

LEDiL®

GUIDE FOR HORTICULTURAL LIGHTING OPTICS



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HORTICULTURAL LIGHTING IN A NUTSHELL

Plants have a completely different sensitivity to light colours. Contrary to other lighting applications which are made for humans and valued in luxes, plants consume light and need photons for photosynthesis. The amount and ratio of different wavelengths from the light determine how, and how fast, plants grow and produce crop. Regardless of different seasons or unstable weather today's artificially created horticultural lighting can mimic any daylight integral and have stable, optimized growing conditions for each plant.

SOME TERMS TO KNOW:

The **photosynthetic photon flux** (PPF), which comes from the total amount of **photosynthetically active radiation** (PAR), is what has the most effect on how strong plant growth will be. More PPF means more photons and more power, and this value can be easily measured and used as a parallel to lumens.

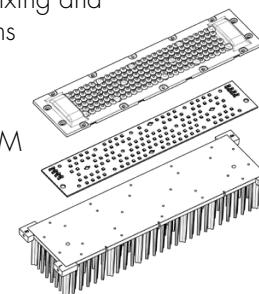
On the other hand **photosynthetic flux density** (PPFD) means how many of the photons actually hit their target, and this can be related to luxes.



WHY LEDiL?

WIDE RANGE OF MODULAR DESIGNS AVAILABLE FOR ALL TYPES OF HORTICULTURAL LIGHTING

- Efficient single lenses and arrays, IP-solutions, uniform colour mixing and various light distributions
- Optimized results with the latest LEDs
- Reduced luminaire BOM costs
- Use same luminaire design over and over again



SUPPORTING COMPONENTS AVAILABLE FROM OUR PARTNERS

Made in collaboration to provide thermally, optically and efficiently optimised off-the-shelf solutions to make your luminaire designs easier. Just add personality.



LIGHT THAT IS RIGHT

LEDiL®

KEY DESIGN QUESTIONS

COMPONENT / AFFECTING / KEY QUESTIONS

LEDs DRIVER

PPF & SPECTRAL POWER

Generating enough photons?
Correct ratio of photons?

OPTICS

PPFD (MIN, MAX, UNIFORMITY)

Are the photons going where they are consumed?
Distance required between luminaires?
Distance required between luminaire & plants?

ALL

PPF/J, W/m², W/kg (EFFICACY)

How efficient the installation is?

SUCCESSFUL GROW LIGHT FIXTURE IS THE SUM OF IT'S COMPONENTS

LED vs HID

ADVANTAGES

LONGER LIFETIME

LED 90% 25.000 h 85% 50.000 h

HID 50% 20.000 h

LESS ENERGY/ELECTRICITY USED

-30%

(No savings if additional heating is needed)

SPECTRUM OPTIMIZATION

+ Higher yield

+ Healthier crops

DISADVANTAGES

INVESTMENT COST
2.0 - 5.0 times higher

LOWER LIGHT OUTPUT
Light should be focused only on plants to maximise PPFD



The right optics can help to:

Focus light more efficiently

Reduce the number of LEDs/Luminaires needed

Improve PPFD with less power

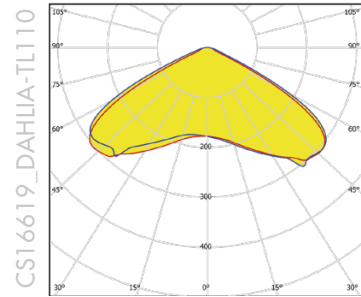
OPTIMISE YOUR SYSTEM ROI WITH THE RIGHT COMPONENTS

DAHLIA

Highly efficient linear platform for horticultural lighting

FEATURES

- Comes with a silicone seal for ingress protection
- Made from PMMA (good chemical resistance)
- Sturdy fastening with 14 screws
- Adopts easily into design with 1-4 channels and varying number of LEDs per channel
- PPFD deviation 10 % over the growth area



COMPATIBILITY

- Typical horticultural 3535 HP LEDs (e.g. Osram Oslon SQ Horti, Luxeon SunPlus 35 Line LEDs)

SIMULATION RESULTS

36 DAHLIA modules in three lines

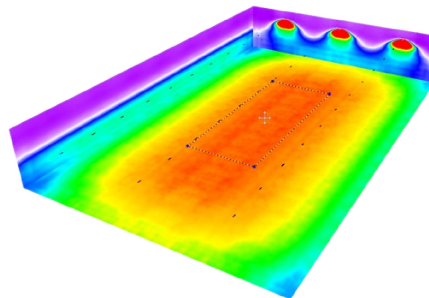
- Distance to tray: 3.2 m
- Spacing: 3.1 x 6.8 m
- Power: 260 W / module
- PPF: 700 $\mu\text{mol/s}$ / module*
- Efficacy: 2.69 $\mu\text{mol/J}$

Results at center tray (width 6.2 m)

- Min 36 $\mu\text{mol/m}^2$, Max 39 $\mu\text{mol/m}^2$
- Average PPFD 38 $\mu\text{mol/m}^2$
- PPFD uniformity on grow tray 95.3 %

Results at first and last tray

- Min 22 $\mu\text{mol/m}^2$, Max 38 $\mu\text{mol/m}^2$
- Average PPFD 32 $\mu\text{mol/m}^2$
- PPFD uniformity on grow tray 67.2 %



*with red/white LED ration being 3:1

Designed to achieve over 90 % PPFD uniformity across the 6 meter growing tray while reducing power consumption.



High power density
by 120 closely
spaced lenses

Ingress protection with easy
to clean smooth surface

Extremely uniform lighting on the growth area
resulting in optimal growing conditions

TOP LIGHTING - GREENHOUSES

Illumination of the hall and plants from ceiling level.

CHALLENGES

- Light concentration on plants
- Uniformity and constant quality of light spectrum
- High amount of power needed

TYPICAL BEAMS:



TOP LIGHTING - VERTICAL FARMING

Illumination from top of the plants at close distance.

CHALLENGES

- Uniform intensity and spectral distribution
- Plants shading each other
- Photosynthetic efficiency (PPF/W)
- Heat

TYPICAL BEAMS:



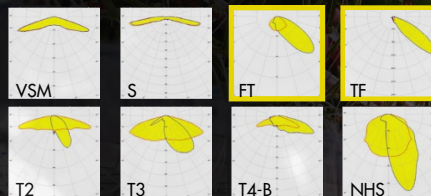
INTRA-CANOPY LIGHTING

Illumination on the side or in between the plants.

CHALLENGES

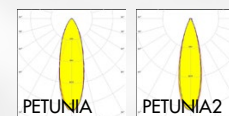
- Uniform PPFD
- Good color uniformity (if continuous/wide spectrum)
- Spectrum fit to the rest of lighting
- Light direction

TYPICAL BEAMS:



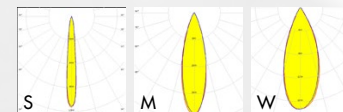
PETUNIA

29.5 x 46.5 mm low profile and dense array with 12 lenses for horticultural lighting and up to 3535 size LED packages.



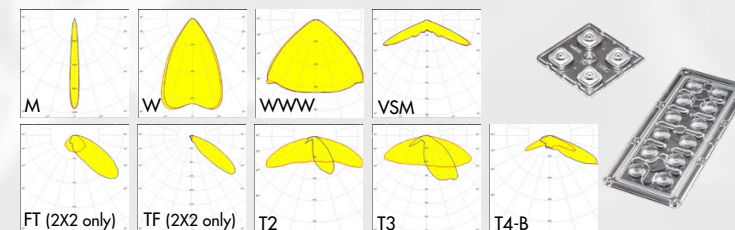
VIRPI

75 x 75 mm 25-up multi-lenses for spot- and track lighting and up to 3535 size LED packages.



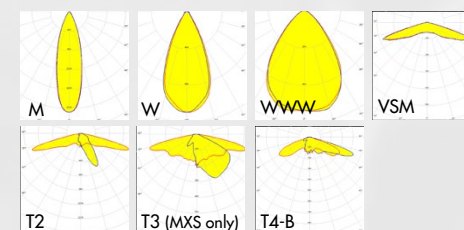
2X2 & IP-2X6 (STRADA & HB)

Standardized modular product families designed for street and industrial lighting, but also suitable for a wide range of other applications.



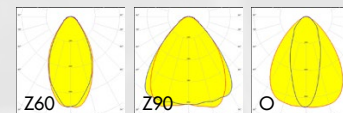
2X2MX/S (STRADA & HB)

90 x 90 mm up to IP67 2X2 arrays for up to 7070 size LED packages.



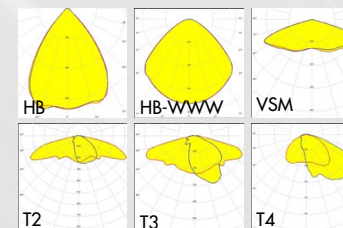
FLORENCE-3R-IP

3-row (Zhaga book 7) up to IP67 linear lenses for humid, wet and dusty environments.



STELLA

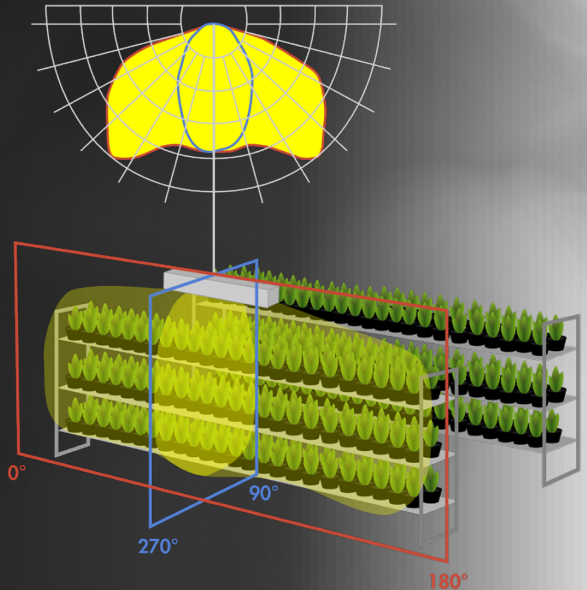
Ø90 mm ingress protected silicone lenses for street, wide area and high bay lighting and up to 30 mm LES size COBs.



HOW TO READ POLAR CURVES

- 0° to 180°:
Longitudinal light distribution
- 90° to 270°:
Horizontal light distribution

The polar curve can be used to estimate optimal beam for installation



TECHNICAL SUPPORT

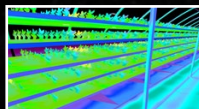
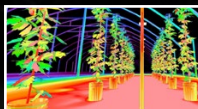
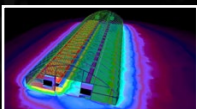
Simulations to show optic performance in real applications

Guides and tips for installations

Thermal analysis for luminaire designs

Free for all our customers

tech.support@ledil.com (GLOBAL)
tech.support.us@ledil.com (NORTH AMERICA)
tech.support.rus@ledil.com (RUSSIA)



LEDiL®

Ledil Oy
Joensuunkatu 13
24100 SALO
FINLAND

Ledil, Inc.
228 West Page Street Suite D
Sycamore IL 60178
USA

www.ledil.com

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