

## Guidance For Luminaire Manufacturers Lamp Operating Temperature Limits

|                       | 50-70W | 100-600W |
|-----------------------|--------|----------|
| Max. Cap Temperature  | 210°C  | 250°C    |
| Max. Bulb Temperature | 400°C  | 420°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<br>Voltage Rise (V)      | 5  | 5  | 7   | 7   | 10  | 12  | 12  |
| Diffuse Elliptical<br>Voltage Rise (V) | -  | -  | 5   | 5   | 10  | 7   | -   |

### Ballasts

To achieve correct lamp starting, performance and life, it is important that the lamp and ballast are compatible and suitably rated for the supply voltage at the luminaire. The Lucalox™ XO range is compatible with IEC60662 (High Pressure Sodium Lamps) and IEC62035 (HID Lamp Safety). Ballasts used to operate these lamps should comply with ballast standards IEC60922 & IEC60923 and incorporate adequate overload protective measures to ensure that safety is maintained under abnormal lamp end-of-life rectification conditions as prescribed by IEC60662, IEC62035 and draft changes to luminaire standard EN60598-1. Ballast thermal protection is one method of providing adequate protection.

**Ballast Voltage Adjustment** — Series choke (reactor) ballasts incorporating additional tapings 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 IEC60926 and IEC60927 and have starting pulse characteristics as shown in the table above.



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| Watts | Min. Pulse Voltage (kV) <sup>1</sup> | Max. Pulse Voltage (kV) <sup>2</sup> | Min. Pulse Width (µs) <sup>3</sup> | Min. Pulse Repetition Rate <sup>4</sup> |
|-------|--------------------------------------|--------------------------------------|------------------------------------|---|
| 50    | 1.8                                  | 2.3                                  | 1.95                               | 1/½ cycle                               |
| 70    | 1.8                                  | 2.3                                  | 1.95                               | 1/½ cycle                               |
| 100   | 2.8                                  | 5.0                                  | 1.95                               | 1/cycle                                 |
| 150   | 2.8                                  | 5.0                                  | 1.95                               | 1/cycle                                 |
| 250   | 3.3                                  | 5.0                                  | 1.95                               | 1/cycle                                 |
| 400   | 3.3                                  | 5.0                                  | 1.95                               | 1/cycle                                 |
| 600   | 3.6                                  | 5.0                                  | 1.95                               | 1/cycle                                 |

1. When Loaded with 100 pF min.  
2. When Loaded with 20 pF max.  
3. At 90 % peak voltage  
4. 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 Restrike 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 impulsor 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 the ignitor manufacturer. When using impulsor type ignitors, longer cable lengths between ballast and lamp are normally permissible. Limits for particular ignitors are available 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 (µF) | 10 | 11 | 13  | 22  | 33  | 50  | 60  |

## GE Consumer & Industrial Lighting

# Lucalox™ XO

## X-tra Output (XO) High Pressure Sodium Lamps with improved reliability

### Lucalox™ XO Clear Tubular

50W, 70W, 100W, 150W, 250W, 400W & 600W

### Lucalox™ XO Diffuse Elliptical

100W, 150W, 250W & 400W



#### • Superb Performance and Longer Life

- GE's sodium resistant ceramic slows voltage rise, to give a rated average life up to 32,000 hours
- rugged monolithic arc tube, with GE Reliable Starting Technology, for higher reliability

#### • High Xenon-Fill gas delivers:

- High luminous efficiency, up to 150 lm/W
- Extra light, up to 20% more lumens than Standard High Pressure Sodium Lamps — without increase in energy consumption.
- More resistant to mains voltage fluctuations

#### • Zirconium gettering system for improved lumen maintenance

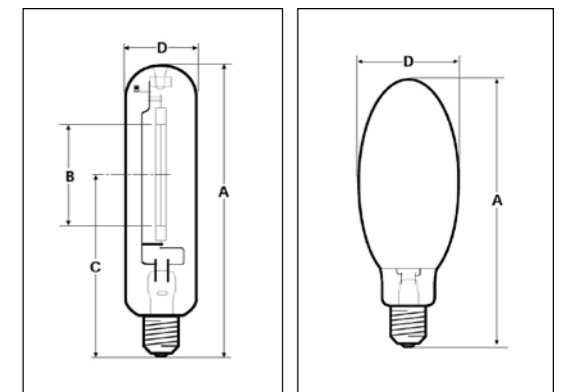


Figure 1.

Figure 2.

## Applications

### Traffic Lighting

- Main streets & pedestrian areas
- Street crossings
- Arterial roads & motorways
- Canals, locks
- Squares & bridges

- Railway yards
- Tunnels & subways
- Airports, aprons
- Sidestreets

- Ports & piers
- Pedestrian crossings
- Refineries

### Industrial Installations

- Factory yards
- Parking lots
- Electrical plants
- Shipyards

## Physical Data

| Watts   | A Length (mm) | B Arc Gap (mm) | C LCL (mm) | D Diameter (mm) | Cap    | Bulb | Mass Weight (g) | Operating Position | Minimum starting Temp. | Product Code |
|---|---------------|----------------|------------|-----------------|--------|------|-----------------|--------------------|------------------------|--------------|
| Lucalox™ XO — X-tra Output Clear Tubular — Figure 1.      |               |                |            |                 |        |      |                 |                    |                        |              |
| 50  | 156           | 30             | 102        | 39              | E27    | Soft | 65              | Universal          | -40°C                  | 93373        |
| 70  | 156           | 38             | 102        | 39              | E27    | Soft | 65              | Universal          | -40°C                  | 93375        |
| 100   | 211           | 44             | 132        | 48              | E40/45 | Hard | 140             | Universal          | -40°C                  | 93376        |
| 150   | 211           | 58             | 132        | 48              | E40/45 | Hard | 150             | Universal          | -40°C                  | 93377        |
| 250   | 260           | 67             | 158        | 48              | E40/45 | Hard | 155             | Universal          | -40°C                  | 93378        |
| 400   | 292           | 87             | 175        | 48              | E40/45 | Hard | 175             | Universal          | -40°C                  | 93269        |
| 600   | 292           | 117            | 170        | 48              | E40/45 | Hard | 180             | Universal          | -40°C                  | 93270        |
| Lucalox™ XO — X-tra Output Diffuse Elliptical — Figure 2. |               |                |            |                 |        |      |                 |                    |                        |              |
| 100   | 186           | -              | -          | 76              | E40/45 | Hard | 140             | Universal          | -40°C                  | 93379        |
| 150   | 227           | -              | -          | 91              | E40/45 | Hard | 175             | Universal          | -40°C                  | 93380        |
| 250   | 227           | -              | -          | 91              | E40/45 | Hard | 195             | Universal          | -40°C                  | 93381        |
| 400   | 292           | -              | -          | 122             | E40/45 | Hard | 250             | Universal          | -40°C                  | 93296        |



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## Photometric Data

| Watts   | 100 Hr. Lumens | Colour Temp. (K) | Colour Rendering (CRI Ra) | Chromaticity Coordinates |       | Properties DIN 5035 Class |
|---|----------------|------------------|---------------------------|--------------------------|-------|---------------------------|
|   |                |                  |                           | x                        | y     |                           |
| Lucalox™ XO — X-tra Output Clear Tubular— Figure 1.       |                |                  |                           |                          |       |                           |
| 50  | 4400           | 2100             | 25                        | 0.530                    | 0.430 | 4                         |
| 70  | 6600           | 2100             | 25                        | 0.530                    | 0.430 | 4                         |
| 100   | 10500          | 2100             | 25                        | 0.537                    | 0.417 | 4                         |
| 150   | 17500          | 2100             | 25                        | 0.535                    | 0.420 | 4                         |
| 250   | 33000          | 2100             | 25                        | 0.531                    | 0.417 | 4                         |
| 400   | 56500          | 2100             | 25                        | 0.537                    | 0.428 | 4                         |
| 600   | 90000          | 2100             | 25                        | 0.527                    | 0.427 | 4                         |
| Lucalox™ XO — X-tra Output Diffuse Elliptical — Figure 2. |                |                  |                           |                          |       |                           |
| 100   | 10000          | 2100             | 25                        | 0.537                    | 0.417 | 4                         |
| 150   | 16900          | 2100             | 25                        | 0.534                    | 0.420 | 4                         |
| 250   | 31200          | 2100             | 25                        | 0.529                    | 0.417 | 4                         |
| 400   | 54000          | 2100             | 25                        | 0.537                    | 0.428 | 4                         |

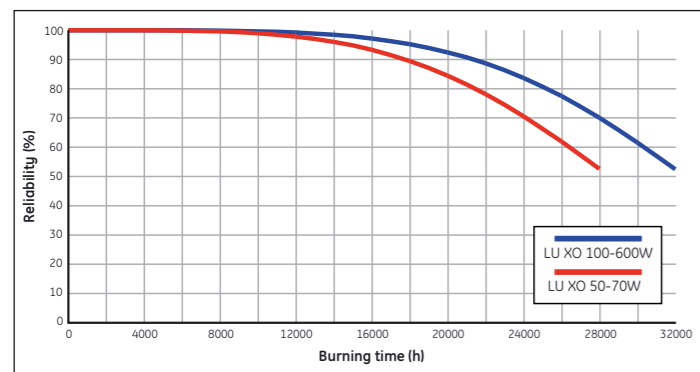
Photometric data is quoted in a horizontal orientation operating from a nominal ballast at rated supply volts.

## Lamp Survival and Lumen Maintenance

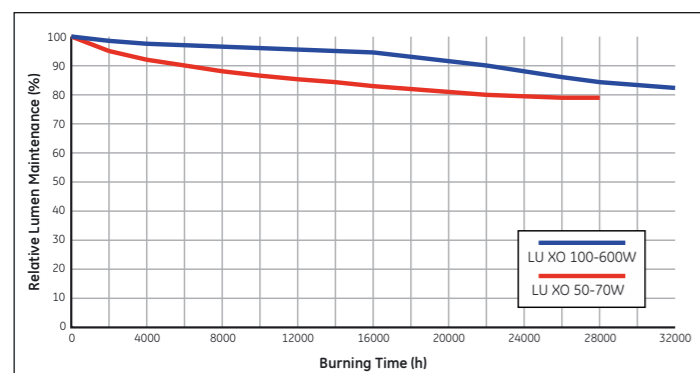
Average lamp life & lumen maintenance is based on laboratory tests of a large number of representative lamps under controlled conditions, including operation at 11 hours per start on ballasts having specified electrical characteristics. The following conditions can reduce average lamp life and lumen maintenance:

- frequent on/off switching
- high line voltage
- excessive vibration
- high ambient temperature within the fixture
- ballast and ignitor characteristics.

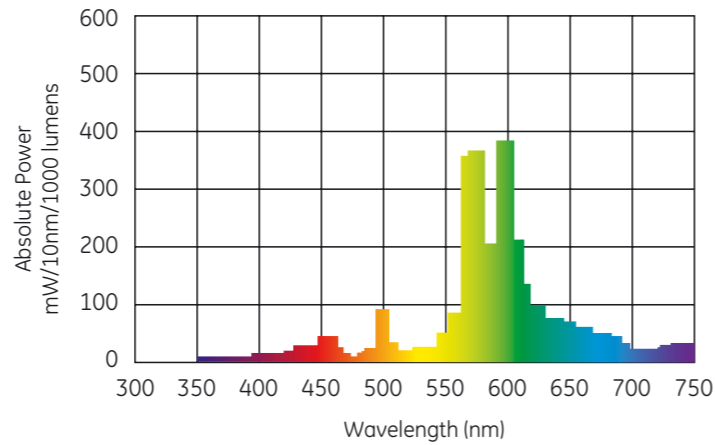
Lamp Survival



Lumen Maintenance



## Spectral Power Distributions



## 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.

| Watts                                       | Volts ±15 (V) | Current (A) | Power (W) | Current Crest Factor |
|---|---------------|-------------|-----------|----------------------|
| Lucalox™ XO—X-tra Output Clear Tubular      |               |             |           |                      |
| 50  | 85            | 0.76        | 50        | 1.80                 |
| 70  | 90            | 0.98        | 70        | 1.80                 |
| 100   | 100           | 1.2         | 100       | 1.80                 |
| 150   | 100           | 1.8         | 150       | 1.80                 |
| 250   | 100           | 2.9         | 250       | 1.80                 |
| 400   | 100           | 4.5         | 400       | 1.80                 |
| 600   | 112           | 6           | 600       | 1.80                 |
| Lucalox™ XO—X-tra Output Diffuse Elliptical |               |             |           |                      |
| 100   | 100           | 1.2         | 100       | 1.80                 |
| 150   | 100           | 1.8         | 150       | 1.80                 |
| 250   | 100           | 2.9         | 250       | 1.80                 |
| 400   | 100           | 4.4         | 400       | 1.80                 |

## Run-Up Characteristics

The graph shows typical run-up characteristics for a 150W Lucalox™ XO 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) | 3  | 5  | 3.5 | 3.5 | 3   | 5   | 4   |

## Hot Restrike Time

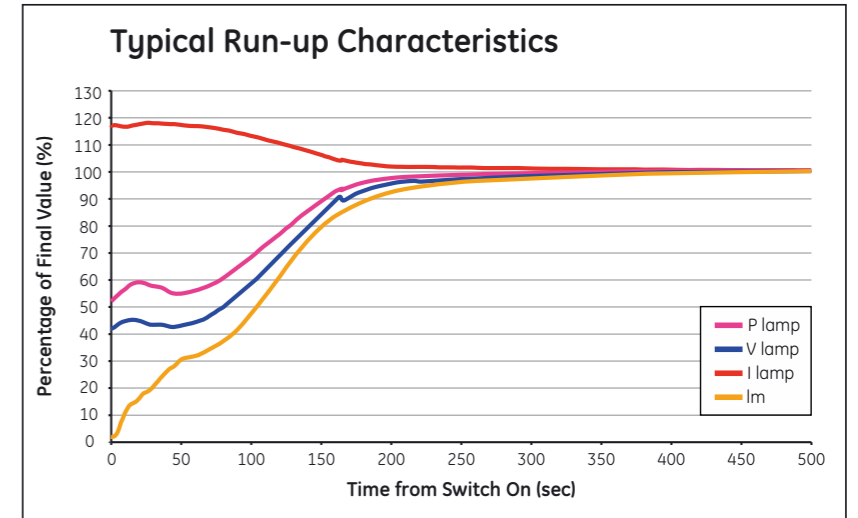
All ratings restrike within 4 minutes. This occurs when the lamp has cooled to a temperature at which the starting aid can re-establish the arc. The new solid state starting aid is integrally bonded to the arc tube for shorter restrike time, and improved reliability — no moving parts or welds.

## 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. 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.

## 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.



Effect of Supply Voltage Variations on Performance

