



Growing your profits

Horticultural lighting

PHILIPS

Contents

- 2-3 The essence of good lighting
- 4-7 Artificial lighting
- 8-9 Translating knowledge into products
- 10 GrowthLight maintenance and lamp life
- 11-21 Product datasheets
- 22 Product-system matrix and Cross reference table



The essence of good lighting

Light is essential for plant growth. Natural sunlight is the cheapest source available but for horticulture it is not always available in sufficient quantities. Especially in regions between 40 and 80 degrees latitude the amount of daylight required for good plant growth is limited during the winter. Therefore, during this period, the use of artificial light has become very common in greenhouses to increase production and quality.

Horticultural lighting and Philips

Philips has been developing light sources for horticulture for many years already. For a deeper understanding of what is required in the greenhouse Philips has close contact with commercial growers. In order to meet these specific requirements we have our own laboratories and test stations and, to further advance our overall knowledge, we contribute to independent research and field testing. This approach has led to the development of no-fuss, highly efficient lamps which have been tailor-made for you.

The role of light

The amount of natural light (global radiation) is in most cases measured in terms of energy (J or W) with a solar meter. Plants use

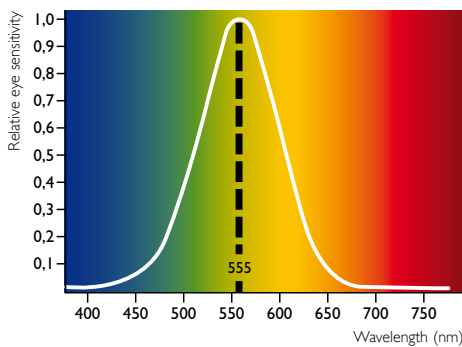
a relatively small part of this radiation for growth and this we call GrowthLight. The majority of the radiation is heat. When you use supplemental light to enhance plant growth, you need to ensure that the lamps are highly efficient at producing GrowthLight, and are not, for example, mostly producing heat.

As evidence mounts that artificial light can increase productivity, more and more growers are turning to artificial light. It is already very commonly used in ornamental crops such as roses, chrysanthemums and lilies and is now increasingly used for vegetables such as tomatoes, cucumber, sweet pepper and lettuce. It is expected that in the future its use will be extended to cover a much wider range of crops.



GrowthLight

Light is, for the human eye, the visible part of electromagnetic radiation. Most products for lighting are developed for human applications. 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.

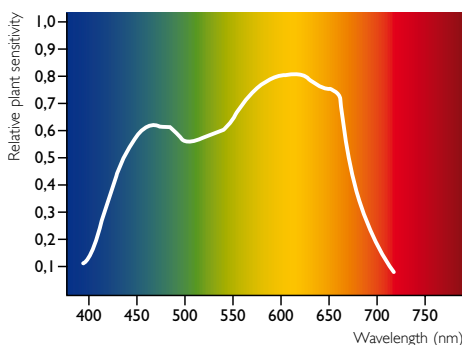


Light sensitivity curve of the human eye

This sensitivity is maximal at green/yellow (555 nm) and is declining towards longer (red) and shorter wavelengths (blue).

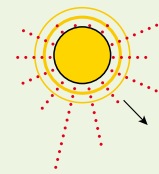
Plants have a completely different sensitivity for light colours than the human eye. For plant growth it is important to define light as small light particles, also called photons or quantum. The energy content of photons is different, depending on wavelength (light colour). For one Watt of energy, almost twice as many red photons can be produced compared with blue. This means that although they still use the green and blue part for growth – or photosynthesis - they use the red part of the light much more efficiently. In fact we are dealing with a plant sensitivity curve for GrowthLight.

So, contrary to common belief, plant growth is not determined by lux or energy, but by photons from the blue to red (400-700 nm) part of the spectrum. This is called GrowthLight!

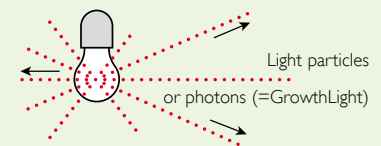


Light sensitivity curve of plants

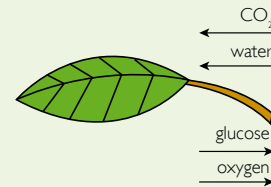
GrowthLight



Light source as GrowthLight



Photosynthesis



Suitability for photosynthesis

Research at universities and applied research stations has demonstrated that the rate of photosynthesis is related to the amount of photons between 400 – 700 nm. This is called 'Photosynthetic Photon Flux' (PPF). It is the only reliable way of measuring 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 why Philips specifies on all his light sources for horticultural use, the PPF value. This is expressed in micromole photons per second ($\mu\text{mol/s}$).

The Philips MASTER GreenPower lamp is specially developed for maximal GrowthLight and has the highest PPF per Watt available for horticulture.



For supplemental GrowthLight applications Philips recommends:

- MASTER GreenPower



Artificial lighting

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

1. To supplement natural daylight and raise GrowthLight levels in order to enhance photosynthesis and thereby improve growth and quality of plants in greenhouses (supplemental GrowthLight).
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).

Philips offers a wide range of lamps for all these horticultural applications.



Figure 1 Supplemental GrowthLight

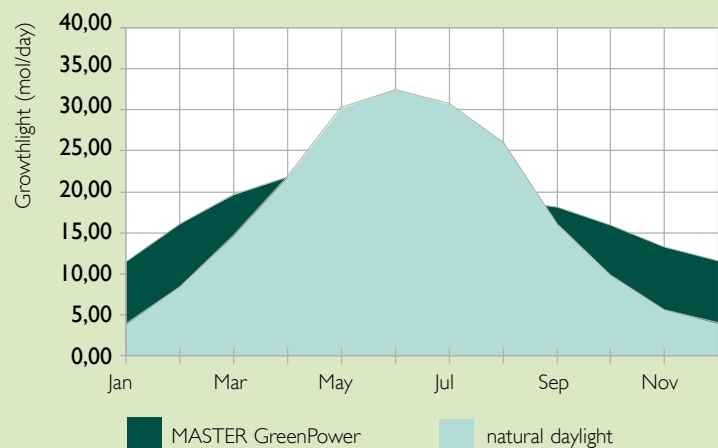


Figure 1 shows an example of how natural daylight is supplemented with MASTER GreenPower during winter. In this example plants are illuminated with $105 \mu\text{mol}/\text{m}^2\cdot\text{s}$ GrowthLight (= circa 8000 lux) during 20 hours/day from November until February. In the remaining lighting period the operating hours is less.

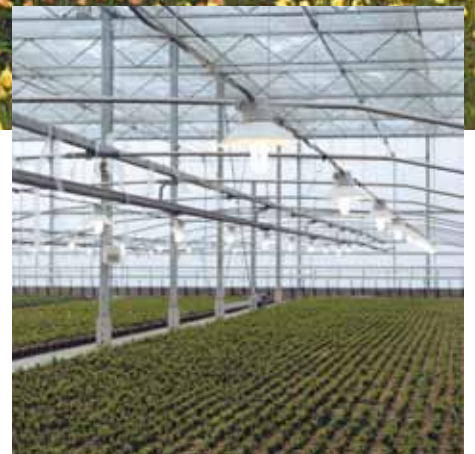
I. Supplemental GrowthLight in greenhouses

The amount of supplemental GrowthLight required very much depends on plant type, desired plant growth and availability of natural daylight. For this reason Philips has designed a tool that calculates how much additional GrowthLight is required in each individual situation. The tool is available at your local Philips office and allows you to calculate the optimal amount of light your greenhouse requires based on your wishes and/or possibilities.

Depending on plant type and desired plant growth for central European conditions, the following supplemental levels are suggested:

1. $15 - 30 \mu\text{mol}/\text{m}^2\cdot\text{s}$ for improving quality, maintenance of the crop and limited production increase;
2. $30 - 45 \mu\text{mol}/\text{m}^2\cdot\text{s}$ for seedlings, growth and production of pot plants;
3. $40 - 100 \mu\text{mol}/\text{m}^2\cdot\text{s}$ for year-round cultivation, for example, of chrysanthemums and roses and multiple layer cultivation;
4. $100 - 200 \mu\text{mol}/\text{m}^2\cdot\text{s}$ for production of plants with high light demand (fruit production of, for example, tomatoes and cucumbers);
5. $100 - 800 \mu\text{mol}/\text{m}^2\cdot\text{s}$ for the production of plants under artificial light alone (for example growth chambers)

In the case of MASTER GreenPower 600W/400V:
 $1 \mu\text{mol}/\text{m}^2\cdot\text{s}$ GrowthLight corresponds to 76 lux.



2. Photoperiodic lighting

For many plants the moment of flowering is determined by the length of the light period. The use of artificial light for control of flowering is called photoperiodic lighting. With this method short-day and long-day plants can be cultivated all year round. For example, very good results have been achieved with photoperiodic lighting of chrysanthemum, euphorbia pulcherrima and kalanchoe as well as with gypsophila and carnations.

The most common ways of influencing the day length are:

- with GrowthLight (also growth takes place during the day prolongation period) or
- with a low dose of light, primary for flower regulation (100 - 400 lux; 2 - 6 $\mu\text{mol}/\text{m}^2\cdot\text{s}$)

For the low dose of light applications Philips recommends:

- Incandescent (SuperluxAgro)
- Compact fluorescent (CFL)



3. Cultivation without daylight

The total replacement of daylight by artificial light is primarily associated with climate controlled rooms. In these applications, it is essential that the spectral composition of the artificial light is balanced for optimal plant development.

For cultivation of plants without daylight Philips offers you three solutions:

- **MASTER HPI-T Plus**

HPI-T Plus lamps have a spectrum closer to daylight, and plants develop very well under this light.

- **A 1:1 mix of 400W MASTER GreenPower and 400W MASTER HPI-T Plus**

This combination of light sources has proven a good lighting solution for several species. Compared with HPI-T Plus lamps, MASTER GreenPower lamps offer a higher efficiency in GrowthLight. The little blue in the spectrum of the MASTER GreenPower is compensated by HPI-T Plus.

- **MASTER TL-D Super 80**

The use of MASTER TL-D Super 80 fluorescent lamps (for example colour 830 and 840) is also a very suitable option.

TL-D Super 80 lamps offer the following advantages:

- Low temperature of the tube. This allows short distance between lamps and plants (around 15 cm) and thus the possibility to grow plants in multiple layers.

TL-D Reflex is particularly suitable for this application.

This tube has an internal reflector that creates an efficient lighting system without the need for an external reflector.

- Dimming is possible. The light output of a high frequency system (TL-D HF) is continuously dimmable between 100% down to approximately 8%. The efficiency of the fluorescent lamp is comparable with that of the HPI-T Plus.



For cultivation without daylight Philips recommends:

- MASTER HPI-T Plus
- Mix of MASTER GreenPower and MASTER HPI-T Plus
- MASTER TL-D Super 80



1:1 mix of MASTER GreenPower and MASTER HPI-T Plus

Translating knowledge into products

Research to improve knowledge is essential. Philips supports several research projects that study the process of plant growth in relation to light. Leading universities in Europe and the USA, together with several growers and luminaire suppliers, have helped us to determine the most efficient lighting solution for ornamental crops and vegetables. Our international contacts ensure that our level of expertise is as broad as possible. A number of commercial growers with different crops allow us to test new concepts over lifetime. This approach means that new or adapted light sources are intensively evaluated by international experts as well as being tested in practice.



Light measurement laboratory Philips Turnhout.

This approach has resulted in Philips designing horticultural lamps that offer you:

- Maximal efficiency in GrowthLight
- Maximal output over life time
- Maximal benefit on plant growth
- Minimal early failure.

Light measurements

Philips has its own independently and officially certified light measurement laboratory. This means measurements can be carried out on the performance of our lamps with the highest accuracy. Here we do all measurements on light sources specified in the IEC standards.



85% screen (partially closed) installed to reduce light pollution

Stray light

With the increasing use of artificial light in greenhouses, stray light that reflects back out of the greenhouse, is becoming an environmental and social issue. In order to operate in a socially responsible manner, we recommend a range of technical measures, such as the installation of screens, to reduce this issue. Philips is also taking the issue of stray light into account as it develops new technologies for greenhouse lighting systems in the future.

Philips support

Your local Philips agent can demonstrate the benefits of using Philips MASTER GreenPower and other lamps for several crops.

Website Horticultural Lighting

Detailed information and recommendations about using additional GrowthLight in horticulture can be found on our horticultural website:

www.philips.com/horti

Our customers

It is very important for Philips that you are satisfied with our products. We are developing lamps on the input we get from the market, a policy that has brought us very positive feedback from growers.



Peter Klapwijk, Klapwijk GreenQ by Tomato grower - Monster, the Netherlands
 "A good lamp is determined by yield times lifetime. That automatically leads you to Philips. Our contact is good and that's important, as technical development and optimal plant breeding should go hand in hand."



Sergey Zaguroyko, Flower company Kamelia - Kiev, the Ukraine
 "Cost reduction, increased light output, safety and reliability – we have found it in new luminaries, equipped with 1000W GreenPower lamps."



Johan Prinsen, Tomato and cucumber grower - Pjelas, Finland
 "Thanks to the concept of interlighting I can optimise the growth of my plants. When using Philips GreenPower lamps in combination with the GrowthLight Guarantee Promise, I am ensured of continuous, fast growth."



Lifetime testing at Philips Turnhout

GrowthLight maintenance and lamp life

GrowthLight maintenance

During lamp life the GrowthLight output of most lamps will depreciate, which means that their efficiency for plant growth will become less. Philips tries to optimise the GrowthLight level over the complete service life. With the GreenPower CG lamps we can even offer a virtually constant GrowthLight level. Over the lamp lifetime of 12.000 hours you will get 5% extra GrowthLight (see figure below). This means that you can burn the same hours and reap the rewards of bigger yields. Or you can burn less lamp hours and get the same yield, then pocket the difference in energy savings. Either way, you make more money.

Lamp life

There are various different definitions of the lamp life:

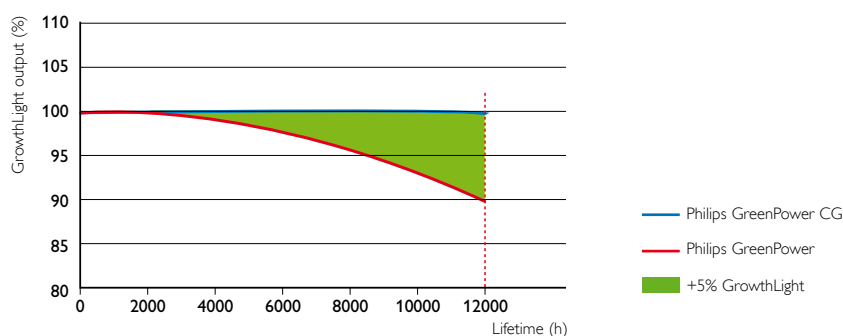
- **Technical lifetime** is the number of hours after which one individual lamp fails. This greatly depends on the practical circumstances, and is therefore of no practical use.
- **Average rated lifetime** is the number of burning hours which have elapsed when 50 per cent of a large batch of lamps have failed. Most lamp manufacturers

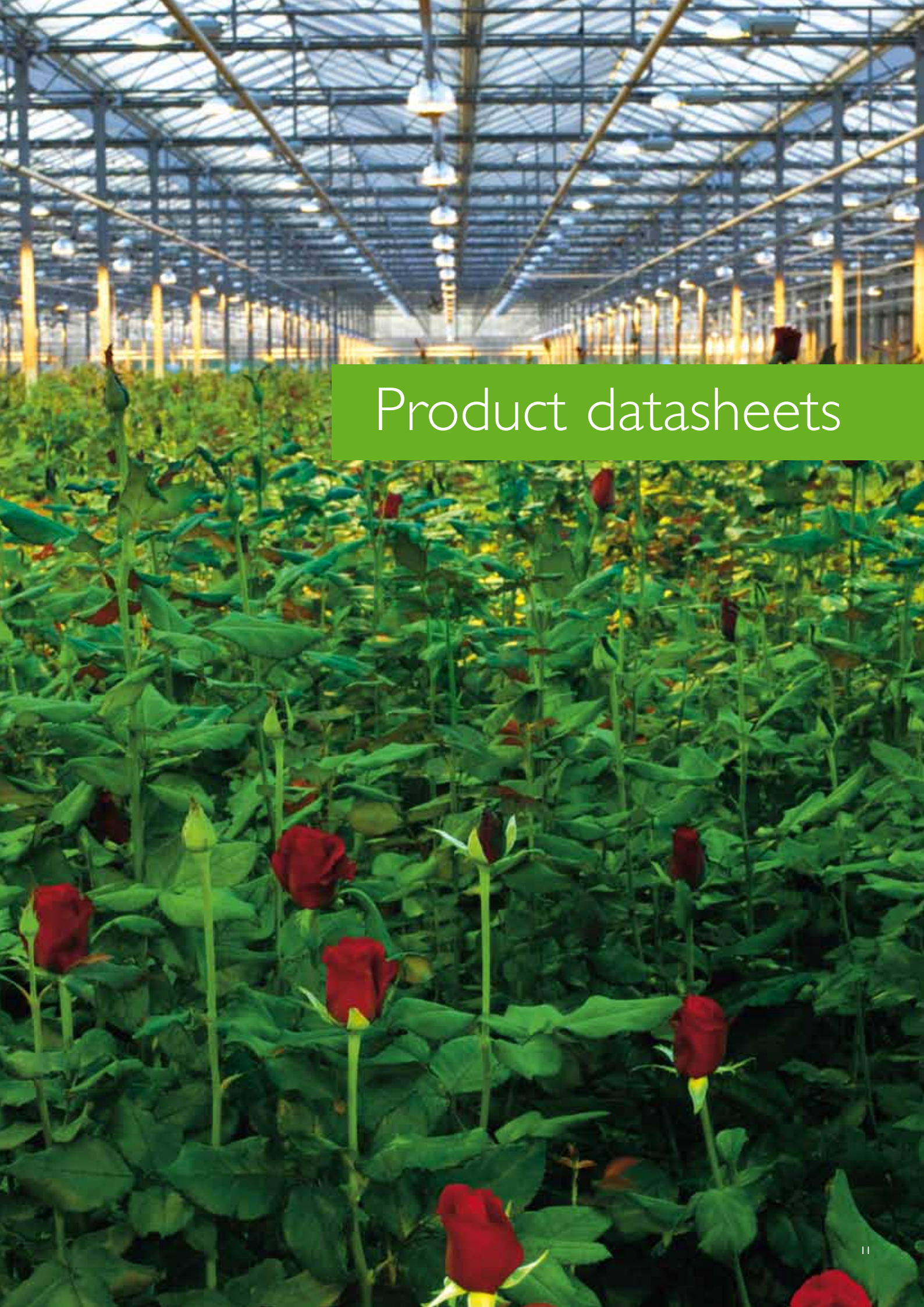
publish this (high!) life-expectancy figure but the figure has no practical use for horticultural lighting with a focus at GrowthLight maintenance.

- **Service lifetime** the number of burning hours over which an installation gives the minimum required amount of GrowthLight. This is the multiplication of the number of lamps that are still burning times the average amount of GrowthLight output per lamp.
- **Guaranteed lifetime** is a certain agreement by contract between the supplier and the user on failure rate and depreciation. The operating conditions are specified in the contract. This lifetime can differ from the concepts of lifetime normally used.

The lifetime published in this brochure is the service lifetime based on a failure rate of virtually 0% and:

- a GrowthLight maintenance of 100% at 12.000 hours for the GreenPower CG 400W and 600W – 230V
- a GrowthLight maintenance > 95% at 10.000 hours for the GreenPower 600W – 400V EM
- a GrowthLight maintenance > 90% at 10.000 hours for the GreenPower 600W and 1000W 400V EL





Product datasheets



MASTER GreenPower CG 400W-600W/230V EM

Lamp

- MASTER GreenPower lamps are High Pressure Sodium Lamps with a ceramic discharge tube, enclosed in a clear tubular outer bulb with virtually constant GrowthLight ($\mu\text{mol/s}$) output.

Features / Benefits

- GreenPower CG results in constant GrowthLight output over service life.
- Ceramic discharge tube with PIA technology for long and reliable lifetime.
- ZrAl getter ensures excellent GrowthLight maintenance over life and fewer premature failures.
- Simple and robust construction for enhanced reliability and longer life.
- Lead free solder.
- Constant GrowthLight results in 5% extra GrowthLight over life: burn the same hours and reap bigger yields, or burn less hours, and save on energy.

Comparison of MASTER GreenPower with MASTER SON-T PIA Plus

- MASTER GreenPower lamps are designed for Constant GrowthLight output over lifetime based on an optimal spectral energy distribution for the light sensitivity curve of plants.
- MASTER SON-T PIA Plus lamps are designed for maximal lumen output over lifetime based on an optimal spectral energy distribution for the light sensitivity curve of the human eye.

Application

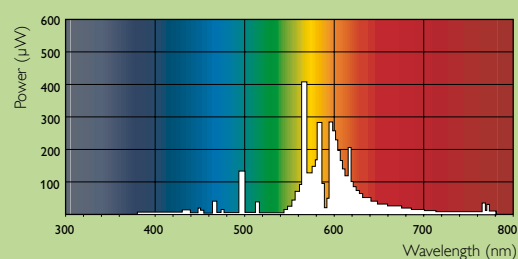
- Supplemental GrowthLight, intended for the stimulation of CO_2 uptake for improved photosynthesis and plant growth.

Gear

- The lamp requires a ballast and ignitor in accordance with the IEC HPS Plus standard.
- We recommend the Philips BSN 400/600 (see page 22).



MASTER GreenPower CG 400W / 600W EM 230V



Product information

	GrowthLight PPF* (initial)	Lifetime	GrowthLight PPF* (12.000 hrs)
MASTER GreenPower CG 400W	725 $\mu\text{mol/sec}$	12.000 hrs	725 $\mu\text{mol/sec}$
MASTER GreenPower CG 600W	1100 $\mu\text{mol/sec}$	12.000 hrs	1100 $\mu\text{mol/sec}$

* PPF information: see page 3



MASTER GreenPower 600W/400V EM

Lamp

MASTER GreenPower lamps are High Pressure Sodium Lamps with a ceramic discharge tube, enclosed in a clear tubular outer bulb with optimised GrowthLight ($\mu\text{mol/s}$) output and maintenance.

Features / Benefits

- GreenPower results in optimised GrowthLight output.
- Ceramic discharge tube with PIA technology for long and reliable lifetime.
- ZrAl getter ensures excellent GrowthLight maintenance over life and fewer premature failures.
- Simple and robust construction for enhanced reliability and longer life.
- Lead free solder.
- High GrowthLight maintenance safeguards a constant crop quality and quantity over life.

Comparison of 400V system with 230V system

- Lower installation cost.
- Very low 3rd harmonic.
- Improved GrowthLight, +4.5%.

Application

- Horticultural lighting, intended for the stimulation of CO_2 uptake for improved photosynthesis and plant growth.

Gear

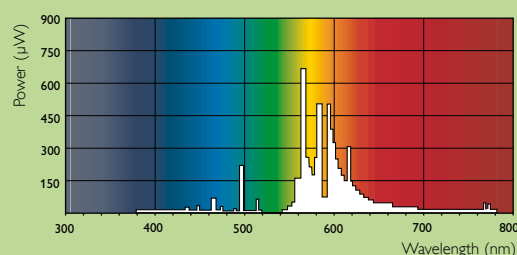
- The lamp requires a ballast and ignitor in accordance with the IEC HPS Plus standard.
- We recommend the Philips BSN 600 (see page 22).

Recommendation lamp replacement

- Luminaire must be disconnected from the mains before lamp replacement because outer ring of the lamp holder is connected to a phase and therefore live.



MASTER GreenPower 600W/400V EM



Product information

	GrowthLight PPF* (initial)	Lifetime	Maintenance (nominal)
MASTER GreenPower 600W/400V EM	1150 $\mu\text{mol/sec}$	10.000 hrs	> 95% at 10.000 hrs

* PPF information: see page 3



MASTER GreenPower 600W EL for 400V electronic systems

Lamp

MASTER GreenPower lamps are High Pressure Sodium Lamps with a ceramic discharge tube, enclosed in a clear tubular outer bulb with optimised GrowthLight ($\mu\text{mol/s}$) output and maintenance.

Features / Benefits

- GreenPower results in optimised GrowthLight output.
- Ceramic discharge tube with PIA technology for long and reliable lifetime.
- ZrAl getter ensures excellent GrowthLight maintenance over life and fewer premature failures.
- Simple and robust construction for enhanced reliability and longer life.
- Lead free solder.
- High GrowthLight maintenance safeguards a constant crop quality and quantity over life.

Comparison of 400V Electronic system with 400V Electro Magnetic system

- Power consumption is considerably reduced: 675W (conventional) to 635W (using electronics)
- Constant Power Factor (PF) of 0.97 during lifetime of the lamp: transformer or power generator used ~ 20% more efficient.
- Electronics compensate for voltage losses in the cabling: all lamps throughout the greenhouse produce the same amount of GrowthLight.

Application

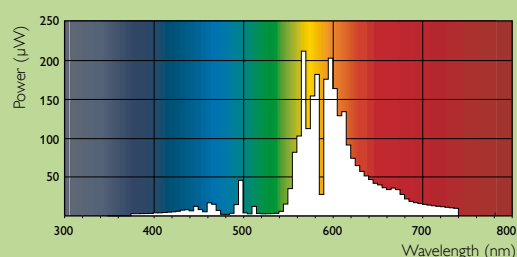
- Horticultural lighting, intended for the stimulation of CO_2 uptake for improved photosynthesis and plant growth.

Gear

- The lamp requires a specific electronic ballast; Philips GreenVision 600W (see page 22).



MASTER GreenPower 600W/400V EL



Product information

	GrowthLight PPF* (initial)	Lifetime	Maintenance (nominal)
MASTER GreenPower 600W/400V EL	1170 $\mu\text{mol/sec}$	10.000 hrs	> 90% at 10.000 hrs

* PPF information: see page 3



MASTER GreenPower 1000W EL for 400V electronic systems

Lamp

MASTER GreenPower 1000W lamps are double ended High Pressure Sodium Lamps with a ceramic discharge tube, enclosed in a clear quartz glass outer bulb with optimised GrowthLight ($\mu\text{mol/s}$) output and maintenance.

Features / Benefits

- GreenPower results in optimised GrowthLight output.
- Ceramic discharge tube with PIA technology for long and reliable lifetime.
- ZrAl getter ensures excellent GrowthLight maintenance over life and fewer premature failures.
- Simple and robust construction for enhanced reliability and longer life.
- High GrowthLight maintenance safeguards a constant crop quality and quantity over life.
- Double-ended to facilitate optimal reflector designs.

Comparison of 400V Electronic system with 400V Electro Magnetic system

- Power losses are considerably reduced: 675W (conventional) to 635W (using electronics)

- Constant Power Factor (PF) of 0.97 during lifetime of the lamp: transformer or power generator used ~ 20% more efficient.
- Electronics compensate for voltage losses in the cabling: all lamps throughout the greenhouse produce the same amount of GrowthLight.

Application

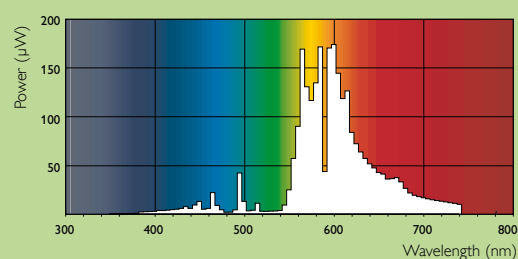
- Horticultural lighting, intended for the stimulation of CO_2 uptake for improved photosynthesis and plant growth.

Gear

- The lamp requires a specific electronic ballast; Philips GreenVision 1000W (see page 22).



MASTER GreenPower 1000W EL



Product information

	GrowthLight PPF* (initial)	Lifetime	Maintenance (nominal)
MASTER GreenPower 1000W/400V EL	1850 $\mu\text{mol/sec}$	10.000 hrs	> 90% at 10.000 hrs

* PPF information: see page 3



GreenVision 600 and 1000W

The GreenVision system has been developed with the growers' main requirements in mind: highest GrowthLight efficiency, high reliability and low energy costs.

But what are the distinctive elements when using electronic drivers?

Mechanical

The PCB with electronic components replaces the traditional copper/iron ballast with ignitor, capacitor and filter coil. It easily weighs 5 kilograms less per system, reducing the load on the greenhouse structure.

Electrical

By using electronics rather than heat-producing ballasts, power losses are reduced considerably. For a 600W/400V system, for example, the power consumption drops from 675W (conventional) to 635W (using electronics).

Furthermore, electronic ballasts have a constant Power Factor (PF) of 0.97, whereas that of conventional gear drops from 0.92 to 0.84 over life. Thanks to the constant PF with electronics, there is only a small difference between the apparent power and the real electric power

consumed, so that the transformer or combined heat and power generator can be used up to 20% more efficiently.

Economical

Electronic ballasts compensate for voltage losses in the cabling. This means that all lamps throughout the greenhouse produce the same amount of GrowthLight. The electronics also protect the lamps against power surges, so you can expect improved lifetime.

The 400V supply voltage results in cheaper lighting systems, because there is no need for a neutral conductor, or for an expensive compensation filter to prevent the network voltage being affected by distortions due to power surges.

Lifetime

Whereas conventional ballasts have a virtually infinite lifetime and a performance that slowly decreases over life, electronic drivers behave in a rather 'digital' manner: they function or not. Every year a small number of drivers will stop. This is different to conventional gear, and something you have to anticipate.



Product information

System	System Power W	Mains V	Freq Hz	Current (nom) A	System Efficacy $\mu\text{mol/W}$
GreenVision 600 W EL 400V	635	400	50	1.66	1.84
GreenVision 1000 W EL 400V	1035	400	50	2.70	1.79



MASTER Agro 400W / 230V

Lamp

MASTER Agro lamps are High Pressure Sodium Lamps with a ceramic discharge tube, enclosed in a clear tubular outer bulb with an increased output of blue light designed for horticultural purposes.

Features / Benefits

- Agro results in extra blue in the spectral energy distribution.
- Ceramic discharge tube with PIA technology for long and reliable lifetime.
- ZrAl getter ensures excellent GrowthLight maintenance over life and fewer premature failures.
- Simple and robust construction enhancing reliability and longer life.
- Lead free solder.
- Especially at lower lighting levels the spectrum of the MASTER Agro lamp will result in a more compact plant development for certain plants and can optimise plant development and quality with good leaf, bloom color and extra branching.

Comparison of MASTER Agro with MASTER GreenPower

- MASTER Agro lamps are designed for applications with low light levels. The extra blue in the spectral energy distribution results in more compact and sturdy plants.
- MASTER GreenPower lamps are designed for optimal GrowthLight output over lifetime based on an optimal spectral energy distribution for the light sensitivity curve of plants.

Application

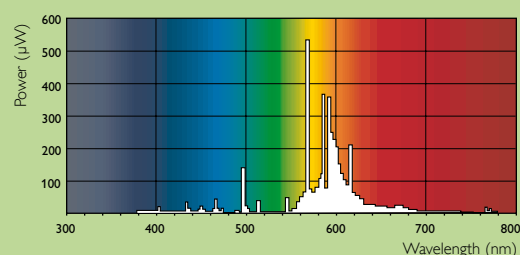
- Horticultural lighting, intended for the stimulation of CO₂ uptake for improved photosynthesis and plant growth.

Gear

- The lamp requires a ballast and ignitor in accordance with the IEC HPS Plus standard.
- We recommend the Philips BSN 400 (see page 22).



MASTER Agro 400W EM 230V



Product information

	GrowthLight PPF* (initial)	Lifetime	Maintenance (nominal)
MASTER Agro 400W	660 µmol/sec	10.000 hrs	> 85% at 10.000 hrs

* PPF information: see page 3



MASTER HPI-T Plus 400W / 230V

Lamp

MASTER HPI-T Plus lamps are Metal Halide Lamps with a quartz discharge tube, enclosed in a clear tubular outer bulb.

Features / Benefits

- 3 band technology resulting in high luminous efficacy, both initially and over long lifetime.
- 3 band technology resulting in high color stability for stable plant growth over lifetime.
- Runs both on HPI gear and for higher GrowthLight output on SON gear.
- Minimal maintenance cost.
- Initial investment saving options when run on SON ballast resulting in higher GrowthLight output.

Applications

- Horticultural lighting, intended for the stimulation of CO₂ uptake for improved photosynthesis and plant growth.
- Horticultural applications with low levels of daylight in combination with SON lamps.
- Horticultural applications without daylight like growing chambers.

Gear

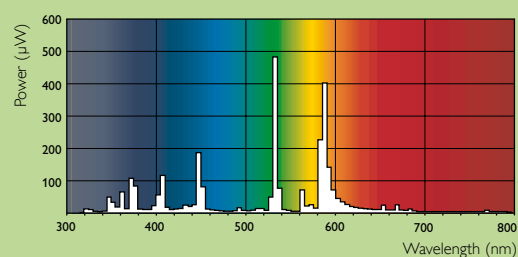
- Can be run on HPI gear as well as SON gear, resulting in different light output and color temperature.
- We recommend the Philips BSN 400 (see page 22).

Recommendation lamp usage

- Luminaire with protective front glass is required.



MASTER HPI-T Plus 400 W 230 V



Product information

	GrowthLight PPF* (initial)	Lifetime	Maintenance (nominal)
MASTER HPI-T Plus (on SON gear)	530 µmol/sec	7.000 hrs	> 75% at 7.000 hrs
MASTER HPI-T Plus (on HPI gear)	420 µmol/sec	7.000 hrs	> 75% at 7.000 hrs

* PPF information: see page 3



MASTER TL-D Reflex Super 80

Lamp

- MASTER TL-D Reflex lamps are fluorescent lamps with an internal reflector to concentrate the lamplight in the direction in which it is needed.

Features / Benefits

- Internal reflector with an opening angle of 160° increases the light intensity by 60%.
- High GrowthLight maintenance.
- MASTER TL-D Reflex lamps are 100% retrofit with all TL-D lamps with similar wattage.
- Recyclable; mercury, phosphor and glass can be re-used in production of new TL-D lamps.

- Lower initial investment because of built in reflector.
- Internal reflector reduces used space in multi layer cultivation.
- Light output is hardly affected in environments subject to dust accumulation due to internal reflector.

Comparison of MASTER TL-D Reflex with standard TL-D

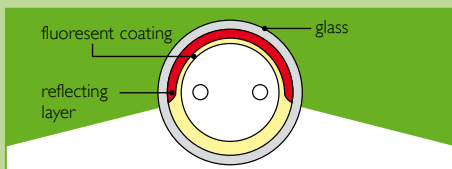
- Up to 60% higher light output resulting in higher yield for existing installation or less battens for new installations.
- 60% longer service lifetime reduces the maintenance and relamping cost.

Applications

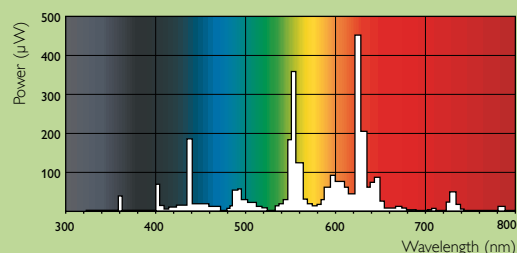
- Cultivation of plants without daylight.
- Growth chamber or cabinet with possibility to grow plants in multiple layers.

Gear

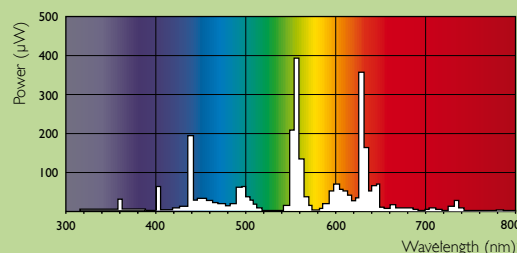
- Operates both on conventional but preferably on HF control gear.
- We recommend the Philips HF-P (see page 22).



MASTER TL-D Reflex/830



MASTER TL-D Reflex/840



Product information

	GrowthLight PPF* (initial)	Lifetime	Maintenance (nominal)
MASTER TL-D Reflex Super 80 36W	47 µmol/sec	12.000 hrs	> 90% at 12.000 hrs
MASTER TL-D Reflex Super 80 58W	73 µmol/sec	12.000 hrs	> 90% at 12.000 hrs

* PPF information: see page 3



MASTER TL-D Secura Super 80

Lamp

- MASTER TL-D Secura lamps are fluorescent lamps with an external transparent protective coating.

Features / Benefits

- Protective coating safely retains all glass and other lamp components if the lamp breaks.
- Easily identified by a blue ring at the end of the lamp.
- High GrowthLight maintenance.
- MASTER TL-D Secura lamps are 100% retrofit with all TL-D lamps with similar wattage.
- Recyclable; mercury, phosphor and glass can be re-used in production of new TL-D lamps.

Comparison of MASTER TL-D Secura with standard TL-D

- Up to 30% higher light output resulting in higher yield for existing installation or less battens for new installations.
- 60% longer service lifetime reduces the maintenance and relamping cost.
- Protective coating ensures a safe environment without the possibility of glass fall.

Applications

- Cultivation of plants without daylight.
- Growth chambers or cabinets where safety is essential.

Gear

- Operates both on conventional but preferably on HF control gear.
- We recommend the Philips HF-P (see page 22).

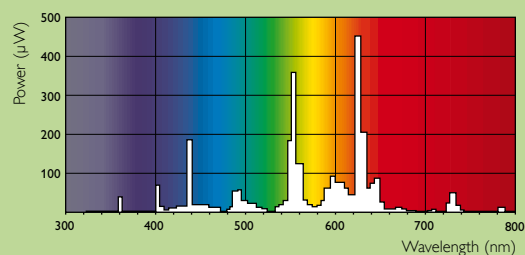


Secura

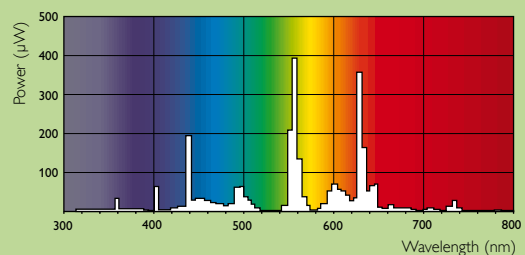


Standard TL-D

MASTER TL-D Secura/830



MASTER TL-D Secura/840



Product information

	GrowthLight PPF* (initial)	Lifetime	Maintenance (nominal)
MASTER TL-D Secura Super 80 36W	45 µmol/sec	12.000 hrs	> 90% at 12.000 hrs
MASTER TL-D Secura Super 80 58W	70 µmol/sec	12.000 hrs	> 90% at 12.000 hrs

* PPF information: see page 3



SuperluxAgro 150W

Lamp

- SuperluxAgro is an incandescent lamp with a mushroom shaped white coated bulb for horticultural applications.

Features / Benefits

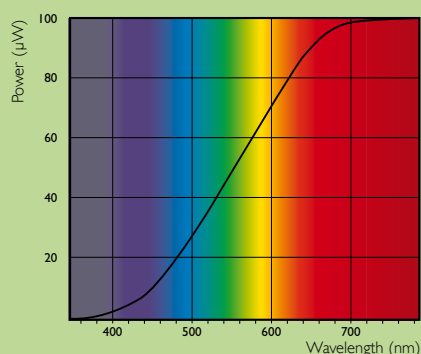
- Internal white coating eliminates the need for an external reflector system.
- Corrosion free nickel-plated brass cap.
- Double lifetime compared with standard incandescent lamps.
- Can directly replace existing 150W lamps clear or diffuse.
- Internal white coating ensures that all light is directed to where it is needed.

Applications

- Photoperiodic lighting in greenhouses.
- To prolong the short days during autumn, winter and spring.

Application advice

- In an installation of 3 x 3.2 m the SuperluxAgro has an installed output of 15.6 w/m².
- For stock plants; one lamp per 7.5 m².
- For cut-flowers; one lamp per 9.6 m².
- Minimal distance of 80 cm between possible obstacle and plants should be maintained due to shadow casting.
- Minimal distance between lamp and plant (Hnett) is 2 m, perpendicular to the plants.
- Nominal voltage variations can influence the lifetime of the lamps.



Product information

	Light intensity at Hnett = 2 m and 1 lamp per 9,6 m²	Lifetime (average)
SuperluxAgro 150W	100 lux (min/max > 70%)	2.000 hrs

Horticulture Product System Matrix

Lamp	Ballast	Ignitor	Capacitor
MASTER Agro 400W EM 230V	BSN 400 L407 ITS 230-240V 50Hz	SND58	45µF – 250V
	BSN 400 L406 ITS 220-230V 50Hz	SND58	45µF – 250V
	BSN 400 L301-ITS 220V 60Hz	SND58	40µF – 250V
MASTER GreenPower CG 400W EM 230V	BSN 400 L407 ITS 230-240V 50Hz	SND58	45µF – 250V
	BSN 400 L406 ITS 220-230V 50Hz	SND58	45µF – 250V
	BSN 400 L301-ITS 220V 60Hz	SND58	40µF – 250V
MASTER GreenPower CG 600W EM 230V	BSN 600 L407-ITS 230-240V 50Hz	SND58	60µF – 250V
	BSN 600 L406-ITS 220-230V 50Hz	SND58	60µF – 250V
MASTER GreenPower 600W EM 400V	BSN 600 L309-ITS 400V 50Hz	SND88/89	18µF – 450V
	BSN 600 L4016-ITS 388/400V 50Hz	SND88/89	18µF – 450V
MASTER GreenPower 600W EM 480V	BSN 600 L3030-ITS 480V 60Hz	SND90/91	16µF – 480V
MASTER GreenPower 600W EL 400V	GreenVision 600W SON-GP 400V 50Hz	-	-
MASTER GreenPower 1000W EL 400V	GreenVision 1000W SON-GP 400V 50Hz	-	-
MASTER HPI-T Plus 400W	BSN 400 L407-ITS (230-240V 50Hz)	SND58	45µF/250V
	BSN 400 L406-ITS (220-230V 50Hz)	SND58	45µF/250V
	BSN 400 L406-ITS (220-230V 50Hz)	SND58	40µF/250V
MASTER TL-D Reflex 36W	HF-P 236 TLD EII 220-240V 50/60Hz	-	-
MASTER TL-D Reflex 58W	HF-P 258 TLD EII 220-240V 50/60Hz	-	-
MASTER TL-D Secura 36W	HF-P 236 TLD EII 220-240V 50/60Hz	-	-
MASTER TL-D Secura 58W	HF-P 258 TLD EII 220-240V 50/60Hz	-	-

Cross reference table Horticultural lamps

Philips	General Electric	Osram	Sylvania
MASTER SON T Plus 400W EM 230V	LU 400W/XO	NAV-T 400 SUPER 4Y	SHP-TS Super 400W
MASTER SON T Plus 600W EM 230V	LU 600W/XO	NAV-T 600 SUPER 4Y	SHP-TS Super 600W
MASTER Agro 400W EM 230V	-	-	-
MASTER GreenPower 400W EM 230V	LU 400W/PSL	Plantastar 400	SHP-TS GroLux 400W
MASTER GreenPower 600W EM 230V	LU 600W/PSL	Plantastar 600	SHP-TS GroLux 600W
MASTER GreenPower CG 400W EM 230V	-	-	-
MASTER GreenPower CG 600W EM 230V	-	-	-
-	LU 750W/PSL	-	-
MASTER GreenPower 600W EM 400V	LU 400V/600W/PSL	-	SHP-TS GroLux 600W-400V
-	LU 400V/750W/PSL	-	-
MASTER GreenPower 600W EL 400V	-	-	-
MASTER GreenPower TD 1000W EL 400V	-	-	-

Philips Lighting

Lamps Europe - Professional Lamps

www.philips.com/horti



© 2010 Koninklijke Philips Electronics N.V.

All rights reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication there of does not convey nor imply any license under patent- or other industrial or intellectual property rights.

3222 635 68175 06/2010