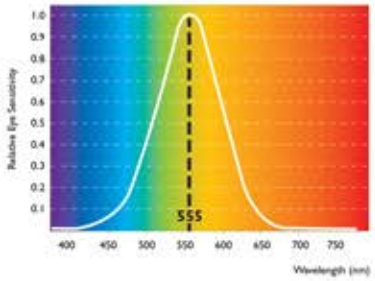
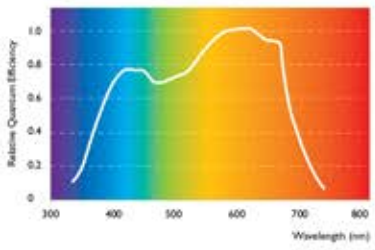
Philips Horticulture Lamps

The role of light in the growth and development of plants.

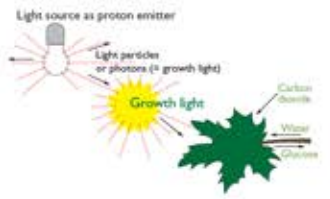
Light sensitivity curve of the human eye



Light sensitivity curve of plants



Photosynthesis process



Plant growth (photosynthesis) is not then determined by lux or energy, but by the photons from the blue to red (400–700 nm) part of the spectrum. This is called growth light!

For the human eye, light is the visible part of electromagnetic radiation. Most lighting products are developed for human application. For these purposes, the intensity of visible light is expressed in lux. Lux is a photometric unit and is based on the average sensitivity of the human eye.

The sensitivity is maximized at green/yellow (555nm) and declines towards longer (red) and shorter (blue) wavelengths. A lux meter is corrected for this specific eye sensitivity.

For horticulture, natural daylight (global radiation) is in most cases measured in terms of energy (J or W) with a solar meter. This meter is generally positioned on top of the greenhouse. The value of global radiation is important for climate and humidity control in the greenhouse.

Growth Light

Plants have a completely different sensitivity for colors of light than the human eye. For plant growth, it is important to define light as small light particles, also called photons or quantum. The energy content of photons is different depending on wavelength (color of light). For one W of energy, almost twice as many red photons can be produced compared to blue. In addition to this, plants are most efficient using the red part of the light and less efficient using the green and blue part. In fact, we are dealing with a plant sensitivity curve for growth light.

Micromol and PPF

Research, both at universities and applied research stations, has demonstrated that the rate of photosynthesis is determined by the amount of photons between 400–700 nm. In scientific terms, this growth light is called Photosynthetic Photon Flux (PPF) and is the only reliable measure to clarify if a light source is suitable for photosynthesis. The higher the PPF value per Watt, the more efficient the light source for plant growth. This is the reason why Philips specifies the PPF value in micromols per second (µmol/s) for all its light sources for horticultural use. Philips Green Power and Agrolite XT lamps are specially developed for maximum growth light and for this reason, are among the most efficient light sources available for horticulture.

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Supplementary lighting

There are several ways in which artificial light can be used to improve and accelerate growth and extend the growing season of commercial crops:

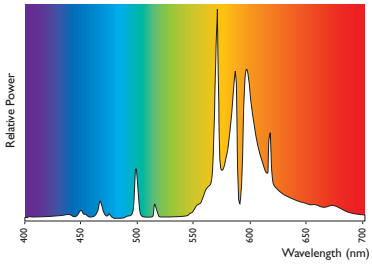
1. To supplement natural daylight and raise growth light levels in order to enhance photosynthesis and thereby improve growth and quality of plants in greenhouses (supplemental growth light)
2. To control the light period by extending the natural day length with artificial light (photoperiodic lighting)
3. To totally replace daylight with artificial light for ultimate climate control (cultivation without daylight)

Horticulture Lamps—High Pressure Sodium Lamps For Plant Growth

- Ideal for growing vegetables and flowers
- Supplements daylight in greenhouses with "growth-light"
- "Growth-light" output is best measured by PPF (Photosynthesis Photon Flux)—micromol value*

Philips Agrolite XT High Pressure Sodium Lamps[5, 6, 7, 8, 9, 12, 13]

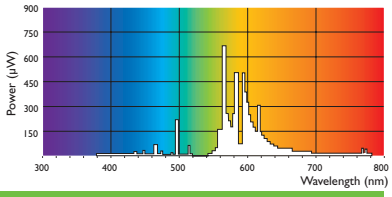
- Enhanced spectrum Xtreme grow lamp offers 22% more micromols*
- Excellent lumen and growth light maintenance at 97%[1] safeguards a constant crop quality and quantity over life
- Ceramic discharge tube with PIA technology, simple and robust construction for reliable lifetime
- Features ALTO® Lamp Technology, environmentally responsible lamps.



Product Number	Ordering Code	Nom. Watts	Bulb	Base	Std. Pkg. Qty.	ANSI Ballast Code	LCL (In)	MOL (In)	CCT	Rated Avg. Life (Hrs)[2]	Approx. Initial Lumens[3]	Approx. Mean Lumens[3,4]	PPF* (µmol/sn)
14064-0	C1000S52/AGROLITE XT	1000	E-25	E39	6	S52	8.75	15.06	2100K	15,000	146,000	135,780	1850

Philips GreenPower High Pressure Sodium Lamps

- High lumen and growth light maintenance safeguards a constant crop quality and quantity over life
- Ceramic discharge tube with PIA technology for long and reliable lifetime
- Simple and robust construction for enhanced reliability and longer life



Product Number	Ordering Code	Nom. Watts	Bulb	Base	Std. Pkg. Qty.	ANSI Ballast Code	LCL (In)	MOL (In)	CCT	Rated Avg. Life (Hrs)[2]	Approx. Initial Lumens[3]	Approx. Mean Lumens[3,4]	PPF* (µmol/sn)
40487-1	SON-T PIA Grn Pw/400W	400	T-15	E39	12	S51	6.65	11.14	2100K	24,000	58,500	52,650	725
40488-9	SON-T PIA Grn Pw/600W/230V	600	T-15	E39	12	S106	6.65	11.14	2100K	18,000	88,500	84,100	1150
40489-7	SON-T PIA Grn Pw/600W/347V	600	T-15	E39	12	S106	6.65	11.14	2100K	18,000	88,000	83,600	1150
40490-5	SON-T PIA Grn Pw/600W/480V	600	T-15	E39	12	S106	6.65	11.14	2100K	18,000	88,000	83,600	1150

Philips SON Agro[6, 8, 10, 11, 13]

Product Number	Ordering Code	Nom. Watts	Bulb	Base	Std. Pkg. Qty.	ANSI Ballast Code	LCL (In)	MOL (In)	CCT	Rated Avg. Life (Hrs)[2]	Approx. Initial Lumens[3]	Approx. Mean Lumens[3,4]	PPF* (µmol/sn)
31710-7	SON AGRO 430W	430	ED-18	E39	12	S145/S51	5.75	9.75	2100K	16,000	54,000	48,600	670

Note: Best practice suggests grow lamps to be replaced at maximum 40% of their rated average life in order to maintain same level of growth-light on plants over time.

* The micromol value expresses the amount of light particles (photons) between 400 and 700 nm that are sent out by a light source (=Photosynthetic Photon Flux) per second. The amount that the plant absorbs determines the rate of photosynthesis and as a result the rate of plant growth. Therefore, the micromol value is also called "growth-light." In general, an increase of 22% in plant growth means an increase of 22% in plant growth.

1) 97% Lumen maintenance at 10% of rated average life. 93% lumen maintenance at 40% of rated average life.

2) Rated average life is the life obtained, on average, from large representative groups of lamps in laboratory tests under controlled conditions at 10 or more operating hours per start. It is based on survival of at least 50% of the lamps and allows for individual lamps or groups of lamps to vary considerably from the average.

3) Measured at 100 hrs. life. Approximate lumen values listed are for vertical and horizontal operation of the lamp.

4) Approximate lumen output at 40% of lamp rated average life.

5) Electrically insulated support for bulb may be required, especially in horizontal and nearly horizontal operating positions.

6) Follow fixture manufacturer recommendations regarding proximity of ballast to bulb.

7) This lamp should be shielded from moisture to prevent breakage.

8) Fixtures should be designed so that sockets and wiring withstand starting pulse up to 5000 volts for 1000 watts and WHITE SON® types and 4000 volts for other sizes.

9) For use in fixtures which do not redirect a substantial portion of the energy toward the arc tube; otherwise very early failure is anticipated.

10) Operates at rated output on ANSI 430W S145 SON AGRO ballasts.

11) UV filtered design (FadeBlock™).

12) Nickel plated brass base.

13) Heat resisting glass bulb.

Please contact Advance Transformer Company for information on ballast requirements: **www.advancetransformer.com

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