LUMITECH

PI-LED®

The HUMAN CENTRIC LIGHTING

LUMITECH
A COMPANY AT THE SOURCE OF LIGHT

Working today on sustainable lighting technologies for tomorrow: This has been LUMITECH's commitment ever since its foundation in Jennersdorf, Austria, in 1997.

LUMITECH is an acknowledged expert in the LED lighting industry and an international pioneer in the field of Human Centric Lighting thanks to its comprehensive scientific and practical know-how of the effects of light on human beings and of natural changes in daylight during the course of a day. As an innovative enterprise, LUMITECH offers holistic Human Centric Lighting systems based on PI-LED technology in a wide range of designs, combining all components of high-quality LED lighting technology from the module right through to control systems. As OEM supplier and licensor, LUMITECH has been supporting leading luminaire manufacturers and providers of lighting solutions with PI-LED technology for about a decade.

MILESTONES

1997
LUMITECH was founded as a spin-off of the TU Graz

2000
Patent applications for white-light LED and chip-on-board technology

2007
Austrian State Prize for Innovation for invention of the PI-LED technology

2009
Commercialization of PI-LED systems

2012
Establishment of the "Food Lighting" business segment

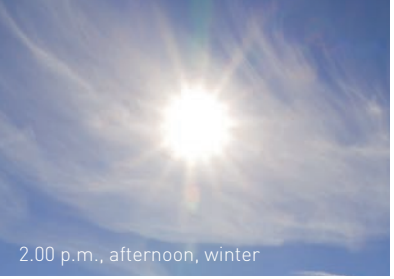
2014
Establishment of an OEM sales network for Human Centric Lighting

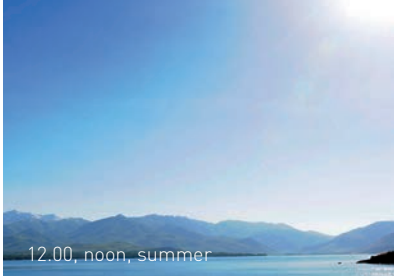
2016
PI-LED end-to-end systems from modules to user interfaces and converters

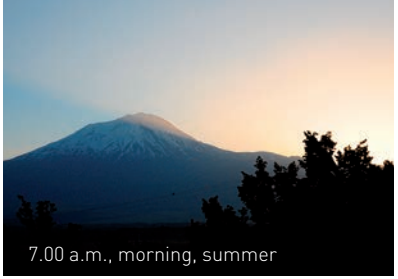
LUMITECH

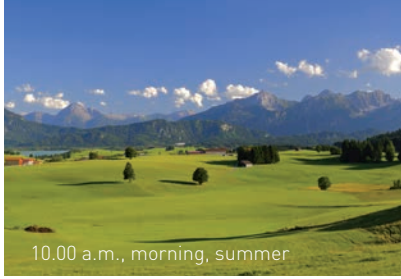
For LUMITECH, the development of PI-LED was a milestone on the way to Human Centric Lighting.

This innovative technology was awarded with the Austrian State Prize for Innovation in 2007.


2.00 p.m., afternoon, winter


12.00, noon, summer


7.00 a.m., morning, summer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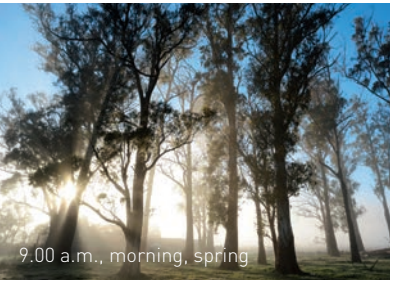
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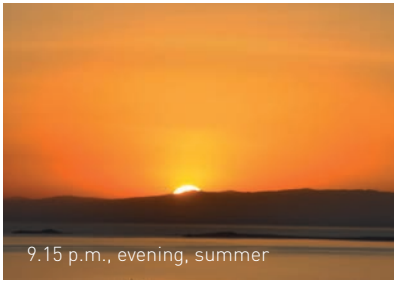
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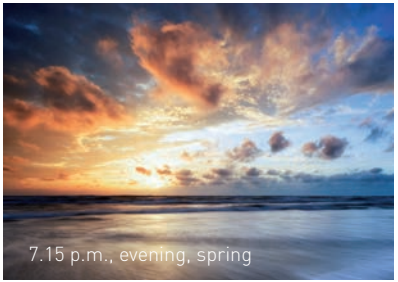
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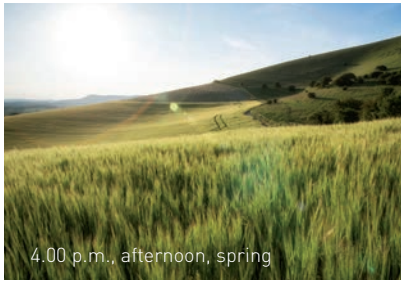
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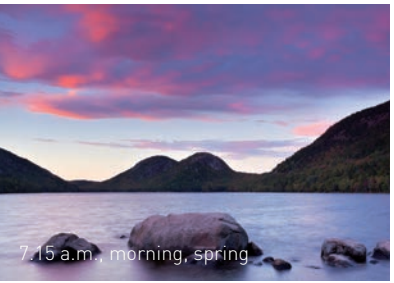
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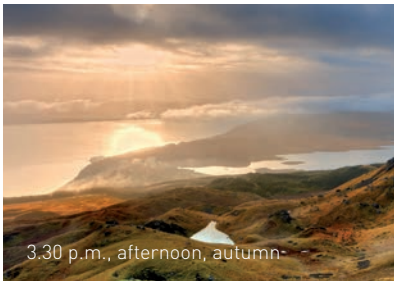
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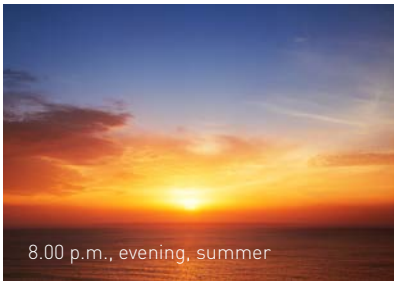
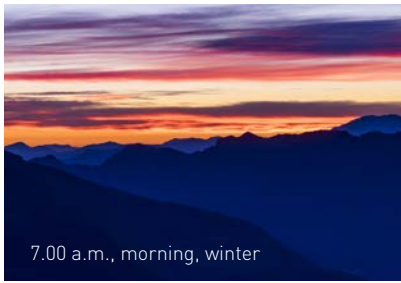
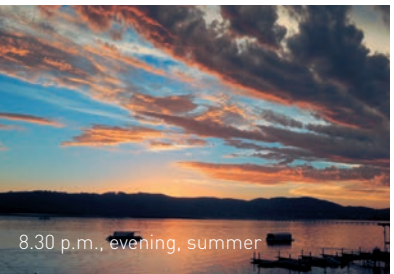

8.00 p.m., evening, summer


7.00 a.m., morning, winter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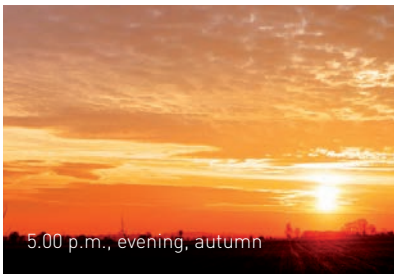
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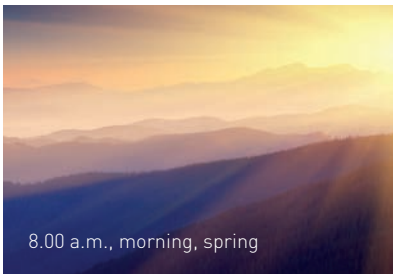
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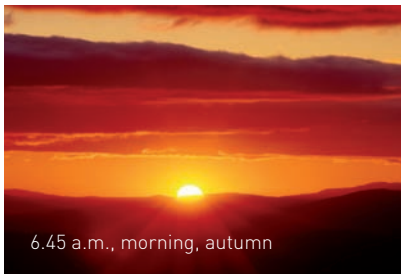
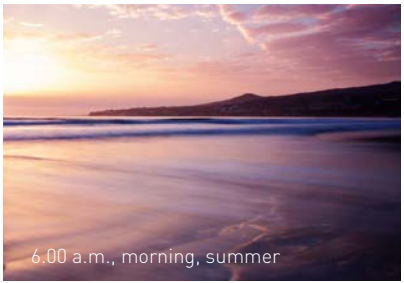

6.45 a.m., morning, autumn



LIGHT IS NOT ALWAYS LIGHT

Numerous studies clearly show: Light has a perceptible effect on a human being's vitality and health.

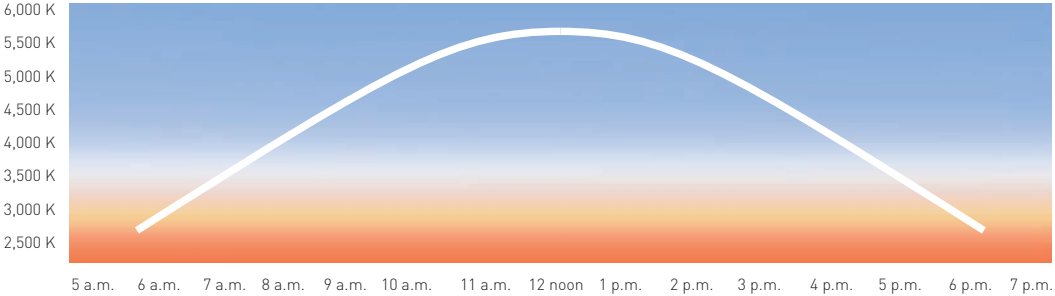
The well-being of the human organism and all involved biological processes depend on natural daylight. But now, as opposed to the past, when the course of the sun determined daily activities, large parts of modern life take place inside buildings, using static lighting.

Numerous studies clearly show that artificial lighting with its uniform, invariable characteristics has a negative effect on human health, well-being and performance.

Human Centric Lighting takes up this challenge. It simulates the spectral quality of natural daylight over the entire day, thus keeping the human hormone levels balanced, even under artificial lighting. This has a demonstrably positive effect on both body and mind. A perceptible increase in performance and improved concentration are the consequence.

Study: The effect of high correlated colour temperature office lighting on employee wellbeing and work performance © Mills et al; licensee BioMed Central Ltd. Peter R. Mills, Susannah C Tomkins and Luc JM Schlangen

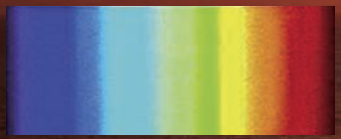
COLOUR TEMPERATURE CHANGES IN THE COURSE OF A DAY



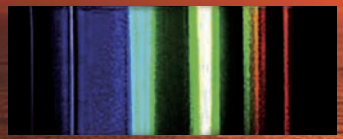
The schematic curve shows the total daylight, i.e. the combination of direct and indirect light. Colour temperature changes on a sunny day, with no clouds and no fog, etc.

HUMAN CENTRIC LIGHTING INSPIRED BY THE SUN

The more closely artificial lighting manages to imitate sunlight, the more pleasant and perfect we experience this light to be. Human Centric Lighting solutions imitate the spectrum of sunlight during the course of the day without emitting any undesirable ultra-violet or infrared radiation. This exceptional light quality cannot be achieved with conventional lighting concepts.

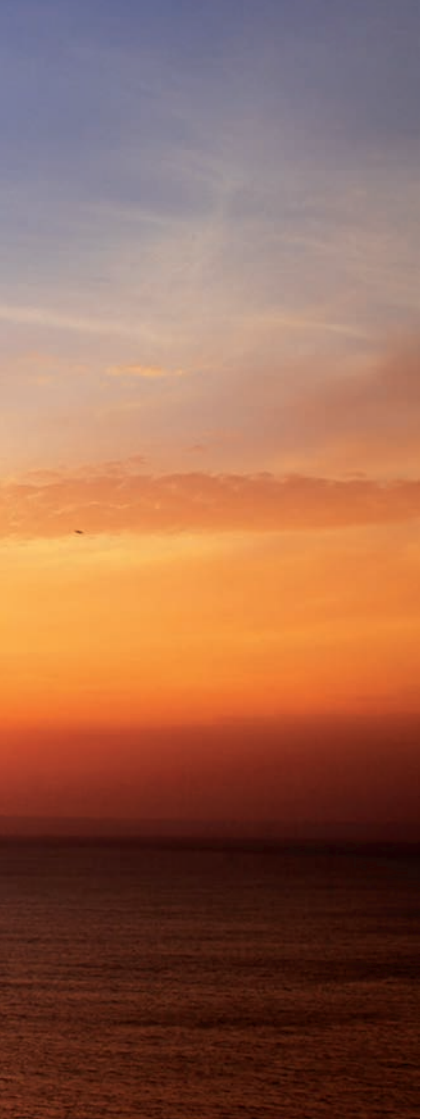


Spectrum of sunlight



Spectrum of a fluorescent tube

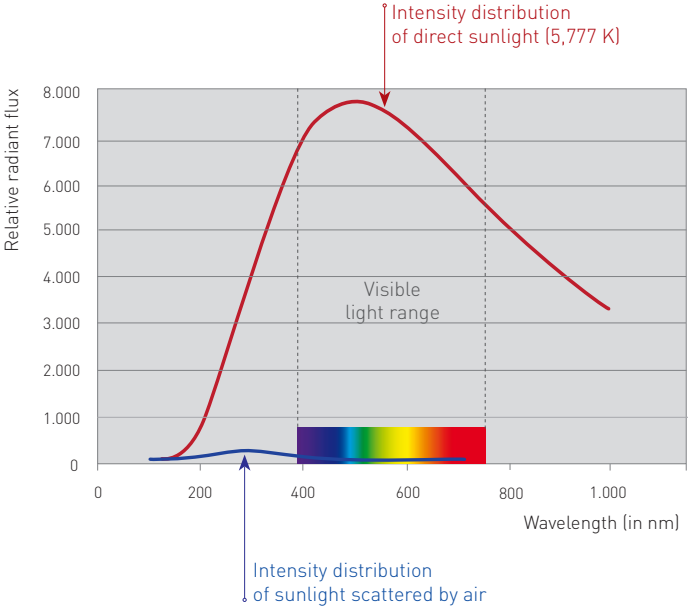
Spectrum of Human Centric Lighting



THE POWER OF SUNLIGHT

Daylight is always a combination of direct sunlight and diffuse radiation from the sky.

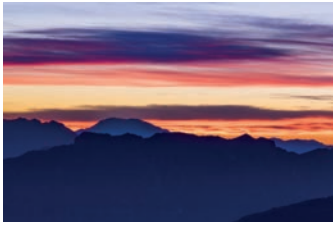
Sunlight is absorbed by the atmosphere to varying degrees, depending on the wavelength. On an annual average, most light reaches the earth's surface in the form of direct light; the lesser part is indirect light due to air molecules, aerosols or clouds scattering the radiation. Around half of this total solar radiation is visible and can be perceived by the human eye. The intensity of the radiation energy, however, strongly depends on the weather and the position of the sun at different times of the day and year.



Sunny day, no clouds, no fog, etc.

THE BIORHYTHMIC REVOLUTION ON THE CONVENTIONAL LIGHTING MARKET

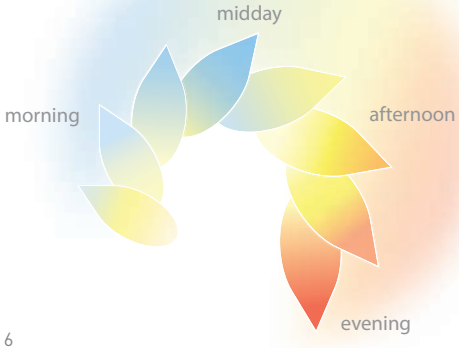
PI-LED allows implementation of top-level Human Centric Lighting solutions because this patented and proven technology combines variable white light and RGB in one single light source. This means that PI-LED can perfectly simulate the spectral quality and continuous colour temperature changes of sunlight over the entire day: From daybreak to clear, blue skies at noon, right through to the glow of sunset.



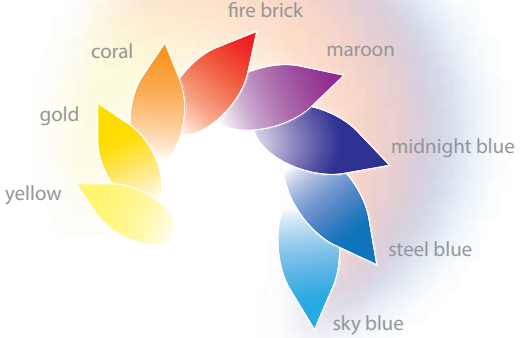
PI-LED IN DETAIL

- colour temperatures automatically adjustable along the Planckian locus to mimic natural daylight during the course of the day (including seasonal and non-seasonal changes)
- standard colour temperature range between 2,500 K and 7,000 K, optional range between 1,800 K and 16,000 K
- individual control of all RGB colours within PI-LED colour space
- complete spectrum with colour rendering of CRI 90
- constantly high energy efficiency from warm white to cold white
- 100% calibration and temperature-compensated for minimum colour tolerances (MacAdams typ. 1)

Light in the course of the day



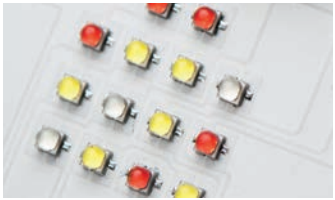
RGB colour range

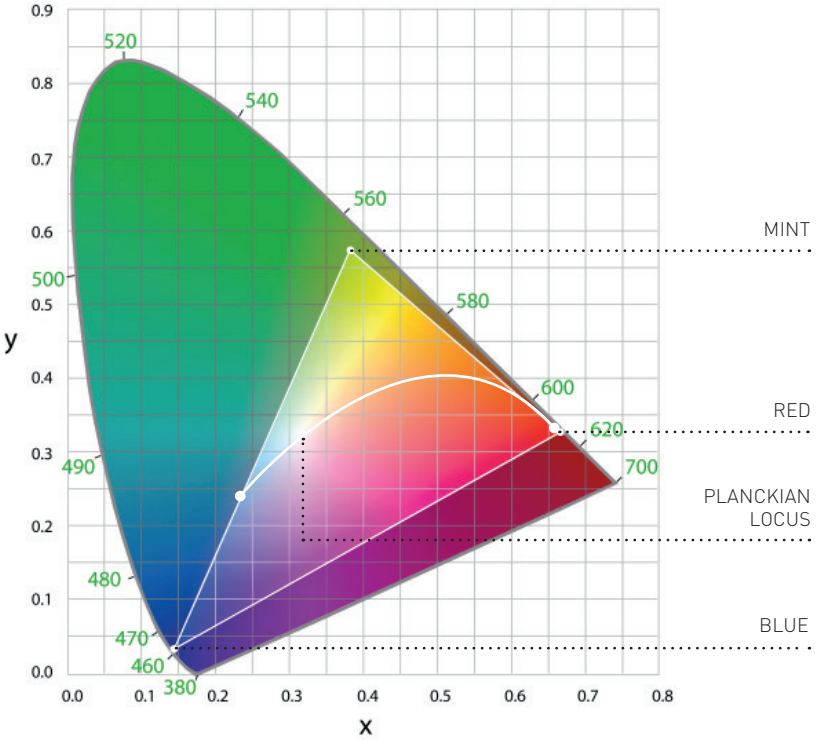


LIGHT COLOURS AND COLOUR RENDERING

PI-LED is based on the three channels red, blue and mint, which are controlled individually and are optimally matched in terms of temperature and intensity.

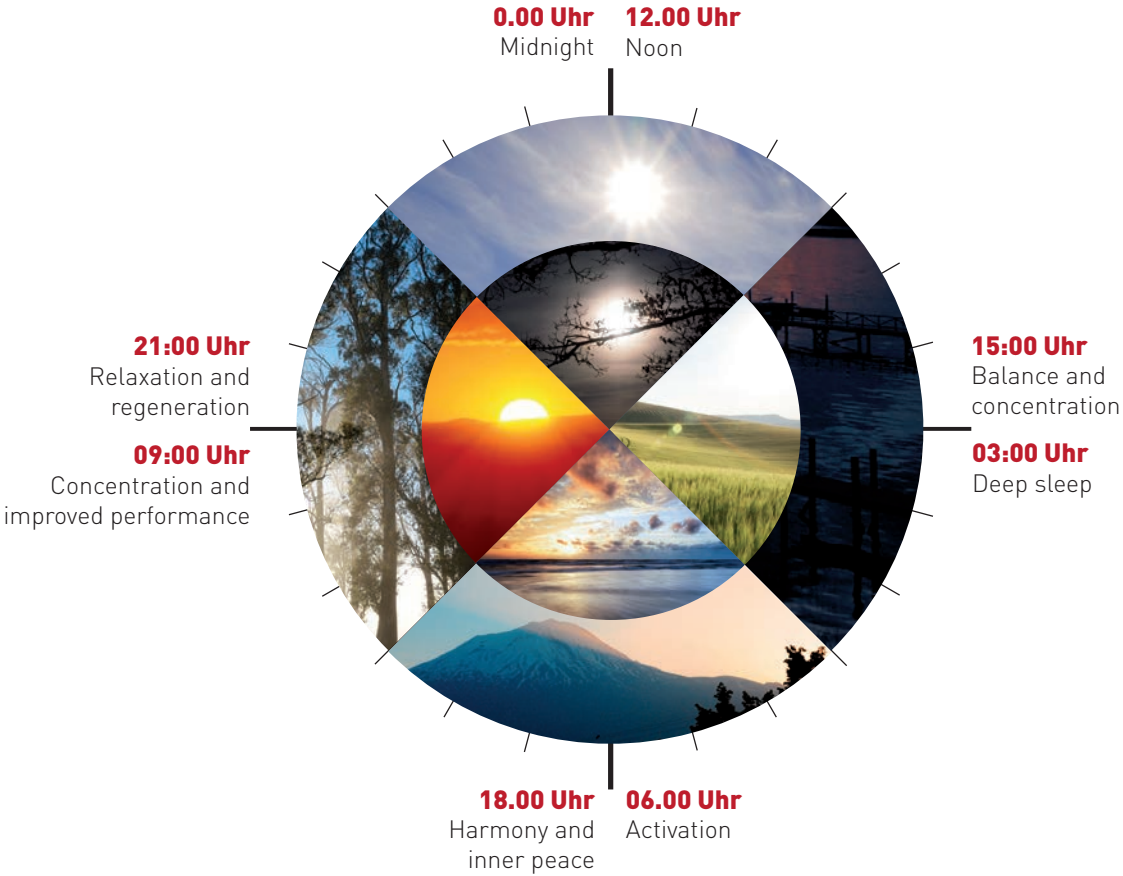
PI-LED has a CRI >90 along the Planckian locus and thus guarantees highest colour authenticity at all times of day and for every type of mood lighting. Furthermore, PI-LED warm white has a high colour rendering in the R9 index.





Ideally, an artificial light source has the characteristics of sunlight. PI-LED is very close to this ideal and offers excellent colour rendering and a high quality light character throughout the entire PI-LED colour space.

PI-LED supports the human biorhythm both day and night. Biorhythmic lighting technology has particularly good biological effects because PI-LED achieves the maximum sensitivity for melanopic vision.



IN RHYTHM WITH THE BIOLOGICAL CLOCK

Natural day-night-rhythm is designed to allow humans to sleep well and regenerate while it is dark and to be active and reach high performance levels when it is light. In the course of human evolution, our body has developed a biorhythm on the basis of this sequence – this is called the circadian rhythm.

Apart from rod cells and cone cells which are responsible for our vision, the human eye also has so-called non-visual photoreceptors which noticeably influence the circadian rhythm.

These receptors control our hormonal balance, in particular the regulation of melatonin, which is responsible for our sleep-wake pattern.

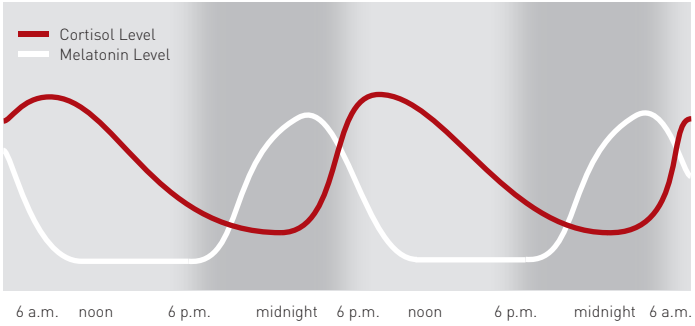
This is exactly where PI-LED takes effect – with the aim of supporting the human circadian rhythm and keeping natural melatonin production in balance. The underlying principle is as follows:

Cold light with a high percentage of blue has a vitalising effect and promotes the release of serotonin and cortisol while at the same time reducing the release of melatonin. Physical fitness, mental performance and vigilance are significantly increased.

Warm light with a high percentage of red promotes the release of melatonin, thus encouraging relaxation and regeneration.

THE EFFECT OF LIGHT ON HUMANS

THE CIRCADIAN RHYTHM

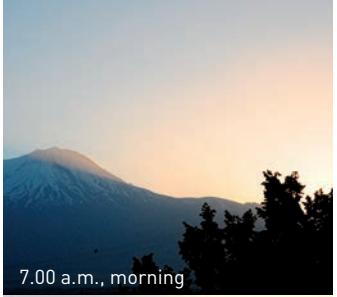


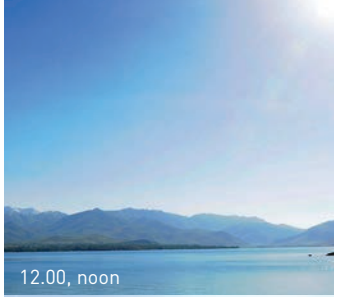
Study: The effect of high correlated colour temperature office lighting on employee wellbeing and work performance

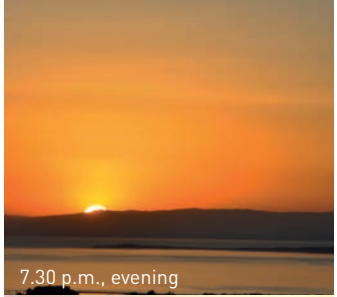
DAYLIGHT: INDOORS AND OUTDOORS

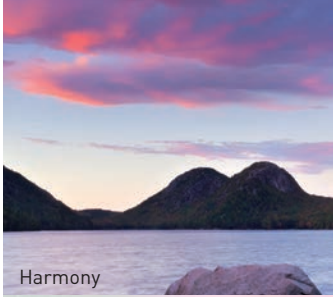
The pleasant imitation of natural daylight during the course of a day is one of the core competencies of PI-LED technology.

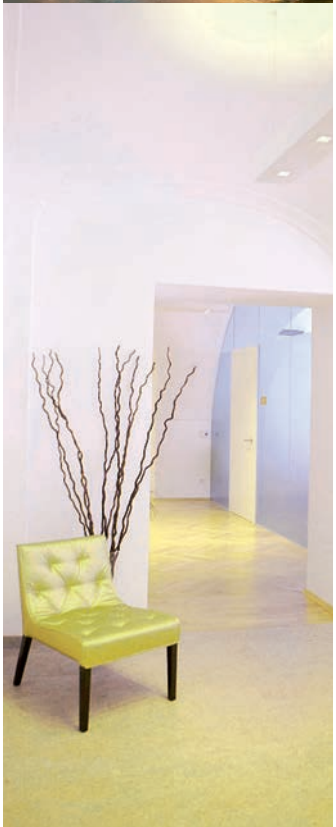
A lighting solution perfectly synchronised with the circadian rhythm assists humans in their everyday life and sustainably enhances their health and well-being – both at home and at the office. PI-LED automatically provides the right light at all times of day. All PI-LED systems are pre-programmed with a daylight programme for all seasons of the year. Nonetheless, users can still adjust the lighting manually to suit their individual needs whenever they want.











LIGHT FOR EVERY OCCASION

Open fireplace or the blue hour: PI-LED transforms every room into an oasis of light.

In addition to imitating natural daylight during the course of a day, PI-LED can also create a wide variety of impressive lighting atmospheres. The selection of different light colours can effectively change the look and atmosphere of any room and adjust it to suit every situation and occasion: Intense colours turn the next party into an unforgettable event, cooler colours create a harmonious atmosphere and warm red and orange light helps you relax.

EVERYTHING FROM A SINGLE SOURCE

PI-LED is all about the relationship between light and humans – both with regard to the effect of light on health and well-being as well as to ease of installation and user-friendliness.

The user can adjust the lighting in a matter of seconds to create the perfect light for every occasion, whenever he wishes. In addition to pre-programmed sequences, users can access the entire spectrum of colour temperatures and colours to adjust the light in accordance with their own requirements.
PI-LED can be controlled using a variety of interfaces: touch control, application or USB – all easier than ever before. Controls are based on wireless NeoLink Air technology, or the cable-bound DALI DT8 standard.

Control function range:

- automatic daylight simulation
- individual control of all 3 channels
- colour temperature, brightness and individual RGB light colours
- microprocessor-controlled lighting and colour temperature management
- long service life of 50,000 h

SMART CONTROL OF LIGHTING WITH NEOLINK AIR

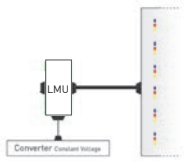
PI-LED NeoLink, developed by LUMITECH and available on the market since 2014, is the world's first Human Centric Lighting system for professional applications that can be controlled using the ZigBee standard.

The control data is transmitted over routes up to 100 m based on a routing process - and that too, with very little energy consumption. Thanks to a broad range of control elements, there is also a matching light control interface for every construction situation and every user. In addition to wall rotary knobs and NeoLink Air App for smartphones and tablets, a USB stick for controlling via PCs and laptops is also available.

Subsequent integration in existing structures can be as easily implemented as installation in a completely new building.

Control functionality:

- Colour temperature, brightness and individual RGB light colours
- Fixed mood lights combined with any dimming level and colours
- Daytime- and colour sequences
- Overall and group control



LED modules incl. LMU

PI-LED Area | PI-LED Linear | PI-LED Downlight | PI-LED Circular System

NeoLink Air WALLY

PC APP via NeoLink Air USB Stick

Smartphone APP via NeoLink Air Box

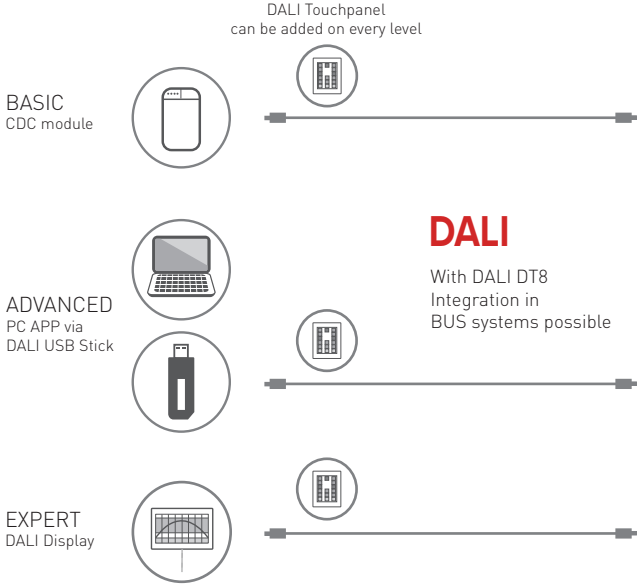
COMPLEX LIGHTING SYSTEMS
SIMPLE CONTROL WITH DALI DT8

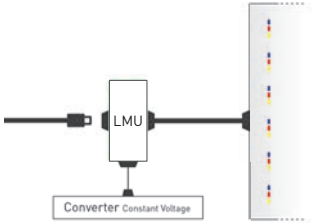
DALI

In addition to NeoLink, the user also has the option of controlling PI-LED lighting via DALI DT8. This control system allows easy integration of Human Centric Lighting into more complex facility management systems.

Control functionality:

- Colour temperature, brightness and individual RGB light colours
- Fixed mood lights combined with any dimming level and colours
- Daytime- and colour sequences
- Overall and group control

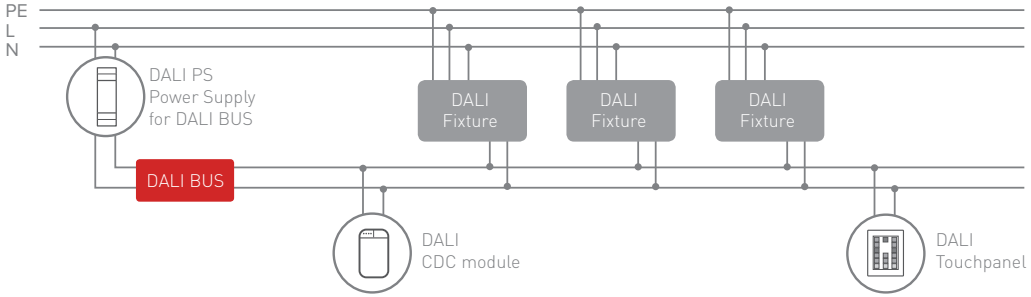




LED modules incl. LMU
PI-LED Area System
PI-LED Linear System
PI-LED Downlight System
PI-LED Circular System

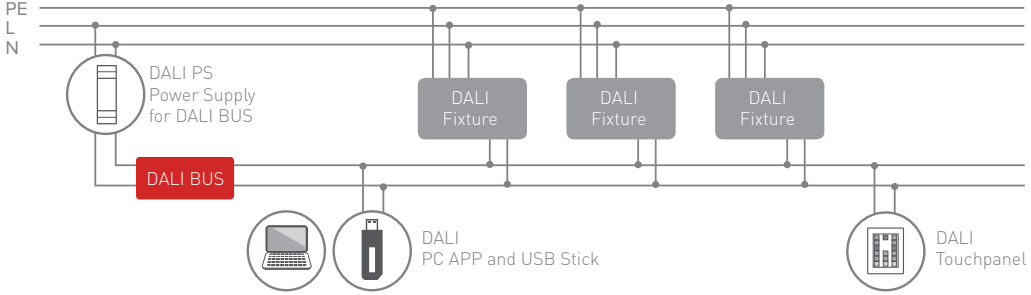
DALI BASIC
Introductory model

The DALI CDC module generates the daytime sequence in the background - for manual interventions, the optional DALI touch panel can be added.



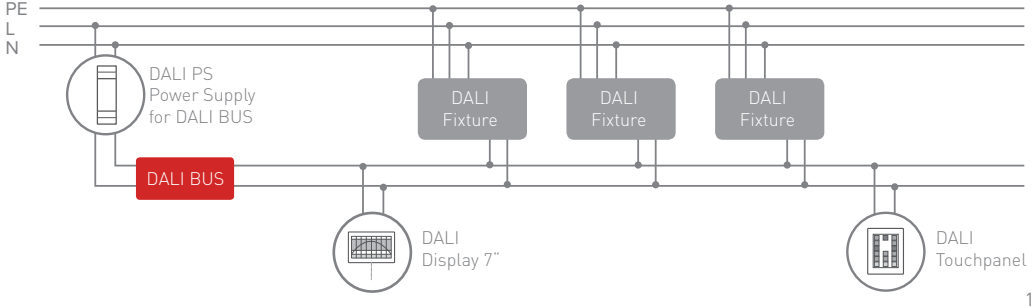
DALI ADVANCED
Advanced controls

Daytime sequencees and mood lights can be called and played on the PC and manual adjustments can be made. The DALI touch panel can be added.



DALI EXPERT
The all-rounder model

The DALI display can be programmed at will and offers the complete range of controls. The DALI touch panel can be added for simple actions.



UNLIMITED LIGHTING POTENTIAL

Thanks to a wide range of designs, PI-LED can be used in all common types of luminaires and applications. Whatever the size and type of the project, biorhythmic lighting has a noticeable positive effect on powers of concentration and productivity as well as on sleeping patterns. This has been verified by various scientific studies in the meantime: the error rates of students were reduced by more than 30 percent, and in the healthcare sector it noticeably supported mental regeneration. The positive effect was also clearly proven at workplaces. In many cases, employee productivity increased by as much as 20 percent and there was a distinct increase in employee motivation.

Recommended types of luminaire for PI-LED systems:

Panel lights | Spots | Linear lights | Decorative luminaires | Floor lamps

Study: The effect of high correleted colour temperature office lighting on employee wellbeing and work performance © Mills et al; licensee BioMed Central Ltd. Peter R. Mills, Susannah C Tomkins and Luc JM Schlangen

OFFICE AND COMMUNICATION

HEALTH CARE

SHOPS AND DISPLAYS

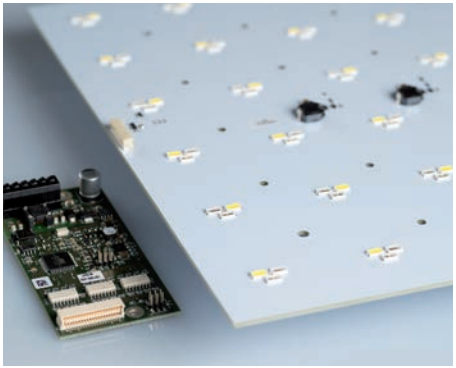
EDUCATION AND SCIENCE

HOME AND RELAXATION

HOTELS AND RESTAURANTS

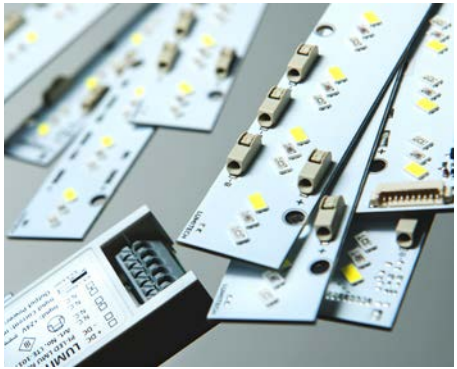

LUMITECH

PI-LED PORTFOLIO

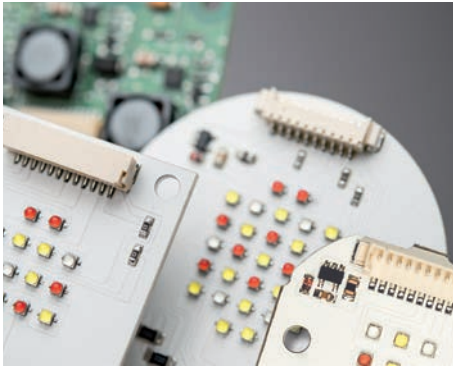


PI-LED AREA SYSTEM PRO

PI-LED AREA SYSTEM PRO ALL-IN-ONE

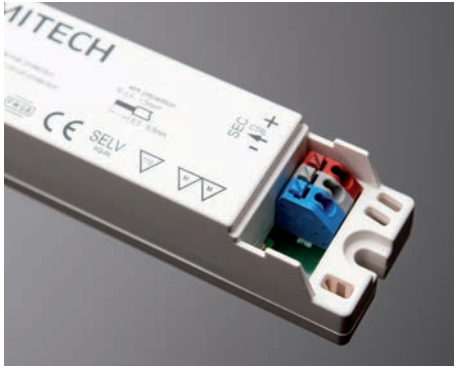


PI-LED LINEAR SYSTEM



PI-LED DOWNLIGHT SYSTEM

HMI - DISPLAYS & CONTROL SYSTEMS



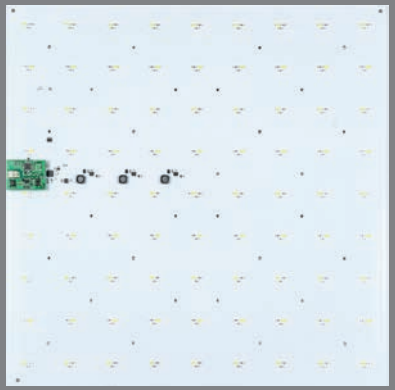
CONVERTERS

PI-LED DESIGN TYPES

PI-LED AREA SYSTEM PRO ALL-IN-ONE

6X6

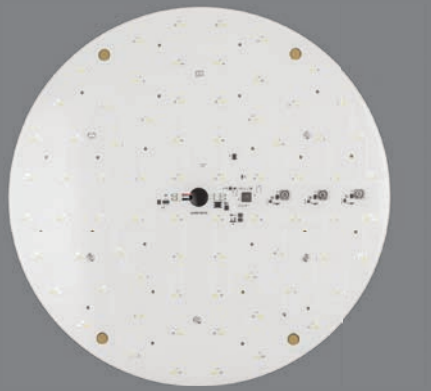
Design	square
Dimensions	260 x 260 mm
Luminous flux	3,000 lm



9X9

Design	square
Dimensions	450 x 450 mm
Luminous flux	6,000 lm

PI-LED CIRCULAR PRO ALL-IN-ONE



Design	round
Dimensions	DM 400mm
Luminous flux	6,000 lm max.

CONVERTERS
For suitable converters please refer to:
www.lumitech.com

PI-LED DOWNLIGHT SYSTEM

MINI SPOT ZHAGA LES 9

Design	Zhaga (Book 11)
Dimensions	31,7 x 33 mm
Luminous flux	900 lm

ZHAGA LES 23

Design	Zhaga (Book 3)
Dimensions	46,5 x 44 mm
Luminous flux	2,300 | 3,000 | 4,000 lm

PI-LED LINEAR SYSTEM

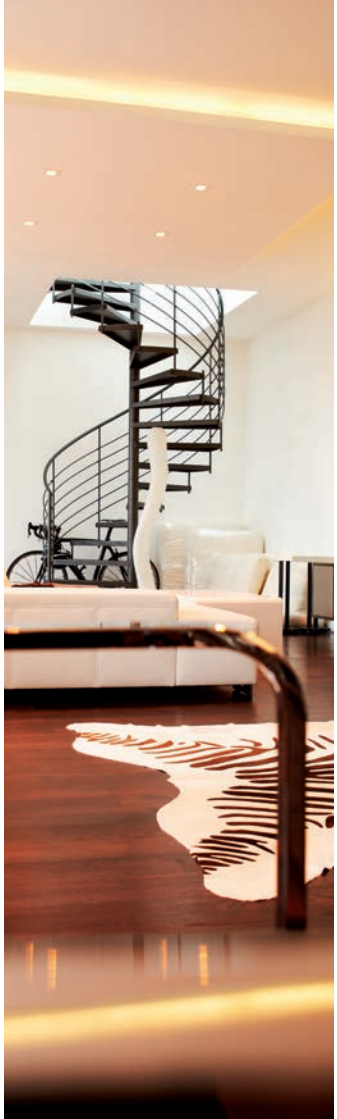
LINEAR SYSTEM M ZHAGA

Design	Zhaga (Book 7)
Dimensions	280 x 24 mm / module
Luminous flux	1.000 lm / module

Sets with 3 to 8 modules (3,000 - 8,000 lm)

PI-LED©

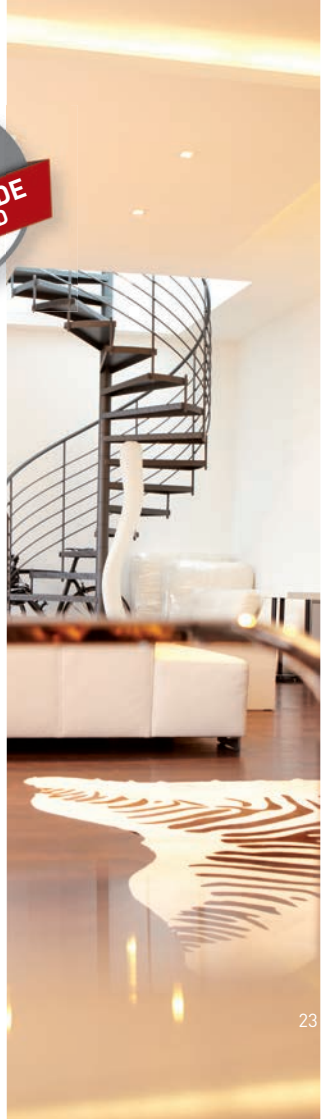
Of all the LED lighting systems available on the market today, PI-LED is the system of choice for Human Centric Lighting solutions.
PI-LED tunable white follows the Planckian locus precisely, thus allowing a high biological activation factor.
Optional RGB light colours are an attractive product enhancement in terms of cost/benefit.

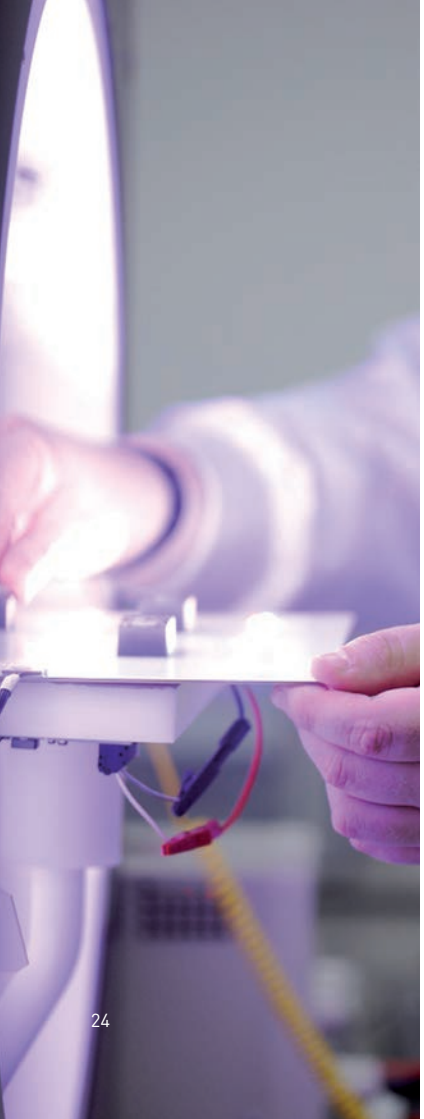




BE CLOSE TO THE SUN WITH PI-LED

WORLDWIDE PATENTED

- ✓ **Health and well-being**
  Stable health and perceptible increase in performance because of PI-LED
- ✓ **Daylight indoors and outdoors**
  Automatic daytime sequences along the Planckian curve
  Colour temperature 1,800K to 16,000K
- ✓ **Colour rendition**
  Wide spectrum with colour rendition CRI 90
- ✓ **Light for every mood**
  Fireplace or twilight: PI-LED transforms each space into an oasis of light
  Custom control of all RGB colours within the PI-LED colour space
- ✓ **Efficient**
  Constantly high energy efficiency from warm white to cold white
- ✓ **Quality**
  100% calibration and temperature compensated for smallest colour tolerances (Mac Adams typ.1)
  Channels: 3 (Control within the CIE colour space: triangle)
  Independent control of blue (for example nightlight)
- ✓ **Everything from a single source**
  Smart control of daytime sequences with NeoLink Air or DALI DT8





LUMITECH CONTACT

Please contact our company headquarters in Jennersdorf (Burgenland), Austria or our Sales Office in Vienna if you have any questions, would like to place an order or want to give us feedback. You can contact us by telephone between 8.00 a.m. - 5.00 p.m. from Monday to Thursday and between 8.00 a.m. and 2.30 p.m. on Friday, or by e-mail.

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