MechaTronix

www.horti-growlight.com

CoolStack®

The Next Dimension in LED Grow Lights

Performance

- Absolute market leading PPF up to 4.380µmol/s
- Highest photon efficiency 3.0µmol/J - 3.6µmol/J
- Various growth spectra developed for optimal results
- Deepest canopy penetration rate

Modularity

- Freedom in growth spectrum composition
- Upgradable LED modules
- Unique light distribution with TIR lenses adaptable to your canopy

Quality

- Extreme lifetime 75.000hrs - L90B50
- 10 years warranty
- Best thermal management
- Full IP67 waterproof

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Introduction

The market leading CoolStack® grow lights offer you precisely what you need!

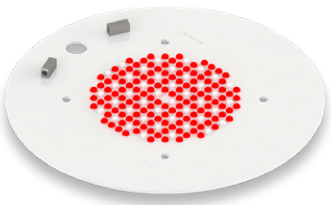
The choice between multiple power and light levels up to a PPF of 4380µmol/s guarantee you an optimal balance between the number of lamps you need to install, a minimal investment cost and a perfect light distribution.

Our research team has developed a multitude of light spectra from full spectra for grow rooms to dedicated narrow band spectra for vegetable production, young plants, germination and each specific process in plant growth what needs to be optimized.

With over two hundred hectares of installed lamps in greenhouses and grow rooms, the CoolStack® became the reference for LED top lights in Europe and gained the trust of many leading growers around the world.

Upgradable LED engines for a sustainable future

Over the last years extremely big steps have been made in the efficiency of LED grow lights, what has led to an exponential increase of LED grow light application in greenhouses for a wide range of crops.



Motivations of the growers though can have wide varieties with each its specific aims

- Saving energy compared to HPS SON-T installations is probably the most common driver today for growers to invest in LED grow lights – as of today we can replace the light level of a 1000 watt HPS SON-T lamp with just 530 watts of LED grow light energy or a saving of 47%.
- More light for the same power consumption – certainly light loving crops like tomatoes do profit a lot from extra light for the same energy cost – while a modern HPS SON-T lamp of 1000 watts produces 1850µmol of light, our new CoolStack® MAX produces now up to 4380µmol out of the same power, or 130% more light.
- Better temperature controls during growth – one of the main disadvantages of growing with HPS SON-T lamps is the extensive heat these lamps produce.
  A 1000 watt HPS SON-T generates 700 watts of heat – more specific the biggest portion of this heat goes to radiated heat which leads immediately to ambient temperature and leaf temperature increase. While growers aim for higher light levels, this heat can become too much for a good controlled production. In these cases a hybrid of full LED installation can be the way to go.
- Specific crop improvements during various growth stages.
  One of the biggest advantages of LED grow lights is the potential of steering plants with specific supplemental light spectra.
  In this way germination can be speed up, a stronger root production can be achieved or stretching of plant can be avoided.

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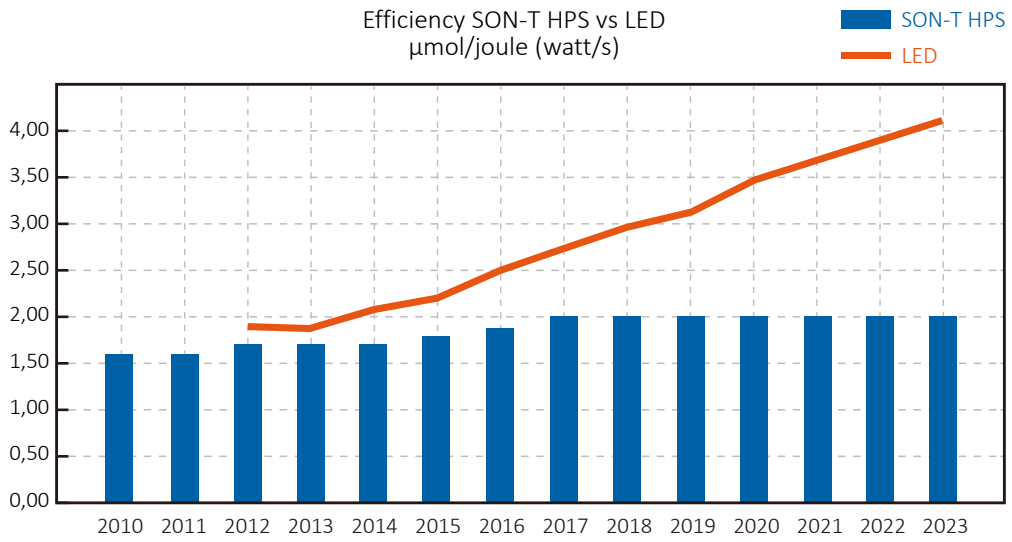
Although the efficiency of LED grow lights highly surpasses these of traditional HPS SON-T lamps today, the end of further improvement is still far away.

Over the next years more big steps are expected in potential light production per watts of energy.

Therefore we have develop our grow lights in this way that the light engines can be individually upgraded without the need to re-invest in a complete new grow light installation.



Why would you upgrade your grow light LED engines over time?

- When you would save more cost of energy than what the upgrade of the LED engines would cost over time.
  This is mainly the case for growers who pay high energy prices like in west and south Europe and work without a CHP, and crops which run with many lighted hours per season like tomatoes, cucumbers, bell peppers,…
- When your crops would benefit more from the extra light you get after an upgrade than the cost of upgrade.
  Mainly light loving crops which still produce more at higher light level than the original installed light level show great profit of this.
  Take for example a tomato grower who installed a light level of 180µmol/sm² in 2018 at an efficiency of 2.5µmol/W.
  This grower could today move for the same power consumption to a light level of 250µmol/sm² with a simple upgrade.
- When in the future other light recipes would be proven to be much more efficient.

Advanced light distribution with TIR lenses

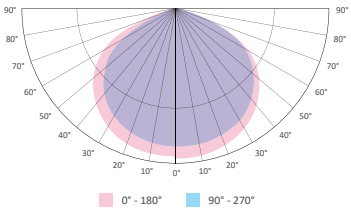
The importance of light distribution in LED grow light systems is many times seriously underestimated.

Certainly plants which are sensitive to fluctuations over the canopy in received PPFD like most ornamentals and leafy greens are in absolute need of a proper light distribution.
High wire crops like tomatoes and cucumbers with a very short distance from grow light to the top of the crop are even a bigger challenge.

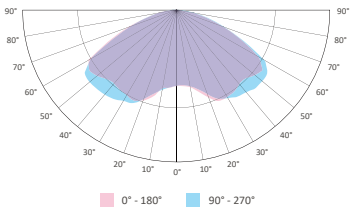
A perfect even light distribution over the plant canopy from a single luminaire is still something most grow lights seem to have difficulties with to manage.

A lot of horticulture grow lights use grow LEDs spread out over a cooler without use of any optics to control the beam distribution, just with a simple glass or plexi cover.
With these lamps the light output always comes as a 120 degree beam with a parabolic shape.

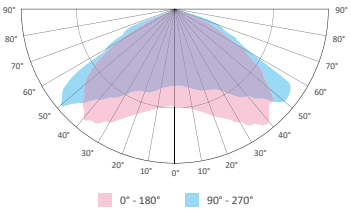
With the CoolStack® grow lights you can choose from various TIR or "Total Internal Reflection" lenses for an optimal balance between light distribution and canopy penetration



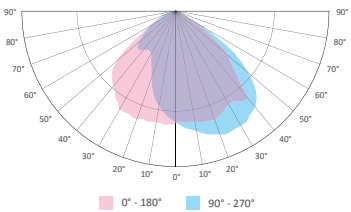
120 degree standard beam
For bigger distances from lamp to crop



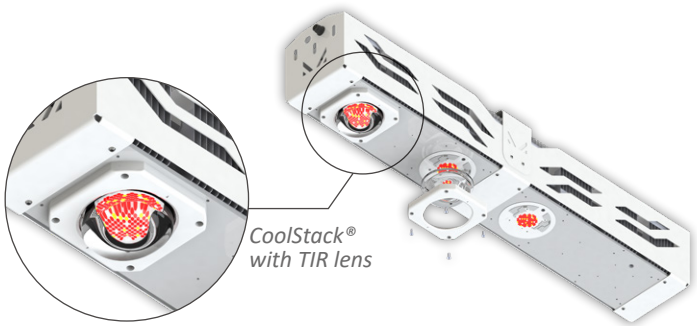
150BW Wide Beam
For high wire crops and lower light levels



120/110 degree wide beam
For high wire crops and smaller distances from lamp to crop



155 degree path beam
Specific lenses for those lamps next to the pathway and the side walls of the greenhouse



CoolStack® with TIR lens

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More light output for reduced installation costs

While the easiest way to compare grow lights is probably the price per µmol, there are many variables which make comparisons between various systems somewhat difficult.

One of the bigger influences comes from the installation cost.
Cables, connectors, circuits breakers, ... all together cost easily over 100€ per lamps as supplemental cost on top of the grow light itself.

Therefore it is utmost important to optimize the number of grow lights in a project to make a perfect balance between required light level and good light distribution, and all that with a minimal number of required lamps.

While a few years ago it was already a big step to come on the market with a LED grow light which could replace a 1000 watts HPS SON-T lamps, today we offer a broad range of lamps which can significantly reduce your required number of grow lights in your project!

CoolStack® COMPACT

up to 2390µmol/s from 680 watts

- 25% more light and 35% energy saving compared to a 1000W HPS SON-T
- Best deal for more light with less energy

CoolStack® BOOST

up to 3680µmol/s from 1048 watts

- The ideal SON-T HPS drop-in replacement LED grow light
- Boosts the light level with 75% for the same energy consumption

CoolStack® MAX

up to 4380µmol/s from 1248 watts

- Maximize your light levels for an optimal harvest
- Delivers more than double the light level of a 1000W HPS SON-T

Longest life time and lowest light decay over time

It maybe doesn't show from the outside, but the CoolStack® is a true masterpiece of technology.

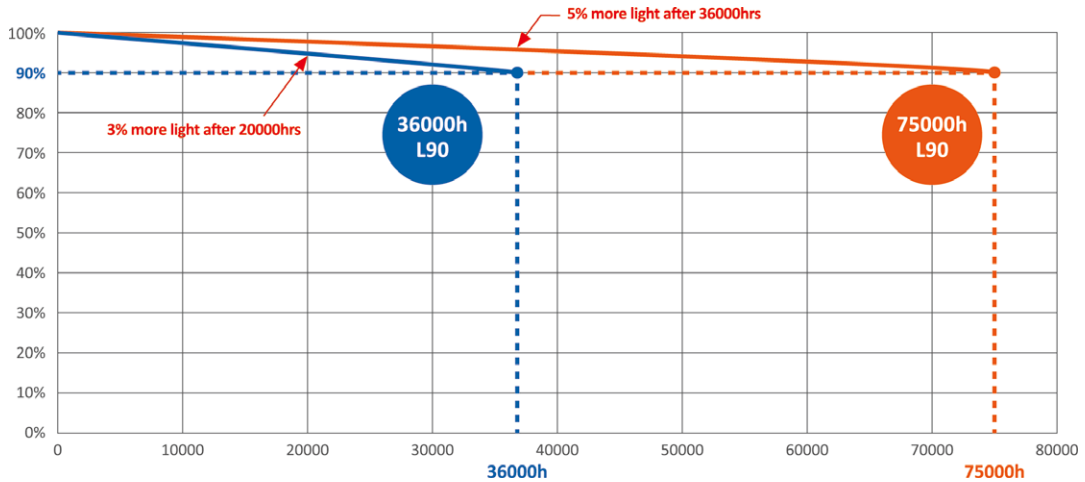
Where most LED grow lights use simple cooling principles like a block of aluminum, water which runs through the chassis or fans which blow, the heart of the CoolStack® is a sophisticated passive heat pipe and stack fin cooler.

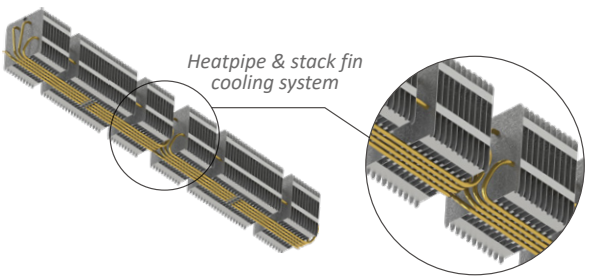
This technology, which is implemented in a lot of high end devices like lap tops, iPads and smart phones, guarantees you the best thermal management of the LEDs on the market.

The light efficiency, the life time and the light decay (how fast or slow the light reduces over time) are all directly related to the LED temperature of the grow light.

So with the CoolStack® which runs the internal LEDs as cold as possible, you as a customer obtain a grow light which lives longer, has a higher efficiency of light per watt and maintains his light at a higher light level over time.

With a life time of 75.000 hours L90B50 and a warranty of 10 years there is quality wise nothing even close to what the CoolStack® offers.





	COMPACT	BOOST/MAX
Cooling surface	1.66m²	3.32m²
Temperature rise	45°C max	45°C max
LED temperature 25°C to 35°C lower than classic cooled grow lights with same power		

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Growth Spectra for Yield and advanced Morphology

To understand how your crops are going to react on different wavelengths and colors, you have to keep in mind that every crop and every growth stage requires an individual approach.

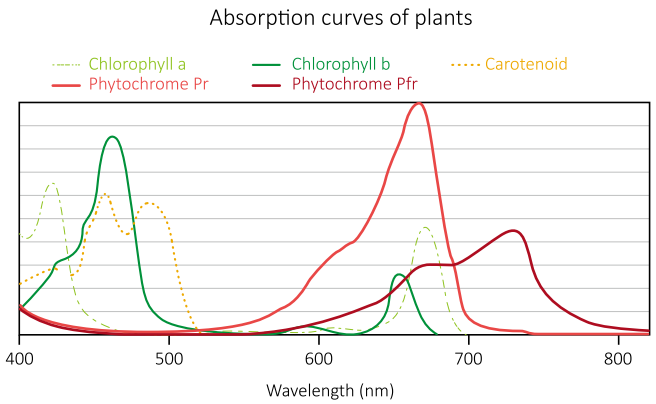
The amount of light affects the photosynthesis process in the plant.

This process is a photochemical reaction within the chloroplasts of the plant cells in which CO^2 is converted into carbohydrate under the influence of the light energy.

The spectral composition of the different wavelength regions (blue, green, yellow, red, far red or invisible e.g. UV or IR) is important for the growth, shape, development and flowering (photomorphogenesis) of the plant.

For the photosynthesis, the blue and red regions are most important.

The timing / light duration which is also called photoperiod is mainly affecting the flowering of the plants. The flowering time can be influenced by controlling the photoperiod.



Photosynthetic efficiency is mainly driven by chlorophyll a and b.

Chlorophyll a and b are mainly responsible for the photosynthesis and responsible for the definition of the area for the photosynthetically active radiation PAR.

The Photosynthetically Active Radiation (PAR) shows further photosynthetic pigments also known as antenna pigments like carotenoids - carotene, zeaxanthin, lycopene and lutein etc.

The Phytochromes Pr (red) and Pfr (far red) are mainly influencing the germination, plant growth, leave building and flowering.

The phytomorphogenic effects are controlled by applying a spectrum with a certain mix of 660nm and 730nm in order to stimulate the Pr and Pfr phytochromes.

Different regions of the wavelength in the illumination spectrum have different effects on the plants

Wavelength range [nm]	Photosynthesis	Further Effects	Further Effects	Further Effects
200 – 280		Harmful		
280 – 315		Harmful		
315 – 380				
380 – 400	Yes			
400 – 520	Yes	Vegetative growth		
520 – 610	Some	Vegetative growth		
610 – 720	Yes	Vegetative growth	Flowering	Budding
720 – 1000		Germination	Leaf building and growth	Flowering
> 1000		Converted to heat		

A typical application example for the use of 730nm:
The shade escape reaction

One of the most obvious influence of far red light on a plant is the shade escape reaction.

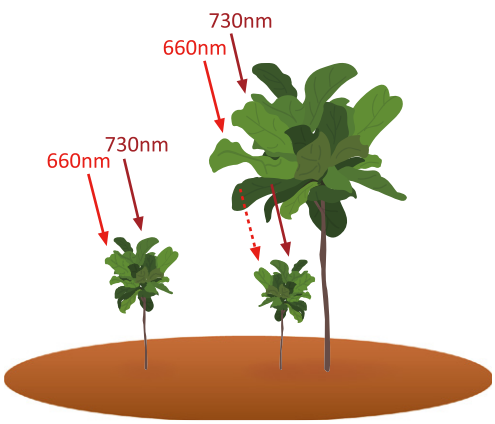
Illumination with 660nm:

If the plant is illuminated mainly with 660nm it feels like illuminated in the direct sun and grows normally.

Illumination with 730nm:

If the plant is illuminated mainly with 730nm it feels like growing in the shadow of another plant that shades the sun light.

Therefore the plant is reacting with an increased length growth to escape the shadow. This leads to taller plants but not necessarily to more bio mass.



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Each crop and growth stage its specific optimal light spectrum

We are strong disbelievers in a “one spectrum fits all” philosophy.

MechaTronix has been investing a tremendous capital in plant trials over the past years, and is a proud sponsor of most advanced plant research centers in West Europe.
Through this approach we have been clearly proven what can be reached with the ideal spectrum per crop and per growth stage.

Plant trials we have been running for the past years:

- Tomato / Cucumber / Bell peppers / Egg plants
- Strawberries / Black berries / Rasp berries / Red currents
- Salads various cultivars / Micro Greens
- Algae vertical and horizontal reactors
- Roses / Phalaenopsis / Anthurium / Chrysanthemum
- Bromeliad / Kalanchoë / Gerberas / Lilies / Lysianthus

For specific questions on plant lighting knowledge please contact us at horti@mechatronix-europe.com and one of our plant specialists will be soon in touch with you.

Spectrum of CoolStack® Growth Recipes

SPECTRUM	SPECTRUM COMPOSITION %				GROWTH RECIPE
	RED	BLUE	WHITE	FAR RED	
High Blue - White High Vegetative	76%	20%	4%	0%	3RBHW
Medium Blue - White Medium Vegetative	83%	13%	4%	0%	4RBHW
Full spectrum / Wide Spectrum	67%	14%	19%	0%	4R2B3HW
Low Blue Generative	94%	6%	0%	0%	5RB
Low Blue - White Generative	89%	6%	5%	0%	5RBHW
Low Blue - White - Far Red Generative - Flowering	83%	5%	6%	6%	5RBHWFR

Above spectra just give a brief overview of our most implemented growth recipes.
For specific cases please contact us - the chance is pretty big we have it on the shelf, or we will compose it for you!

What are typical µmol/s.m² values for horticulture lighting?

What light level for what type of crop?

Plant	Min (µmol/s.m²)	Max (µmol/s.m²)	Typical (µmol/s.m²)
Tomato	170	350	270
Pepper	120	300	230
Cucumber	120	350	230
Cannabis Vegetative growth	280	550	350
Cannabis Flowering	650	1,500	1,000

What light level for what potted plant?

Plant	Min (µmol/s.m²)	Max (µmol/s.m²)	Typical (µmol/s.m²)
Orchid / Phalaenopsis	80	230	160
Dendrobium	130	350	230
Bromelia	40	120	90
Anthurium	60	130	90
Kalanchoë	60	120	90
Potted chrysanthemum	40	80	50
Potted rose	40	120	50
Geranium	40	90	50

What light level for what cut flower?

Plant	Min (µmol/s.m²)	Max (µmol/s.m²)	Typical (µmol/s.m²)
Chrysanthemum	105	220	140
Rose	170	350	220
Lily	80	130	90
Lisianthus	170	350	230
Alstroemeria	60	160	120
Anthurium / Orchid - cut	80	160	120
Freesia	70	140	90
Gerbera	80	120	90
Tulip	25	90	60

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SPECIFICATIONS			
	CoolStack® COMPACT	CoolStack® BOOST	CoolStack® MAX
Input voltage	90 - 305 Vac or 249 - 528 Vac		
Power	500W - 680W	850W - 1.048W	1.025W - 1.248W
Light	1.750 - 2.390 µmol/s	2.850 - 3.680 µmol/s	3.100 - 4.380 µmol/s
Efficacy	3.1 - 3.6 µmol/J	3.0 - 3.35 µmol/J	3.0 - 3.6 µmol/J
Inrush current	< 20A		
Inrush time	< 2.7ms		
CosPhi	> 0.96		
Weight per lamp (Driver included)	9.050gr	15.750gr	
Dimension	W170 x L515 x H160.7 (mm)	W170 x L1000 x H160.7 (mm)	
Connection	Wieland green / black / white		

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