08/31/16
Custodial
GMW

GE Consumer & Industrial
Lighting

Lamp Material Information Sheet

Material Safety Data Sheets (MSDS)
Information and Applicability

The Material Safety Data Sheet (MSDS) requirements of the Occupational Safety and Health Administration (OSHA) for chemicals are *not* applicable to manufactured articles such as lamps. No material contained in a lamp is released during normal use and operation.

The following information is provided as a service to our customers. The following Lamp Material Information Sheet contains applicable Material Safety Data Sheet information.

I. Product Identification

GE Compact Fluorescent Lamps

GE Consumer & Industrial
Lighting
1975 Noble Road
Nela Park
Cleveland, OH 44112
(216) 266-2222

II. Lamp Materials and Hazardous Ingredients

Glass & Metal
The glass tube used in a standard compact fluorescent lamp is manufactured from soda-lime glass and is essentially similar but not identical to that used throughout the glass industry for bottles and other common consumer items. The lamp bases are generally nickel-plated brass. The coils in the lamps (called filaments or cathodes) are made of tungsten. An emission material covers the tungsten coil. The emission material consists of triple oxide (BaO, CaO, SrO) + ZrO2 in a quantity of 4-12 mg/lamp depending on type. Some 4-pin Compact fluorescent lamps contain 2-3 mg of titanium-hydride. None of these materials would present a hazard in the event of breakage of the lamp, aside from the obvious ones due to broken glass. Some fluorescent lamps (CovRguard™ products) use an external coating of polycarbonate to provide a shatter-resistant coating.

Phosphor
The phosphor system (SP/SPX) uses a mixture of rare earth elements such as lanthanum and yttrium as either an oxide or as a phosphate, along with a barium/aluminum oxide. The phosphor components may vary slightly depending on the color of the lamp (SPX30, SPX35, etc.). Compact fluorescent lamps typically have a maximum of 1.5 grams of phosphor. Total phosphor weight will vary by lamp size and type.

Mercury
Mercury is present in small amounts in all fluorescent lamps. The amount of mercury present (typically 5 mg or less) in any given compact fluorescent lamp will vary depending on the lamp type. The amount is lower than that from several years ago, and GE is currently working to further lower the amounts of mercury used in its fluorescent lamp products.

Electronic Ballast for Self-Ballasted Compact Fluorescent Lamp
The electronic ballast is built into the lamp housing. The ballast consists of parts that are essentially similar, but not identical, to those used throughout the electronics industry for other common consumer articles.

Plastic Material
The plastic housing is typically made of PBT (Polybutylene-terephthalate) or PET (Polyethylene-terephthalate) fire retarded plastic with a bromine-containing polymer and antimony oxide. The plastic housing is glass fiber filled. This product consists primarily of high molecular weight polymers that are not hazardous.

III. Health Concerns

Phosphor
Except for small changes, it is essentially the same phosphor that has been in use in our lamps for over twenty years. The Industrial Hygiene Foundation of the Mellon Institute found no significant adverse effects, either by ingestion, inhalation, skin contact, or eye implant, in a five-year animal study of the original phosphor. Also, there have been no significant adverse effects reported in humans by any of these routes during the many years of its manufacture and use. The phosphor is somewhat similar to the inert mineral apatites (calcium phosphate-fluorides) that occur in nature.

Antimony, manganese, yttrium and tin compounds are characterized by OSHA as hazardous chemicals, as are most metals. However, due to their insolubility, relatively low toxicity and small amount present in the phosphor and the lamp, these materials do not present a significant hazard in the event of breakage of the lamp.

Mercury
Neither the mercury nor the phosphor concentration in air produced as a result of breaking one or a small number of compact fluorescent lamps should result in significant exposures to the individual. Where a large quantity of lamps is intentionally broken, for example, in a drum-top crusher, work should be done in a well-ventilated area, and local exhaust ventilation or personal protective equipment may be needed. Also, appropriate industrial hygiene monitoring and controls should be implemented to minimize airborne levels or surface contamination. GE recommends lamp recycling when large quantity lamp disposal is required. See: ***www.lamprecycle.org*** for a list of lamp recyclers.

UV
The Ultraviolet energy emitted by compact fluorescent lamps complies with the Photobiological safety requirements in IESNA RP-27.1 & IESNA RP27.3. (CFL lamps also comply with CIE S009: 2002.)

IV. Disposal Concerns

TCLP

A Toxicity Characteristic Leaching Procedure (TCLP) test conducted on traditional compact fluorescent lamp designs for mercury could possibly cause the lamps to be classified as a hazardous waste due to the mercury content or lead content (in the case of screw-based compact fluorescent lamps). While small numbers of these lamps placed in ordinary trash may not appreciably affect the nature or method of disposal of the trash, under many circumstances disposal of large quantities may be regulated. Lamp recycling is recommended for large quantity disposal. Review your waste handling practices to assure that lamps are disposed properly and contact your state environmental department for any regulations that may apply. To check state regulations or to locate a recycler, go to www.lamprecycle.org. Reduced mercury pin-based compact fluorescent lamps that consistently pass the TCLP test are available and marketed under the **Ecolux** trade name. For more information on Ecolux fluorescent lamps visit www.gelighting.com.

Electronic Ballast

Traditional electronic ballast designs for screw-based compact fluorescent lamps would most likely fail the TCLP test for Lead. Dispose in accordance with local regulations; recycling is recommended for large quantity disposal. Lead-free Ballasts sold in the European market meet the EC directive 2002/95/EC for ROHS (Restriction of Hazardous Substances). Screw-based compact fluorescent lamps designs with lead-free ballasts that will pass the TCLP test in North America are under development.

Plastic Material

The plastic material used in a compact fluorescent lamp can be recycled during the lamp recycling process.

GE
Lighting

Biax® T/E

Triple Biax®
Compact Fluorescent Lamps
Non-Integrated
13W, 18W, 26W, 32W and 42W

Product description

Ultra compact energy saving CFL lamps with triple-tube design give an ideal light source for small fixtures and downlights.

The Biax® T/E lamps are electrically interchangeable with Biax® D/E lamps. They are available in 13, 18, 26, 32 and 42W. Light output ranges between 900 and 3200 lumens. Biax® T/E lamps are designed for high-frequency electronic ballasts.

Features

- Similar light output in any operating position
- Up to 80% energy savings
- Lasts up to 20,000 hours (electronic ballast)
- High color rendering index – CRI = 82
- Full range of color temperatures – 2700K, 3000K, 3500K, 4000K and 5000K (only 32W and 42W)
- May be used with dimmable electronic ballasts
- Built in EOL protection

Application areas

- Outdoor luminaires
- Enclosed luminaires
- Downlights
- Residential applications
- Offices
- Hotels/motels/restaurants
- Corridor lighting, wall sconces
- Industrial and retail

GE Biax® T/E

Range Summary

Non-Amalgam 4-Pin Triple Biax®

Rated Wattage	Base	Description	Product Code	Initial Lumens	Mean Lumens	CCT (K)	Life (3 hrs/start)
13	GX24q-1	F13TBX/827/4P/ECO	97623	900	755	2700	17,000
18	GX24q-1	F18TBX/827/4P/ECO	97628	1200	1010	2700	17,000
26	GX24q-1	F26TBX/827/4P/ECO	97618	1800	1530	2700	17,000

Amalgam 4-Pin Triple Biax®

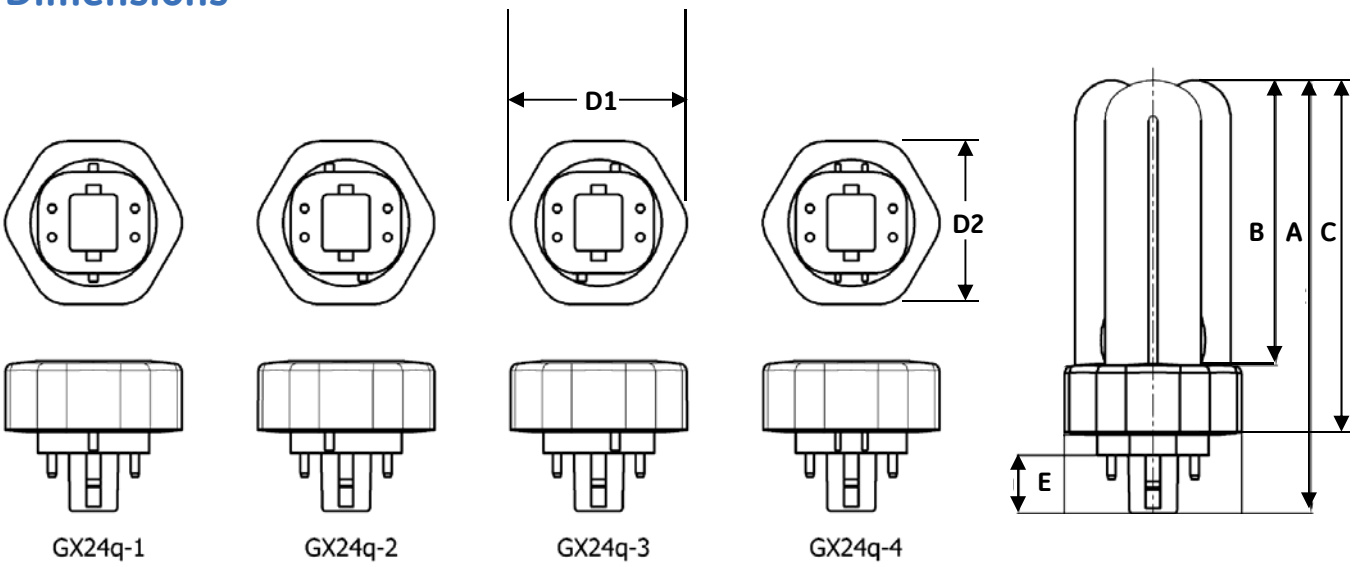
Rated Wattage	Base	Description	Product Code	Initial Lumens	Mean Lumens	CCT (K)	Life (3 hrs/start)
13	GX24q-1	F13TBX/827/A/ECO	97619	900	755	2700	17,000
13	GX24q-1	F13TBX/830/A/ECO	97620	900	755	3000	17,000
13	GX24q-1	F13TBX/835/A/ECO	97621	900	755	3500	17,000
13	GX24q-1	F13TBX/840/A/ECO	97622	900	755	4000	17,000
18	GX24q-2	F18TBX/827/A/ECO	97624	1200	1010	2700	17,000
18	GX24q-2	F18TBX/830/A/ECO	97625	1200	1010	3000	17,000
18	GX24q-2	F18TBX/835/A/ECO	97626	1200	1010	3500	17,000
18	GX24q-2	F18TBX/840/A/ECO	97627	1200	1010	4000	17,000
26	GX24q-3	F26TBX/827/A/ECO	97614	1800	1530	2700	17,000
26	GX24q-3	F26TBX/830/A/ECO	97615	1800	1530	3000	17,000
26	GX24q-3	F26TBX/835/A/ECO	97616	1800	1530	3500	17,000
26	GX24q-3	F26TBX/840/A/ECO	97617	1800	1530	4000	17,000
32	GX24q-3	F32TBX/827/A/ECO	97629	2400	2040	2700	17,000
32	GX24q-3	F32TBX/830/A/ECO	97630	2400	2040	3000	17,000
32	GX24q-3	F32TBX/835/A/ECO	97631	2400	2040	3500	17,000
32	GX24q-3	F32TBX/840/A/ECO	97632	2400	2040	4000	17,000
42	GX24q-4	F42TBX/827/A/ECO	97633	3200	2720	2700	17,000
42	GX24q-4	F42TBX/830/A/ECO	97634	3200	2720	3000	17,000
42	GX24q-4	F42TBX/835/A/ECO	97635	3200	2720	3500	17,000
42	GX24q-4	F42TBX/840/A/ECO	97636	3200	2720	4000	17,000

All the lamps in the table above have:

- CRI = 82
- Mercury (mg): 3
- Life on Electronic Ballast at 3 hours per start: 17,000
- Life on Electronic Ballast at 12 hours per start: 20,000
- Pack Quantity: 10

GE Biax® T/E

Dimensions



Nominal Lamp Dimension – Inches (mm)

	A	B	C	D1	D2	E
F13TBX/A/4P	4.18 (106.2)	2.54 (64.5)	3.27 (83.0)	1.93 (49)	1.77 (45)	0.63 (16)
F18TBX/A/4P	4.75 120.7)	3.11 (79.0)	3.84 (97.5)	1.93 (49)	1.77 (45)	0.63 (16)
F26TBX/A/4P	5.24 (133.2)	3.60 (91.5)	4.33 (110.0)	1.93 (49)	1.77 (45)	0.63 (16)
F32TBX/A/4P	5.56 (141.2)	3.92 (99.5)	4.65 (118.0)	1.93 (49)	1.77 (45)	0.63 (16)
F42TBX/A/4P	6.43 (163.2)	4.78 (121.5)	5.51 (140.0)	1.93 (49)	1.77 (45)	0.63 (16)

GE Biax® T/E

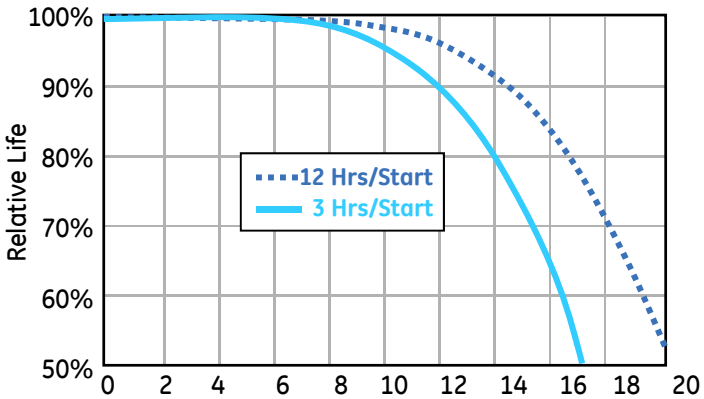
Lamp Life

Rated life for Biax® T/E is 17,000 hours at 3 hours/start and is 20,000 hours at 12 hours/start. (Graph A).

Cathodes of a fluorescent lamp lose their electron-emissivity during life due to the evaporation of emission mixture. When the deterioration reaches a certain level, the cathode breaks. Typical lifetime characteristics are based on GE Lighting's measurements according to the relevant IEC standards.

The rated lamp life is the median life, which is when 50% of the lamps from a large sample batch would have failed. Real lifetime figures may depend on actual application. For instance, improper cathode preheat, too high operating current, or too low operating current without additional cathode heating reduces the expected life

Relative Life vs. Operating Time



(Graph A)

Lumen Maintenance

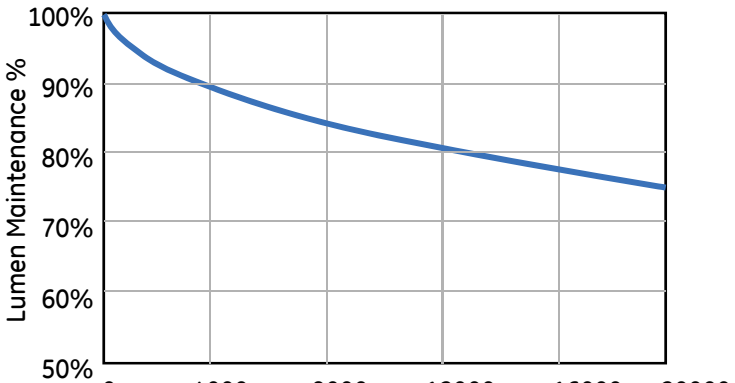
Lumen Maintenance curve presented for Biax® T/E lamps are based on laboratory conditions, in the base up position. In actual use, lumen output is a function of burning hours and lamp operating watts throughout life. (Graph B).

Lumen maintenance graph shows how the luminous output decreases throughout life. The main causes of the lumen depreciation are the deterioration of phosphor coating and the lamp blackening due to the deposition of evaporated emission mixture on the glass tube. Lumen maintenance curve presented here for Biax® T/E lamps are based on photometry under laboratory conditions.

Test conditions:

- Photometric sphere
- Base up operation
- Switching cycle: 165 min on – 15min off and 11 hours on – 1 hour off
- Standard gear or high frequency operation
- 25°C ambient temperature

Lumen Maintenance



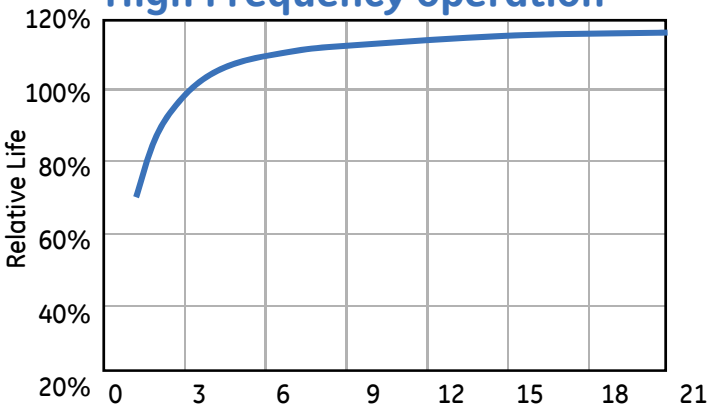
(Graph B)

Life vs. Frequency of Switching

For impact on life of alternative switching cycles refer to 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 program start ballast. Instant start ballasts are not recommended for frequent switching applications.

Relative Life vs. Hours per Start High Frequency operation



(Graph C)

GE Biax® T/E

Luminous Intensity Distribution

The luminous intensity distribution describes the intensity of light that is emitted in a particular direction.

Graph C and D show the Luminous Intensity Distribution curve of Biax® T/E lamps. Tests were taken with lamps operating base-up.

Graph C shows the intensity distribution in the horizontal plane while Graph D shows the light intensity distribution plot in the vertical plane

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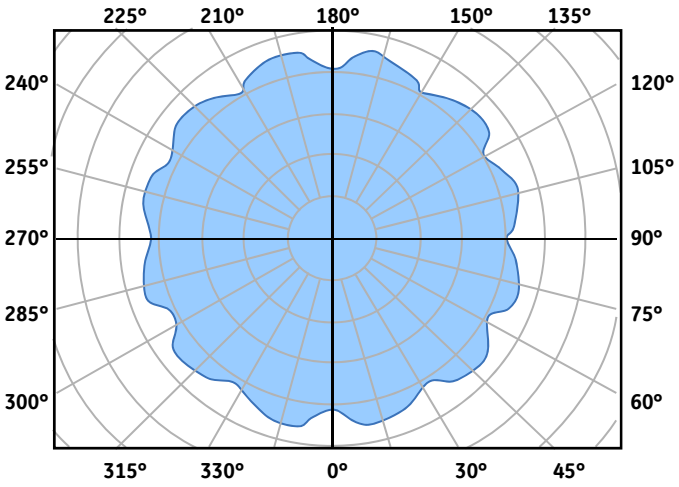
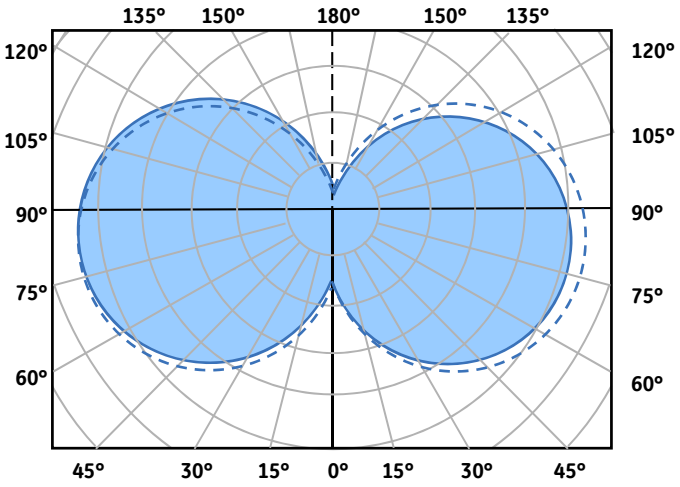
Disclaimer: Graphs show typical lamp behavior. Individual lamps and groups can show different values.

Luminous Intensity Distribution
- Horizontal Plane



Operating Position: Base-up
(Graph C)

Luminous Intensity Distribution
- Vertical Plane



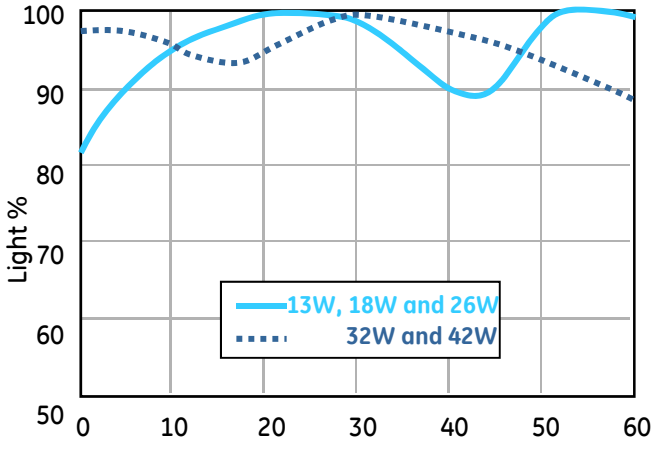
Operating Position: Base-up
(Graph D)

Relative Luminous Flux vs. Ambient Air Temperature – No Airflow

The lamp luminous output depends on the mercury vapor pressure in the discharge tube. The mercury vapor pressure is a function of the thermal conditions around the glass tubes and the amalgam. The operating position, air flow, and radiated heat sources have an effect on these conditions. Graph E shows the relative luminous output as function of the ambient temperature in the base-up position. Tests were performed in draft-free air under thermally controlled conditions.

IES Files are available on **www.gelighting.com.**

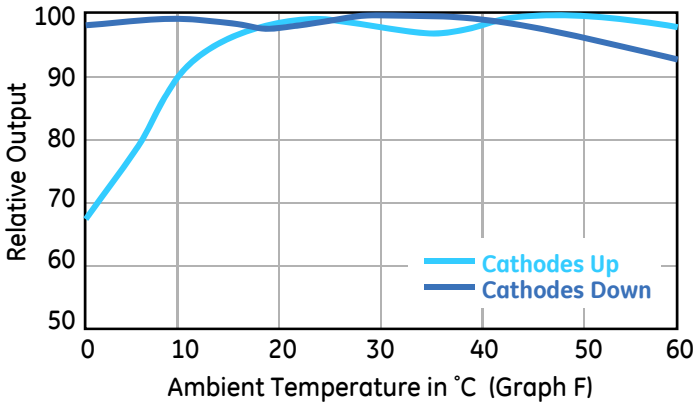
Light Output vs. Ambient Temperature – Base-up Operation



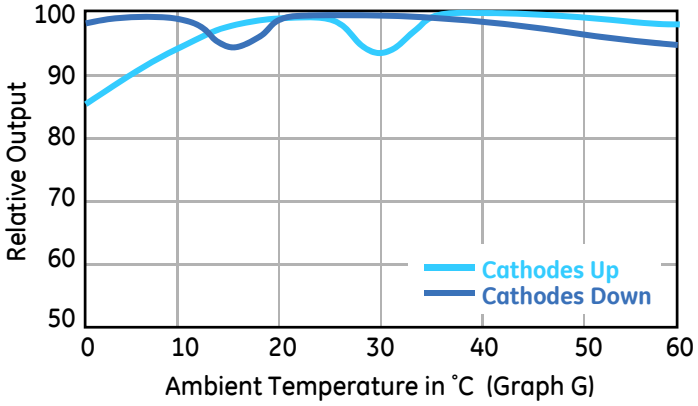
Ambient Temperature in °C (Graph E)

GE Biax® T/E

Relative light output vs. ambient temperature TBX 26W horizontal operation with Airflow



Relative light output vs. ambient temperature TBX 42W horizontal operation with Airflow



Standards

Biax® T/E lamps comply with the relevant clauses of applicable safety and performance specifications such as IEC 61199 Single-capped fluorescent lamps – Safety specifications and IEC 60901 Single-capped fluorescent lamps : Performance specifications.

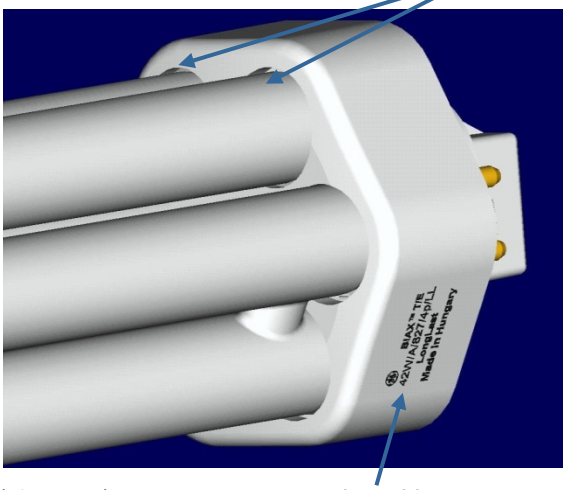
Relative Luminous Flux vs. Ambient Temperature – Airflow across the lamps

In horizontal operation, the light output vs. temperature performance of Biax® T/E 26, 32 and 42W lamps differs depending on the position of the tubes with the cathodes relative to the other tubes. **Graphs F** and **G** show the performance of the 26 and 42W lamps with the cathode legs up (above the other legs) and down (below the other legs). **Figure H** shows the location of the tubes with the cathode legs relative to the monogram on the lamp.

Environmental aspect

The mercury content of the Biax® T/E lamps is maintained under 3mg per lamp, supporting GE Lighting's commitment to the environment.

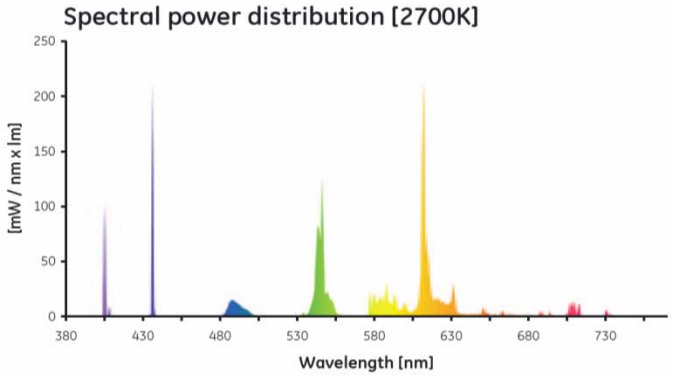
Cathode Position

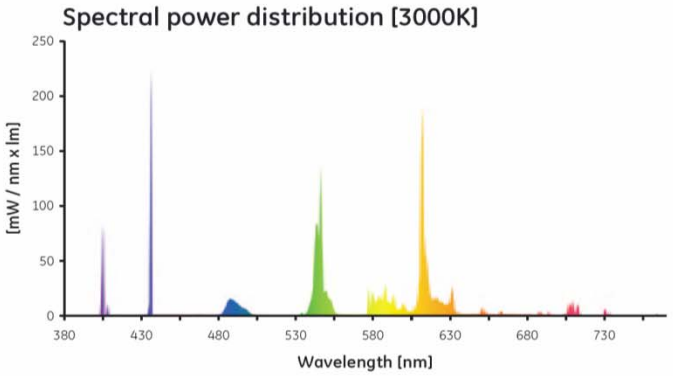


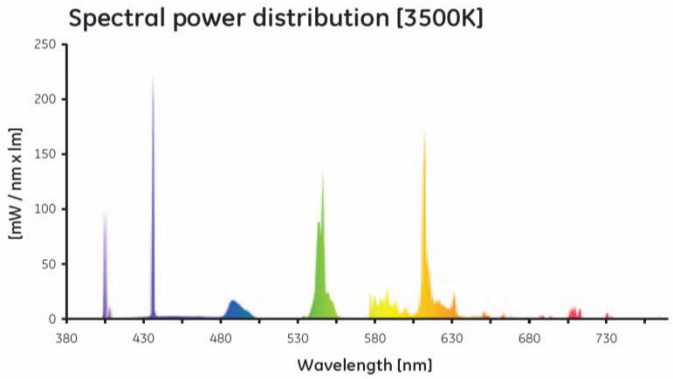
(Figure H)

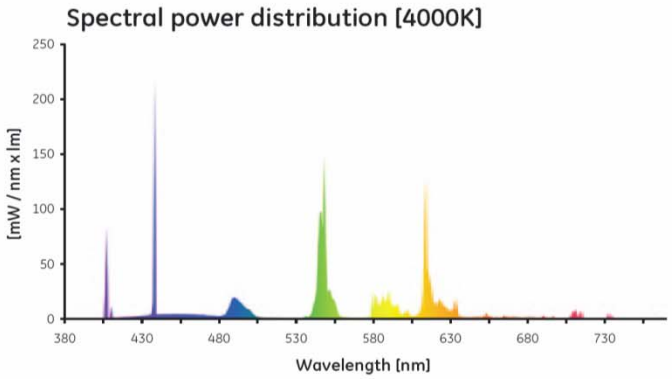
GE Biax® T/E

Spectral Distribution



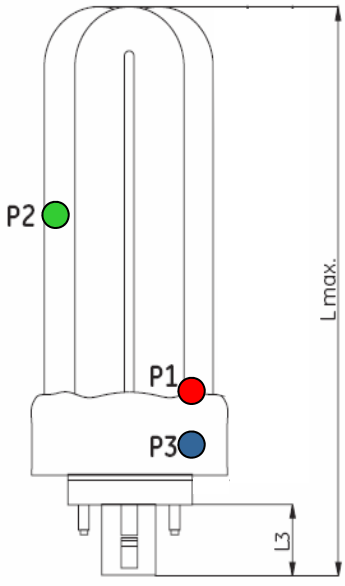






Operating Temperature limits for Biax® T/E

Lamp surface temperatures in any application shall not exceed maximum temperature values that are given on the right. The exact location where the relevant temperature is measured, depends on the lamp orientation, e.g. VBU, horizontal, etc. **P2** and **P3** temperatures are measured on the hottest surfaces of the indicated lamp portion. (This is normally on the uppermost surface of the lamp in horizontal operation.) **P1** is always measured on the surface of the plastic housing between the cathode



Lamp Portion	Description	Maximum Temperature
P1	Plastic housing between cathodes	180 °C
P2	Mid part of the bulb	180 °C
P3	Plastic housing along the circumference	140 °C

GE Biax® T/E

- Values conform to IEC 60901 data sheets at time of publication. Consult IEC 60901 and ANSI/IEC C78.901 for additional parameters not provided here.
- Lamp operating current crest factor (CCF) shall not exceed 1.70.

Cathode Preheat requirements

Nominal Power	Base	Standard Data Sheet 60901-IEC	Emin = Qmin + Pmin*ts			Emax = Qmax + Pmax*ts		
			Qmin (J)	Pmin (W)	Rsub, min (ohm)	Qmin (J)	Pmin (W)	Rsub, min (ohm)
13	GX24q-1	-3413	1	0.7	30	2	1.4	40
18	GX24q-2	-3418	0.9	0.7	18	1.8	1.4	24
26	GX24q-3	-3426	1	0.8	9	2	1.6	12
32	GX24q-3	-7432	1	0.8	9	2	1.6	12
42	GX24q-4	-7442	1	0.8	9	2	1.6	12

Preheat time shall be longer than 0.4 s and shorter than 3s. Ballast preheat energy shall be measured with substitution resistance of table below.

Dimming requirements

Nominal Power	Base	Standard Data Sheet 60901-IEC	Idmin (A)	Idmax (A)	X (A^2)	Y (A^2)
13	GX24q-1	-3413	0.015	0.115	0.035	0.26
18	GX24q-2	-3418	0.020	0.16	0.07	0.35
26	GX24q-3	-3426	0.030	0.25	0.175	0.57
32	GX24q-3	-7432	0.030	0.25	0.175	0.57
42	GX24q-4	-7442	0.030	0.25	0.175	0.57

In the dimming range of the lamp operating current Idmin — Idmax. Minimum SoS = $I^2_{LH} + I^2_{LL} = X - Y*I_d$. Target SoS = $I^2_{LH} + I^2_{LL} = X - 0.3*Y*I_d$.
Idmax for dimming operation = Idmin for normal operation. Values conform to IEC proposal.

Starting requirements

Nominal Power	Base	Standard Data Sheet 60901-IEC	Minimum OCV at +10C (Vrms)	Maximum OCV (non-ignition) (Vrms)	Rsub (ohm)
13	GX24q-1	-3413	400	190	30...90
18	GX24q-2	-3418	550	250	18...54
26	GX24q-3	-3426	550	265	9...27
32	GX24q-3	-7432	560	265	9...27
42	GX24q-4	-7442	600	265	9...27

Ballast open circuit voltage (OCV) shall be measured with substitution resistance of above table.

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