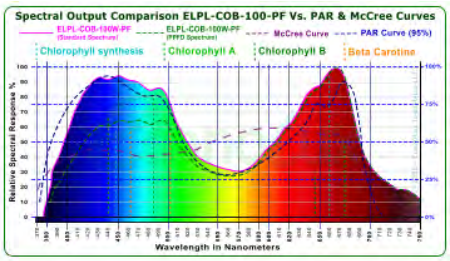
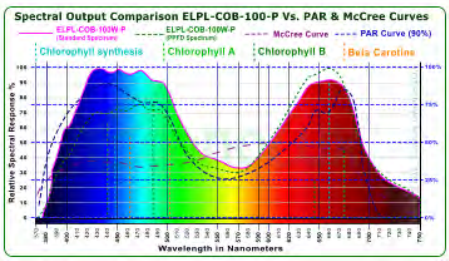
EconoLux Industries Limited - 宜諾科技有限公司

Admin: 7F, Kin On Commercial Building, 49-51 Jervois Street, Sheun Wan, Hong Kong

TEL: (English): (+86) 186-0592-4298 (English & 中国): (+86) 186-2168-9926

ELPL-COB-100W Series Light-engine Catalogue





EconoLux Industries Limited - 宜諾科技有限公司

Admin: 7F, Kin On Commercial Building, 49-51 Jervois Street, Sheun Wan, Hong Kong

TEL: (English): (+86) 186-0592-4298 (English & 中国): (+86) 186-2168-9926

WEB: www.EconoLuxIdustries.com

ELPL-COB-100W Series Light-engine Catalogue

Introduction

The ELPL-COB-100W series of Plant/Grow-light COB (Chip On Board) Light-engines are a world's first, cutting edge, innovation. With a previously unheard of 24 bands (wavelengths) of LEDs, it provides a very close match (90% ~ 95%) to the PAR curve! They are presently available in two models:

- **ELPL-COB-100W-P** - A 90% match to the PAR curve for general purpose growing
- **ELPL-COB-100W-PF** - A 95% match to the PAR curve with extra red for flowering plants

These COBs provide the closest match to the PAR curve available, and offer high PPFD. They are offered in our PRO-LED series of LED grow lights, and they are also available to hobbyists and to makers of LED plant/grow lights (as components), through our "EconoLux Energized" program.

Plant/Grow Light Measurements Quick Review

The unit of measurement for plant/grow light output is **PAR** (Photosynthetically Active Radiation). PAR is measured using a quantum flux meter, which has a response curve between 400nm and 700nm and is a measure of the Micromoles per square meter, per second falling on the plants (µmol/M²/S).

When it comes to measuring overall intensity of the light falling onto the plants, the unit of measurement is **PPFD** (Photosynthetic Photon Flux Density), also measured in Micromoles per square meter per second (µmol/M²/S). This is an important measurement as it allows us to show the overall efficiency of a plant/grow lights in **PPFD/Watt**.

Another important, but less used, measurement is the Daily Light Integral (**DLI**). The DLI is defined as the amount of PAR (PPFD) received by plants each day as a function of light intensity (instantaneous light: µmol/m²/s-1) and duration (day). It is expressed as moles of light (mol) per square meter (m-2) per day (d-1), or: mol/m²/d-1 (moles per day).

Lumens are for humans, PAR/PPFD are for plants!

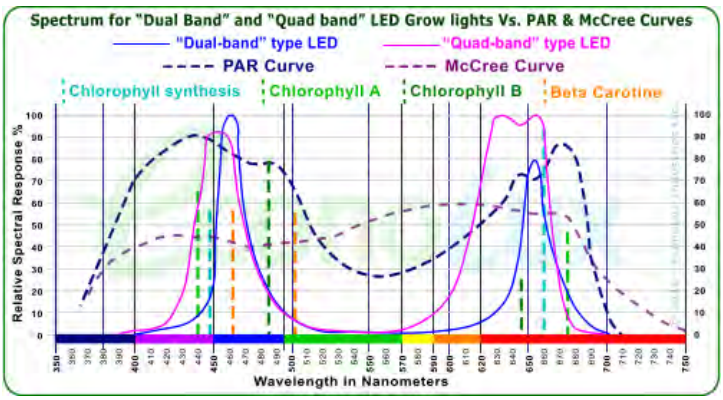
Competing LED Plant Growing Light Spectra

LED grow lights have become increasingly popular as the cost of LEDs have dropped. In addition, they use far less energy for the same PPFD output, than conventional HID grow lights, and they also have a longer lifespan, saving on maintenance and re-lamping costs.

The following is a set of graphs of typical grow LED grow lights where the PAR and McCree curves have been overlaid on some samples of LED grow light spectra (from manufacturers data sheets). The PAR and McCree curves have been scaled to match the peak of the plant light output in the blue region for the PAR curve, and in the orange region for the McCree curve.

LED Grow lights are usually classified by "bands", that is the number of different wavelengths of LEDs that are used in the grow light. The simplest and cheapest types may have

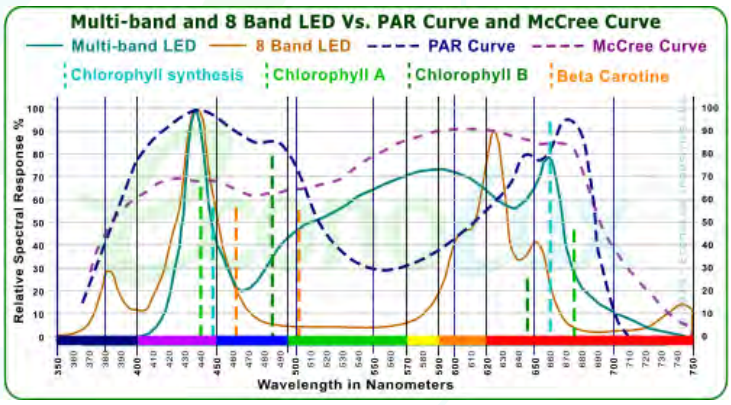
only 2 bands (2 different wavelengths, one red and one blue), or 4 bands (2 different wavelengths of blue, and 2 different wavelengths of red LEDs). Adding different wavelengths of blue and red LEDs, allows for a broader peak of light in each of the blue and red areas.



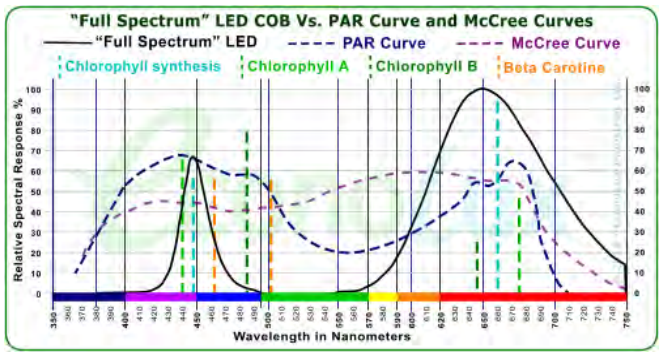
You can see from the graph (left) that the output of these LED grow lights is actually a pair of spikes in the blue and red regions of the spectrum, with the quad (4 band) type having broader output spikes. There is almost no light at all in the 500nm to 580nm green to yellow portion of the spectrum, which is necessary (especially if one is considering the McCree curve). The dual band type's light output in the red barely covers the chlorophyll synthesis line at 660nm. These LED grow lights do not have a close match to the PAR, or the McCree, curves.

In all fairness to vendors, more advanced LED grow lights with 6, 8, or even 10 bands are now on the market, The more different bands (wavelengths) of LEDs that are used, the higher the cost to produce the light, thus many of these multi-band LED grow lights are found in the high end consumer or professional market. Here is a comparison graph (below) of a Multi-band (the exact number was not specified by the manufacturer), and an 8 band LED grow light:

The 8 band LED grow light has two narrow peaks in the blue, and not much far red light above 650nm. It is not a good match to either the PAR curve or the McCree curve. The multi-band LED on the other hand, also has a poor blue portion of the spectrum with a narrow peak, but has a much closer match to the McCree curve in the Green/Yellow/Orange part of the spectrum, up to 640nm where it dips, then increases again to peak at 660nm.



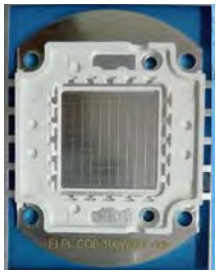
"Full-Spectrum" LEDs



Recently so called "Full Spectrum" LEDs (both as single LEDs and as COBs) have appeared on the market. They are quite low cost to make as they are essentially a single band of Blue LEDs, which are both cheap, and plentiful, as they are used to make 'white-light' LEDs. The blue LEDs are then coated with a low-Kelvin phosphor, to produce a lot of red light. The leakage of blue light through the phosphor coating produces a spike of blue light, while the phosphor coating produces the orange and red light.

Calling these 'full spectrum' LEDs is a serious monomer as they have a very narrow spike of blue between 420nm and 470nm, minuscule amounts of green light, very little yellow light, and an overabundance of red light, peaking at 650nm. These "Full Spectrum" LEDs don't match the PAR or McCree curves at all.

WHAT IS A COB?



COB is a contraction for "Chip On Board". In a COB, rather than the LEDs being individually encapsulated, they are mounted (with thermally conductive glue) onto a zinc plated, copper heat-sink (see photo of an empty COB holder on left). This provides a convenient package that is easy to handle, and also makes the thermal management simpler, as the COBs can be directly mounted to a suitable heat-sink. Due to the popularity of COBs, there are also a wide range of accessories available for them, such as reflectors and lenses to control the beam-spread.

EconoLux COB Light-engines

We have chosen to call our COB products "light-engines" as they provided the engine for building complete LED plant/grow lights. The COBs provide all of the wavelengths required, and no extra, or external, LEDs are required to get the desired spectrum curve.

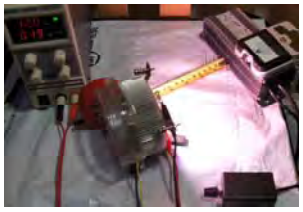
As mentioned before, the more bands (wavelengths) of LEDs one can include, the better control the designer has over the final spectrum. However, adding wavelengths increases costs, not only from the larger numbers of wavelengths of LEDs chips, some of which are unusual (not common) and thus expensive, but adding bands also comes with some additional issues.

1] When you purchase large quantities of LED chips from vendors (such as BridgeLux or EpiLED), they supply them at the Nominal Wavelength (EG: 420nm). This wavelength can vary by as much as +/- 2.5% so the "420nm" chips can have a variance of between 409.5nm and 430.5nm. To get the exact wavelength desired, the LED chips have to be individually tested before encapsulation or assembly into a COB. This is a time and labour intensive process, and results in a high rejection rate where the non-compliant chips need to be recycled into non wavelength-specific projects, thereby increasing the overall costs. One has to buy a lot more LED chips than are needed, to get the wavelengths desired.

2] The Pick and Place (P&P) machines (photo on right) that are used to assemble COBs can usually only hold 4 different wavelengths of LED chips at the same time. In order to make an 8 band COB, you need to make 2 passes through the P&P machine, for a 16 band COB you need to make 4 passes through the P&P machine, and for a 24 band COB, you need to make 6 passes through the P&P machine.

In between each pass of the P&P machine, you have to manually change the LED chip holders to the next set, before restarting the P&P machine - another time and labour intensive operation.

Despite these drawbacks, EconoLux Industries has created the world's first 24 band, 100W, LED COBs that have a close 90% ~ 95% match to the PAR curve. The spectrum of the EconoLux ELPL-COB-100W-P has a 90% match to the PAR curve and is good for cultivation of any kind of plants. The ELPL-COB-100W-PF (flowering version) of the COB, has about 10% more red than required by the PAR curve, so its good for cultivation of flowering/fruiting plants.



Testing the output of an LED COB Grow-light with a PPFD meter

As you can see from the spectrum graphs on the following pages, these COB Light-engines offer full spectrum light output covering the range of 390nm to 750nm (the PAR range is from 400nm to 700nm). It is interesting to note the PPFD curve (dashed green line) tends to discount the blue light, but that part of the spectral curve is still smooth.

In addition, when the spectra of the ELPL COBs are compared to standard absorption curves for Chlorophyll A, B, F, and Beta Carotene, the matches to the curves is almost perfect.

EconoLux Industries Limited - 宜諾科技有限公司

Admin: 7F, Kin On Commercial Building, 49-51 Jervois Street, Sheun Wan, Hong Kong

TEL: (English): (+86) 186-0592-4298 (English & 中国): (+86) 186-2168-9926

WEB: www.EconoLuxIdustries.com

ELPL-COB-100W-P - 24 BAND, LED GROW LIGHT-ENGINE

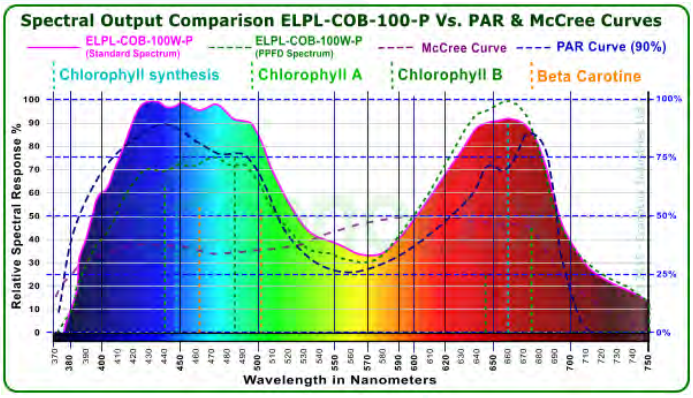
The EconoLux ELPL-COB-100W-P, 24 band, LED grow light-engine is our 100W, LED COB (Chip On Board) with a 90% match to the PAR curve. It produces 346.7 PAR/PPFD* at a distance of 30 cm (1 ft) - that's 3.47 PPFD/Watt!

It features a very close match (90%) to the PAR curve (the light spectrum that plants need to maximize growth), making it ideal for general purpose growing. It has 22 bands (Wavelengths) of LEDs including, UV, Deep Blue, Blue, Light Green, Dark green, Yellow, Orange, Light Red, Dark Red, IR, plus white, and our proprietary B-R (Broadband Red) coating - for a total of 24 bands.

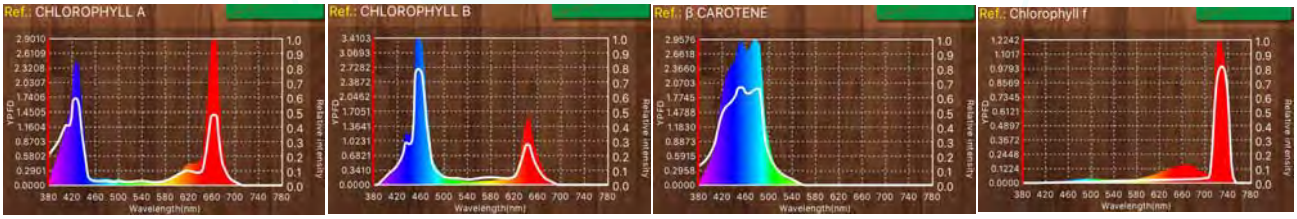
ELPL-COB-100W-P - 24 BAND, 100W, LED GROW LIGHT-ENGINE - Features

Spectrum:

The ELPL-COB-100W-P has a very close match (90%) to the PAR curve - the spectrum of light that plants need to thrive. The graph on the right shows the ELPL-COB-100W-P standard spectrum as the human eyes sees it (pink line with spectrum), the PAR curve (dashed blue line set to 90%), the McCree curve (dashed purple line set to 50%), the major plant-light absorption lines (vertical dashed lines) and the PPFD curve (dashed green line); overlaid onto the ELPL-COB-100W-P spectrum.



The graphs below (from our plant/grow light spectrometer), measuring in PPFD*, shows comparisons of the ELPL-COB-100W-P's spectrum to standard curves for Chlorophyll, and Beta Carotene, the light absorbing compounds in plants responsible for growth. The ELPL-COB-100W-P's match to these curves is almost perfect.



ELPL-COB-100W-P (PAR Type) Specifications:

Type: LED COB Light-engine

Nominal Wattage: 100W

Power: 30VDC @ 3A (constant current driver recommended)

Dimensions: 56mm X 52mm X 5.2mm

LED Lifespan: 50,000 Hours

Kelvin: 11,926K

Luminance:# 42,991 Lux - 3,038.9 Lumens (Measured using the CIE curve)

UV (380~399nm) Output: 30.45 µmol/M^2/$S^{\#}$

Blue (400~499 nm) Output: 404.53 mol/M^2/$S^{\#}$

Green (500~599 nm) Output: 240.5 µmol/M^2/$S^{\#}$

Red (600~700nm) Output: 474.22 µmol/M^2/$S^{\#}$

IR (701~780nm) Output: 102.51 µmol/M^2/$S^{\#}$

Blue to Red Ratio: 1.7:1

Total PAR/PPFD* Output (µ-mol/M^2/S): 1,119.2 @ 15cm (6"); 346.7 @ 30.5cm (12") - using a quantum PAR meter; with NO reflector or lens used.

*** Note:** Light energy for plants is measured as Photosynthetic Active Radiation (PAR), with light falling onto the surface of the plants measured as Photosynthetic Photon Flux Density (PPFD)

 # Note: These measurements were made at a distance of 15cm, (6") with no lens or reflector used. Readings will vary with distance from the COB, and the use of supplementary optics (reflector and/or lens).

EconoLux Industries Limited - 宜諾科技有限公司

Admin: 7F, Kin On Commercial Building, 49-51 Jervois Street, Sheun Wan, Hong Kong
TEL: (English): (+86) 186-0592-4298 (English & 中国): (+86) 186-2168-9926
WEB: www.EconoLuxIdustries.com

ELPL-COB-100W-PF - 24 BAND, LED GROW LIGHT-ENGINE

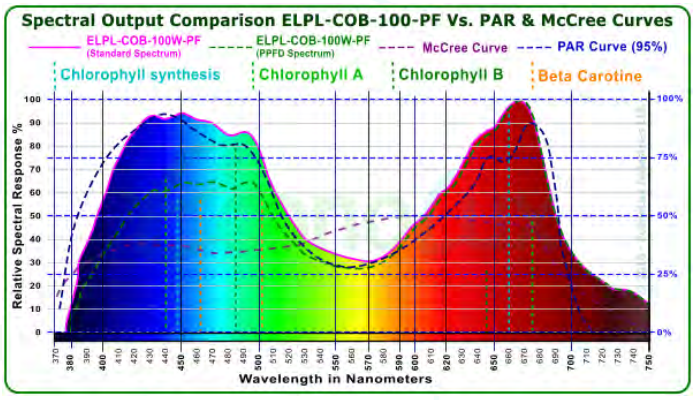
The EconoLux ELPL-COB-100W-PF, 24 band, LED grow light-engine is our LED COB (Chip On Board) with a 95% match to the PAR curve, with about 10% extra Red light. It produces 333.6 PAR/PPFD* at a distance of 30 cm (1 ft) - that's 3.36 PPFD/Watt!

It features a very close match (95%) to the PAR curve (the light spectrum that plants need to maximize growth) Since it has about 10% more red than the PAR curve, it is ideal for growing flowering/fruiting plants. It has 22 bands (Wavelengths) of LEDs including, UV, Deep Blue, Blue, Light Green, Dark green, Yellow, Orange, Light Red, Dark Red, IR, plus white, and our proprietary B-R (Broadband Red) coating - for a total of 24 bands.

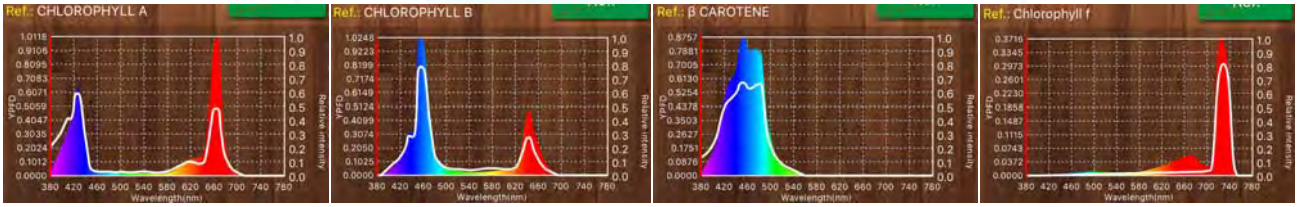
ELPL-COB-100W-PF - 24 BAND, 100W, LED GROW LIGHT-ENGINE - Features

Spectrum:

The ELPL-COB-100W-PF has a very close match (95%) to the PAR curve - the spectrum of light that plants need to thrive. The graph on the right shows the ELPL-COB-100W-PF standard spectrum as the human eyes sees it (pink line with spectrum), the PAR curve (dashed blue line set to 95%), the McCree curve (dashed purple line set to 50%), the major plant-light absorption lines (vertical dashed lines) and the PPFD curve (dashed green line); overlaid onto the ELPL-COB-100W-PF spectrum.



The graphs below (from our plant/grow light spectrometer), measuring in PPFD*, shows comparisons of the ELPL-COB-100W-PF's spectrum to standard curves for Chlorophyll, and Beta Carotene, the light absorbing compounds in plants responsible for growth. The ELPL-COB-100W-PF's match to these curves is almost perfect.



ELPL-COB-100W-PF (PAR Flowering Type) Specifications:

Type: LED COB Light-engine
Nominal Wattage: 100W
Power: 30VDC @ 3A (constant current driver recommended)
Dimensions: 56mm X 52mm X 5.2mm
LED Lifespan: 50,000 Hours
Kelvin: 15,570K

Luminance:# 44,303 Lux - 3,131.6 Lumens (Measured using the CIE curve)

UV (380~399nm) Output: 32.54 µmol/M^2/S#
Blue (400~499 nm) Output: 439.11 mol/M^2/S#
Green (500~599 nm) Output: 350.15 µmol/M^2/S#
Red (600~700nm) Output: 506.45 µmol/M^2/S#
IR (701~780nm) Output: 103.6 µmol/M^2/S#
Blue to Red Ratio: 1:1.8

Total PAR/PPFD* Output (µ-mol/M^2/S): 1,196.6 @ 15cm (6"); 333.6 @ 30.5cm (12") - using a quantum PAR meter; with NO reflector or lens used.

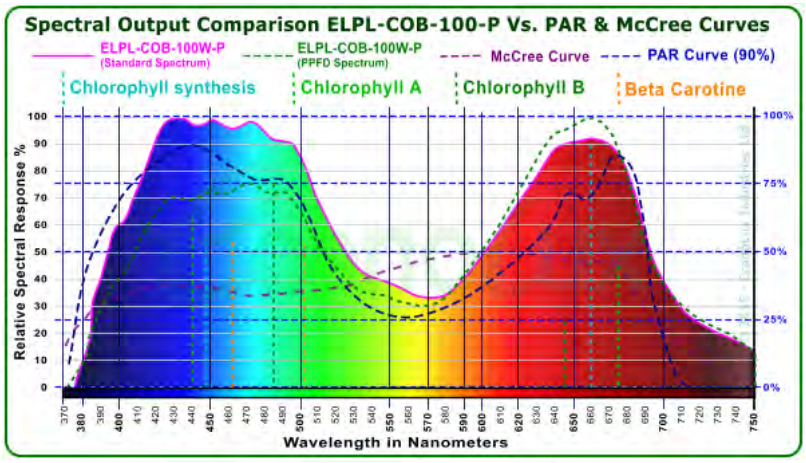
*** Note:** Light energy for plants is measured as Photosynthetic Active Radiation (PAR), with light falling onto the surface of the plants measured as Photosynthetic Photon Flux Density (PPFD)

 # Note: These measurements were made at a distance of 15cm, (6") with no lens or reflector used. Readings will vary with distance from the COB, and the use of supplementary optics (reflector/lens).

SUMMARY

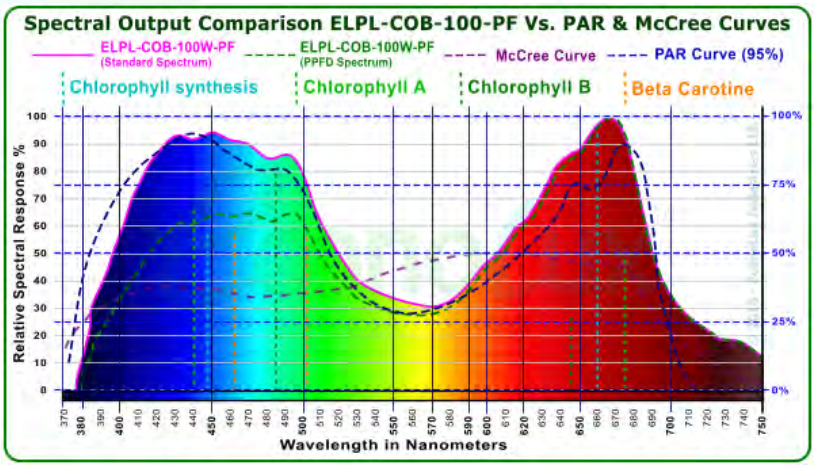
ELPL-COB-100W-P (PAR type)

The ELPL-COB-100W-P is a 100W, 24 band, LED Light-engine, that has a spectrum with a close (90%) match to the PAR curve. It is good for general purpose growing of all plant types.



ELPL-COB-100W-PF (Flowering type)

The ELPL-COB-100W-PF is a 24 band, 100W, LED Light-engine, that has a spectrum with a close (95%) match to the PAR curve. It is good for growing all plant types, especially flowering/ fruiting plants, as it has about 10% more red light than the standard PAR curve.



EconoLux™
EconoLux Industries Limited - 宜諾科技有限公司

Admin: 7F, Kin On Commercial Building, 49-51 Jervois Street, Sheun Wan, Hong Kong

TEL: (English): (+86) 186-0592-4298 (English & 中国): (+86) 186-2168-9926

Web: www.EconoLuxIndustries.com