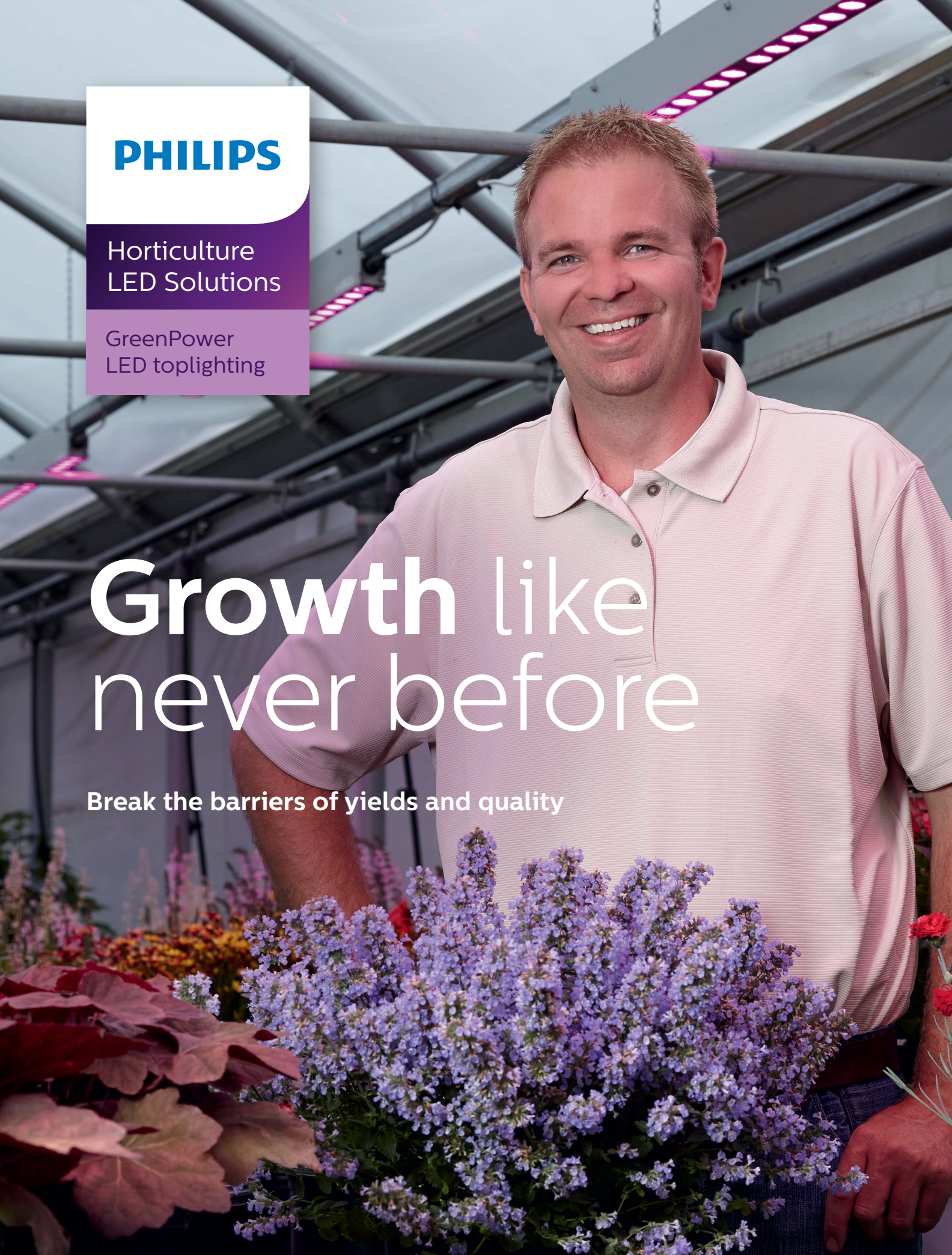




PHILIPS

Horticulture
LED Solutions

GreenPower
LED toplighting

Growth like never before

Break the barriers of yields and quality



Philips GreenPower **LED toplighting**

Want to take your greenhouse to the next level of productivity?

Now is the time for LED toplighting in greenhouses to grow better crops and a more profitable business.

Our GreenPower LED toplighting delivers very high light output, while radiating much less heat than HPS toplighting. That means you can control light and temperature more separately from each other to reach unprecedented lighting levels for your plants and gain more control over growing conditions.

LED toplighting can shorten growth cycles, increase yields, reduce energy and enable more economic use of space. These results may vary depending on the crops being grown and the type of LED installation. Add our proven light recipes and you can further control plant growth, development, and/or nutritional content to produce unique results that differentiate your business in the market.



Improve your production

- Shorten growth cycles
- Improve color, shape, and taste
- Grow with more control over your climate
- Grow year round in low greenhouses



Cut operational costs

- Save up to 40% on energy costs compared to HPS toplighting
- Reduce cost of power infrastructure to obtain your light level
- Avoid costly remodeling with easy plug and play installation
- Lower maintenance costs with long-lasting LED technology

Improve your greenhouse practices

How can you be sure you are getting the maximum value from your lighting? We provide expert know-how and support for your LED solution. Are you thinking improvement or cost reduction? Draw upon cultivation advice from our in-house plant specialists to address your specific needs. Get accurate calculations and lighting plans from our technical experts to assess your options.

Light recipes - the right ingredients for every plant and phase

Our support also includes advising you on a dedicated "light recipe" that takes your growing strategy into account. A light recipe combines the following elements: light spectrum, intensity, illumination moment, uniformity, and positioning. Our light recipe knowledge has been developed over many years of cooperation with growers, universities, and research sites to enhance growth. Different light recipes allow you to steer specific plant characteristics, from compactness, color intensity, and branch development to flowering and more so you improve your results.



Grow more and grow better

Philips GreenPower LED toplighting combined with our dedicated light recipes, open up new opportunities for every greenhouse grower to increase their quality and yields and move to year-round production. LED toplighting offers light output levels typically ranging from 410 - 550 $\mu\text{mol/s}$ per module at a very high efficiency reaching 2.6 $\mu\text{mol} / \text{Joule}$. It offers growers unique advantages as a direct replacement for traditional lighting systems or as an energy-efficient supplement.



Key benefits of **LED toplighting**

Give your plants all the light they need

LED toplighting produces significantly less heat, especially less radiation heat, than conventional HPS lamps, so you can adjust light and temperature more independently. This lets you control your greenhouse climate more precisely and grow better crops, faster, year-round. Less heat gives you more flexibility to use light more effectively, for example by increasing light levels, extending lighting periods, or by using light on warmer days without having to ventilate. Less heat also means you can place the light source closer to your plants to reduce light loss – so close in fact that you can now use toplighting even in low-ceiling greenhouses.

“Because LEDs hardly generate any radiation heat, it is possible to control the temperature and the lighting separately.”

Leo van der Harg, Manager, Leo van der Harg BV

Give each plant the right light for growth and development

Philips GreenPower LED technology lets you harness the full power of the light spectrum to stimulate photosynthesis and growth in an effective way and/or steer plant development and morphology. Eight spectral versions have been developed based upon years of intensive collaboration with research facilities and universities around the world. The modules that include white light are convenient when people need light to work.

Use for every greenhouse and crop

Philips GreenPower LED toplighting is designed to be used for virtually any greenhouse situation. It comes in linear modules to provide maximum flexibility for designing light plans that can apply different light levels, are highly uniform, easy to install, with low light interception. The modules can be assembled head-to-tail in continuous lines or clustered together with cables between to fit different layouts and crop needs. You can combine LED toplighting with existing HPS installations or mix various spectral versions in one line. You can even combine different light sources to increase the light level in your installation.

Reduce operational costs

LED toplighting can use up to 40% less energy than HPS systems at comparable grow light levels ($\mu\text{mol/J}$). Next to lower energy cost for the same light level, toplighting also reduces the cost of installing and maintaining power to your greenhouse. LED technology provides very uniform and targeted light distribution, which minimizes expensive light losses. While conventional HPS lamps usually need to be replaced after 10,000 hours, LEDs still emit at least 90% of their output after 25,000 hours and lasts more than twice as long as conventional horticultural lighting. Toplighting requires very little or no maintenance, just clean with a damp cloth when dirty. This reduces maintenance costs even further.

Break the barriers of **yields and quality**



Cut flowers

Get more out of every square meter

For cut flowers, length, weight, vase life, flower color, and uniformity are important quality and production factors. Our years of experience in applying LED for growing roses, gerberas, chrysanthemums, lisianthus and other cut flowers show positive results. With today's advanced LED technology you can grow cut flowers under full LED or under LED combined with existing HPS lighting with the spectral combination that fits your goal best.

In chrysanthemums and rose production you can choose to get more out of every square meter by installing more light while keeping the temperature under control. The right recipe will increase the productivity and quality and therefore the costs and energy use per stem.



Potted, bedding and
perennial plants

More control over quality, better growing results

Ornamental quality and growth speed are the key success factors for a potted plant grower. Now you can use light to gain more control over quality and improve your results. Better pigmentation, larger, denser clusters, more branches. Our GreenPower LED toplighting makes potted plants grow faster and more abundantly and can help reduce growth regulators, so your margins go up while your operating costs go down.

Walter's Gardens, Michigan, experienced greatly reduced crop times with an increase in overall plant quality while using less energy. Finishing times for dianthus and hibiscus were reduced by as much as 10-14 days. Other results were better survival percentage and consistent growth of plants throughout the plug tray.



Propagation

Better control of seedling quality with reduced cost

Plenty of light and suitable temperatures are key to ensuring the healthy growth and successful propagation of young plants and seedlings. Toplighting produces very uniform light at low heat levels. Energy costs for lighting and for cooling can be reduced significantly.

Bordine's Farms in Grand Blanc, Michigan, experienced significantly better and faster rooting as well as more compact growth when growing begonia and dianthus under Philips LED toplight modules during a winter production cycle in 2015.

More information about GreenPower LED toplighting recipes

As well as the above-mentioned greenhouse crop segments there are many other types of crops and growth situations where GreenPower LED toplighting could be used for the light recipe. Please contact your local Philips Horti contact person or certified Philips LED Horti Partner for support.

Take advantage of the efficiency and flexibility of a GreenPower LED toplighting solution to increase yield, improve plant quality, precisely control growing cycles, and reduce energy costs in your greenhouse. Our modules are easy to install and their sleek design does not cast shadows in the greenhouse. That makes them ideal whether you use them as a replacement or supplement for your existing lighting system. Growers in every segment can easily benefit from the unique capabilities of GreenPower LED toplighting.



High-wire vegetables like tomato and cucumber

Year-round production, more plants, earlier, heavier fruits

For year-round production, high-wire vegetables like tomatoes and cucumbers need to receive light in the most efficient way. The extra heat produced by traditional HPS light sources often restricts the usage of grow lights in a high-wire greenhouse. Our GreenPower LED toplighting changes all that. It gives you more flexibility to light at times of higher outside temperatures.

The GreenQ/Improvement Center in the Netherlands achieved a yield of >100 kg/m² with their Komeett tomato variety in this year's trial. The Warsaw University of Sciences (SGGW) in Poland compared crops grown under HPS versus 100% LED with the same light sums in mol/m². This resulted in a 23% higher production of a winter cucumber crop grown under 100% LED lighting, and a 14% reduction in water usage per kilogram.



Leafy vegetables and herbs

Faster crop cycles, better quality plants

Leafy vegetables are often grown at relatively cold temperatures, but they flourish under high light levels. In most regions, maximum light levels that can be reached with HPS are limited by the maximum radiation heat the lettuce can handle in a certain climate. In our test in PSKW in Belgium we found we could double the light levels to increase winter production, with the same or better quality and compactness compared to HPS. Red coloration of Oak leaf and Lollo Rosso had greatly improved.

One grower produced 20% more heads of lettuce per square meter with the same weight per head, even during winter. This can allow growers to rapidly earn back the return on their LED lighting investment with the same weight per head.



Strawberries

Better quality fruit, year-round production

Traditionally, strawberry production has been limited to the period between April and November when there is sufficient light to grow the plants. Now the strawberry production period can be started up earlier to the winter months by providing the right amount of light and the right temperatures. GreenPower LED toplighting has the benefit of delivering efficient light without the extra heat that can reduce the quality of fruit.

One trial at Wageningen University in the Netherlands showed a 15% increase in production, a 7-12% increase in vitamin C levels, and improved taste when growing strawberries under additional LED toplighting modules.

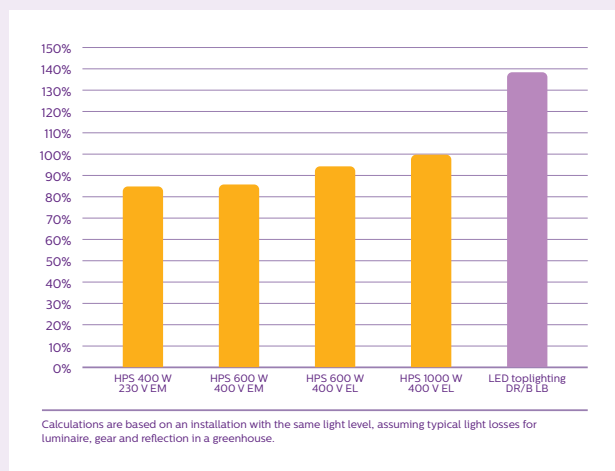


Produce more light with the same amount of energy

This diagram compares the efficiency of LED toplighting and HPS lighting systems. LED toplighting produces significantly more light using the same amount of energy. That makes it a much more energy efficient choice compared to HPS lighting.

This diagram shows how much more light can be produced in $\mu\text{mol/J}$ using the same amount of energy.

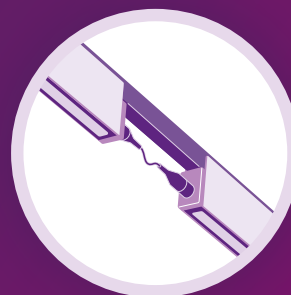
Efficiency of LED toplighting system vs HPS systems



Two installation options

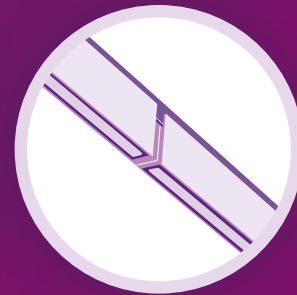
The modules are designed for easy installation no matter what lighting layout or light levels you need. Depending on the lighting plan for your greenhouse the modules can be simply clicked on to each other head-to-tail, through the integrated connector. Or you can connect them to each other using jumper cables.

Non-continuous installation



Connect the modules with a jumper cable...

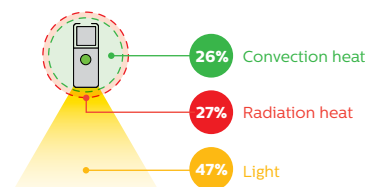
Continuous line installation



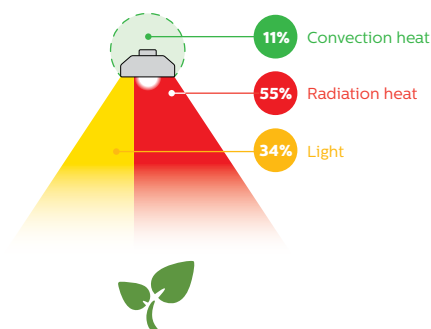
... or click the modules to each other head-to-tail

High light levels with less heat

Energy Balance LED toplighting



Energy Balance HPS

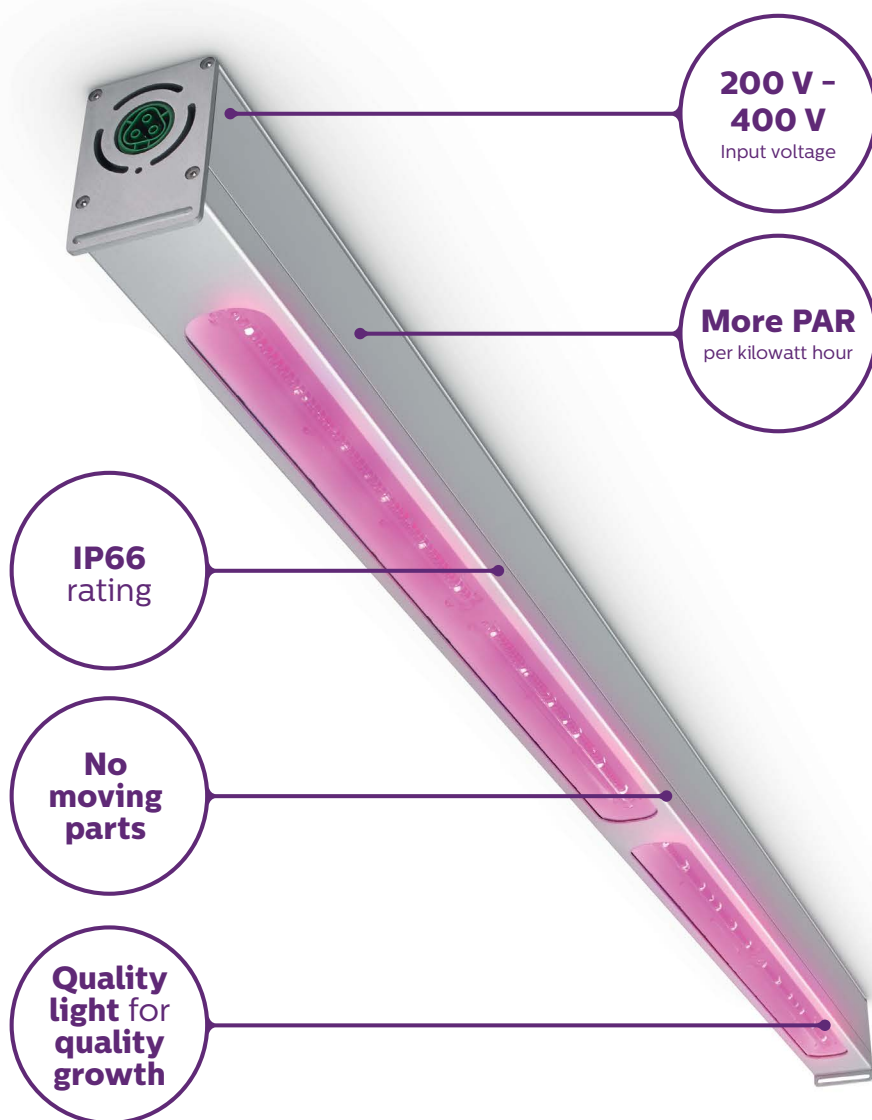


This diagram shows how the 100% of energy used by a best-in-class lighting fixture is converted into heat and light. Convection heat radiates upwards and does not affect the crop. A certain amount of energy is converted into radiation heat. High levels of radiation heat can stress or even burn the plants. LED toplighting has low levels of radiation heat, and is therefore ideal for growing cold-loving crops like lettuce and herbs, for warm dark regions and for use in low greenhouses.

Philips GreenPower LED toplighting

Greater efficiency in lighting

Philips GreenPower LED toplighting brings efficiencies to your greenhouse operations. Not only will you grow better crops – you can realize more profits in the process.



200 V-400 V input voltage

Self-adjusts to your power grid in ranges of 200 V-400 V.

More PAR per kilowatt hour

High efficacy ranging from 2.3 –2.6 $\mu\text{mol}/\text{J}$ compared to 1.7 $\mu\text{mol}/\text{J}$ with HID.

IP 66 (Ingress protection rating)

Module can be power washed for easy cleaning and maintenance.

No moving parts

Passively cooled and doesn't require fan.

Quality light for quality growth

Offers the right levels of red, far red, and blue that support quality growth.

Lasts more than twice as long as conventional horticultural lighting

Lifetime of 25,000 hours at 90% of output.

Slim profile

Doesn't block natural light and cast dark spots over your crop.

Philips has designed several types according to a best practice recipe. This is the outcome of many tests and studies with LEDs we have carried out in recent years in conjunction with universities and growers.

Product specifications and ordering data GreenPower LED toplighting

Philips GreenPower LED toplighting	Voltage	Photon flux	Power consumption	Order code	
	V	μmol/s	W	6NC	12NC
Deep Red/Blue types					
Deep Red/Blue - Low Blue ¹	200-400	550	215	303818	9290 009 79906
Deep Red/Blue - Low Blue - Wide beam ¹	200-400	520	215	303834	9290 009 80006
Deep Red/Blue - Medium Blue ¹	200-400	550	215	303842	9290 009 80106
Deep Red/Blue - High Blue ¹	200-400	520	200	303859	9290 009 80206
Deep Red/White types					
Deep Red/White - Low Blue	200-400	520	200	303867	9290 009 80306
Deep Red/White - Medium Blue	200-400	520	200	303883	9290 009 80406
Deep Red/White - Medium Blue VISN	200-400	430	190	303891	9290 009 80506
Deep Red/White/Far Red type					
Deep Red/White/Far Red - Medium Blue	200-400	410	175	303909	9290 009 80606

¹ Eye safety risk group 2

IEC62471 : Photobiological safety of lamps and lampsystems. LED does not pose a hazard due to the aversion response or thermal discomfort.

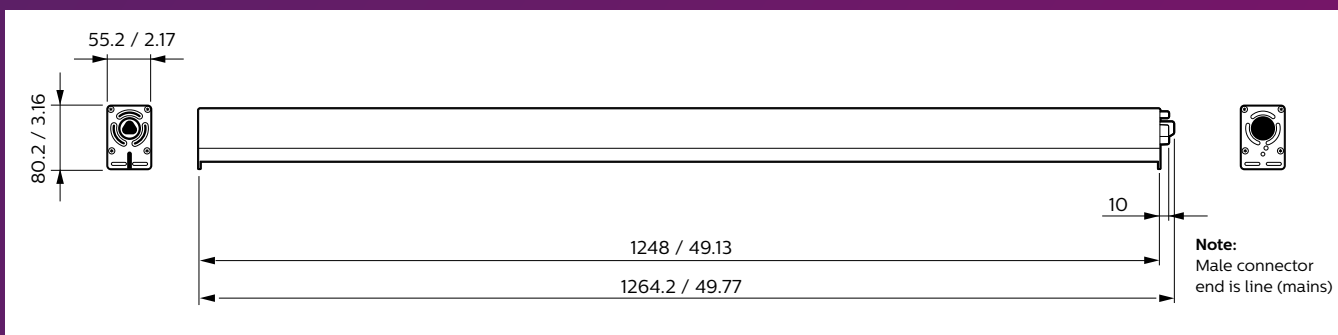
Accessories Philips GreenPower LED toplighting

Philips GreenPower LED toplighting	Remarks	Order code	
		6NC	12NC
GPL bracket toplighting NAM	Stainless steel wire of 2 mm (0.08 inch) in diameter	303925	9290 015 08106
GPL toplighting jumper NAM 6.6ft	3 x 2.0 mm ² (AWG14) wire conductors	303933	9290 015 08206
GPL toplighting main power cable	3 x 2.0 mm ² (AWG14) wire conductors 2 meter (6.6 ft)	304188	9290 015 16206
GPL toplighting end cap		303966	9290 009 15606

Dimensional drawing

Product	Dimensions (mm/inch)		
	Length	Width	Height
GreenPower LED toplighting module	1264.2 / 49.77	55.2 / 2.17	80.2 / 3.16

Note: build length is 1250 mm (49.213 inch).



GreenPower LED toplighting Growth like never before

Now is the time to go beyond the current boundaries in your greenhouse business with the new opportunities offered by LED toplighting:

- Grow better quality crops, faster with higher light levels
- Enhance crops with proven light recipes
- Reduce operational cost through reduced energy consumption and long lifetime
- Extend seasons or grow year round as you gain more control over growing climate

What can toplighting do for you?

Please contact Philips or one of our certified Philips LED horti partners for a quick scan to see what LED lighting can do for your greenhouse production, to learn more about local rebate programs, or financing options.



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