



LED GROW LIGHTS

# LED Fixtures - The bright choice for your business



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**iSii**nitzan  
our flag is a big PLUS! 



## Welcome to the future of light

The purpose of this brochure is to provide you with an idea of what LED lighting is, and what LED systems can offer you. In the pages to follow, you will discover the diverse horticultural applications for LED lighting as well as the unique benefits and savings that can be achieved with iSiinitzan.

## Why invest in LED fixtures?

Growing plants is no longer limited to traditional industrial greenhouses – if you have space, you can grow, whether in a traditional greenhouse, vertical farms, growing directly in closed containers, or even underground with no natural sunlight. New growth conditions require new and smarter light solutions. Lights for growing plants have never been more important – and LED is the answer.

Do you want to grow herbs in an old warehouse? Do you want flexibility to change the cultures in your commercial greenhouse? You guessed it: we can construct the optimal commercial LED grow lights solution for you.

### **Durable technology, easy to use**

Our solutions are designed to withstand the harsh environment of a greenhouse and uphold performance year after year. The minimalistic design means easy installation using standard connection technology, and with a minimal shadow footprint. LED top lights integrate fully into iSiinitzan electronic climate control systems.

### **Will my investment be worthwhile?**

When considering an investment in LED grow light systems, you usually only calculate on the exact cost – how much does a fixture cost, and what is the return on investment? There are many more savings and advantages to consider, such as the impact on production times and efficiency. Many growers now focus on these extra savings – a significant fact to keep in mind and include in your cost-benefit-analysis when considering investing in commercial LED grow lights.

## Reduce climate footprint by using LEDs

LEDs are far more energy effective than traditional lighting. With LED diodes you save energy and reduce your climate footprint compared to using HPS. In addition to improved efficiency, LEDs have a number of other environmentally friendly benefits: LEDs emit significantly less surplus heat, you produce less energy waste, as LEDs do not require frequent change of bulbs, and you maintain CO<sub>2</sub> inside your greenhouse, as you do not open windows as with a warm HPS-fixture. Moreover, LEDs from iSiinitzan can be dimmed to limit unnecessary use of resources.

It has also been proven that blue and red LEDs are particularly effective in terms of growth regulation, and both shorten production times and optimize plant growth more effectively than chemical plant growth regulators (PGR). As a result, you can reduce your use of chemicals. We have also seen that LEDs reduce reproduction among pests and fungus.



## Product range

Our product range consists of controllable top light LED fixtures (range FL300 and FL100), of which you can adjust the spectral distribution and light intensity. Both the FL300 and FL100 come in 3 variants - Grow, Grow White and Sunlight.

Furthermore, we also have a solution for simpler needs, Grow Horti, for those who want the benefits from LED grow lights, but do not need to change the spectral distribution. Grow Horti is our simple plug-and-play solution, but still an effective LED fixture.

Get all the details on the next pages.

# FL300 GROW WHITE 1.2 - CONTROLLABLE



## Powerful and perfect colour recognition

The FL300 Grow white top-light is a 460 watt fixture. The Grow White spectrum was developed by growers with special lighting requirements and offers a full continuous spectrum. This spectrum is used in production areas where a higher photosynthetic activity is required, or by growers requiring supplementary lighting where colour recognition and rapid, healthy growth are key factors. This fixture is the natural replacement for the conventional HPS-system.

### Your benefits

- Control of spectral composition and light intensity.
- Consistent light on the plants due to a patented optical lens system.
- Long lifetime with no reduction of the light output.
- Minimize the use of Plant Growth Regulation (PGR).
- Control the height of the plant.
- Control the intensity of the taste.
- Save energy and improve plant growth.

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Greenhouses



Garden Centers

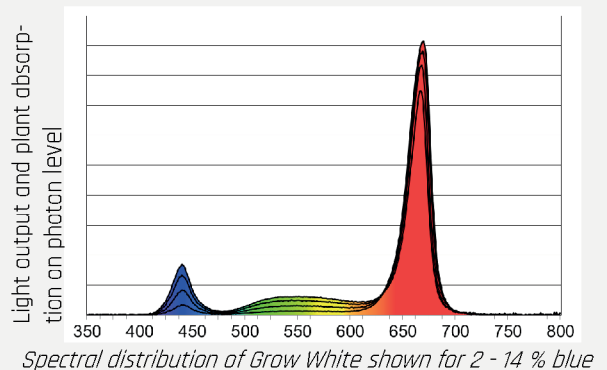


Research



Climate Chambers

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### Technical specifications

Power input	Power usage	Light output from fixture	PPF	Light output from diodes	Light modulation range	Green / White content
230 V AC / 50 Hz 110-277 V / 60 Hz	100 - 460 watt (adjusted via controller)	2.94 $\mu\text{mol/s}$ per Watt*	1352 $\mu\text{mol/s}$	3.23 $\mu\text{mol/j}$	From 2 - 14 % blue light of total light	From 3 - 22 % of total light*

\*Depending on the spectral settings.

For the full technical specifications and description, please contact us to require the specific product sheet.

# FL300 GROW 1.2 - CONTROLLABLE



## Powerful and suitable for hybrid solutions

The FL300 Grow LED top-light is a 500 watt fixture, and the light spectrum can be designed for individual crops. This fixture suits most modern production greenhouses in the world and is also recommended for a hybrid solution. A hybrid solution combines HPS and FL300 Grow, and the solution unites heat radiation from the HPS and the photosynthetic radiated light of the FL300 system. You get the best of both worlds and also the capability to grow highquality plants without changing your entire system all at once.

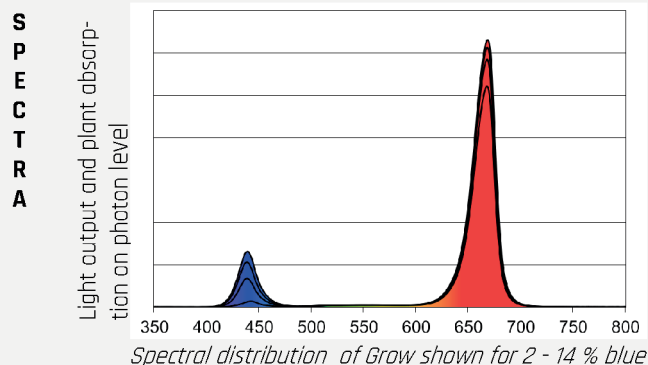
### Your benefits

- Control of spectral composition and light intensity.
- Consistent light on the plants due to a patented optical lens system.
- Long lifetime with no reduction of the light output.
- Minimize the use of Plant Growth Regulation (PGR).
- Control the height of the plant.
- Control the intensity of the taste.
- Save energy and improve plant growth.

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Greenhouses

Research



### Technical specifications

Power input	Power usage	Light output from fixture	PPF	Light output from diodes	Light modulation range	Green / White content
230 V AC / 50 Hz 110-277 V / 60 Hz	100 - 500 watt (adjusted via controller)	3.20 $\mu\text{mol/s}$ per Watt*	1600 $\mu\text{mol/s}$	3.51 $\mu\text{mol/j}$	From 2 - 14 % blue light of total light	From 1 - 5 % of total light*

\*Depending on the spectral settings.

For the full technical specifications and description, please contact us to require the specific product sheet.

# FL300 SUNLIGHT 1.2 - CONTROLLABLE



## The sunlight replicating LED fixture

The FL300 Sunlight is a 460 watt top light fixture which is recommended for growth applications where natural light is essential or for supplementary lighting where colour recognition is important. The white light secures better representation of colours and a comfortable work light. The FL300 Sunlight is designed with a patent pending optical lens system that enables a traditional installation plan similar to HPS with homogeneous distribution profile on plant level - but with less waste of light.

### Your benefits

- Dynamic control of light intensity.
- Consistent light on the plants due to a patented optical lens system.
- Long lifetime with no reduction of the light output.
- Better plant quality and higher output.
- Save energy.
- High colour recognition - makes it very suitable for e.g. garden centers and botanical gardens.

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Indoor Landscaping



Garden Centers



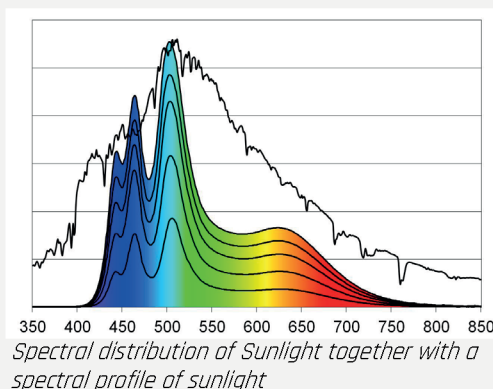
Research



Climate Chambers

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Light output FL300 / FL100 and sunlight



### Technical specifications

Power input	Power usage	Light output from fixture	PPF	Light output from diodes	Light modulation range	Green / White content
230 V AC / 50 Hz 110-277 V / 60 Hz	100 - 460 watt (adjusted via controller)	1.78 $\mu\text{mol/s}$ per Watt*	1325 $\mu\text{mol/s}$	818 $\mu\text{mol/j}$	From 20 - 100 % light intensity	From 33 - 73 % of total light*

\*Depending on the spectral settings.

For the full technical specifications and description, please contact us to require the specific product sheet.

# FL100 GROW WHITE 1.2 - CONTROLLABLE



## Offers a full continuous spectrum

The FL100 Grow White is a 150 watt top light developed together with growers having special lighting requirements. This light bar is used in production areas where a higher photosynthetic activity is required, or by growers requiring supplementary lighting where colour recognition and rapid, healthy growth are key factors. It is highly recommended for indoor growing, vertical farming and climate chambers, and more fixtures can be interconnected.

### Your benefits

- Control of spectral composition and light intensity.
- Consistent light on the plants due to a patented optical lens system.
- Long lifetime with no reduction of the light output.
- Energy saving.
- Better plant quality and higher output.
- A minimal shadow footprint.
- Minimize the use of Plant Growth Regulation (PGR).

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Greenhouses



Vertical Farming



Garden Centers



Research

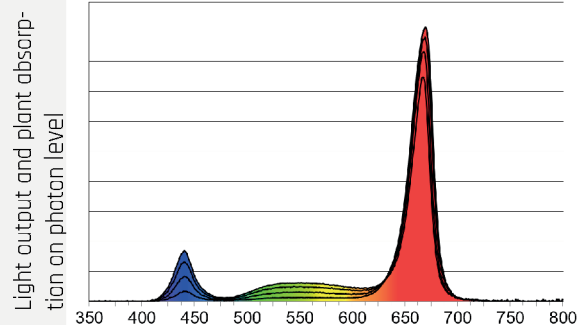


Indoor Growing



Climate Chambers

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*Spectral distribution of Grow White shown for 2 - 14 % blue*

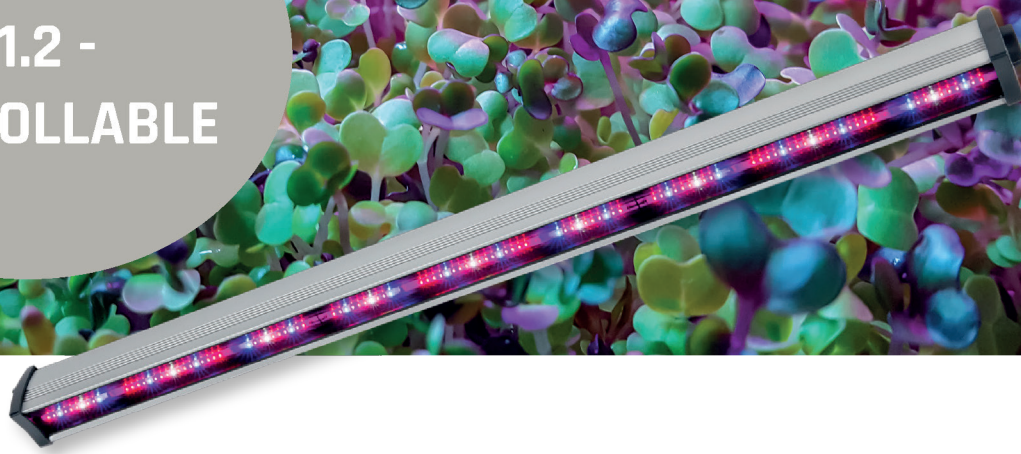
### Technical specifications

Power input	Power usage	Light output from fixture	PPF	Light output from diodes	Light modulation range	Green / White content
230 V AC / 50 Hz 110-277 V / 60 Hz	50 - 150 watt (adjusted via controller)	2.92 $\mu\text{mol/s}$ per Watt*	438 $\mu\text{mol/s}$	3.19 $\mu\text{mol/j}$	From 2 - 14 % blue light of total light	From 3 - 22 % of total light*

\*Depending on the spectral settings.

For the full technical specifications and description, please contact us to require the specific product sheet.

# FL100 GROW 1.2 - CONTROLLABLE



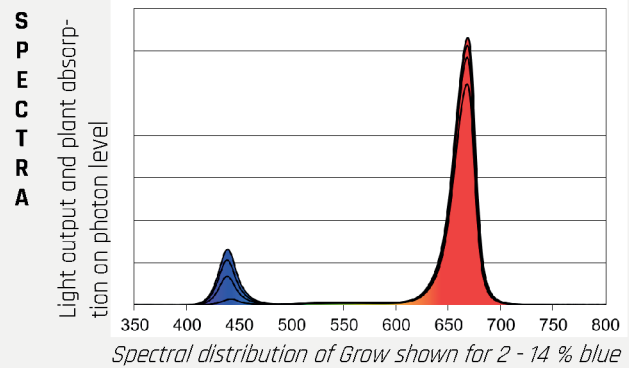
## Design the spectrum for individual crops

The FL100 Grow is a 150 watt top light fixture, and more fixtures can be interconnected. This fixture suits most modern production greenhouses in the world and is also recommended for a hybrid solution. A hybrid solution combines HPS and FL100 Grow, and the solution unites heat radiation from the HPS and the photosynthetic radiated light of the FL100 system. The fixture is fully controllable and the spectrum can be designed for individual crops. Investing in a controllable LED fixture means you always have the option to change the light and spectrum.

### Your benefits

- Control of spectral composition and light intensity.
- Consistent light on the plants due to a patented optical lens system.
- Long lifetime with no reduction of the light output.
- Better plant quality and higher output.
- Energy saving.
- Minimize the use of Plant Growth Regulation (PGR).
- Reduce climate footprint.

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### Technical specifications

Power input	Power usage	Light output from fixture	PPF	Light output from diodes	Light modulation range	Green / White content
400 V AC / 50 Hz (380 - 480 V AC) / 60 Hz	75 - 150 watt (adjusted via controller)	2.96 $\mu\text{mol/s}$ per Watt*	444 $\mu\text{mol/s}$	3.24 $\mu\text{mol/j}$	From 2 - 14 % blue light of total light	From 1 - 5 % of total light*

\*Depending on the spectral settings.

For the full technical specifications and description, please contact us to require the specific product sheet.



# FL100 SUNLIGHT 1.2 - CONTROLLABLE



## Matches the rays of the sun

The FL100 Sunlight is a 150 watt top light and it boasts the spectrum with an almost perfect match of the rays of the sun – hence the name FL100 Sunlight. The FL100 Sunlight is recommended for growth chamber applications where natural light is important or for supplementary lighting where colour recognition is important; for instance, for indoor growing and landscaping such as offices, restaurants or even for growing in shipping containers.

### Your benefits

- Dynamic control of light intensity.
- Consistent light on the plants due to a patented optical lens system.
- Long lifetime with no reduction of the light output.
- Colour recognition.
- Fixtures can be interconnected.

### APPLICATIONS



Greenhouses



Vertical Farming



Indoor Landscaping



Research

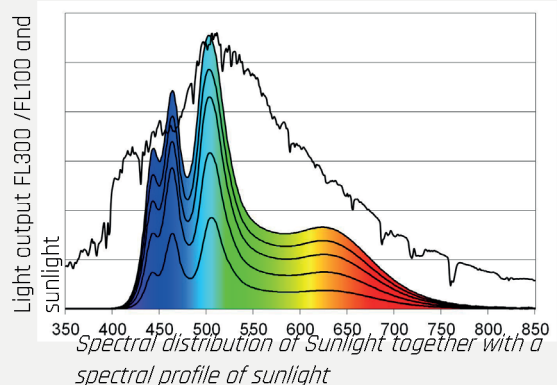


Indoor Growing



Climate Chambers

### SPECTRA



### Technical specifications

Power input	Power usage	Light output from fixture	PPF	Light output from diodes	Light modulation range	Green / White content
400 V AC / 50 Hz (380 - 480 V AC) / 60 Hz	50 - 150 watt (adjusted via controller)	1.74 $\mu\text{mol/s}$ per Watt*	261 $\mu\text{mol/s}$	1.91 $\mu\text{mol/j}$	From 30 - 100 % blue light of total light	From 33 - 73 % of total light*

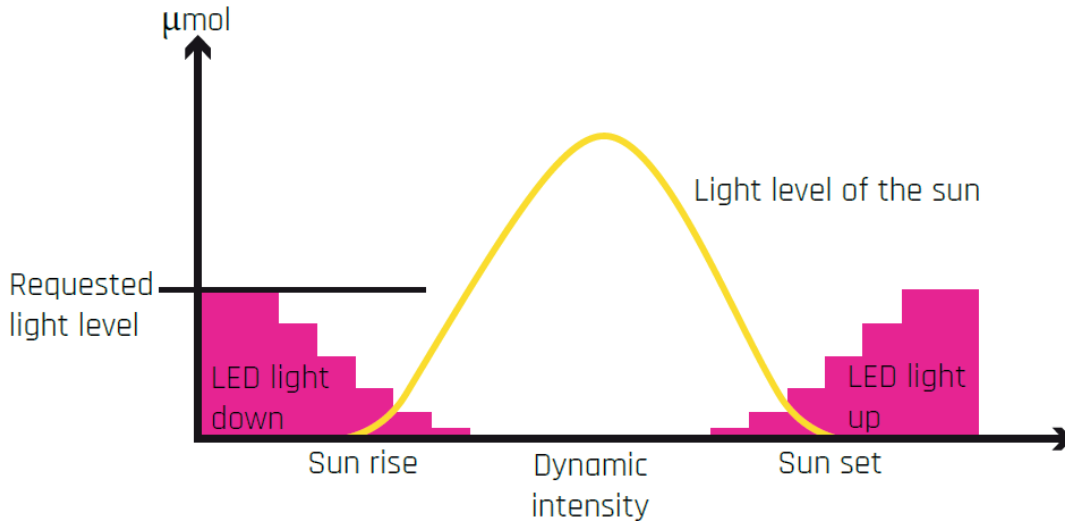
\*Depending on the spectral settings.

For the full technical specifications and description, please contact us to require the specific product sheet.

# Dynamic control of light intensity

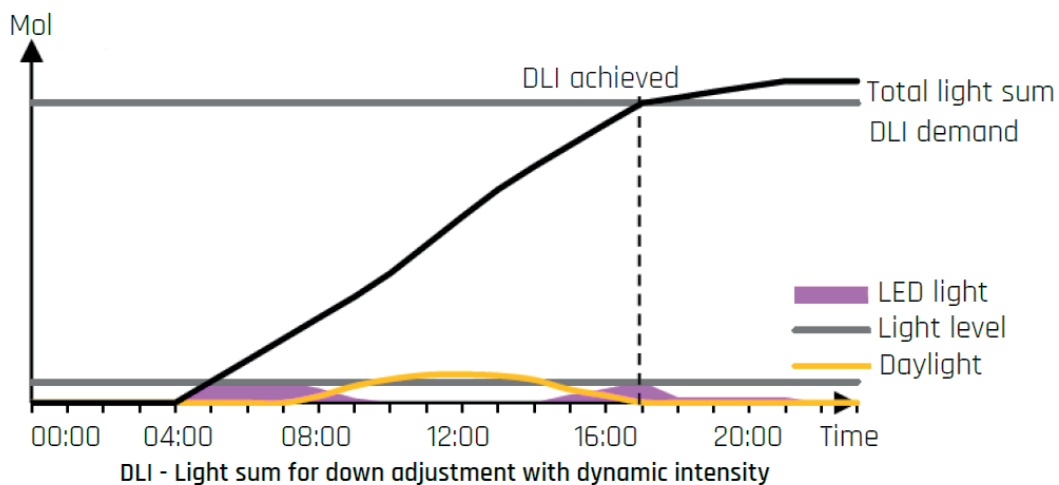
With dynamic intensity the LED fixture will only turn on when the light level gets below the demanded light level.

When the light is measured to be lower than the requested light level it will cause the fixtures to turn up to the light level, and when the measuring is higher than this light level the fixtures will dim the light to the right level.



# The light sum for down adjustment (DLI)

The light sum for down adjustment is a demand that can be set so the plants only get the light they can absorb on a day.



When the demand is achieved the fixture can be turned off or turned down to a low wattage program for long-day plants as shown above. This program will turn off at the same time as the last program for the day is set to turn off.

# GROW HORTI - PLUG & PLAY



## The simple and effective LED fixture

Our Grow Horti LED fixture is for those who want the benefits from LED grow lights, but do not need to change the spectral distribution. Put differently, Grow Horti is our simple and effective LED fixture.

It is a plug-and-play solution, making installation easy as can be – and making changing from HPS to LED simple. We make sure to adapt the grow light to your specific culture, which is why the fixture is available with four different light profiles of blue light in the range 2-8 %. It is 245W fixture available as either 230V or 400V and offers the optimal grow lighting to improve your plants' growth.

### Your benefits

- Reduce climate footprint.
- A 245W fixture available as both 230V and 400V.
- Easy installation of the lightweight fixture with a plug-&-play solution (a cable is connected to your existing installation).
- Available with 4 firm different light profiles of the blue light.
- Designed for the humid climate of a growing environment - IP65.
- We guide you in the optimal diode composition, and make a light plan to ensure the right amount of light and light distribution.
- Predominantly emits white working light making it easy to see the plants' colour.
- Latest diode technology, which provides low power consumption and increased efficiency.
- LEDs improve plant growth and increase taste intensity of edible plants.

### Growth and climate

In the development of Grow Horti, growth and climate have been considered carefully.

- The fixture is equipped with an optical lens system ensuring a constant and precise light on the plant.
- The blue light may reduce the need for Plant Growth Regulation (PGR) and results in a more compact plant.
- LEDs do not emit much heat. The advantage is that by heating from an alternative heat source instead of the fixtures a healthy and uniform climate is ensured without large fluctuations in temperature.
- Long lifetime with no reduction of light output over time.
- Grow Horti can easily connect to any climate control regardless of brand and supplier.

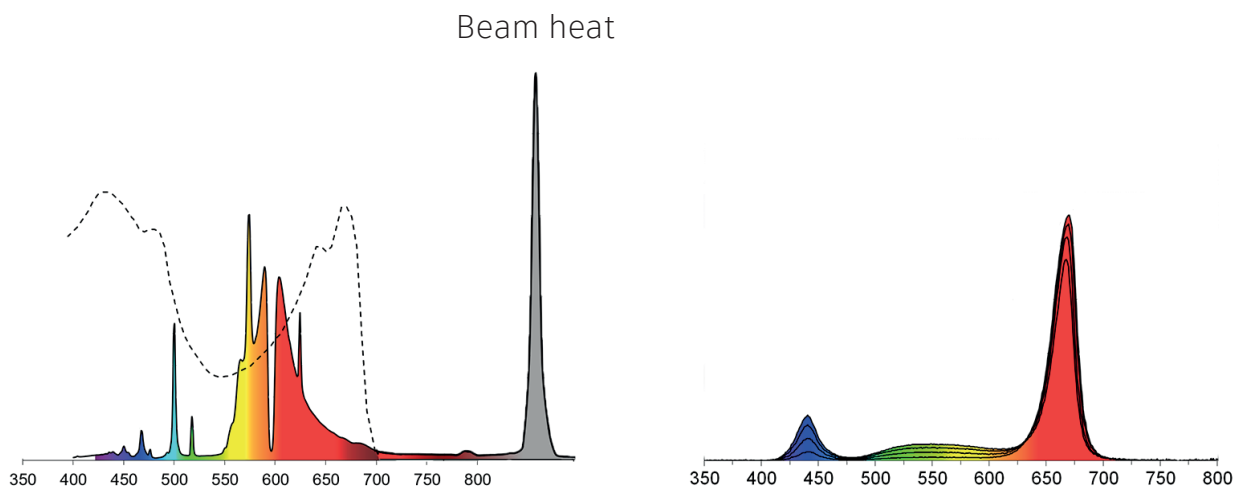


# Grow Horti as replacement for HPS

HPS is the traditional fixture used by many growers. Grow Horti is developed as a good alternative for HPS and is the new generation of grow lights. In addition to the already mentioned advantages of our LED lamp, the switch from HPS to LED also provides the following benefits:

- Grow Horti has a better impact on plant growth than a 400 W HPS.
- No need to change diodes (as you change bulbs in an HPS), which provides a significant saving.
- Grow Horti has a uniform light distribution on a larger area – just like an HPS fixture.
- The graph below shows the plant's lighting requirements and the spectral distribution for an HPS vs. a Grow Horti.
- Light output is constant over a period of time.

## HPS vs. LED - and the plant's light requirements



Dotted line on the graph indicates the active area of the photosynthesis - meaning the plants need for light. Note the difference between the spectra (colours) of HPS and LED respectively. It is vital to know that especially red, somewhat blue and only quite a little green / yellow is essential for the plant's growth.

The HPS graph also shows the beam heat, which is difficult to control and thus contributes to an unstable growth environment.

## Technical specifications

Power input	Power usage	Light output fixture	Light modulation range	Green / White content
230 V AC or 400 V AC / 50/60 Hz	245 watt	2.73 $\mu\text{mol/s}$ per watt depending on model	2 - 8 % blue light of total light	From 4 - 13 % of total light depending on model

## Mounting

The fixture is delivered with 1 cable of 2 metres and 2 fittings for hanging.

## Interested in knowing more?

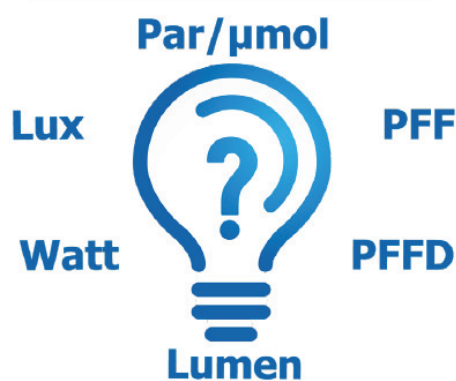
We will gladly assist you with further guidance and a lighting plan, and of course with an offer, to provide you the full overview of upgrading your business.

# Horticultural light units explained - from watt to PAR

The way the human eye perceives light is completely different to how plants see light. Plants perceive light as particles they can absorb. To fully realize the plant's growth potential, grow lights are as important as ever and several horticultural light units should be understood to create optimal growth conditions.

Being in the horticultural industry, you are likely to work with grow light systems to optimize plant growth. If so, you have probably encountered multiple units referring to light. But what does lumen, lux and watt mean and how about the terms PAR,  $\mu\text{mol}$ , PFF, PFFD? Which unit should you refer to?

Let us take a closer look.



**Lumen:** A standardized unit of measurement of the total amount of light emitted. Put simply, the more lumens, the brighter the light.

**Lux:** A standardized unit of measurement of light level intensity in a specific area.

**Watt:** Contrary to lumen and lux, watt refers to the energy consumed by the product, not the light output coming from product itself. This makes it a power consumption unit that does not tell us much about how the light output matches the plant's growth needs. For that reason, we speak in PAR to keep focus on the plant's needs and to ensure that our LEDs match the plant's consumption of light for optimized growth.

**PAR/ $\mu\text{mol}$ :** Photosynthetically Active Radiation, or  $\mu\text{mol}$  as it is also called, refers to the amount of light the plants can use for photosynthesis. PAR is not a light measurement unit, but a unit providing information about the light spectrum used by plants to grow.

**PFF:** Photosynthetic Photon Flux measures how much light reaches the plant in a certain amount of time.

**PFFD:** Photosynthetic Photon Flux Density measures how much light hits a defined plant surface area.

## Adjusting the spectral distribution in our LEDs

Producing healthy, high-quality plants is about more than just increasing efficiency and accelerating the photosynthetic rate. Flexibility and control are also extremely important variables, and variables such as plant appearance, stage of growth and quality demand the option to tailor the spectrum according to your exact requirements.

That is why iSiinitzan LED solutions allow for adjustments in spectral distribution.

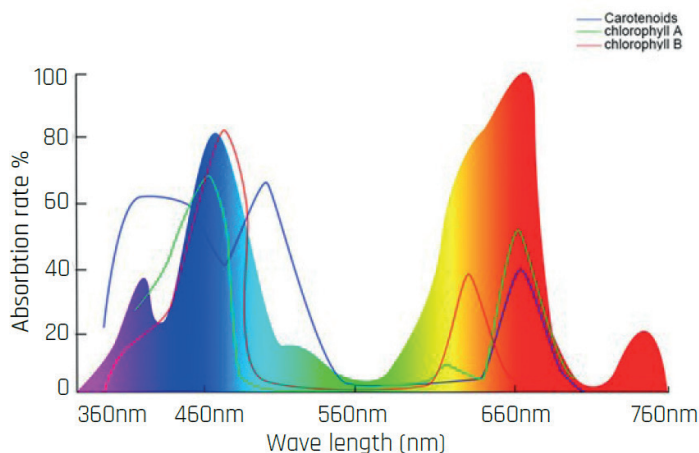
Adjusting the spectral distribution means changing the composition of the colours emitted. You do so by increasing or decreasing the percentage of blue light based on the plant's absorbing range.

The adjustable ranges vary depending on the LED solution, as all fixtures are born with different diode compositions to cover different plant needs. For detailed information about spectral adjustment possibilities and percentage settings optimal for your culture, please reach out to our specialists.

## Why lumen, lux and watt are not applicable for LED grow lights

The form of light that plants capture – and the light that we can see – is known as visible light. Photosynthesis captures the energy from visible light, but it does not make equal use of all the colours from the sun. It primarily uses light from the blue and red parts of the spectrum.

iSiinitzan LED solutions are therefore mainly constructed with these colours.



Okay. Let us get a bit nerdier.

The way that the human eye perceives light is completely different to how plants see light. Plants perceive light as particles they can absorb. These particles are known as photons or quantum. Because of the difference in the way that plants perceive light, the particles are measured in  $\mu\text{mol}/\text{m}^2/\text{s}$  rather than in lux, which is based on how the human eye sees lights.

The increasing understanding of plant physiology in relation to commercial output and plant yield is reflected in discussing  $\mu\text{mol}/\text{s}$  rather than watt per  $\text{m}^2$ . Micromoles are closely related to the plant's

$\text{m}^2$ . Micromoles are closely related to the plant's photosynthetic needs and measure the full spectral distribution, including the photosynthetically active radiation.

Using lumen, lux or watt thereby measure human light, whereas plant light is measured in photons using PAR/ $\mu\text{mol}$ , PFF and PFFD. Lumen, lux, and watt are therefore not accurate or applicable when measuring the light output from LEDs, as the units do not capture the blue and red spectra optimally.

## Converting watt to PAR

Because PAR (or  $\mu\text{mol}$ ) measures the amount of light plant needs to photosynthesize, we use that unit when determining the spectral composition as well as the number of LED fixtures needed for the cultures in your nursery.

To convert watt to PAR or lux to PAR, you can use the converter tables below:

Fixture type	Watt/ $\text{m}^2$	PAR
SONT (magnetic)	20	22
	40	44
	60	66
	80	88
	100	110
HPS (electronic)	20	30
	40	60
	60	90
	80	120
	100	150

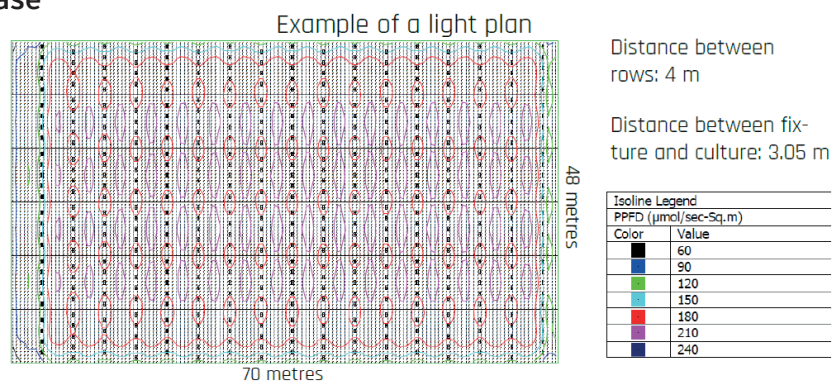
Lux (HPS / SONT)	PAR
100	1.2
500	6.1
1000	12.2
2000	24.4
4000	48.8
8000	97.6
10000	122.0
12000	124.4
15000	183.0
20000	244.0
25000	305.0

# Factors to consider when comparing LED suppliers

There are numerous factors to consider when exploring and comparing LED grow light products from different brands in the initial purchase phase. Factors, which impact plant growth conditions and the number of fixtures needed for optimal plant growth and light distribution.

## Always receive light plans before purchase

We recommend that you always receive light plans from all the suppliers you are considering to be sure that the grow lights will provide the intended effect and that you purchase the correct number of fixtures.



## Important factors when comparing LED fixtures

**Distribution** of light is one of the most important – if not the most important – factor when discussing LEDs. iSiinitzan LED grow lights are built to distribute light evenly across the area the fixture covers. This is not necessarily the case for all LED fixtures on the market.

**Adjustability** is another important factor. Check, if you can adjust the spectral distribution and light intensity.

## Fixture effect

First and foremost consider the relation between price, number of diodes, and effect. The price of the fixture is in all probability closely connected to the given effect and the number of diodes. If you want to compare effect, then have a look at watt.

Products with different watt cannot be compared one-to-one. Just keep in mind that watt alone will not provide the full story compared to price and diode composition.

## Output from the diodes and from the fixtures

The output from the diodes is not the same as the output from the fixtures. It is estimated that the output from diodes and the output from fixtures vary by 8-10 %.

Be aware that information about output is different from supplier to supplier. Keep an eye on whether the output stated from the supplier is the output directly from the diode or what is actually emitted from the fixture.

## Can fixtures be connected to a control system?

Another factor worth considering is whether the LED grow lights can be connected to a control system. iSiinitzan delivers 360-degree control of LED, irrigation and fertilizer, and all climate factors via our climate control and our software iSiinitzan. With a control system, you connect all climate elements to one central PC, from which you can easily adjust the different settings and monitor all processes. This provides a golden opportunity to analyze on how your grow lights – and other climate factors – benefit the production.

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