Photosynthesis
Light for Horticulture
Horticulture Lamps

Lighting for growth
Lamps and lighting for horticulture

Properly balanced blue and red colours to optimise growth

Improves the yield and quality of greenhouse crops

Specially developed for horticulture

More PAR on average compared to standard HPS

Stable PAR performance

Wide range 250–750W
Growers of food plants find artificial light just as important as it is for flowering plants. GE’s specially-developed range of horticultural lamps enable growers to use artificial lighting to improve the yield and quality of greenhouse crops and time growth to meet market demands.

Light output and lumen maintenance on their own are not enough to create plant growth. Plants require a certain radiation level to help with the photosynthesis that enables them to grow, and other factors such as day length also play an important part. Photosynthetically Active Radiation (PAR), measured in micromole/sec, is essential for plant growth. Lucalox™ Photosynthesis Lamps (PSL) are high pressure sodium lamps with a spectrum that gives the best possible PAR, with stable lumen and micromole maintenance, in a greenhouse lighting regime.

Lucalox™ PSL lamps are available in 230V with 250W, 400W and 750W options, and in 400V with 600W, 750W.
Lucalox™
*PhotoSynthesis Lamp (PSL) range*

GE’s range of horticultural lamps has been extended with the addition of 600W electronic product, so the range now spans 250-750 watts with 230 and 400 volt options, to suit both OEMs and growers.

**NEW PRODUCT**

600W 400V Electronic PSL
- High initial mean PAR 1120µMol
- Long service life of 12,000 HOURS (B10)
PSL technology

Performance and reliability
- GE’s advanced sodium resistant ceramic helps eliminate early failures to give a rated service life of 10,000 to 12,000 hours for Lucalox™ PSL products.
- In order to achieve maximum performance, GE recommends lamp replacement when the Rated Service Life is reached.
- The lamps use extra rugged monolithic arc tubes equipped with GE Reliable Starting Technology which provides continuous high performance.

High xenon-fill gas
- Extra light and PAR (Photosynthetically Active Radiation) output.
- More resistance to mains voltage fluctuations.

Zirconium gettering system
- Improves PAR maintenance that drives constant and uniform plant growth.
- The diameter of the frame wire in the lamp has been minimised to reduce shading in the installation without affecting the robustness of the lamp.
- Monolithic arc tube construction for durability and lumen maintenance.

Photosynthetically Active Radiation to extend daylight
The effect of optical radiation on plants has been studied extensively. Generally, photons emitted in the spectral region of 400-700nm are particularly effective. Therefore the simple measurement of the quantity of light [Lux] is not sufficient for the horticultural market. Photosynthetically Active Radiation (PAR) and Photosynthetic Photon Flux (PPF) are more useful measurements.

PPF is defined as flux of the photons emitted in the 400-700nm wavelength range by the light source. It is expressed in micromoles/second (μmol/s), where 1 micromole means $6 \times 10^{17}$ photons.

The Lucalox™ PSL range from GE has optimised spectra for greenhouse use, with an enhanced red portion of the light output.
- Plants can be used over a longer period
- In winter, fruit can be produced with taste to match summer fruit
- Production can start earlier
- Year-round cultivation is possible

Spectral range
Plants respond to light of varying colour. In general, red light causes plants to become tall and “leggy” while blue light, when used alone, can cause low, stocky growth. A proper balance of red and blue energy produces plants that have normal growth and shape.
Day and night
Photoperiodism

The relative length of day and night and the seasons is important to plants. The number of hours of darkness in a 24-hour cycle is an important factor in determining blossoming and growing time.

Night length triggers seed germination, tuber and bulb formation, and other growth characteristics such as colour, enlargement of leaves and stem size and shape. This rhythmic characteristic is called photoperiodism and is of great value to growers.

Plants can be classified according to photoperiodicity.

**Short day (long night)**

The perennial Chrysanthemum and the Poinsettia, which flower in the autumn, are examples of short-day (long-night) plants. They fail to flower when the day length, or period of light, is extended beyond a critical value.

**Long day**

Long-day plants, such as the China Aster and Tuberous Rooted Begonia, flower only with a day length longer than a critical value.

**Day neutral**

Day-neutral plants, such as the Rose and Carnation, are not limited by photoperiod.

Understanding these principles enables commercial growers to use artificial light profitably, so that flowering and vegetable harvesting can be timed for markets.

Timing

**Slow down**

The *Perennial Chrysanthemum* is a short-day length plant that will not flower when the day is long (short-night). To postpone flowering Chrysanthemum growers, instead of lengthening the day, interrupt the night for about four hours. This makes the night appear short to plants, which then continue to grow vegetatively instead of starting to flower.

A more economical method of postponing flowering of Chrysanthemums is to apply cycles of light, switching light on for 10 minutes and off for 50 minutes, for four hours during the night, instead of applying light continuously. This is cyclic lighting. It is an effective way of growing flowers. If lighting levels are higher then the grower will see better stem and flower quality and less opportunity for disease.

**Speed up**

The *China Aster* is a typical long-day (short-night) plant. Long-day plants can be brought to flower ahead of the normal time by lengthening the day. Relatively low intensities of light are enough to induce flowering, when applied early in the morning or at the end of the day. A dark-period interruption - from a few minutes to a few hours - as with other long-day plants, effectively induces flowering just as it inhibits flowering of short-day plants.

*Poinsettias* must have complete and continuous darkness for about 12 hours a day in order to flower. Even 1 minute of light in the middle of the dark period will prevent their flowering.

*Tuberous Begonias* flower only when daily dark periods are short - less than 12 hours - but they require long dark periods for best production of tubers. Flowering of tomatoes, however, is not influenced by photoperiod.
Setting the clock

Add
Use Lucalox™ PSL as an additional daytime source of light, boosting existing light levels and aiding photosynthesis.

Extend
Use Lucalox™ PSL as a means of extending the growth time per day. Lights can be switched on at dusk or other non daylight hours.

Extend
Use Lucalox™ PSL as an extension to the growing season through usage during the winter months.

Substitute
Use Lucalox™ PSL as a complete natural light substitute for total environmental control in growing rooms and biological research establishments.

Plant colour and leaf formation
Photoperiod also influences plant responses such as colour and formation of the leaves.

Coleus, for example, under continuous lighting, produces dark red leaves with bright green edges. Less than 10 hours of light per day results in less sturdy plants and paler colours. The tulip bulb is the main source of food reserve, and the light is needed mainly to develop the plants’ green colour. Stems attain their greatest length if grown under lighting.
Guaranteed
GE is constantly engaged in a global quality process. A statistical quality system, designated SIX SIGMA, is applied in all areas of the company from manufacturing through to sales. The lamps comply with the IEC/EN 62035 standards.

GE offers warranties to distributors of its Lucalox™ PSL lamps. The warranty comprises two parts:

- Warranty on lamp reliability (Lamp Survival).
- Warranty on PAR (Photosynthetically Active Radiation) maintenance.

Reliable performance
While light quality is paramount, reliability and performance have also been key factors in the development of the Lucalox™ PSL lamp range.

Robust construction, reliable starting technology and improved lumen maintenance ensure peace of mind against early lamp failures and provide the consistency demanded for perfect growing conditions.
Single ended 230V

230V 250W
Lamp volts: 115V
Current: 2.7A
Watts: 250W
100 h lumens: 33,000
100 h PAR: 430 μmole/sec
Packing: 12 or 63

230V 400W
Lamp volts: 110V
Current: 4.3A
Watts: 420W
100 h lumens: 56,500
100 h PAR: 710 μmole/sec
Packing: 12 or 63

230V 600W
Lamp volts: 115V
Current: 6.0A
Watts: 615W
100 h lumens: 90,000
100 h PAR: 1080 μmole/sec
Packing: 12 or 63

230V 750W
Lamp volts: 115V
Current: 7.4A
Watts: 755W
100 h lumens: 112,000
100 h PAR: 1320 μmole/sec
Packing: 12 or 63

Single ended 400V

400V 600W
Lamp volts: 200V
Current: 3.6A
Watts: 620W
100 h lumens: 85,000
100 h PAR: 1120 μmole/sec
Packing: 12 or 63

400V 600W EL
Lamp volts: 200V
Current: 3.6A
Watts: 620W
100 h lumens: 85,000
100 h PAR: 1120 μmole/sec
Packing: 12 or 63
(Electronic ballast)

400V 750W
Lamp volts: 205V
Current: 4.4A
Watts: 765W
100 h lumens: 104,000
100 h PAR: 1390 μmole/sec
Packing: 12 or 63

Special purpose lamps.
Not suitable for household illumination.
Product identification

The following glossary of terms will help you when selecting lamps in this section. Within each product line, lamps are divided into families – within these families, lamps are listed by wattage. The Product Description can be used as a quick reference to each product’s attributes. Where Life or Average Life are stated we refer to the industry standard definition of how many hours of operation 50% of a given installation will exceed.

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Dimension details

- D: Diameter [mm]
- B: Arc gap [mm]
- A: Max Length A [mm]
- C: LCL [mm]
- D: Diameter D [mm]
- Cap: Operating position
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* Depending on system conditions, lamp power can vary by ±2.5%
** Electronic ballast

### Brand cross reference

The following table shows GE and alternative brand Product Descriptions. These cross references are provided as a quick guide and may only represent a near equivalent to other brands. The table contains data from alternative brands' catalogues and website.

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