

Horticulture Light Series

With the help of horticulture lighting, year-round crop production can be achieved in any region of the world. In traditional farming, there can be only 1 or 2 harvests in a year; however with CEA, there can be multiple harvests as plants are grown indoors in a controlled environment.

One indoor acre is equivalent to multiple outdoor acres, depending on the plant, available space and story of the building. For instance, one acre of indoor production of strawberries may produce a yield equivalent to 30 acres. According to CropsReview.com (US), one high-rise farm is equal to 480 traditional horizontal farms



Applications

Cannabis
Leafy Greens
Vines
Stadium grass
Floriculture

The science and engineering of plant lighting has advanced tremendously in the past decade. Light from LEDs has enabled new approaches to how we grow plants, changed our production practices and often times improved crop quality

LEDs have been developed for a variety of plant applications, including as supplemental lighting, photoperiodic lighting, inter-canopy lighting and indoor (sole-source) lighting

Light intensity and quality interact to regulate plant growth and development, and thus, the spectral effects of specific wave lengths can vary depending on the spectral and intensity combination

LED lights are now powerful and cost effective enough that they can be the supplemental light source in greenhouses, and the sole sources of light in CEA vertical or indoor farms

With the advances of adjustable full spectrum LED lamps, exciting plant light recipes can be tailor-made by adjusting settings such as light intensity, duration, wavelength (colour), and illumination schedule

As a result, the modern farmer can accommodate a unique environment that fits the specific needs of their plant crop species

Light wavebands and terms

There are five wavebands of light that regulate plant growth and development. The human eye can see some wavebands (blue, green and red light), but not the others (UV and far-red light). Below are common terms used for plant lighting, followed by brief descriptions of the five light wavebands:

PAR—Photosynthetically active radiation.

This refers to the waveband of light from 400 to 700 nanometer (nm). These photons have the energy that powers photosynthesis. When measuring light for photosynthesis, use a sensor that measures in the PAR range.

PPF—Photosynthetic photon flux.

This refers to the number of photons within the PAR waveband that's emitted from a light source. It's expressed in micromoles per second ($\mu\text{mol}\cdot\text{s}^{-1}$). This unit is usually reported by horticultural light manufacturers and isn't easily measured by a grower because it refers to total PAR emitted (in all directions) from a fixture.

PPFD—Photosynthetic photon flux density.

Sometimes referred to as "light intensity" this is the number of photons within the PAR waveband that strikes a surface of 1 square meter in one second. The unit is micromoles per square meter and second ($\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$). This can be quickly measured at plant height using a quantum meter, and is the most appropriate unit for growers measuring light intensity (and potential photosynthesis) at one moment in time.

DLI—Daily light integral.

This refers to the amount of PPFD received during a day. The unit is moles per square meter and day ($\text{mol}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$). The DLI affects total photosynthetic energy available to the crop each day, and can easily be calculated for indoor growers from the PPFD and photoperiod ($\mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1} \times 60 \text{ secs}/\text{min} \times 60 \text{ mins}/\text{hour} \times \text{photoperiod in hours}/\text{day} / 1,000,000$ to convert to DLI in $\text{mol}\cdot\text{m}^{-2}\cdot\text{d}^{-1}$).

UV light—Ultraviolet light. Photons with wavelengths between 100 and 400 nm.

These high-energy photons can be damaging to people and plants, and can degrade plastics. However, at low to moderate intensities, they can increase concentrations of certain compounds, including ones that influence pigmentation. UV LEDs are expensive and have short lifetimes, and thus, aren't commonly used in plant lighting applications. When they're used, UV-A (315 to 400 nm) is more common and less dangerous than UV-B (280 to 315 nm).

Blue light—Photons with wavelengths between 400 and 500 nm.

Blue light typically inhibits extension growth of leaves and stems, making plants more compact. Because we don't perceive blue light very well, yet it has high energy, don't look directly at blue LEDs without blue-blocking glasses.

Green light—Photons with wavelengths between 500 and 600 nm.

Green LEDs are inefficient and so aren't usually used in horticulture. However, green light can be delivered using white LEDs (which emit blue, green, red and a little far-red light). Green light has variable effects on plant growth.

Red light—Photons with wavelengths between 600 and 700 nm.

Red LEDs are very efficient, and therefore, are commonly used in plant-lighting applications.

Far-red light—Photons with wavelengths between 700 and 800 nm.

This waveband promotes extension growth and, in some cases, flowering. Although this waveband is outside of the PAR waveband, recent research indicates that it can directly and indirectly increase plant growth.

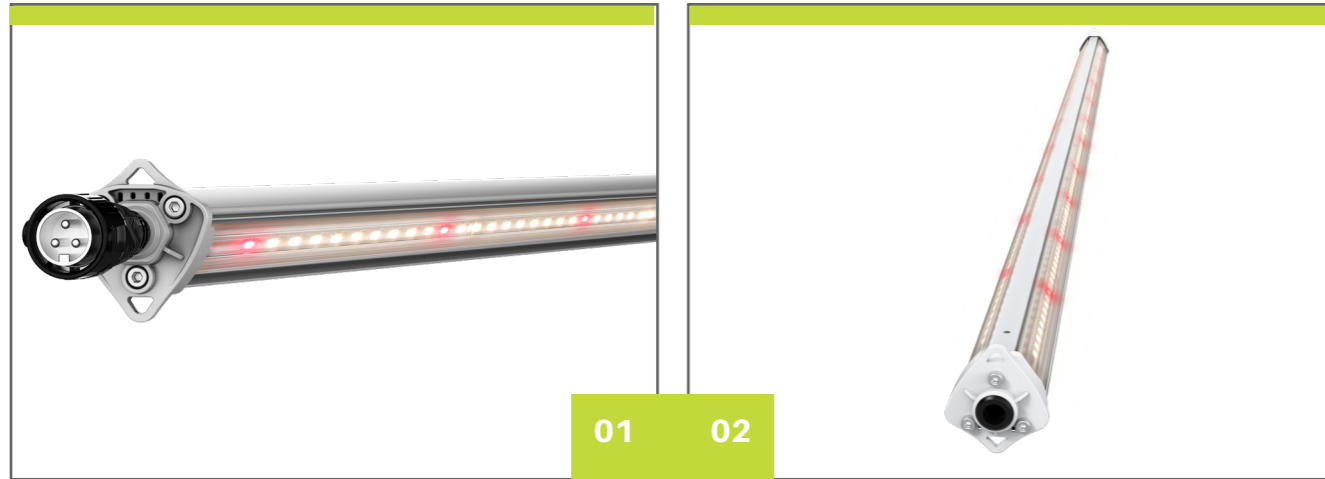
Lighting Young Plants Indoors

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Cresco 03

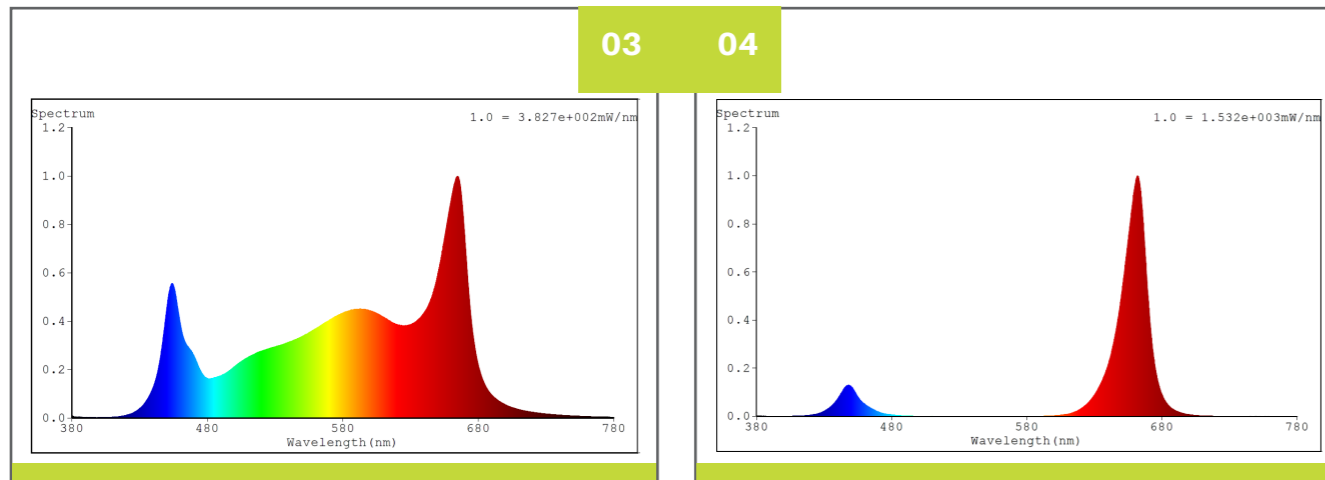
The Cresco 03 is a double sided lighting fixture for commercial vine crop and industrial HEMP greenhouses. By placing the LED's on the canopy of the plants the light is directed to focus growth-simulating light on the most important parts of the crop. Durable aluminium lightweight profile with low shading, delivering a photosynthetic photon flux (PPF) up to 450 $\mu\text{mol/s}$ and class leading efficiency up to 3 $\mu\text{mol/j}$. Cresco 03 features a narrow-profile design that minimizes the interception of light. It emits side wards light distribution, ensuring that your lower leaves get optimal uniform light and result in an increase yield.



Photosynthetic photon flux (PPF) up to 450 $\mu\text{mol/s}$
 System Efficacy 2.8 $\mu\text{mol/J}$ up to 3 $\mu\text{mol/j}$
 Dimming 0~10V
 IP Rating IP65
 Warranty 5 Years

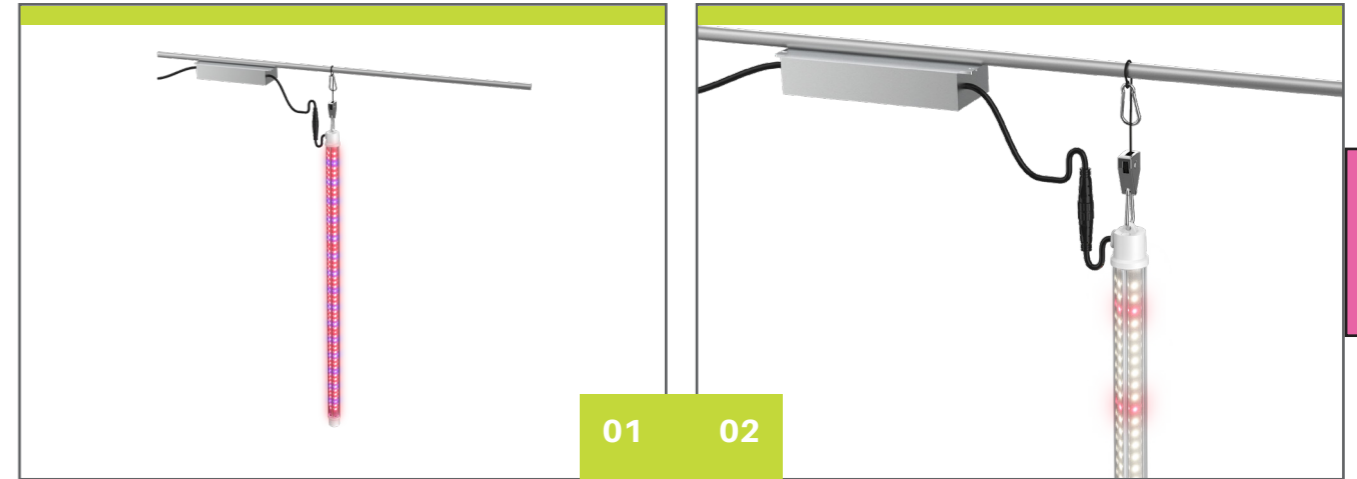
The Cresco 03 features a narrow-profile design that minimizes the interception of light. It emits sideways light distribution, ensuring that lower leaves get optimal uniform light and result in an increase yield.
 The Cresco 03 is a high intensity inter-canopy lighting system, connecting 4-20pcs lighting modules with just one power connection

CODE	POWER (W)	PPF OUTPUT ($\mu\text{mol/s}$)	BEAM ANGLES	DIMENSIONS (MM)
HL120D/075S*03	75	202 ~ 225	240°	1,200*49*58
HL250D/150S*03	150	405 ~ 450	240°	2,500*49*58



Cresco 04

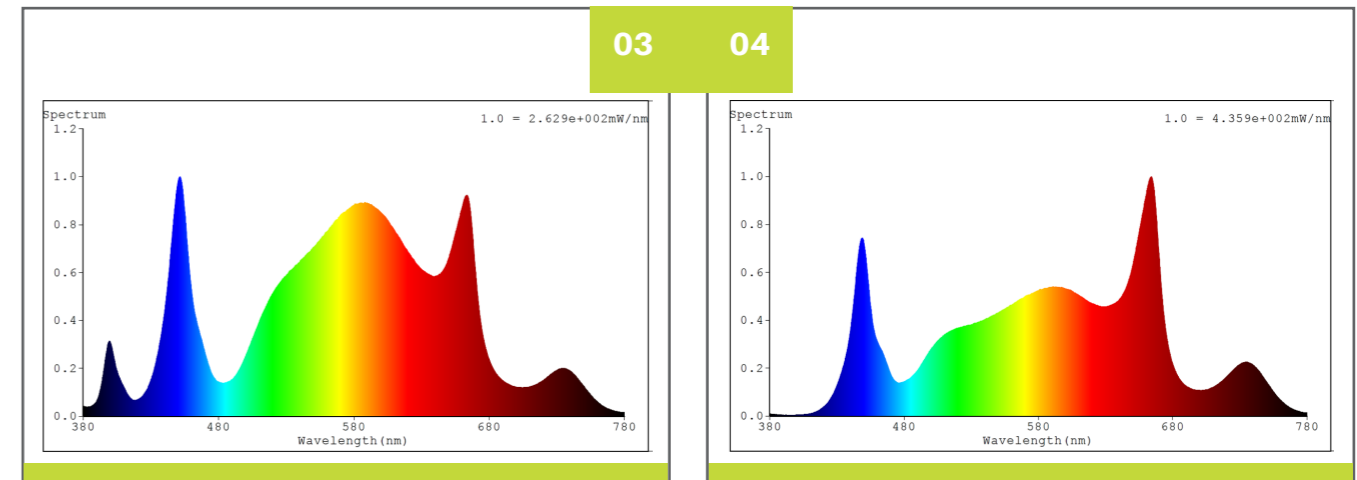
The Cresco 04 LED 360° vertical inter-canopy lighting system is designed for high-wire crops, as well as hydroponics vertical grow tower installations. Four-sides LEDs delivers high levels of PPF values with optimal angled vertical light uniformity. The Inter-lighting modules are constructed in a slim water-proof design and suspended between the plant canopy rows with the easy-hang system, thereby directing growth-simulating light on the most important parts of the crop resulting in higher yields.



Photosynthetic photon flux (PPF) up to 600 $\mu\text{mol/s}$
 System efficacy 2.7 $\mu\text{mol/J}$ and 3 $\mu\text{mol/J}$
 Dimming 0~10V
 IP Rating IP65
 Warranty 5 Years

A durable aluminium lightweight profile with low shading, the Cresco-04 is a high intensity inter-canopy lighting system, connecting up to 6 sets of daisy chains, delivering a photosynthetic photon flux (PPF) up to 600 $\mu\text{mol/s}$ and class leading efficiency up to 3 $\mu\text{mol/j}$

CODE	POWER (W)	PPF OUTPUT ($\mu\text{mol/s}$)	DIMENSIONS (MM)
HL110D/100S*04	100	200 ~ 300	Ø46*1105
HL210D/200S*04	200	400 ~ 600	Ø46*2105



Cresco 06

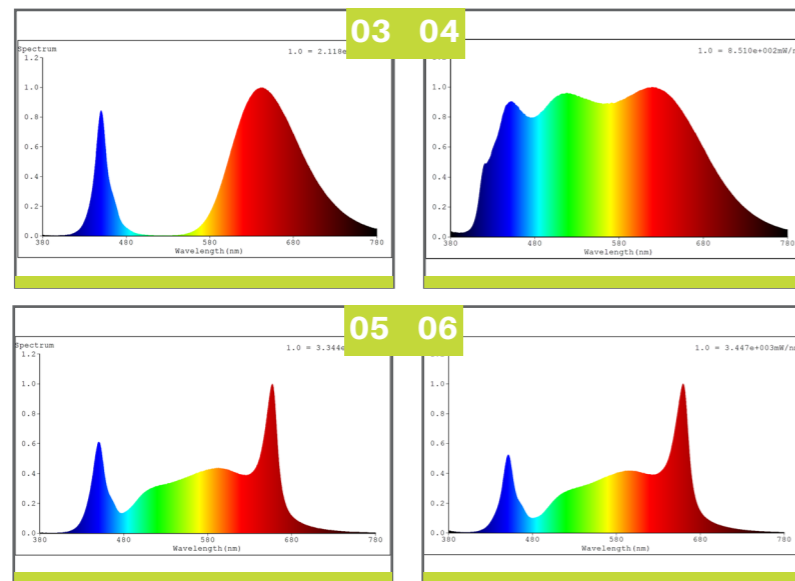
The Cresco 06 LED grow light is an ideal horticulture lighting solution. The Cresco 06 is a full-cycle top lighting solution. The simplicity of installation and use make it an ideal solution for achieving high and uniform lighting levels redefining the use of horticultural lighting for greenhouse and indoor sole-source operations.



Photosynthetic photon flux (PPF) up to 1270 $\mu\text{mol/s}$
 System Efficacy 2.8 $\mu\text{mol/J}$
 Dimming 0~10V
 IP Rating IP65
 Warranty 5 Years
 Ideal for cannabis and floriculture

The Cresco 06 has two standard spectrum solutions with different photosynthetic photon flux (PPF) however can be supplied with a wide range of colour spectra
 The optimal colour recipe is determined by the specific crops you want to cultivate

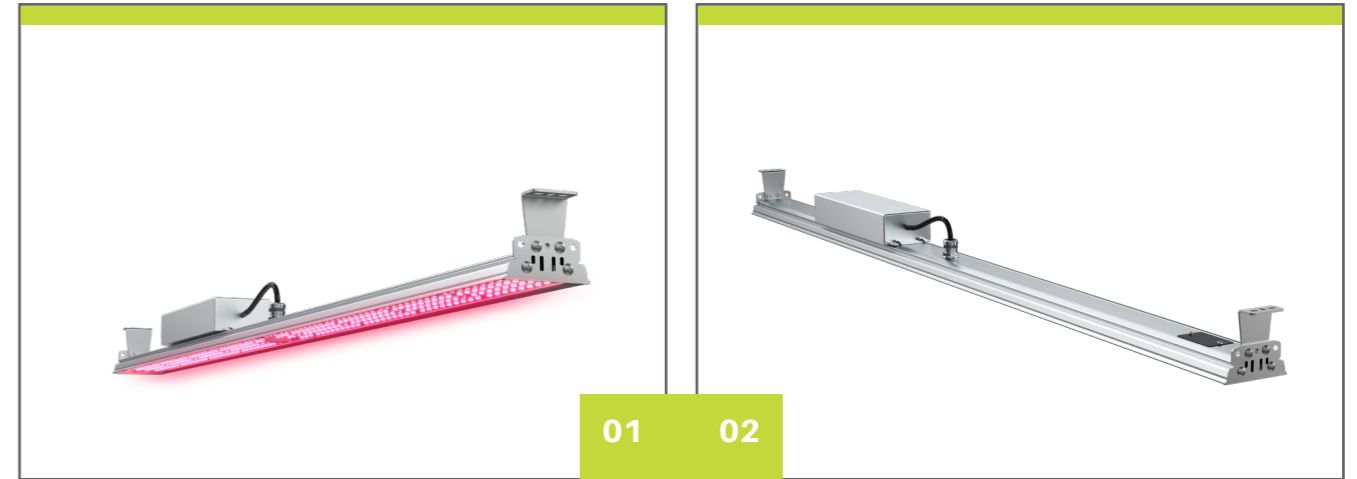
CODE	POWER (W)	PPF OUTPUT ($\mu\text{mol/s}$)	DIMENSIONS (MM)
HL120D/300*06	300	840	1,340*195*200
HL120D/600*06	600	1,680	1,340*195*200



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Cresco 09

The elegance of simplicity allows the Cresco 09 LED grow light to be suitable for every CEA application. Dust free, easy to clean with long life span. External driver, good for reliable and maintainable performance. The Cresco 09 is the versatile lighting solution for every application. The Cresco 09 offers growers with the choice of spectrum, helping maximize growth in a greenhouse and indoor settings, balancing crop quality and yield. A high intensity, bar shaped fixture, the Cresco 09 has a photosynthetic photon flux (PPF) up to 420 $\mu\text{mol/s}$ and class leading efficiency up to 2.8 $\mu\text{mol/J}$.

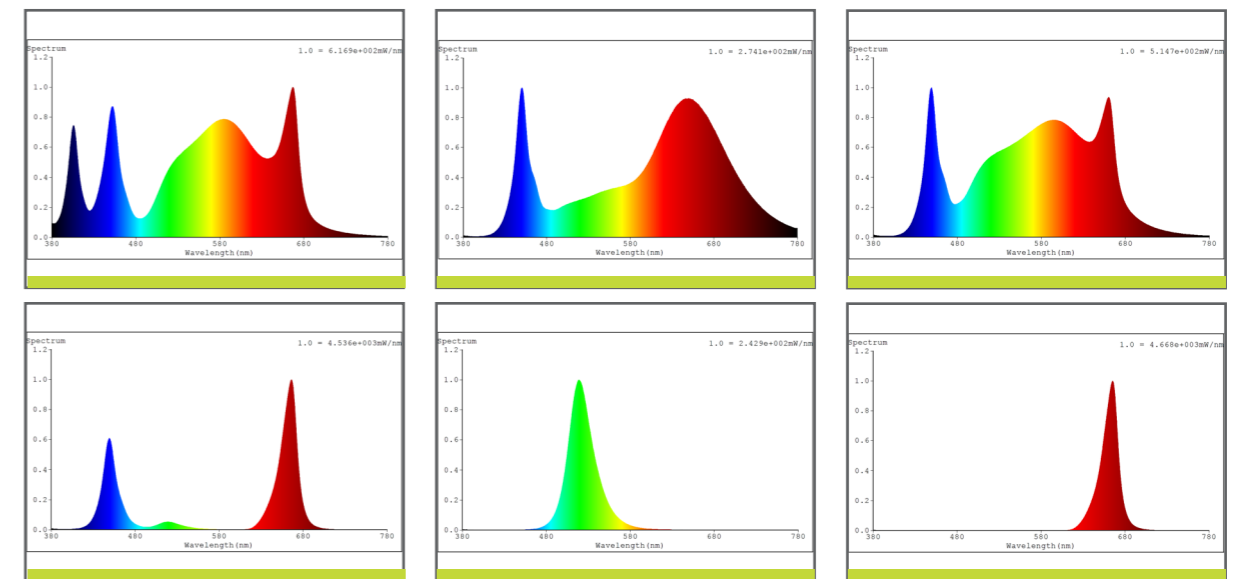


Photosynthetic photon flux (PPF) up to 420 $\mu\text{mol/s}$
 System Efficacy 2.3 $\mu\text{mol/J}$ and 2.8 $\mu\text{mol/J}$
 Dimming 0~10V
 IP Rating IP65
 Warranty 5 Years

The Cresco 09 provides periods of reduced intensity, which allows regeneration of the photosynthetic apparatus and ensures better preparation for the efficient use of light of a higher intensity. In this way, 'energy management' within the plant becomes more efficient.

CODE	POWER (W)	PPF OUTPUT ($\mu\text{mol/s}$)	DIMENSIONS (MM)
HL115D/150S*09	150	345 & 420	1,148*72*60

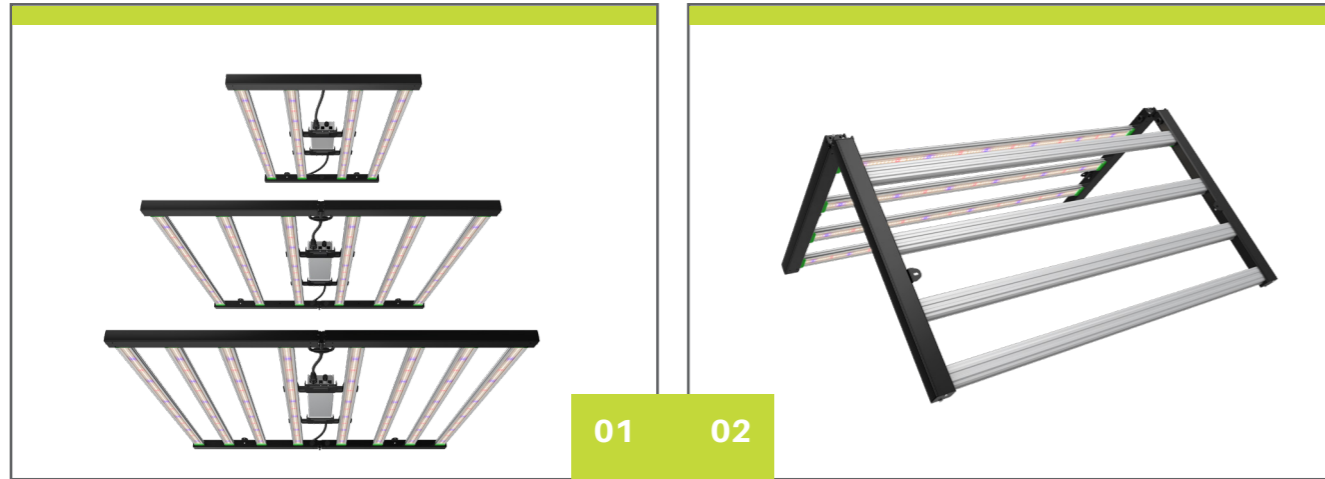
The Cresco 09 has several standard spectrum solutions with different photosynthetic photon flux (PPF) and can be supplied with a wide range of colour spectra. The optimal colour recipe is determined by the specific crops you wish to cultivate.



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Cresco 16

The Cresco 16 LED grow light is an ideal horticulture lighting solution specialising in all grow stages including propagation, vegetation and flowering. The Cresco16 is a full-cycle 4X4 fold lighting solution. The simplicity of installation and use make it an ideal solution for achieving high and uniform lighting levels redefining the use of horticultural lighting for greenhouse and indoor sole-source operations.



Photosynthetic photon flux (PPF) up to 1908 $\mu\text{mol/s}$
 System Efficacy 2.3 $\mu\text{mol/J}$, 2.8 $\mu\text{mol/J}$
 Dimming 0~10V
 IP Rating IP65
 Warranty 5 Years

Designed for multi-tier use, it is an ideal lighting solution for commercial cannabis growing racks. A high intensity, 4X4 fold shaped fixture, the Cresco16 has a photosynthetic photon flux (PPF) up to 1908 $\mu\text{mol/s}$ and class leading efficiency up to 2.65 $\mu\text{mol/J}$.

CODE	POWER (W)	PPF OUTPUT ($\mu\text{mol/s}$)	DIMENSIONS (MM)
HL060D/400S*16	400	980	586*1,044*62
HL 100D/600S*16	600	1,200 ~ 1,590	1,073*1,044*62
HL 180D/720S*16	720	1,440 ~ 1,908	1,187*1,044*62

