HORTILED

Lighting Solutions for Horticulture

The Light of Professional Knowledge

Hortiled

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Hortiled began its activity in 2006 promoting research in the field of plant illumination in collaboration with scientists in the fields of semiconductor physics and plant physiology at Vilnius University and the Institute of Horticulture LRCAF. Industrial greenhouses were used to rigorously test our most promising research results. Based on the experience gained in more than 8 years of research work and successful industrial tests, we can now offer clients superior LED lighting systems designed for science and industry or the home, together with qualified service. The know-how we've gained also allows us, upon a client's request, to provide plant-specific LED lighting solutions.

Why Hortiled

HORTILED

- More than 8 years of R&D experience in LED lighting for plants
- Close work with scientists in the fields of physics and plant photophysiology
- Successful transfer of R&D experience to industry
- Applications for research and industry
- High-quality engineering and components

Hortiled / Sectors we serve

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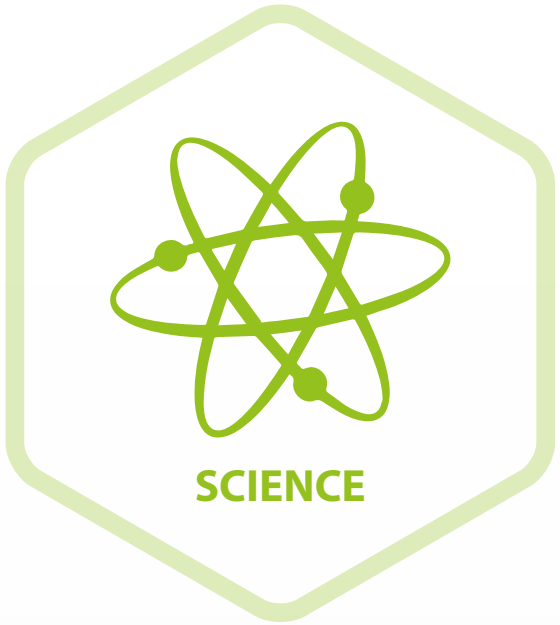

For Industry / Advantages

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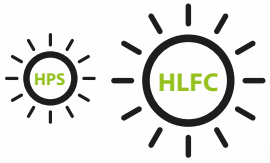
Created through years of advanced scientific research

Produce stronger and better-developed plant roots

Tested for efficiency at industrial greenhouses

Improve fertilizer utilization rates



Provide optimal lighting intensity using at least 2.5 times less energy than HPS lamps

Suitable for the majority of plants, with custom spectral solutions also available

For Industry / HPS vs LED

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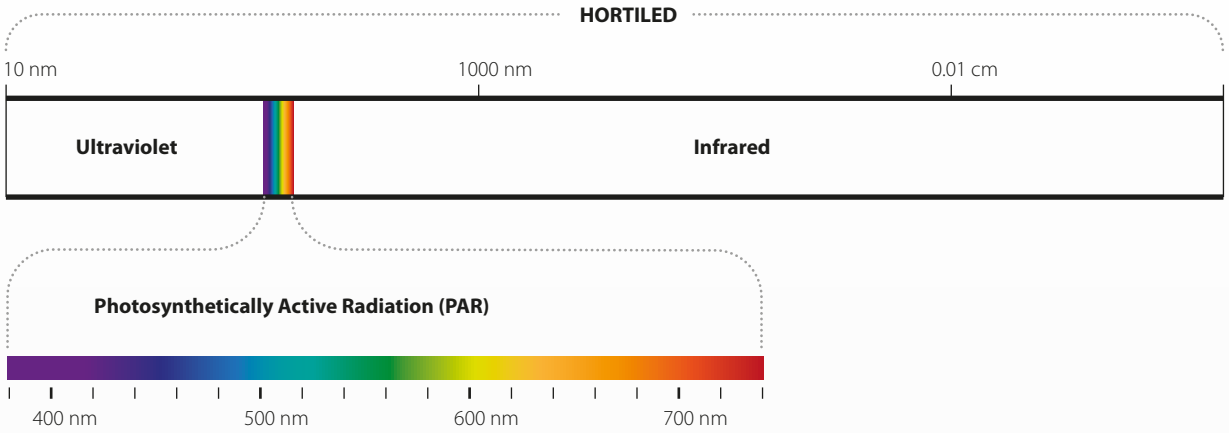
WHY LED

Electric lamps have been used to grow plants for nearly 150 years. They've followed a development paths from incandescent lighting, open arc lighting and enclosed gaseous discharge lamps to the high-pressure sodium (HPS) lamps which are still the most common choice for supplemental lighting in greenhouses. These lamps emit light in the visible **(400-700 nm)** and the invisible **(700-850 nm)** ranges, but with peak emission in the yellow/orange light **(~589 nm**) region. The high amount of yellow light, along with a deficiency of blue light, causes stem elongation in plants and worsens transplant quality.

Solid-state lighting using light-emitting diodes (LEDs) represents a fundamentally different technology from the HPS-type lamps currently used in horticulture. It offers many advantages over traditional forms of lighting. These optoelectronic devices feature excellent energy efficiency, high photo-biological efficacy, long life, a cool emitting temperature, a relatively narrow emission spectrum, and a short switching time. And unlike most conventional light sources, they contain no mercury. One of the main benefits of LEDs is the ability to control the spectral output of a lighting system. LEDs are already available in the entire relevant spectral range from near infrared (IR) to near ultraviolet (UV). They can be customized for specific crops and optimized for maximum production to avoid wasting energy and non-productive wavelengths.



Influence of light spectra on plant physiological processes

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Spectra	Photosynthetic photoreceptors	Morphogenetic photoreceptors	Effects on plants
Far red 700–740 nm		**Phytochrome** (350– 800 nm) **P_{FR}** max 730 nm	• Facilitates the morphogenetic processes necessary for phytochrome transformations • Indicates shading conditions • Regulates photoperiodic reactions in plants, induces stomata closure
Red 620–700 nm	**Chlorophyl *a*** (662; 430 nm) **Chlorophyl *b*** (642; 453 nm)	**PR** max 660 nm	• Provides the main energy for photosynthesis • Contributes to morphogenetic processes • Induces nitrate reduction • Stimulates chloroplast formation and nutrient transport in plants • Promotes the build-up of antioxidant protectants: ascorbate, tocopherols, phenolic compounds, etc.
Orange 585–620 nm			• Promotes carotenoid accumulation • Can play a part in flowering initiation processes
Yelow 550–585 nm			• Can inhibit growth in some species • Efficiently utilized for photosynthesis in lower plant canopy even though quantum yield for photosynthesis is low
Green 490– 550 nm			• Utilized for photosynthesis in lower canopy, where it penetrates easier than other wavelengths, even though quantum yield for photosynthesis is low • Together with blue light regulates stomatal conductance
Blue 425–490 nm	**Carotenoids** (450; 480 nm)	**Cryptochrome** (350–520 nm) (max 365, 445 nm) **Phototropines and ZEITLUPE proteins** (appx 450 nm)	• Efficiently utilized for photosynthesis • Stimulates chloroplast formation and anthocyanin accumulation • Promotes source-sink transport • Regulates apical dominance and phototropic reaction • Inhibits plant elongation and stimulates root formation – a proper amount is thus beneficial for vegetable transplant cultivation
Violet 400–425 nm			• Less efficient for photosynthesis than red or blue light
UV 200–400 nm		**UV–B photo sensor** (280–380 nm)	• UV–A (~380–315 nm) induces synthesis of anthocyanins, flavonoids • Stimulates tomato transplant growth and development

Absorption by photosynthetic pigments
Absorption by cryptochrome
Absorption by phytochrome
Absorption by UV photosensors

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For Industry / Influence on plants of the properly selected light spectrum

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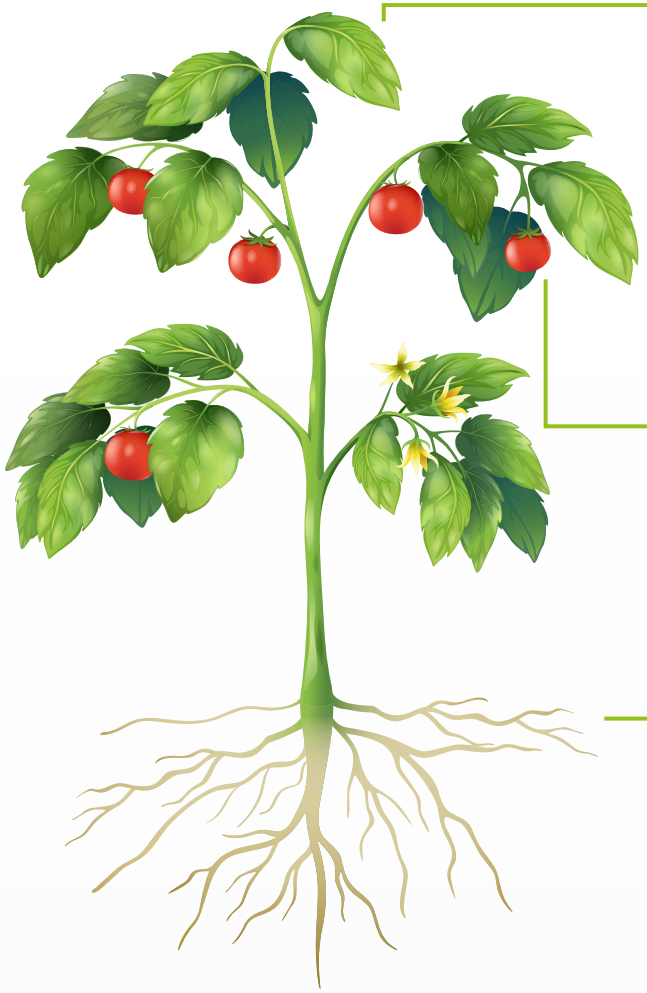

- Increased build-up of photosynthetic pigments (chlorophylls, carotenoids)
- More intensive photosynthesis
- Higher total plant productivity
- Lower levels of harmful nitrates in vegetables
- Larger amounts of flavonoids, anthocyans, ascorbic acid, carotenoids, and tocopherols
- Improved external quality of green vegetables: colour, crunchiness, and curliness

- Acceleration of development
- Improved quality of fruits

- Formation of a stronger root system
- Better absorption of mineral substances

For Industry / HLFC-series lamps specifications

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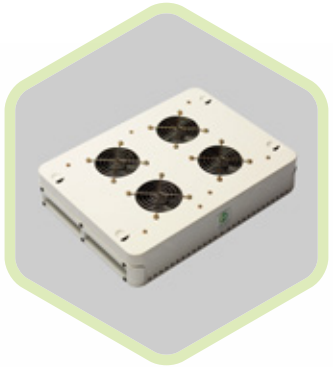
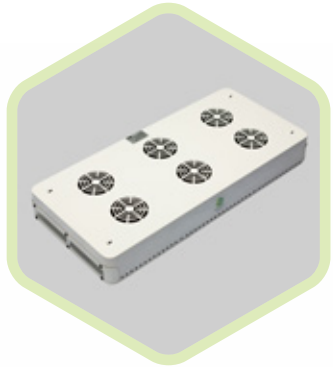
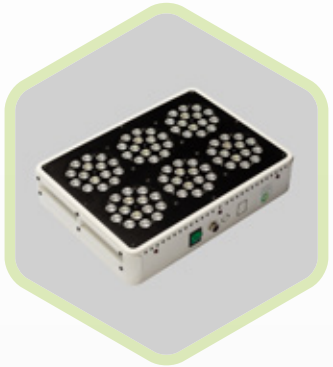
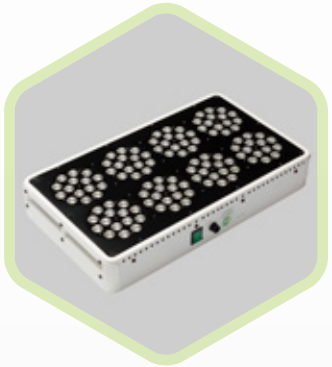
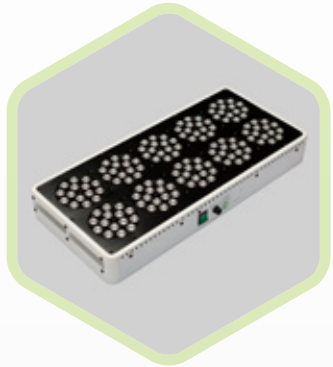
	HLFC06	HLFC08	HLFC10
Length/Width/Height	385/285/85 mm	500/285/85 mm	610/285/85 mm
Weight	4.8 kg	6.1 kg	7.4 kg
Input voltage	110–240V, 50/60 Hz	110–240V, 50/60 Hz	110–240V, 50/60 Hz
Power consumption	176W	230W	288W
Operating temperature	0 – + 50 °C	0 – + 50 °C	0 – + 50 °C
Operating humidity	< 90 %	< 90 %	< 90 %
Photosynthetic photon flux density (lamp height)	60 – 120 µmol m^{-2} s^{-1} **(150 cm)**	100 – 160 µmol m^{-2} s^{-1} **(150 cm)**	125 – 210 µmol m^{-2} s^{-1} **(150 cm)**
Illuminated area (lamp height)	1.50 m^2 **(150 cm)**	2.70 m^2 **(150 cm)**	3.20 m^2 **(150 cm)**



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For Industry / HLFC-series lamps specifications

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APPLICATION

- LED-based plant lighting system for greenhouses

FUNCTIONALITY

- Universal light spectrum suitable for most plants
- Forced convection
- Overheating control
- On/Off indicator

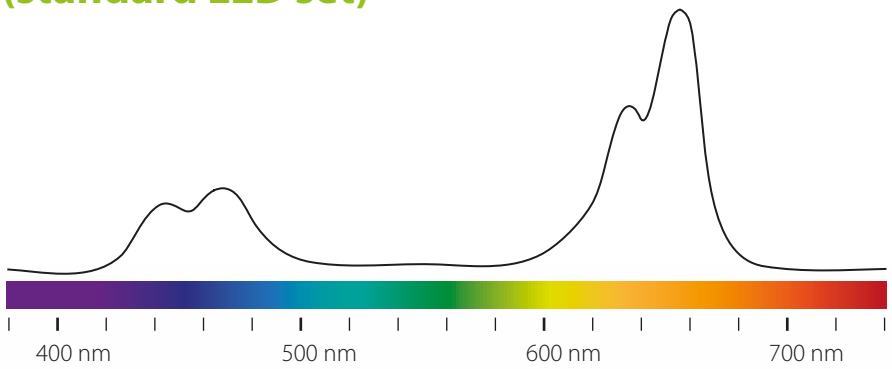
ADVANTAGES

- Extreme energy efficiency
- Fast and convenient mounting
- Optimal lighting intensity
- 24-month warranty

OPTIONS

- Customized spectral composition
- Optimization of spectrum for specific plant species
- Lens dispersion angle (60°; 90°; 120°)

SPECTRAL INFORMATION (standard LED set)



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For Industry / HLAC-series lamps specifications

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Length/Width	200/50 mm
Weight	4.8 kg
Operating temperature	0 – + 50 °C
Operating humidity	< 90 %
Photosynthetic photon flux density (lamp height)	130 µmol m^{-2} s^{-1} **(50 cm)**
Iluminated area (lamp height)	1.50 m^2 **(50 cm)**

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For Industry / HLAC-series lamps specifications

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APPLICATION

- LED-based plant lighting system for plant factories and phytotrons

FUNCTIONALITY

- Light spectra according to customer specifications
- Free-air convection
- Suitable for cultivation in racks

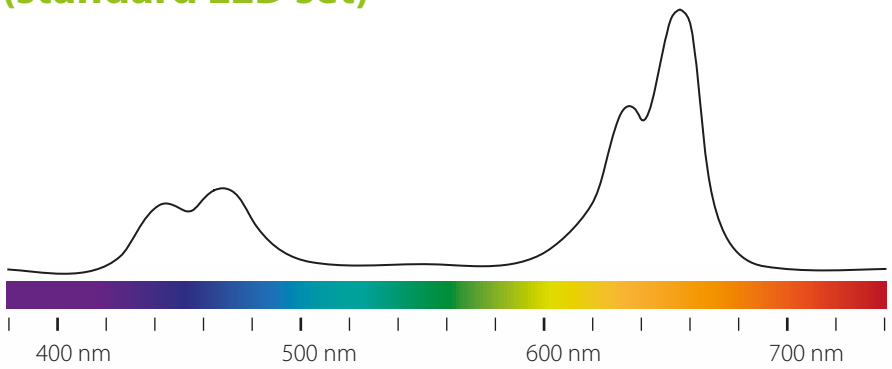
ADVANTAGES

- Extreme energy efficiency
- Fast and convenient mounting
- Optimal lighting intensity
- 24-month warranty

COMPOSITION OF THE SYSTEM

- 5 lamps
- 1 power source

SPECTRAL INFORMATION (standard LED set)



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For Science / Advantages

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OUR ADVANTAGES COMPARED TO OTHER LAMPS FOR SCIENCE

- Suitable for diverse research spaces (growing chambers, phytotrons, laboratories, greenhouses)
- Unique software lets you program each spectral component separately and manage spectral composition throughout an experiment
- Ability to change the spectral composition and intensity of individual components with user-friendly software
- Capabilities for adding new spectral components during an operation

„We've been working in the field of photophysiology for more than 10 years. For a research project to succeed, it's not enough to have an excellent idea – you also need suitable, efficient lighting equipment that enables you to implement the idea."

Dr. Akvilė Viršilė
Senior Researcher
Lithuanian Research Centre for Agriculture and Forestry

For Science / Ergonomics

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The most flexible and versatile lighting solution on the market, with excellent ergonomics

Stand-alone or ceiling-mounted design

Quick disassembly into 3 compact parts for transportation

Easy access to specimens from all sides

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For Science / Ergonomics

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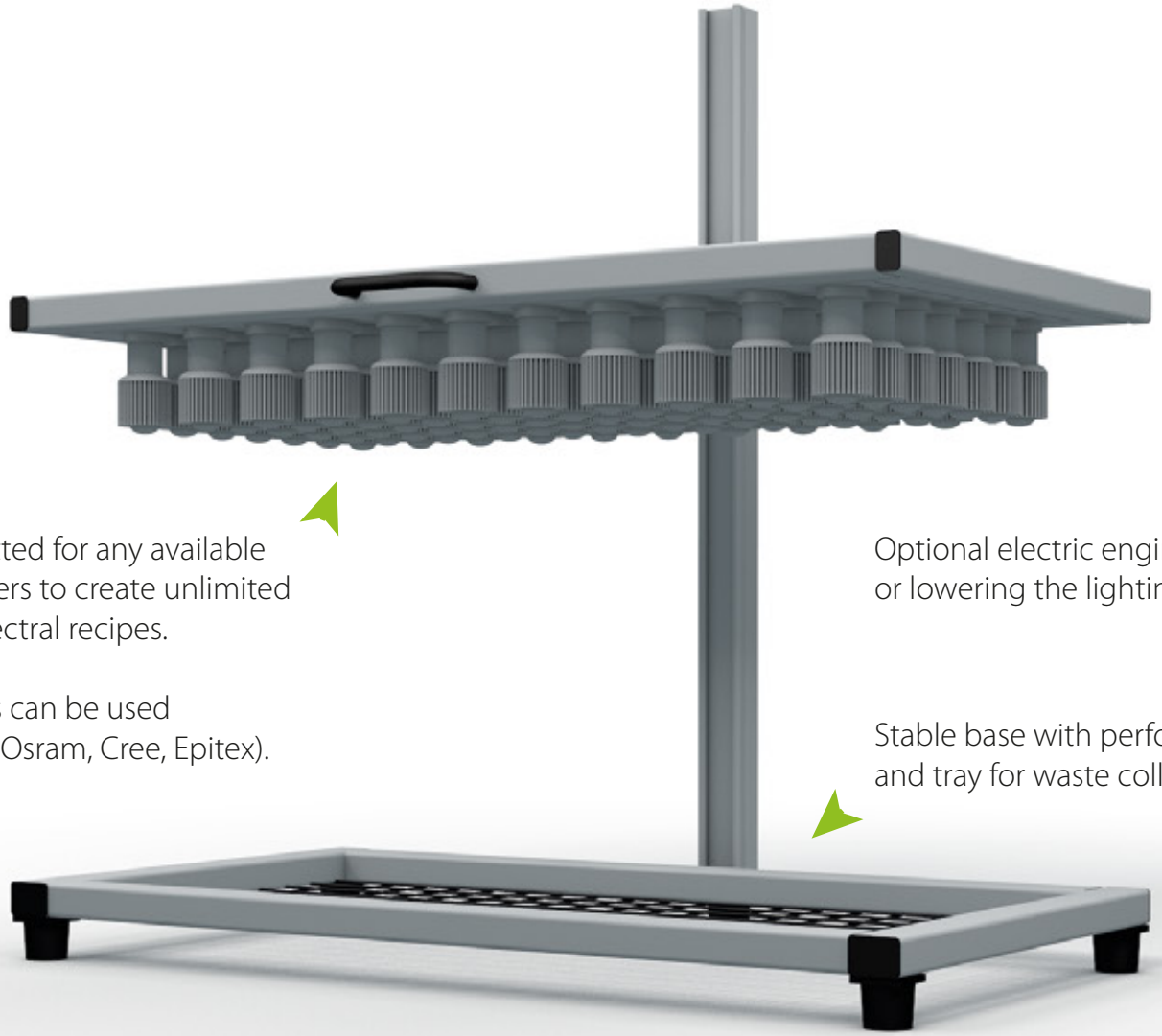

Each lamp can be fitted for any available spectra, allowing users to create unlimited combinations of spectral recipes.

Any producer's LEDs can be used (Phillips, LedEngine, Osram, Cree, Epitex).

Optional electric engine for raising or lowering the lighting panel.

Stable base with perforated net and tray for waste collection.

For Science / Software

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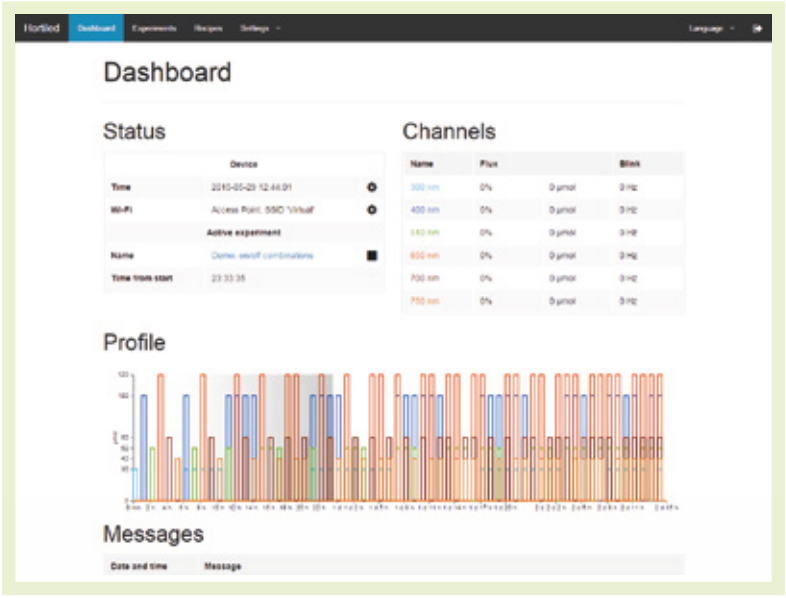
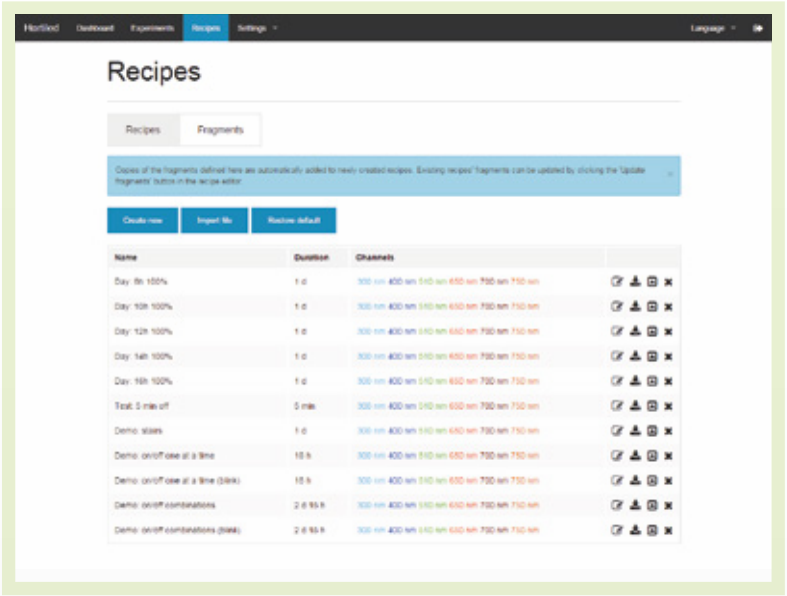
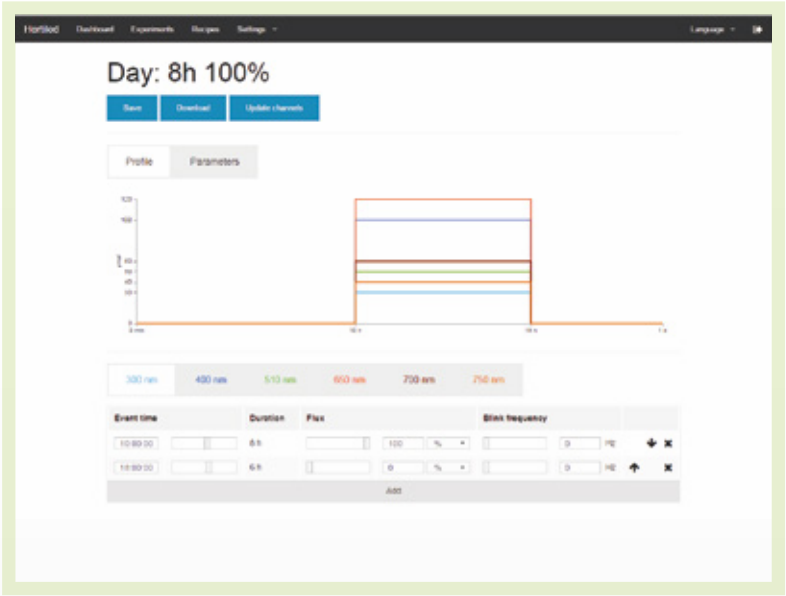
Operation via user-friendly interface from mobile devices or PCs

Simple setup of lighting programs for periods of 1 hour to 180 days

Controlled intensity and blinking frequency







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For Science / Technical specifications

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APPLICATION

- Flexible LED-based plant lighting system for research

FUNCTIONALITY

- Recipe storage in memory
- Export and import of recipes
- Control of blinking frequency
- Control of intensity
- Photoperiod simulation

CONTROL INTERFACE

- HTTP / mobile devices / PCs

ADVANTAGES

- Flexibility and versatility
- User-friendly control interface

OPTIONS

- Lenses: diffused or clear
- Electrical drive

SPECTRA (standard set)

- Far red: 735 nm; 740 nm
- Red: 627 nm; 638 nm; 660 nm
- Blue: 447 nm; 460 nm
- UV: 365 nm; 400 nm

HEIGHT/WIDTH/LENGHT

- 1300/500/800 cm

WEIGHT

- 24 kg

INPUT VOLTAGE

- 110–240V, 50/60 Hz

POWER CONSUMPTION

- 230W

TRANSPORTATION

- Easily disassembled into 3 compact parts

HORTILED

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