, 20W, 35W

Description

Precise™ MR11 lamps are low voltage tungsten halogen reflector-mounted lamps popular for downlighting and accent lighting applications because of their small size, precise beam control, high efficacy, excellent white light and cool beam characteristics.

A Precise™ MR11 lamp comprises a small halogen low voltage filament capsule permanently cemented into a one-piece, dichroic coated all glass reflector. The computer designed multi-faceted reflector produces a “precise” beam pattern with excellent uniformity and sharp beam cut-off. The reflector is ellipsoidal in shape. The filament is precisely aligned along the optical axis of the reflector during the manufacturing process to achieve the required beam pattern. Beam patterns range from very narrow spots to wide floods.

The Cover Glass (closed) versions incorporate an integral clear cover glass to ensure that both bulb and reflector are protected from dust and dirt during installation and operation. The cover glass effectively eliminates UV-C radiation and greatly reduces UV-B radiation. They use the same reflectors as the open versions – and hence have the same dimensions, allowing users to interchange lamps at will.

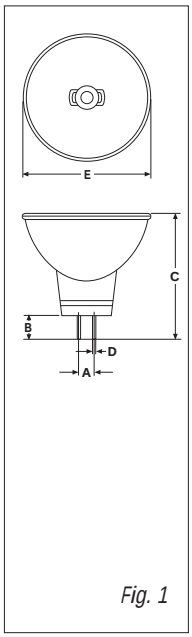


Fig. 1

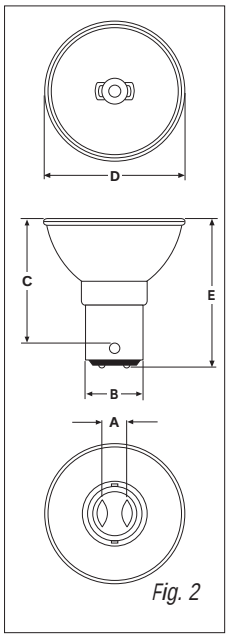


Fig. 2

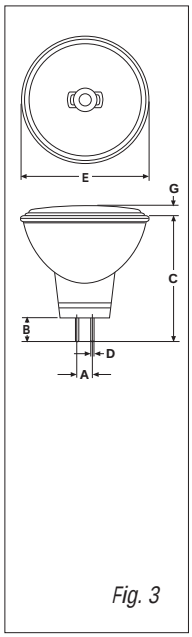


Fig. 3

Dimensions (mm)

	A	*B*	*C*	*D*	*E*	*G*
M64/FTA, M52/FTB, M51/FTC, M62/FTD, M65/FTE, M66/FTF, M199/FTH *– Fig. 1*						
MIN.	*–*	*6.0*	*–*	*0.95*	*34.3*	*–*
AVE.	*4.0*	*–*	*–*	*–*	*–*	*–*
MAX.	*–*	*8.5*	*40.0*	*1.05*	*35.3*	*–*
M54/FST, M63/FSV *– Fig. 2*						
MIN.	*7.0*	*15.0*	*–*	*34.7*	*–*	*–*
AVE.	*–*	*–*	*–*	*–*	*–*	*–*
MAX.	*8.0*	*15.3*	*33.5*	*35.3*	*41.0*	*–*
M264/FTA/CG, M252/FTB/CG, M251/FTC/CG, M262/FTD/CG, M265/FTE/CG, M266/FTF/CG *– Fig. 3*						
MIN.	*–*	*6.0*	*–*	*0.95*	*34.3*	*–*
AVE.	*4.0*	*–*	*–*	*–*	*–*	*–*
MAX.	*–*	*8.5*	*40.0*	*1.05*	*35.3*	*5.0*

Technical Data

Burning Position: any

Order Code	Watts	Volts	Max. Length (mm)	Max. Diameter (mm)	Peak Intensity (CD)	Beam Spread (°)	Colour Temp. (K)	Rated Avrg Life (h)
Bulb: clear, open, Cap: GU4 – Fig. 1								
M64/FTA	12	12	40.0	35.3	6400	7	2900	2000
M52/FTB	20	12	40.0	35.3	5500	10	2900	3500
M51/FTC	20	12	40.0	35.3	1760	17	2900	3500
M62/FTD	20	12	40.0	35.3	600	30	2900	3500
M65/FTE	35	12	40.0	35.3	7480	10	2900	3500
M66/FTF	35	12	40.0	35.3	3000	20	2900	3500
M199/FTH	35	12	40.0	35.3	1300	30	2900	3500
Bulb: clear, open, Cap: B15d – Fig. 2								
M54/FST	20	12	41.0	35.3	1760	17	2900	3500
M63/FSV	20	12	41.0	35.3	600	30	2900	3500
Bulb: clear, closed, Cap: GU4 – Fig. 3								
M264/FTA/CG	12	12	45.0	35.3	5760	7	2900	2000
M252/FTB/CG	20	12	45.0	35.3	4950	10	2900	3500
M251/FTC/CG	20	12	45.0	35.3	1584	17	2900	3500
M262/FTD/CG	20	12	45.0	35.3	540	30	2900	3500
M265/FTE/CG	35	12	45.0	35.3	6800	10	2900	3500
M266/FTF/CG	35	12	45.0	35.3	2700	20	2900	3500

Operation and Maintenance

- Low voltage tungsten-halogen lamps are sensitive to voltage variations. Even a small change in voltage can have a considerable impact on lamp life (see “Light, Life & Voltage”). Designers should match fitting transformer ratings to actual mains line voltages to ensure that the lamps operate at as close to 12V as possible.
- Rapid cycling can also shorten lamp life, and designers should take advice from their GE Lighting representative before using these lamps in flashing or blinking applications.
- The lamps may be dimmed by reducing voltage. However, this may cause the bulbs to blacken. If this occurs the lamp should be run at full voltage (12V) for fifteen minutes, thereby clearing the problem. Note that the nature of low voltage lighting systems requires the use of fluorescent-type dimmers.
- Switch off mains supply before installing / removing lamp.
- Fuse is essential in circuit.
- Observe temperature tolerances: pinch seal, max. 350°C, bulb wall min. 250°C.
- Lamps should be free from contamination, including finger marks, before lamp is operated. Lamps can be cleaned with a soft cloth moistened with spirit.
- Good condition of the lampholder contacts is essential.
- Bulb wall temperatures are high and therefore lamps should not be operated in flammable atmospheres unless enclosed in suitably rated luminaires.
- Ensure lamp is cool before removing.
- Open lamps should only be used within a luminaire with a protective shield.

Cool Pinch

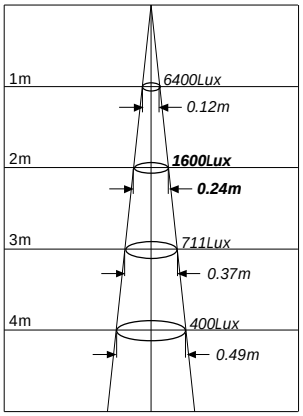
Innovative design of all GE dichroic mirror lamps has created a range with probably the lowest pinch temperature of any comparable lamp. A cool pinch temperature enables sealed lamps to be used in luminaires designed for open lamps. Excessive pinch seal temperature causes premature lamp failure: the maximum permissible pinch temperature is 350°C.

Performance Cones

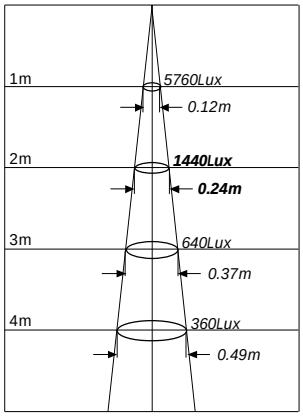
All GE reflector lamps have a performance cone. This is to help achieve the most effective spread and level of illumination by showing the lamp power, beam spread and mounting distance of each lamp.

A performance cone is a visual indicator of the angle at which the intensity of a beam produced by a reflector is at 50% of its peak. The cone shows the angle, the level of peak illuminance (lux) and the beam diameter for planes at right angles at various distances (m) from the lamps. The bold type at 2m serves as a benchmark for at a glance comparison of respective beam diameter and lux for different lamps.

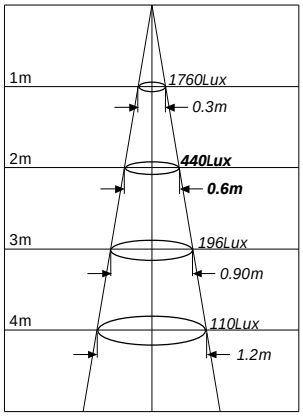
M64/FTA Open 12W 7°



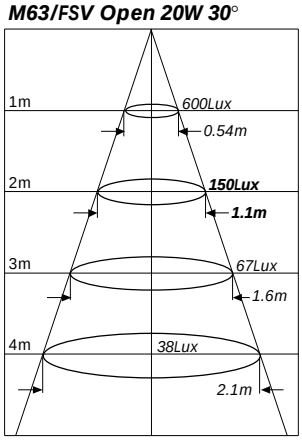
M264/FTA/CG Closed 12W 7°



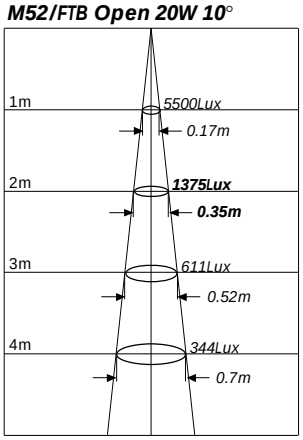
M54/FST Open 20W 17°



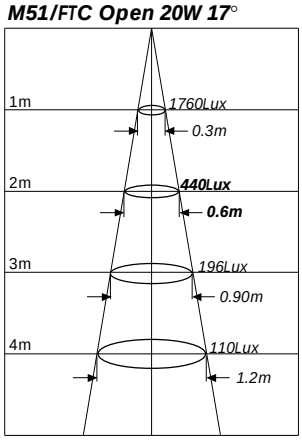
M63/FSV Open 20W 30°



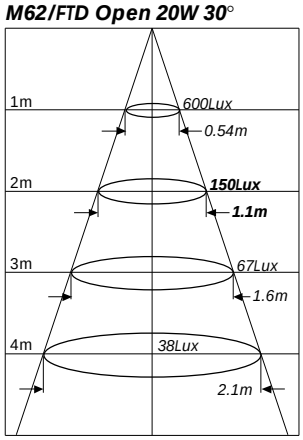
M52/FTB Open 20W 10°



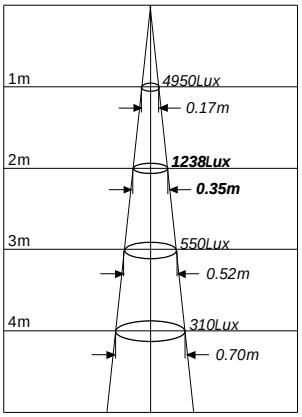
M51/FTC Open 20W 17°



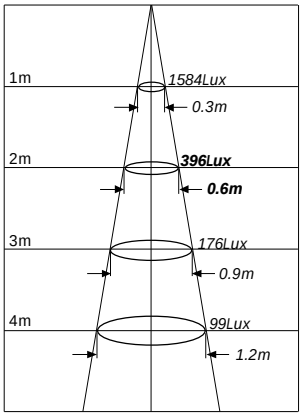
M62/FTD Open 20W 30°



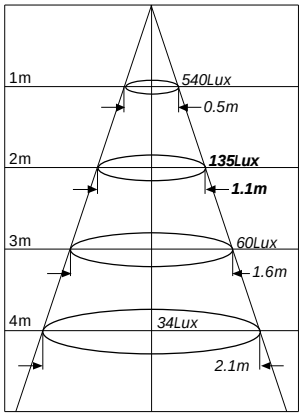
M252/FTB/CG Closed 20W 10°



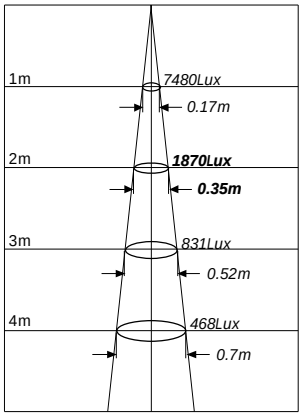
M251/FTC/CG Closed 20W 17°



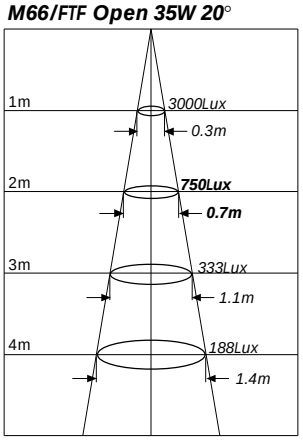
M262/FTD/CG Closed 20W 30°



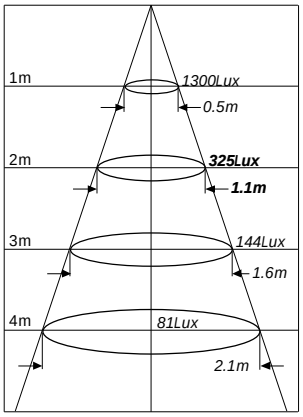
M65/FTE Open 35W 10°



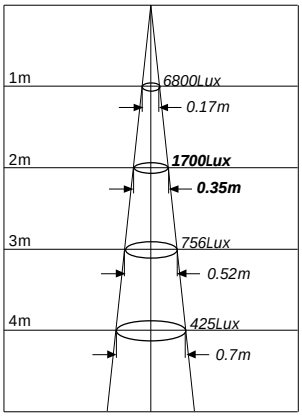
M66/FTF Open 35W 20°



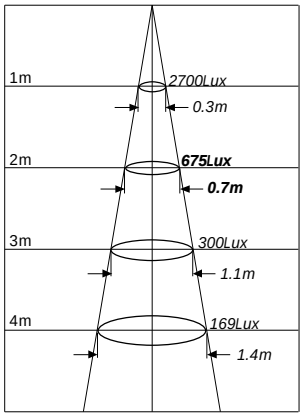
M199/FTH/CG Closed 35W 30°



M265/FTE/CG Closed 35W 10°



M266/FTF/CG Closed 35W 20°

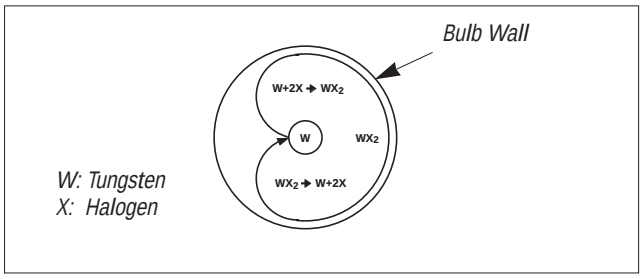


Tungsten Halogen Principle

The tungsten filament is enclosed in a gas filled quartz bulb, together with a controlled quantity of halogen. At the operating temperature some tungsten vapourizes and migrates to the cooler areas of the bulb wall where before it can be deposited, it combines with the halogen to form a tungsten halide. This circulates until it comes near the filament where the halide dissociates and deposits the tungsten back on the filament. This cycle continues throughout the operating life of the lamp.

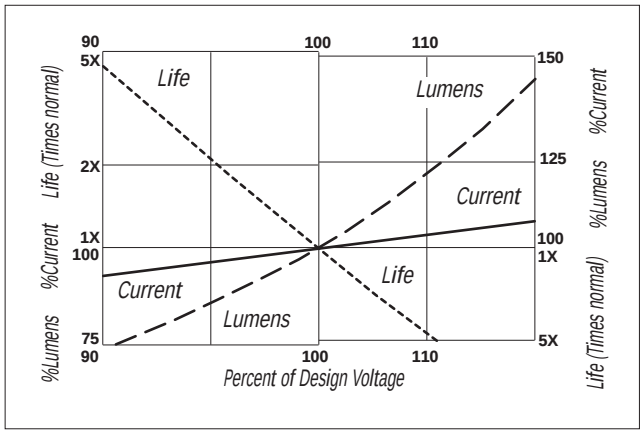
As the bulb wall remains clean the bulb size can be reduced considerably by the use of quartz which can withstand the high wall temperatures.

The small bulb and strong materials withstand much higher working pressures, this reduces filament evaporation, thus offering increased performance either as more light or longer life.



Light, Life & Voltage

For any particular lamp, the light output and life depend upon the voltage at which a lamp is operated. For instance, as approximations, the light output varies as the 3.6th power of the voltage and the life varies inversely as the 12th power of the voltage. The Chart and Tables below illustrate the effects of overvoltage or undervoltage applied to lamp on its current, life and light output. The values given (except for long life lamps) are reasonably valid between 95% and 110% rated volts.



Beyond this range the indicated characteristics may not be realised because of the increasing influence of factors which cannot be incorporated into the chart. The chart applies only to D.C. or sine-wave A.C. current. The data may differ particularly for lamp operation on half-wave rectified voltage, semiconductor dimming devices of constant operation.

Underrated Bulb Voltages (<100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
99	99.4	96.5	112.8
98	98.9	93.2	127.4
97	98.3	89.9	144.1
96	97.8	86.7	163.2
95	97.2	83.6	185.1
90	94.4	69.2	354.1

Overrated Bulb Voltages (>100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
101	100.5	103.5	88.7
102	101.1	107.2	79.8
103	101.6	110.9	70.1
104	102.2	114.7	62.5
105	102.7	118.6	55.7
110	105.4	139.6	31.9

Tungsten Halogen Lamps & UV Radiation

Under normal use, there is no risk to humans of damage to the skin such as sunburn. For example, in typical office applications, the exposure to ultra violet light during an 8 hour day is equivalent to 10 minutes in the summer sun. For tungsten halogen lamps, the amount of ultra violet and the extent of damage it can do to the skin depends on:
— how powerful the lamp is,
— how close you are to the lamp,
— how long you are close to the lamp.

For desk fittings, if the fitting or lamp has no glass shield move the lamp/fitting away from skin. Doubling the distance reduces the UV effect by a quarter. GE Lighting advise that cover glass lamps should always be used for desk type fittings.

IEC Standards

GE tungsten halogen lamps comply with the following international and British Standards where applicable:
IEC 357 & BS 1075 Tungsten Halogen Lamps,
IEC 61 & BS 51001 Lamp Caps & Holders.

Precise™ ConstantColor™ MR16

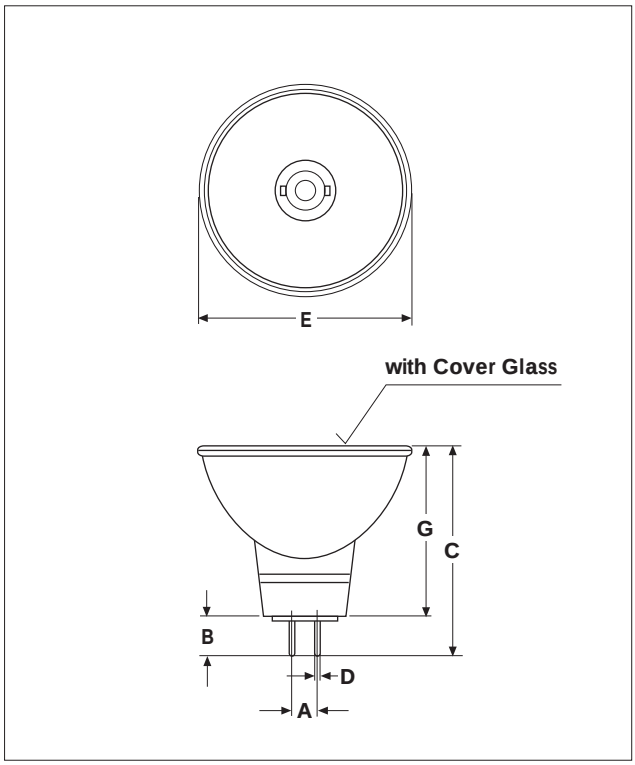
Precise™ ConstantColor™ MR16 50mm ø Dichroic Mirror Halogen Lamps 20W, 35W, 50W, 71W

Description

Precise™ MR16 lamps are low voltage tungsten halogen reflector-mounted lamps popular for downlighting and accent lighting applications because of their small size, precise beam control, high efficacy, excellent white light and cool beam characteristics.
Precise™ MR16 lamp comprises a small halogen low voltage filament capsule permanently cemented into a one-piece, dichroic coated all glass reflector. The computer designed multi-faceted reflector produces a “precise” beam pattern with excellent uniformity and sharp beam cut-off. The reflector is ellipsoidal in shape. The filament is precisely aligned along the optical axis of the reflector during the manufacturing process to achieve the required beam pattern. Beam patterns range from very narrow spots to wide floods.
The Cover glass (closed) versions incorporate an integral clear lens to ensure that both bulb and reflector are protected from dust and dirt during installation and operation. The cover glass effectively eliminates UV-C radiation and greatly reduces UV-B radiation. The use of Cover glass together with specially developed UV control quartz material for the capsule results in almost no UV-B or UV-C radiation. They use the same reflectors as the open versions – and hence have the same dimensions, allowing users to interchange lamps at will.

ConstantColor™ Coating

The application of GE Thin Film Technology is designed to maintain consistent colour throughout life. The durable tantala and silica oxides can withstand temperatures of 500°C without degradation over a rated life of up to 5000 hours on 20, 35 and 50W lamps and 4000 hours on 71W lamps. Because this coating will not degrade over life, a high level of lumen maintenance is achieved throughout lamp life. Normal dichroic coatings can lose as much as 50% of lumen maintenance over life as non-durable coatings degrade. This ensures that light colouration is the same from lamp to lamp.
Because the coating is applied to the inside and the outside of the reflector, a reduced quantity of light is wasted out the back of the lamp. The light that does escape through the reflector is a consistent hue which will not vary from lamp to lamp through life ensuring replacements do not appear different from existing lamps.
The ConstantColor™ interference film still allows 66% of the infra-red heat to pass through the back of the reflector to ensure a cool beam is achieved while reflecting forward almost 100% of the visible light.



Dimensions (mm)

	A	B	C	D	E	F	G
Closed bulb							
MIN.	–	*6.1*	–	*1.45*	*49.4*	–	*36.83*
AVE.	*5.33*	–	–	–	–	–	–
MAX.	–	*7.62*	*50.5*	*1.60*	*50.7*	*4.5*	*37.72*

Technical Data

Burning Position: any

Order Code	Watts	Volts	Max. Length (mm)	Max. Diameter (mm)	Peak Intensity (CD)	Beam Spread (°)	Colour Temp. (K)	Rated Avrg. Life (h)
Bulb: clear, closed, Cap: GX5.3								
ESX/CG	20	12	50.5	50.7	3250	13	2900	5000
BAB/CG	20	12	50.5	50.7	500	40	2900	5000
FRA/CG	35	12	50.5	50.7	3400	20	3000	5000
FMW/CG	35	12	50.5	50.7	925	40	3000	5 000
EXT/CG	50	12	50.5	50.7	9000	14	3050	5000
EXZ/CG	50	12	50.5	50.7	2700	25	3050	5000
EXN/CG	50	12	50.5	50.7	1600	40	3050	5000
FNV/CG	50	12	50.5	50.7	850	55	3050	5000
EYF/CG	71	12	50.5	50.7	11200	14	3050	4000
EYJ/CG	71	12	50.5	50.7	4560	25	3050	4000
EYC/CG	71	12	50.5	50.7	1950	42	3050	4000

Operation and Maintenance

- Low voltage tungsten-halogen lamps are sensitive to voltage variations. Even a small change in voltage can have a considerable impact on lamp life (see “Light, Life & Voltage”). Designers should match fitting transformer ratings to actual mains line voltages to ensure that the lamps operate at as close to 12V as possible.
- Rapid cycling can also shorten lamp life, and designers should take advice from their GE Lighting representative before using these lamps in flashing or blinking applications.
- The lamps may be dimmed by reducing voltage. However, this may cause the bulbs to blacken. If this occurs the lamp should be run at full voltage (12V) for fifteen minutes, thereby clearing the problem. Note that the nature of low voltage lighting systems requires the use of fluorescent-type dimmers.
- Switch off mains supply before installing / removing lamp.
- Fuse is essential in circuit.
- Observe temperature tolerances: pinch seal, max. 350°C, bulb wall min. 250°C.
- Lamps should be free from contamination, including finger marks, before lamp is operated. Lamps can be cleaned with a soft cloth moistened with alcohol.
- Good condition of the lampholder contacts is essential.
- Bulb wall temperatures are high and therefore lamps should not be operated in flammable atmospheres unless enclosed in suitably rated luminaires.
- Ensure lamp is cool before removing.

Cool Pinch

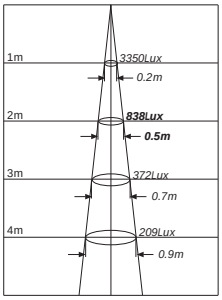
Innovative design of all GE dichroic mirror lamps has created a range with probably the lowest pinch temperature of any comparable lamp. A cool pinch temperature enables sealed lamps to be used in luminaires designed for open lamps. Excessive pinch seal temperature causes premature lamp failure: the maximum permissible pinch temperature is 350 °C.

Performance Cones

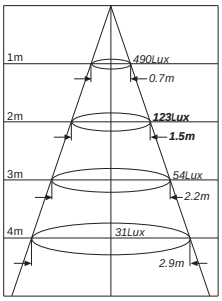
All GE reflector lamps have a performance cone. This is to help achieve the most effective spread and level of illumination by showing the lamp power, beam spread and mounting distance of each lamp.

A performance cone is a visual indicator of the angle at which the intensity of a beam produced by a reflector is at 50% of its peak. The cone shows the angle, the level of peak illuminance (lux) and the beam diameter for planes at right angles at various distances (m) from the lamps. The bold type at 2m serves as a benchmark for at a glance comparison of respective beam diameter and lux for different lamps.

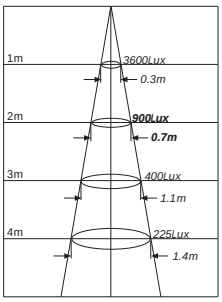
ESX/CG 20W 13°



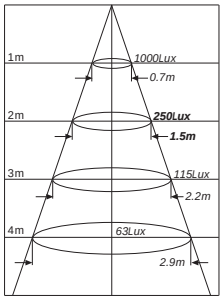
BAB/CG 20W 40°



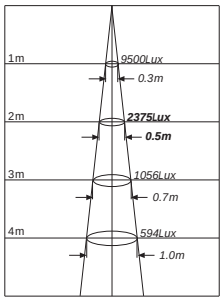
FRA/CG 35W 20°



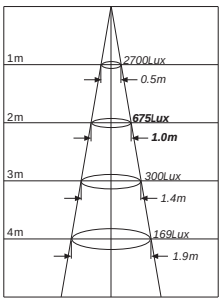
FMW/CG 35W 40°



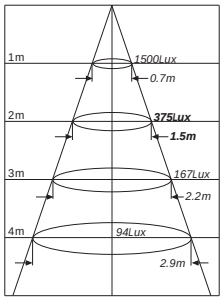
EXT/CG 50W 14°



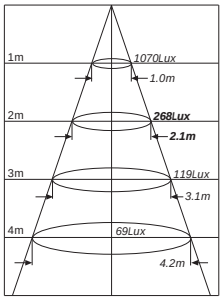
EXZ/CG 50W 25°



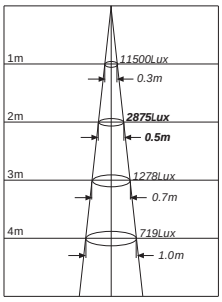
EXN/CG 50W 40°



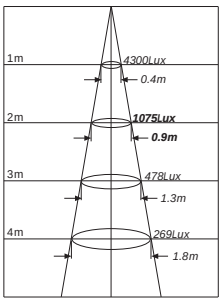
FNV/CG 50W 55°



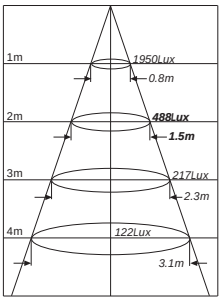
EYF/CG 71W 14°



EYJ/CG 71W 25°



EYC/CG 71W 42°



Tungsten Halogen Principle

The tungsten filament is enclosed in a gas filled quartz bulb, together with a controlled quantity of halogen. At the operating temperature some tungsten vapourizes and migrates to the cooler areas of the bulb wall where before it can be deposited, it combines with the halogen to form a tungsten halide. This circulates until it comes near the filament where the halide dissociates and deposits the tungsten back on the filament. This cycle continues throughout the operating life of the lamp.

As the bulb wall remains clean the bulb size can be reduced considerably by the use of quartz which can withstand the high wall temperatures.

The small bulb and strong materials withstand much higher working pressures and the increased gas density. This reduces filament evaporation, thus offering increased performance either as more light or longer life.

Light, Life & Voltage

For any particular lamp, the light output and life depend upon the voltage at which a lamp is operated. For instance, as approximations, the light output varies as the 3.6th power of the voltage and the life varies inversely as the 12th power of the voltage. The Chart and Tables below illustrate the effects of overvoltage or undervoltage applied to lamp on its current, life and light output. The values given (except for long life lamps) are reasonably valid between 95% and 110% rated volts.

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Tungsten Halogen Lamps & UV Radiation

Potentially harmful high energy UV-C and UV-B radiation emitted by the filament are absorbed by the wall of the capsule which is produced with specially developed “UV Control” quartz. The use of UV control quartz together with an optically neutral front cover glass allows the lamp to fully comply with the latest stringent requirements of IEC 357.

IEC Standards

GE tungsten halogen lamps comply with the following international and British Standards where applicable:

IEC 357 & BS 1075 Tungsten Halogen Lamps,
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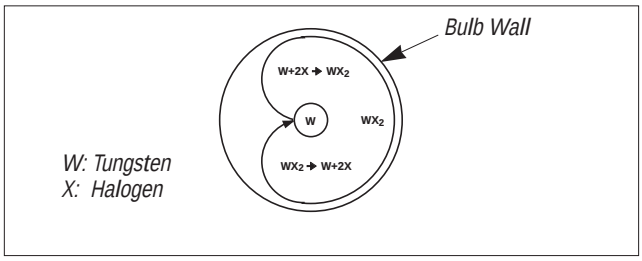

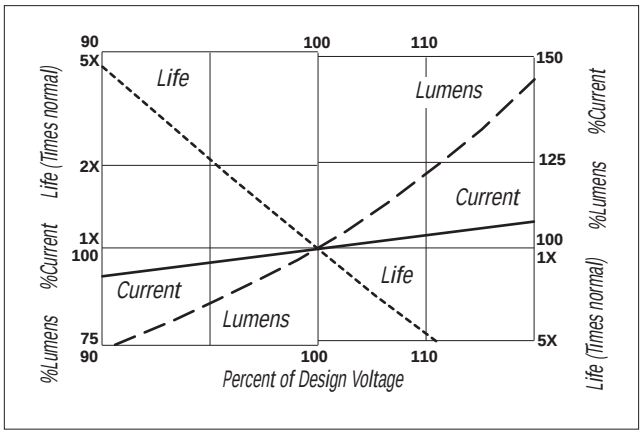

Underrated Bulb Voltages (<100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
99	99.4	96.5	112.8
98	98.9	93.2	127.4
97	98.3	89.9	144.1
96	97.8	86.7	163.2
95	97.2	83.6	185.1
90	94.4	69.2	354.1

Overrated Bulb Voltages (>100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
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104	102.2	114.7	62.5
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Precise™ Bright MR16

Precise™ Bright MR16
50mm ø Dichroic Mirror Halogen Lamps
20W, 35W, 50W

Description

Precise™ Bright MR16 lamps are low voltage tungsten halogen reflector-mounted lamps popular for downlighting and accent lighting applications because of their small size, precise beam control, high efficacy, excellent white light and cool beam characteristics.

A Precise™ Bright MR16 lamp comprises a small halogen low voltage filament capsule produced with UV control quartz permanently cemented into a one-piece, dichroic coated all glass reflector. The computer designed multi-faceted reflector produces a “precise” beam pattern with excellent uniformity and sharp beam cut-off. The reflector is ellipsoidal in shape. The filament is precisely aligned along the optical axis of the reflector during the manufacturing process to achieve the required beam pattern. Beam patterns range from very narrow spots to wide floods.

The Cover Glass (closed) versions incorporate an integral clear lens to ensure that both bulb and reflector are protected from dust and dirt during installation and operation. The cover glass effectively eliminates UV-C radiation and greatly reduces UV-B radiation. The use of the Cover glass together with specially developed UV control quartz material for the capsule results in almost no UV-B or UV-C radiation. They use the same reflectors as the open versions – and hence have the same dimensions, allowing users to interchange lamps at will.

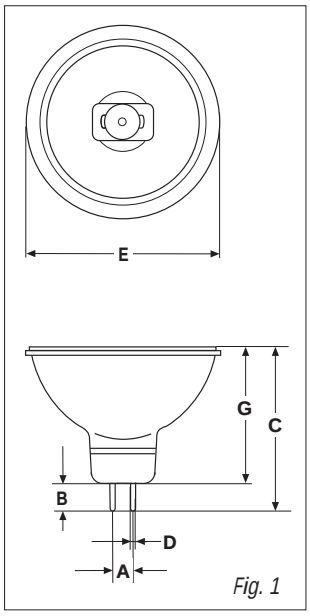

Fig. 1

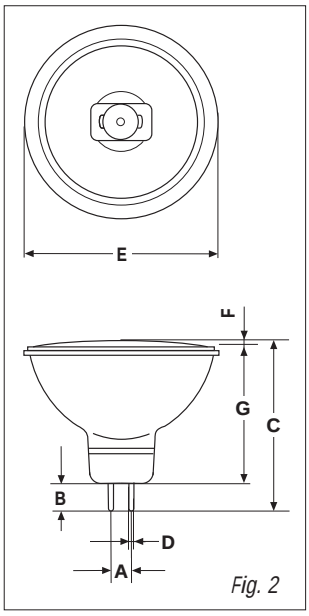

Fig. 2

Dimensions (mm)

	A	*B*	*C*	*D*	*E*	*F*	*G*
Open bulb *– Fig. 1*							
MIN.	*–*	*6.1*	*–*	*1.45*	*49.4*	*–*	*36.8*
AVE.	*5.3*	*–*	*–*	*–*	*–*	*–*	*–*
MAX.	*–*	*7.6*	*46.0*	*1.60*	*50.7*	*–*	*37.7*
Closed bulb *– Fig. 2*							
MIN.	*–*	*6.1*	*–*	*1.45*	*49.4*	*–*	*36.8*
AVE.	*5.3*	*–*	*–*	*–*	*–*	*–*	*–*
MAX.	*–*	*7.6*	*46.0*	*1.60*	*50.7*	*1.5*	*37.7*

Technical Data

Burning Position: any

Order Code	Watts	Volts	Max. Length (mm)	Max. Diameter (mm)	Peak Intensity (CD)	Beam Spread (°)	Colour Temp. (K)	Rated Avrg. Life (h)
Bulb: clear, open, Cap: GU5.3 – Fig. 1								
M94/BBF	20	12	46.0	50.7	2800	24	3000	4000
M69/BAB	20	12	46.0	50.7	500	36	3000	4000
M70/FRA	35	12	46.0	50.7	3660	24	3000	4000
M81/FMW	35	12	46.0	50.7	1620	36	3000	4000
M50/EXZ	50	12	46.0	50.7	5920	24	3000	4000
M58/EXN	50	12	46.0	50.7	2600	36	3000	4000
M80/FNV	50	12	46.0	50.7	1190	60	3000	4000
Bulb: clear, closed, Cap: GU5.3 – Fig. 2								
M268/ESX/CG	20	12	50.5	50.7	6000	8	3000	4000
M294/BBF/CG	20	12	50.5	50.7	2200	24	3000	4000
M269/BAB/CG	20	12	50.5	50.7	450	36	3000	4000
M270/FRA/CG	35	12	50.5	50.7	2950	24	3000	4000
M281/FMW/CG	35	12	50.5	50.7	1300	36	3000	4000
M249/EXT/CG	50	12	50.5	50.7	10100	8	3000	4000
M250/EXZ/CG	50	12	50.5	50.7	4750	24	3000	4000
M258/EXN/CG	50	12	50.5	50.7	2150	36	3000	4000
M280/FNV/CG	50	12	50.5	50.7	950	60	3000	4000

Operation and Maintenance

- Low voltage tungsten-halogen lamps are sensitive to voltage variations. Even a small change in voltage can have a considerable impact on lamp life (see “Light, Life & Voltage”). Designers should match fitting transformer ratings to actual mains line voltages to ensure that the lamps operate at as close to 12V as possible.
- Rapid cycling can also shorten lamp life, and designers should take advice from their GE Lighting representative before using these lamps in flashing or blinking applications.
- The lamps may be dimmed by reducing voltage. However, this may cause the bulbs to blacken. If this occurs the lamp should be run at full voltage (12V) for fifteen minutes, thereby clearing the problem. Note that the nature of low voltage lighting systems requires the use of fluorescent-type dimmers.
- Switch off mains supply before installing/removing lamp.
- Fuse is essential in circuit.
- Observe temperature tolerances: pinch seal, max. 350°C, bulb wall min. 250°C.
- Lamps should be free from contamination, including finger marks, before lamp is operated. Lamps can be cleaned with a soft cloth moistened with alcohol.
- Good condition of the lampholder contacts is essential.
- Bulb wall temperatures are high and therefore lamps should not be operated in flammable atmospheres unless enclosed in suitably rated luminaires.
- Ensure lamp is cool before removing.
- Open lamps should only be used within a luminaire with a protective shield.

Cool Pinch

Innovative design of all GE dichroic mirror lamps has created a range with probably the lowest pinch temperature of any comparable lamp. A cool pinch temperature enables sealed lamps to be used in luminaires designed for open lamps. Excessive pinch seal temperature causes premature lamp failure: the maximum permissible pinch temperature is 350°C.

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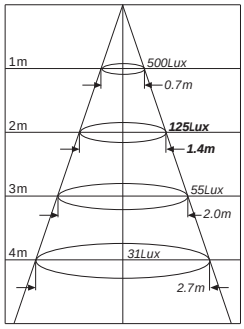
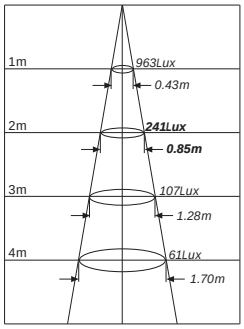
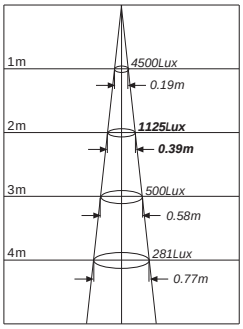
M69/BAB Open 20W 36°



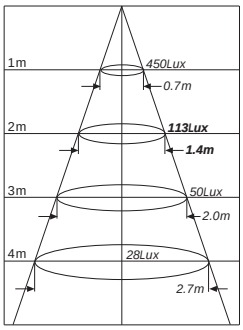
M94/BBF Open 20W 24°



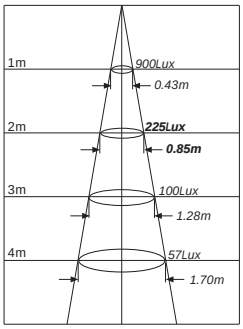
M268/ESX/CG Closed 20W 8°



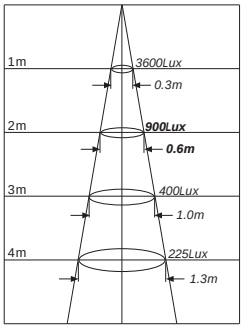
M269/BAB/CG Closed 20W 36°



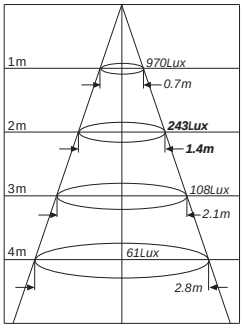
M294/BBF/CG Closed 20W 24°



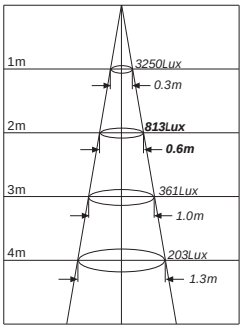
M70/FRA Open 35W 24°



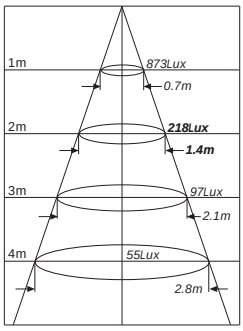
M81/FMW Open 35W 36°



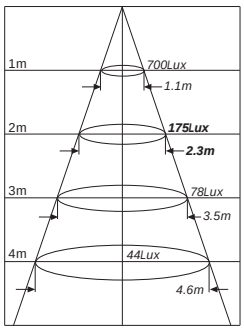
M270/FRA/CG Closed 35W 24°



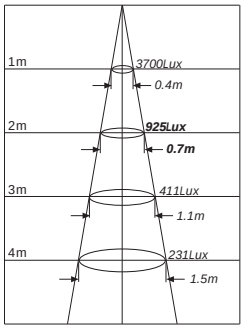
M281/FMW/CG Closed 35W 36°



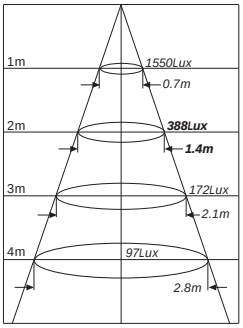
M80/FNV Open 50W 60°



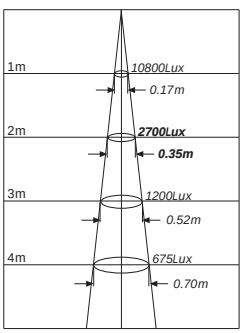
M50/EXZ Open 50W 24°



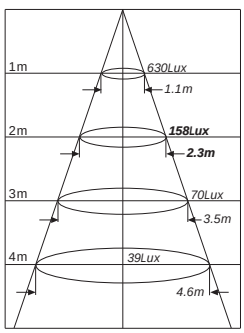
M58/EXN Open 50W 36°



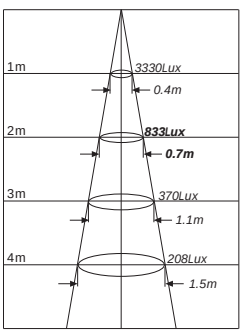
M249/EXT/CG Closed 50W 8°



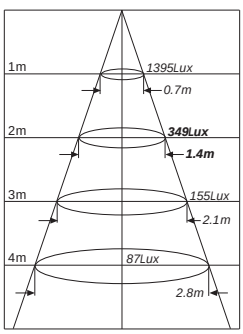
M280/FNV/CG Closed 50W 60°



M250/EXZ/CG Closed 50W 24°



M258/EXN/CG Closed 50W 36°



Note: The above cone angles are pending review.

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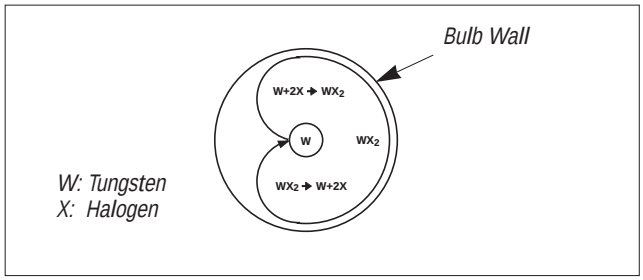

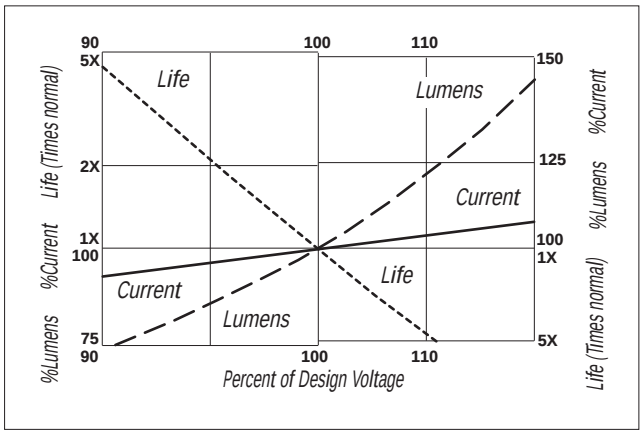

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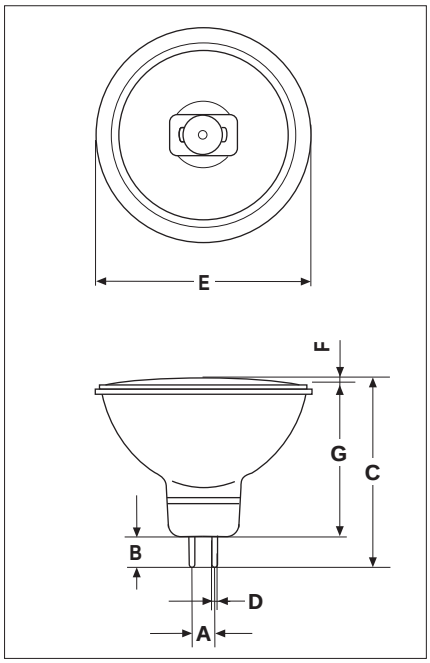
Precise™ Alutech™ MR16

Precise™ Alutech™ MR16
50mm ø Aluminised Mirror Halogen Lamps
20W, 35W, 50W

Description

Aluminised Precise™ Alutech™ MR16 lamps are low voltage tungsten halogen reflector-mounted lamps popular for downlighting and accent lighting applications because of their small size, precise beam control, high efficacy and excellent white light.
Their aluminised mirror directs both visible and infra-red components of emitted light forward preventing the overheating of lampholders and transformers behind them.
An Aluminised Precise™ Alutech™ MR16 lamp comprises a small halogen low voltage filament capsule produced with UV control quartz permanently cemented into a one-piece, aluminium coated all glass reflector. The reflector design produces a precise beam pattern with excellent uniformity and sharp beam cut-off. The reflector is ellipsoidal in shape. The filament is precisely aligned along the optical axis of the reflector during the manufacturing process to achieve the required beam pattern.
These lamps incorporate an integral clear Cover glass to ensure that both bulb and reflector are protected from dust and dirt during installation and operation. The cover glass effectively eliminates UV-C radiation and greatly reduces UV-B radiation. The use of the Cover Glass together with specially developed UV control quartz material for the capsule results in almost no UV-B or UV-C radiation.



IEC Standards

GE tungsten halogen lamps comply with the following international and British Standards where applicable:
IEC 357 & BS 1075 Tungsten Halogen Lamps,
IEC 61 & BS 51001 Lamp Caps & Holders.

Dimensions (mm)

	A	B	C	D	E	F	G
MIN.	–	6.1	–	1.45	49.4	–	36.8
AVE.	5.3	–	–	–	–	–	–
MAX.	–	7.6	46.0	1.60	50.7	1.5	37.7

Technical Data

Burning Position: any

Order Code	Watts	Volts	Max. Length (mm)	Max. Diameter (mm)	Peak Intensity (CD)	Beam Spread (°)	Colour Temp. (K) (h)	Rated Avrg. Life
Bulb: aluminized, closed, Cap: GU5.3								
M269/BAB/CG/AL	20	12	50.5	50.7	450	36	3000	3000
M281/FMW/CG/AL	35	12	50.5	50.7	1300	36	3000	3000
M258/EXN/CG/AL	50	12	50.5	50.7	1800	36	3000	3000
M280/FNV/CG/AL	50	12	50.5	50.7	700	60	3000	3000

Tungsten Halogen Principle

The tungsten filament is enclosed in a gas filled quartz bulb, together with a controlled quantity of halogen. At the operating temperature some tungsten vapourizes and migrates to the cooler areas of the bulb wall where before it can be deposited, it combines with the halogen to form a tungsten halide. This circulates until it comes near the filament where the halide dissociates and deposits the tungsten back on the filament. This cycle continues throughout the operating life of the lamp.
As the bulb wall remains clean the bulb size can be reduced considerably by the use of quartz which can withstand the high wall temperatures.
The small bulb and strong materials withstand much higher working pressures, this reduces filament evaporation, thus offering increased performance either as more light or longer life.

Light, Life & Voltage

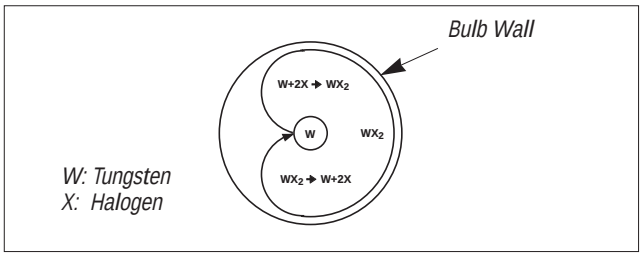
For any particular lamp, the light output and life depend upon the voltage at which a lamp is operated. For instance, as approximations, the light output varies as the 3.6th power of the voltage and the life varies inversely as the 12th power of the voltage. The Chart and Tables below illustrate the effects of overvoltage or undervoltage applied to lamp on its current, life and light output. The values given (except for long life lamps) are reasonably valid between 95% and 110% rated volts.
Beyond this range the indicated characteristics may not be realised because of the increasing influence of factors which cannot be incorporated into the chart. The chart applies only to D.C. or sine-wave A.C. current. The data may differ particularly for lamp operation on half-wave rectified voltage, semiconductor dimming devices of constant operation.

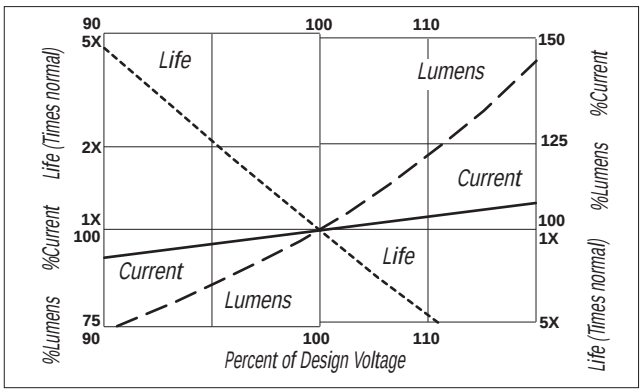
Tungsten Halogen Lamps & UV Radiation

Potentially harmful high energy UV-C and UV-B radiation emitted by the filament are absorbed by the wall of the capsule which is produced with specially developed “UV Control” quartz. The use of UV control quartz together with an optically neutral front cover glass allows the lamp to fully comply with the latest stringent requirements of IEC 357.

Operation and Maintenance

- Low voltage tungsten-halogen lamps are sensitive to voltage variations. Even a small change in voltage can have a considerable impact on lamp life (see “Light, Life & Voltage”). Designers should match fitting transformer ratings to actual mains line voltages to ensure that the lamps operate at as close to 12V as possible.
- Rapid cycling can also shorten lamp life, and designers should take advice from their GE Lighting representative before using these lamps in flashing or blinking applications.
- The lamps may be dimmed by reducing voltage. However, this may cause the bulbs to blacken. If this occurs the lamp should be run at full voltage (12V) for fifteen minutes, thereby clearing the problem. Note that the nature of low voltage lighting systems requires the use of fluorescent-type dimmers.





Underrated Bulb Voltages (<100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
99	99.4	96.5	112.8
98	98.9	93.2	127.4
97	98.3	89.9	144.1
96	97.8	86.7	163.2
95	97.2	83.6	185.1
90	94.4	69.2	354.1

Overrated Bulb Voltages (>100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
101	100.5	103.5	88.7
102	101.1	107.2	79.8
103	101.6	110.9	70.1
104	102.2	114.7	62.5
105	102.7	118.6	55.7
110	105.4	139.6	31.9

- Switch off mains supply before installing/removing lamp.
- Fuse is essential in circuit.
- Observe temperature tolerances: pinch seal, max. 350°C, bulb wall min. 250°C.
- Lamps should be free from contamination, including finger marks, before lamp is operated. Lamps can be cleaned with a soft cloth moistened with alcohol.
- Good condition of the lampholder contacts is essential.
- Bulb wall temperatures are high and therefore lamps should not be operated in flammable atmospheres unless enclosed in suitably rated luminaires.
- Ensure lamp is cool before removing.

Cool Pinch

Innovative design of all GE dichroic mirror lamps has created a range with probably the lowest pinch temperature of any comparable lamp. A cool pinch temperature enables sealed lamps to be used in luminaires designed for open lamps. Excessive pinch seal temperature causes premature lamp failure: the maximum permissible pinch temperature is 350°C.

TAL 50

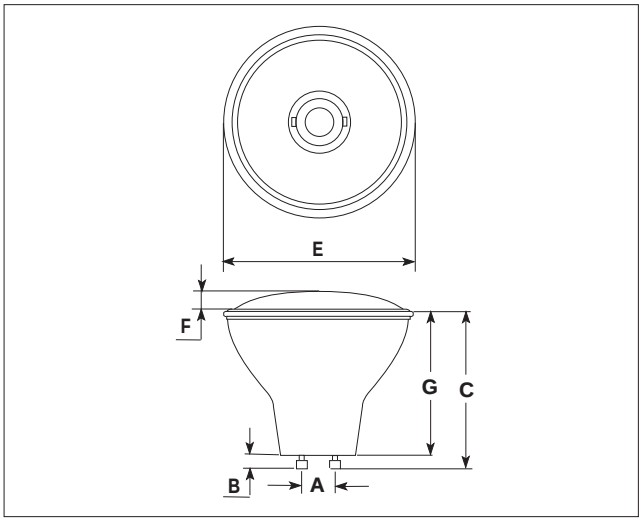
Twist And Lock
TAL 50 ConstantColor™
50mm ø Dichroic Mirror Halogen Lamps
20W, 35W, 50W

Description

TAL 50 lamps are low voltage tungsten halogen reflector-mounted lamps popular for downlighting and accent lighting applications because of their small size, precise beam control, high efficacy, excellent white light and cool beam characteristics.

A TAL 50 lamp comprises a small halogen low voltage filament capsule permanently cemented into a one-piece, dichroic coated all glass reflector. The patented Multi-Mirror™ reflector design produces a “precise” beam pattern with excellent uniformity and sharp beam cut-off. The reflector is ellipsoidal in shape. The filament is precisely aligned along the optical axis of the reflector during the manufacturing process to achieve the required beam pattern. Beam patterns range from very narrow spots to wide floods.

TAL 50 lamps incorporate an integral clear Cover Glass to ensure that both bulb and reflector are protected from dust and dirt during installation and operation. The cover glass effectively eliminates UV-C radiation and greatly reduces UV-B radiation.



Dimensions (mm)

	A	B	C	E	F	G
MIN.	–	5.0	–	49.4	–	–
AVE.	7.00	–	–	–	–	39.0
MAX.	–	5.4	46.0	50.7	4.5	–

Technical Data

Burning Position: any

Order Code	Watts	Volts	Max. Length (mm)	Max. Diameter (mm)	Peak Intensity (CD)	Beam Spread (°)	Colour Temp. (K)	Rated Avrg. Life (h)
Bulb: clear, closed, Cap: GU7								
TAL 414	20	12	50.5	50.7	4500	11	2900	3500
TAL 415	20	12	50.5	50.7	900	24	2900	3500
TAL 416	20	12	50.5	50.7	450	36	2900	3500
TAL 417	35	12	50.5	50.7	8100	8	2900	3500
TAL 418	35	12	50.5	50.7	3240	18	2900	3500
TAL 419	35	12	50.5	50.7	873	38	2900	3500
TAL 420	50	12	50.5	50.7	10800	10	2900	3500
TAL 421	50	12	50.5	50.7	3330	21	2900	3500
TAL 422	50	12	50.5	50.7	1395	38	2900	3500
TAL 423	50	12	50.5	50.7	630	60	2900	3500

Twist And Lock Principle

Mirror lamps, originally made for projectors, were designed to be mechanically supported at their front rim. The lamp's pins were intended only for electrical connection to a simple lampholder.
In display lighting applications, however, the lamps are often held by the pins alone and this has proved to be not only bad engineering practice but also to contravene electrical safety standards as recognised in IEC Standards (unless specifically designed for such purpose). To remedy these shortcomings GE Lighting first introduced a lamp with a patented slot in its base and a lampholder whose springs latched into the slot thus securing the lamp mechanically. These features have been adopted by IEC Standards and the improved lamp and lampholder have the designation GU5.3 and GU4.
Twist And Lock goes one step further. Twist And Lock describes exactly the movement required to mount the lamp onto the holder.

With TAL there is no need for force and trial and error is eliminated. The circular lampbase is guided into position and the pillars naturally find the keyhole entries. Risk of partial electrical contact is reduced since contact can only be made once mechanical lock is achieved. The generously sized TAL pillars offer greater contact area and thus improved electrical reliability. The sturdy construction of the TAL base also offers greater mechanical retention.

ConstantColor™ Coating

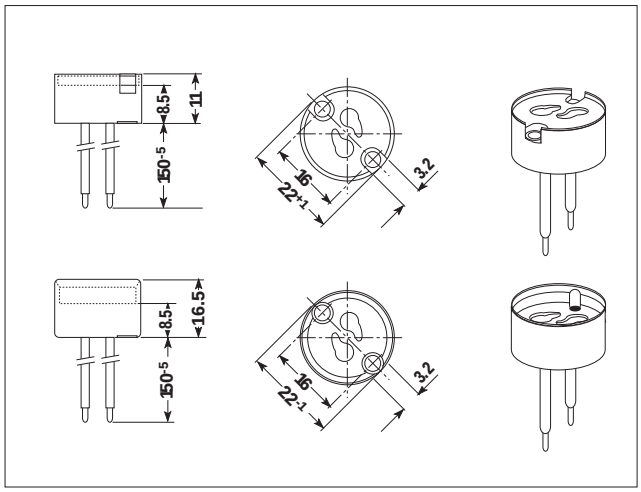
The application of GE Thin Film Technology is designed to maintain consistent colour throughout life. The durable tantala and silica oxides can withstand temperatures of 500 degrees C without degradation over a rated life of up to 3500 hours on TAL lamps. Because this coating will not degrade over life, a high level of lumen maintenance is achieved throughout lamp life. Normal dichroic coatings can lose as much as 50% of lumen maintenance over life as non-durable coatings degrade.

Because the coating is applied to the inside and the outside of the reflector, a reduced quantity of light is wasted out the back of the lamp. The light that does escape through the reflector is a consistent hue which will not vary from lamp to lamp through life ensuring replacements do not appear different from existing lamps.
The ConstantColor™ interference film still allows 66% of the infra-red heat to pass through the back of the reflector to ensure a cool beam is achieved while reflecting forward almost 100% of the visible light.

TAL Lampholder

TAL lamps are compatible with the BJB GL1252 lamp-holder. The standard holder has a 2.5mm rim to assist in guiding the lamp into the keyhole pathways. The second holder has a larger 8mm rim designed for recessed fittings where lamp insertion is more difficult.

The lampholder has a projected life of 12000 hours.



Description

Nickel contacts, steatite ceramic body, PTFE lead wire insulation. Lead: 1.0mm+ nickel plated copper. Lampholder rating 50V 10A. Universal operating position. Note: all lampholders are designed to operate with a maximum contact temperature of 250 degrees C. For lamp pinch temperature limits see IEC 357.

Holder	Lead Length (mm)
GL 1252BR2V/150	150
GL 1252BR2V/250	250
GL 1252BR8V/150	150
GL 1252BR8V/250	250

Cool Pinch

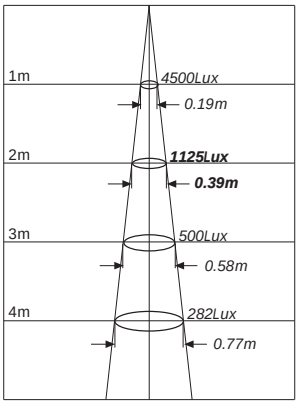
Innovative design of all GE dichroic mirror lamps has created a range with probably the lowest pinch temperature of any comparable lamp. A cool pinch temperature enables closed lamps to be used in luminaires designed for open lamps. Excessive pinch seal temperature causes premature lamp failure: the maximum permissible pinch temperature is 350 °C.

Performance Cones

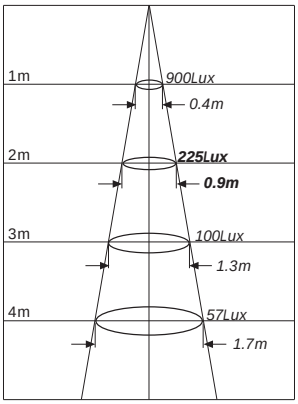
All GE reflector lamps have a performance cone. This is to help achieve the most effective spread and level of illumination by showing the lamp power, beam spread and mounting distance of each lamp.

A performance cone is a visual indicator of the angle at which the intensity of a beam produced by a reflector is at 50% of its peak. The cone shows the angle, the level of peak illuminance (lux) and the beam diameter for planes at right angles at various distances (m) from the lamps. The bold type at 2m serves as a benchmark for at a glance comparison of respective beam diameter and lux for different lamps.

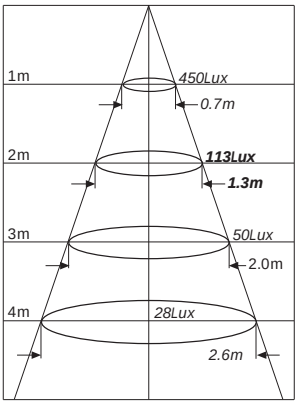
TAL 414 Closed 20W 11°



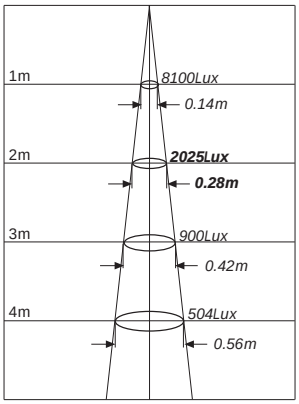
TAL 415 Closed 20W 24°



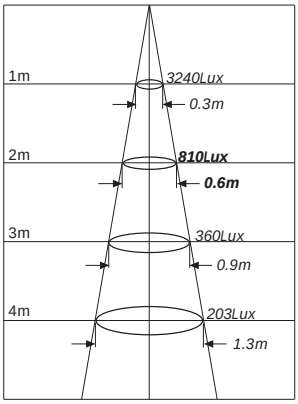
TAL 416 Closed 20W 36°



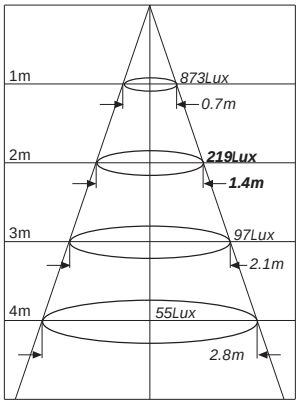
TAL 417 Closed 35W 8°



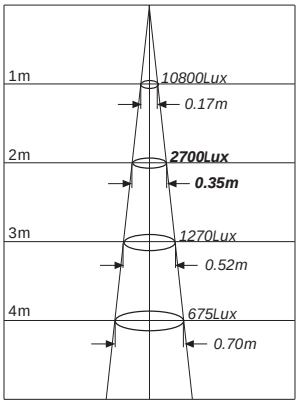
TAL 418 Closed 35W 18°



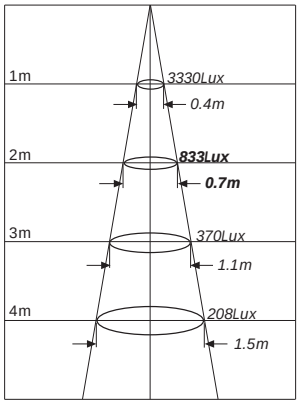
TAL 419 Closed 35W 38°



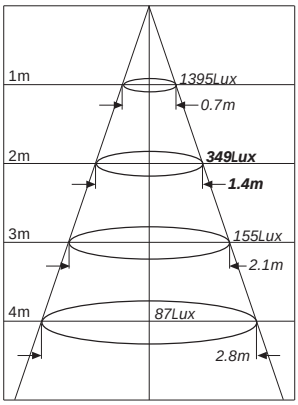
TAL 420 Closed 50W 10°



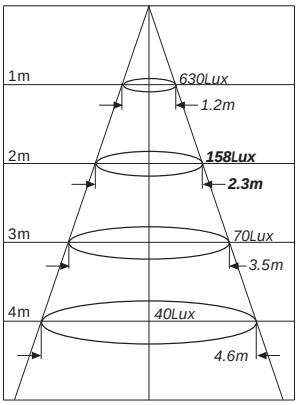
TAL 421 Closed 50W 21°



TAL 422 Closed 50W 38°



TAL 423 Closed 50W 60°



Tungsten Halogen Principle

The tungsten filament is enclosed in a gas filled quartz bulb, together with a controlled quantity of halogen. At the operating temperature some tungsten vapourizes and migrates to the cooler areas of the bulb wall where before it can be deposited, it combines with the halogen to form a tungsten halide. This circulates until it comes near the filament where the halide dissociates and deposits the tungsten back on the filament. This cycle continues throughout the operating life of the lamp.
As the bulb wall remains clean the bulb size can be reduced considerably by the use of quartz which can withstand the high wall temperatures.
The small bulb and strong materials withstand much higher working pressures, this reduces filament evaporation, thus offering increased performance either as more light or longer life.

Light, Life & Voltage

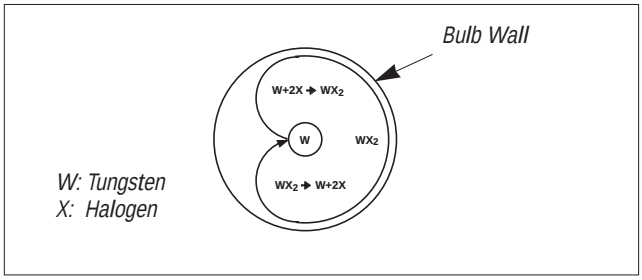
For any particular lamp, the light output and life depend upon the voltage at which a lamp is operated. For instance, as approximations, the light output varies as the 3.6th power of the voltage and the life varies inversely as the 12th power of the voltage. The Chart and Tables below illustrate the effects of overvoltage or undervoltage applied to lamp on its current, life and light output. The values given (except for long life lamps) are reasonably valid between 95% and 110% rated volts.
Beyond this range the indicated characteristics may not be realised because of the increasing influence of factors which cannot be incorporated into the chart. The chart applies only to D.C. or sine-wave A.C. current. The data may differ particularly for lamp operation on half-wave rectified voltage, semiconductor dimming devices of constant operation.

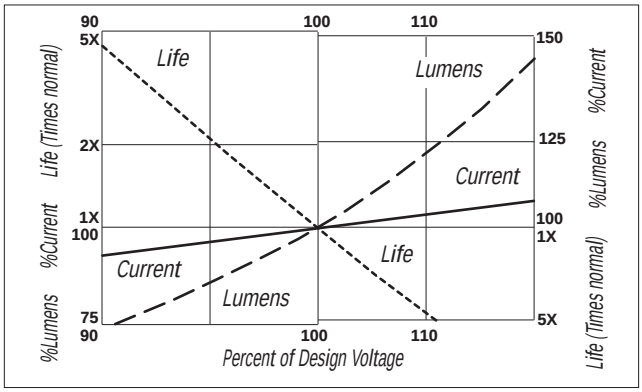
Tungsten Halogen Lamps & UV Radiation

Under normal use, there is no risk to humans of damage to the skin such as sunburn. For example, in typical office applications, the exposure to ultra violet light during an 8 hour day is equivalent to 10 minutes in the summer sun.
For tungsten halogen lamps, the amount of ultra violet and the extent of damage it can do to the skin depends on:
— how powerful the lamp is,
— how close you are to the lamp,
— how long you are close to the lamp.

Operation and Maintenance

- Low voltage tungsten-halogen lamps are sensitive to voltage variations. Even a small change in voltage can have a considerable impact on lamp life (see “Light, Life & Voltage”). Designers should match fitting transformer ratings to actual mains line voltages to ensure that the lamps operate at as close to 12V as possible.
- Rapid cycling can also shorten lamp life, and designers should take advice from their GE Lighting representative before using these lamps in flashing or blinking applications.
- The lamps may be dimmed by reducing voltage. However, this may cause the bulbs to blacken. If this occurs the lamp should be run at full voltage (12V) for fifteen minutes, thereby clearing the problem. Note that the nature of low voltage lighting systems requires the use of fluorescent-type dimmers.
- Switch off mains supply before installing/removing lamp.
- Fuse is essential in circuit.
- Observe temperature tolerances: pinch seal, max. 350°C, bulb wall min. 250°C.





Underrated Bulb Voltages (<100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
99	99.4	96.5	112.8
98	98.9	93.2	127.4
97	98.3	89.9	144.1
96	97.8	86.7	163.2
95	97.2	83.6	185.1
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Overrated Bulb Voltages (>100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
101	100.5	103.5	88.7
102	101.1	107.2	79.8
103	101.6	110.9	70.1
104	102.2	114.7	62.5
105	102.7	118.6	55.7
110	105.4	139.6	31.9

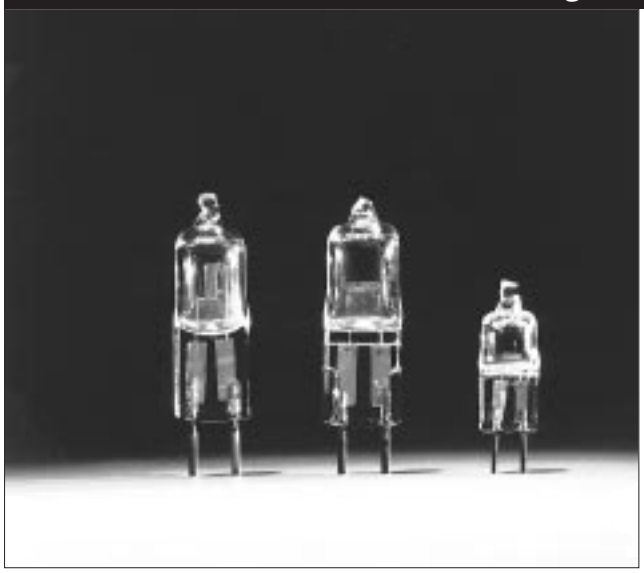
- Lamps should be free from contamination, including finger marks, before lamp is operated. Lamps can be cleaned with a soft cloth moistened with alcohol.
- Good condition of the lampholder contacts is essential.
- Bulb wall temperatures are high and therefore lamps should not be operated in flammable atmospheres unless enclosed in suitably rated luminaires.
- Ensure lamp is cool before removing.

IEC Standards

GE tungsten halogen lamps comply with the following international and British Standards where applicable:
IEC 357 & BS 1075 Tungsten Halogen Lamps,
IEC 61 & BS 51001 Lamp Caps & Holders.

UV-Control CeriTite™

Low Voltage Single Ended UV-Control CeriTite™ Halogen Lamps 10W, 20W, 35W, 50W, 75W, 100W



Description

These lamps are made from a new quartz material which blocks virtually all UV-B and UV-C radiation. With a transmission cut-off wavelength of between 350 and 400 nm, it is ideal for lamps requiring maximum visible transmittance with nearly complete UV protection.

The lamps use GE's patented leading edge technology of Cerium and Titanium doped quartz which is an effective barrier to potentially harmful ultra-violet radiation while maintaining the other high quality properties of standard clear fused quartz.

The axial filament types have been specifically developed to satisfy the demand for a wide smooth beam with a good cut-off, from a miniature linear reflector, for the uniform lighting of vertical surfaces, for table lamps for task lighting, or for wall mounted or portable uplighters. With all wattages having the axial filament at the same light centre, one luminaire design may cover a range of illuminances for a variety of residential and commercial requirements. When used in spot reflectors these lamps may also be more efficient alternatives to transverse filament types, because a substantial portion of the filament will always be in the focal point.

Features

- reduce bleaching to only third that of a conventional halogen lamp with the same luminous flux
- UV radiation falls below the international threshold values

Applications

- general lighting for residential and commercial purposes, especially illumination of light sensitive objects in shop-windows, galleries, museums, etc.

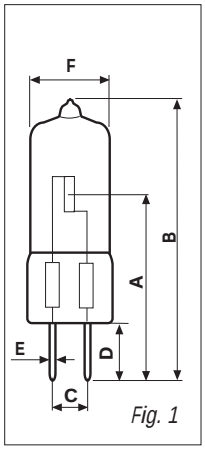


Fig. 1

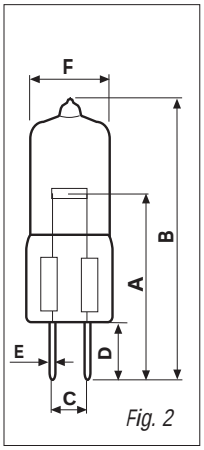


Fig. 2

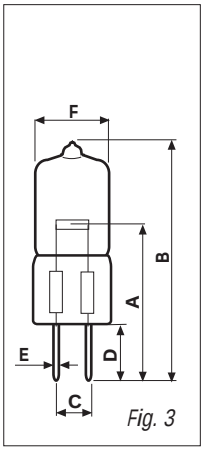


Fig. 3

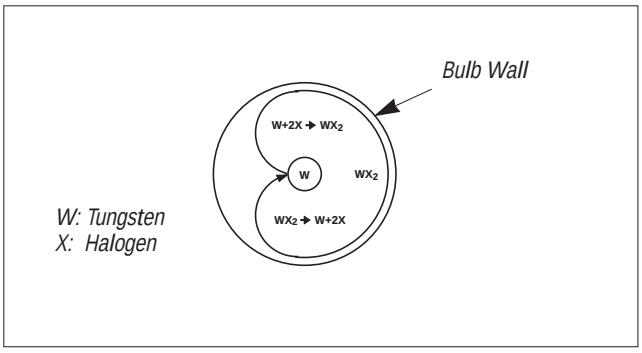
Dimensions (mm)

A	*B*	*C*	*D*	*E*	*F*
M76, M116, M75, M74, M73, M180 *– Cap: GY6.35 – Fig.1*					
30 ± 0.25	*44 MAX.*	*6.35 ± 0.25*	*7.5 MIN.*	*1.25*	*11 MAX.*
M312, M153, M95, M87, M32, M89, M313, M28, M67 *Cap: GY6.35 – Fig.2*					
30 ± 0.25	*44 MAX.*	*6.35 ± 0.25*	*7.5 MIN.*	*1.25*	*11 MAX.*
M29, M42, M30, M34, M47, M35 *– Cap: G4 – Fig. 3*					
19.5 ± 0.25	*32 MAX.*	*4 ± 0.25*	*7.5 MIN.*	*0.7*	*9 MAX*

Technical Data

Type	Watts	Volts	B max. Length (mm)	A LCL (mm)	F max. Diameter (mm)	Description	Average Lumens	Rated Average Life (h)	Fila-ment
Bulb: clear, Cap: GY6.35 – Fig. 1									
Burning position: any									
M76	20	12	44	30	11	Q20T3/12V GY6.35 3000HRS AXIAL	300	3000	axial
M116	35	6	44	30	11	Q35T3/6V GY6.35 2000HRS AXIAL	600	2000	axial
M75	35	12	44	30	11	Q35T3/12V GY6.35 3000HRS AXIAL	600	3000	axial
M74	50	12	44	30	11	Q50T3/12V GY6.35 3000HRS AXIAL	900	3000	axial
M73	75	12	44	30	11	Q75T3/12V GY6.35 3000HRS AXIAL	1350	3000	axial
M180	100	12	44	30	11	Q100T3/12V GY6.35 3000HRS AXIAL	2150	3000	axial
Bulb: clear, Cap: GY6.35 – Fig. 2									
Burning position: any									
M312	20	12	44	30	11	Q20T3/12V GY6.35 2000HRS	350	2000	transv.
M153	35	12	44	30	11	Q35T3/12V GY6.35 2000HRS	600	2000	transv.
M95	35	12	44	30	11	Q35T3/12V GY6.35 3000HRS	550	3000	transv.
M87	50	12	44	30	11	Q50T3/12V GY6.35 2000HRS	900	2000	transv.
M32	50	12	44	30	11	Q50T3/12V GY6.35 3000HRS	850	3000	transv.
M89	50	24	44	30	11	Q50T3/24V GY6.35 2000HRS	850	2000	transv.
M313	75	12	44	30	11	Q75T3/12V GY6.35 2000HRS	1330	2000	transv.
M28	100	12	44	30	11	Q100T3/12V GY6.35 2000HRS	2350	2000	transv.
M67	100	24	44	30	11	Q100T3/24V GY6.35 2000HRS	2000	2000	transv.
Bulb: clear, Cap: G4 – Fig. 2									
Burning position: any									
M29	10	6	32	19.5	9	Q10T2.5/6V G4 100HRS	200	100	transv.
M42	10	6	32	19.5	9	Q10T2.5/6V G4 2000HRS	140	2000	transv.
M30	20	6	32	19.5	9	Q20T2.5/6V G4 100HRS	440	100	transv.
M34	20	6	32	19.5	9	Q20T2.5/6V G4 2000HRS	350	2000	transv.
M47	20	12	32	19.5	9	Q20T2.5/12V G4 2000HRS	380	2000	transv.
M35	20	12	32	19.5	9	Q20T2.5/12V G4 250HRS	400	250	transv.

Tungsten Halogen Principle



The tungsten filament is enclosed in a gas filled quartz bulb, together with a controlled quantity of halogen. At the operating temperature some tungsten vapourizes and migrates to the cooler areas of the bulb wall where before it can be deposited, it combines with the halogen to form a tungsten halide. This circulates until it comes near the filament where the halide dissociates and deposits the tungsten back on the filament. This cycle continues throughout the operative life of the lamp.

As the bulb wall remains clean the bulb size can be reduced considerably by the use of quartz which can withstand the high wall temperatures.

The small bulb and strong materials withstand much higher working pressures and the increased gas density. This reduces filament evaporation, thus offering increased performance either as more light or longer life.

Light, Life & Voltage

For any particular lamp, the light output and life depend upon the voltage at which a lamp is operated. For instance, as approximations, the light output varies as the 3.6th power of the voltage and the life varies inversely as the 12th power of the voltage.

The Chart and Tables below illustrate the effects of overvoltage or undervoltage applied to lamp on its current, life and light output. The values given (except for long life lamps) are reasonably valid between 95% and 110% rated volts.

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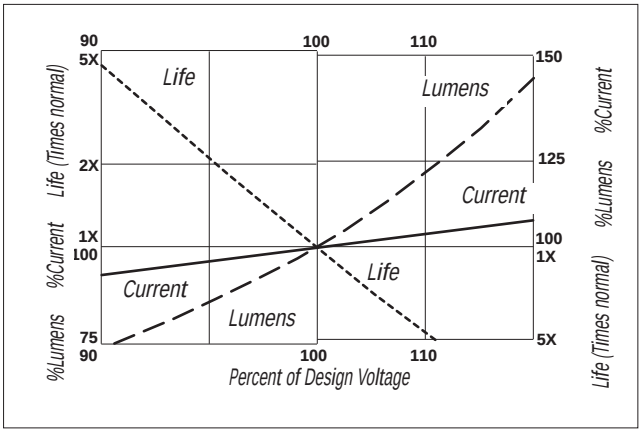


Underrated Bulb Voltages (<100%)

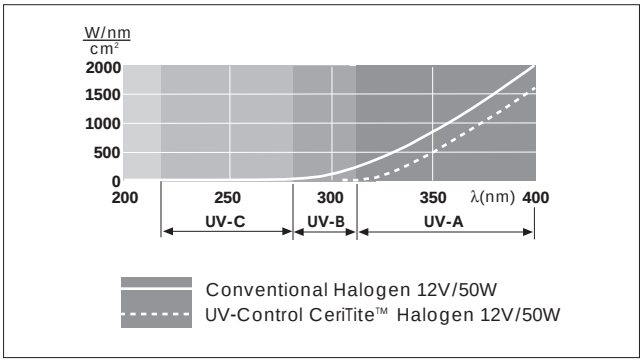
VOLTS %	AMPS %	LUMENS %	LIFE %
99	99.4	96.5	112.8
98	98.9	93.2	127.4
97	98.3	89.9	144.1
96	97.8	86.7	163.2
95	97.2	83.6	185.1
90	94.4	69.2	354.1

Overrated Bulb Voltages (>100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
101	100.5	103.5	88.7
102	101.1	107.2	79.8
103	101.6	110.9	70.1
104	102.2	114.7	62.5
105	102.7	118.6	55.7
110	105.4	139.6	31.9

UV Radiation

The new quartz material used for GE UV-Control CeriTite™ Halogen Lamps blocks virtually all UV-B and UV-C radiation (see the Chart below) and decreases the remaining UV radiation below the international standards (Erythem and NIOSH threshold values). E.g. the Erythem threshold value measured at a luminous intensity of 1000 lux (i.e. double of that needs for the typical office applications) determines the minimum time interval which could affect the human skin as sunburn. In case of GE UV-Control CeriTite™ Halogen Lamps, this value is about a 400 hour / day exposure to ultra-violet light at the threshold values. It means that even in case of very high illumination levels, the use of these lamps has no harmful effects to humans, at all.



Operation and Maintenance

- Fuse is essential in circuit.
- Observe temperature tolerances — pinch seal, max. 350 °C, bulb wall min. 250°C.
- Lamps should be free from contamination, including finger marks, before lamp is operated. Lamps can be cleaned with a soft cloth moistened with alcohol.
- Good condition of the lampholder contacts is essential.
- Bulb wall temperatures are high and therefore lamps should not be operated in flammable atmospheres unless enclosed in suitably rated luminaires.
- Ensure lamp is cool before removing.

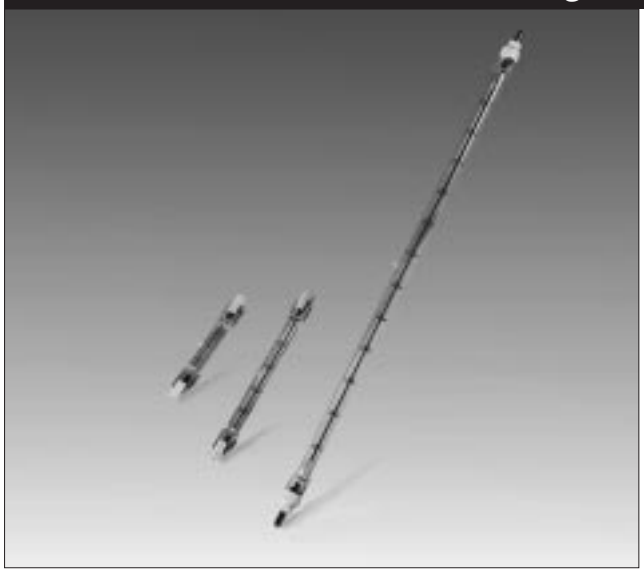
IEC Standards

GE tungsten halogen lamps comply with the following international and British Standards where applicable:

IEC 357 & BS 1075 Tungsten Halogen Lamps,
IEC 61 & BS 51001 Lamp Caps & Holders.

DEQ

Mains Voltage Double Ended Halogen Linear Lamps with quartz spine filament support & R7s cap 100W, 150W, 200W, 250W with R7s cap 150W, 200W, 250W, 300W, 500W, 750W, 1000W, 1500W, 2000W with Fa4 cap 2000W

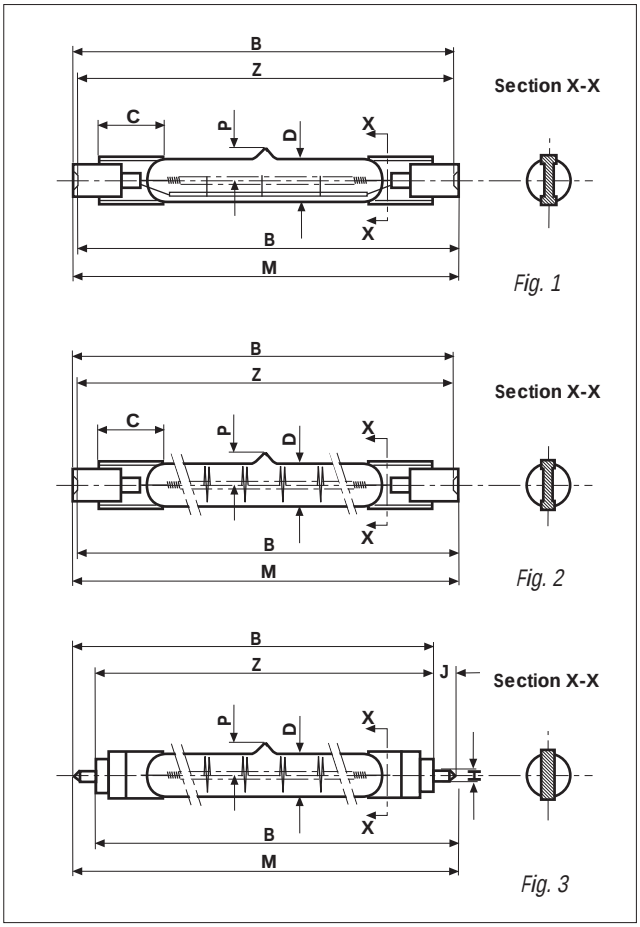


Description

Housing in a clear quartz bulb, these halogen floodlighting lamps have a ceramic one-pin cap on each end and can be operated on 120V, 130V, 220/230V or 240V mains.

Types K14, K12, K27 and K15 are fused internally above 120V, in order to prevent arcing, and they utilize a quartz spine filament support which allows universal burning position.

Award Winning filament support



Features

- high efficacy = energy saving
- stable colour temperature
- excellent lumen maintenance
- long life
- high heat and mechanical impact resistance
- small dimensions = easy directable light beam
- dimmable

Applications

- indoor lighting of sports halls, swimming pools, offices, factories, department stores, supermarkets, shop-windows
- outdoor lighting of railway stations, airports, building areas, small sports grounds, monuments, etc.

Dimensions (mm)

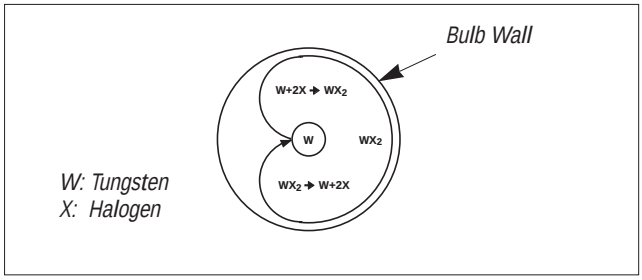
B	C	D	H	J	M	P	Z
K14, K12, K27, K15 *– Fig.1*							
78.3MAX	13.5	10	–	–	80.1MAX	10.2MAX	74.9 ±1.6
K28, K11, K32, K9 *– Fig. 2*							
117.6MAX	13.5	8.2	–	–	119.4MAX	10.2MAX	114.2 ±1.6
K1 *– Fig. 2*							
117.6MAX	13.5	10	–	–	119.4MAX	10.2MAX	114.2 ±1.6
K3, K4 *– Fig. 2*							
189.1MAX	16	10	–	–	190.9MAX	10.2MAX	185.7 ±1.6
K10, K5 *– Fig. 2*							
254.1MAX	16	10	–	–	255.9MAX	10.2MAX	250.7 ±1.6
K8 *– Fig. 2*							
330.8MAX	18	10	–	–	332.2MAX	10.2MAX	327.4 ±1.6
K6 *– Fig. 3*							
322 ±2.1	–	10	4MAX	10	334.4MAX	10.2MAX	313.8MAX

Technical Data

Type	Watts	Volts	B max. Length (mm)	D Diameter (mm)	Average Lumens	Rated Average Life (h)	Fila-ment
Bulb: clear, Cap: R7s – Fig. 1							
Burning position: any							
K14	100	120	78.3	10	1500	2000	CC-8
		230	78.3	10	1350	2000	CC-8
		240	78.3	10	1350	2000	CC-8
K12	150	120	78.3	10	2300	2000	CC-8
		230	78.3	10	2100	2000	CC-8
		240	78.3	10	2100	2000	CC-8
K27	200	120	78.3	10	3300	2000	CC-8
		230	78.3	10	3100	2000	CC-8
		240	78.3	10	3100	2000	CC-8
K15	250	120	78.3	10	4300	2000	CC-8
		230	78.3	10	4000	2000	CC-8
		240	78.3	10	4000	2000	CC-8
Bulb: clear, Cap: R7s – Fig. 2							
Burning position: horizontal ±4°							
K28	150	120	117.6	8.2	2300	2000	C-8
		230	117.6	8.2	2100	2000	C-8
		240	117.6	8.2	2100	2000	C-8
K11	200	120	117.6	8.2	3300	2000	C-8
		230	117.6	8.2	3100	2000	C-8
		240	117.6	8.2	3100	2000	C-8
K32	250	120	117.6	8.2	4500	2000	C-8
		230	117.6	8.2	4000	2000	C-8
		240	117.6	8.2	4000	2000	C-8
K9	300	120	117.6	8.2	5950	2000	C-8
		230	117.6	8.2	4800	2000	C-8
		240	117.6	8.2	4800	2000	C-8
K1	500	120	117.6	10	11000	2000	C-8
		130	117.6	10	11000	2000	C-8
		230	117.6	10	9500	2000	C-8
		240	117.6	10	9500	2000	C-8
K3	750	230	189.1	10	15000	2000	C-8
		240	189.1	10	15000	2000	C-8
K4	1000	120	189.1	10	22000	2000	C-8
		230	189.1	10	21000	2000	C-8
		240	189.1	10	21000	2000	C-8
K10	1000	230	254.1	10	21000	2000	C-8
		240	254.1	10	21000	2000	C-8
K5	1500	230	254.1	10	33000	2000	C-8
		240	254.1	10	33000	2000	C-8
K8	2000	230	330.8	10	44000	2000	C-8
		240	330.8	10	44000	2000	C-8
Bulb: clear, Cap: Fa4 – Fig. 3							
Burning position: horizontal ± 4°							
K6	2000	230	334.4	10	44000	2000	C-8
		240	334.4	10	44000	2000	C-8

Tungsten Halogen Principle

The tungsten filament is enclosed in a gas filled quartz bulb, together with a controlled quantity of halogen. At the operating temperature some tungsten vapourizes and migrates to the cooler areas of the bulb wall where before it can be deposited, it combines with the halogen to form a tungsten halide. This circulates until it comes near the filament where the halide dissociates and deposits the tungsten back on the filament. This cycle continues throughout the operating life of the lamp.
As the bulb wall remains clean the bulb size can be reduced considerably by the use of quartz which can withstand the high wall temperatures.
The small bulb and strong materials withstand much higher working pressures and the increased gas density. This reduces filament evaporation, thus offering increased performance either as more light or longer life.



Light, Life & Voltage

For any particular lamp, the light output and life depend upon the voltage at which a lamp is operated. For instance, as approximations, the light output varies as the 3.6th power of the voltage and the life varies inversely as the 12th power of the voltage. The Chart and Tables below illustrate the effects of overvoltage or undervoltage applied to lamp on its current, life and light output. The values given (except for long life lamps) are reasonably valid between 95% and 110% rated volts.
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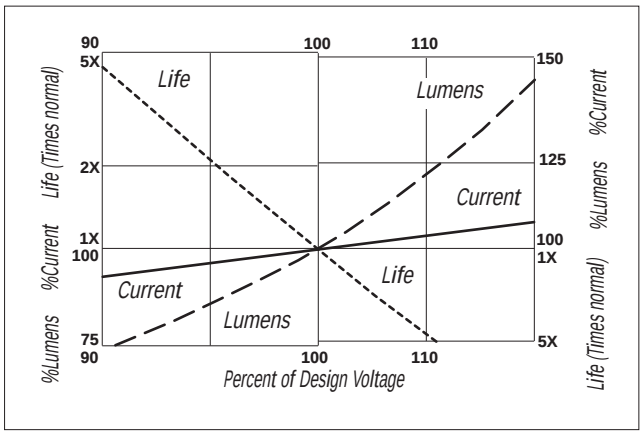

Underrated Bulb Voltages (<100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
99	99.4	96.5	112.8
98	98.9	93.2	127.4
97	98.3	89.9	144.1
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95	97.2	83.6	185.1
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Overrated Bulb Voltages (>100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
101	100.5	103.5	88.7
102	101.1	107.2	79.8
103	101.6	110.9	70.1
104	102.2	114.7	62.5
105	102.7	118.6	55.7
110	105.4	139.6	31.9

Tungsten Halogen Lamps & UV Radiation

Under normal use, there is no risk to humans of damage to the skin such as sunburn. For example, in typical office applications, the exposure to ultra violet light during an 8 hour day is equivalent to 10 minutes in the summer sun.
For tungsten halogen lamps, the amount of ultra violet and the extent of damage it can do to the skin depends on:
— how powerful the lamp is,
— how close you are to the lamp,
— how long you are close to the lamp.
For desk fittings, if the fitting or lamp has no glass shield move lamp/fitting away from skin. Doubling the distance reduces the UV effect by a quarter.
In general if the fitting does not have a glass shield or the lamp does not have an integral front glass the pool of light should be no smaller than 460mm (18 inches) across in any direction.
GE Lighting advice for these desk type fittings is that cover glass lamps should always be used.

Operation and Maintenance

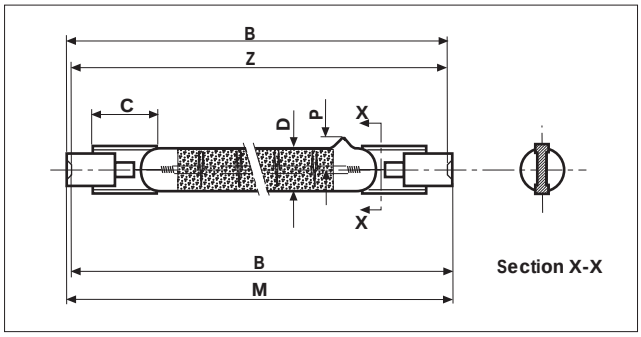
- Switch off mains supply before installing/removing lamp.
- A suitable HBC fuse is essential in circuit.
- Observe temperature tolerances — pinch seal, max. 350°C, bulb wall min. 250°C.
- Lamps should be free from contamination, including finger marks, before lamp is operated. Lamps can be cleaned with a soft cloth moistened with alcohol.
- Good condition of the lampholder contacts is essential.
- Bulb wall temperatures are high and therefore lamps should not be operated in flammable atmospheres unless enclosed in suitably rated luminaires.
- Ensure lamp is cool before removing.

IEC Standards

GE tungsten halogen lamps comply with the following international and British Standards where applicable:
IEC 357 & BS 1075 Tungsten Halogen Lamps,
IEC 61 & BS 51001 Lamp Caps & Holders.

Halogen IR™ DEQ

Double Ended Linear Halogen-IR™ Lamps with R7s cap 225W, 375W, 900W



Description

The quartz bulb is coated with a patented IR reflective thin film which results in the energy saving benefits shown below. The use of standard R7s caps allows direct replacement into standard fittings, whilst the red colour of the caps easily identifies the lamp as a special, energy saving version.
Lamps are offered in both 230 and 240V alternatives.

Halogen-IR™ Technology

In standard incandescent and halogen lamps approximately 76% of the input energy is lost as heat radiation, whilst only 8% is converted to useful light (the rest is lost in the area of the filament).
The Halogen-IR™ thin film, consisting of multiple layers of very durable, thin, interference films, reflects much of the heat back onto the lamp filament, while allowing the visible light to pass through. This increases the filament temperature which allows it to give off more visible light for the same input power.
This increase in efficacy can be used to reduce the required energy input for the same light output, to increase the life of the lamp, or a combination of both.

Benefits

- 25-40% energy savings compared to the light output of their standard equivalents
- excellent lumen maintenance
- stable colour temperature
- dimmable

Dimensions (mm)

	B	C	D	M	P	Z
225W, 375W	117.6MAX.	13	10	119.4MAX.	10.2MAX.	$114.2^{\pm 1.6}$
900W	254.1MAX.	16	10	255.9MAX.	10.2MAX.	$250.7^{\pm 1.6}$

Applications

- indoor lighting of sports halls, swimming pools, offices, factories, department stores, supermarkets, shop-windows
- outdoor lighting of railway stations, airports, building areas, small sports grounds, monuments, etc.

Technical Data

Order Code	Watts	Volts	Replaces Watts	B max. Length (mm)	D Diameter (mm)	Average Lumens	Rated Average Life (h)	Fila-ment
Bulb: IR-coated, Cap: R7s								
Burning position: horizontal ± 4°								
K9-Q225T3/230/HIR	225	230	300	117.6	10	4800	2000	C-8
K9-Q225T3/240/HIR	225	240	300	117.6	10	4800	2000	C-8
K1-Q375T3/230/HIR	375	230	500	117.6	10	9000	2000	C-8
K1-Q375T3/240/HIR	375	240	500	117.6	10	9000	2000	C-8
K5-Q900T3/240/HIR	900	240	1500	254.1	10	32000	2000	C-8

Tungsten Halogen Principle

The tungsten filament is enclosed in an inert gas filled quartz bulb, together with a controlled quantity of halogen. At the operating temperature some tungsten vapourizes and migrates to the cooler areas of the bulb wall where, before it can be deposited, it combines with the halogen to form a tungsten halide. This circulates until it comes near the filament where the halide dissociates and deposits the tungsten back on the filament. This cycle continues throughout the operating life of the lamp.

As the bulb wall remains clean the bulb size can be reduced considerably by the use of quartz which can withstand the high wall temperatures.

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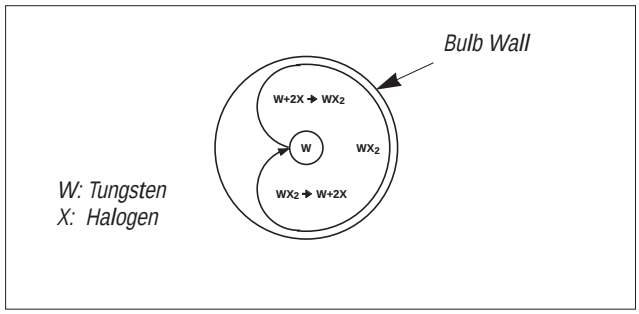

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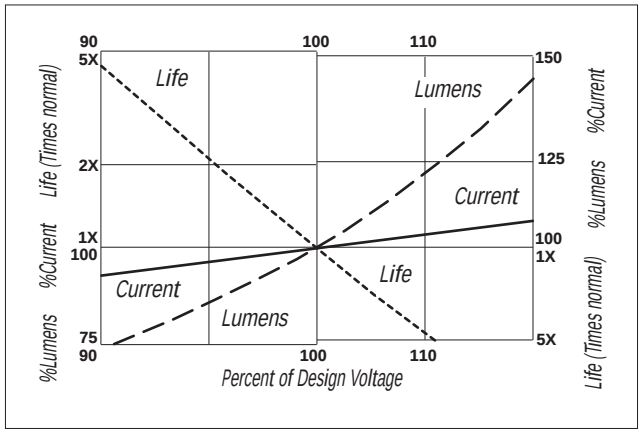

Operation and Maintenance

- Switch off mains supply before installing/removing lamp.
- A suitable HBC fuse is essential in circuit.
- Observe temperature tolerances — pinch seal, max. 350 °C, bulb wall min. 250°C.
- Lamps should be free from contamination, including finger marks, before lamp is operated. Lamps can be cleaned with a soft cloth moistened with alcohol.
- Good condition of lampholder contacts is essential.
- Bulb wall temperatures are high and therefore lamps should not be operated in flammable atmospheres unless enclosed in suitably rated luminaires.
- Ensure lamp is cool before removing.

IEC Standards

GE tungsten halogen lamps comply with the following international and British Standards where applicable:
IEC 357 & BS 1075 —Tungsten Halogen Lamps,
IEC 61 & BS 51001— Lamp Caps & Holders.

Underrated Bulb Voltages (<100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
99	99.4	96.5	112.8
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Overrated Bulb Voltages (>100%)

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101	100.5	103.5	88.7
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103	101.6	110.9	70.1
104	102.2	114.7	62.5
105	102.7	118.6	55.7
110	105.4	139.6	31.9

HaloGlobe & BTT

HaloGlobe Lamps with E27 or B22d cap 60W, 100W, 150W HaloBTT Lamps with E27 or B22d cap 60W, 100W

Description

HaloGlobe and HaloBTT lamps are decorative and economical alternatives to standard incandescent lamps with the advantages of increased output of bright white halogen light and a 2000 or 4000 hour life — two or four times life of a standard incandescent.
Housing in a clear or white outer soft glass bulb, these halogen floodlighting lamps operated on 230V or 240V mains have an E27 or B22d cap and can be fitted directly into traditional incandescent lamp sockets.
The outer bulbs contain Mains Voltage Double Ended Halogen Linear Lamps in clear bulb, with a special filament support, which allows universal burning positions.
The lamps are fused internally, in order to prevent arcing.

Features

- decorative retrofit halogen lamps
- high efficacy = up to 10% more light for the same power
- crisp white halogen light, stable colour temperature
- excellent lumen maintenance
- long life = lasts 2000 hours — two times that of standard incandescents
- universal burning position
- high heat impact resistance
- negligible amount of UV light
- internal fuse for increased safety
- dimmable

Applications

- hotels, restaurants
- clubs, pubs
- offices, homes
- shops
- industry

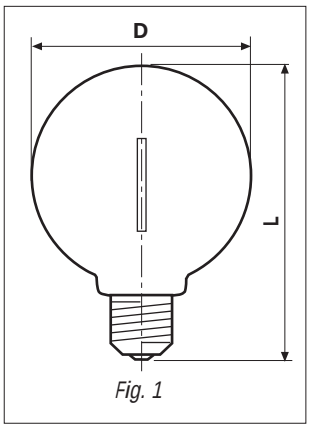


Fig. 1

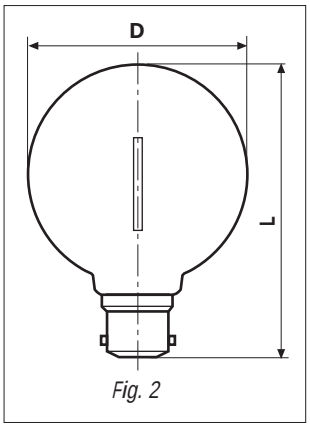


Fig. 2

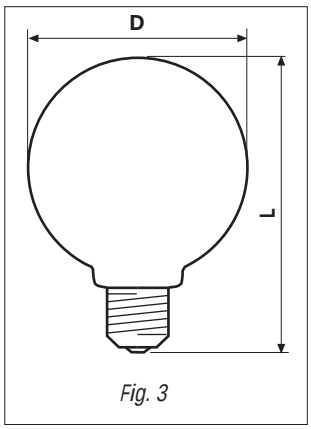


Fig. 3

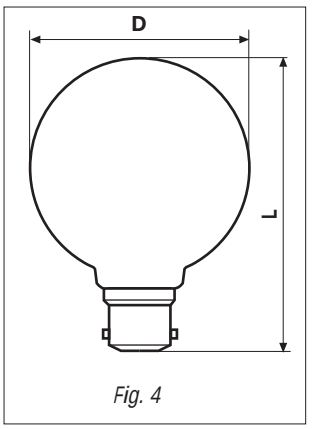


Fig. 4

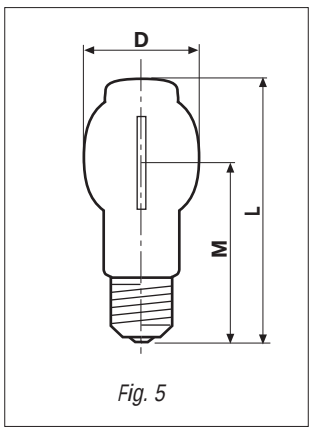


Fig. 5

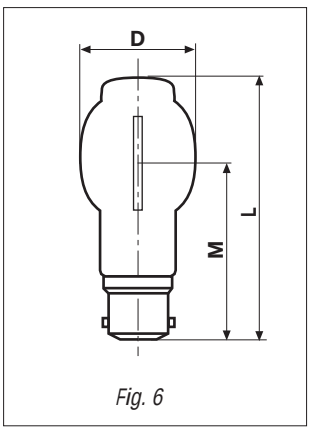
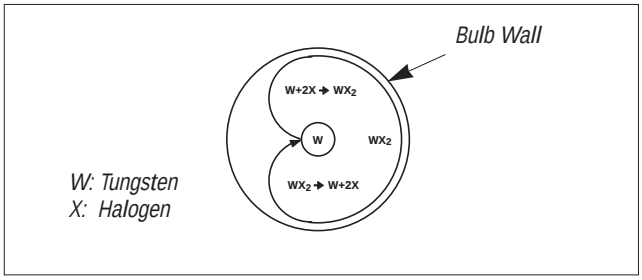


Fig. 6

Technical Data

Type	Watts	Volts	L max. Length (mm)	D max. Diameter (mm)	Average Lumens	Rated Average Life (h)	Fila-ment
HaloGlobe Lamps							
Burning position: any							
Bulb: clear, Cap: E27 — Fig. 1							
51910G	**60**	230	138.5	95	820	2000	CC-8
		240	138.5	95	820	2000	CC-8
Bulb: clear, Cap: B22d — Fig. 2							
51910G	**60**	240	137.5	95	700	2000	CC-8
Bulb: white, Cap: E27 — Fig. 3							
51910G	**60**	230	138.5	95	700	2000	CC-8
		240	138.5	95	700	2000	CC-8
51930G	**100**	230	138.5	95	1450	2000	CC-8
		240	138.5	95	1450	2000	CC-8
51940G	**150**	230	138.5	95	2000	2000	CC-8
		240	138.5	95	2000	2000	CC-8
Bulb: white, Cap: B22d — Fig 4							
51910G	**60**	240	137.5	95	700	2000	CC-8
51930G	**100**	240	137.5	95	1450	2000	CC-8
HaloBTT Lamps							
Burning position: any							
Bulb: clear, Cap: E27 — Fig. 5							
-	**60**	230	115	47	820	2000	CC-8
-		240	115	47	820	2000	CC-8
-	**100**	230	115	47	1600	2000	CC-8
-		240	115	47	1600	2000	CC-8
Bulb: clear, Cap: B22d — Fig. 6							
-	**60**	240	115	47	820	2000	CC-8
-	**100**	240	115	47	1600	2000	CC-8



Tungsten Halogen Principle

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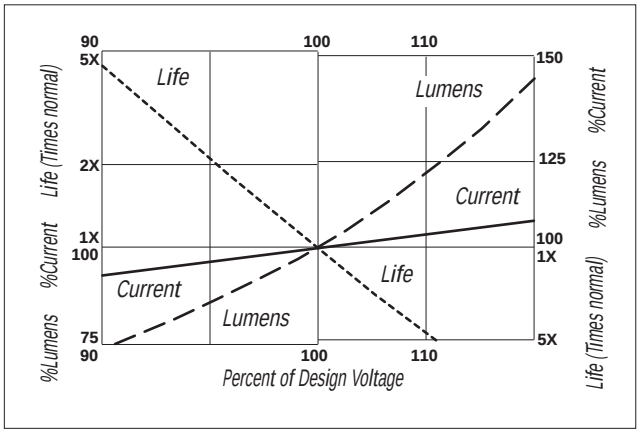
As the bulb wall remains clean the bulb size can be reduced considerably by the use of quartz which can withstand the high wall temperatures.

The small bulb and strong materials withstand much higher working pressures and the increased gas density. This reduces filament evaporation, thus offering increased performance either as more light or longer life.

Light, Life & Voltage

For any particular lamp, the light output and life depend upon the voltage at which a lamp is operated. For instance, as approximations, the light output varies as the 3.6th power of the voltage and the life varies inversely as the 12th power of the voltage. The Chart and Tables below illustrate the effects of overvoltage or undervoltage applied to lamp on its current, life and light output. The values given (except for long life lamps) are reasonably valid between 95% and 110% rated volts.

Beyond this range the indicated characteristics may not be realised because of the increasing influence of factors which cannot be incorporated into the chart. The chart applies only to D.C. or sine-wave A.C. current. The data may differ, particularly for lamp operation on half-wave rectified voltage, semiconductor dimming devices of constant operation.



Underrated Bulb Voltages (<100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
99	99.4	96.5	112.8
98	98.9	93.2	127.4
97	98.3	89.9	144.1
96	97.8	86.7	163.2
95	97.2	83.6	185.1
90	94.4	69.2	354.1

Overrated Bulb Voltages (>100%)

VOLTS %	AMPS %	LUMENS %	LIFE %
101	100.5	103.5	88.7
102	101.1	107.2	79.8
103	101.6	110.9	70.1
104	102.2	114.7	62.5
105	102.7	118.6	55.7
110	105.4	139.6	31.9

Tungsten Halogen Lamps & UV Radiation

Under normal use, there is no risk to humans of damage to the skin such as sunburn. For example, in typical office applications, the exposure to ultra violet light during an 8 hour day is equivalent to 10 minutes in the summer sun.

For tungsten halogen lamps, the amount of ultra violet and the extent of damage it can do to the skin depends on:
— how powerful the lamp is,
— how close you are to the lamp,
— how long you are close to the lamp.

Due to their outer soft glass bulbs, the amount of UV light emitted by GE HaloGlobe and HaloBTT lamps is signifi-cantly less than in case of conventional quartz halogen lamps without outer glass envelope, i.e. these lamps can be used as traditional incandescents and have no harmful effect to humans, at all.

Operation and Maintenance

- Switch off mains supply before installing/removing lamp.
- A suitable HBC fuse is essential in circuit.
- Do not use if outer bulb is scratched or broken.
- Good condition of the lampholder contacts is essential.
- Ensure lamp is cool before removing.

IEC Standards

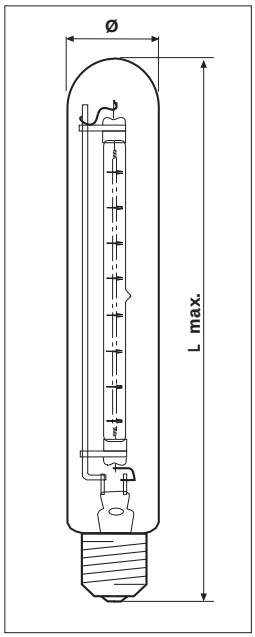
GE tungsten halogen lamps comply with the following international and British Standards where applicable:
IEC 357 & BS 1075 Tungsten Halogen Lamps,
IEC 61 & BS 51001 Lamp Caps & Holders.

Halo T

Mains Voltage Single Ended Halogen Tubular Lamps with E40 cap Halo T 500W, 1000W

Description

Housing in a clear outer soft glass bulb, these halogen floodlighting lamps operated on 230V or 240V mains have an E40 cap and can be fitted directly into traditional incandescent lamp sockets.
The outer bulbs contain Mains Voltage Double Ended Halogen Linear Lamps in clear bulb.



Features

- retrofit halogen lamps
- high efficacy = up to 10% more light for the same power
- crisp white halogen light, stable colour temperature
- excellent lumen maintenance
- long life = lasts 2000 hours — two times that of standard incandescents
- high heat impact resistance
- negligible amount of UV light
- dimmable

Applications

- parking areas
- entrances, garages
- street and industry lighting, etc.

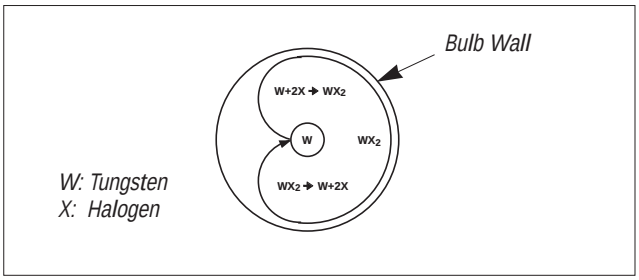
Technical Data

Burning position: horizontal ± 4°

Order Code	Watts	Volts	L max. Length (mm)	ø Diameter (mm)	Average Lumens	Rated Average Life (h)	Fila-ment
Bulb: clear, Cap: E40							
HALOT/500/230/E40	500	230	220	38	9500	2000	C-8
HALOT/500/240/E40	500	240	220	38	9500	2000	C-8
HALOT/1000/230/E40	1000	230	280	38	21000	2000	C-8
HALOT/1000/240/E40	1000	240	280	38	21000	2000	C-8

Tungsten Halogen Principle

The tungsten filament is enclosed in a gas filled quartz bulb, together with a controlled quantity of halogen. At the operating temperature some tungsten vapourizes and migrates to the cooler areas of the bulb wall where before it can be deposited, it combines with the halogen to form a tungsten halide. This circulates until it comes near the filament where the halide dissociates and deposits the tungsten back on the filament. This cycle continues throughout the operating life of the lamp.
As the bulb wall remains clean the bulb size can be reduced considerably by the use of quartz which can withstand the high wall temperatures.
The small bulb and strong materials withstand much higher working pressures and the increased gas density. This reduces filament evaporation, thus offering increased performance either as more light or longer life.



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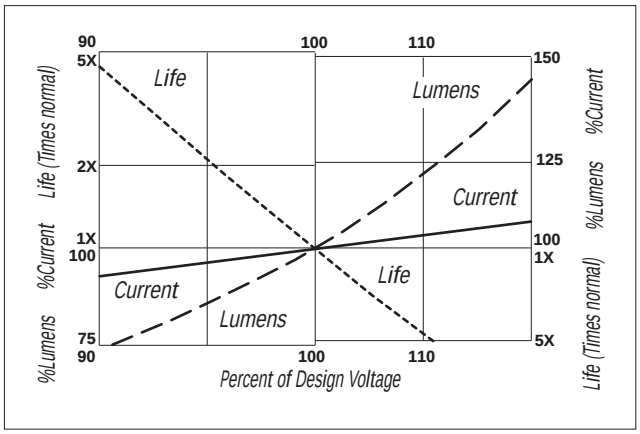

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IEC Standards

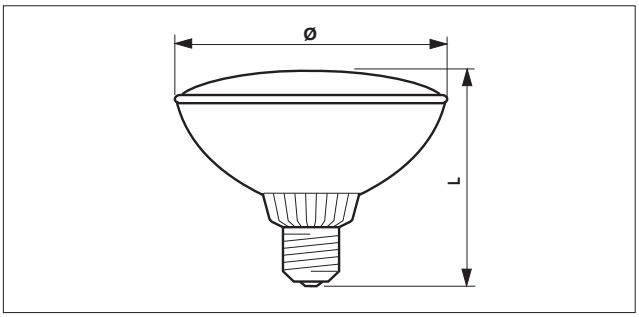
GE tungsten halogen lamps comply with the following international and British Standards where applicable:
IEC 357 & BS 1075 Tungsten Halogen Lamps,
IEC 61 & BS 51001 Lamp Caps & Holders.

PAR 30

PAR 30 Halogen Reflector Lamps with E27 cap 75W, 100W

Features

- Computer designed facated reflector ensures maximum output with high beam control.
- The clear front glass and the reflector's intense sparkle produce livelier accent lighting.
- Colour temperature of 2900K enhances colours and mixes admirably with low voltage dichroic or fluorescent lamps.
- Compact size and attractive appearance make PAR30 perfect for "bare lamp" luminaires such as display spots.

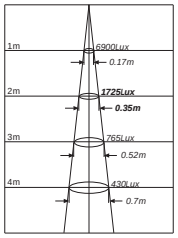


Performance Cones

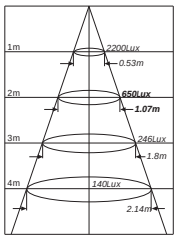
All GE reflector lamps have a performance cone. This is to help achieve the most effective spread and level of illumination by showing the lamp power, beam spread and mounting distance of each lamp.

A performance cone is a visual indicator of the angle at which the intensity of a beam produced by a reflector is at 50% of its peak. The cone shows the angle, the level of peak illuminance (lux) and the beam diameter for planes at right angles at various distances (m) from the lamps. The bold type at 2m serves as a benchmark for at a glance comparison of respective beam diameter and lux for different lamps.

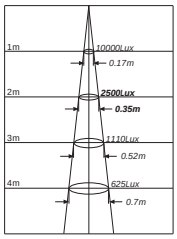
75PAR30/SP 75W 10°



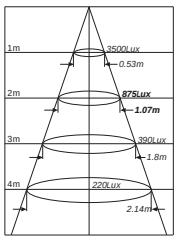
75PAR30/FL 75W 30°



100PAR30/SP 100W 10°



100PAR30/FL 100W 30°



Technical Data

Burning position: any

Order Code	Watts	Volts	L max. Length (mm)	ø Diameter (mm)	Peak Intensity (CD)	Beam Spread (°)	Colour Temp. (K)	Rated Avrg. Life (h)
SPOT, Bulb: clear front lense with aluminized reflector, Cap: E27								
75PAR30/230/SP	75	230	90.5	97	6900	10	2900	2500
75PAR30/240/SP	75	240	90.5	97	6900	10	2900	2500
100PAR30/230/SP	100	230	90.5	97	10000	10	2900	2500
100PAR30/240/SP	100	240	90.5	97	10000	10	2900	2500
FLOOD, Bulb: clear front lense with aluminized reflector, Cap: E27								
75PAR30/230/FL	75	230	90.5	97	2200	30	2900	2500
75PAR30/240/FL	75	240	90.5	97	2200	30	2900	2500
100PAR30/230/FL	100	230	90.5	97	3500	30	2900	2500
100PAR30/240/FL	100	240	90.5	97	3500	30	2900	2500

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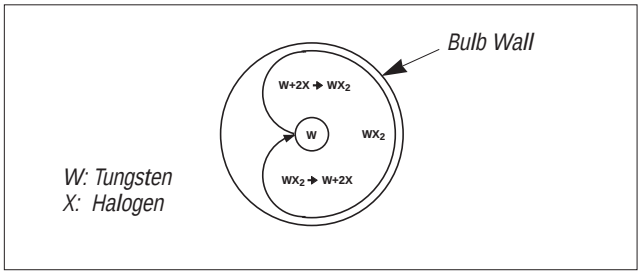

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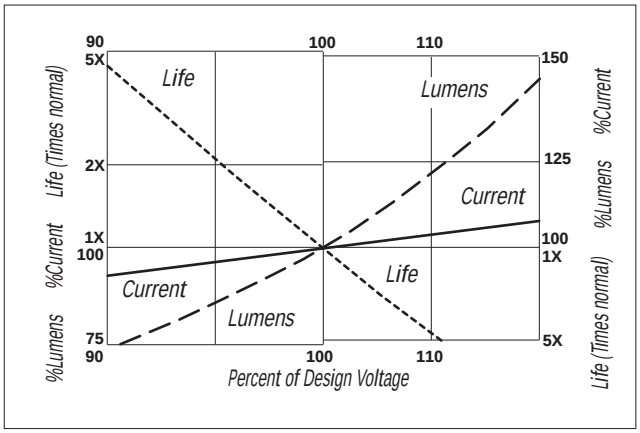

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IEC Standards

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IEC 61 & BS 51001 Lamp Caps & Holders.

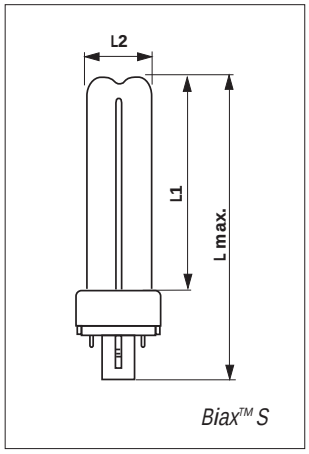
Biax™ S & S/E

BIAX™ S & S/E
Compact Fluorescent Lamps

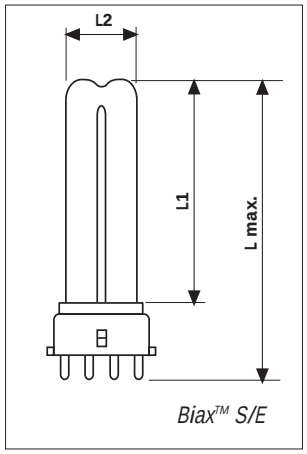
Biax™ S Compact Fluorescent lamps can provide savings of up to 73% in energy costs. Available in 5, 7, 9 and 11 watt ratings, low wattage Biax™ S lamps are ideal for new installations or to replace existing incandescent lamps. These lamps are available in 2700, 3500 and 4000K colour temperature.

The Biax™ S lamps have built-in internal starters. They have a rated average life of 10000 hours, which results in fewer relampings and a reduction in maintenance costs over the life of an installation.

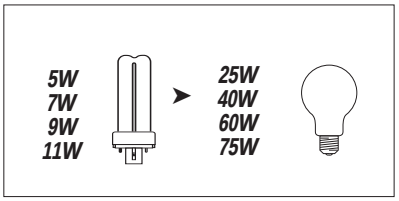
Like the Biax™ S range, Biax™ S/E lamps are Single-Ended Compact Fluorescent products, and are available in 5, 7, 9 and 11 watt ratings. However, the Biax™ S/E lamps have four-pin caps without built-in capacitors and starters. They are therefore suitable for operation with electronic control gear and for dimming and emergency lighting applications. Biax™ S/E lamps have the same energy saving benefits and high quality colour appearance as the Biax™ S range.



Biax™ S



Biax™ S/E



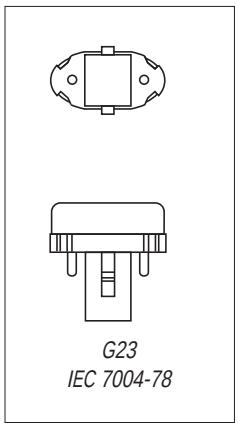
Features

- flat and compact
- high luminous efficacy
- up to 73% energy-saving compared to GLS lamps
- 10x the lamp life of GLS lamps
- pleasant light, excellent colour rendering

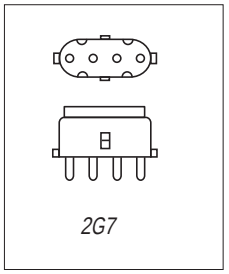
Applications

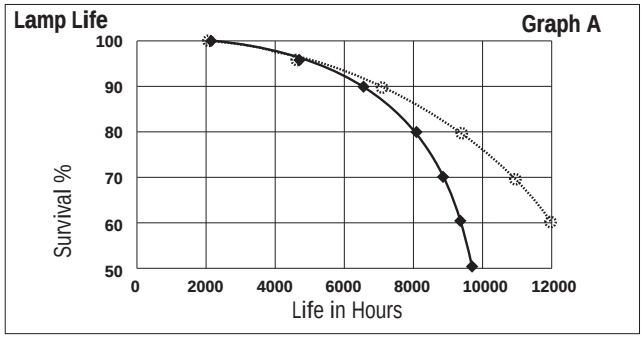
- wall & ceiling luminaires
- in hotels, motels, office buildings, apartment
- building, public areas
- ideal for task light applications also
- emergency lighting

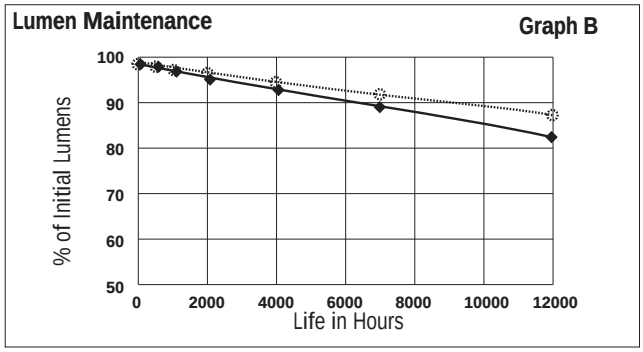
2pin cap
Biax™ S

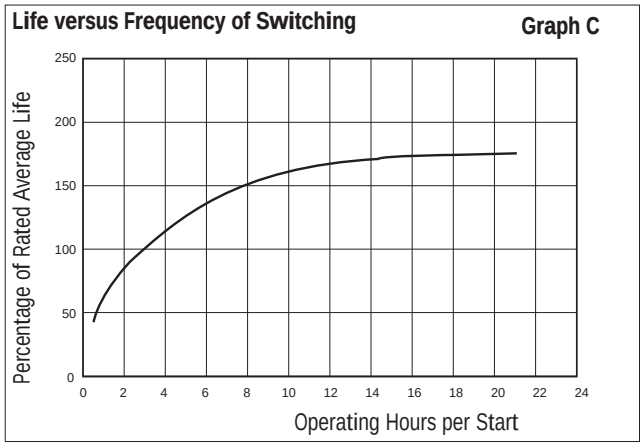

G23
IEC 7004-78

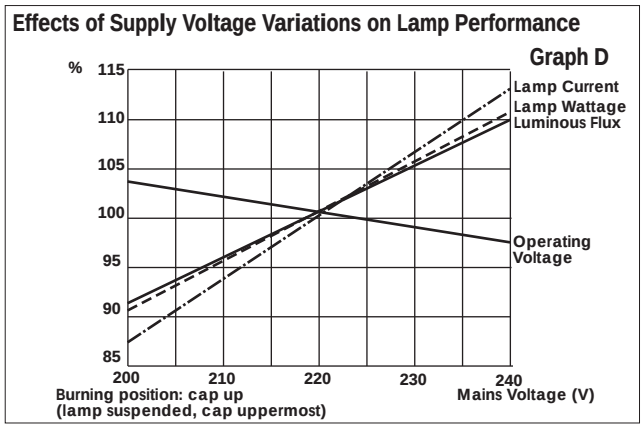
4pin cap
Biax™ S/E

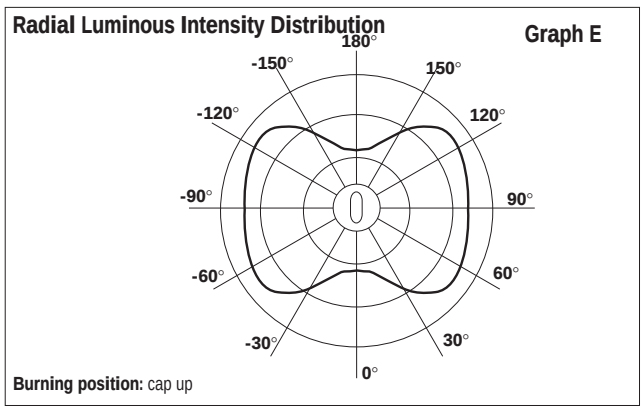

2G7











Lamp Life

Rated Average Life for Biax™ S & S/E lamps is 10000 hours (switching cycle: 3 Hrs: 165 Mins ON/15 Mins OFF). See Graph A.

Lumen Maintenance

Lumen Maintenance curve presented for Biax™ S & S/E lamps is based on lumen readings in a photometric sphere under laboratory conditions, in cap up position. In actual use, lumen output is a function of burning hours and lamp operating watts throughout life. See Graph B.

Life versus Frequency of Switching

For impact on life of alternative switching cycles refer to the Graph C.
For applications where a fast switching cycle is required it is possible to minimize the effect of switching on lamp life with the use of a suitable electronic gear with a 4pin lamp.

Effects of Supply Voltage Variations on Lamp Performance

Biax™ S & S/E lamps are suitable for supplies in the range 220V to 250V, 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings. See Graph D.

Luminous Intensity Distribution

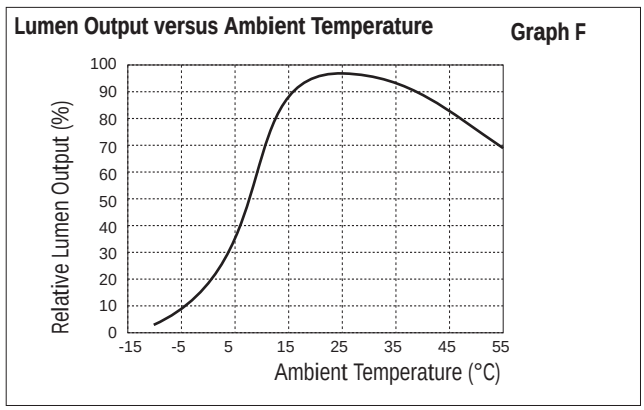
The Luminous Intensity Distribution curve shows the horizontal light intensity of Biax™ S & S/E lamps. See Graph E.

Effects of Temperature Changes

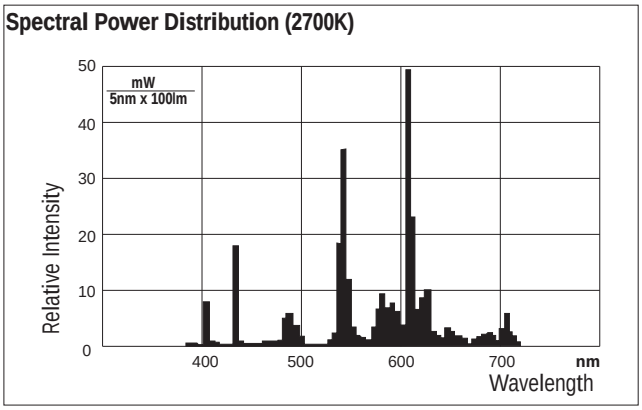
When installed in a luminaire, the temperature of the air surrounding the lamp cap changes and this can affect the light output of the lamp. The effects of changes in ambient temperature for a typical lamp are in Graph F.

Standards

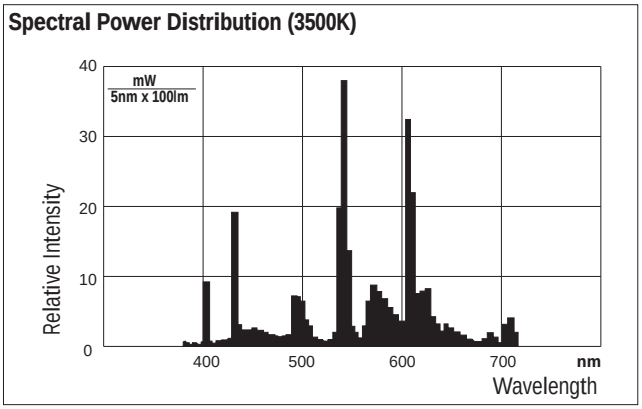
Biax™ S & S/E lamps comply with the relevant clauses of all applicable safety and performance specifications including IEC 1199 and IEC 928.



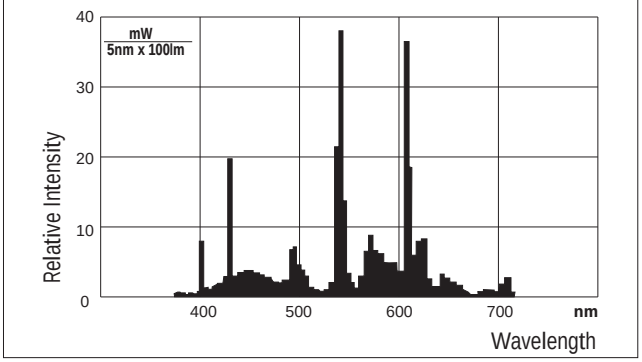
Spectral Power Distribution (2700K)



Spectral Power Distribution (3500K)



Spectral Power Distribution (4000K)



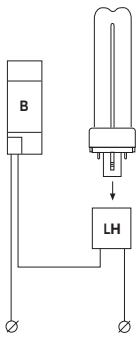
Watts	Volts	Amps	Cap	L (mm)	L_1 (mm)	L_2 (mm)	Order Code	Approx. Initial Lumens	Colour Temp. (K)	Ra	Rated Avrg. Life (h)
2pin base, internal starter											
5	35	0.18	G23	105	65	27	F5BX/827	250	2700	82	10,000
5	35	0.18	G23	105	65	27	F5BX/835	250	3500	82	10,000
5	35	0.18	G23	105	65	27	F5BX/840	250	4000	82	10,000
7	45	0.18	G23	135	95	27	F7BX/827	400	2700	82	10,000
7	45	0.18	G23	135	95	27	F7BX/835	400	3500	82	10,000
7	45	0.18	G23	135	95	27	F7BX/840	400	4000	82	10,000
9	59	0.18	G23	167	127	27	F9BX/827	600	2700	82	10,000
9	59	0.18	G23	167	127	27	F9BX/835	600	3500	82	10,000
9	59	0.18	G23	167	127	27	F9BX/840	600	4000	82	10,000
11	90	0.155	G23	235	197	27	F11BX/827	900	2700	82	10,000
11	90	0.155	G23	235	195	27	F11BX/835	900	3500	82	10,000
11	90	0.155	G23	235	195	27	F11BX/840	900	4000	82	10,000
4pin base, without internal starter											
5	34	0.18	2G7	85	65	27	F5BX/827/4P	250	2700	82	10,000
5	34	0.18	2G7	85	65	27	F5BX/840/4P	250	4000	82	10,000
7	47	0.175	2G7	115	95	27	F7BX/827/4P	400	2700	82	10,000
7	47	0.175	2G7	115	95	27	F7BX/840/4P	400	4000	82	10,000
9	60	0.17	2G7	145	125	27	F9BX/827/4P	600	2700	82	10,000
9	60	0.17	2G7	145	125	27	F9BX/840/4P	600	4000	82	10,000
11	92	0.155	2G7	215	195	27	F11BX/827/4P	900	2700	82	10,000
11	92	0.155	2G7	215	195	27	F11BX/840/4P	900	4000	82	10,000

Circuit Diagrams

Parallel compensated

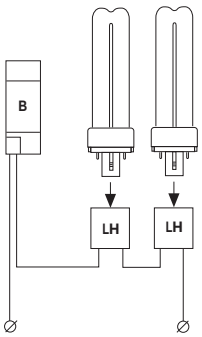
B = Ballast (50 Hz)

LH = Lamp Holder



Supply Voltage

Biax™ S 5W, 7W, 9W & 11W



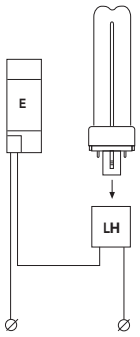
Supply Voltage

Biax™ S 5W, 7W & 9W

Parallel compensated

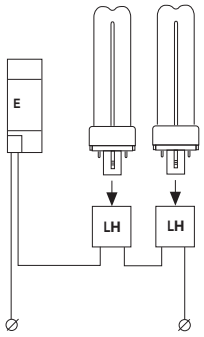
E = Electronic Gear

LH = Lamp Holder



Supply Voltage

Biax™ S/E 5W, 7W, 9W & 11W



Supply Voltage

Biax™ S/E 5W, 7W & 9W

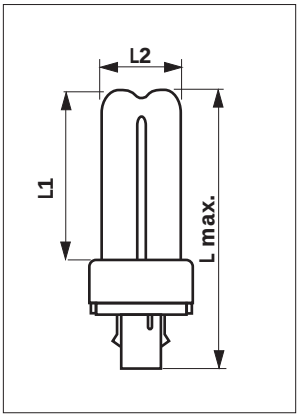
Biax™ D & D/E

Biax™ D & D/E
Compact Fluorescent Lamps

Description

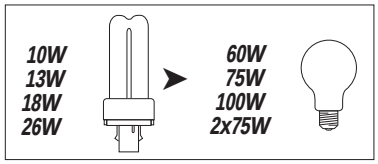
Biax™ D & D/E lamps available in 10, 13, 18 and 26 watt ratings and ranging from 101mm to 174mm in length, can be used in place of 60, 75, 100 and 150 watt incandescent lamps, providing up to 80% savings in energy costs.

Five colours are available in two-pin and four-pin caps. A high colour rendering index (CRI) of 82 gives rich, vibrant colour. The lamps are available in warm and cool colour temperatures suitable for a wide variety of environments.



Features

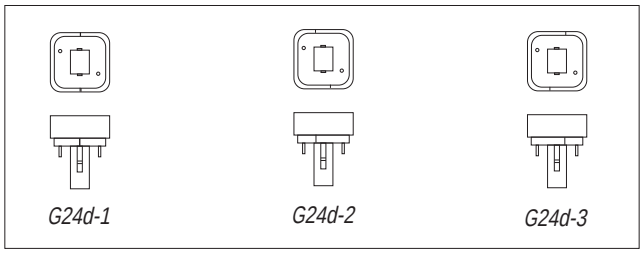
- Up to 80% energy savings
- Lasts 10x longer than standard incandescent lamps
- High colour rendering index — Ra = 82
- Full range of colour temperatures — 2700, 3000, 3500, 4000, 6500K
- 4-pin lamps for use with electronic gear may be used with dimmers
- 2-pin lamps with built-in starters and capacitors for standard applications



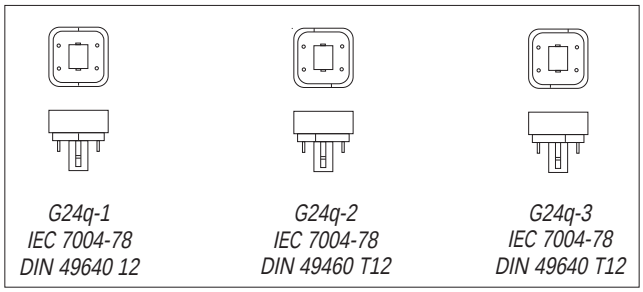
Applications

- down lighting
- corridor lighting
- wall scones in office buildings
- hotels / motels
- restaurants
- retails

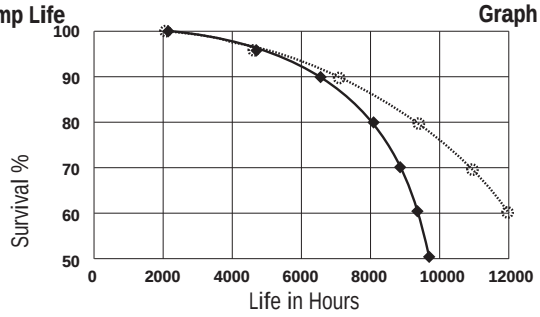
2pin



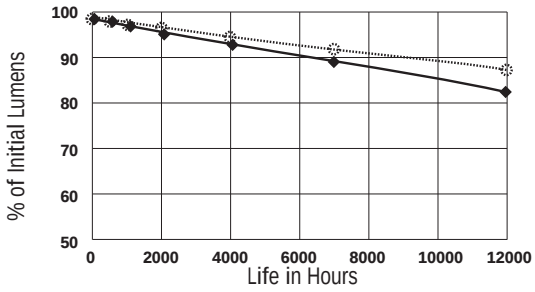
4pin



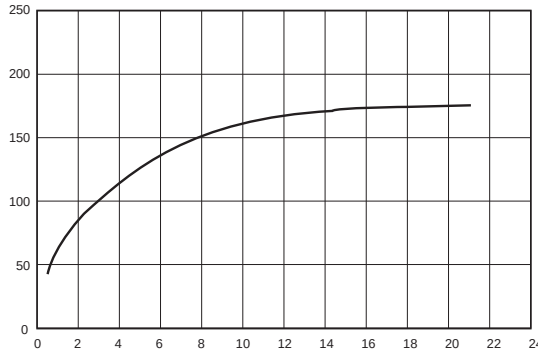
Lamp Life Graph A



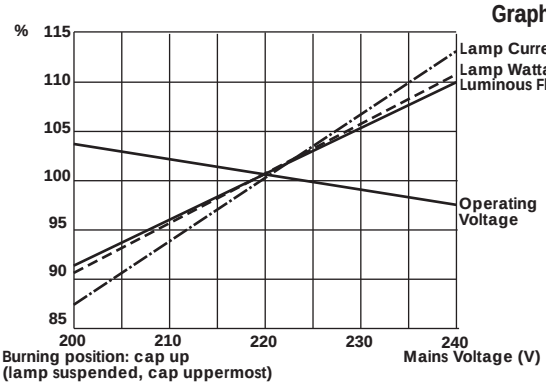
Lumen Maintenance Graph B



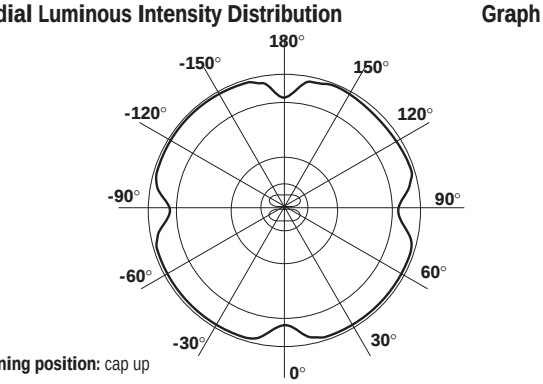
Life versus Frequency of Switching Graph C



Effects of Supply Voltage Variations on Lamp Performance Graph D



Radial Luminous Intensity Distribution Graph E



Lamp Life

Rated Average Life for Biax™ D & D/E lamps is 10000 hours (switching cycle: 3 Hrs: 165 Mins ON/15 Mins OFF). See Graph A.

Lumen Maintenance

Lumen Maintenance curve presented for Biax™ D & D/E lamps is based on lumen readings in a photometric sphere under laboratory conditions, in cap up position. In actual use, lumen output is a function of burning hours and lamp operating watts throughout life. See Graph B.

Life versus Frequency of Switching

For impact on life of alternative switching cycles refer to the Graph C.
For applications where a fast switching cycle is required it is possible to minimise the effect of switching on lamp life with the use of a suitable electronic gear with a 4-pin lamp.

Effects of Supply Voltage Variations on Lamp Performance

Biax™ D & D/E lamps are suitable for supplies in the range 220V to 250V, 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings. See Graph D.

Luminous Intensity Distribution

The Luminous Intensity Distribution curve shows the horizontal light intensity of Biax™ D & D/E lamps. See Graph E.

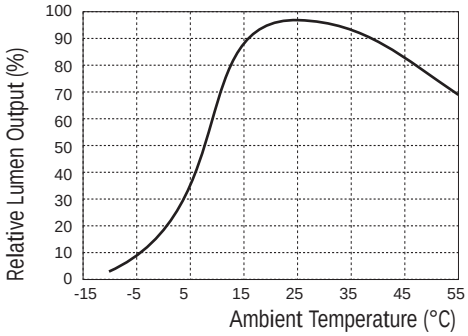
Effects of Temperature Changes

When installed in a luminaire, the temperature of the air surrounding the lamp cap changes and this can affect the light output of the lamp. The effects of changes in ambient temperature for a typical lamp are shown in Graph F.

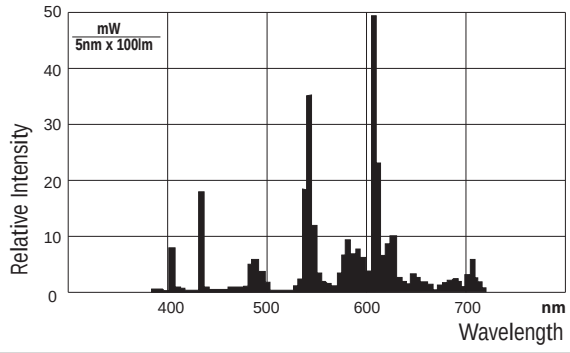
Standards

Biax™ D & D/E lamps comply with the relevant clauses of all applicable safety and performance specifications including IEC 1199 and IEC 928.

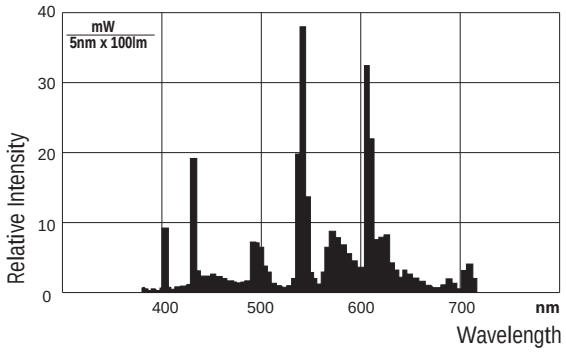
Lumen Output versus Ambient Temperature Graph F



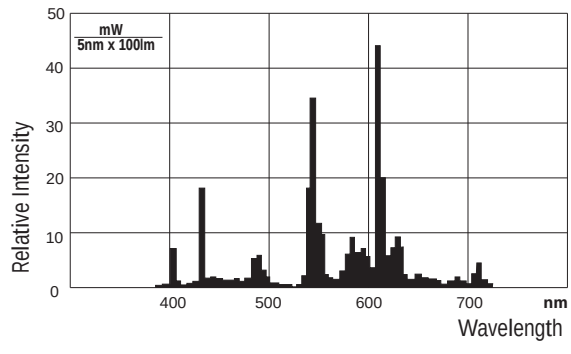
Spectral Power Distribution (2700K)



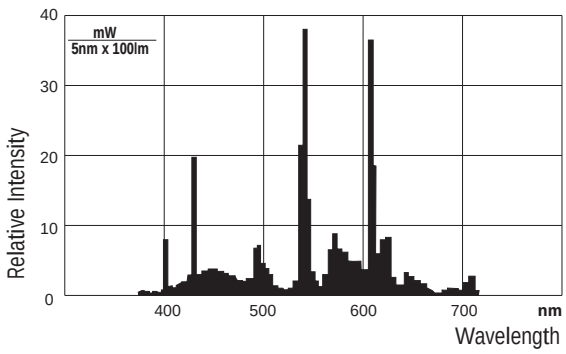
Spectral Power Distribution (3500K)



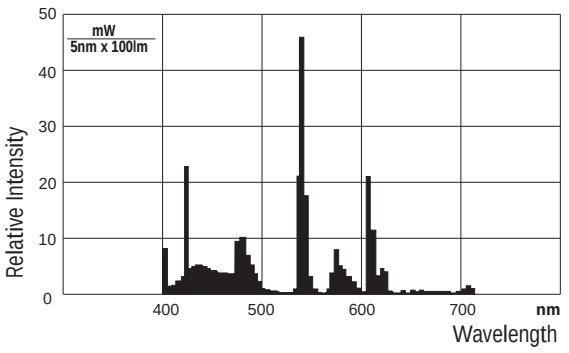
Spectral Power Distribution (3000K)



Spectral Power Distribution (4000K)



Spectral Power Distribution (6500K)



Watts	Volts	Amps	L max. (mm)	L1 (mm)	L2 (mm)	Cap	Order Code	Approx. Initial Lumens	Colour Temp. (K)	Ra a	Rated Avrg. Life (h)
2 pin base, internal starter											
10	64	0.190	109	65	27	G24d-1	**F10DBX/827**	600	2700	82	10 000
10	64	0.190	109	65	27	G24d-1	**F10DBX/830**	600	3000	82	10 000
10	64	0.190	109	65	27	G24d-1	**F10DBX/835**	600	3500	82	10 000
10	64	0.190	109	65	27	G24d-1	**F10DBX/840**	600	4000	82	10 000
10	64	0.190	109	65	27	G24d-1	**F10DBX/865**	600	6500	82	10 000
13	91	0.175	134	95	27	G24d-1	**F13DBX/827**	900	2700	82	10 000
13	91	0.175	134	95	27	G24d-1	**F13DBX/830**	900	3000	82	10 000
13	91	0.175	134	95	27	G24d-1	**F13DBX/835**	900	3500	82	10 000
13	91	0.175	134	95	27	G24d-1	**F13DBX/840**	900	4000	82	10 000
13	91	0.175	134	95	27	G24d-1	**F13DBX/865**	900	6500	82	10 000
18	100	0.220	155	110	27	G24d-2	**F18DBX/827**	1200	2700	82	10 000
18	100	0.220	155	110	27	G24d-2	**F18DBX/830**	1200	3000	82	10 000
18	100	0.220	155	110	27	G24d-2	**F18DBX/835**	1200	3500	82	10 000
18	100	0.220	155	110	27	G24d-2	**F18DBX/840**	1200	4000	82	10 000
18	100	0.220	155	110	27	G24d-2	**F18DBX/865**	1200	6500	82	10 000
26	105	0.325	170	126	27	G24d-3	**F26DBX/827**	1800	2700	82	10 000
26	105	0.325	170	126	27	G24d-3	**F26DBX/830**	1800	3000	82	10 000
26	105	0.325	170	126	27	G24d-3	**F26DBX/835**	1800	3500	82	10 000
26	105	0.325	170	126	27	G24d-3	**F26DBX/840**	1800	4000	82	10 000
26	105	0.325	170	126	27	G24d-3	**F26DBX/865**	1800	6500	82	10 000
4 pin base, without internal starter											
10	64	0.19	102	65	27	G24q-1	**F10DBX/827/4P**	600	2700	82	10 000
10	64	0.19	102	65	27	G24q-1	**F10DBX/830/4P**	600	3000	82	10 000
10	64	0.19	102	65	27	G24q-1	**F10DBX/835/4P**	600	3500	82	10 000
10	64	0.19	102	65	27	G24q-1	**F10DBX/840/4P**	600	4000	82	10 000
13	91	0.17	126	95	27	G24q-1	**F13DBX/827/4P**	900	2700	82	10 000
13	91	0.17	126	95	27	G24q-1	**F13DBX/830/4P**	900	3000	82	10 000
13	91	0.17	126	95	27	G24q-1	**F13DBX/835/4P**	900	3500	82	10 000
13	91	0.17	126	95	27	G24q-1	**F13DBX/840/4P**	900	4000	82	10 000
18	100	0.22	147	110	27	G24q-2	**F18DBX/827/4P**	1200	2700	82	10 000
18	100	0.22	147	110	27	G24q-2	**F18DBX/830/4P**	1200	3000	82	10 000
18	100	0.22	147	110	27	G24q-2	**F18DBX/835/4P**	1200	3500	82	10 000
18	100	0.22	147	110	27	G24q-2	**F18DBX/840/4P**	1200	4000	82	10 000
26	105	0.315	163	126	27	G24q-3	**F26DBX/827/4P**	1800	2700	82	10 000
26	105	0.315	163	126	27	G24q-3	**F26DBX/830/4P**	1800	3000	82	10 000
26	105	0.315	163	126	27	G24q-3	**F26DBX/835/4P**	1800	3500	82	10 000
26	105	0.315	163	126	27	G24q-3	**F26DBX/840/4P**	1800	4000	82	10 000

Biax™ D Compatibility with Other 2pin Cap Lamps

2pin Biax™ D (Double)		2pin Biax™T (Triple)			2pin Biax™ S (Single)
		F13TBX	F18TBX	F26TBX	F5BX F7BX F9BX F11BX
		GX24d-1	GX24d-2	GX24d-3	G23
F10DBX	G24d-1	YES			
F13DBX	G24d-1	YES			
F18DBX	G24d-2		YES		
F26DBX	G24d-3			YES	

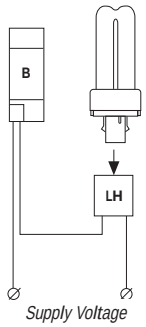
Biax™ D/E Compatibility with Other 4pin Cap Lamps

4pin Biax™ D/E (Double)		4pin Biax™T /E(Triple)			4pin Biax™ S/E (Single)
		F13TBX/4P	F18TBX/4P	F26TBX/4P	F5BX/4P F7BX/4P F9BX/4P F11BX/4P
		GX24q-1	GX24q-2	GX24q-3	2G7
F10DBX/4P	G24q-1	YES			
F13DBX/4P	G24q-1	YES			
F18DBX/4P	G24q-2		YES		
F26DBX/4P	G24q-3			YES	

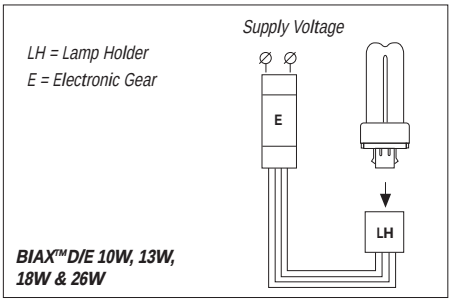
Circuit diagrams

Parallel compensated

B = Ballast (50 Hz)
LH = Lamp Holder



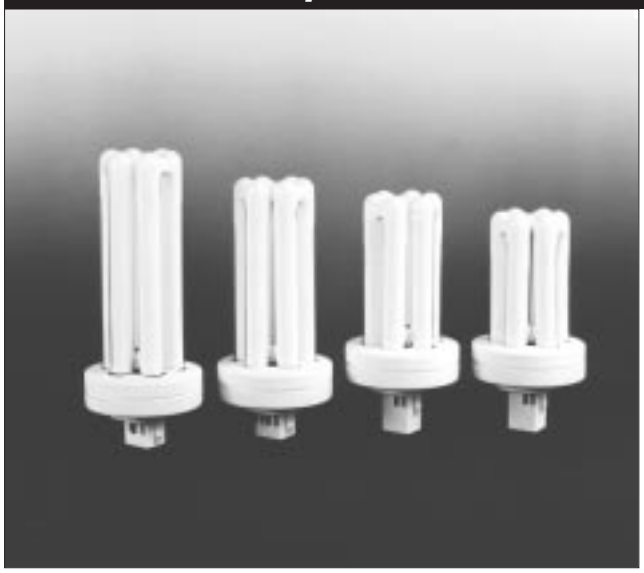
BIAX™D 10W, 13W, 18W & 26W



BIAX™D/E 10W, 13W, 18W & 26W

Biax™ T

Biax™ T
Compact Fluorescent Lamps

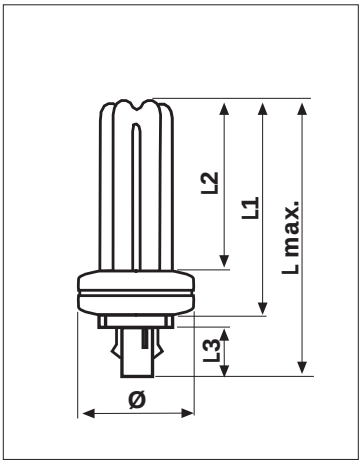


Description

Ultra compact energy saving CFL lamps with the new, innovative triple-tube design give an ideal light source for small fixtures and downlighters.
Biax™ T allow more compact designs with the same lumen output as Biax™ D lamps. Or, they can be used to gain higher lumen output from existing designs.

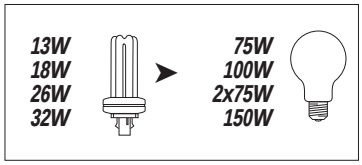
The Biax™ T lamps are electrically interchangeable with Biax™ D lamps. The wattages available are 13W through 26W for Biax™ T lamps. Light output ranges between 900 and 1800.

The Biax™ T 2-pin lamps are for use with an external, conventional (magnetic) ballast, and they are not suitable for use in dimming circuits.



Features

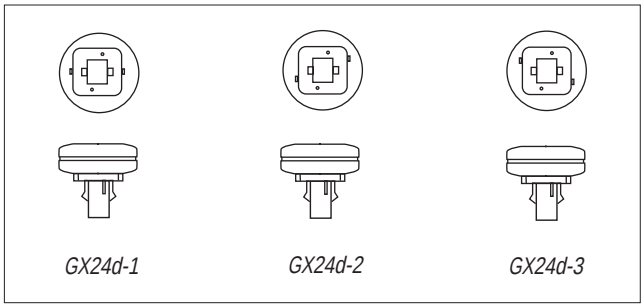
- Fits inside most luminaires
- Up to 80% energy savings
- Lasts 10x longer than standard incandescent lamps
- High colour rendering index — Ra = 82
- Available in four colour temperatures — 2700, 3000, 3500, 4000K
- 2-pin lamps with built-in starters and capacitors for standard applications



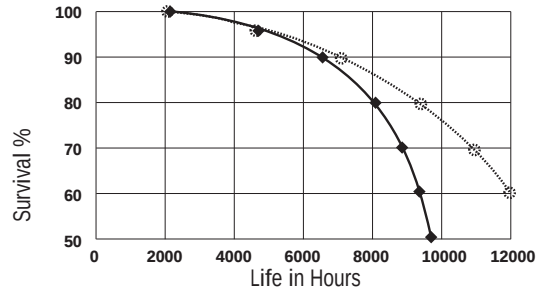
Applications

- post lighting, down lighting
- table lamps
- residential
- offices
- hotels / motels / restaurants
- corridor lighting, wall scones
- industrial and retails

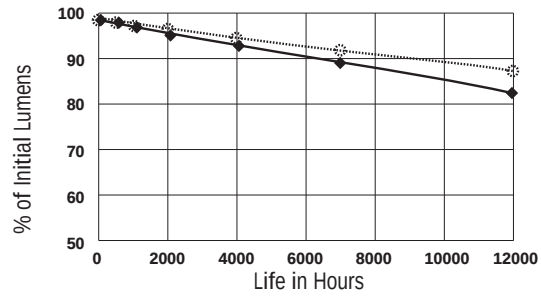
2pin



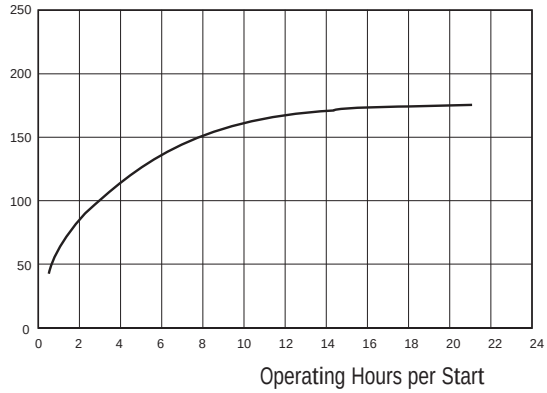
Lamp Life Graph A



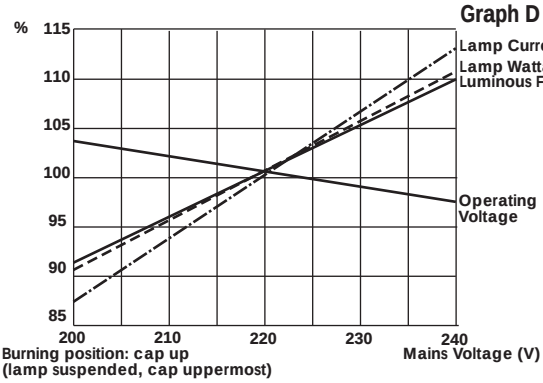
Lumen Maintenance Graph B



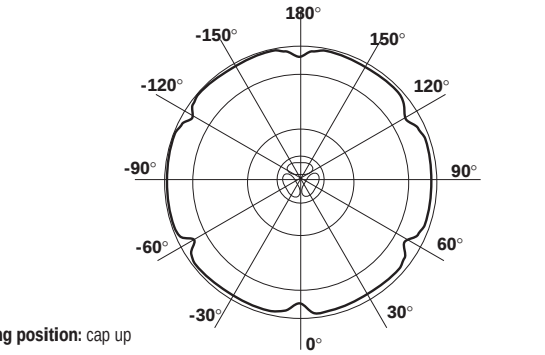
Life versus Frequency of Switching Graph C



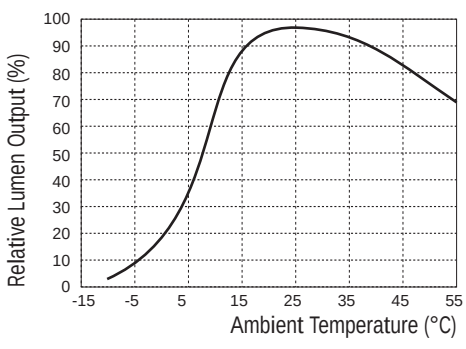
Effects of Supply Voltage Variations on Lamp Performance Graph D



Radial Luminous Intensity Distribution Graph E



Lumen Output versus Ambient Temperature Graph F



Lamp Life

Rated Average Life for Biax™ T lamps is 10000 hours (switching cycle: 3 Hrs: 165 Mins ON/15 Mins OFF). See Graph A.

Lumen Maintenance

Lumen Maintenance curve presented for Biax™ T lamps is based on lumen readings in a photometric sphere under laboratory conditions, in cap up position. In actual use, lumen output is a function of burning hours and lamp operating watts throughout life. See Graph B.

Life versus Frequency of Switching

For impact on life of alternative switching cycles refer to the Graph C.
For applications where a fast switching cycle is required it is possible to minimize the effect of switching on lamp life with the use of a suitable electronic gear with a 4-pin lamp.

Effects of Supply Voltage Variations on Lamp Performance

Biax™ T lamps are suitable for supplies in the range 220V to 250V, 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings. See Graph D.

Luminous Intensity Distribution

The Luminous Intensity Distribution curve shows the horizontal light intensity of Biax™ T lamps. See Graph E.

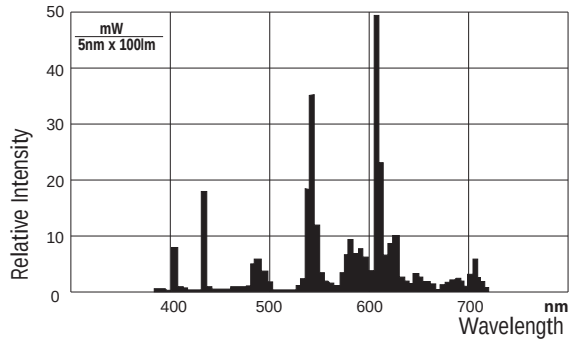
Effects of Temperature Changes

When installed in a luminaire, the temperature of the air surrounding the lamp cap changes and this can affect the light output of the lamp. The effects of changes in ambient temperature for a typical lamp are shown in Graph F.

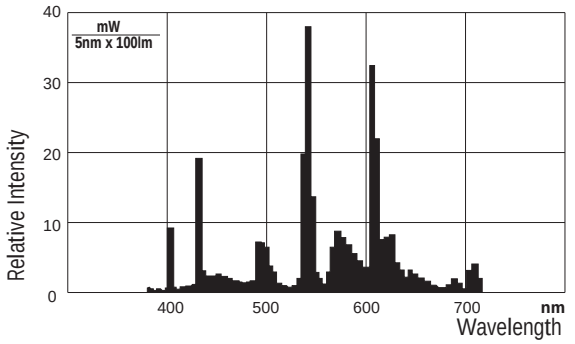
Standards

Biax™ T lamps comply with the relevant clauses of all applicable safety and performance specification including IEC 1199 and IEC 928.

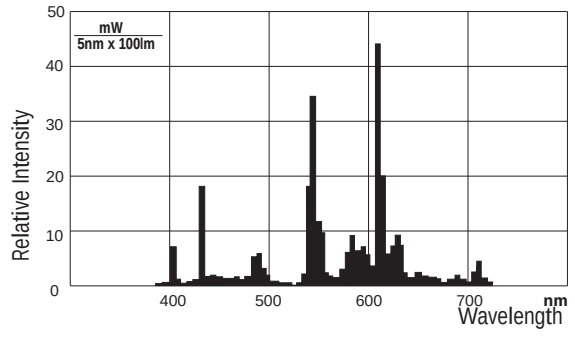
Spectral Power Distribution (2700K)



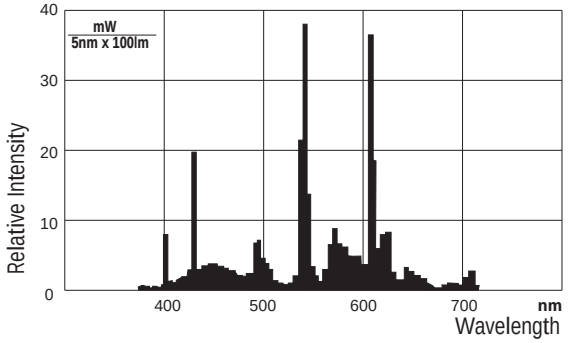
Spectral Power Distribution (3500K)



Spectral Power Distribution (3000K)



Spectral Power Distribution (4000K)



Watts	Volts	Amps	L max. (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Ø (mm)	Cap	Order Code	Approx. Initial Lumen	Colour Temp. (K)	Ra	Rated Avrg. Life (h)
2pin base, internal starter													
13	91	0.175	114	85	66	23	58	GX24d-1	**F13TBX/827**	900	2700	82	10 000
13	91	0.175	114	85	66	23	58	GX24d-1	**F13TBX/830**	900	3000	82	10 000
13	91	0.175	114	85	66	23	58	GX24d-1	**F13TBX/835**	900	3500	82	10 000
13	91	0.175	114	85	66	23	58	GX24d-1	**F13TBX/840**	900	4000	82	10 000
18	100	0.220	124	95	76	23	58	GX24d-2	**F18TBX/827**	1200	2700	82	10 000
18	100	0.220	124	95	76	23	58	GX24d-2	**F18TBX/830**	1200	3000	82	10 000
18	100	0.220	124	95	76	23	58	GX24d-2	**F18TBX/835**	1200	3500	82	10 000
18	100	0.220	124	95	76	23	58	GX24d-2	**F18TBX/840**	1200	4000	82	10 000
26	105	0.325	139	110	91	23	58	GX24d-3	**F26TBX/827**	1800	2700	82	10 000
26	105	0.325	139	110	91	23	58	GX24d-3	**F26TBX/830**	1800	3000	82	10 000
26	105	0.325	139	110	91	23	58	GX24d-3	**F26TBX/835**	1800	3500	82	10 000
26	105	0.325	139	110	91	23	58	GX24d-3	**F26TBX/840**	1800	4000	82	10 000

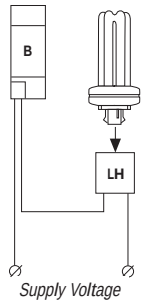
Biax™ T Compatibility with Other 2pin Cap Lamps

2pin Biax™ T (Triple)		2pin Biax™D (Double)			2pin Biax™ S (Single)
		F10DBX F13DBX	**F18DBX**	**F26DBX**	**F5BX F7BX F9BX F11BX**
		G24d-1	**G24d-2**	**G24d-3**	**G23**
F13TBX	**GX24d-1**	YES			
F18TBX	**GX24d-2**		YES		
F26TBX	**GX24d-3**			YES	

Circuit Diagram

Parallel compensated

B = Ballast (50 Hz)
LH = Lamp Holder



Biax™ T 13W, 18W & 26W

Biax™ T/E with Amalgam

Biax™ T/E Compact Fluorescent Lamps with Amalgam

Description

The ultra compact energy saving Biax™ T/E lamps with amalgam technology extend the application space of the innovative triple-tube design. They can be used in closed luminaires and outdoor applications too without significant light loss. See Graph A.

The Amalgam technology makes the Biax™ T/E lamps suitable for use in any burning position with same light output.

The Biax™ T/E lamps are electrically interchangeable with Biax™ D/E lamps. The wattages available are 13W through 32W for Biax™ T/E lamps. Light output ranges between 900 and 2200 lumens.

The Biax™ T/E lamps with a 4-pin electrical connection and without an internal starter are designed for high-frequency electronic ballasts. Biax™ T/E 13W, 18W and 26W lamps can also be used with a conventional 50Hz ballast and starter. The use of separate electronic ballasts makes them suitable for almost every kind of energy supply: high and low voltages, accumulators, batteries, solar cells and systems that can be dimmed.

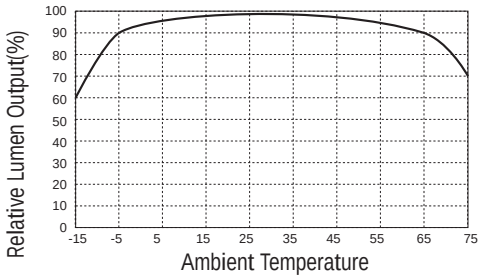
Features

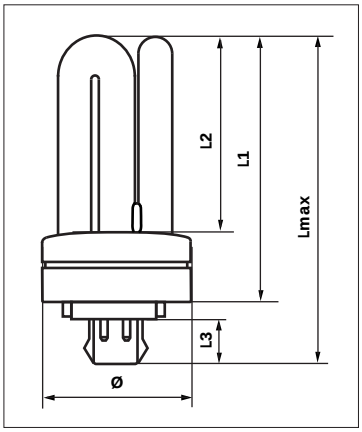
- Same light output in any burning position
- Fits inside most luminaires
- Up to 80% energy savings
- Lasts 10x longer than standard incandescent lamps
- High colour rendering index — Ra = 82
- Available in five colour temperatures — 2700, 3000, 3500, 4000K.
- May be used with dimmable electronic gears

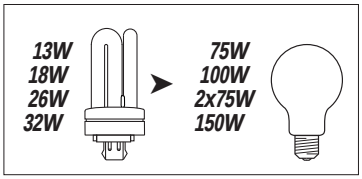
Applications

- outdoor luminaires
- closed luminaires
- post lighting, down lighting
- table lamps
- residential
- offices
- hotels/motels/restaurants
- corridor lighting, wall scones
- industrial and retails

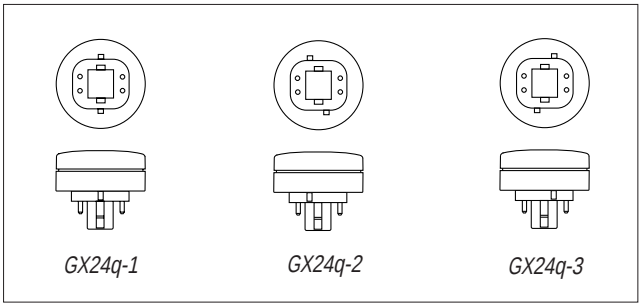
Lumen Output vs Ambient Temperature **Graph A**

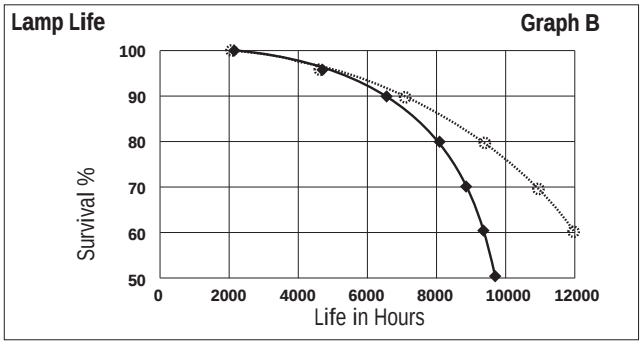


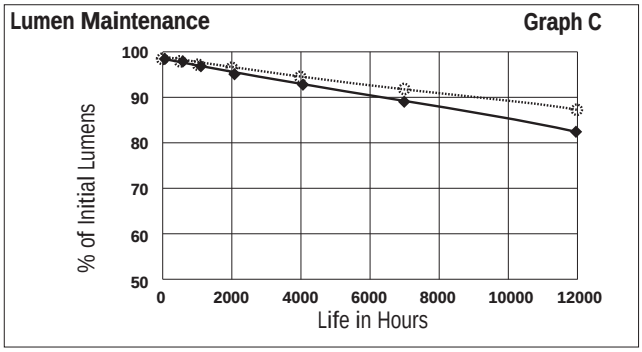


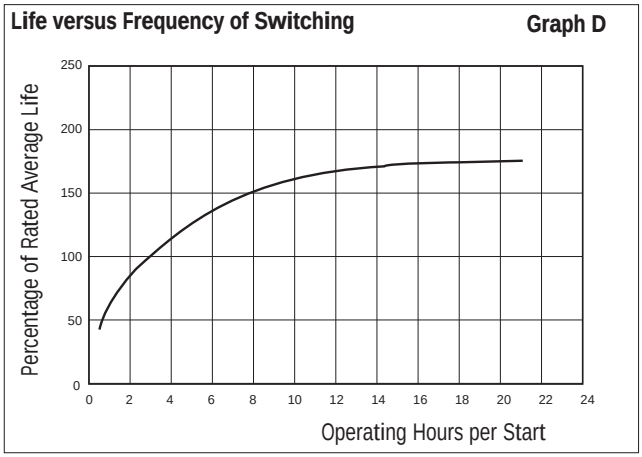


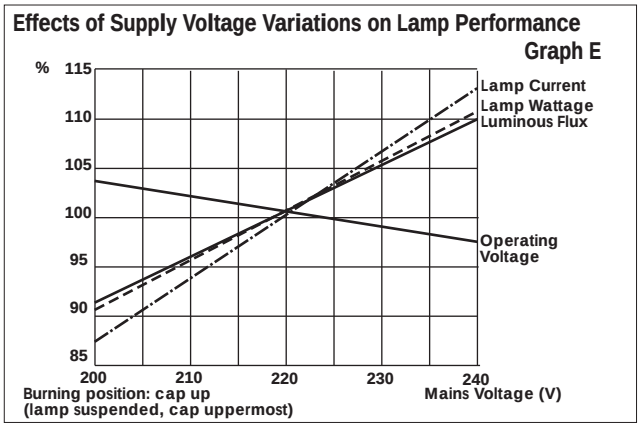
4pin

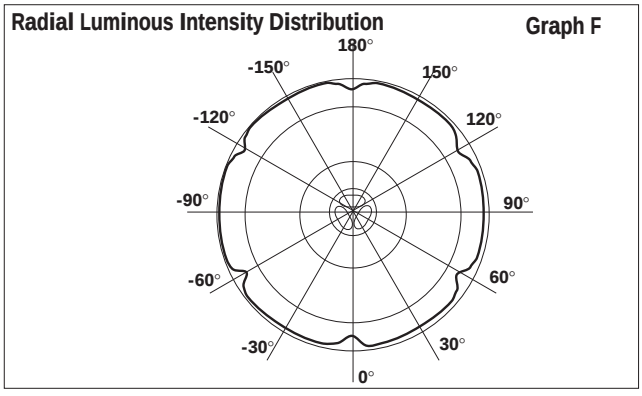












Lamp Life

Rated Average Life for Biax™ T/E lamps is 10000 hours (switching cycle: 3 Hrs: 165 Mins ON/15 Mins OFF). See Graph B.

Lumen Maintenance

Lumen Maintenance curve presented for Biax™ T/E lamps is based on lumen readings in a photometric sphere under laboratory conditions, in cap up position. In actual use, lumen output is a function of burning hours and lamp operating watts throughout life. See Graph C.

Life versus Frequency of Switching

For impact on life of alternative switching cycles refer to the Graph D.
For applications where a fast switching cycle is required it is possible to minimize the effect of switching on lamp life with the use of a suitable electronic gear.

Effects of Supply Voltage Variations on Lamp Performance

Biax™ T/E lamps with Amalgam (except the 32W) are suitable for supplies in the range 220V to 250V, 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings. See Graph E.

Luminous Intensity Distribution

The Luminous Intensity Distribution curve shows the horizontal light intensity of Biax™ T/E lamps.
See Graph E.

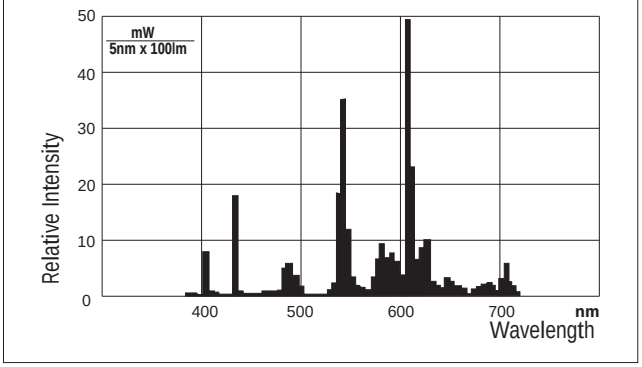
Environmental Aspect

The Mercury content of the Biax™ T/E lamps can be kept under 5mg per lamp without any performance issue, supporting GE Lighting's commitment to environmental issues.

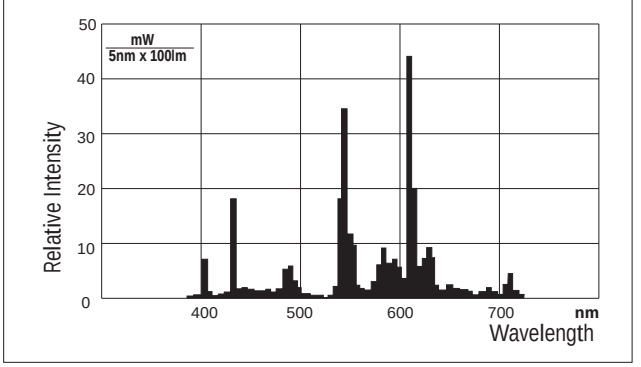
Standards

Biax™ T/E lamps comply with the relevant clauses of all applicable safety and performance specification including IEC 1199 and IEC 928.

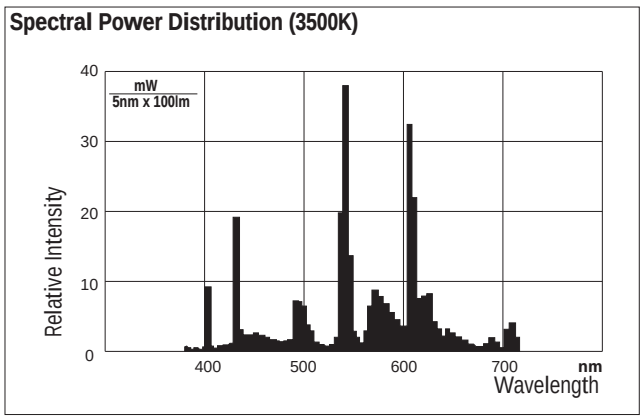
Spectral Power Distribution (2700K)



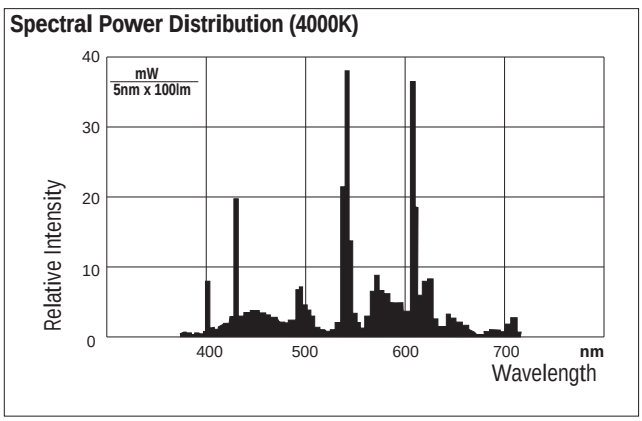
Spectral Power Distribution (3000K)



Spectral Power Distribution (3500K)



Spectral Power Distribution (4000K)



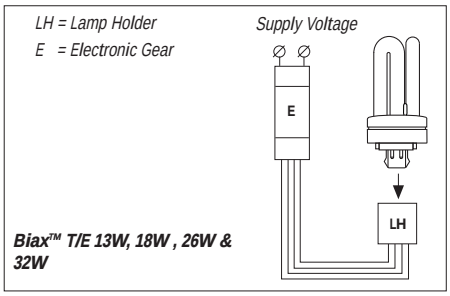
Watts	Volts	Amps	L max. (mm)	L1 (mm)	L2 (mm)	L3 (mm)	Ø (mm)	Cap	Order Code	Approx. Initial Lumen	Colour Temp. (K)	Ra	Rated Avrg. Life (h)
4pin base, without internal starter													
13	91	0.175	109	85	66	15	49	GX24q-1	**F13TBX/827/A/4P**	900	2700	82	10 000
13	91	0.175	109	85	66	15	49	GX24q-1	**F13TBX/830/A/4P**	900	3000	82	10 000
13	91	0.175	109	85	66	15	49	GX24q-1	**F13TBX/835/A/4P**	900	3500	82	10 000
13	91	0.175	109	85	66	15	49	GX24q-1	**F13TBX/840/A/4P**	900	4000	82	10 000
18	100	0.220	123	100	81	15	49	GX24q-2	**F18TBX/827/A/4P**	1200	2700	82	10 000
18	100	0.220	123	100	81	15	49	GX24q-2	**F18TBX/830/A/4P**	1200	3000	82	10 000
18	100	0.220	123	100	81	15	49	GX24q-2	**F18TBX/835/A/4P**	1200	3500	82	10 000
18	100	0.220	123	100	81	15	49	GX24q-2	**F18TBX/840/A/4P**	1200	4000	82	10 000
26	105	0.325	133	110	91	15	49	GX24q-3	**F26TBX/827/A/4P**	1800	2700	82	10 000
26	105	0.325	133	110	91	15	49	GX24q-3	**F26TBX/830/A/4P**	1800	3000	82	10 000
26	105	0.325	133	110	91	15	49	GX24q-3	**F26TBX/835/A/4P**	1800	3500	82	10 000
26	105	0.325	133	110	91	15	49	GX24q-3	**F26TBX/840/A/4P**	1800	4000	82	10 000
32	100*	0.320*	150*	125	106	15	49	GX24q-3	**F32TBX/827/A/4P**	2200	2700	82	10 000
32	100*	0.320*	150*	125	106	15	49	GX24q-3	**F32TBX/830/A/4P**	2200	3000	82	10 000
32	100*	0.320*	150*	125	106	15	49	GX24q-3	**F32TBX/835/A/4P**	2200	3500	82	10 000
32	100*	0.320*	150*	125	106	15	49	GX24q-3	**F32TBX/840/A/4P**	2200	4000	82	10 000

** Measured at High Frequency (> 20 kHz)*

Biax™ T/E Compatibility with Other 4pin Cap Lamps

S/E		4pin Biax™D/E (Double)			4pin Biax™ (Single)
4pin Biax™T/E (Triple)		F10DBX/4P F13DBX/4P	F18DBX/4P	F26DBX/4P	F5BX/4P F7BX/4P F9BX/4P F11BX/4P
		G24q-1	G24q-2	G24q-3	2G7
F13TBX/4P	**GX24q-1**	YES			
F18TBX/4P	**GX24q-2**		YES		
F26TBX/4P	**GX24q-3**			YES	

Circuit Diagram



Biax™ T/E 13W, 18W , 26W & 32W

Biax™ Q with Amalgam

Biax™ Q Compact Fluorescent Lamps with Amalgam

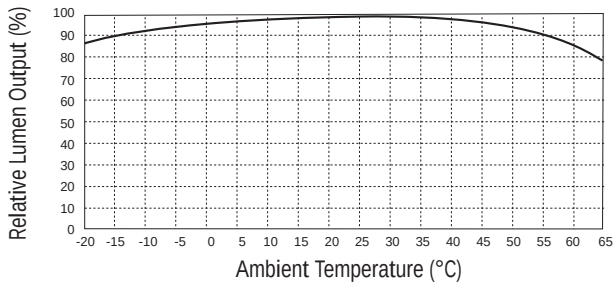
Description

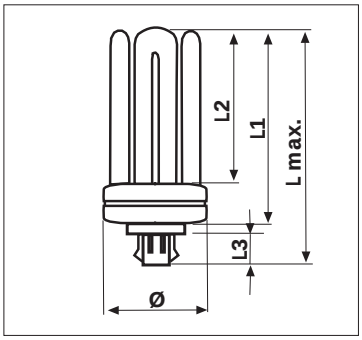
Ultra compact energy saving CFL lamps with the new, innovative four-tube design give an ideal light source for small luminaires and downlighters. In addition to the ultra compact design, the Biax™ Q lamp is made with Amalgam technology to extend its application space. It can be used in closed luminaires and outdoor applications too without significant light loss. See Graph A.
The Amalgam technology makes the Biax™ Q lamp suitable for use in any burning position with same light output.

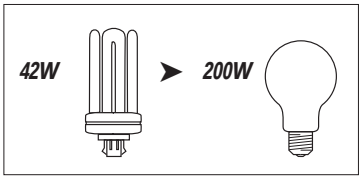
The Biax™ Q lamp is available in 42W with 3200 lumen light output. It can replace two Biax™ Q 26W CFLs or a 200W incandescent lamp.

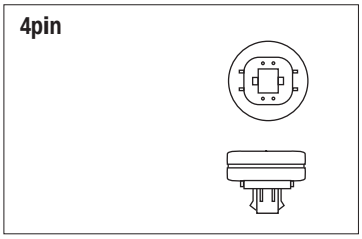
The Biax™ Q lamps with a 4-pin electrical connection and without an internal starter are designed for high-frequency electronic ballasts. The use of separate electronic ballasts makes them suitable for almost every kind of energy supply: high and low voltages, accumulators, batteries, solar cells and systems that can be dimmed.

Lumen Output vs Ambient Temperature **Graph A**









Features

- Made with Amalgam
- Up to 80% energy savings
- Lasts 10x longer than standard incandescent lamps
- High colour rendering index — Ra = 82
- With electronic gear it may be used with dimmers

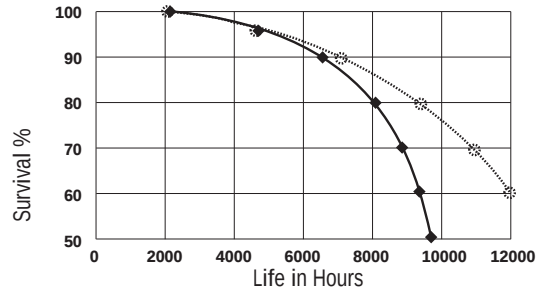
Applications

- outdoor luminaires
- closed luminaires
- offices
- hotels / motels
- industrial and retails

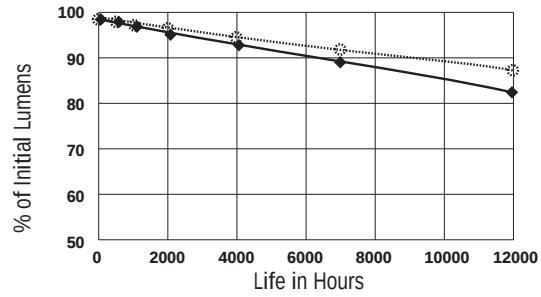
Watts	*Volts*	*Amps*	*L max. (mm)*	*L1 (mm)*	*L2 (mm)*	*L3 (mm)*	*Ø (mm)*	*Cap*	*Order Code*	*Initial Lumen*	*Approx. Temp. (K)*	*Ra*	*Rated Avrg. Life (h)*
4pin base, without internal starter													
42	*135*	*0.325*	*154*	*131*	*111*	*15*	*58*	*GX24q-4*	***F42QBX/830/A/4P***	*3200*	*3000*	*82*	*10 000*
42	*135*	*0.325*	*154*	*131*	*111*	*15*	*58*	*GX24q-4*	***F42QBX/835/A/4P***	*3200*	*3500*	*82*	*10 000*
42	*135*	*0.325*	*154*	*131*	*111*	*15*	*58*	*GX24q-4*	***F42QBX/840/A/4P***	*3200*	*4000*	*82*	*10 000*

Electrical parameters are measured at high frequency (> 20 kHz)

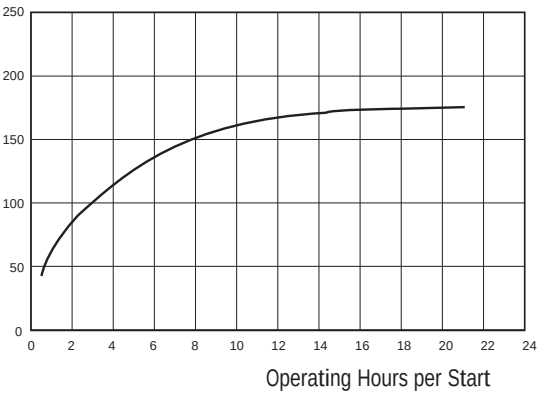
Lamp Life Graph B



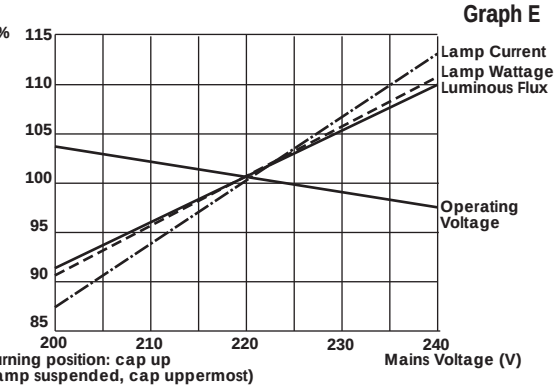
Lumen Maintenance Graph C



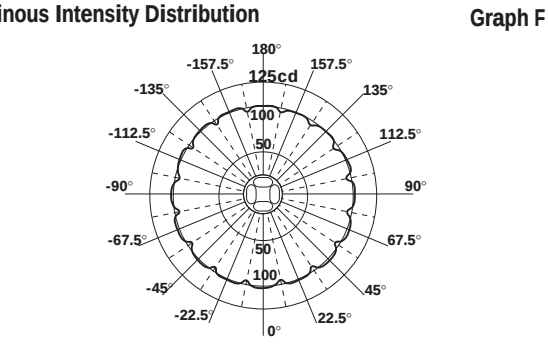
Life versus Frequency of Switching Graph D



Effects of Supply Voltage Variations on Lamp Performance Graph E



Luminous Intensity Distribution Graph F



Lamp Life

Rated Average Life for Biax™ Q lamps is 10000 hours (switching cycle: 3 Hrs: 165 Mins ON/15 Mins OFF). See Graph B.

Lumen Maintenance

Lumen Maintenance curve presented for Biax™ Q lamps is based on lumen readings in a photometric sphere under laboratory conditions, in cap up position. In actual use, lumen output is a function of burning hours and lamp operating watts throughout life. See Graph C.

Life versus Frequency of Switching

For impact on life of alternative switching cycles refer to the Graph D.
For applications where a fast switching cycle is required it is possible to minimize the effect of switching on lamp life with the use of a suitable electronic gear.

Effects of Supply Voltage Variations on Lamp Performance

Biax™ Q lamps with Amalgam are suitable for supplies in the range 220V to 250V, 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings. See Graph E.

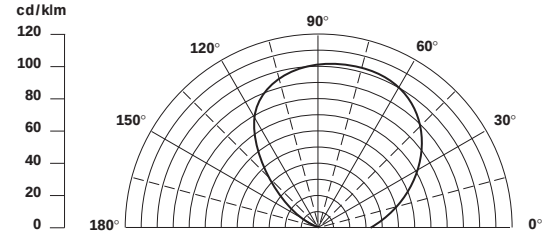
Luminous Intensity Distribution

The Luminous Intensity Distribution curve shows the horizontal light intensity of Biax™ Q lamps. See Graph F.

Environmental Aspect

The Mercury content of the Biax™ T/E lamps can be kept under 5mg per lamp without any performance issue, supporting GE Lighting's commitment to environmental issues.

Luminous Intensity Distribution in the plane parallel to lamp axis Graph G



Biax™ L

Biax™ L
Compact Fluorescent Lamps

Description

Biax™ L High Lumen Compact Fluorescent lamps are available in 18, 24, 34, 36, 40 and 55 watt versions. The single ended design is less than half the length of standard fluorescent lamps. This makes Biax™ L the ideal choice for modular luminaire. The range is available in colours of 2700, 3000, 3500, and 4000K allowing use in most environments.

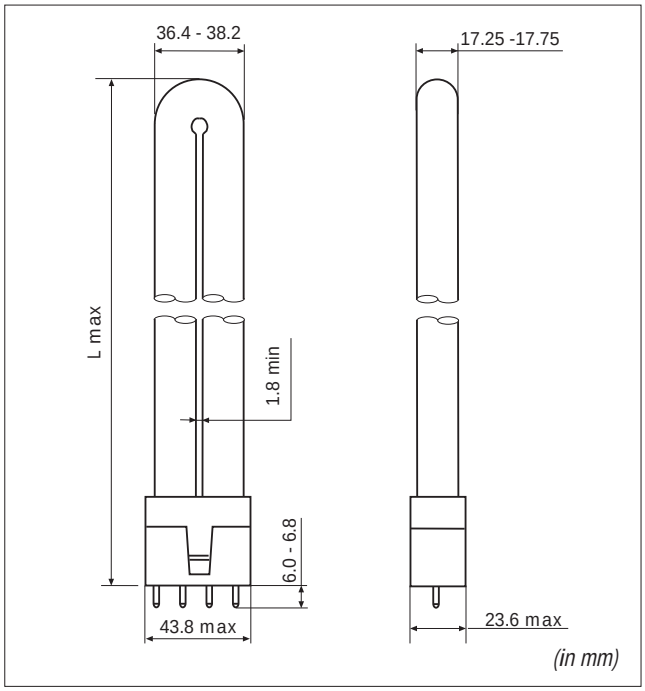
All Biax™ L lamps have a CRI of 82. The family of Biax™ L lamps offers a rated life of 10000 hours (at 3 hours per start). The 40 and 55 watt versions are for use on High-Frequency gear only.

Features

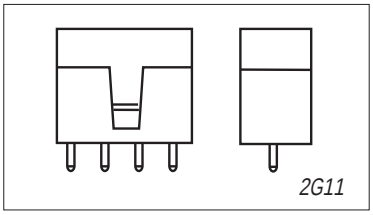
- savings on maintenance costs with 10000 hour rated life
- compact, high wattage
- high lumen package
- increased surface brightness enabling improved optical control
- excellent colour rendering — Ra = 82

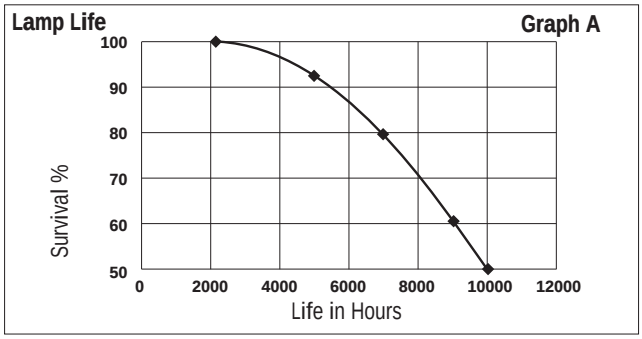
Applications

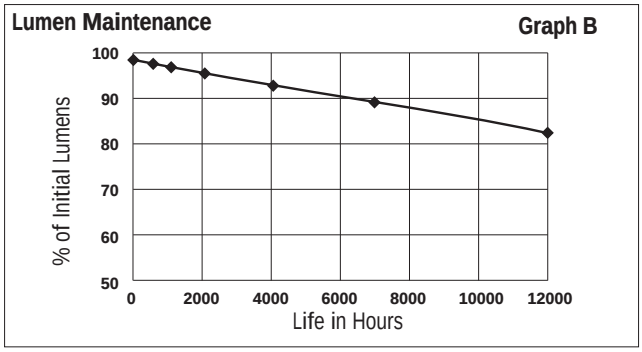
- Compact size is ideal for modular luminaires in commercial premises, shops, offices and hotels.
- Alternative use in non-general lighting applications such as task lights and sign lights.
- The 34W lamp offers an economical alternative to the 40W from an installation point of view and has the same dimensions. It is recommended to use an electronic starter when operating the 34W lamp with conventional gear.
- The 40 watt lamp has been specifically designed for optimum performance when used with High-Frequency control gear.
- The new 55 watt offers 4700 lumens in the same overall length as the 40 watt, ideal for use where higher lumens are required.

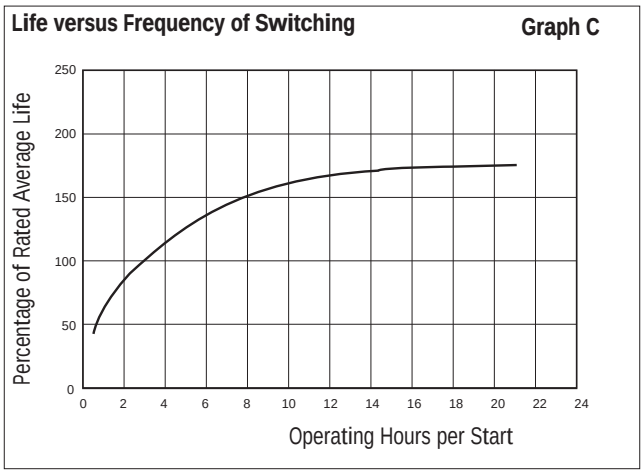


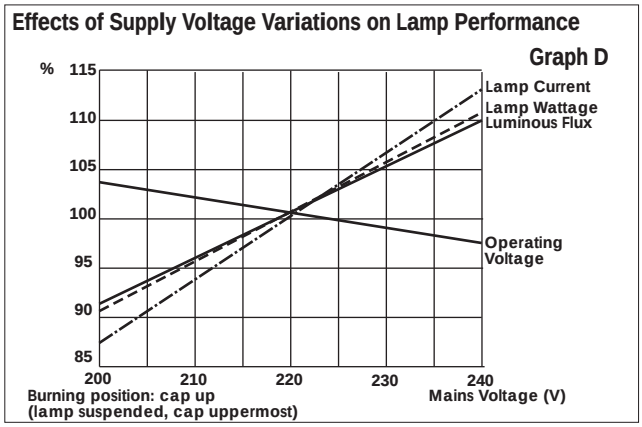
4-pin cap
Biax™ L

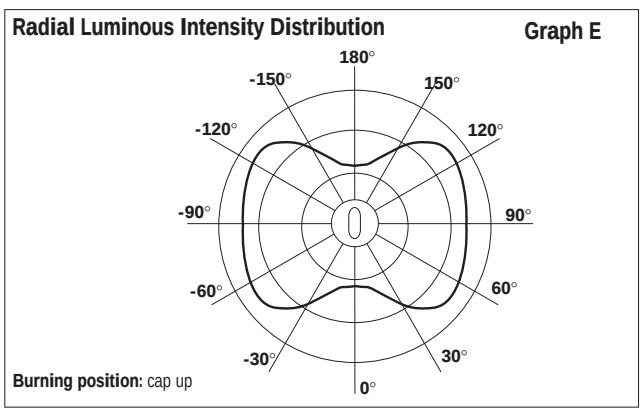












Lamp Life and Lumen Maintenance

Lamp Life for Biax™ L lamps are expressed as Rated Average Life Hours.
Biax™ L lamps have a median life of 10000 hours when tested on a standard switching cycle of 3 hours (2.75 hours On, 0.25 hours Off). (Graph A.)

Lumen Maintenance curve presented for Biax™ L lamps is based on lumen readings in a photometric sphere under laboratory conditions, in cap up position. (Graph B.) In actual use, lumen output is a function of burning hours and lamp operating watts throughout life.

Life versus Frequency of Switching

For impact on life of alternative switching cycles refer to the Graph C.

For applications where a fast switching cycle is required it is possible to minimize the effect of switching on lamp life with the use of a suitable electronic gear.

Effects of Supply Voltage Variations on Lamp Performance

Biax™ L lamps are suitable for supplies in the range 220V to 250V, 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. (Graph D.)

Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

Luminous Intensity Distribution

The Luminous Intensity Distribution curve shows the horizontal light intensity of Biax™ L lamps. (Graph E.)

Effects of Temperature Changes

When installed in a luminaire, the temperature of the air surrounding the lamp cap changes and this can affect the light output of the lamp. The effects of changes in ambient temperature for a typical lamp are shown in Graph F.

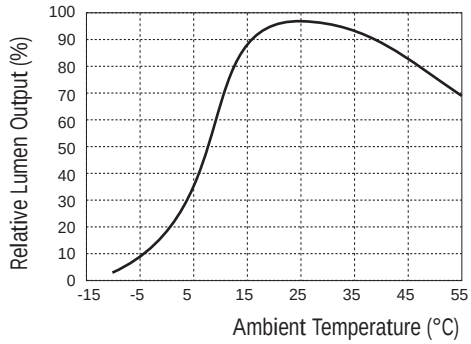
Standards

Biax™ L lamps comply with the relevant clauses of all applicable safety and performance specification including IEC 1199 and IEC 901.

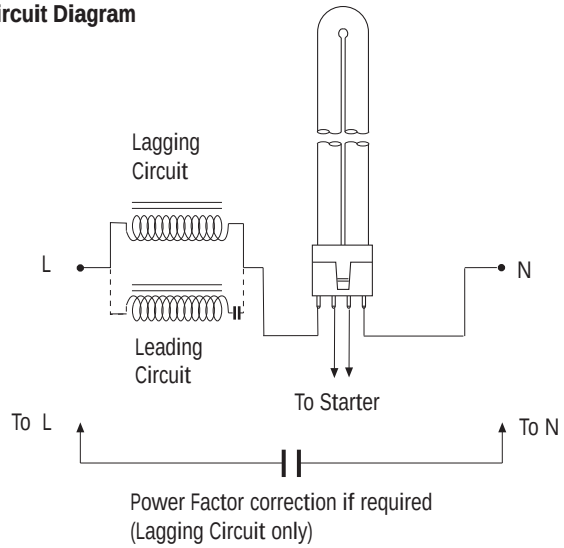
Reference Ballast Characteristics

Biax™ L Type	Ballasts			
	Rated Voltage (V)	Calibration Current (A)	Ratio Volts/Amps (Ω)	Power Factor
18W	127	0.37	270	0.12
24W	220	0.34	539	0.10
34W	220	0.43	390	0.10
36W	220	0.43	390	0.10
40W(HF)	254	0.32	400	1.0
55W(HF)	263	0.55	290	1.0

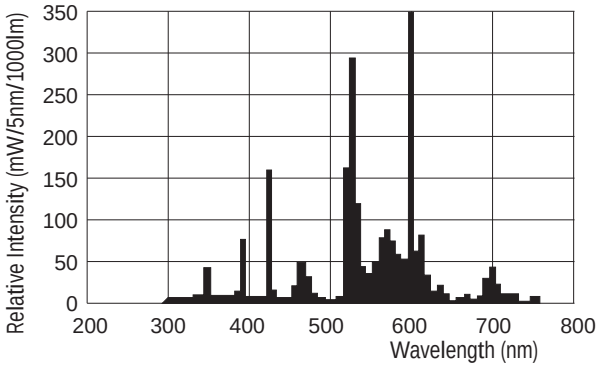
Lumen Output versus Ambient Temperature **Graph F**



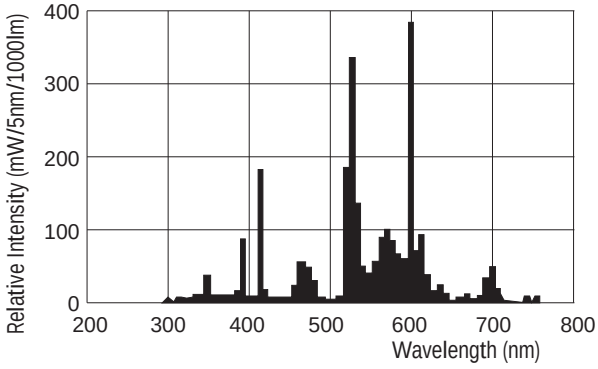
Circuit Diagram



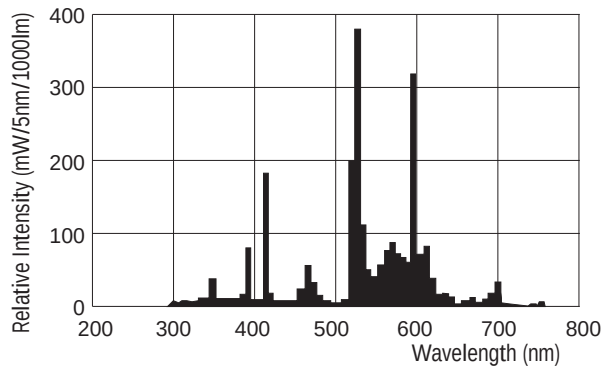
Spectral Power Distribution (2700K)



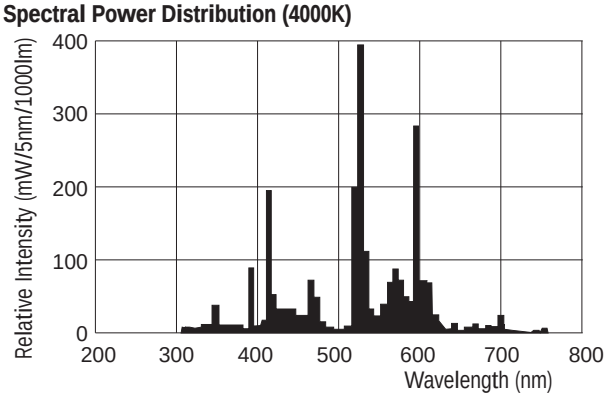
Spectral Power Distribution (3000K)



Spectral Power Distribution (3500K)



Spectral Power Distribution (4000K)



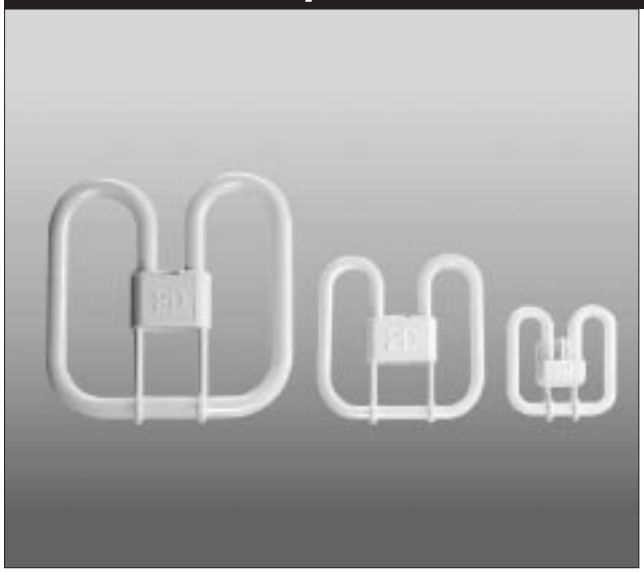
Technical Data

Watts	Volts	Amps	Cap	Lmax. Length (mm)	ø Diam. (mm)	Order Code	Approx. Initial Lumens	Colour Temp. (K)	Ra	Rated Avg. Life (h)
18	61	0.37	2G11	225	20	**F18BX/827**	1250	2700	82	10000
18	61	0.37	2G11	225	20	**F18BX/830**	1250	3000	82	10000
18	61	0.37	2G11	225	20	**F18BX/835**	1250	3500	82	10000
18	61	0.37	2G11	225	20	**F18BX/840**	1250	4000	82	10000
24	91	0.34	2G11	320	20	**F24BX/827**	1800	2700	82	10000
24	91	0.34	2G11	320	20	**F24BX/830**	1800	3000	82	10000
24	91	0.34	2G11	320	20	**F24BX/835**	1800	3500	82	10000
24	91	0.34	2G11	320	20	**F24BX/840**	1800	4000	82	10000
34	120	0.41	2G11	535	20	**F34BX/830**	2800	3000	82	10000
34	120	0.41	2G11	535	20	**F34BX/835**	2800	3500	82	10000
34	120	0.41	2G11	535	20	**F34BX/840**	2800	4000	82	10000
36	112	0.43	2G11	415	20	**F36BX/827**	2900	2700	82	10000
36	112	0.43	2G11	415	20	**F36BX/830**	2900	3000	82	10000
36	112	0.43	2G11	415	20	**F36BX/835**	2900	3500	82	10000
36	112	0.43	2G11	415	20	**F36BX/840**	2900	4000	82	10000
40*	126	0.32	2G11	535	20	**F40MBX/830**	3500	3000	82	10000
40*	126	0.32	2G11	535	20	**F40MBX/835**	3500	3500	82	10000
40*	126	0.32	2G11	535	20	**F40MBX/840**	3500	4000	82	10000
55*	100	0.55	2G11	535	20	**F55BX/830**	4850	3000	82	10000
55*	100	0.55	2G11	535	20	**F55BX/835**	4850	3500	82	10000
55*	100	0.55	2G11	535	20	**F55BX/840**	4850	4000	82	10000

** For High-Frequency Operation.*

Biax™ 2D

BIAX™ 2D Compact Fluorescent Lamps 10W, 16W, 21W, 28W, 38W



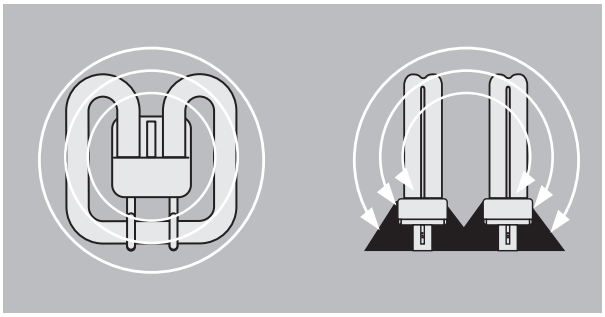
Description

The 10W, 16W, 21W, 28W and 38W Biax™ 2D lamps are energy saving lamps designed for use with suitable control gear in situations where 60W, 100W, 150W and 200W GLS lamps, respectively may otherwise have been used or as a compact alternative to linear fluorescent tubes.

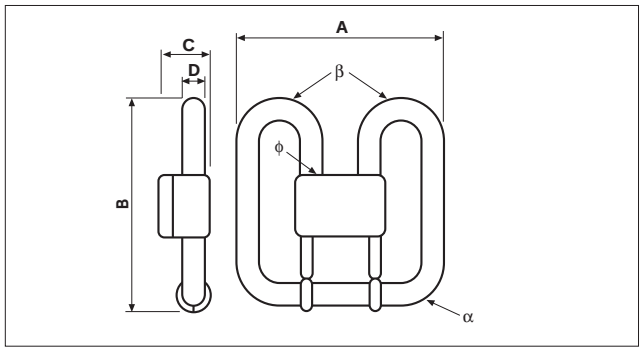
Biax™ 2D lamps are compact fluorescent tubes formed into a “2D” shape. All types are available with a 4pin cap which permits use with conventional or electronic (high frequency) control gear, dimming circuits and emergency lighting circuits.
The 16W and 28W types are available also with 2pin cap which contains a starter switch and r.i.s. capacitors.
All lamps use rare earth triphosphors to give high efficacy with good colour rendering properties.

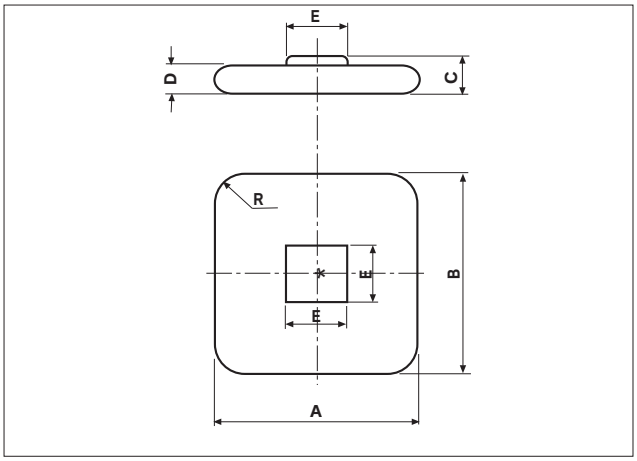
Applications

Domestic, commercial and industrial interiors and exteriors. The flat, slim profile makes the Biax™ 2D an ideal choice for building into slim, attractive luminaires, and its two dimensional shape makes it very suitable for both uplighting and downlighting applications, where directional light is required.
Due to its shallow, broad configuration, it spreads light over a large area without expensive optics making it a better choice than traditional compact fluorescent and Circline lamps.



The 10W Biax™ 2D is particularly suitable for night time security lighting due to its low power consumption and consequently low cost of operation.
The high light output and compact size of the 38W Biax™ 2D lamps make it an excellent light source for use in 300mm x 300mm module ceiling systems.



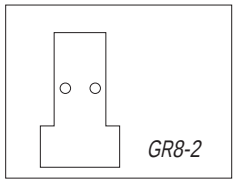


Maximum Lamp Outline

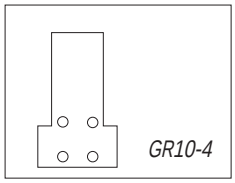
	A	*B*	*C*	*D*	*E*	*R*
2D10W	*98*	*98*	*35*	*23*	*39*	*24.5*
2D16W, 21W	*142*	*142*	*28*	*20*	*42*	*28*
2D28W, 38W	*207*	*207*	*35*	*27*	*56*	*53*

** This central region contains the portion of the cap that protrudes beyond the glass-ware maximum outlines.*

2pin



4pin



Physical Data

Rated Lamp Power (W)		10	16	21	28	38
Dimensions (mm)	A	91	140	140	205	205
	B	91	140	140	205	205
	C	35	27	27	35	35
	D	14max.	15max.	15max.	24max.	24max.
Cap	2pin	–	GR8	–	GR8	–
	4pin	GR10q	GR10q	GR10q	GR10q	GR10q
Mass (g)		65	65	65	130	130
Operating Position		Universal	Universal	See "Operating Notes"	Universal	See "Operating Notes"
Life (hours)		10,000	10,000	10,000	10,000	10,000

Electrical Characteristics

Data for 50Hz circuits tested in 25 °C ambient temperature.

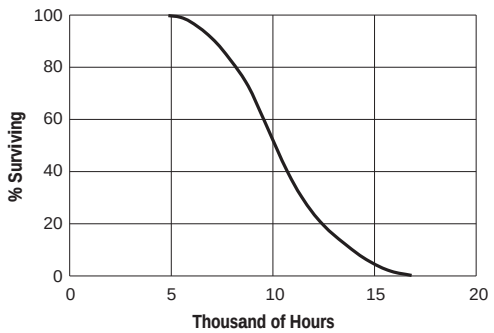
Rated Lamp Power (W)	10	16	21	28	38
Objective Lamp Power (W)	10.5	16	21	28	38.5
Objective Lamp Volts	72	103	102	108	110
Nominal Lamp Current (running) (A)	0.180	0.195	0.26	0.32	0.43
Nominal Lamp Current (preheat) (A)	0.215	0.260	0.31	0.41	0.58
Resistance per Cathode at 8V (Ω)	55	65	35	9	9
Typical Ballast Loss (W)	6	6	6.5	8	11
Typical Circuit Power (W)	16.5	22	27.5	36	49.5
PFC Capacitor Value (µF)	2	2	3	4	4
Nominal Series Capacitor for 220V Loading Circuit Operation* (µF)	–	1.6 (440V wkg)	–	2.5 (440V wkg)	3.6 (440V wkg)

*Increased supply voltage or capacitor value will give higher lamp watts.

Luminous Characteristics

	10W		16W			21W			28W			38W		
Colour Temperature (K)	2,700	3,500	2,700	3,500	6,000	2,700	3,500	6,000	2,700	3,500	4,000	2,700	3,500	6,000
Lumen Output – 100hr	650	650	1,050	1,050	1,050	1,350	1,350	1,350	2,050	2,050	2,050	2,850	2,850	2,850
2000hr	570	570	925	925	925	1,170	1,170	1,170	1,850	1,850	1,850	2,500	2,500	2,500
100hr Lumens per Watt	62	62	66	66	66	64	64	64	73	73	73	74	74	74
Chromaticity Co-ordinates x	0.463	0.415	0.463	0.415	0.316	0.463	0.415	0.316	0.463	0.415	0.380	0.463	0.415	0.316
y	0.420	0.402	0.420	0.402	0.336	0.420	0.402	0.336	0.420	0.402	0.377	0.420	0.402	0.336
Colour Rendering Index (Ra)	82	82	82	82	82	82	82	82	82	82	82	82	82	82

Lamp Life
2D10W, 16W, 21W, 28W, 38W



Lamp Life

All Biax™ 2D lamps have a median life of 10,000 hours when tested on a standard switching cycle of 3 hours (2.75 hours on, 0.25 hours off).
For impact on life of alternative switching cycles refer to graph "Life versus Frequency of Switching".
For application where a fast switching cycle is required it is possible to minimise the effect of switching with the use of a suitable electronic starter.
For lamps with an integral starter switch (2pin), the switch is designed to give approximately 20,000 starts which may be of more relevance than rated lamp life in a frequently switched situation.

Control Gear

Control gear from any reputable manufacturer whose gear conforms to national/international specifications for operation of 13W T5 lamps; 18W T8 and 20W T12 lamps, as well as 36W T8 and 40W T12 lamps will satisfactorily operate the 10W, 28W as well as 38W Biax™ 2D lamps, respectively.

However, in case of 28W Biax™ 2D lamps, a 2.5 µF ± 5%, 440V working capacitor rather than a 4 µF capacitor should be used for 220V leading circuit options. The use of a 4 µF capacitor would cause the lamp to over run by an unacceptable amount.

The use of 38W Biax™ 2D lamp on 220V leading circuits in low ambient temperature applications (below 0°C) is not recommended.

The 16W and 21W Biax™ 2D lamps require dedicated control gears. Ballasts designed for 16W T8 and 20W T12, as well as 18W T8 and 20W T12 lamps are not suitable. Control gears designed for operation of 16W and 21W Biax™ 2D lamps are available from manufacturers such as Thorn Lighting, Tridonic, May & Christic and Vossloh Schwabe.

Starting

For conventional starting of 4pin Biax™ 2D lamps, it is recommended to use GE 155/500 starter switches.

The use of the 4pin 16W Biax™ 2D lamp with glow starters is not recommended because of potential flicker problems originating with the associated r.i.s. capacitor (2pin versions incorporate a special r.i.s. capacitor).

Operating Notes

The 2pin Biax™ 2D lamps are unsuitable for dimming circuits or electronic operation and should not be used for this applications.

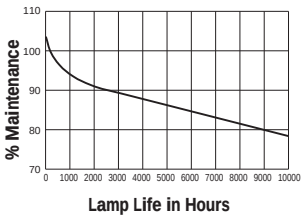
The 4pin Biax™ 2D lamps can be operated electronically and can be dimmed using the appropriate control gear.

The Biax™ 2D lamps can be operated in any position except where leg "α" is higher than bends β in case of 21W and 38W types. This limitation is necessary to ensure that region Ø of cap is kept as cool as possible.

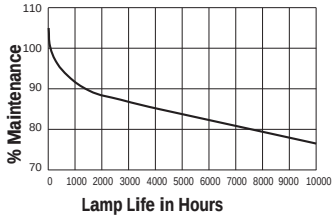
Do not use a Biax™ 2D lamp to replace any other rating of them or in luminaires or circuits designed for any other rating of Biax™ 2D lamp as poor lamp performance and short lamp life will result.

Lumen Maintenance

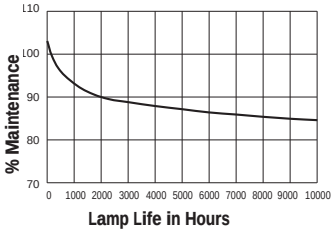
2D10W, 16W



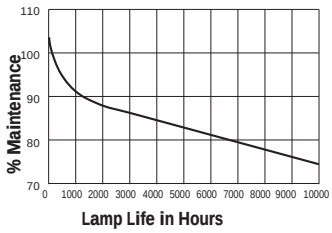
2D21W



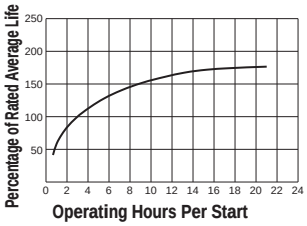
2D28W



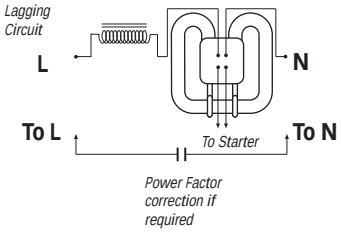
2D38W



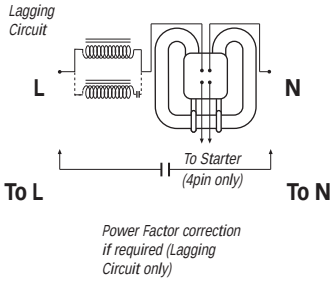
Life versus Frequency of Switching
(2D10W, 16W, 21W, 28W, 38W)



Circuitry (2D10W, 21W)

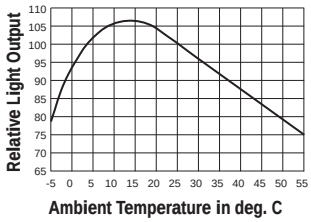


Circuitry (2D16W, 28W, 38W)



Light Output versus Ambient Temperature

2D10W



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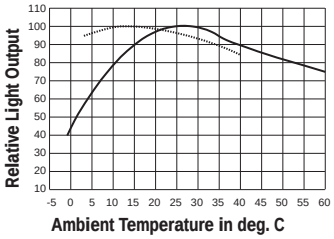

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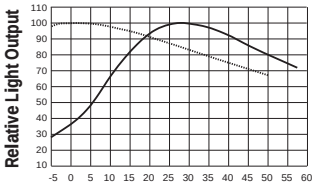

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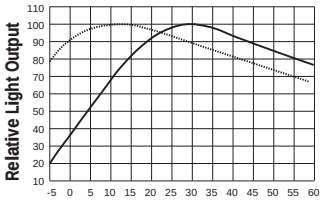

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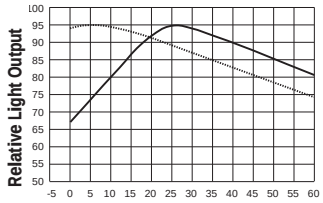
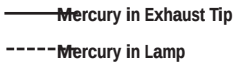
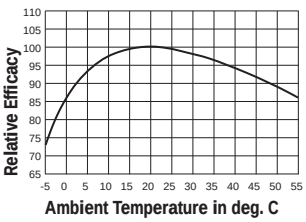




Efficacy versus Ambient Temperature

2D10W



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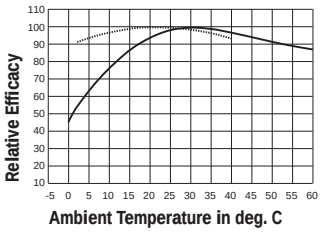

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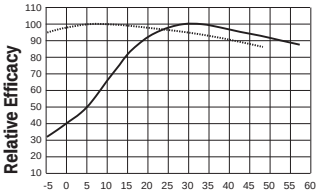

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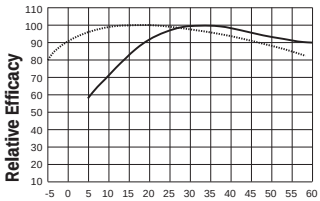

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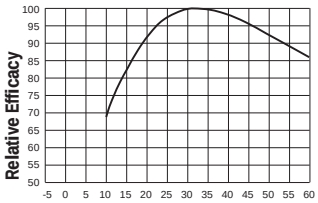
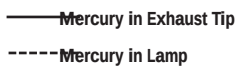
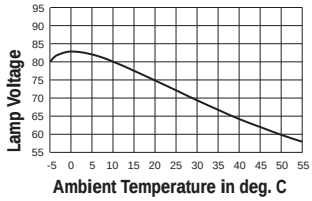




Lamp Voltage versus Ambient Temperature

2D10W



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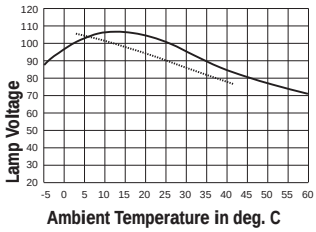

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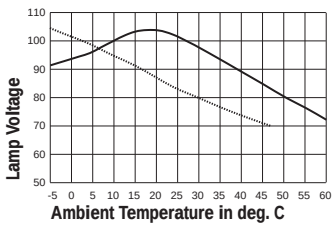

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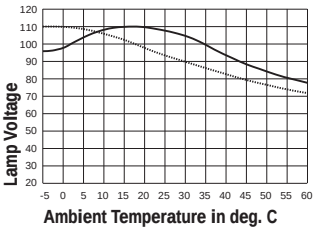
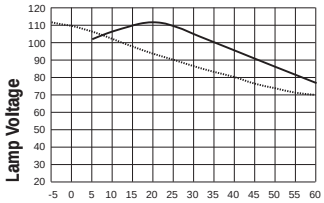
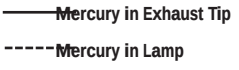


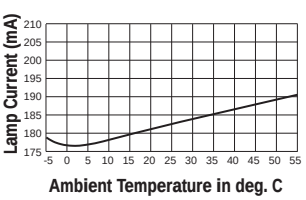
2D38W





Lamp Current versus Ambient Temperature

2D10W



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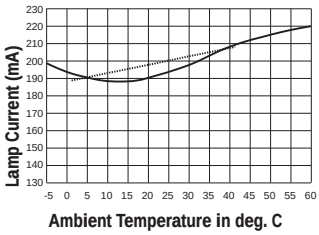

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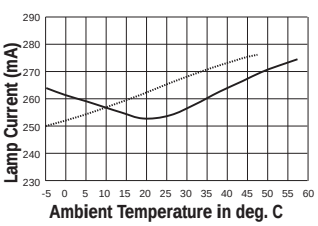

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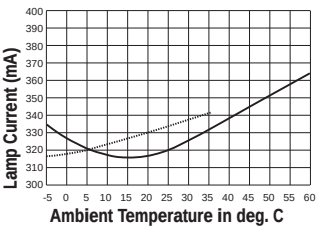
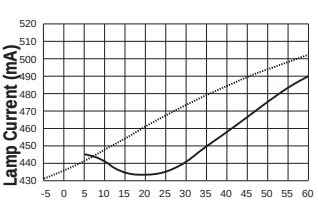
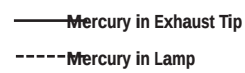


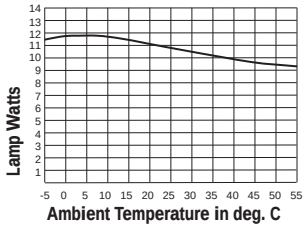
2D38W





Lamp Watts versus Ambient Temperature

2D10W



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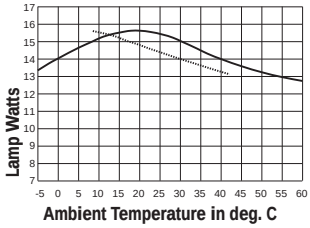

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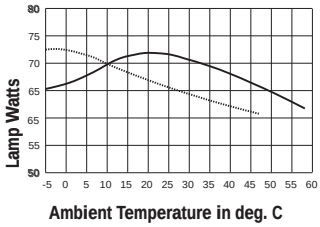

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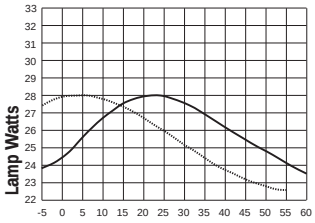

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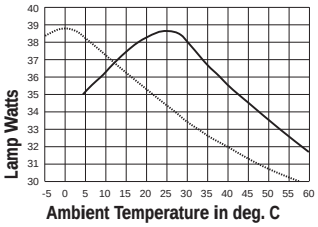
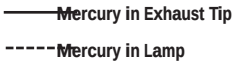




Guidelines for Electronic Ballast Design

(4pin lamps only)

General

The values detailed below are intended to be used as guidelines only. The absolute values may be affected by additional ballast design variables relating to circuit and lamp performance criteria. In case of a multi-lamp ballast, the parameters apply to each lamp.

Ballast Characteristics

Circuit Type	*A cathode preheating circuit is recommended.*
Supply Voltage (V)	*220/240*
Supply Frequency (Hz)	*50/60*
Operating Frequency (kHz)	*>25*
Ballast Efficiency (%)	*>85*
Power Factor	*Where a high power factor is claimed it will exceed 0.9.*

Starting Characteristics

Preheat Time (ms)	*500 minimum or resistance ratio Rh/Rc = 4.25 to ensure cathode temperature of above 700°C.*
Lamp Glow Current (mA r.m.s.)	*0 preferred (max. 25)*
Peak Voltage (V)	*400*
Minimum Starting Temperature (°C)	*-10*
Starting Aid to Lamp Distance (where applicable) (mm)	*7 (for 10W, 16W and 21W types); 12 (for 28W and 38W types)*

Additional Notes

The 16W, 21W, 28W and 38W lamps have a long tip-off tube which acts as a cool spot into which the liquid mercury reservoir (required by all fluorescent lamps) migrates during early lamp operation. In relation to circuit or fittings design or ballast evaluation, tests should be conducted with lamps aged to a minimum of 500 hours with care being taken to keep the mercury in this "cool spot". In practice this means either that the lamp should be left undisturbed in its ageing position or that if the lamp is moved it should not be jolted and the 2D "loops" should always be carried at a greater height than the straight lamp region (90° bends). This procedure is recommended to ensure that the mercury is fully contained in the cool tip.

The graphs in this data sheet depicting the variation of light output and other lamp characteristics with ambient temperature (for typical 50Hz lagging circuits) show performance before and after mercury stabilisation. By measuring the voltage at a given ambient temperature and referring to the curves for the former parameter it can readily de determined whether some liquid mercury is still in the body of the lamp or all is in the cool tip.

The Biax™ 2D lamps have been standardised internationally through the International Electrotechnical Commission (IEC). For lamp performance the relevant data sheets in IEC 901 (EN 60901) apply; for lamp safety the relevant clauses in IEC 1199 apply.

Patent Information

2D lamps are protected by European Patent No. 0057974.

Typical High Frequency Operating Characteristics

	10W	**16W**	**21W**	**28W**	**38W**
Voltage (V)	*60-65*	*82-87*	*84-90*	*96-101*	*92-98*
Current (mA)	*145-170*	*170-190*	*200-240*	*240-275*	*330-380*
Lamp Current Crest Factor	*max. 1.7*	*max. 1.7*	*max. 1.7*	*max. 1.7*	*max. 1.7*
Ballast Lumen Factor	*min. 90%*	*min. 90%*	*min. 90%*	*min. 90%*	*min. 90%*

Biax™ 2D 55W

BIAX™ 2D 55W Compact Fluorescent Lamp

Description

In response to the demand from the market for a higher light output version of the 2D lamp, GE Lighting now offers the new 2D 55W using the 28W/38W envelope size.
The high luminous efficacy achieved with 28W and 38W lamps has been retained in the 55W by incorporating an amalgam which overcomes the fall in efficacy that occurs with increased lamp loading.
This latest addition to the 2D range has a cap which uses an upgraded material and has a unique keyway to eliminate possible safety problems. (See Diagram 1)
The new cap material will withstand the higher temperatures generated by the increased lamp power while the modified holder required for the 55W 2D will stop accidental insertion of any lower rated 2D lamp into a 55W socket.

Cap Fit

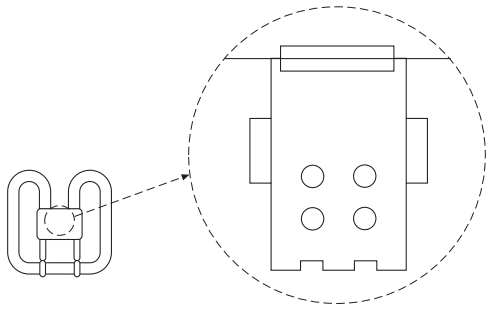


Diagram 1

Applications

Commercial and industrial interiors and exteriors where high lumen output is needed in a compact size. The flat profile makes the 2D an ideal choice for building into slim, attractive luminaires. Its two dimensional shape is suitable for both uplighting and downlighting applications, where directional light is required. 2D's shallow, broad configuration spreads light over a 360° area without the need for expensive optics. The high light output and compact size of the 55W 2D lamp also makes it an excellent light source for use in wall and modular ceiling fittings.

Nominal Dimensions

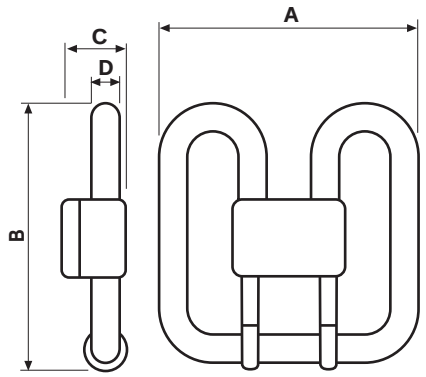


Diagram 2

Physical Data

Rated Lamp Power (W)		55
Dimensions (mm)	**A***	205
	B*	205
	C*	35
	D*	24
Cap - 4pin		GRY10q-3
Weight (g)		130
Operating Position		see Operating Note
Life (hours)		10,000

** see Diagram 2*

Note for fitting designers
For maximum lamp outline see Diagram 3.

Maximum Outline (mm)

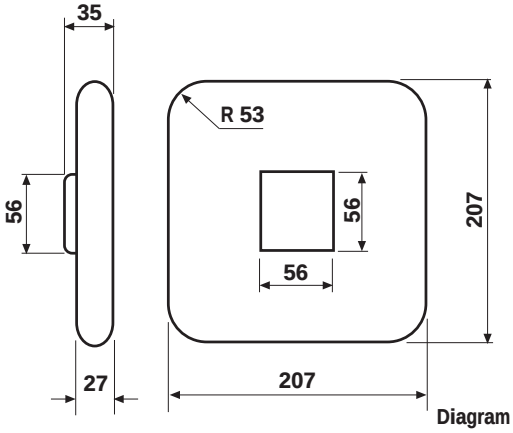
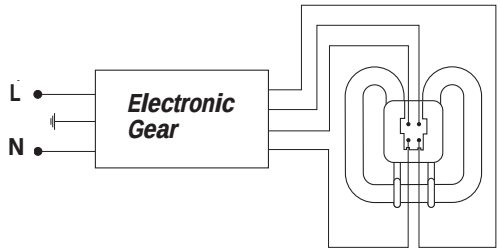
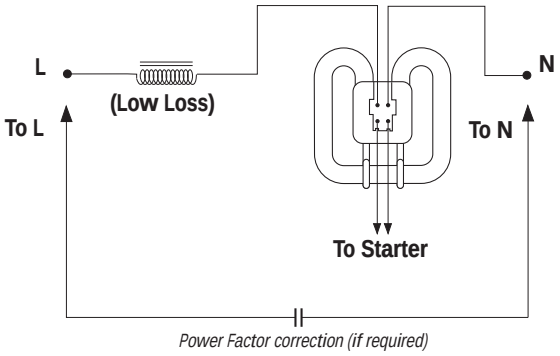


Diagram 3

Circuitry - **High Frequency (Preferred Option) Single Lamp**

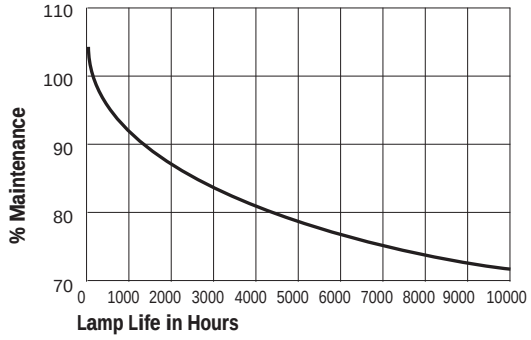


Circuitry - **Mains Frequency (Non-Preferred Option) Lagging Circuit**



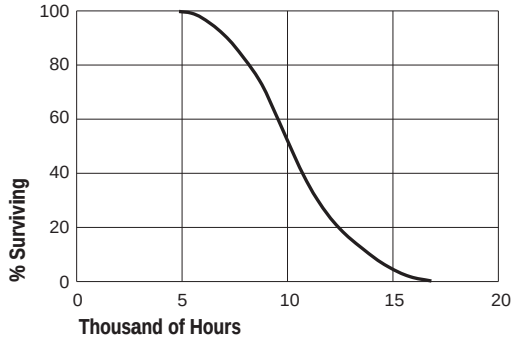
NOTE: LEADING CIRCUIT OPTION IS NOT AVAILABLE

Lumen Maintenance



Graph 1

Lamp Life



Graph 2

Electrical Characteristics

Data for high frequency (20kHz) reference circuits.
Lamp operating in free air at 50°C ambient temperature.

Rated Lamp Power (W)	*55*
Objective Lamp Power (W)	*54*
Objective Lamp Volts (V)	*77*
Nominal Lamp Current (running) (A)	*0.705*

Control Gear

High Frequency

Recommended Ballast Options:
MAGNETEK EET 158 (For single lamp operation)
MAGNETEK EET 258 (For twin lamp operation)
Please contact your local GE sales office for further information regarding suppliers.

Mains Frequency

The lamp can be operated using Low Loss 1500 mm 58/65W ballast.
Standard ballasts are not recommended because the high gear losses will have an adverse effect on the fitting thermal performance as well giving an unsatisfactory ballast life.
Supplier: TRIDONIC
Please contact your local GE sales office for further information regarding suppliers.

Dimming

The 4-pin 55W 2D lamp can be dimmed using appropriate control gear.

Luminous Characteristics

Colour Temperature (K)		*2700*	*3500*
Lumen Output – 100hr		*3900*	*3900*
2000hr		*3400*	*3400*
Efficacy (Lm/W)		*71*	*71*
Chromaticity Co-ordinates	***x***	*0.463*	*0.415*
	y	*0.420*	*0.402*
Colour Rendering Index (Ra)		*82*	*82*

For Lumen Maintenance see Graph 1

Lamp Life

The 55W 2D lamp has a median life of 10,000 hours when tested on a standard switching cycle of 3 hours (2.75 hours on, 0.25 hours off) see Graph 2.
For impact on life of alternative switching cycles refer to graph 3.
To achieve claimed life for high frequency operation a preheated start is recommended for the 55W lamp.
For conventional starting of the 55W 2D lamp a GE 155/500 starter switch is recommended.

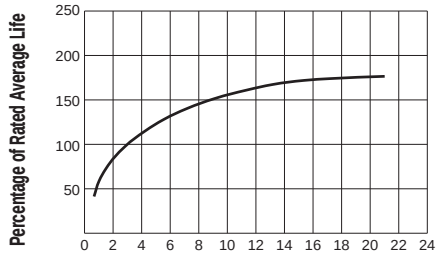
Minimum Starting Temperature

Lamp starting at low ambient temperature (-10°C) can be successfully achieved, however the light output during run up performance will be markedly slow. (See later comment.)
Good starting at low temperatures requires a close proximity earth (ground) plate.

Run-Up Time

When a fluorescent tube is switched on, the light output rises during the first few minutes until the optimum temperature is reached and then falls if the temperature continues to rise.
Since the amalgam lamp optimises at a higher temperature this run-up takes longer but the fall off in light output beyond the temperature at which peak light output occurs is reduced thereby giving a greater flexibility in luminaire design.
As a consequence of this "slow" run-up characteristic this lamp is not considered suitable for applications where very short running periods are normal; or where low ambient temperatures are encountered, unless the fitting is fully enclosed.

Life versus Frequency of Switching



Graph 3

Operating Position

The 55W 2D lamp can be operated in any position except where leg α is higher than bends β (see Diagram 4). This limitation is necessary to ensure that region Φ of cap is kept as cool as possible. Region Φ should not exceed 140°C.
Do not use 55W 2D lamp in luminaires or circuits designed for any other rating of 2D lamp as poor lamp performance and short lamp life will result.

Operating Position

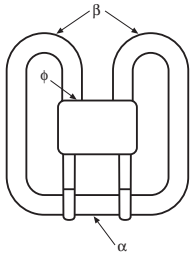
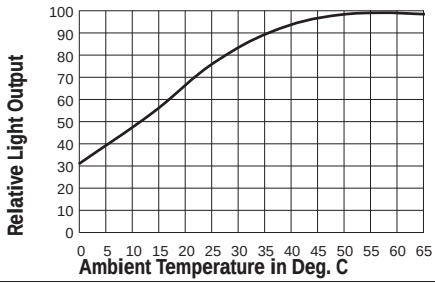


Diagram 4

Lamp Characteristics Over a Range of Ambient Temperatures

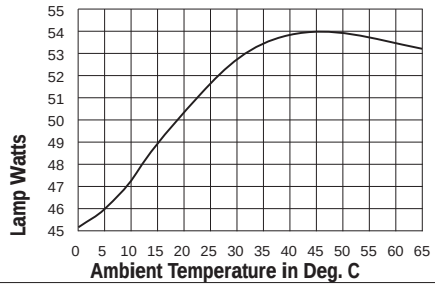
20 kHz Reference Circuit, Lamp Operating in Free Air

Light Output



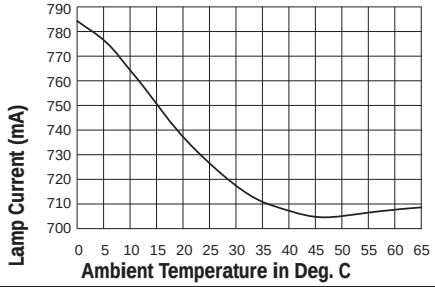
Graph 4

Lamp Watts



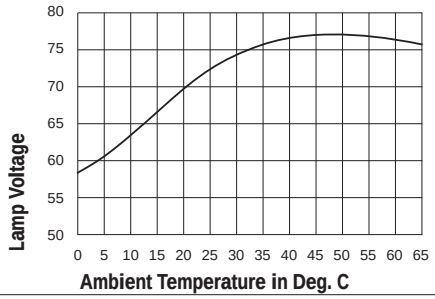
Graph 5

Lamp Current



Graph 6

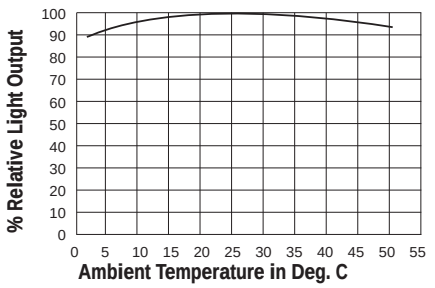
Lamp Voltage



Graph 7

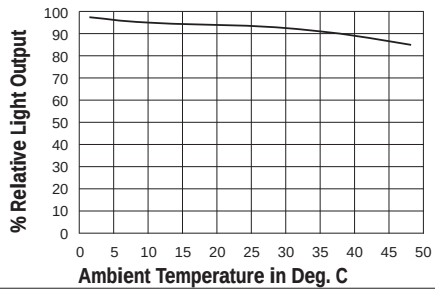
Surface Mounted 55W Fitting with Commercial High Frequency Ballast

Light Output without Diffuser



Graph 8

Light Output with Diffuser



Graph 9

Operating Note

The ambient temperature at which maximum light output occurs is 50°C . For optimum performance in a fitting, consideration must be given to the likely temperature rise within the fitting volume due to the heating effect of the lamp.

Patent Information

2D lamps are protected by European Patent No. 0057974.

Guidelines for Electronic Ballast Design

General

The values detailed below are intended to be used as guidelines only. The absolute values will be affected by the differences in ballast design. In the case of a multi-lamp ballast, the parameters apply to each lamp.

Ballast Characteristics

Circuit Type	*A preheat type circuit is recommended.*
Supply Voltage (V)	*220/240*
Supply Frequency (Hz)	*50/60*
Operating Frequency (kHz)	*>25*
Ballast Efficiency (%)	*>85*
Power Factor	*Where a high power factor is claimed it will exceed 0.9.*

Starting Characteristics

Preheat Time (ms)	*500 minimum or resistance ratio Rh/Rc = 4.25 to ensure a cathode temperature above 700°C.*
Lamp Glow Current (mA r.m.s.)	*0 preferred (max. 25)*
Peak Voltage (V)	*~ 400*
Minimum Starting Temperature (°C)	*-10°C*
Starting Aid to Lamp Distance (where applicable) (mm)	*12*

Typical High Frequency Operating Characteristics (25 kHz)

Voltage (V)	*u.c.*
Current (mA)	*u.c.*
Lamp Current Crest Factor	*u.c.*
Ballast Lumen Factor	*u.c.*

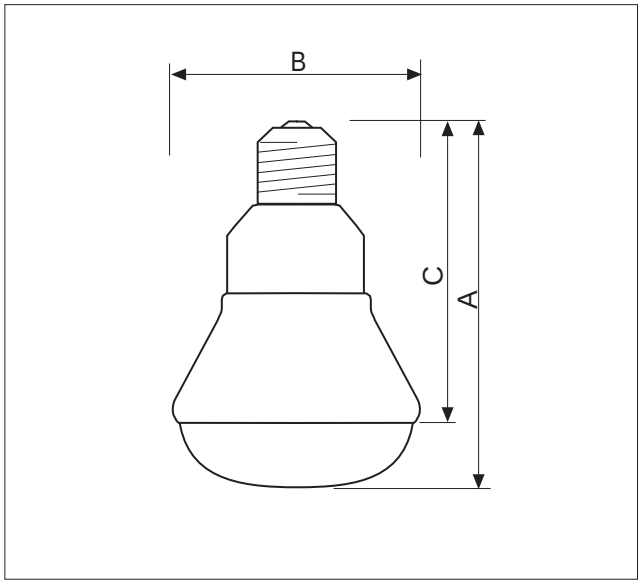
u.c. - under consideration

Genura™ R80

Genura™ R80 Lamp

Description

Based on fluorescent gas discharge and electromagnetic induction operating principles the Genura™ R80 lamp is a revolutionary new addition to GE's range of "Energy saving" lamps. The Genura™ R80 can be used to replace existing incandescent reflector (R80) lamps rated up to 100W providing a saving of over 75% in energy consumption whilst maintaining similar light output levels. The improved shape of the Genura™ R80 lamps compared with conventional compact fluorescent and other energy saving lamps allows a greater number of sockets to be converted from incandescent thereby increasing the opportunity of reducing energy consumption for a minimal investment. The shape of the Genura™ R80 lamp also provides superior light distribution when compared with standard retrofit compact fluorescent lamps.



Applications

Commercial and industrial applications allow significant savings in energy to be realised. The Genura™ R80 lamp is ideally suited for downlighting and spotlighting applications in areas such as hotel receptions, foyers, corridors, conference rooms and commercial offices. In addition the Genura™ R80 is recommended for use in areas:

— where access to lamp sockets is difficult
— with high maintenance costs
— where lamps are left burning for extended periods of time

Physical Data

Rated Lamp Power		*23W*
Dimensions	***A***	*129mm*
	B	*82mm*
	C	*101mm*
Cap		*E27/27*
Mass		*200g*
Operating Position		*Universal*
Rated Average Life		*15,000 hours**

** According to IEC Standard.*

Electrical Characteristics

Data for 230V 50Hz circuits tested in 35 °C ambient temperature in a base up position.

Rated Lamp Power	*23W*
Objective Lamp Power	*23W*
Nominal Lamp Current	*0.180A*
Operating Voltage	*220-240V*
Minimum Starting Temperature	*-10 °C*

Note: Lamp will operate at +1W at 240V and -1W at 220V.

Luminous Characteristics

Colour Temperature		2700, 3000 K
Lumen Output	**100hr**	1100 lm
	2000hr	920 lm
Efficacy		48 lm/W
Chromaticity Co-ordinates	**x**	0.440
	y	0.405
Colour Rendering Index (Ra)		82

Lamp Life

Unlike conventional fluorescent or traditional compact fluorescent lamps, the life of the Genura™ R80 lamp is not affected by the frequency of switching. This is due to the fact that the electrodes found in a conventional fluorescent lamp have been eliminated thereby extending the life of the lamp to at least 15,000 hours.

Starting

Genura™ R80 lamps will start instantly (< 1 second) and will reach 80% light output in less than 1 minute*.

Operating Note

Genura™ R80 lamps produce 25% of the heat generated by an incandescent R80 lamp and therefore allow greater freedom in luminaire design whilst reducing the requirements on air conditioning systems.

Genura™ R80 lamps operate at a frequency of 2.5MHz.

As the electronic control gear used in the Genura™ R80 lamps needs a full and constant current to operate, they cannot be dimmed or used with other electronic switching devices.

Standards

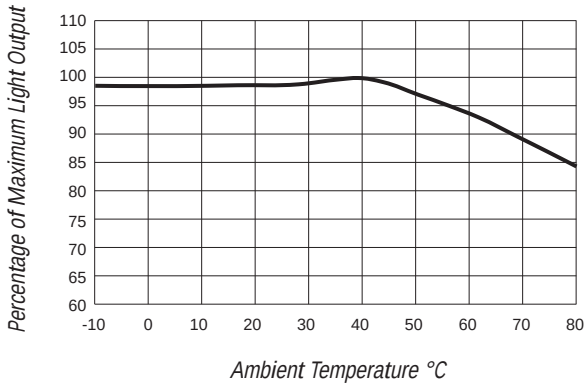
Genura™ R80 lamps comply with the relevant clauses of the following safety and performance specifications:

Safety — EN 60968, EN 60928, EN 60432, EN 60061
Performance — EN 60969, EN 55015, IEC 630, IEC 60555-2.

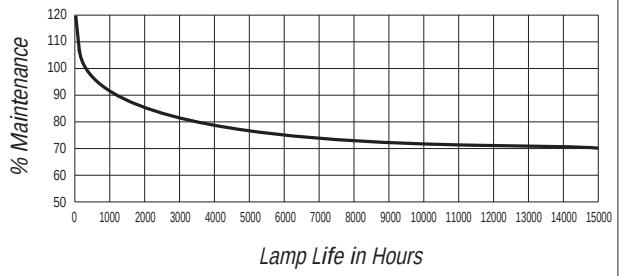
Patents Applied for.

** Available from August 1996.*

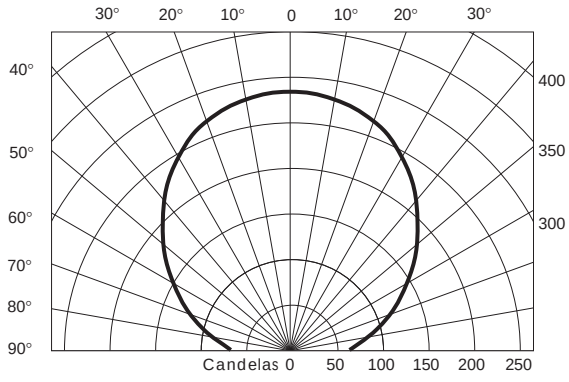
Light Output versus Ambient Temperature



Lumen Maintenance



Luminous Intensity Diagram



Standard Lucalox®

High Pressure Sodium Lamps
Standard Lucalox® Lamps
50W, 70W, 100W, 150W, 250W, 400W & 1000W

From GE's invention of HPS lighting in 1965 to today's advanced sources, GE Lucalox® High Pressure Sodium lamps have led the way in quality and innovation. GE's exclusive amalgam reservoir design (see below) works to increase life expectancy and improve lumen maintenance.

Highest efficiency/lowest operating costs

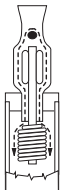
With efficiencies approaching 130 lumens per watt, GE Standard Lucalox® lamps are the most efficient light source available with acceptable colour rendering. High efficiency results in lower operating costs and thus a lower electricity bill.

Very long life

Most Lucalox® lamps have an average rated life of 24,000+ hours. Long life means lower replacement and maintenance costs.

High maintained light output

GE Standard Lucalox® lamps start out bright and stay that way throughout their long life... offering over 80% average maintained lumens over life.



GE´s patented Amalgam Reservoir assures long life and high maintained light output.

Controlling voltage rise is ***the key to long life*** *in high pressure sodium lamps. GE´s unique Reservoir design achieves this control by ensuring only the precise amount of sodium/mercury amalgam vapour is delivered to the arc tube throughout lamp life.*
The result is longer life, less lamp blackening and exceptional lumen maintenance.

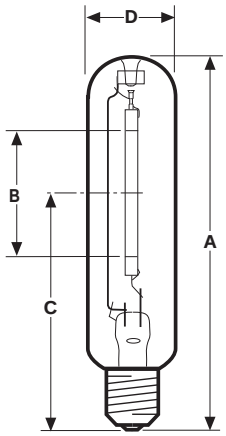


Fig. 1

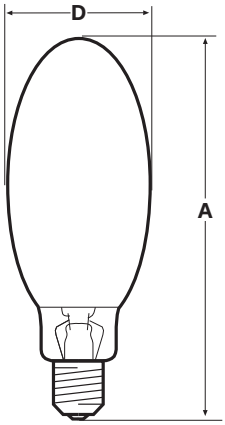


Fig. 2

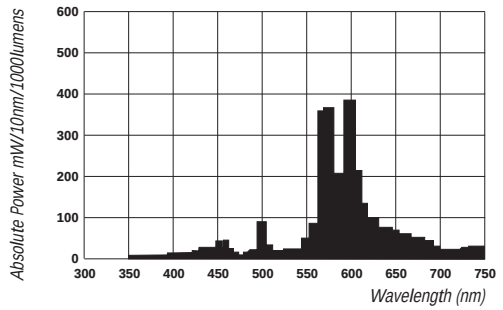
Applications

- Road lighting
- Amenity areas
- Security
- Car parks
- Area floodlighting
- Warehousing
- Industrial units

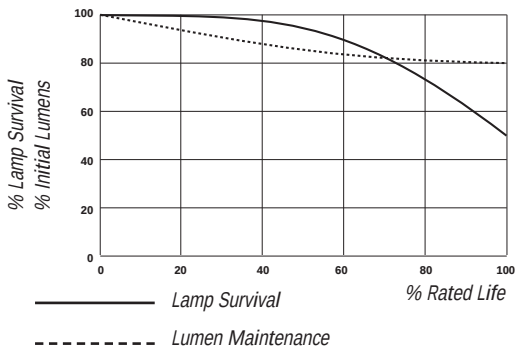
Physical Data

Watts	A Length (mm)	D Diameter (mm)	C LCL (mm)	B Arc Gap (mm)	Cap	Bulb Glass	Mass (g)	Operating Position	Minimum Starting Temp.
Lucalox – Clear Tubular – *Fig. 1*									
50	156	38.5	97	34.8	E27	Hard	55	Universal	-40 °C
70	156	38.5	97	34.8	E27	Hard	55	Universal	-40 °C
100	211	48	133	42.3	E40/45	Hard	140	Universal	-40 °C
150	211	48	133	48.3	E40/45	Hard	150	Universal	-40 °C
250	260	48	158	64.3	E40/45	Hard	180	Universal	-40 °C
400	278	48	175	85.3	E40/45	Hard	200	Universal	-40 °C
1000	372	67	240	150	E40/45	Hard	445	Universal	-40 °C
Lucalox – Diffuse Elliptical – *Fig. 2*									
50	156	72	–	–	E27	Hard	55	Universal	-40 °C
70	156	72	–	–	E27	Hard	55	Universal	-40 °C
100	186	76	–	–	E40/45	Hard	140	Universal	-40 °C
150	227	91	–	–	E40/45	Hard	175	Universal	-40 °C
250	227	91	–	–	E40/45	Hard	195	Universal	-40 °C
400	282	122	–	–	E40/45	Hard	250	Universal	-40 °C
1000	372	168	–	–	E40/45	Hard	445	Universal	-40 °C

Spectral Power Distribution



Lamp Survival & Lumen Maintenance



Photometric Data

Watts	100 Hr. Lumens	Colour Temp. K	CIR (Ra)	DIN5035 Class.
Lucalox – Clear Tubular				
50	3,400	2,000	25	4
70	6,000	2,000	25	4
100	9,600	2,000	25	4
150	15,000	2,000	25	4
250	27,500	2,000	25	4
400	50,000	2,000	25	4
1000	130,000	2,000	25	4
Lucalox – Diffuse Elliptical				
50	3,300	2,000	25	4
70	5,800	2,000	25	4
100	9,200	2,000	25	4
150	14,500	2,000	25	4
250	26,000	2,000	25	4
400	47,500	2,000	25	4
1000	120,000	2,000	25	4

Photometric data is quoted for the lamp in a horizontal orientation operating from a nominal ballast at rated supply volts.

Lamp Survival and Lumen Maintenance

The graph shows the survival of representative groups of lamps operated under control conditions at 10 hrs/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Lamp Survival (%)

Watts	Hours (Thousands)								
	0.1	2	4	8	12	16	20	24	28.5
Lucalox – Clear Tubular & Diffuse Elliptical									
50	100	100	99	98	95	90	80	67	50
70	100	100	99	98	95	90	80	67	50
100	100	100	99	98	95	90	80	67	50
150	100	100	99	98	95	90	80	67	50
250	100	100	99	98	95	90	80	67	50
400	100	100	99	98	95	90	80	67	50
1000	100	99	98	95	90	80	65	50	-

Electrical Data

Data is based on a nominal lamp operating from a nominal choke (reactor) ballast with power factor correction. Supply power is based on a typical commercially available ballast.

Lumen Output (klm)

Watts	Hours (Thousands)							
	0.1	4	8	12	16	20	24	28.5
Lucalox – Clear Tubular								
50	3.4	3.3	3.1	3.0	2.9	2.8	2.8	2.7
70	6.0	5.8	5.5	5.3	5.1	5.0	4.9	4.8
100	9.6	9.2	8.8	8.4	8.2	8.0	7.8	7.7
150	15.0	14.4	13.8	13.2	12.8	12.5	12.2	12.0
250	27.5	26.4	25.3	24.2	23.4	22.8	22.3	22.0
400	50.0	48.0	46.0	44.0	42.5	41.5	40.5	40.0
1000	130.0	124.8	119.6	114.4	110.5	107.9	105.3	–
Lucalox – Diffuse Elliptical								
50	3.2	3.1	2.9	2.8	2.7	2.7	2.6	2.6
70	5.8	5.6	5.3	5.1	4.9	4.8	4.7	4.6
100	9.2	8.8	8.5	8.1	7.8	7.6	7.5	7.4
150	14.5	13.9	13.3	12.8	12.3	12.0	11.7	11.6
250	26.0	25.0	23.9	22.9	22.1	21.6	21.1	20.8
400	47.5	44.6	42.8	40.9	39.5	38.6	37.7	37.2
1000	120.0	115.2	110.4	105.6	102.0	99.6	97.2	–

Circuit Data

Watts	Supply Current (A)		Supply Power (W)		Power Factor Lagging		Percentage 3rd Harmonic	PFC Capacitor (µF)	Max. Supply Current During Run-up (A)		Max. Supply Current Failed/ Hot Lamp (A)	
Supply	**230V**	**240V**	**230V**	**240V**	**230V**	**240V**	**230/240V**	**230/240V**	**230V**	**240V**	**230V**	**240V**
All Types												
50	0.30	0.29	61	62	0.89	0.89	19	8	0.35	0.34	0.58	0.60
70	0.40	0.40	83	86	0.90	0.90	14	10	0.45	0.42	0.72	0.75
100	0.54	0.52	113	114	0.91	0.91	15	12	0.64	0.60	0.87	0.90
150	0.83	0.80	171	172	0.90	0.90	15	20	0.91	0.84	1.45	1.50
250	1.35	1.30	275	276	0.89	0.89	15	30	1.58	1.48	2.17	2.30
400	2.20	2.10	426	427	0.84	0.85	12	40	2.80	2.60	2.79	3.00
1000	5.66	5.40	1092	1090	0.84	0.84	15	85	6.46	6.00	6.14	6.40

Lamp Data

Watts	Volts ±15 (V)	Current (A)	Power (W)	Current Crest Factor
Lucalox – Clear Tubular				
50	85	0.76	50	1.45
70	90	0.98	70	1.45
100	100	1.20	100	1.45
150	100	1.80	150	1.45
250	100	3.00	250	1.45
400	100	4.60	392	1.45
1000	100	10.60	960	1.45
Lucalox – Diffuse Elliptical				
50	85	0.76	50	1.45
70	90	0.98	70	1.45
100	100	1.20	100	1.45
150	100	1.80	150	1.45
250	100	3.00	250	1.45
400	105	4.45	400	1.45
1000	110	10.30	1000	1.45

Run-Up Characteristics

The graph shows typical run-up characteristics for a 250W Lucalox® lamp. Time for the light output to reach 90% of the final value is determined by supply voltage and ballast design. Typical values are :

Watts	50	70	100	150	250	400	1000
Run-Up (Mins)	4	<5	4	4	5	3	6

Hot Re-strike Time

All ratings re-strike within 1 minute following a short interruption in the supply. Actual re-strike time is determined by ignitor type, pulse voltage and cooling rate of the lamp.

Supply Voltage

Lamps are suitable for supplies in the range 220V to 250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used.

However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

Control Gear

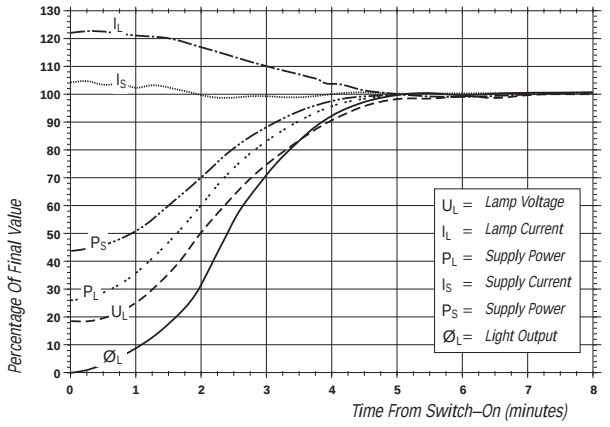
It is essential to use a ballast appropriate to the supply voltage at the luminaire.

Typical wiring diagrams for control circuits incorporating “Superimposed” or “Impulser” ignitor and choke (reactor) ballasts are shown. Refer to actual choke and ignitor manufacturers data for terminal identification and wiring information.

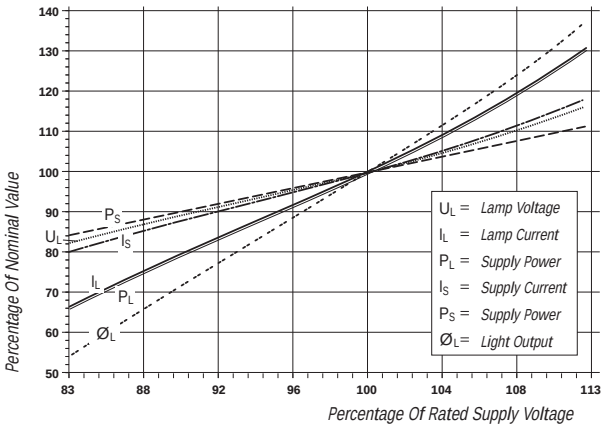
Compliance with IEC Standards

All Tubular and Elliptical Lamps comply with IEC662.

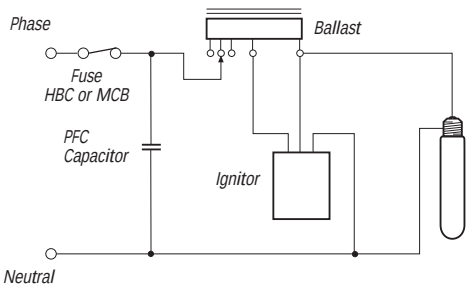
Typical Run-up Characteristics



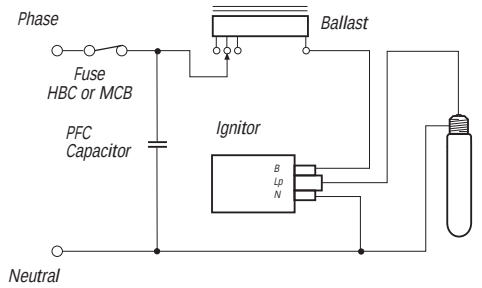
Effect of Supply Voltage Variation on Performance



Typical Impulser Ignitor Circuit



Typical Superimposed Ignitor Circuit



GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

	50/70W	100-400W
Maximum Cap Temperature:	210°C	250°C
Maximum Bulb Temperature:	400°C	400°C

Luminaire Voltage Rise

To maximise lamp life it is essential that luminaires are designed so that when lamps are enclosed lamp voltage rise does not exceed the following values:

Watts	50	70	100	150	250	400	1000
Lucalox – Clear Tubular							
Voltage Rise (V)	5	5	7	7	10	12	20
Lucalox – Diffuse Elliptical							
Voltage Rise (V)	5	5	5	5	10	7	10

Control Gear

To achieve correct lamp starting, performance and life it is important that lamp and control gear are compatible and suitably rated for the supply voltage at the luminaire.

Ballasts

Lamps are fully compatible with ballasts manufactured for high pressure sodium lamps to IEC 662. Ballasts should comply with specifications IEC 922 and IEC 923.

Ballast Thermal Protection — Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for installation.

Ballast Voltage Adjustment — Series choke (reactor) ballasts incorporating additional tappings at ±10V of the rated supply voltage are recommended. Alternatively a single additional tapping 10V above the rated supply voltage will ensure lamps are not over-loaded due to excessive supply voltage.

Ignitors

Both Superimposed and Impulser type ignitors are suitable. It is recommended that only GE approved ignitors are used. Ignitors should comply with specifications IEC 926 and IEC 927 and have starting pulse characteristics as follows:

Watts	Min. Pulse Voltage (kV) (1)	Max. Pulse Voltage (kV) (2)	Min. Pulse Width (µs) (3)	Min. Pulse Repetition Rate (4)	Min. HF Peak Current (A)
50	1.8	2.3	1.95	1/1/2cycle	0.2
70	1.8	2.3	1.95	1/1/2cycle	0.2
100	2.8	4.5	1.95	1/cycle	0.2
150	2.8	4.5	1.95	1/cycle	0.2
250	2.8	4.5	0.95	1/cycle	0.2
400	2.8	4.5	0.95	1/cycle	0.2
1000	3.0	5.0	0.2	1/cycle	0.2

1. When Loaded with 100 pF.
2. When Loaded with 20pF.
3. At 90% peak voltage.
4. From ignitor into lamp during starting.

Pulse Phase Angle: 60-90° el and/or 240-270° el.

Timed Ignitors — Use of a "timed" or "cut-out" ignitor is not a specific requirement, but it is a good optional safety feature for installation. The timed period must be adequate to allow lamps to cool and restart when the supply is interrupted briefly (see "Hot Re-strike Time").

During the production process, GE Lucalox lamps are start tested according to the requirements of the IEC 662 Standards and will therefore be compatible with ignitors designed for lamps to this Standard and which comply with the relevant ignitor Standards (IEC 926 & 927). Examples of commercial ignitors/manufacturers are:

BAG Turgi MZN 70S (50/70W),
MZN150S, MZN150SE-C (100/150W),
MZN250SE (100/150/250W),
MZN400S(R) (100/150/250/400W)
MZN400SU (100/150/250/400W)
MZN1000S (1000W)

ERC 640006 (100-400W)

May & Christe ZG1.0SE (50/70W)
ZG2.0SE (100/150W)
ZG4.5SE (100/150/250/400W)

Parry PB070#, PBE070, PXE070 (50/70W)
PBO19#, PTH150# (150W)
PB404# (250W/400W)
PAE400, PXE400, PWE400
(150/250/400W)

Thorn G53503#, G53353.4#, G53353.2#,
G53434 (50/70W)
G53504#, G53511, G53476, G53455,
G53250 (100/150/250/400W)
G53282/B# (150/250/400W)
G53316 (1000W)

Tridonic ZRM2-ES, ZRM2-IS (50/70W)
ZRM1.8ES/2 (100/150W)
ZRM6-ES (100/150/250/400W)
ZRM12-ES (1000W)

 # Impulser type - approved only when used with a suitable ballast.

Cable between Ignitor and Lamp — The cable connected between the lamp and a superimposed ignitor "Lp" terminal, or the ballast when using an impulser ignitor, must be rated at a minimum 50/60Hz voltage of 1000V. Mineral-insulated cables are not suitable for connecting the lamp to the control gear.
To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor "Lp" terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and/or other cables, unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are normally permissible.

Limits for particular ignitors are available on request from GE Lighting or directly from the ignitor manufacturer.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimise supply current and electricity costs. For 220-250V supplies 250V±10% rated capacitors are recommended as follows:

Watts	50	70	100	150	250	400	1000
PFC Capacitor	8µF	8µF	12µF	20µF	30µF	40µF	85µF

Lucalox® HO

High Output High Pressure Sodium Lamps with the unique External Amalgam Reservoir
Lucalox® HO Clear Tubular
50W, 70W, 100W, 150W, 250W, 400W & 600W
Lucalox® HO Diffuse Elliptical
100W, 150W, 250W & 400W

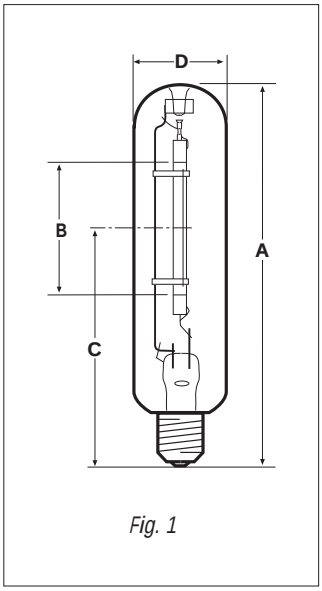


Fig. 1

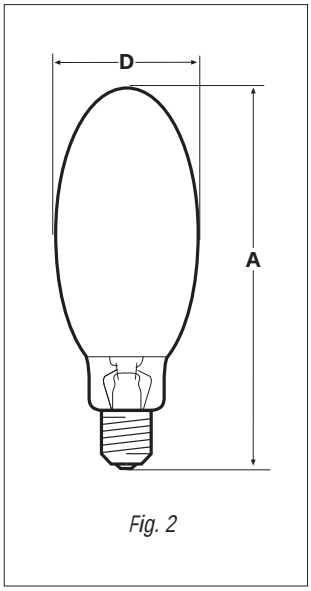


Fig. 2

- Superb Performance and Longer Life
  GE's external amalgam reservoir keeps more sodium for longer, slowing the voltage rise which gives a rated average life of up to 28,500 hours.

- High Xenon-Fill delivers
  — high luminous efficiency up to 150 lm/W
  — extra light up to 20% more lumens — with no increase in energy consumption
  — improved lumen maintenance

- More tolerance of Fluctuating Voltage
  Xenon dampens the effect of main voltage fluctuations limiting colour change and early failures.

Applications

The main fields of applications are as follows:

Traffic Lighting
– Main streets & pedestrian areas
– Arterial roads & motorways
– Squares & bridges
– Tunnels & subways
-- Sidestreets
– Pedestrian crossings
– Street crossings
– Canals, locks
– Railway yards
– Airports, aprons

Industrial Installations
– Factory yards
– Parking lots
– Electrical plants
– Shipyards
– Ports & piers
– Refineries

Plant Cultivation
– Horticultures
– Greenhouses

Physical Data

Watts	*A Length (mm)*	*B Arc Gap (mm)*	*C LCL (mm)*	*D Diameter (mm)*	*Cap*	*Bulb Glass*	*Mass (g)*	*Operating Position*	*Minimum Starting Temp.*
Lucalox - High Output Clear Tubular *– Fig. 1*									
50	*156*	*34.8*	*97*	*38.5*	*E27*	*Hard*	*55*	*Universal*	*-40°C*
70	*156*	*34.8*	*97*	*38.5*	*E27*	*Hard*	*55*	*Universal*	*-40°C*
100	*211*	*42.3*	*133*	*48*	*E40/45*	*Hard*	*140*	*Universal*	*-40°C*
150	*211*	*48.3*	*133*	*48*	*E40/45*	*Hard*	*150*	*Universal*	*-40°C*
250	*260*	*64.3*	*158*	*48*	*E40/45*	*Hard*	*180*	*Universal*	*-40°C*
400	*278*	*85.3*	*175*	*48*	*E40/45*	*Hard*	*200*	*Universal*	*-40°C*
600	*278*	*96*	*117.9*	*48*	*E40/45*	*Hard*	*210*	*Universal*	*-40°C*
Lucalox - High Output Diffuse Elliptical *– Fig. 2*									
100	*186*	*–*	*–*	*76*	*E40/45*	*Hard*	*140*	*Universal*	*-40°C*
150	*227*	*–*	*–*	*91*	*E40/45*	*Hard*	*175*	*Universal*	*-40°C*
250	*227*	*–*	*–*	*91*	*E40/45*	*Hard*	*195*	*Universal*	*-40°C*
400	*282*	*–*	*–*	*122*	*E40/45*	*Hard*	*250*	*Universal*	*-40°C*

Photometric Data

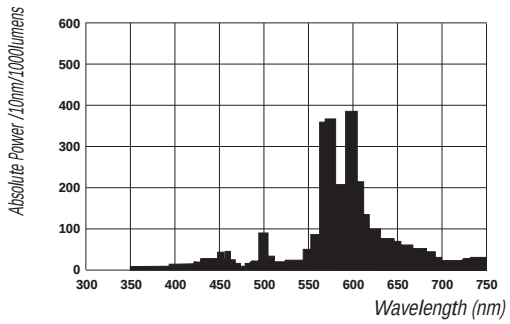
Watts	100 Hr. Lumens	Colour Temp. (K)	Chromaticity Coordinates x	Chromaticity Coordinates y	Colour Rendering Properties CRI (Ra)	Colour Rendering Properties DIN 5035 Class
Lucalox - High Output Clear Tubular						
50	4,000	2,000	0.530	0.430	25	4
70	6,500	2,000	0.530	0.430	25	4
100	10,000	2,000	0.530	0.430	25	4
150	17,500	2,000	0.530	0.430	25	4
250	33,000	2,000	0.530	0.430	25	4
400	56,500	2,000	0.530	0.430	25	4
600	90,000	2,000	0.530	0.430	25	4
Lucalox - High Output Diffuse Elliptical						
100	9,600	2,000	0.530	0.430	25	4
150	16,900	2,000	0.530	0.430	25	4
250	31,200	2,000	0.530	0.430	25	4
400	53,700	2,000	0.530	0.430	25	4

Photometric data is quoted in a horizontal orientation operating from a nominal ballast at rated supply volts.

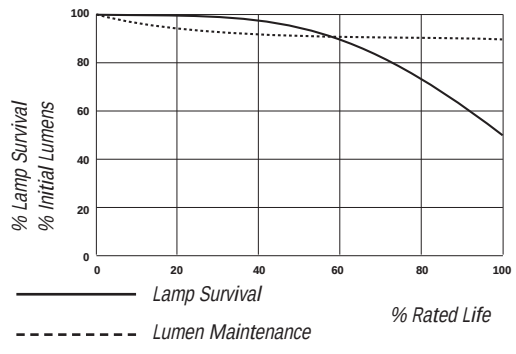
Lumen Output (lm)

Watts	Hours (Thousands) 0.1	4	8	12	16	20	24	28.5
Lucalox - High Output Clear Tubular								
50	4,000	3,900	3,800	3,760	3,700	3,660	3,620	3,600
70	6,500	6,400	6,200	6,100	6,000	5,950	5,900	5,850
100	10,000	9,800	9,600	9,400	9,250	9,150	9,050	9,000
150	17,500	17,200	16,800	16,500	16,200	16,000	15,800	15,750
250	33,000	32,300	31,700	31,000	30,500	30,200	29,900	29,700
400	56,500	55,400	54,200	53,100	52,300	51,700	51,100	50,800
600	90,000	88,200	86,400	84,600	83,300	82,300	81,500	81,000
Lucalox - High Output Diffuse Elliptical								
100	9,600	9,400	9,200	9,000	8,900	8,800	8,700	8,600
150	16,900	16,600	16,200	15,900	15,600	15,500	15,300	15,200
250	31,200	30,600	30,000	29,300	28,900	28,500	28,200	28,100
400	53,700	52,600	51,600	50,500	49,700	49,100	48,600	48,300

Spectral Power Distribution



Lamp Survival & Lumen Maintenance



Lamp Survival and Lumen Maintenance

The graph shows the survival of representative groups of lamps operated under control conditions at 10 hours/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Lamp Survival (%)

Watts	Hours (Thousands) 0.1	4	8	12	16	20	24	28.5
50	100	99	98	95	90	80	67	50
70	100	99	98	95	90	80	67	50
100	100	99	98	95	90	80	67	50
150	100	99	98	95	90	80	67	50
250	100	99	98	95	90	80	67	50
400	100	99	98	95	90	80	67	50
600	100	99	98	95	90	80	67	50

Electrical Data

Data is based on a nominal lamp operating from a nominal choke (reactor) ballast with power factor correction. Supply power is based on a typical commercially available ballast.

Lamp Data

Watts	Volts ±15 (V)	Current (A)	Power (W)	Current Crest Factor
Lucalox - High Output Clear Tubular				
50	85	0.76	50	1.80
70	90	0.98	70	1.80
100	100	1.20	100	1.80
150	100	1.80	150	1.80
250	100	2.95	255	1.80
400	100	4.50	400	1.80
600	105	6.20	600	1.80
Lucalox - High Output Diffuse Elliptical				
100	100	1.20	100	1.80
150	100	1.80	150	1.80
250	100	2.95	255	1.80
400	105	4.40	400	1.80

Run-Up Characteristics

The graph shows typical run-up characteristics for a 150W Lucalox® HO lamp. The time needed for the light output to reach 90% of the final value is determined by the supply voltage and ballast design. Typical values are:

Watts	50	70	100	150	250	400	600
Run-Up (Mins)	5	4	3	2	2.5	2.5	3

Hot Restrike Time

All ratings restrike within 5 minutes. This is due to the lamp having cooled to a temperature at which the internal starting aid is required to re-establish the arc. This starting aid is thermally set and will not operate when hot.

Supply Voltage

Lamps are suitable for supplies in the range 220V to 250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used.

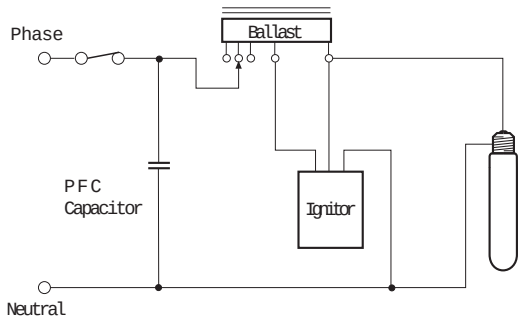
However, in order to maximise lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

Ballasts

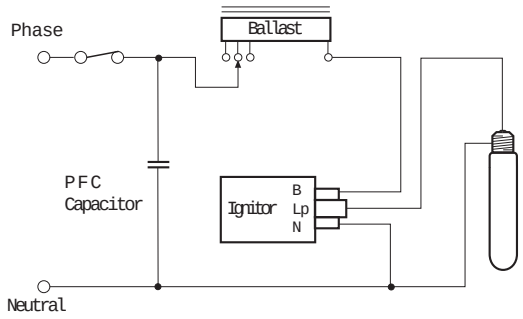
It is essential to use a ballast appropriate to the supply voltage at the luminaire.

Typical wiring diagrams for control circuits incorporating “Superimposed” or “Impulser” ignitor and choke (reactor) ballast are shown. Refer to actual choke and ignitor manufacturers' data for terminal identification and wiring information.

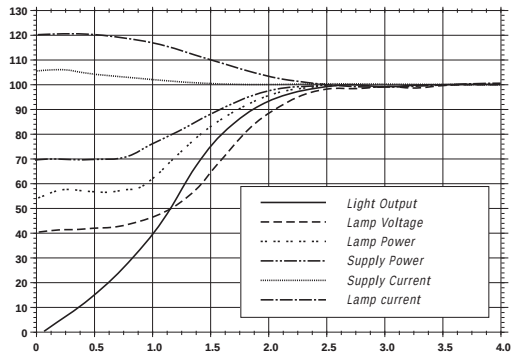
Typical Impulser Ignitor Circuit



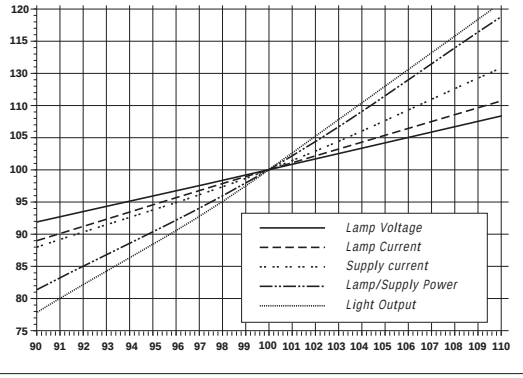
Typical Superimposed Ignitor Circuit



Run-up Graph



Voltage Variation Graph



GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

	50/70W	100-400W
Maximum Cap Temperature	210°C	250°C Maximum
Bulb Temperature	400°C	400°C

Luminaire Voltage Rise

To maximize lamp life it is essential that luminaires are designed so that when lamps are enclosed lamp voltage rise does not exceed the following values:

Watts	50	70	100	150	250	400	600
Clear Tubular							
Voltage Rise (V)	5	5	7	7	10	12	12
Diffuse Elliptical							
Voltage Rise (V)	–	–	5	5	10	7	–

Ballasts

To achieve correct lamp starting, performance and life it is important that lamp and ballast are compatible and suitably rated for the supply voltage at the luminaire.

Lamps are fully compatible with ballasts are manufactured for high pressure sodium lamps to IEC662. Ballasts should comply with specifications IEC922 and IEC923.

Ballast Thermal Protection — Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for installation.

Ballast Voltage Adjustment — Series choke (reactor) ballasts incorporating additional tappings at ±10V of the rated supply voltage are recommended. Alternatively a single additional tapping 10V above the rated supply voltage will ensure lamps are not over loaded due to excessive supply voltage.

Ignitors

Ignitors should comply with specifications IEC926 and IEC927 and have starting pulse characteristics as follows:

Watts	Min. Pulse Voltage (kV) [1]	Max. Pulse Voltage (kV) [2]	Min. Pulse Width (µs)[3]	Min. Pulse Repetition Rate [4]	Min. HF Peak Current (A)
50	1.8	2.3	1.95	1 /1/2 cycle	0.7
70	1.8	2.3	1.95	1 /1/2 cycle	0.7
100	2.8	4.5	1.95	1 / cycle	1.0
150	2.8	4.5	1.95	1 / cycle	1.0
250	3.3	5.0	1.95	1 / cycle	1.0
400	3.3	5.0	1.95	1 / cycle	1.0
600	3.3	5.0	1.95	1 / cycle	1.0

1.When Loaded with 100 pF
2. When Loaded with 20pF
3. At 90% peak voltage
4. From ignitor into lamp during starting

Pulse Phase Angle: 60-90°el and/or 240-270° el.

Timed Ignitors — Use of a "timed" or "cut-out" ignitor is not a specific requirement, but it is a good optional safety feature for the installation. The timed period must be adequate to allow lamps to cool and restart when the supply is interrupted briefly (see "Hot Re-strike Time").

A period of 10 minutes continuous or intermittent operation is recommended before the ignitor is automatically switched off. Commercially available 10/11 minute timed ignitors are suitable.

Cable Between Ignitor And Lamp — Cables connected between the lamp and a superimposed ignitor "Lp" terminal, or the ballast when using an impulser ignitor, must be rated at a minimum 50/60Hz voltage of 1000V. Mineral-insulated cables are not suitable for connecting the lamp to the control gear.

To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor "Lp" terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and/or other cables, unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are normally permissible.

Limits for particular ignitors are available on request from GE Lighting or directly from the ignitor manufacturer.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimise supply current and electricity costs. For 220-250V supplies 250V±10% rated capacitors are recommended as follows:

Watts	50	70	100	150	250	400	600
PFC Capacitor	8µF	10µF	12µF	20µF	30µF	40µF	50µF

Special Lucalox®

High Pressure Sodium Lamps
Lucalox® Classique 150W, 250W & 400W
Lucalox® Reflector 70W
Lucalox®-TD Double-ended
250W, 400W & 1000W

Description

Lucalox® Classique Lamps (Figs. 1 & 2)

- Good colour rendering, warm golden colour Deluxe colour (60 CRI), much better than standard HPS lamps. Improves the appearance of people, material, foliage, and furnishings. Provides more accurate distinction of colours.
- Highly efficient
- Long 14,000 hour life
- Blends well with incandescent or standard HPS sources
- Fits standard HPS sockets – no new fixtures or wiring needed

Lucalox® Reflector Lamp (Fig. 3)

- Reflector-shaped HPS lamps, with internal reflector offer high efficiency and the same colour rendering as conventional HPS lamps
- Internal reflector is impervious to dirt and dust
- Burning position: universal

Double-Ended Lucalox® Lamps (Fig. 4)

- Lucalox® efficiency in an ultra compact size
- Small size fits ultra compact fixtures
- Excellent optical control
- Concentrated beam of light exactly where needed
- High efficiency
- Long 24,000 hour life
- Instant restrike

Lucalox® Internal Ignitor Lamps (Fig. 5)

- For use in luminaires without internal ignitor equipment
- Simplifies luminaire design

Applications

– Sports halls
– Warehouses
– Pedestrian areas
– Building facades
– Offices
– Shopping malls

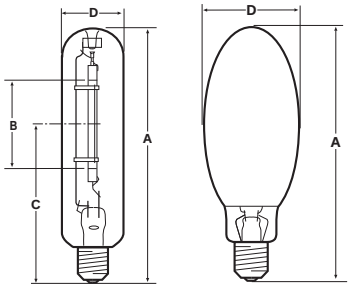


Fig. 1 *Fig. 2*

– Working environments where lamp soiling is unavoidable and maintenance difficult
– Foundries and steel mills
– Industrial workshops

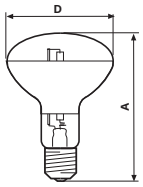


Fig. 3

– Floodlighting
– Security
– Sportlighting

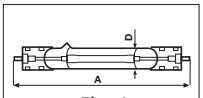


Fig. 4

– Security/Wall packs
– Hotel/Motel
– Pedestrian areas/Downlighting

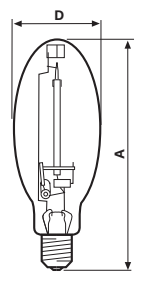
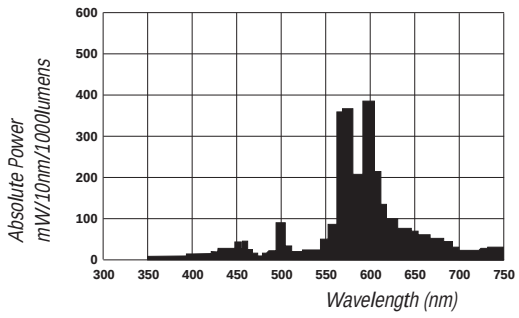


Fig. 5

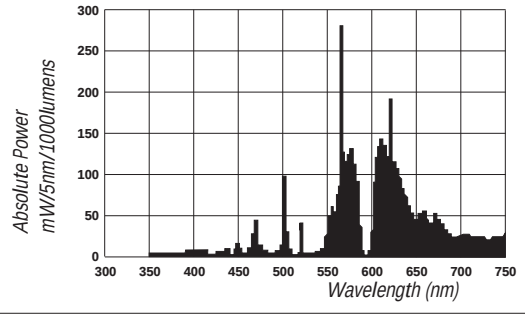
Physical Data

Watts Length (mm)	A Diameter (mm)	D LCL (mm)	C Arc Gap (mm)	B	Cap Glass	Bulb (g)	Mass Position	Operating Starting Temp.	Minimum
Lucalox – Classique Clear Tubular – Fig. 1									
150	211	48	133	39	E40/45	Hard	150	Universal	-40 °C
250	260	48	138	52	E40/45	Hard	180	Universal	-40 °C
400	278	48	175	65	E40/45	Hard	200	Universal	-40 °C
Lucalox – Classique Diffuse Elliptical – Fig. 2									
150	227	91	–	–	E40/45	Hard	175	Universal	-40 °C
250	227	91	–	–	E40/45	Hard	195	Universal	-40 °C
400	282	122	–	–	E40/45	Hard	200	Universal	-40 °C
Lucalox – Reflector – Fig. 3									
70	144	96	–	–	E27	Soft	55	Universal	-40 °C
Lucalox – TD - Clear Tubular Double-Ended – Fig. 4									
250	191	22.4	–	62.5	Rx7s	Quartz	57	Hor. ±20°	-40 °C
400	256	22.4	–	89.2	Rx7s	Quartz	68	Hor. ±20°	-40 °C
1000	334	22.4	–	202	Rx7s	Quartz	90	Hor. ±20°	-40 °C
Lucalox – Internal Ignitor Clear Elliptical – Fig. 5									
50	156	72	97	34.8	E27	Hard	55	Universal	-40 °C
70	156	72	97	34.8	E27	Hard	55	Universal	-40 °C
Lucalox – Internal Ignitor Diffuse Elliptical– Fig. 2									
50	156	72	–	–	E27	Hard	55	Universal	-40 °C
70	156	72	–	–	E27	Hard	55	Universal	-40 °C

Spectral Power Distribution for TD, RFL and Internal Ignitor



Spectral Power Distribution for Classique



Photometric Data

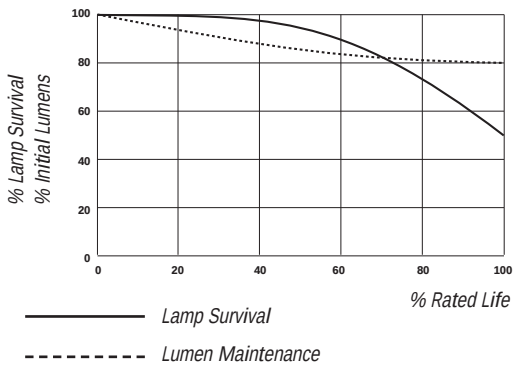
Watts	100 Hr. Lumens	Colour Temp. K	Chromaticity Co-ordinates x	y	Col. Rend. Prop. Ra	DIN5035 Class.
Lucalox – Classique Clear Tubular						
150	12,000	2,170	0.51	0.42	60	2B
250	23,000	2,170	0.51	0.42	60	2B
400	37,000	2,170	0.51	0.42	60	2B
Lucalox – Classique Diffuse Elliptical						
150	11,500	2,170	0.51	0.42	60	2B
250	22,000	2,170	0.51	0.42	60	2B
400	36,000	2,170	0.51	0.42	60	2B
Lucalox – Reflector						
70	4000*	2,000	0.53	0.43	25	4
Lucalox – TD – Clear Tubular Double-Ended						
250	26,000	2,000	0.53	0.43	25	4
400	48,000	2,000	0.53	0.43	25	4
1000	137,500	2,000	0.53	0.43	25	4
Lucalox – Internal Ignitor Clear Elliptical						
50	3,400	2,000	0.53	0.43	25	4
70	6,000	2,000	0.53	0.43	25	4
Lucalox – Internal Ignitor Diffuse Elliptical						
50	3,300	2,000	0.53	0.43	25	4
70	5,800	2,000	0.53	0.43	25	4

** Peak Intensity 6400CD, Approx. Beam Spread 24°.*
Photometric data is quoted for the lamp in a horizontal orientation operating from a nominal ballast at rated supply volts.

Lamp Survival and Lumen Maintenance

This graph shows the survival of representative groups of lamps operated under control conditions at 10 hrs/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Lamp Survival & Lumen Maintenance



Lamp Survival (%)

Watts	Hours (Thousands)										
	0.1	2	4	6	8	10	12	14	16	20	24
Lucalox – Classique Clear Tubular											
150	100	99	98	96	92	86	77	65	50	–	–
250	100	99	98	96	92	86	77	65	50	–	–
400	100	99	98	96	92	86	77	65	50	–	–
Lucalox – Classique Diffuse Elliptical											
150	100	99	98	96	92	86	77	65	50	–	–
250	100	99	98	96	92	86	77	65	50	–	–
400	100	99	98	96	92	86	77	65	50	–	–
Lucalox – Reflector											
70	100	99	98	97	95	93	90	86	80	65	50
Lucalox – TD – Clear Tubular Double-Ended											
250	100	99	98	97	95	93	90	86	80	65	50
400	100	99	98	97	95	93	90	86	80	65	50
1000	100	99	98	97	95	93	90	86	80	65	50
Lucalox – Internal Ignitor Clear Elliptical											
50	100	98	95	90	80	65	50	–	–	–	–
70	100	98	95	90	80	65	50	–	–	–	–
Lucalox – Internal Ignitor Diffuse Elliptical											
50	100	98	95	90	80	65	50	–	–	–	–
70	100	98	95	90	80	65	50	–	–	–	–

Electrical Data

Data is based on a nominal lamp operating from a nominal choke (reactor) ballast with power factor correction. Supply power is based on a typical commercially available ballast.

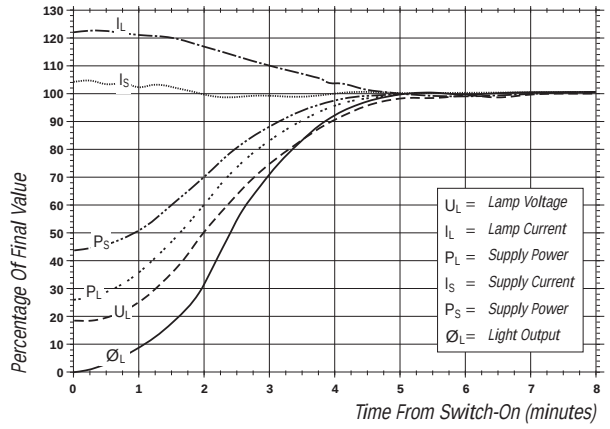
Lamp Data

Watts	Volts ±15 (V)	Current (A)	Power (W)	Current Crest Factor
Lucalox – Classique Clear Tubular				
150	100	1.8	148	1.8
250	100	2.95	245	1.8
400	100	4.5	380	1.8
Lucalox – Classique Diffuse Elliptical				
150	100	1.8	148	1.8
250	100	2.95	245	1.8
400	105	4.4	385	1.8
Lucalox – Reflector				
70	90	0.98	70	1.45
Lucalox – TD – Clear Tubular Double-Ended				
250	100	2.95	250	1.45
400	100	4.40	400	1.45
1000	250	4.70	1000	1.45
Lucalox – Internal Ignitor Clear Elliptical				
50	85	0.76	50	1.45
70	90	0.98	70	1.45
Lucalox – Internal Ignitor Diffuse Elliptical				
50	85	0.76	50	1.45
70	90	0.98	70	1.45

Lumen Output (lm)

Watts	Hours (Thousands)										
	0.1	2	4	6	8	10	12	14	16	20	24
Lucalox – Classique Clear Tubular											
150	12,000	11,600	11,200	10,900	10,600	10,300	10,100	9,800	9,600	–	–
250	23,000	22,200	21,500	20,900	20,200	19,800	19,300	18,900	18,400	–	–
400	37,000	35,700	34,600	33,700	32,600	31,800	31,100	30,300	29,600	–	–
Lucalox – Classique Diffuse Elliptical											
150	11,500	11,100	10,800	10,500	10,100	9,900	9,700	9,400	9,200	–	–
250	22,000	21,200	20,600	20,000	19,400	18,900	18,500	18,000	17,600	–	–
400	36,000	34,700	33,700	32,800	31,700	31,000	30,200	29,500	28,800	–	–
Lucalox – Reflector											
70	4,000	–	3,600	–	3,500	–	3,450	–	3,400	3,350	3,350
Lucalox – TD - Clear Tubular Double-Ended											
250	26,000	–	23,600	–	23,000	–	22,500	–	22,100	21,700	21,200
400	48,000	–	43,600	–	42,400	–	41,600	–	40,800	40,000	39,200
1000	137,500	–	124,900	–	121,400	–	119,200	–	116,900	114,500	112,300
Lucalox – Internal Ignitor Clear Elliptical											
50	3,400	3,300	3,200	3,100	3,000	3,000	2,900	–	–	–	–
70	6,000	5,800	5,700	5,500	5,400	5,300	5,200	–	–	–	–
Lucalox – Internal Ignitor Diffuse Elliptical											
50	3,300	3,200	3,100	3,000	2,900	2,900	2,800	–	–	–	–
70	5,800	5,600	5,500	5,300	5,200	5,100	5,000	–	–	–	–

Typical Run-up Characteristics



Run-Up Characteristics

The graph shows typical run-up characteristics for a 250W Lucalox® lamp. Time for the light output to reach 90% of the final value is determined by supply voltage and ballast design. Typical values are :

Watts	50	70	150	250	400	1000
Run-Up (Mins)	4	<5	6	6	6	8

Hot Re-strike Time

Lucalox® Reflector & TD Clear Tubular Double-Ended

All ratings re-strike within 1 minute following. a short interruption in the supply. Actual re-strike time is determined by ignitor type, pulse voltage and cooling rate of the lamp.

Lucalox® Internal Ignitor

All ratings must restrike between 1 and 7 minutes following a short interruption of Power supply.

Lucalox® Classique

All ratings restrike within 5 minutes. This is due to the lamp having cooled to a temperature at which the internal starting aid is required to re-establish the arc. This starting aid is thermally set and will not operate when hot.

Lucalox® TD Clear Tubular Double-Ended

TD lamps can restrike immediately using suitable high starting pulse.

Supply Voltage

Lamps are suitable for supplies in the range 220V to 250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used.

However, in order to maximise lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

Control Gear

It is essential to use a ballast appropriate to the supply voltage at the luminaire.

Typical wiring diagrams for control circuits incorporating "Superimposed" or "Impulser" ignitor and choke (reactor) ballast are shown. Refer to actual choke and ignitor manufacturers data for terminal identification and wiring information.

A typical wiring diagram for Lucalox® Internal Ignitor HPS lamps and choke (reactor) ballasts is shown separately.

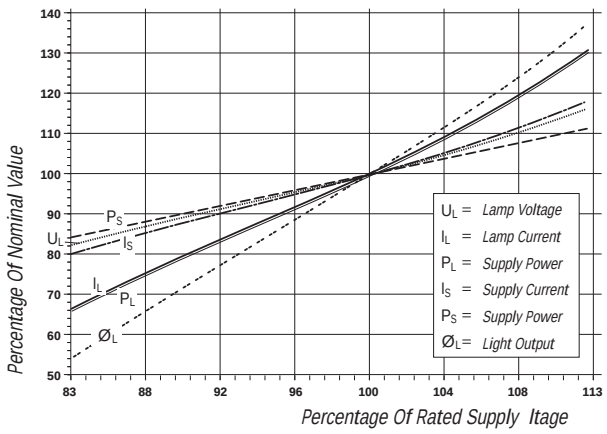
Warning

Do not use a Lucalox® Internal Ignitor HPS lamp in an installation that has an external ignitor unit!

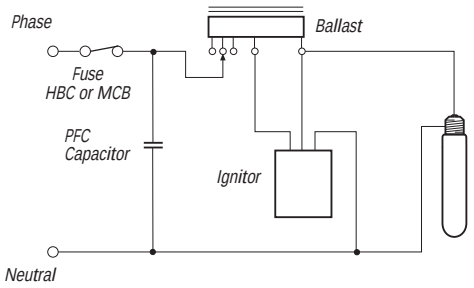
Compliance with IEC Standards

All Tubular and Elliptical Lamps comply with IEC 662.

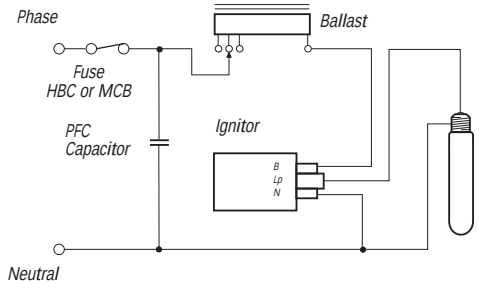
Effect of Supply Voltage Variation on Performance



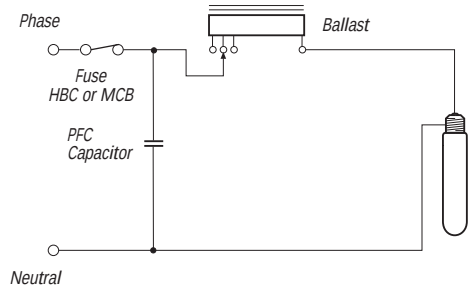
Typical Impulser Ignitor Circuit



Typical Superimposed Ignitor Circuit



Lucalox Internal Ignitor



GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

	50/70W	100-400W
Maximum Cap Temperature:	210°C	250°C
(Lucalox-TD: 350°C)		
Maximum Bulb Temperature:	400°C	400°C
(Lucalox-TD: 750°C)		

Luminaire Voltage Rise

To maximise lamp life it is essential that luminaires are designed so that when lamps are enclosed lamp voltage rise does not exceed the following values:

Watts	50	70	150	250	400	1000
Lucalox – Classique Clear Tubular						
Voltage Rise (V)	–	–	7	7	12	–
Lucalox® Classique Diffuse Elliptical						
Voltage Rise (V)	–	–	5	5	7	–
Lucalox – Reflector						
Voltage Rise (V)	–	5	–	–	–	–
Lucalox – TD – Clear Tubular Double-Ended						
Voltage Rise (V)	–	–	–	7	12	20
Lucalox – Internal Ignitor Clear Elliptical						
Voltage Rise (V)	5	5	–	–	–	–
Lucalox – Internal Ignitor Diffuse Elliptical						
Voltage Rise (V)	5	5	–	–	–	–

Control Gear

To achieve correct lamp starting, performance and life it is important that lamp and control gear are compatible and suitably rated for the supply voltage at the luminaire.

Ballasts

Lamps are fully compatible with ballasts manufactured for high pressure sodium lamps to IEC 662. Ballasts should comply with specifications IEC 922 and IEC 923.

Ballast Thermal Protection — Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for the installation.

Ballast Voltage Adjustment — Series choke (reactor) ballasts incorporating additional tappings at ±10V of the rated supply voltage are recommended. Alternatively a single additional tapping 10V above the rated supply voltage will ensure lamps are not over-loaded due to excessive supply voltage.

Ignitors

Ignitors should comply with specifications IEC926 and IEC927 and have starting pulse characteristics as follows:

Watts	Min. Pulse Voltage (kV) [1]	Max. Pulse Voltage (kV) [2]	Min. Pulse Width (µs) [3]	Min. Pulse Repetition Rate [4]	Min. HF Peak Current (A)
Lucalox – Classique					
150	2.8	4.5	1.95	1 / cycle	1.0
250	3.3	5.0	0.95	1 / cycle	1.0
400	3.3	5.0	0.95	1 / cycle	1.0
Lucalox – Reflector					
70	1.8	2.3	1.95	1 /1/2 cycle	0.2
Lucalox – TD – Clear Tubular Double-Ended					
250	2.8	–	0.95	1 / cycle	0.2
400	2.8	–	0.95	1 / cycle	0.2
1000	3.5	–	0.2	1 / cycle	0.2

1.When Loaded with 100 pF
2. When Loaded with 20pF
3. At 90% peak voltage
4. From ignitor into lamp during starting

Pulse Phase Angle: 60-90°el and/or 240-270° el.

Warning

Do not use a Lucalox® Internal Ignitor HPS lamp in an installation that has an external ignitor unit!

Timed Ignitors — Use of a "timed" or "cut-out" ignitor is not a specific requirement, but it is a good optional safety feature for installation. The timed period must be adequate to allow lamps to cool and restart when the supply is interrupted briefly (see "Hot Re-strike Time").

Cable between Ignitor and Lamp – Cables connected between the lamp and a superimposed ignitor "Lp" terminal, or the ballast when using an impulser ignitor, must be rated at a minimum 50/60Hz voltage of 1000V. Mineral insulated cable is not suitable for connecting the lamp to the control gear.

To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor "Lp" terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and/or other cables, unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are normally permissible.

Limits for particular ignitors are available on request from GE Lighting or directly from the ignitor manufacturer.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimise supply current and electricity costs. For 220-250V supplies 250V±10% rated capacitors are recommended as follows:

Watts	50	70	100	150	250	400	1000

Lucalox® Superlife

Lucalox® Superlife High Pressure Sodium Lamps
Lucalox® Superlife Clear Tubular
50W, 70W, 100W, 150W, 250W & 400W
Lucalox® Superlife Diffuse Elliptical
50W, 70W, 100W, 150W, 250W & 400W

Description

Lucalox® Superlife lamps comprise a sodium discharge system operating at a high pressure within a ceramic arc tube which is mounted in an outer glass bulb. All lamps have two arc tubes, each having the patented amalgam reservoir outside the arc tube. The second arc tube will instantly light when power is reapplied after a momentary power interruption.

- Extremely long rated life up to 55 000 hours. Extended replacement cycles up to six years.
- Dual arc tubes provide immediate recognition eliminating hot restrike time
- Retrofit standard HPS lamps

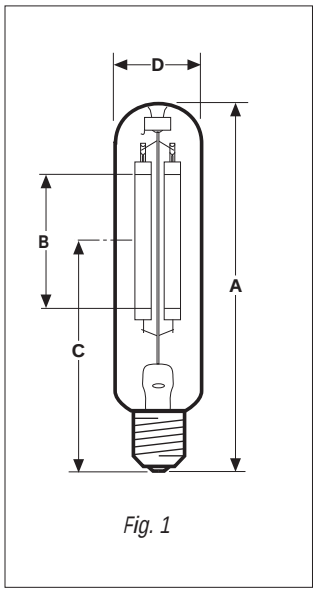


Fig. 1

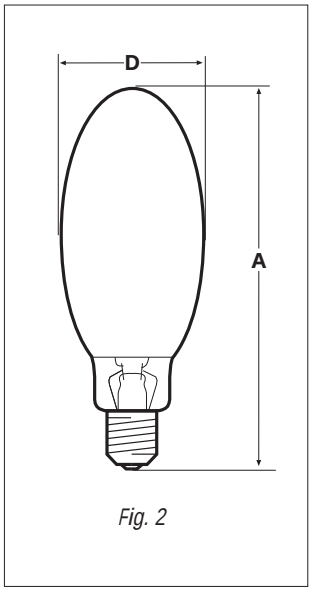


Fig. 2

Applications

The application possibilities include industrial and exterior applications, such as security, roadway, floodlighting and industrial interior illumination.

They are especially suitable for relamp areas which are narrow and/or difficult to access.

They are ideal for places where the switch on and off could happen within 4 -5 minutes, ensuring instant light when power is reapplied.

Physical Data

Watts	A Length (mm)	D Diameter (mm)	C LCL (mm)	B Arc Gap (mm)	Cap	Bulb Glass	Mass (g)	Operating Position	Minimum Starting Temp.
Lucalox - Superlife Clear Tubular – Fig. 1									
50	156	38.5	97	34.8	E27	Hard	60	Universal	-40°C
70	156	38.5	97	34.8	E27	Hard	60	Universal	-40°C
100	211	48	133	42.3	E40/45	Hard	150	Universal	-40°C
150	211	48	133	48.3	E40/45	Hard	160	Universal	-40°C
250	260	48	158	64.3	E40/45	Hard	195	Universal	-40°C
400	278	48	175	85.3	E40/45	Hard	220	Universal	-40°C
Lucalox - Superlife Diffuse Elliptical – Fig. 2									
50	156	72	–	–	E27	Hard	60	Universal	-40°C
70	156	72	–	–	E27	Hard	60	Universal	-40°C
100	186	76	–	–	E40/45	Hard	150	Universal	-40°C
150	227	91	–	–	E40/45	Hard	160	Universal	-40°C
250	227	91	–	–	E40/45	Hard	220	Universal	-40°C
400	282	122	–	–	E40/45	Hard	230	Universal	-40°C

Photometric Data

Watts	100 Hr. Lumens	Colour Temp.(K)	Chromaticity Co-ordinates		Colour Rendering Properties	
			x	y	CRI (Ra)	DIN 5035 Class
Lucalox - Superlife Clear Tubular						
50	3,400	2,000	0.530	0.430	25	4
70	6,000	2,000	0.530	0.430	25	4
100	9,500	2,000	0.530	0.430	25	4
150	15,000	2,000	0.530	0.430	25	4
250	27,500	2,000	0.530	0.430	25	4
400	50,000	2,000	0.530	0.430	25	4
Lucalox - Superlife Diffuse Elliptical						
50	3,300	2,000	0.530	0.430	25	4
70	5,800	2,000	0.530	0.430	25	4
100	9,200	2,000	0.530	0.430	25	4
150	14,500	2,000	0.530	0.430	25	4
250	26,000	2,000	0.530	0.430	25	4
400	47,500	2,000	0.530	0.430	25	4

Photometric data is quoted in a horizontal orientation operating from a nominal ballast at rated supply volts.

Lumen Output (klm)

Watts	Hours (Thousands)											
	0.1	5	10	15	20	25	30	35	40	45	50	55
Lucalox - Superlife Clear Tubular												
50	3,400	3,300	3,200	3,200	3,000	3,000	2,900	2,900	2,900	–	–	–
70	6,000	5,800	5,600	5,500	5,300	5,200	5,200	5,100	5,100	–	–	–
100	9,600	9,300	9,000	8,800	8,500	8,400	8,300	8,200	8,200	–	–	–
150	15,000	14,600	14,100	13,700	13,400	13,100	12,900	12,800	12,800	12,600	12,600	–
250	27,500	26,700	25,900	25,200	24,500	24,000	23,700	23,500	23,400	23,300	23,300	23,200
400	50,000	48,500	47,000	45,800	44,500	43,600	43,000	42,700	42,500	42,300	42,300	42,200
Lucalox - Superlife Diffuse Elliptical												
50	3,300	3,200	3,100	3,000	2,900	2,900	2,800	2,800	2,800	–	–	–
70	5,800	5,600	5,500	5,300	5,200	5,100	5,000	4,900	4,900	–	–	–
100	9,200	8,900	8,600	8,400	8,200	8,000	7,900	7,800	7,800	–	–	–
150	14,500	14,100	13,600	13,300	12,900	12,600	12,500	12,400	12,300	12,200	12,200	–
250	26,000	25,200	24,400	23,800	23,100	22,700	22,400	22,200	22,100	21,900	21,900	21,800
400	47,500	46,100	44,700	43,500	42,300	41,400	40,900	40,500	40,400	40,200	40,000	39,900

Electrical Data

Data is based on a nominal lamp operating from a nominal choke (reactor) ballast with power factor correction. Supply power is based on a typical commercially available ballast.

Lamp Data

Watts	Volts ±15 (V)	Current (A)	Power (W)	Current Crest Factor
Lucalox - Superlife Clear Tubular				
50	85	0.76	50	1.45
70	90	0.98	70	1.45
100	100	1.20	100	1.45
150	100	1.80	150	1.45
250	100	3.00	250	1.45
400	100	4.60	392	1.45
Lucalox - Superlife Diffuse Elliptical				
50	85	0.76	50	1.45
70	90	0.98	70	1.45
100	100	1.20	100	1.45
150	100	1.80	150	1.45
250	100	3.00	250	1.45
400	105	4.45	400	1.45

Lamp Survival and Lumen Maintenance

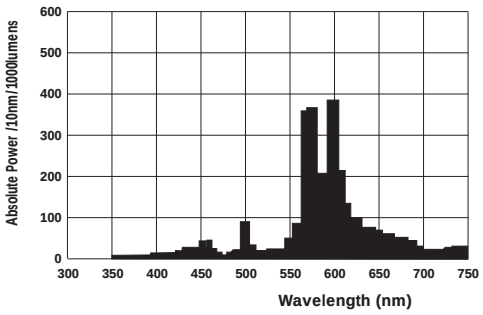
Lumen maintenance and lamp mortality curves shown above are compiled from measurements taken under standard test conditions, for lamps that have been operated 10 or more burning hours per start.

Results in use may fall below the shaded bands for reasons such as:

- High switching frequency
- Mains voltage variations
- Operating position
- Vibration
- High air temperature around lamp (in enclosed luminaire)
- Ballast quality

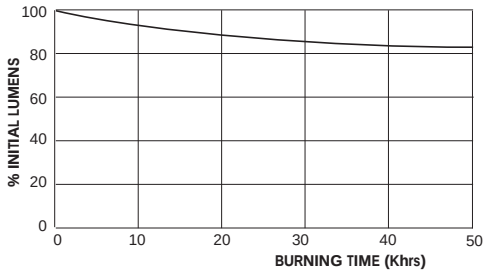
The information given is intended to be a practical guide in determining lamp replacement schedules.

Spectral Power Distribution

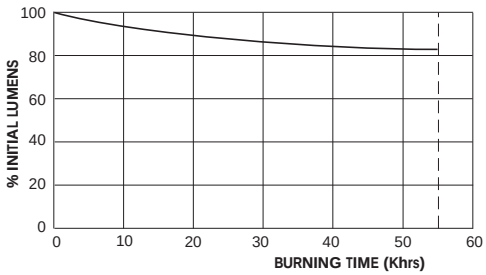


50W, 70W, 100W
Lumen Maintenance at Nominal Supply Voltage

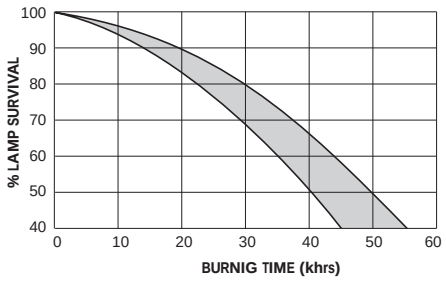
150W
Lumen Maintenance at Nominal Supply Voltage



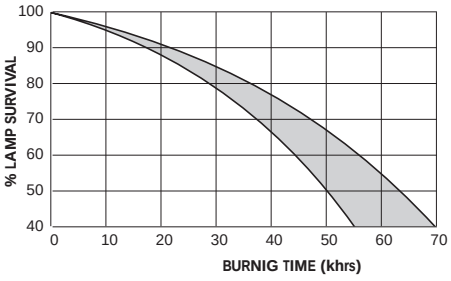
250, 400W
Lumen Maintenance at Nominal Supply Voltage



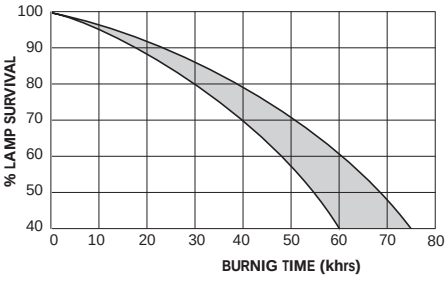
50W, 70W, 100W
Lamp Survival & Lumen Maintenance



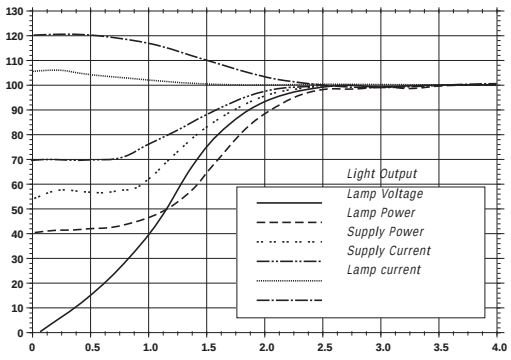
150W
Lamp Survival & Lumen Maintenance



250, 400W
Lamp Survival & Lumen Maintenance



Run-up Graph



Lamp Survival (%)

Watts	Hours (Thousands)							
	0.1	10	20	30	40	50	60	70
50	100	92-96	82-90	68-80	50-67	29-50	–	–
70	100	92-96	82-90	68-80	50-67	29-50	–	–
100	100	92-96	82-90	68-80	50-67	29-50	–	–
150	100	96-98	90-92	80-84	67-76	51-67	33-55	14-40
250	100	96-98	91-93	82-86	70-79	56-71	40-61	22-48
400	100	96-98	91-93	82-86	70-79	56-71	40-61	22-48

Run-Up Characteristics

The graph shows typical run-up characteristics for a 150W Lucalox® Superlife lamp. The time needed for the light output to reach 90% of the final value is determined by the supply voltage and ballast design. Typical values are:

Watts	50	70	100	150	250	400
Run-Up (Mins)	4	<5	4	4	5	3

Hot Restrike Time

Due to the standby construction the 50-70 Watt ratings restrike within 10 seconds and the 100-400 Watt ratings restrike within 5 seconds following a short interruption in the power supply.

Supply Voltage

Lamps are suitable for supplies in the range 220V to 250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA), if it is suitable for standard lamps; to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used.

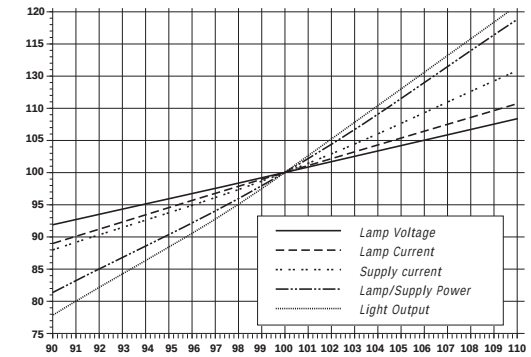
However, in order to maximise lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

Ballasts

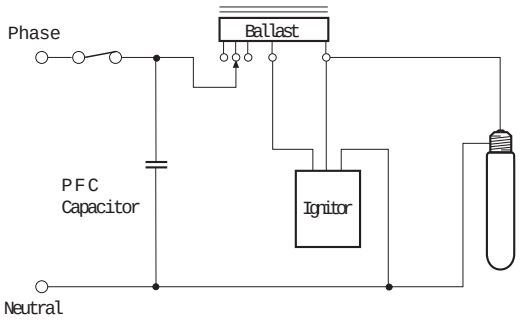
It is essential to use a ballast appropriate to the supply voltage at the luminaire.

Typical wiring diagrams for control circuits incorporating “Superimposed” or “Impulser” ignitor and choke (reactor) ballast are shown. Refer to actual choke and ignitor manufacturers' data for terminal identification and wiring information.

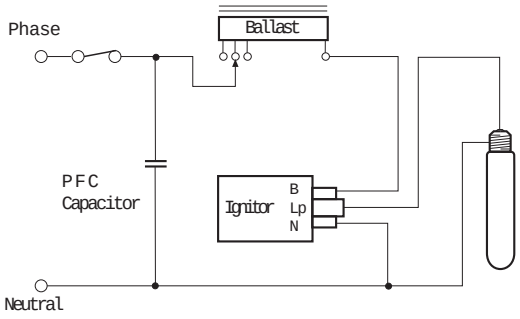
Voltage Variation Graph



Typical Impulser Ignitor Circuit



Typical Superimposed Ignitor Circuit



GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

	50/70W	100-400W
Maximum Cap Temperature	210°C	250°C
Maximum Bulb Temperature	400°C	400°C

Luminaire Voltage Rise

To maximise lamp life it is essential that luminaires are designed so that when lamps are enclosed lamp voltage rise does not exceed the following values:

Watts	50	70	100	150	250	400
Lucalox - Superlife Clear Tubular						
Voltage Rise (V)	5	5	7	7	10	12
Lucalox - Superlife Diffuse Elliptical						
Voltage Rise (V)	5	5	5	5	10	7

Ballast

To achieve correct lamp starting, performance and life it is important that lamp and ballasts are compatible and suitably rated for the supply voltage at the luminaire.

Lamps are fully compatible with ballasts manufactured for high pressure sodium lamps to IEC662. Ballasts should comply with specifications IEC922 and IEC923.

Ballast Thermal Protection — Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for installation.

Ballast Voltage Adjustment — Series choke (reactor) ballasts incorporating additional tappings at ±10V of the rated supply voltage are recommended. Alternatively a single additional tapping 10V above the rated supply voltage will ensure lamps are not over loaded due to excessive supply voltage.

Ignitors

Ignitors should comply with specifications IEC926 and IEC927 and have starting pulse characteristics as follows:

Watts	Min. Pulse Voltage (kV) (1)	Max. Pulse Voltage (kV) (2)	Min. Pulse Width (µs)(3)	Min. Pulse Repetition Rate (4)	Min. HF Peak Current (A)
50	1.8	2.3	1.95	1 /1/2 cycle	0.2
70	1.8	2.3	1.95	1 /1/2 cycle	0.2
100	2.8	4.5	1.95	1 / cycle	0.2
150	2.8	4.5	1.95	1 / cycle	0.2
250	2.8	4.5	0.95	1 / cycle	0.2
400	2.8	4.5	0.95	1 / cycle	0.2

1.When Loaded with 100 pF
2. When Loaded with 20pF
3. At 90% peak voltage
4. From ignitor into lamp during starting

Pulse Phase Angle: 60-90°el and/or 240-270° el.

Timed Ignitors — Use of a "timed" or "cut-out" ignitor is not recommended because of a very short restrike time of the standby construction HPS lamps (see "Hot Re-strike Time").

During the production process, GE Lucalox lamps are start tested according to the requirements of the IEC 662 Standards and will therefore be compatible with ignitors designed for lamps to this Standard and which comply with the relevant ignitor Standards (IEC 926 & 927). Examples of commercial ignitors/manufacturers are:

BAG Turgi MZN 70S (50/70W),
MZN150S, MZN150SE-C (100/150W),
MZN250SE (100/150/250W),
MZN400S(R) (100/150/250/400W)
MZN400SU (100/150/250/400W)
MZN1000S (1000W)

ERC 640006 (100-400W)

May & Christe ZG1.0SE (50/70W)
ZG2.0SE (100/150W)
ZG4.5SE (100/150/250/400W)

Parry PB070#, PBE070, PXE070 (50/70W)
PBO19#, PTH150# (150W)
PB404# (250W/400W)
PAE400, PXE400, PWE400 (150/250/400W)

Thorn G53503#, G53353.4#, G53353.2#, G53434 (50/70W)
G53504#, G53511, G53476, G53455, G53250 (100/150/250/400W)
G53282/B# (150/250/400W)
G53316 (1000W)

Tridonic ZRM2-ES, ZRM2-IS (50/70W)
ZRM1.8ES/2 (100/150W)
ZRM6-ES (100/150/250/400W)
ZRM12-ES (1000W)

 # Impulser type - approved only when used with a suitable ballast.

Cable Between Ignitor And Lamp — Cables connected between the lamp and a superimposed ignitor "Lp" terminal, or the ballast when using an impulser ignitor, must be rated at a minimum 50/60Hz voltage of 1000V. Mineral insulated cable is not suitable for connecting the lamp to the control gear.

To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor "Lp" terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and/or other cables, unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are normally permissible.

Limits for particular ignitors are available on request from GE Lighting or directly from the ignitor manufacturer.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimise supply current and electricity costs. For 220-250V supplies 250V±10% rated capacitors are recommended as follows:

Watts	50	70	100	150	250	400
PFC Capacitor	8µF	10µF	12µF	20µF	30µF	40µF

Arcstream® Single Ended

Arcstream® Single Ended Metal Halide Lamps 70W, 150W

Description

Arcstream® Single Ended lamp consists of a compact high pressure metal halide discharge operating in a quartz bulb. An outer quartz envelope provides thermal and physical protection. The lamp has a ceramic bi-pin cap.

Features

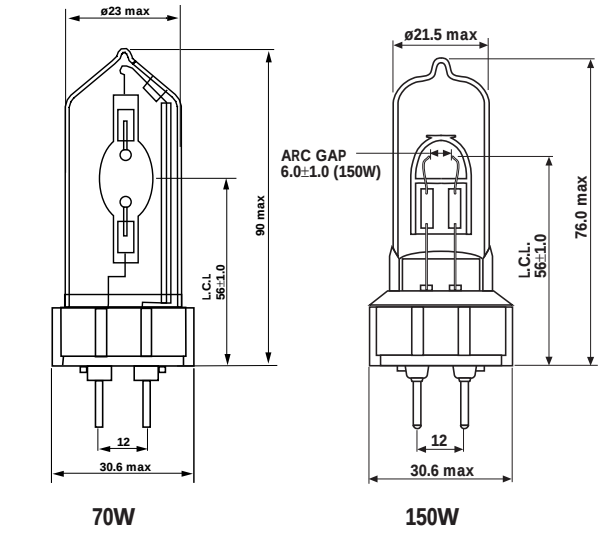
Small powerful point source enables accurate optical control in compact fittings.

- Excellent operating efficiency
- Long life
- High colour rendering index
- Choice of colour temperatures
- Choice of wattages
- Single easy to use G12 bi-pin cap
- Good initial and through life colour stability
- Universal burning

Applications

The above features make Arcstream® Single Ended suitable for a wide range of applications where light quality is important. Applications where precise optical control is required are ideally suited to Arcstream® Single Ended. E.g.:

- Display spotlights
- Downlights
- Uplights
- Floodlights
- Specialist applications – Fibre optics

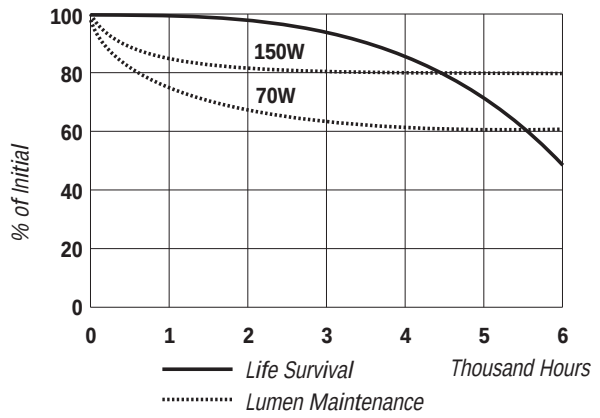


All Dimensions are in mm

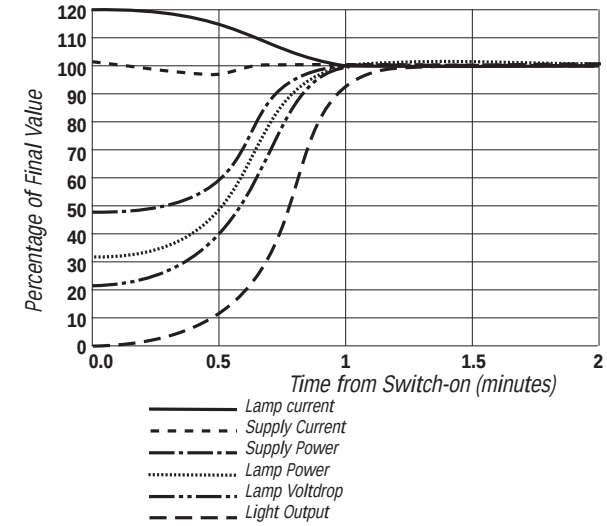
Physical Data

Dimensions	See Line Drawing
Cap	G12
Bulb Material	Quartz
Mass (g)	35g
Operating Position	Universal
Min. Starting Temperature	–40 °C

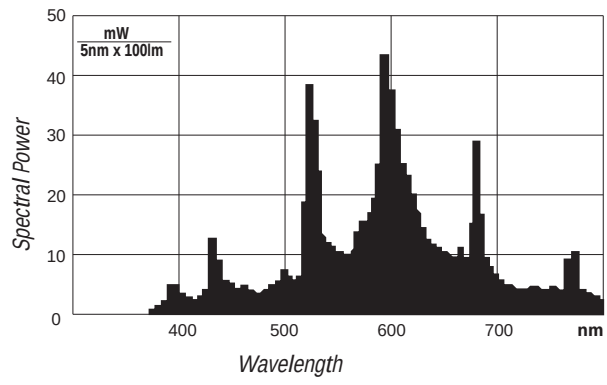
Life Survival



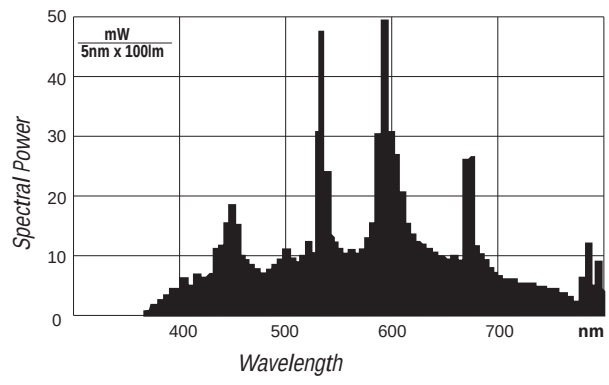
Typical Run Up Characteristics



3000K Spectral Power Distribution



4000K Spectral Power Distribution



Lamp Survival and Lumen Maintenance

Average lamp life: 6000 hours to 50% failures. Lumen maintenance: 60% (for 70W types) or 80% (for 150W types) at 6000 hours.
The graph shows the survival of representative groups of lamps operated under control conditions at 5 hrs/start. Lamp life in service will be affected by a number of parameters, such as main voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Run-Up Characteristics

The graph shows a typical run-up characteristic. Times for the light output to each 90% of the final value are:

70W	150W
80 secs.	60 secs.

Hot Restrike Time

1 to 2 minutes for both lamp ratings, depending on the actual pulse voltage at the lamp.

Photometric Data

Nominal Rating		70W		150W	
Nominal Colour Temperature					
Correlated Colour Temperature (K)		3000	4200	3000	4000
Nominal Light Output					
Lumen Output (at 100 hrs)		5200	5200	12000	11500
Nominal Colour Appearance					
Chromaticity Co-ordinates	x	0.437	0.372	0.437	0.380
	y	0.404	0.372	0.404	0.370
Colour Rendering					
General Colour Rendering Index Ra		75	81	80	85
DIN 5035 Classification		2A	1B	1B	1B

Electrical Data

Based on nominal 3000K or 4000K lamp and control gear. Supply power is based on a typical commercially available ballast.

Rating		70W			150W	
Supply Voltage (V)	220	230	240	220	230	240
Lamp Voltage (V)	95	95	95	95	95	95
Lamp Current (A)	0.9	0.9	0.9	1.82	1.82	1.82
Lamp Power (W)	75	75	75	146	146	146
Supply Current (A)	0.46*	0.43*	0.41	0.85	0.81	0.76
Supply Power (W)	87	87	88	168	169	170
Power Factor (Lagging)	0.87*	0.88*	0.89	0.90	0.91	0.93
% 3rd Harmonic	20	19	19	13	13	13
Max Line Current						
During Run Up (A)	0.55	0.51	0.47	0.92	0.84	0.76
Failed/Hot Lamp (A)	0.69	0.72	0.75	1.40	1.45	1.50
Power Factor						
Correction Capacitor (µF)	10*	10*	10	20	20	20

**Use a 12µF Capacitor if a power factor >0.9 (lag) is required. Supply current is then reduced at 220V to 0.42A (0.94pF) and at 230V to 0.40A (0.94pF).*

NOTE: Arcstream lamps do not retain the claimed performance if they are dimmed. All the performance data quoted have been measured with the lamp in the base down position and at rated supply volts.

Supply Voltage

Lamps will start and operate with a 10% reduction in rated supply voltage when the correct control gear is used. However, in order to maximize lamp survival, lumen maintenance and colour uniformity, the supply voltage and ballast design should be within ±3%. Supply variations of ±5% are permissible for short periods only. Lamps are suitable for supplies in the range 220V-250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation.

Fusing of Choke/Ignitor Circuits

For a very short period after switch-on, all discharge lamps may act as a partial rectifier and as a result the ballast may allow several times the normal supply current to flow. To avoid nuisance fuse failure the ratings shown below should be used.
For further information refer to the publication "Fuse Ratings For Discharge Lamps" available from GE Lighting.
HBC or MCB (type 3 or 4) fuse ratings for single and multiple lamp installations:

Number of Lamps	1	2	3	4	5	6
70W Fuse Rating (A)	4	4	4	6	6	10
150W Fuse Rating (A)	4	6	10	10	16	16

Packaging

Individual card retaining sleeve.

10 way outer carton	
Dimensions	210mm x 160mm x 85mm
Mass	614g

Conformity to Standards

Arcstream lamps are manufactured under BS5750 Part 2/ ISO 9002/EN 29002/QA 34/51.

Warning

Arcstream lamps have an outer bulb made of quartz which transmits UVA and UVB radiation. All metal halide lamps, including Arcstream, operate at very high internal pressures, consequently it is a possibility that in a large installation a few lamps may shatter if run beyond the rated life. To reduce the risk of this happening, continuous operation of the lamps should be avoided and the lamps should be switched off for a brief period at least once every 24 hours.

FOR THESE REASONS ARCSTREAM LAMPS MUST ONLY BE OPERATED IN A FULLY ENCLOSED LUMINAIRE WITH A UV ABSORBENT FRONT COVER GLASS.

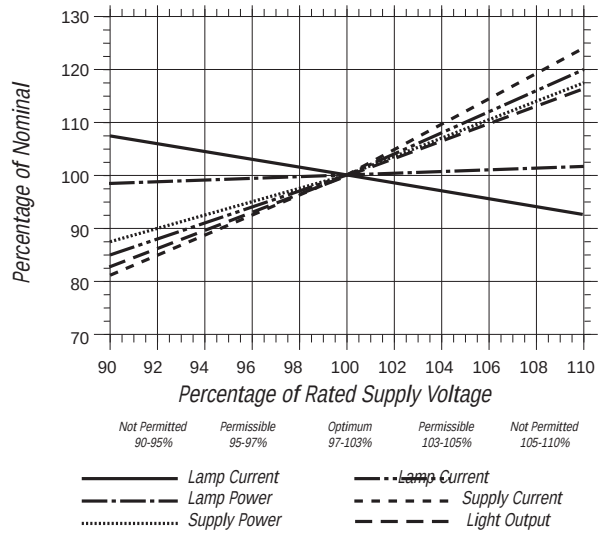
INSTALLATION, OPERATION AND DISPOSAL

Important – The following information gives essential precautions for the safe handling, installation, use and disposal of Metal Halide lamps. Failure to adhere to these precautions could expose the user to harmful UVA and UVB radiation.

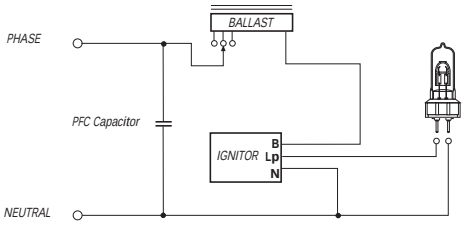
Installation

- All lamps should be installed and replaced by a competent electrician or suitably qualified person who must first isolate the equipment from the electricity supply.

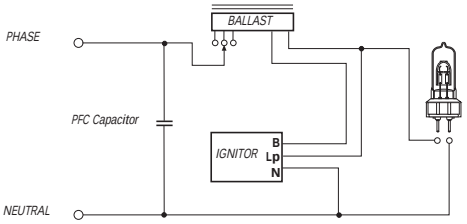
Effect of Supply Voltage Variation on Performance



Typical Superimposed Ignitor Circuit



Typical Impulser Ignitor Circuit



- Ensure that the replacement lamp is the correct type for the application and is located correctly and firmly in the lampholder.
- If the outer bulb is broken or scratched the lamp must not be used.
- Fingerprints on the outer bulb should be removed using a soft cloth impregnated with methylated spirit.

Operation

- During operation parts of the lamp surface may reach temperatures up to 600° C. Prevent liquid condensation droplets or water splashing onto the lamp as these may cause the bulb to shatter.
- The lamp must only be used in a fully enclosed luminaire with a UV absorbing front cover glass that will retain any fragments should the lamp shatter.

Disposal

- Allow a failed lamp to cool and isolate the supply before removal from the luminaire.
- Small quantities of lamps may be disposed of with ordinary refuse. The lamps should be placed in original or similar packaging before dispose.
- Large quantities of lamps must be disposed of in accordance with the rules of the Local Authority.

GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

	70W	150W
Max Pin Temperature Limit	150°C	150°C
Max Cap/Bulb Interface Temperature	250°C	270°C
Max Bulb Temperature	500°C	550°C

Reflector Design

Due to the nature of the arc some separation of colour within the beam produced by a fitting may be experienced. This effect can be minimized by careful reflector design.

In general an evenly mixed beam can be achieved by using a parabolic reflector. Any spreading of the beam should be achieved by using a degree of faceting and surface texturing. Narrow angle reflectors should also incorporate a small degree of facetting or surface texturing. Further information and advice can be obtained on application.

Control Gear

For correct starting and operation it is important that the lamp and control gear are compatible and suitable for the supply voltage at the luminaire.

Ballasts

The following 70W and 150W ballasts are suitable:
(a) Ballasts manufactured for lamps complying with the forthcoming IEC metal halide lamp specification.
(b) Ballasts manufactured for lamps complying with the high pressure sodium lamp specification IEC662.
Ballasts should comply with specifications IEC992 and IEC923.

Ballast Thermal Protection

Incorporation of a thermal cutout into the ballast is not a specific requirement for Arcstream lamps, but some form of thermal protection is required by the forthcoming IEC Metal Halide Lamp specification.

Voltage Adjustment

Additional tappings at ±10V should be provided on series choke ballasts to ensure actual supply voltage and rated voltage of the ballast are within the GE recommended limits. Ballasts rated for 220/230/240V should be used for Europe and Ireland excluding UK Mainland. Ballasts with no means of voltage adjustment may be used provided that the supply voltage is maintained within the recommended limits.

Ignitors

Correct ignitor performance is essential for successful starting of the lamp. Superimposed or impulser type ignitors are suitable for use with Arcstream lamps, but it is recommended that only GE approved ignitors are used. Pulse requirements are ±3.5kV peak (minimum) with pulses produced on both mains half-cycles between 60/90 degrees and 240/270 degrees. Ignitors should comply with specifications IEC926 and IEC927.

Timed Ignitors

Use of a "timed" or "cutout" ignitor is not a specific requirement for Arcstream lamps, but it is a good optional safety feature for the installation. The time period must be sufficient to allow lamps to hot restart where the supply is accidentally switched off or a sudden reduction in supply voltage causes the lamp to extinguish. A minimum period of 6 minutes ignitor operation is recommended before the ignitor is automatically switched off. Commercially available 10/11 minute timed ignitors should be used.

Approved Ignitors for both 70W and 150W ratings

Thorn	G53459, G53476
BAG Turgi	MZN 150S, MZN 250SE, MZN 400SU
Tridonic/Zumtobel	ZRM GES, ZRM 1.8ES/2
May & Christie	PTH070* (for 70W only), PTH150* (for 150W only), PAE400, PXE400
Sabir	AIF40

**Impulser type must be used in conjunction with appropriate Parry ballast – HDZ073 (70W), HSV162 (150W) or HSV163 (150W). You are advised to contact GE Lighting if you wish to use any ignitor not on the above list.*

Lamp to Ignitor Cable Capacitance

To achieve good starting with superimposed types, ignitors must be adjacent to the luminaire. Cable capacitance between wiring from the ignitor "Lp" terminal to lamp and adjacent metal and/or other cables should not exceed 100pF (<1 metre length) unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are permissible. For example Parry impulser types can be used with between 2000pF (13 metres) and 2800pF (19 metres) of typical cable depending upon lamp rating and supply voltage.

PFC Capacitors for Simple Choke Circuits

Power Factor Correction is advisable in order to minimize supply current and electricity costs. For supply voltages in the range 200-250V a 250V rated capacitor with a ±10% tolerance is recommended.

Rating	70W	150W
Capacitor	10µF	20µF

**Use 12µF on 220/230V supplies for > 0.9 Power Factor.*

Suitable Lamp Holders – G12

Any G12 lampholder complying with the relevant IEC spec. is suitable, e.g.:

Bender & Wirth	960
Thorn	GL1235
BJB	G12-25.809

Arcstream® Double Ended

Arcstream® Double-Ended Metal Halide Lamps 70W, 150W, 250W

Applications

High brightness, high quality white light with good colour rendition, excellent colour consistency and energy efficiency make Arcstream® Double Ended lamps suitable for many retail environments and commercial interiors.

- Shops
- Offices
- Architectural floodlighting
- Amenity areas

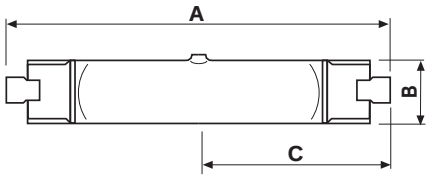


Fig. 1

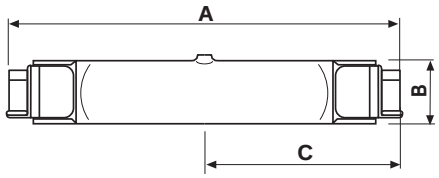


Fig. 2

Physical Data

Watts	A Length (mm)	B Diam. (mm)	C LCL (mm)	Arc Gap (mm)	Cap	Bulb Glass	Mass (g)	Operating Position	Min . Start. Temp. (°C)	Fig. No.
70	114.2*	22	57	8.5	R7s	Quartz	21	Hor. ± 45°	-20	1
150	132*	25	66	18.0	R7s	Quartz	30	Hor. ± 45°	-20	1
250	163	25	81	25.0	Fc2	Quartz	53	Hor. ± 45°	-20	2

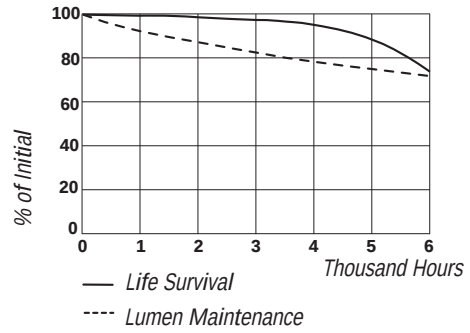
** Contact length.*

Photometric Data

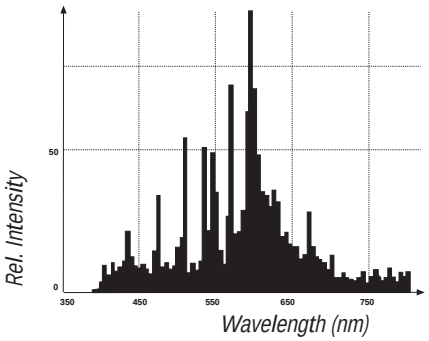
Watts	100 Hr. Lumens	Colour Temp. (K)	Chromaticity Co-ordinates x	y	Ra	DIN5035 Class
Warm White						
70	6000	3000	0.437	0.404	75	2A
150	13000	3000	0.437	0.437	75	2A
250	20000	3200	0.423	0.399	80	1B
White						
70	6000	3500	0.405	0.391	70	2A
150	12000	3500	0.405	0.391	70	2A
Neutral White						
70	6000	4200	0.372	0.372	72	2A
150	12000	4200	0.372	0.372	72	2A
250	20000	4000	0.380	0.377	80	1B

Photometric data are quoted for the lamp in specified orientation operating from a nominal ballast at rated supply volts.

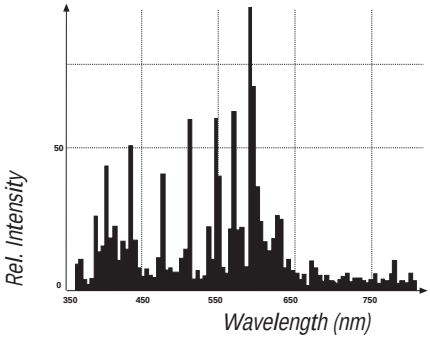
Typical Life Survival & Lumen Maintenance Graph



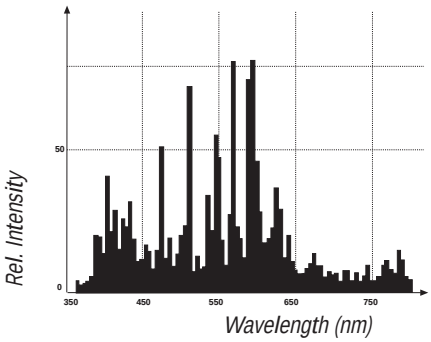
"Warm White" Spectral Power Distribution



"White" Spectral Power Distribution



"Neutral White" Spectral Power Distribution



Lamp Survival and Lumen Maintenance

The graph shows the survival of representative groups of lamps operated under control conditions at 10 hrs/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Lamp Survival (%)

Watts	Hours (Thousands)						
	0.1	1	2	3	4	5	6
70	100	100	98	97	95	87	74
150	100	100	98	97	95	87	74
250	100	100	98	97	95	87	74

Lumen Output (Thousands)

Watts	Hours (Thousands)						
	0.1	1	2	3	4	5	6
Warm White							
70	6.0	5.0	4.5	4.1	3.9	3.5	3.2
150	13.0	12.0	11.5	11.0	10.3	9.8	9.3
250	20	.0	17.8	16.8	16.0	15.4	14.8
14.0							
White							
70	6.0	5.0	4.5	4.2	4.1	4.0	3.8
150	12.0	11.0	10.5	10.0	9.5	9.0	8.5
Neutral White							
70	6.0	5.0	4.5	4.2	4.1	4.0	3.8
150	12	.0	11.0	10.5	10.0	9.5	9.0
8.5							
250	20.0	17.8	16.8	16.0	15.4	14.8	14.0

Operating Note

Arcstream® Double Ended lamps have an outer bulb made of quartz which transmits UVA and UVB radiation. All metal halide lamps, including Arcstream® Double Ended, operate with a high internal pressure and there is a slight risk that lamps may shatter, particularly if run beyond rated life. At end of life a switch off should be introduced every 24 hours to reduce the risk of shattering. The lamp must be fully enclosed by a luminaire to ensure the retention of any fragments in the event of such failure.

Electrical Data

Data are based on a nominal lamp operating from a nominal choke (reactor) ballast.

Lamp Data

Watts	Volts ± 15 (V)	Current (A)	Power (W)	Current Crest Factor
70	95	0.95	75	1.8
150	95	1.8	150	1.8
250	100	3.0	250	1.8

Run-Up Characteristics

Time for the light output to reach 90% of the final value is determined by supply voltage and ballast design. Typical values are:

Watts	70	150	250
Run-Up (Mins.)	3	3	4

Hot Re-strike Time

All ratings re-strike within 10 minutes following a short interruption in the supply. Hot re-strike may be achieved using a suitable ignitor. Actual re-strike time is determined by ignitor type, pulse voltage and cooling rate of the lamp.

Supply Voltage

Lamps are suitable for supplies in the range 220V to 250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used.

However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ± 3%. Supply variations of ± 5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

Control Gear

It is therefore important to check the compatibility of lamp and control gear. Detailed information is given under "Guidance for Luminaire Manufacturers" overleaf.

It is essential to use a ballast appropriate to the supply voltage at the luminaire.

Typical wiring diagrams for control circuits incorporating "Superimposed" or "Impulser" ignitor and choke (reactor) ballast are shown. Refer to actual choke and ignitor manufacturers data for terminal identification and wiring information.

Fusing of Circuits

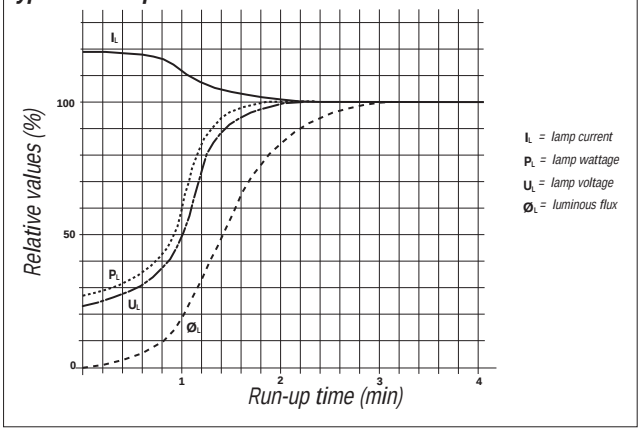
For a very short period after switch-on, all discharge lamps may act as a partial rectifier and as a result the ballast may allow several times the normal supply current to flow. To avoid nuisance fuse failure the ratings shown below should be used. Single fusing is recommended.

For further information refer to the publication "Fuse Ratings for Discharge Lamps" available from GE Lighting.

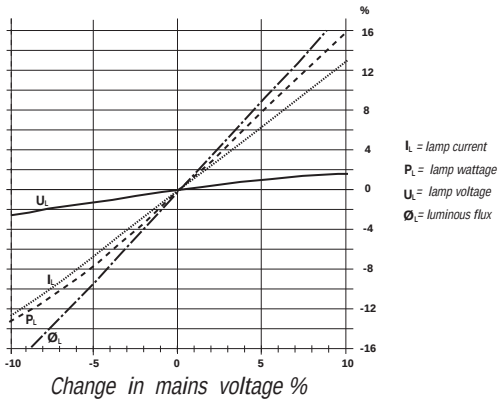
MCB (type 3 or 4) or HBC fuse ratings for single and multiple installations: (A)

Watts	No. of Lamps					
	1	2	3	4	5	6
70	4	4	4	6	6	10
150	4	6	10	10	16	16
250	10	16	18	20	20	20

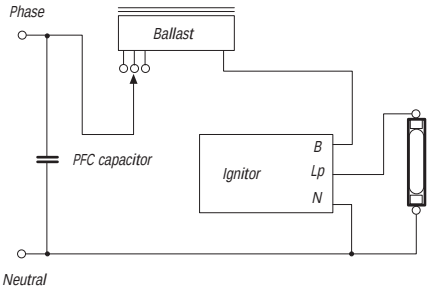
Typical Run-Up Characteristics



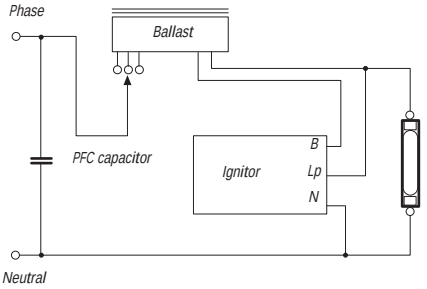
Effect of Supply Voltage Variation on Performance



Typical Superimposed Ignitor Circuit



Typical Impulser Ignitor Circuit



GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

Watts	Maximum Cap Temp. (°C)	Maximum Bulb Temp. (°C)
70	250	500
150	250	650
250	250	650

Control Gear

To achieve correct lamp starting, performance and life it is important that lamp and control gear are compatible and suitable rated for the supply voltage at the luminaire.

Ballasts

Lamps are fully compatible with ballasts manufactured for high pressure sodium lamps to IEC662 and for metal halide lamps to IEC 1167.
Ballasts should comply with specifications IEC922 and IEC923.

Ballast Thermal Protection

Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for the installation.

Ballast Voltage Adjustment

Series choke (reactor) ballasts incorporating additional tappings at ±10V of the rated supply voltage are recommended. Alternatively a single additional tapping 10V above the rated supply voltage will ensure lamps are not overloaded due to excessive supply voltage.

Ignitors

Both Superimposed and Impulser type ignitors are suitable. It is recommended that only GE approved ignitors are used. Ignitors should comply with specifications IEC926 and IEC927 and have starting pulse characteristics as follows:

Watts	Min. Pulse Voltage (kV)*	Min. Pulse Width (µs)**	Min. Pulse Repetition Rate***	Min. HF Peak Current (A)
70	4.0	>1	2/cycle	> 0.2
150	4.0	>1	2/cycle	> 0.2
250	4.0	>1	6/cycle	> 0.2

* When loaded with 100 pF.
** At 90% peak value.
*** From ignitor into lamp during starting.

Pulse Phase Angle: 60-90° el. and/or 240-270° el.

Timed Ignitors

Use of a “timed” or “cut-out” ignitor is not a specific requirement, but it is a good optional safety feature for the installation. The timed period must be adequate to allow lamps to cool and restart when the supply is interrupted briefly (see “Hot Re-strike Time”).

A period of 5 minutes continuous or intermittent operation is recommended before the ignitor is automatically switched off. Commercially available 10/11 minute timed ignitors are suitable.

Cable between Ignitor and Lamp

Cable connected between the lamp and a superimposed ignitor “Lp” terminal, or the ballast when using an impulser ignitor, must be rated at a minimum 50/60Hz voltage of 1000V. Mineral insulated cable is not suitable for connecting the lamp to the control gear.

To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor “Lp” terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and/or other cables, unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are normally permissible.

Limits for particular ignitors are available on request from GE Lighting or directly from the ignitor manufacturer.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimize supply current and electricity costs. For 220-250V supplies min. 250V rated capacitors are recommended as follows:

Watts	70	150	250
PFC Capacitor	10mF	20mF	30mF

Arcstream® UV Control

Arcstream® UV Control
Double-Ended Metal Halide Lamps
70W, 150W

Applications

High brightness, high quality, white light with good colour rendition, excellent colour consistency and energy efficiency make these lamps optimal for museum and retail environments where UV control is important.

- Museums
- Libraries
- Shops
- Offices
- Amenity areas

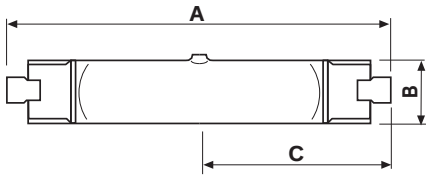


Fig. 1

Physical Data

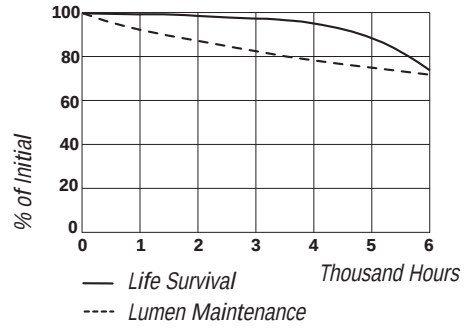
Watts	*A Length (mm)*	*B Diam. (mm)*	*C LCL (mm)*	*Arc Gap (mm)*	*Cap*	*Bulb Glass*	*Mass (g)*	*Operating Position*	*Min . Start. Temp. (°C)*	*Fig. No.*
70	*114.2*	*22*	*57*	*8.5*	*Rx7s*	*UVC-Quartz*	*21*	*Hor. ± 45°*	*-20*	*1*
150	*132*	*25*	*66*	*18.0*	*Rx7s*	*UVC-Quartz*	*30*	*Hor. ± 45°*	*-20*	*1*

Photometric Data

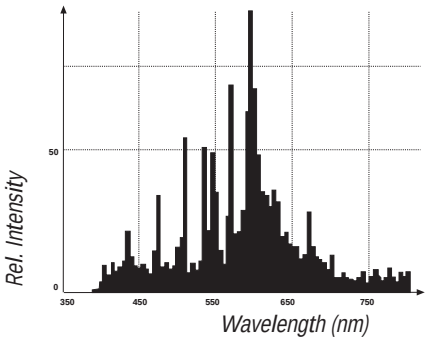
Watts	*100 Hr. Lumens*	*Colour Temp. (K)*	*Chromaticity Co-ordinates*		*Ra*	*DIN5035 Class*
			x	*y*		
Warm White						
70	*5500*	*3000*	*0.437*	*0.404*	*75*	*2A*
150	*12000*	*3000*	*0.437*	*0.404*	*75*	*2A*
Neutral White						
70	*5500*	*4200*	*0.372*	*0.372*	*72*	*2A*
150	*12000*	*4200*	*0.372*	*0.372*	*72*	*2A*

Photometric data are quoted for the lamp in specified orientation operating from a nominal ballast at rated supply volts.

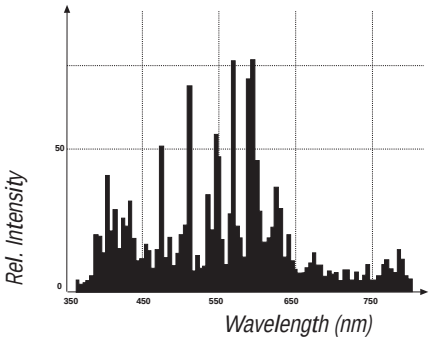
Typical Life Survival & Lumen Maintenance Graph



"Warm White" Spectral Power Distribution



"Neutral White" Spectral Power Distribution



Lamp Survival and Lumen Maintenance

The graph shows the survival of representative groups of lamps operated under control conditions at 10 hrs/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Lamp Survival (%)

Watts	Hours (Thousands)						
	0.1	1	2	3	4	5	6
70	100	100	98	97	95	87	74
150	100	100	98	97	95	87	74

Lumen Output (Thousands)

Watts	Hours (Thousands)						
	0.1	1	2	3	4	5	6
Warm White							
70	6.0	5.0	4.5	4.1	3.9	3.5	3.2
150	13.0	12.0	11.5	11.0	10.3	9.8	9.3
Neutral White							
70	6.0	5.0	4.5	4.2	4.1	4.0	3.8
150	12.0	11.0	10.5	10.0	9.5	9.0	8.5

Typical UV Emission

Watts	UV-C	UV-B	UV-A	E_{eff}	PET
	μW/(cm² · nm)/1000lux				(hours)
Warm White					
70	0.0038	0.0047	10.3434	0.0060	145.4
150	0.0078	0.0090	12.6055	0.0110	81.9
Neutral White					
70	0.0170	0.0213	26.1481	0.0230	39.0
150	0.0049	0.0023	13.7274	0.0076	112.4

Operating Note

All metal halide lamps operate with a high internal pressure and there is a slight risk that lamps may shatter, particularly if run beyond rated life. At end of life a switch off should be introduced every 24 hours to reduce the risk of shattering. The lamp must be fully enclosed by a luminaire to ensure the retention of any fragments in the event of such failure.

Electrical Data

Data is based on a nominal lamp operating from a nominal choke (reactor) ballast with power factor correction. Supply power is based on a typical commercially available ballast.

Lamp Data

Watts	Volts ± 15 (V)	Current (A)	Power (W)	Current Crest Factor
70	95	0.95	75	1.8
150	95	1.8	150	1.8

Run-Up Characteristics

Time for the light output to reach 90% of the final value is determined by supply voltage and ballast design. Typical values are:

Watts	70	150
Run-Up (Mins.)	3	3

Hot Re-strike Time

All ratings re-strike within 10 minutes following a short interruption in the supply. Hot re-strike may be achieved using a suitable ignitor. Actual re-strike time is determined by ignitor type, pulse voltage and cooling rate of the lamp.

Supply Voltage

Lamps are suitable for supplies in the range 220V to 250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used.

However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ± 3%. Supply variations of ± 5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

Control Gear

It is therefore important to check the compatibility of lamp and control gear. Detailed information is given under "Guidance for Luminaire Manufacturers" overleaf.

It is essential to use a ballast appropriate to the supply voltage at the luminaire.

Typical wiring diagrams for control circuits incorporating "Superimposed" or "Impulser" ignitor and choke (reactor) ballast are shown. Refer to actual choke and ignitor manufacturers data for terminal identification and wiring information.

Fusing of Circuits

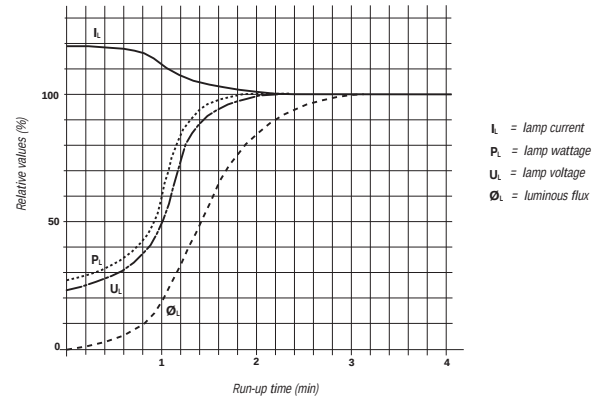
For a very short period after switch-on, all discharge lamps may act as a partial rectifier and as a result the ballast may allow several times the normal supply current to flow. To avoid nuisance fuse failure the ratings shown below should be used. Single fusing is recommended.

For further information refer to the publication "Fuse Ratings for Discharge Lamps" available from GE Lighting.

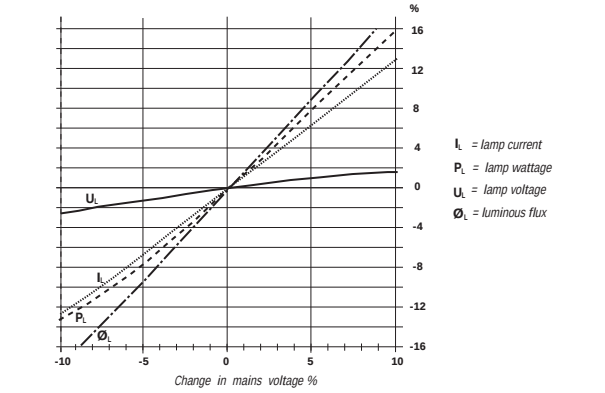
MCB (type 3 or 4) or HBC fuse ratings for single and multiple installations: (A)

Watts	No. of Lamps					
	1	2	3	4	5	6
70	4	4	4	6	6	10
150	4	6	10	10	16	16

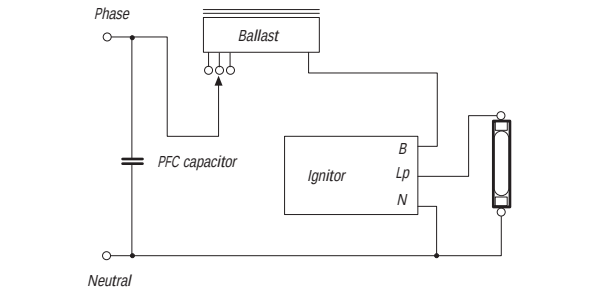
Typical Run-Up Characteristics



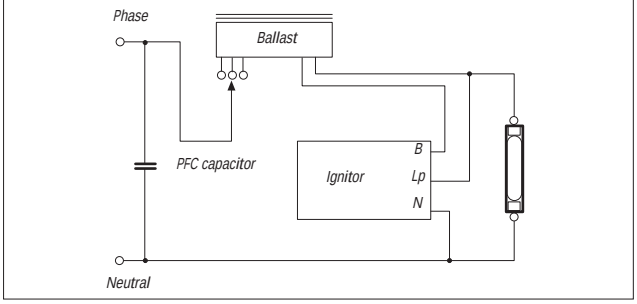
Effect of Supply Voltage Variation on Performance



Typical Superimposed Ignitor Circuit



Typical Impulser Ignitor Circuit



GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

Watts	Maximum Cap Temp. (°C)	Maximum Bulb Temp. (°C)
70	250	500
150	250	650

Control Gear

To achieve correct lamp starting, performance and life it is important that lamp and control gear are compatible and suitable rated for the supply voltage at the luminaire.

Ballasts

Lamps are fully compatible with ballasts manufactured for high pressure sodium lamps to IEC662 and for metal halide lamps to IEC1167.
Ballasts should comply with specifications IEC922 and IEC923.

Ballast Thermal Protection

Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for the installation.

Ballast Voltage Adjustment

Series choke (reactor) ballasts incorporating additional tappings at ±10V of the rated supply voltage are recommended. Alternatively a single additional tapping 10V above the rated supply voltage will ensure lamps are not overloaded due to excessive supply voltage.

Ignitors

Both Superimposed and Impulser type ignitors are suitable. It is recommended that only GE approved ignitors are used. Ignitors should comply with specifications IEC926 and IEC927 and have starting pulse characteristics as follows:

Watts	Min. Pulse Voltage (kV)*	Min. Pulse Width (µs)**	Min. Pulse Repetition Rate***	Min. HF Peak Current (A)
70	4.0	>1	2/cycle	> 0.2
150	4.0	>1	2/cycle	> 0.2

* When loaded with 100 pF.
** At 90% peak value.
*** From ignitor into lamp during starting.

Pulse Phase Angle: 60-90° el. and/or 240-270° el.

Timed Ignitors

Use of a “timed” or “cut-out” ignitor is not a specific requirement, but it is a good optional safety feature for the installation. The timed period must be adequate to allow lamps to cool and restart when the supply is interrupted briefly (see “Hot Re-strike Time”).

A period of 5 minutes continuous or intermittent operation is recommended before the ignitor is automatically switched off. Commercially available 10/11 minute timed ignitors are suitable.

Cable between Ignitor and Lamp

Cable connected between the lamp and a superimposed ignitor “Lp” terminal, or the ballast when using an impulser ignitor, must be rated at a minimum 50/60Hz voltage of 1000V. Mineral insulated cable is not suitable for connecting the lamp to the control gear.

To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor “Lp” terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and/or other cables, unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are normally permissible.

Limits for particular ignitors are available on request from GE Lighting or directly from the ignitor manufacturer.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimize supply current and electricity costs. For 220-250V supplies min. 250V rated capacitors are recommended as follows:

Watts	70	150
PFC Capacitor	10µF	20µF

NDL Metal Halide

Metal Halide Lamps
Tubular 250W, 400W
Elliptical 250W, 400W, 1000W

Applications

High brightness, high quality white light with good colour rendition and energy efficiency makes GE Metal Halide lamps suitable for many commercial and industrial interiors, particularly in high ceiling areas.

- Offices
- Amenity areas
- Retail warehouses
- General warehousing
- Industrial units
- Architectural floodlighting
- Area floodlighting
- Car parks

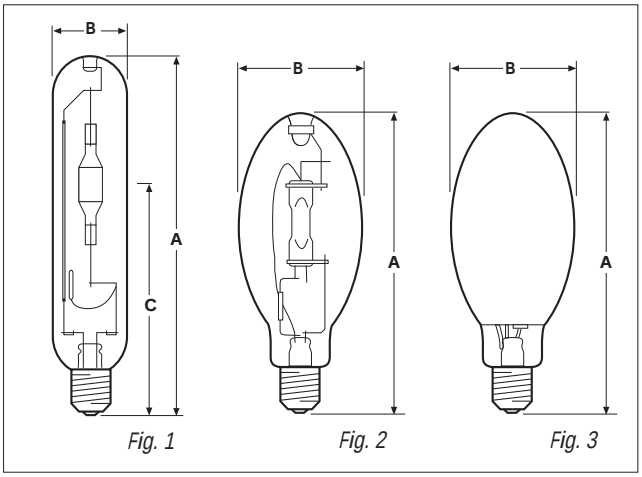


Fig. 1 Fig. 2 Fig. 3

Physical Data

Watts	A Length (mm)	B Diameter (mm)	C LCL (mm)	Arc Gap (mm)	Cap	Bulb Glass	Mass (g)	Operating Position	Minimum Starting Temp.
Tubular Clear									
250	220	46	150	22	E40	Hard	170	Universal	-40°C
400	260	46	175	28	E40	Hard	190	Universal	-40°C
Elliptical Clear & Coated									
250	227	91	144	23	E40	Hard	190	Base Up/Hor.*	-40°C
400/H	286	122	187	36	E40	Hard	250	Horizontal*	-40°C
400/BU	286	122	187	41.5	E40	Hard	250	Base Up*	-40°C
1000	400	167	270	92.5	E40	Hard	430	Universal	-40°C

** Note: "Base Up" is within ±30°of vertical, "Horizontal" is within ±60° of horizontal (±15° of horizontal for optimum performance).*

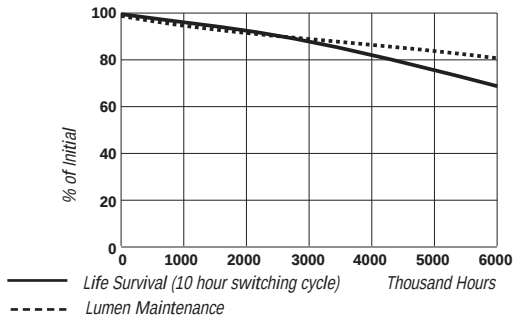
Photometric Data

Watts	100 Hr. Lumens	Colour Temp. (K)	Chromaticity Co-ordinates x	y	Ra	DIN5035 Class.
Tubular Clear						
250	21000	4200	0.373	0.376	70	2A
400	35000	4200	0.373	0.376	70	2A
Elliptical Clear						
250	22500	4500	0.365	0.400	65	2B
400/H	32000/37000*	4500	0.365	0.400	65	2B
400/BU	32000/39000*	4500	0.365	0.400	65	2B
1000	92000	4500	0.365	0.400	65	2B
Elliptical Coated						
250	19500	4000	0.390	0.400	70	2A
400/H	34000/38500*	4000	0.390	0.400	70	2A
400/BU	30500/35500*	4000	0.390	0.400	70	2A
1000	92000	4000	0.390	0.400	70	2A

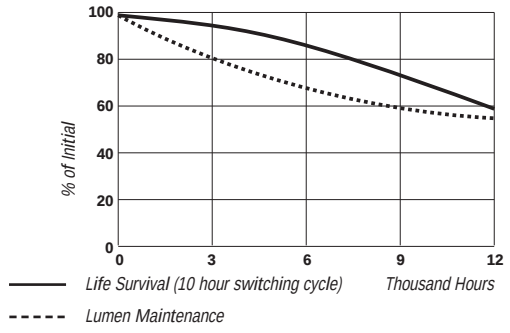
** Enhanced performance on High Output ballast.*

Photometric data are quoted for the lamp in specified orientation operating from a nominal ballast at rated supply volts. In case of Tubular lamps, performance will vary from the above specification in orientations beyond Horizontal ± 15°.

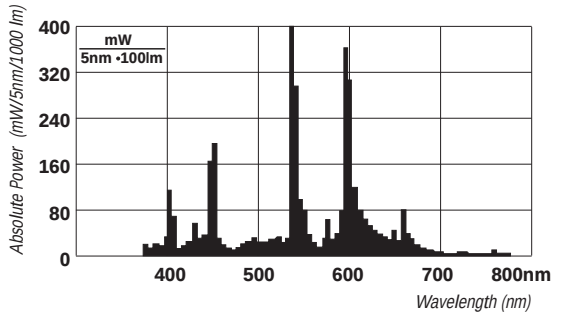
Survival and Lumen Maintenance (Tubular Clear 250W , 400W)



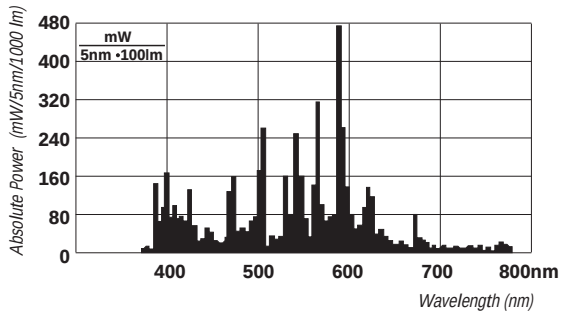
Survival and Lumen Maintenance (Elliptical Clear 250W, 400W, 1000W)



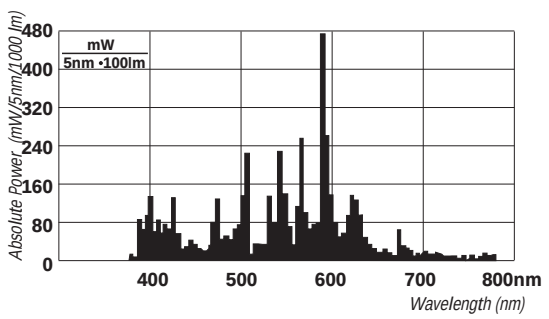
Spectral Power Distribution (Tubular Clear 250W, 400W)



Spectral Power Distribution (Elliptical Clear 250W, 400W, 1000W)



Spectral Power Distribution (Elliptical Fluorescent Coated 250W, 400W, 1000W)



Lamp Survival and Lumen Maintenance

The graph shows the survival of representative groups of lamps operated under control conditions at 10 hrs/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Lamp Survival (%)

Watts	Hours (Thousands)						
	0.1	2	4	6	8	10	12
Tubular Clear							
250	100	93	84	70	–	–	–
400	100	93	84	70	–	–	–
Elliptical Clear & Coated							
250	100	96	92	86	80	73	60
400/H	100	96	92	86	80	73	60
400/BU	100	96	92	86	80	73	60
1000	100	96	92	86	80	73	60

Lumen Output (Thousands)

Watts	Hours (Thousands)						
	0.1	2	4	6	8	10	12
Tubular Clear							
250	21.0	19.3	18.5	16.8	–	–	–
400	35.0	32.2	30.8	28.0	–	–	–
Elliptical Clear							
250	22.5	18.9	17.6	15.9	14.6	13.7	13.3
400/H*	32.0	26.9	25.0	22.6	20.8	19.5	18.9
400/BU*	32.0	26.9	25.0	22.6	20.8	19.5	18.9
1000**	92.0	77.3	71.8	64.9	59.8	56.1	54.3
Elliptical Coated							
250	19.5	16.4	15.2	13.7	12.7	11.9	11.5
400/H*	34.0	28.6	26.5	24.0	22.1	20.7	20.1
400/BU*	30.5	25.6	23.8	21.5	19.8	18.6	18.0
1000**	92.0	77.3	71.8	64.9	59.8	56.1	54.3

* Run on conventional high pressure mercury ballast.
**Run in vertical operating position. For horizontal operation reduce by 10%.

Operating Note

Metal halide lamps operate with a high internal pressure and there is a slight risk that lamps may shatter, particularly if run beyond rated life. At end of life a switch off should be introduced every 24 hrs to reduce the risk of shattering. The lamp must be fully enclosed by a luminaire to ensure the retention of any fragments in the event of such failure.

Electrical Data

Data are based on a nominal lamp operating from a nominal choke (reactor) ballast with power factor correction. Supply power is based on a typical commercially available ballast.

Lamp Data

Watts	Volts ±15 (V)	Current (A)	Power (W)	Current Crest Factor
Tubular Clear				
250	112	2.75	270	1.44
400	105	4.35	400	1.44
Elliptical Clear & Coated				
250	100	2.9	258	1.42
400	135	3.5	380	1.42
400 H/O*	120	3.8	425	1.42
1000	250	4.2	1000	1.42

* Run on "High Output" modified Mercury Ballast.

Circuit Data

Watts	Supply Current (A)		Supply Power (W)		Power Factor Lagging		Percentage 3rd Harmonic	PFC Capacitor (µF)	Max. Supply Current During Run-up (A)		Failed/ Hot Lamp (A)	
Supply	**230V**	**240V**	**230V**	**240V**	**230V**	**240V**	**230/240V**	**230/240V**	**230V**	**240V**	**230V**	**240V**
Tubular Clear												
250	1.35	1.30	298	300	>0.95	>0.95	15	30	1.6	1.5	2.17	2.26
400	2.06	2.00	434	436	0.91	0.91	13	45	2.7	2.4	3.25	3.40
Elliptical Clear & Coated												
250	1.4	1.3	288	288	>0.91	>0.92	14	30	1.6	1.5	2.2	2.3
400	2.1	2.0	410	410	0.85	0.85	11	25	3.6	3.3	1.8	1.9
400 H/O*	2.18	2.03	453	455	0.89	0.89	11	30	3.74	3.35	1.87	1.93
Supply	**400V**	**415V**	**400V**	**415V**	**400V**	**415V**	**400/415V**	**400/415V**	**400V**	**415V**	**400V**	**415V**
1000	3.1	3.0	1051	1055	0.85	0.85	14	15	5.5	5.2	1.9	2.0

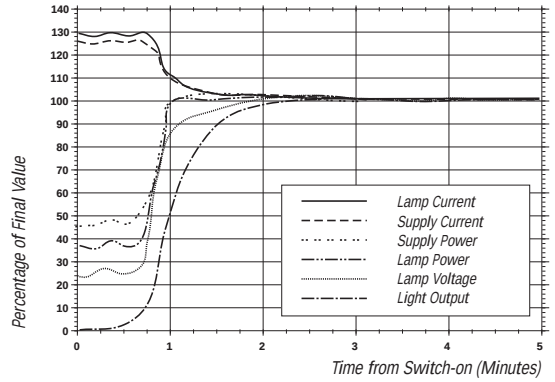
** Run on "High Output" modified Mercury Ballast.*

Run-Up Characteristics

The graph shows typical run-up characteristics for a 400W Kolorarc lamp. Time for the light output to reach 90% of the final value is determined by supply voltage and ballast design. Typical values are:

Watts	250	400	1000
Tubular Clear			
Run-Up (Mins)	< 2	< 2.5	–
Elliptical Clear & Coated			
Run-Up (Mins)	2	3	2

Typical Run-Up Characteristics



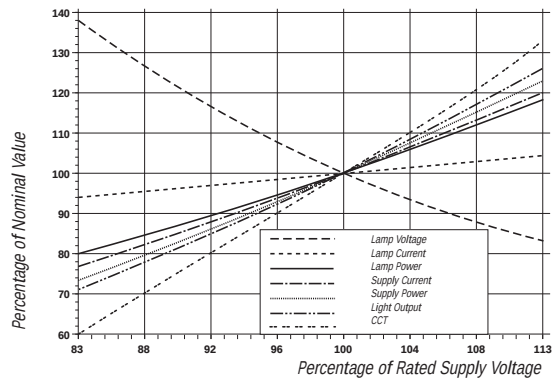
Hot Re-strike Time

All ratings re-strike within 7 minutes following a short interruption in the supply. Actual re-strike time is determined by ignitor type, pulse voltage and cooling rate of the lamp.

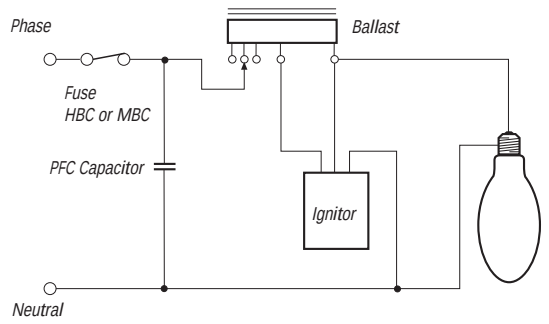
Supply Voltage

250W and 400W lamps are suitable for supplies in the range 220V to 250V and 1000W lamps for supplies in the range 380 to 415V; 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

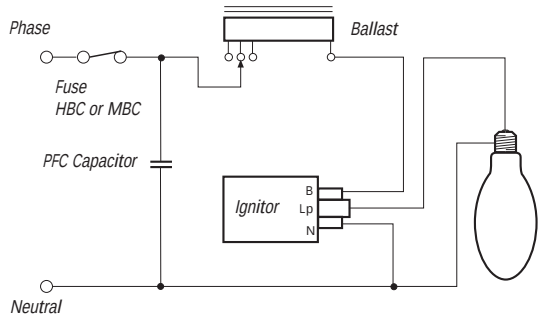
Effect of Supply Voltage Variation on Performance



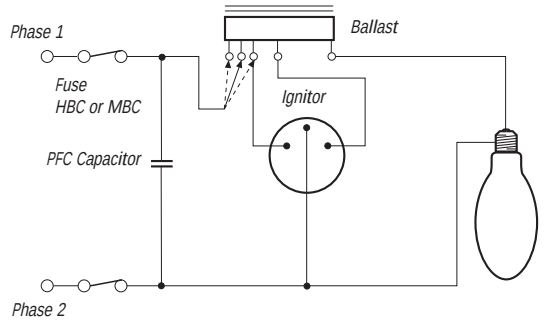
Typical Impulser Ignitor Circuit (250/400W)



Typical Superimposed Ignitor Circuit (250/400W)



Typical 1000W Circuit



Control Gear

There are no international standards for metal halide lamps of this type. It is therefore important to check the compatibility of lamp and control gear. Detailed information is given under “Guidance for Luminaire Manufacturers” overleaf.

It is essential to use a ballast appropriate to the supply voltage at the luminaire.

Typical wiring diagrams for control circuits incorporating “Superimposed” or “Impulser” ignitor and choke (reactor) ballast are shown. Refer to actual choke and ignitor manufacturers data for terminal identification and wiring information.

Fusing of Circuits

For a very short period after switch-on, all discharge lamps may act as a partial rectifier and as a result the ballast may allow several times the normal supply current to flow. To avoid nuisance fuse failure the ratings shown below should be used.

For further information refer to the publication “Fuse Ratings for Discharge Lamps” available from GE Lighting.

MCB (type 3 or 4) or HBC fuse ratings for single and multiple installations: (A)

Watts	No. of Lamps					
	1	2	3	4	5	6
Tubular Clear						
250	10	16	16	20	20	20
400	16	20	20	25	25	32
Elliptical Clear & Coated						
250	10	16	16	20	20	20
400	16	20	20	25	25	25
1000	20	25	32	40	50	63

GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

Maximum Cap Temperature: 250°C
Maximum Bulb Temperature: 450°C

Control Gear

To achieve correct lamp starting, performance and life it is important that lamp and control gear are compatible and suitably rated for the supply voltage at the luminaire.

Ballasts

250W lamps are fully compatible with ballasts manufactured for high pressure sodium lamps to IEC662.
400W lamps are fully compatible with ballasts manufactured for high pressure mercury lamps to IEC188.
Enhanced performance can be achieved by using special ballasts to the specification shown below.
1000W lamps operate between phases and require special ballasts.
Ballasts should comply with specifications IEC922 and IEC923.

Series choke (reactor) ballasts should have characteristics close to the following values:

Supply Voltage	220V	230V	240V	250V
Tubular Clear 250W				
Impedance at 3A (Ω)	60.0	64.0	67.7	71.3
Based on Cold Watts loss (W)	24	25	26	27
Tubular Clear 400W				
Impedance at 4.6A (Ω)	39.6	42.0	44.4	46.7
Based on Cold Watts loss (W)	32	34	36	38
Elliptical Clear & Coated 250W				
Impedance at 3A (Ω)	60.0	64.0	67.7	71.3
Based on Cold Watts loss (W)	24	25	26	27
Elliptical Clear & Coated 400W				
Impedance at 3.25A (Ω)	45.5	49.5	53.8	58.2
Based on Cold Watts loss (W)	23	24	25	26
Elliptical Clear & Coated Enhanced Performance 400W				
Impedance at 3.8A (Ω)	42.0	45.4	48.8	52.2
Based on Cold Watts loss (W)	24	25.5	27	28.5

Supply Voltage	380V	400V	415V
Elliptical Clear & Coated 1000W			
Impedance at 4.2A (Ω)	53.8	59.3	64.8
Based on Cold Watts loss (W)	38	39	40

Ballast Thermal Protection — Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for the installation.

Ballast Voltage Adjustment — Series choke (reactor) ballasts incorporating additional tappings at ±10V of the rated supply voltage are recommended. Alternatively a single additional tapping 10V above the rated supply voltage will ensure lamps are not overloaded due to excessive supply voltage.

Ignitors

Both Superimposed and Impulser type ignitors are suitable. It is recommended that only GE approved ignitors are used. Ignitors should comply with specifications IEC926 and IEC927 and have starting pulse characteristics as follows:

Watts	Min. Pulse Voltage (kV) [1]	Max. Pulse Voltage (kV) [2]	Min. Pulse Width (µs) [3]	Min. Pulse Repetition Rate [4]	Min. HF Peak Current (A)
250	3.5	5.0	>0.3	3 / half cycle	>1
400	3.5	5.0	>0.3	3 / half cycle	>1
1000	2.0	5.0	>0.3	1 / half cycle	>1

1. When loaded with 100 pF.
2. When loaded with 20pF.
3. At 90% peak voltage.
4. From ignitor into lamp during starting.

Pulse Phase Angle: 60-90° el and/or 240-270° el.

Timed Ignitors — Use of a "timed" or "cut-out" ignitor is not a specific requirement, but it is a good optional safety feature for the installation. The timed period must be adequate to allow lamps to cool and restart when the supply is interrupted briefly (see "Hot Re-strike Time").

A period of 5 minutes continuous or intermittent operation is recommended before the ignitor is automatically switched off. Commercially available 10/11 minute timed ignitors are suitable.

The following ignitors have been tested by GE Lighting and have been found to be compatible with NDL Metal Halide lamps.

BAG Turgi	MZN250SE (250W)
	MZN400S(R) (250/400W)
	MZN400SU (250/400W)
	ERC640006 (250-400W)
May & Christe	ZG4.5SE (250/400W)
Parry	PAE400, PXE400, PWE400 (250/400W)
Thorn	G53511, G53476, G53455 (250/400W)
	G353342 (1000W) used with Thorn ballast
Tridonic	ZRM6-ES (250/400W)

Cable between Ignitor and Lamp

Cable connected between the lamp and a superimposed ignitor "Lp" terminal, or the ballast when using an impulser ignitor, must be rated at a minimum 50/60Hz voltage of 1000V. Mineral insulated cable is not suitable for connecting the lamp to the control gear.

To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor "Lp" terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and/or other cables, unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are normally permissible. Limits for particular ignitors are available on request from GE Lighting or directly from the ignitor manufacturer.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimize supply current and electricity costs. For 220-250V supplies 250V±10% rated capacitors are recommended as follows:

Watts	250	400	1000
Tubular Clear			
PFC Capacitor	30µF	40µF	–
Elliptical Clear & Coated			
PFC Capacitor	30µF	25/30*µF	40µF

*With High Output Circuit.

Daylight Metal Halide

Daylight Metal Halide Lamps
Tubular Clear & Elliptical Fluorescent 250W, 400W & 1000W

Applications

High brightness, high quality white light with excellent colour rendition and energy efficiency makes GE Metal Halide lamps suitable for many commercial and industrial interiors, particularly in high ceiling areas.

- Offices
- Amenity areas
- Retail warehouses
- General warehousing
- Industrial units
- Architectural floodlighting
- Area floodlighting
- Car parks

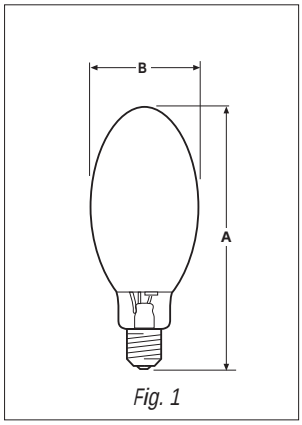


Fig. 1

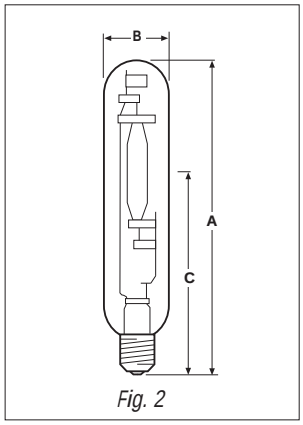


Fig. 2

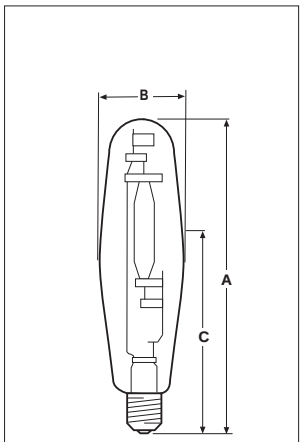


Fig. 3

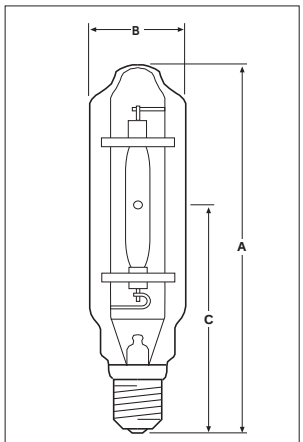


Fig. 4

Physical Data

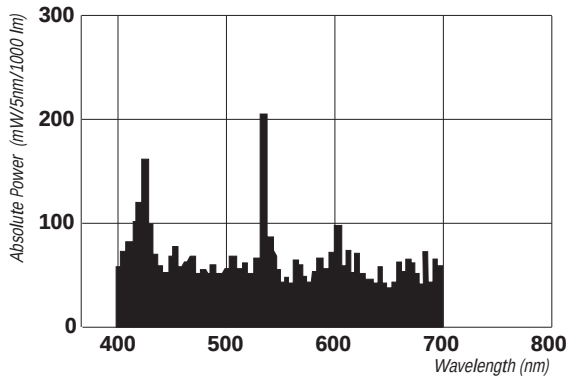
Watts	Operating Position	A Length (mm)	B Diameter (mm)	C LCL (mm	Arc Gap (mm)	Cap	Bulb Glass	Mass (g)	Minimum Starting Temp.	Fig.
Elliptical Coated										
250H	Hor. ±45°	227	90	–	–	E40	Hard	190	-20°C	1
250V	Base Up ±45°	227	90	–	–	E40	Hard	190	-20°C	1
400H	Hor. ±45°	292	120	–	–	E40	Hard	250	-20°C	1
400V	Base Up ±45°	292	120	–	–	E40	Hard	250	-20°C	1
1000	Hor. ±60°	380	160	–	–	E40	Hard	430	-20°C	1
Tubular Clear										
250H	Hor. ±45°	220	47	150	20	E40	Hard	170	-20°C	2
250V	Base Up ±45°	220	47	150	20	E40	Hard	170	-20°C	2
400H	Hor. ±45°	270	58	175	45	E40	Hard	190	-20°C	3
400V	Base Up ±45°	270	58	175	45	E40	Hard	190	-20°C	3
1000	Hor. ±60°	340	80	205	50	E40	Hard	445	-20°C	4

Photometric Data

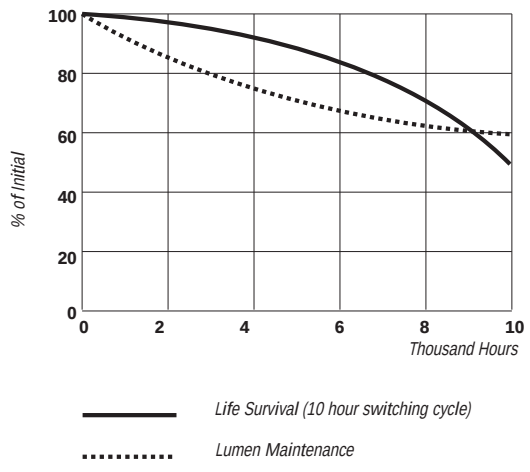
Watts	100 Hr. Lumens	Colour Temp. (K)	Chromaticity Co-ordinates x	y	Ra	DIN5035 Class.
Elliptical Coated						
250/H	17000	6000	0.322	0.340	93	1A
250/V	17000	6000	0.322	0.340	93	1A
400/H	24000	6000	0.322	0.340	90	1A
400/V	26000	6000	0.322	0.340	90	1A
1000/H	68000	6000	0.322	0.340	93	1A
Tubular Clear						
250/H	19000	6000	0.322	0.340	93	1A
250/V	19000	6000	0.322	0.340	93	1A
400/H	25000	6000	0.322	0.340	90	1A
400/V	28000	6000	0.322	0.340	90	1A
1000/H	80000	6000	0.322	0.340	93	1A

Photometric data is quoted for the lamp in specified orientation operating from a nominal ballast at rated supply volts.

Spectral Power Distribution



Lamp Survival and Lumen Maintenance Graph



Lamp Survival and Lumen Maintenance

The graph shows the survival of representative groups of lamps operated under control conditions at 10 hrs/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Lamp Survival (%)

WattsHours (Thousands)	0.1	2	4	6	8	10
250/H	100	95	88.5	80	68.5	50
250/V	100	95	88.5	80	68.5	50
400/H	100	95	88.5	80	68.5	50
400/V	100	95	88.5	80	68.5	50
1000	100	93	84.6	71.2	50	–

Lumen Output (Thousands)

WattsHours (Thousands)	0.1	2	4	6	8	10
Elliptical Coated						
250/H	17	14	12.8	11.6	10.7	10.2
250/V	17	14	12.8	11.6	10.7	10.2
400/H	24	19.5	18	16.4	15.1	14.4
400/V	26	21	19.5	17.8	16.4	15.6
1000	68	54	48.6	43.7	40.8	–
Tubular Clear						
250/H	19	15.5	14.3	13	12	11.4
250/V	19	15.5	14.3	13	12	11.4
400/H	25	20	18.8	17.1	15.8	15
400/V	28	22.5	21	19.2	17.6	16.8
1000	80	65	57.2	51.4	48	–

Operating Note

Metal halide lamps operate with a high internal pressure and there is a slight risk that lamps may shatter, particularly if run beyond rated life. At end of life a switch of should be introduced every 24 hours to reduce the risk of shattering. The lamp must be full enclosed by a luminaire to ensure the retention of any fragments in the event of such failure.

Electrical Data

Data is based on a nominal lamp operating from a nominal choke (reactor) ballast with power factor correction.

Lamp Data

Watts	Volts	Current (A)	Power (W)	Current Crest Factor
250	100 +15; -10	3.0	250	1.8
400	118 ±12	3.5	370	1.8
1000	120 ±10	9.5	1000	1.8

Run-Up Characteristics

The graph shows typical run-up characteristics for a 400W Kolorarc lamp. Time for the light output to reach 90% of the final value is determined by supply voltage and ballast design. Typical values are :

Watts	250	400	1000
Run-Up (Mins)	4	4	4

Hot Re-strike Time

All ratings re-strike within 7 minutes following a short interruption in the supply. Actual re-strike time is determined by ignitor type, pulse voltage and cooling rate of the lamp.

Supply Voltage

Lamps are suitable for supplies in the range 220V to 250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However, in order to maximise lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

Control Gear

There are no international standards for metal halide lamps of this type. It is therefore important to check the compatibility of lamp and control gear. Detailed information is given under “Guidance for Luminaire Manufacturers” overleaf.
It is essential to use a ballast appropriate to the supply voltage at the luminaire.
Typical wiring diagrams for control circuits incorporating “Superimposed” or “Impulser” ignitor and choke (reactor) ballast are shown. Refer to actual choke and ignitor manufacturers data for terminal identification and wiring information.

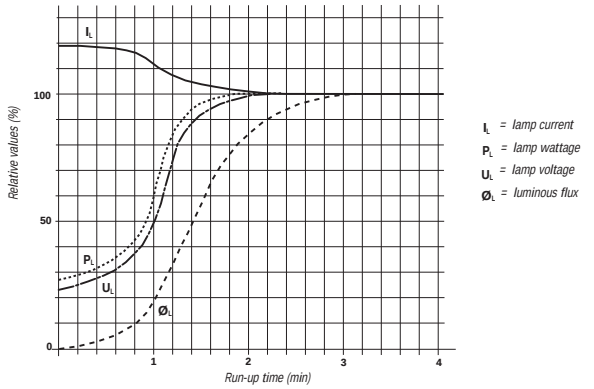
Fusing of Circuits

For a very short period after switch-on, all discharge lamps may act as a partial rectifier and as a result the ballast may allow several times the normal supply current to flow. To avoid nuisance fuse failure the ratings shown below should be used.
For further information refer to the publication “Fuse Ratings for Discharge Lamps” available from GE Lighting.

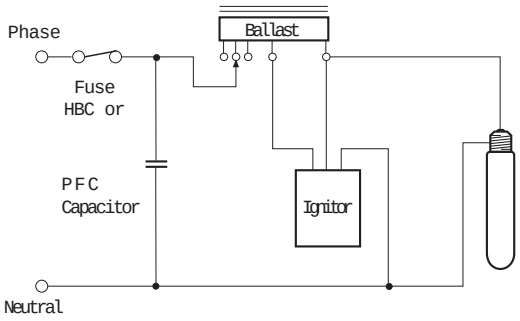
MCB (type 3 or 4) or HBC fuse ratings for single and multiple installations: (A)

Watts	No. of Lamps					
	1	2	3	4	5	6
250	10	16	16	20	20	20
400	16	20	20	25	25	25
1000	16	–	–	–	–	–

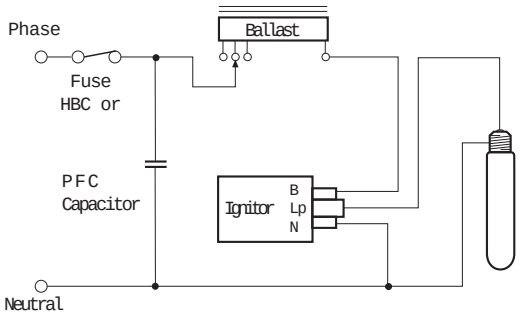
Typical Run-Up Characteristics



Typical Impulser Ignitor Circuit (250/400W)



Typical Superimposed Ignitor Circuit (250/400W)



GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

Maximum Cap Temperature: 210°C
Maximum Bulb Temperature: 400°C

Control Gear

To achieve correct lamp starting, performance and life it is important that lamp and control gear are compatible and suitably rated for the supply voltage at the luminaire.

Ballasts

250W lamps are fully compatible with ballasts manufactured for high pressure sodium lamps to IEC662.
400W lamps are fully compatible with ballasts manufactured for high pressure mercury lamps to IEC188.
1000W lamps require special ballasts, same as HPS lamps.
Ballasts should comply with specifications IEC922 and IEC923.
Series choke (reactor) ballasts should have characteristics close to the following values:

Supply Voltage	220V	230V	240V	250V
250 Watts				
Impedance at 3A (Ω)	60.0	64.0	67.7	71.3
Based on Cold Watts loss (W)	24	25	26	27
400 Watts				
Impedance at 3.5A (Ω)	45	49.5	53.8	58.2
Based on Cold Watts loss (W)	23	24	25	26
1000 Watts				
Impedance at 9.5A (V/A)	17	–	–	–

Ballast Thermal Protection — Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for the installation.

Ballast Voltage Adjustment — Series choke (reactor) ballasts incorporating additional tappings at ±10V of the rated supply voltage are recommended. Alternatively a single additional tapping 10V above the rated supply voltage will ensure lamps are not over loaded due to excessive supply voltage.

Ignitors

Both Superimposed and Impulser type ignitors are suitable. It is recommended that only GE approved ignitors are used. Ignitors should comply with specifications IEC926 and IEC927 and have starting pulse characteristics as follows:

Watts	Min. Pulse Voltage (kV) [1]	Max. Pulse Voltage (kV) [2]	Min. Pulse Width (µs) [3]	Min. Pulse Repetition Rate [4]	Min. HF Peak Current (A)
250	3.0	5.0	>1	1 / half cycle	>0.2
400	3.0	5.0	>1	1 / half cycle	>0.2
1000	4.0	5.0	>1	1 / half cycle	>0.2

1. When Loaded with 100 pF.
2. When Loaded with 20pF.
3. At 90% peak voltage.
4. From ignitor into lamp during starting.

Pulse Phase Angle: 60-90°el and / or 240-270° el.

Timed Ignitors — Use of a "timed" or "cut-out" ignitor is not a specific requirement, but it is a good optional safety feature for the installation. The timed period must be adequate to allow lamps to cool and restart when the supply is interrupted briefly (see "Hot Re-strike Time"). A period of 5 minutes continuous or intermittent operation is recommended before the ignitor is automatically switched off. Commercially available 10 / 11 minute timed ignitors are suitable.

Cable between Ignitor and Lamp

Cable connected between the lamp and a superimposed ignitor "Lp" terminal, or the ballast when using an impulser ignitor, must be rated at a minimum 50 / 60Hz voltage of 1000V. Mineral insulated cable is not suitable for connecting the lamp to the control gear.

To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor "Lp" terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and / or other cables, unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are normally permissible. Limits for particular ignitors are available on request from GE Lighting or directly from the ignitor manufacturer.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimise supply current and electricity costs. For 220-250V supplies 250V±10% rated capacitors are recommended as follows:

Watts	250	400	1000
PFC Capacitor	30µF	25µF	80µF

2000W Sportlight™

2000W Sportlight™ Metal Halide Lamps

Applications

2000W Sportlight™ lamps are high output lamps providing a high colour rendering index of 93.

They are designed for use in sport stadia and other recreational facilities.

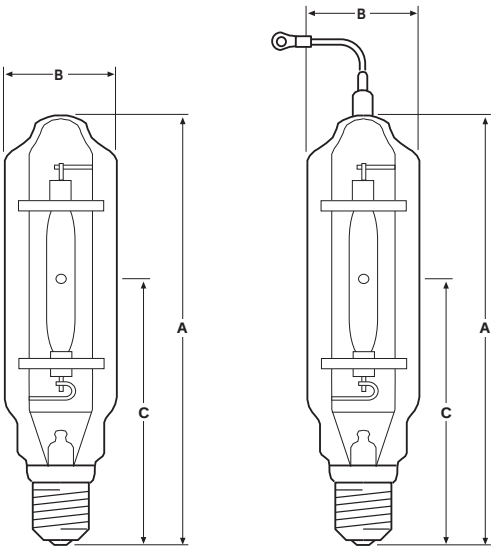


Fig. 1 *Fig. 2*

Physical Data

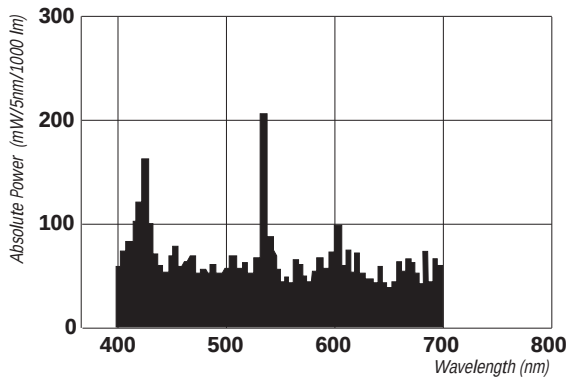
Type	*Watts Length*	*A Diameter (mm)*	*B LCL (mm)*	*C Gap (mm)*	*Arc (mm)*	*Cap Glass*	*Bulb (g)*	*Mass Position*	*Operating Starting*	*Minimum No. Temp.*	*Fig.*
Clear Tubular											
Standard	*2000*	*430*	*101*	*260*	*105*	*E40*	*Hard*	*590*	*Hor. ±60°*	*-20°C*	*1*
Internal Ignitor	*2000*	*430*	*101*	*260*	*105*	*E40*	*Hard*	*590*	*Hor. ±60°*	*-20°C*	*1*
Hot Restrike	*2000*	*430*	*101*	*260*	*105*	*E40*	*Hard*	*590*	*Hor. ±60°*	*-20°C*	*2*

Photometric Data

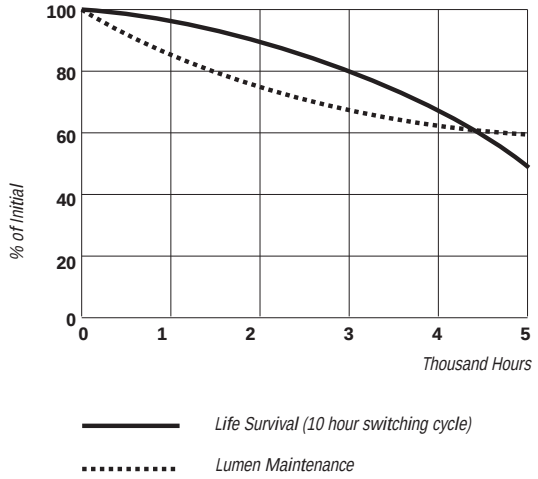
Order Code	*100 Hr (Lumen)*	*Colour Temp. (K)*	*Chromaticity Co-ordinates*		*Ra*	*DIN 5035 Class*
			x	*y*		
Clear Tubular						
Standard	*170,000*	*6000*	*0.322*	*0.340*	*93*	*1A*
Internal Ignitor	*170,000*	*6000*	*0.322*	*0.340*	*93*	*1A*
Hot Restrike	*170,000*	*6000*	*0.322*	*0.340*	*93*	*1A*

Photometric data are quoted for the lamp in specified orientation operating from a nominal ballast at rated supply volts.

Spectral Power Distribution



Lamp Survival and Lumen Maintenance Graph



Lamp Survival and Lumen Maintenance

The graph shows the survival of representative groups of lamps operated under control conditions at 10 hrs/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Lamp Survival (%)

Watts	Hours (Thousands)					
	0.1	1	2	3	4	5
2000	100	95	88.5	80	68.5	50

Lumen Output (Thousands)

Watts	Hours (Thousands)					
	0.1	1	2	3	4	5
2000	170	140	128	116	107	102

Operating Note

Metal halide lamps operate with a high internal pressure and there is a slight risk that lamps may shatter, particularly if run beyond rated life. At end of life a switch of should be introduced every 24 hours to reduce the risk of shattering. The lamp must be full enclosed by a luminaire to ensure the retention of any fragments in the event of such failure.

Electrical Data

Data are based on a nominal lamp operating from a nominal choke (reactor) ballast.

Lamp Data

Watts	Volts	Current (A)	Power (W)	Current Crest Factor
2000	225	10.3	2000	1.8

Run-Up Characteristics

The graph shows typical run-up characteristics for a 2000W Sportlight™ lamp. Time for the light output to reach 90% of the final value is determined by supply voltage and ballast design. Typical value is:

Watts	2000
Run-Up (Mins)	4

Hot Re-strike Time

All ratings re-strike within 7 minutes following a short interruption in the supply. Actual re-strike time is determined by ignitor type, pulse voltage and cooling rate of the lamp. Lamps marked “D2” are designed for immediate re-ignition.

Supply Voltage

Lamps are suitable for supplies in the range 380V to 420V 50/60Hz for appropriately rated series choke (reactor) ballasts. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

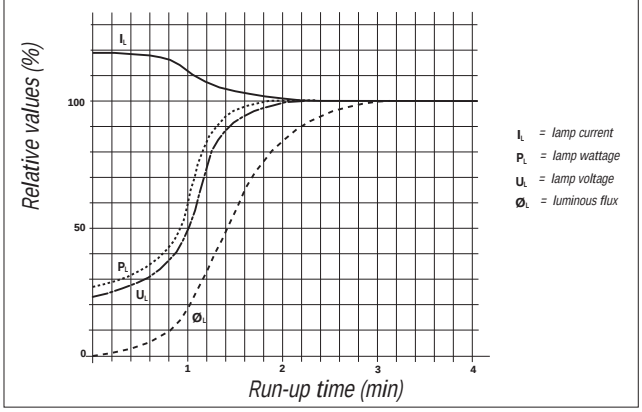
Control Gear

There are no international standards for metal halide lamps of this type. It is therefore important to check the compatibility of lamp and control gear. Detailed information is given under “Guidance for Luminaire Manufacturers” overleaf.
It is essential to use a ballast appropriate to the supply voltage at the luminaire.
Typical wiring diagrams for control circuits incorporating “Superimposed” ignitor and choke (reactor) ballast are shown. Refer to actual choke and ignitor manufacturers data for terminal identification and wiring information.

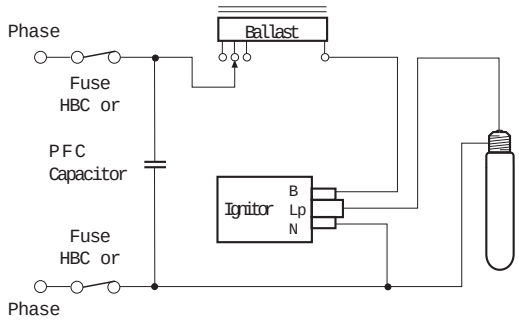
Fusing of Circuits

For a very short period after switch-on, all discharge lamps may act as a partial rectifier and as a result the ballast may allow several times the normal supply current to flow.
For further information refer to the publication “Fuse Ratings for Discharge Lamps” available from GE Lighting.

Typical Run-Up Characteristics



Typical Superimposed Ignitor Circuit



GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

Maximum Cap Temperature: 250°C
Maximum Bulb Temperature: 550°C

Control Gear

To achieve correct lamp starting, performance and life it is important that lamp and control gear are compatible and suitably rated for the supply voltage at the luminaire.

Ballasts

Ballasts should comply with specifications IEC922 and IEC923.
Series choke (reactor) ballasts should have characteristics close to the following values:

Supply Voltage	380V
Impedance at 10.3A (Ω)	25.5

Ballast Thermal Protection — Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for the installation.

Ballast Voltage Adjustment — Series choke (reactor) ballasts incorporating additional tappings at ±20V of the rated supply voltage are recommended. Alternatively a single additional tapping 20V above the rated supply voltage will ensure lamps are not overloaded due to excessive supply voltage.

Ignitors

Superimposed type ignitor are suitable. It is recommended that only GE approved ignitors are used. Ignitors should comply with specifications IEC926 and IEC927 and have starting pulse characteristics as follows:

Order Code	Min. Pulse Voltage (kV) [1]	Max. Pulse Voltage (kV) [2]	Min. Pulse Width (µs) [3]	Min. Pulse Repetition Rate [4]	Min. HF Peak Current (A)
HgMI2000/D1	4000	5,000	1	1/half cycle	0.2
HgMIG2000/D	–	–	–	–	–
HgMI2000/D2	4000 [5]	80,000	–	–	–

1. When loaded with 100 pF.
2. When loaded with 20pF.
3. At 90% peak voltage.
4. From ignitor into lamp during starting.
5. For instant restart 60kV min., 80kV max.

Pulse Phase Angle: 60-90°el and/or 240-270° el.

Timed Ignitors — Use of a "timed" or "cut-out" ignitor is not a specific requirement but it is a good optional safety feature for the installation. The timed period must be adequate to allow lamps to cool and restart when the supply is interrupted briefly (see "Hot Re-strike Time"). A period of 5 minutes continuous or intermittent operation is recommended before the ignitor is automatically switched off. Commercially available 10/11 minute timed ignitors are suitable.

Cable between Ignitor and Lamp

To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor "Lp" terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and/or other cables, unless otherwise stated by ignitor manufacturer.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimize supply current and electricity costs.

Watts	2000
PFC Capacitor	60µF

ConstantColor CMH™

ConstantColor CMH™
Ceramic Metal Halide Lamps
Single- & Double-Ended 35W, 70W, 150W
PAR 30, PAR 38 70W, 100W
Elliptical 70W, 100W

Features

- Excellent colour uniformity and stability
- High 80+ colour rendering index (CRI)
- 10-20% higher lumens than standard metal halide lamps
- Operates on standard metal halide ballast

Applications

- Shops
- Offices
- Architectural floodlighting
- Amenity areas

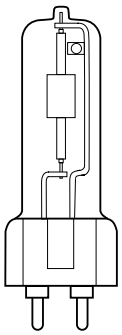


Fig. 1

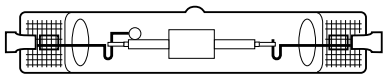


Fig. 2

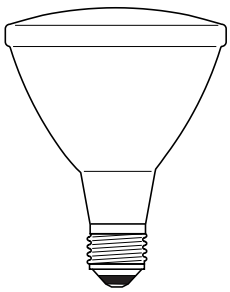


Fig.3

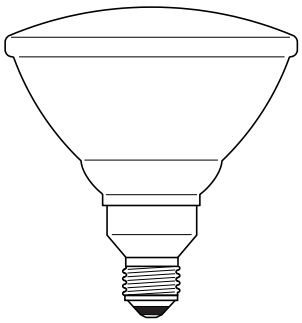


Fig. 4

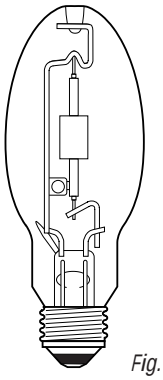


Fig. 5

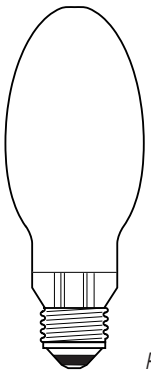


Fig. 6

Physical Data

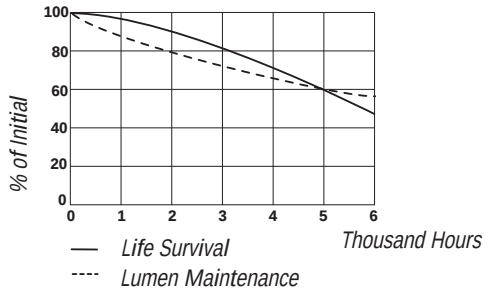
Watts	A Length (mm)	B Diam. (mm)	C LCL (mm)	Arc Gap (mm)	Cap	Bulb Glass	Operating Position	Max. Bulb Temp. (°C)	Max. Cap Temp. (°C)	Fig. No.
Single-Ended										
35	100	19	56	5.0	G12	Quartz	Any	500	250	1
70	100	19	56	7.0	G12	Quartz	Any	500	250	1
150	110	19	56	9.0	G12	Quartz	Any	600	280	1
Double-Ended										
70	117.6*	20	57.1	7.0	Rx7s	Quartz	Horizontal	500	250	2
150	135.4*	23	66	9.0	Rx7s-24	Quartz	Horizontal	600	280	2
PAR 30										
70	121	95	–	–	E27	Hard Glass	Any	300	200	3
PAR 38										
70	138	121	–	–	E27	Hard Glass	Any	300	200	4
100	138	121	–	–	E27	Hard Glass	Any	300	200	4
Elliptical Clear										
70	138	54	86	7.0	E27	Heat Resistant Glass	Any	400	190	5
100	138	54	86	7.0	E27	Heat Resistant Glass	Any	400	190	5
Elliptical Coated										
70	138	54	86	8.0	E27	Heat Resistant Glass	Any	400	190	6
100	138	54	86	8.0	E27	Heat Resistant Glass	Any	400	190	6

* Insertion Length.

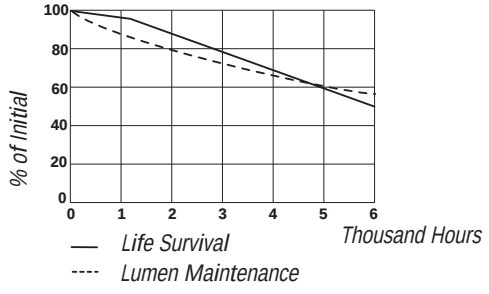
Photometric Data

Watts	100 Hr. Lumens	Colour Temp. (K)	Chromaticity Co-ordinates x	y	Ra
Single-Ended					
35	3000	3000	0.438	0.397	80+
70	6200	3000	0.438	0.397	80+
150	13500	3000	0.438	0.397	80+
Double-Ended					
70	6200	3000	0.438	0.397	80+
150	13500	3000	0.438	0.397	80+
PAR 30					
70	4100	3000	0.438	0.397	80+
PAR 38					
70	4100	3000	0.438	0.397	80+
100	6100	3000	0.438	0.397	80+
Elliptical Clear					
70	6200	3000	0.438	0.397	80+
100	9200	3000	0.438	0.397	80+
Elliptical Coated					
70	5890	3000	0.438	0.397	80+
100	8740	3000	0.438	0.397	80+

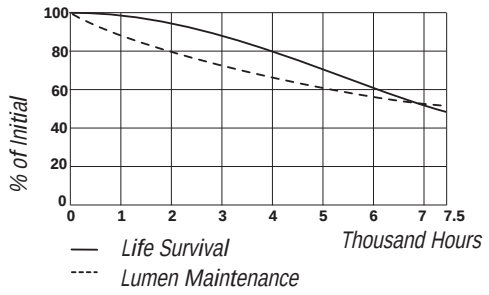
Typical Life Survival & Lumen Maintenance Graph
Single- & Double-Ended 35W, 70W, 150W



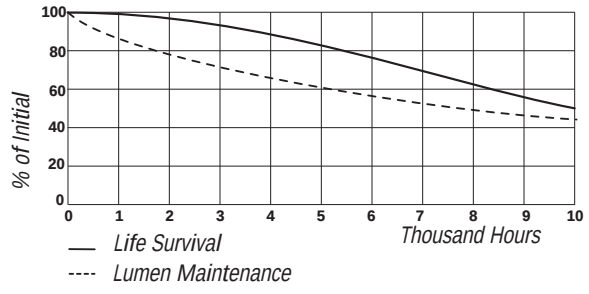
Typical Life Survival & Lumen Maintenance Graph
PAR 30, PAR38 70W, 100W



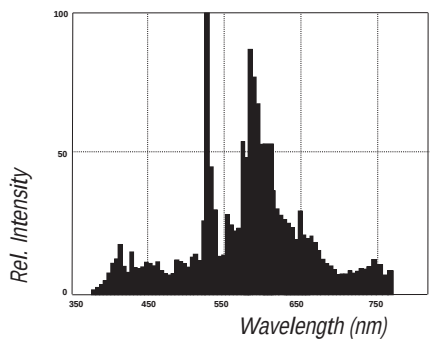
Typical Life Survival & Lumen Maintenance Graph
Elliptical 70W



Typical Life Survival & Lumen Maintenance Graph
Elliptical 100W



Spectral Power Distribution



Lamp Survival and Lumen Maintenance

The graph show the survival of representative groups of lamps operated under control conditions at 7 hrs/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, operating position, vibration and shocks, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules. More frequent switching will reduce lamp life. CMH lamps are not suitable for dimming.

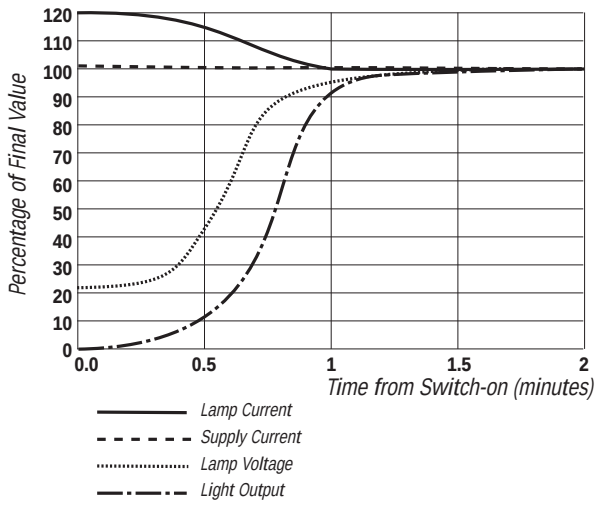
Lamp Survival (%)

Watts	Hours (Thousands)								
	0.1	1	2	3	4	5	6	7.5	10
Single-Ended									
35	100	97	91	82	71	59	50	–	–
70	100	97	91	82	71	59	50	–	–
150	100	97	91	82	71	59	50	–	–
Double-Ended									
70	100	97	91	82	71	59	50	–	–
150	100	97	91	82	71	59	50	–	–
PAR 30									
70	100	97	90	80	71	58	50	–	–
PAR 38									
70	100	97	90	80	71	58	50	–	–
100	100	97	90	80	71	58	50	–	–
Elliptical Clear									
70	100	98	96	88	83	72	62	50	–
100	100	98	96	93	88	82	76	–	50
Elliptical Coated									
70	100	98	96	88	83	72	62	50	–
100	100	98	96	93	88	82	76	–	50

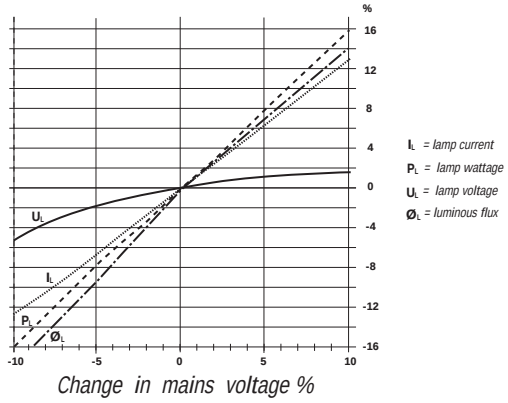
Lumen Output (Thousand)

Watts	Hours (Thousands)								
	0.1	1	2	3	4	5	6	7.5	10
Single-Ended									
35	3.0	2.7	2.4	2.16	1.95	1.8	1.68	–	–
70	6.2	5.58	4.96	4.46	4.03	3.42	3.47	–	–
150	13.5	12.15	10.8	9.72	8.78	8.1	7.56	–	–
Double-Ended									
70	6.2	5.58	5.0	4.46	4.03	3.72	3.47	–	–
150	13.5	12.15	10.8	9.72	8.78	8.1	7.56	–	–
PAR 30									
70	4.1	–	3.28	2.95	2.67	2.46	2.3	–	–
PAR 38									
70	4.1	–	3.28	2.95	2.67	2.46	2.3	–	–
100	6.1	–	4.88	4.39	3.97	3.66	3.42	–	–
Elliptical Clear									
70	6.2	–	4.96	4.46	4.03	3.72	3.41	3.1	–
100	9.2	–	7.36	6.62	5.98	5.52	5.06	4.6	4.05
Elliptical Coated									
70	5.89	–	4.48	3.89	3.42	3.06	2.71	2.36	–
100	8.74	–	6.64	5.77	5.07	4.55	4.02	3.5	2.8

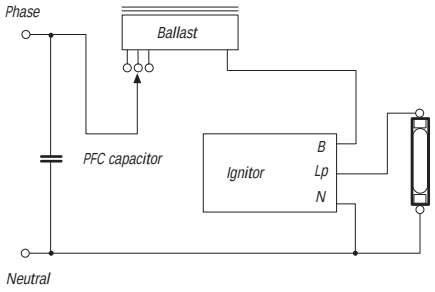
Typical Run-up Characteristics Single- & Double-Ended



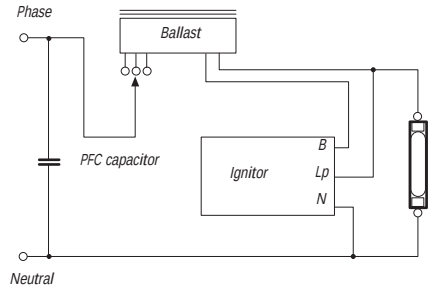
Effect of Supply Voltage Variation on Performance



Typical Superimposed Ignitor Circuit



Typical Impulser Ignitor Circuit



Electrical Data

Data are based on a nominal lamp operating from a nominal choke (reactor) ballast with power factor correction. Supply power is based on a typical commercially available ballast.

Lamp Data

Watts	Volts	Current (A)	Power (W)
Single-Ended			
35	90	0.5	39
70	90	0.96	71
150	96	1.8	150
Double-Ended			
70	90	0.96	71
150	96	1.8	150
PAR 30			
70	90	0.9	71
PAR 38			
70	90	0.9	71
100	105	1.1	100
Elliptical Clear			
70	90	1.2	71
100	105	1.3	100
Elliptical Coated			
70	90	1.2	71
100	105	1.3	100

Run-Up Characteristics

Time for the light output to reach 90% of the final value is determined by supply voltage and ballast design. Typical value is 4 min.

Hot Re-strike Time

All ratings re-strike within 15 minutes following a short interruption in the supply. Hot re-strike may be achieved using a suitable ignitor. Actual re-strike time is determined by ignitor type, pulse voltage and cooling rate of the lamp.

Supply Voltage

Lamps are suitable for supplies in the range 220V to 250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used.

However, in order to maximize lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ± 3%. Supply variations of ± 5% are permissible for short periods only. This may be achieved by measuring mean supply voltage at the installation and selecting ballasts with appropriate settings.

Control Gear

It is therefore important to check the compatibility of lamp and control gear.

It is essential to use a ballast appropriate to the supply voltage at the luminaire.

Typical wiring diagrams for control circuits incorporating “Superimposed” or “Impulser” ignitor and choke (reactor) ballast are shown. Refer to actual choke and ignitor manufacturers data for terminal identification and wiring information.

Fusing of Circuits

For a very short period after switch-on, all discharge lamps may act as a partial rectifier and as a result the ballast may allow several times the normal supply current to flow. To avoid nuisance fuse failure the ratings shown below should be used. Single fusing is recommended.

For further information refer to the publication “Fuse Ratings for Discharge Lamps” available from GE Lighting.

Operation and Maintenance

Important: The following information gives precautions for the safe handling, installation, use and disposal of CMH lamps. Compliance with these instructions is essential.

Before use:

- Always turn off power before inserting or removing a lamp.
- Check that the replacement lamp is of the correct type for the application and for use in the circuit. Only the appropriate ballast must be used. Ensure that the lamp is correctly located in the lampholder.
- Electrically insulate any metal to glass support in luminaire to avoid decomposition of the glass.
- During operation, parts of the lamp surface may reach temperatures up to 600°C. Prevent liquid condensation droplets or water splashing onto the lamp as these may cause the bulb to shatter.
- If the outer bulb is broken or scratched, the lamp must not be operated.
- Relamp luminaires at or before the end or rated life. Beyond rated life, light output diminishes while energy consumption and risk of rupture increase. Turn power off and let lamp cool before removal to avoid potential burn and electrical shock hazard during lamp replacement.
- Small quantities of lamps may be disposed of with ordinary refuse. The lamps should be placed in original or similar packing before disposal.
- Large quantities of lamps must be disposed of in accordance with all applicable regulations.
- These lamps can cause serious skin burn and eye inflammation from shortwave ultraviolet radiation if outer envelope of the lamp is broken or punctured, and the arc tube continues to operate. Do not use where people will remain for more than a few minutes unless adequate shielding or other safety precautions are used.
- Insure that lamp is correctly located in the lampholder and that the outer quartz bulb is clean. Operating when dirty results in permanent marking of the bulb surface. Excessive handling of the outer quartz should be avoided. The lamp can be cleaned with a soft cloth moistened with methanol.
- The outer bulb is made of quartz which transmits UV-A and UV-B radiation. This radiation is harmful to eyes and skin: operators must be shielded from direct or reflected shortwave ultraviolet radiation.
- It is essential that the CMH lamp only be used within a luminaire with a front glass that is able to contain fragments of hot glass (up to 1200 °C) in the event that the lamp shatters. Do not operate lamp in a luminaire if the front glass is either missing or broken. Luminaires must be enclosed with UV-absorbing tempered glass. It is recommended that lamp be used in luminaires with safety interlock lens switch. If in doubt, contact your luminaire manufacturer.

GUIDANCE FOR LUMINAIRE MANUFACTURERS

Control Gear

To achieve correct lamp starting, performance and life it is important that lamp and control gear are compatible and suitable rated for the supply voltage at the luminaire.

Ballasts

The ConstantColor CMH lamps need the same type of ballasts as it is used for the conventional metal halide lamps of the same nominal lamp power. These lamps are compatible with IEC and ANSI type ballasts manufactured for metal halide lamps.

Ballast Thermal Protection

It is mandatory to use either a thermo-protected ballast or an equivalent protection device in the circuit. This requirement is in accordance with IEC 1167 standard regulations.

Ignitors

Both Superimposed and Impulser type ignitors are suitable. It is recommended that only GE approved ignitors are used. Ignitors should comply with specifications of the appropriate IEC and ANSI standards.

Timed Ignitors

Use of a “timed” or “cut-out” ignitor is not a specific requirement, but it is a good optional safety feature for the installation. The timed period must be adequate to allow lamps to cool and restart when the supply is interrupted briefly (see “Hot Re-strike Time”).

A period of 15 minutes continuous or intermittent operation is recommended before the ignitor is automatically switched off. Commercially available 15 minute timed ignitors may be suitable.

Cable between Ignitor and Lamp

Cable connected between the lamp and a superimposed ignitor “Lp” terminal, or the ballast when using an impulser ignitor, must be rated at a minimum 50/60Hz voltage of 1000V. Mineral insulated cable is not suitable for connecting the lamp to the control gear.

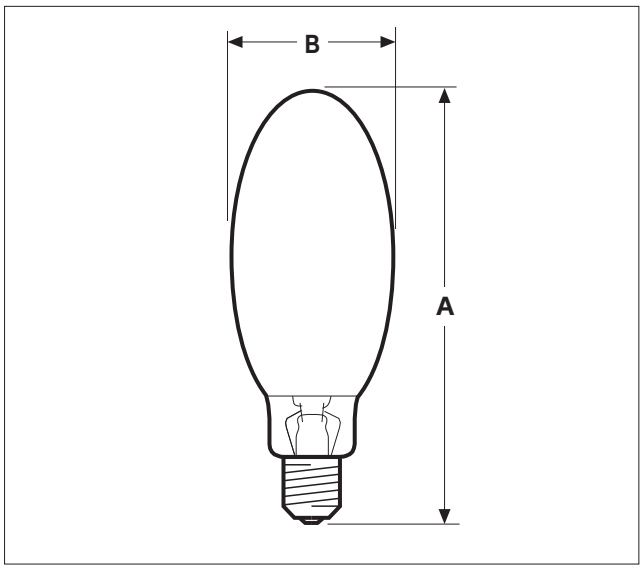
To achieve good starting superimposed ignitors must be adjacent to the luminaire. Cable capacitance of wiring between the ignitor “Lp” terminal and the lamp should not exceed 100pF (<1 metre length) when measured to adjacent earthed metal and/or other cables, unless otherwise stated by ignitor manufacturer.

When using impulser type ignitors longer cable lengths between ballast and lamp are normally permissible.

Limits for particular ignitors are available on request from GE Lighting or directly from the ignitor manufacturer.

Kolorlux™

High Pressure Mercury Lamps
Kolorlux™ Standard 50W, 80W, 125W, 250W, 400W, 700W, 1000W
Kolorlux™ Deluxe 50W, 80W, 125W, 250W, 400W
Kolorlux™ Super Deluxe 50W, 80W, 125W, 250W, 400W



Applications

Low running costs, long life, compact size, and a white light make the Kolorlux™ lamp suitable for a wide range of applications where economy is of prime consideration, but where some differentiation of colours is needed.

Kolorlux™ Super Deluxe Lamps utilise an enhanced phosphor coating which provides additional benefits of increased light output, improved colour rendition and warmer appearance.

- Road lighting
- Amenity areas
- Security
- Car parks
- Area floodlighting
- Warehousing
- Industrial units

Compliance with IEC Standards

All Kolorlux™ Lamps comply with IEC 188.

Physical Data

Watts	*A Length (mm)*	*B Diameter (mm)*	*Cap*	*Bulb Glass*	*Mass (g)*	*Operating Position*	*Minimum Starting Temp.**
Kolorlux™ Standard							
50	*130*	*55*	*E27/B22*	*Soft*	*53*	*Universal*	*-18°C*
80	*156*	*70*	*E27/B22*	*Soft*	*63*	*Universal*	*-18°C*
125	*170*	*75*	*E27/B22*	*Soft*	*83*	*Universal*	*-18°C*
250	*227*	*90*	*E40*	*Hard*	*160*	*Universal*	*-18°C*
400	*292*	*120*	*E40*	*Hard*	*230*	*Universal*	*-18°C*
700	*330*	*140*	*E40*	*Hard*	*625*	*Universal*	*-18°C*
1000	*380*	*160*	*E40*	*Hard*	*830*	*Universal*	*-18°C*
Kolorlux™ Deluxe							
50	*130*	*55*	*E27*	*Soft*	*53*	*Universal*	*-18°C*
80	*156*	*70*	*E27/B22*	*Soft*	*63*	*Universal*	*-18°C*
125	*170*	*75*	*E27/B22*	*Soft*	*83*	*Universal*	*-18°C*
250	*227*	*90*	*E40*	*Hard*	*160*	*Universal*	*-18°C*
400	*292*	*120*	*E40*	*Hard*	*230*	*Universal*	*-18°C*
Kolorlux™ Super Deluxe							
50	*130*	*55*	*E27*	*Soft*	*53*	*Universal*	*-18°C*
80	*156*	*70*	*E27*	*Soft*	*63*	*Universal*	*-18°C*
125	*170*	*75*	*E27*	*Soft*	*83*	*Universal*	*-18°C*
250	*227*	*90*	*E40*	*Hard*	*160*	*Universal*	*-18°C*
400	*292*	*120*	*E40*	*Hard*	*230*	*Universal*	*-18°C*

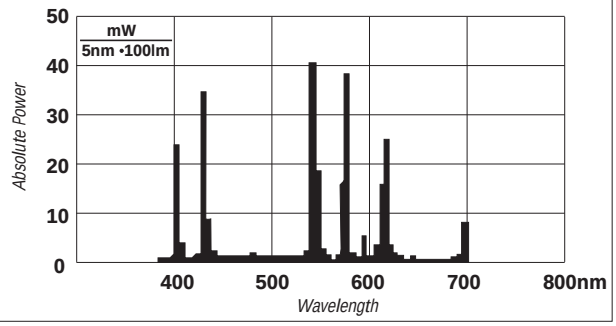
* *On 220V Supply.*

Photometric Data

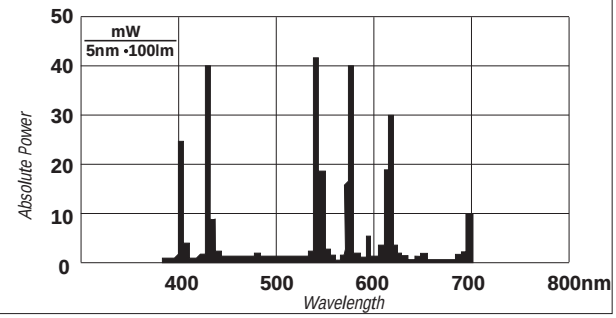
Watts	100 Hr. Lumens	Colour Temp. (K)	Chromaticity Co-ordinates x	y	Ra	DIN5035 Class.
Kolorlux™ Standard						
50	1800	4000	0.390	0.390	40	3
80	3800	4000	0.390	0.390	40	3
125	6300	4000	0.390	0.390	40	3
250	13000	4000	0.390	0.390	40	3
400	22500	4000	0.390	0.390	40	3
700	40000	4000	0.390	0.390	40	3
1000	57000	4000	0.390	0.390	40	3
Kolorlux™ Deluxe						
50	1800	3850	0.400	0.370	52	3
80	3800	3850	0.400	0.370	52	3
125	6300	3850	0.400	0.370	52	3
250	13000	3850	0.400	0.370	52	3
400	22500	3850	0.400	0.370	52	3
Kolorlux™ Super Deluxe						
50	2000	3500	0.405	0.390	57	3
80	4000	3400	0.410	0.393	57	3
125	6500	3350	0.414	0.395	55	3
250	14000	3350	0.414	0.395	55	3
400	24000	3400	0.410	0.393	50	3

Photometric data is quoted for the lamp in a horizontal orientation operating from a nominal ballast at rated supply volts.

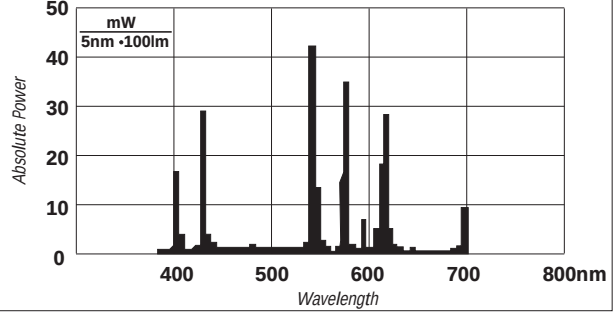
Spectral Power Distribution
Kolorlux™ Standard



Spectral Power Distribution
Kolorlux™ Deluxe



Spectral Power Distribution
Kolorlux™ Super Deluxe



Lamp Survival and Lumen Maintenance

The graph shows the survival of representative groups of lamps operated under controlled conditions at 10 hrs/start. Lamp life in service will be affected by a number of parameters, such as mains voltage deviations, switching cycle, luminaire design and control gear. The information given is intended to be a practical guide in determining lamp replacement schedules.

Lamp Survival (%)

	Hours (Thousands)						
Watts	**0.1**	**2**	**4**	**8**	**12**	**16**	**20**
Kolorlux™ Standard							
50	100	97	91	77	50	–	–
80	100	98	95	83	74	50	–
125	100	98	96	90	82	69	50
250	100	98	96	90	82	69	50
400	100	98	96	90	82	69	50
700	100	98	96	90	82	69	50
1000	100	98	96	90	82	69	50
Kolorlux™ Deluxe							
50	100	97	91	77	50	–	–
80	100	98	95	83	74	50	–
125	100	98	96	90	82	69	50
250	100	98	96	90	82	69	50
400	100	98	96	90	82	69	50
Kolorlux™ Super Deluxe							
50	100	97	91	77	50	–	–
80	100	98	95	83	74	50	–
125	100	98	96	90	82	69	50
250	100	98	96	90	82	69	50
400	100	98	96	90	82	69	50

Lumen Output (Thousands)

	Hours (Thousands)						
Watts	**0.1**	**2**	**4**	**8**	**12**	**16**	**20**
Kolorlux™ Standard							
50	1.8	1.5	1.4	1.1	0.9	–	–
80	3.8	3.3	2.9	2.5	2.2	2.1	–
125	6.3	5.7	5.2	4.4	4.0	3.6	3.3
250	13..0	11.7	10.7	9.1	8.2	7.5	7.0
400	22.5	20.3	18.5	15.8	14.2	12.9	12.2
700	40.0	36.0	32.8	28.0	25.2	23.2	21.6
1000	58.0	54.0	47.5	40.6	36.5	33.6	31.3
Kolorlux™ Deluxe							
50	1.8	1.5	1.4	1.1	0.9	–	–
80	3.8	3.3	2.9	2.5	2.2	2.1	–
125	6.3	5.7	5.2	4.4	4.0	3.6	3.3
250	13..0	11.7	10.7	9.1	8.2	7.5	7.0
400	22.5	20.3	18.5	15.8	14.2	12.9	12.2
Kolorlux™ Super Deluxe							
50	2.0	1.7	1.5	1.2	1.1	–	–
80	4.0	3.5	3.1	2.6	2.3	2.2	–
125	6.5	5.9	5.3	4.6	4.1	3.7	3.4
250	14.0	12.6	11.5	9.8	8.8	5.9	7.6
400	24.0	21.6	19.7	16.8	15.1	13.9	13.0

Electrical Data

Data are based on a nominal lamp operating on a nominal choke (reactor) ballast with power factor correction. Supply power is based on a typical commercially available ballast.

Lamp Data

Watts	Volts ±15 (V)	Current (A)	Power (W)	Current Crest Factor
50	95*	0.60	50	1.8
80	115	0.80	80	1.8
125	125	1.15	125	1.8
250	130	2.15	250	1.8
400	135	3.25	400	1.8
700	140	5.45	700	2.0
1000	145	7.5	1000	2.0

** 95 ± 10V*

Run-Up Characteristics

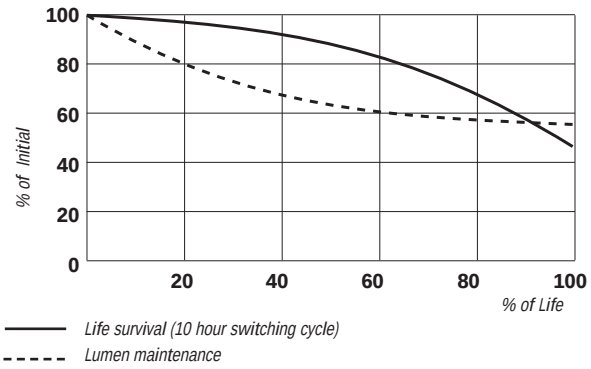
Time for the light output to reach 90% of the final value is determined by supply voltage and ballast design. Typical values are:

Watts	50	80	125	250	400	700	1000
Run-Up (Mins)	6	5	5	5	5	5	5

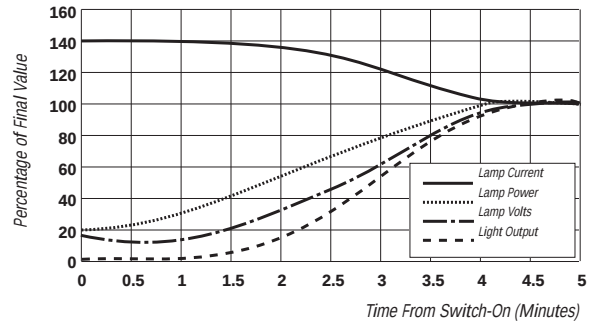
Hot Re-strike Time

All ratings re-strike within 4-7 minutes following a short interruption in the supply. Actual re-strike time is determined by cooling rate of the lamp.

Lamp Survival and Lumen Maintenance Graph



Typical Run-up Characteristics



Supply Voltage

Lamps are suitable for supplies in the range 220V to 250V 50/60Hz for appropriately rated series choke (reactor) ballasts. Supplies outside this range require a transformer (conventional, high reactance or CWA) to ensure correct lamp operation. Lamps start and operate at 10% below the rated supply voltage when the correct control gear is used. However in order to maximise lamp survival, lumen maintenance and colour uniformity the supply voltage and ballast design voltage should be within ±3%. Supply variations of ±5% are permissible for short periods only.

Control Gear

It is indispensable to use a ballast appropriate to the supply voltage at the luminaire.

Fusing of Circuits

For a very short period after switch-on, all discharge lamps may act as a partial rectifier and as a result the ballast may allow several times the normal supply current to flow. To avoid nuisance fuse failure the ratings shown below should be used.
For further information refer to the publication "Fuse Ratings for Discharge Lamps" available from GE Lighting.

MCB (type 3 or 4) or HBC fuse ratings for single and multiple installations: (A)

Watts	No. of Lamps					
	1	2	3	4	5	6
50	4	4	4	4	4	4
80	4	4	4	4	6	6
125	4	4	6	10	10	10
250	10	16	16	20	20	20
400	16	20	20	25	25	25
700	16	20	25	32	32	40
1000	20	25	32	40	50	63

GUIDANCE FOR LUMINAIRE MANUFACTURERS

Lamp Operating Temperature Limits

Maximum Cap Temperature

50W:	125°C
80-1000W:	210°C

Maximum Bulb Temperature

50W:	300°C
80/125W:	350°C
250-1000W:	400°C

Control Gear

To achieve correct lamp starting, performance and life it is important that lamp and control gear are compatible and suitably rated for the supply voltage at the luminaire.

Ballasts

Lamps are fully compatible with ballasts manufactured for high pressure mercury lamps to IEC188. Ballasts should comply with specifications IEC262.

Ballast Thermal Protection — Use of ballasts incorporating thermal cut-out is not a specific requirement but is a good optional safety measure for the installation.

Ballast Voltage Adjustment — Series choke (reactor) ballasts incorporating additional tappings at ±10V of the rated supply voltage are recommended. Alternatively a single additional tapping 10V above the rated supply voltage will ensure lamps are not over-loaded due to excessive supply voltage.

PFC Capacitors for Choke (Reactor) Circuits

Power Factor Correction is advisable in order to minimise supply current and electricity costs. For 220-250V supplies 250V±10% rated capacitors are recommended as follows:

Watts	50	80	125	250	400	700	1000
PFC Capacitor	6µF	8µF	8µF	13µF	20µF	20µF	50µF

Contact Addresses

Austria

GE Lighting GmbH
Hofherr-Schrantz-Gasse 4
A-1211 Vienna

Tel: (43) 1 277 72 0
Fax: (43) 1 277 72 4

Belgium

GE Lighting SA
Manhattan Center 22e étage
21 Avenue du Boulevard
1210 Brussels

Tel: (32) 2 207 7397
Fax: (32) 2 207 7394

CIS

GE Lighting Tungsram Rt
Kosmodamianskaya nab 52
Building 1, 6th Floor
Moscow 113054, Russia

Tel: (7) 095 935 7281
Fax: (7) 095 935 7279

Denmark

GE Lighting A/S
Sdr. Ringvej 45
DK-2605 Brøndby

Tel: (45) 43 23 74 00
Fax: (45) 43 23 74 75

Finland

GE Lighting Oy
Vernissakatu 6, 7krs
FIN-01300 Vantaa

Tel: (358) 9 836 2100
Fax: (358) 9 836 21020

France

GE Lighting SARL
ZAC Paris Nord II
13, rue de la Perdrix
B.P. 50073
95947 Roissy CDG Cedex

Tel: (33) 1 48 63 68 00
Fax: (33) 1 48 63 68 08

Germany

GE Lighting GmbH
Praunheimer Landstrasse 50
60488 Frankfurt am Main

Tel: (49) 69 97 607 0
Fax: (49) 69 97 679 024

Hungary

GE Lighting Tungsram Rt
Vaci ut 77
H-1340 Budapest

Tel: (36) 1 169 2800
Fax: (36) 1 169 2746

Ireland

GE Lighting Limited
280 Holly Road,
Western Industrial Estate,
Naas Road
Dublin 12

Tel: (353) 1 456 5591
Fax: (353) 1 450 4142

Italy

GE Lighting SpA
Via Astichello, 2
P.O. Box 604
36100 Vicenza

Tel: (39) 444 391311
Fax: (39) 444 945863

Netherlands

GE Lighting SA/NV
Burgemeester Goudsmitlaan 5
3956 GS Leersum

Tel: (31) 3434 52149
Fax: (31) 3434 51464

Norway

GE Lighting AS
Lysaker Torg 25
P.O Box 34
N-1324 Lysaker

Tel: (47) 67 51 90 10
Fax: (47) 67 51 90 11

Portugal

GE Lighting S.A.
Av. Helen Keller, 19-A
1400 Lisbon

Tel: (351) 1 363 1166
Fax: (351) 1 364 7083

Spain

GE Lighting S.A.
Muntaner 479-2-1a
08021 Barcelona

Tel: (34) 3 418 21 00
Fax: (34) 3 417 24 17

Sweden

GE Lighting AB
Box 6769
S:t Eriksgatan 117
S-113 85 Stockholm

Tel: (46) 8 457 96 00
Fax: (46) 8 457 96 50

Switzerland

GE Lighting AG
Thurgauerstrasse 40
8050 Zürich

Tel: (41) 1 307 12 00
Fax: (41) 1 307 12 01

Turkey

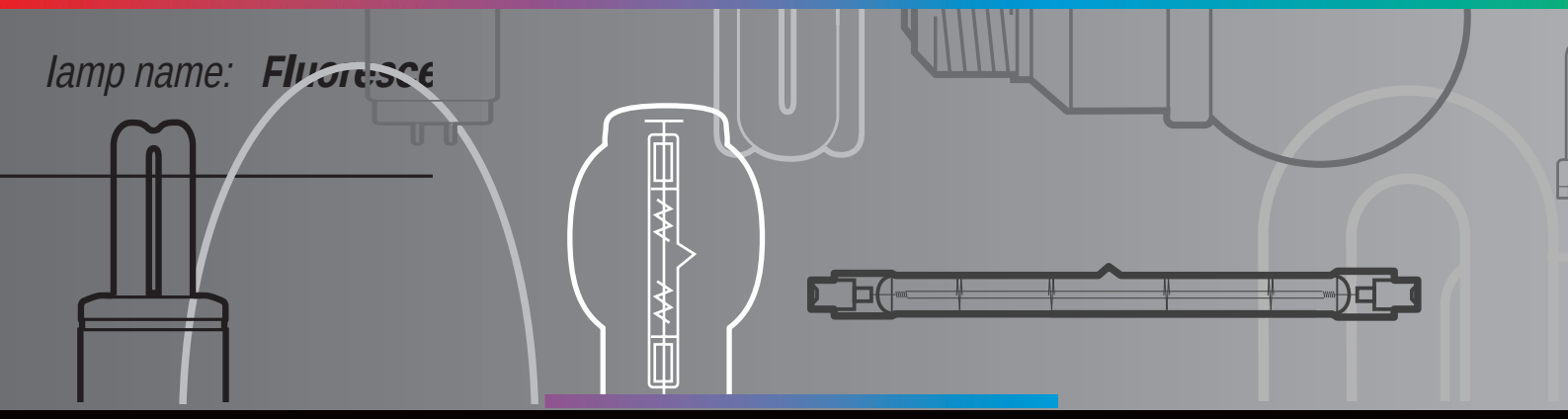
General Electrik T.A.S.
Davutpasa Cad. No. 4
34020 Topkapi
Istanbul

Tel: (90) 212 544 4400
Fax: (90) 212 576 0979

United Kingdom

GE Lighting Limited
Conquest House
42-44 Wood Street
Kingston upon Thames
Surrey KT1 1UZ

Tel: (44) 181 626 8500
Fax: (44) 181 626 8501



GE Lighting

Timothy Guy Design

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