



Innovative dust and
waterproof luminaires
TECHNOLOGY
AND PRODUCTS



HORTICULTURE LED SOLUTIONS FOR PLANT CULTIVATION



**MORE LIGHT
MORE YIELD**

HORTICULTURE LED TECHNOLOGY AND PRODUCTS* PROVIDE YOU SOLUTION FOR PLANT CULTIVATION

Plants need light to survive and grow. But sometimes natural light isn't enough. With our advanced horticultural luminaires, you can ensure your crops receive all the light they need.

Our technology allows you to grow your plants regardless of weather or season. Increase your harvests and extend growing periods with IBV!

***Developed in cooperation with SolvElectric Technologies Kft.**

Lumen and LUX values should never be used to measure the effectiveness of garden lighting.

In case of horticultural luminaires, PPFD is used to express their exact light intensity



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Let us see the most important definitions and concepts of this industry explained:

DEFINITIONS

PAR

Photosynthetically Active Radiation

The range of light that plants are able to use for photosynthesis. 400-700 nanometers.

PPF

Photosynthetic Photon Flux

The total amount of photons in the 400-700 nm range that is produced by a light source each second. Measured in $\mu\text{mol/s}$.

PPFD

Photosynthetic Photon Flux Density

The number of photons in the 400-700 nm range received by a surface for a specified amount of time. Measured in $\mu\text{mol/s/m}^2$.

DLI

Daily Light Integral

The daily flux of photons per ground area.

EFFICACY

Refers to how efficient a horticulture light system is at converting energy into PAR photons. By dividing the PPF of a light system with the input power (W), you can calculate efficacy. Measured in $\mu\text{mol/J}$.



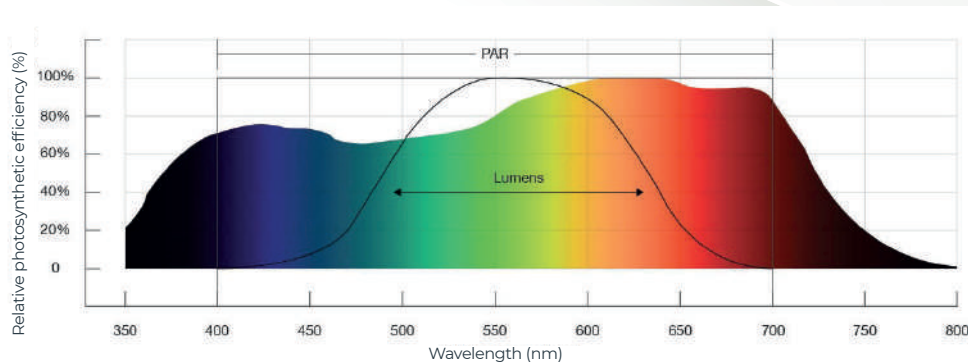


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Facts about LED based plant cultivation

THE ADVANTAGES OF LED BASED PLANT CULTIVATION

- All-year production system (weather independence)
- Production boost
- Can be used in addition to sunlight
- Optimized photosynthesis
- Perfect and well-balanced light distribution
- Outstanding efficiency
- Easy installation
- No maintenance
- Low energy costs
- Can replace inefficient sodium lamps (HPS)



Plants use only about 4-8% of visible light for photosynthesis.

Both sunlight and artificial light are acceptable for plants. However, there is a range between 500-610 nm that isn't absorbed by them. By providing the right wavelength of light, the taste of vegetables can be improved in addition to their yield!

RESEARCH DEVELOPMENT

Our team of experts spent years researching horticultural LEDs. We were able to identify the exact composition of light that plants need to be able to grow. Going further, we also identified that different types of plants have different needs. To better understand this spectrum, first we must look at the differences between artificial and natural light. Natural light is dynamically changing. The intensity of sunlight is always in flux as clouds pass by in the sky. One of the benefits of the artificial light that it is constant in its intensity. We were able to recreate the dynamic aspect of natural light with our LED spectrum. We continuously keep finetuning our horticulture technology. We have kept a close eye on the various developments and innovations of LEDs, always looking for ways to incorporate the latest technology in our own research. As a result, all of our horticultural luminaires are state-of-the-art, using advanced technology to ensure you can grow your plants efficiently, wherever you may be!

IBV PhytoLED plant growing LED luminaires

Our PhytoLED product family, developed over years of active research and development is the ideal choice for providing light to plants both in greenhouses and film tents. Our goal was to develop energy-efficient fixtures and we succeeded! The PhytoLED product family achieved up to 65% energy savings compared to sodium vapor (HPS) lamps, which are often used on farms despite their inefficiency. In fact, less than 10% of the light emitted by HPS lamps is actually used by the plants.

YOUR BENEFITS AT A GLANCE

- Shortened growth cycles
- Increased production
- Improved shelf life and taste
- Colour and shape optimisation

Horticultural luminaires can be separated into two different categories

based on how and where they are applied:
Toplighting and Interlighting.



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Features of TOPLIGHTING

- Mounted above plants
- Emit strong, vibrant light
- Can be used as supplementary light
- Ideal for: seedlings, various flowers, lettuce, wheatgrass, chili peppers, herbs, cannabis
- Can even replace the sun entirely (black box)

In IBV Product portfolio:

PhytoLED SolveSun (coloured, white)
PhytoLED Toplight (white)

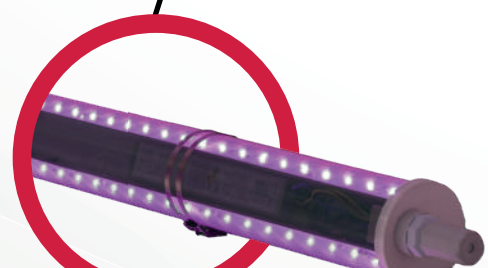
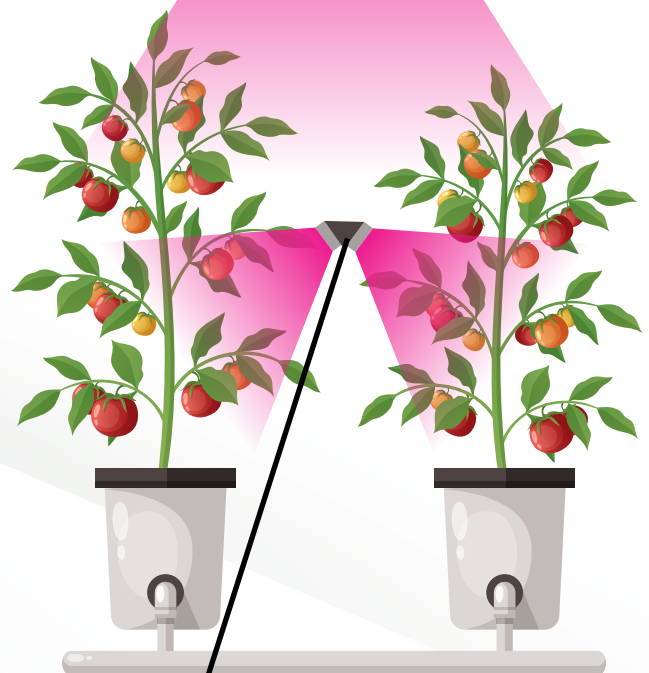


Features of INTERLIGHTING

- Provide light in between the plants - without unwanted heat generation
- LEDs on both sides of the products ensure light to two rows of plants at once
- Serves as an additional light source for tall greenhouse vegetation
- For the illumination the lower, shaded leaves and the stems
- Plants can be lit at the points where they gain most benefit
- Improves the taste and nutritional value of the fruits and vegetables
- Much higher and more efficient plant production
- Where Toplighting is not ideal (in lightweight construction foil tents, or at low ceilings)
- Ideal for: tomatoes, eggplants and cucumbers
- Optimal in vertical farms above the crops (with no rows but shelves instead)

In IBV Product portfolio:

PhytoLED Interlight (purple, white)



INTERLIGHTING

Portfolio

for plant cultivation



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TOPLIGHT RANGE



PhytoLED SolveSun white & coloured

White: Efficacy 2.9 $\mu\text{mol/J}$

Purple: Efficacy 2.4 $\mu\text{mol/J}$

PhytoLED Toplight white

White: Efficacy 2.2 $\mu\text{mol/J}$



INTERLIGHT RANGE

PhytoLED Interlight white & purple

White: Efficacy 2.3 $\mu\text{mol/J}$

Purple: Efficacy 2.2 $\mu\text{mol/J}$

***Developed in cooperation with SolvElectric Technologies Kft.**

Comparison

of technical data



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Product Type	Category	Length (mm)	PPF* (μmol/s)	Efficacy (μmol/J)	Power (W)	Colour spectrum versions	Lifetime (hours)**	Ingress Protection
PhytoLED SolveSun coloured	Toplighting	273	363.3	2.9	125	horticulture coloured (400-800 nm)	up to 50000	IP65
PhytoLED SolveSun white	Toplighting	273	300	2.4	125	horticulture white (400-800 nm)	up to 50000	IP65
PhytoLED Toplight white	Toplighting	1174	259	2.2	55	horticulture (400-800 nm)	up to 50000	IP66 - IP67
		1460	259	2.2	96	horticulture (400-800 nm)	up to 50000	IP66 - IP67
PhytoLED Interlight purple	Interlighting	1835	173	2.2	75	purple	up to 50000	IP66 - IP67
PhytoLED Toplight white	Interlighting	1835	180	2.3	75	horticulture white (400-800 nm)	up to 50000	IP66 - IP67

*Photosynthetic Photon Flux

**L90B50 (Ta=25°C)



The plant growing LED luminaires are ideal for newly constructed greenhouses, for foil tents, vertical farms, experimental laboratories, black boxes, green wall lighting and sport stadiums.



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What sort of plants do you want to grow?

- 🌱 seedlings
- 🌱 vegetables
- 🌱 salads (e.g.: lettuce)
- 🌱 fruits (e.g.: berries)
- 🌱 mushrooms
- 🌱 micro-vegetables, wheatgrass

- 🌱 hemp (cannabis)
- 🌱 herbs & chili peppers
- 🌱 ornamental plants, flowers
- 🌱 green wall lighting
- 🌱 experimental plant cultivation
- 🌱 turfing sport stadiums with grass



Seedlings

Seedlings in general can be grown in greenhouses, foil tents and vertical farms and even in black boxes with no natural light, using grow lights.

We recommend Toplights for greenhouse cultivation of tomatoes. The colourful / purple is ideal, but the white can also be used.

Vegetables

(e.g.: tomatoes, eggplants, cucumbers)



In the first stage of the plant's lifecycle, we recommend Toplights. Similar to seedlings, purple or white or a combination of both may be used. However, as soon as the stems of the plant grow and rich foliage is developed, Interlights are recommended due to their increased efficiency.

The light produced by Interlights hits more of the leaves than Toplights due to the foliage. As these plants develop further, Interlighting becomes the primary lighting method, while Toplights can be used for additional illumination.



Salads

(e.g.: lettuce)

Various kinds of salad can be grown in greenhouses and foil tents and vertical farms. Lettuce is also extremely well-suited for black box cultivation. Toplights are recommended for greenhouse cultivation. Toplights provide plenty of light in foil tents and can be mounted much easier. For vertical farms and black boxes, PhytoLED Interlight is the perfect fit – it works quite well with the shelves in such systems.

Fruits

(e.g.: berries)



Berries of all kinds can be grown in greenhouses, foil tents or in vertical farms. We recommend using Toplights for greenhouse and foil tent cultivation in addition to natural sunlight. The rate of growth can be increased with the Toplights, and the crop quality is guaranteed to be excellent.

For year-round operating vertical farms and black boxes, a combination of Toplights and Interlights are recommended to ensure sufficient amounts of light for the plants.

Herbs & chili peppers



For growing chili peppers and herbs the application of Toplighting technology is advised.



Mushrooms

Mushrooms of various kinds do not require a huge amount of light. PhytoLED Toplights can be used during certain pivotal parts of the growth cycle: oyster mushrooms have a specific time period during their development where light is needed to ensure growth.



Cannabis

Toplights are also recommended for growing cannabis. This technology is very useful for the production of the hemp inflorescences and for the extraction of the active principle. We offer solution to ensure earlier production and shortening of plant internodes: This increases the amount of flowers and dry matter of the harvested product resulting in lower drying costs and higher production yields.



Ornamental plants, flowers

Toplights have already proven their excellence when it comes to growing flowers in greenhouses. Our Toplights guarantee beautiful flowers even in low light conditions and winter periods. Plants grown with our PhytoLED SolveSun had stronger and longer stems and more intense coloration, which made them more valuable.

PhytoLED Toplight is recommended for foil tents, as it can be mounted closer to the plants and due to its lower weight, it does not strain the lightweight construction of the foil tent.



Sport stadiums

PhytoLED Toplights are perfect for quick growing of grass that are used for turfing of sport stadiums.



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Micro-vegetables, wheatgrass

Vertical farms and black boxes are ideal for growing micro-vegetables and wheatgrass. PhytoLED Interlights can be used to provide more than enough light for both type of plant. In these systems, the Interlights should be mounted above each shelf.



Greenwall lighting

Greenwalls are vertical gardens that have different types of plants or other greenery attached to them. The greenery is often planted in a growth medium consisting of soil, stone or water. Because the walls have living plants in them, they usually feature built-in irrigation systems and for instance in shopping malls or indoor areas can operate well with artificial light such as PhytoLED SolveSun.

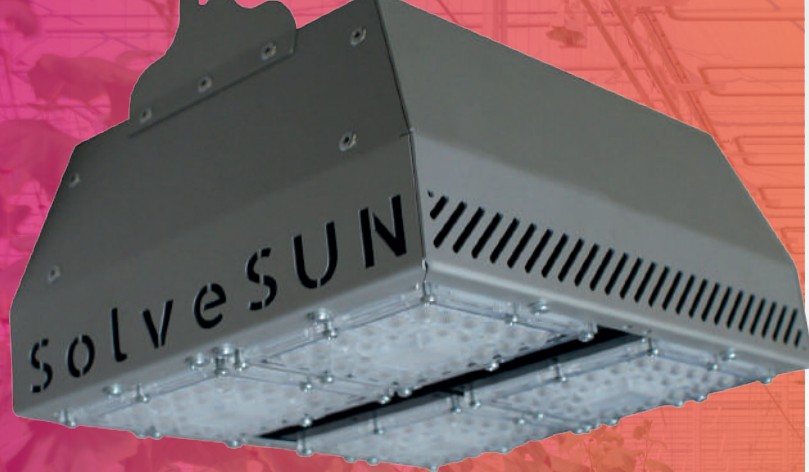


Experimental plant cultivation

Black box plant growing can ensure the sterile conditions of experimental plant cultivation. Plants grown in this way receive no natural sunlight and instead are illuminated exclusively by grow lights. Thus, we can grow plants regardless of climate and season, providing the foundation for a healthy diet to everybody, regardless of where they are located.

Our products are all well-suited for sterile, black box cultivation.

In the aftermath of the pandemic, hygiene and safety concerns have increased the demand for goods produced in sterile environments.



Toplighting for plant cultivation

PHYTOLED SolveSun

**Dust and waterproof plant growing LED
luminaires with metal body**

**Horticulture LED Solutions
for all year production**

CE



IP65



GENERAL DESCRIPTION

The PhytoLED SolveSun is a horticulture LED Solution for **all year production**. This plant growing LED luminaire is the result of 2 years of research, developed by our partner **SolveElectric Technologies Kft.** After examining and considering the needs of gardeners, a high energy efficient product has been created. With its special **chimney heat dissipation system**, it also provides the ideal operating parameters for LED chips with **passive cooling** – without the use of fans. As a Toplight luminaire, it typically emits **strong and vibrant light** therefore it is suitable for greenhouses with high ceilings.

YOUR MAIN BENEFITS

- **Extremely high energy efficiency:** SolveSun achieves **65% energy savings** (compared to sodium vapor (HPS) lamps)
- Ideal for **one-by-one replacement of (HPS) lamps**
- **Low operating cost**
- **Maintenance-free:** Requires only periodic cleaning to maintain their light-emitting efficiency
- **Long lifetime:** up to 50.000 operating hours



FIELD OF APPLICATION

- Locations where crops would not receive adequate amounts of sunlight otherwise (in winter and during rainy and overcast weather)
- **Vertical farms** and **green walls**
- Ideal choice for lighting plants in **greenhouses**
- **Black box cultivation:** Certain toplights, as the PhytoLED SolveSun can even replace the sun entirely – they can be used to grow plants in rooms with no natural light! Plants grown with PhytoLED SolveSun can be completely isolated from the outside world and they could be raised in sterile conditions.
- Excellent for growing seedlings, flowers, chili peppers, tomatoes, wheat grass and lettuce



TECHNICAL FEATURES

- **Body:** Aluminium sheet metal
- **Electrical components:**
 - LED modules specially developed for horticulture
 - Electronic driver
 - Chimney heat dissipation system
 - Passive cooling

➤ **Colour spectrum:** Available in white and coloured version

PhytoLED SolveSun Coloured:

With its unique LED spectrum composition, it has an excellent effect on plants, stimulating their growth optimally. This version can even be used in areas where very little or no natural sunlight is available (black box cultivation).

PhytoLED SolveSun White:

Ideal in environments where staff work daily (eye-protective white light)

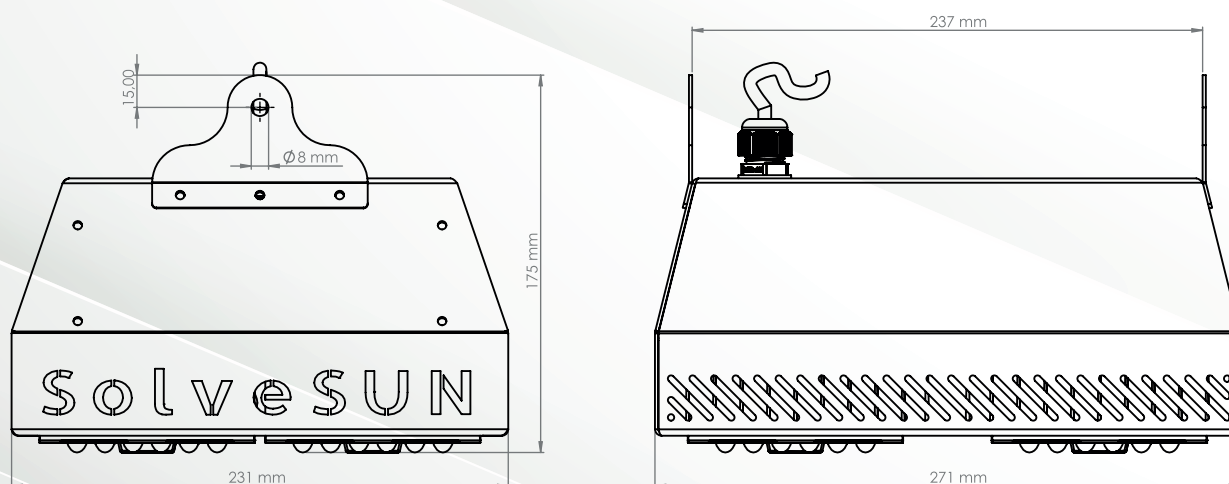
TECHNICAL DATA (extract)

Product Type	Category	Length (mm)	PPF* (μmol/s)	Efficacy (μmol/J)	Power (W)	Colour spectrum versions	Lifetime (hours)**
PhytoLED SolveSun coloured	Toplighting	273	363.3	2.9	125	horticulture coloured (400-800 nm)	up to 50000
PhytoLED SolveSun white	Toplighting	273	300	2.4	125	horticulture white (400-800 nm)	up to 50000

*Photosynthetic Photon Flux

**L90B50 (Ta=25°C)

Schematic drawing with main dimensions



"During the growing season, the plants grew taller, had a higher green mass and the flowers were also more colourful and more pronounced. Due to the excess light, the irrigation and temperature requirements of the plants also changed. We were able to achieve similar results in the winter with artificial LED lighting, as in other parts of the year with natural sunlight."

(Pál Gombos – flower gardener from Hungary)

PHYTOLED Toplight

Dust and waterproof plant growing
LED luminaires with plastic body

Horticulture LED Solutions
for all year production

GENERAL DESCRIPTION

The PhytoLED Toplight is a horticulture LED Solution for **all year production**.

This product is the ideal choice for **lightweight construction foil tents**, or **greenhouses with low ceilings**, where - though Toplight is needed, but PhytoLED SolveSun is not recommended, due to its heavy weight. Intense light can also be harmful to certain vegetation, so in these cases, PhytoLED Toplight is a better fit. The installation of these fittings is very **simple** and **fast** thanks to the construction in which **the gear tray is integrated into the diffuser**. Thus, the installation can be done easily, even without disassembling the luminaire. Considering the material of the luminaire it has a **GRP body** and a **PMMA diffuser** - both are **chemically** and **UV resistant**.

CE



IP66

IP67

1F

3F



YOUR MAIN BENEFITS

- What can you expect when applying Toplight?
1% more light results in at least 1% more yield
- **Perfect energy and light efficiency**, as well as **well-balanced light distribution**
- **Simple** and **fast connection** thanks to **the gear tray integrated into the diffuser**
- **Cost efficient** and **user-friendly installation** even without disassembling the luminaire
- **Long lifetime:** up to 50.000 operating hours

FIELD OF APPLICATION

- Locations where crops would not receive adequate amounts of sunlight otherwise (in winter and during rainy and overcast weather)
- Ideal choice for **lightweight construction foil tents**, or **greenhouses with low ceilings**
- Excellent for growing seedlings, ornamental plants, flowers, mushrooms, cannabis, herbs, chili peppers, salads, lettuce, wheat grass, and quick growing of grass that are used for turfing of sports stadiums
- In year-round operating black boxes and vertical farms, the combination of Toplights and Interlights are recommended to ensure enough light for the plants

PHYTOLED Toplight



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TECHNICAL FEATURES

➤ **Housing:** It is made of flame-retardant GRP - glass fibre reinforced polyester, in light grey (RAL7035) colour. GRP has very good temperature resistance and mechanical stability. Furthermore, it is a good electrical insulator resisting the impacts of several chemicals

➤ **Diffuser:** It is made of acrylic (injection moulded opalised PMMA) that has unique non-aging property. At the same time further main advantages of the PMMA also apply such as chemical and UV resistance

➤ **Fixing the diffuser to the body:**
With stainless steel clips

➤ **Gasket:** The sealing between the diffuser and the housing is injected silicone-based endless foam

➤ **Gear tray (reflector):** The gear tray is a white powder coated steel sheet that is integrated into the diffuser

➤ **Electrical components:** LED modules specially developed for horticulture, Electronic driver

➤ **Colour spectrum:** Available in white
PhytoLED Toplight White:
Ideal in environments where staff work daily (eye-protective white light)

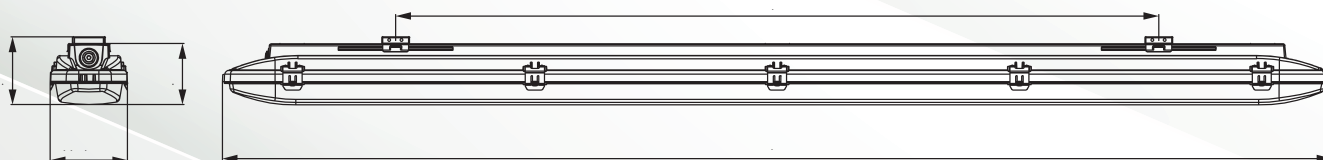
TECHNICAL DATA (extract)

Product Type	Category	Length (mm)	PPF* (μmol/s)	Efficacy (μmol/J)	Power (W)	Colour spectrum versions	Lifetime (hours)**
PhytoLED Toplight white	Toplighting	1174	259	2.2	55	horticulture coloured (400-800 nm)	up to 50000
		1460	259	2.2	96	horticulture white (400-800 nm)	up to 50000

*Photosynthetic Photon Flux

**L90B50 (Ta=25°C)

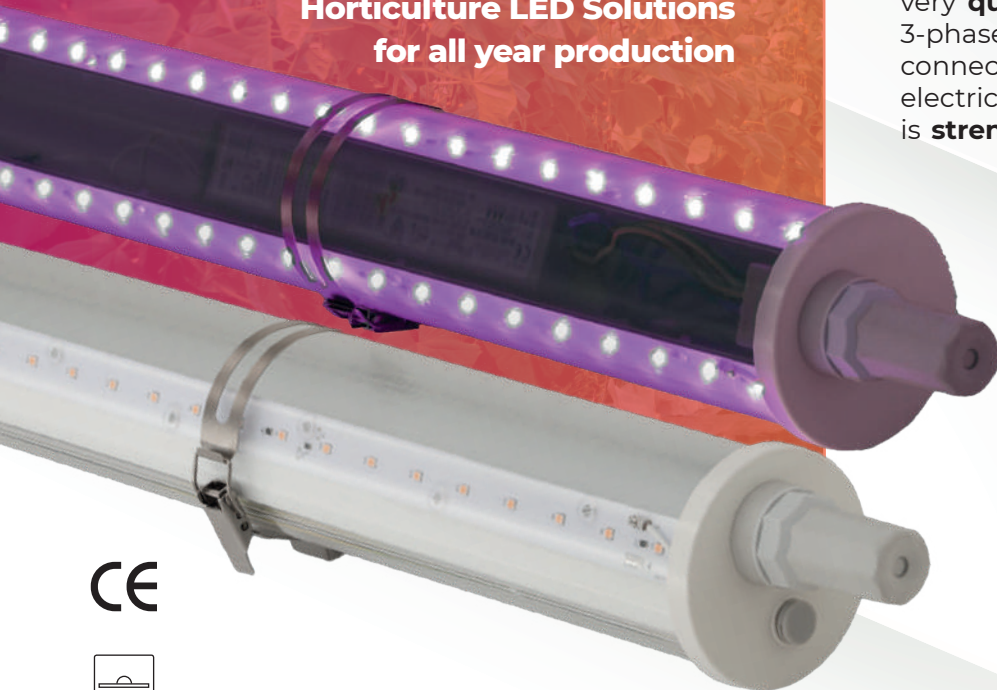
Schematic drawing with main dimensions



PHYTOLED Interlight

Dust and waterproof plant growing LED luminaires with extruded plastic body

Horticulture LED Solutions
for all year production



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IP67

3F



GENERAL DESCRIPTION

The PhytoLED Interlight is a horticulture **all-year production system**.

In modern greenhouses the Toplight fixtures are placed very high above the plants, and it causes difficulties for gardeners to get adequate light to the lower parts of the plants. With Toplighting, only the leaves near the already ripe fruits get enough light. However, PhytoLED Interlight is a perfect solution for this problem. Our plant growing Interlight LED luminaires are suitable for 2 m column spacings in greenhouses and foil tents. The installation of these extruded profile fixtures is very **quick** and **easy**. The luminaires contain 3-phase **through wiring**, so it is enough to connect them to each other by using standard electrical cables. The material of the luminaire is **strengthened PMMA**, which is **chemically** and **impact-resistant**, retains its excellent optical properties in long term use. The endcaps are fixed with non-removable gluing, so **excellent ingress protection** and sealing is ensured **even in high-pressure washing**.



YOUR MAIN BENEFITS

- **Production boost:** LEDs on both sides of the products ensure light to two rows of plants at once (The more the light, the more the yield!)
- Easy and quick installation: **'Plug and Go' system**
- **Perfect energy and light efficiency**, as well as **well-balanced light distribution**
- **Cost-effective** Interlighting module (RG1) to minimize energy consumption
- When applying PhytoLED Interlight, we have calculated a **yield increase of at least 2-3%** for every 1% of additional light invested
- **Long lifetime:** up to 50.000 operating hours

FIELD OF APPLICATION

- Used to provide light **in between the plants** – without unwanted heat generation
- **Additional light source** for tall greenhouse vegetation
- Used to **increase yield** and to **improve the crop quality**
- **Improves the taste and nutritional value** of the fruits and vegetables
- Ideal choice for **lightweight construction foil tents**, or **greenhouses with low ceilings** (where Toplighting is not recommended)
- Excellent choice for growing tomatoes, eggplants, and cucumbers
- Optimal in **vertical farms** above the crops (with no rows but shelves instead)

PHYTOLED Interlight



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TECHNICAL FEATURES

➤ **Body:** Made of acrylic (PMMA) by co-extrusion, in white (RAL 9010) colour. The optical diffusing (upper) part is opalised. Thanks to the strengthened acrylic raw material used, the whole fitting shows very high mechanical strength and high heat and shock resistance. At the same time further main advantages of the PMMA also apply such as chemical and UV resistance.

➤ **End caps:** Made of impact resistant polyamide and glued to the body (high IP protection)

➤ **Gear tray (reflector):** White powder coated steel sheet according to Zhaga standards

➤ **Electrical components:** LED modules specially developed for horticulture, Electronic driver

➤ Colour spectrum:

Available in purple and white version

PhytoLED Interlight Purple:

The human eyes recognize this light as purple, however it consists of blue and red. This is the spectrum where photosynthesis is the most efficient and the energy of the photon is the lowest. Therefore, in greenhouse applications the illumination with this red-blue colour is the best choice to reach the most excellent effect on plants and stimulating their growth.

PhytoLED Interlight Purple:

Ideal in environments where staff work daily (eye-protective white light)

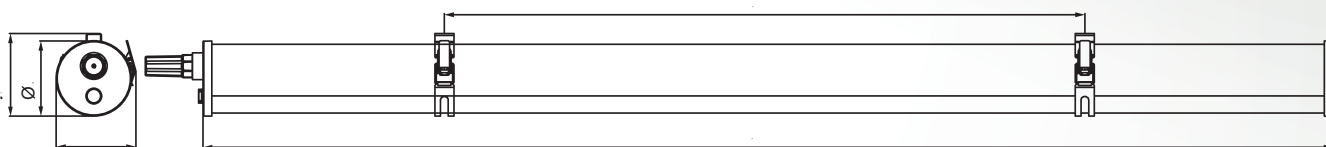
TECHNICAL DATA (extract)

Product Type	Category	Length (mm)	PPF* (μmol/s)	Efficacy (μmol/J)	Power consumption (W)	Colour spectrum versions	Lifetime L90B50**
PhytoLED Interlight purple	Interlighting	1835	173	2.2	75	purple	up to 50000
PhytoLED Interlight white	Interlighting	1835	180	2.3	75	horticulture white (400-800 nm)	up to 50000

*Photosynthetic Photon Flux

**Ta=25°C (hours)

Schematic drawing with main dimensions



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