GE
Lighting

WORLDWIDE PARTNER

LongLast™

DATA SHEET

Biax™ Q/E

Compact Fluorescent Lamps Non-Integrated 57W and 70W

Product information

The Biax™ Q/E, is a high output compact fluorescent lamp designed to fulfill customers' demand for higher lumen packages. The ultra compact energy saving Biax™ Q/E lamps with amalgam technology extend the application space of the innovative quadruple tube design. They can be used both in enclosed luminaires and outdoor applications without significant light loss. Amalgam technology makes the Biax™ Q/E lamps suitable for use in any burning position with the same light output. The Biax™ Q/E lamps with a 4-pin electrical connection and without an internal starter are designed for high-frequency electronic ballasts.

Features

- Same light output in any burning position
- Reliable starting even in extreme temperatures
- Long life – 20,000 hours
- High luminous efficacy – 74lm/W
- High color rendering index – 82Ra
- Available in five colour temperatures – 2700, 3000, 3500, 4000, 5000K
- 4-pin design for high frequency operation
- Wide operating temperature range
- Built-in End-of-Life protection

Applications

- Office
- Commercial
- Retail
- School
- Healthcare

Lamp technology

The F57QBX and F70QBX are compact fluorescent lamps with amalgam technology. The amalgam is a mercury alloy, which is a replacement for the traditional liquid and pellet-dosed mercury. The amalgam is placed in the lamp and provides the following benefits: more stable light output in every burning position, and a wider optimum operating temperature range (since amalgam gives better mercury vapor control).

The unique quadruple tube design results in a shorter overall length, allowing for use in smaller luminaires. Moreover, the horizontal light distribution is more uniform compared to the triple tube lamps.

In certain circumstances (with very low probability), a traditional CFL lamp may smoke and emit a melting plastic-like odour at the end of its life, an incident which is not generally dangerous. It may happen because the lamp voltage is increased, and the ballast still sustains the discharge, thus overheating the lamp. Even though most commercial ballasts are equipped with end-of-life protection, the F57QBX and F70QBX are designed to eliminate the above-mentioned issue by itself. A small portion of titanium-hydride is placed near the cathode, and in case of critical overheat, the evaporating hydrogen quenches the arc.

Compliance with IEC standards

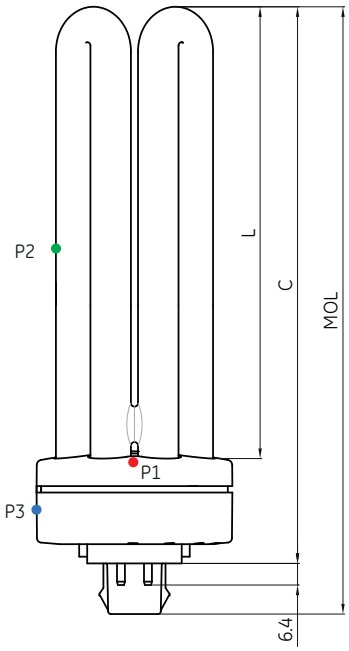
GE Lighting compact fluorescent lamps comply with IEC 60061, IEC 60901 and IEC 61199.

GE imagination at work

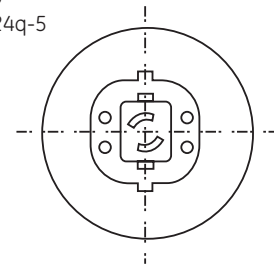
Basic data

Nominal Wattage [W]	Rated Wattage on Electronic Gear [W]	Volts on Electronic Gear [V]	Cap	Product Description	Product Code	Nominal Lumen [lm]	Rated Lumen [lm]	Rated Lamp Efficacy on Electronic Gear [lm/W]	CCT [K]	CRI [Ra]	Mercury [mg]	Life on Electronic Gear 3h Cycle [h]	Life on Electronic Gear 12h Cycle [h]	Diameter [mm]	Length [mm]	EEC	Pack Qty
Biax™ Q/E LongLast™ 4-pin																	
57	56	175	GX24q-5	F57QBX/827/A/4P/LL	45213	4300	4300	77	2700	82	3.0	17,000	20,000	58.3	180.7	B	10
57	56	175	GX24q-5	F57QBX/830/A/4P/LL	45204	4300	4300	77	3000	82	3.0	17,000	20,000	58.3	180.7	B	10
57	56	175	GX24q-5	F57QBX/835/A/4P/LL	45202	4300	4300	77	3500	82	3.0	17,000	20,000	58.3	180.7	B	10
57	56	175	GX24q-5	F57QBX/840/A/4P/LL	45201	4300	4300	77	4000	82	3.0	17,000	20,000	58.3	180.7	B	10
70	70	219	GX24q-6	F70QBX/830/A/4P/LL	45208	5200	5200	74	3000	82	3.0	17,000	20,000	58.3	208.2	B	10
70	70	219	GX24q-6	F70QBX/835/A/4P/LL	45219	5200	5200	74	3500	82	3.0	17,000	20,000	58.3	208.2	B	10
70	70	219	GX24q-6	F70QBX/840/A/4P/LL	45218	5200	5200	74	4000	82	3.0	17,000	20,000	58.3	208.2	B	10

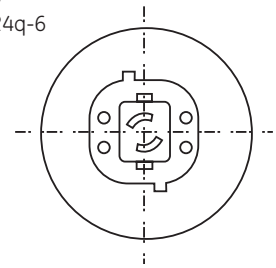
Dimensions



Cap
GX24q-5



Cap
GX24q-6



		57W	70W
A - according to IEC 60901	[mm]	max. 51	max. 51
B - according to IEC 60901	[mm]	max. 51	max. 51
C - according to IEC 60901	[mm]	max. 166	max. 193.5
L - Lighted length	[mm]	max. 134.5	max. 162
D - Plastic shell diameter	[mm]	max. 58.3	max. 58.3
MOL - Maximum overall length	[mm]	180.7	208.2

Operating temperature limits

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

Survival rate and lumen maintenance

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 declared 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.

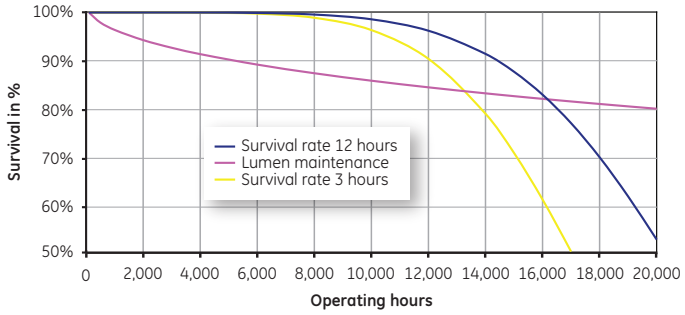
The lumen maintenance graph shows how the luminous output decreases throughout life. The main causes of the light depreciation are the deterioration of phosphor coating and the lamp blackening due to the deposition of evaporated emission mixture on the glass tube. These effects are unavoidable. The lumen maintenance curve presented here for 57W – 70W Biax™ Q/E lamp is based on lumen readings under laboratory conditions.

Test conditions:

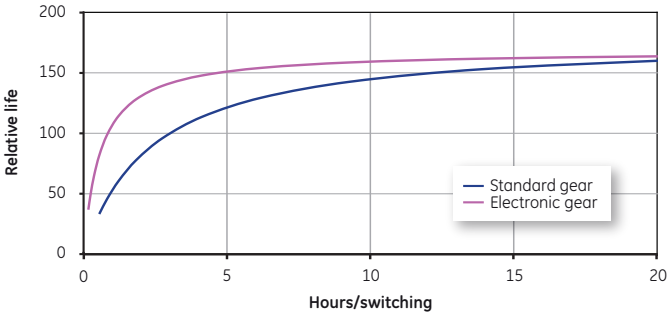
- Photometric sphere
- Vertical, cap up burning position
- Switching cycle: 165 minutes on – 15 minutes off and 11 hours on – 1 hour off
- High frequency operation
- 25°C ambient temperature

Hours	Survival Rate 12 Hours	Lumen Maintenance	Survival Rate 3 Hours
2,000	1.00	0.94	1.00
4,000	1.00	0.91	1.00
6,000	1.00	0.89	1.00
8,000	1.00	0.87	0.99
12,000	0.96	0.84	0.90
16,000	0.83	0.82	0.61
20,000	0.53	0.80	–

Life expectancy and lumen maintenance

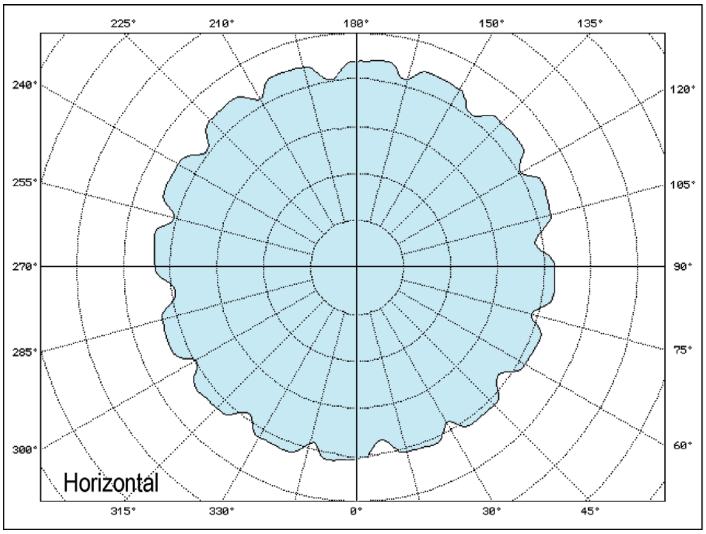


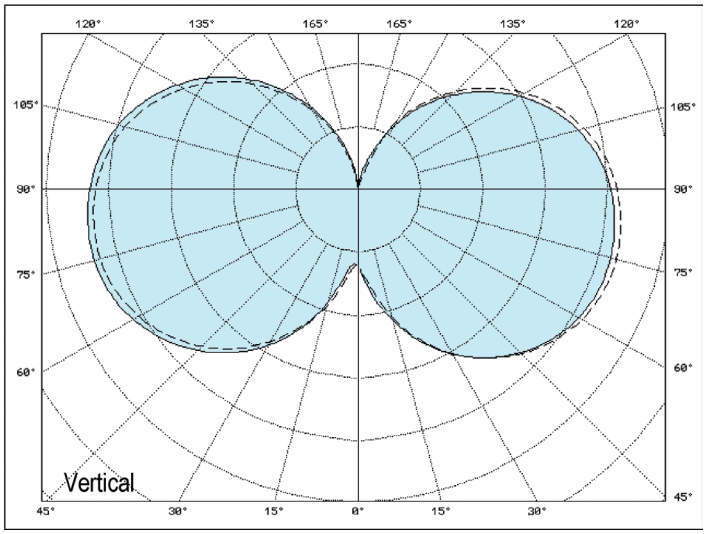
Life versus frequency of switching



Light distribution

The following diagrams show the polar light intensity distribution of the lamp in cap up position.





Lamp starting

Required open circuit voltage

Following curve shows how the maximum open circuit voltage depends on the ambient air temperature. The graph below is based on GE Lighting's measurements under controlled test conditions. Real starting voltage figures depend on the applied electronic ballast. Appropriate preheating of cathodes is necessary to reach low starting voltage and long lamp life.

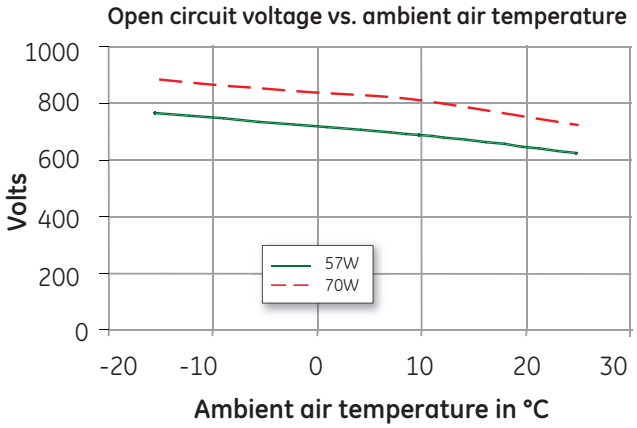
Warm-up

Following curves show the relative light output as the function of time. By definition, warm-up time indicates the time when the luminous output of a lamp reaches 80% of its steady-state value. The second curve shows the initial ramp-up.

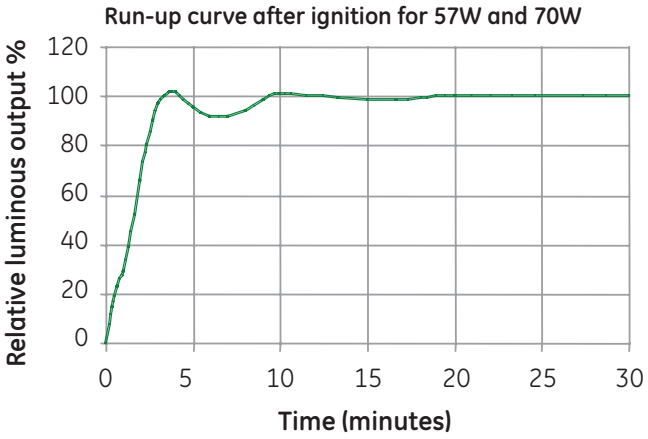
Test conditions:

- 25°C ambient temperature
- base up burning position
- high frequency operation at 320mA

T_{amb} 57W 70W [°C]	OCV 57W [V_{rms}]	OCV 70W [V_{rms}]
-15	880	760
10	810	680
25	710	620

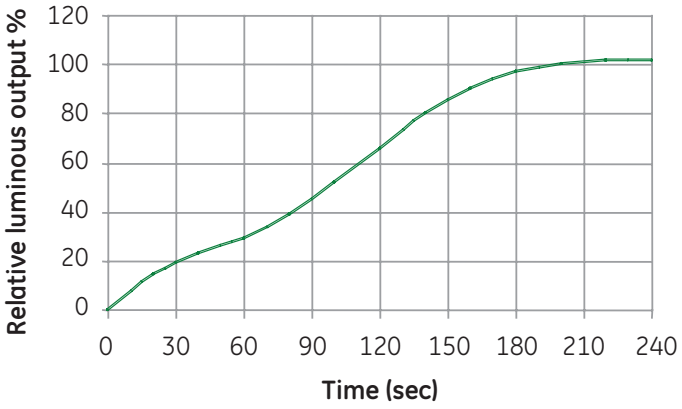


Time [min]	57W Lm%	70W Lm%
1	40	29
2	86	66
3	100	–
4	98	102
5	94	–
6	91	92
7	92	–
8	95	94
9	98	–
10	100	101
20	100	100
30	100	100
60	–	100



Time [s]		
20	22	15
40	30	23
60	40	29
80	54	39
100	72	52
120	86	66
140	93	80
160	98	90
180	100	97
200	–	100
220	–	102
240	–	96

Ramp-up of relative luminous flux after ignition
for 57W and 70W



Influence of ambient temperature

Lamp performance

The lamp performance parameters, such as luminous output, lamp voltage and power depend on the mercury vapour pressure in the discharge tube. The mercury vapour pressure is a function of the thermal conditions around the glass tubes and the amalgam. The burning position, air flow, and radiated heat sources have an effect on these conditions. The first curve shows the relative luminous output as function of the ambient temperature in three burning positions: cap up, horizontal, and cap down. Tests were performed in draught-free air under thermally controlled conditions. The second chart shows the effect of the ambient air temperature on the lamp performance parameters in cap up burning position. These relative parameters are: luminous flux (F), lamp voltage (U), lamp current (I) and lamp power (P).

Test conditions:

- thermal chamber with 2°C accuracy
- draught-free air
- constant arc current

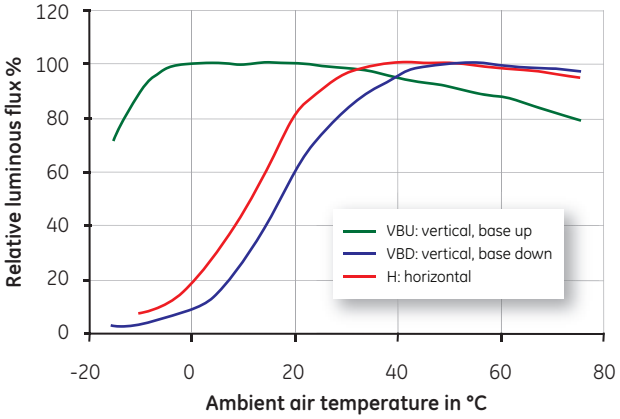
57W

T_{amb} [°C]	Relative Luminous Flux (%)			F %	U %	I %	P %
	Cap up	Hor.	Cap down				
0	100	18	9	100	100	100	100
10	99	44	26	99	101	100	101
20	100	80	59	100	99	100	99
30	98	96	84	98	96	100	96
40	95	100	95	95	93	100	93
50	92	100	100	92	89	100	89
60	87	99	99	87	85	100	85
70	82	97	98	82	81	100	81

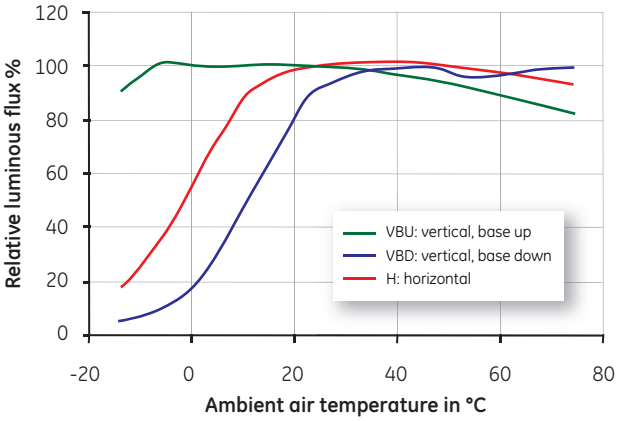
70W

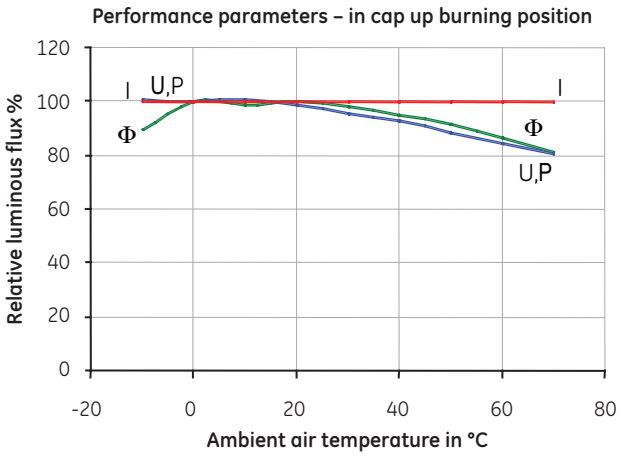
T_{amb} [°C]	Relative Luminous Flux (%)			F %	U %	I %	P %
	Cap up	Hor.	Cap down				
0	76	10	4	76	97	100	97
10	100	32	9	100	99	100	99
20	99	73	31	99	100	100	100
30	99	96	72	99	98	100	98
40	98	100	96	98	94	100	94
50	95	100	100	95	91	100	91
60	90	98	96	90	86	100	86
70	85	94	98	85	82	100	82

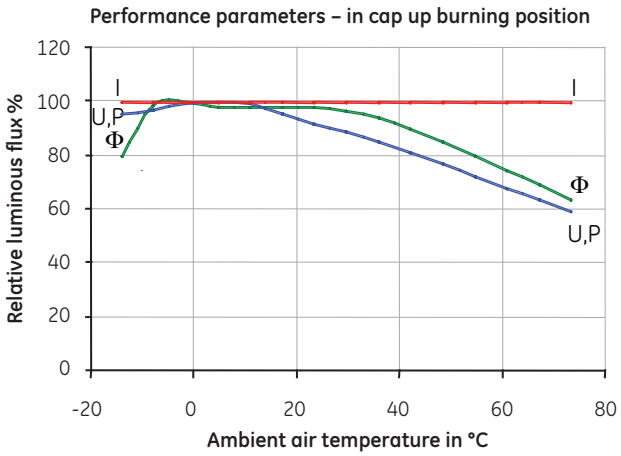
Relative luminous flux vs. ambient air temperature



Relative luminous flux vs. ambient air temperature







Influence of ambient temperature

Lamp temperatures

The following charts show the lamp temperatures in two burning positions at four spots: tube wall near the cathode, center of the plastic cap, amalgam reservoir, and tip of the tube.

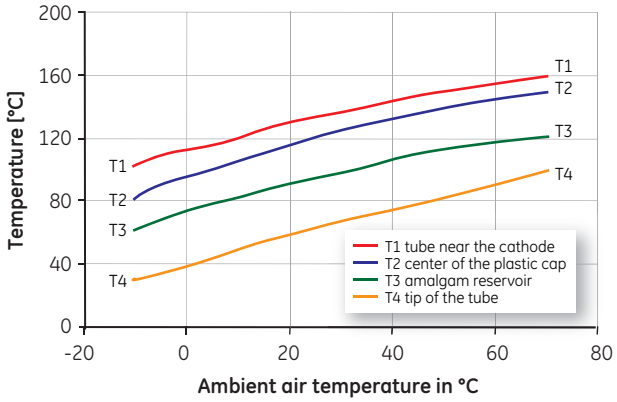
Test conditions:

- thermal chamber with 2°C accuracy
- draught-free air
- constant arc current

QBX 57W Temperature [°C]

Tamb (°C)	Tube Near the Cathode	Centre of the Plastic Cap	Amalgam Reservoir	Tip of the Tube
-10	103	82	61	31
0	113	95	74	38
10	120	104	82	47
20	130	115	91	59
30	137	124	98	67
40	143	132	105	74
50	150	139	112	83
60	155	145	117	91
70	159	149	121	98

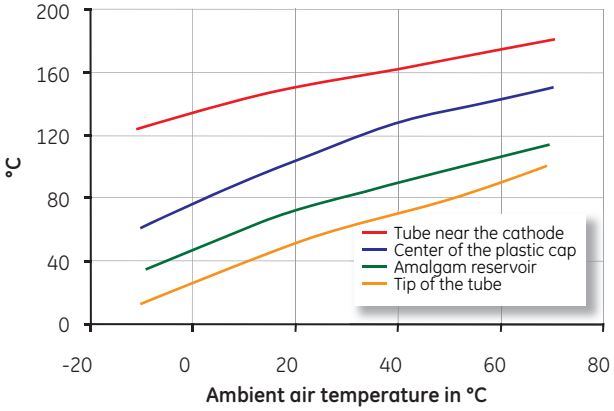
Spot temperatures vs. ambient air temperature
in vertical cap up burning position



QBX 57W Temperature [°C]

Tamb (°C)	Tube Near the Cathode	Centre of the Plastic Cap	Amalgam Reservoir	Tip of the Tube
-10	123	60	13	35
0	131	73	25	47
10	140	88	38	60
20	149	103	50	73
30	158	116	61	82
40	162	125	71	89
50	167	134	81	98
60	172	142	91	105
70	177	149	100	113

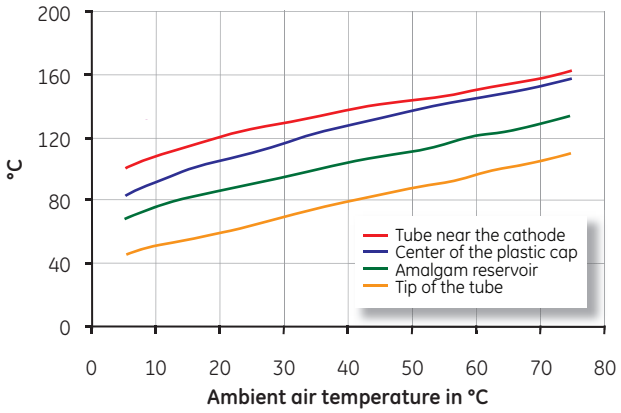
Spot temperatures vs. ambient air temperature
in horizontal, cathodes up burning position



QBX 70W Temperature [°C]

Tamb (°C)	Tube Near the Cathode	Centre of the Plastic Cap	Amalgam Reservoir	Tip of the Tube
0	93	71	60	39
10	108	93	76	53
20	120	105	87	61
30	128	116	96	70
40	136	128	104	80
50	143	138	112	88
60	149	145	120	96
70	156	152	127	104

Spot temperatures vs. ambient air temperature
in cap up burning position

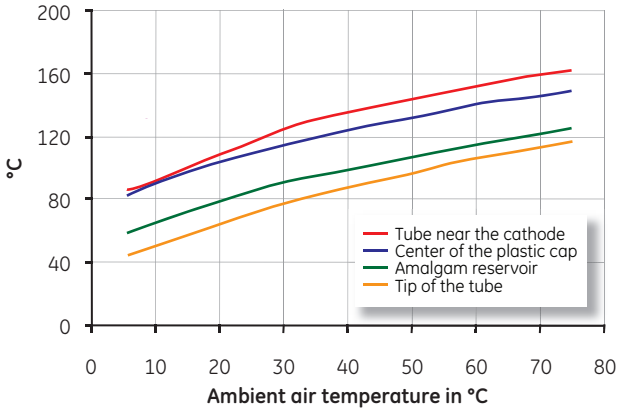


QBX 70W Temperature (°C)

Tamb (°C)	Tube Near the Cathode	Centre of the Plastic Cap	Amalgam Reservoir	Tip of the Tube
0	80	75	39	53
10	91	90	51	66
20	104	108	65	80
30	115	124	78	90
40	124	134	88	98
50	131	143	96	106
60	139	151	105	114
70	145	158	113	120

*Cathodes up horizontal burning position, cap view

Spot temperatures vs. ambient air temperature
in horizontal burning, cathodes up position

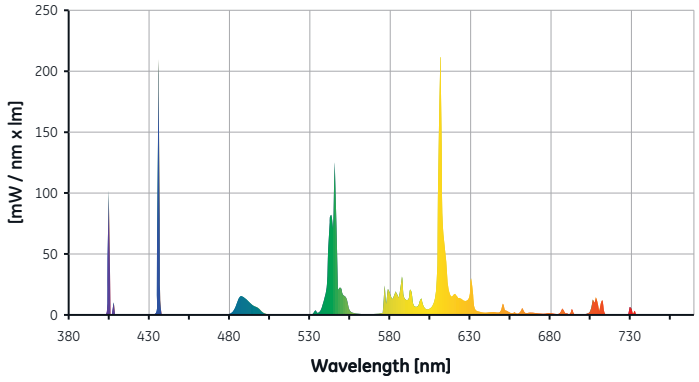


Lamp colour

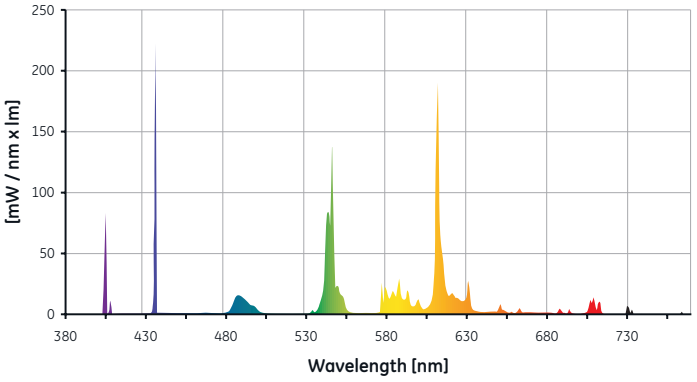
Spectral power distribution

Spectral power distribution curves are given in the following diagrams.

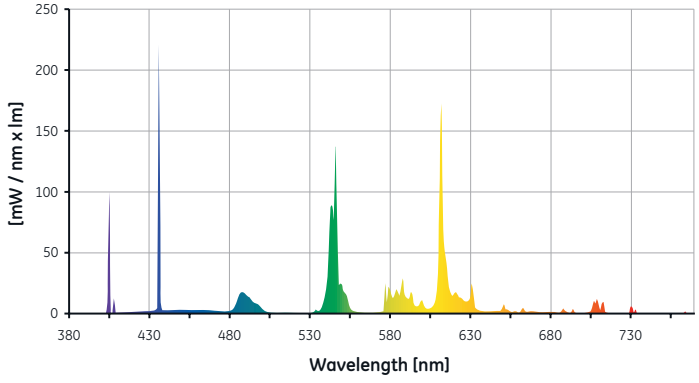
Spectral power distribution [2700K]



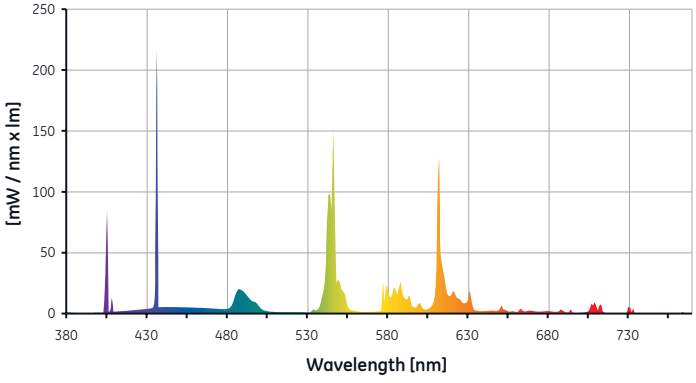
Spectral power distribution [3000K]



Spectral power distribution [3500K]



Spectral power distribution [4000K]



Colour specification according to CIE 1931

CCT [K]	x	y	CRI [Ra]
2700	0.455	0.410	82
3000	0.440	0.403	82
3500	0.413	0.393	82
4000	0.376	0.387	82
5000	0.346	0.359	82

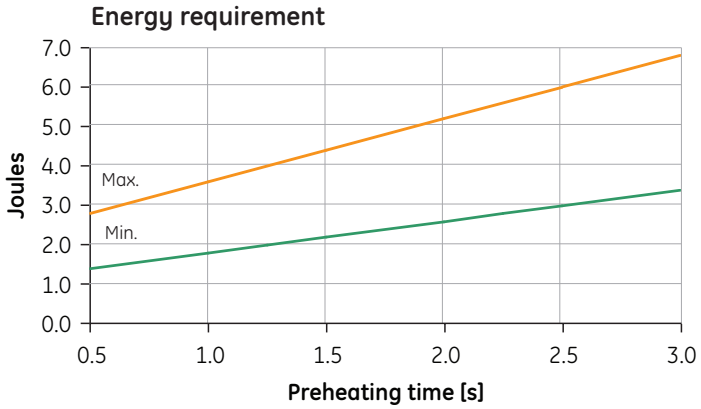
Preheating requirements

Suitable preheating of cathodes prior to ignition is essential for long lamp life. The preheating requirement can be given by the following formula:

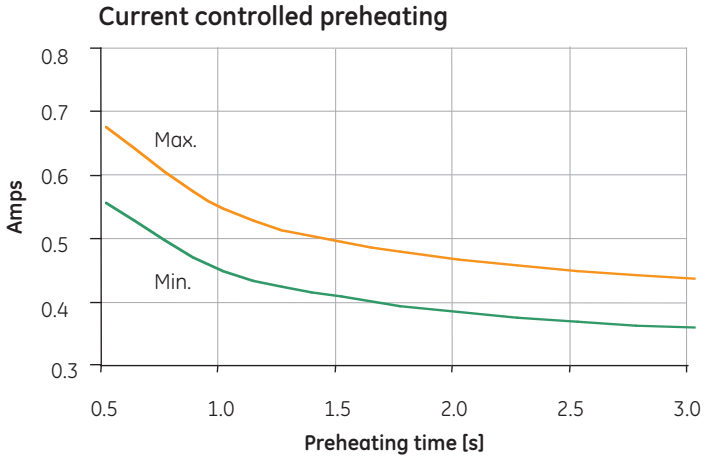
$E = Q + P \cdot t$ This energy is measured on a substitution resistor

Q stands for the necessary thermal energy. P represents the power loss due to the heat transmission from the cathode. The longer the preheating, the more the power loss.

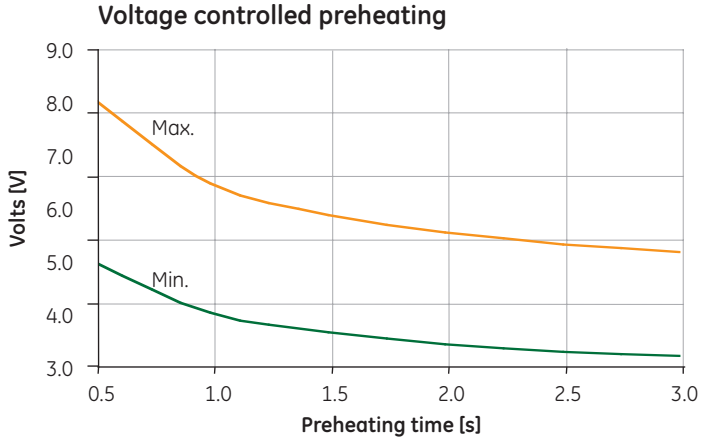
Preheating Time	Energy [J]	
	Min.	Max
0.5	1.40	2.80
1.0	1.80	3.60
1.5	2.20	4.40
2.0	2.60	5.20
2.5	3.00	6.00
3.0	3.40	6.80
Q (J)	1.00	2.00
P (W)	0.80	1.60
Rsub (ohm)	9	12



Preheating Time	Preheating Current [A]	
	Min.	Max
0.5	0.56	0.68
1.0	0.45	0.55
1.5	0.40	0.49
2.0	0.38	0.47
2.5	0.37	0.45
3.0	0.35	0.43

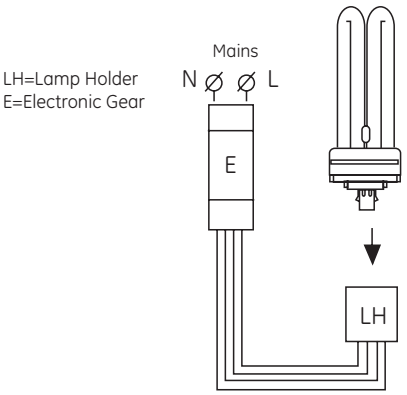


Preheating Time	Preheating Current [A]	
	Min.	Max.
0.5	5.0	8.2
1.0	4.0	6.6
1.5	3.6	5.9
2.0	3.4	5.6
2.5	3.3	5.4
3.0	3.2	5.2



Circuit diagram

4-pin, electronic ballast (single lamp)



Gear specification

Nominal wattage	57W	70W
Operation	High frequency	
Cathode	Preheated	
Burning position	Universal	
Available correlated colour temperature range [K]	2700, 3000, 3500, 4000	

Electrical and photometric characteristics		**57W**	**70W**
Rated lamp current	[A]	0.32	0.32
Operating frequency	[kHz]	>20	>20
Luminous flux at 25 °C, cap up	[lm]	4300	5200
Ambient air temperature range to reach 90% light output			
Vertical, cap up	[°C]	-10...+55	+ 5...60
Horizontal, cap down	[°C]	+ 25...	+ 25...
Vertical, cap down	[°C]	+ 35...	+ 35...
Colour rendering index	[Ra]	82	82
Luminous efficacy	[lm/W]	75	74
Warm-up time to reach 80% light output	[s]	140	140
UV PET	[h]	1000	650

Starting characteristics		**57W**	**70W**
Preheat current for starting test	[A]	0.42	0.42
Preheat time for starting test	[s]	2	2
Starting time	[s]	<0.1	<0.1
Maximum starting voltage at 25°C	[V]	620	710

Cathode characteristics		**57W**	**70W**
Cold resistance	[W]	2.71	
Test current (providing Rh/Rc = 4.75)	[A]	0.31	
Resistance of each cathode at test current	[W]	13	

Reference ballast characteristics		**57W**	**70W**
Frequency	[kHz]	20...26	20...26
Nominal wattage	[W]	57	70
Rated voltage	[V]	560	560
Calibration current	[A]	0.32	0.32
Resistance	[W]	1200	1070

Information for electronic ballast design		**57W**	**70W**
Frequency	[kHz]	>20	>20
Current in any lead to cathodes	[A]	<0.42	<0.420
Lamp operating current	[A]	0.25...0.36	0.25...0.36

Starting requirements with cathode preheating		**57W**	**70W**
E = Q + P·ts (ts = 0.4...3.0 s)		Min. Max.	Min. Max.
Q	[J]	1 2	1 2
P	[W]	0.8 1.6	0.8 1.6
Rsub	[W]	9 12	9 12
Voltage across each cathode for E(t)<Emin	[V]	<11	<11
Minimum open circuit voltage (Vrms) without starting aid			
t < t0	[V]	350	450
t > t0 at 10 °C	[V]	680	810
t > t0 at -15 °C	[V]	760	880
Substitution resistor for each cathode	[W]	9...27	9...27

Safety requirements		**57W**	**70W**
Maximum allowed cap temperature	[°C]	140	140
Maximum preheat current	[A]	0.55	0.55

When the new fluorescent lamp is installed into dimming system, it is advised to operate lamps for period of 100 hours at full light output.

Electronic ballasts

230V electronic ballasts approved by GE Lighting

The list given below is not considered to be comprehensive, but merely indicates the ballasts tested by GE Lighting. Ballasts produced by other reputable control gear manufacturers meeting the relevant IEC standards would also be considered as suitable.

Recommended list of ballasts*

	Wattage	Lamp description	Ballast manufacturer	Single ballast description	Twin ballast description
Biax™ Q/E LongLast™ 4-pin	57W	F57QBX/827/A/4P/LL	Tridonic Atco	PC PRO 1x57/70	
			GE	BLS/E/1x57-70W/QBX	
			Vossloh-Schwabe		ELXc 257.836
Biax™ Q/E LongLast™ 4-pin	70W	F70QBX/830/A/4P/LL	Tridonic Atco	PC PRO 1x57/70	
			GE	BLS/E/1x57-70W/QBX	

*Ballast manufacturers have the right to change ballast specification without prior notification or official announcement so these data based on GE measurement 2010/2011.